Glencoe Mathematics

TEXAS Mathematics Course 3

Noteables™ Interactive Study Notebook with FOLDABLES™

Contributing Author
Dinah Zike

FOLDABLES™

Consultant
Douglas Fisher, Ph.D.
Director of Professional Development
San Diego, CA

Mc Graw Hill Glencoe

New York, New York Columbus, Ohio Chicago, Illinois Peoria, Illinois Woodland Hills, California

Send all inquiries to:
The McGraw-Hill Companies
8787 Orion Place
Columbus, OH 43240-4027

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Mathematics Course 3 (*Texas Student Edition*)
Noteables™: *Interactive Study Notebook with Foldables*™

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Contents

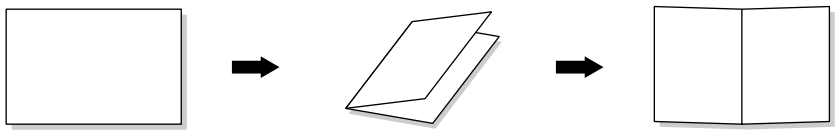
Contents

Organizing Your Foldables

Make this Foldable to help you organize and store your chapter Foldables. Begin with one sheet of 11" × 17" paper.

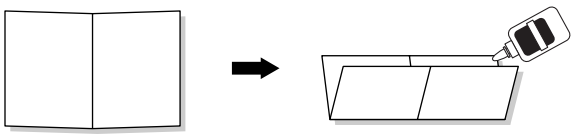
STEP 1 **Fold**

Fold the paper in half lengthwise. Then unfold.



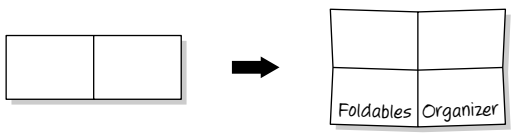
STEP 2 **Fold and Glue**

Fold the paper in half widthwise and glue all of the edges.



STEP 3 **Glue and Label**

Glue the left, right, and bottom edges of the Foldable to the inside back cover of your Noteables notebook.



Reading and Taking Notes As you read and study each chapter, record notes in your chapter Foldable. Then store your chapter Foldables inside this Foldable organizer.

Using Your Noteables™ with FOLDABLES™ Interactive Study Notebook

This note-taking guide is designed to help you succeed in *Mathematics* Course 3. Each chapter includes:

CHAPTER 3

Real Numbers and the Pythagorean Theorem

FOLDABLES Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with two sheets of $8\frac{1}{2}$" by 11" paper.

STEP 1 **Fold** one in half from top to bottom. Cut along fold from edges to margin.

STEP 2 **Fold** the other sheet in half from top to bottom. Cut along fold between margins.

STEP 3 **Insert** first sheet through second sheet and align folds.

STEP 4 **Label** each page with a lesson number and title.

NOTE-TAKING TIP: When you take notes, clarify terms, record concepts, and write examples for each lesson. You may also want to list ways in which the new concepts can be used in your daily life.

The **Chapter Opener** contains instructions and illustrations on how to make a Foldable that will help you to organize your notes.

A **Note-Taking Tip** provides a helpful hint you can use when taking notes.

CHAPTER 3

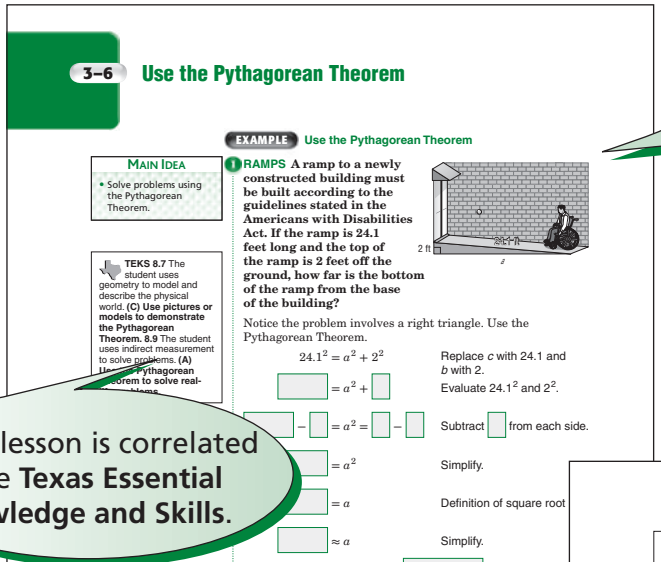
BUILD YOUR VOCABULARY

This is an alphabetical list of new vocabulary terms you will learn in Chapter 3. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
abscissa [ab-SIH-suh]			
converse			
coordinate plane			
hypotenuse			
irrational number			
legs			
ordered pair			
ordinate [OR-din-it]			
origin			
perfect square			

Within each chapter, **Build Your Vocabulary** boxes will remind you to fill in this table.

The **Build Your Vocabulary** table allows you to write definitions and examples of important vocabulary terms together in one convenient place.



3–6 Use the Pythagorean Theorem

EXAMPLE Use the Pythagorean Theorem

MAIN IDEA
- Solve problems using the Pythagorean Theorem.

TEKS 8.7 The student uses geometry to model and describe the physical world. **(C) Use pictures or models to demonstrate the Pythagorean Theorem. 8.9** The student uses indirect measurement to solve problems. **(A) Use the Pythagorean Theorem to solve real-**

1 RAMPS **A ramp to a newly constructed building must be built according to the guidelines stated in the Americans with Disabilities Act. If the ramp is 24.1 feet long and the top of the ramp is 2 feet off the ground, how far is the bottom of the ramp from the base of the building?**

2 ft

Notice the problem involves a right triangle. Use the Pythagorean Theorem.

$24.1^2 = a^2 + 2^2$ Replace c with 24.1 and b with 2.

$\square = a^2 + \square$ Evaluate 24.1^2 and 2^2.

$\square - \square = a^2 = \square - \square$ Subtract $\square$ from each side.

$\square = a^2$ Simplify.

$\square = a$ Definition of square root

$\square \approx a$ Simplify.

The end of the ramp is about $\square$ from the base o the building.

FOLDABLES
ORGANIZE IT
On Less 3-6 of your Foldabl explain the Pythag n Theorem in your o ords and give an exa of how it might d in a real-lif tion.

Check Your Progress If a truck ramp is 32 feet long an the top of the ramp is 10 feet off the ground, how far is the e of the ramp from the truck?

Mathematics Course 3

Lessons cover the content of the lessons in your textbook. As your teacher discusses each example, follow along and complete the **fill-in boxes.** Take notes as appropriate.

Each lesson is correlated to the **Texas Essential Knowledge and Skills.**

Foldables feature reminds you to take notes in your Foldable.

3–1

FOLDABLES
ORGANIZE IT
On Lesson 3-1 of your Foldable, explain how to find the square root of a number and give an example.

Check Your Progress Find each square root.

a. $\sqrt{64}$

c. $\pm\sqrt{2.25}$

Examples parallel the examples in your textbook.

EXAMPLE Use an Equation to Solve a Problem

4 MUSIC **The art work of the square picture in a compact disc case is approximately 14,161 mm² in area. Find the length of each side of the square.**

The area is equal to the square of the length of a side.

Let A = the area and let s = the length of the side $A = s^2$

$14{,}161 = s^2$ Write the equation.

$\square = \sqrt{s^2}$ Take the square root of each side.

The length of a side of a compact disc case is about $\square$ millimeters since distance cannot be negative.

Check Your Progress A piece of art is a square picture that is approximately 11,0 square inches in area. Find the length of each side of the squ picture.

HOMEWORK ASSIGNMENT
Page(s):
Exercises:

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Check Your Progress Exercises allow you to solve similar exercises on your own.

CHAPTER 3 BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 3 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 3, go to glencoe.com	You can use your complete **Vocabulary Builder** *(pages 62–63)* to help you the puzzle.

3-1 Square Roots

Complete each sentence.

1. The principle square root is the $\square$ square root of a number.
2. To solve an equation in which one side of the square is a squared term, you can take the $\square$ of each side of the equation.

Find each square root.

3. $\sqrt{900}$ $\square$
4. $-\sqrt{\frac{36}{49}}$ $\square$
5. $-\sqrt{625}$ $\square$
6. $\sqrt{\frac{25}{121}}$ $\square$

3-2 Estimating Square Roots

Determine between which two consecutive whole numbers each value is located.

7. $\sqrt{23}$ $\square$
8. $\sqrt{59}$ $\square$
9. $\sqrt{27}$ $\square$
10. $\sqrt{18}$ $\square$

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Bringing It All Together Study Guide reviews the main ideas and key concepts from each lesson.

NOTE-TAKING TIPS

Your notes are a reminder of what you learned in class. Taking good notes can help you succeed in mathematics. The following tips will help you take better classroom notes.

- Before class, ask what your teacher will be discussing in class. Review mentally what you already know about the concept.
- Be an active listener. Focus on what your teacher is saying. Listen for important concepts. Pay attention to words, examples, and/or diagrams your teacher emphasizes.
- Write your notes as clear and concise as possible. The following symbols and abbreviations may be helpful in your note-taking.

Word or Phrase	Symbol or Abbreviation	Word or Phrase	Symbol or Abbreviation
for example	e.g.	not equal	$\neq$
such as	i.e.	approximately	$\approx$
with	w/	therefore	$\therefore$
without	w/o	versus	vs
and	+	angle	$\angle$

- Use a symbol such as a star (★) or an asterisk (*) to emphasize important concepts. Place a question mark (?) next to anything that you do not understand.
- Ask questions and participate in class discussion.
- Draw and label pictures or diagrams to help clarify a concept.
- When working out an example, write what you are doing to solve the problem next to each step. Be sure to use your own words.
- Review your notes as soon as possible after class. During this time, organize and summarize new concepts and clarify misunderstandings.

Note-Taking Don'ts

- **Don't** write every word. Concentrate on the main ideas and concepts.
- **Don't** use someone else's notes as they may not make sense.
- **Don't** doodle. It distracts you from listening actively.
- **Don't** lose focus or you will become lost in your note-taking.

CHAPTER 1

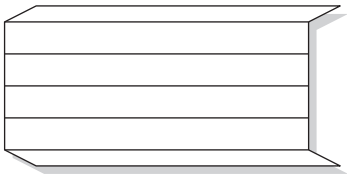
Algebra: Integers

FOLDABLES™

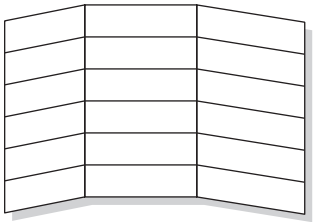
Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with a plain piece of 11" × 17" paper.

STEP 1 **Fold** the paper in sixths lengthwise



STEP 2 **Open and Fold** a 4" tab along the short side. Then fold the rest in half.



STEP 3 **Label** Draw lines along the folds and label as shown.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

NOTE-TAKING TIP: When taking notes, it may be helpful to explain each idea in words and give one or more examples.

CHAPTER 1

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 1. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
absolute value			
additive inverse			
algebra			
algebraic expression [AL-juh-BRAY-ihk]			
conjecture			
coordinate			
counterexample			
define a variable			
equation [ih-KWAY-zhuhn]			
evaluate			
inequality			

Vocabulary Term	Found on Page	Definition	Description or Example
integer [IHN-tih-juhr]			
inverse operations			
negative number			
numerical expression			
opposites			
order of operations			
positive number			
powers			
property			
solution			
solve			
variable			

1–1 A Plan for Problem Solving

MAIN IDEA

- Solve problems using the four-step plan.

BUILD YOUR VOCABULARY (pages 2–3)

Some problem solving strategies require you to make an _____ or conjecture.

FOLDABLES

ORGANIZE IT

Summarize the four-step problem-solving plan in words and symbols. Include an example of how you have used this plan to solve a problem.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(C) Evaluate a solution for reasonableness. 8.14** The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(B) Use a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness.** *Also addresses TEKS 8.14(C), 8.14(D).*

EXAMPLES **Use the Four-Step Plan**

1 **HOME IMPROVEMENT** **The Vorhees family plans to paint the walls in their family room. They need to cover 512 square feet with two coats of paint. If a 1-gallon can of paint covers 220 square feet, how many 1-gallon cans of paint do they need?**

EXPLORE Since they will be using _____ coats of paint, we must _____ the area to be painted.

PLAN They will be covering _____ × _____ square feet or _____ square feet. Next, divide _____ by _____ to determine how many cans of paint are needed.

SOLVE _____ ÷ _____ = _____

CHECK Since they will purchase a whole number of cans of paint, round _____ to _____.

They will need to purchase _____ cans of paint.

Check Your Progress Jocelyn plans to paint her bedroom. She needs to cover 400 square feet with three coats of paint. If a 1-gallon can of paint covers 350 square feet, how many 1-gallon cans of paint does she need?

Remember It

Always check to make sure your answer is reasonable. You can solve the problem again if you think your answer is not correct.

2 **GEOGRAPHY** **Study the table. The five largest states in total area, which includes land and water, are shown. Of the five states shown, which one has the smallest area of water?**

Largest States in Area		
State	Land Area (mi^2)	Total Area (mi^2)
Alaska	570,374	615,230
Texas	261,914	267,277
California	155,973	158,869
Montana	145,556	147,046
New Mexico	121,364	121,598

Source: U.S. Census Bureau

EXPLORE *What do you know?* You are given the total area and the land area for five states. *What are you trying to find?* You need to find the water area.

PLAN To determine the water area, [ ] the [ ] from the [ ] for each state.

SOLVE Alaska = 615,230 − 2 570,374 = [ ]

Texas = 267,277 − 261,914 = [ ]

California = 158,869 − 155,973 = [ ]

Montana = 147,046 − 145,556 = [ ]

New Mexico = 121,598 − 121,364 = [ ]

CHECK Compare the water area for each state to determine which state has the least water area.

[ ] has the least water area with [ ] square miles.

Check Your Progress Refer to Example 2. How many times larger is the land area of Alaska than the land area of Montana?

[ ]

Homework Assignment

Page(s):

Exercises:

1–2 Variables, Expressions, and Properties

Main Idea

- Solve problems using the four-step plan.

TEKS 8.15 The student communicates about Grade 8 mathematics through informal and mathematical language, representations, and models. **(A) Communicate mathematical ideas using language,** efficient tools, appropriate units, **and** graphical, **numerical**, physical, or algebraic mathematical **models. 8.16** The student uses logical reasoning to make conjectures and verify conclusions. **(B) Make conjectures from patterns** or sets of examples and nonexamples.

Build Your Vocabulary (pages 2–3)

A **variable** is a _____, usually a letter, used to represent a _____.

An algebraic expression contains a _____, a number, and at least one _____ symbol.

When you substitute a number for the _____, an algebraic expression becomes a **numeric expression.**

To evaluate an expression means to find its _____ value.

To avoid confusion, mathematicians have agreed on a _____ called the **order of operations.**

Key Concept

Order of Operations

1. Do all operations within grouping symbols first; start with the innermost grouping symbols.
2. Evaluate all powers before other operations.
3. Multiply and divide in order from left to right.
4. Add and subtract in order from left to right.

Examples Evaluate Algebraic Expressions

Evaluate each expression if $q = 5$, $r = 6$, and $s = 3$.

1 **$3r + 2s - 4$**

$3r + 2s - 4$

$= 3(\_\_\_\_)\ 2(\_\_\_\_) - 4$ Replace _____ with 6 and _____ with 3.

$= 18 + 6 - 4$ Do all _____ first.

$= \_\_\_\_ - \_\_\_\_$ _____ and subtract in order from left to right.

$= \_\_\_\_$ Simplify.

BUILD YOUR VOCABULARY (pages 2–3)

Expressions such as 7^2 and 2^3 are called powers and represent repeated ____.

2 $q^2 - 4r - 1$

$q^2 - 4r - 1 = \square^4 - 4\square - 1$ Replace $\square$ with 5 and $\square$ with 6.

$= \square - 4(6) - 1$ Evaluate ____ before other operations.

$= 25 - \square - 1$ ____.

$= \square - \square$ Add and subtract in order from left to right.

$= \square$ ____.

3 $\frac{6q}{5s}$

The fraction bar is a grouping symbol. Evaluate the expressions in the numerator and denominator separately before dividing.

$\frac{6q}{5s} = \frac{6\ (5)}{5\ (3)}$ Replace $\square$ with 5 and $\square$ with 3.

$= \frac{30}{15}$ Do all ____ first.

$= \square$ ____.

Check Your Progress **Evaluate each expression.**

a. $5p - 3s + 2$ if $p = 2$ and $s = 1$

b. $b^2 + 3c - 5$ if $b = 4$ and $c = 2$

c. $\frac{3s}{q + 4}$ if $q = 2$ and $s = 4$

BUILD YOUR VOCABULARY (pages 2–3)

A mathematical sentence that contains an sign (=) is called an **equation.**

An equation that contains a _____ is an **open sentence.**

Properties are _____ sentences that are true for any numbers.

A **counterexample** is an example that shows that a conjecture is _____.

REMEMBER IT

Commutative Property

$a + b = b + a$
$a \cdot b = b \cdot a$

Associative Property

$a + (b + c) = (a + b) + c$
$a \cdot (b \cdot c) = (a \cdot b) \cdot c$

Distributive Property

$a(b + c) = ab + ac$
$a(b - c) = ab - ac$

Identity Property

$a + 0 = a$
$a \cdot 1 = a$

EXAMPLES Identify Properties

4 **Name the property shown by $12 \cdot 1 = 12$.**

Multiplying by 1 does not change the number.

This is the _____ Property.

Check Your Progress Name the property shown by $3 \cdot 2 = 2 \cdot 3$.

_____

EXAMPLES Find a Counterexample

5 **State whether the following conjecture is *true* or *false*. If *false*, provide a counter example.**

The sum of an odd number and an even number is always odd.

This conjecture is _____.

Check Your Progress State whether the following conjecture is *true* or *false*. If false, provide a counterexample.

Division of whole numbers is associative.

_____

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

1–3 Integers and Absolute Values

TEKS 8.1 The student understands that different forms of numbers are appropriate for different situations. **(A) Compare and order rational numbers in various forms including integers,** percents, and positive and negative fractions and decimals.

MAIN IDEA

- Graph integers on a number line and find absolute value

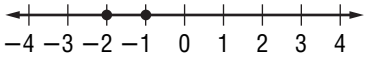
BUILD YOUR VOCABULARY (pages 2–3)

A negative number is a number _____ than zero.

_____ numbers positive numbers and _____ are members of the set of integers.

EXAMPLE **Compare Two Integers**

1 **Replace the ● with < or > to make −2 ● −1 a true sentence.**



The number line shows that −2 is _____ than −1, since it lies to the _____ of −1. So, write −2 _____ −1.

Check Your Progress **Replace each ● with < or > to make a true sentence.**

a. −3 ● 2

b. −4 ● −6

BUILD YOUR VOCABULARY (pages 2–3)

The _____ that corresponds to a _____ is called the coordinate of that point.

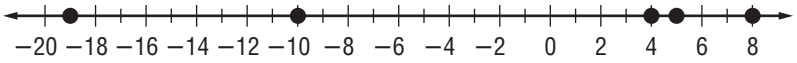
A sentence that _____ two different numbers of quantities is called an inequality.

EXAMPLE Order Integers

2 FOOTBALL The table shows the number of yards rushing for several players on a football team during one game. Order these statistics from least to greatest.

Player	Yards Rushing
Marty	8
Autry	4
Shane	5
Brad	−10
Jim	−19

Graph each integer on a number line.



The order from least to greatest is _____.

Check Your Progress Order the temperatures 83°, 81°, −54°, −30° from least to greatest.

_____

BUILD YOUR VOCABULARY (pages 2–3)

The absolute value of a number is the distance the number is from _____ on the number line.

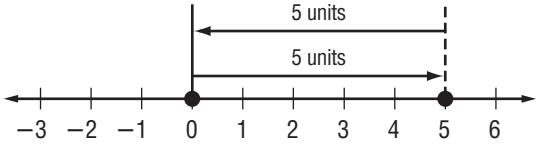
REMEMBER IT

The absolute value of a number is not the same as the opposite of a number. Remember that the absolute value of a number cannot be negative.

EXAMPLES Expressions with Absolute Value

Evaluate each expression.

3 $|5| - |5|$



The graph of 5 is _____ units from 0 on the number line.

So, $|5| =$ _____. Then subtract 5 units.

Thus, $|5| - |5| =$ _____

4 $|6| - |-5|$

$|6| - |-5| = \square - |-5|$ The absolute value of 6 is $\square$.

$= 6 - \square$ $|-5| = \square$

$= \square$ Simplify.

5 **Evaluate $|x| + 13$ if $|x| = -4$.**

$|x| + 13 = |\square| + 13$ Replace x with $\square$.

$= \square + 13$ $|-4| = \square$

$= \square$ Simplify.

Check Your Progress **Evaluate each expression.**

a. $|-3| - |3|$

b. $|9| - |-6|$

c. Evaluate $|x| \div 7$ if $x = -2$.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

1–4 Adding Integers

Reinforcement of TEKS 7.2 The student adds, subtracts, multiplies, or divides to solve problems and justify solutions. **(C) Use models** such as concrete objects, pictorial models, and **number lines, to add,** subtract, multiply, and divide **integers and connect the actions to algorithms.** *Also addresses TEKS 8.16(B).*

MAIN IDEA
- Add integers.

EXAMPLE 1 **Add Integers with the Same Sign**

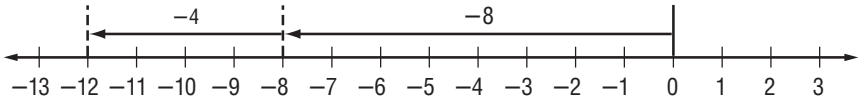
Add −8 + (−4).

Use a number line.

Start at zero.

Move ____ units to the left.

From there, move 4 units ____.



So, −8 + (−4) = ____.

KEY CONCEPT

Adding Integers with the Same Sign To add integers with the same sign, add their absolute values. Give the result the same sign as the integers.

Check Your Progress **Add using a number line or counters.**

a. −3 + (−6)

b. −13 + (−12)

EXAMPLES Add Integers with Different Signs

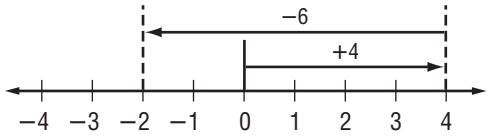
2 **Find 4 + (−6).**

Use a number line.

Start at ____.

Move 4 units ____.

From there, move ____ units left.



So, 4 + (−6) = ____.

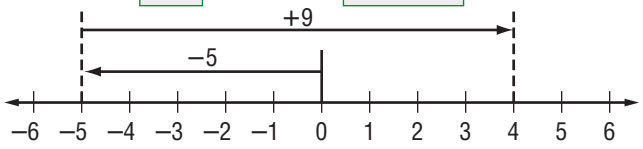
3 **Find −5 + 9.**

Use a number line.

Start at ____.

Move ____ units ____.

From there, move ____ units left ____.



4 **Find −33 + 16.**

−33 + 16 = ____

To find −33 + 16, subtract |16| from |−33|.

The sum is ____

because |−33| > |16|.

FOLDABLES

ORGANIZE IT

Explain and give examples of how to add integers with the same sign and how to add integers with a different signs.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

KEY CONCEPTS

Adding Integers with Different Signs To add integers with different signs, subtract their absolute values. Give the result the same sign as the integer with the greater absolute value.

Check Your Progress **Add.**

a. $3 + (-5)$

b. $-6 + 8$

c. $25 + (-15)$.

BUILD YOUR VOCABULARY (pages 2–3)

Two numbers with the same _____ but different signs are called **opposites.**

An integer and its _____ are also called **additive inverses.**

EXAMPLE **Add Three or More Integers**

5 **Find the sum $2 + (-5) + (-3)$.**

$2 + (-5) + (-3) = 2 + [\ \ + (-3)]$ Associative Property

$= 2 +$ Order of operations.

$=$ Simplify.

Check Your Progress **Find each sum.**

a. $3 + (-6) + (-2)$

b. $-10 + 5 + 10 + 7$

EXAMPLE **Add Three or More Integers**

6 STOCKS **An investor owns 50 shares in a video game manufacturer. A broker purchases 30 shares more for the client on Tuesday. On Friday, the investor asks the broker to sell 65 shares. How many shares of this stock will the client own after these trades are completed?**

Selling a stock decreases the number of shares, so the integer for selling is ____.

Purchasing new stock increases the number of shares, so the integer for buying is ____.

Add these integers to the starting number of shares to find the new number of shares.

$50 + \_\_\_\_ + (\_\_\_\_)$

$= (50 + \_\_\_\_) + (\_\_\_\_)$ Associative Property

$= \_\_\_\_ + (-65)$ $50 + \_\_\_\_ = \_\_\_\_$

$= \_\_\_\_$ Simplify.

Check Your Progress **MONEY** Jaime gets an allowance of $5. She spends $2 on video games and $1 on lunch. Her best friend repays a $2 loan and she buys a $3 pair of socks. How much money does Jaime have left?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

1–5 Subtracting Integers

Reinforcement of TEKS 7.2 The student adds, subtracts, multiplies, or divides to solve problems and justify solutions. **(C) Use models such as concrete objects,** pictorial models, and number lines, **to** add, **subtract**, multiply, and divide **integers and connect the actions to algorithms.**

MAIN IDEA

- Subtract integers.

EXAMPLES Subtract a Positive Integer

1 **Find 2 − 6.**

$2 - 6 = 2 + (-6)$ To subtract 6, add ☐.

$= \square$ Add.

2 **Find −7 − 5.**

$-7 - 5 = 7 \square (-5)$ To subtract ☐, add −5.

$= -12$ Add.

KEY CONCEPT

Subtracting Integers

To subtract an integer, add its opposite or additive inverse.

EXAMPLES Subtract a Negative Integer

3 **Find 11 − (−8).**

$11 - (-8) = \square - 8$ To subtract −8, add ☐.

$= \square$ Add.

4 **WEATHER The overnight temperature at a research station in Antarctica was −13°C, and the temperature rose 2°C during the day. What was the difference between the temperatures?**

$-13 - 2 = -13 \square \square - 8$ To subtract 2, ☐.

$= -15$ Add.

The difference between the temperatures was ☐.

FOLDABLES

ORGANIZE IT

Record in your Foldable how to subtract integers. Be sure to include examples.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

Check Your Progress **Subtract.**

a. $3 - 7$ ☐

b. $-6 - 2$ ☐

c. $15 - (-3)$ ☐

d. $-7 - (-11)$ ☐

WRITE IT

Explain why $-b$ does not necessarily mean that the value of $-b$ is negative.

EXAMPLES Evaluate Algebraic Expressions

5 **Evaluate each expression if $p = 6$, $q = -3$, and $r = -7$.**

$12 - r = 12 -$ ☐ Replace r with ☐.

$= 12 +$ ☐ To subtract ☐ add ☐.

$=$ ☐ Add.

6 $q - p$

$q - p = -3 - 6$ Replace q with ☐ and p with ☐.

$= -3 +$ ☐ To subtract ☐, add ☐.

$=$ ☐ Add.

Check Your Progress **Evaluate each expression if $a = 3$, $b = -6$, and $c = 2$.**

a. $10 - c$

b. $b - a$

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

1–6 Multiplying and Dividing Integers

Reinforcement of TEKS 7.2 The student adds, subtracts, multiplies, or divides to solve problems and justify solutions. **(C) Use models such as** concrete objects, pictorial models, and **number lines, to** add, subtract, **multiply, and divide integers and connect the actions to algorithms.** *Also addresses TEKS 8.16(A) and 8.16(B).*

MAIN IDEA

- Multiply and divide integers.

KEY CONCEPTS

Multiplying Two Integers The product of two integers with different signs is negative.

The product of two integers with the same sign is positive.

Dividing Integers The quotient of two integers with different signs is negative.

The quotient of two integers with the same sign is positive.

REMEMBER IT

Decide on the sign of the product before multiplying. If the number of negatives is *even* the product is positive. If the number of negatives is *odd* the product is negative.

EXAMPLE 1 Multiply Integers with Different Signs

Find 8 (−4).

$8\ (-4) =$ ☐

The factors have ☐ signs. The product is ☐.

EXAMPLE 2 Multiply Integers with the Same Sign

Find −12 (−12).

$-12(-12) =$ ☐

The factors have the ☐ sign. The product is ☐.

EXAMPLE 3 Multiply More Than Two Integers

Find 6 (−2)(−4).

$6\ (-2)(-4) = [6(-2)]$ ☐ ☐ Property

$= -12$ ☐ $6(-2) =$ ☐

$=$ ☐ $-12(-4) =$ ☐

Check Your Progress **Multiply.**

a. $6(-3)$ ☐

b. $-2(6)$ ☐

c. $-8(-8)$ ☐

d. $5(-3)(-2)$ ☐

EXAMPLE **Divide Integers**

4 **Find $30 \div -5$.**

$30 \div -5 =$ ☐

The dividend and the divisor have ☐ signs.

The quotient is ☐.

Check Your Progress **Divide.**

a. $36 \div (-6)$ ☐

b. $\frac{-30}{5}$ ☐

FOLDABLES™

ORGANIZE IT

Describe why the product or quotient of two integers with the same sign is positive and the product or quotient of two integers with different signs is negative.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

EXAMPLE **Evaluate Algebraic Expressions**

5 **Evaluate $-3x - (-4y)$ if $x = -10$ and $y = -4$.**

$3x - (-4y)$

$= 3($☐$) - [-4($☐$)]$ Replace x with ☐ and y with ☐.

$=$ ☐ $-$ ☐ $(3 - 10) =$ ☐

$-4(-4) =$ ☐

$= -30 +$ ☐ To subtract ☐, add ☐.

$=$ ☐ Add.

Check Your Progress Evaluate $2a - (-3b)$ if $a = -6$ and $b = -4$.

EXAMPLE Find the Mean of a Set of Integers

6 WEATHER The table shows the low temperature for each month in McGrath, Alaska. Find the mean (average) of all 12 temperatures.

To find the mean of a set of numbers, find the sum of the numbers. Then divide the result by how many numbers there are in the set.

Average Low Temperatures	
Month	Temp. (°C)
Jan.	−27
Feb.	−26
March	−19
April	−9
May	1
June	7
July	9
Aug.	7
Sept.	2
Oct.	−8
Nov.	−19
Dec.	−26

Source: weather.com

$$\frac{-27 + (-26) + (-19) + (-9) + 1 + 7 + 9 + 7 + 2 + (-8) + (-19) + (-26)}{12}$$

$$= \frac{\square}{12}$$

$$= \square$$

Check Your Progress

The table shows a set of record low temperatures. Find the mean (average) of all 12 temperatures.

Average Low Temperatures	
Month	Temp. (°C)
Jan.	−20
Feb.	−15
March	−5
April	10
May	25
June	31
July	41
Aug.	38
Sept.	34
Oct.	19
Nov.	3
Dec.	−15

Source: weather.com

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

1–7 Writing Equations

TEKS 8.4 The student makes connections among various representations of a numerical relationship. **The student is expected to generate a different representation of data given another representation of data** (such as a table, graph, **equation, or verbal description**).

BUILD YOUR VOCABULARY (pages 2–3)

When you choose a variable and an unknown quantity for the variable to represent, this is called **defining the variable.**

MAIN IDEA

- Write algebraic expressions and equations from verbal phrases and sentences.

EXAMPLE 1 **Write an Algebraic Equation**

CONSUMER ISSUES **The cost of a book purchased online plus $5 shipping and handling comes to a total of $29. Write an equation to model this situation.**

Words → Variable → Equation

The price of a book plus $5 shipping is $29.

Let b represent the price of the book.

The price of a book	plus	$5 shipping	is $29.
☐	+	☐	= 29

The equation is ☐.

Check Your Progress Write *the price of a toy plus $6 shipping is $35* as an algebraic equation.

☐

EXAMPLE 2 **Write an Equation to Solve a Problem**

NUTRITION **A box of oatmeal contains 10 individual packages. If the box contains 30 grams of fiber, write an equation to find the amount of fiber in one package of oatmeal.**

Words → Variable → Equation

Ten packages of oatmeal contain 30 grams of fiber.

Let f represent the grams of fiber per package.

Ten packages of oatmeal	contain	30 grams of fiber.
☐	=	30

REMEMBER IT

It is often helpful to select letters that can easily be connected to the quantity they represent. For example, age = a.

REVIEW IT

Explain why it is important to read a word problem more than once before attempting to solve it.

Check Your Progress A particular box of cookies contains 10 servings. If the box contains 1,200 calories, write an equation to find the number of calories in one serving of cookies.

EXAMPLE

3 TEST EXAMPLE **The eighth grade has $35 less in its treasury than the seventh grade has. Given s, the number of dollars in the seventh grade treasury, which equation can be used to find e, the number of dollars in the eighth grade treasury?**

A $e = 35 - s$

B $e = s - 35$

C $e = s \div 35$

D $e = 35s$

Read the Test Item

The phrase *$35 less . . . that the seveth grade* indicates

[ ].

Solve the Test Item

The amount of money in the eighth grade century	is	the amount of money in the seventh grade treasury	less	$35
e	$=$	s	$-$	35

The solution is [ ].

Check Your Progress Helena and her friends ordered 3 bags of popcorn and 4 drinks from the snack stand. Which equation could be used to find c, the total cost if p represents the cost of a bag of popcorn and d represents the cost of a drink?

