## 5th Grade CALIFORNIA



# CALIFORNIA Co 

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## CALIFORNIA

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## Fluency with Whole Numbers and Decimals

Critical Area Extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations

Project: In the Chef's Kitchen.

## 1 Place Value, Multiplication, and Expressions

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## Chapter 1 Overview

In this chapter, you will explore and discover answers to the following Essential Questions:

- How can you use place value, multiplication, and expressions to represent and solve problems?
- How can you read, write, and represent whole numbers through millions?
- How can you use properties and multiplication to solve problems?
- How can you use expressions to represent and solve a problem?


## Chapter 2 Overview

In this chapter, you will explore and discover answers to the following
Essential Questions:

- How can you divide whole numbers?
- What strategies have you used to place the first digit in the quotient?
- How can you use estimation to help you divide?
- How do you know when to use division to solve a problem?


## Chapter 3 Overview

In this chapter, you will explore and discover answers to the following Essential Questions:

- How can you add and subtract decimals?
- What methods can you use to find decimal sums and differences?
- How does using place value help you add and subtract decimals?
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## Chapter 4 Overview

In this chapter, you will explore and discover answers to the following
Essential Questions:

- How can you solve decimal multiplication problems?
- How is multiplying with decimals similar to multiplying with whole numbers?
- How can patterns, models, and drawings help you solve decimal multiplication problems?
- How do you know where to place a decimal point in a product?
- How do you know the correct number of decimal places in a product?


## Chapter 5 Overview

In this chapter, you will explore and discover answers to the following

## Essential Questions:

- How can you solve decimal division problems?
- How is dividing with decimals similar to dividing with whole numbers?
- How can patterns, models, and drawings help you solve decimal division problems?
- How do you know where to place a decimal point in a quotient?
- How do you know the correct number of decimal places in a quotient?


## Operations with Fractions

Critical Area Developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions)

## 0 <br> DIGITAL

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Chapter 6 Overview
In this chapter, you will explore and discover answers to the following Essential Questions:

- How can you add and subtract fractions with unlike denominators?
- How do models help you find sums and differences of fractions?
- When you add and subtract fractions, when do you use the least common denominator?

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## Chapter 7 Overview

In this chapter, you will explore and discover answers to the following
Essential Questions:

- How do you multiply fractions?
- How can you model fraction multiplication?
- How can you compare fraction factors and products?


## Chapter 8 Overview

In this chapter, you will explore and discover answers to the following Essential Questions:

- What strategies can you use to solve division problems involving fractions?
- What is the relationship between multiplication and division, and how can you use it to solve division problems?
- How can you use fractions, diagrams, equations, and story problems to represent division?
- When you divide a whole number by a fraction or a fraction by a whole number, how do the dividend, the divisor, and the quotient compare?


## Critical Area

## Geometry and Measurement

2sse common Critical Area Developing understanding of volume

Project: Space Architecture 386

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## Chapter 9 Overview

In this chapter, you will explore and discover answers to the following Essential Questions:

- How can you use line plots, coordinate grids, and patterns to help you graph and interpret data?
- How can a line plot help you find an average with data given in fractions?
- How can a coordinate grid help you interpret experimental and real-world data?
- How can you write and graph ordered pairs on a coordinate grid using two numerical patterns?

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In this chapter, you will explore and discover answers to the following Essential Questions:

- What strategies can you use to compare and convert measurements?
- How can you decide whether to multiply or divide when you are converting measurements?
- How can you organize your solution when you are solving a multistep measurement problem?
- How is converting metric measurements different from converting customary measurements?


## Chapter 11 Overview

In this chapter, you will explore and discover answers to the following Essential Questions:

- How do unit cubes help you build solid figures and understand the volume of a rectangular prism?
- How can you identify, describe, and classify three-dimensional figures?
- How can you find the volume of a rectangular prism?

1. Geometry and Volume
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CALIFORNIA COMMON CORE STANDARDS
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## In the Chef's Kitchen

Restaurant chefs estimate the amount of food they need to buy based on how many diners they expect. They usually use recipes that make enough to serve large numbers of people.

## Get Started

Although apples can grow in any of the 50 states, Pennsylvania is one of the top apple-producing states. The ingredients at the right are needed to make 100 servings of Apple Dumplings. Suppose you and a partner want to make this recipe for 25 friends. Adjust the amount of each ingredient to make just 25 servings.

## Important Facts

## Apple Dumplings (100 servings)

- 100 baking apples
- 72 tablespoons sugar ( $4 \frac{1}{2}$ cups)
- 14 cups all-purpose flour
- 6 teaspoons baking powder
- 24 eggs
- 80 tablespoons butter ( 10 sticks of butter)
- 50 tablespoons chopped walnuts (31 $\frac{1}{8}$ cups)



## Place Value, Multiplication, and Expressions

## Show What You Know

Check your understanding of important skills.
Name $\qquad$

Place Value Write the value of each digit for the given number.

1. 2,904
2. 6,423

2 $\qquad$ 6 $\qquad$
9 $\qquad$ 4 $\qquad$

0 $\qquad$ 2 $\qquad$
4 $\qquad$ 3 $\qquad$

Regroup Through Thousands Regroup. Write the missing numbers.
3. 40 tens $=$ $\qquad$ hundreds
4. 60 hundreds $=$ $\qquad$ thousands
5. $\qquad$ tens 15 ones $=6$ tens 5 ones
6. 18 tens 20 ones $=$ $\qquad$ hundreds

## Missing Factors Find the missing factor.

7. $4 \times$ $\qquad$ $=24$
8. $6 \times$ $\qquad$ $=48$
9. $\qquad$ $\times 9=63$

## Clues

- This 7 -digit number is $8,920,000$ when rounded to the nearest ten thousand.
- The digits in the tens and hundreds places are the least and same value.
- The value of the thousands digit is double that of the ten thousands digit.
- The sum of all its digits is 24 .


## Vocabulary Builder

## Visualize It

## Sort the review words into the Venn diagram.



## Understand Vocabulary

## Write the preview words that answer the question "What am I?"

1. I am a group of 3 digits separated by commas in a multidigit number. $\qquad$
2. I am a mathematical phrase that has numbers and operation signs but no equal sign. $\qquad$
3. I am operations that undo each other, like multiplication and division.
4. I am the property that states that multiplying a sum by a number is the same as multiplying each addend in the sum by the number and then adding the products.
5. I am a number that tells how many times the base is used as a factor. $\qquad$
$\qquad$
$\qquad$

## Review Words

estimate
factor
multiply
place value
product
quotient

## Preview Words

base
Distributive Property
evaluate
exponent
inverse operations
numerical expression order of operations
period

## Place Value and Patterns

Essential Question How can you describe the relationship between two place-value positions?

## Investigate

Materials $■$ base-ten blocks
You can use base-ten blocks to understand the relationships among place-value positions. Use a large cube for 1,000 , a flat for 100 , a long for 10 , and a small cube for 1 .

| Number | 1,000 | 100 | 10 | 1 |
| :--- | :---: | :---: | :---: | :---: |
| Model |  |  |  |  |
| Description | large <br> cube | flat | long | small <br> cube |

Complete the comparisons below to describe the relationship from one place-value position to the next place-value position.
A. - Look at the long and compare it to the small cube.

The long is $\qquad$ times as much as the small cube.

- Look at the flat and compare it to the long.

The flat is $\qquad$ times as much as the long.

- Look at the large cube and compare it to the flat.

The large cube is $\qquad$ times as much as the flat.
B. - Look at the flat and compare it to the large cube.

The flat is $\qquad$ of the large cube.

- Look at the long and compare it to the flat.

The long is $\qquad$ of the flat.

- Look at the small cube and compare it to the long.

The small cube is $\qquad$ of the long.


Mathematical Practices

How many times as much is the flat compared to the small cube? the large cube to the small cube? Explain.

## Draw Bonclusions

 see when you move from a lesser place-value position to the next greater place-value position.
$\qquad$
$\qquad$
$\qquad$
2.

Marif:waical (7) Look for a Pattern Describe the pattern you see when you move from a greater place-value position to the next lesser place-value position.
$\qquad$
$\qquad$
$\qquad$

## Make Connections

You can use your understanding of place-value patterns and a place-value chart to write numbers that are 10 times as much as or $\frac{1}{10}$ of any given number.

| Hundred <br> Thousands | Ten Thousands | One Thousands | Hundreds | Tens | Ones |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | 3 | 0 | 0 |
|  |  | ? | 300 | ? |  |

$\qquad$

$\qquad$ as 300 .
is $\frac{1}{10}$ of 300 .
Use the steps below to complete the table.
STEP 1 Write the given number in a place-value chart.

STEP 2 Use the place-value chart to write a number that is 10 times as much as the given number.

STEP 3 Use the place-value chart to write a number that is $\frac{1}{10}$ of the given number.

| Number | $\mathbf{1 0}$ times as <br> much as | $\frac{\mathbf{1}}{\mathbf{1 0}}$ of |
| :---: | :---: | :---: |
| 10 |  |  |
| 70 |  |  |
| 9,000 |  |  |

$\qquad$

## Share and Show

## Complete the sentence.

1. 500 is 10 times as much as $\qquad$ .
2. 20,000 is $\frac{1}{10}$ of $\qquad$ .
3. 900 is $\frac{1}{10}$ of $\qquad$ .

Use place-value patterns to complete the table.

| Number | 10 times as <br> much as | $\frac{1}{10}$ of |
| :---: | :---: | :---: |
| 5. 10 |  |  |
| 6. 3,000 |  |  |
| 7. 800 |  |  |
| 8. 50 |  |  |


| Number | 10 times as <br> much as | $\frac{1}{10}$ of |
| :--- | :---: | :---: |
| 9. 400 |  |  |
| 10. 90 |  |  |
| 11. 6,000 |  |  |
| 12. 200 |  |  |

## THINKSMARTER Complete the sentence with 100 or $\mathbf{1 , 0 0 0}$.

13. 200 is $\qquad$ times as much as 2.
14. 4,000 is $\qquad$ times as much as 4.
15. 700,000 is $\qquad$ times as much as 700 .
16. 600 is $\qquad$ times as much as 6 .

## Problem Solving • Applications

17. WRITE Math Explain how you can use place-value patterns to describe how 50 and 5,000 compare.
$\qquad$
$\qquad$
18. Mary inaical (2) Use Reasoning 30,000 is $\qquad$ times as much as 30 .

So, $\qquad$ is 10 times as much as 3,000 .

## THINKSMARTER Sense or Nonsense?

19. Mark and Robyn used base-ten blocks to show that 200 is 100 times as much as 2 . Whose model makes sense? Whose model is nonsense? Explain your reasoning.

Mark's Work


Robyn's Work

20. GIDEEPER Explain how you would help Mark understand why he should have used small cubes instead of longs.
$\qquad$
$\qquad$
$\qquad$
21. THINK SMARTER For numbers 21a-21c, choose True or False for each sentence.

21a. 600 is $\frac{1}{10}$ of 6,000 .
○ True

O False
21b. 67 is $\frac{1}{10}$ of 6,700 .
○ True
O False

21c. 1,400 is 10 times as much as 140 .
O True
False

## Place Value of Whole Numbers

Essential Question How do you read, write, and represent whole numbers through hundred millions?

## 1 Unlock the Problem

The diameter of the sun is $1,392,000$ kilometers.
To understand this distance, you need to understand the place value of each digit in 1,392,000.

A place-value chart contains periods. In numbers a period is a group of three digits separated by commas in a multidigit number. The millions period is left of the thousands period. One million is 1,000 thousands and is written as $1,000,000$.


| Periods |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| MILLIONS |  |  | $\downarrow$ |  |  | $\downarrow$ |  |  |
|  |  |  | THOUSANDS |  |  | ONES |  |  |
| Hundreds | Tens | Ones | Hundreds | Tens | Ones | Hundreds | Tens | Ones |
|  |  | 1, | 3 | 9 | 2 | ,0 | 0 | 0 |
|  |  | $1 \times 1,000,000$ | $3 \times 100,000$ | $9 \times 10,000$ | $2 \times 1,000$ | $0 \times 100$ | $0 \times 10$ | $0 \times 1$ |
|  |  | 1,000,000 | 300,000 | 90,000 | 2,000 | 0 | 0 | 0 |

The place value of the digit 1 in $1,392,000$ is millions. The value of 1 in $1,392,000$ is $1 \times 1,000,000=1,000,000$.

Standard Form: 1,392,000
Word Form: one million, three hundred ninety-two thousand
Expanded Form:
$(1 \times 1,000,000)+(3 \times 100,000)+(9 \times 10,000)+(2 \times 1,000)$

Try This! Use place value to read and write numbers.

Standard Form: 582,030
Word Form: five hundred eighty-two $\qquad$ ,

Expanded Form: $(5 \times 100,000)+$ $\qquad$ $\times$ $\qquad$ $)+(2 \times 1,000)+($ $\qquad$ $\times$ $\qquad$ )

- The average distance from Jupiter to the sun is four hundred eighty-three million, six hundred thousand miles. Write the number that shows this distance in miles. $\qquad$


## Place-Value Patterns

Canada's land area is about $4,000,000$ square miles. Iceland has a land area of about 40,000 square miles. Compare the two areas.

## ( Example 1 use a place-value chart.

STEP 1 Write the numbers in a place-value chart.

| MILLIONS |  |  | THOUSANDS |  |  | ONES |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Hundreds | Tens | Ones | Hundreds | Tens | Ones | Hundreds | Tens | Ones |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

## STEP 2

Count the number of whole number place-value positions.
4,000,000 has $\qquad$ more whole number places than 40,000 .

Think: 2 more places is $10 \times 10$, or 100 .
$4,000,000$ is $\qquad$ times as much as 40,000.

So, Canada's estimated land area is $\qquad$ times as much as Iceland's estimated land area.

You can use place-value patterns to rename a number.

## 1. Example 2 use place-value patterns.

Rename 40,000 using other place values.

| 40,000 | 4 ten thousands | $4 \times 10,000$ |
| :--- | :--- | :--- |
| 40,000 | $-\quad$ thousands | $-\times 1,000$ |
| 40,000 |  |  |

$\qquad$

## Share and Show

1. Complete the place-value chart to find the value of each digit.

| MILLIONS |  |  | THOUSANDS |  |  | ONES |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Hundreds | Tens | Ones | Hundreds | Tens | Ones | Hundreds | Tens | Ones |
|  |  | 7, | 3 | 3 | 3, | 8 | 2 | 0 |
|  |  | $7 \times 1,000,000$ | $3 \times$ |  | $3 \times 10,000$ | $\times 1,000$ | $8 \times 100$ |  |
|  |  |  |  | 30,000 | 3,000 |  | 20 | 0 |

Write the value of the underlined digit.
2. $1,574,833$
3. 598,1024. $7,0 \underline{9} 3,455$
5. $\underline{3} 01,256,878$

Write the number in two other forms.
6. $(8 \times 100,000)+(4 \times 1,000)+(6 \times 1)$
$\qquad$
$\qquad$

## On Your Own

Write the value of the underlined digit.
8. $849,567,043$
9. $9, \underline{4} 22,850$

$\qquad$ | $9,422,850$ |
| :--- |

10. 96,283
11. $498,354,021$
12. $791, \underline{3} 50$
13. $27,911,534$
$\qquad$
14. seven million, twenty thousand, thirty-two
$\qquad$
$\qquad$
15. ${ }^{-1}$
$\qquad$
16. $8,26 \underline{6}, 178$
17. $105,980,774$
$\qquad$
Write the number in two other forms.
18. 345,000
$\qquad$
$\qquad$
$\qquad$
$\qquad$
19. 119,000,003
$\qquad$
$\qquad$

## Problem Solving • Applications

## Use the table for 18-19.

18. Which planet is about 10 times as far as Earth is from the Sun?
19. 



Analyze Relationships Which planet is about $\frac{1}{10}$ of the distance Uranus is from the Sun?

| Average Distance from the Sun <br> (in thousands of km) |  |  |  |
| :--- | ---: | :--- | ---: |
| Mercury | 57,910 | Jupiter | 778,400 |
| Venus | 108,200 | Saturn | $1,427,000$ |
| Earth | 149,600 | Uranus | $2,871,000$ |
| Mars | 227,900 | Neptune | $4,498,000$ |

$\qquad$
20. THINKSMARTER What's the Error? Matt wrote the number four million, three hundred five thousand, seven hundred sixty-two as $4,350,762$. Describe and correct his error.
$\qquad$
21. GIDEEPER Explain how you know that the values of the digit 5 in the numbers 150,000 and 100,500 are not the same.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
22. THINKSMARTER Select other ways to write 400,562 . Mark all that apply.
(A) $(4 \times 100,000)+(50 \times 100)+(6 \times 10)+(2 \times 1)$
(B) four hundred thousand, five hundred sixty-two
(C) $(4 \times 100,000)+(5 \times 100)+(6 \times 10)+(2 \times 1)$
(D) four hundred, five hundred sixty-two

## Properties

Essential Question How can you use properties of operations to solve problems?
You can use the properties of operations to help you evaluate numerical expressions more easily.


Operations and Algebraic Thinking-5.0A. 1 mathematical practices MP.2, MP. 8

Properties of Addition
Commutative Property of Addition
If the order of addends changes, the sum stays the same.
$12+7=7+12$
Associative Property of Addition
If the grouping of addends changes, the sum stays the same.
$5+(8+14)=(5+8)+14$
Identity Property of Addition
The sum of any number and 0 is that number.
$13+0=13$

## Properties of Multiplication

Commutative Property of Multiplication
If the order of factors changes, the product stays the same.
$4 \times 9=9 \times 4$
Associative Property of Multiplication
If the grouping of factors changes, the product stays the same. $11 \times(3 \times 6)=(11 \times 3) \times 6$
Identity Property of Multiplication
The product of any number and 1 is that number.
$4 \times 1=4$

## Unlock the Problem

The table shows the number of bones in several parts of the human body. What is the total number of bones in the ribs, the skull, and the spine?

To find the sum of addends using mental math, you can use the Commutative and Associative Properties.

| Part | Number of Bones |
| :--- | :---: |
| Ankle | 7 |
| Ribs | 24 |
| Skull | 28 |
| Spine | 26 |

(I)

Use properties to find $24+28+26$.

$$
24+28+26=28+\ldots+26 \text { Use the ___ Property to reorder the addends. }
$$

$=28+(24+\ldots)$ Use the ___ Property to group the addends.
$=28+\quad$ Use mental math to add.

So, there are $\qquad$ bones in the ribs, the skull, and the spine.

Explain why grouping 24 and 26 makes the problem easier to solve.

## Distributive Property

Multiplying a sum by a number is the same as multiplying each addend by the number and then adding the products.

$$
5 \times(7+9)=(5 \times 7)+(5 \times 9)
$$

The Distributive Property can also be used with multiplication and subtraction. For example, $2 \times(10-8)=(2 \times 10)-(2 \times 8)$.

## (1) Example 1 Use the Distributive Property to find the product.

 one Way Use addition.$8 \times 59=8 \times(\quad+9)$
$\qquad$ $\times 50)+(8 \times$ $\qquad$ Use the Distributive Property.
$=$ $\qquad$ $+$ $\qquad$ Use mental math to multiply.
$=$ $\qquad$ Use mental math to add.

## Another Way use subtraction.

$8 \times 59=8 \times(\ldots \quad$ Use a multiple of 10 to write 59 as a difference.
$\qquad$ $\times 60)-(8 \times$ $\qquad$ ) Use the Distributive Property.
$\qquad$
$\qquad$ Use mental math to multiply.
$=$ $\qquad$ Use mental math to subtract.

## (Example 2 complete the equation, and tell which property you used.

(A) $23 \times$ $\qquad$ $=23$
(B) $47 \times 15=15 \times$ $\qquad$
Think: A number times 1 is equal to itself.

Property: $\qquad$

Think: Changing the order of factors does not change the product.

Property: $\qquad$
$\qquad$

## Share and Show

1. Use properties to find $4 \times 23 \times 25$.
$23 \times$ $\qquad$ $\times 25$ $\qquad$ Property of Multiplication
$23 \times($ $\qquad$ $\times$ $\qquad$ ) $\qquad$ Property of Multiplication
$23 \times$ $\qquad$
$\qquad$
Use properties to find the sum or product.
2. $89+27+11$
3. $9 \times 52$
$\qquad$
4. $107+0+39+13$

Complete the equation, and tell which property you used.
5. $9 \times(30+7)=(9 \times$ $\qquad$ $)+(9 \times 7)$
6. $0+$ $\qquad$ $=47$

## On Your Own



Mathematical Practices
Describe how you can use properties to solve problems more easily.

Practice: Copy and Solve Use properties to find the sum or product.
7. $3 \times 78$
8. $4 \times 60 \times 5$
9. $21+25+39+5$

Complete the equation, and tell which property you used.
10. $11+(19+6)=(11+$ $\qquad$ ) +6
11. $25+14=$ $\qquad$ $+25$
12. Mandinaical 3 Apply Show how you can use the Distributive Property to rewrite and find $(32 \times 6)+(32 \times 4)$.

## Problem Solving • Applications

13. G■DEEPER Three friends' meals at a restaurant cost $\$ 13, \$ 14$, and $\$ 11$. Use parentheses to write two different expressions to show how much the friends spent in all. Which property does your pair of expressions demonstrate?
 Which property did Sylvia use?
$\qquad$
14. Sylvia bought 8 tickets to a concert. Each ticket costs $\$ 18$. To find the total cost in dollars, she added the product $8 \times 10$ to the product $8 \times 8$, for a total of 144 .
$\qquad$ WRITE Math . Show Your Work
15. IHINKSMARTER Sense or Nonsense? Julie wrote $(15-6)-3=15-(6-3)$. Is Julie's equation sense or nonsense? Do you think the Associative Property works for subtraction? Explain.

16. THINKSMARIER Find the property that each equation shows.

| $14 \times(4 \times 9)=(14 \times 4) \times 9$ | - Commutative Property of Multiplication |
| :--- | :--- |
| $1 \times 3=3 \times 1$ - | - Associative Property of Multiplication |
| $7 \times 3=3 \times 7$ - | Identity Property of Multiplication |

$\qquad$

## Powers of 10 and Exponents

Essential Question How can you use an exponent to show powers of 10?

## Unlock the Problem

Expressions with repeated factors, such as $10 \times 10 \times 10$, can be written by using a base with an exponent. The base is the number that is used as the repeated factor. The exponent is the number that tells how many times the base is used as a factor.


Word form: the third power of ten
Exponent form: $10^{3}$

## (1) Activity use base-ten blocks.

Materials $\quad$ base-ten blocks
What is $10 \times 1,000$ written with an exponent?


- How many ones are in 1 ? $\qquad$
- How many ones are in 10 ? $\qquad$
- How many tens are in 100 ? $\qquad$
Think: 10 groups of 10 or $10 \times 10$
- How many hundreds are in 1,000 ? $\qquad$
Think: 10 groups of 100 or $10 \times(10 \times 10)$
- How many thousands are in 10,000 ? $\qquad$ -

In the box at the right, draw a quick picture to show 10,000.

So, $10 \times 1,000$ is 10

Number and Operations in Base Ten-5.NBT. 2

## Example Multiply a whole number by a power of ten.

Hummingbirds beat their wings very fast. The smaller the hummingbird is, the faster its wings beat. The average hummingbird beats its wings about $3 \times 10^{3}$ times a minute. How many times a minute is that, written as a whole number?

Multiply 3 by powers of ten. Look for a pattern.
$3 \times 10^{0}=3 \times 1=$ $\qquad$

$3 \times 10^{1}=3 \times 10=$ $\qquad$
$3 \times 10^{2}=3 \times 10 \times 10=$ $\qquad$
$3 \times 10^{3}=3 \times 10 \times 10 \times 10=$ $\qquad$

So, the average hummingbird beats its wings about $\qquad$ times a minute.

- Mainimatical (7) Look for a Pattern What pattern do you see?
$\qquad$
$\qquad$


## Share and Show

Write in exponent form and word form.

1. $10 \times 10$

Exponent form: $\qquad$
Word form: $\qquad$
$\qquad$

Find the value.
3. $10^{2}$
4. $4 \times 10^{2}$
5. $7 \times 10^{3}$
$\qquad$

## On Your Own

## Write in exponent form and word form.

6. $10 \times 10 \times 10$
exponent form: $\qquad$
word form: $\qquad$
7. $10 \times 10 \times 10 \times 10 \times 10$
exponent form: $\qquad$
word form: $\qquad$
$\qquad$

## Find the value.

8. $10^{4}$
9. $2 \times 10^{3}$
10. $6 \times 10^{4}$

## GDDEEPER <br> Complete the pattern.

11. $7 \times 10^{0}=7 \times 1=$ $\qquad$
$7 \times 10^{1}=7 \times 10=$ $\qquad$
$7 \times 10^{2}=7 \times 100=$ $\qquad$
$7 \times 10^{3}=7 \times 1,000=$ $\qquad$
$7 \times 10^{4}=7 \times 10,000=$ $\qquad$
12. $12 \times 10^{0}=12 \times 1=$ $\qquad$
$12 \times 10^{1}=12 \times 10=$ $\qquad$
$12 \times 10^{2}=12 \times 100=$ $\qquad$
$12 \times 10^{3}=12 \times 1,000=$ $\qquad$
$12 \times 10^{4}=12 \times 10,000=$ $\qquad$
13. $9 \times 10^{0}=$ $\qquad$ $=9$
$9 \times 10^{1}=$ $\qquad$ $=90$
$9 \times 10^{2}=$ $\qquad$ $=900$
$9 \times 10^{3}=$ $\qquad$ $=9,000$
$9 \times 10^{4}=$ $\qquad$ $=90,000$
14. Martimatical (2) Reason Abstractly $10^{3}=10 \times 10^{n}$ What is the value of $n$ ?

Think: $10^{3}=10 \times$ $\qquad$ $\times$ $\qquad$ ,
or $10 \times$ $\qquad$
The value of $n$ is $\qquad$ .
15. WRITE Math Explain how to write 50,000 using exponents.

## Unlock the Problem

16. THINKSMARTER Lake Superior is the largest of the Great Lakes. It covers a surface area of about 30,000 square miles. How can you show the estimated area of Lake Superior as a whole number multiplied by a power of ten?

a. What are you asked to find?
$\qquad$
b. How can you use a pattern to find the answer?
c. Write a pattern using the whole number 3 and powers of ten.
$3 \times 10^{0}=3 \times 1=$ $\qquad$
$3 \times 10^{1}=3 \times 10=$ $\qquad$
$3 \times 10^{2}=$ $\qquad$ $=$ $\qquad$
$3 \times 10^{3}=$ $\qquad$ $=$ $\qquad$
$3 \times 10^{4}=$ $\qquad$ $=$ $\qquad$
d. Complete the sentence.

The estimated area of Lake Superior is $\qquad$ .
17. The Earth's diameter through the equator is about 8,000 miles. What is the Earth's estimated diameter written as a whole number multiplied by a power of ten?
18. THINKSMARTER Yolanda says $10^{5}$ is the same as 50 because $10 \times 5$ equals 50 . What was Yolanda's mistake?
$\qquad$

## Multiplication Patterns

Essential Question How can you use a basic fact and a pattern to multiply by a 2-digit number?

Number and Operations in Base Ten-5.NBT. 2

## Unlock the Problem

How close have you been to a bumblebee?

The actual length of a queen bumblebee is about 20 millimeters. The photograph shows part of a bee under a microscope, at 10 times its actual size. What would the length of the bee appear to be at a magnification of 300 times its actual size?

- 

Use a basic fact and a pattern.
Multiply. $300 \times 20$
$3 \times 2=6 \leftarrow$ basic fact
$30 \times 2=(3 \times 2) \times 10^{1}=60$
$300 \times 2=(3 \times 2) \times 10^{2}=$ $\qquad$


What pattern do you see in the number sentences and the exponents? about $\qquad$ millimeters.

- What would the length of the bee shown in the photograph appear to be if the microscope shows it at 10 times its actual size?


## P. Example use mental math and a pattern.

Multiply. $50 \times 8,000$

$$
\begin{aligned}
5 \times 8 & =40 \quad \leftarrow \text { basic fact } \\
5 \times 80 & =(5 \times 8) \times 10^{1}=400 \\
5 \times 800 & =(5 \times 8) \times 10^{2}= \\
50 \times 800 & =(5 \times 8) \times(10 \times 100)=40 \times 10^{3}= \\
50 \times 8,000 & =(5 \times 8) \times(10 \times 1,000)=40 \times 10^{4}=
\end{aligned}
$$

## Share and Show

## Use mental math and a pattern to find the product.

1. $30 \times 4,000=$ $\qquad$

- What basic fact can you use to help you find $30 \times 4,000$ ? $\qquad$


## Use mental math to complete the pattern.

2. $1 \times 1=1$
$1 \times 10^{1}=$ $\qquad$
$1 \times 10^{2}=$ $\qquad$
$1 \times 10^{3}=$ $\qquad$

## On Your Own

## Use mental math to complete the pattern.

5. $9 \times 5=45$
$(9 \times 5) \times 10^{1}=$ $\qquad$
$(9 \times 5) \times 10^{2}=$ $\qquad$
$(9 \times 5) \times 10^{3}=$ $\qquad$
6. $3 \times 7=21$

$$
(3 \times 7) \times 10^{1}=
$$

$\qquad$
$(3 \times 7) \times 10^{2}=$ $\qquad$
$(3 \times 7) \times 10^{3}=$ $\qquad$
4. $6 \times 5=$ $\qquad$ $(6 \times 5) \times$ $\qquad$ $=300$
$(6 \times 5) \times$ $\qquad$ $=3,000$
$(6 \times 5) \times$ $\qquad$ $=30,000$

Explain how to find $50 \times 9,000$ by using a basic fact and pattern.
7. $5 \times 4=$ $\qquad$
$(5 \times 4) \times$ $\qquad$ $=200$
$(5 \times 4) \times$ $\qquad$ $=2,000$
$(5 \times 4) \times$ $\qquad$ $=20,000$

Use mental math and a pattern to find the product.
8. $(6 \times 6) \times 10^{1}=$ $\qquad$
9. $(7 \times 4) \times 10^{3}=$ $\qquad$
10. $(9 \times 8) \times 10^{2}=$ $\qquad$
11. $(4 \times 3) \times 10^{2}=$ $\qquad$
12. $(2 \times 5) \times 10^{3}=$ $\qquad$
13. $(2 \times 8) \times 10^{2}=$ $\qquad$
14. $(6 \times 5) \times 10^{3}=$ $\qquad$ 15. $(8 \times 8) \times 10^{4}=$ $\qquad$
16. $(7 \times 8) \times 10^{4}=$ $\qquad$
17. THINKSMARTER What does the product of any whole-number factor multiplied by 100 always have? Explain.
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Use mental math to complete the table.

18. 1 roll $=50$ dimes Think: 50 dimes per roll $\times 20$ rolls $=(5 \times 2) \times(10 \times 10)$

| Rolls | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Dimes | $10 \times 10^{2}$ |  |  |  |  |  |  |  |  |

19. 1 roll $=40$ quarters Think: 40 quarters per roll $\times 20$ rolls $=(4 \times 2) \times(10 \times 10)$

| Rolls | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Quarters | $8 \times 10^{2}$ |  |  |  |  |  |  |  |  |


| $\times$ | $\mathbf{6}$ | $\mathbf{7 0}$ | $\mathbf{8 0 0}$ | $\mathbf{9 , 0 0 0}$ |
| :---: | :---: | :---: | :---: | :---: |
| $\mathbf{8 0}$ |  |  | $64 \times 10^{3}$ |  |
| $\mathbf{9 0}$ |  |  |  | $81 \times 10^{4}$ |

## Problem Solving • Applications

## Use the table for 22-24.

22. What if you magnified the image of a cluster fly by $9 \times 10^{3}$ ? What would the length appear to be?
23. GПDEEPER If you magnified the images of a fire ant by $4 \times 10^{3}$ and a tree hopper by $3 \times 10^{3}$, which

Arthropod Lengths
Arthropod

| Arhropod | Length <br> (in millimeters) |
| :--- | :---: |
| Cluster Fly | 9 |
| Crab Spider | 5 |
| Fire Ant | 4 |
| Tree Hopper | 6 |


 to magnify the image of a fire ant and a crab spider so they appear to be the same length. How many times their actual sizes would he need to magnify each image? pancilc: 2) Reason Quantitatively John wants
to magnify the image of a fire ant and a crab spider
$\qquad$
$\qquad$

## Connect to Health

Blood Cells
Blood is necessary for all human life. It contains red blood cells and white blood cells that nourish and cleanse the body and platelets that stop bleeding. The average adult has about 5 liters of blood.

Use patterns and mental math to solve.
25. GDDEEPER

A human body has about 30 times as many platelets as white blood cells. A small sample of blood has $8 \times 10^{3}$ white blood cells. About how many platelets are in the sample?
27. Lymphocytes and eosinophils are types of white blood cells. A blood sample has about 10 times as many lymphocytes as eosinophils. If there are $2 \times 10^{2}$ eosinophils in the sample, about how many lymphocytes are there?
26. Basophils and monocytes are types of white blood cells. A blood sample has about 5 times as many monocytes as basophils. If there are 60 basophils in the sample, about how many monocytes are there?
28. THINKSMARTER An average person has $6 \times 10^{2}$ times as many red blood cells as white blood cells. A small sample of blood has $7 \times 10^{3}$ white blood cells. About how many red
 blood cells are in the sample?
$\qquad$
29. THINKSMARTER Kyle says $20 \times 10^{4}$ is the same as 20,000 . He reasoned that since he saw 4 as the exponent he should write 4 zeros in his answer. Is Kyle correct?
$\qquad$

Standards Practice Book
$\qquad$

## (V) Mid-Chapter Checkpoint

## Vocabulary

Vocabulary
Choose the best term for the box.

1. A group of three digits separated by commas in a multidigit number is a $\qquad$ . (p. 9)

## base

exponent
period
2. An $\qquad$ is the number that tells how many times a base is used as a factor. (p. 17)

## Concepts and Skills

Complete the sentence. (5.NBT.1)
3. 7 is $\frac{1}{10}$ of $\qquad$ .

Write the value of the underlined digit. (5.NBT.1)
5. $6,5 \underline{8} 1,678$
$\qquad$
6. $125, \underline{6} 34$
$\xrightarrow{ }$
4. 800 is 10 times as much as $\qquad$ .

Complete the equation, and tell which property you used. (5.0A.1)
$\qquad$

Find the value. (5.nвт.2)
7. $34,634,803$
$\qquad$
8. $2, \underline{Z} 64,835$
$\qquad$
9. $8 \times(14+7)=\square+(8 \times 7)$
$\qquad$
10. $7+(8+12)=$ $\qquad$ $+12$
11. $10^{3}$
$\qquad$

Use mental math and a pattern to find the product. (5.NBT.2)
14. $70 \times 300=$ $\qquad$
15. $(3 \times 4) \times 10^{3}=$ $\qquad$
16. DVDs are on sale for $\$ 24$ each. Felipe writes the expression $4 \times 24$ to find the cost in dollars of buying 4 DVDs. How can you rewrite Felipe's expression using the Distributive Property? (5.0A.1)
17. The Muffin Shop chain of bakeries sold 745,305 muffins last year. Write this number in expanded form. (5.Nвт.1)
18. The soccer field at Mario's school has an area of 6,000 square meters.

How can Mario show the area as a whole number multiplied by a power of ten? (5.NBT.2)
19. Ms. Alonzo ordered 4,000 markers for her store. Only $\frac{1}{10}$ of them arrived.

How many markers did she receive? (5.NBт.1)
20. Mark wrote the highest score he made on his new video game as the product of $70 \times 6,000$. What was his score? (5.nвт.2)

## Multiply by 1-Digit Numbers

Essential Question How do you multiply by 1-digit numbers?

## Unlock the Problem

Each day an airline flies 9 commercial jets from New York to London, England. Each plane holds 293 passengers. If every seat is taken on all flights, how many passengers fly on this airline from New York to London in 1 day?

## (Use place value and regrouping.

STEP 1 Estimate: $293 \times 9$

Think: $300 \times 9=$ $\qquad$


STEP 2 Multiply the ones.
A The Queen's Guard protects Britain's Royal Family and their residences.

$$
\begin{array}{rl}
293 & 9 \times 3 \text { ones }= \\
\times \quad 9 \\
\hline 7 & \text { Write the ones and the } \\
& \\
& \text { regrouped tens. }
\end{array}
$$

## Math <br> Talk

Mathematical Practices
Explain how you record the 27 ones when you multiply 3 by 9 in Step 2.
STEP 3 Multiply the tens.

$$
\begin{array}{rl}
82 \\
293 & 9 \times 9 \text { tens }= \\
\times \quad 9 & \text { tens } \\
\hline 37 & \text { Add the regrouped tens. }
\end{array}
$$

$\qquad$ tens +2 tens $=$ $\qquad$ tens

Write the tens and the regrouped hundreds.
STEP 4 Multiply the hundreds.
$\qquad$ hundreds +8 hundreds $=$ $\qquad$ hundreds Write the hundreds.

So, in 1 day, $\qquad$ passengers fly from New York to London.
$\qquad$

## (1) Example

A commercial airline makes several flights each week from New York to Paris, France. If the airline serves 1,978 meals on its flights each day, how many meals are served for the entire week?

To multiply a greater number by a 1 -digit number, repeat the process of multiplying and regrouping until every place value is multiplied.

STEP 1 Estimate. 1,978 $\times 7$

Think: $2,000 \times 7=$ $\qquad$
STEP 2 Multiply the ones.

$$
\begin{aligned}
\begin{array}{r}
5 \\
1,978 \\
\times \quad 7
\end{array} & 7 \times 8 \text { ones }= \\
\hline 6 & \begin{array}{l}
\text { Write the ones and the } \\
\\
\\
\\
\text { regrouped tens. }
\end{array}
\end{aligned}
$$



- The Eiffel Tower in Paris, France, built for the 1889 World's Fair, was the world's tallest man-made structure for 40 years.

STEP 3 Multiply the tens.

$$
\begin{array}{rl}
55 & \\
1,978 & 7 \times 7 \text { tens }= \\
\times \quad 7 & \\
\hline 46 & \text { Add the regrouped tens. }
\end{array}
$$

$\qquad$ tens +5 tens $=$ $\qquad$ tens

Write the tens and the regrouped hundreds.
STEP 4 Multiply the hundreds.

$$
\begin{array}{ll}
655 & 7 \times 9 \text { hundreds }= \\
1,978 & \\
\times \quad 7 \\
\hline 846 & \text { Add the regrouped hundreds. }
\end{array}
$$

$\qquad$ hundreds +5 hundreds $=$ $\qquad$ hundreds

Write the hundreds and the regrouped thousands.
STEP 5 Multiply the thousands.

$$
\begin{array}{ll}
655 & 7 \times 1 \text { thousand }= \\
1,978
\end{array} \quad \text { thousands }
$$

$\qquad$ thousands +6 thousands $=$ $\qquad$ thousands

Write the thousands. Compare your answer to the estimate to see if it is reasonable.

So, in 1 week, $\qquad$ meals are served on flights from
New York to Paris.
$\qquad$

## Share and Show

MATH
BOARD

## Complete to find the product.

1. $6 \times 796$

Estimate: $6 \times$ $\qquad$
$\qquad$

| 796 | Multiply the ones and regroup. | 3 796 | Multiply the | 53 796 | Multiply the |
| :---: | :---: | :---: | :---: | :---: | :---: |
| +6 |  | a $\times 6$ | tens and add the | $\begin{array}{r}\text { a } \\ \times 6 \\ \hline 76\end{array}$ | hundreds and a |
|  |  | 6 | regrouped tens. | 76 | the regrouped hundreds. |

Estimate. Then find the product.
2. Estimate: $\qquad$ 608 $\times 8$
3. Estimate: $\qquad$
556
$\times 4$
(3. Estimate: $\qquad$
1,925

| 1 |
| :--- |
| $\times \quad$ |

## On Your Own

## Rathemicil (2) Use Reasoning Algebra Solve for the unknown numbers.

5. 396

| $\times \quad 6$ |
| :---: |
| 2,36 |

6. 5,12

7. 8,56


Practice: Copy and Solve Estimate. Then find the product.
8. $116 \times 3$
9. $338 \times 4$
10. $6 \times 219$
11. $7 \times 456$
12. THINKSMARIER For numbers 12a-12b, select True or False for each equation.
12a. $1,205 \times 3=3,605$TrueFalse
12b. $1,362 \times 5=6,810$TrueFalse

## Problem Solving • Applications

13. THINKSMARTER What's the Error? The Plattsville Glee Club is sending 8 of its members to a singing contest in Cincinnati, Ohio. The cost will be $\$ 588$ per person. How much will it cost for the entire group of 8 students to attend?

Both Brian and Jermaine solve the problem. Brian says the
 answer is $\$ 40,704$. Jermaine's answer is $\$ 4,604$.

Estimate the cost. A reasonable estimate is $\qquad$ .

Although Jermaine's answer seems reasonable, neither Brian nor Jermaine solved the problem correctly. Find the errors in Brian's and Jermaine's work. Then, solve the problem correctly.


- Manifynical (3)Verify the Reasoning of Others What error did Brian make? Explain.
$\qquad$
$\qquad$
- What error did Jermaine make? Explain.
$\qquad$
$\qquad$

14. GПDEEPER How could you predict that Jermaine's answer might be incorrect using your estimate? $\qquad$
$\qquad$
$\qquad$

## Lesson 1.7

$\qquad$

## Multiply by 2-Digit Numbers

Essential Question How do you multiply by 2-digit numbers?

## Unlock the Problem

A tiger can eat as much as 40 pounds of food at a time but it may go for several days without eating anything. Suppose a Siberian tiger in the wild eats an average of 18 pounds of food per day. How much food will the tiger eat in 28 days if he eats that amount each day?

0
Use place value and regrouping.
STEP 1 Estimate: $28 \times 18$
Think: $30 \times 20=$ $\qquad$
STEP 2 Multiply by the ones.

| 28 |
| ---: |
| $\times 18$ |
|  |
|  |
|  |
|  |
|  |

STEP 3 Multiply by the tens.


STEP 4 Add the partial products.


Remember
Use patterns of zeros to find the product of multiples of 10 .

$$
3 \times 4=12
$$

$3 \times 40=120 \quad 30 \times 40=1,200$
$3 \times 400=1,200 \quad 300 \times 40=12,000$

So, on average, a Siberian tiger may eat $\qquad$ pounds of food in 28 days.

## 1 Example

A Siberian tiger sleeps as much as 18 hours a day, or 126 hours per week. About how many hours does a tiger sleep in a year? There are 52 weeks in one year.

STEP 1 Estimate: $126 \times 52$

Think: $100 \times 50=$ $\qquad$
STEP 2 Multiply by the ones.

$$
126
$$

$\begin{array}{r} \\ \times \quad 52 \\ \hline\end{array}$
$126 \times 2$ ones $=$ $\qquad$ ones

STEP 3 Multiply by the tens.


126
$\begin{array}{r} \\ \times \quad 52 \\ \hline\end{array}$

$126 \times 5$ tens $=$ $\qquad$ tens, or $\qquad$ ones

STEP 4 Add the partial products.


So, a Siberian tiger sleeps about $\qquad$ hours in one year.

Are there different numbers you could have used in Step 1 to find an estimate that is closer to the actual answer? Explain.

- mathenatical (6)When you multiply 126 and 5 tens in Step 3, why does its product have a zero in the ones place? Explain. $\qquad$
$\qquad$

Name

## Share and Show

## Complete to find the product.

1. 


2.


## Estimate. Then find the product.

3. Estimate: $\qquad$

24
$\times 15$
4. Estimate: $\qquad$

37

| $\times 63$ |
| :--- |

5. Estimate: $\qquad$

384
$\begin{array}{r}\times 45 \\ \hline\end{array}$

## On Your Own

## Estimate. Then find the product.

6. Estimate: $\qquad$ 7. Estimate: $\qquad$
$\begin{array}{r}28 \\ \times 22 \\ \hline\end{array}$
+22
93
$\times 76$
7. Estimate: $\qquad$

295
$\qquad$

Practice: Copy and Solve Estimate. Then find the product.
9. $54 \times 31$
10. $42 \times 26$
11. $38 \times 64$
12. $63 \times 16$
13. $204 \times 41$
14. $534 \times 25$
15. $722 \times 39$
16. $957 \times 43$

## Problem Solving • Applications

## Use the table for 17-19.

17. How much sleep does a jaguar get in 1 year?
18. THINKSMARTER In 1 year, how many more hours of sleep does a giant armadillo get than a platypus?
19. 



Owl monkeys sleep during the day, waking about 15 minutes after sundown to find food. At midnight, they rest for an hour or two, then continue to feed until sunrise. They live about


| Animal Sleep Amounts |  |
| :--- | :---: |
| Animal | Amount <br> (usual hours per week) |
| Jaguar | 77 |
| Giant Armadillo | 127 |
| Owl Monkey | 119 |
| Platypus | 98 |
| Three-Toed Sloth | 101 | 27 years. How many hours of sleep does an owl monkey that lives 27 years get in its lifetime?

20. GIDEEPER Tickets to a museum cost $\$ 17$ each. For a field trip, the museum offers a $\$ 4$ discount on each ticket. How much will tickets for 32 students cost?
21. THINKSMARTER Rachel earns $\$ 21$ per day.

For numbers 21a-21d, select True or False for each statement.

21a. Rachel earns $\$ 421$ for 20 days of work.
O True
○ False

21b. Rachel earns $\$ 315$ for 15 days of work.$\bigcirc$ False

21c. Rachel earns $\$ 273$ for 13 days of work.
○ True
False

21d. Rachel earns $\$ 250$ for 13 days of work.
$\qquad$

## Relate Multiplication to Division

Essential Question How is multiplication used to solve a division problem?
You can use the relationship between multiplication and division to solve a division problem. Using the same numbers, multiplication and division are opposite, or inverse operations.


## Unlock the Problem

Joel and 5 friends collected 126 marbles. They shared the marbles equally. How many marbles will each person get?

> Underline the dividend.
> What is the divisor?

## (1)One Way Make an array.

- Outline a rectangular array on the grid to model 126 squares arranged in 6 rows of the same length. Shade each row a different color.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |

- How many squares are shaded in each row? $\qquad$
- Use the array to complete the multiplication sentence. Then, use the multiplication sentence to complete the division sentence.
$6 \times$ $\qquad$ $=126$
$126 \div 6=$ $\qquad$

So, each of the 6 friends will get $\qquad$ marbles.

## (D) Another Way Use the istributive Property.

Divide. $52 \div 4$
You can use the Distributive Property and an area model to solve division problems. Remember that the Distributive Property states that multiplying a sum by a number is the same as multiplying each addend in the sum by the number and then adding the products.

## STEP 1

Write a related multiplication sentence for the division problem.

Think: Use the divisor as a factor and the dividend as the product. The quotient will be the unknown factor.

$$
\begin{array}{r}
52 \div 4=\square \\
4 \times \square=52
\end{array}
$$



## STEP 2

Use the Distributive Property to break apart the large area into smaller areas for partial products that you know.
$\left.\begin{array}{lll}\left(\begin{array}{lll}40 & + & 12\end{array}\right)=52 \\ (4 & \times \quad\end{array}\right)+\left(\begin{array}{lll}4 & \times\end{array}\right)=52$


## STEP 3

Find the sum of the unknown factors of the smaller areas.
$\qquad$ $+$ $\qquad$ $=$ $\qquad$

## STEP 4

Write the multiplication sentence with the unknown factor that you found. Then, use the multiplication sentence to find the quotient.

$$
\begin{aligned}
& 4 \times \quad=52 \\
& 52 \div 4=
\end{aligned}
$$

(Marifingical (6) Explain how you can use the Distributive Property to find the quotient of $96 \div 8$.
$\qquad$
$\qquad$
$\qquad$

## Share and Show

## MATH BOARD

1. Brad has 72 toy cars that he puts into 4 equal groups. How many cars does Brad have in each group? Use the array to show your answer.
$4 \times$ $\qquad$ $=72 \quad 72 \div 4=$ $\qquad$

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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Use multiplication and the Distributive Property to find the quotient.
2. $108 \div 6=$
$\qquad$
$\qquad$
$\qquad$
3. $84 \div 6=$ $\qquad$
$\qquad$
$\qquad$
4. $184 \div 8=$ $\qquad$

Explain how using multiplication as the inverse operation helps you solve a division problem.

## On Your Own

Use multiplication and the Distributive Property to find the quotient.
5. $60 \div 4=$ $\qquad$
6. $144 \div 6=$ $\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
7. $252 \div 9=$ $\qquad$

IHINKSMARTER Find each quotient. Then compare. Write $<,>$, or $=$.
8. $51 \div 3 \bigcirc 68 \div 4$
9. $252 \div 6 \bigcirc$
$135 \div 3$
$\qquad$
$\qquad$
10. $110 \div 5$
 $133 \div 7$

## Problem Solving • Applications

Use the table to solve 11-12.
11.


Mr. Henderson has
2 bouncy-ball vending machines. He buys one bag of the 27 -millimeter balls and one bag of the 40 -millimeter balls. He puts an equal number of each in the 2 machines. How many bouncy balls does he put in each machine?

13. Marilinaical 3) Verify the Reasoning of


Others Sandra writes $(4 \times 30)+(4 \times 2)$ and says the quotient for $128 \div 4$ is 8 . Is she correct? Explain.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
Personal Math Trainer
14. THINKSMARTER Joe collected 45 seashells. Joe wants to share his seashells with 5 of his friends equally. How many seashells will each friend get? Use the array to show your answer.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |  |  |

Use the multiplication sentence to complete the division sentence.
$5 \times \quad=45$
$45 \div 5=$
$\qquad$

## Problem Solving•Multiplication and Division

Essential Question How can you use the strategy solve a simpler Lesson 1.9
problem to help you solve a division problem?

## Unlock the Problem

Mark works at an animal shelter. To feed 9 dogs, Mark empties eight 18 -ounce cans of dog food into a large bowl. If he divides the food equally among the dogs, how many ounces of food will each dog get?

Use the graphic organizer below to help you solve the problem.


## Read the Problem

## What do I need to find?

I need to find $\qquad$

## What information do I need to use?

I need to use the number of $\qquad$ , the number of $\qquad$ in each can, and the
number of dogs that need to be fed.

## How will I use the information?

I can $\qquad$ to find the total number of ounces. Then I can solve a simpler problem to
$\qquad$ that total by 9 .

## Solve the Problem

- First, multiply to find the total number of ounces of dog food.
$8 \times 18=$ $\qquad$
- To find the number of ounces each dog gets,

I'll need to divide.
$144 \div$ $\qquad$ $=\square$

- To find the quotient, I break 144 into two simpler numbers that are easier to divide.


So, each dog gets $\qquad$ ounces of food.

## (1) Try Another Problem

Michelle is building shelves for her room. She has a plank 137 inches long that she wants to cut into 7 shelves of equal length. The plank has jagged ends, so she will start by cutting 2 inches off each end. How long will each shelf be?

What do I need to find?

What information do I need to use?

How will I use the information?

So, each shelf will be $\qquad$ inches long.

Name

## Share and Show

## Unlock the Problem

$\checkmark$ Underline what you need to find.
$\checkmark$ Circle the numbers you need to use.

1. To make concrete mix, Monica pours 34 pounds of cement, 68 pounds of sand, 14 pounds of small pebbles, and 19 pounds of large pebbles into a large wheelbarrow. If she pours the mixture into 9 equal-size bags, how much will each bag weigh?

WRITE Math . Show Your Work
First, find the total weight of the mixture.

Then, divide the total by the number of bags. Break the total into two simpler numbers to make the division easier, if necessary.


Finally, find the quotient and solve the problem.
So, each bag will weigh $\qquad$ pounds.
2. What if Monica pours the mixture into 5 equal-size bags? How much will each bag weigh?
3. Taylor is building doghouses to sell. Each doghouse requires 3 full sheets of plywood which Taylor cuts into new shapes. The plywood is shipped in bundles of 14 full sheets. How many doghouses can Taylor make from 12 bundles of plywood?
4. Eileen is planting a garden. She has seeds for 60 tomato plants, 55 sweet corn plants, and 21 cucumber plants. She plants them in 8 rows, with the same number of plants in each row. How many seeds are planted in each row?

## On Your Own

5. G■DEEPER Starting on day 1 with 1 jumping jack, Keila doubles the number of jumping jacks she does every day. How many jumping jacks will Keila do on day 10 ?
6. 

Maritemarical
Represent a Problem Starting in the blue square, in how many different ways can you draw a line that passes through every square without picking up your pencil or crossing a line you've already drawn? Show the ways.

7. On April 11, Millie bought a lawn mower with a 50 -day guarantee. If the guarantee begins on the date of purchase, what is the first day on which the mower will no longer be guaranteed?
8. THINKSMARTER The teacher of a jewelry-making class had a supply of 236 beads. Her students used 29 beads to make earrings and 63 beads to make bracelets. They will use the remaining beads to make necklaces with 6 beads on each necklace. How many necklaces will the students make?

$\qquad$
9. IHINKSMARTER Susan is making 8 casseroles. She uses 9 cans of beans. Each can is 16 -ounces. If she divides the beans equally among 8 casseroles, how many ounces of beans will be in each casserole? Show your work.
$\qquad$

## Numerical Expressions

Essential Question How can you use a numerical expression to describe a situation?

## Unlock the Problem

A numerical expression is a mathematical phrase that has numbers and operation signs but does not have an equal sign.

Tyler caught 15 small bass, and his dad caught 12 small bass in the Memorial Bass Tourney in Tidioute, PA. Write a numerical expression to represent how many fish they caught in all.

## $\square$ <br> Choose which operation to use.

You need to join groups of different sizes, so use addition.

| 15 small bass | plus | 12 small bass |
| :---: | :---: | :---: |
| $\downarrow$ | $\downarrow$ | $\downarrow$ |
| 15 | + | 12 |

So, $15+12$ represents how many fish they caught in all.

## (1) Example 1 write an expression to match the words.

## A Addition

Emma has 11 fish in her aquarium. She buys 4 more fish.

| fish | plus | more fish |
| :---: | :---: | :---: |
| $\downarrow$ | $\downarrow$ | $\downarrow$ |
| 11 | + | 4 |

## Multiplication

Karla buys 5 books.
Each book costs $\$ 3$.

| books | multiplied | cost per |
| :---: | :---: | :---: |
| $\downarrow$ | by | book |
|  | $\downarrow$ | $\downarrow$ |
|  | $\times$ |  |
|  |  |  |

## B Subtraction

Lucia has 128 stamps. She uses 38 stamps on party invitations.

| stamps |  |
| :---: | :---: |
| $\downarrow$ | $\downarrow$ |
| 128 | - |
| minus |  |
| stamps used |  |
| $\downarrow$ |  |

(D) Division

Four players share 52 cards equally.



Expressions with Parentheses The meaning of the words in a problem will tell you where to place the parentheses in an expression.

## I) Example 2 which expression matches the meaning of the words?

Doug went fishing for 3 days. Each day he put $\$ 15$ in his pocket. At the end of each day, he had $\$ 5$ left. How much money did Doug spend by the end of the trip?

- Underline the events for each day.
- Circle the number of days these events happened.

Think: Each day he took $\$ 15$ and had $\$ 5$ left. He did this for 3 days.
(\$15-\$5) $\leftarrow$ Think: What expression can you write to show how much money Doug spends in one day?
$\leftarrow$ Think: What expression can you write to show how much money Doug spends in three days?

Mathematical Practices
Explain how the expression of what Doug spent in three days compares to the expression of what he spent in one day?
Fxample 3 which problem matches the expression \$20 - $(\$ 12+\$ 3)$ ?

Kim has $\$ 20$ to spend for her fishing trip. She spends $\$ 12$ on a fishing pole and $\$ 3$ on bait. How much money does Kim have now?

List the events in order.
First: Kim has \$20.

Next: $\qquad$ .

Then: $\qquad$ .

Do these words match the expression? $\qquad$

## Share and Show

Circle the expression that matches the words.

1. Teri had 18 worms. She gave 4 worms to Susie and 3 worms to Jamie.

$$
(18-4)+3 \quad 18-(4+3)
$$

2. Rick had $\$ 8$. He then worked 4 hours for \$5 each hour.
$\$ 8+(4 \times \$ 5) \quad(\$ 8+4) \times \$ 5$

Name $\qquad$

## Write an expression to match the words.

3. Greg drives 26 miles on Monday and 90 miles on Tuesday.
$\qquad$

Write words to match the expression.
5. $34-17$
$\qquad$
$\qquad$

## On Your Own

## Write an expression to match the words.

7. José shared 12 party favors equally among 6 friends.
$\qquad$
8. Isabelle bought 12 bottles of water at \$2 each.
$\qquad$

Write words to match the expression.
11. $36 \div 9$
$\qquad$
$\qquad$

Draw a line to match the expression with the words.
13. Fred catches 25 fish. Then he releases 10 fish and catches 8 more.

Nick has 25 pens. He gives 10 pens to one friend and 8 pens to another friend.

Jan catches 15 fish and lets 6 fish go.
Libby catches 15 fish and lets 6 fish go for three days in a row.
12. $35-(16+11)$
4. Lynda has 27 fewer fish than Jack. Jack has 80 fish.
$\qquad$
6. $6 \times(12-4)$
$\qquad$
$\qquad$

Mathematical Practices

Is $4 \times 8=32$ an expression? Explain why or why not.
8. Braden has 14 baseball cards. He finds 5 more baseball cards.
$\qquad$
10. Monique had $\$ 20$. She spent $\$ 5$ on lunch and $\$ 10$ at the bookstore.
$\qquad$
12. $-16+11$
$\qquad$
$\qquad$

- $15-6$
- $25-(10+8)$
- $(25-10)+8$


## Problem Solving • Applications

## Use the rule and the table for 14-15.

14. (Marthenaical (4) Write an Expression to represent the total number of lemon tetras that could be in a 20 -gallon aquarium.
15. THINKSMARIER There are tiger barbs in a 15 -gallon aquarium and giant danios in a 30 -gallon aquarium. Write a numerical expression to represent the greatest total number of fish
 that could be in both aquariums.
$\qquad$
16. GПDEEPER Write a word problem for an expression that is three times as great as $(15+7)$. Then write the expression.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
17. IHINKSMARTER Daniel bought 30 tokens when he arrived at the festival. He won 8 more tokens for getting the highest score at the basketball contest, but lost 6 tokens at the ring toss game. Write an expression to find the number of tokens Daniel has left.

Aquarium Fish

| Type of Fish | Length <br> (in inches) |
| :--- | :---: |
| Lemon Tetra | 2 |
| Strawberry Tetra | 3 |
| Giant Danio | 5 |
| Tiger Barb | 3 |
| Swordtail | 5 |

$\Delta$ The rule for the number of fish in an aquarium is to allow 1 gallon of water for each inch of length.

## Name

## Evaluate Numerical Expressions

Essential Question In what order must operations be evaluated to find the solution to a problem?

CONNECT Remember that a numerical expression is a mathematical phrase that uses only numbers and operation symbols.
$(5-2) \times 7 \quad 72 \div 9+16 \quad(24-15)+32$
To evaluate, or find the value of, a numerical expression with more than one operation, you must follow rules called the order of operations. The order of operations tells you in what order you should evaluate an expression.

## ALGEBRA Lesson 1.11

## Operations and Algebraic Thinking-5.0A. 1 mathematical practices MP.3, MP. 4

## Order of Operations

1. Perform operations in parentheses.
2. Multiply and divide from left to right.
3. Add and subtract from left to right.

## Unlock the Problem

A bread recipe calls for 4 cups of wheat flour and 2 cups of rye flour. To triple the recipe, how many cups of flour are needed in all?

- 

Evaluate $3 \times 4+3 \times 2$ to find the total number of cups.
(A) Gabriela did not follow the order of operations correctly.


Explain why Gabriela's answer is not correct.

B Follow the order of operations by multiplying first and then adding.

|  |  |
| :--- | :--- |
| 0 | $3 \times 4+3 \times 2$ |
|  |  |
| 0 |  |
|  |  |
|  |  |

So, $\qquad$ cups of flour are needed.

Evalluate Expressions with Parentheses To evaluate an expression with parentheses, follow the order of operations. Perform the operations in parentheses first. Multiply from left to right. Then add and subtract from left to right.

## 1. Example

Each batch of granola Lena makes uses 3 cups of oats, 1 cup of raisins, and 2 cups of nuts. Lena wants to make 5 batches of granola. How many cups of oats, raisins, and nuts will she need in all?

Write the expression.

```
5\times(3+1+2)
5\times( , )
\(5 \times(\quad)\)
```

First, perform the operations in parentheses.

Then multiply.

So, Lena will use $\qquad$ cups of oats, raisins, and nuts in all.
Matipanaical (2) Reason Quantitatively What if Lena makes 4 batches?
Will this change the numerical expression? Explain.

## Try This! Rewrite the expression with parentheses to equal the given value.

A $6+12 \times 8-3$; value: 141

- Evaluate the expression without the parentheses.
- Try placing the parentheses in the expression so the value is 141 .

Think: Will the placement of the parentheses increase or decrease the value of the expression?

- Use order of operations to check your work.

$$
6+12 \times 8-3
$$

B $5+28 \div 7-4$; value: 11

- Evaluate the expression without the parentheses. $\qquad$
- Try placing the parentheses in the expression so that the value is 11 .

Think: Will the placement of the parentheses increase or decrease the value of the expression?

- Use order of operations to check your work.

$$
5+28 \div 7-4
$$

Name

## Share and Show

## Evaluate the numerical expression.

1. $10+36 \div 9$

Think: I need to divide first.

## On Your Own

2. $10+(25-10) \div 5$
$\qquad$
$\qquad$

Evaluate the numerical expression.
3. $9-(3 \times 2)+8$

Mathematical Practices
Raina evaluated the expression $5 \times 2+2$ by adding first and then multiplying. Will her answer be correct? Explain.
4. $(4+49)-4 \times 10$

6. $36-(8+5)$
7. $125-(68+7)$

Rewrite the expression with parentheses to equal the given value.
8. $100-30 \div 5$
value: 14
9. $12+17-3 \times 2$
value: 23
10. $9+5 \div 5+2$
value: 2
11.


Reason Abstractly The value of $100-30 \div 5$ with parentheses can have a value of 14 or 94 . Explain.
$\qquad$
$\qquad$

## Unlock the Problem

12. FIDEEPER

A movie theater has 4 groups of seats. The largest group of seats, in the middle, has 20 rows, with 20 seats in each row. There are 2 smaller groups of seats on the sides, each with 20 rows and 6 seats in each row. A group of seats in the back has 5 rows, with 30 seats in each row. How many seats are in the movie theater?

a. What do you need to know? $\qquad$
$\qquad$
b. What operation can you use to find the number of seats in the back group of seats? Write the expression.
c. What operation can you use to find the number of seats in both groups of side seats? Write the expression.
$\qquad$
d. What operation can you use to find the number of seats in the middle group?

Write the expression.
$\qquad$
e. Write an expression to represent the total number of seats in the theater.
$\qquad$
$\qquad$
13. THINKSMARTER

Write and evaluate two equivalent numerical expressions that show the Distributive Property of Multiplication.

f. How many seats are in the theater? Show the steps you use to solve the problem.
$\qquad$
$\qquad$

14. THINKSMARTER Rosalie evaluates the numerical expression $4+5 \times 2-1$. Rosalie's first step should be to | add |
| :--- |
| subtract |
| multiply |.

## Grouping Symbols

Essential Question In what order must operations be evaluated to find a solution when there are parentheses within parentheses?

## Unlock the Problem

Mary's weekly allowance is $\$ 8$ and David's weekly
allowance is $\$ 5$. Every week they each spend $\$ 2$

- Underline Mary's weekly allowance and how much she spends. on lunch. Write a numerical expression to show how many weeks it will take them together to save enough money to buy a video game for $\$ 45$.
- Circle David's weekly allowance and how much he spends.

0
Use parentheses and brackets to write an expression.
You can use parentheses and brackets to group operations that go together. Operations in parentheses and brackets are performed first.

STEP 1 Write an expression to represent how much Mary and David save each week.

- How much money does Mary save each week?

Think: Each week Mary gets $\$ 8$ and spends $\$ 2$.
$\qquad$

- How much money does David save each week?

Think: Each week David gets $\$ 5$ and spends $\$ 2$.
$\qquad$

- How much money do Mary and David save together each week? $\qquad$

STEP 2 Write an expression to represent how many weeks it will take Mary and David to save enough money for the video game.

- How many weeks will it take Mary and David to save enough for a video game?

Think: I can use brackets to group operations a second time.
$\$ 45$ is divided by the total amount of money saved each week.
$\qquad$ $\div[$ ]

Mathematical Practices
Explain why brackets are placed around the part of the expression that represents the amount of money Mary and David save each week.

Evaluate Expressions with Grouping Symbols When evaluating an expression with different grouping symbols (parentheses, brackets, and braces), perform the operation in the innermost set of grouping symbols first, evaluating the expression from the inside out.

## 1. Example

Juan gets $\$ 6$ for his weekly allowance and spends $\$ 4$ of it. His sister Tina gets $\$ 7$ for her weekly allowance and spends $\$ 3$ of it. Their mother's birthday is in 4 weeks. If they spend the same amount each week, how much money can
 they save together in that time to buy her a present?

- Write the expression using parentheses and brackets. $4 \times[(\$ 6-\$ 4)+(\$ 7-\$ 3)]$
- Perform the operations in the parentheses first.
$4 \times$ $\qquad$ $+$ $\qquad$ ]
- Next perform the operations in the brackets.
$4 \times$ $\qquad$
- Then multiply.

So, Juan and Tina will be able to save $\qquad$ for their mother's birthday present.

- Maribyaical (2) Connect Symbols and Words What if only Tina saves any money? Will this change the numerical expression? Explain.

Try This! Follow the order of operations.
A $4 \times\{[(5-2) \times 3]+[(2+4) \times 2]\}$

- Perform the operations in the parentheses.
$4 \times\{[3 \times 3]+[$ $\qquad$ $\times$ $\qquad$ ]\}
- Perform the operations in the brackets.
$4 \times\{9+$ $\qquad$
- Perform the operations in the braces.
$4 \times$ $\qquad$
- Multiply.


B $32 \div\{[(3 \times 2)+7]-[(6-4)+7]\}$

- Perform the operations in the parentheses.
$32 \div\{[$ $\qquad$ $+$ $\qquad$ $+$ $\qquad$
- Perform the operations in the brackets.
$32 \div\{$ $\qquad$ - $\qquad$
- Perform the operations in the braces.
$32 \div$ $\qquad$
- Divide. $\qquad$


## Share and Show

## Evaluate the numerical expression.

1. $12+[(15-5)+(9-3)]$
$12+[10+$ $\qquad$ ]
$12+$ $\qquad$
2. $5 \times[(26-4)-(4+6)]$
$\qquad$

## On Your Own

Evaluate the numerical expression.
4. $4+[(16-4)+(12-9)]$
5. $24-[(10-7)+(16-9)]$
6. $3 \times\{[(12-8) \times 2]+$ $[(11-9) \times 3]\}$

## Problem Solving • Applications

 with parentheses and brackets two different ways so one value is less than 10 and the other value is greater than 50.
3. $36 \div[(18-10)-(8-6)]$
8. HПDEEPER Wilma works at a bird sanctuary and stores birdseed in plastic containers. She has 3 small containers that hold 8 pounds of birdseed each and 6 large containers that hold 12 pounds of birdseed each. Each container was full until she used 4 pounds of bird seed. She wants to put some of the remaining birdseed into 30 bird feeders that can hold 2 pounds each. How much birdseed does she have left over? Show the expression you used to find your answer.

## Unlock the Problem

9. THINK SMARTER Dan has a flower shop. Each day he displays 24 roses. He gives away 10 and sells the rest. Each day he displays 36 carnations. He gives away 12 and sells the rest. What expression can you use to find out how many roses and carnations Dan sells in a week?
a. What information are you given? $\qquad$

$\qquad$
$\qquad$
b. What are you being asked to do? $\qquad$
$\qquad$
$\qquad$
c. What expression shows how many roses Dan sells in one day?
d. What expression shows how many carnations Dan sells in one day? $\qquad$
e. Write an expression to represent the total number of roses and carnations Dan sells in one day. $\qquad$
f. Write the expression that shows how many
roses and carnations Dan sells in a week. $\qquad$

Personal Math Trainer
10. IHINKSMARTER A gift shop had 500 coloring pencils. The shop sold 3 sets of 20 coloring pencils, 6 sets of 12 coloring pencils, and 10 sets of 18 coloring pencils. Write a numerical expression to show how many coloring pencils are left. Evaluate the numerical expression using order of operations. Show your work.
$\qquad$

## (V) Chapter 1 Review/Test

1. Find the property that each equation shows.

Write the equation in the correct box.


| Identity Property of <br> Addition  Commutative Property <br> of Multiplication | Identity Property of <br> Multiplication |  |
| :--- | :--- | :--- |
| Associative Property of <br> Multiplication | Commutative Property <br> of Addition | Associative Property of <br> Addition |

2. For numbers 2a-2d, select True or False for each statement.
2a. $\quad 170$ is $\frac{1}{10}$ of 17
○ True
$\bigcirc$ False
2b. 660 is 10 times as much as 600
O True
$\bigcirc$ False
2c. 900 is $\frac{1}{10}$ of 9,000
○ True
$\bigcirc$ False
2d. 4,400 is 10 times as much as 440
O True
$\bigcirc$ False
3. Select other ways to write 700,562 . Mark all that apply.
(A) $(7 \times 100,000)+(5 \times 1,000)+(6 \times 10)+(2 \times 1)$
(B) seven hundred thousand, five hundred sixty-two
(C) $700,000+500+60+2$
(D) 7 hundred thousands +5 hundreds +62 tens
4. Carrie has 140 coins. She has 10 times as many coins as she had last month. How many coins did Carrie have last month?
$\qquad$ coins
5. Valerie earns $\$ 24$ per hour. Which expression can be used to show how much money she earns in 7 hours?
(A) $(7+20)+(7+4)$
(B) $(7 \times 20)+(7 \times 4)$
(C) $(7+20) \times(7+4)$
(D) $(7 \times 20) \times(7 \times 4)$
6. The table shows the equations Ms. Valez discussed in math class today.

| Equations |
| :--- |
| $6 \times 10^{0}=6$ |
| $6 \times 10^{1}=60$ |
| $6 \times 10^{2}=600$ |
| $6 \times 10^{3}=6,000$ |

Explain the pattern of zeros in the product when multiplying by powers of 10 .

## Name

7. It is 3,452 miles round trip to Craig's aunt's house. If he travels to her house 3 times this year, how many miles did he travel in all?
$\qquad$ miles
8. Lindsey earns $\$ 33$ per day at her part-time job. Complete the table to show the total amount Lindsey earns.

| Lindsey's Earnings |  |
| :---: | :---: |
| Number of Days | Total Amount |
| 3 |  |
| 8 |  |
| 14 |  |

9. Jackie followed these steps to evaluate the expression $15-(37+8) \div 3$.
$37+8=45$
$45-15=30$
$30 \div 3=10$
Mark looks at Jackie's work and says she made a mistake. He says she should have divided by 3 before she subtracted.

## Part A

Which student is correct? Explain how you know.
$\square$

## Part B

Evaluate the expression.
$\square$
10. Carmine buys 8 plates for $\$ 1$ each. He also buys 4 bowls. Each bowl costs twice as much as each plate. The store is having a sale that gives Carmine $\$ 3$ off the bowls. Which numerical expression shows how much he spent?
(A) $(8 \times 1)+[(4 \times 16)-3]$
(B) $(8 \times 1)+[4 \times(16-3)]$
(C) $(8 \times 1)+[(4 \times 2)-3]$
(D) $(8 \times 4)+[(4 \times 2)-3]$
11. Evaluate the numerical expression.
$2+(65+7) \times 3=\square$
12. An adult elephant eats about 300 pounds of food each day. Write an expression to represent the number of pounds of food a herd of 12 elephants eat in 5 days.
13. Jason is solving a homework problem.

Arianna buys 5 boxes of granola bars. Each box contains
12 granola bars. Arianna eats 4 bars.
Jason writes a numerical expression to represent the situation.
His expression, $(12-4) \times 5$, has a mistake.

## Part A

Explain Jason's mistake.
$\square$

## Part B

Write an expression to show how many granola bars are left, and then solve it.
$\square$
14. Paula collected 75 stickers. She shares her stickers with 5 of her friends equally. How many stickers will each friend get?

## Part A

Use the array to show your answer.


## Part B

Use the multiplication sentence to complete the division sentence.
$5 \times \square=75$ $\square$
15. Mario is making dinner for 9 people. Mario buys 6 containers of soup. Each container is 18 ounces. If everyone gets the same amount of soup, how much soup will each person get? How can you solve a simpler problem to help you find the solution?
$\square$
16. Jill wants to find the quotient. Use multiplication and the Distributive Property to help Jill find the quotient.
$144 \div 8=\square$
Multiplication $\square$
Distributive Property $\square$
17. Jeannette eats a breakfast sandwich that has 345 calories. If she eats the same kind of sandwich every day for 12 days, how many calories would she have for breakfast?
$\qquad$ calories
18. There are 8 teachers going to the science museum. If each teacher pays $\$ 15$ to get inside, how much did the teachers pay?
\$ $\qquad$
19. Select other ways to write 50,897 . Mark all that apply.
(A) $(5 \times 10,000)+(8 \times 100)+(9 \times 10)+(7 \times 1)$
(B) $50,000+800+90+7$
(C) $5,000+800+90+7$
(D) fifty thousand, eight hundred ninety-seven
20. For numbers 20a-20b, select True or False.

20a. $55-(12+2)$, value: 41TrueFalseTrueFalse

20b. $25+(14-4) \div 5$, value: 27
21. Tara bought 2 bottles of juice a day for 15 days. On the 16th day, Tara bought 7 bottles of juice.

Write an expression that matches the words.
$\square$
22. Select other ways to express $10^{2}$. Mark all that apply.
(A) 20
(B) 100
(C) $10+2$
(D) $10 \times 2$
(E) $10+10$
(F) $10 \times 10$

## Divide Whole Numbers

## Show What You Know

Check your understanding of important skills.
Name $\qquad$

## Meaning of Division Use counters to solve.

1. Divide 18 counters into 3 equal groups. How many counters are in each group?
$\qquad$ counters
2. Divide 21 counters into 7 equal groups. How many counters are in each group?
$\qquad$ counters

Multiply 3-Digit and 4-Digit Numbers Multiply.
3. 321
$\begin{array}{r}\times \quad 4 \\ \hline\end{array}$
4.
5. $\begin{array}{r}4,092 \\ \times \quad 6 \\ \hline\end{array}$
6. $\begin{array}{r}8,264 \\ \times \quad 9 \\ \hline\end{array}$

## Estimate with 1-Digit Divisors Estimate the quotient.

7. $2 \longdiv { 3 1 2 }$
8. $4 \longdiv { 1 8 9 }$
9. $6 \longdiv { 6 0 3 }$
10. $3 \longdiv { 1 , 7 8 8 }$

The height of the Gateway Arch shown on the Missouri quarter is 630 feet, or 7,560 inches. Be a math detective to find how many 4-inch stacks of quarters make up the height of the Gateway Arch. If there are 58 quarters in a 4-inch stack, how many quarters high is the arch?


## Vocabulary Builder

## Visualize It

Complete the Flow Map using the words with a $\checkmark$.
Inverse Operations


Review Words
compatible numbers
$\checkmark$ dividend
Jdivisor
estimate
$\checkmark$ factor
partial quotients
Sproduct
Squotient
remainder

## Understand Vocabulary

Use the review words to complete each sentence.

1. You can $\qquad$ to find a number that is close to the exact amount.
2. Numbers that are easy to compute with mentally are called
$\qquad$ .
3. The $\qquad$ is the amount left over when a number cannot be divided evenly.
4. A method of dividing in which multiples of the divisor are subtracted from the dividend and then the quotients are added together is called $\qquad$ .
5. The number that is to be divided in a division problem is the
$\qquad$ .
6. The $\qquad$ is the number, not including the remainder, that results from dividing.
$\qquad$

## Place the First Digit

Essential Question How can you tell where to place the first digit of a quotient without dividing?

## Number and Operations in Base Ten-5.NBT. 6

MATHEMATICAL PRACTICES MP.1, MP. 6

## Unlock the Problem

Tania has 8 purple daisies. In all, she counts 128 petals on her flowers. If each flower has the same number of petals, how many petals are on one flower?

- Underline the sentence that tells you what you are trying to find.
- Circle the numbers you need to use.
- How will you use these numbers to solve the problem?
$\Omega$
Divide. $128 \div 8$
STEP 1 Use an estimate to place the first digit in the quotient.

Estimate. $160 \div$ $\qquad$ $=$ $\qquad$
The first digit of the quotient will be in
the $\qquad$ place.

STEP 2 Divide the tens.
Check. $\qquad$ tens cannot be shared among 8 groups without regrouping.

STEP 3 Regroup any tens left as ones. Then, divide the ones.


Divide. 48 ones $\div 8$
Multiply. $8 \times 6$ ones

Subtract. 48 ones - $\qquad$ ones

Check. $\qquad$ ones cannot be shared among 8 groups.

Explain how estimating the quotient helps you at both the beginning and the end of a division problem.

Since 16 is close to the estimate of $\qquad$ , the answer is reasonable.

So, there are 16 petals on one flower.

## Example

Divide. Use place value to place the first digit. $4,236 \div 5$
STEP 1 Use place value to place the first digit.
$5 \longdiv { 4 , 2 3 6 }$
Look at the thousands.
4 thousands cannot be shared among 5 groups without regrouping.
Look at the hundreds.

Remember
Remember to estimate the quotient first.

Estimate: $4,000 \div 5=$ $\qquad$
$\qquad$ hundreds can be shared among 5 groups.

The first digit is in the $\qquad$ place.

STEP 2 Divide the hundreds.

| $\frac{8}{5} \lcm{4,236}$ |
| :---: |
| - |

Divide. $\qquad$ hundreds $\qquad$ Multiply. $\qquad$ $\times$ $\qquad$ hundreds

Subtract. $\qquad$ hundreds - $\qquad$ hundreds

Check. $\qquad$ hundreds cannot be shared among
5 groups without regrouping.
STEP 3 Divide the tens.
$\qquad$

STEP 4 Divide the ones.

| 847 | Divide. |
| :---: | :---: |
| $5 \longdiv { 4 , 2 3 6 }$ |  |
| -40 | Multiply. |
| 23 |  |
| -20 | Subtract. |
| 36 |  |
| -35 | Check |

So, $4,236 \div 5$ is $\qquad$ r $\qquad$ .

## Divide.

1. $3 \longdiv { 5 7 9 }$
© 2. $5 \longdiv { 1 , 0 3 5 }$
2. $8 \longdiv { 1 , 7 6 6 }$

## On Your Own

As you divide, explain how you know when to place a zero in the quotient.

## Divide.

4. $8 \longdiv { 2 7 5 }$
5. $3 \longdiv { 4 6 8 }$
6. $4 \longdiv { 3 , 2 2 0 }$
7. $6 \longdiv { 6 1 8 }$
8. $4 \longdiv { 7 1 6 }$
9. $9 \longdiv { 1 , 1 5 7 }$
10. $6 \longdiv { 6 , 8 2 7 }$
11. $7 \longdiv { 8 , 5 2 3 }$

## Practice: Copy and Solve Divide.

12. $645 \div 8$
13. $942 \div 6$
14. $723 \div 7$
15. $3,478 \div 9$
16. $3,214 \div 5$
17. $492 \div 4$
18. $2,403 \div 9$
19. $2,205 \div 6$
20. $6 \square D E E P E R$ Will the first digit of the quotient of $2,589 \div 4$ be in the hundreds or the thousands place? Explain how you can decide without finding the quotient.
$\qquad$

## Unlock the Problem

21. Mãinmanical (4) Interpret a Result Rosa has a garden divided into sections. She has 125 daisy plants. If she plants an equal number of the daisy plants in each of 3 sections, how many daisy plants will be in each section? How many daisy plants will be left over?
a. What information will you use to solve the problem?
$\qquad$
$\qquad$
b. How will you use division to find the number of daisy
 plants left over?
$\qquad$
$\qquad$
$\qquad$
c. Show the steps you use to solve the problem. Estimate: $120 \div 3=$ $\qquad$
d. Complete the sentences:

Rosa has $\qquad$ daisy plants. She puts an equal number in each
of $\qquad$ sections.

Each section has $\qquad$ plants. Rosa has
$\qquad$ daisy plants left over.
22. IHINKSMARTER One case can hold 3 boxes. Each box can hold 3 binders. How many cases are needed to hold 126 binders?
23. THINKSMARTER For numbers 23a-23b, choose Yes or No to indicate whether the first digit of the quotient is in the hundreds place.

23a. $1,523 \div 23$
O Yes
O No
23b. $2,315 \div 9$
O Yes
O No

## Divide by 1-Digit Divisors

Essential Question How do you solve and check division problems?

Number and Operations in Base Ten-5.NBT. 6
mathematical practices MP.1, MP. 2

## Unlock the Problem

Jenna's family is planning a trip to Oceanside, California. They will begin their trip in Scranton, Pennsylvania, and will travel 2,754 miles over 9 days. If the family travels an equal number of miles every day, how far will they travel each day?

- Underline the sentence that tells you what you are trying to find.
- Circle the numbers you need to use.

$\square$
Divide. $2,754 \div 9$

## STEP 1

Use an estimate to place the first digit in the quotient.

Estimate. $2,700 \div 9=$ $\qquad$
The first digit of the quotient is in
the $\qquad$ place.

## STEP 2

Divide the hundreds.

## STEP 3

Divide the tens.
STEP 4
Divide the ones.
$9 \longdiv { 2 , 7 5 4 }$


Since $\qquad$ is close to the estimate of $\qquad$ ,
the answer is reasonable.
So, Jenna's family will travel $\qquad$ miles each day.

CONNECT Division and multiplication are inverse operations. Inverse operations are opposite operations that undo each other. You can use multiplication to check your answer to a division problem.

## (1) EXOM@

To check your answer to a division problem, multiply the quotient by the divisor. If there is a remainder, add it to the product. The result should equal the dividend.

| 102 r 2 |
| :--- |
| $6 \longdiv { 6 1 4 }$ |
| $\frac{-6}{01}$ |
| $\frac{-0}{14}$ |
| $\frac{-12}{2}$ |



2

Since the result of the check is equal to the dividend, the division is correct.


So, $614 \div 6$ is $\qquad$ .

You can use what you know about checking division to find an unknown value.

Try This! Find the unknown number by finding the value of $n$ in the related equation.

$\qquad$

## Share and Show

Divide. Check your answer.

1. $8 \longdiv { 6 2 4 }$ Check.

## On Your ©wn

## Divide.

4. $6 \longdiv { 9 3 8 }$
5. $4 \longdiv { 7 6 2 }$
6. $3 \longdiv { 5 , 6 5 4 }$
7. $8 \longdiv { 4 7 5 }$

Practice: Copy and Solve Divide.
8. $4 \longdiv { 6 7 1 }$
9. $9 \longdiv { 2 , 0 2 3 }$
10. $3 \longdiv { 4 , 6 8 5 }$
11. $8 \longdiv { 9 4 8 }$
12. $1,326 \div 4$
13. $5,868 \div 6$
14. $566 \div 3$
15. $3,283 \div 9$

Matilimatical (2) Use Reasoning Algebra Find the value of $\boldsymbol{n}$ in each equation.
PrActic: Write what $\boldsymbol{n}$ represents in the related division problem.
16. $n=4 \times 58$
$n=$ $\qquad$
17. $589=7 \times 84+n$
$n=$
18. $n=5 \times 67+3$
$n=$ $\qquad$

## Problem Solving • Applications

## Use the table to solve 19-21.

19. If the Welcome gold nugget were turned into 3 equal-sized gold bricks, how many troy ounces would each brick weigh?
20. Pose a Problem Look back at Problem 19. Write a similar problem by changing the nugget and the number of bricks. Then solve the problem.

| Large Gold Nuggets Found |  |  |
| :--- | :---: | :---: |
| Name | Weight | Location |
| Welcome Stranger | 2,284 troy ounces | Australia |
| Welcome | 2,217 troy ounces | Australia |
| Willard | 788 troy ounces | California |

$\qquad$
21. GロDEEPER Suppose the Willard gold nugget was turned into 4 equal-sized gold bricks. If one of the bricks was sold, how many troy ounces of the Willard nugget would be left?
22. THINKSMARIER There are 246 students going on a field trip to pan for gold. If they are going in vans that hold 9 students each, how many vans are needed? How many students will ride in the van that isn't full?


## Division with 2-Digit Divisors

Essential Question How can you use base-ten blocks to model and understand division of whole numbers?

Number and Operations in Base
Ten-5.NBT. 6
MATHEMATICAL PRACTICES MP.4, MP.5, MP. 6

## Investigate

Materials $\quad$ base-ten blocks
There are 156 students in the Carville Middle School chorus. The music director wants the students to stand with 12 students in each row for the next concert. How many rows will there be?
A. Use base-ten blocks to model the dividend, 156.
B. Place 2 tens below the hundred to form a rectangle. How many groups of 12 does the rectangle show? How much of the dividend is not shown in this rectangle?
C. Combine the remaining tens and ones into as many groups of 12 as possible. How many groups of 12 are there?

D. Place these groups of 12 on the right side of the rectangle to make a larger rectangle.
E. The final rectangle shows $\qquad$ groups of 12 .

So, there will be $\qquad$ rows of 12 students.

## Draw Conclusions

1. 


$\qquad$
$\qquad$
2.
(Manitemaical (6)Describe how you can use base-ten blocks to find the quotient $176 \div 16$.

## Make Connections

The two sets of groups of 12 that you found in the Investigate are partial quotients. First you found 10 groups of 12 and then you found 3 more groups of 12 . Sometimes you may need to regroup before you can show a partial quotient.

You can use a quick picture to record the partial products.


Divide. $180 \div 15$

MODEL Use base-ten blocks.
STEP 1 Model the dividend, 180, as 1 hundred 8 tens.
Model the first partial quotient by making a rectangle with the hundred and 5 tens. In the Record section, cross out the hundred and tens you use.

The rectangle shows $\qquad$ groups of 15 .

STEP 2 Additional groups of 15 cannot be made without regrouping.

Regroup 1 ten as 10 ones. In the Record section, cross out the regrouped ten.

There are now $\qquad$ tens and $\qquad$ ones.

STEP 3 Decide how many additional groups of 15 can be made with the remaining tens and ones. The number of groups is the second partial quotient.

Make your rectangle larger by including these groups of 15. In the Record section, cross out the tens and ones you use.

There are now $\qquad$ groups of 15 .

RECORD Use quick pictures.


Draw the first partial quotient.

Draw the first and second partial quotients.

Explain how your model shows the quotient.

## Share and Show

## Use the quick picture to divide.

1. $143 \div 13$


Name

Divide. Use base-ten blocks.
2. $168 \div 12$
3. $154 \div 14$
3. $154-14$

Divide. Draw a quick picture.
5. $165 \div 11$
6. $216 \div 18$
7. $196 \div 14$
8. $195 \div 15$
9. $182 \div 13$
10. $228 \div 12$
4. $187 \div 11$

## Connect tol Social Studies

## Pony Express

The Pony Express used men riding horses to deliver mail between St. Joseph, Missouri, and Sacramento, California, from April, 1860 to October, 1861. The trail between the cities was approximately 2,000 miles long. The first trip from St. Joseph to Sacramento took 9 days 23 hours. The first trip from Sacramento to St. Joseph took 11 days 12 hours.

Solve.

11. THINKSMARTER Two Pony Express riders each rode part of a 176 -mile trip. Each rider rode the same number of miles. They changed horses every 11 miles. How many horses did each rider use?

12. $G \square D E E P E R$ Suppose a Pony Express rider was paid $\$ 192$ for 12 weeks of work. If he was paid the same amount each week, how much was he paid for 3 weeks of work?
 rode a total of 240 miles. If they used a total of 16 horses, and rode each horse the same number of miles, how many miles did they ride before replacing each horse?
14. THINKSMARTER Suppose it took 19 riders a total of 11 days 21 hours to ride from St. Joseph to Sacramento. If they all rode the same number of hours, how many hours did each rider ride?

Number and Operations in Base Ten-5.NBT. 6
MATHEMATICAL PRACTICES MP.3, MP. 8

## Unlock the Problem

People in the United States eat about 23 pounds of pizza per person every year. If you ate that much pizza each year, how many years would it take you to eat 775 pounds of pizza?

0
Divide by using partial quotients.

- Rewrite in one sentence the problem you are asked to solve.
$\qquad$
$\qquad$


## COMPLETE THE DIVISION PROBLEM.

$2 3 \longdiv { 7 7 5 }$

$$
\begin{equation*}
10 \times 23 \tag{10}
\end{equation*}
$$

$775 \div 23$ is $\qquad$ $r$ $\qquad$ .

So, it would take you more than 33 years to eat 775 pounds of pizza.

## Remember

Depending on the question, a remainder may or may not be used in answering the question. Sometimes the quotient is adjusted based on the remainder.

## 1) Example

Myles is helping his father with the supply order for his pizza shop. For next week, the shop will need 1,450 ounces of mozzarella cheese. Each package of cheese weighs 32 ounces. Complete Myles's work to find how many packages of mozzarella cheese he needs to order.
$3 2 \longdiv { 1 , 4 5 0 }$

$1,450 \div 32$ is $\qquad$ r $\qquad$ .

So, he needs to order $\qquad$ packages of mozzarella cheese.

Try This! Use different partial quotients to solve

Math Talk

What does the remainder represent? Explain how the remainder will affect your answer. the problem above.


## Math Idea

Using different multiples of the divisor to find partial quotients provides many ways to solve a division problem. Some ways are quicker, but all result in the same answer.

## Share and Show

Divide. Use partial quotients.

1. $1 8 \longdiv { 6 4 8 }$

## On Your Own

Divide. Use partial quotients.
5. $5 1 \longdiv { 1 , 8 3 1 }$

## 4. $7 3 \longdiv { 5 8 4 }$

6. $8 2 \longdiv { 2 , 9 6 4 }$
7. $892 \div 26$

Practice: Copy and Solve Divide. Use partial quotients.
10. $653 \div 42$
14. $1,544 \div 34$
11. $946 \div 78$
12. $412 \div 18$
16. $2,740 \div 83$
3. $858 \div 57$

## Math

Mathematical Practices
Explain what the greatest possible whole-number remainder is if you divide any number by 23 .
9. $2,950 \div 67$
8. $1,056 \div 48$

## Problem Solving • Applications

## Use the table to solve 18-21.

18. How many years would it take for a person in the United States to eat 855 pounds of apples?
19. How many years would it take for a person in the

Each year each person in the U.S. eats about. - 68 quarts of popcorn . 53 pounds of bread - 19 pounds of apples - 14 pounds of turkey
20. GПDEEPER If 6 people in the United States each eat the average amount of popcorn for 5 years, how many quarts of popcorn will they eat?
21. Marinicilce (1) Make Sense of Problems In the United States, a person eats more than 40,000 pounds of bread in a lifetime if he or she lives to be 80 years old. Does this statement make sense, or is it nonsense? Explain.
$\qquad$
$\qquad$
$\qquad$
22. THINKSMARTER In a study, 9 people ate a total of 1,566 pounds of potatoes in 2 years. If each person ate the same amount each year, how many pounds of potatoes did each person eat in 1 year?

23. THINKSMARTER Nyree divided 495 by 23 using partial quotients. Find the quotient and remainder. Explain your answer using numbers and words.

$\qquad$

## Mid-Chapter Checkpoint

## Goncepts and Skills

1. Explain how estimating the quotient helps you place the first
digit in the quotient of a division problem. (5.Nвт.6)
2. Explain how to use multiplication to check the answer to a division problem. (5.NBT.6)
$\qquad$
$\qquad$
$\qquad$

Divide. (5.NBT.6)
3. $633 \div 3$
4. $487 \div 8$
5. $1,641 \div 4$
6. $2,765 \div 9$

Divide. Use partial quotients. (5.nвт.6)

| 7. $156 \div 13$ | 8. $318 \div 53$ |
| :--- | :--- |

$\qquad$
9. $1,562 \div 34$
10. $4,024 \div 68$
11. Emma is planning a party for 128 guests. If 8 guests can be seated at each table, how many tables will be needed for seating at the party? (5.NBT.6)
12. Tickets for the basketball game cost $\$ 14$ each. If the sale of the tickets brought in $\$ 2,212$, how many tickets were sold? (5.NBT.6)
13. Margo used 864 beads to make necklaces for the art club. She made 24 necklaces with the beads. If each necklace has the same number of beads, how many beads did Margo use for each necklace? (5.NBT.6)
14. Angie needs to buy 156 candles for a party. Each package has 8 candles. How many packages should Angie buy? (5.NBT.6)

## Name

connect You can estimate quotients using compatible numbers that are found by using basic facts and patterns.

$$
\begin{aligned}
35 \div 5 & =7 \quad \leftarrow \text { basic fact } \\
350 \div 50 & =7 \\
3,500 \div 50 & =70 \\
35,000 \div 50 & =700
\end{aligned}
$$

## Unlock the Problem

The observation deck of the Willis Tower in Chicago, Illinois, is 1,353 feet above the ground. Elevators lift

visitors to that level in 60 seconds. About how many feet do the elevators travel per second?

4 Willis Tower,
formerly known as the Sears Tower, is the tallest building in the United States.

## STEP 1

Use two sets of compatible numbers to find two different estimates.


STEP 2
Use patterns and basic
facts to help estimate.

$$
\begin{array}{r|r}
12 \div 6 & = \\
120 \div 60 & = \\
1,200 \div 60 & =
\end{array}\left|\begin{array}{r}
18 \div 6 \\
-
\end{array}\right| \begin{aligned}
& \square \\
& \div
\end{aligned}
$$

The elevators travel about $\qquad$ to $\qquad$ feet per second.

The more reasonable estimate is $\qquad$ because
$\qquad$ is closer to 1,353 than $\qquad$ is.

So, the observation deck elevators in the Willis Tower travel
about $\qquad$ feet per second.

## $\Omega$ Example Estimate money.

Miriam saved $\$ 650$ to spend during her 18-day trip to Chicago. She doesn't want to run out of money before the trip is over, so she plans to spend about the same amount each day. Estimate how much she can spend each day.

Estimate. 18 $\$ \longdiv { \$ 6 5 0 }$

$\$ 600 \div$ $\qquad$ $=\$ 30$
or $\qquad$ $\div 20=\$ 40$

So, Miriam can spend about $\qquad$ to $\qquad$ each day.

- Marinkaical 2) Use Reasoning Which estimate do you think
is the better one for Miriam to use? Explain your reasoning.
$\qquad$
$\qquad$
Try This! Use compatible numbers.

Find two estimates.
$5 2 \longdiv { 4 1 5 }$

Estimate the quotient.
$3 8 \longdiv { \$ 2 , 7 6 4 }$

## Share and Show

## MATH

 BOARDUse compatible numbers to find two estimates.

1. $2 2 \longdiv { 1 5 4 }$
$140 \div 20=$ $\qquad$
$160 \div 20=$ $\qquad$
©4. $3 3 \longdiv { 2 9 1 }$
2. $6 8 \longdiv { 5 0 3 }$
3. $8 1 \longdiv { 7 , 0 5 2 }$
4. $1 9 \longdiv { 5 , 3 1 2 }$

## On Your Own

Use compatible numbers to find two estimates.
7. $4 2 \longdiv { 3 9 6 }$
8. $5 9 \longdiv { 4 1 3 }$
10. $2 2 \longdiv { 3 6 8 }$
11. $7 8 \longdiv { 3 7 5 }$

## Use compatible numbers to estimate the quotient.

13. $1 9 \longdiv { 2 2 8 }$
14. $2 5 \longdiv { \$ 5 9 5 }$
15. $8 3 \longdiv { 4 6 2 }$
16. $2 7 \longdiv { 9 , 1 4 4 }$
17. $8 8 \longdiv { 6 , 0 8 0 }$
18. $8 6 \longdiv { 7 , 1 3 0 }$
19. $6 8 \longdiv { 7 1 0 }$
20. $6 8 \longdiv { 7 1 0 }$
21. A store owner bought a large box of 5,135 paper clips. He wants to repackage the paper clips into 18 smaller boxes. Each box should contain about the same number of paper clips. About how many paper clips should the store owner put into each box?
$\qquad$
22. Explain how you can use compatible numbers to estimate the quotient of $925 \div 29$.

## Problem Solving • Applications

## Use the picture to solve 21-22.

21. $\square$ Use estimation to decide which building has the tallest floors. About how many meters is each floor?

22. 

Marin:mical (3) Make Arguments About how many meters tall is each floor of the Chrysler Building? Use what you know about estimating quotients to justify your answer.
$\qquad$
$\qquad$
23. WRITE Math Explain how you know whether the quotient of $298 \div 31$ is closer to 9 or to 10 .

$\qquad$

[^0]24. G■DEEPER Eli needs to save $\$ 235$. To earn money, he plans to mow lawns and charge $\$ 21$ for each. Write two estimates Eli could use to determine the number of lawns he needs to mow. Decide which estimate you think is the better one for Eli to use. Explain your reasoning.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
25. THINKSMARTER Anik built a tower of cubes. It was 594 millimeters tall.

The height of each cube was 17 millimeters. About how many cubes did Anik use? Explain your answer.

## Unlock the Problem

Mr. Yates owns a smoothie shop. To mix a batch of his famous orange smoothies, he uses 18 ounces of

- Underline the sentence that tells you what you are trying to find.
- Circle the numbers you need to use.
Circle the numbers you need to use. 560 ounces of fresh orange juice. How many batches of

Divide. $560 \div 18 \quad$ Estimate.

STEP 1 Use the estimate to place the first digit in the quotient.
$1 8 \longdiv { 5 6 0 }$
The first digit of the quotient will be in the place.

STEP 2 Divide the tens.


STEP 3 Divide the ones.

Mathematical Practices
Explain what the remainder 2 represents.
Since 31 is close to the estimate of 30 , the answer is reasonable.


$\qquad$ So, Mr. Yates can make 31 batches of orange smoothies each day.

## ( ) Example

Every Wednesday, Mr. Yates orders fruit. He has set aside $\$ 1,250$ to purchase Valencia oranges. Each box of Valencia oranges costs $\$ 41$. How many boxes of Valencia oranges can Mr. Yates purchase?

You can use multiplication to check your answer.

Divide. 1,250 $\div 41$


DIVIDE
CHECK YOUR WORK
Estimate. $\qquad$


$$
\begin{array}{r}
30 \\
\times 41 \\
\hline 30 \\
+1,200 \\
\hline
\end{array} \quad+\quad .
$$

So, Mr. Yates can buy $\qquad$ boxes of Valencia oranges.

Try This! Divide. Check your answer.


## Share and Show

Divide. Check your answer.

1. $2 8 \longdiv { 6 2 0 }$
2. $6 4 \longdiv { 8 4 2 }$
3. $723 \div 31$

## On Your Own

Divide. Check your answer.
7. $1 6 \longdiv { 3 4 6 }$
8. $3 4 \longdiv { 4 2 1 }$
10. $2 1 \longdiv { 1 , 0 9 8 }$
11. $3 2 \longdiv { 6 , 4 6 6 }$
14. $2,292 \div 19$
13. $483 \div 21$
5. $1,359 \div 45$
8. $3 4 \longdiv { 4 2 1 }$
15. $4,255 \div 30$

## Practice: Copy and Solve Divide. Check your answer.

16. $775 \div 35$
17. $820 \div 41$
18. $805 \div 24$
19. $1,166 \div 53$
20. $1,989 \div 15$
21. $3,927 \div 35$

## Problem Solving • Applications ( $\left.\begin{array}{c}\text { eorld } \\ \text { (arl }\end{array}\right)$

## Use the list at the right to solve 22-24.

22. GロDEEPER A smoothie shop receives a delivery of 968 ounces of grape juice and 720 ounces of orange juice. How many more Royal Purple smoothies than Orange Tango smoothies can be made with the shipment of juices?
23. THINKSMARTER The shop has 1,260 ounces of cranberry juice and 650 ounces of passion fruit juice. If the juices are used to make Crazy Cranberry smoothies,
 which juice will run out first? How much of the other juice will be left over?
 there are 680 ounces of orange juice and 410 ounces of mango juice. How many Orange Tango smoothies can be made? Explain your reasoning.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
Personal Math Trainer
24. THINKSMARTER For numbers 25a-25b, select True or False for each statement.
$25 a$. $1,585 \div 16$ is 99 rl .
O TrueFalse

25b. $1,473 \div 21$ is 70 r 7 .True
False

Smoothie Maino Ingredients
Orange Tango

## Smoothie

18 ounces orange juice
12 ounces mango juice
Crazy Cranberry Smoothie
 Smoothie

22 ounces grape juice 8 ounces apple juice

20 ounces cranberry juice 10 ounces passion fruit juice

WRITE Math . Show Your Work
$\qquad$

## Interpret the Remainder

Essential Question When solving a division problem, when do you write the remainder as a fraction?

Number and Operations-Fractions5.NF. 3

Also 5.NBT. 6
MATHEMATICAL PRACTICES
MP.2, MP. 4

## Unlock the Problem

Scott and his family want to hike a trail that is 1,365 miles long. They will hike equal parts of the trail on 12 different hiking trips. How many miles will Scott's family hike on each trip?

When you solve a division problem with a remainder, the way you interpret the remainder depends on the situation and the question. Sometimes you need to use both the quotient and the remainder. You can do that by writing the remainder as a fraction.

## I) One Way write the remainder as a fraction.

First, divide to find the quotient and remainder.
Then, decide how to use the quotient and remainder to answer the question.

- The $\qquad$ represents the number of trips Scott and his family plan to take.
- The $\qquad$ represents the whole-number part of the number of miles Scott and his family will hike on each trip.
- The $\qquad$ represents the number of miles left over.
- The remainder represents 9 miles, which can also be divided into 12 parts and written as a fraction.
- Circle the dividend you will use to solve the division problem.
- Underline the divisor you will use to solve the division problem.
$\qquad$

So, Scott and his family will hike $\qquad$ miles on each trip.

## (1) Another Way use only the quotient.

The segment of the Appalachian Trail that runs through Pennsylvania is 232 miles long. Scott and his family want to hike 9 miles each day on the trail. How many days will they hike exactly 9 miles?


So, they will hike exactly 9 miles on each of $\qquad$ days.

## P) Other Ways

Add 1 to the quotient.
What is the total number of days that Scott will need to hike 232 miles?

- To hike the 7 remaining miles, he will need 1 more day.

So, Scott will need $\qquad$ days to hike 232 miles.

## B Use the remainder as the answer.

If Scott hikes 9 miles each day except the last day, how many miles will he hike on the last day?

- The remainder is 7 .

So, Scott will hike $\qquad$ miles on the last day.

## Try This!

A sporting goods store is going to ship 1,252 sleeping bags. Each shipping carton can hold 8 sleeping bags. How many cartons are needed to ship all of the sleeping bags?


Since there are $\qquad$ sleeping bags left over,
cartons will be needed for all of the sleeping bags.

Math

Explain why you would not write the remainder as a fraction when you find the number of cartons needed in the Try This.

## Share and Show

## MATH

 BOARD
## Interpret the remainder to solve.

1. Erika and Bradley want to hike the Big Cypress Trail. They will hike a total of 75 miles. If Erika and Bradley plan to hike for 12 days, how many miles will they hike each day?
a. Divide to find the quotient and remainder.
b. Decide how to use the quotient and remainder to answer the question.
2. What if Erika and Bradley want to hike 14 miles each day? How many days will they hike exactly 14 miles?

## On Your Own

## Interpret the remainder to solve.

4. GODEEPER The students in a class of 24 share 48 apple slices and 36 orange slices equally among them. How many pieces of fruit did each student get?
$\qquad$
5. A total of 123 fifth-grade students are going to Fort Verde State Historic Park. Each bus holds 38 students. All of the buses are full except one. How many students will be in the bus that is not full?
6. Dylan's hiking club is planning to stay overnight at a camping lodge. Each large room can hold 15 hikers. There are 154 hikers. How many rooms will they need?
7. A campground has cabins that can each hold 28 campers. There are 148 campers visiting the campground. How many cabins are full if 28 campers are in each cabin?
8. 

(martimatical (3) Verify the Reasoning of Others Sheila is going to divide a 36 -inch piece of ribbon into 5 equal pieces. She says each piece will be 7 inches long. What is Sheila's error?

## Unlock the Problem

8. Maureen has 243 ounces of trail mix. She puts an equal number of ounces in each of 15 bags. How many ounces of trail mix does Maureen have left over?
a. What do you need to find? $\qquad$
b. How will you use division to find how many ounces of trail mix are left over?
$\qquad$
$\qquad$
c. Show the steps you use to solve the problem.
d. Complete the sentences.

Maureen has $\qquad$ ounces of trail mix.

She puts an equal number of ounces in each of $\qquad$ bags.

Each bag has $\qquad$ ounces.

Maureen has $\qquad$ ounces of trail mix left over.
9. THINK SMARTER James has 884 feet of rope. There are 12 teams of hikers. If James gives an equal amount of rope to each team, how much rope will each team receive?

10. THINKSMARTER Rory works at a produce packing plant. She packed 2,172 strawberries last week and put them in containers with 8 strawberries in each one. How many containers of strawberries did Rory fill with 8 strawberries? Explain how you used the quotient and the remainder to answer the question.
$\qquad$
$\qquad$
$\qquad$

CONnect When you estimate to decide where to place the first digit, you can also try using the first digit of your estimate to find the first digit of your quotient. Sometimes an estimate is too low or too high.

Divide. $3,382 \div 48$
Estimate. 3,000 $\div 50=60$
Try 6 tens.
If an estimate is too low, the difference will be greater than the divisor.
$\begin{array}{cl}6 & \begin{array}{l}\text { Since the estimate is too } \\ \text { low, adjust by increasing the } \\ 48 \lcm{3,382} \\ \frac{-288}{50}\end{array}\end{array}$

Divide. $453 \div 65$
Estimate. $490 \div 70=7$
Try 7 ones.
If an estimate is too high, the product with the first digit will be too large and cannot be subtracted.
$\begin{aligned} 7 & \begin{array}{l}\text { Since the estimate is too } \\ \text { high, adjust by decreasing the } \\ 6 5 \longdiv { 4 5 3 } \\ -455\end{array}\end{aligned}$

## Unlock the Problem

A new music group makes 6,127 copies of its first CD. The group sells 75 copies of the CD at each of its shows. How many shows does it take the group to sell all of the CDs?

0
Divide. 6,127 $\div 75$ Estimate. $6,300 \div 70=90$


STEP 1 Use the estimate, 90. Try 9 tens.

- Is the estimate too high, too low, or correct?
- Adjust the number in the quotient if needed.

STEP 2 Estimate the next digit in the quotient.
Divide the ones.
Estimate: $140 \div 70=2$. Try 2 ones.

- Is the estimate too high, too low, or correct?
$7 5 \longdiv { 6 , 1 2 7 }$
- Adjust the number in the quotient if needed.

So, it takes the group $\qquad$ shows to sell all of the CDs.

Try This! When the difference is equal to or greater than the divisor, the estimate is too low.

Divide. $336 \div 48$ Estimate. $300 \div 50=6$

Use the estimate.

Try 6 ones.

$$
4 8 \longdiv { 3 3 6 }
$$

Since $\qquad$ , the estimate is $\qquad$ .

Adjust the estimated digit in the quotient if needed. Then divide.

Try $\qquad$ .
$336 \div 48=$ $\qquad$
Mathematical Practices
Explain why using the closest estimate could be useful in solving a division problem.

## Shape and Show

```
MATH BOARD
```

Adjust the estimated digit in the quotient, if needed. Then divide.

1. $4 1 \longdiv { 1 , 5 4 6 }$
2. $1 6 \longdiv { 4 1 6 }$
9
3. $3 4 \longdiv { 2 , 8 3 1 }$

## Divide.

4. $1 9 \longdiv { 9 1 5 }$
5. $2 8 \longdiv { 1 , 8 2 5 }$
6. $4 5 \longdiv { 3 , 5 1 8 }$
$\qquad$

## On Your Own

## Divide.

7. $1 5 \longdiv { 9 7 5 }$
8. $3 7 \longdiv { 2 6 4 }$
9. $3 4 \longdiv { 6 , 8 3 7 }$

Practice: Copy and Solve Divide.
10. $452 \div 31$
13. $601 \div 66$
16. $1,488 \div 78$
,
11. $592 \div 74$
12. $785 \div 14$

Maमi:nanical 7) Identify Relationships Algebra Write the unknown number for each $\square$.
19.
$1 \div 33=11$
$\square=$ $\qquad$
20. $1,092 \div 52=$
$\square$
21. $429 \div \square=33$

$$
\square=
$$

$\qquad$
 4 weeks. If they serve the same number of sandwiches each day, how many sandwiches do they serve in 1 day? Explain how you found your answer.
$\qquad$
$\qquad$
$\qquad$
23. THINKSMARTER Kainoa collects trading cards. He has 1,025 baseball cards, 713 basketball cards, and 836 football cards. He wants to put all of them in albums. Each page in the albums holds 18 cards. How many pages will he need to hold all of his cards?


## Unlock the Problem

24. GПDEEPER

A banquet hall serves 2,394 pounds of turkey during a 3-week period. If the same amount is served each day, how many pounds of turkey does the banquet hall serve each day?
a. What do you need to find? $\qquad$
$\qquad$
b. What information are you given? $\qquad$

$\qquad$
c. What other information will you use?
$\qquad$
$\qquad$
$\qquad$
d. Find how many days there are in 3 weeks.

There are $\qquad$ days in 3 weeks.
e. Divide to solve the problem.
f. Complete the sentence.

The banquet hall serves $\qquad$ of turkey each day.
25. Marcos mixes 624 ounces of lemonade. He wants to fill the 52 cups he has with equal amounts of lemonade. How much lemonade should he put in each cup?
26. THINKSMARTER Oliver estimates the first digit in the quotient.

$$
\frac{9}{7 5 \longdiv { 6 , 2 3 4 }}
$$

Oliver's estimate is
correct.
too high.
too low

Name

## Problem Solving • Division

Essential Question How can the strategy draw a diagram help you solve a division problem?

## Unlock the Problem

Sean and his family chartered a fishing boat for the day. Sean caught a blue marlin and an amberjack. The weight of the blue marlin was 12 times as great as the weight of the amberjack. The combined weight of both fish was 273 pounds. How much did each fish weigh?

## Read the Problem

What do I need to find?
I need to find $\qquad$ .

I need to know that Sean caught a total of $\qquad$ pounds of fish and the weight of the blue marlin was $\qquad$ times as great as the weight of the amberjack.

## How will I use the information?

I can use the strategy
and then divide. I can draw and use a bar model to write the division problem that helps me find the weight of each fish.

## Solve the Problem

I will draw one box to show the weight of the amberjack. Then I will draw a bar of 12 boxes of the same size to show the weight of the blue marlin. I can divide the total weight of the two fish by the total number of boxes.


So, the amberjack weighed $\qquad$ pounds and the
blue marlin weighed $\qquad$ pounds.

## (1) Try Another Problem

Jason, Murray, and Dana went fishing. Dana caught a red snapper. Jason caught a tuna with a weight 3 times as great as the weight of the red snapper. Murray caught a sailfish with a weight 12 times as great as the weight of the red snapper. If the combined weight of the three fish was
 208 pounds, how much did the tuna weigh?

## Read the Problem

What do I need to find?

## What information do I need to use?

## How will I use the information?

## Solve the Problem

So, the tuna weighed $\qquad$ pounds.

- How can you check if your answer is correct? $\qquad$


## Share and Show

1. Paula caught a tarpon with a weight that was 10 times as great as the weight of a permit fish she caught. The total weight of the two fish was 132 pounds. How much did each fish weigh?

First, draw one box to represent the weight of the permit fish and ten boxes to represent the weight of the tarpon.

Next, divide the total weight of the two fish by the total number of boxes you drew. Place the quotient in each box.
$\square$
Last, find the weight of each fish.

## WRITE Math . Show Your Work

The permit fish weighed $\qquad$ pounds.

The tarpon weighed $\qquad$ pounds.
2. What if the weight of the tarpon was 11 times the weight of the permit fish, and the total weight of the two fish was 132 pounds? How much would each fish weigh?
permit fish: $\qquad$ pounds
tarpon: $\qquad$ pounds
6. Jon caught four fish that weighed a total of 252 pounds. The kingfish weighed twice as much as the amberjack and the white marlin weighed twice as much as the kingfish. The weight of the tarpon was 5 times the weight of the amberjack. How much did each fish weigh?
amberjack: $\qquad$ pounds
kingfish: $\qquad$ pounds
marlin: $\qquad$ pounds
tarpon: $\qquad$ pounds

## On Your Own

## Use the table to solve 4-5.

4. THINKSMARTER Kevin bought 3 bags of gravel to cover the bottom of his fish tank. He has 8 pounds of gravel left over. How much gravel did Kevin use to cover the bottom of the tank?
5. 



Apply Look back at Problem 4. Write a similar problem by changing the number of bags of gravel and the amount of gravel left.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
6. THINKSMARTER The crew on a fishing boat caught four fish that weighed a total of 1,092 pounds. The tarpon weighed twice as much as the amberjack and the white marlin weighed twice as
 much as the tarpon. The weight of the tuna was 5 times the weight of the amberjack. How much did each fish weigh?
$\qquad$
$\qquad$
7. G【DEEPER A fish market bought two swordfish at a rate of $\$ 13$ per pound. The cost of the larger fish was 3 times as great as the cost of the smaller fish. The total cost of the two fish was $\$ 3,952$. How much did each fish weigh?

Personal Math Trainer
8. THINK SMARTIER Eric and Stephanie took their younger sister Melissa to pick apples. Eric picked 4 times as many apples as Melissa. Stephanie picked 6 times as many apples as Melissa. Eric and Stephanie picked 150 apples together. Draw a diagram to find the number of apples Melissa picked.


## (V)Chapter 2 Review/Test

1. Choose the word that makes the sentence true.

The first digit in the quotient of $1,875 \div 9$

2. For numbers 2a-2d, select True or False to indicate whether the quotient is correct.
2a. $225 \div 9=25$
O TrueFalse
2b. $154 \div 7=22$True
False
2c. $312 \div 9=39$True
False
2d. $412 \div 2=260$
O True
False
3. Chen is checking a division problem by doing the following:

$$
\begin{array}{r}
152 \\
\times \quad 4 \\
\hline 608 \\
+\quad 2 \\
\hline 610
\end{array}
$$

What problem is Chen checking?
$\square$
4. Isaiah wrote this problem in his notebook. Using the vocabulary box, label the parts of the division problem. Then, using the vocabulary, explain how Isaiah can check whether his quotient is correct.

$\square$
5. Tammy says the quotient of $793 \div 6$ is 132 rl . Use multiplication to show if Tammy's answer is correct.
$\square$
6. Jeffery wants to save the same amount of money each week to buy a new bike. He needs $\$ 252$. If he wants the bike in 14 weeks, how much money should Jeffery save each week?

## \$

$\qquad$
7. Dana is making a seating chart for an awards banquet. There are 184 people coming to the banquet. If 8 people can be seated at each table, how many tables will be needed for the awards banquet?
$\qquad$ tables

## Name

8. Divide 575 by 14 by using partial quotients. What is the quotient? Explain your answer using numbers and words.
$\square$
9. For numbers $9 a-9 c$, choose Yes or No to indicate whether the statement is correct.

9a. $5,210 \div 17$ is 306 r 8 .
$\bigcirc$ Yes
9b. $8,808 \div 42$ is 209 r 30 .
$\bigcirc$ Yes
O No
9c. $\quad 1,248 \div 24$ is 51 .
Yes
10. Divide. Draw a quick picture.

$$
156 \div 12=\square
$$


11. Divide. Show your work.
17) 5,210
$\square$
12. Choose the compatible numbers that will give the best estimate for $429 \div 36$.

| 300 |
| :---: |
| 350 |
| 440 | and | 60 |
| :---: |
| 50 |
| 40 |

13. Samuel needs 233 feet of wood to build a fence. The wood comes in lengths of 11 feet.

## Part A

How many total pieces of wood will Samuel need? Explain your answer.
$\square$

## Part B

Theresa needs twice as many feet of wood as Samuel. How many pieces of wood does Theresa need? Explain your answer.
$\square$

## Name

14. Russ and Vickie are trying to solve this problem:

There are 146 students taking buses to the museum. If each bus holds 24 students, how many buses will they need?

Russ says the students need 6 buses. Vickie says they need 7 buses.
Who is correct? Explain your reasoning.
$\square$
15. Write the letter for each quick picture under the division problem it represents.


16. Steve is buying apples for the fifth grade. Each bag holds 12 apples. If there are 75 students total, how many bags of apples will Steve need to buy if he wants to give one apple to each student?
$\qquad$ bags
17. Rasheed needs to save $\$ 231$. To earn money, he plans to wash cars and charge $\$ 12$ per car. Write two estimates Rasheed could use to determine how many cars he needs to wash.
$\square$
18. Paula has a dog that weighs 3 times as much as Carla's dog. The total weight of the dogs is 48 pounds. How much does
Paula's dog weigh?
Draw a diagram to find the weight of Paula's dog.
$\square$
19. Dylan estimates the first digit in the quotient.
$4 6 \longdiv { 3 , 6 6 2 }$
Dylan's estimate is $\begin{gathered}\text { too high. } \\ \text { too low }\end{gathered}$.

## Add and Subtract Decimals

## Show What You Know

Check your understanding of important skills.
Name $\qquad$
2-Digit Addition and Subtraction Find the sum or difference.

2.

| Hundreds | Tens | Ones |
| :---: | :---: | :---: |
|  | $\square$ | $\square$ |
| - |  |  |
|  | 4 | 2 |
|  |  |  |

Decimals Greater Than One Write the word form and the expanded form for each.
3. 3.4
4. 2.51

## Relate Fractions and Decimals Write as a decimal or a fraction.

5. 0.8
6. $\frac{5}{100}$
7. 0.46
8. $\frac{6}{10}$ $\qquad$ 9. 0.90
9. $\frac{35}{100}$ $\qquad$

## Clues

- The digit in the tens place is the greatest number.
- The digit in the tenths place is less than the digit in the hundredths place.
- The digit in the ones place is greater than the digit in the hundredths place.


## Vocabulary Builder

## Visualize It

Use the $\checkmark$ words to complete the tree map.


## Understand Vocabulary

Read the description. Which word do you think is described?

1. One of one hundred equal parts $\qquad$
2. The value of each digit in a number based on the location of the digit
3. To replace a number with one that is simpler and is approximately the same size as the original number $\qquad$
4. An ordered set of numbers $\qquad$
5. One of ten equal parts $\qquad$
6. A familiar number used as a point of reference $\qquad$
7. One of one thousand equal parts $\qquad$
8. Each of the numbers in a sequence
$\qquad$

## Thousandths

Essential Question How can you describe the relationship between two decimal place-value positions?

Number and Operations in Base Ten-5.NBT. 1
Also 5.NBT.3a
MATHEMATICAL PRACTICES
MP.5, MP.6, MP. 7

## Investigate

Materials $■$ color pencils $■$ straightedge
Thousandths are smaller parts than hundredths. If one hundredth is divided into ten equal parts, each part is one thousandth.

Use the model at the right to show tenths, hundredths, and thousandths.
A. Divide the larger square into 10 equal columns or rectangles. Shade one rectangle. What part of the whole is the shaded rectangle? Write that part as a decimal and a fraction.
B. Divide each rectangle into 10 equal squares. Use a second color to shade in one of the squares. What part of the whole is the shaded square? Write that part as a decimal and a fraction.


Use a third color to shade one rectangle of the enlarged hundredths square. What part of the whole is the shaded rectangle? Write that part as a decimal and a fraction.

Mathematical Practices
There are 10 times as many hundredths as there are tenths. Explain how the model shows this.

## Draw Conclusions

1. Explain what each shaded part of your model in the Investigate section shows. What fraction can you write that relates each shaded
part to the next greater shaded part? $\qquad$
$\qquad$
2. Martimatical (5) Use a Concrete Model Identify and describe a part of your model that shows one thousandth. Explain how you know.
$\qquad$
$\qquad$
$\qquad$

## Make Gonnections

The relationship of a digit in different place-value positions is the same with decimals as it is with whole numbers. You can use your understanding of place-value patterns and a place-value chart to write decimals that are 10 times as much as or $\frac{1}{10}$ of a decimal.

| Ones • Tenths | Hundredths | Thousandths |  |
| :---: | :---: | :---: | :---: |
| 0 | $\bullet$ | 0 | 4 |
|  | $?$ | 0.04 | $?$ |
| (10 times <br> as much |  |  |  |

$\qquad$ is 10 times as much as 0.04 .
as much
$\qquad$ is $\frac{1}{10}$ of 0.04 .

## Use the steps below to complete the table.

STEP 1 Write the given decimal in a place-value chart.

STEP 2 Use the place-value chart to write a decimal that is 10 times as much as the given decimal.

STEP 3 Use the place-value chart to write a decimal that is $\frac{1}{10}$ of the given decimal.

| Decimal | $\mathbf{1 0}$ times <br> as much as | $\frac{\mathbf{1}}{\mathbf{1 0}}$ of |
| :--- | :---: | :---: |
| 0.03 |  |  |
| 0.1 |  |  |
| 0.07 |  |  |

Explain the pattern you see when you move one decimal place value to the right and one decimal place value to the left.
$\qquad$

## Share and Show

```
MATH
```

BOARD

Write the decimal shown by the shaded parts of each model.
1.

2.

3.

4.


Complete the sentence.
5. 0.6 is 10 times as much as $\qquad$ .
7. 0.008 is $\frac{1}{10}$ of $\qquad$ .

Use place-value patterns to complete the table.

|  | Decimal | 10 times <br> as much as | $\frac{1}{10}$ of |
| :---: | :---: | :---: | :---: |
| 9. | 0.2 |  |  |
| 10. | 0.07 |  |  |
| 11. | 0.05 |  |  |
| 12. | 0.4 |  |  |

## Problem Solving • Applications (rad $\left.\begin{array}{l}\text { world }\end{array}\right)$

Use the table for 17 and 20.
17. FロDEEPER A science teacher showed an image of a carpenter bee on a wall. The image is 10 times as large as the actual bee. Then he showed another image of the bee that is 10 times as large as the first image. What is the length of the bee in the second image?
18. WRITE Math Explain how you can use place value to describe how 0.05 and 0.005 compare.

Bee Lengths (in meters)

| Bumblebee | 0.019 |
| :--- | :--- |
| Carpenter Bee | 0.025 |
| Leafcutting Bee | 0.014 |
| Orchid Bee | 0.028 |
| Sweat Bee | 0.006 |

$\qquad$
$\qquad$
19.

Marifnaical 8 Use Repeated Reasoning Terry,
Sasha, and Harry each chose a number. Terry's number is ten times as much as Sasha's. Harry's number is $\frac{1}{10}$ of Sasha's. Sasha's number is 0.4 . What number did each person choose?
20. IHINKSMARTER An atlas beetle is about 0.14 of a meter long. How does the length of the atlas beetle compare to the length of a leafcutting bee?

$\qquad$
21. THINKSMARTER Choose the numbers that make the statement true.

0.65 is 10 times as much as \begin{tabular}{|c|}
\hline 0.065 <br>
0.65 <br>
6.5 <br>
65.0 <br>
\hline

 and $\frac{1}{10}$ of 

\hline 0.065 <br>
0.65 <br>
6.5 <br>
65.0 <br>
\hline
\end{tabular}

## Place Value of Decimals

Essential Question How do you read, write, and represent decimals through thousandths?
-

## Unlock the Problem

The Brooklyn Battery Tunnel in New York City is 1.726 miles long. It is the longest underwater tunnel for vehicles in the United States. To understand this distance, you need to understand the place value of each digit in 1.726.

You can use a place-value chart to understand decimals. Whole numbers are to the left of the decimal point. Decimals are to the right of the decimal point. The thousandths place is to the right of the hundredths place.
$\left.\begin{array}{|c|c|c|c|c|}\hline \text { Tens } & \text { Ones } \bullet \text { Tenths } & \text { Hundredths } & \text { Thousandths } \\ \hline & 1 & \bullet & 7 & 2 \\ \hline & 1 \times 1 & 7 \times \frac{1}{10} & 2 \times \frac{1}{100} & 6 \times \frac{1}{1,000} \\ \hline & 1.0 & 0.7 & 0.02 & 0.006 \\ \hline\end{array}\right\}$ Value

The place value of the digit 6 in 1.726 is thousandths. The value of 6 in 1.726 is $6 \times \frac{1}{1,000}$, or 0.006 .

Standard Form: 1.726
Word Form: one and seven hundred twenty-six thousandths
Expanded Form: $1 \times 1+7 \times\left(\frac{1}{10}\right)+2 \times\left(\frac{1}{100}\right)+6 \times\left(\frac{1}{1,000}\right)$

Explain how the value of the last digit in a decimal can help you read a decimal.

## Try This! Use place value to read and write decimals.

A Standard Form: 2.35
Word Form: two and $\qquad$
Expanded Form: $2 \times 1+$ $\qquad$

B Standard Form: $\qquad$
Word Form: three and six hundred fourteen thousandths
Expanded Form: $\qquad$ $+6 \times\left(\frac{1}{10}\right)+$ $\qquad$ $+$ $\qquad$

## $\square$ <br> Example use a place-value chart.

A common garden spider spins a web with its silk that is about 0.003 millimeter thick. A commonly used sewing thread is about 0.3 millimeter thick. How does the thickness of the spider silk and the thread compare?

STEP 1 Write the numbers in a place-value chart.


| Ones • Tenths | Hundredths | Thousandths |  |
| :---: | :---: | :---: | :---: |
| $\bullet$ |  |  |  |
| $\bullet$ |  |  |  |

## STEP 2

Count the number of decimal place-value positions to the digit 3 in 0.3 and 0.003 .
0.3 has $\qquad$ fewer decimal places than 0.003

2 fewer decimal places: $10 \times 10=$ $\qquad$
0.3 is $\qquad$ times as much as 0.003
0.003 is $\qquad$ of 0.3

So, the thread is $\qquad$ times as thick as the garden spider's silk. The thickness of the garden spider's silk is
$\qquad$ that of the thread.

You can use place-value patterns to rename a decimal.

## Try This! Use place-value patterns.

## Rename 0.3 using other place values.

| 0.300 | 3 tenths | $3 \times \frac{1}{10}$ |
| :--- | :--- | :--- |
| 0.300 | - | $\times \frac{1}{100}$ |
| 0.300 | - |  |

$\qquad$

## Share and Show

## MATH <br> BOARD

1. Complete the place-value chart to find the value of each digit.
$\left.\begin{array}{|c|c|c|c|}\hline \text { Ones } & \text { Tenths } & \text { Hundredths } & \text { Thousandths } \\ \hline 3 & 5 & 2 & 4 \\ \hline 3 \times 1 & & 2 \times \frac{1}{100} & \\ \hline & 0.5 & & \\ \hline\end{array}\right\}$ Value

Write the value of the underlined digit.
2. $0.5 \underline{4} 3$
3. 6.234
$\qquad$
$\qquad$
4. 3.954
$\qquad$

Write the number in two other forms.
5. 0.253
$\qquad$
$\qquad$
$\qquad$
6. 7.632
$\qquad$
$\qquad$
$\qquad$

## On Your Own

Write the value of the underlined digit.
7. $0.4 \underline{9} 6$
$\qquad$
8. 2.726
$\qquad$
9. $1.06 \underline{6}$
$\qquad$
10. 6.399
11. 0.002
$\qquad$

Write the number in two other forms.
13. 0.489
$\qquad$
$\qquad$
$\qquad$
14. 5.916
$\qquad$
$\qquad$
$\qquad$

## Problem Solving • Applications

## Use the table for 15-16.

15. What is the value of the digit 7 in New Mexico's average annual rainfall?
16. GIDEEPER

Which of the states has an average annual rainfall with the least number in the thousandths place? What is another way to write the total annual rainfall in this state?
$\qquad$
$\qquad$
17. Marimegical (3)Verify the Reasoning of Others Damian wrote the number four and twenty-three thousandths as 4.23. Describe and correct his error.
$\qquad$
$\qquad$
18. THINKSMARTER Dan used a meter stick to measure some seedlings in his garden. One day, a corn stalk was 0.85 m tall. A tomato plant was 0.850 m . A carrot top was 0.085 m . Which plant was shortest?

| Average Annual Rainfall (in meters) |  |
| :--- | :---: |
| California | 0.564 |
| New Mexico | 0.372 |
| New York | 1.041 |
| Wisconsin | 0.820 |
| Maine | 1.074 |

19. WRITE Math Explain how you know that the digit 6 does not have the same value in the numbers 3.675 and 3.756.
$\qquad$
$\qquad$
$\qquad$
20. THINKSMARTER What is the value of the underlined digit? Mark all that apply.

$$
0.5 \underline{8} 9
$$eight hundredths0.08

○ $8 \times\left(\frac{1}{10}\right)$
○ eight tenths

## Compare and Order Decimals

Essential Question How can you use place value to compare and order decimals?


- The Tetons are located in Grand Teton National Park.


## (1) One Way use place value.

Line up the decimal points. Start at the left. Compare the digits in each placevalue position until the digits are different.

STEP 1 Compare the ones.

```
2.495
    \downarrow 2 = 2
    2.488
```

STEP 2 Compare the tenths.


STEP 3 Compare the hundredths.


Since 9
 8, then 2.495 $\square$ 2.488, and 2.488 $\square$ 2.495 .

So, the height of Cloud Peak is $\qquad$ the height of Boundary Peak.

## (1) Another Way Use a place-value chart to compare.

Compare the height of Cloud Peak to Wheeler Peak.

| Ones | $\bullet$ | Tenths | Hundredths |
| :---: | :---: | :---: | :---: |
| 2 | $\bullet$ | 4 | 9 |
| 2 | $\bullet$ | 4 | 9 |

Mathematical Practices
Explain why it is important to line up the decimal points when comparing decimals.
$2=2$
$4=$ $\qquad$ $9=$ $\qquad$ $5>$ $\qquad$

Since 5 $\square$ 3 , then 2.495 $\square$ 2.493, and 2.493 $\square$ 2.495 .

So, the height of Cloud Peak is $\qquad$ the height of Wheeler Peak.

Order Decimals You can use place value to order decimal numbers.

## (1) Example

Mount Whitney in California is 2.745 miles high, Mount Rainier in Washington is 2.729 miles high, and Mount Harvard in Colorado is 2.731 miles high. Order the heights of these mountains from least to greatest. Which mountain has the least height? Which mountain has the greatest height?

## STEP 1

Line up the decimal points. There are the same number of ones. Circle the tenths and compare.
2.745 Whitney
2.729 Rainier
2.731 Harvard

There are the same number of tenths.

## STEP 2

Underline the hundredths and compare. Order from least to greatest.
2.745 Whitney
2.729 Rainier
2.731 Harvard
since $\bigcirc<\bigcirc<\bigcirc$, the heights in order from least to greatest are $\qquad$ , $\qquad$ , $\qquad$ .

So, $\qquad$ has the least height and has the greatest height.

Explain why you do not have to compare the digits in the thousandths place to order the heights of the 3 mountains.

## Try This! Use a place-value chart.

What is the order of $1.383,1.321,1.456$, and 1.32 from greatest to least?

- Write each number in the place-value chart. Compare the digits, beginning with the greatest place value.
- Compare the ones. The ones are the same.
- Compare the tenths. $4>3$.

The greatest number is $\qquad$ .
Circle the greatest number in the place-value chart.

| Ones | $\bullet$ Tenths | Hundredths | Thousandths |
| :---: | :---: | :---: | :---: |
| 1 | $\bullet$ | 3 | 8 |
| 1 | $\bullet$ |  | 3 |
| 1 | $\bullet$ |  |  |
| 1 | $\ddots$ |  |  |

- Compare the remaining hundredths. $8>2$.

The next greatest number is $\qquad$ .
Draw a rectangle around the number.

- Compare the remaining thousandths. $1>0$.

So, the order of the numbers from greatest to least is: $\qquad$ .

## Share and Show

1. Use the place-value chart to compare the two numbers. What is the greatest place-value position where the digits differ?

| Ones | • Tenths | Hundredths | Thousandths |  |
| :---: | :---: | :---: | :---: | :---: |
| 3 | $\bullet$ | 4 | 7 | 2 |
| 3 | $\bullet$ | 4 | 4 | 5 |

Compare. Write $<,>$, or $=$.
2. 4.563
4.536
3. 5.640
 5.64
O 4.
4. 8.673
 8.637

Name the greatest place-value position where the digits differ.
Name the greater number.
5. $3.579 ; 3.564$
6. $9.572 ; 9.637$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
7. $4.159 ; 4.152$
$\qquad$
$\qquad$

## Order from least to greatest.

8. $4.08 ; 4.3 ; 4.803 ; 4.038$

## On Your Own

Compare. Write $<,>$, or $=$.

10. $8.72 \bigcirc 8.720$
10. $8.72 \bigcirc 8.720$
13. $2.573 \bigcirc 2.753$
13. $2.573 \bigcirc 2.753$
11. 5.4
 5.243
14. 9.300
 9.3
9. 1.703; 1.037; 1.37; 1.073
$\qquad$

Order from greatest to least.
16. $2.007 ; 2.714 ; 2.09 ; 2.97$
18. $5.249 ; 5.43 ; 5.340 ; 5.209$
19. $0.678 ; 1.678 ; 0.587 ; 0.687$

мary panaical 2) Use Reasoning Algebra Find the unknown digit to make each statement true.
20. $3.59>3.5 \quad 1>3.572$
21. $6.837>6.83$
$>6.835$
22. $2.45<2$. $6<2.461$

## Problem Solving • Applications ( (2Gald

## Use the table for 23-26.

23. In comparing the height of the mountains, which is the greatest place value where the digits differ?
24. Maty finaical (6) Use Math Vocabulary How does the height of Mount Steele compare to the height of Mount Blackburn? Compare the heights using words.
$\qquad$

25. GПDEEPER Explain how to order the heights of the mountains from greatest to least.
$\qquad$
$\qquad$
$\qquad$
26. THINKSMARTER What if the height of Mount Blackburn were 0.05 mile greater? Would it then be the mountain with the greatest height? Explain.
$\qquad$
$\qquad$

27. THINKSMARIER Orlando kept a record of the total rainfall each month for 5 months.

| Month | Rainfall (in.) |
| :--- | :---: |
| March | 3.75 |
| April | 4.42 |
| May | 4.09 |
| June | 3.09 |
| July | 4.04 |

Order the months from the least amount of rainfall to the greatest amount of rainfall.

$\qquad$

## Round Decimals

Essential Question How can you use place value to round decimals to a given place?

## Unlock the Problem

The Gold Frog of South America is one of the smallest frogs in the world. It is 0.386 of an inch long. What is this length rounded to the nearest hundredth of an inch?

## I) One Way use a place-value chart.

- Write the number in a place-value chart and circle the digit in the place to which you want to round.
- In the place-value chart, underline the digit to the right of the place to which you are rounding.
- If the digit to the right is less than 5 , the digit in the place to which you are rounding stays the same. If the digit to the right is 5 or greater, the digit in the rounding place increases by 1 .
- Drop the digits after the place to which you are rounding.

So, to the nearest hundredth of an inch, a Gold Frog is
about $\qquad$ of an inch long.

## I. Another Way use place value.

The Little Grass Frog is the smallest frog in North America. It is 0.437 of an inch long.

A What is the length of the frog to the nearest hundredth of an inch?

```
0.437 7> 5
0.44
```

So, to the nearest hundredth of an inch, the frog is about $\qquad$ of an inch long.

B What is the length of the frog to the nearest tenth of an inch?
$0.437 \quad 3<5$
$\downarrow$
0.4

So, to the nearest tenth of an inch, the frog is
about $\qquad$ of an inch long.

## (1) Example

The Goliath Frog is the largest frog in the world. It is found in the country of Cameroon in West Africa. The Goliath Frog can grow to be 11.815 inches long. How long is the Goliath Frog to the nearest inch?

STEP 1 Write 11.815 in the place-value chart.


| Tens | Ones • Tenths | Hundredths | Thousandths |
| :---: | :---: | :---: | :---: |
|  | $\bullet$ |  |  |
|  | $\bullet$ |  |  |

STEP 2 Find the place to which you want to round. Circle the digit.
STEP 3 Underline the digit to the right of the place to which you are rounding. Then round.

Think: Does the digit in the rounding
place stay the same or increase by 1 ?

So, to the nearest inch, the Goliath Frog is about $\qquad$ inches long.

- Mafinmaical 8 Generalize Explain why any number less than 12.5 and greater than or equal to 11.5 would round to 12 when rounded to the nearest whole number.
$\qquad$
$\qquad$
$\qquad$
Try This! Round. 14.603
A To the nearest hundredth:

| Tens | Ones • Tenths | Hundredths | Thousandths |
| :---: | :---: | :---: | :---: | :---: |
|  | $\bullet$ |  |  |
|  |  |  |  |

Circle and underline the digits as you did above to help you round to the nearest hundredth.

So, 14.603 rounded to the nearest hundredth is $\qquad$ .

B To the nearest whole number:

| Tens | Ones $\bullet$ Tenths | Hundredths | Thousandths |  |
| :---: | :---: | :--- | :--- | :--- |
|  |  |  |  |  |

Circle and underline the digits as you did above to help you round to the nearest whole number.

So, 14.603 rounded to the nearest whole number is $\qquad$ .

## Share and Show

Write the place value of the underlined digit. Round each number to the place of the underlined digit.

1. $0.6 \underline{7} 3$
$\qquad$
$\qquad$
2. 4.282
$\qquad$
$\qquad$
3. $1 \underline{2} .917$
$\qquad$
$\qquad$

Name the place value to which each number was rounded.
4. 0.982 to 0.98

## On Your Own

Write the place value of the underlined digit. Round each number to the place of the underlined digit.
7. 0.592
$\qquad$
$\qquad$
10. 3.334
$\qquad$
$\qquad$
8. 6.518
$\qquad$
$\qquad$
11. 12.074
$\qquad$
$\qquad$

Name the place value to which each number was rounded.
13. 0.328 to 0.33
14. 2.607 to 2.61
$\qquad$
Round 16.748 to the place named.
$\qquad$ 17. hundredths $\qquad$
16. tenths

19. WRITE Math Explain what happens when you round 4.999 to the nearest tenth.
18. ones $\qquad$
15. 12.583 to 13
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Problem Solving - Applications (rad)

## Use the table for 20-22.

20. GПDEEPER The speeds of two insects when rounded to the nearest whole number are the same. Which two insects are they?
21. What is the speed of the housefly rounded to the nearest hundredth?
22. THINKSMARIER What's the Error? Mark said that the speed of a dragonfly rounded to the nearest tenth was 6.9 meters per second. Is he correct? If not, what is his error?
$\qquad$


Insect Speeds (meters per second)

| Insect | Speed |
| :--- | :--- |
| Dragonfly | 6.974 |
| Horsefly | 3.934 |
| Bumblebee | 2.861 |
| Honeybee |  |
| Housefly |  |
|  |  |
|  |  |
|  |  |
|  |  |

WRITE Math Show Your Work
23. Matinmaical (6)A rounded number for the speed of an insect is 5.67 meters per second. What are the fastest and slowest speeds to the thousandths that could round to 5.67 meters per second? Explain.

## Name

## Decimal Addition

Essential Question How can you use base-ten blocks to model decimal addition?
connect You can use base-ten blocks to help you find sums of decimals.

Number and Operations in Base
Ten-5.NBT. 7
MATHEMATICAL PRACTICES MP.5, MP. 6


## Make Connections

You can use a quick picture to add decimals greater than 1.

## STEP 1

Model the sum of 2.5 and 2.8 with a quick picture.

## STEP 2

Add the tenths.

- Are there more than 9 tenths? $\qquad$ If there are more than 9 tenths, regroup.

Add the ones.


## STEP 3

Draw a quick picture of your answer. Then record.
$2.5+2.8=$ $\qquad$

## Shape and Show

## MATH BOARD

Complete the quick picture to find the sum.

1. $1.37+1.85=$ $\qquad$

$\qquad$

Add. Draw a quick picture.
2. $0.9+0.7=$ $\qquad$
4. $1.3+0.7=$ $\qquad$

## Problem Solving • Applications

6. THINKSMARTER Carissa bought 2.35 pounds of chicken and 2.7 pounds of turkey for lunches this week. She used a quick picture to find the amount of lunch meat. Does Carissa's work make sense? Explain.
$\qquad$
$\qquad$
$\qquad$

## THINKSMARTER <br> Sense or Nonsense?

7. Robyn and Jim used quick pictures to model $1.85+2.73$.

## Robyn's Work


$1.85+2.73=3.158$

Does Robyn's work make sense?
Explain your reasoning.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
8. Marifmaical (3) Make Arguments Explain how you would help Robyn understand that regrouping is important when adding decimals.
$\qquad$
$\qquad$
9. GПDEEPER Write a decimal addition problem that requires regrouping the hundredths. Explain how you know you will need to regroup.
$\qquad$
$\qquad$
$\qquad$

## Decimal Subtraction

Essential Question How can you use base-ten blocks to model decimal subtraction?

MATHEMATICAL PRACTICES MP.5, MP.6, MP. 8

Connect You can use base-ten blocks to help you find the difference between two decimals.

## Investigate

Materials ■ base-ten blocks
A. Use base-ten blocks to find $0.84-0.56$.

Model 0.84.
B. Subtract 0.56 . Start by removing 6 hundredths.

- Do you need to regroup to subtract? Explain.
C. Subtract the tenths. Remove 5 tenths.
D. Record the difference. $0.84-0.56=$ $\qquad$


## Draw Conclusions

1. What if you remove the tenths first and then the hundredths? Explain how you would regroup.
$\qquad$
$\qquad$
2. Matimwical 8 Generalize If two decimals are both less than 1.0 , what do you know about the difference between them? Explain.

## Make Connections

You can use quick pictures to subtract decimals that need to be regrouped.

## STEP 1

- Use a quick picture to model 2.82 - 1.47.
- Subtract the hundredths.
- Are there enough hundredths to remove? $\qquad$ If there are not enough hundredths, regroup.



## STEP 2

- Subtract the tenths.
- Are there enough tenths to remove? $\qquad$ If there are not enough tenths, regroup.
- Subtract the ones.



## STEP 3

Draw a quick picture of your answer. Then record the answer.
$2.82-1.47=$ $\qquad$

## Share and Show

Complete the quick picture to find the difference.

1. $0.62-0.18=$ $\qquad$


Subtract. Draw a quick picture.
2. $3.41-1.74=$ $\qquad$ 3. $0.84-0.57=$ $\qquad$
4. $4.05-1.61=$ $\qquad$ 5. $1.37-0.52=$ $\qquad$

## Problem Solving • Applications

6. G■DEEPER Write a decimal subtraction equation that requires regrouping from the tenths. Explain how you know you will need to regroup.
$\qquad$
$\qquad$
$\qquad$

## THINKSMARTER

## Pose a Problem

7. Antonio left his MathBoard on his desk during lunch. The quick picture below shows the problem he was working on when he left.


Write a word problem that can be solved using the quick picture above.

Pose a problem.
$\qquad$

Solve your problem.
$\square$

- manthengical 2) Use Reasoning Describe how you can change the problem by changing the quick picture.
$\qquad$
$\qquad$
$\qquad$

8. THINKSMARTER The price of a box of markers at a retail store is $\$ 4.65$. The price of a box of markers at the school bookstore is $\$ 3.90$. How much more do the markers cost at the retail store? Explain how you can use a quick picture to solve the problem.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Wid-Chapter Checkpoint

## Concepts and Skills

1. Explain how you can use base-ten blocks to find $1.54+2.37$. (5.Nвт.7)

Complete the sentence. (5.NBT.1)
2. 0.04 is $\frac{1}{10}$ of $\qquad$ .
3. 0.06 is 10 times as much as $\qquad$ .

Write the value of the underlined digit. (5.лвт.3а)
4. 6.54
5. 0.837
$\qquad$
6. 8.702
7. 9.173

Compare. Write $<,>$, or $=$. (5. мвт.3b)
8. 6.52
 6.520
9. 3.589
 3.598
10. 8.483 $\square$ 8.463

Write the place value of the underlined digit. Round each number to the place of the underlined digit. (5.Nвт.4)
11. $0 . \underline{7} 24$
12. 2.576
13. 4.769
$\qquad$
$\square$
$\qquad$

Draw a quick picture to find the sum or difference. (5.Nвт.7)
14. $2.46+0.78=$ $\qquad$
15. $3.27-1.84=$ $\qquad$
16. Marco read that a honeybee can fly up to 2.548 meters per second. He rounded the number to 2.55 . To which place value did Marco round the speed of a honeybee? (5.лвт.4)
17. What is the relationship between 0.04 and 0.004 ? (5.nвт.1)
18. Jodi drew a quick picture to model the answer for $3.14-1.75$. Draw what her picture might look like. (5.nвт.7)
19. The average annual rainfall in California is 0.564 of a meter per year. What is the value of the digit 4 in that number? (5.Nвт.3a)
20. Jan ran 1.256 miles on Monday, 1.265 miles on Wednesday, and 1.268 miles on Friday. What were her distances from greatest to least? (5.nвт.3b)
$\qquad$

## Estimate Decimal Sums and Differences

Essential Question How can you estimate decimal sums
and differences?

Number and Operations in Base

## Unlock the Problem

A singer is recording a CD . The lengths of the three songs are 3.4 minutes, 2.78 minutes, and 4.19 minutes. About how much recording time will be on the CD ?
(f) Use rounding to estimate.

Round to the nearest whole number. Then add.



## Remember

To round a number, determine the place to which you want to round.

- If the digit to the right is less than 5 , the digit in the rounding place stays the same.
- If the digit to the right is 5 or greater, the digit in the rounding place increases by 1 .

So, there will be about $\qquad$ minutes of recording time on the CD.

## Try This! Use rounding to estimate.

Round to the nearest whole dollar.
Then subtract.

$$
\begin{array}{r}
\$ 27.95 \\
-\$ 11.72 \\
\hline
\end{array}
$$



To the nearest dollar, $\$ 27.95-\$ 11.72$ is about $\qquad$ .

B Round to the nearest ten dollars. Then subtract.


To the nearest ten dollars, $\$ 27.95$ - \$11.72 is about $\qquad$ .

- Mathishaical (5) Use Appropriate Tools Do you want an overestimate or an underestimate when you estimate the total cost of items you want to buy? Explain.

Use Benchmarks Benchmarks are familiar numbers used as points of reference. You can use the benchmarks $0,0.25,0.50,0.75$, and 1 to estimate decimal sums and differences.

## 1. Example 1

Use benchmarks to estimate. $0.18+0.43$
Locate and graph a point on the number line for each decimal. Identify which benchmark each decimal is closer to.


Think: 0.18 is between 0 and 0.25 .

It is closer to $\qquad$ .

Think: 0.43 is between $\qquad$ and
$\qquad$ It is closer to $\qquad$ .


So, $0.18+0.43$ is about $\qquad$ .

## 1 Example 2 Use benchmarks to estimate. $0.76-0.22$

Locate and graph a point on the number line for each decimal. Identify which benchmark each decimal is closer to.


Think: 0.76 is between $\qquad$ and
$\qquad$ It is closer to $\qquad$ . closer to $\qquad$ .


So, $0.76-0.22$ is about $\qquad$ .
$\qquad$

## Share and Show

```
MATH
BOARD
```


## Use rounding to estimate.

1. 2.34
1.9

$$
\begin{array}{r}
5.23 \\
\hline
\end{array}
$$

2. 10.39
$-4.28$
3. $\$ 19.75$

$$
\begin{array}{r}
+\$ 38 \\
\hline
\end{array}
$$



Describe the difference between an estimate and an exact answer.

## On Your Own

## Use rounding to estimate.

6. 0.93
$+0.18$
7. 7.41
$-3.88$
8. 14.68 - 9.93

Use benchmarks to estimate.
9. 12.41
$-6.47$
10. 8.12
$+5.52$
11. $\quad 9.75$ $-3.47$

Practice: Copy and Solve Use rounding or benchmarks to estimate.
12. $12.83+16.24$
13. $\$ 26.92-\$ 11.13$
14. $9.41+3.82$

## 

15. $2.74+4.22 \bigcirc 3.13+1.87$
estimate
16. $6.25-2.39$$9.79-3.84$
estimate

## Problem Solving • Applications

## Use the table to solve 17-18. Show your work.

17. For the week of April 4, 1964, the Beatles had the top four songs. About how long would it take to listen to these four songs?

|  |  |  |
| :---: | :--- | :---: |
| Number | Song Title |  |
| 1 | "Can't Buy Me Love" | Song Length <br> (in minutes) |
| 2 | "She Loves You" | 2.30 |
| 3 | "I Want to Hold Your Hand" | 2.50 |
| 4 | "Please Please Me" | 2.75 |

19. THINKSMARIER Tracy ran a lap around the school track in 74.2 seconds. Malcolm ran a lap in 65.92 seconds. Estimate the difference in the times in which the students completed the lap.
$\qquad$

## Connect rol Science

## Nutrition

Your body needs protein to build and repair cells. You should get a new supply of protein each day. The average 10 -year-old needs 35 grams of protein daily. You can find protein in foods like meat, vegetables, and dairy products.

## Use estimation to solve.

20. F■DEEPER Gina had a scrambled egg and a cup of low-fat milk for breakfast. She had an oat bran muffin for a morning snack. About how many more grams of protein did Gina have for breakfast than for a snack?

| Grams of Protein per Serving |  |
| :--- | :---: |
| Type of Food | Protein (in grams) |
| 1 scrambled egg | 6.75 |
| 1 cup shredded wheat cereal | 5.56 |
| 1 oat bran muffin | 3.99 |
| 1 cup low-fat milk | 8.22 |

21. THINKSMARTER Pablo had a cup of shredded wheat cereal, a cup of low-fat milk, and one other item for breakfast. He had about 21 grams of protein. What was the third item Pablo had for breakfast?

$\qquad$

## Add Decimals

Essential Question How can place value help you add decimals?

Number and Operations in Base
Ten-5.NBT. 7
MATHEMATICAL PRACTICES MP.4, MP. 5

## Unlock the Problem

Henry recorded the amount of rain that fell during 2 hours. In the first hour, Henry measured 2.35 centimeters of rain. In the second hour, he measured 1.82 centimeters of rain.

Henry estimated that about 4 centimeters of rain fell in 2 hours. What is the total amount of rain that fell? How can you use this estimate to decide if your answer is reasonable?

Add. 2.35 + 1.82

- Add the hundredths first.


5 hundredths +2 hundredths $=$ $\qquad$ hundredths.

- Then add the tenths and ones. Regroup as needed.

- Record the sum for each place value.

Draw a quick picture to check your work.

So, $\qquad$ centimeters of rain fell.

Since $\qquad$ is close to the estimate, 4 , the answer is reasonable.

Equivalent Decimals When adding decimals, you can use equivalent decimals to help keep the numbers aligned in each place. Add zeros to the right of the last digit as needed, so that the addends have the same number of decimal places.