F $c = 7(p + d)$

G $c = 7(p - d)$

H $c = 3p + 4d$

J $c = 7p + 7d$

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

1–8 Problem-Solving Investigation: Work Backward

EXAMPLE

MAIN IDEA

- Solve problems by working backward.

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(C) Select or develop an appropriate problem-solving strategy from a variety of different types, including … working backwards to solve a problem.**

SCHEDULING **Wendie is meeting some friends for a movie and a dinner. She needs to be finished with dinner by 7:30 P.M. to make it home by 8:00 P.M. The movie runs for 90 minutes, and she wants to have at least 1 hour for dinner. If it takes 20 minutes to get from the theater to the restaurant, what is the latest starting time she can choose for the movie she wants to see?**

EXPLORE You know what time Wendie needs to head home. You know the time it takes for each event. You need to determine _____ _____

PLAN Start with the _____ and work backward.

SOLVE

Finish dinner _____ 7:30 P.M.

Go back 1 hour for dinner. _____

Go back _____ for travel. 6:10 P.M.

Go back 90 minutes for the movie. _____

CHECK Assume the movie starts at _____ Work foward, adding the time for each event.

The latest starting time for the movie is _____

Check Your Progress **SHOPPING** Mia spent $9.50 at a fruit stand, then spent three times that amount at the grocery store. She had $7.80 left. How much money did she have initially?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

1–9 Solving Addition and Subtraction Equations

TEKS 8.5 The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A)** Predict, **find, and justify solutions to application problems using** appropriate tables, graphs, and **algebraic equations.**

Main Idea

- Solve equations using the Subtraction and Addition Properties of Equality.

Build Your Vocabulary (pages 2–3)

When you **solve** an equation, you are trying to find the values of the variable that makes the equation [ ].

A **solution** is the value of the variable that makes the variable [ ].

Key Concepts

Subtraction Property of Equality If you subtract the same number from each side of an equation, the two sides remain equal.

Addition Property of Equality If you add the same number to each side of an equation, the two sides remain equal.

EXAMPLE 1 Solve an Addition Equation

Solve $7 = 15 + c$.

METHOD 1 Vertical Method

$7 = 15 + c$ Write the equation.

$7 = 15 + c$ Subtract [ ] from each side.

$-15 = -15$

[ ] $= c$ $7 - 15 =$ [ ]; $15 - 15 =$ [ ]

METHOD 2 Horizontal Method

$7 = 15 + c$ Write the equation.

$7 -$ [ ] $= 15 + c -$ [ ] Subtract [ ] from each side.

[ ] $= c$ $7 - 15 =$ [ ]; and

[ ] $- 15 = 0$

Check Your Progress Solve $6 = 11 + a$.

BUILD YOUR VOCABULARY (pages 2–3)

Addition and subtraction are called **inverse operations** because they "undo" each other.

EXAMPLE Solve an Addition Equation

2 OCEANOGRAPHY **At high tide, the top of a coral formation is 2 feet above the surface of the water. This represents a change of –6 feet from the height of the coral at low tide. Write and solve an equation to determine h, the height of the coral at low tide.**

Words The height at low tide plus the change is the height at high tide.

Variable Let h represent the height at low tide.

Equation $h + (-6) = 2$

$h + -6 = 2$ Write the equation.

$h + (-6) - \square = 2 - \square$ Subtract $\square$ from each side.

$h = \square$ Simplify.

The height of the coral at low tide is 8 feet.

EXAMPLE Solve a Subtraction Equation

3 Solve $-5 = z - 16$.

Use the horizontal method.

$-5 = z - 16$ Write the equation.

$-5 + \square = z - 16 + \square$ Add $\square$ to each side.

$\square = z$ $-16 + 16 = \square$ and $\square + 16 = 11$.

Check Your Progress Solve $x - 12 = 26$.

FOLDABLES

ORGANIZE IT

Compare how to solve an equation involving whole numbers and an equation involving integers.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

1–10 Solving Multiplication and Division Equations

TEKS 8.5 The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A) Predict, find, and justify solutions to application problems using** appropriate tables, graphs, and **algebraic equations.**

MAIN IDEA

- Solve equations by using the Division and Multiplication Properties of Equality.

KEY CONCEPTS

Division Property of Equality If you divide each side of an equation by the same nonzero number, the two sides remain equal.

Multiplication Property of Equality If you multiply each side of an equation by the same number, the two sides remain equal.

EXAMPLE Solve a Multiplication Equation

1 **Solve $7z = -49$.**

$7z = -49$ Write the equation.

$\frac{7z}{\square} = \frac{-49}{\square}$ ☐ each side by ☐.

☐ z = ☐ $7 \div 7 =$ ☐, $-49 \div 7 =$ ☐

☐ = ☐ Identity Property; $1z =$ ☐

EXAMPLE Solve a Division Equation

2 **Solve $\frac{c}{9} = 26$.**

$\frac{c}{9} = -6$ Write the equation.

$\frac{c}{9}$ ☐ $= -6$ ☐ Multiply each since by ☐.

$c =$ ☐ -6 ☐ = ☐

EXAMPLE Use an Equation to Solve a Problem

3 **SURVEYING English mathematician Edmund Gunter lived around 1600. He invented the *chain*, which was used as a unit of measure for land and deeds. One chain equals 66 feet. If the south side of a property measures 330 feet, how many chains long is it?**

Words

One chain equals 66 feet.

Variable

Let c = the number of chains in ☐ feet.

Equation

Measurement of property	is	66 times the number of chains
330	=	☐

FOLDABLES

ORGANIZE IT

On your Foldable table, explain how to solve multiplication equations using the multiplication properties of equality.

	Words	Example(s)
A Plan for Problem Solving		
+ & − of Integers		
× & ÷ of Integers		
Solving + & − Equations		
Solving × & ÷ Equations		

Solve the equation.

$330 = 66c$ Write the equation.

$\frac{330}{\square} = \frac{66c}{\square}$ Divide each side by $\square$.

$\square = \square$ $330 \div \square = \square$

The number of chains in 330 feet is $\square$.

Check Your Progress

a. Solve $8a = -64$.

b. Solve $\frac{x}{5} = -10$.

c. Most horses are measured in hands. One hand equals 4 inches. If a horse measures 60 inches, how many hands is it?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

CHAPTER 1

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 1 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 1, go to: glencoe.com	You can use your completed **Vocabulary Builder** *(pages 2–3)* to help you solve the puzzle.

1-1

A Plan for Problem Solving

Use the four step plan to solve the problem.

1. Lisa plans to redecorate her bedroom. Each wall is 120 square feet. Three walls need a single coat of paint and the fourth wall needs a double coat. If each can of paint will cover 200 square feet, how many gallons of paint does Lisa need?

1-2

Variables, Expressions and Properties

2. Number the operations in the correct order for simplifying $2 + 4\ (9 - 6 \div 3)$.

☐ addition ☐ subtraction

☐ multiplication ☐ division

3. Describe how the expressions $2 + 5$ and $5 + 2$ are different. Then determine whether the two expressions are equal to each other. If the expressions are equal, name the property that says they are equal.

1-3

Integers and Absolute Values

Complete each sentence with either *left* or *right* to make a true sentence. Then write a statement comparing the two numbers with either <, or >.

4. −45 lies to the _____ of 0 on a number line. _____

5. 72 lies to the _____ of 0 on a number line. _____

6. −3 lies to the _____ of −95 on a number line. _____

7. 6 lies to the _____ of −7 on a number line. _____

1-4

Adding Integers

Determine whether you *add* or *subtract* the absolute values of the numbers to find the sum. Give reasons for your answers.

8. 4 + 8 _____

9. −3 + 5 _____

10. 9 + (−12) _____

11. −23 + (−16) _____

1-5

Subtracting Integers

Rewrite each difference as a sum. Then find the sum.

12. 2 − 9 _____

13. −3 − 8 _____

14. 10 − (−12) _____

15. −5 − (−16) _____

1-6

Multiplying and Dividing Integers

Find each product or quotient.

16. $9(-2)$

17. $-6(-7)$

18. $12 \div (-4)$

19. $-35 \div (-7)$

1-7

Writing Expressions and Equations

Determine whether each situation requires *addition*, *subtraction*, *multiplication* or *division*.

20. Find the difference in the cost of a gallon of premium gasoline and the cost of a gallon of regular gasoline.

21. Find the flight time after the time has been increased by 15 minutes.

1-8

Problem Solving Investigation: Work Backward

22. LOANS Alonso bought supplies for a camping trip. He has about $2 left. He spent $15.98 at the grocery store, then spent $21.91 at the sporting goods store. He also spent a third of his money for a deposit on the campsite. About how much money did Alonso have originally?

1-9

Solving Addition and Subtraction Equations

Solve each equation.

23. $x + 6 = 9$

24. $s - 5 = 14$

25. $11 + m = 33$

1-10

Solving Multiplication and Division Equations

Solve each equation.

26. $8r = 32$

27. $3 = \frac{x}{7}$

28. $-9 = -9g$

CHAPTER 1 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 1.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want take the Chapter 1 Practice Test on page 79 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 1 Study Guide and Review on pages 74–78 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 1 Practice Test on page 79 of your textbook.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 1 Foldable.
- Then complete the Chapter 1 Study Guide and Review on pages 74–78 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 1 Practice Test on page 79 of your textbook.

Student Signature

Parent/Guardian Signature

Teacher Signature

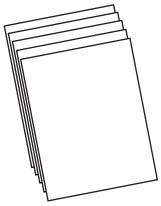
CHAPTER 2

Algebra: Rational Numbers

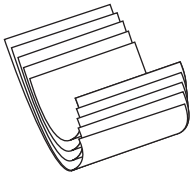
FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with five sheets of $8\frac{1}{2}$" × 11" paper.

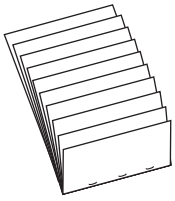
STEP 1 **Place** 5 sheets of paper $\frac{3}{4}$ inch apart.



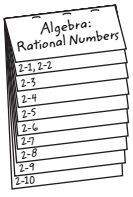
STEP 2 **Roll** up bottom edges. All tabs should be the same size.



STEP 3 **Staple** along the fold.



STEP 4 **Label** the tabs with the lesson numbers.



NOTE-TAKING TIP: As you study a lesson, write down questions you have, comments and reactions, short summaries of the lesson, and key points that are highlighted and underlined.

CHAPTER 2

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 2. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
bar notation			
base			
dimensional analysis			
exponent			
like fractions			
multiplicative inverses			

(continued on the next page)

Vocabulary Term	Found on Page	Definition	Description or Example
power			
rational number			
reciprocals			
repeating decimal			
scientific notation			
terminating decimal			
unlike fractions			

2–1 Rational Numbers

Reinforcement of TEKS 7.1 The student represents and uses numbers in a variety of equivalent forms. **(B) Convert between fractions, decimals, whole numbers,** and percents mentally, **on paper, or with a calculator.**

MAIN IDEA

- Express rational numbers as decimals and decimals as fractions.

BUILD YOUR VOCABULARY (pages 33–34)

A **rational number** is any number that can be expressed in the form $\frac{a}{b}$ where a and b are _____ and $b \neq 0$.

A decimal like 0.0625 is a **terminating** decimal because the division ends, or terminates, when the _____ is 0.

KEY CONCEPT

Rational Numbers
A rational number is any number that can be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$.

EXAMPLE 1 **Write a Fraction as a Decimal**

Write $\frac{3}{16}$ as a decimal.

$\frac{3}{16}$ means 3 _____ 16.

$$\begin{array}{r} 0.1875 \\ 16\overline{)3.0000} \\ \underline{16} \\ 140 \\ \underline{128} \\ 120 \\ \underline{112} \\ 80 \\ \underline{80} \\ 0 \end{array}$$

Divide 3 by 16.

Division ends when the _____ is 0.

You can also use a calculator.

The fraction $\frac{3}{16}$ can be written as _____.

Check Your Progress Write $\frac{1}{16}$ as a decimal.

BUILD YOUR VOCABULARY (pages 33–34)

A _____ like 1.6666 . . . is called a **repeating decimal.**

Since it is not possible to show all of the _____, you can use **bar notation** to show that the 6 _____.

WRITE IT

Explain how you decide where the bar is placed when you use bar notation for a repeating decimal.

_____

_____

_____

_____

_____

EXAMPLE **Write a Mixed Number as a Decimal**

2 **Write $-3\frac{2}{11}$ as a decimal.**

You can write $-3\frac{2}{11}$ as $\frac{-35}{11}$ or $\frac{35}{-11}$. To change $-3\frac{2}{11}$ to a decimal, find _____ or _____.

$$
\begin{array}{r}
\_\_\_\_ \\
-11\overline{)35.0000} \\
\underline{-33} \\
20 \\
\underline{-11} \\
90 \\
\underline{-88} \\
20 \\
\underline{-11} \\
90 \\
\underline{-88} \\
2
\end{array}
$$

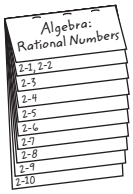
The remainder after each step is 2 or 9.

The mixed number $-3\frac{2}{11}$ can be written as _____.

FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 2–1, explain in your own words how to express rational numbers as decimals and decimals as fractions.



Check Your Progress Write $5\frac{1}{9}$ as a decimal.

EXAMPLE **Write a Terminating Decimal as a Fraction**

3 **Write 0.32 as a fraction.**

$0.32 = \frac{32}{\square}$ 0.32 is 32 $\square$.

$= \square$ Simplify. Divide by the greatest common factor of 32 and 100, $\square$.

The decimal 0.32 can be written as $\square$.

Check Your Progress Write 0.16 as a fraction.

EXAMPLE **Write a Repeating Decimal as a Fraction**

4 **ALGEBRA** **Write $2.\overline{7}$ as a mixed number.**

Let $N = 2.\overline{7}$ or 2.777 . . . . Then $10N =$ $\square$.

Multiply N by $\square$ because 1 digit repeats.

Subtract $N = 2.777\ldots$ to eliminate the $\square$ part, 0.777 . . . .

$10N = 27.777\ldots$

$-1N = \ \ 2.777\ldots$ $N = 1N$

$\square = 25$ $10N - 1N = \square$

$\square = \square$ Divide each side by $\square$.

$N = \square$ Simplify.

Check Your Progress Write $1.\overline{7}$ as a mixed number.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

2–2 Comparing and Ordering Rational Numbers

TEKS 8.1 The student understands that different forms of numbers are appropriate for different situations. **(A) Compare and order rational numbers in various forms including** integers, percents, and **positive and negative fractions and decimals.**

MAIN IDEA

Compare and order rational numbers.

EXAMPLE 1 Compare Positive Rational Numbers

Replace ● with <, >, or = to make $\frac{3}{7}$ ● $\frac{8}{13}$ a true sentence.

Write as fractions with the same denominator.

For $\frac{3}{7}$ and $\frac{8}{13}$, the least common denominator is 91.

$$\frac{3}{7} = \frac{3 \cdot \square}{7 \cdot \square} = \frac{\square}{91}$$

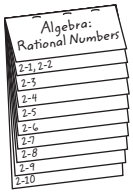
$$\frac{8}{13} = \frac{8 \cdot \square}{13 \cdot \square} = \frac{\square}{91}$$

Since $\frac{\square}{91} < \frac{\square}{91}$, $\frac{3}{7} \square \frac{8}{13}$.

FOLDABLES

ORGANIZE IT

Under the tab for Lesson 2–2, explain how you can compare two numbers by expressing them as decimals and comparing the decimals.



EXAMPLE 2 Compare Using Decimals

Replace ● with <, >, or = to make 0.7 ● $\frac{7}{11}$ a true sentence.

0.7 ● $\frac{7}{11}$

$\square$ ● $\square$

Express $\frac{7}{11}$ as a decimal.

In the tenths place, 7 > 6.

So, 0.7 $\square$ $\frac{7}{11}$.

Check Your Progress **Replace each ● with <, >, or = to make a true sentence.**

a. $\frac{2}{3}$ ● $\frac{3}{5}$

b. $\frac{4}{9}$ ● 0.5

EXAMPLE **Order Rational Numbers**

REMEMBER IT

On a number line, a number to the left is always less than a number to the right.

3 **CHEMISTRY** **The values for the approximate densities of various substances are shown in the table. Order the densities from least to greatest.**

Write each fraction as a decimal.

$1\frac{4}{5} =$ ____

$2\frac{1}{4} =$ ____

$2\frac{3}{5} =$ ____

Substance	Density (g/cm^3)
aluminum	2.7
beryllium	1.87
brick	$1\frac{4}{5}$
crown glass	$2\frac{1}{4}$
fused silica	$2.\overline{2}$
marble	$2\frac{3}{5}$
nylon	1.1
pyrex glass	2.32
rubber neoprene	$1.\overline{3}$

Source: *CRC Handbook of Chemistry and Physics*

From the least to the greatest, the densities are $1.1, 1.\overline{3}, 1\frac{4}{5}, 1.87, 2.\overline{2}, 2\frac{1}{4}, 2.32, 2\frac{3}{5}$, and 2.7. So, the ____ is the least dense, and ____ is the most dense.

Check Your Progress

The ride times for five amusement park attractions are shown in the table. Order the lengths from least to greatest.

Coaster	Ride Time (min)
Big Dipper	$1\frac{3}{4}$
Double Loop	1.5
Mind Eraser	1.8
Serial Thriller	$2\frac{1}{12}$
X–Flight	$2.\overline{3}$

Source: www.coasterglobe.com

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

2–3 Multiplying Positive and Negative Fractions

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(B) Use appropriate operations to solve problems involving rational numbers in problem situations.**

MAIN IDEA
- Multiply fractions.

BUILD YOUR VOCABULARY (pages 33–34)

Dimensional analysis is the process of including units of [ ] when you [ ].

KEY CONCEPT

Multiply Fractions
To multiply fractions, multiply the numerators and multiply the denominators.

EXAMPLE **Multiply Fractions**

1 **Find $\frac{3}{7} \cdot \frac{8}{9}$. Write in simplest form.**

$\frac{3}{7} \cdot \frac{8}{9} = \frac{\cancel{3}^{1}}{7} \cdot \frac{8}{\cancel{9}_{3}}$ Divide 3 and 9 by their GCF, [ ].

$= \frac{\square}{\square}$ ← Multiply the numerators. ← Multiply the denominators.

$= \frac{8}{21}$ Simplify.

EXAMPLE **Multiply Negative Fractions**

2 **Find $-\frac{3}{4} \cdot \frac{7}{12}$. Write in simplest form.**

$-\frac{3}{4} \cdot \frac{7}{12} = -\frac{\cancel{3}^{1}}{4} \cdot \frac{7}{\cancel{12}_{4}}$ Divide −3 and 12 by their GCF, [ ].

$= \frac{\square}{\square}$ ← Multiply the numerators. ← Multiply the denominators.

$= -\frac{\square}{\square}$ The factors have different signs, so the product is negative.

EXAMPLE **Multiply Mixed Numbers**

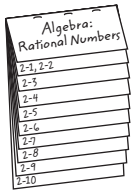
3 **Find $3\frac{1}{5} \cdot 1\frac{3}{4}$. Write in simplest form.**

$3\frac{1}{5} \cdot 1\frac{3}{4} = \square \cdot \square$ $3\frac{1}{5} = \square$, $1\frac{3}{4} = \square$

FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 2–3, explain in your own words how to multiply rational numbers.



$= \frac{\overset{4}{\cancel{16}}}{5} \cdot \frac{7}{\underset{1}{\cancel{4}}}$ Divide 16 and 4 by their GCF, ☐.

$= \frac{\square}{5 \cdot 1}$ ← Multiply the numerators. ← Multiply the denominators.

$= \square$, or $5\square$ Simplify.

Check Your Progress **Multiply. Write in simplest form.**

a. $-\frac{2}{15} \cdot \frac{5}{9}$ ☐

b. $3\frac{2}{5} \cdot 2\frac{2}{9}$ ☐

EXAMPLE

4 VOLUNTEER WORK **Last summer the 7th graders performed a total of 250 hours of community service. If the 8th graders spent $1\frac{1}{5}$ this much time volunteering, how many hours of community service did the 8th graders perform?**

The 8 graders spent $1\frac{1}{5}$ times the amount of time as the 7th graders on community service.

$\frac{11}{5} \cdot 250 = \square \cdot \square$

$= \frac{1{,}500}{5}$ or ☐

The 8th graders did ☐ of community service last summer.

Check Your Progress **VOLUNTEER WORK** Last summer the 5th graders performed a total of 150 hours of community service. If the 6th graders spent $1\frac{1}{3}$ this much time volunteering, how many hours of community service did the 6th graders perform?

☐

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

2–4 Dividing Positive and Negative Fractions

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(B) Use appropriate operations to solve problems involving rational numbers in problem situations.**

MAIN IDEA
- Divide fractions.

BUILD YOUR VOCABULARY (pages 33–34)

Two numbers whose product is one are **multiplicative inverses.**

The numbers 4 and $\frac{1}{4}$ are ____

or **reciprocals** of each other.

KEY CONCEPTS

Inverse Property of Multiplication The product of a rational number and its multiplicative inverse is 1.

Dividing Fractions To divide by a fraction, multiply by its multiplicative inverse.

EXAMPLE 1 Find a Multiplicative Inverse

Write the multiplicative inverse of $-2\frac{4}{7}$.

$-2\frac{4}{7} =$ ____ Write $-2\frac{4}{7}$ as an improper fraction.

Since $-\frac{18}{7}\left(-\frac{7}{18}\right) =$ ____, the multiplicative inverse of $-2\frac{4}{7}$ is ____.

EXAMPLE 2 Divide Fractions

Find $\frac{3}{10} \div \frac{2}{5}$. Write in simplest form.

$\frac{3}{10} \div \frac{2}{5} = \frac{3}{10} \cdot$ ____ Multiply by the multiplicative inverse of $\frac{2}{5}$.

$= \frac{3}{\cancel{10}_{2}} \cdot \frac{\cancel{5}^{1}}{2}$ Divide 5 and 10 by their GCF, ____.

$=$ ____ Simplify.

Check Your Progress

a. Write the multiplicative inverse of $-1\frac{5}{6}$.

____

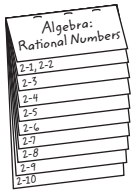
b. Find $\frac{4}{15} \div \frac{3}{5}$. Write in simplest form.

____

FOLDABLES™

ORGANIZE IT

On the tab for Lesson 2–4, explain in your own words how to divide rational numbers.



EXAMPLE **Divide Negative Fractions**

3 **Find $\frac{2}{7} \div -\frac{8}{9}$. Write in simplest form.**

$\frac{2}{7} \div -\frac{8}{9} = \frac{2}{7} \cdot$ ☐ Multiply by the multiplicative inverse of $-\frac{8}{9}$ which is ☐.

$= \frac{\overset{1}{\cancel{2}}}{7} \cdot \frac{9}{\underset{4}{\cancel{8}}}$ Divide 2 and 8 by their GCF, ☐.

$=$ ☐ The fractions have different signs, so the quotient is negative.

EXAMPLE **Divide by a Whole Number**

4 **Find $\frac{6}{7} \div 12$. Write in simplest form.**

$\frac{6}{7} \div 12 = \frac{6}{7} \div \frac{12}{1}$ Write 12 as ☐.

$= \frac{6}{7} \cdot$ ☐ Multiply by the multiplicative inverse of 12, which is ☐.

$= \frac{\overset{1}{\cancel{6}}}{7} \cdot \frac{1}{\underset{2}{\cancel{12}}}$ Divide 6 and 12 by their GCF, ☐.

$=$ ☐ Simplify.

WRITE IT

Explain how you would divide a fraction by a whole number.

Check Your Progress **Find each quotient. Write in simplest form.**

a. $-\frac{3}{5} \div \frac{9}{10}$

b. $\frac{3}{4} \div 6$

EXAMPLE **Divide Mixed Numbers**

5 **Find $3\frac{1}{4} \div \left(-2\frac{1}{8}\right)$. Write in simplest form.**

$3\frac{1}{4} \div \left(-2\frac{1}{8}\right) = \square \div \left(\square\right)$ $3\frac{1}{4} = \square$,

$-2\frac{1}{8} = \square$

$= \square \cdot \left(-\frac{8}{17}\right)$ The multiplicative inverse of $\square$ is $-\frac{8}{17}$.

$= \frac{13}{\cancel{4}_{1}} \cdot \left(-\frac{\overset{2}{\cancel{8}}}{17}\right)$ Divide 4 and 8 by their GCF, $\square$.

$= -\frac{26}{17}$ or $\square$ Simplify.

Check Your Progress Find $2\frac{1}{3} \div \left(-1\frac{1}{9}\right)$. Write in simplest form.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

2–5 Adding and Subtracting Like Fractions

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(B) Use appropriate operations to solve problems involving rational numbers in problem situations.**

Main Idea

- Add and subtract fractions with like denominators

Build Your Vocabulary (pages 33–34)

Fractions with like [ ] are called **like fractions**.

EXAMPLE **Add Like Fractions**

1 **Find $\frac{3}{16} + \left(-\frac{15}{16}\right)$. Write in simplest form.**

$$\frac{3}{16} + \left(-\frac{15}{16}\right) = \frac{\square + \left(\square\right)}{16}$$

← Add the numerators.

← The denominators are the same.

$$= \frac{-12}{16} \text{ or } \square$$

Simplify.

EXAMPLE **Subtract Like Fractions**

2 **Find $-\frac{7}{10} - \frac{9}{10}$. Write in simplest form.**

$$-\frac{7}{10} - \frac{9}{10} = \frac{\square}{10}$$

← Subtract the numerators.

← The denominators are the same.

$$= \frac{-16}{10} \text{ or } \square$$

Rename $-\frac{16}{10}$ as $-1\frac{6}{10}$ or [ ].

Key Concepts

Adding Like Fractions To add fractions with like denominators, add the numerators and write the sum over the denominator.

Subtracting Like Fractions To subtract fractions with like denominators, subtract the numerators and write the difference over the denominator.

Check Your Progress **Find each difference. Write in simplest form.**

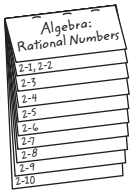
a. $\frac{2}{9} + \left(-\frac{8}{9}\right)$

b. $-\frac{7}{8} - \frac{5}{8}$

FOLDABLES

ORGANIZE IT

Under the tab for Lesson 2–5, record models illustrating the addition and subtraction of like fractions.



EXAMPLE **Add Mixed Numbers**

3 **Find $2\frac{5}{8} + 6\frac{1}{8}$. Write in simplest form.**

$2\frac{5}{8} + 6\frac{1}{8} = \left(\square + \square\right) + \left(\frac{5}{8} + \frac{1}{8}\right)$ Add the whole numbers and fractions separately.

$= \square + \frac{5+1}{8}$ Add the numerators.

$= \square$ or $\square$ Simplify.

EXAMPLE **Subtract Mixed Numbers**

4 **HEIGHTS** **In the United States, the average height of a 9-year-old girl is $53\frac{4}{5}$ inches. The average height of a 16-year-old girl is $64\frac{1}{5}$ inches. How much does an average girl grow from age 9 to age 16?**

$64\frac{1}{5} - 53\frac{4}{5} = \frac{\square}{5} - \frac{\square}{5}$ Write the mixed numbers as improper fractions.

$= \frac{\square - \square}{5}$ ← Subtract the numerators. ← The denominators are the same.

$= \frac{52}{5}$ or $\square$ Rename $\frac{52}{5}$ as $\square$.

The average girl grows $\square$ inches from age 9 to age 16.

Check Your Progress

a. Find $3\frac{3}{10} + 4\frac{1}{10}$. Write in simplest form.

b. Ainsley was $42\frac{1}{7}$ inches tall when she was 4 years old. When she was 10 years old, she was $50\frac{3}{7}$ inches tall. How much did she grow between the ages of 4 and 10?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

2–6 Adding and Subtracting Unlike Fractions

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(B) Use appropriate operations to solve problems involving rational numbers in problem situations.**

Main Idea

- Add and subtract fractions with unlike denominators.

Build Your Vocabulary (pages 33–34)

Fractions with ____ denominators are called **unlike fractions**.

Examples Add and Subtract Unlike Fractions

Add or subtract. Write in simplest form.

1 $\frac{5}{8} + \left(-\frac{3}{4}\right)$

$\frac{5}{8} + \left(-\frac{3}{4}\right) = \frac{5}{8} + \left(-\frac{3}{4}\right) \cdot$ ____ The LCD is 2 • 2 • 2 or 8.

$=$ ____ $+$ ____ Rename the fractions using the LCD.

$=$ ____ Add the numerators.

$=$ ____ Simplify.

Key Concept

Adding and Subtracting Unlike Fractions To find the sum or difference of two fractions with unlike denominators, rename the fractions with a common denominator. Then add or subtract and simplify, if necessary.

2 $\frac{1}{5} - \left(-\frac{2}{7}\right)$

$\frac{1}{5} - \left(-\frac{2}{7}\right) = \frac{1}{5} \cdot \frac{7}{7} - \left(-\frac{2}{7}\right) \cdot \frac{5}{5}$ The LCD is 7 • 5 or ____.

$=$ ____ $-$ (____) Rename each fraction using the LCD.

$= \frac{7}{35} +$ ____ Subtract $-\frac{10}{35}$ by adding its inverse, ____.

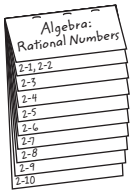
$=$ $\frac{\text{____}}{35}$ Add the numerators.

$=$ ____ Simplify.

FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 2–6, record the differences between adding and subtracting like and unlike fractions.



Check Your Progress **Add or subtract. Write in simplest form.**

a. $\frac{5}{6} + \left(-\frac{2}{3}\right)$

b. $\frac{1}{3} - \left(-\frac{3}{5}\right)$

EXAMPLE **Add Mixed Numbers**

3 **Find $-4\frac{1}{8} + 2\frac{5}{12}$. Write in simplest form.**

$-4\frac{1}{8} + 2\frac{5}{12} =$ ☐ + ☐ Write the mixed numbers as fractions.

$= -\frac{33}{8} \cdot \frac{3}{3} + \frac{29}{12} \cdot \frac{2}{2}$ The LCD is 2 • 2 • 2 • 3 or ☐.

$=$ ☐ + ☐ Rename each fraction using the LCD.

$=$ $\frac{\square}{24}$ Add the numerators.

$=$ ☐ or 1 ☐ Simplify.

Check Your Progress Find $-5\frac{1}{6} + 3\frac{5}{8}$. Write in simplest form.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

2–7 Solving Equations with Rational Numbers

TEKS 8.5 The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A) Predict, find, and justify solutions to application problems using appropriate** tables, graphs, and **algebraic equations.** *Also addresses TEKS 8.1(A).*

MAIN IDEA

- Solve equations involving rational numbers.

EXAMPLES Solve by Using Addition or Subtraction

1 **Solve $g + 2.84 = 3.62$.**

$g + \square = 3.62$ — Write the equation.

$g + 2.84 - \square = 3.62 - \square$ — Subtract $\square$ from each side.

$g = \square$ — Simplify.

2 **Solve $-\frac{4}{5} = s - \frac{2}{3}$.**

$-\frac{4}{5} = s - \frac{2}{3}$ — Write the equation.

$-\frac{4}{5} + \square = s - \frac{2}{3} + \square$ — Add $\square$ to each side.

$-\frac{4}{5} + \square = s$ — Simplify.

$\square + \frac{10}{15} = s$ — Rename each fraction using the LCD.

$\square = s$ — Simplify.

EXAMPLES Solve by Using Multiplication or Division

3 **Solve $\frac{7}{11}c = -21$.**

$\frac{7}{11}c = -21$ — Write the equation.

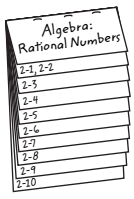
$\square\left(\frac{7}{11}c\right) = \square(-21)$ — Multiply each side by $\square$.

$c = \square$ — Simplify.

FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 2–7, summarize in your own words what you have learned about solving equations with rational numbers.



REVIEW IT

What is a mathematical sentence containing equals sign called? (*Lesson 1–8*)

_____

_____

_____

_____

_____

4 **Solve $9.7t = -67.9$.**

$9.7t = -67.9$ Write the equation.

$\frac{9.7t}{\square} = \frac{-67.9}{\square}$ Divide each side by $\square$.

$t = \square$ Simplify.

Check Your Progress **Solve each equation.**

a. $h + 2.65 = 5.73$

b. $-\frac{2}{5} = x - \frac{3}{4}$.

c. $\frac{3}{5}x = -27$

d. $3.4t = -27.2$

EXAMPLE **Write an Equation to Solve a Problem**

5 **PHYSICS** **You can determine the rate an object is traveling by dividing the distance it travels by the time it takes to cover the distance $\left(r = \frac{d}{t}\right)$. If an object travels at a rate of 14.3 meters per second for 17 seconds, how far does it travel?**

$r = \frac{d}{t}$

$14.3 = \frac{d}{\square}$ Write the equation.

$\square(14.3) = 17\left(\frac{d}{\square}\right)$ Multiply each side by $\square$.

$\square = d$ Simplify.

Check Your Progress If an object travels at a rate of 73 miles per hour for 5.2 hours, how far does it travel?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

2–8 Problem-Solving Investigation: Look for a Pattern

MAIN IDEA

- Solve problems by looking for a pattern.

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(C) Select or develop an appropriate problem-solving strategy from a variety of different types, including… looking for a pattern… to solve a problem.**

EXAMPLE

1 INTEREST **The table below shows the amount of interest $3,000 would earn after 7 years at various interest rates. How much interest would $3,000 earn at 6 percent interest?**

Interest Rate (%)	Interest Earned ($)
1	$210
2	$420
3	$630
4	$840
5	$1,050

EXPLORE You know the amount of interest earned at interest rates of 1%, 2%, 3%, 4%, 5%, and 6%. You want to know the amount of interest earned at 6%.

PLAN Look for a pattern in the amounts of interest earned. Then continue the pattern to find the amount of interest earned at a rate of ____.

SOLVE For each increase in interest rate, the amount of interest earned increases by $210. So for an interest rate of 6%, the amount of interest earned would be $1,050 + $210 = ____.

CHECK Check your pattern to make sure the answer is correct.

Check Your Progress **INTEREST** The table below shows the amount of interest $5,000 would earn after 3 years at various interest rates. How much interest would $5,000 earn at 7 percent interest?

Interest Rate (%)	Interest Earned ($)
1	$150
2	$300
3	$450
4	$600
5	$750

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

2–9 Powers and Exponents

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(B) Use appropriate operations to solve problems involving rational numbers in problem situations.**

MAIN IDEA

- Use powers and exponents in expressions.

BUILD YOUR VOCABULARY (pages 33–34)

The **base** is the number that is _____.

The **exponent** tells how many times the _____ is used as a _____.

The number that is expressed using an _____ is called a **power.**

KEY CONCEPT

Zero and Negative Exponents Any nonzero number to the zero power is 1. Any nonzero number to the negative n power is 1 divided by the number to the nth power.

EXAMPLES Write Expressions Using Powers

1 **Write $3 \cdot 3 \cdot 3 \cdot 7 \cdot 7$ using exponents.**

$3 \cdot 3 \cdot 3 \cdot 7 \cdot 7 =$ _____ $\cdot$ _____ Associative Property

$=$ _____ Definition of exponents

2 **Write $p \cdot p \cdot p \cdot q \cdot p \cdot q \cdot q$ using exponents.**

$p \cdot p \cdot p \cdot q \cdot p \cdot q \cdot q$

$= p \cdot p \cdot p \cdot p \cdot q \cdot q \cdot q$ _____ Property

$= (p \cdot p \cdot p \cdot p) \cdot (q \cdot q \cdot q)$ _____ Property

$=$ _____ $\cdot$ _____ Definition of exponents

Check Your Progress **Write each expression using exponents.**

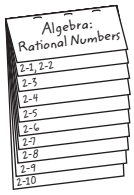
a. $2 \cdot 2 \cdot 2 \cdot 2 \cdot 5 \cdot 5 \cdot 5$

b. $x \cdot y \cdot x \cdot x \cdot y \cdot y \cdot y$

FOLDABLES™

ORGANIZE IT

On the tab for Lesson 2–9, compare how to evaluate an expression with positive exponents and one with negative exponents.



EXAMPLES Evaluate Powers

3 **Evaluate 9^5.**

$9^5 =$ ☐ Definition of exponents

$= 59{,}049$ Simplify.

Check using a calculator.

9 ☐ 5 ENTER = ☐

4 **Evaluate 3^{-7}.**

$3^{-7} = \frac{1}{\square}$ Definition of negative exponents

$= \frac{1}{\square}$ Simplify.

5 **ALGEBRA Evaluate $x^3 \cdot y^5$ if $x = 4$ and $y = 2$.**

$x^3 \cdot y^5 = \square^3 \cdot \square^5$ Replace x with ☐ and y with ☐.

$= (\square) \cdot (\square)$ Write the powers as products.

$= 64 \cdot 32$ Simplify.

$= \square$ Simplify.

Check Your Progress **Evaluate each expression.**

a. 6^5 ☐

b. 2^{-5} ☐

c. Evaluate $x^2 \cdot y^4$ if $x = 3$ and $y = 4$. ☐

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

2–10 Scientific Notation

TEKS 8.1 The student understands that different forms of numbers are appropriate for different situations. **(D) Express numbers in scientific notation, including negative exponents, in appropriate problem situations.** *Also addresses TEKS 8.1(A).*

MAIN IDEA

- Express numbers in scientific notation

BUILD YOUR VOCABULARY (pages 33–34)

A number is expressed in **scientific notation** when it is written as a _____ of a factor and a _____ of 10.

KEY CONCEPT

Scientific Notation
A number is expressed in scientific notation when it is written as the product of a factor and a power of 10. The factor must be greater than or equal to 1 and less than 10.

EXAMPLES Express Numbers in Standard Form

1 **9.62×10^5 in standard form.**

$9.62 \times 10^5 = 962000$

The decimal place moves _____ places to the right.

$=$ _____

2 **Write 2.85×10^{-6} in standard form.**

$2.85 \times 10^{-6} = 0.00000285$

The decimal point moves 6 places to the left.

$=$ _____

Check Your Progress **Write each number in standard form.**

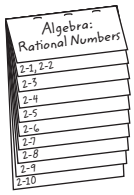
a. 5.32×10^4

b. 3.81×10^{-4}

FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 2–10, collect and record examples of numbers you encounter in your daily life and write them in scientific notation.



EXAMPLES Write Numbers in Scientific Notation

3 **Write 931,500,000 in scientific notation.**

$931500000 = 9.315 \times 100{,}000{,}000$ The decimal point moves 8 places.

$= \square$ The exponent is positive.

4 **Write 0.00443 in scientific notation.**

$0.00443 = \square \times 0.001$ The decimal point moves $\square$ places.

$= 4.43 \times \square$ The exponent is $\square$.

EXAMPLE Compare Numbers in Scientific Notation

5 **PLANETS** **The following table lists the average radius at the equator for each of the planets in our solar system. Order the planets according to radius from largest to smallest.**

First order the numbers according to their exponents. Then order the numbers with the same exponents by comparing the factors.

Planet	Radius (km)
Earth	6.38×10^3
Jupiter	7.14×10^4
Mars	3.40×10^3
Mercury	2.44×10^3
Neptune	2.43×10^4
Pluto	1.5×10^3
Saturn	6.0×10^4
Uranus	2.54×10^4
Venus	6.05×10^3

Source: *CRC Handbook of Chemistry and Physics*

Jupiter, Neptune, Saturn, Uranus		Earth, Mars, Mercury, Pluto, Venus
STEP 1		
$\square \times 10^4$		6.38×10^3
2.43×10^4		3.40×10^3
6.0×10^4	$>$	2.44×10^3
2.54×10^4		1.5×10^3
		$\square \times 10^3$

STEP 2

$7.14 \times 10^4 > 6.0 \times 10^4 > 2.54 \times 10^4 > 2.43 \times 10^4$

Jupiter, Saturn, Uranus, Neptune

$6.38 \times 10^3 > 6.05 \times 10^3 > 3.40 \times 10^3 > 2.44 \times 10^3 > 1.5 \times 10^3$

Earth, Venus, Mars, Mercury, Pluto

The order from largest to smallest is _____, Saturn, Uranus, Neptune, Earth, Venus, Mars, Mercury, and _____.

Check Your Progress **Write each number in scientific notation.**

a. 35,600,000

b. 0.000653

c. The table lists the mass for each of the planets in our solar system. Order the planets according to mass from largest to smallest.

Planet	Mass (in tons)
Mercury	3.64×10^{20}
Venus	5.37×10^{21}
Earth	6.58×10^{21}
Mars	7.08×10^{20}
Jupiter	2.09×10^{24}
Saturn	6.25×10^{23}
Uranus	9.57×10^{23}
Neptune	1.13×10^{23}
Pluto	1.38×10^{19}

Source: nssdc.gsfc.nasa.gov

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

CHAPTER 2

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 2 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 2, go to: glencoe.com	You can use your completed **Vocabulary Builder** *(pages 33–34)* to help you solve the puzzle.

2-1 Fractions and Decimals

Write each fraction or mixed number as a decimal.

1. $-\frac{3}{4}$ **2.** $3\frac{1}{6}$ **3.** $-7\frac{2}{5}$

Write each decimal as a fraction or mixed number in simplest form.

4. 9.5 **5.** 0.6 **6.** 8.125

2-2 Comparing and Ordering Rational Numbers

Use <, >, or = to make each sentence true.

7. $-\frac{4}{5}$ ☐ $-\frac{2}{3}$ **8.** 4.4 ☐ $4\frac{2}{5}$ **9.** 2.93 ☐ 2.93

Graph each pair of rational numbers on a number line.

10. $\frac{1}{5}, \frac{1}{3}$ **11.** $-\frac{4}{5}, -\frac{9}{10}$

2-3

Multiplying Rational Numbers

Complete each sentence.

12. The greatest common factor of two numbers is the _____ number that is a _____ of both numbers.

13. Numerators and denominators are _____ by their greatest common factors to _____ the fraction.

Multiply. Write in simplest form.

14. $-\frac{7}{12} \cdot \frac{3}{4}$

15. $4\frac{2}{3} \cdot 5\frac{1}{8}$

2-4

Dividing Rational Numbers

Write the multiplicative inverse for each mixed number.

16. $2\frac{1}{5}$ **17.** $-1\frac{3}{8}$ **18.** $3\frac{4}{7}$

Complete the sentence.

19. To divide by a _____, multiply by its _____ inverse.

20. To _____ a number by $2\frac{1}{5}$, multiply by $\frac{5}{11}$.

2-5

Adding and Subtracting Like Fractions

Determine whether each pair of fractions are like fractions.

21. $\frac{3}{5}, \frac{3}{7}$ **22.** $\frac{5}{8}, \frac{7}{8}$ **23.** $\frac{4}{7}, -\frac{5}{7}$ **24.** $\frac{5}{9}, -\frac{2}{3}$

Add or subtract. Write in simplest form.

25. $\frac{5}{9} - \frac{2}{9}$ **26.** $\frac{5}{8} + \frac{7}{8}$ **27.** $\frac{4}{7} - \frac{5}{7}$

2-6

Adding and Subtracting Unlike Fractions

Add or subtract. Write in simplest form.

28. $\frac{5}{8} - \frac{7}{12}$ **29.** $\frac{3}{5} + \frac{3}{7}$ **30.** $-\frac{2}{3} + \frac{5}{9}$

2-7

Solving Equations with Rational Numbers

Match the method of solving with the appropriate equation.

31. $25a = 3.75$

32. $\frac{3}{5}m + \frac{7}{10}$

33. $r - 1.25 = 4.5$

34. $\frac{3}{5} + f = \frac{1}{2}$

a. Subtract $\frac{3}{5}$ from each side.

b. Multiply each side by $\frac{5}{3}$.

c. Subtract 3.75 from each side.

d. Add 1.25 to each side.

e. Divide each side by 1.25.

2-8

Problem Solving Investigation: Look for a Pattern

35. **LIFE SCIENCE** The table shows about how many times a firefly flashes at different temperatures. About how many times will a firefly flash when the temperature is 36°C?

Outside Temperature (°C)	Flashes per Minute
16	8
20	9
24	11
28	14

2-9

Powers and Exponents

Evaluate each expression.

36. 5^4 **37.** 6^3 **38.** 2^8

2-10

Scientific Notation

Write each number in scientific notation.

39. 8,790,000 **40.** 0.0000125

CHAPTER 2 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 2.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want take the Chapter 2 Practice Test on page 139 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 2 Study Guide and Review on pages 134–138 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 2 Practice Test on page 139 of your text book.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 2 Foldable.
- Then complete the Chapter 2 Study Guide and Review on pages 134–138 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 2 Practice Test on page 139 of your textbook.

Student Signature

Parent/Guardian Signature

Teacher Signature

CHAPTER 3

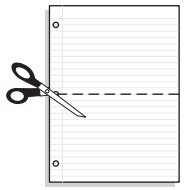
Real Numbers and the Pythagorean Theorem

FOLDABLES™

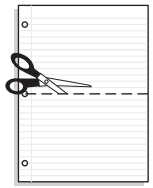
Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with two sheets of $8\frac{1}{2}$" by 11" paper.

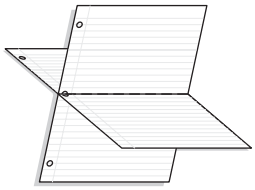
STEP 1 **Fold** one in half from top to bottom. Cut along fold from edges to margin.



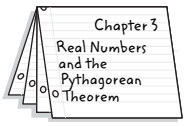
STEP 2 **Fold** the other sheet in half from top to bottom. Cut along fold between margins.



STEP 3 **Insert** first sheet through second sheet and align folds.



STEP 4 **Label** each page with a lesson number and title.



NOTE-TAKING TIP: When you take notes, clarify terms, record concepts, and write examples for each lesson. You may also want to list ways in which the new concepts can be used in your daily life.

CHAPTER 3

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 3. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
abscissa [ab-SIH-suh]			
converse			
coordinate plane			
hypotenuse			
irrational number			
legs			
ordered pair			
ordinate [OR-din-it]			
origin			
perfect square			

Vocabulary Term	Found on Page	Definition	Description or Example
Pythagorean Theorem			
quadrants			
radical sign			
real number			
square root			
x-axis			
x-coordinate			
y-axis			
y-coordinate			

3–1 Square Roots

Reinforcement of TEKS 7.1 The student represents and uses numbers in a variety of equivalent forms. **(C) Represent squares and square roots using geometric models.**

MAIN IDEA

- Find square roots of perfect squares.

BUILD YOUR VOCABULARY (pages 62–63)

Numbers such as 1, 4, 9, and 25 are called **perfect squares** because they are squares of _____ numbers.

The _____ of squaring a number is finding a **square root.**

The symbol $\sqrt{\ }$ is called a **radical sign** and is used to indicate the positive _____.

A _____ square root is called the **principal square root.**

KEY CONCEPT

Square Root A square root of a number is one of its two equal factors.

EXAMPLES Find Square Roots

Find each square root.

1 $\sqrt{81}$

$\sqrt{81}$ indicates the _____ square root of 81.

Since $\square = 81$, $\sqrt{81} = \square$.

2 $-\sqrt{\frac{16}{81}}$

$-\sqrt{\frac{16}{81}}$ indicates the _____ square root of $\frac{16}{81}$.

Since $\square = \frac{16}{81}$, $-\sqrt{\frac{16}{81}} = \square$.

3 $\pm\sqrt{1.44}$

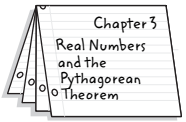
$\pm\sqrt{1.44}$ indicates *both* _____ square roots of 1.44.

Since $\square = 1.44$ and $\square = 1.44$, $\pm\sqrt{1.44} = \pm 1.2$, or _____.

FOLDABLES™

ORGANIZE IT

On Lesson 3-1 of your Foldable, explain how to find the square root of a number and give an example.



Check Your Progress **Find each square root.**

a. $\sqrt{64}$

b. $-\sqrt{\frac{25}{144}}$

c. $\pm\sqrt{2.25}$

EXAMPLE **Use an Equation to Solve a Problem**

4 **MUSIC** **The art work of the square picture in a compact disc case is approximately 14,161 mm^2 in area. Find the length of each side of the square.**

The area is equal to the square of the length of a side.

Let A = the area and let s = the length of the side $A = s^2$

$14{,}161 = s^2$ Write the equation.

$\square = \sqrt{s^2}$ Take the square root of each side.

The length of a side of a compact disc case is about $\square$ millimeters since distance cannot be negative.

Check Your Progress A piece of art is a square picture that is approximately 11,025 square inches in area. Find the length of each side of the square picture.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

3–2 Estimating Square Roots

TEKS 8.1 The student understands that different forms of numbers are appropriate for different situations. **(C) Approximate (mentally and with calculators) the value of irrational numbers as they arise from problem situations** (such as π, $\sqrt{2}$).

MAIN IDEA
- Estimate square roots.

EXAMPLES Estimate Square Roots

1 **Estimate $\sqrt{54}$ to the nearest whole number.**

The first perfect square less than 54 is ☐.

The first perfect square greater than 54 is ☐.

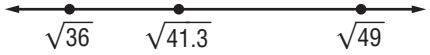
$49 < 54 < 64$	Write an inequality.
$\square < 54 < \square$	49 = ☐ and 64 = ☐
$\sqrt{7^2} < \sqrt{54} < \sqrt{8^2}$	Take the square root of each number.
$7 < \sqrt{54} < 8$	Simplify.

So, $\sqrt{54}$ is between ☐ and ☐. Since 54 is closer to 49 than 64, the best whole number estimate for $\sqrt{54}$ is ☐.

2 **Estimate $\sqrt{41.3}$ to the nearest whole number.**

- The first perfect square less than 41.3 is 36.
- The first perfect square greater than 41.3 is 49.

Plot each square root on a number line. Then plot $\sqrt{41.3}$.



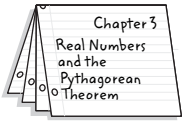
$36 < 41.3 < 49$	Write an inequality.
$\square < 41.3 < \square$	36 = ☐ and 49 = ☐
$\sqrt{6^2} < \sqrt{41.3} < \sqrt{7^2}$	Find the square root of each number.
$\square < \sqrt{41.3} < \square$	Simplify.

So, $\sqrt{41.3}$ is between ☐ and ☐. Since 41.3 is closer to 36 than 49, the best whole number estimate for $\sqrt{41.3}$ is ☐.

FOLDABLES™

ORGANIZE IT

On Lesson 3-2 of your Foldable, explain how to estimate square roots.



EXAMPLE Estimate Square Roots

3 **FINANCE** **If you were to invest $100 in a bank account for two years, your money would earn interest daily and be worth more when you withdrew it. If you had $120 after two years, the interest rate, written as a decimal, would be found using the expression $\frac{(\sqrt{120} - 10)}{10}$. Estimate this value.**

First estimate the value of $\sqrt{120}$.

$100 < 120 \quad < 121$ ☐ and ☐ are perfect squares.

$10^2 < 120 \quad < 11^2$ $100 =$ ☐ and $121 =$ ☐

☐ $< \sqrt{120} <$ ☐ Take the square root of each number.

Since 120 is closer to ☐ than 100, the best whole number estimate for $\sqrt{120}$ is ☐. Use this to evaluate the expression.

$\frac{(\sqrt{120} - 10)}{10} = \frac{(\square - 10)}{10}$ or ☐

The approximate interest rate is 0.10 or ☐.

Check Your Progress

a. Estimate $\sqrt{65}$ to the nearest whole number.

b. If you were to invest $100 in a bank account for two years, your money would earn interest daily and be worth more when you withdrew it. If you had $250 after two years, the interest rate, written as a decimal, would be found using the expression $\frac{(\sqrt{150} - 10)}{10}$.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

3–3 Problem-Solving Investigation: Use a Venn Diagram

EXAMPLE

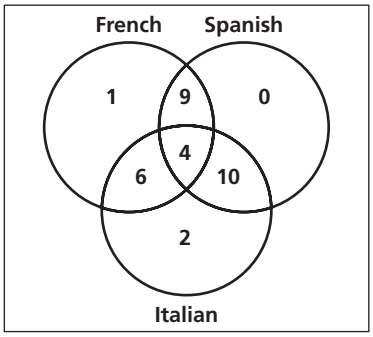
MAIN IDEA
- Solve problems by using a Venn diagram.

TEKS 8.12 The student uses statistical procedures to describe data. **(C) Select and use an appropriate representation for presenting and displaying relationships among collected data, including … Venn diagrams, with and without the use of technology.**

LANGUAGES Of the 40 foreign exchange students attending a middle school, 20 speak French, 23 speak Spanish, and 22 speak Italian. Nine students speak French and Spanish, but not Italian. Six students speak French and Italian, but not Spanish. Ten students speak Spanish and Italian, but not French. Only 4 students speak all three languages. Use a Venn diagram to find how many exchange students do not speak any of these languages.

EXPLORE You know how many students speak each of the different languages. You want to organize the information.

PLAN Make a Venn Diagram to organize the information.



SOLVE Since 4 students speak all three languages, place a three in the section that represents all three languages. Fill in the other sections as appropriate.

Add the numbers in each region of the diagram:

$1 + 9 + 6 + 4 + 10 + 2 =$ ☐

Since there are 40 exchange students altogether,

$40 - 32 =$ ☐ of them do not speak French, Spanish, or Italian.

CHECK Check each circle to see if the appropriate number of students is represented.

Check Your Progress **SPORTS** Of the 30 students in Mr. Hall's gym class, 14 play basketball, 9 play soccer, and 11 play volleyball. Three students play basketball and soccer, but not volleyball. One student plays soccer and volleyball, but not basketball. Six students play basketball and volleyball, but not soccer. Only 2 students play all three sports. Use a Venn diagram to find how many students in the class do not play any of these sports.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

3–4 The Real Number System

MAIN IDEA

- Identify and classify numbers in the real number system.

BUILD YOUR VOCABULARY (pages 62–63)

Numbers that are not _____ are called **irrational numbers.**

The set of rational numbers and the set of _____ numbers together make up the set of **real numbers.**

KEY CONCEPT

Irrational Number An irrational number is a number that cannot be expressed as $\frac{a}{b}$, where a and b are integers and $b \neq 0$.

EXAMPLES **Classify Numbers**

Name all sets of numbers to which each real number belongs.

1. **0.090909 . . .**

The decimal ends in a _____ pattern.

It is a _____ number because it is equivalent to _____.

2. $\sqrt{25}$

Since $\sqrt{25} =$ _____, it is a _____ number, an _____, and a rational number.

3. $-\sqrt{12}$

Since the decimal does not repeat or _____, it is an _____ number.

TEKS 8.1 The student understands that different forms of numbers are appropriate for different situations. **(A) Compare and order rational numbers in various forms including integers, percents, and positive and negative fractions and decimals. (C) Approximate (mentally and with calculators) the value of irrational numbers as they arise from problem situations** (such as π, $\sqrt{2}$).

Check Your Progress **Name all sets of numbers to which each real number belongs.**

a. 0.1010101010...

b. $\sqrt{64}$

c. $\sqrt{13}$

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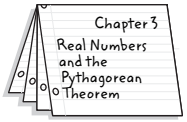
ORGANIZE IT

On Lesson 3-4 of your Foldable, summarize the properties of the real number system.



EXAMPLES Graph Real Numbers

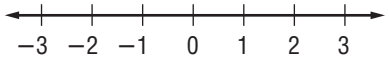
4 **Estimate $\sqrt{8}$ and $-\sqrt{2}$ to the nearest tenth. Then graph $\sqrt{8}$ and $-\sqrt{2}$ on a number line.**

Use a calculator to determine the approximate decimal values.

$\sqrt{8} \approx$ ____

$-\sqrt{2} \approx$ ____

Locate these points on a number line.



$\sqrt{8} \approx$ ____ and $-\sqrt{2} \approx$ ____.

Check Your Progress Estimate $\sqrt{3}$ and $-\sqrt{6}$ to the nearest tenth. Then graph $\sqrt{3}$ and $-\sqrt{6}$ on a number line.

REMEMBER IT

Always simplify numbers before classifying them.

EXAMPLES Compare Real Numbers

Replace each ● with <, >, or = to make a true sentence.

5 **$3\frac{7}{8}$ ● $\sqrt{15}$**

Write each number as a decimal.

$3\frac{7}{8} =$ ____ $\sqrt{15} =$ ____

Since ____ is greater than ____,

$3\frac{7}{8} =$ ____ $\sqrt{15}$.

WRITE IT

Explain why you can determine that $-\sqrt{2}$ is less than 1.2 without computation.

6 **$3.\overline{2}$ ● $\sqrt{10.4}$**

Write $\sqrt{10.4}$ as a decimal.

$\sqrt{10.4} \approx$ [ ]

Since $3.\overline{2}$ is [ ] than 3.224903099...,

$3.\overline{2}$ [ ] $\sqrt{10.4}$.

Check Your Progress **Replace each ● with <, >, or = to make a true sentence.**

a. $3\frac{3}{8}$ ● $\sqrt{14}$ [ ]

b. $1.\overline{5}$ ● $\sqrt{2.25}$ [ ]

EXAMPLE

7 **BASEBALL** **The time in seconds that it takes an object to fall d feet is $0.25\sqrt{d}$. How many seconds would it take for a baseball that is hit 250 feet straight up in the air to fall from its highest point to the ground?**

Use a calculator to approximate the time it will take for the baseball to fall to the ground.

$0.25\sqrt{d} = 0.25$[ ] Replace d with [ ].

≈ 3.95 or about [ ] Use a calculator.

It will take about [ ] for the baseball to fall to the ground.

Check Your Progress The time in seconds that it takes an object to fall d feet is $0.25\sqrt{d}$. How many seconds would it take for a baseball that is hit 450 feet straight up in the air to fall from its highest point to the ground?

[ ]

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

3–5 The Pythagorean Theorem

MAIN IDEA

- Use the Pythagorean Theorem.

BUILD YOUR VOCABULARY (pages 62–63)

A right triangle is a triangle with one right angle of 90°.

The sides that form the right angle are called **legs.**

The **hypotenuse** is the side opposite the right angle.

The **Pythagorean Theorem** describes the relationship between the lengths of the legs and the hypotenuse for *any* right triangle.

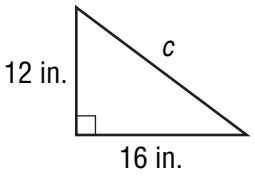
KEY CONCEPT

Pythagorean Theorem
In a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the legs.

TEKS 8.7 The student uses geometry to model and describe the physical world. **(C) Use pictures or models to demonstrate the Pythagorean Theorem. 8.9** The student uses indirect measurement to solve problems. **(A) Use the Pythagorean Theorem to solve real-life problems.**

EXAMPLES **Find the Length of a Side**

1 **Write an equation you could use to find the length of the missing side of the right triangle. Then find the missing length. Round to the nearest tenth if necessary.**

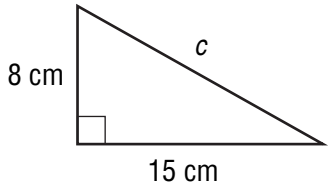


$c^2 = a^2 + b^2$	Pythagorean Theorem
$c^2 = 12^2 +$ ☐	Replace a with ☐ and b with ☐.
$c^2 =$ ☐ $+$ ☐	Evaluate 12^2 and 16^2.
$c^2 =$ ☐	Add 144 and 256.
$c = \pm\sqrt{400}$	Definition of square root
$c =$ ☐ or ☐	Simplify.

The equation has two solutions, ☐ and ☐. However, the length of a side must be positive. So, the hypotenuse is ☐ inches long.

Check Your Progress

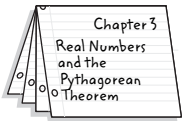
Write an equation you could use to find the length of the missing side of the right triangle. Then find the missing length. Round to the nearest tenth if necessary.



FOLDABLES™

ORGANIZE IT

On Lesson 3-5 of your Foldable, explain how to use the Pythagorean Theorem to find the missing length of a side of a right triangle.



EXAMPLE **Find the Length of a Side**

2 **The hypotenuse of a right triangle is 33 centimeters long and one of its legs is 28 centimeters. What is a, the length of the other leg?**

$c^2 = a^2 + b^2$ Pythagorean Theorem

$\square^2 = a^2 + \square^2$ Replace the variables.

$1{,}089 = a^2 + 784$ Evaluate each power.

$\square - \square = a^2 + \square - \square$ Subtract.

$\square = a^2$ Simplify.

$\pm\sqrt{305} = a$ Definition of square root

$\square = a$ Use a calculator.

The length of the other leg is about $\square$ centimeters.

REMEMBER IT

The longest side of a right triangle is the hypotenuse. Therefore, c represents the length of the longest side.

Check Your Progress The hypotenuse of a right triangle is 26 centimeters long and one of its legs is 17 centimeters. Find the length of the other leg.

KEY CONCEPT

Converse of the Pythagorean Theorem
If the sides of a triangle have lengths a, b, and c units such that $c^2 = a^2 + b^2$, then the triangle is a right triangle.

EXAMPLE **Identify a Right Triangle**

3 **The measures of three sides of a triangle are 24 inches, 7 inches, and 25 inches. Determine whether the triangle is a right triangle.**

$c^2 = a^2 + b^2$	Pythagorean Theorem
$25^2 \stackrel{?}{=} 7^2 + 24^2$	$c = 25, a = 7, b = 24$
$625 \stackrel{?}{=} \square + 576$	Evaluate 25^2, 7^2, and 24^2.
$\square = 625$	Simplify. The triangle is a right triangle.

Check Your Progress

a. The base of a 12-foot ladder is 5 feet from the wall. How high can the ladder reach?

b. The measures of three sides of a triangle are 13 inches, 5 inches, and 12 inches. Determine whether the triangle is a right triangle.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

3–6 Use the Pythagorean Theorem

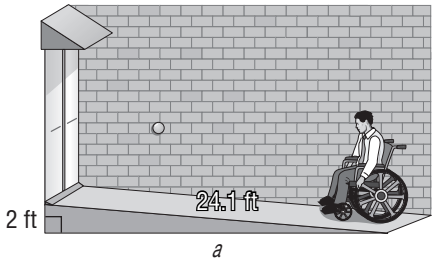
Main Idea

- Solve problems using the Pythagorean Theorem.

TEKS 8.7 The student uses geometry to model and describe the physical world. **(C) Use pictures or models to demonstrate the Pythagorean Theorem. 8.9** The student uses indirect measurement to solve problems. **(A) Use the Pythagorean Theorem to solve real-life problems.**

EXAMPLE 1 Use the Pythagorean Theorem

RAMPS A ramp to a newly constructed building must be built according to the guidelines stated in the Americans with Disabilities Act. If the ramp is 24.1 feet long and the top of the ramp is 2 feet off the ground, how far is the bottom of the ramp from the base of the building?



Notice the problem involves a right triangle. Use the Pythagorean Theorem.

$24.1^2 = a^2 + 2^2$ Replace c with 24.1 and b with 2.

$\square = a^2 + \square$ Evaluate 24.1^2 and 2^2.

$\square - \square = a^2 = \square - \square$ Subtract $\square$ from each side.

$\square = a^2$ Simplify.

$\square = a$ Definition of square root

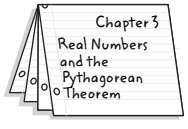
$\square \approx a$ Simplify.

The end of the ramp is about $\square$ from the base of the building.

Check Your Progress If a truck ramp is 32 feet long and the top of the ramp is 10 feet off the ground, how far is the end of the ramp from the truck?

FOLDABLES ORGANIZE IT

On Lesson 3-6 of your Foldable, explain the Pythagorean Theorem in your own words and give an example of how it might be used in a real-life situation.

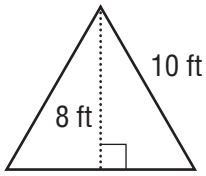


BUILD YOUR VOCABULARY (pages 62–63)

Whole numbers such as 3, 4, and 5, which satisfy the _____, are called Pythagorean triples.

EXAMPLE

2 TEST EXAMPLE **The cross-section of a camping tent is shown. Find the width of the base of the tent.**



A 6 ft **C** 10 ft

B 8 ft **D** 12 ft

Read the Test Item

From the diagram, you know that the tent forms two congruent right triangles. Let $a = \frac{1}{2}x$ represent half the base of the tent.

Solve the Test Item

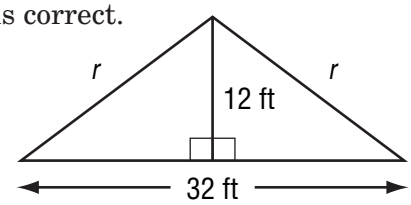
Use the Pythagorean Theorem.

$c^2 = a^2 + b^2$	Pythagorean Theorem
$\square = a^2 + \square$	$c = \square$, $b = \square$
$\square = a^2 + \square$	Evaluate 10^2 and 8^2.
$100 - 64 = a^2 + 64 - 64$	Subtract 64 from each side.
$\square = a^2$	Simplify.
$\sqrt{\square} = a$	Definition of square root
$\square = a$	Simplify

The width of the base of the tent is $a + a$ or $\square + \square = \square$ feet. Therefore, choice $\square$ is correct.

Check Your Progress

The diagram shows the cross-section of a roof. How long is each rafter, r?



F 15 ft **H** 20 ft

G 18 ft **J** 22 ft

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

3–7 Distance on the Coordinate Plane

MAIN IDEA

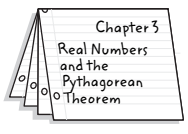
- Find the distance between points on the coordinate plane.

TEKS 8.7 The student uses geometry to model and describe the physical world. **(D) Locate and name points on a coordinate plane using ordered pairs of rational numbers. 8.9** The student uses indirect measurement to solve problems. **(A) Use the Pythagorean Theorem to solve real-life problems.** *Also addresses TEKS 8.1(C).*

FOLDABLES

ORGANIZE IT

On Lesson 3-7 of your Foldable, explain in writing how to use ordered pairs to find the distance between two points.



BUILD YOUR VOCABULARY (pages 62–63)

A **coordinate plane** is formed by two number lines that form right angles and intersect at their _____ points.

The point of intersection of the two number lines is the **origin.**

The _____ number line is the ***y*-axis.**

The _____ number line is the ***x*-axis.**

The number lines separate the coordinate plane into _____ sections called **quadrants.**

Any point on the coordinate plane can be graphed by using an **ordered pair** of numbers.