## Try This! Estimate. Then find the sum.

## STEP 1

## Estimate the sum.



## STEP 2

Find the sum.
Add the hundredths first.
Then, add the tenths, ones, and tens.
Regroup as needed.

|  |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
|  |  |  |  |  |
|  | 2 | 0.4 | 0 |  |
| + | 1 | 3.7 | 6 |  |
|  |  |  |  |  |
|  |  |  |  |  |$\quad$ Think: $20.4=20.40$

$20.40+13.76=$ $\qquad$

- mathencical (1) Evaluate Reasonableness Is your answer reasonable? Explain.


## Share and Show

## MATH BOARD

## Estimate. Then find the sum.

1. Estimate: $\qquad$
2.5
$+4.6$
2. Estimate:

$$
\begin{array}{r}
8.75 \\
+6.43 \\
\hline
\end{array}
$$

3. Estimate: $\qquad$

$$
\begin{array}{r}
2.03 \\
+7.89 \\
\hline
\end{array}
$$

4. Estimate: $\qquad$
$6.34+3.8=$ $\qquad$
5. Estimate: $\qquad$
$5.63+2.6=$ $\qquad$

Math Talk

Mathematical Practices
Explain why it is important to remember to line up the place values in each number when adding or subtracting decimals.

## On Your Own

## Marpinaical (2) Connect Symbols and Words Find the sum.

6. seven and twenty-five hundredths added to nine and four tenths
7. nineteen and seven tenths added to four and ninety-two hundredths
$\qquad$

Practice: Copy and Solve Find the sum.
10. $7.99+8.34$
11. $15.76+8.2$
13. $33.5+16.4$
14. $9.84+21.52$
16. $42.19+8.8$
17. $16.74+5.34$
7. twelve and eight hundredths added to four and thirty-five hundredths
$\qquad$
9. one and eighty-two hundredths added to fifteen and eight tenths
$\qquad$
19. THINKSMARIER Tania measured the growth of her plant each week. The first week, the plant's height measured 2.65 decimeters. During the second week, Tania's plant grew 0.7 decimeter. How tall was Tania's plant at the end of the second week?
19. THINKSMARIER Tania measured the growth of
week, the plant's height measured 2.65 decimeter
plant grew 0.7 decimeter. How tall was Tania's pla
Describe the steps you took to solve the problem.
12. $9.6+5.49$
15. $3.89+4.6$
18. $27.58+83.9$
20. F■DEEPER Maggie had $\$ 35.13$. Then her mom gave her $\$ 7.50$ for watching her younger brother. She was paid $\$ 10.35$ for her old roller skates. How much money does Maggie have now?

## Unlock the Problem

21. A city receives an average rainfall of 16.99 centimeters in August. One year, during the month of August, it rained 8.33 centimeters by August 15th. Then it rained another 4.65 centimeters through the end of the month. What was the total rainfall in centimeters for the month?
a. What do you need to find?
$\qquad$
b. What information are you given?
$\qquad$
$\qquad$
c. How will you use addition to find the total number of centimeters of rain that fell?
$\qquad$
d. Show how you solved the problem.
e. Complete the sentence. It rained
$\qquad$ centimeters for the month.

## Personal Math Trainer

22. THINK SMARTER $\}$ Horatio caught a fish that weighed 1.25 pounds. Later he caught another fish that weighed 1.92 pounds. What was the combined weight of both fish? Use the digits on the tiles to solve the problem. Digits may be used more than once or not at all.

$\qquad$

## Subtract Decimals

Essential Question How can place value help you subtract decimals?

## Unlock the Problem

Hannah has 3.36 kilograms of apples and 2.28 kilograms of oranges. Hannah estimates she has about 1 more kilogram of apples than oranges. How many more kilograms of apples than oranges does Hannah have? How can you use this estimate to decide if your answer is reasonable?

- What operation will you use to solve the problem?
- Circle Hannah's estimate to check that your answer is reasonable.

Subtract. $3.36-2.28$

- Subtract the hundredths first. If there are not enough hundredths, regroup 1 tenth as 10 hundredths.
$\qquad$ hundredths -8 hundredths $=8$ hundredths
- Then subtract the tenths and ones. Regroup as needed.
$\qquad$ tenths -2 tenths $=0$ tenths
$\qquad$ ones -2 ones $=1$ one

$$
3.36
$$

-20ata

- Record the difference for each place value.

Draw a quick picture to check your work.

So, Hannah has $\qquad$ more kilograms of apples than oranges.
$\qquad$ is close to 1 , the answer is reasonable.

## Try This! Use addition to check.

Since subtraction and addition are inverse operations, you can check subtraction by adding.

## STEP 1

Find the difference.
Subtract the hundredths first.
Then, subtract the tenths, ones, and tens. Regroup as needed.


## STEP 2

## Check your answer.

Add the difference to the number you subtracted. If the sum matches the number you subtracted from, your answer is correct.


$\qquad$
$\qquad$

## Share and Show

## MATH

BOARD

## Estimate. Then find the difference.

1. Estimate: $\qquad$ $\begin{array}{r}5.83 \\ -2.18 \\ \hline\end{array}$
2. Estimate: $\qquad$

$$
\begin{array}{r}
4.45 \\
-1.86 \\
\hline
\end{array}
$$

3. Estimate: $\qquad$

$$
\begin{array}{r}
4.03 \\
-2.25 \\
\hline
\end{array}
$$

Find the difference. Check your answer.
4.

$$
\begin{array}{r}
0.70 \\
-0.43 \\
\hline
\end{array}
$$

5. 13.2
$-8.04$
6. 15.8
$-9.67$

## On Your Own

## Maryenaical (2) Connect Symbols and Words Find the difference.

7. three and seventy-two hundredths subtracted from five and eighty-one hundredths
8. one and six hundredths subtracted from eight and thirty-two hundredths

## Matifnaical (2) Use Reasoning Algebra Write the unknown number for $n$.

18. H■DEEPER Beth finished a race in 3.35 minutes. Ana finished the race in 0.8 minute less than Beth. Fran finished the race in 1.02 minutes less than Ana. What was Fran's time to finish the race in minutes?
$\qquad$
19. Fatima planted sunflower seeds in a flower patch. The tallest sunflower grew 2.65 meters tall. The height of the shortest sunflower was 0.34 meter less than the tallest sunflower. What was the height, in meters, of the shortest sunflower?
20. $5.28-3.4=n$
$n=$ $\qquad$
21. $n-6.47=4.32$

$$
n=
$$

$\qquad$

## Practice: Copy and Solve Find the difference.

13. $16.46-13.87$
14. $12.74-10.54$
15. $48.21-13.65$
16. $34.27-17.51$
17. $11.57-n=7.51$
$n=$ $\qquad$
18. $15.83-11.45$

WRITE Math . Show Your Work.

## Unlock the Problem

20. THINK SMARTER In peanut butter, how many
21. THINKSMARTER In peanut butter, how many more grams of protein are there than grams of carbohydrates? Use the label at the right.
a. What do you need to know? $\qquad$
$\qquad$
$\qquad$
b. How will you use subtraction to find how many more grams of protein there are than grams of carbohydrates?
carbohydrates?

c. Show how you solved the problem.
d. Complete each sentence.

The peanut butter has $\qquad$ grams of protein.

The peanut butter has $\qquad$ grams of carbohydrates.

There are $\qquad$ more grams of protein than grams of carbohydrates in the peanut butter.
21. Kyle is building a block tower. Right now the tower stands 0.89 meter tall. How much higher does the tower need to be to reach a height of 1.74 meters?
22. IHINKSMARTER Dialyn scored 2.5 points higher than Gina at a gymnastics event. Select the values that could represent each student's gymnastics score. Mark all that apply.
(A) Dialyn: 18.4 points, Gina: 16.9 points
(B) Dialyn: 15.4 points, Gina: 13.35 points
(C) Dialyn: 16.2 points, Gina: 13.7 points
(D) Dialyn: 19.25 points, Gina: 16.75 points

## Patterns with Decimals

Essential Question How can you use addition or subtraction to describe a pattern or create a sequence with decimals?

## (1)

## Unlock the Problem

A state park rents canoes for guests to use at the lake. It costs $\$ 5.00$ to rent a canoe for 1 hour, $\$ 6.75$ for 2 hours, $\$ 8.50$ for 3 hours, and $\$ 10.25$ for 4 hours. If this pattern continues, how much should it cost Jason to rent a canoe for 7 hours?

A sequence is an ordered list of numbers. A term is each number in a sequence. You can find the pattern in a sequence by comparing one term with the next term.


## STEP 1

Write the terms you know in a sequence. Then look for a pattern by finding the difference from one term in the sequence to the next.
difference between terms

STEP 2
Write a rule that describes the pattern in the sequence.
Rule: $\qquad$

## STEP 3

Extend the sequence to solve the problem.
\$5.00, \$6.75, \$8.50, \$10.25, $\qquad$ , $\qquad$ , $\qquad$
So, it should cost $\qquad$ to rent a canoe for 7 hours.

- Marifenalcal (7) Look for a Pattern What observation can you make about the pattern in the sequence that will help you write a rule?

Write a rule for the pattern in the sequence.
Then find the unknown terms in the sequence.
29.6, 28.3, 27, 25.7, $\qquad$ , $\qquad$ , $\qquad$ , 20.5, 19.2

STEP 1 Look at the first few terms in the sequence.
Think: Is the sequence increasing or decreasing from one term to the next?

STEP 2 Write a rule that describes the pattern in the sequence.
What operation can be used to describe a sequence that increases?

What operation can be used to describe a sequence that decreases?

Rule: $\qquad$

STEP 3 Use your rule to find the unknown terms. Then complete the sequence above.

- Explain how you know whether your rule for a sequence would involve addition or subtraction. $\qquad$
$\qquad$
$\qquad$


## Try This!

Write a rule for the sequence. Then find the unknown term.
65.9, 65.3, $\qquad$ 64.1, 63.5, 62.9

Rule: $\qquad$

B Write the first four terms of the sequence.
Rule: start at 0.35 , add 0.15
$\qquad$ , $\qquad$ , $\qquad$ ,

## Share and Show

## MATH BOARD

## Write a rule for the sequence.

1. $0.5,1.8,3.1,4.4, \ldots$

Think: Is the sequence increasing or decreasing?

Rule: $\qquad$
2. $23.2,22.1,21,19.9, \ldots$

Rule: $\qquad$

Write a rule for the sequence. Then find the unknown term.
3. $0.3,1.5$, $\qquad$ ,3.9, 5.1

Rule: $\qquad$

## On Your Own

$\qquad$

Rule: $\qquad$


Write the first four terms of the sequence.
5. Rule: start at 10.64 , subtract 1.45
$\qquad$ , $\qquad$ , $\qquad$ , $\qquad$
7. Rule: start at 19.3 , add 1.8
$\qquad$ , $\qquad$ , $\qquad$ , $\qquad$
9. $5 \square$ DEEPER Marta put $\$ 4.87$ in her coin bank. Each day she added 1 quarter, 1 nickel, and 3 pennies. How much money was in her coin bank after 6 days? Describe the pattern you used to solve.
10. Matilematical (7RAGTCE Identify Relationships Look at the list below. Do the numbers show a pattern? Explain how you know.
$11.23,10.75,10.3,9.82,9.37,8.89$
$\qquad$
$\qquad$

## Problem Solving • Applications

THINKSMARTER Pose a Problem
11. Bren has a deck of cards. As shown below, each card is labeled with a rule describing a pattern in a sequence. Select a card and decide on a starting number. Use the rule to write the first five terms in your sequence.


Sequence: $\qquad$ , $\qquad$ , $\qquad$ , $\qquad$ , $\qquad$

Write a problem that relates to your sequence and requires the sequence be extended to solve.

Pose a Problem
Solve your problem.
12. THINKSMARIER Colleen and Tom are playing a number pattern game. Tom wrote the following sequence.
33.5, 34.6, 35.7,
$\qquad$ 37.9

What is the unknown term in the sequence? $\qquad$

## Problem Solving • Add and Subtract Money

Essential Question How can the strategy make a table help you organize and keep track of your bank account balance?

## Unlock the Problem

At the end of May, Mrs. Freeman had a bank account balance of $\$ 442.37$. Since then, she has written a check for $\$ 63.92$ and made a deposit of $\$ 350.00$. Mrs. Freeman says she has $\$ 729.45$ in her bank account. Make a table to determine if Mrs. Freeman is correct.

## Read the Problem

## What do I need to find?

I need to find $\qquad$

What information do I need to use?
I need to use the $\qquad$

1. Mavilnaical (1) Evaluate Reasonableness How can you tell if your answer
is reasonable?

## Solve the Problem

| Mrs. Freeman's Checkbook |  |  |  |  |
| :--- | :--- | :--- | :--- | :--- |
| May balance |  | $\$ 442.37$ |  |  |
| Check | $\$ 63.92$ |  | $-\$ 63.92$ |  |
|  |  |  |  |  |
| Deposit |  |  | $\$ 350.00$ |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Mrs. Freeman's correct balance is $\qquad$ .
$\qquad$

## (1) Try Another Problem

Nick is buying juice for himself and 5 friends. Each bottle of juice costs $\$ 1.25$. How much do 6 bottles of juice cost? Make a table to find the cost of 6 bottles of juice.

Use the graphic below to solve the problem.


## Read the Problem

What do I need to find?

What information do I need to use?

How will I use the information?

So, the total cost of 6 bottles of juice is $\qquad$ .
2. What if Ginny says that 12 bottles of juice cost $\$ 25.00$ ? Is Ginny's statement reasonable? Explain. $\qquad$
$\qquad$
$\qquad$
3. If Nick had $\$ 10$, how many bottles of juice could he buy? $\qquad$

## Share and Show

1. Sara wants to buy a bottle of apple juice from a vending machine. She needs exactly $\$ 2.30$. She has the following bills and coins:


Make and complete a table to find all the ways Sara could pay for the juice.

First, draw a table with a column for each type of bill or coin.

Next, fill in your table with each row showing a different way Sara can make exactly \$2.30.
2. What if Sara decides to buy a bottle of water that costs $\$ 1.85$ ? What are all the different ways she can make exactly $\$ 1.85$ with the bills and coins she has? Which coin must Sara use?
3. At the end of August, Mr. Diaz had a balance of $\$ 441.62$. Since then, he has written two checks for $\$ 157.34$ and $\$ 19.74$ and made a deposit of $\$ 575.00$. Mr. Diaz says his balance is $\$ 739.54$. Find Mr. Diaz's correct balance.

## On Your Own

## Use the following information to solve 4-6.

At Open Skate Night, admission is $\$ 3.75$ with a membership card and $\$ 5.00$ without a membership card. Skate rentals are $\$ 3.00$.
4. GODEEPER Aidan paid the admission for himself and two friends at Open Skate Night. Aidan had a membership card, but his friends did not. Aidan paid with a $\$ 20$ bill. How much change should Aidan receive?
5. THINKSMARTER The Moores paid $\$ 6$ more for skate rentals than the Cotters did. Together, the two families paid $\$ 30$ for skate rentals. How many pairs of skates did the Moores rent?

6. Matinaical (1) Analyze Jennie and 5 of her friends are going to Open Skate Night. Jennie does not have a membership card. Only some of her friends have membership cards. What is the total amount that Jennie and her friends might pay for admission?
$\qquad$
$\qquad$
$\qquad$
7. THINKSMARTER Marisol bought 5 movie tickets for a show. Each ticket cost $\$ 6.25$. Complete the table to show the price of $2,3,4$, and 5 tickets.

| Number of <br> Tickets | Price |
| :---: | :---: |
| 1 | $\$ 6.25$ |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

## Choose a Method

Essential Question Which method could you choose to find decimal sums and differences?

## Unlock the Problem

At a track meet, Steven entered the long jump.
His jumps were 2.25 meters, 1.81 meters, and 3.75 meters. What was the total distance Steven jumped?

To find decimal sums, you can use properties and mental math or you can use paper and pencil.

- Underline the sentence that tells you what you are trying to find.
- Circle the numbers you need to use.
- What operation will you use?


## Q One Way

Use properties and mental math.
Add. $2.25+1.81+3.75$

$$
\begin{aligned}
& 2.25+1.81+3.75 \\
& =2.25+3.75+1.81 \quad \text { Commutative Property } \\
& =(\square+1.81 \quad \text { Associative Property } \\
& =(\square \\
& =\square
\end{aligned}
$$

## (1) Another Way use place-value.

Add. $2.25+1.81+3.75$
2.25
1.81
$+\underline{3.75}$

So, the total distance Steven jumped was $\qquad$ meters.

Explain why you might choose to use the properties to solve this problem.

## Try This!

In 1924, William DeHart Hubbard won a gold medal with
a long jump of 7.44 meters. In 2000, Roman Schurenko won the
bronze medal with a jump of 8.31 meters. How much longer was
Schurenko's jump than Hubbard's?
(A) Use place-value.


B Use a calculator.


So, Schurenko's jump was $\qquad$ meter longer than Hubbard's.

- Marinkaical (7) Identify Relationships Explain why you cannot use the Commutative Property or the Associative Property to find the difference between two decimals.


## Share and Show

```
MATH
BOARD
```

Find the sum or difference.

1. $4.19+0.58$
2. $9.99-4.1$
3. $\$ 15.79+\$ 32.81$
4. $38.44-25.86$
$\qquad$

## On Your Own

Find the sum or difference.

## 7. $\$ 18.39$ <br> +\$ 7.56

8. $8.22-4.39$
9. $93.6-79.84$
10. 1.82
2.28
$+2.18$

Practice: Copy and Solve Find the sum or difference.
11. $6.3+2.98+7.7$
12. $27.96-16.2$
13. $12.63+15.04$
14. $9.24-2.68$
15. $\$ 18-\$ 3.55$
16. $9.73-2.52$
17. $\$ 54.78+\$ 43.62$
18. $7.25+0.25+1.5$

## 

19. $n-9.02=3.85$
$n=$ $\qquad$
20. $n+31.53=62.4$
$n=$ $\qquad$
21. $9.2+n+8.4=20.8$
$n=$ $\qquad$

## Problem Solving • Applications

22. $5 \square D E E P E R$ Jake needs 7.58 meters of wood to complete a school project. He buys a 2.25 -meter plank of wood and a 3.12-meter plank of wood. How many more meters of wood does Jake need to buy?
23. THINKSMARTER Lori needs a length of twine 8.5 meters long to mark a row in her garden. Andrew needs a length of twine 7.25 meters long for his row. They have one length of twine that measures 16.27 meters. After they each take the lengths they need, how much twine will be left?


## Use the table to solve 24-26.

24. How much farther did the gold medal winner jump than the silver medal winner?
25. Marismaical (6) The fourth-place competitor's jump measured 8.19 meters. If his jump had been 0.10 meter greater, what medal would he have received? Explain how you solved the problem.

| \left.2008   <br> Long Jen's Olympic   <br> Medal  Distance (in meters) <br> Gold  $\right] 8.34$ |  |
| :--- | :---: |
| Silver | 8.24 |
| Bronze | 8.20 |

26. In the 2004 Olympics, the gold medalist for the men's long jump had a jump of 8.59 meters. How much farther did the 2004 gold medalist jump compared to the 2008 gold medalist?
27. THINKSMARTER Alexander and Holly are solving the following word problem.

At the supermarket Carla buys 2.25 pounds of hamburger. She also buys 3.85 pounds of chicken. How many pounds of hamburger and chicken did Carla buy?

Alexander set up his problem as $2.25+3.85$.
Holly set up her problem as $3.85+2.25$.
Who is correct? Explain your answer and solve the problem.
$\qquad$
$\qquad$
$\qquad$

## $\sqrt{3}$ Chapter 3 Review/Test

1. Chaz kept a record of how many gallons of gas he purchased each day last week.

| Day | Gas (in gallons) |
| :--- | :---: |
| Monday | 4.5 |
| Tuesday | 3.9 |
| Wednesday | 4.258 |
| Thursday | 3.75 |
| Friday | 4.256 |

Order the days from least amount of gas Chaz purchased to greatest amount of gas Chaz purchased.

2. For numbers $2 \mathrm{a}-2 \mathrm{c}$, select True or False for each statement.

2a. $\quad 16.437$ rounded to the nearest whole number is 16 .

2b. $\quad 16.437$ rounded to the nearest
O True
$\bigcirc$ False tenth is 16.4.

2c. $\quad 16.437$ rounded to the nearest hundredth is 16.43.
True
$\bigcirc$ False
3. Students are selling muffins at a school bake sale. One muffin costs $\$ 0.25$, 2 muffins cost $\$ 0.37,3$ muffins cost $\$ 0.49$, and 4 muffins cost $\$ 0.61$. If this pattern continues, how much will 7 muffins cost? Explain how you found your answer.
$\square$
4. What is the value of the underlined digit? Mark all that apply.
0.6790.6six hundredths0.06

$$
6 \times \frac{1}{10}
$$six tenths

5. Rowanda jogged 2.14 kilometers farther than Terrance. Select the values that could represent how far each student jogged. Mark all that apply.

O Rowanda: 6.5 km , Terrance: 4.36 kmRowanda: 4.8 km, Terrance: 2.76 kmRowanda: 3.51 km , Terrance: 5.65 kmRowanda: 7.24 km , Terrance: 5.1 km
6. Shade the model to show the decimal 0.542 .

7. Benjamin rode his bicycle 3.6 miles on Saturday and 4.85 miles on Sunday. How many miles did he ride Saturday and Sunday combined? Use the digits on the tiles to solve the problem. Digits may be used more than once or not at all.


## Name

8. The school is 3.65 miles from Tonya's house and 1.28 miles from Jamal's house. How much farther from school is Tonya's house than Jamal's house? Explain how you can use a quick picture to solve the problem.
$\square$
9. A vet measured the mass of two birds. The mass of the robin was 76.64 grams. The mass of the blue jay was 81.54 grams. Estimate the difference in the masses of the birds.
$\qquad$
10. Rick bought 5 yogurt bars at a snack shop. Each yogurt bar cost $\$ 1.75$. Complete the table to show the price of $2,3,4$, and 5 yogurt bars.

| Number of <br> Yogurt Bars | Price |
| :---: | :---: |
| 1 | $\$ 1.75$ |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |

11. Clayton Road is 2.25 miles long. Wood Pike Road is 1.8 miles long. Kisha used a quick picture to find the combined length of Clayton Road and Wood Pike Road. Does Kisha's work make sense? Explain why or why not.

$\square$
12. Bob and Ling are playing a number pattern game. Bob wrote the following sequence.
28.9, 26.8, 24.7, 20.5

What is the unknown term in the sequence?
$\square$
13. Rafael bought 2.15 pounds of potato salad and 4.2 pounds of macaroni salad to bring to a picnic. For numbers 13a-13c, select Yes or No to indicate whether each statement is true.

13a. Rounded to the nearest whole number,
Yes

No Rafael bought 2 pounds of potato salad.

13b. Rounded to the nearest whole number,Yes
O No Rafael bought 4 pounds of macaroni salad.

13c. Rounded to the nearest tenth, Rafael Yes No bought 2.1 pounds of potato salad.
14. The four highest scores on the floor exercise at a gymnastics meet were $9.675,9.25,9.325$, and 9.5 points. Choose the numbers that make the statement true.

15. Michelle records the value of one euro in U.S. dollars each day for her social studies project. The table shows the data she has recorded so far.

| Day | Value of 1 Euro <br> (in U.S. dollars) |
| :--- | :---: |
| Monday | 1.448 |
| Tuesday | 1.443 |
| Wednesday | 1.452 |
| Thursday | 1.458 |

On which two days was the value of 1 euro the same when rounded to the nearest hundredth of a dollar?
$\square$
16. Miguel has $\$ 20$. He spends $\$ 7.25$ on a movie ticket, $\$ 3.95$ for snacks, and $\$ 1.75$ for bus fare each way. How much money does Miguel have left?
$\qquad$
17. Yolanda's sunflower plant was 64.34 centimeters tall in July. During August, the plant grew 18.2 centimeters.

## Part A

Estimate the height of Yolanda's plant at the end of August by rounding each value to the nearest whole number. Will your estimate be less than or greater than the actual height? Explain your reasoning.
$\square$

## Part B

What was the exact height of the plant at the end of August? Was the estimate less than or greater than the exact value?

18. Oscar ran the 100 -yard dash in 12.41 seconds. Jesiah ran the 100 -yard dash in 11.85 seconds. How many seconds faster was Jesiah's time than Oscar's time?
$\qquad$ second(s)
19. Choose the value that makes the statement true.

20. Troy and Lazetta are solving the following word problem.

Rosalie's cat weights 9.8 pounds. Her dog weighs 25.4 pounds. What is the weight of both animals combined.

Troy sets up his problem as $9.8+25.4$. Lazetta sets up her problem as $25.4+9.8$. Who is correct? Explain your answer and solve the problem.

21. 0.84 is 10 times as much as

| 0.084 |
| :---: |
| 0.84 |
| 8.4 |
| 84 | and $\frac{1}{10}$ of | 0.084 |
| :---: |
| 0.84 |
| 8.4 |
| 84 |

## Multiply Decimals

## Show What You Know

Check your understanding of important skills.
Name $\qquad$

Meaning of Multiplication Complete.
1.

groups of $\qquad$ = $\qquad$
2.

$\qquad$ groups of $\qquad$ $=$ $\qquad$

Decimals Greater Than One Write the word form and the expanded form for each.
3. 1.7
$\qquad$
$\qquad$
5. 321
$\begin{array}{r}\times \quad 4 \\ \hline\end{array}$
6. 387
$\begin{array}{r}\times \quad 5 \\ \hline\end{array}$
7. 126
$\times 13$
8. 457
$\begin{array}{r} \\ \times 35 \\ \hline\end{array}$

## > Multiply by 3-Digit Numbers Multiply.

4. 5.62
$\qquad$

Staghorn Coral is a type of branching coral.
It can add as much as 0.67 foot to its branches each year. Be a Math Detective and find how much a staghorn coral can grow in 5 years.

## Vocabulary Builder

## Visualize It

Complete the flow map using the words with a $\checkmark$.


Understand Vocabulary
Read the description. What term do you think it describes?

1. It is the process used to find the total number of items in a given number of groups. $\qquad$
2. It is a way to write a number that shows the value of each digit. $\qquad$
3. It is one of one hundred equal parts.
4. This is the result when you multiply two numbers.
5. It is the value of a digit in a number based on the location
of the digit. $\qquad$

## Multiplication Patterns with Decimals

Essential Question How can patterns help you place the decimal point in a product?

Number and Operations in Base
Ten-5.NBT. 2
Also 5.NBT. 7
MATHEMATICAL PRACTICES
MP.4, MP.7, MP. 8

## Unlock the Problem

Cindy is combining equal-sized rectangles from different fabric patterns to make a postage-stamp quilt. Each rectangle has an area of 0.75 of a square inch. If she uses 1,000 rectangles to make the quilt, what will be the area of the quilt?

Use the pattern to find the product.

$$
\begin{aligned}
& 1 \times 0.75=0.75 \\
& 10 \times 0.75=7.5 \\
& 100 \times 0.75=7 \underbrace{75}_{i} \\
& 1,000 \times 0.75=750 .
\end{aligned}
$$

The quilt will have an area of $\qquad$ square inches.

1. As you multiply by increasing powers of 10 , how does the position of the decimal point change in the product? $\qquad$

Place value patterns can be used to find the product of a number and the decimals 0.1 and 0.01 .

## (1) Example 1

Jorge is making a scale model of the Willis Tower in Chicago for a theater set. The height of the tower is 1,353 feet. If the model is $\frac{1}{100}$ of the actual size of the building, how tall is the model?

$$
\begin{aligned}
& 1 \times 1,353=1,353 \\
& 0.1 \times 1,353=135.3 \\
& 0.01 \times 1,353=
\end{aligned} \quad \leftarrow \frac{1}{100} \text { of } 1,353
$$

Jorge's model of the Willis Tower is $\qquad$ feet tall.
2. As you multiply by decreasing powers of 10 , how does the position of the decimal point change in the product?

## 1. Example 2

Three friends are selling items at an arts and crafts fair. Josey makes $\$ 45.75$ selling jewelry. Mark makes 100 times as much as Josey makes by selling his custom furniture. Carlos makes a tenth of the money Mark makes by selling paintings.


How much money does each friend make?
Josey: \$45.75
Mark: $\qquad$ $\times \$ 45.75$

Carlos: $\qquad$ $\times$ $\qquad$
Think: $1 \times \$ 45.75=$ $\qquad$ Think: $1 \times$ $\qquad$ $=$ $\qquad$
$10 \times \$ 45.75=$ $\qquad$ $100 \times \$ 45.75=$ $\qquad$
$\qquad$ $\times$ $\qquad$
$\qquad$

So, Josey makes $\$ 45.75$, Mark makes $\qquad$ ,
and Carlos makes $\qquad$ .

## Try This! Complete the pattern.

(A) $10^{0} \times 4.78=$ $\qquad$
$10^{1} \times 4.78=$ $\qquad$
$10^{2} \times 4.78=$ $\qquad$
$10^{3} \times 4.78=$ $\qquad$

## Shape and Show

## Complete the pattern.

1. $10^{0} \times 17.04=17.04$
$10^{1} \times 17.04=170.4$
$10^{2} \times 17.04=1,704$
$10^{3} \times 17.04=$ $\qquad$
$\qquad$

Complete the pattern.
2. $1 \times 3.19=$

$$
10 \times 3.19=
$$

$$
100 \times 3.19=
$$

$\qquad$

$$
1,000 \times 3.19=
$$

$\qquad$

## On Your Own

$\qquad$ 4. $1 \times 6,391=$ $\qquad$

$$
45.6 \times 10^{1}=
$$

$$
45.6 \times 10^{2}=
$$

$\qquad$ $45.6 \times 10^{3}=$ $\qquad$

Explain how you know that when you multiply the product of $10 \times 34.1$ by 0.1 , the result will be 34.1.

## Rati:naical 2) Use Reasoning Algebra Find the value of $n$.

5. $n \times \$ 3.25=\$ 325.00$
$n=$ $\qquad$
6. GDDEEPER A glacier in Alaska moves about 29.9 meters a day. About how much farther will it move in 1,000 days than it will move in 100 days?
$\qquad$
7. THINKSMARTER For numbers 9a-9e, choose Yes or No to indicate whether the product is correct.
9a. $\quad 0.81 \times 10=0.081$
O Yes
$\bigcirc$ No
9b. $\quad 0.33 \times 100=33$
O Yes
○ No
9c. $\quad 0.05 \times 100=5$
O Yes
9d. $\quad 0.70 \times 1,000=70$
O Yes
O No
9e. $\quad 0.38 \times 10=0.038$YesNo

## Problem Solving • Applications waid

## THINKSMARTER

## What's the Error?

10. Kirsten is making lanyards for a convention.

She needs to make 1,000 lanyards and knows that 1 lanyard uses 1.75 feet of cord.
How much cord will Kirsten need?
Kirsten's work is shown below.
$1 \times 1.75=1.75$
$10 \times 1.75=10.75$
$100 \times 1.75=100.75$
$1,000 \times 1.75=1,000.75$

Find and describe Kirsten's error.
$\qquad$


Solve the problem using the correct pattern.


So, Kirsten needs $\qquad$ feet of cord to make 1,000 lanyards.

- Marifingical 3) Compare Strategies Describe how Kirsten could solve the problem without writing out the pattern.
$\qquad$


## Multiply Decimals and Whole Numbers

Essential Question How can you use a model to multiply a whole number and a decimal?

## Investigate

Materials $\quad$ decimal models $■$ color pencils
Giant tortoises move very slowly. They can travel a distance of about 0.17 mile in 1 hour. How far could a giant tortoise move if it travels at this same speed for 4 hours?
A. Complete the statement to describe the problem.

I need to find how many total miles are in $\qquad$ groups
of $\qquad$ .

- Write an expression to represent the problem. $\qquad$
B. Use the decimal model to find the answer.
- What does each small square in the decimal model represent?
$\qquad$

C. Shade a group of $\qquad$ squares to represent the distance a giant tortoise can move in 1 hour.
D. Use a different color to shade each additional group of $\qquad$ squares until you
have $\qquad$ groups of $\qquad$ squares.
E. Record the total number of squares shaded. $\qquad$ squares So, the giant tortoise can move $\qquad$ mile in 4 hours.

Explain how the model helps you determine if your answer is reasonable.

## Draw Conclusions

1. Explain why you used only one decimal model to show the product.
2. Explain how the product of 4 groups of 0.17 is similar to the product of 4 groups of 17 . How is it different?
$\qquad$
$\qquad$
3. Mäमinailcal (6) Compare the product of 0.17 and 4 with each of the factors. Which number has the greatest value? Explain how this is different than multiplying two whole numbers.

## Make Connections

You can draw a quick picture to solve decimal multiplication problems.
Find the product. $3 \times 0.46$
STEP 1 Draw 3 groups of 4 tenths and 6 hundredths. Remember that a square is equal to 1 .

STEP 2 Combine the hundredths and rename.
There are $\qquad$ hundredths. I will rename
$\qquad$ hundredths as $\qquad$ .

Cross out the hundredths you renamed.
STEP 3 Combine the tenths and rename.
There are $\qquad$ tenths. I will rename
$\qquad$ tenths as $\qquad$ .

Cross out the tenths you renamed.
STEP 4 Record the value shown by your completed quick picture.

So, $3 \times 0.46=$ $\qquad$ .

Explain how renaming decimals is like renaming whole numbers.
$\qquad$

## Share and Show

## Use the decimal model to find the product.

1. $5 \times 0.06=$ $\qquad$

2. $2 \times 0.38=$ $\qquad$

3. $4 \times 0.24=$ $\qquad$

|  |  |  |  |
| :--- | :--- | :--- | :--- |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Find the product. Draw a quick picture.
4. $4 \times 0.6=$ $\qquad$
5. $2 \times 0.67=$ $\qquad$
6. $3 \times 0.62=$ $\qquad$
$\qquad$ ,
7. $4 \times 0.32=$ $\qquad$
8. WRITE Math Describe how you solved Exercise 7 using place
value and renaming. $\qquad$
$\qquad$
$\qquad$

## Problem Solving • Applications

## Use the table for 9-11.

9. Marimwical (2) Reason Quantitatively Each day a bobcat drinks about 3 times as much water as a Canada goose drinks. How much water can a bobcat drink in one day?

10. G■DEEPER An animal shelter provides a bowl with 1.25 liters of water for 3 cats. About how much water will be left after the cats drink their average daily amount of water?
11. THINKSMARIER Yossi is shading the model to show $0.14 \times 3$.

Describe what Yossi should shade to show the product. Then shade in the correct amount of boxes that will show the product of $0.14 \times 3$.
$\qquad$ groups of $\qquad$ small squares or $\qquad$ small squares


Number and Operations in Base
Ten-5.NBT. 7
Also 5.NBT. 2
mathematical practices

MP.5, MP. 7


Essential Question How can you use properties and place value to multiply a decimal and a whole number?

## Multiplication with Decimals and Whole Numbers

- How much mass does one penny have?
- How many pennies are on the tray?
- Use grouping language to describe what you are asked to find.


## Unlock the Problem

Estimate the product. Round to the nearest whole number.
$5 \times$ $\qquad$ $=$ $\qquad$

## P One Way <br> -

Use the Distributive Property.

$$
\begin{aligned}
5 \times 2.5 & =5 \times(\ldots+0.5) \\
& =(\square \times 2)+(5 \times \ldots) \\
& =\square \\
& =
\end{aligned}
$$

In 2010, the United States Mint released a newly designed Lincoln penny. A Lincoln penny has a mass of 2.5 grams. If there are 5 Lincoln pennies on a tray, what is the total mass of the pennies?

## Multiply. $5 \times 2.5$



So, 5 Lincoln pennies have a mass of $\qquad$ grams.

## (2) Example use pate value patems.

Having a thickness of 1.35 millimeters, the dime is the thinnest coin produced by the United States Mint. If you stacked 8 dimes, what would be the total thickness of the stack?


Multiply. $8 \times 1.35$

## STEP 1

Write the decimal factor as a whole number.

Think: $1.35 \times 100=135$

## STEP 2

Multiply as with whole numbers.

## STEP 3

Place the decimal point.
Think: 0.01 of 135 is 1.35 .
Find 0.01 of 1,080 and record the product.


A stack of 15 dimes would have a thickness of $\qquad$ millimeters.

1. Mathenatcal (6) Explain how you know the product of $8 \times 1.35$ is greater than 8 .
2. What if you multiplied 0.35 by 8 ? Would the product be less than or greater than 8 ? Explain.
$\qquad$
$\qquad$

## Shape and Show

## Place the decimal point in the product.

1. $\begin{aligned} & 6.81 \text { Think: The place value of the } \\ & \times \quad 7 \\ & 4767\end{aligned} \quad$ decimal factor is hundredths.
2. 3.7
$\begin{array}{r}\times \quad 2 \\ \hline 74\end{array}$
3. 19.34
$\begin{array}{r}\times \quad 5 \\ \hline 9670\end{array}$

Name

Find the product.
4. 6.32
$\begin{array}{r}\times \quad 3 \\ \hline\end{array}$

$$
\text { 5. } \begin{array}{r}
4.5 \\
\times \quad 8 \\
\hline
\end{array}
$$

6. 40.7
$\begin{array}{r}\times \quad 5 \\ \hline\end{array}$ determine if your answer to Exercise 6 is reasonable.

## On Your Own

## Find the product.

7. $\begin{array}{r}4.93 \\ \times \quad 7 \\ \hline\end{array}$
$\begin{array}{r}\times \quad 7 \\ \hline\end{array}$
8. 8.2
$\begin{array}{r}\times 6 \\ \hline\end{array}$
9. 15.37
$\begin{array}{r}15.37 \\ \times \quad \\ \hline\end{array}$
10. 0.49
$\begin{array}{r}\times \quad 4 \\ \hline\end{array}$
11. 9.08
$\begin{array}{r}\times \quad 9 \\ \hline\end{array}$
12. $\begin{array}{r}7.55 \\ \times \quad 8 \\ \hline\end{array}$
13. $\begin{array}{r}7.55 \\ \times \quad 8 \\ \hline\end{array}$

Practice: Copy and Solve Find the product.
13. $8 \times 7.2$
14. $3 \times 1.45$
15. $9 \times 8.6$
16. $6 \times 0.79$
17. $4 \times 9.3$
18. $7 \times 0.81$
19. $6 \times 2.08$
20. $5 \times 23.66$

## Problem Solving • Applications (

Use the table for 21-22.
21. $G \square D E E P E R$ Sari has a bag containing 6 half dollars and 3 dollar coins. What is the total mass of the coins in Sari's bag?
22. THINKSMARIER Chance has $\$ 2$ in quarters. Blake has $\$ 5$ in dollar coins. Whose coins have the greatest mass? Explain.

$\qquad$
$\qquad$
$\qquad$
23. Marifmaical (3) Make Arguments Julie multiplies 6.27 by 7 and claims the product is 438.9 . Explain without multiplying how you know Julie's answer is not correct. Find the correct answer.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
24. THINKSMARTER Rachel and Abby are trying to solve a science homework question. They need to find how much a rock that weighs 6 pounds on Earth would weigh on the moon. They know they can multiply weight on Earth by about 0.16 to find weight on the moon. Select the partial products Rachel and Abby would need to add to find the product of 6 and 0.16 . Mark all that apply.
(A) 0.22
(B) 0.6
(C) 3.65
(D) 3.6
(E) 0.36
$\qquad$

## Multiply Using Expanded Form

Essential Question How can you use expanded form and place value to multiply a decimal and a whole number?

Number and Operations in Base Ten-5.NBT. 7
Also 5.NBT. 2
MATHEMATICAL PRACTICES MP.3, MP. 4

## Unlock the Problem

The length of a day is the amount of time it takes a planet to make a complete rotation on its axis. On Jupiter, there are 9.8 Earth hours in a day. How many Earth hours are there in 46 days on Jupiter?

You can use a model and partial products to solve the problem.

## P) One Way use a model.


$\Delta$ A day on Jupiter is called a Jovian day.
Multiply. $46 \times 9.8$
THINK
MODEL
RECORD

## STEP 1

Rewrite the factors in expanded form, and label the model.
$46=$ $\qquad$ $+$ $\qquad$
$9.8=$ $\qquad$ $+$ $\qquad$


Multiply to find the area of each section. The area of each section represents a partial product.

STEP 3
Add the partial products.



So, there are $\qquad$ Earth hours in 46 days on Jupiter.

1. What if you wanted to find the number of Earth hours in 125 days on Jupiter? How would your model change?
$\qquad$
$\qquad$

## (I) Another Way use place value patterns.

A day on the planet Mercury lasts about 58.6 Earth days. How many Earth days are there in 14 days on Mercury?

Multiply. $14 \times 58.6$

## STEP 1

Write the decimal factor as a whole number.

A It takes Mercury 88 Earth days to complete an orbit of the Sun.

## STEP 2

Multiply as with whole numbers.

## STEP 3

Place the decimal point.
The decimal product is $\qquad$ of the whole number product.

So, there are $\qquad$ Earth days in 14 days on Mercury.
2. $\begin{aligned} & \text { Maringaical } 3 \text { Compare Strategies What if you rewrite the problem }\end{aligned}$
as $(10+4) \times 58.6$ and used the Distributive Property to solve?
Explain how this is similar to your model using place value.
$\qquad$
$\qquad$

Try This! Find the product.
(A) Use a model.
$52 \times 0.35=$ $\qquad$
(B) Use place value patterns.
$16 \times 9.18=$ $\qquad$

## Share and Show

Draw a model to find the product.

1. $19 \times 0.75=$ $\qquad$

2. $27 \times 8.3=$ $\qquad$

Find the product.
3. $18 \times 8.7=$
4. $23 \times 56.1=$ $\qquad$ 5. $47 \times 5.92=$ $\qquad$


Describe how you could use an estimate to determine if your answer to Exercise 3 is reasonable.

## On Your Own

Find the product.
6. $71 \times 8.3=$ $\qquad$
$\qquad$
7. $28 \times 0.19=$
8. THINKSMARTER A jacket costs $\$ 40$ at the store. Max pays only 0.7 of the price because his father works at the store. Evan has a coupon for $\$ 10$ off. Explain who will pay less for the jacket.

9. GПDEEPER An orchard sells apples in 3.5-pound bags. The orchard sells 45 bags of apples each day. How many pounds of apples does the orchard sell in 1 week?
10.


Make Sense of Problems While researching facts on the planet Earth, Kate learned that a true Earth day is about 23.93 hours long. How many hours are in 2 weeks on Earth?
a. What are you being asked to find?
$\qquad$
$\qquad$

b. What information do you need to know to solve the problem? $\qquad$
$\qquad$
$\qquad$
c. Write an expression to represent the problem to be solved.
d. Show the steps you used to solve the problem.
e. Complete the sentences.

On Earth, there are about $\qquad$
hours in a day, $\qquad$ days in 1 week, and $\qquad$ days in 2 weeks.

Since $\qquad$ $\times$ $\qquad$ $=$
$\qquad$ , there are about
$\qquad$ hours in 2 weeks on Earth.
11. THINKSMARTER Write each number in a box next to the expression that has the same value. A number may be used more than once.

| 7.68 | 768 |
| :--- | :--- |
| $48 \times 16=\square$ |  |
| $48 \times 1.6=$ | $4.8 \times 16=\square$ |
| $0.48 \times 16=\square$ | $48 \times 0.16=\square$ |

## Problem Solving • Multiply Money

Essential Question How can the strategy draw a diagram help you solve a decimal multiplication problem?

## Unlock the Problem

A group of friends go to a local fair. Jayson spends $\$ 3.75$. Myra spends 3 times as much as Jayson. Teresa spends $\$ 5.25$ more than Myra. How much does Teresa spend?

Use the graphic organizer below to help you solve the problem.


## Read the Problem

## What do I need to find?

I need to find $\qquad$
$\qquad$
$\qquad$

## What information do I need to use?

I need to use the amount spent by $\qquad$ to find the amount spent by $\qquad$ and
$\qquad$ at the fair.

## How will I use the information?

I can draw a diagram to show $\qquad$
$\qquad$
 - $\square$
$\square$

So, Teresa spent $\qquad$ at the fair.

## Solve the Problem

The amount of money Myra and Teresa spend depends on the amount Jayson spends. Draw a diagram to compare the amounts without calculating. Then, use the diagram to find the amount each person spends.

Jayson $\$ 3.75$


Jayson: \$3.75
Myra: $3 \times$ $\qquad$ $=$ $\qquad$

Teresa: $\qquad$ $+\$ 5.25=$ $\qquad$

## (1) Try Another Problem

Julie's savings account has a balance of $\$ 57.85$ in January. By March, her balance is 4 times as much as her January balance. Between March and November, Julie deposits a total of \$78.45. If she does not withdraw any money from her account, what should Julie's balance be in November?


| Read the Problem | Solve the Problem |
| :--- | :--- |
| What do I need to find? |  |
| What information do I need to use? |  |
| How will I use the information? | So, Julie's savings account balance will be <br> in November. |

- Masinimaical (1) Evaluate Reasonableness How does the diagram help you determine
if your answer is reasonable? $\qquad$
$\qquad$

Mathematical Practices
Describe a different diagram you could use to solve the problem.

## Share and Show

## MATH BOARD

1. Manuel collects $\$ 45.18$ for a fundraiser. Gerome collects $\$ 18.07$ more than Manuel. Cindy collects 2 times as much as Gerome. How much money does Cindy collect for the fundraiser?

First, draw a diagram to show the amount Manuel collects.

Then, draw a diagram to show the amount Gerome collects.

Next, draw a diagram to show the amount Cindy collects.

Finally, find the amount each person collects.

Cindy collects $\qquad$ for the fundraiser.
2. What if Gerome collects $\$ 9.23$ more than Manuel? If Cindy still collects 2 times as much as ..... WRITE Math . Show Your Work Gerome, how much money would Cindy collect?
3. Jenn buys a pair of jeans for $\$ 24.99$. Her friend Karen spends $\$ 3.50$ more for the same pair of jeans. Vicki paid the same price as Karen for the jeans but bought 2 pairs. How much did Vicki spend?
$\qquad$
4. The fifth-grade students in Miguel's school formed 3 teams to raise money for the Penny Harvest fundraiser. Team A raised $\$ 65.45$. Team B raised 3 times as much as Team A. Team C raised \$20.15 more than Team B. How much money did Team C raise?

## On Your Own

## Use the sign for 5-7.

5. Nathan receives a coupon in the mail for $\$ 10$ off of a purchase of $\$ 100$ or more. If he buys 3 pairs of board shorts, 2 towels, and a pair of sunglasses, will he spend enough to use the coupon? How much will his purchase cost?

6. GロDEEPER Austin shops at Surfer Joe's Surf Shop before going to the beach. He buys 2 T-shirts, a pair of board shorts, and a towel. If he gives the cashier $\$ 60$, how much change will Austin get back?
7. IHINKSMARTER It costs $\$ 5.15$ to rent a kayak for 1 hour at a local state park. The price per hour stays the same for up to 5 hours of rental. After 5 hours, the cost decreases to $\$ 3.75$ per hour. How much would it cost to rent a kayak
 for 6 hours?
8. THINKSMARTER At a video game store it costs $\$ 10.45$ to buy one movie. It costs 3 times as much to buy one video game. Choose the answer to complete the sentence.

It would cost Jon | $\$ 20.90$ |
| :--- |
| $\$ 31.35$ |
| $\$ 41.80$ | to buy one movie and one video game.

## Mid-Chapter Checkpoint

## Goncepts and Skills

1. Explain how you can use a quick picture to find $3 \times 2.7$. (5.NBT.7)

Complete the pattern. (5.NBT.2)
2. $1 \times 3.6=$ $\qquad$
$10 \times 3.6=$ $\qquad$
$100 \times 3.6=$ $\qquad$
$1,000 \times 3.6=$ $\qquad$
3. $10^{0} \times 17.55=$ $\qquad$
$10^{1} \times 17.55=$ $\qquad$
$10^{2} \times 17.55=$ $\qquad$
$10^{3} \times 17.55=$ $\qquad$
4. $1 \times 29=$ $\qquad$
$0.1 \times 29=$ $\qquad$
$0.01 \times 29=$ $\qquad$

Find the product. (5.Nвт.7)
5.

| 3.14 |
| ---: |
| $\times \quad 8$ |

6. $17 \times 0.67$
7. $29 \times 7.3$

Draw a diagram to solve. (5.NBT.7)
8. Julie spends $\$ 5.62$ at the store. Micah spends 5 times as much as Julie. Jeremy spends $\$ 6.72$ more than Micah. How much money does each person spend?

Julie: \$5.62
Micah: $\qquad$
Jeremy: $\qquad$
9. Sarah is cutting ribbons for a pep rally. The length of each ribbon needs to be 3.68 inches. If she needs 1,000 ribbons, what is the length of ribbon Sarah needs? (5.NBT.2)
10. Adam is carrying books to the classroom for his teacher. Each books weighs 3.85 pounds. If he carries 4 books, how many pounds is Adam carrying? (5.Nвт.7)
11. A car travels 54.9 miles in an hour. If the car continues at the same speed for 12 hours, how many miles will it travel? (5.NBT.7)
12. Charlie saves $\$ 21.45$ each month for 6 months. In the seventh month, he only saves $\$ 10.60$. How much money will Charlie have saved after 7 months? (5.мвт.7)
$\qquad$

## Decimal Multiplication

Essential Question How can you use a model to multiply decimals?

## Investigate

Materials $\quad$ color pencils
The distance from Charlene's house to her school is 0.8 mile. Charlene rides her bike 0.7 of the distance and walks the rest of the way. How far does Charlene ride her bike to school?

You can use a decimal square to multiply decimals.
Multiply. $0.7 \times 0.8$
A. Draw a square with 10 equal columns.

- What decimal value does each column represent? $\qquad$
B. Using a color pencil, shade columns on the grid to represent the distance to Charlene's school.
- The distance to the school is 0.8 mile.

How many columns did you shade? $\qquad$

C. Divide the square into 10 equal rows.

- What decimal value does each row represent? $\qquad$
D. Using a different color, shade rows that overlap the shaded columns to represent the distance to school that Charlene rides her bike.
- What part of the distance to school does Charlene ride her bike? $\qquad$
- How many rows of the shaded columns did you shade?
$\qquad$

E. Count the number of squares that you shaded twice.

There are $\qquad$ squares. Each square represents $\qquad$ .

Record the value of the squares as the product. $0.7 \times 0.8=$ $\qquad$

So, Charlene rides her bike for $\qquad$ mile.

## Draw Conclusions

1. Explain how dividing the decimal square into 10 equal columns and rows shows that tenths multiplied by tenths is equal to hundredths.
$\qquad$
$\qquad$
$\qquad$
2. Matifncilcal 8 Draw Conclusions Why is the part of the model representing the product less than either factor?
$\qquad$
$\qquad$
$\qquad$

## Make Gonnections

You can use decimal squares to multiply decimals greater than 1.
Multiply. $0.3 \times 1.4$

## STEP 1

Shade columns to represent 1.4.
How many tenths are in 1.4 ?
$\qquad$

## STEP 2

Shade rows that overlap the shaded columns to represent 0.3.

$0.3 \times 1.4=$ $\qquad$
$\qquad$

## Share and Show

```
MATH
BOARD
```

Multiply. Use the decimal model.

1. $0.8 \times 0.4=$ $\qquad$ -

2. $0.3 \times 0.4=$ $\qquad$ 5. $0.9 \times 0.6=$ $\qquad$

3. $0.1 \times 0.7=$ $\qquad$


## Problem Solving • Applications

7. GПDEEPER Rachel buys 1.5 pounds of grapes. She eats 0.3 of that amount on Tuesday and 0.2 of that amount on Wednesday. How many pounds of grapes are left?
8. $0.5 \times 1.2=$ $\qquad$

9. $0.4 \times 1.6=$ $\qquad$


10. THINKSMARTER A large bottle contains 1.2 liters of olive oil. A medium-sized bottle has 0.6 times the amount of olive oil as the large bottle. How much more olive oil does the large
 bottle contain than the medium-sized bottle?
11. Maringaical (3)Compare Representations Randy and Stacy used models to find 0.3 of 0.5 . Both Randy's and Stacy's models are shown below. Whose model makes sense? Whose model is nonsense? Explain your reasoning below each model. Then record the correct answer.

Randy's Model

$\qquad$

Stacy's Model

$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$0.3 \times 0.5=$ $\qquad$

- For the answer that is nonsense, describe the error the student made.
$\qquad$
$\qquad$

10. THINKSMARTER Shade the model to show $0.2 \times 0.6$. Then find the product.

$0.2 \times 0.6=$ $\qquad$

## Multiply Decimals

Essential Question What strategies can you use to place a decimal point in a product?
connect You can use what you have learned about patterns and place value to place the decimal point in the product when you multiply two decimals.
$1 \times 0.1=0.1$
$0.1 \times 0.1=0.01$
$0.01 \times 0.1=0.001$

## Remember

When a number is multiplied by a decimal, the decimal point moves one place to the left in the product for each decreasing place value being multiplied.

## Unlock the Problem

A male leopard seal is measured and has a length of 2.8 meters. A male elephant seal is about 1.5 times as long. What length is the male elephant seal?

Multiply. $1.5 \times 2.8$

## (1) One Way Use place value.

## STEP 1

Multiply as with whole numbers.

## STEP 2

Think: Tenths are being multiplied by tenths. Use the pattern $0.1 \times 0.1$.

Place the decimal point so the value of the decimal is $\qquad$ .

So, the length of a male elephant seal is about
$\qquad$ meters.

- Manifnaical (1) Analyze What if you multiplied 2.8 by 1.74? What would be the place value of the product? Explain your answer.


## (1) Another Way use estimation.

You can use an estimate to place the decimal point in a product.
Multiply. $7.8 \times 3.12$
STEP 1
Esimate by rounding each factor to the nearest whole number.
$\times$ $\qquad$
$\qquad$

STEP 2
Multiply as with whole numbers.

## STEP 3

Use the estimate to place the decimal point.
Think: The product should be close to your estimate.
$7.8 \times 3.12=$ $\qquad$

## Share and Show

## Place the decimal point in the product.

1. 3.62 Think: A hundredth is being multiplied
$\times 1.4$ by a tenth. Use the pattern $0.01 \times 0.1$.
2. 6.8
$\times 1.2$ 816

312
$\begin{array}{r}78 \\ \times \\ \hline\end{array}$


5068

## Find the product.

3. 

0.9
$\times 0.8$

| 64.5 |
| :---: |
|  |
| $\times \quad 5.5$ |

5. 2.39
$\times 2.7$

## On Your Own

Find the product.
6. 7.9
$\times 3.4$
9. 45.3
$\times 0.8$
7. 9.2
$\times 5.6$
10. 6.98
$\times 2.5$
8. 3.45
$\begin{array}{r}9.7 \\ \hline\end{array}$
11. 7.02
$\times 3.4$

## Practice: Copy and Solve Find the product.

12. $3.4 \times 5.2$
13. $0.9 \times 2.46$
14. $9.1 \times 5.7$
15. $4.8 \times 6.01$
16. $7.6 \times 18.7$
17. $1.5 \times 9.34$
18. $0.77 \times 14.9$
19. $3.3 \times 58.14$
20. Charlie has an adult Netherlands dwarf rabbit that weighs 1.2 kilograms. Cliff's adult Angora rabbit weighs 2.9 times as much as Charlie's rabbit. How much does Cliff's rabbit weigh?

## Problem Solving • Applications

21. GПDEEPER John has pet rabbits in an enclosure that has an area of 30.72 square feet. The enclosure Taylor is planning to build for his rabbits will be 2.2 times as large as John's. How many more square feet will Taylor's enclosure have than John's enclosure?
22. THINKSMARTER A zoo is planning a new building for the penguin exhibit. First, they made a model that was 1.3 meters tall. Then, they made a more detailed model that was 1.5 times as tall
 as the first model. The building will be 2.5 times as tall as the height of the detailed model. What will be the height of the building?
23. Mafinmaical 3) Make Arguments Leslie and Paul both solve the multiplication problem $5.5 \times 4.6$. Leslie says the answer is 25.30 . Paul says the answer is 25.3. Whose answer is correct? Explain your reasoning.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
24. THINKSMARTER For 24a-24d select True or False to indicate if the statement is correct.

24a. The product of 1.3 and 2.1 is 2.73 .
O True
$\bigcirc$ False
24 b . The product of 2.6 and 0.2 is 52 .TrueFalse

24 c . The product of 0.08 and 0.3 is 2.4 .TrueFalse

24 d . The product of 0.88 and 1.3 is 1.144 .TrueFalse
$\qquad$

## Zeros in the Product

Essential Question How do you know you have the correct number of decimal places in your product?

Number and Operations in Base Ten-5.NBT. 7
Also 5.NBT. 2
MATHEMATICAL PRACTICES
MP.2, MP.7, MP. 8

## Unlock the Problem

connect When decimals are multiplied, the product may not have enough digits to place the decimal point. In these cases, you may need to write additional zeros as place holders.

Students are racing typical garden snails and measuring the distance the snails travel in 1 minute. Chris's snail travels a distance of 0.2 foot. Jamie's snail travels 0.4 times as far as Chris's snail. How far does Jamie's snail travel?

- Using the given information, describe what you are being asked to find.

Multiply. $0.4 \times 0.2$

## STEP 1

Multiply as with whole numbers.

## STEP 2

Determine the position of the decimal point in the product.

Since tenths are being multiplied by tenths, the product will show $\qquad$ .

## STEP 3

Place the decimal point.
Are there enough digits in the product to place the decimal point? $\qquad$
Write zeros, as needed, to the left of the whole number product to place the decimal point.

So, Jamie's snail travels a distance of $\qquad$


## Example multiply money

Multiply. $0.2 \times \$ 0.30$
STEP 1 Multiply as with whole numbers.
Think: The factors are 30 hundredths and 2 tenths.
What are the whole numbers you will multiply?

STEP 2 Determine the position of the decimal point in the product.


Since hundredths are being multiplied by tenths, the product will show $\qquad$ .

STEP 3 Place the decimal point. Write zeros to the left of the whole number product as needed.

Since the problem involves dollars and cents, what place value should you use to show cents?
$\qquad$

So, $0.2 \times \$ 0.30$ is $\qquad$ .

## Try This! Find the product.

$0.2 \times 0.05=$ $\qquad$

Math

## Mathematical Practices

Explain why the answer to the Try This! can have a digit with a place value of hundredths or thousandths and still be correct.

What steps did you take to find the product?
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Share and Show

## MATH <br> BOARD

## Write zeros in the product.

1. 0.05 Think: Hundredths $\times 0.7$ are multiplied by 35 tenths. What should be the place value of the product?
2. 0.2
$\begin{array}{r}\times 0.3 \\ \hline 6\end{array}$
3. 0.02
$\begin{array}{r}\times 0.2 \\ \hline 4\end{array}$

Find the product.
4. $\$ 0.05$
$\begin{array}{r}\times \quad 0.8 \\ \hline\end{array}$
5. 0.09
$\times \quad 0.7$

## On Your Own

## Find the product.

7. 

$\begin{array}{r}0.3 \\ \times 0.3 \\ \hline\end{array}$
8. 0.05
$\times 0.3$
9. 0.02
$\times 0.4$
10. $\$ 0.40$
$\times 0.1$

## $\left.\begin{array}{c}\text { MATHEMATICAL } \\ \text { PRACICE } \\ 2\end{array}\right)$ Use Reasoning Algebra Find the value of $n$.

11. $0.03 \times 0.6=n$
12. $n \times 0.2=0.08$ $n=$
$\qquad$
13. $0.09 \times n=0.063$

$$
n=
$$

14. THINKSMARTER Michael multiplies 0.2 by a number. He records the product as 0.008 . What number did Michael use?


## Unlock the Problem

15. EDDEEPER On an average day, a garden snail can travel about 0.05 mile. The snail travels 0.2 times as far as the average distance on Day 1. It travels 0.6 times as far as the average distance on Day 2. How far does it travel in two days?
a. What are you being asked to find? $\qquad$
b. What information will you use to solve the problem? $\qquad$
$\qquad$
$\qquad$
c. Which operations can you use to solve the problem? $\qquad$
$\qquad$
$\qquad$
d. Show how you will solve the problem.
16. In a science experiment, Tania uses 0.8 ounce
of water to create a reaction. She wants the next reaction to be 0.1 times the size of the previous reaction. How much water should she use?再
e. Complete the sentence. A garden snail travels
$\qquad$ mile in 2 days.

## Personal Math Trainer

17. IHINKSMARTER The library is 0.5 mile from Celine's house. The dog park is 0.3 times as far from Celine's house as the library. How far is the dog park from Celine's house? Write an equation and solve.
$\qquad$

## (V) Chapter 4 Review/Test

1. Omar is making a scale model of the Statue of Liberty for a report on New York City. The Statue of Liberty is 305 feet tall measuring from the ground to the tip of the torch. If the model is $\frac{1}{100}$ the actual size of the Statue of Liberty, how tall is the model?
$\qquad$ feet
2. For numbers $2 \mathrm{a}-2 \mathrm{~d}$, choose Yes or No to indicate whether the product is correct.

2a. $\quad 0.62 \times 10=62$
YesNo

2b. $\quad 0.53 \times 10=5.3$
YesNo

2c. $\quad 0.09 \times 100=9$
O YesNo

2d. $0.60 \times 1,000=60$O No
3. Nicole is making 1,000 bows for people who donate to the library book sale. She needs a piece of ribbon that is 0.75 meter long for each bow. How many meters of ribbon does Nicole need to make the bows?
Explain how to find the answer.
$\square$
4. Fatima is shading this model to show $0.08 \times 3$. Shade the correct amount of boxes that will show the product.

Fatima should shade $\square$ groups of $\square$ small squares or $\qquad$ small squares.

5. Tenley is making a square frame for her painting. She is using 4 pieces of wood that are each 2.75 feet long. How much wood will Tenley use to make the frame?
$\qquad$ feet
6. Which problems will have two decimal places in the product? Mark all that apply.
(A) $5 \times 0.89$
(B) $7.4 \times 10$
(C) $5.31 \times 10^{0}$
(D) $6.1 \times 3$
(E) $3.2 \times 4.3$
7. Ken and Leah are trying to solve a science homework question. They need to find out how much a rock that weighs 4 pounds on Earth would weigh on Venus. They know they can multiply the number of pounds the rock weighs on Earth by 0.91 to find its weight on Venus. Select the partial products Ken and Leah would need to add to find the product of 4 and 0.91. Mark all that apply.
(A) 0.95
(B) 0.04
(C) 3.65
(D) 3.6
(E) 0.36
8. Sophia exchanged 1,000 U.S. dollars for the South African currency, which is called the rand. The exchange rate was 7.15 rand to $\$ 1$.

## Part A

How many South African rand did Sophia get? Explain how you know.
$\square$

## Part B

Sophia spent 6,274 rand on her trip. She exchanged the rand she had left for U.S. dollars. The exchange rate was 1 rand to $\$ 0.14$. How many U.S. dollars did Sophia get? Support your answer using specific information from the problem.


## Name

9. Trevor is reading a book for a book report. Last week, he read 35 pages of the book. This week, he read 2.5 times as many pages as he read last week. How many pages of the book has Trevor read this week? Show your work.
$\square$
10. Jonah drives his car to and from work. The total length of the trip to and from work is 19.2 miles. In August, Jonah worked 21 days. How many miles in all did Jonah drive to and from work that month? Show your work.

11. Write each number in a box next to the expression that has the same value. A number may be used more than once.

| 8.99 | 89.9 | 899 |
| :---: | :---: | :---: |

$29 \times 31=\square$
$29 \times 3.1=\square$
$0.29 \times 31=$ $\square$
$2.9 \times 31=$ $\square$
12. Melinda, Zachary, and Heather went to the mall to shop for school supplies. Melinda spent $\$ 14.25$ on her supplies. Zachary spent $\$ 2.30$ more than Melinda spent. Heather spent 2 times as much money as Zachary spent. How much did Heather spend on school supplies?
$\qquad$
13. The cost of admission to the Baytown Zoo is $\$ 10.50$ for each senior citizen, $\$ 15.75$ for each adult, and $\$ 8.25$ for each child.

## Part A

A family of 2 adults and 1 child plan to spend the day at the Baytown Zoo. How much does admission for the family cost? Explain how you found your answer.
$\square$

## Part B

Describe another way you could solve the problem.
$\square$

## Part C

What if 2 more tickets for admission are purchased? If the two additional tickets cost $\$ 16.50$, determine what type of tickets the family purchases.
Explain how you can determine the answer without calculating.
$\square$
14. At a tailor shop, it costs $\$ 6.79$ to shorten a pair of pants and 4 times as much to mend a dress. Choose the answer that correctly completes the statement.

It would cost Lisa | $\$ 19.47$ |
| :---: |
| $\$ 27.16$ |
| $\$ 33.95$ | to shorten one pair of pants and mend one dress.

## Name

15. Shade the model to show $0.3 \times 0.5$. Then find the product.

$0.3 \times 0.5=\square$
16. Mr. Evans is paid $\$ 9.20$ per hour for the first 40 hours he works in a week. He is paid 1.5 times that rate for each hour after that.

Last week, Mr. Evans worked 42.25 hours. He says he earned $\$ 388.70$ last week. Do you agree? Support your answer.
$\square$
17. Explain how an estimate helps you to place the decimal point when multiplying $3.9 \times 5.3$.
$\square$
18. On Saturday, Ahmed walks his dog 0.7 mile. On the same day, Latisha walks her dog 0.4 times as far as Ahmed walks his dog. How far does Latisha walk her dog on Saturday?
$\qquad$
19. For 19a-19d select True or False for each statement.

19a. The product of 1.5 and
2.8 is 4.2.
O True
○ False

19b. The product of 7.3 and 0.6 is 43.8 .

O TrueFalse

19c. The product of 0.09 and 0.7 is 6.3 .TrueFalse

19d. The product of 0.79 and 1.5 is 1.185 .
TrueFalse
20. A builder buys 24.5 acres of land to develop a new community of homes and parks.

## Part A

The builder plans to use 0.25 of the land for a park. How many acres will he use for the park?
$\qquad$ acres

## Part B

He buys a second property that has 0.62 times as many acres as the first property. How many acres of land are in the second property? Show your work.
$\square$
21. Joaquin lives 0.3 miles from Keith. Layla lives 0.4 as far from Keith as Joaquin. How far does Layla live from Keith? Write an equation to solve.
$\qquad$
22. Brianna is getting materials for a chemistry experiment. Her teacher gives her a container that has 0.15 liter of a liquid in it. Brianna needs to use 0.4 of this liquid for the experiment. How much liquid will Brianna use?

## Divide Decimals

## Show What You Know

Check your understanding of important skills.
Name $\qquad$

Division Facts Find the quotient.

1. $6 \longdiv { 2 4 } =$ $\qquad$
2. $7 \longdiv { 5 6 } =$ $\qquad$
3. $18 \div 9=$ $\qquad$
4. $35 \div 5=$ $\qquad$

## Estimate with 1-Digit Divisors Estimate the quotient.

5. $6 \longdiv { 2 5 3 }$
6. $4 \longdiv { 1 , 1 6 5 }$
7. $7 \longdiv { 1 , 5 0 4 }$

## Division Divide.

8. $3 4 \longdiv { 7 8 5 }$
9. $2 7 \longdiv { 1 , 5 8 1 }$
10. $4 1 \longdiv { 4 , 5 9 2 }$


Instead of telling Carmen her age, Sora gave her this clue. Be a Math Detective and find Sora's age.

## Clue

My age is 10 more than one-tenth of one-tenth of one-tenth of 3,000.

## Vocabulary Builder

## Visualize It

## Complete the bubble map using review words.



## Review Words

compatible numbers
decimal
decimal point
dividend
divisor
equivalent fractions
estimate
exponent
hundredth
quotient
remainder
tenth

## Understand Vocabulary

## Complete the sentences using the review words.

1. A $\qquad$ is a symbol used to separate the ones place from the tenths place in decimal numbers.
2. Numbers that are easy to compute with mentally are called
$\qquad$ -.
3. A $\qquad$ is one of ten equal parts.
4. A number with one or more digits to the right of the decimal point is called a $\qquad$ .
5. The $\qquad$ is the number that is to be divided in a division problem.
6. A $\qquad$ is one of one hundred equal parts.
7. You can $\qquad$ to find a number that is close to the exact amount.

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## ALGEBRA

Name $\qquad$

## Division Patterns with Decimals

Essential Question How can patterns help you place the decimal point in a quotient?

Number and Operations in Base Ten-5.NBT. 2 MATHEMATICAL PRACTICES MP.5, MP.6, MP. 7

## Unlock the Problem

The Healthy Wheat Bakery uses 560 pounds of flour to make 1,000 loaves of bread. Each loaf contains the same amount of flour. How many pounds of flour does the bakery use in each loaf of bread?

You can use powers of ten to help you find quotients.

- Underline the sentence that tells you what you are trying to find.
- Circle the numbers you need to use.

Dividing by a power of 10 is the same as multiplying by $0.1,0.01$, or 0.001 .

## 1) One Way use place-value paterns.

Divide. $560 \div 1,000$
Look for a pattern in these products and quotients.
$560 \times 1=560$
$560 \div 1=560$
$560 \times 0.1=56.0$
$560 \div 10=56.0$
$560 \times 0.01=5.60$
$560 \div 100=5.60$
$560 \times 0.001=0.560$
$560 \div 1,000=0.560$

So, $\qquad$ pound of flour is used in each loaf of bread.

1. As you divide by increasing powers of 10 , how does the position of the decimal point change in the quotients?

## (1) Another Way use exponents.

Divide. $560 \div 10^{3}$

Look for a pattern. $\quad 560 \div 10^{0}=560$

$$
\begin{aligned}
& 560 \div 10^{1}=56.0 \\
& 560 \div 10^{2}=5.60 \\
& 560 \div 10^{3}=
\end{aligned}
$$

Remember
The zero power of 10 equals 1 .

$$
10^{0}=1
$$

The first power of 10 equals 10.

$$
10^{1}=10
$$

2. Each divisor, or power of 10 , is 10 times the divisor before it.

How do the quotients compare?

CONNECT Dividing by 10 is the same as multiplying by 0.1 or finding $\frac{1}{10}$ of a number.

## Example

Liang used 25.5 pounds of tomatoes to make a large batch of salsa. He used one-tenth as many pounds of onions as pounds of tomatoes. He used one-hundredth as many pounds of green peppers as pounds of tomatoes. How many pounds of each ingredient did Liang use?

Tomatoes: 25.5 pounds

Onions: 25.5 pounds $\div$ $\qquad$
Think: $25.5 \div 1=$ $\qquad$
$\qquad$
$25.5 \div 10=$
Green Peppers: 25.5 pounds $\div$ $\qquad$
Think: $\qquad$ $\div 1=$ $\qquad$
$\qquad$ $\div 10=$ $\qquad$
$\qquad$ $\div 100=$ $\qquad$

So, Liang used 25.5 pounds of tomatoes, $\qquad$ pounds of onions,
and $\qquad$ pound of green peppers.

## Try This! Complete the pattern.

(A) $32.6 \div 1=$ $\qquad$
$32.6 \div 10=$ $\qquad$ $32.6 \div 100=$ $\qquad$
(B) $50.2 \div 10^{0}=$ $\qquad$
$50.2 \div 10^{1}=$ $\qquad$ $50.2 \div 10^{2}=$ $\qquad$

## Share and Show

## Complete the pattern.

1. $456 \div 10^{0}=456$
$456 \div 10^{1}=45.6$
$456 \div 10^{2}=4.56$
$456 \div 10^{3}=$ $\qquad$ increasing power of 10 , so the decimal
point will move to the $\qquad$ one place for each increasing power of 10 .

Explain how you can determine where to place the decimal point in the quotient $47.3 \div 10^{2}$.
$\qquad$

Complete the pattern.
2. $225 \div 10^{0}=$ $\qquad$
$225 \div 10^{1}=$ $\qquad$
$225 \div 10^{2}=$ $\qquad$

$$
74.3 \div 100=
$$

$225 \div 10^{3}=$ $\qquad$

## On Your Own

3. $605 \div 10^{0}=$ $\qquad$

$$
\begin{aligned}
& 605 \div 10^{1}= \\
& 605 \div 10^{2}= \\
& 605 \div 10^{3}=
\end{aligned}
$$

4. $74.3 \div 1=$ $\qquad$

$$
74.3 \div 10=
$$

$\qquad$
$\qquad$

## Complete the pattern.

5. $156 \div 1=$ $\qquad$
$156 \div 10=$ $\qquad$
$156 \div 100=$ $\qquad$
$156 \div 1,000=$ $\qquad$
6. $12.7 \div 1=$ $\qquad$
$12.7 \div 10=$ $\qquad$
$12.7 \div 100=$ $\qquad$
7. $32 \div 1=$ $\qquad$
$32 \div 10=$ $\qquad$
$32 \div 100=$ $\qquad$
$32 \div 1,000=$ $\qquad$
8. $92.5 \div 10^{0}=$ $\qquad$
$92.5 \div 10^{1}=$ $\qquad$
$92.5 \div 10^{2}=$ $\qquad$

## 

11. $268 \div n=0.268$
12. $n \div 10^{2}=0.123$

$$
n=
$$

$\qquad$
7. $16 \div 10^{0}=$ $\qquad$
$16 \div 10^{1}=$ $\qquad$
$16 \div 10^{2}=$ $\qquad$
$16 \div 10^{3}=$ $\qquad$
10. $86.3 \div 10^{0}=$ $\qquad$
$86.3 \div 10^{1}=$ $\qquad$
$86.3 \div 10^{2}=$ $\qquad$
13. $n \div 10^{1}=4.6$
$n=$ $\qquad$

## Problem Solving • Applications (earld

## Use the table to solve 14-16.

14. GПDEEPER

About how much more cornmeal than flour does each muffin contain?
15. $\qquad$ If each muffin contains the same amount of sugar, how many kilograms of sugar, to the nearest thousandth, are in each corn muffin?


|  |  |
| :--- | :---: |
| Dry Ingredients |  |
| for 1,000 Corn Muffins |  |

16. 

Marinmaical (5) Use Patterns The bakery decides to make only 100 corn muffins on Tuesday. How many kilograms of sugar will be needed?
17. WRITE Math Explain how you know that the quotient $47.3 \div 10^{1}$ is equal to the product $47.3 \times 0.1$.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
18. THINKSMARTER Use the numbers on the tiles to write the value of each expression.
$62.4 \div 10^{0}=$ $\qquad$

$62.4 \div 10^{1}=$ $\qquad$
$62.4 \div 10^{2}=$ $\qquad$


## Investigate

Materials $■$ decimal models $■$ color pencils
Angela has enough wood to make a picture frame with a perimeter of 2.4 meters. She wants the frame to be a square. What will be the length of each side of the frame?
A. Shade decimal models to show 2.4.
B. You need to share your model among $\qquad$ equal groups.
C. Since 2 wholes cannot be shared among 4 groups without regrouping, cut your model apart to show the tenths.

There are $\qquad$ tenths in 2.4.

Share the tenths equally among the 4 groups.

There are $\qquad$ ones and $\qquad$ tenths in each group.

Write a decimal for the amount in each group. $\qquad$
D. Use your model to complete the number sentence.
$2.4 \div 4=$ $\qquad$
So, the length of each side of the frame will be $\qquad$ meter.

## Draw Conclusions

1. Martingical (5) Use a Concrete Model Explain why you needed to cut apart the model in Step C.
$\qquad$
$\qquad$
2. Explain how your model would be different if the perimeter were 4.8 meters.

## Make Connections

You can also use base-ten blocks to model division of a decimal by a whole number.