The _____ number in the ordered pair is called the ***x*-coordinate.**

The _____ number of an ordered pair is the ***y*-coordinate.**

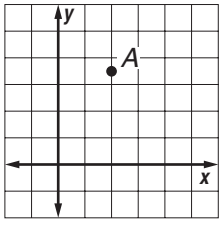
Another name for the _____ is **abscissa.**

Another name for the _____ is **ordinate.**

EXAMPLE 1 **Name an Ordered Pair**

Name the ordered pair for point *A*.

- Start at the origin.
- Move right to find the _____ of point *A*, which is _____.

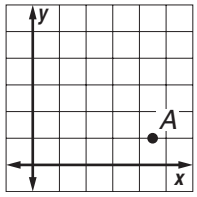


(continued on the next page)

• Move up to find the _____, which is _____.

So, the ordered pair for point A is _____.

Check Your Progress Name the ordered pair for point A.



_____

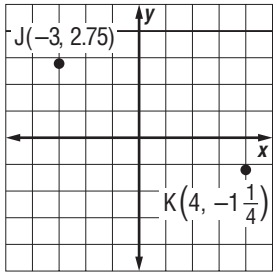
EXAMPLES **Graphing Ordered Pairs**

Graph and label each point on the same coordinate plane.

2 $J(-3, 2.75)$

• Start at _____ and move _____ units to the _____.

Then move _____ _____ units.



• Draw a dot and label it _____.

3 $K\left(4, -1\frac{1}{4}\right)$

• Start at _____ and move _____ units to the _____.

Then move _____ units.

• Draw a dot and label it _____.

Check Your Progress

Graph and label each point on the same coordinate plane.

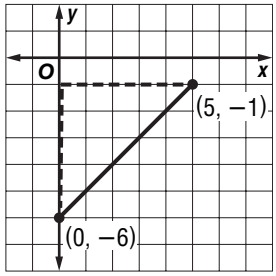
a. $J(-2.5, 3.5)$

b. $K\left(2, -2\frac{1}{2}\right)$

_____

EXAMPLE **Find the Distance on the Coordinate Plane**

4 **Graph the ordered pairs (0, −6) and (5, −1). Then find the distance between the points.**



Let c = distance between the two points, $a = 5$, and $b = 5$.

$c^2 = a^2 + b^2$ Pythagorean Theorem

$c^2 =$ ☐ $+$ ☐ Replace a with ☐ and b with ☐.

$c^2 =$ ☐ ☐ $+$ ☐ $=$ ☐

$\sqrt{c^2} =$ ☐ Definition of ☐

$c =$ ☐ Simplify.

The points are about ☐ apart.

Check Your Progress Graph the ordered pairs $(0, -3)$ and $(2, -6)$. Then find the distance between the points.

REMEMBER IT

You can use the Pythagorean Theorem to find the distance between two points on a coordinate plane.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

CHAPTER 3

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 3 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 3, go to glencoe.com	You can use your completed **Vocabulary Builder** *(pages 62–63)* to help you solve the puzzle.

3-1

Square Roots

Complete each sentence.

1. The principle square root is the _____ square root of a number.

2. To solve an equation in which one side of the square is a squared term, you can take the _____ of each side of the equation.

Find each square root.

3. $\sqrt{900}$ _____

4. $-\sqrt{\frac{36}{49}}$ _____

5. $-\sqrt{625}$ _____

6. $\sqrt{\frac{25}{121}}$ _____

3-2

Estimating Square Roots

Determine between which two consecutive whole numbers each value is located.

7. $\sqrt{23}$ _____

8. $\sqrt{59}$ _____

9. $\sqrt{27}$ _____

10. $\sqrt{18}$ _____

3-3

Problem-Solving Investigation: Use a Venn Diagram

11. **NUMBER THEORY** A subset is a part of a set. The symbol $\subset$ means "is a subset of." Consider the following two statements.

integers $\subset$ rational numbers
rational numbers $\subset$ integers

Are both statements true? Draw a Venn diagram to justify your answer.

3-4

The Real Number System

Match the property of real numbers with the algebraic example.

12. Commutative

13. Associative

14. Distributive

15. Identity

16. Multiplicative Inverse

a. $(x + y) + z = x + (y + z)$

b. $pq = qp$

c. $h + 0 = h$

d. $c + (-c) = 0$

e. $x(y + z) = xy + xz$

f. $\frac{a}{b} \cdot \frac{b}{a} = 1$

3-5

The Pythagorean Theorem

Use the Pythagorean Theorem to determine whether each of the following measures of the sides of a triangle are the sides of a right triangle.

17. 4, 5, 6

18. 9, 12, 15

19. 10, 24, 26

20. 5, 7, 9

3-6

Using the Pythagorean Theorem

21. The triple 8-15-17 is a Pythagorean Triple. Complete the table to find more Pythagorean triples.

	a	b	c	Check: $c^2 = a^2 + b^2$
original	8	15	17	289 = 64 + 225
× 2				
× 3				
× 5				
× 10				

Determine whether each of the following is a Pythagorean triple.

22. 13–84–85 ____ **23.** 11–60–61 ____

24. 21–23–29 ____ **25.** 12–25–37 ____

3-7

Distance on the Coordinate Plane

Match each term of the coordinate plane with its description.

26. ordinate ____

27. y-axis ____

28. origin ____

29. abscissa ____

30. x-axis ____

a. one of four sections of the coordinate plane

b. x-coordinate

c. y-coordinate

d. vertical number line

e. horizontal number line

f. point where number lines meet

CHAPTER 3 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 3.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 3 Practice Test on page 183 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 3 Study Guide and Review on pages 179–182 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 3 Practice Test on page 183 of your textbook.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 3 Foldable.
- Then complete the Chapter 3 Study Guide and Review on pages 179–182 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 3 Practice Test on page 183 of your textbook.

Student Signature

Parent/Guardian Signature

Teacher Signature

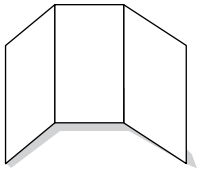
CHAPTER 4

Proportions and Similarity

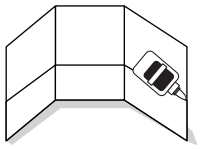
FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with a plain sheet of 11" by 17" paper.

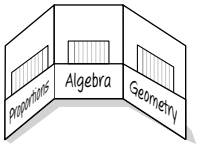
STEP 1 **Fold** in thirds widthwise.



STEP 2 **Open** and fold the bottom to form a pocket. Glue edges.



STEP 3 **Label** each pocket. Place index cards in each pocket.



NOTE-TAKING TIP: When you take notes, define new vocabulary words, describe new ideas, and write examples that help you remember the meanings of the words and ideas.

CHAPTER 4

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 4. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
congruent			
constant of proportionality			
corresponding parts			
cross products			
dilation			
equivalent ratios			
indirect measurement			
nonproportional			
polygon			
proportion			

(continued on the next page)

Vocabulary Term	Found on Page	Definition	Description or Example
proportional			
rate			
rate of change			
ratio			
reduction			
scale			
scale drawing			
scale factor			
scale model			
similar			
unit rate			

4–1 Ratios and Rates

MAIN IDEA

- Express ratios as fractions in simplest form and determine unit rates.

TEKS 8.3 The student identifies proportional or nonproportional linear relationships in problem situations and solves problems. **(B) Estimate and find solutions to application problems involving** percents and other **proportional relationships such as** similarity and **rates**. *Also addresses TEKS 8.1(B).*

BUILD YOUR VOCABULARY (pages 85–86)

A **ratio** is a comparison of two numbers by _____.

A **rate** is a special kind of _____. It is a comparison of two quantities with different types of units.

When a rate is _____ so it has a denominator of _____, it is called a **unit rate.**

EXAMPLE 1 Write Ratios in Simplest Form

Express *12 blue marbles out of 18 marbles* in simplest form.

$$\frac{12 \text{ marbles}}{18 \text{ marbles}} = \frac{\square}{\square}$$

Divide the numerator and denominator by the greatest common factor, _____.

Divide out common units.

The ratio of blue marbles to marbles is _____ or _____ out of _____.

EXAMPLE 2 Find a Unit Rate

READING Yi-Mei reads 141 pages in 3 hours. How many pages does she read per hour?

Write the rate that expresses the comparison of pages to hours. Then find the unit rate.

$$\frac{141 \text{ pages}}{3 \text{ hours}} = \frac{\square \text{ pages}}{\square \text{ hour}}$$

Divide the numerator and denominator by _____ to get a denominator of 1.

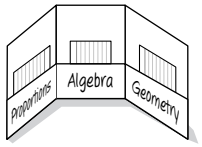
Yi-Mei reads an average of _____ pages per _____.

Review It

What is the greatest common factor of two or more numbers? How can you find it? *(Prerequisite Skill)*

Foldables Organize It

Write the definitions of *rate* and *unit rate* on an index card. Then on the other side of the card, write examples of how to find and compare unit rates. Include these cards in your Foldable.



Homework Assignment

Page(s):

Exercises:

Check Your Progress **Express each ratio in simplest form.**

a. 5 blue marbles out of 20 marbles

b. 14 inches to 2 feet

c. On a trip from Columbus, Ohio, to Myrtle Beach, South Carolina, Lee drove 864 miles in 14 hours. What was Lee's average speed in miles per hour?

EXAMPLE **Compare Unit Rates**

3 **SHOPPING** **Alex spends $12.50 for 2 pounds of almonds and $23.85 for 5 pounds of jellybeans. Which item costs less per pound? By how much?**

For each item, write a rate that compares the cost to the amount. Then find the unit rates.

Almonds: $\frac{\$12.50}{2 \text{ pounds}} = \frac{\quad}{1 \text{ pound}}$

Jellybeans: $\frac{\$23.85}{5 \text{ pounds}} = \frac{\quad}{1 \text{ pound}}$

The almonds cost _____ per pound and the jellybeans cost _____ per pound. So, the jellybeans cost _____ – _____ or _____ per pound less than the almonds.

Check Your Progress Cameron spends $22.50 for 2 pounds of macadamia nuts and $31.05 for 3 pounds of cashews. Which item costs less per pound? By how much?

4–2 Proportional and Nonproportional Relationships

Main Idea

- Identify proportional and nonproportional relationships.

Key Concepts

Proportional A statement of equality of two ratios with a constant ratio.

Nonproportional A relationship in which two quantities do not have a common ratio.

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(D) Use multiplication by a constant factor (unit rate) to represent proportional relationships.**
8.3 The student identifies proportional or non-proportional linear relationships in problem situations and solves problems. **(A) Compare and contrast proportional and non-proportional linear relationships.** *Also addresses TEKS 8.1(B), 8.3(B), 8.4.*

Build Your Vocabulary (pages 85–86)

If two quantities are _____, then they have a _____ ratio.

For ratios in which this ratio is _____, the two quantities are said to be _____.

Examples Identify Proportional Relationships

1 HOUSE CLEANING A house-cleaning service charges $45 for the first hour and $30 per hour for each additional hour. The service works for 4 hours. Is the fee proportional to the number of hours worked? Make a table of values to explain your reasoning.

Find the cost for 1, 2, 3, and 4 pizzas and make a table to display numbers and cost.

Hours Worked	1	2	3	4
Cost ($)				

For each number of hours, write the relationship of the cost and number of hours as a ratio in simplest form.

$\frac{\text{cost}}{\text{hours worked}} \rightarrow \frac{45}{1}$ or _____ $\frac{75}{2}$ or _____ $\frac{105}{3}$ or _____ $\frac{135}{4}$ or _____

Since the ratios of the two quantities are _____, the cost is _____ to the number of hours worked. The relationship is _____.

2 BAKING **A recipe for jelly frosting calls for $\frac{1}{3}$ cup of jelly and 1 egg white. Is the number of egg whites used proportional to the cups of jelly used? Make a table of values to explain your reasoning.**

Find the amount of jelly and egg whites needed for different numbers of servings and make a table to show these measures.

Cups of Jelly				
Egg whites	1	2	3	4

For each number of cups of jelly, write the relationship of the _____ to the _____ as a ratio in simplest form.

_____ → $\frac{1}{3}$ or $\frac{\quad}{1}$ $\frac{2}{3}$ or $\frac{\quad}{2}$ $\frac{\quad}{\quad}$ $1\frac{1}{3}$ or $\frac{\quad}{4}$

Since the ratios between the two quantities are all equal to _____, the amount of jelly used is _____ to the number of egg whites used.

Check Your Progress

a. PLUMBING A plumbing company charges $50 for the first hour and $40 for each additional hour. Suppose a service call is estimated to last 4 hours. Is the fee proportional to the number of hours worked?

b. COOKING Among other ingredients, a chocolate chip cookie recipe calls for 2.5 cups of flour for every 1 cup of sugar and every 2 eggs. Is the amount of flour used proportional to the number of eggs used?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

4–3 Solving Proportions

Main Idea

- Use proportions to solve problems.

Build Your Vocabulary (pages 85–86)

In a **proportion,** two ____ are ____.

In a proportion, the **cross products** are ____.

Key Concepts

Proportion A proportion is an equation stating that two ratios are equivalent.

Property of Proportions The cross products of a proportion are equal.

FOLDABLES Be sure to include this definition and property in your Foldable.

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(D) Use multiplication by a constant factor (unit rate) to represent proportional relationships. 8.14** The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(A) Identify and apply mathematics to everyday experiences, to activities in and outside of school, with other disciplines, and with other mathematical topics.**

EXAMPLE **Write and Solve a Proportion.**

1 **COOKING** **A recipe serves 10 people and calls for 3 cups of flour. If you want to make the recipe for 15 people, how many cups of flour should you use?**

cups of flour → $\frac{3}{10} = \frac{n}{15}$ ← cups of flour
total people served → total people served

$\square = \square$ Find the cross products.

$45 = 10n$ Multiply.

$\frac{45}{\square} = \frac{10n}{\square}$ Divide each side by $\square$.

$\square = n$ Simplify.

You will need ____ cups of flour to make the recipe for 15 people.

Check Your Progress **COOKING** A recipe serves 12 people and calls for 5 cups of sugar. If you want to make the recipe for 18 people, how many cups of sugar should you use?

EXAMPLE

2 **FOOD** **Haley bought 4 pounds of tomatoes for $11.96. Write an equation relating the cost to the number of pounds of tomatoes. How much would Haley pay for 6 pounds at this same rate? for 10 pounds?**

Find the constant of proportionality between cost and pounds.

$\frac{\text{cost in dollars}}{\text{pounds of tomatoes}} = \frac{11.96}{4}$ or 2.99 The cost is $2.99 per pound.

Words ▼ **Variables** ▼ **Equation**

The cost is $2.99 times the number of pounds.

Let c represent the cost.
Let p represent the number of pounds.

$c = 2.99 \cdot p$

Use this same equation to find the cost for 6 and 10 pounds of tomatoes sold at the same rate.

$c = 2.99p$ ← Write the equation. → $c = 2.99p$

$c = 2.99$ ☐ ← Replace p with the number of pounds. → $c = 2.99$ ☐

$c =$ ☐ ← Multiply. → $c =$ ☐

The cost for 6 pounds of tomatoes is ☐ and for 10 pounds is ☐.

Check Your Progress **FOOD** Cameron bought 3 pounds of apples for $11.37. Write an equation relating the cost to the number of pounds of apples. How much would Cameron pay for 5 pounds at this same rate?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

4–4 Problem-Solving Investigation: Draw a Diagram

EXAMPLE

MAIN IDEA

- Solve problems by drawing a diagram.

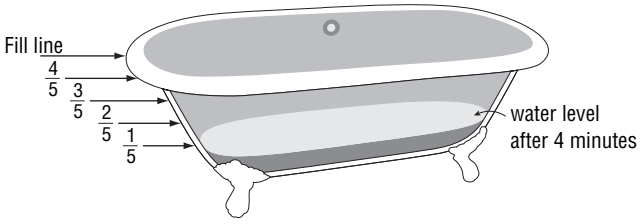
TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(C) Select or develop an appropriate problem-solving strategy… including drawing a picture… to solve a problem.** *Also addresses TEKS 8.14(B).*

VOLUME **A bathtub is being filled with water. After 4 minutes, $\frac{1}{5}$ of the bathtub is filled. How much longer will it take to completely fill the bathtub assuming the water rate is constant?**

EXPLORE After 4 minutes, the bathtub is $\frac{1}{5}$ of the way filled. How many more minutes will it take to fill the bathtub?

PLAN Draw a diagram showing the water level after every 4 minutes.

SOLVE The bathtub will be filled after [ ] 4-minute periods. This is a total of 5×4 or [ ].



CHECK The question asks how much *longer* will it take to completely fill the bathtub after the initial 4 minutes. Since the total time needed is 20 minutes, it will take [ ] or [ ] to completely fill the bathtub.

Check Your Progress **VOLUME** A swimming pool is being filled with water. After 3 hours, $\frac{1}{4}$ of the pool is filled. How much longer will it take to completely fill the swimming pool assuming the water rate is constant?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

4–5 Similar Polygons

Main Idea

- Identify similar polygons and find missing measures of similar polygons.

Key Concept

Similar Polygons If two polygons are similar, then

- their corresponding angles are congruent, or have the same measure, and
- their corresponding sides are proportional.

TEKS 8.9 The student uses indirect measurement to solve problems. **(B) Use proportional relationships in similar two-dimensional figures** or similar three-dimensional figures **to find missing measurements. 8.10** The student describes how changes in dimensions affect linear, area, and volume measures. **(A) Describe the resulting effects on perimeter and area when dimensions of a shape are changed proportionally.**

Build Your Vocabulary (pages 85–86)

A **polygon** is a simple closed figure in a plane formed by _____ line segments.

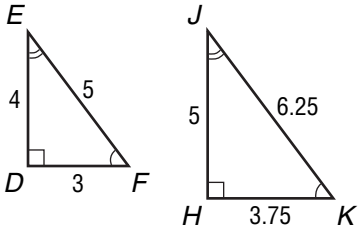
Polygons that have the _____ shape are called similar polygons.

The parts of _____ figures that "match" are called **corresponding parts.**

Congruent means to have the _____ measure.

Example 1 Identify Similar Polygons

Determine whether triangle *DEF* is similar to triangle *HJK*. Explain your reasoning.



First, check to see if corresponding angles are congruent.

$\angle D \cong \angle H$, $\angle E \cong \angle J$, and $\angle F \cong \angle K$.

Next, check to see if corresponding sides are proportional.

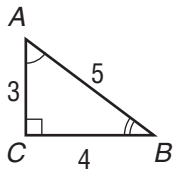
$$\frac{DE}{HJ} = \frac{\quad}{\quad} = 0.8 \qquad \frac{EF}{JK} = \frac{\quad}{\quad} = 0.8$$

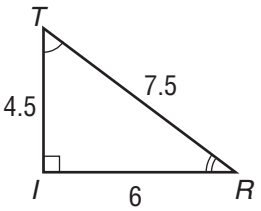
$$\frac{DF}{HK} = \frac{\quad}{\quad} = 0.8$$

Since the corresponding angles are congruent and $\frac{4}{5} = \frac{5}{6.25} = \frac{3}{3.75}$, triangle *DEF* is _____ to triangle *HJK*.

Check Your Progress

Determine whether triangle *ABC* is similar to triangle *TRI*. Explain your reasoning.





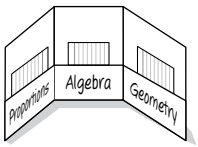
BUILD YOUR VOCABULARY (pages 85–86)

The ____ of the lengths of two ____ sides of two similar polygons is called the **scale factor.**

FOLDABLES

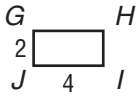
ORGANIZE IT

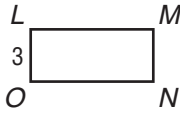
Make vocabulary cards for each term in this lesson. Be sure to place the cards in your Foldable.



EXAMPLE 2 Finding Missing Measures

Given that rectangle *LMNO* ~ rectangle *GHIJ*, find *n*.





METHOD 1 Write a proportion.

The missing measure n is the length of $\overline{NO}$. Write a proportion involving NO that relates corresponding sides of the two rectangles.

rectangle *GHIJ* → ____ = ____ ← rectangle *GHIJ*
rectangle *LMNO* → ____ = ____ ← rectangle *LMNO*

$\frac{2}{3} = \frac{4}{n}$ $GJ =$ ____, $LO =$ ____, $IJ =$ ____, and $NO =$ ____

____ $\cdot n =$ ____ $\cdot 4$ Find the cross products.

____ = ____ Multiply.

____ = ____ Divide each side by 2.

METHOD 2 Use the scale factor to write an equation.

Find the scale factor from rectangle *GHIJ* to rectangle *LMNO* by finding the ratio of corresponding sides with known lengths.

scale factor: $\frac{GJ}{LO} =$ ____ The scale factor is the constant of proportionality.

(continued on the next page)

Words A length on rectangle *GHIJ* is ____ times as long as a corresponding length on rectangle ____.

Variables Let ____ represent the measure of ____.

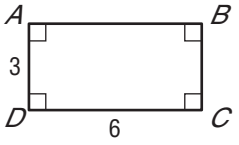
Equation ____

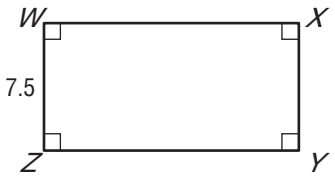
$$4 = \frac{2}{3}n$$ Write the equation.

$$4 \cdot \square = \square \cdot \frac{2}{3}n$$ Multiply each side by ____.

$$\square = \square$$ Simplify.

Check Your Progress Given that rectangle $ABCD \sim$ rectangle $WXYZ$, write a proportion to find the measure of $\overline{ZY}$. Then solve.





Homework Assignment

Page(s):

Exercises:

4–6 Dilations

TEKS 8.6 The student uses transformational geometry to develop spatial sense. **(A) Generate similar figures using dilations including enlargements and reductions. (B) Graph dilations,** reflections, and translations **on a coordinate plane.** *Also addresses TEKS 8.1(B), 8.10(A).*

MAIN IDEA

- Graph dilations on a coordinate plane.

BUILD YOUR VOCABULARY (pages 85–86)

The image produced by _____ or reducing a _____ is called a **dilation.**

EXAMPLE **Graph a Dilation**

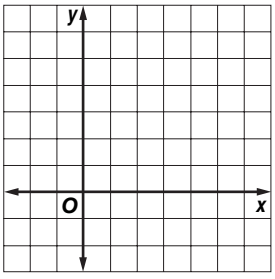
1 **Graph $\triangle MNO$ with vertices $M(3, -1)$, $N(2, -2)$, and $O(0, 4)$. Then graph its image $\triangle M'N'O'$ after a dilation with a scale factor of $\frac{3}{2}$.**

To find the vertices of the dilation, multiply each coordinate in the ordered pairs by $\frac{3}{2}$. Then graph both images on the same axes.

$M(3, -1) \rightarrow$ _____ $\rightarrow M'\left(\frac{9}{2}, -\frac{3}{2}\right)$

$N(2, -2) \rightarrow \left(2 \cdot \frac{3}{2} -2 \cdot \frac{3}{2}\right) \rightarrow N'$ _____

$O(0, 4) \rightarrow$ _____ $\rightarrow O'$ _____



CHECK Draw lines through the origin and each of the vertices of the original figure. The vertices of the dilation should lie on those same lines.

REVIEW IT

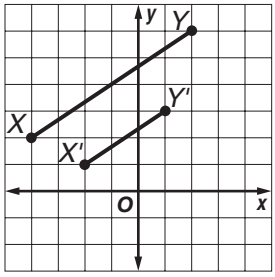
What is a scale factor of similar polygons? *(Lesson 4-5)*

Check Your Progress

Graph $\triangle JKL$ with vertices $J(2, 4)$, $K(4, -6)$, and $L(0, -4)$. Then graph its image $\triangle J'K'L'$ after a dilation with a scale factor of $\frac{1}{2}$.

EXAMPLE **Find and Classify a Scale Factor**

2 **In the figure, segment $X'Y'$ is a dilation of segment XY. Find the scale factor of the dilation, and classify it as an enlargement or as a reduction.**

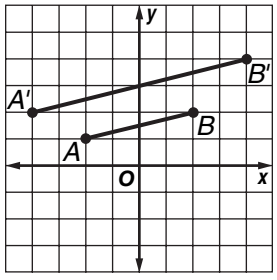


Write a ratio of the x- or y-coordinate of one vertex of the dilation to the x- or y-coordinate of the corresponding vertex of the original figure. Use the y-coordinates of $X(-4, 2)$ and $X'(-2, 1)$.

$$\frac{y\text{-coordinate of } X'}{y\text{-coordinate of } X} = \square$$

The scale factor is ☐. Since the image is smaller than the original figure, the dilation is a ☐.

Check Your Progress In the figure, segment $A'B'$ is a dilation of segment AB. Find the scale factor of the dilation, and classify it as an *enlargement* or as a *reduction*.



REMEMBER IT

- If the scale factor is between 0 and 1, the dilation is a reduction.
- If the scale factor is greater than 1, the dilation is an enlargement.
- If the scale factor is equal to 1, the dilation is the same size as the original figure.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

4–7 Scale Drawings and Models

Main Idea

- Solve problems involving scale drawings.

TEKS 8.3 The student identifies proportional or non-proportional linear relationships in problem situations and solves problems. **(B) Estimate and find solutions to application problems involving** percents and other **proportional relationships such as similarity** and rates. *Also addresses TEKS 8.1(B), 8.7(B).*

Remember It

Scales and scale factors are usually written so that the drawing length comes first in the ratio.

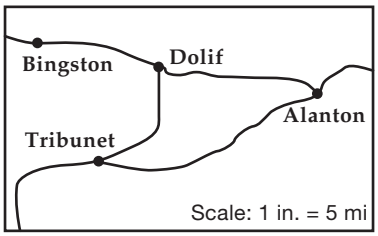
Build Your Vocabulary (pages 85–86)

A **scale drawing** or a **scale model** is used to represent an object that is too _____ or too _____ to be drawn or built at actual size.

The **scale** is determined by the _____ of given length on a _____ to the corresponding actual length of the object.

Example — Find a Missing Measurement

1 RECREATION Use the map to find the actual distance from Bingston to Alanton.



Use an inch ruler to measure the map distance.

The map distance is about 1.5 inches.

METHOD 1 Write and solve a proportion.

map → $\frac{1 \text{ in.}}{5 \text{ mi}} = \frac{\quad}{\quad}$ ← map

actual → actual

$\frac{\quad}{\quad} = \frac{\quad}{\quad}$ Find the cross products.

$x =$ _____ Simplify.

METHOD 2 Write and solve an equation.

Write the scale as _____ which means _____ per inch.

Words ▼ **Variables** ▼ **Equation**

The actual distance is ____ per inch of map distance.

Let a represent the actual distance in miles.
Let m represent the map distance in inches.

____

$a =$ ____ Write the equation.

$a = 5$ ____ Replace m with ____.

$a =$ ____ Multiply.

The actual distance from Bingston to Alanton is ____.

EXAMPLE **Find the Scale**

2 SCALE DRAWINGS **A wall in a room is 15 feet long. On a scale drawing it is shown as 6 inches. What is the scale of the drawing?**

Write and solve a proportion to find the scale of the drawing.

Length of Room → scale drawing length → $\frac{6 \text{ in.}}{15 \text{ ft}}$ = $\frac{1 \text{ in.}}{x \text{ ft}}$ ← Scale Drawing ← scale drawing length ← actual length

actual length →

____ = ____ Find the cross products. Multiply. Then divide each side by 6.

$x =$ ____ Simplify.

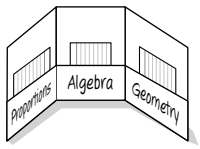
So, the scale is 1 inch = ____.

Check Your Progress The length of a garage is 24 feet. On a scale drawing the length of the garage is 10 inches. What is the scale of the drawing?

FOLDABLES

ORGANIZE IT

Write definitions of *scale, scale drawing,* and *scale model* on cards and give your own examples. Be sure to explain how to create a scale for a scale drawing or model.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

4–8 Indirect Measurement

Main Idea

- Solve problems involving similar triangles.

TEKS 8.3 The student identifies proportional or non-proportional linear relationships in problem situations and solves problems. **(B) Estimate and find solutions to application problems involving** percents and other **proportional relationships such as similarity** and rates. **8.9** The student uses indirect measurement to solve problems. **(B) Use proportional relationships in similar two-dimensional figures** or similar three-dimensional figures **to find missing measurements.**

Write It

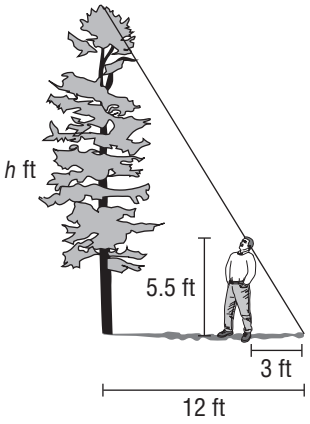
Which property of similar polygons is used to set up the proportion for the shadow and height of Marcel and the tree?

Build Your Vocabulary (pages 85–86)

Indirect measurement uses the properties of _____ polygons and _____ to measure distance of lengths that are too _____ to measure directly.

EXAMPLE Use Shadow Reckoning

1 TREES **A tree in front of Marcel's house has a shadow 12 feet long. At the same time, Marcel has a shadow 3 feet long. If Marcel is 5.5 feet tall, how tall is the tree?**



tree's shadow → / Marcel's shadow → $\frac{12}{3} = \frac{h}{5.5}$ ← tree's height / ← Marcel's height

_____ = _____ Find the cross products.

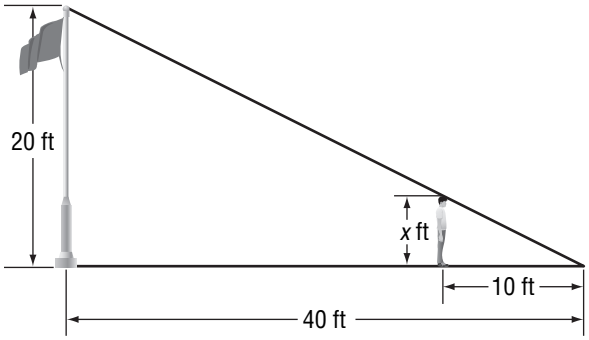
_____ = _____ Multiply.

$\frac{\text{_____}}{\text{_____}} = \frac{\text{_____}}{\text{_____}}$ Divide each side. by _____.

_____ $= h$ Simplify.

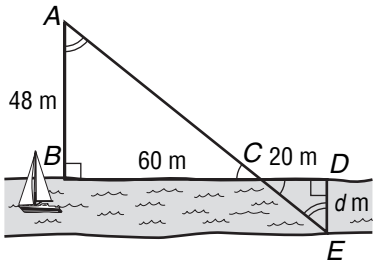
The tree is _____ feet tall.

Check Your Progress Jayson casts a shadow that is 10 feet. At the same time, a flagpole casts a shadow that is 40 feet. If the flagpole is 20 feet tall, how tall is Jayson?



EXAMPLE **Use Indirect Measurement**

2 **SURVEYING** **The two triangles shown in the figure are similar. Find the distance *d* across the stream.**



In this figure $\triangle ABC \sim \triangle EDC$.

So, $\overline{AB}$ corresponds to $\overline{ED}$, and $\overline{BC}$ corresponds to ____.

$\frac{AB}{EB} = \frac{BC}{DC}$ Write a ____.

____ = ____ $AB = 48$, $ED = d$, $BC = 60$, and $DC = 20$

____ = ____ Find the cross products.

____ = ____ Multiply. Then divide each side by ____.

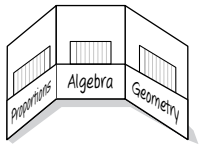
____ $= d$ Simplify.

The distance across the stream is ____.

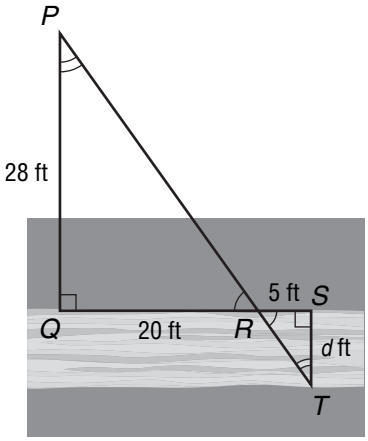
FOLDABLES

ORGANIZE IT

Include a definition of *indirect measurement.* Also include an explanation of how to use indirect measurement with your own words or sketch.



Check Your Progress The two triangles shown in the figure are similar. Find the distance d across the river.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

4–9 Rates of Change

MAIN IDEA
- Find rates of change.

TEKS 8.5 The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A)** Predict, **find,** and justify **solutions to application problems using appropriate tables, graphs,** and algebraic equations. *Also addresses TEKS 8.2(D).*

REMEMBER IT

Rate of change is always expressed as a unit rate.

BUILD YOUR VOCABULARY (pages 85–86)

A **rate of change** is a rate that describes how one quantity [ ] in [ ] to another.

EXAMPLE 1 Find a Rate of Change

DOGS The table below shows the weight of a dog in pounds between 4 and 12 months old. Find the rate of change in the dog's weight between 8 and 12 months of age.