Materials $■$ base-ten blocks
Kyle has a roll of ribbon 3.21 yards long. He cuts the ribbon into 3 equal lengths. How long is each piece of ribbon?

Divide. $3.21 \div 3$

## STEP 1

Use base-ten blocks to show 3.21.
Remember that a flat represents one, a long represents one tenth, and a small cube represents one hundredth.

There are $\qquad$ one(s), $\qquad$ tenth(s), and
$\qquad$ hundredth(s).

STEP 2 Share the ones.
Share the ones equally among 3 groups.
There is $\qquad$ one(s) shared in each group and $\qquad$ one(s) left over.

STEP 3 Share the tenths.
Two tenths cannot be shared among 3 groups without regrouping. Regroup the tenths by replacing them with hundredths.

There are $\qquad$ tenth(s) shared in each group and
$\qquad$ tenth(s) left over.

There are now $\qquad$ hundredth(s).

STEP 4 Share the hundredths.
Share the 21 hundredths equally among the 3 groups.
There are $\qquad$ hundredth(s) shared in each group and $\qquad$ hundredth(s) left over.

So, each piece of ribbon is $\qquad$ yards long.

(1)

븐


## Share and Show

Use the model to complete the number sentence.

1. $1.6 \div 4=$ $\qquad$

2. $3.42 \div 3=$

$\qquad$ |  |  |
| :--- | :--- |
|  |  |
|  |  |
|  |  |



( ถาาาาาาา


Divide. Use base-ten blocks.
3. $1.8 \div 3=$ $\qquad$ 4. $3.6 \div 4=$ $\qquad$ 5. $2.5 \div 5=$ $\qquad$
6. $2.4 \div 8=$ $\qquad$ 7. $3.78 \div 3=$ $\qquad$ 8. $1.33 \div 7=$ $\qquad$
9. $4.72 \div 4=$ $\qquad$
11. $6.25 \div 5=$ $\qquad$
10. $2.52 \div 9=$ $\qquad$

## Problem Solving • Applications

12. IHINKSMARTER What's the Error? Aida is making banners from a roll of paper that is 4.05 meters long. She will cut the paper into 3 equal lengths. She uses base-ten blocks to model how long each piece will be. Describe


Aida's error.
$\qquad$
$\qquad$
$\qquad$

$\qquad$
$\qquad$
13. GDDEEPER Sam can ride his bike 4.5 kilometers in 9 minutes, and Amanda can ride her bike 3.6 kilometers in 6 minutes. Which rider might go farther in 1 minute?
$\qquad$
14. Marpicmaical (2) Use Reasoning Explain how you can use inverse operations to find $1.8 \div 3$.
$\qquad$
$\qquad$
15. THINKSMARTER Draw a model to show $4.8 \div 4$ and solve.
$\square$
$4.8 \div 4=$ $\qquad$
$\qquad$

## Estimate Quotients

Essential Question How can you estimate decimal quotients?

## Unlock the Problem

Carmen likes to ski. The ski resort where she goes to ski got 3.2 feet of snow during a 5 -day period. The average daily snowfall for a given number of days is the quotient of the total amount of snow and the number of days. Estimate the average daily snowfall.

You can estimate decimal quotients by using compatible numbers. When choosing compatible numbers, you can look at the whole-number part of a decimal dividend or rename the decimal dividend as tenths or hundredths.

$\square$ Estimate. $3.2 \div 5$
Carly and her friend Marco each find an estimate. Since the divisor is greater than the dividend, they both first rename 3.2 as tenths.
3.2 is $\qquad$ tenths.

## CARLY'S ESTIMATE

30 tenths is close to 32 tenths and divides easily by 5 . Use a basic fact to find 30 tenths $\div 5$.

30 tenths $\div 5$ is $\qquad$ tenths or $\qquad$ .

So, the average daily snowfall is about
$\qquad$ foot.

## MARCO'S Estimate

35 tenths is close to 32 tenths and divides easily by 5 . Use a basic fact to find 35 tenths $\div 5$.

35 tenths $\div 5$ is $\qquad$ tenths or $\qquad$ .

So, the average daily snowfall is about
$\qquad$ foot.

1. Mantingical (1) Interpret a Result Whose estimate do you think is closer to the exact quotient?

Explain your reasoning.
2. Explain how you would rename the dividend in $29.7 \div 40$ to choose compatible numbers and estimate the quotient.

## Estimate with 2-Digit Divisors

When you estimate quotients with compatible numbers, the number you use for the dividend can be greater than the dividend or less than the dividend.

## (1) Example

A group of 31 students is going to visit the museum. The total cost for the tickets is $\$ 144.15$. About how much money will each student need to pay for a ticket?

Estimate. \$144.15 $\div 31$
(A) Use a whole number greater than the dividend.

Use 30 for the divisor. Then find a number close to and greater than $\$ 144.15$ that divides easily by 30 .
$\$ 144.15 \div 31$
$\$ 150 \div 30=\$$ $\qquad$
So, each student will pay about \$ $\qquad$ for a ticket.

Use a whole number less than the dividend.
Use 30 for the divisor. Then find a number close to and less than $\$ 144.15$ that divides easily by 30 .

```
$144.15 \div 31
$120 \div 30=$
```

$\qquad$

So, each student will pay about \$ $\qquad$ for a ticket.
3.
estimate of the cost of a ticket? Explain your reasoning. $\qquad$
$\qquad$
$\qquad$

Share and Show

## Use compatible numbers to estimate the quotient.

1. $28.8 \div 9$
$\qquad$ $\div$ $\qquad$ $=$ $\qquad$
$\qquad$

## Estimate the quotient.

3. $161.7 \div 7$

## On Your Own

5. $145.4 \div 21$

Mathematical Practices
Explain why you might want to find an estimate for a quotient.

## Estimate the quotient.

6. $15.5 \div 4$
7. $72.1 \div 7$
8. $21.8 \div 4$
9. $17.9 \div 9$
10. $394.8 \div 7$
11. $32.4 \div 52$
12. $3.4 \div 5$
13. $3.4 \div$

## Problem Solving • Applications Werld

## Use the table to solve 16-17.

16. HDDEEPER How does the estimate of the average daily snowfall for Wyoming's greatest 7-day snowfall compare to the estimate of the average daily snowfall for South Dakota's greatest 7-day snowfall?
17. 

THINKSMARTER The greatest monthly snowfall total in Alaska is 297.9 inches. This happened in February, 1953. Compare the daily average snowfall for February, 1953, with the average daily snowfall for Alaska's greatest 7-day snowfall. Use estimation.
$\qquad$
$\qquad$
18. WRITE Math What's the Error? During a 3-hour storm, it snowed 2.5 inches. Jacob said that it snowed an average of about 8 inches per hour.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
19. THINK SMARIER Juliette will cut a piece of string that is 45.1 feet long into 7 smaller pieces. Each of the 7 pieces will be the same length. Write a division sentence using compatible numbers to estimate the quotient.
$\qquad$

## Division of Decimals by Whole Numbers

Essential Question How can you divide decimals by whole numbers?

## Unlock the Problem

In a swimming relay, each swimmer swims an equal part of the total distance. Brianna and 3 other swimmers won a relay in 5.68 minutes. What is the average time each relay team member swam?

- How many swimmers are part of the relay team?

THINK AND RECORD
STEP 1 Share the ones.
$4 \longdiv { 5 . 6 8 }$
Divide. 5 ones $\div 4$
Multiply. $4 \times 1$ one
-4 Subtract. 5 ones -4 ones

Check. $\qquad$ one(s) cannot be shared among 4 groups without regrouping.

STEP 2 Share the tenths.


Divide. $\qquad$ tenths $\div 4$

Multiply. $4 \times$ $\qquad$ tenths

Subtract. $\qquad$ tenths - $\qquad$ tenths

Check. $\qquad$ tenth(s) cannot be shared among 4 groups.

STEP 3 Share the hundredths.


Divide. 8 hundredths $\div 4$

Multiply. $4 \times$ $\qquad$ hundredths

Subtract. $\qquad$ hundredths - $\qquad$ hundredths

Check. $\qquad$ hundredth(s) cannot be shared among 4 groups.

Place the decimal point in the quotient to separate the ones and the tenths.

So, each girl swam an average of $\qquad$ minutes.

## (1) Another Way use an estimate.

Divide as you would with whole numbers.
Divide. $\$ 40.89 \div 47$

- Estimate the quotient. 4,000 hundredths $\div 50=80$ hundredths, or $\$ 0.80$
- Divide the tenths.
- Divide the hundredths. When the remainder is zero and there are no more digits in the dividend, the division is complete.
- Use your estimate to place the decimal point. Place a zero to show there are no ones.

So, $\$ 40.89 \div 47$ is $\qquad$ .

- Marifagical (6) Explain how you used the estimate to place the decimal
point in the quotient.

Try This! Divide. Use multiplication to check your work.


## Share and Show

Write the quotient with the decimal point placed correctly.

1. $4.92 \div 2=246$ $\qquad$ 2. $50.16 \div 38=132$
$\qquad$

## Divide.

3. $8 \longdiv { \$ 8 . 2 4 }$
4. $3 \longdiv { 2 . 5 2 }$
5. $2 7 \longdiv { 9 7 . 2 }$

## On Your Own



Practice: Copy and Solve Divide.
6. $3 \longdiv { \$ 7 . 7 1 }$
7. $1 4 \longdiv { 7 9 . 8 }$
8. $3 3 \longdiv { 2 5 . 4 1 }$
9. $7 \longdiv { 1 5 . 6 1 }$
10. $1 4 \longdiv { 1 3 7 . 2 }$
11. $3 4 \longdiv { 5 2 3 . 6 }$

## Mariznaical (2) Use Reasoning Algebra Write the unknown number for each $\quad$.

12. 

$\square \div 5=1.21$
$\square=$ $\qquad$
13. $46.8 \div 39=$


$\qquad$
14. $34.1 \div \square=22$

$$
\square=
$$

$\qquad$
15. THINKSMARTER Mei runs 80.85 miles in 3 weeks. If she runs 5 days each week, what is the average distance she runs each day?

16. FПDEEPER Rob buys 6 tickets to the basketball game. He pays $\$ 8.50$ for parking. His total cost is $\$ 40.54$. What is the cost of each ticket?

## Unlock the Problem

17. Märinagical (1) Make Sense of Problems The standard width of 8 lanes in swimming pools used for competitions is 21.92 meters. The standard width of 9 lanes is 21.96 meters. How much wider is each lane when there are 8 lanes than when there are 9 lanes?

a. What are you asked to find? $\qquad$
$\qquad$
b. What operations will you use to solve the problem? $\qquad$
$\qquad$
c. Show the steps you used to solve the problem.
d. Complete the sentences.

Each lane is $\qquad$ meters wide when there are 8 lanes.

Each lane is $\qquad$ meters wide when there are 9 lanes.

Since $\qquad$ - $\qquad$ = $\qquad$ , the
lanes are $\qquad$ meter(s) wider when there are 8 lanes than when there are 9 lanes.
19. Jasmine uses 14.24 pounds of fruit for 16 servings of fruit salad. If each serving contains the same amount of fruit, how much fruit is in each serving?
18. IHINKSMARTER Simon cut a pipe that was 5.75 feet long. Then he cut the pipe into 5 equal pieces. What is the length of each piece?

## (V) Mid-Chapter Checkpoint

## Goncepts and Skills

1. Explain how the position of the decimal point changes in a quotient as you divide by increasing powers of 10. (5.NBT.2)
2. Explain how you can use base-ten blocks to find $2.16 \div 3$. (5.nвт.7)

## Complete the pattern. (5.NBT.2)

3. $223 \div 1=$ $\qquad$
$223 \div 10=$ $\qquad$
$223 \div 100=$ $\qquad$
$223 \div 1,000=$ $\qquad$

Estimate the quotient. (5.Nвт.7)
6. $31.9 \div 4$
7. $6.1 \div 8$
8. $492.6 \div 48$
4. $61 \div 1=$ $\qquad$
$61 \div 10=$ $\qquad$
$61 \div 100=$ $\qquad$
$61 \div 1,000=$ $\qquad$
5. $57.4 \div 10^{0}=$ $\qquad$ $57.4 \div 10^{1}=$ $\qquad$
$57.4 \div 10^{2}=$ $\qquad$
11. $6 1 \longdiv { 2 0 7 . 4 }$
12. The Westside Bakery uses 440 pounds of flour to make 1,000 loaves of bread. Each loaf contains the same amount of flour. How many pounds of flour are used in each loaf of bread? (5.NBT.2)
13. Elise pays $\$ 21.75$ for 5 student tickets to the fair. What is the cost of each student ticket? (5.NBT.7)
14. Jason has a piece of wire that is 62.4 inches long. He cuts the wire into 3 equal pieces. Estimate the length of 1 piece of wire. (5.Nвт.7)
15. Elizabeth uses 33.75 ounces of granola for 15 servings of trail mix. If each serving contains the same amount of granola, how much granola is in each serving? (5.Nвт.7)
$\qquad$

## Decimal Division

Essential Question How can you use a model to divide by a decimal?

Number and Operations in Base
Ten-5.NBT. 7
MATHEMATICAL PRACTICES
MP.2, MP.5, MP. 6

## Investigate

Materials $■$ decimal models $\square$ color pencils
Lisa is making reusable shopping bags. She has 3.6 yards of fabric. She needs 0.3 yard of fabric for each bag. How many shopping bags can she make from the 3.6 yards of fabric?
A. Shade decimal models to show 3.6.
B. Cut apart your model to show the tenths. Separate the tenths into as many groups of 3 tenths as you can.

There are $\qquad$ groups of $\qquad$ tenths.
C. Use your model to complete the number sentence.
$3.6 \div 0.3=$ $\qquad$
So, Lisa can make $\qquad$ shopping bags.

## Draw Conclusions

1. Explain why you made each group equal to the divisor.

## Remember

The divisor can tell the number of same-sized groups, or it can tell the number in each group.
2.


Represent a Problem Identify the problem you एtell would be modeling if each strip in the model represents 1 .
3. Matifnaical (5) Communicate Dennis has 2.7 yards of fabric to make bags that require 0.9 yard of fabric each. Describe a decimal model you can use to find how many bags he can make.

## Make Connections

You can also use a model to divide by hundredths.
Materials $■$ decimal models $■$ color pencils
Julie has $\$ 1.75$ in nickels. How many stacks of $\$ 0.25$ can she make from $\$ 1.75$ ?

## STEP 1

Shade decimal models to show 1.75.
There are $\qquad$ one(s) and $\qquad$ hundredth(s).

## STEP 2

Cut apart your model to show groups of 0.25 .
There are $\qquad$ groups of $\qquad$ hundredths.

## STEP 3

Use your model to complete the number sentence.
$1.75 \div 0.25=$ $\qquad$

So, Julie can make $\qquad$ stacks of $\$ 0.25$ from $\$ 1.75$.

## Share and Show



Math
Talk
Mathematical Practices
Explain how to use decimal models to find $3 \div 0.75$.

Use the model to complete the number sentence.

1. $1.2 \div 0.3=$ $\qquad$

2. $0.45 \div 0.09=$ $\qquad$

3. $0.96 \div 0.24=$ $\qquad$

4. $1 \div 0.5=$

$\qquad$

Divide. Use decimal models.
5. $1.24 \div 0.62=$
6. $0.84 \div 0.14=$ $\qquad$
7. $1.6 \div 0.4=$ $\qquad$

## Problem Solving • Applications

## Matyingical (5) Use Appropriate Tools Use the model to find the unknown value.

8. $2.4 \div$ $\qquad$ $=3$

9. $\qquad$ $\div 0.32=4$

10. THINKSMARTER Make a model to find $0.6 \div 0.15$. Describe your model.
11. Matifnalcal (6) Explain using the model, what the equation represents in Exercise 9.
$\qquad$
$\qquad$
Personal Math Trainer
12. THINKSMARTER 5 Shade the model below and circle to show $1.8 \div 0.6$.

$$
1.8 \div 0.6=\square
$$



## THINK SMARTER/ Pose a Problem

13. Emilio buys 1.2 kilograms of grapes. He separates the grapes into packages that contain 0.3 kilogram of grapes each. How many packages of grapes does Emilio make?

$1.2 \div 0.3=4$
Emilio made 4 packages of grapes.
Write a new problem using a different amount for the weight in each package. The amount should be a decimal with tenths. Use a total amount of 1.5 kilograms of grapes. Then use decimal models to solve your problem.

Pose a problem.
$\square$

Solve your problem. Draw a picture of the model you used to solve your problem.
$\square$
14. GПDEEPER Jose has 2.31 meters of blue ribbon to cut into 0.33 -meter long pieces. Isha has 2.05 meters of red ribbon. She will cut her ribbon into pieces that are 0.41 meters long. How many more pieces of blue ribbon will there be?

## Name

$\qquad$

## Divide Decimals

Essential Question How can you place the decimal point
in the quotient?
When you multiply both the divisor and the dividend by the same power of 10 , the quotient stays the same.

| divisor | dividend |  |
| :---: | :---: | :---: |
| $6 \quad \div$ | $3=2$ |  |
| $\downarrow \times 10$ | $\downarrow \times 10$ |  |
| $60 \quad \div$ | $30=2$ |  |
| $\downarrow \times 10$ | $\downarrow \times 10$ |  |
| $600 \div$ | $300=2$ |  |


| divisor | dividend |  |
| :--- | :--- | :--- |
| 120 | $\div$ | $30=4$ |
| $\downarrow \times 0.1$ | $\downarrow \times 0.1$ |  |
| 12 | $\div$ | $3=4$ |
| $\downarrow \times 0.1$ | $\downarrow \times 0.1$ |  |
| 1.2 | $\div$ | $0.3=4$ |

## Unlock the Problem

Matthew has $\$ 0.72$. He wants to buy stickers that cost $\$ 0.08$ each. How many stickers can he buy?

- Multiply both the dividend and the divisor by the power of 10 that makes the divisor a whole number. Then divide.

$$
\begin{aligned}
& 0.72 \div 0.08= \\
& \downarrow \times 100 \downarrow \times 100 \\
& 72 \div 8=
\end{aligned}
$$

So, Matthew can buy $\qquad$ stickers.

- What do you multiply hundredths by to get a whole number?

$\qquad$

1. Mathematical (1) Make Connections Explain how you know that the quotient $0.72 \div 0.08$ is equal to the quotient $72 \div 8$.

Try This! Divide. $0.56 \div 0.7$

- Multiply the divisor by a power of 10 to make it a whole number. Then multiply the dividend by the same power of 10 .
$0.7 \times$ $\qquad$ $=$ $\qquad$
$0.56 \times$ $\qquad$ $=$ $\qquad$
- Divide.
$07 \sqrt{5 \cdot 6}$


## 1) Example

Sherri hikes on the Pacific Coast trail. She plans to hike 3.72 miles. If she hikes at an average speed of 1.2 miles per hour, how long will she hike?

Divide. $3.72 \div 1.2$
Estimate. $\qquad$

## STEP 1

Multiply the divisor by a power of 10 to make it a whole number. Then, multiply the dividend by the same power of 10 .
$1.2 \times$ $\qquad$ $=$ $\qquad$
$3.72 \times$ $\qquad$ $=$ $\qquad$

So, Sherri will hike $\qquad$ hours. ous.

## STEP 2

Write the decimal point in the quotient above the decimal point in the new dividend.
$1 2 \longdiv { 3 7 . 2 }$

## STEP 3

Divide.

2. Marituaical 8 Generalize Describe what happens to the decimal point in the divisor and in the dividend when you multiply by 10 .
3. Explain how you could have used the estimate to place the decimal point.
$\qquad$
$\qquad$

Try This!
Divide. Check your answer.

## Share and Show

## MATH

BOARD

## Copy and complete the pattern.

1. $45 \div 9=$ $\qquad$

$$
4.5 \div \_=5
$$

$\qquad$

$$
\div 0.09=5
$$

2. $175 \div 25=$ $\qquad$

$$
17.5 \div
$$

$\qquad$ $=7$
$\qquad$

$$
\div 0.25=7
$$

## Divide.

4. $1 . 6 \longdiv { 9 . 6 }$
5. $0 . 3 \longdiv { 0 . 2 4 }$

## On Your Dwn

## Divide.

8. $0 . 3 \longdiv { 0 . 9 }$
9. $0 . 6 \longdiv { 1 3 . 2 }$
 $\$ 0.06$ each. Describe how Samuel can find the number of erasers he can buy.
10. $164 \div 2=$ $\qquad$

$$
16.4 \div \square=82
$$

$\qquad$

$$
\div 0.02=82
$$

6. $3.45 \div 1.5$

## Math

Mathematical Practices
Explain how you know that your quotient for Exercise 5 will be less than 1.
$\qquad$
$\qquad$
$\qquad$

## Problem Solving • Applications

## Use the table to solve 11-15.

11. Connie paid $\$ 1.08$ for pencils. How many pencils did she buy?
12. Albert has $\$ 2.16$. How many more pencils can he buy than markers?
$\qquad$
13. HПDEEPER How many erasers can Ayita buy for the $^{\text {n }}$ same amount that she would pay for two notepads?
$\qquad$
14. THINK SMARTER

Ramon paid $\$ 3.25$ for notepads and $\$ 1.44$ for markers. What is the total number of items he bought?


| Prices at School Store |  |
| :--- | :---: |
| Item | Price |
| Eraser | $\$ 0.05$ |
| Marker | $\$ 0.36$ |
| Notepad | $\$ 0.65$ |
| Pencil | $\$ 0.12$ |

$\qquad$

## Write Zeros in the Dividend

Essential Question When do you write a zero in the dividend to find a quotient?

Number and Operations in Base Ten-5.NBT. 7
Also 5.NF. 3
MATHEMATICAL PRACTICES
MP.1, MP. 6
connect When decimals are divided, the dividend may not have enough digits for you to complete the division. In these cases, you can write zeros to the right of the last digit.

## Unlock the Problem

The equivalent fractions show that writing zeros to the right of a decimal does not change the value.
$90.8=90 \frac{8 \times 10}{10 \times 10}=90 \frac{80}{100}=90.80$
During a fund-raising event, Adrian rode his bicycle 45.8 miles in 4 hours. Find his speed in miles per hour by dividing the distance by the time.

Divide. $45.8 \div 4$
Estimate. $44 \div 4=$ $\qquad$

## STEP 1

Write the decimal point in the quotient above the decimal point in the dividend.

## STEP 2

Divide the tens, ones, and tenths.


## STEP 3

Write a zero in the dividend and continue dividing.

$\qquad$ miles per hour.

Explain how you would model this problem using base-ten blocks.
connect When you divide whole numbers, you can show the amount that is left over by writing a remainder or a fraction. By writing zeros in the dividend, you can also show that amount as a decimal.

## (1) Example write zeros in the dividend.

Divide. $372 \div 15$


So, $372 \div 15=$ $\qquad$ .

- Marpinaical (6) Sarah has 78 ounces of rice. She puts an equal amount of rice ineach of 12 bags. What amount of rice does she put in each bag? Explain how you would write the answer using a decimal.
$\qquad$
$\qquad$

Try This! Divide. Write a zero at the end of the dividend as needed.

Divide. $1.23 \div 0.06$


Divide. $10 \div 0.8$


## Share and Show

## MATH

BOARD
Write the quotient with the decimal point placed correctly.

| 1. $5 \div 0.8=625$ | 2. $26.1 \div 6=435$ |
| :--- | :--- |

$\mid$
3. $0.42 \div 0.35=12$
4. $80 \div 50=16$

Divide.
5. $4 \longdiv { 3 2 . 6 }$
6. $1 . 2 \longdiv { 9 }$
7. $1 5 \longdiv { 4 2 }$
8. $0 . 1 4 \longdiv { 0 . 9 1 }$

## On Your Own

## Practice: Copy and Solve Divide.

9. $1 . 6 \longdiv { 2 0 }$
10. $1 5 \longdiv { 4 . 8 }$
11. $0 . 5 4 \longdiv { 2 . 4 3 }$
12. $2 8 \longdiv { 9 8 }$
13. $1.8 \div 12$
14. $3.5 \div 2.5$
15. $40 \div 16$
16. $2.24 \div 0.35$
17. Marifnaical (2) Reason Quantitatively Lana has a ribbon that is 2.2 meters long. She cuts the ribbon into 4 equal pieces to trim the edges of her bulletin board. What is the length of each piece of ribbon?
18. Hiro's family lives 896 kilometers from the beach. Each of the 5 adults drove the family van an equal distance to get to the beach. How far did each adult drive?

## Problem Solving • Applications

19. G■DEEPER Jerry takes trail mix on hikes. A package of dried apricots weighs 25.5 ounces. A package of sunflower seeds weighs 21 ounces. Jerry divides the apricots and seeds equally among 6 bags of trail mix. How many more ounces of apricots than seeds are in each bag?
20. Marienaical (3) Compare Representations Find $65 \div 4$. Write your answer using a remainder, a fraction, and a decimal. Then tell which form of the answer you prefer. Explain your choice.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
21. THINKKSMARTER Amy has 3 pounds of raisins. She divides the raisins equally into 12 bags. How many pounds of raisins are in each bag? Tell how many zeros you had to write at the end of the dividend to solve.
22. THINKSMARTER For numbers 22a-22d select Yes or No to indicate whether a zero must be written in the dividend to find the quotient.
22a. $5.2 \div 8$
O Yes
○ No
22b. $3.63 \div 3$
O Yes
○ No
22c. $71.1 \div 0.9$
O Yes
○ No
22d. $2.25 \div 0.6$
O Yes
○ No

## Connect Tto Science

## Rate of Speed Formula

The formula for velocity, or rate of speed, is $r=d \div t$, where $r$ represents rate of speed, $d$ represents distance, and $t$ represents time. For example, if an object travels 12 feet in 10 seconds, you can find its rate of speed by using the formula.
$r=d \div t$
$r=12 \div 10$
$r=1.2$ feet per second

## Use division and the formula for rate of speed to solve.

23. A car travels 168 miles in 3.2 hours. Find the car's rate of speed in miles per hour.
24. A submarine travels 90 kilometers in 4 hours. Find the submarine's rate of speed in kilometers per hour.

## Problem Solving• Decimal Operations

Essential Question How do you use the strategy work backward to solve multistep decimal problems?

## Unlock the Problem

Carson spent $\$ 15.99$ for 2 books and 3 pens. The books cost $\$ 4.95$ each. The sales tax on the total purchase was $\$ 1.22$. Carson also used a coupon for $\$ 0.50$ off his purchase. If each pen had the same cost, how much did each pen cost?


| Read the Problem <br> What do I need to find? |  | What information do I <br> need to use? |
| :--- | :--- | :--- |
| How will I use the <br> information? |  |  |

## Solve the Problem

- Make a flowchart to show the information. Then using inverse operations, work backward to solve.

| Cost of 3 pens | $\xrightarrow{\text { plus }}$ | Cost of 2 books | $\xrightarrow{\text { plus }}$ | Amount of $\operatorname{tax}$ | $\xrightarrow{\text { minus }}$ | Amount of Coupon | $\xrightarrow{\text { equals }}$ | Total Spent |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| $3 \times$ cost of each pen | + | $2 \times$ | + |  | - |  | $=$ |  |


| Total Spent | $\xrightarrow{\text { plus }}$ | Amount of Coupon | $\xrightarrow{\text { minus }}$ | Amount of tax | $\xrightarrow{\text { minus }}$ | Cost of 2 books | $\xrightarrow{\text { equals }}$ | Cost of 3 pens |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | + |  | - |  | - |  | $=$ |  |

- Divide the cost of 3 pens by 3 to find the cost of each pen.
$\qquad$ $\div 3=$ $\qquad$

So, the cost of each pen was $\qquad$ .

Explain why the amount of the coupon was added when you worked backward.

## (1) Try Another Problem

Last week, Vivian spent a total of $\$ 20.00$. She spent $\$ 9.95$ for tickets to the school fair, $\$ 5.95$ for food, and the rest for 2 rings that were on sale at the school fair. If each ring had the same cost, how much did each ring cost?


| Read the Problem |  |  |
| :--- | :--- | :--- |
| What do I need to find? | What information do I <br> need to use? | How will I use the <br> information? |

Solve the Problem

So, the cost of each ring was $\qquad$ .

## Share and Show

1. Hector spent $\$ 36.75$ for 2 DVDs that cost the same amount. The sales tax on his purchase was $\$ 2.15$. Hector also used a coupon for $\$ 1.00$ off his purchase. How much did each DVD cost?

First, make a flowchart to show the information and show how you would work backward.
$\square$

Then, work backward to find the cost of 2 DVDs.
$\qquad$

Finally, find the cost of one DVD.

So, each DVD costs $\qquad$ .
2. What if Hector spent $\$ 40.15$ for the DVDs, the sales tax was $\$ 2.55$, and he didn't have a coupon? How much would each DVD cost?
3. Sophia spent $\$ 7.30$ for school supplies. She spent $\$ 3.00$ for a notebook and $\$ 1.75$ for a pen. She also bought 3 large erasers. If each eraser had the same cost, how much did she spend for each eraser?

## On Your Own

4. The change from a gift purchase was $\$ 3.90$. Each of 6 students donated an equal amount for the gift. How much change should each student receive?
5. HIDEEPER A mail truck picks up two boxes of mail $^{\text {a }}$ from the post office. The total weight of the boxes is 32 pounds. One box is 8 pounds heavier than the other box. How much does each box weigh?
$\qquad$
6. THINKSMARTER Stacy buys 3 CDs in a set for $\$ 29.98$. She saved $\$ 6.44$ by buying the set instead of buying the individual CDs. If each CD costs the same amount, how much does each of the 3 CDs cost
 when purchased individually?
$\qquad$

## (V) Chapter 5 Review/Test

1. Rita is hiking along a trail that is 13.7 miles long. So far she has hiked along one-tenth of the trail. How far has Rita hiked?
$\qquad$ miles
2. Use the numbers on the tiles to write the value of each expression. You can use a tile more than once or not at all.

3. Tom and his brothers caught 100 fish on a weeklong fishing trip. The total weight of the fish was 235 pounds.

## Part A

Write an expression that will find the weight of one fish. Assume that the weight of each fish is the same.
$\square$

## Part B

What is the weight of one fish?
pounds

## Part C

Suppose the total weight of the fish caught stayed the same but instead of 100 fish caught during the weekend, only 10 fish were caught. How would the weight of each fish change? Explain.
4. Draw a model to show $5.5 \div 5$.

$$
5.5 \div 5=\square
$$

5. Emma, Brandy, and Damian will cut a rope that is 29.8 feet long into 3 jump ropes. Each of the 3 jump ropes will be the same length. Write a division sentence using compatible numbers to estimate the length of each rope.
$\square$
6. Karl drove 617.3 miles. For each gallon of gas, the car can travel 41 miles.

Select a reasonable estimate of the number of gallons of gas Karl used.
Mark all that apply.
(A) 1.5 gallons
(B) 1.6 gallons
(C) 15 gallons
(D) 16 gallons
(E) 150 gallons
7. Donald bought a box of golf balls for $\$ 9.59$. There were 18 golf balls in the box. About how much did each golf ball cost?
$\square$
8. Luke cut down a tree that was 28.8 feet tall. Then he cut the tree into 6 equal pieces to take it away. What is the length of each piece?
$\qquad$
feet

## Name

9. Samantha is making some floral arrangements. The table shows the prices for one-half dozen of each type of flower.

| Prices For $\frac{\mathbf{1}}{\mathbf{2}}$ Dozen Flowers |  |
| :--- | :---: |
| Rose | $\$ 5.29$ |
| Carnation | $\$ 3.59$ |
| Tulip | $\$ 4.79$ |

## Part A

Samantha wants to buy 6 roses, 4 carnations, and 8 tulips. She estimates that she will spend about $\$ 14$ on these flowers. Do you agree? Explain your answer.
$\square$

## Part B

Along with the flowers, Samantha bought 4 packages of glass beads and 2 vases. The vases cost $\$ 3.59$ each and the total sales tax was $\$ 1.34$. The total amount she paid was $\$ 28.50$, including sales tax. Explain a strategy she could use to find the cost of 1 package of glass beads.
$\square$
10. Les is sending 8 identical catalogs to one of his customers. If the package with the catalogs weighs 6.72 pounds, how much does each catalog weigh?
$\qquad$ pounds
11. Divide.
$\square$
$5 \longdiv { 6 . 5 5 }$
12. Isabella is buying art supplies. The table shows the prices for the different items she buys.

## Part A

Isabella spends $\$ 2.25$ on poster boards. How many poster boards does she buy?
$\qquad$ poster boards

| Art Supplies |  |
| :--- | :--- |
| Item | Price |
| Glass beads | $\$ 0.28$ perounce |
| Paint brush | $\$ 0.95$ |
| Poster board | $\$ 0.75$ |
| Jar of paint | $\$ 0.99$ |

## Part B

Isabella spends $\$ 4.87$ on paintbrushes and paint. How many of each item does she buy? Explain how you found your answer.
$\square$
13. Shade the model and circle to show $1.4 \div 0.7$.
$1.4 \div 0.7=\square$


## Name

14. Tabitha bought peppers that cost $\$ 0.79$ per pound. She paid $\$ 3.95$ for the peppers. How many pounds of peppers did she buy? Show your work.
$\square$
15. Hank has a large bag of trail mix that weighs 7.8 pounds. He uses the mix in the large bag to make bags each containing 0.6 pound of mix. How many bags containing 0.6 pound can be made?
$\qquad$ bags
16. Shareen walked a total of 9.52 miles in a walk-a-thon. If her average speed was 2.8 miles per hour, how long did it take Shareen to complete the walk?
$\qquad$ hours
17. For numbers 17a-17c, choose Yes or No to indicate whether a zero must be written in the dividend to find the quotient.
17a. $1.4 \div 0.05$
O Yes
No
17b. $2.52 \div 0.6$
Yes
No
17c. $2.61 \div 0.3$
Yes
No
18. Lisandra made 22.8 quarts of split pea soup for her restaurant. She wants to put the same amount of soup into each of 15 containers. How much soup should Lisandra put into each container?
$\qquad$ quarts
19. Percy buys tomatoes that cost $\$ 0.58$ per pound. He pays $\$ 2.03$ for the tomatoes.

## Part A

Percy estimates he bought 4 pounds of tomatoes. Is Percy's estimate reasonable? Explain.
$\square$

## Part B

How many pounds of tomatoes did Percy actually buy? Show your work.

20. Who drove the fastest? Select the correct answer.
(A) Harlin drove 363 miles in 6 hours.
(B) Kevin drove 435 miles in 7 hours.
(C) Shanna drove 500 miles in 8 hours.
(D) Hector drove 215 miles in 5 hours.
21. Maritza is buying a multipack of 3 pairs of socks for $\$ 25.98$. She will save $\$ 6.39$ by buying the multipack instead of buying 3 individual pairs of the same socks. If each pair of socks costs the same amount, how much does each pair of socks cost when bought individually? Show your work.

22. Eric spent $\$ 22.00$, including sales tax, on 2 jerseys and 3 pairs of socks. The jerseys cost $\$ 6.75$ each and the total sales tax was $\$ 1.03$. Fill in the table with the correct prices.

| Item | Cost |
| :--- | :--- |
| Cost of each jersey |  |
| Cost of each pair of socks |  |
| Cost of sales tax |  |

## Gitialara Operations with Fractions

CRITICAL AREA Developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions)


## Project

## The Rhythm Track

Math and music both involve numbers and patterns of change. In music, these patterns are called rhythm. We hear rhythm as a number of beats.

kind of note
that gets
1 beat

## Get Started

The time signature at the beginning of a line of music looks like a fraction. It tells the number of beats in each measure and the kind of note that fills 1 beat. When the time signature is $\frac{4}{4}$, each $\frac{1}{4}$ note or quarter note, is 1 beat.

In the music below, different kinds of notes make up each measure. The measures are not marked. Check the time signature. Then draw lines to mark each measure.

Important Facts

$$
\begin{aligned}
& d=\frac{1}{2} \\
& d=\frac{1}{4} \\
& d=\frac{1}{8} \\
& y=\frac{1}{16}
\end{aligned}
$$



# Add and Subtract Fractions with Unllke Denominations 

## Show What You Know

Check your understanding of important skills.
Name $\qquad$

Part of a Whole Write a fraction to name the shaded part.
1.

number of shaded parts $\qquad$
number of total parts $\qquad$
fraction $\qquad$ _
2.

number of shaded parts $\qquad$
number of total parts $\qquad$
fraction $\qquad$ _

Add and Subtract Fractions Write the sum or difference in simplest form.
3. $\frac{3}{6}+\frac{1}{6}=$ $\qquad$
4. $\frac{4}{10}+\frac{1}{10}=$ $\qquad$
5. $\frac{7}{8}-\frac{3}{8}=$ $\qquad$
6. $\frac{9}{12}-\frac{2}{12}=$
$\qquad$

## Multiples Write the first six nonzero multiples.

7. 5 $\qquad$ 8. 3 $\qquad$ 9. 7 $\qquad$

## Math <br> Detective

There are 30 senators and 60 members of the House of Representatives in the Arizona Legislature. Suppose 20 senators and 25 representatives came to a committee meeting. Be a math detective to write a fraction that compares the number of legislators that attended to the total number of legislators.


## Vocabulary Builder

## Visualize It.

## Use the $\boldsymbol{\checkmark}$ words to complete the H -diagram.

| Add and Subtract <br> Fractions with Like | Add and Subtract <br> Fractions with Unlike |
| :--- | :--- |
|  |  |

## Review Words

## benchmark

$\checkmark$ common multiple
$\checkmark$ denominators
$\checkmark$ difference
$\checkmark$ equivalent fractions
mixed number
$\checkmark$ numerators
$\checkmark$ simplest form
$\checkmark$ sum

Preview Words
common denominator

## Understand Vocabulary

## Draw a line to match the word with its definition.

1. common multiple
2. benchmark
3. simplest form
4. mixed number
5. common
denominator
6. equivalent fractions

- a number that is made up of a whole number and a fraction
- a number that is a multiple of two or more numbers
- a common multiple of two or more denominators
- the form of a fraction in which the numerator and denominator have only 1 as their common factor
- a familiar number used as a point of reference
- fractions that name the same amount or part
- Interactive Student Edition
- Multimedia eGlossary
$\qquad$


## Addition with Unlike Denominators

Essential Question How can you use models to add fractions that have different denominators?

## Investigate

Hilary is making a tote bag for her friend. She uses $\frac{1}{2}$ yard of blue fabric and $\frac{1}{4}$ yard of red fabric. How much fabric does Hilary use?

Materials $■$ fraction strips $■$ MathBoard
A. Find $\frac{1}{2}+\frac{1}{4}$. Place a $\frac{1}{2}$ strip and a $\frac{1}{4}$ strip under the 1 -whole strip on your MathBoard.
B. Find fraction strips, all with the same denominator, that are equivalent to $\frac{1}{2}$ and $\frac{1}{4}$ and fit exactly under the sum $\frac{1}{2}+\frac{1}{4}$. Record the addends, using like denominators.

C. Record the sum in simplest form. $\frac{1}{2}+\frac{1}{4}=$ $\qquad$
So, Hilary uses $\qquad$ yard of fabric.

## Draw Conclusions

1. Describe how you would determine what fraction strips, all with the

How can you tell if the sum of the fractions is less than 1 ? same denominator, would fit exactly under $\frac{1}{2}+\frac{1}{3}$. What are they?
$\qquad$
$\qquad$
$\qquad$
2.
(Mantungical (5) Use Concrete Models Explain the difference between finding fraction strips with the same denominator for $\frac{1}{2}+\frac{1}{3}$ and $\frac{1}{2}+\frac{1}{4}$.

## Make Connections

Sometimes, the sum of two fractions is greater than 1 . When adding fractions with unlike denominators, you can use the 1-whole strip to help determine if a sum is greater than 1 or less than 1 .

Use fraction strips to solve. $\frac{3}{5}+\frac{1}{2}$

## STEP 1

Work with another student. Place three $\frac{1}{5}$ fraction strips under the 1 -whole strip on your MathBoard. Then place a $\frac{1}{2}$ fraction strip beside the three $\frac{1}{5}$ strips.

## STEP 2

Find fraction strips, all with the same denominator, that are equivalent to $\frac{3}{5}$ and $\frac{1}{2}$. Place the fraction strips under the sum. At the right, draw a picture of the model and write the equivalent fractions.

$$
\frac{3}{5}=\quad \frac{1}{2}=
$$

## STEP 3

Add the fractions with like denominators. Use the 1 -whole strip to rename the sum in simplest form.

Think: How many fraction strips with the same denominator are equal to 1 whole?

Share and Show

$$
\begin{aligned}
& \frac{3}{5}+\frac{1}{2}=+ \\
&= \\
&
\end{aligned}
$$

BOARD


Use fraction strips to find the sum. Write your answer in simplest form.

$\frac{1}{2}+\frac{3}{8}=+\quad+\quad=$
2.

$\frac{1}{2}+\frac{2}{5}=$ $\qquad$ $+$ $\qquad$ $=$

## Name

Use fraction strips to find the sum. Write your answer in simplest form.
3.


$$
\frac{3}{8}+\frac{1}{4}=
$$

$\qquad$ $+$ $\qquad$
$\qquad$
4.

$\frac{3}{4}+\frac{1}{3}=$ $\qquad$ $+$ $\qquad$ $=$ $\qquad$

Use fraction strips to find the sum. Write your answer in simplest form.
5. $\frac{2}{5}+\frac{3}{10}=$ $\qquad$
8. $\frac{2}{3}+\frac{1}{6}=$ $\qquad$ 9. $\frac{5}{8}+\frac{1}{4}=$ $\qquad$ 10. $\frac{1}{2}+\frac{1}{5}=$ $\qquad$

## Problem Solving • Applications

11. WRITE Math Explain how using fraction strips with like denominators makes it possible to add fractions with unlike denominators.
$\qquad$
$\qquad$
12. GПDEEPER Luis is making two batches of muffins for a school picnic. One batch of muffins uses $\frac{1}{4}$ cup of oats and $\frac{1}{3}$ cup of flour. How much oats and flour does Luis need for two batches? Explain how you use fraction strips to solve the problem.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
13. THINKSMARTER Maya makes trail mix by combining $\frac{1}{3}$ cup of mixed nuts, $\frac{1}{4}$ cup of dried fruit, and $\frac{1}{6}$ cup of chocolate morsels. What is the total amount of ingredients in her trail mix?

14. Pose a Problem Write a new problem using different amounts for ingredients Maya used. Each amount should be a fraction with a denominator of 2,3 , or 4 .
$\qquad$
$\qquad$
$\qquad$
15. 

Maringaical (4) Use Diagrams Solve the problem you wrote. Draw a picture of the fractions strips you use to solve your problem.
$\qquad$
16. Explain why you chose the amounts you did for your problem.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
17. THINKSMARTER Alexandria used $\frac{1}{2}$ cup of grapes and $\frac{2}{3}$ cup of strawberries combined to make a fruit snack. How many cups of grapes and strawberries did she use? Use the tiles to complete the fraction strip model to show how you found your answer. The fractions may be used more than once or not at all.

$\qquad$

## Subtraction with Unlike Denominators

Essential Question How can you use models to subtract fractions that have different denominators?

Number and Operations-Fractions-5.NF. 2
mathematical practices MP.1, MP.5, MP. 8

## Investigate

Mario fills a hummingbird feeder with $\frac{3}{4}$ cup of sugar water on Friday. On Monday, Mario sees that $\frac{1}{8}$ cup of sugar water is left. How much sugar water did the hummingbirds drink?

Materials $■$ fraction strips $■$ MathBoard
A. Find $\frac{3}{4}-\frac{1}{8}$. Place three $\frac{1}{4}$ strips under the 1 -whole strip on your MathBoard. Then place a $\frac{1}{8}$ strip under the $\frac{1}{4}$ strips.

B. Find fraction strips all with the same denominator that fit exactly under the difference $\frac{3}{4}-\frac{1}{8}$.

C. Record the difference. $\frac{3}{4}-\frac{1}{8}=$ $\qquad$

Mathematical Practices
How can you tell if the difference of the fractions is less than 1? Explain.

## Draw Gonclusions

1. Describe how you determined what fraction strips, all with the same denominator, would fit exactly under the difference. What are they?
$\qquad$
$\qquad$
$\qquad$
2. 



Use Appropriate Tools Explain whether you could have used fraction strips with any other denominator to find the difference.
If so, what is the denominator?

## Make Connections

Sometimes you can use different sets of same-denominator fraction strips to find the difference. All of the answers will be correct.

Solve. $\frac{2}{3}-\frac{1}{6}$

A Find fraction strips, all with the same denominator, that fit exactly under the difference $\frac{2}{3}-\frac{1}{6}$.


$$
\frac{2}{3}-\frac{1}{6}=\frac{3}{6}
$$

B Find another set of fraction strips, all with the same denominator, that fit exactly under the difference $\frac{2}{3}-\frac{1}{6}$. Draw the fraction strips you used.

$\frac{2}{3}-\frac{1}{6}=$ $\qquad$

C Find other fraction strips, all with the same denominator, that fit exactly under the difference $\frac{2}{3}-\frac{1}{6}$. Draw the fraction strips you used.


While each answer appears different, all of the answers can be simplified to $\qquad$ .

## Share and Show

Mathematical Practices
Which other fraction strips with the same denominator could fit exactly in the difference of $\frac{2}{3}-\frac{1}{6}$ ?

## Use fraction strips to find the difference. Write your answer in simplest form.


$\qquad$

Use fraction strips to find the difference. Write your answer in simplest form.

$\frac{5}{6}-\frac{1}{4}=$ $\qquad$
5.

$\frac{3}{8}-\frac{1}{4}=$
4.


$$
\frac{1}{2}-\frac{3}{10}=
$$

$\qquad$
6.

$\frac{2}{3}-\frac{1}{2}=$ $\qquad$

Use fraction strips to find the difference. Write your answer in simplest form.
7. $\frac{3}{5}-\frac{3}{10}=$ $\qquad$ 8. $\frac{5}{12}-\frac{1}{3}=$ $\qquad$ 9. $\frac{3}{5}-\frac{1}{2}=$
$\qquad$

## Problem Solving • Applications

10. Maritwaical (3) Compare Representations Explain how your model for $\frac{3}{5}-\frac{1}{2}$ is different from your model for $\frac{3}{5}-\frac{3}{10}$.
$\qquad$
$\qquad$
11. EDDEEPER The shaded part of the diagram shows what Tina had left from a yard of fabric. She now uses $\frac{1}{3}$ yard of fabric for one project and $\frac{1}{6}$ yard for a second project. How much of the original yard of fabric does Tina have left after the two projects? Write the answer in simplest form.


## Unlock the Problem

12. THINKSMARTER The picture at the right shows how much pizza was left over from lunch. Jason eats $\frac{1}{4}$ of the whole pizza for dinner. Write a fraction that represents the amount of pizza that is remaining after dinner.
a. What problem are you being asked to solve?

$\qquad$
b. How will you use the diagram to solve the problem? $\qquad$
$\qquad$
$\qquad$
c. Jason eats $\frac{1}{4}$ of whole pizza. How many slices does he eat? $\qquad$
d. Redraw the diagram of the pizza. Shade the sections of pizza that are remaining after Jason eats his dinner.
e. Complete the sentence.

There is $\qquad$ of the pizza remaining after dinner.
13. THINKSMARTER The shaded part of the diagram shows what Margie had left over from a roll of construction paper that measured one yard. She will use $\frac{3}{4}$ yard of paper to make a poster. She wants to determine how much paper she will have remaining after making the poster. For numbers 13a-13c, select True or False for each statement.


13a. To determine how much paper will be left after making the poster, Margie must find $1-\frac{3}{4}$.
O True
OFalse
O True
O False
O True
O False

13b. The fractions $\frac{3}{4}$ and $\frac{6}{8}$ are equivalent.
13c. Margie will have $\frac{1}{8}$ yard of paper remaining.
$\qquad$

# Estimate Fraction Sums and Differences 

Essential Question How can you make reasonable estimates of fraction sums and differences? distance from her house to the end of the street is $\frac{1}{6}$ mile. The <br> \section*{0 t Unlock the Problem <br> \section*{0 t Unlock the Problem <br> <br> Kimberly will be riding her bike to school this year. The <br> <br> Kimberly will be riding her bike to school this year. The distance from the end of the street to the school is distance from the end of the street to the school is $\frac{3}{8}$ mile. About how far is Kimberly's house from school? $\frac{3}{8}$ mile. About how far is Kimberly's house from school? <br> <br> You can use benchmarks to find reasonable estimates by <br> <br> You can use benchmarks to find reasonable estimates by rounding fractions to $0, \frac{1}{2}$, or 1 . rounding fractions to $0, \frac{1}{2}$, or 1 . <br> <br> O One Way vsea number ine:} <br> <br> O One Way vsea number ine:}

Estimate. $\frac{1}{6}+\frac{3}{8}$

Number and Operations-Fractions-5.NF. 2 MATHEMATICAL PRACTICES MP.1, MP. 7


STEP 1 Place a point at $\frac{1}{6}$ on the number line.
The fraction is between $\qquad$ and $\qquad$ .

The fraction $\frac{1}{6}$ is closer to the benchmark $\qquad$ .


Round to $\qquad$ .

STEP 2 Place a point at $\frac{3}{8}$ on the number line.
The fraction is between $\qquad$ and $\qquad$ .

The fraction $\frac{3}{8}$ is closer to the benchmark $\qquad$ .


Round to $\qquad$ .

STEP 3 Add the rounded fractions.


So, Kimberly's house is about $\qquad$ mile from the school.

## (1) Another Way use mental math.

You can compare the numerator and the denominator to round a fraction and find a reasonable estimate.

Estimate. $\frac{9}{10}-\frac{5}{8}$
STEP 1 Round $\frac{9}{10}$.
Think: The numerator is about the same as the denominator.

Round the fraction $\frac{9}{10}$ to $\qquad$ .

A fraction with the same numerator and denominator, such as $\frac{2}{2}, \frac{5}{5}, \frac{12}{12}$, or $\frac{96}{96}$, is equal to 1 .

STEP 2 Round $\frac{5}{8}$.
Think: The numerator is about half the denominator.

Round the fraction $\frac{5}{8}$ to $\qquad$ .

STEP 3 Subtract.


So, $\frac{9}{10}-\frac{5}{8}$ is about $\qquad$ .

## Try This! Estimate.

(A) $2 \frac{7}{8}-\frac{2}{5}$
(B) $1 \frac{8}{9}+4 \frac{8}{10}$

## Share and Show

```
MATH
BOARD
```

Estimate the sum or difference.

1. $\frac{5}{6}+\frac{3}{8}$
a. Round $\frac{5}{6}$ to its closest benchmark. $\qquad$
b. Round $\frac{3}{8}$ to its closest benchmark. $\qquad$
c. Add to find the estimate. $\qquad$ $+$ $\qquad$ $=$ $\qquad$
2. $\frac{5}{9}-\frac{3}{8}$
3. $\frac{6}{7}+2 \frac{4}{5}$
4. $\frac{5}{6}+\frac{2}{5}$

Explain how you know whether your

## On Your Own

 estimate for $\frac{9}{10}+3 \frac{6}{7}$ would be greater than or less than the actual sum.Estimate the sum or difference.
5. $\frac{5}{8}-\frac{1}{5}$
8. $\frac{11}{12}+\frac{6}{10}$
6. $\frac{1}{6}+\frac{3}{8}$
9. $\frac{9}{10}-\frac{1}{2}$
7. $\frac{6}{7}-\frac{1}{5}$
10. $\frac{3}{6}+\frac{4}{5}$
11. FIDEEPER Lisa and Valerie are picnicking in Trough Creek State Park in Pennsylvania. Lisa has brought a salad that she made with $\frac{3}{4}$ cup of strawberries, $\frac{7}{8}$ cup of peaches, and $\frac{1}{6}$ cup of blueberries. They ate $\frac{11}{12}$ cup of salad.
About how many cups of fruit salad are left?

## Problem Solving • Applications

12. IHINKSMARTER At Trace State Park in Mississippi, there is a 40-mile mountain bike trail. Tommy rode $\frac{1}{2}$ of the trail on Saturday and $\frac{1}{5}$ of the trail on Sunday. He estimates that he rode more than 22 miles over the two days. Is Tommy's estimate reasonable?
$\qquad$
$\qquad$
13. 



Make Arguments Explain how you know that $\frac{5}{8}+\frac{6}{10}$ is greater than 1 .
$\qquad$
$\qquad$
$\qquad$
14. WRITE Math Nick estimated that $\frac{5}{8}+\frac{4}{7}$ is about 2. Explain how you know his estimate is not reasonable.
$\qquad$
$\qquad$
15. THINKSMARTER Aisha painted for $\frac{5}{6}$ hour in the morning and $2 \frac{1}{5}$ hours in the afternoon. Estimate how long Aisha painted. For numbers 15a-15b, choose the number that makes each sentence true.

15a. Aisha painted for about

hour in the morning.

15b. Aisha painted for about

15c. Aisha painted for about

Name $\qquad$

## Factors

Essential Question How can you write a whole number as a product of its prime factors?

Factors are numbers that are multiplied to form a product.

```
2 and 3 are factors of 6 because 2 }\times3=
```

A prime number is a whole number greater than 1 that has exactly two factors, 1 and itself.

A composite number is a whole number greater than 1 that has more than two factors. A composite number can be written as a product of its prime factors.

## Unlock the Problem

Marcel makes mathematical patterns in his paintings with vertical stripes. For his next painting, each stripe will be the width, in inches, of one of the prime factors of the total width of the painting. He wants this painting to have a width of 20 inches. Marcel needs to determine all the prime factors of 20 so he will know the width of each stripe. What are the prime factors of 20 ?

## Make a list to find the factors.

List the pairs of factors that form the product 20.
$1 \times 20=20$
$2 \times 10=20$

$4 \times 5=20$
So, the factors of 20 are $\qquad$ , $\qquad$
$\qquad$ , $\qquad$ , $\qquad$ , and $\qquad$ .

Find which of the factors of 20 are prime.
Ask: Does 1 have exactly 2 factors? $\qquad$
Repeat for each factor. Circle the prime factors.
So, the prime factors of 20 are $\qquad$ and $\qquad$ .

Mathematical Practices
Explain how to check that your list of factors includes all possible factors of a number.

## (1) Example use a diagram.

Dionne has forgotten the code for her locker. She remembers that the four 1-digit numbers in the code show 36 written as a product of its prime factors. What are the numbers in Dionne's code?

Choose any two factors with a product of 36. Continue finding factors until only prime factors are left.

## (A) Use a basic fact.

Think: 6 times what number is equal to 36 ?
$6 \times$ $\qquad$ $=36$

$36=$ $\qquad$ $\times$ $\qquad$ $\times$ $\qquad$ $\times$ $\qquad$

So, 36 written as a product of its prime factors is $\qquad$ $\times$ $\qquad$ $\times$ $\qquad$ $\times$ $\qquad$ .

## Share and Show

MATH
BOARD

## Find the prime factors.

1. 27
$\qquad$ $\times$ $\qquad$ $\times$ $\qquad$
2. 28

28
3. 35

## Name

Write the number as a product of its prime factors.
4. 16
5. 42
$\qquad$

## On Your Own

Write the number as a product of its prime factors.
6. 21 $\qquad$
7. 24
$\qquad$
8. 30
9. Sense or Nonsense? Brianna writes $4 \times 11$ to show the number 44 as a product of its prime factors. Does her answer make sense? Explain your reasoning.
$\qquad$
$\qquad$
$\qquad$
10. (madinnaical 2) Use Reasoning The number 9 has only one prime factor, 3 . What is another number less than 50 with only one prime factor?
$\qquad$
11. THINKSMARTER Todd wants to know how many numbers between 1 and 50 have only 2 and 5 as prime factors. List all the numbers that have only 2 and 5 as prime factors. Explain how you found your answer.
$\qquad$

$\qquad$
$\qquad$
$\qquad$

## Problem Solving • Applications

## Use the table for 12-14.

Amber weaves tapestries with colored blocks based on the prime factors of numbers. For the number 6, she makes a tapestry with 1 red block and 1 green block since 2 and 3 are the only prime factors of 6 .
12. What colors would Amber use in a tapestry based on the prime factors of 15 ?

| Prime Factors | Color |
| :---: | :---: |
| 2 | Red |
| 3 | Green |
| 5 | Blue |
| 7 | Yellow |
| 11 | Purple |

13. F■DEEPER Amber wants to know how many blocks of each color will be needed for a tapestry based on the number 40 . How many blocks of each color will she make?
Explain how you found your answer.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
14. Manimpaical (6) Amber wants to make a tapestry based on the prime factors of 39 .

Explain why she needs to identify a new color for this tapestry.
$\qquad$
$\qquad$
Personal Math Trainer
15. THINKSMARTER Jeremy has 120 books in his collection. Complete the diagram by using the tiles to write 120 as the product of its prime factors. You may use a number more than once or not at all.

$\qquad$

# Common Denominators and Equivalent Fractions 

Essential Question How can you rewrite a pair of fractions so that they have a common denominator?

## Number and Operations-Fractions-5.NF. 1 <br> Also 5.OA.2.1 <br> MATHEMATICAL PRACTICES MP.1, MP. 2

## Unlock the Problem

Sarah planted two 1-acre gardens. One had three sections of flowers and the other had 4 sections of flowers. She plans to divide both gardens into more sections so that they have the same number of equal-sized sections. How many sections will each garden have?

You can use a common denominator or a common multiple of two or more denominators to write fractions that name the same part of a whole.

## I) One Way Multiply the denominators.



## RECORD

- Multiply the denominators to find a common denominator.
A common denominator of $\frac{1}{3}$ and $\frac{1}{4}$ is $\qquad$ .
- Write $\frac{1}{3}$ and $\frac{1}{4}$ as equivalent fractions using the common denominator.
Divide each $\frac{1}{3}$ into fourths and divide each $\frac{1}{4}$ into thirds, each of the wholes will be divided into the same size parts, twelfths.
 $\frac{1}{3}=\quad \frac{1}{4}=$
 THINK


So, both gardens will have $\qquad$ sections.

## (1) Another Way use a list.

- Make a list of the first eight nonzero multiples of 3 and 4.

Multiples of 3: 3, 6, 9 , $\qquad$ , $\qquad$ , $\qquad$ , $\qquad$

## So bard

Multiples of 4: 4, 8, $\qquad$ , $\qquad$ , $\qquad$ , ,

- Circle the common multiples.
- Use one of the common multiples as a common denominator to write equivalent fractions for $\frac{1}{3}$ and $\frac{1}{4}$.

$$
\frac{1}{3}=\square \quad \frac{1}{4}=
$$

So, both gardens can have $\qquad$ , or $\qquad$ sections.

Least Common Denominator Find the least common denominator of two or more fractions by finding the least common multiple of two or more numbers.

## O One Way usea ist.

Find the least common denominator of $\frac{3}{4}$ and $\frac{1}{6}$. Use the least common denominator to write an equivalent fraction for each fraction.
STEP 1 List nonzero multiples of the denominators. Find the least common multiple.
Multiples of 4: $\qquad$

Multiples of 6 : $\qquad$
So, the least common denominator of $\frac{3}{4}$ and $\frac{1}{6}$ is $\qquad$ .

STEP 2 Using the least common denominator, write an equivalent fraction for each fraction.

Think: What number multiplied by the denominator of the fraction will result in the least common denominator?

$$
\frac{3}{4}=\frac{?}{12}=\frac{3 \times 3}{4 \times 3}=\quad \frac{1}{6}=\frac{?}{12}=\frac{1 \times}{6 \times}=
$$

$\frac{3}{4}$ can be rewritten as $\qquad$ and $\frac{1}{6}$ can be rewritten as $\qquad$ .

## П Another Way use pine factors.

Use prime factors to find a common denominator of $\frac{5}{8}$ and $\frac{7}{20}$. Then write an equivalent fraction for each fraction.
STEP 1 Write each denominator as a product of its prime factors.
Prime factors of $8: 2 \times 2 \times 2$
Think: Look for all prime factors that are common to both numbers.
Prime factors of $20: 2 \times 2 \times 5$
A common denominator of $\frac{5}{8}$ and $\frac{7}{20}$ is $2 \times 2 \times 2 \times 5=40$.
STEP 2 Write an equivalent fraction for each fraction.
$\frac{5}{8}=\frac{5 x}{8 x}=\frac{}{40}$
$\frac{7}{20}=\frac{7 \times}{20 \times}=\frac{}{40}$
$\frac{5}{8}$ can be rewritten as $\qquad$ and $\frac{7}{20}$ can be rewritten as $\qquad$ .

## Share and Show

Use a common denominator to write an equivalent fraction for each fraction.

1. $\frac{1}{3}, \frac{1}{5}$ common
denominator: $\qquad$
2. $\frac{2}{3}, \frac{5}{9}$ common
denominator: $\qquad$
denominator: $\qquad$

## On Your Own

Practice: Copy and Solve Use the least common denominator to write an equivalent fraction for each fraction.
4. $\frac{5}{9}, \frac{4}{15}$
5. $\frac{1}{6}, \frac{4}{21}$
6. $\frac{5}{14}, \frac{8}{42}$
7. $\frac{7}{12}, \frac{5}{18}$

Use Reasoning Algebra Write the unknown number for each
8. $\frac{1}{5}, \frac{1}{8}$ least common denominator:
$=$ $\qquad$
9. $\frac{2}{5}, \frac{1}{}$ least common denominator: 15
$\qquad$
$=$
11. THINK SMARTER Arnold had three pieces of different colored strings that are all the same length. Arnold cut the blue string into 2 equal-size lengths. He cut the red string into 3 equal-size lengths, and the green string into 6 equal-size lengths. He needs to cut the string so each color has the same number of equal-size lengths. What is the least number of equal-sized lengths each color string could have?
10. $\frac{3}{-}, \frac{5}{6}$ least common denominator: 42
$=$ $\qquad$ -

12. GDDEEPER One tray of granola bars was cut into 4 equal-size pieces. A second tray was cut into 12 equal-size pieces, and a third was cut into 8 equal-size pieces. Jan wants to continue cutting until all three trays have the same number of pieces. How many pieces will there be on each tray?

## Unlock the Problem

13. Katie made two pies for the bake sale. One was cut into three equal slices and the other into 5 equal slices. She will continue to cut the pies so each one has the same number of equal-sized slices. What is the least number of equal-sized slices each pie could have?
a. What information are you given? $\qquad$
$\qquad$
b. What problem are you being asked to solve?
$\qquad$
c. When Katie cuts the pies more, can she cut each pie the same number of times and have all the slices the same size? Explain $\qquad$
$\qquad$
$\qquad$
d. Use the diagram to show the steps you use to solve the problem.

e. Complete the sentences.

The least common denominator of $\frac{1}{3}$ and $\frac{1}{5}$ is $\qquad$ .

Katie can cut each piece of the first pie into
$\qquad$ and each piece of the second pie into $\qquad$ .

That means that Katie can cut each pie into pieces that are $\qquad$ of the whole pie.
14. THINKSMARTER Mindy bought $\frac{5}{8}$ pound of almonds and $\frac{3}{4}$ pound of walnuts. Select the pairs of fractions that are equivalent to the amount that Mindy bought. Mark all that apply.
(A) $\frac{5}{8}$ and $\frac{6}{8}$
(B) $\frac{10}{16}$ and $\frac{14}{16}$
C) $\frac{20}{32}$ and $\frac{23}{32}$
D $\frac{15}{24}$ and $\frac{18}{24}$

## Add and Subtract Fractions

Essential Question How can you use a common denominator to add and subtract fractions with unlike denominators?
connect You can use what you have learned about common denominators to add or subtract fractions with unlike denominators.

## Unlock the Problem

Malia bought shell beads and glass beads to weave into designs in her baskets. She bought $\frac{1}{4}$ pound of shell beads and $\frac{3}{8}$ pound of glass beads. How many pounds of beads did she buy?

Add. $\frac{1}{4}+\frac{3}{8}$ Write your answer in simplest form.

## One Way

Find a common denominator by multiplying the denominators.
$4 \times 8=$ $\qquad$ $\leftarrow$ common denominator

Use the common denominator to write equivalent fractions with like denominators. Then add, and write your answer in simplest form.

$$
\begin{aligned}
& \frac{1}{4}=\frac{1 x}{4 x} \\
&= \\
&+\frac{3}{8}=+\frac{3 x}{8 x}
\end{aligned}=+
$$

$$
=
$$

- Underline the question you need to answer.
- Draw a circle around the information you will use.


## Another Way

Find the least common denominator.

The least common denominator of $\frac{1}{4}$ and $\frac{3}{8}$ is $\qquad$ .

So, Malia bought $\qquad$ pound of beads.

1. Manimenical (1) Evaluate Reasonableness Explain how you know whether your answer is reasonable.
$\qquad$
$\qquad$

## 1. Example

When subtracting two fractions with unlike denominators, follow the same steps you follow when adding two fractions. However, instead of adding the fractions, subtract.

Subtract. $\frac{9}{10}-\frac{2}{5}$ Write your answer in simplest form.

$$
\begin{aligned}
& \frac{9}{10}= \\
& -\frac{2}{5}=
\end{aligned}
$$

Describe the steps you took to solve the problem.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
2. Maryingical (1) Evaluate Reasonableness Explain how you know whether your answer is reasonable.
$\qquad$
$\qquad$

## Share and Show

Find the sum or difference. Write your answer in simplest form.

1. $\frac{5}{12}+\frac{1}{3}$
2. $\frac{2}{5}+\frac{3}{7}$
3. $\frac{1}{6}+\frac{3}{4}$
4. $\frac{3}{4}-\frac{1}{8}$
5. $\frac{1}{4}-\frac{1}{7}$
6. $\frac{9}{10}-\frac{1}{4}$
$\qquad$

## On Your Own

## Practice: Copy and Solve Find the sum or difference. Write your

 answer in simplest form.7. $\frac{1}{3}+\frac{4}{18}$
8. $\frac{3}{5}+\frac{1}{3}$
9. $\frac{3}{10}+\frac{1}{6}$
10. $\frac{1}{2}+\frac{4}{9}$
11. $\frac{1}{2}-\frac{3}{8}$
D $\frac{5}{7}-\frac{2}{3}$
12. $\frac{4}{9}-\frac{1}{6}$
13. $\frac{11}{12}-\frac{7}{15}$

## 

15. $\frac{9}{10}-\square=\frac{1}{5}$
= $\qquad$
16. $\frac{5}{12}+\square=\frac{1}{2}$

$\qquad$

## Problem Solving • Applications

Use the picture for 17-18.
17. Sara is making a key chain using the bead design shown. What fraction of the beads in her design are either blue or red?

18. THINKSMARTER In making the key chain, Sara uses the pattern of beads 3 times. After the key chain is complete, what fraction of the beads in the key chain are either white or blue?

19. G■DEEPER On Friday, $\frac{1}{6}$ of band practice was spent trying on uniforms. The band spent $\frac{1}{4}$ of practice on marching. The remaining practice time was spent playing music. What fraction of practice time was spent playing music?
 of twine. He then used $\frac{1}{2}$ of a spool of twine to make friendship knots. He claims to have $\frac{3}{10}$ of the original spool of twine left over. Explain how you know whether Jamie's claim is reasonable.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
21. THINKSMARTER Mr. Barber used $\frac{7}{9}$ yard of wire to put up a ceiling fan. He used $\frac{1}{3}$ yard of wire to fix a switch.

Complete the calculations below to write equivalent fractions with a common denominator.
$\frac{7}{9}=\frac{7 \times}{9 \times}=\square \quad \frac{1}{3}=\frac{1 \times}{3 \times}=\square$

How much wire did Mr. Barber use to put up the ceiling fan and fix the switch combined? Explain how you found your answer.
$\qquad$
$\qquad$
$\qquad$

## ( $\checkmark$ Mid-Chapter Checkpoint

## Vocabulary

Choose the best term from the box.

1. A $\qquad$ is a number that is
a multiple of two or more numbers. (p. 269)
2. A $\qquad$ is a common multiple
of two or more denominators. (p. 269)

## Concepts and Skills

Estimate the sum or difference.

## (5.NF.2)

3. $\frac{8}{9}+\frac{4}{7}$
4. $3 \frac{2}{5}-\frac{5}{8}$

## Use a common denominator to write an equivalent

 fraction for each fraction. (5.NF.1)6. $\frac{1}{6}, \frac{1}{9}$
common
denominator: $\qquad$
7. $\frac{3}{8}, \frac{3}{10}$
common
denominator: $\qquad$
8. $\frac{1}{9}, \frac{5}{12}$
common
denominator: $\qquad$

Write the number as a product of its prime factors. (5.0A.2.1)
9. 48
10. 18
$\qquad$

Find the sum or difference. Write your answer in simplest form. (5.NF.1)
12. $\frac{11}{18}-\frac{1}{6}$
13. $\frac{2}{7}+\frac{2}{5}$
14. $\frac{3}{4}-\frac{3}{10}$
15. Mrs. Vargas bakes a pie for her book club meeting. The shaded part of the diagram below shows the amount of pie left after the meeting. That evening, Mr. Vargas eats $\frac{1}{4}$ of the whole pie. What fraction represents the amount of pie remaining? (5.NF.2)

16. Keisha makes a large sandwich for a family picnic. She takes $\frac{1}{2}$ of the sandwich to the picnic. At the picnic, her family eats $\frac{3}{8}$ of the whole sandwich. What fraction of the whole sandwich does Keisha bring back from the picnic? (5.NF.2)
17. Mike is mixing paint for his walls. He mixes $\frac{1}{6}$ gallon blue paint and $\frac{5}{8}$ gallon green paint in a large container. What fraction represents the total amount of paint Mike mixes? (5.NF.2)
$\qquad$

## Add and Subtract Mixed Numbers

Essential Question How can you add and subtract mixed numbers with unlike denominators?

## Unlock the Problem

Denise mixed $1 \frac{4}{5}$ ounces of blue paint with $2 \frac{1}{10}$ ounces of yellow paint. How many

- What operation should you use to solve the problem?
- Do the fractions have the same denominator?

0
Add. $1 \frac{4}{5}+2 \frac{1}{10}$
To find the sum of mixed numbers with unlike denominators, you can use a common denominator.

STEP 1 Estimate the sum.
STEP 2 Find a common denominator. Use the fractions with like denominators.

STEP 3 Add the fractions. Then add the whole
$\begin{array}{ll}\text { STEP } 3 \text { Add the fractions. Then add the whole } \\ & \text { numbers. Write the answer in simplest form. }\end{array}$

So, Denise mixed $\qquad$ ounces of paint.

$$
\begin{array}{r}
1 \frac{4}{5}= \\
+2 \frac{1}{10}=+
\end{array}
$$


ounces of paint did Denise mix?

Do fractions have the same denominator?


#### Abstract

common denominator to write equivalent


 So, Denise mixed1. Maryinaical (1) Evaluate Reasonableness Explain how you know whether your answer is reasonable.
$\qquad$
$\qquad$
2. What other common denominator could you have used? $\qquad$

## 1) Example

Subtract. $4 \frac{5}{6}-2 \frac{3}{4}$
You can also use a common denominator to find the difference of mixed numbers with unlike denominators.

STEP 1 Estimate the difference. $\qquad$

$$
\begin{array}{r}
4 \frac{5}{6}= \\
-2 \frac{3}{4}=-
\end{array}
$$

STEP 3 Subtract the fractions. Subtract the whole numbers. Write the answer in simplest form.
3. MATHEMATICAL (1) Evaluate Reasonableness Explain how you know whether your answer is reasonable.
$\qquad$
$\qquad$

## Share and Show

1. Use a common denominator to write equivalent fractions with like
denominators and then find the sum. Write your answer in simplest form.

$$
\begin{array}{r}
7 \frac{2}{5}= \\
+4 \frac{3}{4}=+
\end{array}
$$

Find the sum. Write your answer in simplest form.
2. $2 \frac{3}{4}+3 \frac{3}{10}$
3. $5 \frac{3}{4}+1 \frac{1}{3}$
64. $3 \frac{4}{5}+2 \frac{3}{10}$

Name
Find the difference. Write your answer in simplest form.
5. $9 \frac{5}{6}-2 \frac{1}{3}$
6. $10 \frac{5}{9}-9 \frac{1}{6}$
7. $7 \frac{2}{3}-3 \frac{1}{6}$

## On Your Own

Find the sum or difference. Write your answer in simplest form.

Mathematical Practices
Explain why you need to write equivalent fractions with common denominators to add $4 \frac{5}{6}$ and $1 \frac{1}{8}$.
8. $1 \frac{3}{10}+2 \frac{2}{5}$
9. $8 \frac{1}{6}+7 \frac{3}{8}$
11. $12 \frac{3}{4}-6 \frac{1}{6}$
12. $2 \frac{5}{8}-1 \frac{1}{4}$
10. $2 \frac{1}{2}+2 \frac{1}{3}$
13. $14 \frac{7}{12}-5 \frac{1}{4}$

Practice: Copy and Solve Find the sum or difference. Write your answer in simplest form.
14. $1 \frac{5}{12}+4 \frac{1}{6}$
15. $8 \frac{1}{2}+6 \frac{3}{5}$
16. $2 \frac{1}{6}+4 \frac{5}{9}$
17. $3 \frac{5}{8}+\frac{5}{12}$
18. $3 \frac{2}{3}-1 \frac{1}{6}$
19. $5 \frac{6}{7}-1 \frac{2}{3}$
20. $2 \frac{7}{8}-\frac{1}{2}$
21. $4 \frac{7}{12}-1 \frac{2}{9}$
22. F■DEEPER Dakota makes a salad dressing by combining $6 \frac{1}{3}$ fluid ounces of oil and $2 \frac{3}{8}$ fluid ounces of vinegar in a jar. She then pours $2 \frac{1}{4}$ fluid ounces of the dressing onto her salad. How much dressing remains in the jar?

## Problem Solving • Applications

## Use the table to solve 23-24.

23. 

(Maдमinagical (2) Reason Quantitatively Gavin plans to mix a batch of Tangerine paint. He expects to have a total of $5 \frac{3}{10}$ ounces of paint after he mixes the amounts of red and yellow. Explain how you can tell if Gavin's expectation is reasonable.

25. THINKSMARTER Martin won first place in the 100 -meter dash with a time of $4 \frac{23}{100}$ seconds. Samuel came in second place with a time of $15 \frac{7}{10}$ seconds.
For 25a-25d, select True or False for each statement.

25a. A common denominator of the mixed numbers is 100 .

25b. To find the difference between the runners' times, Samuel's time needs to be rewritten.

25c. Samuel's time written with a denominator
O TrueTrue
O False

O True
O False of 100 is $15 \frac{70}{100}$.

25d. Martin beat Samuel by $\frac{21}{25}$ second.
True
O False

## Number and Operations-Fractions-5.NF. 1 <br> Also 5.NF. 2 <br> MATHEMATICAL PRACTICES MP.1, MP. 2

## Unlock the Problem

To practice for a race, Kara is running $2 \frac{1}{2}$ miles. When she reaches the end of her street, she knows that she has already run $1 \frac{5}{6}$ miles. How many miles does Kara have left to run?

- Underline the sentence that tells you what you need to find.
- What operation should you use to solve the problem?


## (1) One Way Rename the first mixed number.

Subtract. $2 \frac{1}{2}-1 \frac{5}{6}$

STEP 1 Estimate the difference.

STEP 2 Find a common denominator. Use the common denominator to write equivalent fractions with like denominators.

STEP 3 Rename $2 \frac{6}{12}$ as a mixed number with a fraction greater than 1 .

Think: $2 \frac{6}{12}=1+1+\frac{6}{12}=1+\frac{12}{12}+\frac{6}{12}=1 \frac{18}{12}$ $2 \frac{6}{12}=$

$$
\begin{aligned}
2 \frac{1}{2} & =2 \frac{6}{12}= \\
-1 \frac{5}{6} & =-1 \frac{10}{12}=-1 \frac{10}{12}
\end{aligned}
$$

## Subtraction with Renaming

Essential Question How can you use renaming to find the difference of two mixed numbers?

## 

कृता world

## (A) Aother W/ay Rename both mixed numbers as

fractions greater than 1.
Subtract. $2 \frac{1}{2}-1 \frac{5}{6}$

STEP 1 Write equivalent fractions, using a common denominator.

A common denominator of $\frac{1}{2}$ and $\frac{5}{6}$ is 6 .

$$
\begin{aligned}
& 2 \frac{1}{2} \longrightarrow \\
& 1 \frac{5}{6} \longrightarrow
\end{aligned}
$$

STEP 2 Rename both mixed numbers as fractions greater than 1.

$$
\begin{array}{ll}
2 \frac{3}{6}= & \text { Think: } \frac{6}{6}+\frac{6}{6} \\
1 \frac{5}{6}= & \text { Think: } \frac{6}{6}+\frac{5}{6}
\end{array}
$$

STEP 3 Find the difference of the fractions. Then write the answer in simplest form.

$$
\begin{aligned}
- & = \\
& =
\end{aligned}
$$

$2 \frac{1}{2}-1 \frac{5}{6}=$ $\qquad$

## Share and Show

MATH
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Estimate. Then find the difference and write it in simplest form.
81. Estimate: $\qquad$
$4 \frac{1}{2}-3 \frac{4}{5}$
©2. Estimate: $\qquad$
$9 \frac{1}{6}-2 \frac{3}{4}$

## On Your Own

Estimate. Then find the difference and write it in simplest form.
3. Estimate:

$$
3 \frac{2}{3}-1 \frac{11}{12}
$$

4. Estimate: $\qquad$

$$
4 \frac{1}{4}-2 \frac{1}{3}
$$

5. Estimate:

$$
5 \frac{2}{5}-1 \frac{1}{2}
$$

## Practice: Copy and Solve Find the difference and write it in simplest form.

6. $11 \frac{1}{9}-3 \frac{2}{3}$
7. $6-3 \frac{1}{2}$
8. $4 \frac{3}{8}-3 \frac{1}{2}$
9. $9 \frac{1}{6}-3 \frac{5}{8}$
10. $1 \frac{1}{5}-\frac{1}{2}$
11. $13 \frac{1}{6}-3 \frac{4}{5}$
12. $12 \frac{2}{5}-5 \frac{3}{4}$
13. $7 \frac{3}{8}-2 \frac{7}{9}$
14. G■DEEPER Three commercials are played in a row between songs on the radio. The three commercials fill exactly 3 minutes of time. If the first commercial uses $1 \frac{1}{6}$ minutes, and the second uses $\frac{3}{5}$ minute, how long is the third commercial?
15. THINKSMARTER Four students made videos for an art project. The table shows the length of each video.

Match each pair of videos with the correct difference between their times.

Video 1 and Video $3 \bullet$

Video 2 and Video 3

- $1 \frac{9}{10}$ hours

Video 2 and Video $4 \bullet$ - $1 \frac{17}{30}$ hours

- $1 \frac{11}{12}$ hours

| Art in Nature |  |
| :---: | :---: |
| Video | Time (in hours) |
| 1 | $4 \frac{3}{4}$ |
| 2 | $4 \frac{2}{5}$ |
| 3 | $2 \frac{5}{6}$ |
| 4 | $2 \frac{1}{2}$ |

## Connect [to Reading

## Summarize

An amusement park in Sandusky, Ohio, offers 17 amazing roller coasters for visitors to ride. One of the roller coasters runs at 60 miles per hour and has 3,900 feet of twisting track. This coaster also has 3 trains with 8 rows per train. Riders stand in rows of 4 , for a total of 32 riders per train.

The operators of the coaster recorded the number of riders on each train during a run. On the first train, the operators reported that $7 \frac{1}{4}$ rows were filled. On the second train, all 8 rows were filled, and on the third train, $5 \frac{1}{2}$ rows were filled. How many more rows were filled on the first train than on the third train?

When you summarize, you restate the most important information in a shortened form to more easily understand what you have read.
13. $\square$ Analyze Identify and summarize the important information given in the problem.
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Use the summary from item 13 to solve.

14. Solve the problem above.
$\qquad$
$\qquad$
15. IHINKSMARTER How many rows were empty on the first train? How many additional riders would it take to fill the empty rows? Explain your answer.
$\qquad$
$\qquad$


## Patterns with Fractions

Essential Question How can you use addition or subtraction to describe a pattern or create a sequence with fractions?

## Unlock the Problem

Mr. Patrick wants to develop a new chili recipe for his restaurant. Each batch he makes uses a different amount of chili powder. The first batch uses $3 \frac{1}{2}$ ounces, the second batch uses $4 \frac{5}{6}$ ounces, the third uses $6 \frac{1}{6}$ ounces, and the fourth uses $7 \frac{1}{2}$ ounces. If this pattern continues, how much chili powder will he use in the sixth batch?

You can find the pattern in a sequence by comparing one term with the next term.

STEP 1 Write the terms in the sequence as equivalent fractions with a common denominator. Then examine the sequence and compare the consecutive terms to find the rule used to make the sequence
 of fractions.


STEP 2 Write a rule that describes the pattern in the sequence.

- Is the sequence increasing or decreasing from one term to the next? Explain.
$\qquad$
$\qquad$

Rule:

STEP 3 Extend the sequence to solve the problem.

$$
3 \frac{1}{2}, 4 \frac{5}{6}, 6 \frac{1}{6}, 7 \frac{1}{2}
$$

$\qquad$ , $\qquad$

So, Mr. Patrick will use $\qquad$ ounces of chili powder in the sixth batch.

## $\square$ <br> Example find the unkroun tems in thes sequeree.

$1 \frac{3}{4}, 1 \frac{9}{16}, 1 \frac{3}{8}, 1 \frac{3}{16}$, $\qquad$ , $\qquad$
$\qquad$ $, \frac{7}{16}, \frac{1}{4}$

STEP 1 Write the terms in the sequence as equivalent fractions with a common denominator.
$\qquad$ , $\qquad$ , $\qquad$ , $\qquad$ , $\qquad$ , $\qquad$ ? , $\qquad$ _ $\qquad$ , $\qquad$

STEP 2 Write a rule describing the pattern in the sequence.

- What operation can be used to describe a sequence that increases?
$\qquad$
-What operation can be used to describe a sequence that decreases?
$\qquad$

Rule: $\qquad$

STEP 3 Use your rule to find the unknown terms. Then complete the sequence above.

## Try This!

A Write a rule for the sequence. Then find the unknown term.
$1 \frac{1}{12}, \frac{5}{6}, \quad, \frac{1}{3}, \frac{1}{12}$

Rule: $\qquad$
(B) Write the first four terms of the sequence.

Rule: start at $\frac{1}{4}$, add $\frac{3}{8}$
$\qquad$ , $\qquad$ , $\qquad$ , $\qquad$

## Share and Show

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```


## Write a rule for the sequence.

1. $\frac{1}{4}, \frac{1}{2}, \frac{3}{4}, \ldots$

Think: Is the sequence increasing or decreasing?
$\qquad$

Rule: $\qquad$

Write a rule for the sequence. Then, find the unknown term.
3. $\frac{3}{10}, \frac{2}{5}$, $\qquad$ $, \frac{3}{5}, \frac{7}{10}$

Rule: $\qquad$

## On Your Own

Write the first four terms of the sequence.
5. Rule: start at $5 \frac{3}{4}$, subtract $\frac{5}{8}$
$\qquad$ , $\qquad$ , $\qquad$ , $\qquad$
7. Rule: start at $2 \frac{1}{3}$, add $2 \frac{1}{4}$
$\qquad$ , $\qquad$ , $\qquad$ , $\qquad$
6. Rule: start at $\frac{3}{8}$, add $\frac{3}{16}$
$\qquad$ , $\qquad$ , $\qquad$ , $\qquad$
8. Rule: start at $\frac{8}{9}$, subtract $\frac{1}{18}$
$\qquad$ , $\qquad$ , $\qquad$ , $\qquad$
9.

Marinamical (7) Look for a Pattern Vicki started jogging. The first time she ran, she ran $\frac{3}{16}$ mile. The second time, she ran $\frac{3}{8}$ mile, and the third time, she ran $\frac{9}{16}$ mile. If she continued this pattern, when was the first time she ran more than 1 mile? Explain.
$\qquad$
$\qquad$
$\qquad$
10. F■DEEPER Mr. Conners drove $78 \frac{1}{3}$ miles on Monday, $77 \frac{1}{12}$ miles on Tuesday, and $75 \frac{5}{6}$ miles on Wednesday. If he continues this pattern on Thursday and Friday, how many fewer miles will he drive on Friday than on Tuesday?

## Problem Solving • Applications

11. When Bill bought a marigold plant, it was $\frac{1}{4}$ inch tall. After the first week, it measured $1 \frac{1}{12}$ inches tall. After the second week, it was $1 \frac{11}{12}$ inches. After week 3 , it was $2 \frac{3}{4}$ inches tall. Assuming the growth of the plant was constant, what was the height of the plant at the end of week 4 ?
$\qquad$
12. THINKSMARIER What if Bill's plant grew at the same rate but was $1 \frac{1}{2}$ inches when he bought it? How tall would the plant be after 3 weeks?

13. THINKSMARTER Kendra hiked each day for a week. The first day she hiked $\frac{1}{8}$ mile, the second day she hiked $\frac{3}{8}$ mile, and the third day she hiked $\frac{5}{8}$ mile.

What is the rule for the distance Kendra hikes each day? Show how you can check your answer.

If the pattern continues, how many miles will Kendra hike on day 7 ? Explain how you found your answer.
$\qquad$
$\qquad$
$\qquad$

## Problem Solving •

## Practice Addition and Subtraction

Essential Question How can the strategy work backward help you solve a problem with fractions that involves addition and subtraction?

## Unlock the Problem

The Diaz family is cross-country skiing the Big Tree trails, which have a total length of 4 miles. Yesterday, they skied the $\frac{7}{10}$ mile Oak Trail. Today, they skied the $\frac{3}{5}$ mile Pine Trail. If they plan to ski all of the Big Tree trails, how many more miles do they have left to ski?

Use the graphic organizer to help you solve the problem.


## Read the Problem

## What do I need to find?

I need to find the distance
$\qquad$ .

## What information do I need to use?

I need to use the distance
and the total distance

## How will I use the information?

I can work backward by starting with the $\qquad$ and $\qquad$ each distance they have already skied to find amount they have left.

## Solve the Problem

Addition and subtraction are inverse operations. By working backward and using the same numbers, one operation undoes the other.

- Write an equation.

- Then work backward to find $m$.
$\qquad$ - $\qquad$ - $\qquad$ $=m$
$\qquad$

So, the family has $\qquad$ miles left to ski.

[^1]
## (1) Try Another Problem

As part of their study of Native American basket weaving, Lia's class is making wicker baskets. Lia starts with a strip of wicker 36 inches long. From the strip, she first cuts one piece but does not know its length, and then cuts a piece that is $6 \frac{1}{2}$ inches long. The piece left is $7 \frac{3}{4}$ inches long. What is the length of the first piece she cut from the strip?


$\qquad$ inches.

Name

## Share and Show <br> MATH BOARD

1. Caitlin has $4 \frac{3}{4}$ pounds of clay. She uses $1 \frac{1}{10}$ pounds to make a cup, and another 2 pounds to make a jar. How many pounds are left?

First, write an equation to model the problem.

Next, work backwards and rewrite the equation to find $x$.

Solve.

So, $\qquad$ pounds of clay remain.
2. IHINKSMARTER What if Caitlin had used more than 2 pounds of clay to make a jar? Would the amount remaining have been more or less than your answer to Exercise 1?
3. A pet store donated 50 pounds of food for adult dogs, puppies, and cats to an animal shelter. $19 \frac{3}{4}$ pounds was adult dog food and $18 \frac{7}{8}$ pounds was puppy food. How many pounds of cat food did the pet store donate?
4. Thelma spent $\frac{1}{6}$ of her weekly allowance on dog toys, $\frac{1}{4}$ on a dog collar, and $\frac{1}{3}$ on dog food. What fraction of her weekly allowance is left?

## Unlock the Problem

\ Plan your solution by deciding on the steps you will use.
』 Check your exact answer by comparing it with your estimate.
』 Check your answer for reasonableness.

## On Your Own

5. GUDEEPER Martin is making a model of a Native American canoe. He has $5 \frac{1}{2}$ feet of wood. He uses $2 \frac{3}{4}$ feet for the hull and $1 \frac{1}{4}$ feet for a paddle. How much wood does he have left?
6. THINKSMARTER Beth's summer vacation lasted 87 days. At the beginning of her vacation, she spent some time at soccer camp, 5 days at her grandmother's house, and 13 days visiting Glacier National Park with her parents. She then had 48 vacation days remaining. How many weeks did Beth spend at soccer camp?

 you would pay for 3 CDs selling for $\$ 13.20$ apiece. Explain how you could find the price of 1 DVD.
$\qquad$
$\qquad$
$\qquad$
7. THINK SMARTER Julio caught 3 fish weighing a total of $23 \frac{1}{2}$ pounds. One fish weighed $9 \frac{5}{8}$ pounds and another weighed $6 \frac{1}{4}$ pounds. How much did the third fish weigh? Use the numbers and symbols to write an equation that represents the problem. Then solve the equation. Symbols may be used more than once or not at all.

weight of third fish: $\qquad$ pounds

## Use Properties of Addition

Essential Question How can properties help you add fractions with unlike denominators?
connect You can use properties of addition to help you add fractions with unlike denominators.

Commutative Property: $\frac{1}{2}+\frac{3}{5}=\frac{3}{5}+\frac{1}{2}$
Associative Property: $\quad\left(\frac{2}{9}+\frac{1}{8}\right)+\frac{3}{8}=\frac{2}{9}+\left(\frac{1}{8}+\frac{3}{8}\right)$

## Remember

Parentheses () tell which operation to do first.

## 1 Unlock the Problem

Jane and her family are driving to Big Lagoon State Park. On the first day, they travel $\frac{1}{3}$ of the total distance. On the second day, they travel $\frac{1}{3}$ of the total distance in the morning and then $\frac{1}{6}$ of the total distance in the afternoon. How much of the total distance has Jane's family driven by the end of the second day?


## Use the Associative Property.

Day 1 + Day 2

$$
\begin{aligned}
\frac{1}{3}+\left(\frac{1}{3}+\frac{1}{6}\right) & =(+)+ \\
& =+ \\
& =+ \\
& =
\end{aligned}
$$

So, Jane's family has driven $\qquad$ of the total distance by the end of the second day.


Write the number sentence to represent the problem. Use the Associative Property to group fractions with like denominators together.

Use mental math to add the fractions with like denominators.

Write equivalent fractions with like denominators. Then add.

Explain why grouping the fractions differently makes it easier to find the sum.

## (1) Example Add. $\left(\frac{5}{8}+1 \frac{12}{3}\right)+1 \frac{1}{8}$

Use the Commutative Property and the Associative Property.

$$
\begin{aligned}
\left(2 \frac{5}{8}+1 \frac{2}{3}\right)+1 \frac{1}{8} & =\left(+\infty+\begin{array}{l}
\text { Use the Commutative Property to } \\
\text { put fractions with like denominators } \\
\text { next to each other. }
\end{array}\right. \\
& = \\
= & \begin{array}{l}
\text { Use the Associative Property to } \\
\text { group fractions with like } \\
\text { denominators together. }
\end{array} \\
= & \begin{array}{l}
\text { Use mental math to add the fractions } \\
\text { with like denominators. }
\end{array} \\
= & \begin{array}{l}
\text { Write equivalent fractions with } \\
\text { like denominators. } \\
\text { Then add. }
\end{array} \\
= & =
\end{aligned}
$$

Try This! Use properties to solve. Show each step and name the property used.
(A) $5 \frac{1}{4}+\left(\frac{3}{4}+1 \frac{5}{12}\right)$
(B) $\left(\frac{1}{5}+\frac{3}{10}\right)+\frac{2}{5}$

## Share and Show

## MATH

 BOARDUse the properties and mental math to solve. Write your answer in simplest form.

1. $\left(2 \frac{5}{8}+\frac{5}{6}\right)+1 \frac{1}{8}$
2. $\frac{5}{12}+\left(\frac{5}{12}+\frac{3}{4}\right)$
3. $\left(3 \frac{1}{4}+2 \frac{5}{6}\right)+1 \frac{3}{4}$

## On Your Own

Use the properties and mental math to solve. Write your answer in simplest form.
4. $\left(\frac{2}{7}+\frac{1}{3}\right)+\frac{2}{3}$
5. $\left(\frac{1}{5}+\frac{1}{2}\right)+\frac{2}{5}$
7. $\left(2 \frac{5}{12}+4 \frac{1}{4}\right)+\frac{1}{4}$
6. $\left(\frac{1}{6}+\frac{3}{7}\right)+\frac{2}{7}$
9. $\frac{5}{9}+\left(\frac{1}{9}+\frac{4}{5}\right)$

## Problem Solving • Applications

Use the map to solve 10-12.
10. GПDEEPER

Julie rides her bike from the sports complex to the school. Then she rides from the school to the mall, and then on to the library. Kyle rides his bike from his house to the mall, and then to the library. Who rides farther? How many miles farther?
11. THINKSMARTER On one afternoon, Mario walks from his house to the library. That evening, Mario walks from the library to the mall, and then to Kyle's house. Describe how you can use the properties to find how far Mario walks.

12. Mapitmaical (4) Write an Expression Kyle is adding the distances between the school and the mall, the mall and the park, and the mall and his house. He writes $\frac{2}{5}+\frac{2}{3}+\frac{4}{5}$. Rewrite Kyle's expression using properties so the fractions are easier to add.
13. THINKSMARTER For 13a-13c, tell whether each expression was rewritten using the Commutative Property or the Associative Property. Choose the correct property of addition.

13a. $\frac{9}{10}+\left(\frac{3}{10}+\frac{5}{6}\right)=\left(\frac{9}{10}+\frac{3}{10}\right)+\frac{5}{6}$
Associative Property
Commutative Property

13b. $\left(\frac{3}{4}+\frac{1}{5}\right)+\frac{1}{4}=\left(\frac{1}{5}+\frac{3}{4}\right)+\frac{1}{4}$
Associative Property
Commutative Property

13c. $\left(3 \frac{1}{2}+2 \frac{1}{8}\right)+1 \frac{5}{8}=3 \frac{1}{2}+\left(2 \frac{1}{8}+1 \frac{5}{8}\right)$
Associative Property
Commutative Property

## (V)Chapter 6 Review/Test

1. Sophia babysat for $3 \frac{7}{12}$ hours on Friday. She babysat for $2 \frac{5}{6}$ hours on Saturday. For numbers la-1c, estimate how long Sophia babysat on Friday and Saturday combined. Choose the correct benchmarks and sum.

1a. Sophia babysat for about | 2 |
| :---: |
| 3 |
| $3 \frac{1}{2}$ |
| 4 | hours on Friday.

1b. Sophia babysat for about | 1 |
| :---: |
| 2 |
| $2 \frac{1}{2}$ |
| 3 | hours on Saturday.

K. Sophia babysat for about | 5 |
| :---: |
| $5 \frac{1}{2}$ |
| 6 |
| $6 \frac{1}{2}$ | hours on Friday and Saturday combined.

2. Rodrigo practiced playing the guitar $15 \frac{1}{3}$ hours over the past 3 weeks. He practiced for $6 \frac{1}{4}$ hours during the first week and $4 \frac{2}{3}$ hours during the second week. How much time did Rodrigo spend practicing during the third week? Use the numbers and symbols to write an equation that represents the problem. Then solve the equation. Symbols may be used more than once or not at all.


Practice time during third week: $\qquad$ hours
3. Liam bought $5 \frac{7}{8}$ pounds of steak. He used $2 \frac{1}{16}$ pounds of the steak for a cookout. For numbers 3a-3c, fill in each blank.

3a. Rounded to the closest benchmark, Liam bought about $\square$ pounds of steak.

3b. Rounded to the closest benchmark, Liam used about $\square$ pounds of steak for the cookout.

3c. Liam has about $\square$ pounds of steak remaining after
the cookout.
4. Filipe has 80 songs on his mp 3 player. Complete the diagram by using the tiles to write 80 as the product of its prime factors. You may use a number more than once or not at all.

5. Write $\frac{2}{5}$ and $\frac{1}{3}$ as equivalent fractions using a common denominator.
$\square$
6. Jill brought $2 \frac{1}{3}$ boxes of carrot muffins for a bake sale. Mike brought $1 \frac{3}{4}$ boxes of apple muffins. What is the total number of boxes of muffins Jill and Mike brought to the bake sale?
7. The shaded part of the diagram shows what Genie has left from a meter of string. She will use $\frac{3}{5}$ meter of string to make bracelets. She wants to determine how much of the string she will have remaining after making the bracelets. For numbers 7a-7c, select True or False for each statement.


7a. To determine how much
O TrueFalse string will be left after making the bracelets, Rebecca must find $\frac{9}{10}-\frac{3}{5}$.

7b. The fractions $\frac{3}{5}$ and $\frac{6}{10}$ are equivalent.

7c. Rebecca will have $\frac{1}{5}$ meter of
O True

False string left.
8. For numbers $8 \mathrm{a}-8 \mathrm{c}$, tell whether each expression was rewritten using the Commutative Property or the Associative Property. Choose the correct property of addition. 8a. $\frac{1}{6}+\left(\frac{7}{8}+\frac{5}{6}\right)=\frac{1}{6}+\left(\frac{5}{6}+\frac{7}{8}\right)$
O True

O False O False

| Associative Property |
| :---: |
| Commutative Property |

8b. $\left(\frac{7}{10}+\frac{1}{3}\right)+\frac{1}{10}=\left(\frac{1}{3}+\frac{7}{10}\right)+\frac{1}{10}$
Associative Property Commutative Property

8c. $\left(6 \frac{2}{5}+\frac{4}{9}\right)+3 \frac{2}{9}=6 \frac{2}{5}+\left(\frac{4}{9}+3 \frac{2}{9}\right)$
Associative Property
Commutative Property
9. Joshua uses a rule to write the following sequence of numbers.

$$
\frac{1}{6}, \frac{1}{2}, \frac{5}{6}, \longrightarrow, 1 \frac{1}{2}
$$

What rule did Joshua use? $\square$
What is the missing number in the sequence? $\square$
10. Jeffrey walked $\frac{1}{3}$ mile on Monday and jogged $\frac{3}{4}$ mile on Tuesday. How far did he walk and jog on Monday and Tuesday combined? Use the tiles to complete the fraction strip model to show how you found your answer. The fractions may be used more than once or not at all.

11. Mr. Cohen drives $84 \frac{2}{10}$ miles on Tuesday, $84 \frac{6}{10}$ miles on Wednesday, and 85 miles on Thursday.

## Part A

What is the rule for the distance Mr. Cohen drives each day? Show how you can check your answer.
$\square$

## Part B

If the pattern continues, how many miles will Mr. Cohen drive on Sunday? Explain how you found your answer.
$\square$
12. Alana bought $\frac{3}{8}$ pound of Swiss cheese and $\frac{1}{4}$ pound of American cheese. Which pairs of fractions are equivalent to the amount Alana bought? Mark all that apply.
(A) $\frac{24}{64}$ and $\frac{8}{64}$
(C) $\frac{12}{32}$ and $\frac{6}{32}$
(B) $\frac{6}{16}$ and $\frac{4}{16}$
(D) $\frac{15}{40}$ and $\frac{10}{40}$
13. Four students spent time volunteering last weekend. The table shows how much time each student spent volunteering.

| Volunteering |  |
| :--- | :---: |
| Student | Time (in hours) |
| Amy | $4 \frac{5}{6}$ |
| Beth | $6 \frac{1}{2}$ |
| Victor | $5 \frac{3}{4}$ |
| Cal | $5 \frac{2}{3}$ |

Match each pair of students with the difference between how much time they spent volunteering.
Amy and Victor

- $\frac{3}{4}$ hour
Cal and Beth
- $\frac{11}{12}$ hour
Beth and Victore
- $\frac{5}{6}$ hour

14. For numbers $14 \mathrm{a}-14 \mathrm{~d}$, tell which expressions require you to rename mixed numbers before you can subtract. Find each difference. Write each expression and the difference in the correct box.

14a. $2 \frac{1}{3}-1 \frac{3}{4}$
14b. $1 \frac{3}{4}-\frac{7}{8}$
Requires Renaming

14c. $5 \frac{2}{3}-2 \frac{5}{8}$
14d. $6 \frac{1}{5}-2 \frac{1}{3}$
Does Not Require Renaming
15. Mr. Clements painted his barn for $3 \frac{3}{5}$ hours in the morning. He painted the barn for $5 \frac{3}{4}$ hours in the afternoon. For numbers 15a-15c, select True or False for each statement.

15a. A common denominator of the mixed numbers is 20 .

15b. The amount of time spent
O True

○ True painting in the morning can be rewritten as $3 \frac{15}{20}$ hours.

15c. Mr. Clements spent $2 \frac{3}{20}$ hours longer painting in the afternoon than the morning.
16. Tom exercised $\frac{4}{5}$ hour on Monday and $\frac{5}{6}$ hour on Tuesday.

## Part A

Complete the calculations below to write equivalent fractions with a common denominator.


## Part B

How much time did Tom spend exercising on Monday and Tuesday combined? Explain how you found your answer.
$\square$

## Part C

How much longer did Tom spend exercising on Tuesday than he spent on Monday? Explain how you found your answer.
$\square$

# Moltiofy froctions 

## Show What You Know

Check your understanding of important skills.
Name $\qquad$

Part of a Group Write a fraction that names the shaded part.
1.

shaded parts
total parts $\qquad$
fraction $\qquad$
$\qquad$ .
2.

shaded parts $\qquad$
total parts $\qquad$
fraction $\qquad$

Area Write the area of each shape.
3.

$\qquad$ square units
4.

$\qquad$ square units
5.

square units

## Equivalent Fractions Write an equivalent fraction.

6. $\frac{3}{4}$
7. $\frac{9}{15}$ $\qquad$ 8. $\frac{24}{40}$
8. $\frac{5}{7}$ $\qquad$

Carmen recovered 2 gold bars that were stolen from a safe. The first bar weighed $2 \frac{2}{5}$ pounds. The second bar weighed $1 \frac{2}{3}$ times as much as the first bar. Be a Math Detective and find out how much gold was recovered.


## Vocabulary Builder

## Visualize It

## Match the review words with their examples.

What is it? What are some examples?


## Review Words

denominator
equivalent fractions
mixed number
numerator
product
simplest form

## Understand Vocabulary

## Complete the sentences by using the review words.

1. A $\qquad$ is a number that is made up of a
whole number and a fraction.
2. A fraction is in $\qquad$ when the numerator and the denominator have only the number 1 as a common factor.
3. The number below the bar in a fraction that tells how many equal parts are in the whole or in the group is the
$\qquad$ .
4. The $\qquad$ is the answer to a multiplication problem.
5. Fractions that name the same amount or part are called
$\qquad$ .
6. The $\qquad$ is the number above the bar in a fraction that tells how many equal parts of the whole are being considered.
$\qquad$

## Find Part of a Group

Essential Question How can you find a fractional part of a group?

## Unlock the Problem

Maya collects stamps. She has 20 stamps in her collection. Four-fifths of her stamps have been canceled. How many of the stamps in Maya's collection have been canceled?

0
Find $\frac{4}{5}$ of 20.

- Put 20 counters on your MathBoard.

Since you want to find $\frac{4}{5}$ of the stamps, you should arrange the 20 counters in $\qquad$
A The post office cancels stamps to keep them from being reused. equal groups.

- Draw the counters in equal groups below.

How many counters are in each group? $\qquad$


- Each group represents $\qquad$ of the stamps.
Circle $\frac{4}{5}$ of the counters.
How many groups did you circle? $\qquad$
Mathematical Practices
How many groups would you circle if $\frac{3}{5}$ of the stamps were canceled? Explain.
How many counters did you circle? $\qquad$
$\frac{4}{5}$ of $20=$ $\qquad$ , or $\frac{4}{5} \times 20=$ $\qquad$
So, $\qquad$ of the stamps have been canceled.


## (1) Example

Max's stamp collection has stamps from different countries. He has 12 stamps from Canada. Of those twelve, $\frac{2}{3}$ of them have pictures of Queen Elizabeth II. How many stamps have the queen on them?

- Draw an array to represent the 12 stamps by drawing an $\boldsymbol{X}$ for each stamp. Since you want to find $\frac{2}{3}$ of the stamps, your array should show $\qquad$ rows with an equal number of $\boldsymbol{X}_{\mathrm{s}}$.


- Circle $\qquad$ of the 3 rows to show $\frac{2}{3}$ of 12 . Then count the number of $X s$ in the circle.

There are $\qquad$ Xs circled.

- Complete the number sentences.
$\frac{2}{3}$ of $12=$ $\qquad$ , or $\frac{2}{3} \times 12=$ $\qquad$
So, there are $\qquad$ stamps with a picture of Queen Elizabeth II.
- Madinnaitcal 5 Use Appropriate Tools On your MathBoard, use counters to find $\frac{4}{6}$ of 12 . Explain why the answer is the same as the answer when you found $\frac{2}{3}$ of 12 .


## Try This! Draw an array.

Susana has 16 stamps. In her collection, $\frac{3}{4}$ of the stamps are from the United States. How many of her stamps are from the United States and how many are not?


So, $\qquad$ of Susana's stamps are from the United States, and $\qquad$ stamps are not.

## Share and Show

## MATH BOARD

1. Complete the model to solve.
$\frac{7}{8}$ of 16, or $\frac{7}{8} \times 16$

- How many rows of counters are there? $\qquad$
- How many counters are in each row? $\qquad$
- Circle $\qquad$ rows to solve the problem.
- How many counters are circled? $\qquad$
$\frac{7}{8}$ of $16=$ $\qquad$ , or $\frac{7}{8} \times 16=$ $\qquad$


## Use a model to solve.

2. $\frac{2}{3} \times 18=$ $\qquad$
3. $\frac{2}{5} \times 15=$ $\qquad$
(4. $\frac{2}{3} \times 6=$ $\qquad$

## On Your Own

## Math

Mathematical Practices
Explain how you used a model to solve Exercise 4.

Use a model to solve.
5. $\frac{5}{8} \times 24=$ $\qquad$
6. $\frac{3}{4} \times 24=$ $\qquad$ 7. $\frac{4}{7} \times 21=$ $\qquad$


## Problem Solving • Applications

## Use the table for 9-10.

9. Matifnarical (4) Use Models Four-fifths of Zack's stamps have pictures of animals. How many stamps with pictures of animals does Zack have? Use a model to solve.
10. THINKSMARTER Zack, Teri, and Paco combined the foreign stamps from their collections for a stamp show. Out of their collections, $\frac{3}{10}$ of Zack's stamps, $\frac{5}{6}$ of Teri's stamps, and $\frac{3}{8}$ of Paco's stamps were from foreign countries. How many stamps were in their display? Explain how you solved the problem.

## Stamps Collected

| Name | Number of Stamps |
| :--- | :---: |
| Zack | 30 |
| Teri | 18 |
| Paco | 24 |

WRITE Math • Show Your Work
11. FDDEEPER Paula has 24 stamps in her collection. Among her stamps, $\frac{1}{3}$ have pictures of animals. Out of her stamps with pictures of animals, $\frac{3}{4}$ of those stamps have pictures of birds. How many stamps have pictures of birds on them?
12. THINKSMARTER Charlotte bought 16 songs for her MP3 player. Three-fourths of the songs are classical songs. How many of the songs are classical songs? Draw a model to show how you found your answer.
$\square$
$\qquad$

## Multiply Fractions and Whole Numbers

Essential Question How can you use a model to show the product of a fraction and a whole number?

## Investigate

Martin is planting a vegetable garden. Each row is 2 meters long. He wants to plant carrots along $\frac{3}{4}$ of each row. How many meters of each row will he plant with carrots?

0
Multiply. $\frac{3}{4} \times 2$
Materials $\quad$ fraction strips $■$ MathBoard
A. Place two 1-whole fraction strips side-by-side to represent the length of the garden.
B. Find 4 fraction strips all with the same denominator that fit exactly under the two wholes.
C. Draw a picture of your model.

| 1 | 1 |
| :--- | :--- |


D. Circle $\frac{3}{4}$ of 2 on the model you drew.
E. Complete the number sentence. $\frac{3}{4} \times 2=$ $\qquad$
So, Martin will plant carrots along $\qquad$ meters of each row.

## Draw Conclusions

1. Mapitingical (5) Use a Concrete Model Explain why you placed four fraction strips with the same denominator under the two 1-whole strips.
$\qquad$
$\qquad$
2. Maryinaical (5) Use a Concrete Model Explain how you would model $\frac{3}{10}$ of 2.

## Make Connections

In the Investigate activity, you multiplied a whole number by a fraction. You can also use a model to multiply a fraction by a whole number.

Margo was helping clean up after a class party. There were 3 boxes remaining with pizza in them. Each box had $\frac{3}{8}$ of a pizza left.
How much pizza was left in all?
Materials ■ fraction circles

STEP 1 Find $3 \times \frac{3}{8}$. Model three 1 -whole fraction circles to represent the number of boxes containing pizza.

STEP 2 Place $\frac{1}{8}$ fraction circle pieces on each circle to represent the amount of pizza that was left in each box.

- Shade the fraction circles below to show your model.


Each circle shows $\qquad$ eighths of a whole.

The 3 circles show $\qquad$ eighths of a whole.

STEP 3 Complete the number sentences.
$\qquad$

So, Margo had $\qquad$ boxes of pizza left.

## Share and Show

## Use the model to find the product.

1. $\frac{5}{6} \times 3=$ $\qquad$

| 1 |  | 1 |  | 1 |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{2}$ |

2. $2 \times \frac{5}{6}=$ $\qquad$


## Find the product.

3. $\frac{5}{12} \times 3=$ $\qquad$ 4. $9 \times \frac{1}{3}=$ $\qquad$ 5. $\frac{7}{8} \times 4=$ $\qquad$

## Problem Solving • Applications

6. $5 \square D E E P E R$ Eliza brought 3 pans of homemade fruit bars to school.

Her classmates ate $\frac{7}{12}$ of each pan. Eliza gave 1 whole pan of the
leftover fruit bars to the school's secretaries and took the rest home.
Explain how to find how much of a pan of fruit bars Eliza took home.
$\qquad$
$\qquad$
$\qquad$
7. THINKSMARTER Tracy is cleaning up after tiling a bathroom. There are 4 open boxes of tile. Each box has $\frac{5}{8}$ of the tiles remaining. How many boxes of tile are left? Shade the model and complete the calculations below to show how you found your answer.
$\qquad$

$4 \times \frac{5}{8}=\frac{\square}{8}=$ boxes of tile
8. Martiwaical (4) Use Models Tarique drew the model below for a problem. Write 2 problems that can be solved using this model. One of your problems should involve multiplying a whole number by a fraction, and the other problem should involve multiplying a fraction by a whole number.


Pose problems.
$\qquad$

Solve your problems.
$\square$
9. THINKSMARIER How could you change the model to give you an answer of $4 \frac{4}{5}$ ? Explain and write a new equation.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Fraction and Whole Number <br> Multiplication

Essential Question How can you find the product of a fraction and a whole number without using a model?

## Unlock the Problem

Charlene has five 1-pound bags of sand, each a different color. For an art project, she will use $\frac{3}{8}$ pound of each bag of sand to create a colorful sand-art jar. How much sand will be in Charlene's sand-art jar?

Multiply a fraction by a whole number.

## MODEL

- Shade the model to show 5 groups of $\frac{3}{8}$.

- Rearrange the shaded pieces to fill as many wholes as possible.

- How much sand is in each bag?
- Will Charlene use all of the sand in each bag? Explain.


## RECORD

- Write an expression to represent the problem.

$$
5 \times \frac{3}{8} \quad \begin{aligned}
& \text { Think: I need to find } 5 \text { groups } \\
& \text { of } 3 \text { eighth-size pieces. }
\end{aligned}
$$

- Multiply the number of eighth-size pieces in each whole by 5 . Then write the answer as the total number of eighth-size pieces.

- Write the answer as a mixed number in simplest form.


So, there are $\qquad$ pounds of sand in Charlene's sand-art jar.

## (f) Example Multiply a whole number by a fraction.

Kirsten brought in 4 loaves of sliced bread to make sandwiches for the class picnic. Her classmates used $\frac{2}{3}$ of the bread. How many loaves of bread were used?

## MODEL <br> RECORD

- Write an expression to represent the problem.

$$
\frac{2}{3} \times 4 \quad \begin{aligned}
& \text { Think: I need to find } \\
& \frac{2}{3} \text { of } 4 \text { wholes. }
\end{aligned}
$$

- Multiply 4 by the number of third-size pieces in each whole. Then, write the answer as the total number of thirdsize pieces.

- Write the answer as a mixed number.

$$
\square=\square
$$

So, $\qquad$ loaves of bread were used.

- mapinagical (6) Would we have the same amount of bread if we had 4 groups of $\frac{2}{3}$ of a loaf? Explain.

Try This! Find the product. Write the product in simplest form.
(A) $4 \times \frac{7}{8}$
(B) $\frac{5}{9} \times 12$

## Share and Show

## MATH <br> BOARD

Find the product. Write the product in simplest form.

1. $3 \times \frac{2}{5}=$ $\qquad$

- Multiply the numerator by the whole number. Write the product over the denominator.
- Write the answer as a mixed number in simplest form.

2. $\frac{2}{3} \times 5=$ $\qquad$ 3. $6 \times \frac{2}{3}=$ $\qquad$ 4. $\frac{5}{7} \times 4=$

## On Your Own

Practice: Copy and Solve Find the product. Write the product in simplest form.
5. $\frac{3}{5} \times 11$
6. $3 \times \frac{3}{4}$
7. $\frac{5}{8} \times 3$

## Marinaicical (2) Use Reasoning Algebra Find the unknown digit.

8. $\frac{\square}{2} \times 8=4$
$=$ $\qquad$
9. 

$\square \times \frac{5}{6}=\frac{20}{6}$, or $3 \frac{1}{3}$
$\square=$ $\qquad$
10. $\frac{1}{} \times 18=3$

$\qquad$

## Unlock the Problem

13. A caterer wants to have enough turkey to feed 24 people. If he wants to provide $\frac{3}{4}$ of a pound of turkey for each person, how much turkey does he need?
a. What do you need to find? $\qquad$
$\qquad$
b. What operation will you use? $\qquad$
c. What information are you given? $\qquad$
$\qquad$
d. Solve the problem.
e. Complete the sentences.

The caterer wants to serve 24 people
$\qquad$ of a pound of turkey each.

He will need $\qquad$ $\times$ $\qquad$ , or
$\qquad$ pounds of turkey.

Personal Math Trainer
14. THINK SMARIER Julie is using this recipe to make salad dressing. She plans to make 5 batches of the dressing. She has 4 cups of vegetable oil.

Write a multiplication expression to show how much vegetable oil is needed for 5 batches.

Does Julie have enough vegetable oil for 5 batches of the salad dressing? Explain your reasoning.

Salad Dressing
$1 \frac{1}{2}$ teaspoons paprika 1 teaspoon dry mustard
$1 \frac{1}{2}$ teaspoons salt $\frac{1}{8}$ teaspoon onion powder
$\frac{3}{4}$ cup vegetable oil
$\frac{1}{4}$ cup vinegar
$\qquad$

## Multiply Fractions

Essential Question How can you use an area model to show the product of two fractions?

## Investigate

Jane is making reusable grocery bags and lunch bags. She needs $\frac{3}{4}$ yard of cloth to make a grocery bag. A lunch bag requires $\frac{2}{3}$ of the amount of cloth a grocery bag needs. How much cloth does she need to make a lunch bag?

0
Find $\frac{2}{3}$ of $\frac{3}{4}$. Materials $\square$ color pencils
A. Fold a sheet of paper vertically into 4 equal parts. Using the vertical folds as a guide, shade $\frac{3}{4}$ yellow.
B. Fold the paper horizontally into 3 equal parts. Using the horizontal folds as a guide, shade $\frac{2}{3}$ of the yellow sections blue.
C. Count the number of sections into which the whole sheet of paper is folded.

- How many rectangles are formed by all
the folds in the paper? $\qquad$
- What fraction of the whole sheet of paper
does one rectangle represent? $\qquad$
D. Count the sections that are shaded twice and record
the answer. $\frac{2}{3} \times \frac{3}{4}=$ $\qquad$
So, Jane needs $\qquad$ yard of cloth to make a lunch bag.


## Draw Conclusions

1. Explain why you shaded $\frac{2}{3}$ of the yellow sections blue rather than shading $\frac{2}{3}$ of the whole.


## Make Bonnections

You can find a part of a part in different ways. Marguerite and James both correctly solved the problem $\frac{1}{3} \times \frac{3}{4}$ using the steps shown.

Use the steps to show how each person found $\frac{1}{3} \times \frac{3}{4}$.


- Shade the model to show $\frac{3}{4}$ of the whole.
- How many $\frac{1}{4}$ pieces did you shade?
$\qquad$ one-fourth pieces
- To find $\frac{1}{3}$ of $\frac{3}{4}$, circle $\frac{1}{3}$ of the three $\frac{1}{4}$ pieces that are shaded.
- What part of the whole is $\frac{1}{3}$ of the shaded pieces? $\qquad$ of the whole

So, $\frac{1}{3} \times \frac{3}{4}$ is $\qquad$ .


- Shade the model to show $\frac{3}{4}$ of the whole.
- Divide each $\frac{1}{4}$ piece into thirds.
- What part of the whole is each
small piece? $\qquad$
- To find $\frac{1}{3}$ of $\frac{3}{4}$, circle $\frac{1}{3}$ of each of the three $\frac{1}{4}$ pieces that are shaded.
- How many $\frac{1}{12}$ pieces are circled?
$\qquad$ one-twelfth pieces

So, $\frac{1}{3} \times \frac{3}{4}$ is $\qquad$ .

- Pose a Problem that can be solved using the equation above.
$\qquad$
$\qquad$


## Share and Show

## MATH BOARD

## Use the model to find the product.

1. 


$\frac{3}{5} \times \frac{1}{3}=$ $\qquad$
2.


Circle $\frac{2}{3}$ of $\frac{3}{5}$.

$$
\frac{2}{3} \times \frac{3}{5}=
$$

$\qquad$

## Name

## Find the product. Draw a model.

3. $\frac{2}{3} \times \frac{1}{5}=$ $\qquad$
4. $\frac{3}{5} \times \frac{1}{3}=$ $\qquad$
5. $\frac{1}{2} \times \frac{5}{6}=$ $\qquad$
6. $\frac{3}{4} \times \frac{1}{6}=$ $\qquad$

## Problem Solving • Applications

7. Mantinwircil (1) Evaluate Reasonableness Ricardo's recipe for 4 loaves of bread requires $\frac{2}{3}$ cup of olive oil. He only wants to make 1 loaf. Ricardo makes a model to find out how much oil he needs to use. He folds a piece of paper into three parts and shades two parts. Then he folds the paper into four parts and shades $\frac{1}{4}$ of the shaded part. Ricardo decides he needs $\frac{1}{4}$ cup of olive oil. Is he right? Explain.
$\qquad$
$\qquad$
$\qquad$
8. FПDEEPER Three-fourths of a spinach casserole is leftover after Sam has lunch. Jackie and Alicia each take $\frac{1}{2}$ of the leftover casserole. Jackie eats only $\frac{2}{3}$ of her portion. What fraction of a whole casserole did Jackie eat? Draw a model.

## THINKSMARTER/ What's the Error?

9. Cheryl and Marcus are going to make 2 batches of muffins. The smaller batch is $\frac{2}{3}$ the size of the larger batch. The recipe for the larger batch requires $\frac{3}{5}$ cup of water. How much water will they need to make the smaller batch?

They made a model to represent the problem. Cheryl says
 they need $\frac{6}{9}$ cup of water. Marcus says they need $\frac{2}{5}$ cup of water. Who is correct? Explain.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
10. THINKSMARTER A farmer took $\frac{2}{3}$ of the strawberries that he harvested to a market. At the market, the farmer sold $\frac{1}{4}$ of the strawberries. How can you find what part of the strawberries the farmer harvested were sold at the market? For numbers 10a-10d, choose the number that makes each sentence true.

10a. Draw a rectangular array with 3 rows and | 3 |
| :--- |
| 4 |
| 5 | columns.

10b. Shade $\begin{aligned} & 1 \\ & 2 \\ & 3\end{aligned}$ of the rows gray.
10c. Shade $\begin{aligned} & 2 \\ & 3 \\ & 4\end{aligned}$ of the gray squares black.

10d. The farmer sold | $\frac{3}{8}$ |
| :---: |
| $\frac{1}{4}$ |
| $\frac{1}{6}$ | of his strawberries at the market.

## Compare Fraction Factors and Products

Essential Question How does the size of the product compare to the size of one factor when multiplying fractions?

## Unlock the Problem

Multiplication can be thought of as resizing one number by another number. For example, $2 \times 3$ will result in a product that is 2 times as great as 3 .

What happens to the size of a product when a number is multiplied by a fraction rather than a whole number?

## (1)One Way Use a model.



A During the week, the Delgado family ate $\frac{3}{4}$ of a box of cereal.

- Shade the model to show $\frac{3}{4}$ of a box of cereal.
- Write an expression for $\frac{3}{4}$ of 1 box of cereal. $\frac{3}{4} \times$ $\qquad$

- Will the product be equal to, greater than, or less than 1 ?

B The Ling family has 4 boxes of cereal. They ate $\frac{3}{4}$ of all the cereal during the week.

- Shade the model to show $\frac{3}{4}$ of 4 boxes of cereal. $\square$

- Write an expression for $\frac{3}{4}$ of 4 boxes of cereal. $\frac{3}{4} \times$ $\qquad$
- Will the product be equal to, greater than, or less than 4 ?

C The Carter family has only $\frac{1}{2}$ of a box of cereal at the beginning of the week. They ate $\frac{3}{4}$ of the $\frac{1}{2}$ box of cereal.

- Shade the model to show $\frac{3}{4}$ of $\frac{1}{2}$ box of cereal.

- Write an expression to show $\frac{3}{4}$ of $\frac{1}{2}$ box of cereal. $\frac{3}{4} \times$ $\qquad$
- Will the product be equal to, greater than, or less than $\frac{1}{2}$ ? than $\frac{3}{4}$ ?


## (1) Another Way use a diagram.

You can use a diagram to show the relationship between the products when a fraction is multiplied or scaled (resized) by a number.

Graph a point to show $\frac{3}{4}$ scaled by $1, \frac{1}{2}$, and 4 .
(A) $1 \times \frac{3}{4}$


Think: Locate $\frac{3}{4}$ on the diagram and shade that distance from 0 . Then graph a point to show 1 of $\frac{3}{4}$.
(B) $\frac{1}{2} \times \frac{3}{4}$


Think: Locate $\frac{3}{4}$ on the diagram and shade that distance from 0 . Then graph a point to show $\frac{1}{2}$ of $\frac{3}{4}$.

C $4 \times \frac{3}{4}$


Think: Locate $\frac{3}{4}$ on the diagram and shade that distance from 0 . Then graph a point to show 4 times $\frac{3}{4}$.
atilemaical 6 Complete each statement with equal to, greater than, or less than. Explain your choices.

- The product of 1 and $\frac{3}{4}$ will be $\qquad$ $\frac{3}{4}$.
$\qquad$
- The product of a number less than 1 and $\frac{3}{4}$ will be
$\qquad$ $\frac{3}{4}$ and $\qquad$ the other factor.
$\qquad$
$\qquad$
- The product of a number greater than 1 and $\frac{3}{4}$ will be $\qquad$ $\frac{3}{4}$ and $\qquad$ the other factor.

What if $\frac{3}{5}$ was multiplied by $\frac{1}{6}$ or by the whole number 7? Would the products be equal to, greater than, or less than $\frac{3}{5}$ ? Explain.

## Share and Show

Complete the statement with equal to, greater than, or less than.

1. $4 \times \frac{7}{8}$ will be $\qquad$

2. $\frac{3}{5} \times \frac{2}{7}$ will be $\_\frac{3}{5}$.
3. $\frac{5}{8} \times 6$ will be $\qquad$

## On Your Own

Complete the statement with equal to, greater than, or less than.
4. $\frac{4}{9} \times \frac{3}{8}$ will be $\longrightarrow \frac{3}{8}$.
5. $7 \times \frac{9}{10}$ will be $\qquad$
6. $5 \times \frac{1}{3}$ will be $\quad \frac{1}{3}$.
7. $\frac{6}{11} \times 1$ will be $\qquad$

## Problem Solving • Applications

8. Peter is planning on spending $\frac{2}{3}$ as many hours watching television this week as he did last week. Is Peter going to spend more hours or fewer hours watching television this week?
9. $\because \square D E E P E R$ Mrs. Rodriguez has 18 packages of pens in stock at her store on Monday. On Tuesday, she has $\frac{5}{6}$ the number of pens she had on Monday. On Wednesday, she has $\frac{2}{5}$ of the number of pens she had on Tuesday. How many packages of pens does she have on Wednesday?
10. Matifnaical (2) Represent a Problem Ariel goes running for $\frac{5}{6}$ of an hour.

The next day, she runs for $\frac{3}{4}$ as much time. Does she spend more or less time running the second day? Draw a diagram or make a model to represent the problem.

## Connect to] Art

A scale model is a representation of an object with the same shape as the real object. Models can be larger or smaller than the actual object but are often smaller.

Architects often make scale models of the buildings or structures they plan to build. Models can give them an idea of how the structure will look when finished. Each measurement of the building is scaled up or down by the same factor.

Bob is building a scale model of his bike. He wants his model to be $\frac{1}{5}$ as long as his bike.

11. If Bob's bike is 60 inches long, how long will his model be? $\qquad$
12. THINKSMARTER If one wheel on Bob's model is 4 inches across, how many inches across is the actual wheel on his bike? Explain.
$\qquad$
$\qquad$

$\qquad$

Personal Math Trainer
13. THINKSMARTER Write each multiplication expression in the correct box.
$\frac{5}{6} \times \frac{2}{3}$
$2 \times \frac{5}{6}$
$\frac{5}{6} \times \frac{4}{4}$
$\frac{5}{6} \times \frac{7}{3}$
$\frac{10}{10} \times \frac{5}{6}$
$\frac{5}{6} \times \frac{5}{6}$
Product is equal to $\frac{5}{6}$.
Product is greater than $\frac{5}{6}$.
Product is less than $\frac{5}{6}$.
$\qquad$

## Fraction Multiplication

- Shade $\frac{3}{5}$ of the model yellow.
- Draw a horizontal line across the rectangle to show 2 equal parts.
- Shade $\frac{1}{2}$ of the yellow sections blue.
- Count the sections that are shaded twice and write a fraction for the parts of the whole that are shaded twice.

$\frac{1}{2} \times \frac{3}{5}=$ $\qquad$
- Compare the numerator and denominator of the product with the numerators and denominators of the factors. Describe what you notice.
$\qquad$


## Unlock the Problem

- How much of the scarf does Sasha have left to knit? $\frac{1}{2}$ of that today, how much of the scarf will Sasha knit today?
Multiply. $\frac{1}{2} \times \frac{3}{5}$


## 』) One Way Use a model.

Sasha has $\frac{3}{5}$ of a scarf left to knit. If she finishes

- Of the fraction that is left, how much will she finish today? forthepartsof
$\qquad$

CONNECT Remember you can write a whole number as a fraction with a denominator of 1 .

## 1. Example

Find $4 \times \frac{5}{12}$. Write the product in simplest form.

$$
\begin{aligned}
4 \times \frac{5}{12} & =\frac{4}{x} \times \frac{5}{12} \\
& =\frac{4 \times}{\times}=\square \\
& =\frac{\div}{12 \div}=\square, \text { or }
\end{aligned}
$$

Write the whole number as a fraction.

$$
=4 \times \quad=\quad \text { Multiply the numerators. }
$$

Multiply the denominators.

Write the product as a fraction or a mixed number in simplest form.


So, $4 \times \frac{5}{12}=$ $\qquad$ or $\qquad$ .

Is the answer reasonable? Explain.

Try This! Evaluate $c \times \frac{4}{5}$ for $c=\frac{2}{2}$.

- What is another way to write the value of $c$ ? $\qquad$
- What happens when you multiply a whole number by 1 ?
$\qquad$

- Replace $c$ in the expression with $\qquad$ .
- Multiply the numerators.

- Multiply the denominators.
- What do you notice about the product?

So, multiplying $c \times \frac{4}{5}$ is equal to $\qquad$ when $c=\frac{2}{2}$.

- Masinimaical 3 Use Reasoning Will you get the same result if you multiply $\frac{4}{5}$ by any fraction with a numerator and denominator that are the same digit? Explain.
$\qquad$
$\qquad$


## Share and Show

MATH
MOARD

Find the product. Write the product in simplest form.

1. $6 \times \frac{3}{8}$

$$
\frac{6}{1} \times \frac{3}{8}=
$$

$\qquad$
2. $\frac{3}{8} \times \frac{8}{9}$
$\qquad$
3. $\frac{2}{3} \times 27$
4. $\frac{5}{12} \times \frac{3}{5}$
5. $\frac{1}{2} \times \frac{3}{5}$
6. $\frac{2}{3} \times \frac{4}{5}$
$\qquad$
$\left.\right|^{\text {6. } \frac{2}{3} \times \frac{1}{5}}$

## On Your Own

7. $\frac{1}{3} \times \frac{5}{8}$
8. $4 \times \frac{1}{5}$

## Math

Explain how to find the product
$\frac{1}{6} \times \frac{2}{3}$ in simplest form.

Find the product. Write the product in simplest form.
11. $\frac{1}{12} \times \frac{2}{3}$
$\qquad$
15. $\frac{2}{3} \times \frac{8}{8}$
16. $5 \times \frac{4}{5}$
12. $\frac{1}{7} \times 30$
$\qquad$
$\qquad$
9. $2 \times \frac{1}{8}$
10. $\frac{4}{9} \times \frac{4}{5}$
13. $\frac{2}{5} \times \frac{4}{7}$
14. $\frac{7}{8} \times \frac{4}{5}$
17. Of the pets in the pet show, $\frac{5}{6}$ are cats. $\frac{4}{5}$ of the cats are calico cats. What fraction of the pets are calico cats?
18. F■DEEPER Five cats each ate $\frac{1}{4}$ cup of canned food and $\frac{1}{4}$ cup of dry food. How much food did they eat altogether?

## Problem Solving • Applications

Speedskating is a popular sport in the Winter Olympics. Many young athletes in the U.S. participate in speedskating clubs and camps.
19. At a camp in Green Bay, Wisconsin, $\frac{7}{9}$ of the participants were from Wisconsin. Of that group, $\frac{3}{5}$ were 12 years old. What fraction of the group was from Wisconsin and 12 years old?

20. THINKSMARTER Maribel wants to skate $1 \frac{1}{2}$ miles on Monday. If she skates $\frac{9}{10}$ mile Monday morning and $\frac{2}{3}$ of that distance Monday afternoon, will she reach her goal? Explain.

21.
(Martinagical (2) Reason Quantitatively On the first day of camp, $\frac{5}{6}$ of the skaters were beginners. Of the beginners, $\frac{1}{3}$ were girls. What fraction of the skaters were girls and beginners? Explain why your answer is reasonable.
$\qquad$
$\qquad$
22. THINK SMARIER A scientist had $\frac{3}{5}$ liter of solution. He used $\frac{1}{6}$ of the solution for an experiment. How much solution did the scientist use for the experiment? Use the numbers on the tiles to complete the calculations. You may use numbers more than once or not at all.

$\qquad$ liter

Name $\qquad$

## Mid-Chapter Checkpoint

## Concepts and Skills

1. Explain how you would model $5 \times \frac{2}{3}$. (5.NF.4a)
2. When you multiply $\frac{2}{3}$ by a fraction less than one, how does the product compare to the factors? Explain. (5.NF.5a)
$\qquad$
$\qquad$

Find the product. Write the product in simplest form. (5.NF.4a, 5.NF.4b)
3. $\frac{2}{3} \times 6$
$\qquad$
6. $\frac{7}{8} \times \frac{3}{8}$
7. $\frac{1}{2} \times \frac{3}{4}$
9. $2 \times \frac{3}{11}$
4. $\frac{4}{5} \times 7$

Complete the statement with equal to, greater than, or less than. (5.NF.5a)
$\qquad$
5. $8 \times \frac{5}{7}$
8. $\frac{7}{8} \times \frac{4}{7}$
11. $\frac{7}{12} \times 8$
13. $\frac{5}{7} \times 3$ will be $\qquad$
14. There is $\frac{5}{6}$ of an apple pie left from dinner. Tomorrow, Victor plans to eat $\frac{1}{6}$ of the pie that was left. How much of the whole pie will he eat tomorrow? (5.NF.4a)
15. Everett and Marie are going to make fruit bars for their family reunion. They want to make 4 times the amount the recipe makes. If the recipe calls for $\frac{2}{3}$ cup of oil, how much oil will they need? (5.NF.5a)
16. Matt made the model below to help him solve his math problem.

Write an expression that matches Matt's model. (5.NF.4b)


## Area and Mixed Numbers

Essential Question How can you use a unit tile to find the area of a rectangle with fractional side lengths?

Number and Operations-Fractions-5.NF.4b mathematical practices MP.2, MP.4, MP.5, MP. 6

## Investigate

You can use square tiles with side lengths that are unit fractions to find the area of a rectangle.

Li wants to cover the rectangular floor of her closet with tile. The floor is $2 \frac{1}{2}$ feet by $3 \frac{1}{2}$ feet. She wants to use the fewest tiles possible and doesn't want to cut any tiles. The tiles come in three sizes: 1 foot by 1 foot, $\frac{1}{2}$ foot by $\frac{1}{2}$ foot, and $\frac{1}{4}$ foot by $\frac{1}{4}$ foot. Choose the tile that Li should use. What is the area of the closet floor?
A. Choose the largest tile Li can use to tile the floor of the closet and avoid gaps or overlaps.


- Which square tile should Li choose? Explain.
$\qquad$
$\qquad$
B. On the grid, let each square represent the dimensions of the tile you chose. Then draw a diagram of the floor.
C. Count the squares in your diagram.
- How many squares cover the diagram?
$\qquad$ $\times$ $\qquad$ , or $\qquad$ squares

- What is the area of the tile you chose? $\qquad$
- Since 1 square on your diagram represents an area of $\qquad$ square foot, the area represented by $\qquad$ squares is $\qquad$ $\times$ $\qquad$ , or $\qquad$ square feet.

So, the area of the floor written as a mixed number
is $\qquad$ square feet.

## Draw Gonclusions

1. Using the formula for area, write a multiplication expression that could be used to find the area of the floor.
2. 

Marifenical (4) Write an Expression Rewrite the expression with fractions greater than 1 and calculate the area. Is it the same as what you found using the model?
3. How many $\frac{1}{4}$ foot by $\frac{1}{4}$ foot tiles would Sonja need to cover one
$\frac{1}{2}$ foot by $\frac{1}{2}$ foot tile? $\qquad$
4. How could you find the number of $\frac{1}{4}$ foot by $\frac{1}{4}$ foot tiles needed to cover the same closet floor?
$\qquad$

## Make Gonnections

Sometimes it is easier to multiply mixed numbers if you break them apart into whole numbers and fractions.

Use an area model to solve. $1 \frac{3}{5} \times 2 \frac{3}{4}$
STEP 1 Rewrite each mixed number as the sum of a whole number and a fraction.
$1 \frac{3}{5}=$ $\qquad$

$$
2 \frac{3}{4}=
$$

$\qquad$
STEP 2 Draw an area model to show the original multiplication problem.
STEP 3 Draw dashed lines and label each section to show how you broke apart the mixed numbers in Step 1.

STEP 4 Find the area of each section.
STEP 5 Add the area of each section to find the total area of the rectangle.

So, the product of $1 \frac{3}{5} \times 2 \frac{3}{4}$ is $\qquad$ .

## Share and Show

## MATH BOARD

Use the grid to find the area. Let each square represent $\frac{1}{3}$ meter by $\frac{1}{3}$ meter.

1. $1 \frac{2}{3} \times 1 \frac{1}{3}$

- Draw a diagram to represent the dimensions.
- How many squares cover the diagram? $\qquad$

- What is the area of the diagram? $\qquad$

Use the grid to find the area. Let each square represent $\frac{1}{4}$ foot by $\frac{1}{4}$ foot.
$\qquad$


The area is $\qquad$ square feet.
3. $1 \frac{1}{4} \times 1 \frac{1}{2}=$ $\qquad$


The area is $\qquad$ square feet.

## Use an area model to solve.

4. $1 \frac{3}{4} \times 2 \frac{1}{2}$
5. $1 \frac{3}{8} \times 2 \frac{1}{2}$
6. $1 \frac{1}{9} \times 1 \frac{2}{3}$
7. Манमimicical (2) Use Reasoning Explain how finding the area of a rectangle with whole-number side lengths compares to finding the area of a rectangle with fractional side lengths.
$\qquad$
$\qquad$

## Problem Solving • Applications

## THINKSMARTER

## Pose a Problem

8. Terrance is designing a garden. He drew this diagram of his garden. Pose a problem using mixed numbers that can be solved using his diagram.


Pose a Problem.
$\qquad$

Solve your problem.
9. GПDEEPER Tucker's bedroom is a rectangle that measures $3 \frac{1}{3}$ yards by $4 \frac{1}{2}$ yards. His dad buys two area rugs that each has a length of 4 yards. One rug has an area of 16 square yards. The other is 12 square yards. Which rug will fit Tucker's room? Explain.
$\qquad$
$\qquad$
10. THINKSMARTER Nancy's garden has the dimensions shown.

She needs to find the area of the garden so she knows how much topsoil to buy. Complete the area model below to find the area.


The area of the garden is $\qquad$ square yards.
$\qquad$

## Compare Mixed Number Factors and Products

Essential Question How does the size of the product compare to the size of one factor when multiplying fractions greater than one?

Number and Operations-
Fractions-5.NF.5a, 5.NF.5b
MATHEMATICAL PRACTICES
MP.5, MP. 6

## Unlock the Problem

You can make general statements about the relative size of a product when one factor is equal to 1 , less than 1 , or greater than 1 .

## ( ) One Way use a model.

Sherise has a recipe that requires $1 \frac{1}{4}$ cups of flour. She wants to know how much flour she would need if she made the recipe as written, if she made half the recipe, and if she made $1 \frac{1}{2}$ times the recipe.


Shade the models to show $1 \frac{1}{4}$ scaled by 1 , by $\frac{1}{2}$, and by $1 \frac{1}{2}$.
(A) $1 \times 1 \frac{1}{4}$


Think: I can use what I know about the Identity Property.

- What can you say about the product when $1 \frac{1}{4}$ is multiplied by 1 ?
(B) $\frac{1}{2} \times 1 \frac{1}{4}$


Think: The product will be half of what I started with.

- What can you say about the product when $1 \frac{1}{4}$ is multiplied by a fraction less than 1 ? $\qquad$
(C) $1 \frac{1}{2} \times 1 \frac{1}{4}=\left(1 \times 1 \frac{1}{4}\right)+\left(\frac{1}{2} \times 1 \frac{1}{4}\right)$


Think: The product will be what I started with and $\frac{1}{2}$ more.

- What can you say about the product when $1 \frac{1}{4}$ is multiplied by a number greater than 1 ?

Mathematical Practices

CONNECT You can also use a diagram to show the relationship between the products when a fraction greater than one is multiplied or scaled (resized) by a number.

## (1) Another Way use a diagram.

Jake wants to train for a road race. He plans to run $2 \frac{1}{2}$ miles on the first day. On the second day, he plans to run $\frac{3}{5}$ of the distance he runs on the first day. On the third day, he plans to run $1 \frac{2}{5}$ of the distance he runs on the first day. Which distance is greater: the distance on day 2 when he runs $\frac{3}{5}$ of $2 \frac{1}{2}$ miles, or the distance on day 3 when he runs $1 \frac{2}{5}$ of $2 \frac{1}{2}$ miles?

Graph a point on the diagram to show the size of the product. Then complete the statement with equal to, greater than, or less than.
(A) $1 \times 2 \frac{1}{2}$


- The product of 1 and $2 \frac{1}{2}$ will be $\qquad$ $2 \frac{1}{2}$.

B $\frac{3}{5} \times 2 \frac{1}{2}$


- The product of a number less than 1 and $2 \frac{1}{2}$
is $\qquad$ $2 \frac{1}{2}$.

C $1 \frac{2}{5} \times 2 \frac{1}{2}=\left(1 \times 2 \frac{1}{2}\right)+\left(\frac{2}{5} \times 2 \frac{1}{2}\right)$


- The product of a number greater than 1 and $2 \frac{1}{2}$ will
be $\qquad$ $2 \frac{1}{2}$ and $\qquad$ the other factor.

Think: Locate $2 \frac{1}{2}$ on the diagram and shade that distance. Then graph a point to show 1 of $2 \frac{1}{2}$ and $\frac{2}{5}$ more of $2 \frac{1}{2}$.

So, $\qquad$ of $\qquad$ miles is a greater distance than $\qquad$ of $\qquad$ miles.

## Share and Show

Complete the statement with equal to, greater than, or less than.

1. $\frac{5}{6} \times 2 \frac{1}{5}$ will be $\qquad$ $2 \frac{1}{5}$.


Shade the model to show $\frac{5}{6} \times 2 \frac{1}{5}$.
2. $1 \frac{1}{5} \times 2 \frac{2}{3}$ will be $\qquad$ $2 \frac{2}{3}$.
3. $\frac{4}{5} \times 2 \frac{2}{5}$ will be $\qquad$ $2 \frac{2}{5}$.

## On Your Own

Complete the statement with equal to, greater than, or less than.
4. $\frac{2}{2} \times 1 \frac{1}{2}$ will be $\qquad$ $1 \frac{1}{2}$.
5. $\frac{2}{3} \times 3 \frac{1}{6}$ will be $\qquad$ $3 \frac{1}{6}$.

## Mary:magical (2) Use Reasoning Algebra Tell whether the unknown factor is

 less than 1 or greater than 1.6. $\square 1 \frac{2}{3}=\frac{5}{6}$
7. $\square \times 1 \frac{1}{4}=2 \frac{1}{2}$

The unknown factor is $\qquad$ 1. $\qquad$ 1.
8. FIDEEPER Kadeem is making two drawings of an oak leaf. The dimensions of the first drawing will be $\frac{1}{3}$ the dimensions of the leaf. The dimensions of the second drawing will be $2 \frac{1}{2}$ the dimensions of the leaf. If the length of the oak leaf is $5 \frac{1}{2}$ inches, will the length of each drawing be equal to, greater than, or less than $5 \frac{1}{2}$ inches?

## Problem Solving • Applications

9. Man pacicici (3) Verify the Reasoning of Others Penny wants to make a model of a beetle that is larger than life-size. Penny says she is going to use a scaling factor of $\frac{7}{12}$. Does this make sense? Explain.
$\qquad$
$\qquad$
$\qquad$
10. THINKSMARTER

Shannon, Mary, and John earn a weekly allowance. Shannon earns an amount that is $\frac{2}{3}$ of what John earns. Mary earns an amount that is $1 \frac{2}{3}$ of what John earns. John earns $\$ 20$ a week. Who earns the greatest allowance? Who earns the least?
11. THINKSMARIER Stuart rode his bicycle $6 \frac{3}{5}$ miles on Friday. On Saturday he rode $1 \frac{1}{3}$ times as far as he rode on Friday. On Sunday he rode $\frac{5}{6}$ times as far as he rode on Friday. For numbers 11a-11d, select True or False for each statement.

11a. Stuart rode more miles on Saturday than he rode on Friday.
O True
O False

11b. Stuart rode more miles on Friday than he rode on Saturday and Sunday combined.

True
False
11c. Stuart rode fewer miles on Sunday than he rode on Friday.True
O False

11d. Stuart rode more miles on Sunday than he rode on Saturday.True
False

Number and Operations-Fractions-5.NF. 6 MATHEMATICAL PRACTICES MP.1, MP.2, MP. 4

## Unlock the Problem

One-third of a $1 \frac{1}{4}$ acre park has been reserved as a dog park. Find the number of acres that are used as a dog park.

Multiply. $\frac{1}{3} \times 1 \frac{1}{4}$

## P One Way use a model.

- Is the area of the dog park less than or greater than the area of the $1 \frac{1}{4}$ acre park?

STEP 1 Shade the model to represent the whole park.

Think: The whole park is $\qquad$ acres.

STEP 2 Shade the model again to represent the part of the park that is a dog park.

Think: The dog park is $\qquad$ of the park.

Draw horizontal lines across each rectangle to show $\qquad$ _.


- How many parts does each rectangle show? $\qquad$
- What fraction of each rectangle is shaded twice?
$\qquad$ and $\qquad$
- What fraction represents all the parts which are shaded twice?
$\qquad$ $+$ $\qquad$ $=$ $\qquad$

So, $\qquad$ acre has been set aside.


## (1) Another Way Rename the mixed number as a fraction.

STEP 1 Write the mixed number as a fraction greater than 1.

$$
\frac{1}{3} \times 1 \frac{1}{4}=\frac{1}{3} \times \frac{}{4}
$$

STEP 2 Multiply the fractions.

$$
=\frac{1 \times}{3 \times 4}=
$$

Mathematical Practices
So, $\frac{1}{3} \times 1 \frac{1}{4}=$ $\qquad$ .

## (1) Example 1 Rename the whole number.

Multiply. $12 \times 2 \frac{1}{6}$ Write the product in simplest form.
STEP 1 Determine how the product will compare to the greater factor.
$12 \times 2 \frac{1}{6}$ will be $\qquad$ 12.

STEP 2 Write the whole number and mixed number as fractions.

STEP 3 Multiply the fractions.

STEP 4 Write the product in simplest form.

So, $12 \times 2 \frac{1}{6}=$ $\qquad$ .

## (1) Example 2 Use the Distributive Property.

Multiply. $16 \times 4 \frac{1}{8}$ Write the product in simplest form.
STEP 1 Rewrite the expression by using the Distributive Property.

STEP 2 Multiply 16 by each number.

STEP 3 Add.

$$
\begin{aligned}
16 \times 4 \frac{1}{8} & =16 \times\left(\ldots+\frac{1}{8}\right) \\
& =(16 \times 4)+(16 \times-) \\
& =\ldots+2=
\end{aligned}
$$

So, $16 \times 4 \frac{1}{8}=$ $\qquad$ .

Explain how you know that your answers to both examples are reasonable.

1. Mathematical (2) Use Reasoning Explain why you might choose to use the Distributive Property to solve Example 2.
2. When you multiply two factors greater than 1 , is the product less than, between, or greater than the two factors? Explain.

## Share and Show

## MATH BOARD

Find the product. Write the product in simplest form.

1. $1 \frac{2}{3} \times 3 \frac{4}{5}=\frac{}{3} \times \frac{}{5}$
$=\square$

$$
=
$$

$\qquad$
2. $1 \frac{1}{8} \times 2 \frac{1}{3}$
©3. $\frac{3}{4} \times 6 \frac{5}{6}$

Use the Distributive Property to find the product.
4. $16 \times 2 \frac{1}{2}$
5. $1 \frac{4}{5} \times 15$

## On Your Own

Find the product. Write the product in simplest form.
6. $\frac{3}{4} \times 1 \frac{1}{2}$
7. $4 \frac{2}{5} \times 1 \frac{1}{2}$
8. $5 \frac{1}{3} \times \frac{3}{4}$
9. $2 \frac{1}{2} \times 1 \frac{1}{5}$
10. THINKSMARTER The table shows how many hours some students worked on their math project.

April worked $1 \frac{1}{2}$ times longer on her math project than Carl. Debbie worked $1 \frac{1}{4}$ times longer than Sonia. Richard worked $1 \frac{3}{8}$ times longer than Tony. Match each student's name to the number of hours he or she worked on the math project.

| Math Project |  |
| :--- | :---: |
| Name | Hours Worked |
| Carl | $5 \frac{1}{4}$ |
| Sonia | $6 \frac{1}{2}$ |
| Tony | $5 \frac{2}{3}$ |


| Student | Hours Worked |
| :---: | :---: |
| April • | $\bullet 7 \frac{19}{24}$ |
| Debbie • | $\bullet \frac{7}{8}$ |
| Richard | $\bullet 8 \frac{1}{8}$ |

## Connect to Health

## Changing Recipes

You can make a lot of recipes more healthful by reducing the amounts of fat, sugar, and salt.

Kelly has a muffin recipe that calls for $1 \frac{1}{2}$ cups of sugar. She wants to use $\frac{1}{2}$ that amount of sugar. How much sugar will she use?


Multiply $1 \frac{1}{2}$ by $\frac{1}{2}$ to find what part of the original amount of sugar to use.

Write the mixed number as a fraction greater than 1.

$$
\begin{aligned}
\frac{1}{2} \times 1 \frac{1}{2} & =\frac{1}{2} \times \frac{}{2} \\
& =
\end{aligned}
$$

Multiply.

So, Kelly will use $\qquad$ cup of sugar.
11. Manilmaical (6) Describe a Method Tony's recipe for soup calls for $1 \frac{1}{4}$ teaspoons of salt. He wants to use $\frac{1}{2}$ that amount. How much salt will he use? Describe how you found your answer.
$\qquad$
$\qquad$
$\qquad$
12. G■DEEPER Jeffrey's recipe for oatmeal muffins calls for $2 \frac{1}{4}$ cups of oatmeal and makes one dozen muffins. If he makes $1 \frac{1}{2}$ dozen muffins for a club meeting and 2 dozen muffins for a family reunion, how much oatmeal will he use?
13. THINKSMARTER Cara's muffin recipe calls for $1 \frac{1}{2}$ cups of flour for the muffins and $\frac{1}{4}$ cup of flour for the topping. If she makes $\frac{1}{2}$ of the original recipe, how much flour will she use?


## Problem Solving • Find Unknown Lengths

Essential Question How can you use the strategy guess, check, and revise to solve problems with fractions?

## Unlock the Problem

Sara wants to design a rectangular garden with a section for flowers that attract butterflies. She wants the area of this section to be $\frac{3}{4}$ square yard. If she wants the width to be $\frac{1}{3}$ the length, what will the dimensions of the butterfly section be?

## Read the Problem

What do I need to find?
I need to find $\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$ .

## What information do I

 need to use?The part of the garden for
butterflies has an area of
$\qquad$ square yard and the width is $\qquad$ the length.

## How will I use the information?

I will $\qquad$ the sides of the butterfly area. Then I will $\qquad$ my guess and $\qquad$ it if it is not correct.

## Solve the Problem

I can try different lengths and calculate the widths by finding $\frac{1}{3}$ the length. For each length and width, I find the area and then compare. If the product is less than or greater than $\frac{3}{4}$ square yard, I need to revise the length.

| Guess |  | Check | Revise |
| :--- | :---: | :---: | :---: |
| Length <br> (in yards) | Width (in yards) <br> ( $\frac{1}{3}$ of the length) | Area of Butterfly Garden <br> (in square yards) |  |
| $\frac{3}{4}$ | $\frac{1}{3} \times \frac{3}{4}=\frac{1}{4}$ | $\frac{3}{4} \times \frac{1}{4}=\frac{3}{16}$ too low | Try a longer length. |
| $2 \frac{1}{4}$, or $\frac{9}{4}$ |  |  |  |
|  |  |  |  |

So, the dimensions of Sara's butterfly garden will be $\qquad$ yard by $\qquad$ yards.