Age (mo)	4	8	12
Weight (lb)	15	28	43

$$\frac{\text{change in weight}}{\text{change in age}} = \frac{(43 - \square)\text{ pounds}}{(\square - 8)\text{ months}}$$

The dog grew from 28 to 43 pounds from ages 8 to 12 months.

$$= \frac{\square\text{ pounds}}{\square\text{ months}}$$

Subtract to find the change in weights and ages.

$$= \frac{\square\text{ pounds}}{\square\text{ month}}$$

Express this rate as a [ ].

The dog grew an average of [ ] pounds per [ ].

Check Your Progress The table below shows Julia's height in inches between the ages of 6 and 11. Find the rate of change in her height between ages 6 and 9.

Age (yr)	6	9	11
Weight (in.)	52	58	60

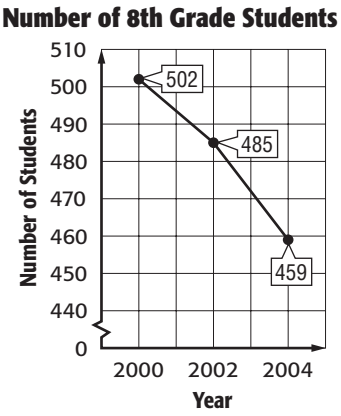
EXAMPLE Find a Negative Rate of Change

KEY CONCEPT

Rate of Change To find the rate of change, divide the difference in the *y*-coordinate by the difference in the *x*-coordinate.

FOLDABLES Record this concept on one side of an index card. Write an example on the other side of the card.

2 SCHOOLS The graph shows the number of students in the eighth grade between 2000 and 2004. Find the rate of change between 2002 and 2004.



Use the data to write a rate comparing the change in students to the change in time.

$$\frac{\text{change in students}}{\text{change in time}} = \frac{\square - \square}{\square - \square}$$

The number of students changed from 485 to 459 from 2002 to 2004.

$$= \frac{\square}{\square}$$

Simplify.

$$= \frac{\square}{\square}$$

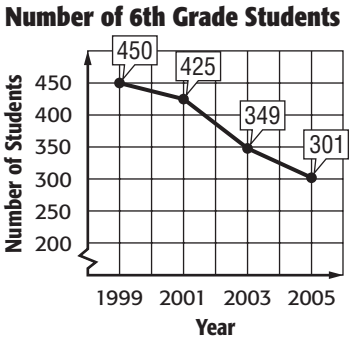
Express as a unit rate.

The rate of change is ☐ students per ☐.

REMEMBER IT

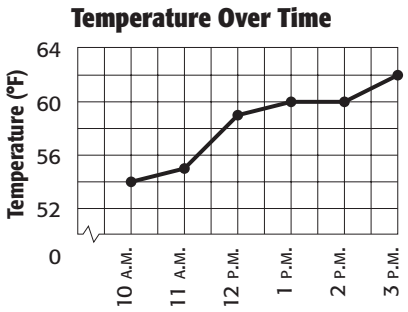
Always read graphs from left to right.

Check Your Progress The graph below shows the number of students in the 6th grade between 1999 and 2005. Find the rate of change between 2003 and 2005.



EXAMPLES Compare Rates of Change

3 TEMPERATURE **the graph shows the temperature measured on each hour from 10 A.M. to 3 P.M. During which 1-hour period was the rate of change in temperature the greatest?**



Find the rates of change for each 1-hour period. Use the ratio $\frac{\text{change in temperature}}{\text{change in time}}$.

10 A.M. to 11 A.M. $\quad \frac{55° - 54°}{11 \text{ A.M.} - 10 \text{ A.M.}} = $ ☐

11 A.M. to 12 P.M. $\quad \frac{59° - 55°}{12 \text{ P.M.} - 11 \text{ A.M.}} = $ ☐

12 P.M. to 1 P.M. $\quad \frac{60° - 59°}{2 \text{ P.M.} - 12 \text{ P.M.}} = $ ☐

1 P.M. to 2 P.M. $\quad \frac{60° - 60°}{2 \text{ P.M.} - 1 \text{ P.M.}} = $ ☐

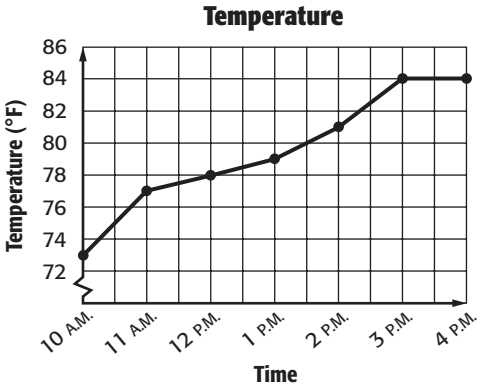
2 P.M. to 3 P.M. $\quad \frac{62° - 60°}{3 \text{ P.M.} - 2 \text{ P.M.}} = $ ☐

The greatest rate of change in temperature is ☐

between ☐

Check Your Progress

The graph shows the temperature measured each hour from 10 a.m. to 4 p.m. Find the 1-hour time period in which the rate of change in temperature was the greatest.



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HOMEWORK ASSIGNMENT

Page(s):

Exercises:

4–10 Constant Rate of Change

MAIN IDEA

- Identify proportional and nonproportional relationships by finding a constant rate of change.

TEKS 8.3 The student identifies proportional or non-proportional linear relationships in problem situations and solves problems. **(A) Compare and contrast proportional and non-proportional linear relationships. 8.5** The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A)** Predict, **find, and justify solutions to application problems using appropriate tables, graphs,** and algebraic equations.

BUILD YOUR VOCABULARY (pages 85–86)

A relationship that has a straight-line graph is called a _____. The rate of change between any two points of a _____ is _____.

EXAMPLE 1 Identify linear Relationships

BABYSITTING The amount a babysitter charges is shown. Is the relationship between the number of hours and the amount charged linear? If so, find the constant rate of change. If not, explain your reasoning.

Number of Hours	Amount Earned
1	$10
2	$18
3	$26
4	$34

Examine the change in the number of hours worked and in the amount earned.

	Number of Hours	Amount Earned	
	1	$10	
+1	2	$18	+8
+1	3	$26	+8
+1	4	$34	+8

Since the rate of change _____, this is _____. The _____ is $\frac{8}{1}$ or _____. This means that the babysitter earns _____.

Check Your Progress

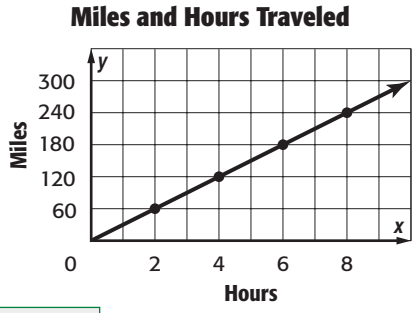
BABYSITTING The amount a babysitter charges is shown. Is the relationship between the number of hours and the amount charged linear? If so, find the constant rate of change.

Number of Hours	Amount Earned
1	$10
2	$18
3	$26
4	$34

EXAMPLE Find a Constant Rate of Change

2 TRAVEL Find the constant rate of change for the hours traveled and miles traveled. Interpret its meaning.

Choose any two points on the line and find the rate of change between them.



(2, 60) →

(4, 120) →

$\frac{\text{change in miles}}{\text{change in time}} =$

The amount of miles from 60 to 120 between hours 2 and 4.

=

Subtract.

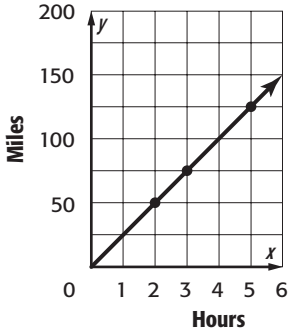
=

Express as a unit rate.

The rate of speed is .

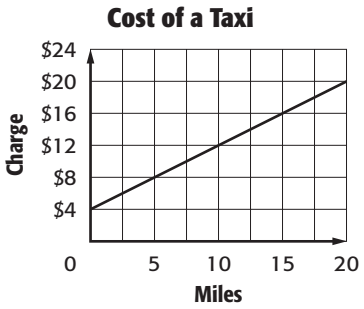
Check Your Progress

TRAVEL Find the constant rate of change for the hours traveled and miles traveled. Interpret its meaning.



EXAMPLE

3 TAXIS **Use the graph to determine if there is a proportional linear relationship between the miles driven and the charge for a ride. Explain your reasoning.**



Since the graph of the data forms a line, the relationship between the two scales is linear. This can also be seen in the table of values created using the points on the graph.

		+4	+4	+4	+4
Charge ($)	4	8	12	16	20
Miles	0	5	10	15	20
		+5	+5	+5	+5

Constant Rate of Change

$$\frac{\text{change in charge}}{\text{change in miles}} = \square$$

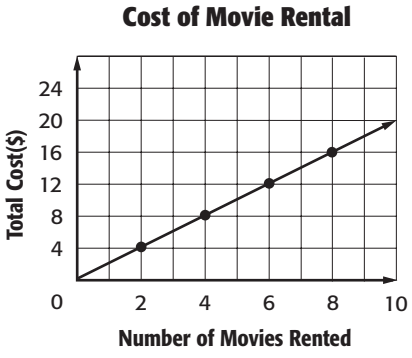
To determine if the two scales are proportional, express the relationship between the charges for several miles as a ratio.

$$\frac{\text{charge}}{\text{miles}} \rightarrow \frac{8}{5} = \square \qquad \frac{12}{10} = \square \qquad \frac{16}{15} \approx \square$$

Since the ratios are _____, the total charge is _____ to the number of miles driven.

Check Your Progress

MOVIES Use the graph to determine if there is a proportional linear relationship between the number of movies rented and the total cost. Explain your reasoning.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

CHAPTER 4

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 4 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 4, go to: glencoe.com	You can use your completed **Vocabulary Builder** *(pages 85–86)* to help you solve the puzzle.

4-1 Ratios and Rates

Match each phrase with the term they describe.

1. a comparison of two numbers ____
2. a comparison of two quantities with different types of units ____
3. a rate that is simplified so it has a denominator of 1 ____

a. unit rate
b. numerator
c. ratio
d. rate

4. Express 12 wins to 14 losses in simplest form. ____

5. Express 6 inches of rain in 4 hours as a unit rate. ____

4-2 Proportional and Nonproportional Relationships

Determine whether each relationship is proportional.

6.

Side length (ft)	1	2	3	4	5
Perimeter (ft)	4	8	12	16	20

____

7.

Time (hr)	1	2	3	4	5
Rental Fee ($)	10.00	12.50	15.00	17.50	20.00

____

4-3

Solving Proportions

8. Do the ratios $\frac{a}{b}$ and $\frac{c}{d}$ always form a proportion? Why or why not?

Solve each proportion.

9. $\frac{7}{b} = \frac{35}{5}$

10. $\frac{a}{16} = \frac{3}{8}$

11. $\frac{4}{13} = \frac{3}{c}$

4-4

Problem-Solving Investigation: Draw a Diagram

12. **FAMILY** At Willow's family reunion, $\frac{4}{5}$ of the people are 18 years of age or older. Half of the remaining people are under 12 years old. If 20 children are under 12 years old, how many people are at the reunion?

4-5

Similar Polygons

13. If two polygons have corresponding angles that are congruent, does that mean that the polygons are similar? Why or why not?

14. Rectangle *ABCD* has side lengths of 30 and 5. Rectangle *EFGH* has side lengths of 15 and 3. Determine whether the rectangles are similar.

4-6 Dilations

15. If you are given the coordinates of a figure and the scale factor of a dilation of that figure, how can you find the coordinates of the new figure?

16. Complete the table.

If the scale factor is	Then the dilation is
between 0 and 1	
greater than 1	
equal to 1	

4-7 Scale Drawings and Models

17. The scale on a map is 1 inch = 20 miles.
Find the actual distance for the map distance of $\frac{5}{8}$ inch.

18. What is the scale factor for a model if part of the model that is 4 inches corresponds to a real-life object that is 16 inches?

4-8 Indirect Measurement

19. When you solve a problem using shadow reckoning, the objects being compared and their shadows form two sides of triangles.

20. **STATUE** If a statue casts a 6-foot shadow and a 5-foot mailbox casts a 4-foot shadow, how tall is the statue?

4-9

Rate of Change

Use the table shown to answer each question.

21. Find the rate of change in the number of bicycles sold between weeks 2 and 4.

Week	Bicycles Sold
2	2
4	14
6	14
8	12

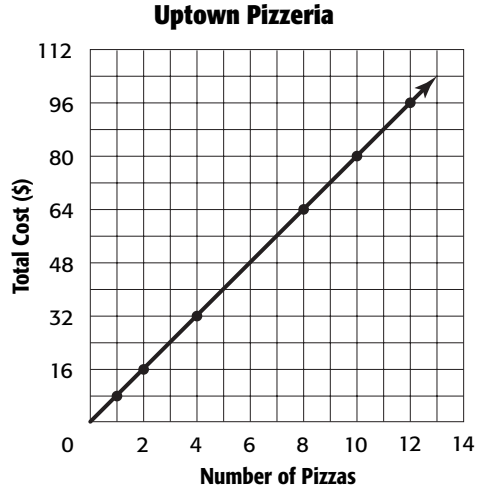
22. Between which weeks is the rate of change negative?

4-10

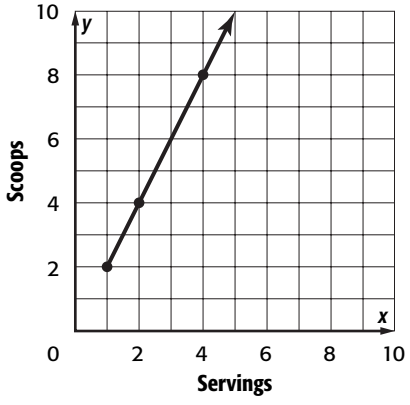
Constant Rate of Change

Find the constant rate of change for each graph and interpret its meaning.

23.



24.



CHAPTER 4 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Math Online

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 4.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 4 Practice Test on page 247 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 4 Study Guide and Review on pages 242–246 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 4 Practice Test on page 247.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 4 Foldable.
- Then complete the Chapter 4 Study Guide and Review on pages 242–246 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 4 Practice Test on page 247.

Student Signature

Parent/Guardian Signature

Teacher Signature

CHAPTER 5

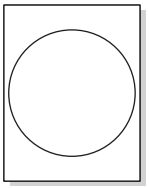
Percent

FOLDABLES™

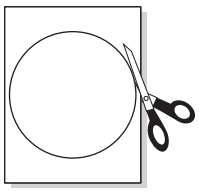
Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with 4 sheets of $8\frac{1}{2}$" × 11" paper.

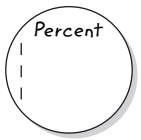
STEP 1 **Draw** a large circle on one of the sheets of paper.



STEP 2 **Stack** the sheets of paper. Place the one with the circle on top. Cut all four sheets in the shape of a circle.



STEP 3 **Staple** the circles on the left side. Write the chapter title and the first four lesson numbers on each circle.



STEP 4 **Turn** the circles to the back side so that the staples are still on the left. Write the last four lesson titles on the front and right pages of the journal.

NOTE-TAKING TIP: When you take notes, it may help to create a visual representation, such as a drawing or a chart, to organize the information you learn. When you use a visual, be sure to clearly label it.

CHAPTER 5

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 5. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
compatible numbers			
discount			
interest			
markup			
percent			

Vocabulary Term	Found on Page	Definition	Description or Example
percent equation			
percent of change			
percent of decrease			
percent of increase			
percent proportion			
principal			
selling price			

5–1 Ratios and Percents

Reinforcement of TEKS 7.1 The student represents and uses numbers in a variety of equivalent forms. **(B) Convert between fractions,** decimals, whole numbers, and **percents mentally, on paper,** or with a calculator. *Also addresses TEKS 8.16(A).*

MAIN IDEA

- Write ratios as percents and vice versa.

BUILD YOUR VOCABULARY (pages 116–117)

_____ such as 27 out of 100 or 8 out of 25 can be written as **percents.**

KEY CONCEPT

Percent A percent is a ratio that compares a number to 100.

EXAMPLES **Write Ratios as Percents**

1 **POPULATION** **According to a recent census, 13 out of every 100 people living in Delaware were 65 or older. Write this ratio as a percent.**

13 out of every _____ = 13%

2 **BASEBALL** **In 2005, Manny Ramirez got on base 38.8 times for every 100 times he was at bat. Write this ratio as a percent.**

38.8 out of _____ = 38.8%

Check Your Progress **Write each ratio as a percent.**

a. 59 out of 100

_____

b. 68 out of 100

_____

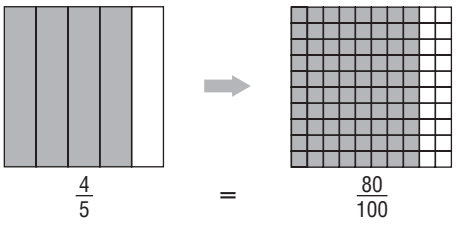
EXAMPLES **Write Ratios and Fractions as Percents**

3 **TRANSPORTATION** **About 4 out of 5 commuters in the United States drive or carpool to work. Write this ratio as a percent.**

$\times$ _____

$\frac{4}{5} = \frac{80}{100}$

$\times$ _____



$\frac{4}{5}$ = $\frac{80}{100}$

So, _____ out of _____ equals _____.

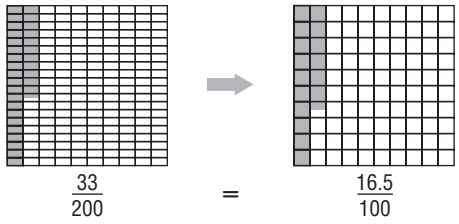
FOLDABLES™

ORGANIZE IT

Write in words and symbols what you've learned about expressing ratios as percents.

4 INTERNET **In 2005, about $\frac{33}{200}$ of the population in Peru used the Internet. Write this fraction as a percent.**

$\frac{33}{200} = \frac{16.5}{100}$



So, ____ out of ____ equals ____.

Check Your Progress **Write each ratio or fraction as a percent.**

a. 3 out of 5

b. $\frac{122}{200}$ teens

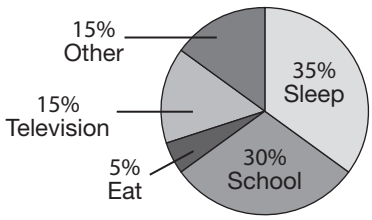
EXAMPLE **Write Percents as Fractions**

5 SCHEDULE **The circle graph shows an estimate of the percent of his day that Peter spends on each activity. Write the percents for eating and sleeping as fractions in simplest form.**

Eating: 5% = ____ or ____

Sleeping: 35% = ____ or ____

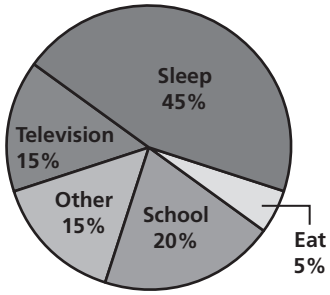
How Peter Spends His Day



Check Your Progress

The circle graph shows an estimate of the percent of his day that Leon spends on each activity. Write the percents for school and television as fractions in simplest form.

How Leon Spends His Day



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

5–2 Comparing Fractions, Decimals, and Percents

TEKS 8.1 The student understands that different forms of numbers are appropriate for different situations. **(A) Compare and order rational numbers in various forms including** integers, **percents, and positive** and negative **fractions and decimals.** *Also addresses TEKS 8.2(A), 8.2(B).*

MAIN IDEA

- Write percents as fractions and decimals and vice versa.

KEY CONCEPTS

Decimals and Percents
To write a percent as a decimal, divide by 100 and remove the percent symbol.

To write a decimal as a percent, multiply by 100 and add the percent symbol.

EXAMPLES Percents as Decimals

Write each percent as a decimal.

1 **52%**

$52\% = \underbrace{52}\%$ Divide by ☐.

$= \square$ Remove the percent symbol.

2 **245%**

$245\% = \underbrace{245}\%$ Divide by ☐.

$= \square$ Remove the percent symbol.

Check Your Progress **Write each percent as a decimal.**

a. 28%

b. 135%

EXAMPLES Decimals as Percents

Write each decimal as a percent.

3 **0.3**

$0.3 = 0.\underbrace{30}$ Multiply by ☐.

$= \square$ Add the percent symbol.

4 **0.71**

$0.71 = 0.\underbrace{71}$ Multiply by ☐.

$= \square$ Add the percent symbol.

Check Your Progress **Write each decimal as a percent.**

a. 0.91

b. 1.65

EXAMPLES Fractions as Percents

5 **Write $\frac{3}{4}$ as a percent.**

METHOD 1

Use a proportion.

$$\frac{3}{4} = \frac{x}{100}$$

$3 \cdot 100 =$ ☐

$300 =$ ☐

☐ $=$ ☐

☐ $= x$

So, $\frac{3}{4}$ can be written as ☐.

METHOD 2

First write as a decimal. Then write as a percent.

$\frac{3}{4} = 0.\underset{\smile}{75}$

$=$ ☐

$$4\overline{)3.00}\quad 0.75,\ 28,\ 20,\ 20,\ 0$$

6 **Write $\frac{1}{6}$ as a percent.**

METHOD 1

Use a proportion.

$$\frac{1}{6} = \frac{x}{100}$$

☐ $= 6 \cdot x$

☐ $= 6x$

☐ $=$ ☐

☐ $= x$

So, $\frac{1}{6}$ can be written as ☐.

METHOD 2

First write as a decimal. Then write as a percent.

$\frac{1}{6} = 0.1\overline{6}$

$=$ ☐

$$6\overline{)1.0000}\quad 0.166\ldots,\ 6,\ 40,\ 36,\ 40,\ 36,\ 4$$

REVIEW IT

Show an example of how to write fractions as decimals. *(Lesson 2-1)*

Check Your Progress **Write each fraction as a percent.**

a. $\frac{1}{4}$ ☐

b. $\frac{1}{9}$ ☐

FOLDABLES

ORGANIZE IT

Write in words and symbols what you have learned about the relationship between percents, decimals, and fractions.

EXAMPLE **Compare Numbers**

7 **POLITICS** **In Sun City, $\frac{9}{20}$ of voters are Democrats. In Moon Town, 48% of voters are Democrats. In which town is there a greater proportion of Democrats?**

Write $\frac{9}{20}$ as a percent.

$\frac{9}{20} = 0.\underset{\smile}{45}$ $\quad$ $9 \div 20 = 0.45$

$=$ ☐ $\quad$ ☐ and add the ☐ symbol.

Since ☐ is less than ☐, there are ☐ Democrats in Moon Town.

Check Your Progress In Star City, $\frac{3}{20}$ of voters are Republicans. In Meteorville, 13% of voters are Republicans. In which town is there a greater proportion of Republicans?

☐

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

5–3 Algebra: The Percent Proportion

Main Idea

- Solving problems using the percent proportion.

Key Concept

Percent Proportion

$$\frac{\text{part}}{\text{whole}} = \frac{\text{percent}}{100}$$

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(B) Use appropriate operations to solve problems involving rational numbers in problem situations. 8.3** The student identifies proportional or non-proportional linear relationships in problem situations and solves problems. **(B) Estimate and find solutions to application problems involving percents** and other proportional relationships such as similarity and rates. *Also addresses TEKS 8.5(A).*

Build Your Vocabulary (pages 116–117)

In a **percent proportion,** _____ of the numbers, called the **part,** is being compared to the _____ quantity, also called the *base*. The other ratio is the percent, written as a fraction, whose base is _____.

Example 1 Find the Percent

34 is what percent of 136?

Since 34 is being compared to 136, _____ is part and _____ is the whole. You need to find the percent. Let n represent the percent.

part → $\frac{34}{136} = \frac{n}{100}$ ← whole — Write the percent proportion.

$\_\_ \cdot \_\_ = \_\_ \cdot n$ — Find the cross products.

$\_\_ = \_\_$ — Multiply.

$\_\_ = \_\_$ — Divide each side by _____.

$\_\_ = \_\_$ — Simplify.

So, 34 is _____ of 136.

Check Your Progress 63 is what percent of 210?

FOLDABLES

ORGANIZE IT

Be sure to explain how to find the percent, the part, and the base of a percent proportion. You also may want to show the ideas in a chart like the Concept Summary in your text.

EXAMPLE **Find the Part**

2 **What number is 70% of 600?**

The percent is 70, and the whole is 600. You need to find the part. Let n represent the part.

part → $\frac{n}{600} = \frac{70}{100}$ ← part
whole → ← whole — Write the percent proportion.

$n \cdot 100 = 600 \cdot 70$ — Find the cross products.

$100n =$ ☐ — Multiply.

$\frac{100n}{100} = \frac{42{,}000}{100}$ — Divide each side by ☐.

$n =$ ☐ — Simplify.

So, ☐ is 70% of 600.

Check Your Progress What number is 40% of 400?

☐

EXAMPLE **Find the Base**

3 **BASEBALL** **In 2005, Derek Jeter had 202 hits. This was about 31% of his at bats. How many times was he at bat?**

The percent is 31, and the part is 202 hits. You need to find the whole number of hits.

part → $\frac{202}{n} = \frac{31}{100}$ ← part
whole → ← whole } percent — Write the percent proportion.

$202 \cdot$ ☐ $= n \cdot$ ☐ — Find the cross products.

☐ $=$ ☐ — Multiply.

☐ $\approx n$ — Divide each side by 31.

He had about ☐ at bats.

Check Your Progress **BASEBALL** In 2005, Alex Rodriguez had 194 hits. This was about 32% of his at bats. How many times was he at bat?

☐

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

5–4 Finding Percents Mentally

Main Idea

- Compute mentally with percents.

TEKS 8.1 The student understands that different forms of numbers are appropriate for different situations. **(B) Select and use appropriate forms of rational numbers to solve real-life problems including those involving proportional relationships. 8.3** The student identifies proportional or non-proportional linear relationships in problem situations and solves problems. **(B) Estimate and find solutions to application problems involving percents** and other proportional relationships such as similarity and rates. *Also addresses TEKS 8.2(B).*

EXAMPLES Use Fractions to Compute Mentally

Compute mentally.

1 **40% of 80**

40% of 80 = ☐ of 80 or ☐

Use the fraction form of 40%, which is ☐.

2 **$66\frac{2}{3}$% of 75**

$66\frac{2}{3}$% of 75 = ☐ of 75 or ☐.

Use the fraction form of $66\frac{2}{3}$%, which is ☐.

EXAMPLES Use Decimals to Compute Mentally

Compute mentally.

3 **10% of 65**

10% of 65 = ☐ of 65 or ☐

4 **1% of 304**

1% of 304 = ☐ of 304 or ☐

Check Your Progress **Compute mentally.**

a. 20% of 60

b. $66\frac{2}{3}$% of 300

c. 10% of 13

d. 1% of 244

WRITE IT

Explain how you can move the decimal point to mentally multiply 0.1 by 1.1.

FOLDABLES

ORGANIZE IT

In your Foldable, be sure to include examples that show how to estimate percents of numbers.

EXAMPLE **Use Mental Math to Solve a Problem**

5 **TECHNOLOGY** **A company produces 2,500 of a particular printer. They later discover that 25% of the printers have defects. How many printers from this group have defects?**

METHOD 1 Use a fraction.

25% of 2,500 = ☐ of 2,500

THINK $\frac{1}{4}$ of 2,000 is ☐ and $\frac{1}{4}$ of 500 is ☐.

So, ☐ of 2,500 is ☐ + ☐ or ☐.

METHOD 2 Use a decimal.

25% of 2,500 = ☐ of 2,500

THINK 0.5 of 2,500 is ☐.

So, 0.25 of 2,500 is ☐ • ☐ or ☐.

There were ☐ printers that had defects.

Check Your Progress A company produces 1,400 of a particular monitor. They later discover that 20% of the monitors have defects. How many monitors from this group have defects?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

5–5 Problem-Solving Investigation: Reasonable Answers

EXAMPLE

MAIN IDEA

- Determine whether answers are reasonable.

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(C) Evaluate a solution for reasonableness.** *Also addresses TEKS 8.14(B).*

SHOPPING **Cara sees an advertisement for a pair of shoes she likes. One pair costs $34.99 plus 5 percent tax. She wants to buy a black pair and a brown pair. Cara has $75 saved in her clothing budget. Can she afford both pairs of shoes?**

EXPLORE You know the cost of the shoes and the sales tax rate. You want to know if two pairs of shoes plus sales tax will be [ ] or [ ] than [ ].

PLAN Use [ ] to determine a reasonable answer.

SOLVE THINK $34.99 \times 2 \approx$ [ ]

10% of $70 = $7, so 5% of $70 = [ ]

The total cost will be about $70 + $3.50 = [ ]. Since Cara has $75, she will have enough to buy [ ].

CHECK Find the [ ] of the two pairs of shoes. Then compute the sales tax and compare the sum to $75.

Check Your Progress **SHOPPING** David wants to buy a CD for $11.99 and a pack of batteries for $3.99. The sales tax rate is 5 percent. If David has $17 in his wallet, will he have enough to buy the CD and batteries?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

5–6 Percent and Estimation

MAIN IDEA

- Estimate by using equivalent fractions, decimals, and percents.

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(C) Evaluate a solution for reasonableness.** **8.3** The student identifies proportional or non-proportional linear relationships in problem situations and solves problems. **(B) Estimate** and find **solutions to application problems involving percents** and other proportional relationships such as similarity and rates.

BUILD YOUR VOCABULARY (pages 116–117)

Compatible numbers are two numbers that are easy to add, subtract, multiply, or divide mentally.

EXAMPLES Estimate Percents of Numbers

Estimate.

1 **48% of 70**

48% is about ☐ or ☐. ☐ and 70 are compatible numbers.

☐ of 70 is ☐.

So, 48% of 70 is about ☐.

2 **75% of 98**

75% is $\frac{3}{4}$, and 98 is about ☐. $\frac{3}{4}$ and ☐ are compatible numbers.

$\frac{3}{4}$ of ☐ is ☐.

So, 75% of 98 is about ☐.

3 **12% of 81**

12% is about 12.5% or ☐, ☐ and ☐ are compatible numbers.

and 81 is about ☐.

☐ of ☐ is ☐.

So, 12% of 81 is about ☐.

Check Your Progress **Estimate.**

a. 51% of 60 **b.** 25% of 33 **c.** 34% of 59

EXAMPLE

4 **LEFT-HANDEDNESS** **About 11% of the population is left-handed. If there are about 36 million people in California, about how many California residents are left-handed?**

11% of 36 million ≈ ☐ or ☐ of 36 million 11% is about ☐

= ☐ ☐ × 36 = ☐

So, about ☐ California residents are left-handed.

Check Your Progress **LEFT-HANDEDNESS** About 11% of the population is left-handed. If there are about 17 million people in Florida, about how many Florida residents are left-handed?

EXAMPLES **Estimate Percents**

Estimate each percent.

5 **12 out of 47**

$\frac{12}{47} \approx$ ☐ or $\frac{1}{4}$ 47 is about ☐.

$\frac{1}{4} =$ ☐ %

So, 12 out of 47 is about ☐.

FOLDABLES

ORGANIZE IT

Include the meaning of the symbol "≈." You may wish to include an example of estimating a percent in which the symbol ≈ is used.

6 **19 out of 31**

$\frac{19}{31} \approx$ ☐ or $\frac{2}{3}$ 19 is about ☐, and 31 is about ☐.

$\frac{2}{3} =$ ☐ %

So, 19 out of 31 is about ☐.

7 **41 out of 200**

$\frac{41}{200} \approx$ ☐ or $\frac{1}{5}$ 41 is about ☐.

$\frac{1}{5} =$ ☐

So, 41 out of 200 is about ☐.

Check Your Progress **Estimate each percent.**

a. 15 out of 76

b. 14 out of 47

c. 58 out of 121

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

5–7 Algebra: The Percent Equation

MAIN IDEA
- Solve problems using the percent equation.

BUILD YOUR VOCABULARY (pages 116–117)

The **percent equation** is an equivalent form of the percent proportion in which the ____ is written as a ____.

REVIEW IT

Explain how to write a decimal as a percent. *(Lesson 5-2)*

EXAMPLE **Find the Part**

1 **Find 30% of 450.**

Estimate 10% of 450 is 45. So, 30% of 450 is 3 • 45 or 135.

The percent is ____. The whole is ____. You need to find the part. Let n represent the part.

part = percent • whole

$n =$ ____ • ____ Write the percent equation.

$n =$ ____ Multiply.

So, 30% of 450 is ____.

TEKS 8.3 The student identifies proportional or non-proportional linear relationships in problem situations and solves problems. **(B)** Estimate and **find solutions to application problems involving percents** and other proportional relationships such as similarity and rates. **8.5** The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A)** Predict, **find,** and justify **solutions to application problems using** appropriate tables, graphs, and **algebraic equations.** *Also addresses TEKS 8.2(B).*

EXAMPLE **Find the Percent**

2 **102 is what percent of 150?**

Estimate $\frac{102}{150} \approx \frac{100}{150}$ or $66\frac{2}{3}\%$

The part is ____. The whole is ____. You need to find the percent. Let n represent the percent.

part = percent • whole

____ = n • ____ Write the percent equation.

$\frac{105}{150} = \frac{150n}{150}$ Divide each side by 150.

____ = n Simplify.

Since ____ = ____%, 102 is ____% of 150.

FOLDABLES

ORGANIZE IT

Write the percent equation in words and symbols. Explain why the rate in a percent equation is usually written as a decimal.

EXAMPLE **Find the Base**

3 **144 is 45% of what number?**

Estimate 144 is 50% of 288.

The part is ____. The percent is ____. You need to find the whole. Let n represent the whole.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$\square = \square \cdot n$ Write the percent equation.

$\frac{144}{0.45} = \frac{0.45n}{0.45}$ Divide each side by 0.45.

$\square = n$ Simplify.

So, 144 is 45% of ____.

Check Your Progress **Find the part, percent, or base.**

a. Find 20% of 315.

b. 135 is what percent of 250?

c. 186 is 30% of what number?

EXAMPLE **Solve a Real-Life Problem**

4 **SALES TAX** **The price of a sweater is $75. The sales tax is $5\frac{3}{4}$ percent. What is the total price of the sweater?**

You need to find what amount is $5\frac{3}{4}\%$ of $75.

Let t = the amount of tax.

$t = \square \cdot \square$ Write the equation.

$t = \square$ Simplify.

The amount of tax is ____. The total cost of the sweater is $75 + ____ or ____.

Check Your Progress The price of a pair of shoes is $60. The sales tax is 5 percent. What is the total price of the shoes?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

5–8 Percent of Change

Main Idea

- Find and use the percent of increase or decrease.

Build Your Vocabulary (pages 116–117)

A **percent of change** is a _____ that compares the change in quantity to the original amount. When the new amount is _____ than the original, the percent of change is called a **percent of increase.**

When the new amount is _____ than the original, the percent of change is called a **percent of decrease.**

Key Concept

Percent of Change A percent of change is a ratio that compares the change in quantity to the original amount.

EXAMPLE **Find the Percent of Increase**

1 **HOMES** **The Neitos bought a house several years ago for $120,000. This year, they sold it for $150,000. Find the percent of change. State whether the change is an increase or decrease.**

Step 1 The amount of change is $150{,}000 - 120{,}000 =$ _____

Step 2 Percent of change $= \dfrac{\text{amount of change}}{\text{original amount}}$ Definition of percent of change

$= \dfrac{\text{\_\_\_\_\_}}{\text{\_\_\_\_\_}}$

$= 0.25$ Divide.

Step 3 The decimal 0.25 written as a percent is _____. So, the percent of change is _____.

The new amount is _____ than the original. The percent of _____ is 25%.

Check Your Progress **CLUBS** Last year Cedar Park Swim Club had 340 members. This year they have 391 members. Find the percent increase.

_____

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(A) Identify and apply mathematics to everyday experiences, to activities in and outside of school,** with other disciplines, and with other mathematical topics. *Also addresses TEKS 8.2(B), 8.3(B).*

FOLDABLES™

ORGANIZE IT

Be sure to include an explanation and examples showing the difference between percent of increase and percent of decrease.

EXAMPLE **Find the Percent of Change**

2 **SCHOOLS** **Johnson Middle School had 240 students last year. This year, there are 192 students. Find the percent of change. State whether the percent of change is an increase or a decrease.**

Step 1 The amount of change is $240 - 192 =$ ☐.

Step 2 Percent of change $= \dfrac{\text{amount of change}}{\text{original amount}}$

$= \dfrac{\square}{\square}$

$= 0.20$ Divide.

Step 3 The decimal 0.20 written as a percent is ☐.

The percent of change is ☐. Since the new amount is ☐ than the original, it is a percent of ☐.

Check Your Progress **CARS** Meagan bought a new car several years ago for $14,000. This year she sold the car for $9,100. Find the percent of change. State whether the percent of change is an *increase* or a *decrease*.

BUILD YOUR VOCABULARY (pages 116–117)

The **markup** is the amount the price of an item is ☐ above the price the store ☐ for the item.

The **selling price** is the amount the ☐ pays.

The amount by which a ☐ is ☐ is called the **discount.**

EXAMPLE **Find the Selling Price**

REMEMBER IT

There may be more than one way to solve a problem. See pages 286 and 287 of your textbook for other methods you can use to solve Examples 3 and 4.

3 MARKUP **Shirts bought by a sporting goods store cost them $20 per shirt. They want to mark them up 40%. What will be the selling price?**

METHOD 1 Find the amount of the markup first.

The whole is ☐. The percent is ☐. You need to find the amount of the markup, or the part. Let m represent the amount of the markup.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$m = \square \cdot \square$ Write the equation.

$m = \square$ Multiply.

Add the markup ☐ to the cost of each shirt to find the selling price. ☐ + ☐ = ☐

METHOD 2 Find the total percent first.

The customer will pay 100% of the store's cost plus an extra 40% of the cost. Find 100% + 40% or 140% of the store's cost. Let p represent the price.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$p = \square \cdot \square$ Write the equation.

$p = \square$ Multiply.

The selling price of the shirts for the customer is ☐.

Check Your Progress Silk flowers bought by a craft store cost them $10 per yard. They want to mark them up 35 percent. What will be the selling price?

EXAMPLE **Find the Sale Price**

4 SHOPPING **A computer usually sells for $1,200. This week, it is on sale for 30% off. What is the sale price?**

METHOD 1 Find the amount of the discount first.

The percent is ☐, and the whole is ☐. We need to find the amount of the discount, or the part. Let d represent the amount of discount.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$d = \square \cdot \square$ Write the equation.

$d = \square$ Multiply.

Subtract the amount of the discount from the original price to find the sale price.

☐ − ☐ = ☐

METHOD 2 Find the percent paid first.

If the amount of the discount is 30%, the percent paid is 100% − 30% or 70%. Find 70% of $1,200. Let s represent the sale price.

$\underbrace{\text{part}} = \underbrace{\text{percent}} \cdot \underbrace{\text{whole}}$

$s = \square \cdot \square$ Write the equation.

$s = \square$ Multiply.

The sale price of the computer is ☐.

Check Your Progress A DVD sells for $28. This week it is on sale for 20% off. What is the sale price?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

5–9 Simple Interest

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(B) Use appropriate operations to solve problems involving rational numbers in problem situations.** *Also addresses TEKS 8.3(B), 8.5(A), 8.14(A).*

MAIN IDEA

- Solve problems involving simple interest.

BUILD YOUR VOCABULARY (pages 116–117)

Interest is the amount of money paid or _____ for the use of money.

Principal is the amount of money _____ or borrowed.

EXAMPLE Find Simple Interest

1 **Find the simple interest for $2,000 invested at 5.5% for 4 years.**

$I = prt$ Write the simple interest formula.

$I =$ _____ $\cdot$ _____ $\cdot$ _____ Replace p with _____, r with _____, and t with _____.

$I =$ _____ The simple interest is _____.

EXAMPLE Find the Total Amount

REMEMBER IT

The t in the simple interest formula represents time in years. If time is given in months, weeks, or days, the time must be changed to time in years.

2 **Find the total dollar amount in an account where $80 is invested at 6% for 6 months.**

You need to find the total amount in an account. The time is given in months. Six months is $\frac{6}{12}$ or _____ year.

$I = prt$

$I =$ _____ $\cdot$ _____ $\cdot$ _____

$I =$ _____

The amount in the account is $80 + $ _____ or _____.

FOLDABLES™

ORGANIZE IT

Explain what you have learned about computing simple interest. Be sure to include the simple interest formula.

Check Your Progress

a. Find the simple interest for $1,500 invested at 5% for 3 years.

b. Find the total amount of money in an account where $60 is invested at 8% for 3 months.

EXAMPLE **Find the Interest Rate**

3 LOANS **Gerardo borrowed $4,500 from his bank for home improvements. He will repay the loan by paying $120 a month for the next four years. Find the simple interest rate of the loan.**

Use the formula $I = prt$. To find I, first find the total amount of money Gerardo will pay.

$\$120 \cdot 48 =$ ____.

He will pay ____ − $4,500 or ____ in interest.
So $I = 1{,}260$.

The principle is $4,500. So, $p = 4{,}500$. The loan will be for 48 months or 4 years. So, $t = 4$.

$I = p \cdot r \cdot t$

____ = ____ $\cdot r \cdot$ ____

____ = ____ Simplify.

____ = ____ Divide each side by 18,000.

____ $= r$ Simplify.

The simple interest rate is ____.

Check Your Progress Jocelyn borrowed $3,600 from her bank for home improvements. She will repay the loan by paying $90 a month for the next 5 years. Find the simple interest rate of the loan.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

CHAPTER 5

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 5 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 5, go to: glencoe.com	You can use your completed **Vocabulary Builder** *(pages 116–117)* to help you solve the puzzle.

5-1 Ratios and Percents

Write each ratio or fraction as a percent.

1. 21 out of 100 **2.** 4:10 **3.** $\frac{9}{25}$

Write each percent as a fraction in simplest form.

4. 27% **5.** 50% **6.** 80%

5-2 Fractions, Decimals, and Percents

Write each percent as a decimal.

7. 29% **8.** 376% **9.** 5%

Write each decimal or fraction as a percent.

10. 3.9 **11.** $\frac{7}{8}$ **12.** $\frac{1}{3}$

5-3 The Percent Proportion

Solve.

13. What percent of 48 is 6?

14. 14 is 20% of what number?

5-4 Finding Percents Mentally

Complete each statement.

15. 40% of 25 = ____ of 25 or ____

16. ____ of 36 = $\frac{1}{4}$ of 36 or ____

17. $66\frac{2}{3}$% of 48 = ____ of 48 or ____

18. ____ of 89 = 0.1 of 89 or ____

5-5 Problem-Solving Investigation: Reasonable Answers

19. **AGRICULTURE** An orange grower harvested 1,260 pounds of oranges from one grove, 874 pounds from another, and 602 pounds from a third. What is a reasonable number of crates to have on hand if each crate holds 14 pounds of oranges?

5-6 Percent and Estimation

20. Are $\frac{1}{8}$ and 56 compatible numbers? Explain.

21. Describe how to estimate 65% of 64 using compatible numbers.

5-7 The Percent Equation

Write each percent proportion as a percent equation.

22. $\frac{16}{64} = \frac{25}{100}$

23. $\frac{a}{14} = \frac{2}{100}$

24. $\frac{96}{b} = \frac{48}{100}$

25. $\frac{13}{100} = \frac{p}{675}$

5-8 Percent of Change

Find the percent of change. Round to the nearest tenth if necessary. State whether the change is an *increase* or *decrease*.

29. Original: 29
New: 64

30. Original: 51
New: 42

31. Find the selling price for the sweater.

Cost to store: $15
Mark up: 35%

5-9 Simple Interest

Write *interest* or *principal* to complete each sentence.

32. _____ is the amount of money paid or earned for the use of money.

33. _____ equals _____ times rate times time.

34. Find the total amount in the account where $560 is invested at 5.6% for 6 months.

First, find the _____ earned. Then, add the _____ earned and the _____ to find the total amount in the account. What is the total amount for $560 at 5.6% for 6 months? _____

CHAPTER 5 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Math Online

Visit **glencoe.com** to access your text book, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 5.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 5 Practice Test on page 299 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 5 Study Guide and Review on pages 295–298 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may want to take the Chapter 5 Practice Test on page 299.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 5 Foldable.
- Then complete the Chapter 5 Study Guide and Review on pages 295–298 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may want to take the Chapter 5 Practice Test on page 299.

Student Signature

Parent/Guardian Signature

Teacher Signature

CHAPTER 6

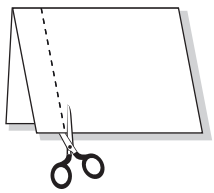
Geometry and Spatial Reasoning

FOLDABLES™

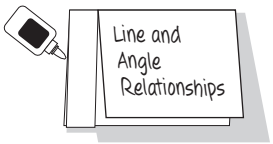
Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with 7 sheets of $8\frac{1}{2}$" × 11" paper.

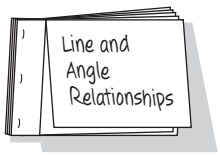
STEP 1 **Fold** a sheet of paper in half lengthwise. Cut a 1" tab along the left edge through one thickness.



STEP 2 **Glue** the 1" tab down. Write the lesson title on the front tab.



STEP 3 **Repeat** Steps 1–2 for the remaining sheets of paper. Staple together to form a booklet.



NOTE-TAKING TIP: When you read and learn new concepts, help yourself remember these concepts by taking notes, writing definitions and explanations, and draw models as needed.

CHAPTER 6

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 6. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
alternate exterior angles			
alternate interior angles			
complementary angles			
congruent polygon			
corresponding angles			
equiangular			
equilateral			
equilateral triangle			
exterior angle			
interior angle			
line of reflection			
line of symmetry			

Vocabulary Term	Found on Page	Definition	Description or Example
line symmetry			
obtuse triangle			
parallel lines			
perpendicular lines			
reflection			
regular polygon			
supplementary angles			
transformation			
translation			
transversal			
vertical angles			

6–1 Line and Angle Relationships

TEKS 8.16 The student uses logical reasoning to make conjectures and verify conclusions. **(B) Validate his/her conclusions using mathematical properties and relationships.**

Main Idea

- Identify special pairs of angles and relationships of angles formed by two parallel lines cut by a transversal.

Key Concepts

Special Pairs of Angles

Vertical angles are opposite angles formed by intersecting lines. Vertical angles are congruent.

Adjacent angles have the same vertex, share a common side, and do not overlap.

The sum of the measures of **supplementary angles** is 180°.

The sum of the measures of **complementary angles** is 90°.

Build Your Vocabulary (pages 144–145)

Acute angles have measures less than ____.

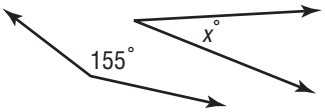
Right angles have measures ____ to 90°.

Obtuse angles have measures between ____ and ____.

Straight angles have measures equal to ____.

EXAMPLE **Finding a Missing Angle Measure**

1 **The two angles below are supplementary. Find the value of x.**

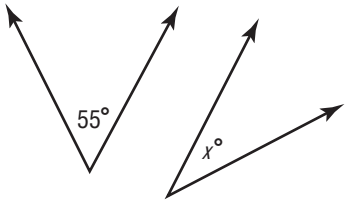


$155 + x = 180$ Write an equation.

$\square = \square$ Subtract ____ from each side.

$x = 25$ Simplify.

Check Your Progress The two angles shown are complementary. Find the value of x.



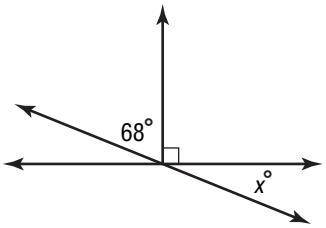
Remember It

Supplementary and complementary angles may or may not be adjacent angles.

EXAMPLE **Find a Missing Angle Measure**

2 **Find the value of x in the figure.**

Use the two vertical angles to solve for x.

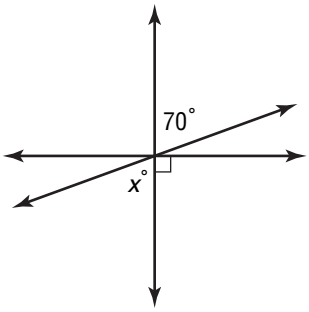


$\square + x = \square$ Write an equation.

$-68 \qquad -68$ Subtract 68 from each side.

$x = \square$ Simplify.

Check Your Progress Find the value of x in the figure.



Key Concept

If two parallel lines are cut by a transversal, then the following statements are true.

Alternate interior angles, those on opposite sides of the transversal and inside the other two lines, are congruent.

Alternate exterior angles, those on opposite sides of the transversal and outside the other two lines, are congruent.

Corresponding angles, those in the same position on the two lines in relation to the transversal, are congruent.

Build Your Vocabulary (pages 144–145)

Lines that intersect at ☐ angles are called **perpendicular lines**.

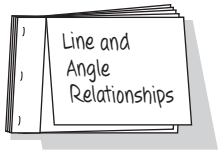
Two lines in a plane that never ☐ or cross are called **parallel lines**.

A **transversal** is a line that ☐ two or more lines.

FOLDABLES™

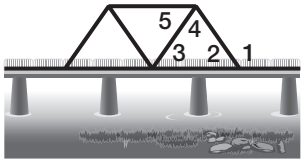
ORGANIZE IT

Use sketches and words to define the lines and angles discussed in this lesson. Try to show relationships among different lines and angles. Write this in your Foldable.



EXAMPLE **Find an Angle Measure**

3 **BRIDGES** **The sketch below shows a simple bridge design. The top beam and the floor of the bridge are parallel. If $\angle 2 \cong \angle 3$ and $m\angle 3 = 55°$, classify the relationship between $\angle 1$ and $\angle 5$. Then find $m\angle 1$ and $m\angle 5$.**



Since $\angle 3$ and $\angle 5$ are _____ angles, they are congruent. Also, since $\angle 1$ and $\angle 2$ are _____, $\angle 1$ and $\angle 3$ are _____, and $\angle 1$ and $\angle 5$ are supplementary.

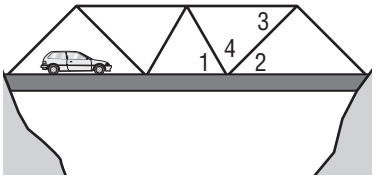
Since $m\angle 3 = 55°$ and $\angle 2 \cong \angle 3$, $m\angle 2 =$ _____.

Since $\angle 3$ and $\angle 5$ are alternate interior angles, $m\angle 5 =$ _____.

Since $\angle 1$ and $\angle 2$ are supplementary, the sum of their measures is 180°.

Therefore, $m\angle 1 = 180° - 55°$ or _____.

Check Your Progress **BRIDGES** The sketch below shows a simple bridge design. The top beam and floor of the bridge are parallel. If $m\angle 1 = 45°$ and $m\angle 3 = 40°$, find $m\angle 4$.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

6–2 Problem-Solving Investigation: Use Logical Reasoning

MAIN IDEA

- Solve problems by using logical reasoning.

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(B) Use a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness.**

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

EXAMPLE Use Logical Reasoning

FOOD Mona, Sharon, Pat, and Dena each have a favorite food. One likes pizza, another fish and chips, another chicken, and another hamburgers. From the given clues, give each person's favorite food.

- **Pat does not like pizza, hamburgers, or fish and chips.**
- **Neither Mona nor Dena likes hamburgers.**
- **Mona does not like to eat fried food.**

EXPLORE You know that each of the four students has a particular favorite food. Use the clues given and logical reasoning to determine the favorite food of each student.

PLAN Read each clue and deduce what you know about the favorite foods of the students.

SOLVE According to the first clue, Pat does not like pizza, hamburgers, or fish and chips. The only other option is _____, so Pat likes _____.

Since neither Mona nor Dena likes hamburgers, that means that _____ must like hamburgers.

Finally, there are two students left, Mona and Dena, and two food choices left, pizza and fish and chips. Since Mona does not like _____, she must like _____. Dena likes _____.

CHECK Read each clue again and make sure the answers seem reasonable.

Check Your Progress **SPORTS** Craig, Amy, Julia, and Ronaldo each have a favorite sport. One likes soccer, another basketball, another tennis, and another skateboarding. From the given clues, give each person's favorite sport.

- Amy does not like soccer, basketball, or skateboarding.
- Neither Craig nor Ronaldo likes playing soccer.
- Craig prefers individual sports as opposed to team sports.

6–3 Polygons and Angles

MAIN IDEAS

- Find the sum of angle measures of a polygon.
- Find the measure of an interior angle of a polygon.

KEY CONCEPT

Interior Angle Sum of a Polygon

The sum of the measures of the interior angles of a polygon is $(n - 2)180$, where n is the number of interior angles in the polygon.

TEKS 8.7 The student uses geometry to model and describe the physical world. **(B)** Use geometric concepts and properties to solve problems in fields such as art and architecture. **8.16** The student uses logical reasoning to make conjectures and verify conclusions. **(A) Make conjectures from patterns or sets of examples** and nonexamples.

EXAMPLE Find the Sum of Interior Angle Measures

1 Find the sum of the measures of the interior angles of a hexagon.

A hexagon has ☐ sides.

$S = (n - 2)180$ Write an equation.

$S = (\square - 2)180$ Replace n with ☐.

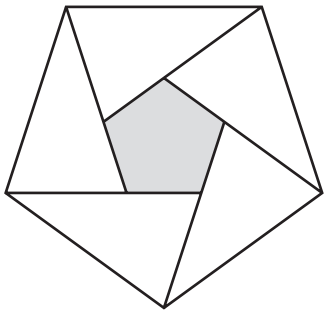
$S = (4)180$ or ☐ Simplify.

The sum of the measures of the interior angles of a hexagon is ☐.

Check Your Progress Find the sum of the measures of the interior angles of a heptagon (7-sided figure).

EXAMPLE Find the Measure of an Interior Angle

2 DESIGN A designer is creating a new logo for a bank. The logo consists of a regular pentagon surrounded by isosceles triangles. Find the measure of an interior angle of a pentagon.



A pentagon has ☐ sides.

Step 1 Find the sum of the measures of the angles.

$S = (n - 2)180$ Write an equation.

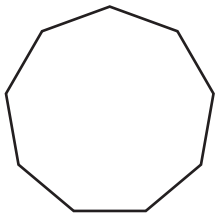
$S = \left(\square - 2\right)180$ Replace n with $\square$.

$S = (3)180$ or $\square$ Simplify.

The sum of the measures of the interior angles of a regular pentagon is $\square$.

Step 2 Divide 540 by $\square$, the number of interior angles, to find the measure of one interior angle. So, the measure of one interior angle of a regular pentagon is $\square \div \square$ or $\square$.

Check Your Progress **DESIGN** Michelle is designing a new logo for the math club. She wants to use a regular nonagon as part of the logo. Find the measure of an interior angle of a nonagon.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

6–4 Congruent Polygons

TEKS 8.7 The student uses geometry to model and describe the physical world. **(B) Use geometric concepts and properties to solve problems in fields such as art and architecture.**

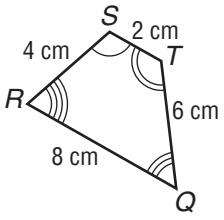
MAIN IDEA
- Identify congruent polygons.

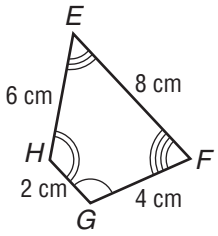
KEY CONCEPT

Congruent Polygons
If two polygons are congruent, their corresponding sides are congruent and their corresponding angles are congruent.

EXAMPLE 1 Identify Congruent Polygons

Determine whether the trapezoids shown are congruent. If so, name the corresponding parts and write a congruence statement.





The arcs indicate that $\angle S \cong \angle G$,

$\angle T \cong \angle H$, $\angle Q \cong \angle E$, and _____.

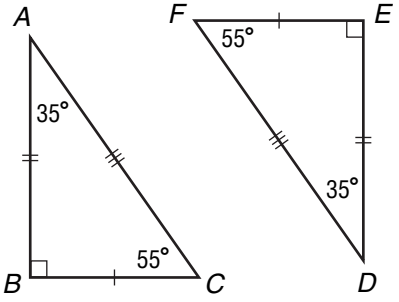
The side measures indicate that $\overline{ST} \cong \overline{GH}$,

$\overline{TQ} \cong \overline{HE}$, $\overline{QR} \cong \overline{EF}$, and _____.

Since _____ pairs of corresponding angles and sides are _____, the two trapezoids are _____.

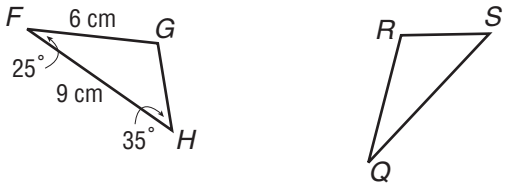
One congruence statement is trapezoid $EFGH \cong$ trapezoid _____.

Check Your Progress Determine whether the triangles shown are congruent. If so, name the corresponding parts and write a congruence statement.



EXAMPLES **Find Missing Measures**

In the figure, $\triangle FGH \cong \triangle QRS$



2 **Find $m\angle S$.**

According to the congruence statement, $\angle H$ and $\angle S$ are corresponding angles. So, ☐ $\cong$ ☐.

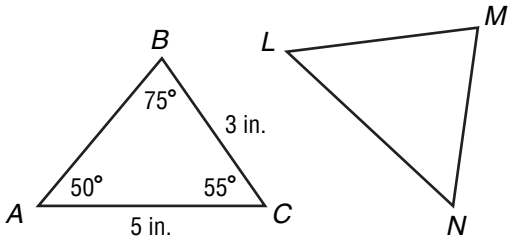
Since $m\angle H =$ ☐, $m\angle S =$ ☐.

3 **Find QR.**

$\overline{FG}$ corresponds to ☐. So, ☐ $\cong$ ☐.

Since $FG =$ ☐ centimeters, $QR =$ ☐ centimeters.

Check Your Progress **In the figure, $\triangle ABC \cong \triangle LMN$.**



a. Find $m\angle N$.

b. Find LN.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

6–5 Symmetry

TEKS 8.7 The student uses geometry to model and describe the physical world. **(B) Use geometric concepts and properties to solve problems in fields such as art and architecture.**

MAIN IDEA
- Identify line symmetry and rotational symmetry.

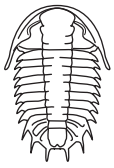
BUILD YOUR VOCABULARY (pages 144–145)

A figure has **line symmetry** if it can be folded over a line so that one half of the figure ____ the other half.

EXAMPLES Identify Line Symmetry

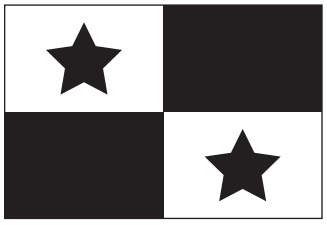
Determine whether each figure has line symmetry. If it does, draw all lines of symmetry. If not, write *none*.

1



This figure has ____ line of symmetry.

2



This figure has ____ line of symmetry.

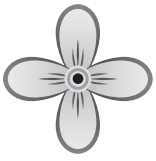
Check Your Progress

Determine whether the leaf has line symmetry. If it does, draw all lines of symmetry. If not, write *none*.

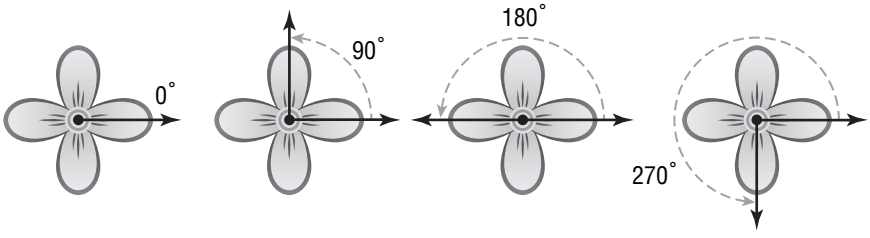
____

EXAMPLE Identify Rotational Symmetry

3 **FLOWERS** **Determine whether each flower design has rotational symmetry. Write yes or no. If yes, name its angle(s) of rotation.**



Yes, this figure has ____ symmetry. It will match itself after being rotated 90°, 180°, and ____.



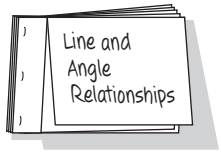
WRITE IT

How many degrees does one complete turn of a figure measure? Why is it this number of degrees?

FOLDABLES™

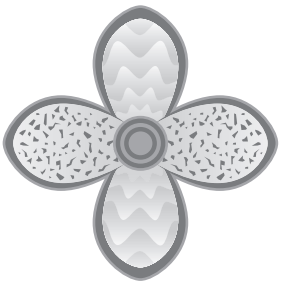
ORGANIZE IT

Use sketches and words to show lines of symmetry and line symmetry. Write this in your Foldable.

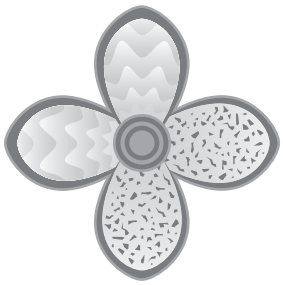


Check Your Progress **Determine whether the flower design has rotational symmetry. Write *yes* or *no*. If *yes*, name its angle(s) of rotation.**

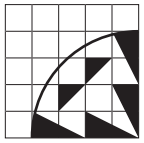
a.



b.

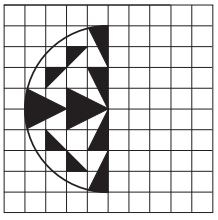


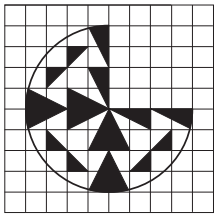
4 ARCHITECTURE **A rosette is a painted or sculptured ornament, usually circular, having designs that radiate symmetrically from the center. Copy and complete the picture of the rosette shown so that the completed figure has rotational symmetry with 90°, 180°, and 270° as its angles of rotation.**

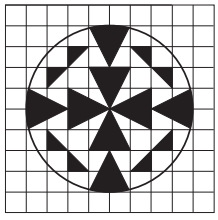


Use the procedure described above and the points indicated to rotate the figure 90°, 180°, and 270° counterclockwise. Use a 90° rotation clockwise to produce the same rotation as a 270° rotation counterclockwise.

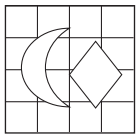
_____ counterclockwise _____ counterclockwise _____ clockwise







Check Your Progress **DESIGN** Copy and complete the figure so that the completed design has rotational symmetry with 90°, 180°, and 270° as its angles of rotation.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

6–6 Reflections

Main Idea

- Graph reflections on a coordinate plane.

Build Your Vocabulary (pages 144–145)

A **reflection** (sometimes called a *flip*) is a transformation in which a _____ image is produced by _____ a figure over a line.

Key Concept

Properties of Reflections

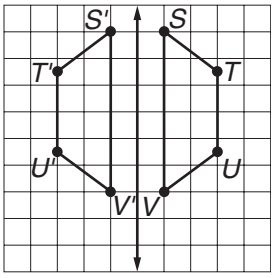
1. Every point on a reflection is the same distance from the line of reflection as the corresponding point on the original figure.
2. The image is congruent to the original figure, but the orientation of the image is *different* from that of the original figure.

TEKS 8.6 The student uses transformational geometry to develop spatial sense. **(B) Graph** dilations, **reflections**, and translations **on a coordinate plane. 8.7** The student uses geometry to model and describe the physical world. **(B) Use geometric concepts and properties to solve problems in fields such as art and architecture.**

EXAMPLE 1 **Draw a Reflection**

Draw the image of trapezoid *STUV* after a reflection over the given line.

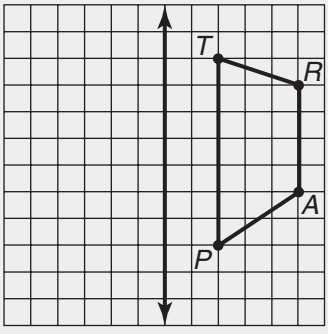
Step 1 Count the number of units between each vertex and the line of _____.



Step 2 Plot a point for each vertex the _____ distance away from the line on the other side.

Step 3 Connect the new _____ to form the image of trapezoid *STUV*, trapezoid *S′T′U′V′*.

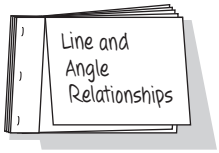
Check Your Progress Draw the image of trapezoid *TRAP* after a reflection over the given line.



FOLDABLES

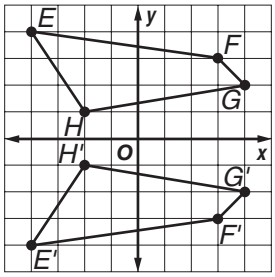
ORGANIZE IT

Draw a triangle or simple quadrilateral on graph paper. Reflect your figure over the *x*-axis. Add your work to your Foldable.



EXAMPLE **Reflect a Figure over the *x*-axis**

2 **Graph quadrilateral *EFGH* with vertices *E*(−4, 4), *F*(3, 3), *G*(4, 2), and *H*(−2, 1). Then graph the image of *EFGH* after a reflection over the *x*-axis and write the coordinates of its vertices.**



The coordinates of the vertices of the image are E' ____, F' ____, G' ____ and H' ____.

opposites
same

$E(-4, 4) \rightarrow E'(-4, -4)$

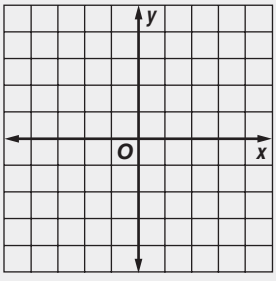
$F(3, 3) \rightarrow F'(3, -3)$

$G(4, 2) \rightarrow$ ____

$H(-2, 1) \rightarrow$ ____

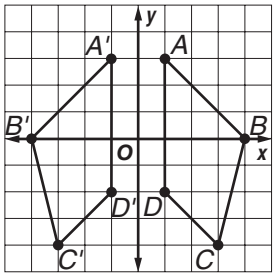
Notice that the *y*-coordinate of a point reflected over the *x*-axis is the ____ of the *y*-coordinate of the original point.

Check Your Progress Graph quadrilateral *QUAD* with vertices *Q*(2, 4), *U*(4, 1), *A*(−1, 1), and *D*(−3, 3). Then graph the image of *QUAD* after a reflection over the *x*-axis, and write the coordinates of its vertices.