## (1) Try Another Problem

Marcus is building a rectangular box for his kitten to sleep in. He wants the area of the bottom of the box to be 360 square inches and the length of one side to be $1 \frac{3}{5}$ the length of the other side. What should the dimensions of the bottom of the bed be?

## Read the Problem

| What do I need to find? | What information do I <br> need to use? | How will I use the <br> information? |
| :--- | :--- | :--- |

## Solve the Problem

So, the dimensions of the bottom of the kitten's bed will be $\qquad$ by $\qquad$ .

- Marifegical (3) Apply What if the longer side was still $1 \frac{3}{5}$ the length of the shorter side and the shorter side was 20 inches long? What would the area of the bottom of the bed be then? $\qquad$
$\qquad$


## Share and Show

1. When Pascal built a dog house, he knew he wanted the floor of the house to have an area of 24 square feet. He also wanted the width to be $\frac{2}{3}$ the length. What are the dimensions of the dog house?

First, choose two numbers that have a product of 24 .
Guess: $\qquad$ feet and $\qquad$ feet

Then, check those numbers. Is the greater number $\frac{2}{3}$ of the other number?

Check: $\frac{2}{3} \times$ $\qquad$ $=$ $\qquad$


My guess is $\qquad$ .

Finally, if the guess is not correct, revise it and check again.
Continue until you find the correct answer.

So, the dimensions of the dog house are $\qquad$ .
2. What if Pascal wanted the area of the floor to be 54 square feet and the width still to be $\frac{2}{3}$ the length? What would the dimensions of the floor be?
3. Leo wants to paint a mural that covers a wall with an area of 1,440 square feet. The height of the wall is $\frac{2}{5}$ of its length. What is the length and the height of the wall?

## On Your Own

4. FDDEEPER Barry wants to make a drawing that is $\frac{1}{4}$ the size of the original. If a tree in the original drawing is 14 inches tall and 5 inches wide, what will be the length and width of the tree in Barry's drawing?
5. THINKSMARTER A blueprint is a scale drawing of a building. The dimensions of the blueprint for Patricia's doll house are $\frac{1}{4}$ of the measurements of the actual doll house. The floor of the doll house has an area of 864 square inches. If the width of the
 doll house is $\frac{2}{3}$ the length, what are the dimensions of the floor on the blueprint of the doll house?
6. Marin maical (3) Verify the Reasoning of Others Beth wants the floor of her tree house to be 48 square feet. She wants the length to be $\frac{3}{4}$ the width. Using the strategy guess, check, and revise, Beth guesses the dimensions will be 4 feet by 12 feet. Is Beth's guess the correct dimensions? Explain.
7. THINKSMARIER Sally has a photograph that has an area of 35 square inches. She creates two enlargements of the photograph. The enlargements have areas of 140 square inches and 560 square inches. In each photograph, the length is $1 \frac{2}{5}$ times the width. Select which of the following could be the dimensions of the original photograph or one of the enlargements. Mark all that apply.
(A) 5 inches by 7 inches
(B) 20 inches by 28 inches
(C) 7 inches by 20 inches
(D) 21 inches by 15 inches
(E) 10 inches by 14 inches

## (V)Chapter 7 Review/Test

1. Mrs. Williams is organizing her office supplies. There are 3 open boxes of paper clips in her desk drawer. Each box has $\frac{7}{8}$ of the paper clips remaining. How many boxes of paper clips are left? Shade the model and complete the calculations below to show how you found your answer.

$\qquad$ full boxes of paper clips
2. Diana worked on her science project for $5 \frac{1}{3}$ hours. Gabe worked on his science project $1 \frac{1}{4}$ times as long as Diana. Paula worked on her science project $\frac{3}{4}$ times as long as Diana. For numbers 2a-2d, select True or False for each statement.

2a. Diana worked longer on her science project than Gabe worked on his science project.TrueFalse

2b. Paula worked less on her science
project than Diana worked on her science project.
True
$\bigcirc$ False

2c. Gabe worked longer on his science project than Paula worked on her science project.TrueFalse

2d. Gabe worked longer on his science project than Diana and Paula combined.
O True
$\bigcirc$ False
3. Louis wants to carpet the rectangular floor of his basement. The basement has an area of 864 square feet. The width of the basement is $\frac{2}{3}$ its length. What is the length of Louis's basement?
$\qquad$ feet
4. Frannie put $\frac{2}{3}$ of her music collection on an mp3 player. While on vacation, she listened to $\frac{3}{5}$ of the music on the player. How much of Frannie's music collection did she listen to while on vacation? For numbers 4a-4d, choose the correct values to describe how to solve the problem.

4a. Draw a rectangular array with 3 rows and | 3 |
| :---: |
| 4 |
| 5 |

4b. Shade | $\begin{array}{l}1 \\ 2 \\ 3\end{array}$ |
| :--- |
| of the rows gray. |

4c. Shade $\begin{aligned} & 3 \\ & 5 \\ & 6\end{aligned}$ of the gray squares black.

4d. Frannie listened to | $\frac{2}{5}$ |
| :---: |
| $\frac{3}{5}$ |
| $\frac{3}{10}$ | of her music collection while on vacation.

5. Logan bought 15 balloons. Four-fifths of the balloons are purple. How many of the balloons are purple? Draw a model to show how you found your answer.
$\square$
6. Kayla walks $3 \frac{2}{5}$ miles each day. Which of the following statements correctly describe how far she walks? Mark all that apply.
(A) Kayla walks $14 \frac{2}{5}$ miles in 4 days.
(B) Kayla walks $23 \frac{4}{5}$ miles in 7 days.
(C) Kayla walks 34 miles in 10 days.
(D) Kayla walks $102 \frac{2}{5}$ miles in 31 days.

## Name

7. Write each multiplication expression in the correct box.
$\frac{4}{5} \times 1 \frac{1}{8} \quad \frac{1}{3} \times \frac{4}{5} \quad 3 \times \frac{4}{5} \quad \frac{4}{5} \times \frac{4}{5} \quad \frac{8}{8} \times \frac{4}{5} \quad \frac{4}{5} \times \frac{2}{2}$

| Product is equal |
| :--- |
| to $\frac{4}{5}$. |



> Product is less than $\frac{4}{5}$.
8. A postcard has an area of 24 square inches. Two enlargements of the postcard have areas of 54 square inches and 96 square inches. In each postcard, the length is $1 \frac{1}{2}$ times the width. Which of the following could be the dimensions of the postcard or one of the enlargements? Mark all that apply.
(A) 6 inches by 9 inches
(D) 6 inches by 12 inches
(B) 10 inches by 15 inches
(E) 4 inches by 6 inches
(C) 8 inches by 12 inches
9. In a fifth grade class, $\frac{4}{5}$ of the girls have brown hair. Of the brown-haired girls, $\frac{3}{4}$ of them have long hair. Of the girls with long brown hair, $\frac{1}{3}$ of them have green eyes.

## Part A

What fraction of the girls in the class have long brown hair?
$\qquad$ of the girls

## Part B

What fraction of the girls in the class have long brown hair and green eyes? Explain how you found your answer.
$\qquad$ of the girls

10. Caleb's family room has the dimensions shown. He needs to find the area of the room so that he knows how much carpet to buy. Complete the area model below to find the area of the family room.

area of the room $=$ $\qquad$ square yards
11. Doreen lives $\frac{3}{4}$ mile from the library. Sheila lives $\frac{1}{3}$ as far away from the library as Doreen. For numbers 11a-11c, choose Yes or No to answer each question.

11a. Does Doreen live farther from
the library than Sheila?
YesNo

11b. Does Sheila live $\frac{1}{4}$ mile from the library?

Yes
$\bigcirc \mathrm{No}$
11c. Does Sheila live twice as far from the library than Doreen?Yes
12. Taniqua took a test that had 20 multiple-choice questions and 10 True/False questions. She got $\frac{9}{10}$ of the multiple-choice questions correct, and she got $\frac{4}{5}$ of the True/False questions correct.

12a. How many multiple-choice questions did Taniqua get correct?
$\qquad$ multiple-choice questions

12b. How many True/False questions did Taniqua get correct?
$\qquad$ True/False questions
13. The table shows how many hours some of the part-time employees at the toy store worked last week.

| Name | Hours Worked |
| :--- | :---: |
| Conrad | $6 \frac{2}{3}$ |
| Giovanni | $9 \frac{1}{2}$ |
| Sally | $10 \frac{3}{4}$ |

This week, Conrad will work $1 \frac{3}{4}$ times longer than last week. Giovanni will work $1 \frac{1}{3}$ times longer than last week. Sally will work $\frac{2}{3}$ the number of hours she worked last week. Match each employee's name to the number of hours he or she will work this week.

## Employee

| Conrad • | $\bullet 7 \frac{1}{6}$ |
| :--- | :--- |
| Giovanni | $\bullet 12 \frac{2}{3}$ |
| Sally | $\bullet$ |

## Hours This Week

- $7 \frac{1}{6}$
- $12 \frac{2}{3}$
- $11 \frac{2}{3}$

14. Peggy is making a quilt using panels that are $\frac{1}{2}$ foot by $\frac{1}{2}$ foot. The quilt is $5 \frac{1}{2}$ feet long and 4 feet wide.

## Part A

Let each square of the grid below represent $\frac{1}{2}$ foot by $\frac{1}{2}$ foot. Draw a rectangle on the grid to represent the quilt.


## Part B

What is the area of the quilt? Explain how you found your answer.
$\qquad$ square feet
$\square$
15. Ruby conducted a survey and found that $\frac{5}{6}$ of her classmates have a pet and $\frac{2}{3}$ of those pets are dogs. What fraction of her classmates has dogs? Write a number from the number tiles in each box to complete the calculations shown below. You may use numbers more than once or not at all.

$\qquad$ of her classmates
16. Robbie is using the recipe below to make chicken noodle soup. He plans to make 6 batches of the soup. He has $\frac{2}{3}$ teaspoon of black pepper.

## Chicken Noodle Soup

4 cups chicken broth
1 medium carrot, sliced
1 stalk celery, sliced
$\frac{1}{2}$ cup uncooked egg noodles
$\frac{1}{8}$ teaspoon ground black pepper
1 cup shredded cooked chicken

## Part A

Write an expression that Robbie can use to determine how much black pepper is needed for 6 batches.

## Part B

Draw a model to show how Robbie can find the product from Part A.


## Part C

Does Robbie have enough black pepper for 6 batches of the soup?
Explain your reasoning.

## Show What You Know

Check your understanding of important skills.
Name $\qquad$

Part of a Group Write a fraction that names the shaded part.

1. total counters $\qquad$ shaded counters $\qquad$
 fraction $\qquad$ -
2. total groups $\qquad$
shaded groups $\qquad$ fraction $\qquad$

## Relate Multiplication and Division Use inverse operations and

 fact families to solve.3. Since $6 \times 4=24$, then $\qquad$ $\div 4=6$.
4. Since $9 \times 3=$ $\qquad$ ,
5. Since $\times 8=56$,
then $\qquad$ $\div 7=8$. then $\qquad$ $\div 3=9$.
6. Since $\qquad$ $\div 4=10$,
$\qquad$ .

## Equivalent Fractions Write an equivalent fraction.

7. $\frac{16}{20}$ $\qquad$ 8. $\frac{3}{8}$ $\qquad$ 9. $\frac{5}{12}$ $\qquad$ 10. $\frac{25}{45}$
$\qquad$


## Vocabulary Builder

## Visualize It

Complete the flow map using the review words.

Inverse Operations


## Understand Vocabulary

## Complete the sentences using the review words.

1. The number that divides the dividend is the
$\qquad$ .
2. An algebraic or numerical sentence that shows that two quantities are equal is an $\qquad$ .
3. A number that names a part of a whole or a part of a group is called a $\qquad$ .
4. The $\qquad$ is the number that is to be divided in a division problem.
5. The $\qquad$ is the number, not including the remainder, that results from dividing.
$\qquad$

## Divide Fractions and Whole Numbers

Essential Question How do you divide a whole number by a fraction and divide a fraction by a whole number?

Number and Operations-Fractions-5.NF.7a, 5.NF.7b Also 5.NF.7C
MATHEMATICAL PRACTICES MP.3, MP. 5

## Investigate

Materials $■$ fraction strips
A. Mia walks a 2-mile fitness trail. She stops to exercise every $\frac{1}{5}$ mile. How many times does Mia stop to exercise?

- Draw a number line from 0 to 2 . Divide the number line into fifths. Label each fifth on your number line.

- Skip count by fifths from 0 to 2 to find $2 \div \frac{1}{5}$.

There are $\qquad$ one-fifths in 2 wholes.

You can use the relationship between multiplication and division to explain and check your solution.

- Record and check the quotient.
$2 \div \frac{1}{5}=$ $\qquad$ because $\qquad$ $\times \frac{1}{5}=2$.

So, Mia stops to exercise $\qquad$ times.
B. Roger has 2 yards of string. He cuts the string into pieces that are $\frac{1}{3}$ yard long. How many pieces of string does Roger have?

- Model 2 using 2 whole fraction strips.
- Then place enough $\frac{1}{3}$ strips to fit exactly under the 2 wholes. There are $\qquad$ one-third-size pieces in 2 wholes.
- Record and check the quotient.
$2 \div \frac{1}{3}=$ $\qquad$ because $\qquad$ $\times \frac{1}{3}=2$.

So, Roger has $\qquad$ pieces of string.

## Draw Conclusions

1. When you divide a whole number by a fraction, how does the quotient compare to the dividend? Explain.
$\qquad$
$\qquad$
2. Mastimatical (3) Apply Explain how knowing the number of fifths
in 1 could help you find the number of fifths in 2 .
$\qquad$
$\qquad$
3. Describe how you would find $4 \div \frac{1}{5}$.
$\qquad$
$\qquad$

## Make Connections

You can use fraction strips to divide a fraction by a whole number.

Calia shares half of a package of clay equally among herself and each of 2 friends. What fraction of the whole package of clay will each friend get?


STEP 1 Place a $\frac{1}{2}$ strip under a 1 -whole strip to show the $\frac{1}{2}$ package of clay.

STEP 2 Find 3 fraction strips, all with the same denominator, that fit exactly under the $\frac{1}{2}$ strip.

Each piece is $\qquad$ of the whole.

STEP 3 Record and check the quotient.


Think: How much of the whole is each piece when $\frac{1}{2}$ is divided into 3 equal pieces?
$\frac{1}{2} \div 3=$ $\qquad$ because $\qquad$ $\times 3=\frac{1}{2}$.

So, each friend will get $\qquad$ of the whole package of clay.

## Divide. Check the quotient.

1. 


$3 \div \frac{1}{3}=$ $\qquad$ because $\qquad$ $\times \frac{1}{3}=3$.
2.


Think: What label should I write for each of the smaller marks?
$3 \div \frac{1}{6}=$ $\qquad$ because
$\qquad$ $\times \frac{1}{6}=3$.
3.

$\frac{1}{4} \div 2=$ $\qquad$ because
$\qquad$ $\times 2=\frac{1}{4}$.

Divide. Draw a number line or use fraction strips.
4. $1 \div \frac{1}{3}=$ $\qquad$
5. $3 \div \frac{1}{4}=$ $\qquad$ 6. $\frac{1}{5} \div 2=$ $\qquad$

## Problem Solving • Applications

7. GDDEEPER Luke has $\frac{1}{3}$ of a package of dried apricots. He divides the dried apricots equally into 3 small bags. Luke gives one of the bags to a friend and keeps the other two bags for himself. What fraction of the original package of dried apricots did Luke keep for himself?
8. THINKSMARTER For numbers 8a-8e, select True or False for each equation.
8a. $4 \div \frac{1}{3}=\frac{1}{12}$
○ True
$\bigcirc$ False
8b. $6 \div \frac{1}{2}=12$
○ TrueFalse
8c. $\frac{1}{8} \div 2=16$
○ True
$\bigcirc$ False
8d. $\frac{1}{3} \div 4=\frac{1}{12}$
○ True
○ False
8e. $\frac{1}{5} \div 3=15$
O True
$\bigcirc$ False

## THINKSMARTER Sense or Nonsense?

9. Emilio and Julia used different ways to find $\frac{1}{2} \div 4$. Emilio used a model to find the quotient. Julia used a related multiplication equation to find the quotient. Whose answer makes sense? Whose answer is nonsense? Explain your reasoning.


Julia's Work

If $\frac{1}{2} \div 4=\square$, then $\square \times 4=\frac{1}{2}$.
I know that $\frac{1}{8} \times 4=\frac{1}{2}$.
So, $\frac{1}{2} \div 4=\frac{1}{8}$ because $\frac{1}{8} \times 4=\frac{1}{2}$.
$\frac{1}{2} \div 4=\frac{1}{4}$
Emilio's Work

$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

- For the answer that is nonsense, describe how to find the correct answer.
$\qquad$
$\qquad$

10. 

(Marinagical (5) Use a Concrete Model If you were going to find $\frac{1}{2} \div 5$, explain how you would find the quotient using fraction strips.
$\qquad$
$\qquad$
$\qquad$

## Problem Solving • Use Multiplication

Essential Question How can the strategy draw a diagram help you solve fraction division problems by writing a multiplication sentence?

Number and Operations-Fractions-5.NF.7b MATHEMATICAL PRACTICES MP.1, MP.4, MP.5, MP. 6

## Unlock the Problem

Erica makes 6 submarine sandwiches and cuts each sandwich into thirds. How many $\frac{1}{3}$-size sandwich pieces does she have?


## Read the Problem

## What do I need to find?

I need to find $\qquad$
$\qquad$
$\qquad$

## What information do I need to use?

I need to use the size of each $\qquad$ of
$\qquad$ she cuts.

## How will I use the information?

I can to
organize the information from the problem. Then I can use the organized information to find
$\qquad$
$\qquad$ -.

So, Erica has $\qquad$ one-third-size sandwich pieces. ond

## Solve the Problem

Since Erica cuts 6 submarine sandwiches, my diagram needs to show 6 rectangles to represent the sandwiches. I can divide each of the 6 rectangles into thirds.


To find the total number of thirds in the 6 rectangles, I can multiply the number of thirds in each rectangle by the number of rectangles.
$6 \div \frac{1}{3}=6 \times$ $\qquad$ $=$ $\qquad$

Explain how you can use multiplication to check your answer.

## 1. Try Another Problem

Roberto is cutting 3 blueberry pies into halves to give to his neighbors. How many neighbors will get $\frac{1}{2}$ of a pie?

## Read the Problem

Solve the Problem

What information do I need to use?

How will I use the information?

So, $\qquad$ neighbors will get $\frac{1}{2}$ of a pie.

- mathenaical (6) Explain how the diagram you drew for the division problem helps you write a multiplication sentence.


## Share and Show

## MATH <br> BOARD

1. A chef has 5 blocks of butter. Each block weighs 1 pound. She cuts each block into fourths. How many $\frac{1}{4}$-pound pieces of butter does the chef have?

First, draw rectangles to represent the blocks of butter.
Then, divide each rectangle into fourths.


Finally, multiply the number of fourths in each block by the number of blocks.

So, the chef has $\qquad$ one-fourth-pound pieces of butter.
2. What if the chef had 3 blocks of butter and cut the blocks into thirds? How many $\frac{1}{3}$-pound pieces of butter would the chef have?
3. Holly cuts 3 ribbons into eighths for a craft project. How many $\frac{1}{8}$-size pieces of ribbon does she have?
4. Jason has 2 pizzas that he cuts into fourths. How many $\frac{1}{4}$-size pizza slices does he have?
$\qquad$
5. Thomas makes 5 sandwiches that he cuts into thirds. How many $\frac{1}{3}$-size sandwich pieces does he have?

## On Your Own

6. THINKSMARTER Julie wants to make a drawing that is $\frac{1}{4}$ the size of the original drawing. Sahil makes a drawing that is $\frac{1}{3}$ the size of the original. A tree in the original drawing is 12 inches tall. What will be the difference between the height of the tree in Julie's and Sahil's drawings?

7. Three friends go to a book fair. Allen spends $\$ 2.60$. Maria spends 4 times as much as Allen. Akio spends $\$ 3.45$ less than Maria. How much does Akio spend?
$\qquad$
8. GロDEEPER Brianna has a sheet of paper that is 6 feet long. She cuts the length of paper into sixths and then cuts the length of each of these $\frac{1}{6}$ pieces into thirds. How many pieces does she have? How many inches long is each piece?
$\qquad$
9. Mathemaical 8 Use Repeated Reasoning Look back at Problem 8. Write a similar problem by changing the length of the paper and the size of the pieces.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
Personal Math Trainer
10. IHINKSMARTER Adrian made 3 granola bars. He cut each bar into fourths. How many $\frac{1}{4}$-size pieces of granola bar does Adrian have? Draw lines in the model to find the answer.


Adrian has $\qquad$ one-quarter-size pieces of granola bar.
$\qquad$

## Connect Fractions to Division

Essential Question How does a fraction represent division?

Number and Operations-Fractions-5.NF. 3
mathematical practices MP.2, MP.5, MP.6, MP. 7

CONNECT A fraction can be written as a division problem.

$$
\frac{3}{4}=3 \div 4 \quad \frac{12}{2}=12 \div 2
$$

## Unlock the Problem

There are 3 students in a crafts class and 2 sheets of construction paper for them to share equally. What part of the construction paper will each student get?

- Circle the dividend.
- Underline the divisor.

(1)

## Use a drawing.

Divide. $2 \div 3$

STEP 1 Draw lines to divide each piece of paper into 3 equal pieces.


Each student's share of one sheet of construction paper is $\qquad$ .

STEP 2 Count the number of thirds each student will get. Since there are 2 sheets of construction paper, each student will
get 2 of the $\qquad$ , or $2 \times$ $\qquad$ .

STEP 3 Complete the number sentence.
$2 \div 3=$
$\qquad$
STEP 4 Check your answer.

Since $\qquad$ $\times$ $\qquad$ $=$ $\qquad$ the quotient is correct.
quotient divisor dividend

So, each student will get $\qquad$ of a sheet of construction paper.

## (1) Example

Four friends share 6 sheets of poster board equally. How many sheets of poster board does each friend get?

Divide. $6 \div 4$
STEP 1 Draw lines to divide each of the 6 sheets into fourths.
Each friend's share of 1 sheet is $\qquad$ .

STEP 2 Count the number of fourths each friend gets. Since
STEP 2 Count the number of fourths each friend gets. Since
there are 6 sheets of poster board, each friend will get $\qquad$ of the fourths, or

STEP 3 Complete the number sentence. Write the fraction as a mixed number in simplest form.

$\qquad$


$$
6 \div 4=- \text {, or }
$$



STEP 4 Check your answer.
Since $\qquad$ $\times 4=$ $\qquad$ the quotient is correct.

So, each friend will get $\qquad$ sheets of poster board.

## Try This!

Ms. Ruiz has a piece of string that is 125 inches long. For a science experiment, she divides the string equally among 8 groups of students.
How much string will each group get?
You can represent this problem as a division equation or a fraction.

- Divide. Write the remainder as a fraction. $125 \div 8=$ $\qquad$
- Write $\frac{125}{8}$ as a mixed number in simplest form. $\frac{125}{8}=$ $\qquad$
So, each group will get $\qquad$ inches of string.
- Martimatical (1) Evaluate Explain why $125 \div 8$ gives the same result as $\frac{125}{8}$.
$\qquad$
$\qquad$


## Share and Show

## Draw lines on the model to complete the number sentence.

1. Six friends share 4 small pizzas equally.

$4 \div 6=$ $\qquad$

Each friend's share is $\qquad$ of a pizza.
2. Four brothers share 5 packs of stickers equally.

$5 \div 4=$ $\qquad$

Each brother's share is $\qquad$ packs of stickers.

## Complete the number sentence to solve.

3. Twelve friends share 3 melons equally. What fraction of a melon does each friend get?
$3 \div 12=$ $\qquad$
Each friend's share is $\qquad$ of a melon.
4. Three students share 8 blocks of clay equally. How much clay does each student get?
$8 \div 3=$ $\qquad$

Each student's share is $\qquad$ blocks of clay.

Mathematical Practices
Explain how you can check your answer.

## Complete the number sentence to solve.

5. Four students share 7 feet of ribbon equally. How many feet of ribbon does each student get?
$7 \div 4=$ $\qquad$
Each student's share is $\qquad$ feet of ribbon.
6. Eight girls share 5 fruit bars equally. What fraction of a fruit bar does each girl get?
$5 \div 8=$ $\qquad$

Each girl's share is $\qquad$ of a fruit bar.
7. THINKSMARTER Eight students share 12 mini oatmeal muffins equally and 6 students share 15 mini apple muffins equally. Carmine is in both groups of students. What is the total number of mini muffins Carmine gets?


## Problem Solving • Applications (egald

8. Shawna has 3 adults and 2 children coming over. She is going to serve 2 small apple pies. If she plans to give each person, including herself, an equal amount of pie, how much pie will each person get?
9. $\operatorname{G\square DEEPER}$ Addison brought 9 pounds of oranges and 7 pounds of cherries to make fruit salad for a fund raiser. She wants to package an equal amount of fruit salad into each of 12 containers. How much fruit salad should Addison put in each container?
10. (marifmaitcal (2) Use Reasoning Nine friends order 4 large pizzas. Four of the friends share 2 pizzas equally and the other 5 friends share 2 pizzas equally. In which group does each member get a greater amount of pizza? Explain your reasoning.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
11. THINKSMARTER Jason has 5 zucchinis he grew in his garden. He wants to share them equally among 3 of his neighbors. How many zucchinis will each neighbor get? Use the numbers to complete the number sentence. You may use a number more than once or not at all.


$\qquad$

## (V) Mid-Chapter Checkpoint

## Concepts and Skills

1. Explain how you can tell, without computing, whether the quotient
$\frac{1}{2} \div 6$ is greater than 1 or less than 1. (5.NF.7a, 5.NF.7b)

Divide. Draw a number line or use fraction strips. (5.NF.7a, 5.NF.7b)
2. $3 \div \frac{1}{2}=$ $\qquad$ 3. $1 \div \frac{1}{4}=$ $\qquad$ 4. $\frac{1}{2} \div 2=$ $\qquad$
5. $\frac{1}{3} \div 4=$
$\qquad$ 6. $2 \div \frac{1}{6}=$ $\qquad$
7. $\frac{1}{4} \div 3=$ $\qquad$

## Complete the number sentence to solve. (5.NF.3)

8. Two students share 3 granola bars equally. How many granola bars does each student get?
$3 \div 2=$ $\qquad$
Each student's share is $\qquad$ granola bars.
9. Nine boys share 4 pizzas equally. What fraction of a pizza does each boy get?
$4 \div 9=$ $\qquad$
Each boy's share is $\qquad$ of a pizza.
10. Five girls share 4 sandwiches equally. What fraction of a sandwich does each girl get?
$4 \div 5=$ $\qquad$
Each girl's share is $\qquad$ of a sandwich.
11. Four friends share 10 fruit bars equally. How many fruit bars does each friend get?
$10 \div 4=$ $\qquad$
Each friend's share is $\qquad$ fruit bars.
12. Mateo has 8 liters of punch for a party. Each glass holds $\frac{1}{5}$ liter of punch. How many glasses can Mateo fill with punch? (5.NF.7b)

13. Four friends share 3 sheets of construction paper equally. What fraction of a sheet of paper does each friend get? (5.NF.3)

14. Caleb and 2 friends are sharing $\frac{1}{2}$ quart of milk equally. What fraction of a quart of milk does each of the 3 friends get? (5.Nf.7a)
15. Makayla has 3 yards of ribbon to use for a craft project. She cuts the ribbon into pieces that are $\frac{1}{4}$ yard long. How many pieces of ribbon does Makayla have? (5.NF.7b)
$\qquad$

## Fraction and Whole-Number Division

Essential Question How can you divide fractions by solving a related multiplication sentence?

Number and Operations-Fractions-5.NF.7c
Also 5.NF.7a, 5.NF.7b
MATHEMATICAL PRACTICES
MP.3, MP. 5

## Unlock the Problem

Three friends share a $\frac{1}{4}$-pound package of beads equally. What fraction of a pound of beads does each friend get?
(Divide. $\frac{1}{4} \div 3$

- Let the rectangle represent 1 pound of beads. Divide the rectangle into fourths and then divide each fourth into three equal parts.

The rectangle is now divided into $\qquad$ equal parts.

- When you divide one fourth into 3 equal parts, you are finding one of three equal parts or $\frac{1}{3}$ of $\frac{1}{4}$. Shade $\frac{1}{3}$ of $\frac{1}{4}$.

The shaded part is $\qquad$ of the whole rectangle.

- Complete the number sentence.

So, each friend gets $\qquad$ of a pound of beads.

## 1. Example

Brad has 9 pounds of ground turkey to make turkey burgers for a picnic. How many $\frac{1}{3}$-pound turkey burgers can he make?

- Will the number of turkey burgers be less than or greater than 9 ?

Divide. $9 \div \frac{1}{3}$

- Draw 9 rectangles to represent each pound of ground turkey. Divide each rectangle into thirds.
- When you divide the $\qquad$ rectangles into thirds, you are finding the number of thirds in 9 rectangles or finding 9 groups of $\qquad$ . There are $\qquad$ thirds.

- Complete the number sentence.
$9 \div \frac{1}{3}=$ $\qquad$ $\times$ $\qquad$
$\qquad$

So, Brad can make $\qquad$ one-third-pound turkey burgers.
connect You have learned how to use a model and write a multiplication sentence to solve a division problem.

## (1) Examples

(A) $\frac{1}{4} \div 2=\frac{1}{8} \quad \frac{1}{2} \times \frac{1}{4}=\frac{1}{8}$

(B) $4 \div \frac{1}{2}=8$ $4 \times 2=8$


1. Look at Example A. Describe how the model shows that dividing by 2 is the same as multiplying by $\frac{1}{2}$.
$\qquad$
$\qquad$
2. Look at Example B. Describe how the model shows that dividing by $\frac{1}{2}$ is the same as multiplying by 2 .
$\qquad$
$\qquad$

When you divide by whole numbers greater than 1 , the quotient is always less than the dividend. For example, the quotient for $6 \div 2$ is less than 6 and the quotient for $2 \div 3$ is less than 2 . Learn below how the quotient compares to the dividend when you divide fractions and whole numbers.

## Try This!

For the two expressions below, which will have a quotient that is greater than its dividend? Explain.

$$
\frac{1}{2} \div 3 \quad 3 \div \frac{1}{2}
$$

So, when I divide a fraction by a whole number greater than 1 , the quotient
is $\qquad$ the dividend. When I divide a whole number by a
fraction less than 1 , the quotient is $\qquad$ the dividend.

## Share and Show

1. Use the model to complete the number sentence.

$2 \div \frac{1}{4}=2 \times$ $\qquad$ $=$ $\qquad$

## On Your Own

Write a related multiplication sentence to solve.
4. $\frac{1}{3} \div 4$
5. $\frac{1}{4} \div 12$
6. $6 \div \frac{1}{5}$
 that dividing by 2 is the same as finding $\frac{1}{2}$ of $\frac{1}{4}$.
$\qquad$
$\qquad$
$\frac{1}{4} \div 2=\frac{1}{8}$

$\qquad$
9. FIDEEPER Mrs. Lia has 12 pounds of modeling clay. She divides the clay into $\frac{1}{2}$-pound blocks. If Mrs. Lia sets aside 6 of the blocks and gives the rest to the students in her art class, how many $\frac{1}{2}$-pound blocks of clay does Mrs. Lia give to her class?

## Unlock the Problem

10. THINKSMARTER The slowest mammal is the three-toed sloth. The top speed of a three-toed sloth on the ground is about $\frac{1}{4}$ foot per second. The top speed of a giant tortoise on the ground is about $\frac{1}{3}$ foot per second.
How much longer would it take a three-toed
 sloth than a giant tortoise to travel 10 feet on the ground?

a. What do you need to find? $\qquad$
$\qquad$
b. What operations will you use to solve the problem? $\qquad$
$\qquad$
c. Show the steps you used to solve the problem.
d. Complete the sentences.

A three-toed sloth would travel 10 feet in
$\qquad$ seconds.

A giant tortoise would travel 10 feet in
$\qquad$ seconds.

Since $\qquad$ - $\qquad$ $=$ $\qquad$ ,
it would take a three-toed sloth
$\qquad$ seconds longer to travel 10 feet.

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11. THINKSMARTER Jamie has a striped fabric that is 5 yards long and a solid fabric that is 4 yards long. She cuts the striped fabric into equal pieces that are $\frac{1}{4}$ yard long and the solid fabric into equal pieces that are $\frac{1}{3}$ yard long. How many more pieces of striped fabric does she have than pieces of solid fabric? Explain how you solved the problem.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Interpret Division with Fractions

Essential Question How can you use diagrams, equations, and story problems to represent division?

Number and Operations-
Fractions-5.NF.7a, 5.NF.7b
Also 5.NF.7c
MATHEMATICAL PRACTICES
MP.2, MP. 5

## Unlock the Problem

Elisa has 6 cups of raisins. She divides the raisins into $\frac{1}{4}$-cup servings. How many servings does she have?

- How many $\frac{1}{4}$-cups are in 1 cup?

You can use diagrams, equations, and story problems to represent division.

- How many cups does Elisa have?

0
Draw a diagram to solve.

- Draw 6 rectangles to represent the cups of raisins. Draw lines to divide each rectangle into fourths.
- To find $6 \div \frac{1}{4}$, count the total number of fourths in the 6 rectangles.
$6 \div$ $\qquad$ $=$ $\qquad$

So, Elisa has $\qquad$ servings.

## (1) Example 1 Write an equation to solve.

Four friends share $\frac{1}{4}$ of a gallon of orange juice. What fraction of a gallon of orange juice does each friend get?

## STEP 1

Write an equation.
$\frac{1}{4} \div$ $\qquad$ $=n$

So, each friend will get $\qquad$ of a gallon of orange juice.


1) Example 2

Write a story problem. Then draw a diagram to solve.
$4 \div \frac{1}{3}$
STEP 1 Choose the item you want to divide.
Think: Your problem should be about how many groups of $\frac{1}{3}$ are in 4 wholes.

Possible items: 4 sandwiches, 4 feet of ribbon, 4 apples

STEP 2 Write a story problem to represent $4 \div \frac{1}{3}$ using the item you chose. Describe how it is divided into thirds. Then ask how many thirds there are.
$\qquad$


STEP 3 Draw a diagram to solve.
$4 \div \frac{1}{3}=$ $\qquad$
(1) Example 3 write a story problem. Then draw a diagram to solve. $\frac{1}{2} \div 5$

STEP 1 Choose the item you want to divide.
Think: Your problem should describe $\frac{1}{2}$ of an item that can be divided into 5 equal parts.

Possible items: $\frac{1}{2}$ of a pizza, $\frac{1}{2}$ of a yard of rope, $\frac{1}{2}$ of a gallon of milk

STEP 2 Write a story problem to represent $\frac{1}{2} \div 5$ using the item you chose. Describe how it is divided into 5 equal parts. Then ask about the size of each part.
$\qquad$
$\qquad$
$\qquad$

STEP 3 Draw a diagram to solve.
$\frac{1}{2} \div 5=$ $\qquad$
Mathematical Practices
Explain how you decided what type of diagram to draw for your problem.

## Share and Show

## MATH <br> BOARD

1. Complete the story problem to represent $3 \div \frac{1}{4}$.

Carmen has a roll of paper that is $\qquad$ feet long. She cuts
the paper into pieces that are each $\qquad$ foot long. How many pieces of paper does Carmen have?
2. Draw a diagram to represent the problem. Then solve.

April has 6 fruit bars. She cuts the bars into halves. How many $\frac{1}{2}$-size bar pieces does she have?
3. Write an equation to represent the problem. Then solve.

Two friends share $\frac{1}{4}$ of a large peach pie. What fraction of the whole pie does each friend get?

## On Your Own

4. THINKSMARTER Write an equation to represent the problem. Then solve.

Benito has $\frac{1}{3}$ kilogram of grapes. He divides the grapes equally into 3 bags. What fraction of a kilogram of grapes is in each bag?
$\qquad$

5. GロDEEPER Draw a diagram to represent the problem. Then solve.

Sonya has 5 sandwiches. She cuts each sandwich into fourths and gives away 6 pieces. How many $\frac{1}{4}$-size sandwich pieces does she have now?
6. Mandientical (2) Represent a Problem Write a story problem to
represent $2 \div \frac{1}{8}$. Then solve.

## Problem Solving • Applications

## THINK SMARTIER/ Pose a Problem

7. Amy wrote the following problem to represent $4 \div \frac{1}{6}$.

Jacob has a board that is 4 feet long. He cuts the board into pieces that are each $\frac{1}{6}$ foot long. How many pieces does Jacob have now?

Then Amy drew this diagram to solve her problem.


So, Jacob has 24 pieces.
Write a new problem using a different item to be divided and different fractional pieces. Then draw a diagram to solve your problem.

Pose a problem.
$\qquad$

Draw a diagram to solve your problem.
8. THINK SMARIER Melvin has $\frac{1}{4}$ gallon of fruit punch. He shares the punch equally with each of 2 friends and himself. Which equation represents the fraction of a gallon of punch that each of the 3 friends will get? Mark all that apply.
(A) $\frac{1}{4} \div \frac{1}{3}=n$
(C) $3 \div \frac{1}{4}=n$
(E) $\frac{1}{4} \div 3=n$
(B) $\frac{1}{4} \times \frac{1}{3}=n$
(D) $3 \div 4=n$
(F) $3 \times \frac{1}{4}=n$

## (V) Chapter 8 Review/Test

1. A builder has an 8 -acre plot divided into $\frac{1}{4}$-acre home sites. How many $\frac{1}{4}$-acre home sites are there?

2. For numbers $2 \mathrm{a}-2 \mathrm{e}$, select True or False for each equation.
2a. $3 \div \frac{1}{4}=\frac{1}{12}$
○ True
O False
2b. $7 \div \frac{1}{2}=14$
O True
O False
2c. $\frac{1}{5} \div 4=20$
O True
O False
2d. $\frac{1}{2} \div 5=\frac{1}{10}$
○ True
False
2e. $\frac{1}{7} \div 3=21$
O True
False
3. Twelve pounds of beans are distributed equally into 8 bags to give out at the food bank. How many pounds of beans are in each bag?
$\qquad$ pounds
4. Gabriel made 4 small meatloaves. He cut each meatloaf into fourths.

How many $\frac{1}{4}$-size pieces of meatloaf does Gabriel have? Draw lines in the model to find the answer.

5. Five friends share 3 bags of trail mix equally. What fraction of a bag of trail mix does each friend get?
$\square$
6. Landon and Colin bought $\frac{1}{2}$ pound of strawberries. They are sharing the strawberries equally. Each person will receive $\square$ pound of strawberries.
7. Choose the numbers to create a story problem that represents $4 \div \frac{1}{3}$.

8. A giant tortoise can walk about $\frac{1}{10}$ meter per second on land. A cooter turtle can walk about $\frac{1}{2}$ meter per second on land.

## Part A

How long would it take a giant tortoise to travel 5 meters? Show your work.
$\square$

## Part B

How much longer would it take a giant tortoise than a cooter turtle to travel 10 meters on land? Explain how you found your answer.
$\square$

## Name

9. Camilla has a $\frac{1}{2}$ pound of raisins that she will divide evenly into 5 bags. Shade the diagram to show the fractional part of a pound that will be in each bag.

10. Mrs. Green wrote the following problem on the whiteboard:

Lisa and Frank shared $\frac{1}{3}$ pound of cherries equally. What fractional part of a pound did each person receive?

## Part A

Molly wrote the following equation to solve the problem: $2 \div \frac{1}{3}=n$.
Do you agree with Molly's equation? Support your answer with information from the problem.


## Part B

Noah drew this diagram to solve the problem. Can Noah use his diagram to find the fractional part of a pound of cherries that each person received? Support your answer with information from the problem.

11. Divide. Draw a number line to show your work.
$2 \div \frac{1}{3}=\square$
$\square$
12. Zoe has 5 cucumbers she grew in her garden. She wants to share them equally among 4 of her neighbors. How many cucumbers will each neighbor receive? Use the numbers on the tiles to complete the number sentence. You may use a number more than once or not at all.

13. Dora buys one package each of 1-pound, 2-pound, and 4-pound packages of ground beef to make hamburgers.

How many $\frac{1}{4}$-pound hamburgers can she make? Show your work using words, pictures, or numbers.

14. Adan has $\frac{1}{2}$ quart of milk. If he pours the same amount of milk into 3 glasses, each glass will contain $\square$ quart of milk.
15. Nine friends share 3 pumpkin pies equally. What fraction of a pumpkin pie does each friend get?
Each friend will get $\square$ of a pumpkin pie.

Name
16. Jesse is making a pitcher of fruit smoothies that contains 3 cups of orange juice. His measuring cup only holds $\frac{1}{4}$ cup. How many times will Jesse need to fill the measuring cup to get the 3 cups of orange juice?
$\square$
17. Kayleigh has $\frac{1}{4}$-cup of oil. She pours the same amount into each of 2 oil lamps. Which equation represents the fraction of a cup of oil that is in each oil lamp? Mark all that apply.
(A) $\frac{1}{2} \div \frac{1}{4}=n$
(B) $\frac{1}{4} \times \frac{1}{2}=n$
(C) $2 \div \frac{1}{4}=n$
(D) $4 \div 2=n$
(E) $\frac{1}{4} \div 2=n$
(F) $2 \times \frac{1}{4}=n$
18. Brendan made a loaf of bread. He gave equal portions of $\frac{1}{2}$ of the loaf of bread to 6 friends. Which diagram could Brendon use to find the fraction of the loaf of bread that each friend received? Mark all that apply.
(A)

(B)

(C)

(D)

19. Your teacher gives you the problem $6 \div \frac{1}{5}$.

## Part A

Draw a diagram to represent $6 \div \frac{1}{5}$.
$\square$

## Part B

Write a story problem to represent $6 \div \frac{1}{5}$.
$\square$

## Part C

Use a related multiplication expression to solve your story problem.
Show your work.
$\square$
20. Seven friends picked 7 quarts of blueberries. Three of the friends will share 4 quarts of blueberries equally and the other 4 friends will share 3 quarts of the blueberries equally. In which group does each friend get a greater amount of blueberries? Explain your reasoning.
$\square$

## crivical area Ceometry and Measurement

mos

CRITICAL AREA Developing understanding of volume


## Project

## Space Architecture

NASA's Lunar Architecture Team develops ideas for rovers and space habitats. A space habitat is made up of modules linked by airlocks. Airlocks are double doors that allow people to move between the modules without losing atmosphere.

## Get Started

Work with a partner to design a space habitat made up of 3 modules. The Important Facts name some modules that you can choose for your design. Cut out, fold, and tape the patterns for each of the modules that you have selected, and for the measuring cube.

Use a formula to find the volume of the measuring cube in cubic centimeters. Estimate the volume of each module by filling it with rice, then pouring the rice into the measuring cube. Let every cubic centimeter in the measuring cube represent 32 cubic feet. Determine what the volume of your space habitat would be in cubic feet.

Connect the modules to complete your space habitat.
$\qquad$
Completed by


## 9 Algebrat Patems and Grophing

## Show What You Know

Check your understanding of important skills.
Name $\qquad$
$>$ Read and Use a Bar Graph Use the graph to answer the questions.

1. Which fruit received the most votes?
2. Which fruit received 5 votes? $\qquad$
3. There were $\qquad$ votes in all.

## Extend Patterns Find the missing numbers. Then write a description for each pattern.


4. $0,5,10,15$, $\qquad$ , ,
description: $\qquad$
6. $12,18,24,30$, $\qquad$ , $\qquad$ , $\qquad$
5. $70,60,50,40$, $\qquad$ , $\qquad$ , $\qquad$
description: $\qquad$
7. $150,200,250,300$, $\qquad$ , $\qquad$ ,
description: $\qquad$
8. $200,180,160,140$, $\qquad$ , $\qquad$ ,
description: $\qquad$

Be a math detective by graphing and connecting the map coordinates to locate the secret documents in the lost briefcase.
$(3,3),(4,2),(4,4),(5,3)$


## Vocabulary Builder

## Visualize It

## Use the checked words to complete the tree map.



## Understand Vocabulary

## Complete the sentences using the preview words.

1. A graph that uses line segments to show how data changes over time is called a $\qquad$ .
2. The pair of numbers used to locate points on a grid is an $\qquad$ .
3. The point, $(0,0)$, also called the $\qquad$ , is where the $x$-axis and the $y$-axis intersect.
4. On a coordinate grid, the horizontal number line is the $\qquad$ and the vertical number line is the $\qquad$ .
5. The first number in an ordered pair is the $\qquad$ and the second number in an ordered pair is the $\qquad$ .
6. The difference between the values on the scale of a graph
is an $\qquad$ .
$\qquad$

## Line Plots

Essential Question How can a line plot help you find an average with data given in fractions?

Measurement and Data-5.MD. 2 Also 5.OA. 1
mathematical practices MP.2, MP.4, MP. 7

## Unlock the Problem

Students have measured different amounts of water into beakers for an experiment. The amount of water in each beaker is listed below.
$\frac{1}{4}$ cup, $\frac{1}{4}$ cup, $\frac{1}{2}$ cup, $\frac{3}{4}$ cup, $\frac{1}{4}$ cup, $\frac{1}{4}$ cup, $\frac{1}{4}$ cup, $\frac{1}{2}$ cup, $\frac{1}{4}$ cup, $\frac{3}{4}$ cup, $\frac{1}{4}$ cup, $\frac{3}{4}$ cup

If the total amount of water stayed the same, what would be the average amount of water in a beaker?


Water Used (in cups)

STEP 1 Count the number of cups for each amount. Draw an $X$ for the number of times each amount is recorded to complete the line plot.

$$
\frac{1}{4}:-\frac{1}{2}:-\frac{3}{4}:
$$

$\qquad$

STEP 3 Find the total amount of water in all of the beakers that contain $\frac{1}{2}$ cup of water.

There are $\qquad$ beakers with $\frac{1}{2}$ cup of water. So, there are $\qquad$ halves, or

$$
\text { _, or } 1 \text { cup. }
$$

STEP 5 Add to find the total amount of water in all of the beakers.

$$
1 \frac{3}{4}+1+2 \frac{1}{4}=
$$

$\qquad$

So, the average amount of water in a beaker is

STEP 2 Find the total amount of water in all of the beakers that contain $\frac{1}{4}$ cup of water.

There are $\qquad$ beakers with $\frac{1}{4}$ cup of water. So, there are $\qquad$ fourths, or cups.

STEP 4 Find the total amount of water in all of the beakers that contain $\frac{3}{4}$ cup of water.

$$
3 \times \frac{3}{4}=- \text { or }
$$

STEP 6 Divide the sum you found in Step 5 by the number of beakers to find the average.

$$
5 \div 12=\square
$$

$\qquad$ cup.

## Try This!

You can use the order of operations to find the average. Solve the problem as a series of expressions that use parentheses and brackets to separate them. Perform operations from inside the parentheses to the outer brackets.
$\left[\left(7 \times \frac{1}{4}\right)+\left(2 \times \frac{1}{2}\right)+\left(3 \times \frac{3}{4}\right)\right] \div 12 \quad$ Perform the operations inside the parentheses.

$\div 12$

Next, perform the operations in the brackets.

Divide.

Write the expression as a fraction.

## 1. Example

Raine divides three 2-ounce bags of rice into smaller bags. The first bag is divided into bags weighing $\frac{1}{6}$-ounce each, the second bag is divided into bags weighing $\frac{1}{3}$-ounce each, and the third bag is divided into bags weighing $\frac{1}{2}$-ounce each.


Find the number of $\frac{1}{6} ; \frac{1}{3}$-, and $\frac{1}{2}$-ounce rice bags.
Then graph the results on the line plot.
STEP 1 Write a title for your line plot. It should describe what you are counting.

STEP 2 Label $\frac{1}{6}, \frac{1}{3}$, and $\frac{1}{2}$ on the line plot to show the different amounts into which the three 2 -ounce bags of rice are divided.

STEP 3 Use division to find the number of $\frac{1}{6}$-ounce, $\frac{1}{3}$-ounce, and $\frac{1}{2}$-ounce bags that were made from the three original 2 -ounce bags of rice.
$2 \div \frac{1}{6}$
$2 \div \frac{1}{3}$
$2 \div \frac{1}{2}$
$2 \times=$
$2 \times=$
$2 \times=$


STEP 4 Draw an $X$ above $\frac{1}{6}, \frac{1}{3}$, or $\frac{1}{2}$ to show the number of rice bags.

Explain why there are more $\frac{1}{6}$-ounce rice bags than $\frac{1}{2}$-ounce rice bags.

## Share and Show

## MATH

BOARD
Use the data to complete the line plot. Then answer the questions.
Liliana needs to buy beads for a necklace. The beads are sold by mass. She sketches a design to determine what beads are needed, and then writes down their sizes. The sizes are shown below.

$$
\begin{aligned}
& \frac{2}{5} \mathrm{~g}, \frac{2}{5} \mathrm{~g}, \frac{4}{5} \mathrm{~g}, \frac{2}{5} \mathrm{~g}, \frac{1}{5} \mathrm{~g}, \frac{1}{5} \mathrm{~g}, \frac{3}{5} \mathrm{~g}, \\
& \frac{4}{5} \mathrm{~g}, \frac{1}{5} \mathrm{~g}, \frac{2}{5} \mathrm{~g}, \frac{3}{5} \mathrm{~g}, \frac{3}{5} \mathrm{~g}, \frac{2}{5} \mathrm{~g}
\end{aligned}
$$

1. What is the combined mass of the beads with a mass of $\frac{1}{5}$ gram?

Think: There are $\qquad$ Xs above $\frac{1}{5}$ on the line plot, so the combined mass of the beads
 is $\qquad$ fifths, or $\qquad$ gram.
2. What is the combined mass of all the beads with a mass of $\frac{2}{5}$ gram?
3. What is the combined mass of all the beads on the necklace?
4. What is the average mass of the beads on the necklace?
$\qquad$

## On Your Own

## Use the data to complete the line plot. Then answer the questions.

A breakfast chef used different amounts of milk when making pancakes, depending on the number of pancakes ordered. The results are shown below.


Milk in Pancake Orders (in cups)
5. How much milk combined is used in
$\frac{1}{2}$-cup amounts? $\qquad$
7. GПDEEPER How many more orders of pancakes used $\frac{1}{2}$ cup of milk than $\frac{1}{4}$ cup and $\frac{3}{4}$ cup of milk combined?
6. THINKSMARTER What is the average amount of milk used for an order of pancakes? $\qquad$
8.


Describe an amount you could add to the data that would make the average increase.

## Unlock the Problem

9. 

(Mariswical (1) Make Sense of Problems For 10 straight days, Samantha measured the amount of food that her cat Dewey ate, recording the results, which are shown below. Graph the results on the line plot. What is the average amount of cat food that Dewey ate daily?

$$
\frac{1}{2} c, \frac{3}{8} c, \frac{5}{8} c, \frac{1}{2} c, \frac{5}{8} c, \frac{1}{4} c, \frac{3}{4} c, \frac{1}{4} c, \frac{1}{2} c, \frac{5}{8} c
$$



Amount of Cat Food Eaten (in cups)
a. What do you need to know? $\qquad$
$\qquad$
b. How can you use a line plot to organize the information?
$\qquad$
$\qquad$
c. What steps could you use to find the average amount of food that Dewey ate daily?
$\qquad$
$\qquad$
d. Fill in the blanks for the totals of each amount measured.

| $\frac{1}{4}$ cup: | $\frac{5}{8}$ cup: |
| :--- | :--- |
| $\frac{3}{8}$ cup: |  |
| $\frac{3}{2}$ cup:cup: |  |

e. Find the total amount of cat food eaten over 10 days.

$$
\begin{aligned}
& Z^{+} Z^{+} Z^{+} Z^{+}+ \\
& \\
& =
\end{aligned}
$$

So, the average amount was $\qquad$ .
10. THINKSMARTER Maya measured the heights of the seedlings she is growing. The heights were $\frac{3}{4} \mathrm{in}$., $\frac{7}{8} \mathrm{in}$., $\frac{1}{2}$ in., $\frac{3}{4}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in., $\frac{7}{8}$ in., $\frac{5}{8}$ in., $\frac{1}{2}$ in., and $\frac{3}{4}$ in. Organize the information in a line plot.

What is the average height of the seedlings? $\qquad$ inch

## Name

## Ordered Pairs

Essential Question How can you identify and plot points
on a coordinate grid?

CONNECT Locating a point on a coordinate grid is similar to describing directions using North-South and West-East. The horizontal number line on the grid is the $\boldsymbol{x}$-axis. The vertical number line on the grid is the $\boldsymbol{y}$-axis.

Each point on the coordinate grid can be described by an ordered pair of numbers. The $\boldsymbol{x}$-coordinate is the first number in the ordered pair. It is the horizontal location, or the distance the point is from 0 in the direction of the $x$-axis. The $y$-coordinate is the second number in the ordered pair. It is the vertical location, or the distance the point is from 0 in the direction of the $y$-axis.


Geometry-5.G. 1 MATHEMATICAL PRACTICES
MP.4, MP. 5


The $x$-axis and the $y$-axis intersect at the point $(0,0)$, called the origin.

## Unlock the Problem

©Write the ordered pairs for the locations of the arena and the aquarium.

Locate the point for which you want to write an ordered pair.
Look below at the $x$-axis to identify the point's horizontal distance from 0 , which is its $x$-coordinate.

Look to the left at the $y$-axis to identify the point's vertical distance from 0 , which is its $y$-coordinate.

So, the ordered pair for the arena is $(3,2)$ and the ordered pair for the aquarium
is $($ $\qquad$ , $\qquad$ ).


- Describe the path you would take to get from the origin to the aquarium, using horizontal, then vertical movements.
$\qquad$
$\qquad$
Use the $x$ - and $y$-coordinates to describe the distance of the point $(3,2)$ from the $x$ - and $y$-axes.


## () Example1 Use the graph.

A point on a coordinate grid can be labeled with an ordered pair, a letter, or both.

A Plot the point $(5,7)$ and label it $J$.
From the origin, move right 5 units and then up 7 units.

Plot and label the point.

## B Plot the point $(8,0)$ and label it $S$.

From the origin, move right $\qquad$ units and then up $\qquad$ units.

Plot and label the point.


## 1. Example 2 <br> Find the distance between two points.

You can find the distance between two points when the points are along the same horizontal or vertical line.

- Draw a line segment to connect point $A$ and point $B$.
- Count vertical units between the two points.

There are $\qquad$ units between points $A$ and $B$.

1. Points $A$ and $B$ form a vertical line segment and have the same $x$-coordinates. How can you use subtraction to find the distance between the points?
$\qquad$
$\qquad$

$\qquad$
$\qquad$
2. Graph the points $(3,2)$ and $(5,2)$. Explain how you can use subtraction to find the horizontal distance between these two points.
$\qquad$

## Share and Show

## MATH BOARD

Use Coordinate Grid A to write an ordered pair for the given point.

1. $C$ $\qquad$
2. $D$ $\qquad$
3. $E$ $\qquad$ 4. $F$ $\qquad$

Plot and label the points on Coordinate Grid A.
5. $M(0,9)$
6. $H(8,6)$
7. $K(10,4)$
8. $T(4,5)$
9. $W(5,10)$
10. $R(1,3)$

Coordinate Grid A


## On Your Own

Use Coordinate Grid B to write an ordered pair for the given point.
11. $G$ $\qquad$ 12. $H$ $\qquad$
13. I $\qquad$ 14. $J$ $\qquad$
15. $K$ $\qquad$ 16. $L$ $\qquad$

Plot and label the points on Coordinate Grid B.
17. $W(8,2)$
18. $E(0,4)$
19. $X(2,9)$
20. $B(3,4)$
21. $R(4,0)$
22. $F(7,6)$
23. $T(5,7)$
24. $A(7,1)$

Coordinate Grid B

25. WRITE Math Explain how to find the distance between point $F$ and point $A$.

## Problem Solving • Applications

Nathan and his friends are planning a trip to New York City. Use the map for 26-30. Each unit represents 1 city block.
26. What ordered pair gives the location of Bryant Park?
27.
 Use Graphs The Empire State Building is located 5 blocks right and 1 block up from ( 0,0 ). Write the ordered pair for this location. Plot and label a point for the Empire State Building.

28. THINKSMARTER What's the Error? Nathan says that Madison Square Garden is located at $(0,3)$ on the map. Is his ordered pair correct? Explain.

29. GロDEEPER Paulo walks from point $B$ to Bryant Park. Raul walks from point $B$ to Madison Square Garden. If they only walk along the grid lines, who walks farther? Explain.
$\qquad$
$\qquad$
Personal Math Trainer
30. THINKSMARTER Look at the map of New York City above. Suppose a subway station is located at $(6,5)$. Which of the following accurately describes the location of the subway station? Mark all that apply.
(A) The station is 2 blocks right and 3 blocks down from Bryant Park.
(B) The station is 4 blocks right and 1 block down from point $B$.
(C) The station is 1 block right and 3 blocks down from the library.
(D) The station is 5 blocks right and 3 blocks up from Madison Square Garden.
$\qquad$

## Graph Data

Essential Question How can you use a coordinate grid to display data collected in an experiment?

## Investigate

Materials $\llbracket$ paper cup $■$ water $\llbracket$ Fahrenheit thermometer $■$ ice cubes $\square$ stopwatch

When data is collected, it can be organized in a table.
A. Fill the paper cup more than halfway with roomtemperature water.
B. Place the Fahrenheit thermometer in the water and find its beginning temperature before adding any ice. Record this temperature in the table at 0 seconds.
C. Place three cubes of ice in the water and start the stopwatch. Find the temperature every 10 seconds for 60 seconds. Record the temperatures in the table.

| Water Temperature |  |
| :---: | :---: |
| Time <br> (in seconds) | Temperature <br> (in ${ }^{\circ}$ ) |
| 0 |  |
| 10 |  |
| 20 |  |
| 30 |  |
| 40 |  |
| 50 |  |
| 60 |  |



## Draw Conclusions

1. Explain why you would record the beginning temperature at 0 seconds.
2. Describe what happens to the temperature of the water in 60 seconds, during the experiment.
$\qquad$
$\qquad$
3. Mafitwaical 8 Draw Conclusions Analyze your observations of the temperature of the water during the 60 seconds, and explain what you think would happen to the temperature if the experiment continued for 60 seconds longer.
$\qquad$
$\qquad$
$\qquad$

## Make Connections

You can use a coordinate grid to graph and analyze the data you collected in the experiment.

STEP 1 Write the related pairs of data as ordered pairs.
$\qquad$ )
(20, $\qquad$ ) (40, $\qquad$ (10, ) $(30$, $\qquad$
(50, $\qquad$ (60, $\qquad$

STEP 2 Construct a coordinate grid and write a title for it. Label each axis.

STEP 3 Plot a point for each ordered pair.

What is the ordered pair that you recorded for the data at 10 seconds? Explain what each coordinate represents.

## Share and Show

## MATH <br> BOARD

For items 1-3, graph the data on the coordinate grid.

1. Write the ordered pairs for each point.
2. What does the ordered pair $(3,38)$ tell you about Ryan's age and height?
$\qquad$
$\qquad$
3. Why would the point $(6,42)$ be nonsense?
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

| Ryan's Height |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Age (in years) | 1 | 2 | 3 | 4 | 5 |
| Height (in inches) | 30 | 35 | 38 | 41 | 44 |



## Problem Solving • Applications

4. THINKSMARTER The table shows the depth of the Dakota River at different times during a rainstorm.

Graph the ordered pairs from the tiles on the coordinate grid.

| Dakota River |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Time (hours) | 1 | 2 | 3 | 4 | 5 |
| Depth (feet) | 7 | 8 | 10 | 12 | 15 |



## THINK SMARTER <br> What's the Error?

5. Mary places a miniature car onto a track with launchers. The speed of the car is recorded every foot. Some of the data is shown in the table. Mary graphs the data on the coordinate grid below.

| Miniature Car's Speed |  |
| :---: | :---: |
| Distance <br> (in feet) | Speed <br> (in miles per hour) |
| 0 | 0 |
| 1 | 4 |
| 2 | 8 |
| 3 | 6 |
| 4 | 3 |

Look at Mary's graphed data. Find her error.

Graph the data and correct the error.


|  |  | Miniature Car's Speed |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |  |
|  | $\uparrow$ |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| \% |  |  |  |  |  |  |  |  |  |
| $\stackrel{+}{+}$ |  |  |  |  |  |  |  |  |  |
| ¢ | 8 |  |  |  |  |  |  |  |  |
| ${ }_{0}$ | 6 |  |  |  |  |  |  |  |  |
| $\stackrel{\text { ¢ }}{ }$ | 6 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| $\pm$ | 4 |  |  |  |  |  |  |  |  |
| \% |  |  |  |  |  |  |  |  |  |
| $\stackrel{\otimes}{0}$ | 2 |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  | 0 |  | 123 | 34 | 56 | 678 |  |  |  |
|  |  |  | Dista | tance | (in f | feet) |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

6. (Mantimaical 3) Verify the Reasoning of Others Describe the error Mary made.
7. HDDEEPER

At what distance do you think the car will stop? Explain and write the ordered pair.
$\qquad$

## Line Graphs

Essential Question How can you use a line graph to display and analyze real-world data?

MATHEMATICAL PRACTICES MP.4, MP.5, MP. 7

## Unlock the Problem

A line graph is a graph that uses line segments to show how data changes over time. The series of numbers placed at fixed distances that label the graph are the graph's scale. The intervals, or difference between the values on the scale, should be equal.

0
Graph the data. Use the graph to determine the times between which the greatest temperature change occurred.

Recorded Temperatures

| Time (A.m.) | 1:00 | 2:00 | $3: 00$ | $4: 00$ | 5:00 | $6: 00$ | $7: 00$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Temperature (in ${ }^{\circ}$ F) | 51 | 49 | 47 | 44 | 45 | 44 | 46 |

- Write related number pairs of data as ordered pairs.


STEP 1 For the vertical axis, choose a scale and an interval that are appropriate for the data. You can show a break in the scale between 0 and 40 , since there are no temperatures between $0^{\circ} \mathrm{F}$ and $44^{\circ} \mathrm{F}$.

STEP 2 For the horizontal axis, write the times of day. Write a title for the graph and name each axis. Then graph the ordered pairs. Complete the graph by connecting the points with line segments.

## Recorded Temperatures



Look at each line segment in the graph. Find the line segment that shows the greatest change in temperature between two consecutive points.

The greatest temperature change occurred between $\qquad$ and $\qquad$ .

Try This! Jill used a rain gauge to collect data on the total rainfall during 6 days at her home in Miami. She read the amount of rain collected in the rain gauge each day and did not pour it out. Her data is shown in the table. Make a line graph to display Jill's data.

STEP 1 Write related pairs of data as ordered pairs.
(Mon, $\qquad$ L $\qquad$ ) $\qquad$ , $\qquad$
$\qquad$ , $\qquad$
$\qquad$ , $\qquad$  $\qquad$ , _

STEP 2 Choose a scale and an interval for the data.
STEP 3 Label the horizontal and vertical axes. Write a title for the graph. Graph the ordered pairs. Connect the points with line segments.

Rainfall Collected

| Day | Rainfall <br> (in inches) |
| :--- | :---: |
| Mon | 2 |
| Tue | 2 |
| Wed | 3 |
| Thu | 6 |
| Fri | 8 |
| Sat | 9 |



Mathematical Practices
Explain how you could use the graph to identify the two readings between which it did not rain.

Use the graph to answer the questions.

1. On which day was the total rainfall recorded the greatest?
2. On which day did Jill record the greatest increase in rainfall collected from the previous day?

## Share and Show

Use the table at the right for 1-3.

1. What scale and intervals would be appropriate to make a graph of the data?
$\qquad$
$\qquad$
2. Write the related pairs as ordered pairs.
3. Make a line graph of the data.
4. Use the graph to determine between which two months the least change in average temperature occurs.

## On Your Own

## Use the table at the right for 5-7.

5. Write the related number pairs for the plant height as ordered pairs.
6. What scale and intervals would be appropriate to make a graph of the data?
$\qquad$
$\qquad$
7. Make a line graph of the data.
8. Use the graph to find the difference in height between Month 1 and Month 2.
9. THINKSMARTER Use the graph to estimate the height at $1 \frac{1}{2}$ months.

| Plant Height |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
| Month | 1 | 2 | 3 | 4 |
| Height (in inches) | 20 | 25 | 29 | 32 |



## Connect Tto Science

Evaporation changes water on Earth's surface into water vapor. Water vapor condenses in the atmosphere and returns to the surface as precipitation. This process is called the water cycle. The ocean is an important part of this cycle. It influences the average temperature and precipitation of a place.

The overlay graph below uses two vertical scales to show monthly average precipitation and temperatures for Redding, California.

Use the graph for 10-12.
10.
maidienatcal (4) Use Graphs Explain how
pracice the overlay graph helps you relate precipitation and temperature for each month.
$\qquad$
$\qquad$
$\qquad$
11. G■DEEPER Describe how the average temperature changes in the first 5 months of the year. Describe the relationship between the average temperature and the amount of precipitation.
$\qquad$
$\qquad$
12. THINKSMARIER The line graph shows the amount of snowfall over several days.
For numbers 12a-12c, select True or False for each statement.

12a. There was no change in the amount of snow from Day 2 to Day 3.

12b. The greatest increase in the amount of snow between consecutive days occurred from Day 4 to Day 5 .

12c. From Day 1 to Day 6, the amount of snow increased from 1 foot to 8 feet.

O True

O True
$\bigcirc$ False O False -
$\qquad$

## D Mid-Chapter Checkpoint

## Vocabulary

Choose the best term from the box.

1. The $\qquad$ is the horizontal number line on the coordinate grid. (p. 393)
2. A $\qquad$ is a graph that uses line segments to show how data changes over time. (p. 401)

## Concepts and Skills

Use the line plot at the right for 3-5. (5.MD.2)
3. How many kittens weigh at least $\frac{3}{8}$ of a pound?
4. What is the combined weight of all the kittens?
$\qquad$ -
5. What is the average weight of the kittens in the shelter?
$\qquad$

Use the coordinate grid at the right for 6-13. (5.G.1)
Write an ordered pair for the given point.
6. $A$ $\qquad$ 7. $B$ $\qquad$
8. $C$ $\qquad$ 9. $D$ $\qquad$

Plot and label the point on the coordinate grid.
10. $E(6,2)$
11. $F(5,0)$
12. $G(3,4)$
13. $H(3,1)$

14. Jane drew a point that was 1 unit to the right of the $y$-axis and 7 units above the $x$-axis. What is the ordered pair for this location? (5.G.1)
15. The graph below shows the amount of snowfall in a 6 -hour period.

Total Amount of Snow


Between which hours did the least amount of snow fall? (5.G.2)
16. Joy recorded the distances she walked each day for five days. How far did she walk in 5 days? (5.MD.2)


Distance Walked Each Day (in miles)
$\qquad$

## Numerical Patterns

Essential Question How can you identify a relationship between two numerical patterns?

## Unlock the Problem

On the first week of school, Joel purchases 2 movies and 6 songs from his favorite media website. If he purchases the same number of movies and songs each week, how does the number of songs purchased compare to the number of movies purchased from one week to the next?

STEP 1 Use the two rules given in the problem to generate the first 4 terms in the sequence for the number of movies and the sequence for number of songs.

- How many movies does Joel purchase each week?
- How many songs does Joel purchase each week?
- The sequence for the number of movies each week is:

- The sequence for the number of songs each week is:


STEP 2 Write number pairs that relate the number of movies to the number of songs.

Week 1: $\qquad$ Week 2: $\qquad$

Week 3: $\qquad$ Week 4: $\qquad$


STEP 3 For each number pair, compare the number of movies to the number of songs. Write a rule to describe this relationship.

Think: For each related number pair, the second number is $\qquad$ times as great as the first number.

Rule: $\qquad$
So, from one week to the next, the number of songs Joel purchased
is $\qquad$ times as many as the number of movies purchased.

## I) Example

When Alice completes each level in her favorite video game, she wins 3 extra lives and 6 gold coins. What rule can you write to relate the number of gold coins to the number of extra lives she has won at any level? How many extra lives will Alice have won after she completes 8 levels?

Add $\qquad$ .

Add $\qquad$ .

| Level | $\mathbf{0}$ | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\ldots$ | $\mathbf{8}$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Extra Lives | 0 | 3 | 6 | 9 | 12 | $\ldots$ |  |
| Gold Coins | 0 | 6 | 12 | 18 | 24 | $\ldots$ | 48 |
|  | Multiply by ____ or |  |  |  |  |  |  |
| divide by |  |  |  |  |  |  |  |

STEP 1 To the left of the table, complete the rule for how you could find the number of extra lives won from one level to the next.


From one level to the next, Alice wins $\qquad$ more extra lives.

STEP 2 To the left of the table, complete the rule for how you could find the number of gold coins won from one level to the next.


From one level to the next, Alice wins $\qquad$ more gold coins.

STEP 3 Write number pairs that relate the number of gold coins to the number of extra lives won at each level.

Level 1: 6, 3
Level 2: $\qquad$
Level 3: $\qquad$ Level 4: $\qquad$
STEP 4 Complete the rule to the right of the table that describes how the number pairs are related. Use your rule to find the number of extra lives at level 8.

Think: For each level, the number of extra lives is $\qquad$ as great as the number of gold coins.

Rule: $\qquad$

So, after 8 levels, Alice will have won $\qquad$ extra lives.

## Math

Explain how your rule would change if you were relating extra lives to gold coins instead of gold coins to extra lives.
$\qquad$

## Share and Show

## MATH <br> BOARD

Use the given rules to complete each sequence. Then, complete the rule that describes how nickels are related to dimes.
1.

| Add 5. | Number of coins | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ |
| :--- | :--- | :---: | :---: | :---: | :---: | :---: |
|  | Nickels ( $\mathbf{(})$ | 5 | 10 | 15 | 20 |  |
|  | Dimes ( $\mathbf{(})$ | 10 | 20 | 30 | 40 |  |
|  |  |  |  |  |  |  |

$\qquad$ .

Complete the rule that describes how one sequence is related to the other. Use the rule to find the unknown term.
2. Multiply the number of books by to find the amount spent.

| Day | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\ldots$ | $\mathbf{8}$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Number <br> of Books | 3 | 6 | 9 | 12 | $\ldots$ | 24 |
| Amount <br> Spent (\$) | 12 | 24 | 36 | 48 | $\ldots$ |  |

3. Divide the weight of the bag by to find the number of marbles.

| Bags | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\ldots$ | $\mathbf{1 2}$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Number of <br> Marbles | 10 | 20 | 30 | 40 | $\ldots$ |  |
| Weight of <br> Bag (grams) | 30 | 60 | 90 | 120 | $\ldots$ | 360 |

## On Your Own

Complete the rule that describes how one sequence is related to the other. Use the rule to find the unknown term.
4. Multiply the number of eggs by to find the number of muffins.

| Batches | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\ldots$ | $\mathbf{9}$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Number <br> of Eggs | 2 | 4 | 6 | 8 | $\ldots$ | 18 |
| Muffins | 12 | 24 | 36 | 48 | $\ldots$ |  |

5. Divide the number of meters by to find the number of laps.

| Runners | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ |
| :--- | :---: | :---: | :---: | :---: |
| Number of Laps | 4 | 8 | 12 |  |
| Number of Meters | 1,600 | 3,200 | 4,800 | 6,400 |

6. Mary manical (6) Make Connections Suppose the number of eggs used in Exercise 4 is changed to 3 eggs for each batch of 12 muffins, and 48 eggs are used. How many batches and how many muffins will be made?

## Problem Solving • Applications

7. HIDEEPER Emily has a road map with a key that shows an $^{2}$ inch on the map equals 5 miles of actual distance. She will drive on two roads to get to the beach. One road is 7 inches long on the map. The other road is 5 inches long. What is the actual distance Emily will drive to the beach? Write the rule you used to find the actual distance.
8. Matyenatical (7) Identify Relationships To make a shade of lavender paint, Jon mixes 4 ounces of red tint and 28 ounces of blue tint into one gallon of white paint. If 20 gallons of white paint and 80 ounces of red tint are used, how much blue tint should be added? Write a rule that you can use to find the amount of blue tint needed.

## WRITE Math

 Show Your Work$\qquad$
$\qquad$
8.
9. IHINKSMARTER In the cafeteria, tables are arranged in groups of 4 , with each table seating 8 students. How many students can sit at 10 groups of tables? Write the rule you used to find the number of students.

10. IHINKSMARIER The table shows two sequences of numbers.

| Day | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\mathbf{5}$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Number of Runners | 4 | 8 | 12 | 16 | 20 |
| Number of Miles | 12 | 24 | 36 | 48 | $?$ |

For numbers 10a-10b, choose the correct values to describe how one sequence is related to the other.

10a. The unknown number in Day 5 is5456

10b. The rule that relates the number of miles to the number of runners is

## Problem Solving • Find a Rule

Essential Question How can you use the strategy solve a simpler problem to help you solve a problem with patterns?

Operations and Algebraic Thinking-5.0A. 3 mathematical practices MP.1, MP.4, MP. 7

## Unlock the Problem

On an archaeological dig, Gabriel separates his dig site into sections with areas of 15 square feet each. There are 3 archaeological members digging in every section. What is the area of the dig site if 21 members are digging at one time?


## Read the Problem

## What do I need to find?

I need to find the
$\qquad$
$\qquad$
$\qquad$ .
there are $\qquad$ members in each section, and that there are 21 members digging.

## What information do I need to use?

I can use the area of each section, which is
$\qquad$ , that

## How will I use the information?

I will use the information to search for patterns to solve
a $\qquad$ problem.

## Solve the Problem

## (1) Try Another Problem

Casey is making a design with triangles and beads for a costume. In his design, each pattern unit adds 3 triangles and 18 beads. Casey uses 72 triangles in his design. How many beads does Casey use?

Use the graphic organizer below to solve the problem.


## Solve the Problem

So, Casey uses $\qquad$ beads.

- What rule could you use to find an unknown number of beads if you know the related number of triangles?
$\qquad$
$\qquad$
$\qquad$


## Share and Show

## MATH <br> BOARD

1. Max builds rail fences. For one style of fence, each section uses 3 vertical fence posts and 6 horizontal rails. How many rails does he need for a fence that has 27 posts?



First, think about what the problem is asking and what you know. As each section of fence is added, how does the number of posts and the number of rails change?
Next, make a table and look for a pattern. Use what you know about 1,2 , and 3 sections. Write a rule for the number of posts and rails needed for 9 sections of fence.

Possible rule for posts: $\qquad$

| Number of Sections | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\ldots$ | $\mathbf{9}$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Number of Posts | 3 | 6 | 9 | $\ldots$ | 27 |
| Number of Rails | 6 | 12 | 18 | $\ldots$ |  |

Possible rule for rails: $\qquad$

Finally, use the rule to solve the problem.
THINKSMARTER What if another style of rail fencing has 6 rails between each pair of posts? How many rails are needed for 27 posts?

| Number of Sections | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\ldots$ | $\mathbf{9}$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Number of Posts | 3 | 6 | 9 | $\ldots$ | 27 |
| Number of Rails | 12 | 24 | 36 | $\ldots$ |  |

Possible rule: $\qquad$


## On Your Own

3. Mafitematical (7) Look for a Pattern Jane works as a limousine driver. She earns $\$ 50$ for every 2-hour shift that she works. How much does Jane earn in one week if she works 40 hours per week? Write a rule and complete

| Shift | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{\ldots}$ | $\mathbf{2 0}$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Hours Worked | 2 | 4 | 6 | $\ldots$ | 40 |
| Jane's Pay (\$) | 50 | 100 | 150 | $\ldots$ |  | the table.