EXAMPLE **Reflect a Figure over the *y*-axis**

3 **Graph trapezoid *ABCD* with vertices *A*(1, 3), *B*(4, 0), *C*(3, −4), and *D*(1, −2). Then graph the image of *ABCD* after a reflection over the *y*-axis, and write the coordinates of its vertices.**



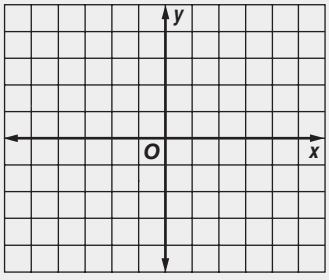
The coordinates of the vertices of the image are A' ____, B' ____, C' ____, and D' ____.

opposites
same

$A(1, 3)$	$A'(-1, 3)$
$B(4, 0)$	$B'(-4, 0)$
$C(3, -4)$	
$D(1, -2)$	

Notice that the *x*-coordinate of a point reflected over the *y*-axis is the opposite of the *x*-coordinate of the ____ point.

Check Your Progress Graph quadrilateral *ABCD* with vertices $A(2, 2)$, $B(5, 0)$, $C(4, -2)$, and $D(2, -1)$. Then graph the image of ABCD after a reflection over the *y*-axis, and write the coordinates of its vertices.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

6–7 Translations

TEKS 8.6 The student uses transformational geometry to develop spatial sense. **(B) Graph** dilations, reflections, and **translations on a coordinate plane.**

Main Idea

- Graph translations on a coordinate plane.

Build Your Vocabulary (pages 144–145)

A **translation** (sometimes called a *slide*) is the _____ of a figure from one position to another _____ turning it.

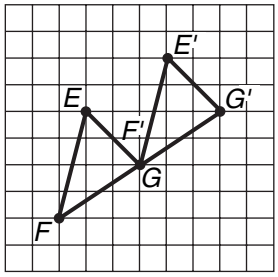
Key Concept

Properties of Translations

1. Every point on the original figure is moved the same distance and in the same direction.
2. The image is congruent to the original figure, and the orientation of the image is the same as that of the original figure.

Example 1 **Draw a Translation**

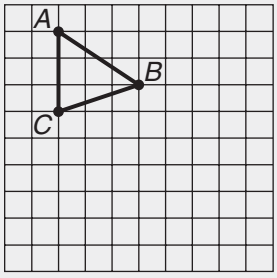
Draw the image of $\triangle EFG$ after a translation of 3 units right and 2 units up.



Step 1 Move each vertex of the triangle _____ units right and _____ units up.

Step 2 Connect the new vertices to form the _____.

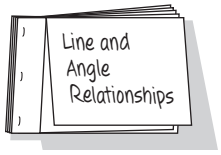
Check Your Progress Draw the image of $\triangle ABC$ after a translation of 2 units right and 4 units down.



FOLDABLES

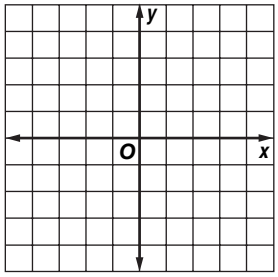
ORGANIZE IT

Draw a triangle or simple quadrilateral on graph paper. Then draw a translation. Show how you determined the points needed to graph the translated figure. Put your work in your Foldable.



EXAMPLE **Translation in the Coordinate Plane**

2 **Graph $\triangle ABC$ with vertices $A(-2, 2)$, $B(3, 4)$, and $C(4, 1)$. Then graph the image of $\triangle ABC$ after a translation of 2 units left and 5 units down. Write the coordinates of its vertices.**

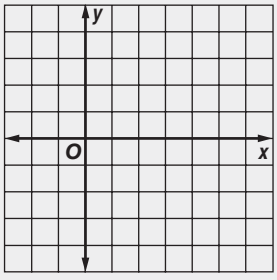


The coordinates of the vertices of the image are

A' ____, B' ____, and C' ____. Notice that these vertices can also be found by adding ____ to the x-coordinates and ____ to the y-coordinates, or $(-2, -5)$.

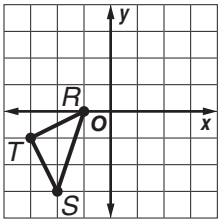
Original	Add $(-2, -5)$	Image
$A(-2, 2) \rightarrow$	$(-2 + (-2), 2 + (-5)) \rightarrow$	
$B(3, 4) \rightarrow$	$(3 + (-2), 4 + (-5)) \rightarrow$	
$C(4, 1) \rightarrow$	$(4 + (-2), 1 + (-5)) \rightarrow$	

Check Your Progress Graph $\triangle PQR$ with vertices $P(-1, 3)$, $Q(2, 4)$, and $R(3, 2)$. Then graph the image of $\triangle PQR$ after a translation of 2 units right and 3 units down. Write the coordinates of its vertices.



EXAMPLE

3 TEST EXAMPLE **If triangle *RST* is translated 4 units right and 3 units up, what are the coordinates of point *T′*?**



A (0, 3)
B (1, 2)
C (2, 1)
D (1, 1)

Read the Test Item

You are asked to find the coordinates of point T' after the original figure has been translated 4 units right and 3 units up.

Solve the Test Item

You can answer this question without translating the entire triangle.

The coordinates of point T are _____.

Original figure

The x-coordinate of T' is _____, so the same x-coordinate of T' is _____ + 4 or _____.

Translating 4 units right is the as _____ to the x-coordinate.

The y-coordinate of T is _____, so the y-coordinate of T' is _____ + 3 or _____.

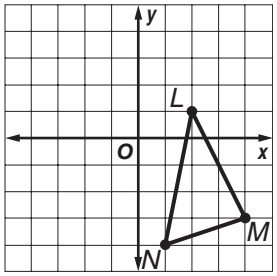
Translating 3 units up is the same as adding _____ to the y-coordinate.

The coordinates of T' are _____.

The answer is _____.

Check Your Progress

If triangle *LMN* is translated 4 units left and 2 units up, what are the coordinates of point *L′*?



F (0, −1)
G (−3, 2)
H (−1, −4)
J (−2, 3)

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

CHAPTER 6

BRINGING IT ALL TOGETHER

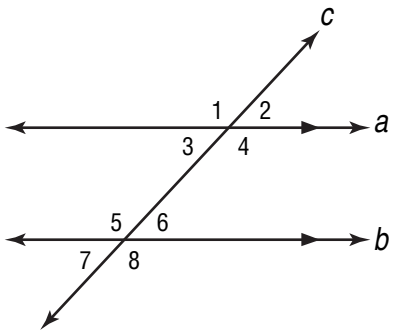
STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 6 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 6, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 144–145*) to help you solve the puzzle.

6-1 Line and Angle Relationships

For Questions 1–3, use the figure at the right.

1. Look at ∠5 and ∠6. Classify the angle pair using all names that apply.



2. Find $m\angle 3$ if $m\angle 2 = 60°$.

3. Find $m\angle 4$ if $m\angle 2 = 60°$.

6-2 Problem-Solving Investigation: Use Logical Reasoning

4. **BASKETBALL** Juan, Dallas, and Scott play guard, forward, and center on a team, but not necessarily in that order. Juan and the center drove Scott to practice on Saturday. Juan does not play guard. Who is the guard?

6-3

Polygons and Angles

Find the sum of the measures of the interior angles of each polygon.

5. heptagon

6. nonagon

7. 15-gon

Find the measure of one interior angle in each regular polygon.

8. hexagon

9. decagon

10. 18-gon

6-4

Congruent Polygons

11. Complete the sentence. Two polygons are congruent if their _____ sides are congruent and the corresponding angles are _____.

***△ABC* ≅ *△EDF*. *m∠A* = 40° and *m∠B* = 50°. *∠E* ≅ *∠A* and *∠F* ≅ *∠C*.**

12. What is $m\angle C$?

13. What is $m\angle D$?

6-5

Symmetry

Write whether each sentence is *true* or *false*. If *false*, replace the underlined words to make a true sentence.

14. A figure has line symmetry if it can be folded over a line so that one half of the figure matches the other half.

15. To rotate a figure means to turn the figure from its center.

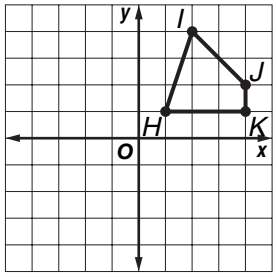
16. A figure has rotational symmetry if it first matches itself after being rotated exactly 360°.

6-6

Reflections

17. Complete. A reflection is a _____ image of a figure produced by flipping the figure over a line.

18. If you graphed quadrilateral *HIJK* reflected over the *y*-axis, what would be the coordinates of these vertices:



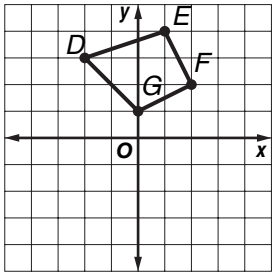
$H'($ _____ $)$ $J'($ _____ $)$

6-7

Translations

19. Complete. A translation is the movement of a figure from one position to another _____ turning it.

20. If you graphed the image of quadrilateral *DEFG* after a translation 3 units right and 4 units down, what would be the coordinates of these vertices:



$D'($ _____ $)$ $F'($ _____ $)$

CHAPTER 6 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 6.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want take the Chapter 6 Practice Test on page 347 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 6 Study Guide and Review on pages 342–346 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 6 Practice Test on page 347.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 6 Foldable.
- Then complete the Chapter 6 Study Guide and Review on pages 342–346 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 6 Practice Test on page 347.

Student Signature

Parent/Guardian Signature

Teacher Signature

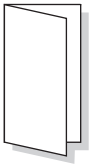
CHAPTER 7

Geometry: Measuring Area and Volume

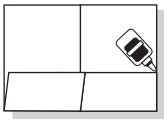
FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with a plain piece of 8 $\frac{1}{2}$" × 11" paper.

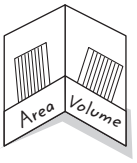
STEP 1 **Fold** in half widthwise.



STEP 2 **Open** and fold the bottom to form a pocket. Glue edges.



STEP 3 **Label** each pocket. Place several index cards in each pocket.



NOTE-TAKING TIP: As you read and learn a new concept, such as how to measure area or volume, write examples and explanations showing the main ideas of the concept.

CHAPTER 7

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 7. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
base			
center			
circumference			
composite figure			
cone			
cylinder			
diameter			
edge			
face			
lateral face			
lateral surface area			
net			

(continued on the next page)

Vocabulary Term	Found on Page	Definition	Description or Example
pi			
plane			
prism			
pyramid			
radius			
regular pyramid			
similar solids			
slant height			
sphere			
total surface area			
vertex			
volume			

7–1 Circumference and Area of Circles

Reinforcement of TEKS 7.9 The student solves application problems involving estimation and measurement. **(A) Estimate measurements and solve application problems involving length (including circumference) and area of polygons and other shapes.** *Also addresses TEKS 8.10(A).*

Main Idea

- Find the circumference and the area of circles.

Build Your Vocabulary (pages 167–168)

The **radius** of a circle is the distance from the _____ to any point _____ the circle.

The **diameter** of a circle is the _____ the circle through the center.

The **circumference** of a circle is the _____ the circle.

Key Concepts

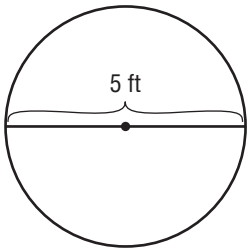
Circumference of a Circle The circumference C of a circle is equal to its diameter d times π, or 2 times its radius r times π.

Area of a Circle The area A of a circle is equal to π times the square of the radius r.

Examples Find the Circumferences of Circles

Find the circumference of each circle. Round to the nearest tenth.

1



$C =$ _____ Circumference of a circle

$C =$ _____ $\cdot$ _____ Replace d with _____.

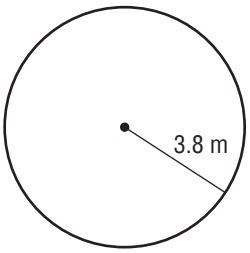
$C =$ _____ This is the *exact* circumference.

Use a calculator to find 5π.

5 [×] [π] [ENTER] 15.70796327

The circumference is about _____.

2



$C =$ _____ Circumference of a circle

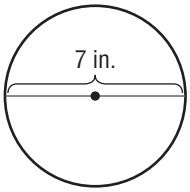
$C = 2 \cdot \pi \cdot$ _____ Replace r with _____.

$C \approx$ _____ Use a calculator.

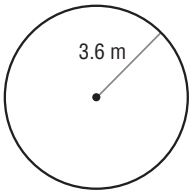
The circumference is about _____.

Check Your Progress **Find the circumference of each circle. Round to the nearest tenth.**

a.



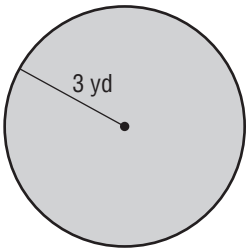
b.



EXAMPLES **Find the Areas of Circles**

Find the area of each circle. Round to the nearest tenth.

3



$A =$ ☐ Area of a circle

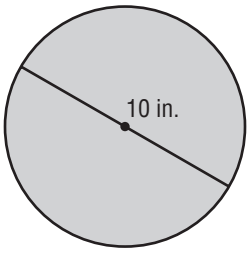
$A = \pi \cdot$ ☐^{2} Replace r with ☐.

$A = \pi \cdot$ ☐ Evaluate 3^2.

$A \approx$ ☐ Use a calculator.

The area is about ☐.

4



$A = \pi r^2$ Area of a circle

$A = \pi \cdot$ ☐^{2} $r = \frac{1}{2}$ of 10

$A = \pi \cdot$ ☐ Evaluate 5^2.

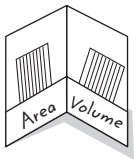
$A \approx$ ☐ Use a calculator.

The area is about ☐.

FOLDABLES

ORGANIZE IT

On index cards, write the formulas for finding the circumference and area of a circle. Sketch a circle and label its parts. Place your cards in the "Area" pocket of your Foldable.



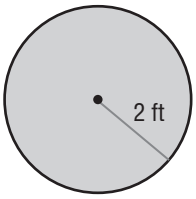
HOMEWORK ASSIGNMENT

Page(s):

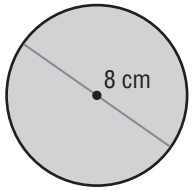
Exercises:

Check Your Progress **Find the area of each circle. Round to the nearest tenth.**

a.



b.



7–2 Problem-Solving Investigation: Solve a Simpler Problem

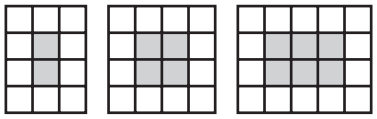
EXAMPLE

MAIN IDEA

- Solve problems by solving a simpler problem.

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(C) Select or develop an appropriate problem-solving strategy from a variety of different types, including …working a simpler problem… to solve a problem.**

GARDENS **A series of gardens framed by tiles is arranged such that each successive garden is one tile longer than the previous garden. The width of the gardens is four tiles. The first three gardens are shown below. How many tiles surround Garden 10?**



Garden 1 Garden 2 Garden 3

EXPLORE You know how many tiles surround the first three gardens. Use this information to predict how many tiles will surround Garden 10.

PLAN It would take a long time to draw each of the gardens 1 through 10. Instead, find the number of tiles surrounding the smaller gardens and look for a pattern.

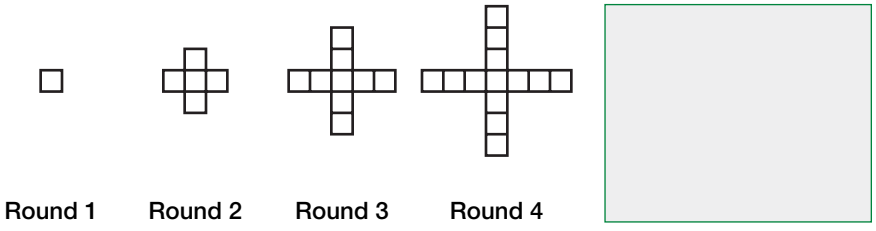
SOLVE

Garden	1	2	3	4
Surrounding Tiles	10	12	14	16
		+2	+2	+2

For each successive garden, ____ additional tiles are needed to surround it. The 10th garden will have 16 + 2 + 2 + 2 + 2 + 2 + 2 or ____ tiles.

CHECK Check your answer by drawing Garden 10.

Check Your Progress **GAMES** The figures below show the number of tiles on a game board after the first 4 rounds of the game. Each round, the same number of tiles are added to the board. How many tiles will be on the board after the 12th round?



Round 1 Round 2 Round 3 Round 4

7–3 Area of Composite Figures

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(A) Identify and apply mathematics to everyday experiences,** to activities in and outside of school, with other disciplines, and with other mathematical topics.

MAIN IDEA
- Find the area of composite figures.

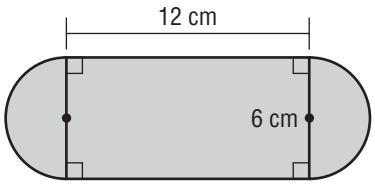
BUILD YOUR VOCABULARY (pages 167–168)

A **composite figure** is made up of ____ shapes.

EXAMPLES **Find the Areas of a Composite Figure**

Find the area of each composite figure. Round to the nearest tenth if necessary.

1



The figure can be separated into two ____ and a ____.

Area of one semicircle

$A = \frac{1}{2}\pi r^2$

$A =$ ____

$A =$ ____

Area of triangle

$A = \ell w$

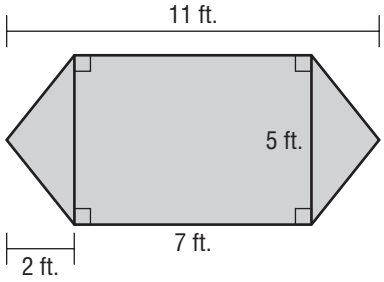
$A =$ ____

$A =$ ____

The area of the garden is 14.1 + ____ + ____ or 100.3 square centimeters.

Check Your Progress Find the area of the composite figure. Round to the nearest tenth if necessary.

2 GARDENING **The dimensions of a flower garden are shown. What is the area of the garden?**



The garden can be separated into a ____ and two congruent ____.

Area of rectangle

$A = \ell w$

$A =$ ____

$A =$ ____

Area of one triangle

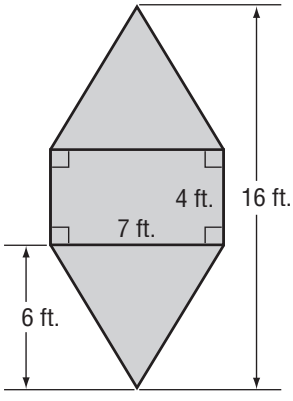
$A = \frac{1}{2}bh$

$A =$ ____

$A =$ ____

The area of the garden is ____ + ____ + ____ or ____ square feet.

Check Your Progress **GARDENING** The dimensions of a flower garden are shown. What is the area of the garden?



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

7–4 Three-Dimensional Figures

TEKS 8.7 The student uses geometry to model and describe the physical world.
(A) Draw three-dimensional figures from different perspectives.

MAIN IDEA

- Identify and draw three-dimensional figures.

BUILD YOUR VOCABULARY (pages 167–168)

A **polyhedron** is a solid with _____ surfaces that are _____.

An **edge** is where two planes _____ in a line.

A **face** is a _____ surface.

A **vertex** is where three or more planes _____ at a point.

A **prism** is a polyhedron with two _____ faces, or bases.

A **pyramid** is a polyhedron with one base that is a _____ and faces that are _____.

KEY CONCEPT

Common Polyhedrons

triangular prism

rectangular prism

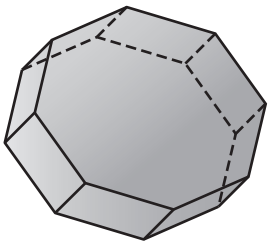
triangular pyramid

rectangular pyramid

EXAMPLES Identify Prisms and Pyramids

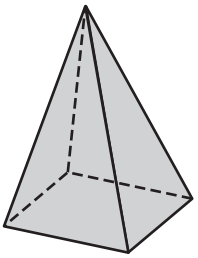
Identify each solid. Name the number and shapes of the faces. Then name the number of edges and vertices.

1



The figure has two parallel _____ bases that are _____, so it is an _____ prism. The other faces are rectangles. It has a total of _____ faces, _____ edges, and _____ vertices.

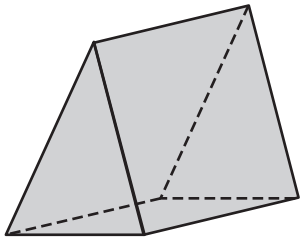
2



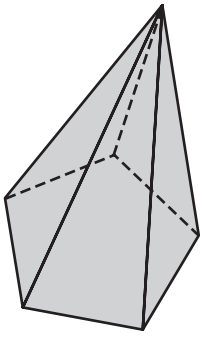
The figure has one base that is a _____, so it is a _____. The other faces are triangles. It has a total of _____ faces, _____ edges, and _____ vertices.

Check Your Progress **Identify each solid. Name the number and shapes of the faces. Then name the number of edges and vertices.**

a.

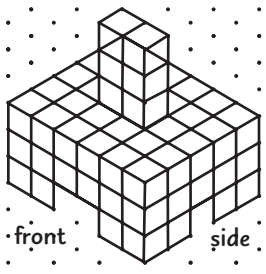


b.

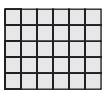


EXAMPLES **Analyze Real-Life Drawings**

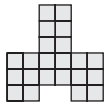
ARCHITECTURE **The plans for a hotel fireplace are shown at the right.**



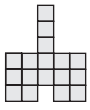
3 **Draw and label the top, front, and side views.**



_____ view



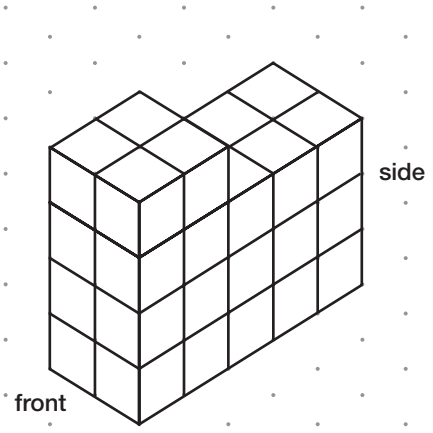
_____ view



_____ view

Check Your Progress

The plans for a building are shown to the right. Draw and label the top, front, and side views.



EXAMPLE

4 **The top-count view of a three-dimensional figure is shown below. Draw the figure on isometric dot paper.**

		2
		1
2	3	1

The greatest number on the top-count view is ____. Therefore, the height of the solid is ____, and it has ____ layers. Draw each layer one at a time, adding the appropriate number of cubes.

Check Your Progress

The top-count view of a three-dimensional figure is shown. Draw the figure on isometric dot paper.

4	3	2
2	2	2
1		

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

7–5 Volume of Prisms and Cylinders

TEKS 8.8 The student uses procedures to determine measures of three-dimensional figures. **(B) Connect models of prisms, cylinders,** pyramids, spheres, and cones **to formulas for volume of these objects. (C) Estimate measurements and use formulas to solve application problems involving** lateral and total surface area and **volume**. *Also addresses TEKS 8.10(B).*

MAIN IDEA

- Find the volumes of prisms and cylinders.

BUILD YOUR VOCABULARY (pages 167–168)

Volume is the measure of the ____ occupied by a solid. Volume is measured in cubic units.

KEY CONCEPT

Volume of a Prism The volume V of a prism is the area of the base B times the height h.

EXAMPLE **Find the Volume of a Rectangular Prism**

1 **Find the volume of the prism.**

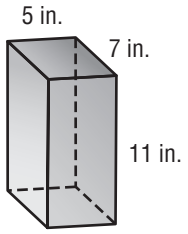
$V = Bh$ Volume of a prism

$V = (\quad)h$ The base is a rectangle, so $B =$ ____.

$V = (5 \cdot 7)11$ $\ell = 5$, $w = 7$, $h = 11$

$V =$ ____ Simplify.

The volume is 385 ____ inches.



EXAMPLE **Find the Volume of a Triangular Prism**

2 **Find the volume of the prism.**

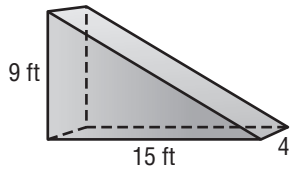
$V = Bh$ Volume of a prism

$V = \left(\frac{1}{2} \cdot 9 \cdot 15\right)h$ The base is a ____, so $B = \frac{1}{2} \cdot 9 \cdot 15$.

$V = \left(\frac{1}{2} \cdot 9 \cdot 15\right)4$ The height of the prism is ____.

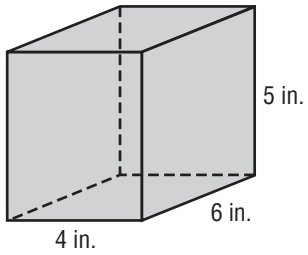
$V =$ ____ Simplify.

The volume is ____ cubic inches.

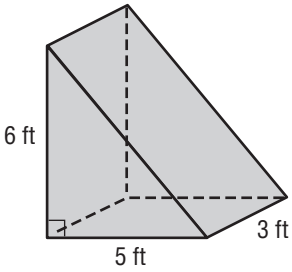


Check Your Progress **Find the volume of each prism.**

a.



b.



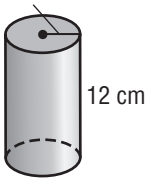
BUILD YOUR VOCABULARY (pages 167–168)

A **cylinder** is a solid whose bases are congruent, parallel, ____, connected with a ____ side.

EXAMPLE **Find the Volumes of Cylinders**

Find the volume of each cylinder. Round to the nearest tenth if necessary.

3



$V = \pi r^2 h$ Volume of a cylinder

$V = \pi \cdot$ ____$^2 \cdot$ ____ $r =$ ____, $h =$ ____

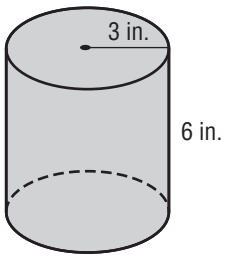
$V \approx$ ____ Simplify.

The volume is about 339.3 ____ centimeters.

KEY CONCEPT

Volume of a Cylinder The volume V of a cylinder with radius r is the area of the base B times the height h.

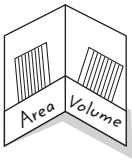
Check Your Progress Find the volume of the cylinder. Round to the nearest tenth if necessary.



FOLDABLES

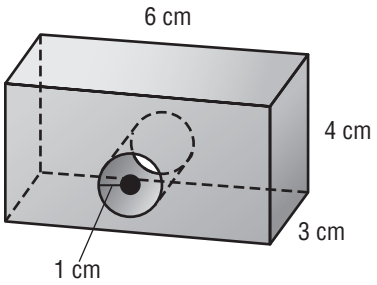
ORGANIZE IT

On index cards, write the formula for the volume of a rectangular prism, a triangular prism, and a cylinder. Sketch each figure and label its parts. Place your cards in the "Volume" pocket of your Foldable.



EXAMPLE **Find the Volume of a Complex Solid**

4 **TOYS** **A wooden block has a single hole drilled entirely though it. What is the volume of the block? Round to the nearest hundredth.**



The block is a rectangular prism with a cylindrical hole.

To find the volume of the block, _____ the volume of the _____ from the volume of the _____.

Rectangular Prism

$V =$ _____

$V = (6 \cdot 3)4$ or 72

Cylinder

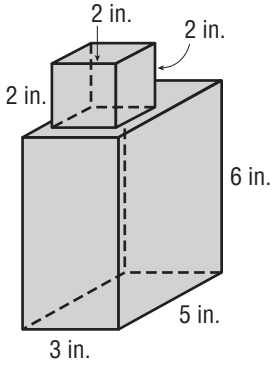
$V =$ _____

$V = \pi(1)^2(3)$ or 9.42

The volume of the box is about _____ – _____ or _____ cubic centimeters.

Check Your Progress

A small wooden cube has been glued to a larger wooden block for a whittling project. What is the volume of the wood to be whittled?



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

7–6 Volume of Pyramids, Cones, and Spheres

MAIN IDEA

- Find the volumes of pyramids and cones.

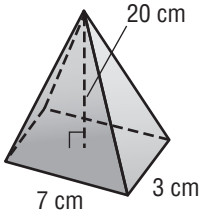
KEY CONCEPT

Volume of a Pyramid
The volume V of a pyramid is one-third the area of the base B times the height h.

TEKS 8.8 The student uses procedures to determine measures of three-dimensional figures. **(B) Connect models of** prisms, cylinders, **pyramids, spheres, and cones to formulas for volume of these objects. (C) Estimate measurements and use formulas to solve application problems involving** lateral and total surface area and **volume**. *Also addresses TEKS 8.10(B).*

EXAMPLE Find the Volume of the Pyramid.

1 **Find the volume of the pyramid.**



$V = \frac{1}{3}Bh$ Volume of a pyramid

$V = \frac{1}{3}\left(\square \cdot \square\right)\square$ $B = \square \cdot \square$,

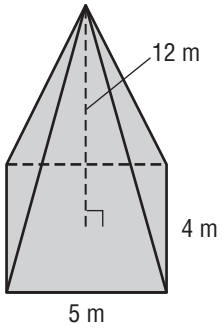
$h = \square$

$V = 140$ Simplify.

The volume is $\square$.

Check Your Progress

Find the volume of the pyramid.



$\square$

EXAMPLE Use Volume to Solve a Problem

2 **SOUVENIRS** **A novelty souvenir company wants to make snow globes shaped like a pyramid. It decides that the most cost-effective maximum volume of water for the pyramids is 12 cubic inches. If a pyramid globe measures 4 inches in height, find the area of its base.**

$V = \frac{1}{3}Bh$ Volume of a pyramid

$\square = \frac{1}{3} \cdot B \cdot 4$ Replace V with $\square$ and h with $\square$.

$12 = \frac{4}{3} \cdot B$ Simplify.

$\square \cdot 12 = \square \cdot \frac{4}{3} \cdot B$ Multiply each side by $\square$.

$\square = B$

The area of the base of the snow globe is $\square$.

Check Your Progress A company is designing pyramid shaped building blocks with a square base. They want the volume of the blocks to be 18 cubic inches. If the length of the side of the base is 3 inches, what should be the height of the blocks?

KEY CONCEPT

Volume of a Cone
The volume V of a cone with radius r is one-third the area of the base B times the height h.

BUILD YOUR VOCABULARY (pages 167–168)

A **cone** is a three-dimensional figure with one _____ base. A curved surface connects the base and the _____.

EXAMPLE **Find the Volume of a Cone**

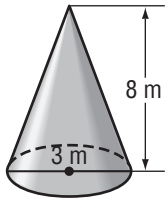
3 **Find the volume of the cone. Round to the nearest tenth.**

$V = \frac{1}{3}\pi r^2 h$ Volume of a cone

$V = \frac{1}{3} \cdot \pi \cdot$ _____$^2 \cdot$ _____ Replace r with _____

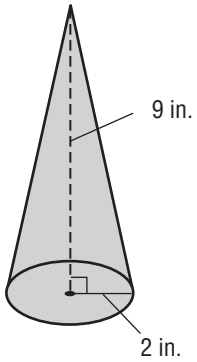
and h with _____.

$V \approx$ _____ Simplify.



The volume is _____.

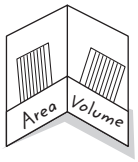
Check Your Progress Find the volume of the cone. Round to the nearest tenth.



FOLDABLES

ORGANIZE IT

On index cards, write the formula for the volume of a pyramid and a cone. Sketch each figure and label its parts. Place your cards in the "Volume" pocket of your Foldable.



EXAMPLE

4 GLOBES **A school principal purchased a new globe for each classroom in the school. The radius of each globe was 6 inches. What is the volume of each globe? Round to the nearest tenth.**

$V = \frac{4}{3}\pi r^3$ Volume of a sphere

$V = \frac{4}{3}\pi$ $\square^3$ Replace r with $\square$.

$V \approx \square$ Simplify.

The volume of each globe is about $\square$ cubic inches.

Check Your Progress **SPORTS** The diameter of a tennis ball is 6.5 centimeters. What is the volume of a tennis ball? Round to the nearest tenth.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

7–7

Surface Area of Prisms and Cylinders

TEKS 8.8 The student uses procedures to determine measures of three-dimensional figures. **(A) Find lateral and total surface area of prisms,** pyramids, **and cylinders using concrete models and nets (two-dimensional models). (C) Estimate measurements and use formulas to solve application problems involving lateral and total surface area** and volume.

BUILD YOUR VOCABULARY (pages 167–168)

The **surface area** of a solid is the _____ of the _____ of all its _____, or faces.

MAIN IDEA

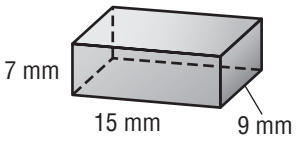
- Find the surface areas of prisms and cylinders.

KEY CONCEPT

Surface Area of a Rectangular Prism The surface area S of a rectangular prism with length ℓ, width w, and height h is the sum of the areas of the faces.

EXAMPLE **Surface Area of a Rectangular Prism**

1 **Find the lateral and total surface area of the rectangular prism.**



Perimeter of Base

$P = 2\ell + 2w$

$P = 2$ _____ $+ 2$ _____ or _____

Area of Base

$B = \ell w$

$B =$ _____ $\cdot$ _____ or _____

Use this information to find the lateral and total surface area.