Possible rule: $\qquad$
4. IHINKSMARTER Rosa plays games at a fair. She can buy 8 game tokens for $\$ 1$. Each game costs 2 tokens. How many games can she play with 120 tokens? Write a rule and complete the table.

| Cost (\$) | $\mathbf{1}$ | $\mathbf{2}$ | $\mathbf{3}$ | $\mathbf{4}$ | $\ldots$ | $\mathbf{1 5}$ |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| Tokens | 8 | 16 | 24 | 32 | $\ldots$ | 120 |
| Games | 4 | 8 | 12 | 16 | $\ldots$ |  |

Possible rule: $\qquad$
$\qquad$
5. HDDEEPER

Janelle is making snacks for her classmates.
There are two cups of raisins in one batch. For every 2 cups of raisins, Janelle adds 4 cups of oats. How many cups of oats will she need if she has 10 cups of raisins? Draw a table and write a possible rule.

Possible rule: $\qquad$
6. THINKSMARTER Look for a pattern.

Figure 1


2 squares

Figure 2


6 squares

Figure 3


10 squares

Figure 4


What is the rule? $\qquad$

How many squares will there be in Figure 5? $\qquad$ squares
$\qquad$

## Graph and Analyze Relationships

Essential Question How can you write and graph ordered pairs on a coordinate grid using two numerical patterns?

## Unlock the Problem

Sasha is making hot cocoa for a party. For each mug of cocoa, he uses 3 tablespoons of cocoa mix and 6 fluid ounces of hot water. If Sasha uses an entire 18 -tablespoon container of cocoa mix, how many fluid ounces of water will he use?

STEP 1 Use the two given rules in the problem to generate the first four terms for the number of tablespoons of cocoa mix and the number of fluid ounces of water.

| Cocoa Mix (tbsp) | 3 |  |  |  | $\ldots$ | 18 |
| :--- | :---: | :--- | :--- | :--- | :--- | :--- |
| Water (fl oz) | 6 |  |  |  | $\ldots$ |  |

STEP 2 Write the number pairs as ordered pairs, relating the number of tablespoons of cocoa mix to the number of fluid ounces of water.
$(3,6)$

STEP 3 Graph and label the ordered pairs. Then write a rule to describe how the number pairs are related.

- What rule can you write that relates the amount of cocoa mix to water?

So, Sasha will use $\qquad$ fluid ounces of water if he uses the entire container of cocoa mix.

- How many tablespoons of cocoa mix does Sasha add for each mug of cocoa?
- How many fluid ounces of water does Sasha add for each mug of cocoa?


Cocoa Mix (tbsp)

- mathengical (7) Look for Structure Write the final number pair as an ordered pair. Then graph and label it. Starting at the origin, connect the points with straight line segments. What do the connected points form? Explain why this is formed.

Try This! Find the unknown term in the table.

Each \$2-bag of copper wire contains 6 meters of wire.

Write the number pairs as ordered pairs and graph the data. Then write the rule that relates the cost to the number of meters of copper wire.

Think: Multiply the number of dollars by $\qquad$ to find the number of meters of copper wire.

Find the unknown term in the table.

| Cost (dollars) | 2 | 4 | 6 | 8 |
| :--- | :---: | :---: | :---: | :---: |
| Copper wire (m) | 6 | 12 | 18 |  |

## Share and Show



Explain how the terms in each sequence are related. Then determine how one sequence is related to the other.

Graph and label the related number pairs as ordered pairs. Complete the rule that describes how one sequence is related to the other. Then use the rule to find the unknown term.

1. For every 2 square feet of lawn, Charlie needs 8 ounces of fertilizer.

| Lawn (sq ft) | 2 | 4 | 6 | 8 | 10 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Weight (oz) | 8 | 16 | 24 | 32 |  |

Multiply the number of square feet by to find the ounces of fertilizer needed.

2. On Mary's map, every 2 inches represents 10 miles.

| Map (in.) | 2 | 4 | 6 | 8 | 10 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Miles | 10 | 20 | 30 | 40 |  |

Multiply the number of inches by $\qquad$ to find the distance in miles.


## On Your Own

3. HDDEEPER On Sandy's scale drawing of the school campus, 2 inches equals 4 yards. The distance between the swings and the track is 10 inches on the drawing, and the distance between the track and the basketball court is 4 inches on the drawing. How much farther is the track from the swings than from the basketball court, in actual distance?

Draw your own graph. Write a rule that describes how one sequence of terms is related to the other. Complete the table and solve.

| Map (in.) | 2 | 4 | 6 | 8 | 10 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Distance (yds) | 4 | 8 | 12 | 16 |  |

Rule: $\qquad$
$\qquad$
$\qquad$
4. THINK SMARTER Eric recorded the total number of push ups he did each minute for 4 minutes.

| Time (minutes) | 1 | 2 | 3 | 4 |
| :--- | :---: | :---: | :---: | :---: |
| Number of <br> Push Ups | 15 | 30 | 45 | 60 |

Write the number pairs as ordered pairs.

Graph the ordered pairs on a coordinate plane.


Write a rule to describe how the number pairs are related.

## Problem Solving • Applications (ear

## THINK SMARTER <br> Sense or Nonsense?

5. Elsa solved the following problem.

Lou and George are making chili for the Annual Firefighter's Ball. Lou uses 2 teaspoons of hot sauce for every 2 cups of chili that he makes, and George uses 3 teaspoons of the same hot sauce for every cup of chili in his recipe. Who has the hotter chili, George or Lou?

Write the related number pairs as ordered pairs and then graph them. Use the graph to compare who has the hotter chili, George or Lou.

| Lou's chili (cups) | 2 | 4 | 6 | 8 |
| :--- | :--- | :--- | :--- | :--- |
| Hot sauce (tsp) | 2 | 4 | 6 | 8 |


| George's chili (cups) | 1 | 2 | 3 | 4 |
| :--- | :---: | :---: | :---: | :---: |
| Hot sauce (tsp) | 3 | 6 | 9 | 12 |

Lou's chili: $\quad(2,2),(4,4),(6,6),(8,8)$
George's chili: $(1,3),(2,6),(3,9),(4,12)$
Elsa said that George's chili was hotter than Lou's, because the graph showed that the amount of hot sauce in George's chili was always 3 times as great as the amount of hot sauce in Lou's chili. Does Elsa's answer make sense, or is it nonsense? Explain.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

[^2]
$\qquad$

## (V) Chapter 9 Review/Test

1. The letters on the coordinate grid represent the locations of the first four holes on a golf course. Which of the following accurately describes the location of a hole? Mark all that apply.
(A) Hole $U$ is 4 units left and 4 units down from hole $S$.
(B) Hole $F$ is 1 unit right and 7 units down from hole $U$.
(C) Hole $T$ is 2 units left and 4 units up from hole $S$.
(D) Hole $S$ is 3 units left and 5 units up from hole $F$.

2. A builder is buying property to build new houses. The sizes of the lots are $\frac{1}{6}, \frac{1}{2}, \frac{1}{3}, \frac{1}{2}, \frac{1}{6}, \frac{1}{2}, \frac{1}{2}, \frac{1}{3}, \frac{1}{6}, \frac{1}{2}, \frac{1}{6}, \frac{1}{2}, \frac{1}{6}, \frac{1}{6}$, and $\frac{1}{3}$ acre. Organize the information in a line plot.

What is the average size of the lots?
$\qquad$ acre $\square$
3. For 6 days in a row, Julia measured the depth of the snow in a shaded area of her backyard. The line graph shows her data. Between which two days did the depth of the snow decrease the most?

Snow Depth

between Day $\square$ and Day $\square$
4. The table shows two sequences of numbers.

| Day | 1 | 2 | 3 | 4 | 5 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Number of T-shirts <br> sold | 5 | 10 | 15 | 20 | 25 |
| Amount earned (\$) | 20 | 40 | 60 | 80 | $?$ |

For numbers $4 \mathrm{a}-4 \mathrm{~b}$, choose the correct values to describe how one sequence is related to the other.

4a. The unknown number in Day 5 is | 90 |
| :---: |
| 100 |
| 120 |

4b. The rule that describes how the number of T -shirts sold relates to the amount earned is

| add 15 |
| :---: |
| multiply by 5 |
| multiply by 4 |

5. Jawan made a table to figure out how much he earns at his job.

| Job Earnings |  |  |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Week | 1 | 2 | 3 | 4 | $\ldots$ | 6 |  |
| Hours Worked | 6 | 12 | 18 | 24 | $\ldots$ | 36 |  |
| Amount Earned (\$) | 54 | 108 | 162 | 216 | $\ldots$ | $?$ |  |

## Part A

Write a rule that relates the amount Jawan earns to the number of hours worked. Explain how you can check your rule.
$\square$

## Part B

How much does he earn from his job in Week 6 ?

Name
6. Look for a pattern.


Figure 1


Figure 2


Figure 3


Figure 4

What is the rule? $\qquad$

How many squares will there be in Figure 5? $\qquad$ squares
7. Lindsey made a map of her town. Match each location below with the correct ordered pair that marks it on the coordinate grid. Not every ordered pair will be used.

| Clock Tower | $\bullet(4,4)$ |
| :--- | :--- |
| Art Museum • | $\bullet(4,1)$ |
| East Park | $\bullet(1,3)$ |
|  | $\bullet(5,4)$ |
| Movie Theater | $\bullet(4,5)$ |
|  | $\bullet(3,1)$ |
| School | $\bullet(2,4)$ |
|  | $\bullet(1,4)$ |
|  | $\bullet(4,2)$ |


8. Lucy's house is located at the point shown on the coordinate grid. Ainsley's house is located 2 units right and 3 units down from Lucy's house. Plot a point on the coordinate grid to represent the location of Ainsley's house.

What ordered pair represents the location
$\square$
What ordered pair represents the location of Ainsley's house? $\square$

9. Each week, Maria saves some of her allowance.

The line graph shows the amount of Maria's savings for the first 5 weeks of the year.

For numbers 9a-9b, select True or False for each statement.

9a. Maria's savings increased from $\$ 30$ to $\$ 55$ over the 5 -week period.

9b. The greatest increase in Maria's savings
O
TrueFalse

O True occurred from Week 1 to Week 2.
10. The line plot shows the weights of bags of beans.

What is the average weight of the bags? Show your work.
$\square$
11. The table shows how much a puppy weighs from 1 month old to 5 months old.

| Puppy's Weight |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Age (in months) | 1 | 2 | 3 | 4 | 5 |
| Weight (in pounds) | 12 | 18 | 23 | 31 | 34 |

What ordered pairs would you plot to show the puppy's weight on a coordinate grid? How do you think the ordered pairs would be different if the puppy's weight was measured every week instead of every month? Explain your reasoning.
$\square$

12. Randy is training for a race. She makes a table that shows how long it takes her to run different distances.

| Running Time and Distance |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
| Distance (in miles) | 1 | 2 | 3 | 4 |
| Time (in minutes) | 10 | 20 | 30 | 40 |

## Part A

Write the number pairs as ordered pairs. Then write the rule to describe how the number pairs are related.
$\square$

## Part B

Graph the ordered pairs on the coordinate plane.

13. A scientist made a line graph that shows how a bear's average heart rate changes over time.


For numbers 13a-13c, select True or False for each statement.
13a. The bear's heart rate is at its highest in July.
O True
False

13b. The bear's average heart rate increases by
O True 10 beats per minute from July to August.

13c. The bear's heart rate is at its lowest in January.
O True
$\bigcirc$ False
14. The table shows the total number of tickets sold for the school play each day for 5 days.

| Ticket Sales |  |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Day | 1 | 2 | 3 | 4 | 5 |
| Tickets Sold | 20 | 30 | 45 | 75 | 90 |

Graph the ordered pairs from the tiles on the coordinate grid.

15. The graph shows the relationship between the amount of milk and water used in a recipe. Determine a rule that relates the amount of milk to the amount of water by writing the correct term or value from the tiles in each blank.



Rule: $\square$ the amount of milk by $\square$
16. Steven is buying a new mountain bike on layaway for $\$ 272$. If he pays $\$ 34$ each week, how many weeks will it take Steven to pay for the bike? How can making a table help you solve the problem?
$\square$

## Show What You Know

Check your understanding of important skills.
Name $\qquad$
Measure Length to the Nearest Inch
Use an inch ruler. Measure the length to the nearest inch.

1. 1
 about $\qquad$ inches
2. 

 about $\qquad$ inches

Multiply and Divide by 10, 100, and 1,000 Use mental math.
3. $1 \times 5.98=5.98$
$10 \times 5.98=59.8$
$100 \times 5.98=$ $\qquad$
$1,000 \times 5.98=$ $\qquad$
4. $235 \div 1=235$
$235 \div 10=23.5$
$235 \div 100=$ $\qquad$ $235 \div 1,000=$ $\qquad$
5. length of a pencil $\qquad$ 6. length of a football field
$\qquad$

## Choose Customary Units Write the appropriate unit to measure each. Write inch, foot, yard, or mile.

You can step out distances of 5 feet by using an estimate. Two steps or 2 paces is about 5 feet. Be a Math Detective and act out the directions on the map to find a treasure. About how many feet from start to finish is the path to the treasure?


## Vocabulary Builder

## Visualize It •

## Sort the review and preview words into the Venn diagram.



## Understand Vocabulary

## Complete the sentences.

1. A metric unit of length that is equal to one tenth of a meter is a $\qquad$ .
2. A metric unit of length that is equal to one thousandth of a meter is a $\qquad$ .
3. A metric unit of capacity that is equal to one thousandth of a liter is a $\qquad$ .
4. A metric unit of length that is equal to 10 meters
is a $\qquad$ .
5. A metric unit of mass that is equal to one thousandth
of a gram is a $\qquad$ .
$\qquad$

## Customary Length

Essential Question How can you compare and convert customary units of length?

## Measurement and Data5.MD. 1

mathematical practices MP.5, MP. 7

## Unlock the Problem

To build a new swing, Mr. Mattson needs 9 feet of rope for each side of the swing and 6 more feet for the monkey bar. The hardware store sells rope by the yard.

- How many feet of rope does Mr. Mattson need for the swing? $\qquad$
- How many feet does Mr. Mattson need for
the swing and the monkey bar combined? $\qquad$
Mr. Mattson needs to find how many yards of rope he needs to buy. He will need to convert 24 feet to yards. How many groups of 3 feet are in 24 feet?

$\square$

A yardstick is 1 yard.

Use a bar model to write an equation.


So, Mr. Mattson needs to buy $\qquad$ yards of rope.

What operation did you use when you found groups of 3 feet in 24 feet? Do you multiply or divide when you convert a smaller unit to a larger unit? Explain.

## 1) Example 1 Use the table to find the relationship between miles and feet.

The distance between the new high school and the football field is 2 miles. How does this distance compare to 10,000 feet?

When you convert larger units to smaller units, you need to multiply.

| Customary Units <br> of Length |
| :---: |
| 1 foot $(\mathrm{ft})=12$ inches (in.) |
| 1 yard $(\mathrm{yd})=3 \mathrm{ft}$ |
| 1 mile $(\mathrm{mi})=5,280 \mathrm{ft}$ |
| 1 mile $=1,760 \mathrm{yd}$ |

STEP 1 Convert 2 miles to feet.
Think: 1 mile is equal to 5,280 feet.
I need to $\qquad$ the total
number of miles by $\qquad$ .
total
feet $=$ $\qquad$

2 miles $=$ $\qquad$ feet

STEP 2 Compare. Write $<,>$, or $=. \quad \mid \quad$ feet $\bigcirc$ 10,000 feet

Since $\qquad$ is $\qquad$ than 10,000 , the distance between the new high school and the football field is $\qquad$ than 10,000 feet.

## (1) Example 2 convert to mixed measures.

Mixed measures use more than one unit of measurement. You can convert a single unit of measurement to mixed measures.

Convert 62 inches into feet and inches.

STEP 1 Use the table.
Think: 12 inches is equal to 1 foot
I am changing from a smaller unit to a larger unit, so I $\qquad$ .

STEP 2 Convert.


So, 62 inches is equal to $\qquad$ feet $\qquad$ inches.

- Maninmaical (6) Explain how to convert the mixed measures, 12 yards 2 feet, to a single unit of measurement in feet. How many feet is it?


## Share and Show

## Convert.

1. $2 \mathrm{mi}=$ $\qquad$ yd
2. $6 \mathrm{yd}=$ $\qquad$ ft
3. $90 \mathrm{in} .=$
$\qquad$ ft $\qquad$ in.

## Math

## On Your Own

## Practice: Copy and Solve Convert.

4. $125 \mathrm{in} .=\square \mathrm{ft} \square \mathrm{in}$.
5. $46 \mathrm{ft}=\square \mathrm{yd} \square \mathrm{ft}$
6. $42 \mathrm{yd} 2 \mathrm{ft}=\square \mathrm{ft}$

Compare. Write $<,>$, or $=$.
7. 8 ft

8. 2 mi

9. 3 yd 2 ft
 132 in.
10. THINKSMARTER Choose the correct word and number to complete the sentence.

Katy's driveway is 120 feet long.

To convert feet to yards, I need to \begin{tabular}{|l|}
\hline add <br>
subtract <br>
multiply <br>
divide

 .120 by 

3 <br>
12 <br>
1,760 <br>
5,280 <br>
\hline
\end{tabular}

## Problem Solving • Applications

11. EIDEEPER Javon is helping his dad build a tree house. He has a piece of trim that is 13 feet long. How many pieces can Javon cut that are 1 yard long? How much of a yard will he have left over?
12. THINKSMARIER Patty is building a rope ladder for a tree house. She needs two 5 -foot pieces of rope for the sides of the ladder. She needs 7 pieces of rope, each 18 inches long, for the steps. How many feet of rope does Patty need to make the ladder? Write your answer as a mixed number and as a mixed measure in feet and inches.


## Connect to Reading

## Compare and Contrast

When you compare and contrast, you tell how two or more things are alike and different. You can compare and contrast information in a table.

Complete the table below. Use the table to answer the questions.

| Linear Units |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
| Yards | 1 | 2 | 3 | 4 |
| Feet | 3 | 6 | 9 |  |
| Inches | 36 | 72 |  |  |

13. 



Identify Relationships How are the items in the table alike? How are they different?
$\qquad$
$\qquad$
14.

Marifmailcal
Look for a Pattern What do you notice about the relationship between the number of larger units and the number of smaller units as the length increases? Explain.
$\qquad$
$\qquad$
$\qquad$

## Customary Capacity

Essential Question How can you compare and convert customary units of capacity?

Measurement and Data5.MD. 1
mathematical practices MP.5, MP. 6

## Unlock the Problem

Mara has a can of paint with 3 cups of purple paint in it. She also has a bucket with a capacity of 26 fluid ounces. Will the bucket hold all of the paint Mara has?

The capacity of a container is the amount the container can hold.

$1 \operatorname{cup}(c)=$ $\qquad$ fluid ounces (fl oz)

Use a bar model to write an equation.
STEP 1 Convert 3 cups to fluid ounces.
After Mara converts the units, what does she need to do next?


STEP 2 Compare. Write $<,>$, or $=$. $\qquad$ $\mathrm{fl} \mathrm{oz} \bigcirc 26 \mathrm{fl} \mathrm{oz}$

Since $\qquad$ fluid ounces is $\qquad$ than 26 fluid ounces,

Mara's bucket $\qquad$ hold all of the paint.

- Matyingical 6 What if Mara has 7 cups of green paint and a container filled with 64 fluid ounces of yellow paint? Which color paint does Mara have more of? Explain your reasoning.


## $\square$ <br> Example

Coral made 32 pints of fruit punch for a party. She needs to carry the punch in 1-gallon containers.
How many containers does Coral need?

To convert a smaller unit to a larger unit, you need to divide. Sometimes you may need to convert more than once.

## Customary Units of Capacity

| 1 cup $(\mathrm{c})=8$ fluid ounces (fl oz) |
| :---: |
| 1 pint $(\mathrm{pt})=2$ cups |
| 1 quart $(\mathrm{qt})=2$ pints |
| 1 gallon (gal) $=4$ quarts |

1 pint (pt) $=2$ cups
1 quart (qt) $=2$ pints
1 gallon (gal) $=4$ quarts

## Convert 32 pints to gallons.

STEP 1 Write an equation to convert pints to quarts.


STEP 2 Write an equation to convert quarts to gallons.


So, Coral needs $\qquad$ 1-gallon containers to carry the punch.

## Share and Show

MATH BOARD

1. Use the picture to complete the statements and convert 3 quarts to pints.
a. 1 quart $=$ $\qquad$ pints
b. 1 quart is $\qquad$ than 1 pint.
c. 3 qt $\qquad$ pt in $1 \mathrm{qt}=$ $\qquad$ pt


## Convert.

2. $3 \mathrm{gal}=$ $\qquad$ pt
3. $5 \mathrm{qt}=$ $\qquad$ pt
4. 6 qt $=$ $\qquad$ c

Name

## On Your Own

## Convert.

5. $38 \mathrm{c}=$ $\qquad$ pt
6. $36 \mathrm{qt}=$ $\qquad$ gal
7. $104 \mathrm{fl} \mathrm{oz}=$ $\qquad$ c

## Practice: Copy and Solve Convert.

8. $200 \mathrm{c}=\square \mathrm{qt}$
9. $22 \mathrm{pt}=\square \mathrm{fl} \mathrm{oz}$
10. $8 \mathrm{gal}=\square \mathrm{qt}$
11. $72 \mathrm{fl} \mathrm{oz}=\square \mathrm{c}$
12. $2 \mathrm{gal}=\square \mathrm{pt}$
13. $48 \mathrm{pt}=\square \mathrm{gal}$

Compare. Write $<,>$, or $=$.
14. $28 \mathrm{c} \bigcirc 14 \mathrm{pt}$
15. $25 \mathrm{pt} \bigcirc 13 \mathrm{qt}$
16. $20 \mathrm{qt} \bigcirc 80 \mathrm{c}$
19. $15 \mathrm{qt} \bigcirc 63 \mathrm{c}$
18. $320 \mathrm{fl} \mathrm{oz} \bigcirc 18 \mathrm{pt}$
17. $12 \mathrm{gal} \bigcirc 50 \mathrm{qt}$
20. WRITE Math Which of exercises 14-19 could you solve mentally? Explain your answer for one exercise.

## Problem Solving • Applications

Show your work. For 21-23, use the table.
21.

Marivingical (4) Use Graphs Complete the table, and make a graph showing the relationship between quarts and pints.

| Quarts | 0 | 1 | 2 | 3 | 4 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| Pints | 0 |  |  |  |  |

22. GПDEEPER Describe any pattern you notice in the pairs of numbers you graphed. Write a rule to describe the pattern.
$\qquad$

$\qquad$
$\qquad$
23. THINKSMARTER What other pair of customary units of capacity have the same relationship as pints and quarts? Explain.
$\qquad$

$\qquad$
24. THINKSMARIER Shelby made 5 quarts of juice for a picnic. She said that she made $1 \frac{1}{4}$ cups of juice. Explain Shelby's mistake.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Weight

Essential Question How can you compare and convert customary units of weight?

## Unlock the Problem

Hector's school is having a model rocket contest. To be in the contest, each rocket must weigh 4 pounds or less. Without any paint, Hector's rocket weighs 62 ounces. If Hector wants to paint his rocket, what is the weight of the most paint he can use?


1 pound $=$ $\qquad$ ounces

- What weight does Hector need to convert?
- After Hector converts the weight, what does he need to do next?

Use a bar model to write an equation.
STEP 1 Convert 4 pounds to ounces.


STEP 2 Subtract the rocket's weight from the total ounces a rocket can weigh to be in the contest.

So, the weight of the paint can be at most $\qquad$ ounces
$\qquad$ for Hector's model rocket to be in the contest.

How did you choose which operation to use to change from pounds to ounces? Explain.

## 1. Example

The rocket boosters for a U.S. space shuttle weigh 1,292,000 pounds each when the shuttle is launched. How many tons does each rocket booster weigh?

Use mental math to convert pounds to tons.

STEP 1 Decide which operation to use.

STEP 2 Break 2,000 into two factors that are easy to divide by mentally.

Since pounds are smaller than tons, I need to $\qquad$ the number of pounds by $\qquad$ .

Units of Weight
1 pound (lb) = 16 ounces (oz) $1 \operatorname{ton}(\mathrm{~T})=2,000 \mathrm{lb}$

STEP 3 Divide 1,292,000 by the first factor. Then divide the quotient by the second factor.
$2,000=$ $\qquad$ $\times 2$

So, each rocket booster weighs $\qquad$ tons when launched.

## Share and Show

$1,292,000$ $\qquad$ $=$ $\qquad$
$\qquad$ $\div 2=$ $\qquad$

1. Use the picture to complete each equation.
a. $\quad 1$ pound $=$ $\qquad$ ounces
b. 2 pounds $=$ $\qquad$ ounces
c. 3 pounds $=$ $\qquad$ ounces
d. 4 pounds $=$ $\qquad$ ounces
e. 5 pounds $=$ $\qquad$ ounces

## Convert.

2. $15 \mathrm{lb}=$ $\qquad$ oz
3. $3 \mathrm{~T}=$ $\qquad$ lb 4. $320 \mathrm{oz}=$ $\qquad$ lb

## On Your Own

## Practice: Copy and Solve Convert.

5. $23 \mathrm{lb}=\square \mathrm{oz}$
6. $15 \mathrm{~T}=\square \mathrm{lb}$

Compare. Write $<,>$, or $=$.
11. 130 oz

14. 16 T
 $32,000 \mathrm{lb}$
6. $6 \mathrm{~T}=\square \mathrm{lb}$
9. $352 \mathrm{oz}=\square \mathrm{lb}$
12. $34 \mathrm{lb} \bigcirc 544 \mathrm{oz}$
15. $5 \mathrm{lb} \bigcirc 79 \mathrm{oz}$
7. $144 \mathrm{oz}=\square \mathrm{lb}$
10. $18 \mathrm{lb}=\square \mathrm{oz}$
13. 14 lb

16. $85,000 \mathrm{lb}$


## Problem Solving • Applications

17. HDDEEPER Rhada has a 5-pound bag of clay. Her craft project requires 5 ounces of clay for each batch of 6 ornaments. If she uses all of the clay, how many ornaments can Rhada make?
18. 

Matinmatical (2) Represent a Problem Ellis used 48 ounces of rye flour in a bread recipe. Write an expression you could use to find how many pounds of rye flour Ellis used. Explain how the expression represents the problem.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
19. THINK SMARTER Kevin uses 36 ounces of dried apples and 18 ounces of dried cranberries to make a fruit snack. He plans to sell the snack in $\frac{1}{2}$-pound containers. How may containers will he fill? Will any fruit snack be left over?

## THINKSMARTER) Pose a Problem

20. Kia wants to have 4 pounds of munchies for her party. She has 36 ounces of popcorn and wants the rest to be pretzel sticks. How many ounces of pretzel sticks does she need to buy?

So, Kia needs to buy $\qquad$ ounces of pretzel sticks.

$64-36=$ $\qquad$

Write a new problem using different amounts of snacks.
Some weights should be in pounds and others in ounces.
Make sure the amount of snacks given is less than the total amount of snacks needed.

Pose a Problem
$\qquad$

Draw a bar model for your problem. Then solve.
21. THINKSMARTER For numbers 21a-21c, select True or False for each statement.
21a. $1,500 \mathrm{lb}>1 \mathrm{~T}$
○ True
$\bigcirc$ False
21b. $32 \mathrm{oz}<4 \mathrm{lb}$TrueFalse
21c. $24 \mathrm{oz}<1 \mathrm{lb} 16 \mathrm{oz}$
TrueFalse

## Multistep Measurement Problems

Essential Question How can you solve multistep problems that include measurement conversions?

## Unlock the Problem

A leaky faucet in Jarod's house drips 2 cups of water each day. After 2 weeks of dripping, the faucet is fixed. If it dripped the same amount each day, how many quarts of water dripped from Jarod's leaky faucet in 2 weeks?

Use the steps to solve the multistep problem.


## STEP 1

Record the information you are given.
The faucet drips $\qquad$ cups of water each day.

The faucet drips for $\qquad$ weeks.

## STEP 2

Find the total amount of water dripped in 2 weeks.

Since you are given the amount of water dripped each day, you must convert 2 weeks into days and multiply.

Think: There are 7 days in 1 week.
cups each day days in 2 weeks total cups
2

The faucet drips $\qquad$ cups in 2 weeks.

## STEP 3

Convert from cups to quarts.
Think: There are 2 cups in 1 pint.

There are 2 pints in 1 quart.
$\qquad$ cups $=$ $\qquad$ pints
$\qquad$ pints $=$ $\qquad$ quarts

So, Jarod's leaky faucet drips $\qquad$ quarts of water in 2 weeks.

- What if the faucet dripped for 4 weeks before it was fixed?

How many quarts of water would have leaked?

## ( ) Example

A carton of large, Grade A eggs weighs about 1.5 pounds. If a carton holds a dozen eggs, how many ounces does each egg weigh?

## STEP 1

In ounces, find the weight of a carton of eggs.
Think: 1 pound = $\qquad$ ounces


Weight of a carton (in ounces):
$1.5 \times$ $\qquad$ $=$ $\qquad$

The carton of eggs weighs about $\qquad$ ounces.

## STEP 2

In ounces, find the weight of each egg in a carton.

Think: 1 carton (dozen eggs) = $\qquad$ eggs

So, each egg weighs about $\qquad$ ounces.

## Share and Show

## Solve.

1. After each soccer practice, Scott runs 4 sprints of 20 yards each. If he continues his routine, how many practices will it take for Scott to have sprinted a total of 2 miles combined?

Scott sprints $\qquad$ yards each practice.

Since there are $\qquad$ yards in 2 miles, he will need to continue his routine for
$\qquad$ practices.
3. Cory brings five 1-gallon jugs of juice to serve during parent night at his school. If the paper cups he is using for drinks can hold 8 fluid ounces, how many drinks can Cory serve for parent night?

Weight of each egg (in ounces):


## On Your Own

Solve.
4. A science teacher needs to collect lake water for a lab she is teaching. The lab requires each student to use 4 fluid ounces of lake water. If 68 students are participating, how many pints of lake water will the teacher need to collect?
6. When Elena's car moves forward such that each tire makes one full rotation, the car has traveled 72 inches. How many full rotations will the tires need to make for Elena's car to travel 10 yards?
8. An office supply company is shipping a case of wooden pencils to a store. There are 64 boxes of pencils in the case. If each box of pencils weighs 2.5 ounces, what is the weight, in pounds, of the case of wooden pencils?
5. (maringaical (4) Use Diagrams A string of decorative lights is 28 feet long. The first light on the string is 16 inches from the plug. If the lights on the string are spaced 4 inches apart, how many lights are there on the string? Draw a picture to help you solve the problem.
7. EDDEEPER A male African elephant weighs 7 Tons. If a male African lion at the local zoo weighs $\frac{1}{40}$ of the weight of the male African elephant, how many pounds does the lion weigh?
9. THINKSMARTER A gallon of unleaded gasoline weighs about 6 pounds. About how many ounces does 1 quart of unleaded gasoline weigh? HINT: 1 quart $=\frac{1}{4}$ of a gallon

## Unlock the Problem

10. THINKSMARTER

At a local animal shelter there are 12 small-size dogs and 5 medium-size dogs. Every day, the small-size dogs are each given 12.5 ounces of dry food and the medium-size dogs are each given 18 ounces of the same dry food. How many pounds of dry food does the shelter serve in one day?
a. What are you asked to find? $\qquad$

b. What information will you use? $\qquad$
c. What conversion will you need to do to solve the problem?
$\qquad$
$\qquad$
d. Show the steps you use to solve the problem.
e. Complete the sentences. The small-size
dogs eat a total of $\qquad$ ounces of dry food each day.

The medium-size dogs eat a total of
$\qquad$ ounces of dry food each day.

The shelter serves $\qquad$ ounces, or $\qquad$ pounds, of dry food each day.
11. THINKSMARTER Gus is painting his house. He uses 2 quarts of paint per hour. Gus paints for 8 hours. How many gallons of paint did he use? Show your work.
$\qquad$

## (V) Mid-Chapter Checkpoint

## Vocabulary

## Vocabulary

Choose the best term from the box.

1. The $\qquad$ of an object is how heavy the object is. (p. 435)
2. The $\qquad$ of a container is the amount the container can hold. (p. 431)

## Concepts and Skills

Convert. (5.MD.1)
3. $5 \mathrm{mi}=\square \mathrm{yd}$
$\qquad$ 4. $48 \mathrm{qt}=$ $\qquad$ gal
6. $336 \mathrm{oz}=$ $\qquad$ lb
7. $14 \mathrm{ft}=$ $\qquad$ yd $\qquad$ ft
5. $9 \mathrm{~T}=$ $\qquad$ lb
8. $11 \mathrm{pt}=$ $\qquad$ fl oz

Compare. Write $<,>$, or $=$. (5.MD.1)
9. $96 \mathrm{fl} \mathrm{oz} \bigcirc 13 \mathrm{c}$
10. $25 \mathrm{lb} \bigcirc 384 \mathrm{oz}$
13. The length of a classroom is 34 feet. What is this measurement in yards and feet? (5.MD.1)
14. Charlie's puppy, Max, weighs 8 pounds. How many ounces does Max weigh? (5.MD.1)
15. Milton purchases a 5-gallon aquarium for his bedroom. To fill the aquarium with water, he uses a container with a capacity of 1 quart. How many times will Milton fill and empty the container before the aquarium is full? (5.MD.1)
16. Sarah uses a recipe to make 2 gallons of her favorite mixed-berry juice. The containers she plans to use to store the juice have a capacity of 1 pint. How many containers will Sarah need? (5.MD.1)
17. The average length of a female white-beaked dolphin is about 111 inches. What is this length in feet and inches? (5.MD.1)
$\qquad$

## Metric Measures

Essential Question How can you compare and convert metric units?

## Unlock the Problem

Using a map, Alex estimates the distance between his house and his grandparent's house to be about 15,000 meters. About how many kilometers away from his grandparent's house does Alex live?

- Underline the sentence that tells you what you are trying to find.
- Circle the measurement you need to convert.

The metric system is based on place value. Each unit is related to the next largest or next smallest unit by a power of 10 .

## I) One Way convert 15,000 meters to kilometers.

| kilo- <br> (k) | hecto- <br> (h) | deka- <br> (da) | $\begin{aligned} & \text { meter (m) } \\ & \text { liter (L) } \\ & \operatorname{gram}(\mathbf{g}) \end{aligned}$ | deci- <br> (d) | centi- <br> (c) | milli- (m) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |

STEP 1 Find the relationship between the units.
Meters are $\qquad$ powers of 10 smaller than kilometers.

There are $\qquad$ meters in 1 kilometer.

STEP 2 Determine the operation to be used.
I am converting from a $\qquad$ unit to a
$\qquad$ unit, so I will $\qquad$ .

STEP 3 Convert.

| number of <br> meters | meters in <br> 1 kilometer | number of <br> kilometers |
| :---: | :---: | :---: |
| $\downarrow$ | $\downarrow$ |  |
| 15,000 |  |  |
|  |  |  |

So, Alex's house is $\qquad$ kilometers from his grandparent's house.


## (I) Another Way use a diagram.

Jamie made a bracelet 1.8 decimeters long. How many millimeters long is Jamie's bracelet?

Convert 1.8 decimeters to millimeters.

|  |  |  |  | 1 | 8 |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| kilo- | hecto- | deka- | meter <br> liter <br> gram | deci- | centi- | milli- |

STEP 1 Show 1.8 decimeters.
Since the unit is decimeters, place the decimal point so that decimeters are the whole number unit.

STEP 2 Convert.
Cross out the decimal and rewrite it so that millimeters will be the whole number unit. Write zeros to the left of the decimal point as needed to complete the whole number.

STEP 3 Record the value with the new units.
$1.8 \mathrm{dm}=$ $\qquad$ mm

So, Jamie's bracelet is $\qquad$ millimeters long.

## Try This! Complete the equation to show the conversion.

(A)

Convert 247 milligrams to centigrams, decigrams, and grams.

Are the units being converted to a larger unit or a smaller unit? $\qquad$
Should you multiply or divide by powers of 10 to convert? $\qquad$ $247 \mathrm{mg} \bigcirc 10=$ $\qquad$ cg
$247 \mathrm{mg} \bigcirc 100=$ $\qquad$ dg
$247 \mathrm{mg} \bigcirc 1,000=$ $\qquad$
(B) Convert 3.9 hectoliters to dekaliters, liters, and deciliters.

Are the units being converted to a larger unit or a smaller unit? $\qquad$
Should you multiply or divide by powers of 10 to convert? $\qquad$
$3.9 \mathrm{hL} \bigcirc 10=$ $\qquad$ daL
$3.9 \mathrm{hL} \bigcirc 100=$ $\qquad$ L
3.9 hL
 $1,000=$ $\qquad$ dL

## Share and Show

## Complete the equation to show the conversion.

1. 8.47 L
 $10=$ $\qquad$ dL
$8.47 \mathrm{~L} \bigcirc 100=$ $\qquad$ cL
8.47 L
 $1,000=$ $\qquad$ mL

Think: Are the units being converted to a larger unit or a smaller unit?
2. $9,824 \mathrm{dg} \bigcirc 10=$ $\qquad$ g
 $9,824 \mathrm{dg} \bigcirc 1,000=$ $\qquad$ hg

Convert.
3. $4,250 \mathrm{~cm}=$ $\qquad$ m L
4. $6,000 \mathrm{~mL}=$ $\qquad$
5. $4 \mathrm{dg}=$ $\qquad$ cg

## On Your Own

## Convert.

6. $7 \mathrm{~g}=$ $\qquad$ mg
7. $5 \mathrm{~km}=$ $\qquad$ m
8. $1,521 \mathrm{~mL}=$ $\qquad$ dL

Explain how you can compare the lengths 4.25 dm and 4.25 cm without converting.

## Problem Solving • Applications

## For 13-14, use the table.

13. HロDEEPER Kelly made one batch of raisin and pretzel snack mix. How many grams does she need to add to the snack mix to make 2 kilograms?
$\qquad$
14. THINK SMARTER Kelly plans to take juice on her camping trip. Which will hold more juice, 8 cans or 2 bottles? How much more?
$\qquad$
15. Erin's water bottle holds 600 milliliters of water. Dylan's water bottle holds 1 liter of water. Whose water bottle holds more water? How much more water?
16. Liz and Alana each participated in the high jump at the track meet. Liz's high jump was 1 meter. Alana's high jump was 132 centimeters. Who jumped higher? How much higher?
17. THINKSMARIER Monica has 426 millimeters of fabric. How many centimeters of fabric does Monica have? Use the numbers and symbols on the tiles to write an equation to show the conversion.


# Problem Solving • Customary and Metric Conversions 

Essential Question How can you use the strategy make a table to help you solve problems about customary and metric conversions?

## Unlock the Problem

Aaron is making fruit punch for a family reunion. He needs to make 120 cups of punch. If he wants to store the fruit punch in gallon containers, how many gallon containers will Aaron need?

Use the graphic organizer below to help you solve the problem.

| Conversion Table |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
|  | gal | qt | pt | $\mathbf{c}$ |
| $\mathbf{1}$ gal | 1 | 4 | 8 | 16 |
| $\mathbf{1} \mathbf{q t}$ | $\frac{1}{4}$ | 1 | 2 | 4 |
| $\mathbf{1} \mathbf{p t}$ | $\frac{1}{8}$ | $\frac{1}{2}$ | 1 | 2 |
| $\mathbf{1} \mathbf{c}$ | $\frac{1}{16}$ | $\frac{1}{4}$ | $\frac{1}{2}$ | 1 |

## Read the Problem

What do I need to find?
I need to find $\qquad$
$\qquad$
$\qquad$
$\qquad$ .

## How will I use the information?

I will make a table to show the relationship between the number of $\qquad$ and the number of $\qquad$ .

## Solve the Problem

There are $\qquad$ cups in 1 gallon. So, each cup is $\qquad$ of a gallon.
Complete the table below.

| c | 1 | 2 | 3 | 4 | 1 |
| :--- | :---: | :---: | :---: | :---: | :---: |
| gal | $\frac{1}{16}$ | $\frac{1}{8}$ | $\frac{3}{16}$ | $\frac{1}{4}$ |  |${ }^{2}$ Multiply by 0

$\qquad$ .

So, Aaron needs $\qquad$ gallon containers to store the punch.

- Maprimanaical (2)

Use Reasoning Will all of the gallon containers Aaron uses be filled to capacity? Explain.

## (1) Try Another Problem

Sharon is working on a project for art class. She needs to cut strips of wood that are each 1 decimeter long to complete the project. If Sharon has 7 strips of wood that are each 1 meter long, how many 1-decimeter strips can she cut?

| Conversion Table |  |  |  |  |
| :--- | :---: | :---: | :---: | :---: |
|  | $\mathbf{m}$ | $\mathbf{d m}$ | $\mathbf{c m}$ | $\mathbf{m m}$ |
| $\mathbf{1} \mathbf{m}$ | 1 | 10 | 100 | 1,000 |
| $\mathbf{1 ~ d m}$ | $\frac{1}{10}$ | 1 | 10 | 100 |
| $\mathbf{1} \mathbf{~ c m}$ | $\frac{1}{100}$ | $\frac{1}{10}$ | 1 | 10 |
| $\mathbf{1 ~ m m}$ | $\frac{1}{1,000}$ | $\frac{1}{100}$ | $\frac{1}{10}$ | 1 |


| Read the Problem <br> What do I need to find? | What information do I <br> need to use? | How will I use the <br> information? |
| :--- | :--- | :--- |

## Solve the Problem

So, Sharon can cut $\qquad$ 1-decimeter lengths to complete her project.

- Look for a Pattern What relationship did the table you made show?


## Share and Show

## MATH <br> BOARD

1. Edgardo has a drink cooler that holds 10 gallons of water. He is filling the cooler with a 1-quart container. How many times will he have to fill the quart container to fill the cooler?

First, make a table to show the relationship between gallons and quarts. You can use a conversion table to find how many quarts are in a gallon.

| gal | 1 | 2 | 3 | 4 | 1 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| qt | 4 |  |  |  |  |

Then, look for a rule to help you complete your table.
number of gallons $\times$ $\qquad$ $=$ number of quarts

Finally, use the table to solve the problem.
Edgardo will need to fill the quart container $\qquad$ times.
2. THINK SMARTER What if Edgardo only uses 32 quarts of water to fill the cooler. How can you use your table to find how many gallons that is?
$\qquad$
$\qquad$
$\qquad$
$\qquad$
3. If Edgardo uses a 1-cup container to fill the cooler, how will that affect the number of times he has to fill a container to fill the cooler? Explain.

## On Your Own

4. THINKSMARTER Maria put trim around a banner that is the shape of a triangle. Each side is 22 inches long. Maria has $\frac{1}{2}$ foot of trim left. What was the length of the trim when she started? Write your answer in yards.
5. Dan owns 9 DVDs. His brother Mark has 3 more DVDs than Dan has. Their sister, Marsha, has more DVDs than either of her brothers. Together, the three have 35 DVDs. How many DVDs does Marsha have?
$\qquad$
6. GПDEEPER Kevin is making a picture frame. He has a piece of trim that is 4 feet long. How many 14 -inch-long pieces can Kevin cut from the trim? How much of a foot will he have left over?
$\qquad$
$\qquad$
7. 



Reason Quantitatively Explain how you could find the number of cups in five gallons of water.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
8. Carla uses $2 \frac{3}{4}$ cups of whole wheat flour and $1 \frac{3}{8}$ cups of rye flour in her bread recipe. How many cups does she use in all?
$\qquad$
9. THINKSMARTER A large pot holds 12 gallons of soup. Jared has 1-pint containers of chicken broth. Complete the table to help you find the number of 1-pint containers of chicken broth Jared will need to fill the pot.

| gallon | 2 | 4 | 6 | 8 | 10 | 12 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| pint |  |  |  |  |  |  |

Jared will need $\qquad$ 1-pint containers to fill the pot.
$\qquad$

## Elapsed Time

Essential Question How can you solve elapsed time problems by converting units of time?

## Unlock the Problem

A computer company claims its laptop has a battery that lasts 4 hours. The laptop actually ran for 200 minutes before the battery ran out. Did the battery last 4 hours?


1 hour $=$ $\qquad$ minutes

Think: The minute hand moves from one number to the next in 5 minutes.

0
Convert 200 minutes to hours and minutes.
STEP 1 Convert minutes into hours and minutes.
$200 \min =$ $\qquad$ hr $\qquad$ $\min$


STEP 2 Compare. Write $<,>$, or $=$. $\qquad$ hr $\qquad$ min $\qquad$

Since $\qquad$ hours $\qquad$ minutes is $\qquad$ 4 hours, the
battery $\qquad$ last as long as the computer company claims.

## Try This! Convert to mixed measures.

Jill spent much of her summer away from home. She spent 10 days with her grandparents, 9 days with her cousins, and 22 days at camp. How many weeks and days was she away from home?

STEP 1 Find the total number of days away.
10 days +9 days +22 days $=$ $\qquad$ days

STEP 2 Convert the days into weeks and days.

| Units of Time |
| :---: |
| 60 seconds (s) $=1$ minute (min) |
| 60 minutes $=1$ hour (hr) |
| 24 hours $=1$ day (d) |
| 7 days $=1$ week (wk) |
| 52 weeks $=1$ year (yr) |
| 12 months (mo) $=1$ year |
| 365 days $=1$ year |

$\qquad$ $\div 7$ is $\qquad$ $r$ $\qquad$
So, Jill was away from home $\qquad$ weeks and $\qquad$ days.

## P One Way

Use a number line to find elapsed time.
Monica spent $2 \frac{1}{2}$ hours working on her computer. If she started working at 10:30 A.m., what time did Monica stop working?

$$
1+\quad+
$$



10:30 $\qquad$ $-$

Think: $\frac{1}{2}$ hour $=30$ minutes

## (1) Another Way Use a clock to find elapsed time.



So, Monica stopped working at $\qquad$ .

## Try This! Find a start time.

Robert's soccer team needs to be off the soccer field by 12:15 P.m. Each game is at most $1 \frac{3}{4}$ hours long. What time should the game begin to be sure that the team finishes on time?
$\frac{1}{4}$ hour $=15$ minutes, so $\frac{3}{4}$ hour $=$ $\qquad$ minutes

STEP 1 Subtract the minutes first.


45 minutes earlier is $\qquad$ .

So, the game should begin at $\qquad$ .

STEP 2 Then subtract the hour.


1 hour and 45 minutes earlier is $\qquad$ .


## Share and Show

## Convert.

1. $540 \mathrm{~min}=$ $\qquad$ hr
2. $8 \mathrm{~d}=$ $\qquad$ hr
3. $110 \mathrm{hr}=$ $\qquad$ d $\qquad$ hr

## Find the end time.

4. Start time: 9:17 A.m. Elapsed time: 5 hr 18 min
 End time: $\qquad$

## On Your Own

Find the start, elapsed, or end time.
5. Start time: 11:38 А.м.

Elapsed time: 3 hr 10 min
End time: $\qquad$
7. Start time: $\qquad$
Elapsed time: $2 \frac{1}{4} \mathrm{hr}$
End time: 5:30 P.M.
6. Start time: $\qquad$
Elapsed time: 2 hr 37 min
End time: 1:15 P.M.
8. Start time: 7:41 P.M.

Elapsed time: $\qquad$
End time: 8:50 P.M.
9. WRITE Math Explain how you could find the number
of seconds in a full 24 -hour day. Then solve.
$\qquad$
$\qquad$

## Problem Solving • Applications

## For 10-12, use the graph.

10. 

(Мমमझinaical (4) Use Graphs Which Internet services downloaded the podcast in less than 4 minutes?
11. THINKSMARTER Which service took the longest to download the podcast? How much longer did it take than Red Fox in minutes and seconds?


12. GIDEEPER If both Jackrabbit and Red Fox started the podcast download at 10:05 A.m., at what time did each service complete its download? What was the difference between these times?
$\qquad$

## Personal Math Trainer

13. THINKSMARTER Samit and his friends went to a movie at 7:30 p.M. The movie ended at 9:55 P.M.

How long was the movie?

Samit arrived home 35 minutes after the movie ended. What time did Samit get home? Explain how you found your answer.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## ( $\mathbb{V}$ Chapter 10 Review/Test

1. The library is 5 miles from the post office. How many yards is the library from the post office?
$\qquad$ yards
2. Billy made 3 gallons of juice for a picnic. He said that he made $\frac{3}{4}$ quart of juice. Explain Billy's mistake.

3. The Drama Club is showing a video of their recent play. The first showing begins at 2:30 P.m. The second showing is scheduled at 5:25 P.M. with a $\frac{1}{2}$-hour break between the showings.

## Part A

How long is the video in hours and minutes?
$\qquad$ hours and $\qquad$ minutes

## Part B

Explain how you can use a number line to find the answer.
$\square$

## Part C

The second showing started 20 minutes late. Will the second showing be over by 7:45 P.m.? Explain why your answer is reasonable.

4. Fred bought 4 liters of liquid laundry detergent, 3,250 milliliters of fabric softener, and 2.5 liters of bleach. For numbers $4 \mathrm{a}-4 \mathrm{e}$, select True or False for each statement.
4a. Fred bought 75 milliliters more
O True
$\bigcirc$ False
fabric softener than bleach.
4b. Fred bought 1.75 liters moreTrue
$\bigcirc$ False
laundry detergent than bleach.
4c. Fred bought 750 milliliters more
O True
$\bigcirc$ False fabric softener than bleach.
4d. Fred bought 150 milliliters more
O True
$\bigcirc$ False laundry detergent than bleach.
4e. Fred bought 0.75 liters more laundry $\bigcirc$ True $\quad \bigcirc$ False
detergent than fabric softener.
5. A male hippopotamus can weigh up to 10,000 pounds. How many tons is 10,000 pounds?
$\qquad$ tons
6. Amar and his friends went to a movie at 4:45 p.M. The movie ended at 6:20 p.м.

## Part A

How long was the movie?
$\qquad$ hours and $\qquad$ minutes

## Part B

Amar got home 45 minutes after the movie ended. What time did Amar get home? Explain how you found your answer.
$\square$

## Name

7. Select the objects that hold the same amount of liquid as a 96 -fluid-ounce jug. Mark all that apply.
(A) three 1-quart bottles
(B) two 1-quart bottles
(C) two 1-quart bottles and two 1-pint bottles
(D) one 1-quart bottle and eight 8-ounce fluid glasses
(E) two 8-ounce fluid glasses and two 1-pint bottles
8. Lorena's backpack has a mass of 3,000 grams. What is the mass of Lorena's backpack in kilograms?
$\qquad$ kilograms
9. Richard walks every day for exercise at a rate of 1 kilometer every 12 minutes.

## Part A

At this rate, how many meters can Richard walk in 1 hour? Explain how you found your answer.
$\square$

## Part B

Suppose Richard walks 1 kilometer every 10 minutes. How many meters further can he walk in 1 hour at this new rate? Explain how you found your answer.

10. Beth filled 32 jars with paint. If each jar holds 1 pint of paint, how many gallons of paint did Beth use?
$\qquad$ gallons
11. Griffins's driveway is 36 feet long. Choose the word and number to complete the sentence correctly.

To convert 36 feet to yards, \begin{tabular}{|c|c|}
\hline add <br>
subtract <br>
multiply <br>
divide

 .36 

3 <br>
36 by <br>
12 <br>
1,760 <br>
5,280 <br>
\hline
\end{tabular}

12. Carlos bought 5 pounds of carrots. How many ounces of carrots did he buy?
$\qquad$ ounces
13. Chandler has 824 millimeters of fabric. How many centimeters of fabric does Chandler have? Use the numbers and symbols on the tiles to write an equation to show the conversion.

$\square$
Chandler has $\qquad$ centimeters of fabric.
14. Glenn needs to cut pieces of ribbon that are each 1 meter long to make ribbon key chains. If he has 3 pieces of ribbon that are each 1 dekameter long, how many 1-meter pieces of ribbon can he cut?
$\qquad$ pieces
15. A large pot holds 8 quarts of spaghetti sauce. Lisa has 1-pint containers of spaghetti sauce. Complete the table to help you find the number of 1-pint containers of spaghetti sauce Lisa will need to fill the pot.

| quart | 2 | 4 | 6 | 8 |
| :---: | :---: | :---: | :---: | :---: |
| pint |  |  |  |  |

Lisa will need $\square$ 1-pint containers to fill the pot.
16. Emily bought 48 yards of fabric to make curtains. How many inches of fabric did Emily buy?
$\qquad$ inches
17. Kelly is having a party. She wants to make punch. The recipe for punch uses 3 pints of pineapple juice, 5 cups of orange juice, $\frac{1}{4}$ gallon of lemonade, and 1 quart of apricot nectar.

## Part A

Kelly says her recipe will make 20 cups of punch. Is Kelly correct?
Explain your answer.
$\square$

## Part B

Kelly decides to pour her punch into 1-quart containers to fit into her refrigerator until the party starts. She has four 1-quart containers. Will all of her punch fit into the containers? Explain.
$\square$
18. Sam is practicing long track speed skating at an ice skating rink. The distance around the rink is 250 yards. He has skated around the rink 6 times so far. How many more yards does he need to skate around the rink to complete 3 miles?
$\qquad$ yards
19. Maria spent 15 days traveling in South America. How many hours did she spend traveling in South America?
$\qquad$ hours
20. A concrete truck loaded with concrete weighs about 30 tons. About how many pounds does the loaded truck weigh?
$\qquad$ pounds
21. A plumber has a piece of pipe that is 2 -meter long. He needs to cut it into sections that are 10 centimeters long. How many sections will he be able to cut? Show your work. Explain how you found your answer.

22. For numbers 22a-22d, select True or False for each statement.
22a. $2,000 \mathrm{lb}>1 \mathrm{~T}$TrueFalse
22b. $56 \mathrm{oz}<4 \mathrm{lb}$TrueFalse
22c. $48 \mathrm{oz}=3 \mathrm{lb}$TrueFalse
22d. $\quad 40 \mathrm{oz}<2 \mathrm{lb} 4 \mathrm{oz}$True
False

## Ceometry and yolume

## Show What You Know

Check your understanding of important skills.
Name $\qquad$

Perimeter Count the units to find the perimeter.
1.

|  | 1 | 2 | 3 | 4 | 5 | 6 |  |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| 20 |  |  |  |  |  |  | 7 |
| 19 |  |  |  |  |  |  | 8 |
| 18 |  |  |  |  |  |  | 9 |
| 17 |  |  |  |  |  |  | 10 |
|  | 16 | 15 | 14 | 13 | 12 | 11 |  |

Perimeter $=$ $\qquad$ units
2.


Perimeter $=$ $\qquad$ units
$>$ Area Write the area of each shape.

$\qquad$ square units
4.

$\qquad$ square units

## Multiply Three Factors Write the product.

5. $3 \times 5 \times 4 \times$ $\qquad$ 6. $5 \times 5 \times 10 \times$ $\qquad$ 7. $7 \times 3 \times 20 \times$ $\qquad$

Helen must find a certain polyhedron for a treasure hunt. Be a Math Detective by using the clues to help Helen identify the polyhedron.

- The polyhedron has 1 base.
- It has 4 lateral faces that meet at a common vertex.
- The edges of the base are all the same length.

square pyramid
 prism

cube


## Vocabulary Builder

## Visualize It

## Sort the checked words into the circle map.



## Understand Vocabulary

## Write the preview word that answers the riddle.

1. I am a solid figure with two congruent polygons that are bases, connected with lateral faces that are rectangles. $\qquad$
2. I am a polygon in which all sides are congruent and all angles are congruent. $\qquad$
3. I am a cube that has a length, width, and height of 1 unit.
4. I am a solid figure with faces that are polygons.
5. I am the measure of the amount of space a solid figure occupies. $\qquad$
6. I am a polygon that connects with the bases of a polyhedron. $\qquad$

## Review Words

$\checkmark$ acute triangle
decagon
equilateral triangle
$\checkmark$ hexagon
isosceles triangle
$\checkmark$ obtuse triangle
$\checkmark$ octagon
$\checkmark$ parallelogram
quadrilateral
$\checkmark$ rectangle
$\checkmark$ rhombus
right triangle
scalene triangle
trapezoid
Preview Words
base
congruent
heptagon
lateral face
nonagon
polygon
polyhedron
prism
pyramid
regular polygon
unit cube
volume
$\qquad$

## Polygons

Essential Question How can you identify and classify polygons?

## Unlock the Problem

The Castel del Monte in Apulia, Italy, was built more than 750 years ago. The fortress has one central building with eight surrounding towers. Which polygon do you see repeated in the structure? How many sides, angles, and vertices does this polygon have?

A polygon is a closed plane figure formed by three or more line segments that meet at points called vertices. It is named by the number of sides and angles it has. To identify the repeated polygon in the fortress, complete the tables below.


| Polygon | Triangle |  | Quadrilateral | Pentagon |
| ---: | :---: | :---: | :---: | :---: |
| Sides | 3 |  | 5 |  |
| Angles |  |  |  |  |
| Vertices |  |  |  |  |


| Polygon | Heptagon | Octagon | Nonagon | Decagon |
| ---: | :---: | :---: | :---: | :---: |
| Sides | 7 | 8 |  |  |
| Angles |  |  |  |  |
| Vertices |  |  |  |  |

Sometimes the angles inside a polygon are greater than $180^{\circ}$.


So, the $\qquad$ is the repeated polygon in the

Castel del Monte because it has $\qquad$ sides, $\qquad$ angles, and $\qquad$ vertices.

What pattern do you see among the number of sides, angles, and vertices a polygon has?

Regular Polygons When line segments have the same length or when angles have the same measure, they are congruent. Two polygons are congruent when they have the same size and the same shape. In a regular polygon, all sides are congruent and all angles are congruent.

## regular polygon

All sides are congruent.

All angles are congruent.


You can write measurements to show congruent sides and angles.

## not a regular polygon

Not all sides are congruent.

Not all angles are congruent.

You can use the same markings to show the congruent sides and angles.

Try This! Label the Venn diagram to classify the polygons in each group.
Then draw a polygon that belongs only to each group.

Congruent $\qquad$ Congruent $\qquad$


Explain how the group of polygons in the center section of

## Share and Show

MATH
BOARD the Venn Diagram is related to the groups in the left and right sections of the diagram.

1. Name the polygon. Then use the markings on the figure to tell whether it is a regular polygon or not a regular polygon.
a. Name the polygon. $\qquad$
b. Are all the sides and all the angles congruent? $\qquad$


Name $\qquad$
Name each polygon. Then tell whether it is a regular polygon or not a regular polygon.
2.

83.

$\checkmark 4$.

$\qquad$

## On Your Own

Name each polygon. Then tell whether it is a regular polygon or not a regular polygon.

7.

9.

$\qquad$
6.

8.

10.


## Problem Solving • Applications

For 11-12, use the Castel del Monte floor plan at the right.
11. GIDEEPER Which polygons in the floor plan have four equal sides and four congruent angles? How many of these polygons are there?
12. GחDEEPER Is there a quadrilateral in the floor plan that is not a regular polygon? Name the quadrilateral and tell how many of the quadrilaterals are in the floor plan.

 vertices of a closed plane figure. Connect the points to draw the figure.


What kind of polygon did you draw? $\qquad$
14. THINKSMARTER Look at the angles for all regular polygons. As the number of sides increases, do the measures of the angles increase or decrease? What pattern do you see?


15. THINKSMARTER Kayla drew the shape shown. For numbers 15a-15b, choose the values and term that correctly describe the shape Kayla drew. 15a. The figure has \begin{tabular}{|c}
4 <br>
6 <br>
12 <br>
\hline

 sides and 

4 <br>
6 <br>
8
\end{tabular} \(\begin{gathered} <br>

\end{gathered}\) angles.


15b. The figure is a
regular heptagon
regular pentagon
regular hexagon

## Triangles

Essential Question How can you classify triangles?

## Unlock the Problem

If you look closely at Epcot Center's Spaceship Earth building in Orlando, Florida, you may see a pattern of triangles. The triangle outlined in the pattern at the right has 3 congruent sides and 3 acute angles. What type of triangle is outlined?

$\square$
Complete the sentence that describes each type of triangle.


Classify triangles by the lengths
of their sides.


Classify triangles by the measures of their angles.

A right triangle has one $90^{\circ}$, or angle.


An acute triangle has 3
$\qquad$ angles.


An isosceles triangle has


The type of triangle outlined in the pattern can be classified by the length of its sides as an $\qquad$ triangle.

The triangle can also be classified by the measures of its angles as an $\qquad$ triangle.

## (1) Activity

Classify triangle $A B C$ by the lengths of its sides and by the measures of its angles.

Materials $■$ centimeter ruler $■$ protractor

- What type of triangle has 3 sides of different lengths?
- What is an angle called that is greater than $90^{\circ}$ and less than $180^{\circ}$ ?

STEP 1 Measure the sides of the triangle using a centimeter ruler. Label each side with its length. Classify the triangle by the lengths of its sides.

STEP 2 Measure the angles of the triangle using a protractor. Label each angle with its measure. Classify the triangle by the measures of its angles.


Triangle $A B C$ is a $\qquad$ triangle.

Try This! Draw the type of triangle described by the lengths of its sides and by the measures of its angles.

|  | Triangle by Length of Sides |  |  |
| :---: | :---: | :---: | :---: |
|  |  | Scalene | Isosceles |
|  |  | Think: I need to draw a triangle that is acute and scalene. |  |
|  |  |  |  |

## Share and Show

## MATH

BOARD
Classify each triangle. Write isosceles, scalene, or equilateral.
Then write acute, obtuse, or right.
1.

2.

3.


## On Your Own

Can you tell that a triangle is obtuse, right, or acute without measuring the angles? Explain.

A triangle has sides with the lengths and angle measures given. Classify each triangle. Write isosceles, scalene, or equilateral. Then write acute, obtuse, or right.
4. sides: $3.5 \mathrm{~cm}, 6.2 \mathrm{~cm}, 3.5 \mathrm{~cm}$
angles: $27^{\circ}, 126^{\circ}, 27^{\circ}$
$\qquad$
6. Circle the figure that does not belong. Explain.

$\qquad$
7. G■DEEPER Draw 2 equilateral triangles that are congruent and share a side. What polygon is formed? Is it a regular polygon?

## Problem Solving • Applications

8. THINK SMARTER Shannon said that a triangle with exactly 2 congruent sides and an obtuse angle is an equilateral obtuse triangle. Describe her error.

$\qquad$
9. IHINKSMARTER Kelly drew a triangle with exactly 2 congruent sides and 3 acute angles. Which of the following accurately describes the triangle? Mark all that apply.
(A) isosceles
(C) obtuse
(B) acute
(D) equilateral

## Connect 〔to Science

## Forces and Balance

What makes triangles good for the construction of buildings or bridges?
The 3 fixed lengths of the sides of a triangle, when joined, can form no other shape. So, when pushed, triangles don't bend or break.


Write isosceles, scalene, or equilateral. Then write acute, obtuse, or right.

11.

$\qquad$

## Quadrilaterals

Essential Question How can you classify and compare quadrilaterals?

## Unlock the Problem

A seating chart for a baseball field has many four-sided figures, or quadrilaterals. What types of quadrilaterals can you find in the seating chart?

There are five special types of quadrilaterals. You can classify quadrilaterals by their properties, such as parallel sides and perpendicular sides. Parallel lines are lines that are always the same distance apart. Perpendicular lines are lines that intersect to form four right angles.

Complete the sentence that describes each type of quadrilateral.


A general quadrilateral has 4 sides and 4 angles.


A parallelogram has opposite $\qquad$
 that are $\qquad$ and parallel.

A rectangle is a special
parallelogram with $\qquad$ right angles and 4 pairs of
$\qquad$ sides.


A rhombus is a special parallelogram with $\qquad$


A square is a special parallelogram with
$\qquad$ congruent sides

and $\qquad$ right angles.

So, the types of quadrilaterals you can find in the seating chart of the field are

## 1) Activity

Materials $■$ quadrilaterals $■$ scissors
You can use a Venn diagram to sort quadrilaterals and find out how they are related.

- Draw the diagram below on your MathBoard.
- Cut out the quadrilaterals and sort them into the Venn diagram.
- Record your work by drawing each figure you have placed in the Venn diagram below.


Complete the sentences by writing always, sometimes, or never.

A rhombus is $\qquad$ a square.

A parallelogram is $\qquad$ a rectangle.

A rhombus is $\qquad$ a parallelogram.

A trapezoid is $\qquad$
a parallelogram.
A square is $\qquad$ a rhombus.

1. Explain why the circle for parallelograms does not intersect the circle for trapezoids.
$\qquad$
$\qquad$
$\qquad$
2. Explain why the section of the Venn Diagram for squares intersects with both the section for rhombuses and the section for rectangles.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Share and Show

## MATH <br> BOARD

1. Use quadrilateral $A B C D$ to answer each question. Complete the sentence.
a. Measure the sides. Are any of the sides congruent? $\qquad$
Mark any congruent sides.
b. How many right angles, if any, does the quadrilateral have? $\qquad$

c. How many pairs of parallel sides, if any, does the quadrilateral have? $\qquad$
So, quadrilateral $A B C D$ is a $\qquad$ .

Classify the quadrilateral in as many ways as possible. Write quadrilateral, parallelogram, rectangle, rhombus, square, or trapezoid.

3.

$\qquad$

Can the parallel sides of a trapezoid be the same length? Explain your answer.

## On Your Own

Classify the quadrilateral in as many ways as possible. Write quadrilateral, parallelogram, rectangle, rhombus, square, or trapezoid.
4.

5.

6.

7.


## Problem Solving • Applications

8. A quadrilateral has exactly 2 congruent sides. Which quadrilateral types could it be? Which quadrilaterals could it not be?
$\qquad$
$\qquad$
9. THINKSMARTER A quadrilateral has exactly 3 congruent sides. Davis claims that the figure must be a rectangle. Why is his claim incorrect?
Use a diagram to explain your answer.
$\qquad$
$\qquad$
$\qquad$
10. Matimwicil (3) Make Arguments The opposite corners of a quadrilateral
 are right angles. The quadrilateral is not a rhombus. What kind of quadrilateral is this figure? Explain how you know.
$\qquad$
$\qquad$
11. G■DEEPER I am a figure with four sides. I can be placed in the
following categories: quadrilateral, parallelogram, rectangle, rhombus, and square. Draw me. Explain why I fit into each category.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
Personal Math Trainer
12. IHINKSMARTER For numbers 12a-12c, write the name of one
quadrilateral from the tiles on the line to complete a true statement. Use each quadrilateral only once.

12a. A $\qquad$ is sometimes a square.

12b. A $\qquad$ is always a rectangle.

12c. A parallelogram is never a $\qquad$ .

## Three-Dimensional Figures

Essential Question How can you identify, describe, and classify three-dimensional figures?

## Unlock the Problem

A solid figure has three dimensions: length, width, and height. Polyhedrons, such as prisms and pyramids, are three-dimensional figures with faces that are polygons.

A prism is a polyhedron that has two congruent polygons as bases.
A polyhedron's lateral faces are polygons that connect with the bases. The lateral faces of a prism are rectangles.


A prism's base shape is used to name the solid figure. The base shape of this prism is a triangle. The prism is a triangular prism.

0Identify the base shape of the prism. Use the terms in the box to correctly name the prism by its base shape.


Base shape: $\qquad$
Name the solid figure.


Base shape: $\qquad$
Name the solid figure.

## Math Idea

A two-dimensional figure has the dimensions length and width, which are used to find the figure's area.
A three-dimensional figure, or solid, has three dimensions: length, width, and height. These dimensions are used to find the figure's volume, or the space it occupies.

Types of Prisms decagonal prism octagonal prism hexagonal prism pentagonal prism rectangular prism triangular prism


Base shape: $\qquad$
Name the solid figure.


Base shape:
Name the solid figure.

Mathematical Practices
What shapes make up a decagonal prism, and how many are there? Explain.

[^3]Pyramid A pyramid is a polyhedron with only one base. The lateral faces of a pyramid are triangles that meet at a common vertex.

Like a prism, a pyramid is named for the shape of its base.

$\square$
Identify the base shape of the pyramid. Use the terms in the box to correctly name the pyramid by its base shape.

Types of Pyramids pentagonal pyramid rectangular pyramid square pyramid triangular pyramid


Base shape: $\qquad$
Name the solid figure.


Base shape: $\qquad$
Name the solid figure.


Base shape: $\qquad$
Name the solid figure.

Non-polyhedrons Some three-dimensional figures have curved surfaces. These solid figures are not polyhedrons.


A cone has 1 circular base and 1 curved surface.


A cylinder has 2 congruent circular bases and 1 curved surface.


A sphere has no bases and 1 curved surface.

## Share and Show

Classify the solid figure. Write prism, pyramid, cone, cylinder, or sphere.
1.


## Name the solid figure.

4. 



2.

3.

6.

$\qquad$

## On Your Own

Classify the solid figure. Write prism, pyramid, cone, cylinder, or sphere.
7.

8.

9.


Name the solid figure.
10.

$\qquad$
13.

11.

14.

12.

15.

$\qquad$

## Problem Solving • Applications

16. 

Mastimaical (6) Use Math Vocabulary Mario is making a sculpture out of stone. He starts by carving a base with five sides. He then carves five triangular lateral faces that all meet at a point at the top. What three-dimensional figure does Mario make?
17.
 What is another name for a cube? Explain your reasoning.
18. GПDEEPER Compare the characteristics of prisms and pyramids.

Tell how they are alike and how they are different.
19. THINKSMARTER Write the letter in the box that correctly describes the three-dimensional figure.
A

B

C

D


Pyramid

## Connect tol Reading

## Identify the Details

If you were given a description of a building and asked to identify which one of these three buildings is described, which details would you use to determine the building?

A word problem contains details that help you solve the problem. Some details are meaningful and are important to finding the solution and some details may not be. Identify the details you need to solve the problem.

## Example Read the description. Underline the details

 you need to identify the solid figure that will name the correct building.

This building is one of the most identifiable structures in its city's skyline. It has a square foundation and 28 floors. The building has four triangular exterior faces that meet at a point at the top of the structure.


Identify the solid figure and name the correct building.
20. Solve the problem in the Example.

Solid figure: $\qquad$
Building: $\qquad$ -
21. This building was completed in 1902. It has a triangular foundation and a triangular roof that are the same size and shape. The three sides of the building are rectangles.

Solid figure: $\qquad$
Building: $\qquad$
$\qquad$

## (V) Mid-Chapter Checkpoint

## Vocabulary

Choose the best term from the box.

1. A closed plane figure with all sides congruent and all angles congruent is called a $\qquad$ (p. 466)
2. Line segments that have the same length, or angles that have the same measure, are $\qquad$ . (p. 466)

## Concepts and Skills

Name each polygon. Then tell whether it is a regular polygon or not a regular polygon. (5.G.3)
3.

$\qquad$
Classify each triangle. Write isosceles, scalene, or equilateral.
Then write acute, obtuse, or right. (5.G.3, 5.G.4)
6.

7.

$\qquad$
4.

5.

8.


Classify the quadrilateral in as many ways as possible. Write all that apply: quadrilateral, parallelogram, rectangle, rhombus, square, or trapezoid. (5.G.4)

10.

$\qquad$
$\qquad$
11.

12. What type of triangle is shown below? (5.G.3, 5.G.4)

13. Classify the quadrilateral in as many ways as possible. (5.G.4)

14. Classify the following figure. (5.MD.3)

$\qquad$

## Unit Cubes and Solid Figures

Essential Question What is a unit cube and how can you use it to build a solid figure?

## Investigate

You can build rectangular prisms using unit cubes.
How many different rectangular prisms can you build with a given number of unit cubes?

Materials ■ centimeter cubes
A unit cube is a cube that has a length, width, and height
of 1 unit. A cube has $\qquad$ square faces. All of its faces
are congruent. It has $\qquad$ edges. The lengths of all its edges are equal.
A. Build a rectangular prism with 2 unit cubes.

Think: When the 2 cubes are pushed together, the faces and edges that are pushed together make 1 face and 1 edge.

- How many faces does the rectangular prism have? $\qquad$
- How many edges does the rectangular prism have? $\qquad$
B. Build as many different rectangular prisms as you can with 8 unit cubes.
C. Record in units the dimensions of each rectangular prism you built with 8 cubes.



So, with 8 unit cubes, I can build $\qquad$ different rectangular prisms.

Describe the different rectangular prisms that you can make with 4 unit cubes.

## Draw Conclusions

1. Explain why a rectangular prism composed of 2 unit cubes has 6 faces. How do its dimensions compare to a unit cube?
$\qquad$
$\qquad$
$\qquad$
2. Matifnnical (6) Explain how the number of edges for the rectangular prism compares to the number of edges for the unit cube.
$\qquad$
$\qquad$
3. Мапमimanical 6 Describe what all of the rectangular prisms you made in Step B have in common.

## Make Connections

You can build other solid figures and compare the solid figures
by counting the number of unit cubes.


Figure 1
Figure 1 is made up of $\qquad$ unit cubes.


Figure 2
Figure 2 is made up of $\qquad$ unit cubes.

So, Figure $\qquad$ has more unit cubes than Figure $\qquad$ .

- Use 12 unit cubes to build a solid figure that is not a rectangular prism. Share your model with a partner. Describe how your model is the same and how it is different from your partner's model.
$\qquad$
$\qquad$
$\qquad$


## Share and Show

Count the number of cubes used to build each solid figure.

1. The rectangular prism is made up of $\qquad$ unit cubes.

2. 


$\qquad$ unit cubes
83.

unit cubes
4.

$\qquad$ unit cubes
5. WRITE Math How are the rectangular prisms in Exercises 2-3 related? Can you show a different rectangular prism with the same relationship? Explain.
$\qquad$
$\qquad$

## Problem Solving • Applications

Compare the number of unit cubes in each solid figure. Use $<,>$ or $=$.
6.
 unit cubes $\qquad$ unit cubes
$\qquad$ unit cubes

$\qquad$ unit cubes
7.
$\qquad$
8. Matinwical 2) Use Reasoning Melissa makes a solid figure by stacking 1 cube on top of a row of 2 cubes on top of a row of 3 cubes. Then she rearranges the cubes to form a rectangular prism. Describe the arrangement of cubes in the rectangular prism.

## Connect to Art

Architecture is the art and science of designing buildings and structures.

The Cube Houses of Rotterdam in the Netherlands, shown at the top right, were built in the 1970s. Each cube is a house, tilted and resting on a hexagon-shaped pylon, and is meant to represent an abstract tree. The village of Cube Houses creates a "forest."

The Nakagin Capsule Tower, shown at the right, is an office
 and apartment building in Tokyo, Japan, made up of modules attached to two central cores. Each module is a rectangular prism connected to a concrete core by four huge bolts. The modules are office and living spaces that can be removed or replaced.

## Use the information to answer the questions.

9. G■DEEPER There are 38 Cube Houses. Each house could hold 1,000 unit cubes that are 1 meter by 1 meter by 1 meter. Describe the dimensions of a cube house using unit cubes. Remember that the edges of a cube are all the same length.

10. THINKSMARTER The Nakagin Capsule Tower has 140 modules, and is 14 stories high. If all of the modules were divided evenly among the number of stories, how many modules would be on each floor? How many different rectangular prisms could be made from that number?

11. THINKSMARTER Match the figure with the number of unit cubes that would be needed to build each figure. Not every number of unit cubes will be used.

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$\qquad$

## Understand Volume

Essential Question How can you use unit cubes to find the volume of a rectangular prism?

Measurement and Data5.MD.3b, 5.MD. 4 MATHEMATICAL PRACTICES MP.3, MP.5, MP. 6

## Investigate

CONNECT You can find the volume of a rectangular prism by counting unit cubes. Volume is the measure of the amount of space a solid figure occupies and is measured in cubic units. Each unit cube has a volume of 1 cubic unit.


The rectangular prism above is made up of $\qquad$ unit cubes and has a volume of $\qquad$ cubic units.

Materials $\quad$ rectangular prism net $\mathrm{A} ■$ centimeter cubes
A. Cut out, fold, and tape the net to form a rectangular prism.
B. Use centimeter cubes to fill the base of the rectangular prism without gaps or overlaps. Each centimeter cube has a length, width, and height of 1 centimeter and a volume of 1 cubic centimeter.

- How many centimeter cubes make up the length of the first layer? the width? the height?
length: $\qquad$ width: $\qquad$ height: $\qquad$
- How many centimeter cubes are used to fill the base? $\qquad$
C. Continue filling the rectangular prism, layer by layer. Count the number of centimeter cubes used for each layer.
- How many centimeter cubes are in each layer? $\qquad$
- How many layers of cubes fill the rectangular prism? $\qquad$
- How many centimeter cubes fill the prism? $\qquad$
So, the volume of the rectangular prism is $\qquad$ cubic centimeters.


## Draw Conclusions

1. Describe the relationship among the number of centimeter cubes you used to fill each layer, the number of layers, and the volume of the prism.
$\qquad$
$\qquad$
$\qquad$
 3 units, a width of 4 units, and a height of 2 units, how many unit cubes would you need for each layer? How many unit cubes would you need to fill the rectangular prism?

## Make Connections

To find the volume of three-dimensional figures, you measure in three directions. For a rectangular prism, you measure its length, width, and height. Volume is measured using cubic units, such as cu cm , cu in., or cu ft.


- Which has a greater volume, 1 cu cm or 1 cu in.? Explain.


1 cu in.

Find the volume of the prism if each cube represents $1 \mathrm{cu} \mathrm{cm}, 1 \mathrm{cu}$ in., and 1 cuft .

$\qquad$ cu cm
$\qquad$ cu in.
$\qquad$ cuft
mathematical
Practice
6 Would the prism above be the same size if it were built with centimeter cubes, inch cubes, or foot cubes? Explain.
$\qquad$
$\qquad$
$\qquad$
$\qquad$

## Share and Show

## Use the unit given. Find the volume.



Volume $=$ $\qquad$ cu $\qquad$
3.


Each cube $=1 \mathrm{cuft}$

Volume $=$ $\qquad$ cu $\qquad$
Compare the volumes. Write $<,>$, or $=$.
5.


Each cube $=1 \mathrm{cu} \mathrm{cm}$
2.


Each cube $=1 \mathrm{cu}$ in.

Volume $=$ $\qquad$ cu $\qquad$
4.


Each cube $=1 \mathrm{cu}$ in.

Volume $=$ $\qquad$ cu $\qquad$


Each cube $=1 \mathrm{cu}$ in.
$\qquad$ cu cm $\qquad$ cu in.
6.


Each cube $=1 \mathrm{cuft}$
$\qquad$ cu ft $\qquad$ cu ft

## Problem Solving • Applications

7. Marifyaical 3) Verify the Reasoning of Others Gerardo says that a cube with edges that measure 10 centimeters has a volume that is twice as much as a cube with sides that measure 5 centimeters. Explain and correct Gerardo's error.
8. 

THINKSMARTER Pia built a rectangular prism with cubes. The base of her prism has 12 cm cubes. If the prism was built with 108 cm cubes, what is the height of her prism?

9. HIDEEPER A packing company makes boxes with edges each $^{2}$ measuring 3 feet. What is the volume of the boxes? If 10 boxes are put in a larger, rectangular shipping container and completely fill it with no gaps or overlaps, what is the volume of the shipping container?
10. THINKSMARTER Carlton used 1 -centimeter cubes to build the rectangular prism shown.

Find the volume of the rectangular prism Carlton built.

$\qquad$

## Estimate Volume

Essential Question How can you use an everyday object to estimate the volume of a rectangular prism?

Measurement and Data-5.MD. 4 Also 5.MD. 36
MATHEMATICAL PRACTICES MP.1, MP.2, MP. 6

## Investigate

Izzy is mailing 20 boxes of crayons to a children's-education organization overseas. She can pack them in one of two differentsized shipping boxes. Using crayon boxes as a cubic unit, about what volume is each shipping box, in crayon boxes? Which shipping box should Izzy use to mail the crayons?

Materials $\square$ rectangular prism net $\mathrm{B} \square 2$ boxes, different sizes
A. Cut out, fold, and tape the net to form a rectangular prism. Label the prism "Crayons." You can use this prism to estimate and compare the volume of the two boxes.
B. Using the crayon box that you made, count to find the number of boxes that make up the base of the shipping box. Estimate the length to the nearest whole unit.

## Number of crayon boxes that fill the base:

Box 1: $\qquad$ Box 2: $\qquad$
C. Starting with the crayon box in the same position, count to find the number of crayon boxes that make up the height of the shipping box. Estimate the height to the nearest whole unit.

## Number of layers:

Box 1: $\qquad$ Box 2: $\qquad$

Box 1 has a volume of $\qquad$ crayon boxes and Box 2 has a volume of $\qquad$ crayon boxes.

So, Izzy should use Box $\qquad$ to ship the crayons.

## Draw Conclusions

1. Maryinnaical (6) Explain how you estimated the volume of the shipping boxes.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
2. Matifnilical (1) Analyze If you had to estimate to the nearest whole unit to find the volume of a shipping box, how might you be able to ship a greater number of crayon boxes in the shipping box than you actually estimated? Explain.
$\qquad$
$\qquad$
$\qquad$

## Make Connections

The crayon box has a length of 3 inches, a width of 4 inches, and a height of 1 inch. The volume of the crayon box is $\qquad$ cubic inches.

Using the crayon box, estimate the volume of the box at the right in cubic inches.

- The box to the right holds $\qquad$ crayon boxes in each

of $\qquad$ layers, or $\qquad$ crayon boxes.
- Multiply the volume of 1 crayon box by the estimated number of crayon boxes that fit in the box at the right.
$\qquad$ $\times$ $\qquad$ $=$ $\qquad$

So, the volume of the shipping box at the right is about $\qquad$ cubic inches.
$\qquad$

## Share and Show

## MATH

 BOARD
## Estimate the volume.

1. Each tissue box has a volume of 125 cubic inches.

There are $\qquad$ tissue boxes in the larger box.

The estimated volume of the box holding the tissue boxes is $\qquad$ $\times 125=$ $\qquad$ cu in.
2. Volume of chalk box: 16 cu in .


Volume of large box:

3. Volume of small jewelry box: 30 cu cm


Volume of large box: $\qquad$

## Problem Solving • Applications

4. MATHEMATCAL (2) Use Reasoning Jamie is mailing a large box of donated books to a community center. The volume of each book is 80 cubic inches. The picture shows the number of books she put in the box. Jamie can fit one more layer of books in the box. About what is the volume of the box?

5. GDDEEPER

Anna is collecting boxes of cereal to deliver to a food bank. The volume of each cereal box is 324 cubic inches. The picture shows the cereal boxes she has collected so far. A large delivery box holds three times as many boxes as Anna collected. About what is the volume of the delivery box?


## THINKSMARTER <br> Sense or Nonsense?

6. Marcelle estimated the volume of the two boxes below, using one of his books. His book has a volume of 48 cubic inches. Box 1 holds about 7 layers of books, and Box 2 holds about 14 layers of books. Marcelle says that the volume of either box is about the same.


- Does Marcelle's statement make sense or is it nonsense?

Explain your answer.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
$\qquad$
7. THINK SMARIER A pack of folders have a length of 5 inches, a width of 12 inches, and a height of 1 inch. The pack of folders will be shipped in a box that holds 12 packs of folders. For numbers 7a-7c, select True or False for each statement.

7a. Each pack of folders has a volume of 60 cubic inches.True

False
7b. The box has a volume of about 720 cubic inches.
O True
False
7c. If the box held 15 packs of folders, it would have a
O True
False volume of about 1,200 cubic inches.

## Name

## Volume of Rectangular Prisms

Essential Question How can you find the volume of a rectangular prism?

Connect The base of a rectangular prism is a rectangle. You know that area is measured in square units, or units ${ }^{2}$, and that the area of a rectangle can be found by multiplying the length and the width.

Volume is measured in cubic units, or units ${ }^{3}$. When you build a prism and add each layer of cubes, you are adding a third dimension, height.


The area of the base
is $\qquad$ sq units.

## Unlock the Problem

Yuan built the rectangular prism shown at the right, using 1 -inch cubes. The prism has a base that is a rectangle and has a height of 4 cubes. What is the volume of the rectangular prism that Yuan built?

You can find the volume of a prism in cubic units by multiplying the number of square units in the base shape by the number of layers, or its height.

Each layer of Yuan's rectangular prism

is composed of $\qquad$ inch cubes.

| Height (in layers) | 1 | 2 | 3 | 4 |
| :--- | :---: | :---: | :---: | :---: |
| Volume (in cubic inches) | 12 | 24 |  |  |

$\qquad$ -

1. How does the volume change as each layer is added?
$\qquad$
$\qquad$
2. What does the number you multiply the height by represent?
$\qquad$
$\qquad$

So, the volume of Yuan's rectangular prism is $\qquad$ in. ${ }^{3}$

## Relate Height to Volume

Toni stacks cube-shaped beads that measure 1 centimeter on each edge in a storage box. The box can hold 6 layers of 24 beads with no gaps or overlaps. What is the volume of Toni's storage box?

- What are the dimensions of the base of the box?
- What operation can you use to find the area of the base shape?


## I) One Way Use base and height.

The volume of each bead is $\qquad$ $\mathrm{cm}^{3}$.

The storage box has a base with an area of $\qquad$ $\mathrm{cm}^{2}$.

The height of the storage box is $\qquad$ centimeters.

The volume of the storage box is $\times$ $\qquad$ ), or $\qquad$ $\mathrm{cm}^{3}$.
 area

## ( ) Another Way

Use length, width, and height.
You know that the area of the base of the storage box is $24 \mathrm{~cm}^{2}$.
The base has a length of $\qquad$ centimeters and a width of $\qquad$ centimeters. The height
is $\qquad$ centimeters. The volume of the storage box is
( $\qquad$ $\times$ $\qquad$ ) $\times$ $\qquad$ , or $\qquad$ $\times$ $\qquad$ , or $\qquad$ $\mathrm{cm}^{3}$.
Base area
So, the volume of the storage box is $\qquad$ $\mathrm{cm}^{3}$.
3. THINKSMARTER What if each cube-shaped bead measured 2 centimeters on each edge? How would the dimensions of the storage box change?
How would the volume change?
$\qquad$

## Share and Show

## Find the volume.

1. The length of the rectangular prism is $\qquad$ .

The width is $\qquad$ . So, the area of the base is $\qquad$ .

The height is $\qquad$ . So, the volume of the prism is $\qquad$ .

6 in.



Volume: $\qquad$
3.


Volume: $\qquad$

## On Your Own

Math
Talk
Mathematical Practices
Explain why the exponent 2 is used to express the measure of area and the exponent 3 is used to express the measure of volume.
 the rectangular prism shown. If they stand all of their prisms together, side by side, to make one large rectangular prism, what is the volume of the new prism? How did the dimensions change?

$\qquad$
5. FIDEEPER The rectangular prism is made of 1-inch cubes. If two more layers of cubes are placed on top of the rectangular prism, how many more cubes are added to the prism? What would be the volume of the new rectangular prism?


## Problem Solving • Applications

6. THINKSMARIER Rich is building a travel crate for his dog, Thomas, a beagle-mix who is about 30 inches long, 12 inches wide, and 24 inches tall. For Thomas to travel safely, his crate needs to be a rectangular prism that is about 12 inches greater than his length and width, and 6 inches greater than his height. What is the volume of the travel crate that Rich should build?

7. What happens to the volume of a rectangular prism if you double the height? Give an example.
$\qquad$
 area and volume.
$\qquad$
$\qquad$
$\qquad$
8. THINKSMARTER John used 1-inch cubes to make the rectangular prism shown. For numbers 9a-9d, write the value from the tiles that makes each statement correct. Each value can be used more than once or not at all.
$\square$

175

9a. Each cube has a volume of $\square$ cubic inch(es).


9b. Each layer of the prism is made up of $\square$ cubes.
9c. There are $\square$ layers of cubes.
9d. The volume of the prism is $\square$ cubic inches.

Name

## Apply Volume Formulas

Essential Question How can you use a formula to find the volume of a rectangular prism?

CONNECT Both prisms show the same dimensions and have the same volume.


## ALGEBRA

Lesson 11.9

Measurement and Data-5.MD.5a, 5.MD.5b

MATHEMATICAL PRACTICES MP.1, MP. 6

## Unlock the Problem

Mike is making a box to hold his favorite DVDs. The length of the box is 7 inches, the width is 5 inches and the height is 3 inches. What is the volume of the box Mike is making?

> Underline what you are asked to find.
> Circle the numbers you need to use to solve the problem.

## () One Way Use length, width, and height.

You can use a formula to find the volume of a rectangular prism.

$$
\begin{aligned}
& \text { Volume }=\text { length } \times \text { width } \times \text { height } \\
& \qquad V=I \times w \times h
\end{aligned}
$$

STEP 1 Identify the length, width, and height of the rectangular prism.
length $=$ $\qquad$ in.
width $=$ $\qquad$ in.
height = $\qquad$ in.


7 in.

STEP 2 Multiply the length by the width.
$\qquad$ $\times$ $\qquad$ $=$

STEP 3 Multiply the product of the length and width by the height.
$35 \times$ $\qquad$ $=$ $\qquad$

So, the volume of Mike's DVD box is $\qquad$ cubic inches.

You have learned one formula for finding the volume of a rectangular prism.
You can also use another formula.

Volume $=$ Base area $\times$ height

$$
V=B \times h
$$

$B=$ area of the base shape,
$h=$ height of the solid figure.

## (1) Another Way Use the area of the base shape and height.

Emilio's family has a sand castle kit. The kit includes molds for several solid figures that can be used to make sand castles. One of the molds is a rectangular prism like the one shown at the right. How much sand will it take to fill the mold?
$V=$

$$
B \quad \times h
$$

$V=($ $\qquad$ $\times$ $\qquad$ ) $\times$ $\qquad$
Replace $B$ with an expression for the area of the base shape. Replace $h$ with the height of the solid figure. Multiply.

$V=$ $\qquad$ $\times$ $\qquad$
$V=$ $\qquad$ cu in.

So, it will take $\qquad$ cubic inches of sand to fill the
rectangular prism mold.

## Try This!

Find the volume.

$V=l \times w \times h$
$V=$ $\qquad$ $\times$ $\qquad$ $\times$ $\qquad$
$V=$ $\qquad$ $\times$ $\qquad$
$V=$ $\qquad$ cu ft
(B) Find the unknown measurement.
$60=$ $\qquad$ $\times$

Think: If I filled this prism with centimeter cubes, each layer would have 20 cubes. How many layers of 20 cubes are equal to 60?

So, the unknown measurement is $\qquad$ cm.

Name $\qquad$

## Share and Show

## MATH BOARD

Find the volume.

$V=$ $\qquad$

## On Your Own

## Find the volume.

3. 



$$
V=
$$

5. 


$V=$ $\qquad$
4.

$V=$ $\qquad$
6.


14 in.
$V=$ $\qquad$

Martimatical (2) Use Reasoning Algebra Find the unknown measurement.
7.

$V=420 \mathrm{cu} \mathrm{ft} \quad \square=$ $\qquad$ ft
8.

$V=900 \mathrm{cucm} \quad \square=$ $\qquad$ cm

## Problem Solving • Applications (earld

9. The Jade Restaurant has a large aquarium on display in its lobby. The base of the aquarium is 5 feet by 2 feet. The height of the aquarium is 4 feet. How many cubic feet of water are needed to completely fill the aquarium?
10. G■DEEPER The Pearl Restaurant put a larger aquarium
 in its lobby. The base of their aquarium is 6 feet by 3 feet, and the height is 4 feet. How many more cubic feet of water does the Pearl Restaurant's aquarium hold than the Jade Restaurant's aquarium?
11. THINKSMARTER Eddie measured his aquarium using a small fish food box. The box has a base area of 6 inches and a height of 4 inches. Eddie found that the volume of his aquarium is 3,456 cubic inches. How many boxes of fish food could fit in the aquarium? Explain your answer.

$\qquad$
$\qquad$
$\qquad$
$\qquad$
12. THINKSMARTER Manuel stores his favorite CDs in a box like the one shown.

Use the numbers and symbols on the tiles to write a formula that represents the volume of the box. Symbols may be used more than once or not at all.


What is the volume of the box? $\qquad$ cubic centimeters

## Problem Solving • Compare Volumes

Essential Question: How can you use the strategy make a table to compare different rectangular prisms with the same volume?

## Unlock the Problem

Adam has 50 one-inch cubes. The cubes measure 1 inch on each edge. Adam wonders how many rectangular prisms, each with a different-size base, that he could make with all of the one-inch cubes.

Use the graphic organizer below to help you solve the problem.

## Read the Problem

## What do I need to find?

I need to find the number of $\qquad$ ,
each with a different-size $\qquad$ , that have
a volume of $\qquad$ .

## What information do I need to use?

I can use the formula $\qquad$
$\qquad$ and the factors of $\qquad$ .

## How will I use the information?

I will use the formula and the factors of 50 in a $\qquad$ that shows all of the possible combinations of dimensions with a volume of $\qquad$ without repeating
the dimensions of the bases.

## Solve the Problem

## Complete the table.

| Base (sq in.) | Height (in.) | Volume (cu in.) |
| :---: | :---: | :---: |
| $(1 \times 1)$ | 50 | $(1 \times 1) \times 50=50$ |
| $(1 \times 2)$ | 25 | $(1 \times 2) \times 25=50$ |
| $(1 \times 5)$ | 10 | $(1 \times 5) \times 10=50$ |
| $(1 \times 10)$ | 5 | $(1 \times 10) \times 5=50$ |
| $(1 \times 25)$ | 2 | $(1 \times 25) \times 2=50$ |
| $(1 \times 50)$ | 1 | $(1 \times 50) \times 1=50$ |
|  |  |  |
|  |  |  |
|  |  |  |

1. Mary phaicical (1) Evaluate What else do you need to do to solve the problem?
2. How many rectangular prisms with different bases can Adam make using 50 one-inch cubes? $\qquad$

## (1) Try Another Problem

Mrs. Wilton is planning a rectangular flower box for her front window. She wants the flower box to hold exactly 16 cubic feet of soil. How many different flower boxes, all with whole-number dimensions and a different-size base, will hold exactly 16 cubic feet of soil?

Use the graphic organizer below to help you solve the problem.


| Read the Problem |  |
| :--- | :--- |
| What do I need to find? |  |
| What information do I need to use? |  |
| How will I use the information? |  |

3. How many flower boxes with different-size bases will hold exactly 16 cubic feet of soil, using whole-number dimensions?

## Name

## Share and Show

MATH BOARD

1. A company makes concrete paving stones in different sizes. Each stone has a volume of 360 cubic inches and a height of 3 inches. The stones have different lengths and widths.
No stones have a length or width of 1 or 2 inches. How many different paving stones, each with a different-size base, have a volume of 360 cubic inches?

First, think about what the problem is asking you to solve, and the information that you are given.

Next, make a table using the information from the problem.
Finally, use the table to solve the problem.
$\qquad$
$\qquad$
2. What if the 360 cubic-inch paving stones are 4 inches thick and any whole number length and width are possible? How many different paving stones could be made? Suppose that the cost of a paving stone is $\$ 2.50$, plus $\$ 0.18$ for every 4 cubic inches of concrete. How much would each paving stone cost?
$\qquad$
$\qquad$
$\qquad$
3. One company makes inflatable swimming pools that come in four sizes of rectangular prisms. The length of each pool is twice the width and twice the depth. The depth of the pools are each a whole number from 2 to 5 feet. If the pools are filled all the way to the top, what is the volume of each pool?
$\qquad$
$\qquad$

## On Your Own

4. $\because \square D E E P E R$ Ray wants to buy the larger of two aquariums. One aquarium has a base that is 20 inches by 20 inches and a height that is 18 inches. The other aquarium has a base that is 40 inches by 12 inches and a height that is 12 inches. Which aquarium has a greater volume? By how much?
5. THINK SMARIER Mr. Rodriguez works at a store. He wants to arrange 12 toys in a display shaped like a rectangular prism. The toys are in cube-shaped boxes. How many rectangular prisms with a different-size base can he make with the boxes?
6. Mantinaical (6) Marilyn has 4,000 one-inch cubes. She wants to pack them into a carton. The carton is 1 foot high and its base is 1 foot by 2 feet. Will all the cubes fit into the carton? Explain how you know.
$\qquad$
$\qquad$
$\qquad$
$\qquad$
7. THINKSMARTER Dakota's wading pool has a volume of 8,640 cubic inches. Which could be the dimensions of the wading pool? Mark all that apply.
(A) 24 in. by 30 in. by 12 in.
(B) 27 in . by 32 in. by 10 in .
(C) 28 in. by 31 in. by 13 in.
(D) 30 in. by 37 in. by 18 in.

## Find Volume of Composed Figures

Essential Question How can you find the volume of rectangular prisms that are combined?

Measurement and Data5.MD.5c

Also 5.MD.5b
MATHEMATICAL PRACTICES MP.3, MP. 5

## Unlock the Problem

The shape at the right is a composite figure. It is made up of two rectangular prisms that are combined. How can you find the volume of the figure?

## Q) One Woy Use addition.

STEP 1 Break apart the solid figure into two rectangular prisms.


STEP 2 Find the length, width, and height of each prism.


STEP 3 Find the volume of each prism.
$V=l \times w \times h$
$V=I \times w \times h$
$V=$ $\qquad$ $\times$ $\qquad$ $\times$ $\qquad$
$V=$ $\qquad$ $\times$
$\qquad$ $\times$ $\qquad$
$V=$ $\qquad$ in. ${ }^{3}$
$V=$ $\qquad$ in. ${ }^{3}$

STEP 4 Add the volumes of the rectangular prisms.
$\qquad$ $+$ $\qquad$ $=$ $\qquad$

So, the volume of the composite figure is $\qquad$ cubic inches.

- Masilinilical 3 Compare Strategies What is another way you could divide the composite figure into two rectangular prisms?


## (1) Another Way use subtraction.

You can subtract the volumes of prisms formed in empty spaces from the greatest possible volume to find the volume of a composite figure.

## STEP 1

Find the greatest possible volume.
length $=$ $\qquad$ in.
width $=$ $\qquad$ in.
height $=$ $\qquad$ in.
$V=$ $\qquad$ cubic inches


## STEP 2

Find the volume of the prism in the empty space.
8 in.
length $=$ $\qquad$ in.

Think: $10-2=8$
width $=$ $\qquad$ in.
height $=$ $\qquad$ in. Think: $6-2=4$
$V=8 \times 4 \times 4=$ $\qquad$ cubic inches

## STEP 3

Subtract the volume of the empty space from the greatest possible volume.
$\qquad$ - $\qquad$ $=$ $\qquad$ cubic inches

So, the volume of the composite figure is $\qquad$ cubic inches.

## Try This!

Find the volume of a composite figure made by putting together three rectangular prisms.
$V=$
$\times \quad \times$
$=$
cu ft
$V=$
$\times$
$\times$
$=$
cu ft
$V=$
$\times$
$\times$
$=$
cu ft


Total volume $=$ $\qquad$ $+$ $\qquad$ $+$ $\qquad$ $=$ $\qquad$ cubic feet

## Share and Show

MATH
BOARD

Find the volume of the composite figure.
1.

2.

$V=$ $\qquad$

## On Your Own

Find the volume of the composite figure.
3.

$V=$ $\qquad$
4.

$V=$ $\qquad$
5. GПDEEPER Mr. Williams' class built this platform for a school event. They also built a model of the platform in which 1 foot was represented by 2 inches. What is the volume of the platform? What is the volume of the model?

6. IHINKSMARTER Patty added the values of the expressions $2 \times 3 \times 11$ and $2 \times 3 \times 10$ to find the volume of the composite figure. Describe her error. What is the correct volume of the composite figure?

$\qquad$
$\qquad$
$\qquad$

## Problem Solving • Applications (rad $\begin{gathered}\text { world }\end{gathered}$

Use the composite figure at the right for 7-9.
7. As part of a wood-working project, Jordan made the figure at the right out of wooden building blocks. How much space does the figure he made take up?
$\qquad$
8. What are the dimensions of the two rectangular prisms you used to find the volume of the figure? What other rectangular prisms could you have used?

9. Matyinaical (6) If the volume is found using subtraction, what is the volume of the empty space that is subtracted? Explain.
$\qquad$
$\qquad$
10. WRITE Math Explain how you can find the volume
of composite figures that are made by combining rectangular prisms.
$\qquad$
$\qquad$
Personal Math Trainer
8. THINKSMARTER A composite figure is shown. What is the volume of the composite figure?


Volume $=$ $\qquad$ cubic centimeters
$\qquad$

## (V) Chapter 11 Review/Test

1. Fran drew a triangle with no congruent sides and 1 right angle. Which term accurately describes the triangle? Mark all that apply.
(A) isosceles
(C) acute
(B) scalene
(D) right
2. Jose stores his baseball cards in a box like the one shown.


Use the numbers and symbols on the tiles to write a formula that represents the volume of the box. Symbols may be used more than once or not at all.


What is the volume of the box? $\qquad$ cubic inches
3. Mr. Delgado sees this sign while he is driving. For numbers 3a-3b, choose the values and term that correctly describes the shape Mr. Delgado saw.


3a. The figure has \begin{tabular}{|c}
3 <br>
4 <br>
5 <br>
\hline

 sides and 

0 <br>
2 <br>
3 <br>
\hline
\end{tabular}

3b. All of the sides are congruent, so the figure is
4. What is the volume of the composite figure?

$\qquad$ cubic feet
5. Match the figure with the number of unit cubes that would be needed to build each figure. Not every number of unit cubes will be used.

6. Chuck is making a poster about polyhedrons for his math class. He will draw figures and organize them in different sections of the poster.

## Part A

Chuck wants to draw three-dimensional figures whose lateral faces are rectangles. He says he can draw prisms and pyramids. Do you agree?
Explain your answer.
$\square$

## Part B

Chuck says that he can draw a cylinder on his polyhedron poster because it has a pair of bases that are congruent. Is Chuck correct? Explain your reasoning.

## Name

7. Javier drew the shape shown. For numbers 7a-7b, choose the values and term that correctly describe the shape Javier drew.

7a The figure has \begin{tabular}{c}
6 <br>
7 <br>
8 <br>
\hline

 sides and 

6 <br>
8 <br>
12 <br>
\hline
\end{tabular} angles.



7b The figure is a | regular octagon |
| :---: |
| regular heptagon |
| regular quadrilateral |.

8. Victoria used 1 -inch cubes to build the rectangular prism shown. Find the volume of the rectangular prism Victoria built.
$\qquad$ cubic inches

6 in.


3 in.
4 in.
9. Nathan drew a scalene, obtuse triangle. For 9a-9c, choose Yes or No to indicate whether the figure shown could be the triangle that Nathan drew.
9a.

YesNo
9b.

9c.

Yes
O No
YesNo
10. A shipping crate holds 20 shoeboxes. The dimensions of a shoebox are 6 inches by 4 inches by 12 inches. For numbers 10a-10b, select True or False for each statement.

10a. Each shoebox has a volume
O True
O False of 22 cubic inches.

10b. Each crate has a volume of aboutTrue
O False 440 cubic inches.

10c. If the crate could hold 27 shoeboxes
O True
O False the volume of the crate would be about 7,776 cubic inches.
11. Mario is making a diagram that shows the relationship between different kinds of quadrilaterals. In the diagram, each quadrilateral on a lower level can also be described by the quadrilateral(s) above it on higher levels.

## Part A

Complete the diagram by writing the name of one figure from the tiles in each box. Not every figure will be used.


## Part B

Mario claims that a rhombus is sometimes a square, but a square is always a rhombus. Is he correct? Explain your answer.


## Name

12. Write the letter in the box that correctly describes the three-dimensional figure.

B

C

D


13. Mark packed 1 -inch cubes into a box with a volume of 120 cubic inches. How many layers of 1 -inch cubes did Mark pack?

$\qquad$ layers
14. A composite figure is shown. What is the volume of the composite figure?


Volume $=$ $\qquad$ cubic centimeters
15. For numbers $15 a-15 c$, write the name of one quadrilateral from the tiles to complete a true statement. Use each quadrilateral once only.

15a.


15b.
 is always a rhombus.

15c.

square
trapezoid
rectangle
16. Megan's aquarium has a volume of 4,320 cubic inches. Which could be the dimensions of the aquarium? Mark all that apply.
(A) 16 in. by 16 in. by 18 in.
(C) 12 in. by 15 in. by 24 in .
(B) 14 in . by 18 in . by 20 in .
(D) 8 in. by 20 in . by 27 in .
17. Ken keeps paper clips in a box that is the shape of a cube. Each side of the cube is 3 inches. What is the volume of the box?
$\qquad$ cubic inches
18. Monica used 1 -inch cubes to make the rectangular prism shown. For numbers 18a-18d, write the value from the tiles that makes each statement true. Each value can be used more than once or not at all.

1
3

20
60

18a. Each cube has a volume of $\qquad$ cubic inch(es).

18b. Each layer of the prism is made up of $\qquad$ cubes.

18c. There are $\qquad$ layers of cubes.

18d. The volume of the prism is $\qquad$ cubic inches.

## Pronunciation Key

|  | add, map ace, rate |
| :---: | :---: |
| â(r) | care, air |
| ä | palm, father |
| b | bat, rub |
| ch | check, catch |
| d | dog, rod |
|  | end, pet |

ə the schwa, an unstressed vowel representing the sound spelled a in above, e in sicken, i in possible, o in melon, $u$ in circus

Other symbols:

- separates words into syllables indicates stress on a syllable


## A

acute angle [ə*kyōt' ang'gal] ángulo agudo An angle that has a measure less than a right angle (less than $90^{\circ}$ and greater than $0^{\circ}$ ) Example:


## Word History

The Latin word for needle is acus. This means "pointed" or "sharp." You will recognize the root in the words acid (sharp taste), acumen (mental sharpness), and acute, which describes a sharp or pointed angle.
acute triangle [ə•kyoot' trīang•gal] triángulo acutángulo A triangle that has three acute angles
addend [ad'end] sumando A number that is added to another in an addition problem
addition [ə•dish'ən] suma The process of finding the total number of items when two or more groups of items are joined; the inverse operation of subtraction
algebraic expression [al•زə•brā ik ek•spresh'ən] expresión algebraica An expression that includes at least one variable Examples: x + 5, 3a - 4
angle [ang'gəl] ángulo A shape formed by two rays that share the same endpoint Example:

area [âr'ē•ə] área The measure of the number of square units needed to cover a surface
array [ə•rā'] matriz An arrangement of objects in rows and columns
Example:


| equal, ${ }^{\text {tr }}$fit, half go, log hope, h it, give |  |
| :---: | :---: |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

m move, seem
$n$ nice, tin
ng ring, song
o odd, hot
ó open, so
ô order, jaw
oi oil, boy
ou pout, now
oo took, full

| $\overline{\text { oo pool, food }}$ | pu |
| :---: | :---: |
| p pit, stop | û(r) burn, term |
| $r$ run, poor | yoo fuse, few |
| s see, pass | $\checkmark$ vain, eve |
| sh sure, rush | w win, away |
| $\dagger$ talk, sit | y yet, yearn |
| th thin, both | z zest, muse |
| th this, bathe | zh vision, |
| u up, done | pleasure |

Associative Property of Addition [ə•‘sō'shē•āt•iv
 la suma The property that states that when the grouping of addends is changed, the sum is the same
Example: $(5+8)+4=5+(8+4)$
Associative Property of Multiplication
[ə•sō'shē•āt•iv präp'ər•tē əv mul•†ə•plikā'shən] propiedad asociativa de la multiplicación The property that states that factors can be grouped in different ways and still get the same product
Example: $(2 \times 3) \times 4=2 \times(3 \times 4)$

## B

balance [bal'əns] equilibrar To equalize in weight or number
bar graph [bär graf] gráfica de barras A graph that uses horizontal or vertical bars to display countable data
Example:

base (arithmetic) [bās] base A number used as a repeated factor
Example: $8^{3}=8 \times 8 \times 8$. The base is 8 .
base (geometry) [bās] base In two dimensions, one side of a triangle or parallelogram that is used to help find the area. In three dimensions, a plane figure, usually a polygon or circle, by which a three-dimensional figure is measured or named
Examples:

benchmark [bench'märk] punto de referencia A familiar number used as a point of reference
capacity [kə•pas'iं + ē] capacidad The amount a container can hold when filled

Celsius ( ${ }^{\circ} \mathrm{C}$ ) [sel'sē•əs] Celsius ( ${ }^{\circ} \mathrm{C}$ ) A metric scale for measuring temperature
centimeter (cm) [sen'tə•mēt•ər] centímetro (cm) A metric unit used to measure length or distance; 0.01 meter $=1$ centimeter
closed figure [klōzd fig'yər] figura cerrada A figure that begins and ends at the same point
common denominator [käm'ən dē•näm'ə•nāt•ər] denominador común A common multiple of two or more denominators Example: Some common denominators for $\frac{1}{4}$ and $\frac{5}{6}$ are 12,24 , and 36 .
common factor [käm'ən fak'tər] factor común A number that is a factor of two or more numbers
common multiple [käm'ən mul'tə•pal] múltiplo común A number that is a multiple of two or more numbers

## Commutative Property of Addition

[kə•myōot'əətiv präp'ər•tē əv ə•dish'ən] propiedad conmutativa de la suma The property that states that when the order of two addends is changed, the sum is the same
Example: $4+5=5+4$

## Commutative Property of Multiplication

[kə•myoot'əətiv präp'əə•tē əv mul・ナə•pli•kā'shən] propiedad conmutativa de la multiplicación The property that states that when the order of two factors is changed, the product is the same
Example: $4 \times 5=5 \times 4$
compatible numbers [kəm•pat'əəbəl num'bərz] números compatibles Numbers that are easy to compute with mentally
composite number [kəm•päz'it num'bər] número compuesto A number having more than two factors
Example: 6 is a composite number, since its factors are 1, 2, 3, and 6 .
cone [kōn] cono A solid figure that has a flat, circular base and one vertex
Example:

congruent [kən•groo'ənt] congruente Having the same size and shape
coordinate grid [kō•ôrd'noit grid] cuadrícula de coordenadas A grid formed by a horizontal line called the $x$-axis and a vertical line called the $y$-axis
Example:

counting number [kount'ing num'ber] número natural A whole number that can be used to count a set of objects ( $1,2,3,4, \ldots$ )
cube [kyōob] cubo A three-dimensional figure with six congruent square faces Example:

cubic unit [ky $\overline{o o}$ 'bik y $\overline{o o \prime}$ 'nit] unidad cúbica $A$ unit used to measure volume such as cubic foot ( ft 3 ), cubic meter $\left(\mathrm{m}^{3}\right)$, and so on
cup (c) [kup] taza (t) A customary unit used to measure capacity; 8 ounces $=1$ cup
cylinder [sil'ən•dər] cilindro A solid figure that has two parallel bases that are congruent circles Example:


## D

data [dāt'ə] datos Information collected about people or things, often to draw conclusions about them
decagon [dek'ə•gän] decágono A polygon with ten sides and ten angles Examples:

decagonal prism [dek•ag'ə•nəl priz'əm] prisma decagonal A three-dimensional figure with two decagonal bases and ten rectangular faces
decimal [des'əəmal] decimal A number with one or more digits to the right of the decimal point
decimal point [des'ə•məl point] punto decimal A symbol used to separate dollars from cents in money, and to separate the ones place from the tenths place in a decimal
decimal system [des'əəməl sis'təm] sistema decimal A system of computation based on the number 10
decimeter (dm) [des'i•mēt•ər] decímetro (dm) A metric unit used to measure length or distance; 10 decimeters $=1$ meter
degree ( ${ }^{\circ}$ ) [di•grē'] grado ( ${ }^{\circ}$ ) A unit used for measuring angles and temperature
degree Celsius ( ${ }^{\circ} \mathrm{C}$ ) [di•grē' sel'sē•əs] grado Celsius A metric unit for measuring temperature
degree Fahrenheit ( ${ }^{\circ} \mathrm{F}$ ) [di•grē' fâr'ən•hīt] grado Fahrenheit A customary unit for measuring temperature
dekameter (dam) [dek'ə•mēt•ər] decámetro A metric unit used to measure length or distance; 10 meters = 1 dekameter
denominator [dē•näm'ə•nāt•ər] denominador The number below the bar in a fraction that tells how many equal parts are in the whole or in the group
Example: $\frac{3}{4} \leftarrow$ denominator
diagonal [di`ag'ə•nal] diagonal A line segment that connects two non-adjacent vertices of a polygon
Example:

difference [dif'ər•əns] diferencia The answer to a subtraction problem
digit [dij ${ }^{\text {it] }}$ d dígito Any one of the ten symbols $0,1,2,3,4,5,6,7,8,9$ used to write numbers
dimension [də•men'shən] dimensión A measure in one direction

Distributive Property [di•strib'yōo॰tiv präp'ər•tē] propiedad distributiva The property that states that multiplying a sum by a number is the same as multiplying each addend in the sum by the number and then adding the products
Example: $3 \times(4+2)=(3 \times 4)+(3 \times 2)$

$$
\begin{aligned}
3 \times 6 & =12+6 \\
18 & =18
\end{aligned}
$$

divide [də॰ $v i{ }^{\prime}$ '] dividir To separate into equal groups; the inverse operation of multiplication
dividend [div'ə•dend] dividendo The number that is to be divided in a division problem Example: $36 \div 6 ; 6 \longdiv { 3 6 }$ The dividend is 36 .
division [də•vizh'ən] división The process of sharing a number of items to find how many equal groups can be made or how many items will be in each equal group; the inverse operation of multiplication
divisor [də•vǐzzr] divisor The number that divides the dividend
Example: $15 \div 3 ; 3 \longdiv { 1 5 }$ The divisor is 3 .
edge [ej] arista The line segment made where two faces of a solid figure meet Example:

elapsed time [ē•lapst' tī̀] tiempo transcurrido The time that passes between the start of an activity and the end of that activity
endpoint [end' point] extremo The point at either end of a line segment or the starting point of a ray
equal to (=) [é’kwal $+\overline{o o}]$ igual a Having the same value
equation [ē•kwā'zhən] ecuación An algebraic or numerical sentence that shows that two quantities are equal
equilateral triangle [ē•kwi•lat'ər•əl tri'ang•gol] triángulo equilátero A triangle with three congruent sides Example:

equivalent [ē•kwiv’ə•lənt] equivalente Having the same value
equivalent decimals [ē•kwiv'əələnt des'ə•məlz] decimales equivalentes Decimals that name the same amount
Example: $0.4=0.40=0.400$
equivalent fractions [ē•kwiv'ə.lənt frak'shənz] fracciones equivalentes Fractions that name the same amount or part
Example: $\frac{3}{4}=\frac{6}{8}$
estimate [es'tə•mit] noun estimación (s) A number close to an exact amount
estimate [es'tə•māt] verb estimar (v) To find a number that is close to an exact amount
evaluate [ē•val'yoo $\cdot \bar{a} t$ ] evaluar To find the value of a numerical or algebraic expression
even [ē'vən] par A whole number that has a 0,2 , 4,6 , or 8 in the ones place
expanded form [ek•span'did fôrm] forma desarrollada A way to write numbers by showing the value of each digit Examples: $832=8 \times 100+3 \times 10+2 \times 1$ $3.25=(3 \times 1)+\left(2 \times \frac{1}{10}\right)+\left(5 \times \frac{1}{100}\right)$
exponent [eks'•pōn•ənt] exponente A number that shows how many times the base is used as a factor
Example: $10^{3}=10 \times 10 \times 10$.
3 is the exponent.
expression [ek•spresh'ən] expresión A mathematical phrase or the part of a number sentence that combines numbers, operation signs, and sometimes variables, but does not have an equal sign

## F

face [fās] cara A polygon that is a flat surface of a solid figure
Example:

fact family [fakt fam'ə•lē] familia de operaciones A set of related multiplication and division, or addition and subtraction, equations
Examples: $\begin{aligned} & 7 \times 8=56 ; 8 \times 7=56 ; \\ & 56 \div 7=8 ; 56 \div 8=7\end{aligned}$
factor [fak'ter] factor A number multiplied by another number to find a product

Fahrenheit ( ${ }^{\circ}$ F) [fâr'ən•hīt] Fahrenheit ( ${ }^{\circ} \mathrm{F}$ ) A customary scale for measuring temperature
fluid ounce ( fl oz ) [floo'id ouns] onza fluida A customary unit used to measure liquid capacity; 1 cup $=8$ fluid ounces
foot ( ft ) [foot] pie (ft) A customary unit used to measure length or distance; 1 foot $=12$ inches
formula [fôr'my $\overline{o \circ} \stackrel{\circ}{ }$ ] fórmula $A$ set of symbols that expresses a mathematical rule Example: $A=b \times h$
fraction [frak'shən] fracción A number that names a part of a whole or a part of a group
fraction greater than 1 [frak'shən grāt'er than wun] fracción mayor que 1 A number which has a numerator that is greater than its denominator Example:

gallon (gal) [gal'ən] galón (gal) A customary unit used to measure capacity; 4 quarts $=1$ gallon
general quadrilateral [jen'ər•əl kwä•drilat'ər•əl] cuadrilátero en general See quadrilateral.
gram (g) [gram] gramo (g) A metric unit used to measure mass; 1,000 grams = 1 kilogram
greater than ( $>$ ) [grāt'ər than] mayor que ( $>$ ) A symbol used to compare two numbers or two quantities when the greater number or greater quantity is given first
Example: $6>4$
greater than or equal to ( $\geq$ ) [grāt'ər than ôr ékwal tō] mayor que o igual a A symbol used to compare two numbers or quantities when the first is greater than or equal to the second
greatest common factor [grāt'əst käm'ən fak'tər] máximo común divisor The greatest factor that two or more numbers have in common Example: 6 is the greatest common factor of 18 and 30.
grid [grid] cuadrícula Evenly divided and equally spaced squares on a figure or flat surface

## H

height [hit] altura The length of a perpendicular from the base to the top of a two-dimensional or three-dimensional figure Example:

heptagon [hep'tə•gän] heptágono A polygon with seven sides and seven angles

hexagon［hek＇sə•gän］hexágono A polygon with six sides and six angles
Examples：

hexagonal prism［hek•sag＇ə•nəl priz＇əm］prisma hexagonal A three－dimensional figure with two hexagonal bases and six rectangular faces
horizontal［hôroi•zänt＇l］horizontal Extending left and right
hundredth［hun＇drədth］centésimo One of 100 equal parts Examples：0．56，$\frac{56}{100}$ ，fifty－six hundredths

Identity Property of Addition［ī•den＇tə•tē
 de la suma The property that states that when you add zero to a number，the result is that number

Identity Property of Multiplication［ïden＇to•tē präp＇er•tē əv mul•tə•pli•kā＇shən］propiedad de identidad de la multiplicación The property that states that the product of any number and 1 is that number
inch（in．）［inch］pulgada（pulg）A customary unit used to measure length or distance； 12 inches $=1$ foot
inequality［in•ē•kwôl＇ə・ャē］desigualdad $A$ mathematical sentence that contains the symbol $<,>, \leq, \geq$ ，or $\neq$
intersecting lines［in•tər•sekt＇ing linz］líneas secantes Lines that cross each other at exactly one point
Example：

interval［in＇ter•val］intervalo The difference between one number and the next on the scale of a graph
inverse operations［in＇vûrs äp•ə•rā＇shənz］ operaciones inversas Opposite operations， or operations that undo each other，such as addition and subtraction or multiplication and division
isosceles triangle［ī•säs＇əəlēz trīang•gəl］triángulo isósceles A triangle with two congruent sides Example：

key［kē］clave The part of a map or graph that explains the symbols
kilogram（kg）［kilōəgram］kilogramo（kg）A metric unit used to measure mass； 1，000 grams $=1$ kilogram
kilometer（km）［kəläm＇ət•ər］kilómetro（km） A metric unit used to measure length or distance； 1,000 meters $=1$ kilometer

lateral face［lat＇ər•ol fās］cara lateral Any surface of a polyhedron other than a base
least common denominator［lēst käm＇ən dē•näm＇ə•nāt•ər］mínimo común denominador The least common multiple of two or more denominators
Example：The least common denominator for $\frac{1}{4}$ and $\frac{5}{6}$ is 12 ．
least common multiple［lēst käm＇ən mul＇tə•pal］ mínimo común múltiplo The least number that is a common multiple of two or more numbers
less than（ $<$ ）［les than］menor que（ $<$ ）A symbol used to compare two numbers or two quantities，with the lesser number given first Example： $4<6$
less than or equal to ( $\leq$ ) [les than ôr ékwal too] menor que o igual a A symbol used to compare two numbers or two quantities, when the first is less than or equal to the second
line [lin] línea A straight path in a plane, extending in both directions with no endpoints Example:
line graph [lin graf] gráfica lineal A graph that uses line segments to show how data change over time
line plot [lin plät] diagrama de puntos A graph that shows frequency of data along a number line
Example:

line segment [lin seg'mənt] segmento A part of a line that includes two points called endpoints and all the points between them
line symmetry [lin sim'ə•trē] simetría axial A figure has line symmetry if it can be folded about a line so that its two parts match exactly.
linear unit [lin'ē•冨 yoo'nit] unidad lineal A measure of length, width, height, or distance
liquid volume [lik'wid väl'yoom] volumen de un líquido The amount of liquid in a container
liter (L) [lēt'ər] litro (L) A metric unit used to measure capacity; 1 liter $=1,000$ milliliters
mass [mas] masa The amount of matter in an object
meter ( m ) [mét'ər] metro ( m ) A metric unit used to measure length or distance; 1 meter $=100$ centimeters
mile (mi) [mill] milla (mi) A customary unit used to measure length or distance;
5,280 feet $=1$ mile
milligram (mg) [miliं•gram] miligramo A metric unit used to measure mass;
1,000 milligrams $=1 \mathrm{gram}$
milliliter ( mL ) [mili'॰lēt•ər] mililitro (mL) A metric unit used to measure capacity;
1,000 milliliters $=1$ liter
millimeter (mm) [miliə•mēt•ər] milímetro (mm) A metric unit used to measure length or distance; 1,000 millimeters $=1$ meter
million [mil'yən] millón 1,000 thousands; written as 1,000,000
mixed number [mikst num'bər] número mixto A number that is made up of a whole number and a fraction
Example: $1 \frac{5}{8}$
multiple [mul'tə•pal] múltiplo The product of two counting numbers is a multiple of each of those numbers
multiplication [mul••əəpli•kā'shən] multiplicación A process to find the total number of items made up of equal-sized groups, or to find the total number of items in a given number of groups. It is the inverse operation of division.
multiply [mul'tə•pli]] multiplicar When you combine equal groups, you can multiply to find how many in all; the inverse operation of division
nonagon [nän'ə•gän] eneágono A polygon with nine sides and nine angles
not equal to $(\neq)$ [not ékwal tō] no igual a A symbol that indicates one quantity is not equal to another
number line [num'bər līn] recta numérica A line on which numbers can be located Example:

numerator [nō'mər•āt•ər] numerador The number above the bar in a fraction that tells how many equal parts of the whole or group are being considered
Example: $\frac{3}{4} \leftarrow$ numerator
numerical expression [nō•mer'i•kəl ek•spresh'ən] expresión numérica A mathematical phrase that uses only numbers and operation signs
obtuse angle [äb•toos' ang'gel] ángulo obtuso An angle whose measure is greater than $90^{\circ}$ and less than $180^{\circ}$
Example:

obtuse triangle [äb•toos' trī’ang•gal] triángulo obtusángulo A triangle that has one obtuse angle
octagon [äk'tə•gän] octágono A polygon with eight sides and eight angles Examples:

octagonal prism [äk•tag'əənəl priz'əm] prisma octagonal A three-dimensional figure with two octagonal bases and eight rectangular faces
odd [od] impar A whole number that has a 1, 3, 5,7 , or 9 in the ones place
open figure [ō'pən fig'yər] figura abierta A figure that does not begin and end at the same point
order of operations [ôr'dər əv äp•əərā'shənz] orden de las operaciones A special set of rules which gives the order in which calculations are done in an expression
ordered pair [ôr'dərd pâr] par ordenado A pair of numbers used to locate a point on a grid. The first number tells the left-right position and the second number tells the up-down position
origin [ôr'ə>jin] origen The point where the two axes of a coordinate grid intersect; $(0,0)$
ounce (oz) [ouns] onza (oz) A customary unit used to measure weight;
16 ounces $=1$ pound
overestimate [óver•es•†əmit] sobrestimar An estimate that is greater than the exact answer

pan balance [pan bal'əns] balanza de platillos An instrument used to weigh objects and to compare the weights of objects
parallel lines [pâr’əəlel linz] líneas paralelas Lines in the same plane that never intersect and are always the same distance apart Example:

parallelogram [pâr•ə•lel'ə•gram] paralelogramo A quadrilateral whose opposite sides are parallel and have the same length, or are congruent
Example:

parentheses [pəəren'thə•sēz] paréntesis The symbols used to show which operation or operations in an expression should be done first
partial product [pär'shal präd'əkt] producto parcial A method of multiplying in which the ones, tens, hundreds, and so on are multiplied separately and then the products are added together
partial quotient [pär'shəl kwō'shənt] cociente parcial A method of dividing in which multiples of the divisor are subtracted from the dividend and then the quotients are added together
pattern［pat＇ərn］patrón An ordered set of numbers or objects；the order helps you predict what will come next
Examples：2，4，6，8， 10

pentagon［pen＇tə•gän］pentágono A polygon with five sides and five angles Examples：

pentagonal prism［pen॰tag＇əənəl priz＇əm］prisma pentagonal A three－dimensional figure with two pentagonal bases and five rectangular faces
pentagonal pyramid［pen•tag＇ə•nal pir＇ə•mid］ pirámide pentagonal A pyramid with a pentagonal base and five triangular faces
perimeter［pə•rim＇ə・ャər］perímetro The distance around a closed plane figure
period［pir＇é•əd］período Each group of three digits separated by commas in a multi－digit number
Example：85，643，900 has three periods．
perpendicular lines［pər•pən•dik＇yoo•lər līnz］líneas perpendiculares Two lines that intersect to form four right angles Example：

picture graph［pik＇chər graf］gráfica con dibujos A graph that displays countable data with symbols or pictures
Example：

| HOW WE GET TO SCHOOL |  |
| :---: | :---: |
| Walk | ＊＊ |
| Ride a Bike | ＊＊ |
| Ride a Bus | ＊＊＊＊ |
| Ride in a Car | ＊ |

Key：Each $=10$ students．
pint（pt）［pīt ］pinta A customary unit used to measure capacity； 2 cups $=1$ pint
place value［plās val＇yōo］valor posicional The value of each digit in a number based on the location of the digit
plane［plān］plano A flat surface that extends without end in all directions Example：

plane figure［plān fig＇yər］figura plana See two－dimensional figure
point［point］punto An exact location in space
polygon［päli•gän］polígono A closed plane figure formed by three or more line segments Examples：


Polygons

s


Not Polygons
polyhedron［päl•••hédrən］poliedro A solid figure with faces that are polygons Examples：

pound（lb）［pound］libra（lb）A customary unit used to measure weight；
1 pound＝ 16 ounces
prime number［prīm num＇bər］número primo A number that has exactly two factors：
1 and itself
Examples：2，3，5，7，11，13，17，and 19 are prime numbers． 1 is not a prime number．
prism［priz＇em］prisma A solid figure that has two congruent，polygon－shaped bases，and other faces that are all rectangles Examples：

rectangular prism

triangular prism
product [präd'əkt] producto The answer to a multiplication problem
protractor [prō’trak•tər] transportador A tool used for measuring or drawing angles
pyramid [pir'ə•mid] pirámide A solid figure with a polygon base and all other faces are triangles that meet at a common vertex Example:


## Word History

A fire is sometimes in the shape of a pyramid, with a point at the top and a wider base. This may be how pyramid got its name. The Greek word for fire was pura, which may have been combined with the Egyptian word for pyramid, pimar.

quadrilateral [kwä•dri•lat'ər•əl] cuadrilátero A polygon with four sides and four angles Example:

quart (qt) [kwôrt] cuarto (ct) A customary unit used to measure capacity; 2 pints $=1$ quart
quotient [kwō'shənt] cociente The number that results from dividing Example: $8 \div 4=2$. The quotient is 2 .

## R

range [rānj] rango The difference between the greatest and least numbers in a data set
ray [rā] semirrecta A part of a line; it has one endpoint and continues without end in one direction
Example:

rectangle [rek'tang•gal] rectángulo A parallelogram with four right angles Example:

rectangular prism [rek•tang'gyə•lər priz'əm] prisma rectangular A three-dimensional figure in which all six faces are rectangles Example:

 pirámide rectangular A pyramid with a rectangular base and four triangular faces
regroup [rē•groop'] reagrupar To exchange amounts of equal value to rename a number Example: $5+8=13$ ones or 1 ten 3 ones
regular polygon [reg'yə*lər päli'gän] polígono regular A polygon in which all sides are congruent and all angles are congruent
related facts [ri॰lāt'id fakts] operaciones relacionadas A set of related addition and subtraction, or multiplication and division, number sentences
Examples: $4 \times 7=28 \quad 28 \div 4=7$

$$
7 \times 4=28 \quad 28 \div 7=4
$$

remainder [ri•mān'dər] residuo The amount left over when a number cannot be divided equally
rhombus [räm'bəs] rombo A parallelogram with four equal, or congruent, sides Example:


## Word History

Rhombus is almost identical to its Greek origin, rhombos. The original meaning was "spinning top" or "magic wheel," which is easy to imagine when you look at a rhombus, an equilateral parallelogram.
right angle [rīt ang'gəl] ángulo recto An angle that forms a square corner and has a measure of $90^{\circ}$ Example:

right triangle [rī̀ trīang•gəl] triángulo rectángulo A triangle that has a right angle Example:

round [round] redondear To replace a number with one that is simpler and is approximately the same size as the original number Example: 114.6 rounded to the nearest ten is 110 and to the nearest one is 115 .

## S

scale [skāl] escala A series of numbers placed at fixed distances on a graph to help label the graph
scalene triangle [skā’lēn tri’ang•gal] triángulo escaleno A triangle with no congruent sides Example:

second (sec) [sek'ənd] segundo (seg) A small unit of time; 60 seconds $=1$ minute
sequence [sē’kwəns] sucesión An ordered list of numbers
simplest form [sim'pləst fôrm] mínima expresión A fraction is in simplest form when the numerator and denominator have only 1 as a common factor.
skip count [skip kount] contar salteado A pattern of counting forward or backward
Example: 5, 10, 15, 20, 25, 30, . . .
solid figure [sä'lid fig'yər] cuerpo geométrico See three-dimensional figure
solution [sə•loo'shən] solución A value that, when substituted for the variable, makes an equation true
sphere [sfir] esfera A solid figure whose curved surface is the same distance from the center to all its points
Example:

square [skwâr] cuadrado A polygon with four equal, or congruent, sides and four right angles
square pyramid [skwâr pir'ə•mid] pirámide cuadrada A solid figure with a square base and with four triangular faces that have a common vertex Example:

square unit [skwâr yōo'nit] unidad cuadrada $A$ unit used to measure area such as square foot $\left(\mathrm{ft}^{2}\right)$, square meter $\left(\mathrm{m}^{2}\right)$, and so on
standard form [stan'dərd fôrm] forma normal A way to write numbers by using the digits 0-9, with each digit having a place value Example: $456 \leftarrow$ standard form
straight angle [strāt ang'gəl] ángulo llano An angle whose measure is $180^{\circ}$
Example:

subtraction [səb•trak'shən] resta The process of finding how many are left when a number of items are taken away from a group of items; the process of finding the difference when two groups are compared; the inverse operation of addition
sum [sum] suma o total The answer to an addition problem
tablespoon (tbsp) [tā’bel•spōon] cucharada (cda) A customary unit used to measure capacity; 3 teaspoons $=1$ tablespoon
tally table [tal'ē tā'bal] tabla de conteo A table that uses tally marks to record data
teaspoon (tsp) [tē'spoon] cucharadita (cdta) A customary unit used to measure capacity; 1 tablespoon $=3$ teaspoons
tenth [tenth] décimo One of ten equal parts Example: 0.7 = seven tenths
term [tûrm] término A number in a sequence
thousandth [thou'zəndth] milésimo One of one thousand equal parts Example: $0.006=$ six thousandths
three-dimensional [three də•men'shə•nal] tridimensional Measured in three directions, such as length, width, and height
three-dimensional figure [thrē də•men'shə•nal fig'yor] figura tridimensional A figure having length, width, and height
Example:

ton (T) [tun] tonelada A customary unit used to measure weight; 2,000 pounds $=1$ ton
trapezoid [trap'i•zoid] trapecio A quadrilateral with exactly one pair of parallel sides Examples:

triangle [tri’ang•gal] triángulo A polygon with three sides and three angles Examples:

triangular prism [tri•ang'gyə•lor priz'əm] prisma triangular A solid figure that has two triangular bases and three rectangular faces
triangular pyramid [trīang'gyə॰ər pir'ə•mid] pirámide triangular A pyramid that has a triangular base and three triangular faces
two-dimensional [t̄oo də•men'shə•nəl] bidimensional Measured in two directions, such as length and width
two-dimensional figure [too də•men'shə•nal fig'yər] figura bidimensional A figure that lies in a plane; a figure having length and width
underestimate [un•dər•es'tə•mit] subestimar An estimate that is less than the exact answer
unit cube [yoónit kyōob] cubo unitaria A cube that has a length, width, and height of 1 unit
unit fraction [yō'nit frak'shən] fracción unitaria A fraction that has 1 as a numerator
variable [vâr'ē•ə•bal] variable A letter or symbol that stands for an unknown number or numbers

Venn diagram [ven di'ə.gram] diagrama de Venn A diagram that shows relationships among sets of things
Example:

vertex [vûr'teks] vértice The point where two or more rays meet; the point of intersection of two sides of a polygon; the point of intersection of three (or more) edges of a solid figure; the top point of a cone; the plural of vertex is vertices
Examples:


## Word History

The Latin word vertere means "to turn" and also relates to "highest." You can turn a figure around a point, or vertex.
vertical [vûr'tiokal] vertical Extending up and down
volume [väl'yoom] volumen The measure of the space a solid figure occupies

## W

weight [wāt] peso How heavy an object is
whole [hōl] entero All of the parts of a shape or group
whole number [hōl num'bər] número entero One of the numbers $0,1,2,3,4, \ldots$; the set of whole numbers goes on without end
word form [wûrd fôrm] en palabras A way to write numbers in standard English Example: $4,829=$ four thousand, eight hundred twenty-nine
$x$-axis [eks ak'sis] eje de la $x$ The horizontal number line on a coordinate plane
$x$-coordinate [eks kō•ôrd'noit] coordenada $x$ The first number in an ordered pair; tells the distance to move right or left from ( 0,0 )
yard (yd) [yärd] yarda (yd) A customary unit used to measure length or distance; 3 feet $=1$ yard
$\boldsymbol{y}$-axis [wī ak'sis] eje de la $y$ The vertical number line on a coordinate plane
$y$-coordinate [wī kō•ôrd'noit] coordenada $y$ The second number in an ordered pair; tells the distance to move up or down from $(0,0)$

## Z

Zero Property of Multiplication [zē'rō präp'ər・ナē əv mul・ャəplikä'shən] propiedad del cero de la multiplicación The property that states that when you multiply by zero, the product is zero

## commen CALIFORNIA COMMON CORE STATE STANDARDS

## Standards You will Learn

| Mathematical Practices |  |  |
| :---: | :---: | :---: |
| MP. 1 | Make sense of problems and persevere in solving them. | Lessons 1.6, 1.9, 1.10, 2.1, 2.2, 2.5, 2.6, 2.8, 2.9, 3.11, 3.12, 4.2, 4.5, 4.6, 5.3, 5.7, 5.8, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.10, 7.9, 7.10, 8.2, 9.6, 10.3, 10.4, 11.2, 11.3, 11.5, 11.7, 11.8, 11.9, 11.10 |
| MP. 2 | Reason abstractly and quantitatively. | Lessons 1.2, 1.3, 1.8, 1.9, 1.10, 1.12, 2.2, 2.7, 2.8, 2.9, 3.2, 3.3, 3.4, 3.7, 3.9, 3.12, 4.7, 4.8, 5.3, 5.4, 5.5, 5.6, 5.8, 6.4, 6.5, 6.6, 6.7, 6.8, 6.10, 6.11, 7.3, 7.7, 7.9, 8.3, 8.5, 9.1, 9.7, 10.4, $10.5,10.6,11.7$ |
| MP. 3 | Construct viable arguments and critique the reasoning of others. | Lessons 1.11, 2.4, 2.5, 3.10, 4.4, 5.2, 7.4, 7.5, 8.1, 8.4, 10.6, 11.6, 11.11 |
| MP. 4 | Model with mathematics. | Lessons 1.6, 1.7, 1.9, 1.10, 1.11, 1.12, 2.3, 2.7, 2.9, 3.8, 3.11, 4.1, 4.2, 4.4, 4.5, 7.5, 7.7, 7.9, 7.10, 8.2, 9.1, 9.2, 9.3, 9.4, 9.6, 9.7, 10.6, 11.2 |
| MP. 5 | Use appropriate tools strategically. | Lessons 1.1, 1.4, 1.6, 1.7, 1.8, 2.3, <br> 3.1, 3.5, 3.6, 3.7, 3.8, 3.12, 4.2, 4.3, 4.6, 5.1, 5.2, 5.5, 5.8, 6.1, 6.2, 6.9, <br> $7.1,7.2,7.3,7.4,7.5,7.6,7.7,7.8$, 8.1, 8.2, 8.3, 8.4, 8.5, 9.2, 9.3, 9.4, $10.1,10.2,11.1,11.5,11.6,11.11$ |
| MP. 6 | Attend to precision. | Lessons 1.7, 1.8, 2.1, 2.3, 3.1, 3.3, 3.5, 3.6, 3.9, 4.5, 4.6, 4.7, 5.1, 5.5, 5.6, 5.7, 6.1, 6.6, 6.7, 7.1, 7.2, 7.3, $7.4,7.5,7.7,7.8,7.10,8.2,8.3,10.2$, 10.3, 10.4, 10.5, 10.7, 11.2, 11.4, 11.5, 11.6, 11.7, 11.9 |
| MP. 7 | Look for and make use of structure. | Lessons 1.1, 1.2, 1.4, 1.5, 3.1, 3.2, 3.4, 3.7, 3.10, 3.12, 4.1, 4.3, 4.8, 5.1, 5.4, 5.6, 6.1, 6.3, 6.4, 6.9, 6.11, 7.6, 8.3, 9.1, 9.4, 9.5, 9.6, 9.7, 10.1, 10.6, 10.7, 11.1, 11.2, 11.3, 11.4, 11.8, 11.10 |
| MP. 8 | Look for and express regularity in repeated reasoning. | Lessons 1.3, 1.5, 2.4, 2.6, 3.6, 4.1, 4.8, 6.2, 6.9, 6.11, 7.6, 9.3, 9.5, 10.5, 11.1, 11.3, 11.8 |

## Standards You WHII Learn

| Domain: Operations and Algebraic Thinking |  |  |
| :---: | :---: | :---: |
| Write and interpret numerical expressions. |  |  |
| 5.OA. 1 | Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols. | Lessons 1.3, 1.10, 1.11, 1.12 |
| 5.OA. 2 | Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. For example, express the calculation "add 8 and 7, then multiply by 2 " as $2 \times(8+7)$. Recognize that $3 \times$ $(18932+921)$ is three times as large as $18932+921$, without having to calculate the indicated sum or product. | Lesson 1.10 |
| 5.OA.2.1 | Express a whole number in the range 2-50 as a product of its prime factors. For example, find the prime factors of 24 and express 24 as $2 \times 2 \times 2 \times 3$. | Lesson 6.4 |
| Analyze patterns and relationships. |  |  |
| 5.OA.3 | Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. For example, given the rule "Add 3" and the starting number 0 , and given the rule "Add 6" and the starting number 0 , generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so. | Lessons 9.5, 9.6, 9.7 |

## Standards You WHII Learn

Domain: Number and Operations in Base Ten

| Understand the place value system. |  |  |
| :---: | :---: | :---: |
| 5.NBT. 1 | Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and $1 / 10$ of what it represents in the place to its left. | Lessons 1.1, 1.2, 3.1 |
| 5.NBT. 2 | Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10 . Use whole-number exponents to denote powers of 10. | Lessons 1.4, 1.5, 4.1, 5.1 |
| 5.NBT. 3 | Read, write, and compare decimals to thousandths. |  |
| 5.NBT.3a | Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392=3 \times 100+4 \times 10+7$ $\times 1+3 \times(1 / 10)+9 \times(1 / 100)+2 \times$ (1/1000). | Lesson 3.2 |
| 5.NBT.3b | Compare two decimals to thousandths based on meanings of the digits in each place, using $>$, $=$, and < symbols to record the results of comparisons. | Lesson 3.3 |
| 5.NBT. 4 | Use place value understanding to round decimals to any place. | Lesson 3.4 |

Perform operations with multi-digit whole numbers and with decimals to hundredths.

| 5.NBT. 5 | Fluently multiply multi-digit whole numbers using the standard algorithm. | Lessons 1.6, 1.7 |
| :---: | :---: | :---: |
| 5.NBT. 6 | Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. | $\begin{aligned} & \text { Lessons } 1.8,1.9,2.1,2.2,2.3,2.4 \\ & 2.5,2.6,2.8,2.9 \end{aligned}$ |
| 5.NBT. 7 | Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. | Lessons 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, 3.11, 3.12, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, $4.8,5.2,5.3,5.4,5.5,5.6,5.7,5.8$ |
| Domain: Number and Operations-Fractions |  |  |
| Use equivalent fractions as a strategy to add and subtract fractions. |  |  |
| 5.NF. 1 | Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. For example, $2 / 3+5 / 4$ $=8 / 12+15 / 12=23 / 12$. (In general, $a / b+c / d=(a d+b c) / b d$. | $\begin{aligned} & \text { Lessons } 6.1,6.5,6.6,6.7,6.8 \\ & 6.9,6.11 \end{aligned}$ |
| 5.NF. 2 | Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. For example, recognize an incorrect result $2 / 5+1 / 2=3 / 7$, by observing that $3 / 7<1 / 2$. | Lessons 6.1, 6.2, 6.3, 6.10 |

Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

| 5.NF. 3 | Interpret a fraction as division of the numerator by the denominator ( $a / b=$ $a \div b$ ). Solve word problems involving division of whole numbers leading to answers in the form of fractions, mixed numbers, e.g., by using visual fraction models or equations to represent the problem. For example, interpret $3 / 4$ as the result of dividing 3 by 4, noting that $3 / 4$ multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size 3/4. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie? | Lessons 2.7, 8.3 |
| :---: | :---: | :---: |
| 5.NF. 4 | Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. |  |
| 5.NF.4a | Interpret the product $(a / b) \times q$ as $a$ parts of a partition of $q$ into $b$ equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. For example, use a visual fraction model to show $(2 / 3) \times 4=8 / 3$, and create a story context for this equation. Do the same with $(2 / 3) \times(4 / 5)=8 / 15$. (In general, ( $a / b$ ) $\times(c / d)=a c / b d$. | Lessons 7.1, 7.2, 7.3, 7.4, 7.6 |
| 5.NF.4b | Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. | Lessons 7.7, 7.10 |

## Standards You Will Learn

| Apply and extend previous understandings of multiplication and division to multiply and divide fractions. (Continued) |  |  |
| :---: | :---: | :---: |
| 5.NF. 5 | Interpret multiplication as scaling (resizing), by: |  |
| 5.NF.5a | Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. | Lessons 7.5, 7.8 |
| 5.NF.5b | Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a / b=(n \times a) /(n \times b)$ to the effect of multiplying $a / b$ by 1 . | Lessons 7.5, 7.6, 7.8 |
| 5.NF. 6 | Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem. | Lessons 7.9, 7.10 |

## Standards You WHII Learn

Apply and extend previous understandings of multiplication and division to multiply and divide fractions. (Continued)

| 5.NF. 7 | Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. |  |
| :---: | :---: | :---: |
| 5.NF.7a | Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for $(1 / 3) \div 4$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $(1 / 3) \div 4$ $=1 / 12$ because $(1 / 12) \times 4=1 / 3$. | Lessons 8.1, 8.5 |
| 5.NF.7b | Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for $4 \div(1 / 5)$, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \div(1 / 5)=20$ because $20 \times(1 / 5)$ $=4$. | Lessons 8.1, 8.2, 8.5 |
| 5.NF.7c | Solve real world problems involving division of unit fractions by nonzero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share $1 / 2 \mathrm{lb}$ of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins? | Lessons 8.1, 8.4 |
| Domain: Measurement and Data |  |  |
| Convert like measurement units within a given measurement system. |  |  |
| 5.MD. 1 | Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m ), and use these conversions in solving multistep, real world problems. | $\begin{aligned} & \text { Lessons 10.1, 10.2, 10.3, 10.4, 10.5, } \\ & 10.6,10.7 \end{aligned}$ |

## Standards You Will Learn

Represent and interpret data.

| 5.MD. 2 | Make a line plot to display a data set of measurements in fractions of a unit ( $1 / 2,1 / 4,1 / 8$ ). Use operations on fractions for this grade to solve problems involving information presented in line plots. For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally. | Lesson 9.1 |
| :---: | :---: | :---: |
| Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. |  |  |
| 5.MD. 3 | Recognize volume as an attribute of solid figures and understand concepts of volume measurement. | Lesson 11.4 |
| 5.MD.3a | A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume. | Lesson 11.5 |
| 5.MD.3b | A solid figure which can be packed without gaps or overlaps using $n$ unit cubes is said to have a volume of $n$ cubic units. | Lesson 11.6 |
| 5.MD. 4 | Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft , and improvised units. | Lessons 11.6, 11.7 |

## Standards You WFII Learn

Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition. (Continued)

| 5.MD. 5 | Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. |  |
| :---: | :---: | :---: |
| 5.MD.5a | Find the volume of a right rectangular prism with wholenumber side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold wholenumber products as volumes, e.g., to represent the associative property of multiplication. | Lessons 11.8, 11.9 |
| 5.MD.5b | Apply the formulas $V=I \times w \times h$ and $V=b \times h$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems. | Lessons 11.8, 11.9, 11.10 |
| 5.MD.5c | Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems. | Lesson 11.11 |

## Standards You Will Learn

| Domain: Geometry |  |  |
| :---: | :---: | :---: |
| Graph points on the coordinate plane to solve real-world and mathematical problems. |  |  |
| 5.G. 1 | Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., $x$-axis and $x$-coordinate, $y$-axis and $y$-coordinate). | Lesson 9.2 |
| 5.G. 2 | Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. | Lessons 9.3, 9.4 |
| Classify two-dimensional figures into categories based on their properties. |  |  |
| 5.G. 3 | Understand that attributes belonging to a category of twodimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles. | Lessons 11.1, 11.2, 11.3 |
| 5.G.4 | Classify two-dimensional figures in a hierarchy based on properties. | Lessons 11.1, 11.2, 11.3 |

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1) Make sense of problems and persevere in solving them, In some lessons.
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2) Reason abstractly and quantitatively, In some lessons. Some examples are: 16, 282, 317, 437
3) Construct viable arguments and critique the reasoning of others, In some lessons. Some examples are: 38, 116, 259, 400
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6) Attend to precision, In some lessons. Some examples are: 65, 344, 361, 468
7) Look for and make use of structure, In some lessons. Some examples are: 95, 290, 410, 472
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## Table of Measures

## Length

1 centimeter $(\mathrm{cm})=10$ millimeters (mm)
1 meter $(m)=1,000$ millimeters
1 meter $=100$ centimeters
1 meter $=10$ decimeters ( dm )
1 kilometer $(k m)=1,000$ meters

## Capacity

1 foot (ft) $=12$ inches (in.)
1 yard (yd) $=3$ feet, or 36 inches
1 mile (mi) = 1,760 yards, or 5,280 feet

$$
\begin{aligned}
1 \text { liter }(\mathrm{L}) & =1,000 \text { milliliters }(\mathrm{mL}) & 1 \text { cup }(\mathrm{c}) & =8 \text { fluid ounces (fl oz) } \\
1 \text { metric cup } & =250 \text { milliliters } & 1 \text { pint }(\mathrm{pt}) & =2 \text { cups } \\
1 \text { liter } & =4 \text { metric cups } & 1 \text { quart }(\mathrm{qt}) & =2 \text { pints, or } 4 \text { cups } \\
1 \text { kiloliter }(\mathrm{kL}) & =1,000 \text { liters } & 1 \text { gallon }(\mathrm{gal}) & =4 \text { quarts }
\end{aligned}
$$

## Mass/Weight

1 gram ( g ) $=1,000$ milligrams ( mg ) 1 gram $=100$ centigrams (cg)

1 pound (lb) = 16 ounces (oz)
1 ton $(T)=2,000$ pounds

1 kilogram (kg) = 1,000 grams

## TIME

$$
\begin{aligned}
1 \text { minute }(\mathrm{min}) & =60 \text { seconds }(\mathrm{sec}) \\
1 \text { half hour } & =30 \text { minutes } \\
1 \text { hour }(\mathrm{hr}) & =60 \text { minutes } \\
1 \text { day }= & 24 \text { hours } \\
1 \text { week }(\mathrm{wk})= & 7 \text { days } \\
1 \text { year }(\mathrm{yr})= & 12 \text { months (mo), or } \\
& \text { about } 52 \text { weeks } \\
1 \text { year }= & 365 \text { days } \\
1 \text { leap year }= & 366 \text { days } \\
1 \text { decade }= & 10 \text { years } \\
1 \text { century }= & 100 \text { years } \\
1 \text { millennium }= & 1,000 \text { years }
\end{aligned}
$$

| $=$ | is equal to | $\stackrel{\leftrightarrow}{A B}$ | line $A B$ |
| :--- | :--- | :--- | :--- |
| $\neq$ | is not equal to | $\overrightarrow{A B}$ | ray $A B$ |
| $>$ | is greater than | $\overrightarrow{A B}$ | line segment $A B$ |
| $<$ | is less than | $\angle A B C$ | angle $A B C$, or angle $B$ |
| $(2,3)$ | ordered pair $(x, y)$ | $\triangle A B C$ | triangle $A B C$ |
| $\perp$ | is perpendicular to | ${ }^{\circ}$ | degree |
| $\\|$ | is parallel to | ${ }^{\circ} \mathrm{C}$ | degrees Celsius |
|  |  | ${ }^{\circ} \mathrm{F}$ | degrees Fahrenheit |

## FORMULAS

| Perimeter |  | Area |  |
| :---: | :---: | :---: | :---: |
| Polygon | $P=$ sum of the lengths of sides | Rectangle | $\begin{aligned} & A=b \times h \\ & \text { or } A=b h \end{aligned}$ |
| Rectangle | $\begin{aligned} & P=(2 \times I)+(2 \times w), \text { or } \\ & P=2 l+2 w \end{aligned}$ |  |  |
| Square | $P=4 \times s$, or $P=4 s$ |  |  |
| Volume |  |  |  |
| Rectangular prism $\quad V=B \times h$, or $V=I \times w \times h$ $B=$ area of base shape, $h=$ height of prism |  |  |  |


[^0]:    WRITE Math Show Your Work

[^1]:    

[^2]:    都

[^3]:    - MATHEMATICA PRACTICE