Lateral Surface Area

$L = Ph$

$L = 48$ _____ or _____

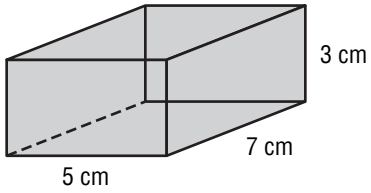
Total Surface Area

$S = L + 2B$

$S =$ _____ $+ 2 \cdot$ _____ or _____

The lateral surface area is _____, and the total surface area is _____.

Check Your Progress Find the total surface area of the rectangular prism.



_____

REVIEW IT

What is the formula for finding the area of a triangle? How does this relate to finding the surface area of a triangular prism? *(Lesson 7-1)*

_____

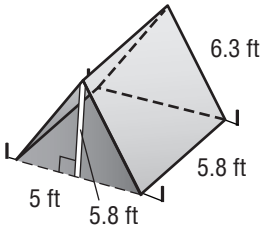
_____

_____

_____

EXAMPLE **Surface Area of a Triangular Prism**

2 CAMPING **A family wants to reinforce the fabric of its tent with a waterproofing treatment. Find the surface area, including the floor, of the tent below.**



A triangular prism consists of two congruent [ ] faces and three [ ] faces.

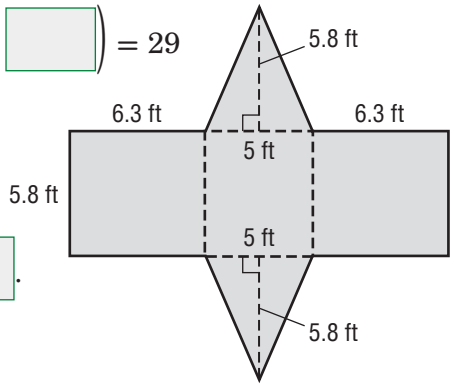
Draw and label a net of this prism. Find the area of each face.

bottom [ ] · [ ] = 29

left side [ ] · [ ] = 36.54

right side [ ] · [ ] = 36.54

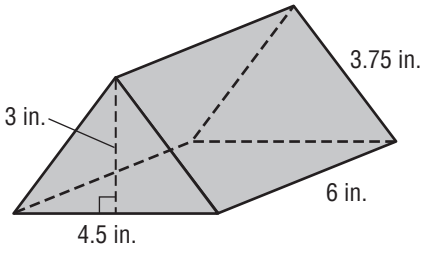
two bases $2\left(\frac{1}{2} \cdot 5 \cdot [\ ]\right) = 29$



The surface area of the tent is 29 + 36.54 + 36.54 + 29

or about [ ].

Check Your Progress Julia is painting triangular prisms to use as decoration in her garden. Find the surface area of the prism.

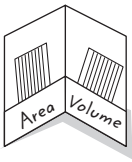


[ ]

FOLDABLES™

ORGANIZE IT

On index cards, write these formulas for finding surface area. Then sketch and label each figure. Place the cards in the "Area" pocket of your Foldable.

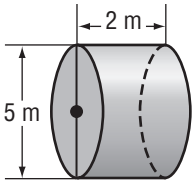


EXAMPLE Surface Area of a Cylinder

KEY CONCEPT

Surface Area of a Cylinder The surface area S of a cylinder with height h and radius r is the area of the two bases plus the area of the curved surface.

3 **Find the lateral area and the surface area of the cylinder. Round to the nearest tenth.**



Lateral Surface Area

$L = 2\pi rh$

$L = 2\pi$ ____

$L =$ ____

Total Surface Area

$S = L + 2\pi r^2$

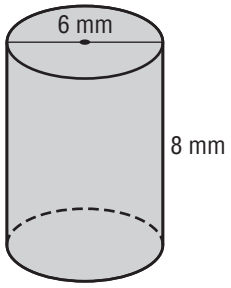
$S \approx$ ____ $+ 2\pi$ ____

$S \approx$ ____

The lateral surface area is about ____,

and the total surface area is about ____.

Check Your Progress Find the total surface area of the cylinder. Round to the nearest tenth.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

7–8 Surface Area of Pyramids

MAIN IDEA

- Find the surface areas of pyramids and cones.

BUILD YOUR VOCABULARY (pages 167–168)

The _____ of a pyramid are called **lateral faces.**

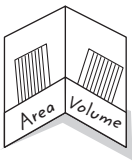
The altitude or _____ of each _____ is called the **slant height.**

The sum of the _____ of the _____ is the **lateral area.**

FOLDABLES

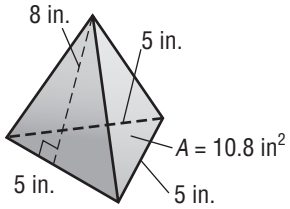
ORGANIZE IT

On a card, write the formula for finding the surface area of a pyramid. Then sketch a pyramid and label the parts. Place the card in the "Area" pocket of your Foldable.



TEKS 8.8 The student uses procedures to determine measures of three-dimensional figures. **(A) Find lateral and total surface area of** prisms, **pyramids,** and cylinders **using concrete models and nets (two-dimensional models). (C) Estimate measurements and use formulas to solve application problems involving lateral and total surface area** and volume. *Also addresses TEKS 8.10(B).*

EXAMPLE **Surface Area of a Pyramid**



1 **Find the lateral and total surface areas of the triangular pyramid.**

Find the lateral area and the area of the base.

Area of each lateral face

$A =$ _____ Area of a triangle

$A = \frac{1}{2}($_____$)($_____$)$ or _____ Replace b with _____ and h with _____.

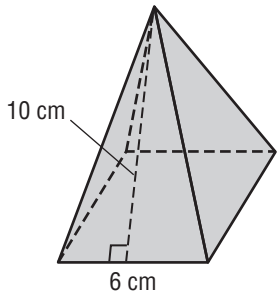
There are 3 faces, so the lateral area is 3(_____) or _____ square inches.

Area of base

$A =$ _____

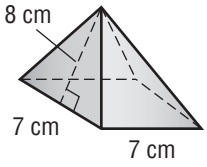
The total surface area of the pyramid is _____ + _____ or _____ square inches.

Check Your Progress Find the total surface area of the square pyramid.



EXAMPLE

2 TOYS **A toy block has the shape of a regular pyramid with a square base. The manufacturer wants to paint the lateral surface green. How many square centimeters will be painted green?**



$L = \frac{1}{2}P\ell$ Lateral surface area of a pyramid

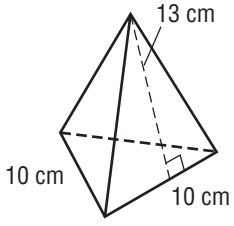
$L = \frac{1}{2}$ ____ $P =$ ____ and $\ell = 8$

$L =$ ____ Simplify.

The lateral surface area is ____.

Check Your Progress

TOYS A toy block has the shape of a regular pyramid with a square base. The manufacturer wants to paint the lateral surface green. How many square centimeters will be painted green?



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

7–9 Similar Solids

MAIN IDEA

- Find dimensions, surface area, and volume of similar solids.

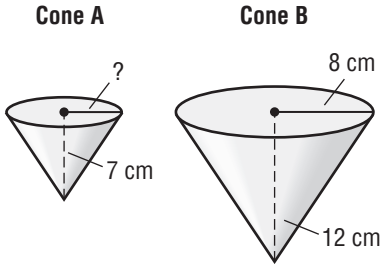
KEY CONCEPT

If the scale factor of the linear measures of two similar solids is $\frac{a}{b}$, then the scale factor of their surface areas is $\left(\frac{a}{b}\right)^2$ and the scale factor of their volumes is $\left(\frac{a}{b}\right)^3$.

EXAMPLE **Find Missing Linear Measures**

1 **These cones are similar. What is the radius of Cone A to the nearest tenth?**

Since the two cones are similar, the ratios of their corresponding linear measures are proportional.



Words $\frac{\text{radius cone A}}{\text{radius cone B}}$ is proportional to $\frac{\text{height cone A}}{\text{height cone B}}$

Variable Let r represent the radius of cone A.

Equation $\frac{\square}{\square} = \frac{\square}{\square}$

$\frac{\square}{\square} = \frac{\square}{\square}$ Write the proportion.

$r \cdot 12 = \square$ Find the cross products.

$12r = 56$ Multiply.

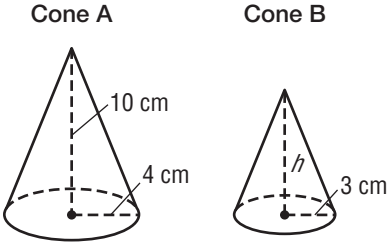
$\frac{12r}{\square} = \frac{56}{\square}$ Divide each side by $\square$.

$r \approx \square$ Simplify.

The radius of cone A is about $\square$.

Check Your Progress

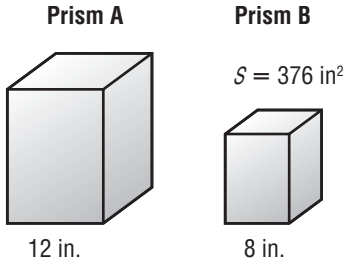
These cones are similar. What is the height of Cone B to the nearest tenth?



TEKS 8.9 The student uses indirect measurement to solve problems. **(B) Use proportional relationships in** similar two-dimensional figures or **similar three-dimensional figures to find missing measurements. 8.10** The student describes how changes in dimensions affect linear, area, and volume measures. **(B) Describe the resulting effect on volume when dimensions of a solid are changed proportionally.** *Also addresses TEKS 8.14(D).*

EXAMPLE **Find Surface Area of a Similar Solid**

2 **These rectangular prisms are similar. Find the total surface area of Prism A.**



The ratio of the measures of Prism A to Prism B is $\frac{12}{8}$ or $\frac{3}{2}$.

$\frac{\text{surface area of prism A}}{\text{surface area of prism B}} = \left(\frac{a}{b}\right)^2$ Write a proportion.

$\frac{\square}{\square} = \frac{\square}{\square}$ Substitute the known values.

$\frac{\square}{\square} = \frac{\square}{\square}$ Simplify.

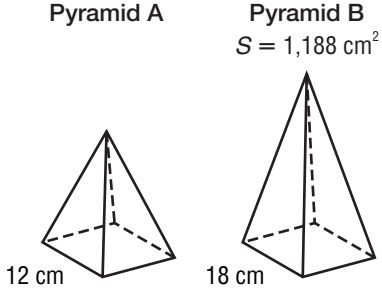
$\square \cdot \square = \square \cdot \square$ Find the cross products.

$\square = \square$ Divide each side by $\square$.

$S = \square$ Simplify.

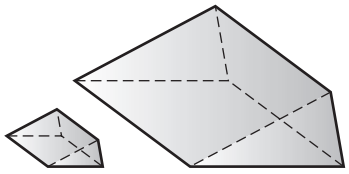
The surface area of Prism A is $\square$.

Check Your Progress These square pyramids are similar. Find the total surface area of Prism A.



EXAMPLE

3 TEST EXAMPLE **A triangular prism has a volume of 12 cubic centimeters. Suppose the dimensions are tripled. What is the volume of the new prism?**



A 36 cm^3 **C** 324 cm^3

B 96 cm^3 **D** 1,728 cm^3

Read the Test Item

You know that the prisms are similar, the ratio of the side lengths ☐ is ☐, and the volume of the smaller prism is 12 cubic centimeters.

Solve the Test Item

Since the volumes of similar solids have a ratio of $\left(\frac{a}{b}\right)^3$ and $\frac{a}{b} = 13$, replace a with ☐ and b with ☐ in $\left(\frac{a}{b}\right)^3$.

$\frac{\text{volume of smaller prism}}{\text{volume of larger prism}} = \left(\frac{a}{b}\right)^3$ Write a proportion.

$\frac{\square}{} = \left(\frac{1}{3}\right)^3$ Substitute known values.

$\square \cdot \square = \square \cdot \square$ Find the cross products.

$\square = V$ Simplify.

So, the volume of the larger prism is ☐. The answer is ☐.

Check Your Progress **TEST EXAMPLE** A hexagonal prism has a volume of 25 cubic inches. Suppose the dimensions are tripled. What is the volume of the new prism?

A 75 $in.^3$ **C** 200 $in.^3$

B 120 $in.^3$ **D** 675 $in.^3$

HOMEWORK ASSIGNMENT

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CHAPTER 7

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 7 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 7, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 167–168*) to help you solve the puzzle.

7-1 Circumference and Area of Circles

Complete.

1. The distance from the center of a circle to any point on the circle is called the _____, while the distance around the circle is called the _____.

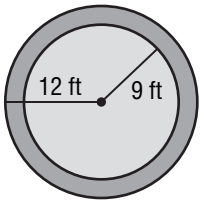
Find the circumference and area of each circle. Round to the nearest tenth.

2. The radius is 14 miles.

3. The diameter is 17.4 in^2.

7-2 Problem-Solving Investigation: Solve a Simpler Problem

4. **LANDSCAPING** Laura is helping her father make a circular walkway around a flower bed as shown. What is the area, in square feet, of the walkway?



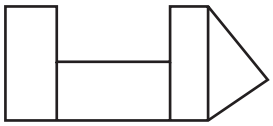
7-3

Area of Complex Figures

5. What is a complex figure?

6. What is the first step in finding the area of a complex figure?

7. Explain how to divide up the figure shown.



7-4

Three-Dimensional Figures

Match each description with the word it describes.

8. a flat surface

9. a polyhedron with one base that is a polygon and faces that are triangles

10. where three or more planes intersect at a point

11. where two planes intersect in a line

12. a polyhedron with two parallel, congruent faces

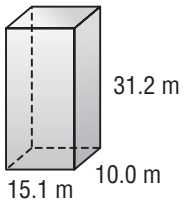
a. vertex
b. edge
c. face
d. base
e. prism
f. pyramid

7-5

Volume of Prisms and Cylinders

Find the volume of each solid. Round to the nearest tenth if necessary.

13.



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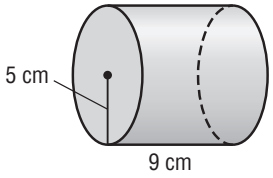

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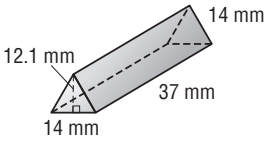
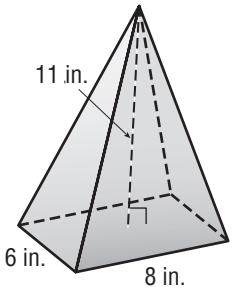


7-6

Volume of Pyramids and Cones

16. Fill in the table about what you know from the diagram. Then complete the volume of the pyramid.



length of rectangle	
width of rectangle	
area of base	
height of pyramid	
volume of pyramid	

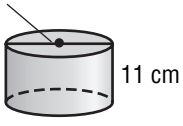
7-7

Surface Area of Prisms and Cylinders

17. Complete the sentence with the correct numbers. When you draw a net of a triangular prism, there are ____ congruent triangular faces and ____ rectangular faces.

18. If you unroll a cylinder, what does the net look like?

19. Find the surface area of the cylinder. Round the nearest tenth.



7-8

Surface Area of Pyramids and Cones

20. Complete the steps in finding the surface area of a square pyramid.

Area of each lateral face

$A = \frac{1}{2}bh$ ____

$A = \frac{1}{2}(9)(16)$ ____

$A = 72$ ____

There are ____ faces, so the lateral area is $4(72) =$ ____ square inches.

Area of base

$A = s^2$ ____

$A = 9^2$ or 81 ____

The surface area of the square pyramid is ____ + ____ or ____ square inches.

21. What two areas are needed to calculate the surface area of a cone?

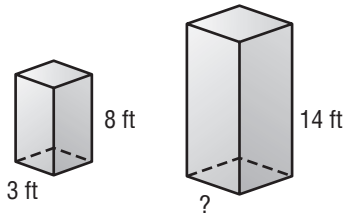
____

7-9

Similar Solids

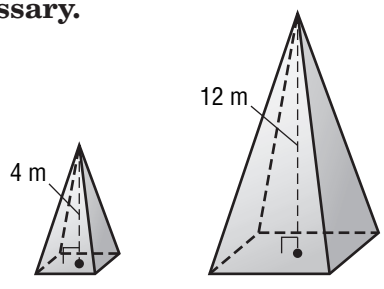
Find the missing measure for each pair of similar solids. Round to the nearest tenth if necessary.

22.



____

23.



____

CHAPTER 7 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 7.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 7 Practice Test on page 409 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 7 Study Guide and Review on pages 405–408 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 7 Practice Test on page 409.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 7 Foldable.
- Then complete the Chapter 7 Study Guide and Review on pages 405–408 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 7 Practice Test on page 409.

Student Signature

Parent/Guardian Signature

Teacher Signature

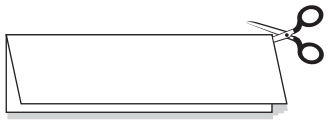
CHAPTER 8

Probability

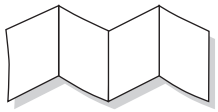
FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with a plain sheet of 11" × 17" paper.

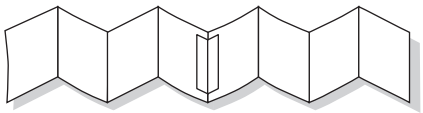
STEP 1 **Fold** the sheet in half lengthwise. Cut along the fold.



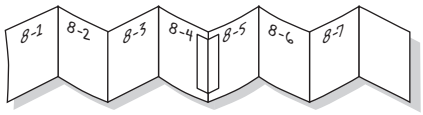
STEP 2 **Fold** each half in quarters along the width.



STEP 3 **Unfold** each piece and tape to form one long piece.



STEP 4 **Label** each page with the lesson number as shown. Refold to form a booklet.



NOTE-TAKING TIP: It helps to take notes as you progress through studying a subject. New concepts often build upon concepts you have just learned in a previous lesson. If you take notes as you go, you will know what you need to know for the concept you are now learning.

CHAPTER 8

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 8. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
biased sample			
combination			
composite experiment			
convenience sample			
dependent events			
event			
experimental probability			
Fundamental Counting Principle			
independent events			
outcome			

(continued on the next page)

Vocabulary Term	Found on Page	Definition	Description or Example
permutation			
population			
probability			
random			
sample			
sample space			
simple random sample			
simulation			
stratified random sample			
systematic random sample			
theoretical probability			
tree diagram			
unbiased sample			
voluntary response sample			

8–1 Counting Outcomes

Reinforcement of TEKS 7.10 The student recognizes that a physical or mathematical model can be used to describe the experimental and theoretical probability of real-life events. **(A) Construct sample spaces for** simple or **composite experiments.** *Also addresses TEKS 8.15(A).*

MAIN IDEA

- Count outcomes by using a tree diagram or the Fundamental Counting Principle.

BUILD YOUR VOCABULARY (pages 197–198)

A **tree diagram** is a diagram used to show the _____ number of _____ in a probability experiment.

The **Fundamental Counting Principle** uses _____ of the number of ways each event in an experiment can occur to find the number of _____ in a sample space.

WRITE IT

How is using a tree diagram to find total number of outcomes like using a factor tree to find prime factors? (see factor trees in Prerequisite Skills page 682)

_____

_____

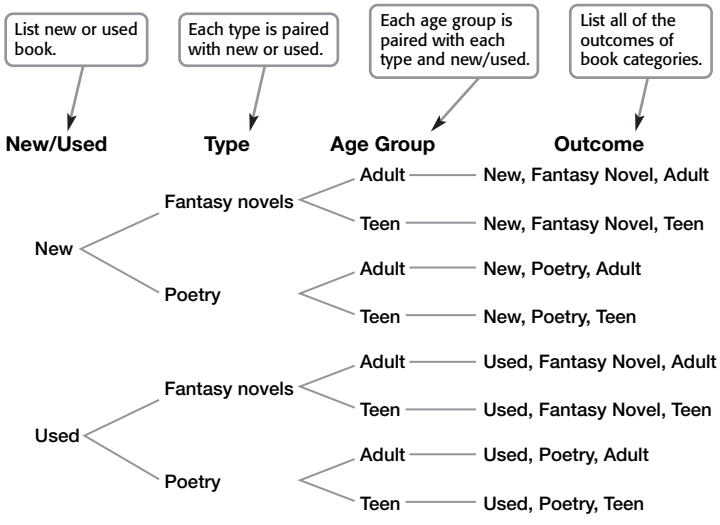
_____

_____

_____

EXAMPLE 1 Use a Tree Diagram

BOOKS A flea market vendor sells new and used books for adults and teens. Today she has fantasy novels and poetry collections to choose from. Draw a tree diagram to determine the number of categories of books.



There are _____ different categories.

KEY CONCEPT

Fundamental Counting Principle If event *M* an occur in *m* ways and is followed by event *N* that can occur in *n* ways, then the event *M* followed by the event *N* can occur in $m \cdot n$ ways.

Check Your Progress A store has spring outfits on sale. You can choose either striped or solid pants. You can also choose green, pink, or orange shirts. Finally, you can choose either long-sleeved shirts or short-sleeved shirts. Draw a tree diagram to determine the number of possible outfits.

EXAMPLE **Use the Fundamental Counting Principle**

2 RESTAURANTS **A manager assigns different codes to all the tables in a restaurant to make it easier for the wait staff to identify them. Each code consists of the vowel A, E, I, O, or U, followed by two digits from 0 through 9. How many codes could the manager assign using this method?**

number of possible numbers for the first place	×	number of possible numbers for the second place	×	number of possible numbers for the third place	=	number of possible codes
☐	×	☐	×	☐	=	☐

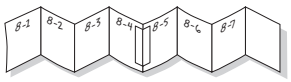
There are ☐ possible codes.

Check Your Progress A middle school assigns each student a code to use for scheduling. Each code consists of a letter, followed by two digits from 0 though 9. How many codes are possible?

FOLDABLES™

ORGANIZE IT

Under Lesson 8-1, write notes on what you learned about counting outcomes by using a tree diagram and by using the Counting Principle. Include examples of each. On the last page of your Foldable, write the key terms in the lesson and their definitions.



EXAMPLE **Find Probability**

3 COMPUTERS **What is the probability that Liana will guess her friend's computer password on the first try if all she knows is that it consists of three letters?**

Find the number of possible outcomes. Use the Fundamental Counting Principle.

choices for the fist letter	×	choices for the second letter	×	choices for the third letter	=	total number of outcomes
	×		×		=	

There are _____ possible outcomes. There is _____ correct password. So, the probability of guessing on the first try is _____.

Check Your Progress What is the probability that Shauna will guess her friend's locker combination on the first try if all she knows is that it consists of three digits from 0 through 9?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

8–2 Permutations

TEKS 8.11 The student applies concepts of theoretical and experimental probability to make predictions. **(B) Use theoretical probabilities** and experimental results **to make predictions and decisions.** *Also addresses TEKS 8.14(D).*

MAIN IDEA

- Find the number of permutations of objects.

BUILD YOUR VOCABULARY (pages 197–198)

A **permutation** is an arrangement or listing in which _____.

A **factorial** is a mathematical expression in which $n!$ is the _____ of all counting numbers beginning with n and counting backward to _____.

EXAMPLE **Find a Permutation**

1 **SOFTBALL** **There are 10 players on a softball team. In how many ways can the manager choose three players for first, second, and third base?**

number of possible players for first base	×	number of possible players for second base	×	number of possible players for third base	=	total number of possible ways
_____	×	_____	×	_____	=	_____

There are _____ different ways the manager can pick players for first, second, and third base.

Check Your Progress There are 15 students on student council. In how many ways can Mrs. Sommers choose three students for president, vice president, and secretary?

_____

EXAMPLE **Use Permutation Notation**

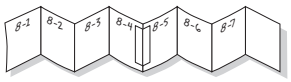
2 **Find $P(7, 2)$.**

$P(7, 2) =$ _____ $\cdot$ _____ or _____ 7 things taken _____ at a time.

FOLDABLES

ORGANIZE IT

Under Lesson 8-2, explain how to find the number of permutations of objects. Use words and symbols and include examples.



Check Your Progress **Find each value.**

a. $P(8, 4)$

b. $P(12, 5)$

EXAMPLE **Find Probability**

3 **NUMBERS** **Consider all of the five-digit numbers that can be formed using the digits 1, 2, 3, 4, and 5 where no digit is used twice. Find the probability that one of these numbers picked at random is an even number.**

Find the number of possible five-digit numbers.

$P(5, 5) =$ ____ !

REMEMBER IT

Remember that the symbol ! does not always represent an exclamation. Sometimes it is used to represent factorials, such as 3! for $3 \cdot 2 \cdot 1$.

For a number to be even, the ones digit must be 2 or 4.

number of ways to pick the last digit	×	number of ways to pick the first four digits	=	number of permutations that are even
____	×	P ____	=	$2P(4, 4)$ or ____

$$P(\text{even}) = \frac{\text{number or permutations that are even}}{\text{total number of permutations}}$$

$=$ ____ Substitute.

$= \dfrac{\overset{1}{\cancel{2}} \cdot \overset{1}{\cancel{4}} \cdot \overset{1}{\cancel{3}} \cdot \overset{1}{\cancel{2}} \cdot \overset{1}{1}}{\underset{1}{\cancel{5}} \cdot \underset{1}{\cancel{4}} \cdot \underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{2}} \cdot \underset{1}{1}}$ Definition of factorial

$=$ ____ or ____ Simplify

Check Your Progress Consider all of the five-digit numbers that can be formed using the digits 1, 2, 3, 4, and 5 where no digit is used twice. Find the probability that one of these numbers picked at random is an odd number.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

8–3 Combinations

TEKS 8.16 The student uses logical reasoning to make conjectures and verify conclusions. **(A) Make conjectures from patterns or sets of examples and nonexamples.**

MAIN IDEA

- Find the number of combinations of objects.

BUILD YOUR VOCABULARY (pages 197–198)

A **combination** is an arrangement or listing in which _____.

EXAMPLE Find a Combination

1 TOURNAMENTS **Five teams are playing each other in a tournament. If each team plays every other team once, how many games are played?**

METHOD 1

Let A, B, C, D, and E represent the five teams. First, list all of the possible permutations of A, B, C, D, and E taken _____ at a time. Then cross out the letter pairs that are the same as one another.

AB	AC	AD	AE	~~BA~~
BC	BD	BE	~~CA~~	~~CB~~
CD	CE	~~DA~~	~~DB~~	~~DC~~
DE	~~EA~~	~~EB~~	~~EC~~	~~ED~~

Team A playing Team B is the same as Team B playing Team A, so cross off one of them.

There are only _____ different games

METHOD 2

Find the number of permutations of 5 teams taken _____ at a time.

$P(5, 2) = 5 \cdot 4$ or _____

Since order is not important, divide the number of permutations by the number of ways 2 things can be arranged.

$$\frac{20}{2!} = \frac{20}{\square \cdot \square} \text{ or } \square$$

There are _____ games that can be played.

Check Your Progress Six teams are playing each other in a tournament. If each team plays every other team once, how many games are played?

EXAMPLES **Combinations and Permutations**

2 **SCHOOL** **An eighth grade teacher needs to select 4 students from a class of 22 to help with sixth grade orientation. Does this represent a combination or a permutation?**

This is a _____ problem since the order is not important.

3 **How many possible groups could be selected to help out the new students?**

$C(22, 4) = \frac{P(22, 4)}{4!}$ 22 students taken 4 at a time.

$= \frac{\overset{11}{\cancel{22}} \cdot \overset{7}{\cancel{21}} \cdot \overset{5}{\cancel{20}} \cdot \cancel{19}}{\underset{1}{\cancel{4}} \cdot \underset{1}{\cancel{3}} \cdot \underset{1}{\cancel{2}} \cdot \cancel{1}}$ or _____

There are _____ different groups of eighth grade students that could help the new students.

4 **SCHOOL** **One eighth grade student will be assigned to sixth grade classes on the first floor, another student will be assigned to classes on the second floor, another student will be assigned to classes on the third floor, and still another student will be assigned to classes on the fourth floor. Does this represent a combination or a permutation?**

Since it makes a difference which student goes to which floor, order is important. This is a _____.

REVIEW IT

Explain the difference between combinations and *permutations* *(Lessons 8-2)*

5 **In how many possible ways can the eighth graders be assigned to help with the sixth grade orientation?**

$P(22, 4) = 22 \cdot 21 \cdot 20 \cdot$ ☐ Definition of $P(22, 4)$

$= 175{,}560$

There are ☐ for the eighth grade students to be selected to help with sixth grade orientation.

Check Your Progress **A teacher needs to select 5 students from a class of 26 to help with parent teacher conferences.**

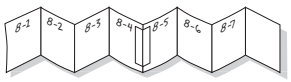
a. Does this represent a combination or a permutation? How many possible groups could be selected to help?

b. One student will be assigned to fifth grade parents, another student will be assigned to sixth grade parents, another student will be assigned to seventh grade parents, another student will be assigned to eighth grade parents. Does this represent a combination or a permutation? In how many possible ways can the students be assigned to help with the parent teacher conferences?

FOLDABLES™

ORGANIZE IT

Under Lesson 8-3, write notes on what you learned about finding the number of combinations of objects. Include examples. On the last page in your Foldable, write the key terms in the lesson and their definitions.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

8–4 Probability of Composite Events

TEKS 8.11 The student applies concepts of theoretical and experimental probability to make predictions. **(A) Find the probabilities of dependent and independent events. (B) Use theoretical probabilities** and experimental results **to make predictions and decisions.**

MAIN IDEA

- Find the probability of independent and dependent events.

BUILD YOUR VOCABULARY (pages 197–198)

A **compound event** consists of _____ simple events.

Independent events are _____ events in which the outcome of one event _____ affect the outcome of the other events.

KEY CONCEPT

Probability of Two Independent Events
The probability of two independent events can be found by multiplying the probability of the first event by the probability of the second event.

EXAMPLE **Probability of Independent Events**

1 **The two spinners below are spun. What is the probability that both spinners will show a number greater than 6?**

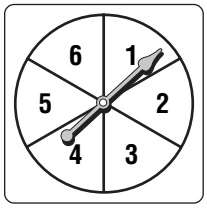
P(first spinner is greater than 6) = _____

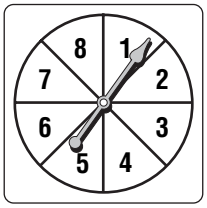
P(second spinner is greater than 6) = _____

P(both spinners are greater than 6) = $\frac{3}{10} \cdot \frac{3}{10}$ or _____

Check Your Progress The two spinners below are spun. What is the probability that both spinners will show a number less than 4?

_____





EXAMPLE

2 TEST EXAMPLE **A red number cube and a white number cube are rolled. The faces of both cubes are numbered from 1 to 6. What is the probability of rolling a 3 on the red number cube and rolling the number 3 or less on the white number cube?**

A $\frac{1}{2}$ **B** $\frac{1}{6}$ **C** $\frac{1}{9}$ **D** $\frac{1}{12}$

Read the Test Item

You are asked to find the probability of rolling a 3 on the red number cube and rolling a number 3 or less on the white number cube. The events are ____ because rolling one number cube ____ affect rolling the other cube.

Solve the Test Item

First, find the probability of each event.

P(rolling a 3 on the red number cube) = ____

P(rolling 3 or less on the white number cube) = ____

Then, find the probability of both events occurring.

P(3 red and 3 or less white) = ____ · ____ $P(A \text{ and } B) = P(A) \cdot P(B)$

= ____ Multiply.

The probability is ____, which is ____.

Check Your Progress **TEST EXAMPLE** A white number cube and a green number cube are rolled. The faces of both cubes are numbered from 1 to 6. What is the probability of rolling an even number on the white number cube and rolling a 3 or a 5 on the green number cube?

F $\frac{1}{12}$ **G** $\frac{1}{6}$ **H** $\frac{1}{3}$ **J** $\frac{1}{2}$

KEY CONCEPT

Probability of Two Dependent Events
If two events, A and B, are dependent, then the probability of both events occurring is the product of the probability of A and the probability of B after A occurs.

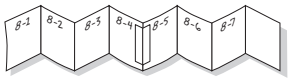
BUILD YOUR VOCABULARY (pages 197–198)

If the outcome of one event does [ ] the outcome of another event, the compound events are called **dependent events.**

FOLDABLES

ORGANIZE IT

Under Lesson 8-4, write what you learned about how to find the probability of independent and dependent events. On the last page in your Foldable, write the key terms in the lesson and their definitions.



EXAMPLE **Probability of Dependent Events**

3 **There are 4 red, 8 yellow, and 6 blue socks mixed up in a drawer. Once a sock is selected, it is not replaced. Find the probability of reaching into the drawer without looking and choosing 2 blue socks.**

Since the first sock [ ] replaced, the first event affects the second event. These are dependent events.

P(first sock is blue) = [ ] ← number of blue socks / total number of socks

P(second sock is blue) = [ ] ← number of blue socks after one blue sock is removed / Total number of socks after one blue sock is removed

P(two blue socks) = [ ] or [ ]

Check Your Progress There are 6 green, 9 purple, and 3 orange marbles in a bag. Once a marble is selected, it is not replaced. Find the probability that two purple marbles are chosen.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

8–5 Experimental and Theoretical Probability

TEKS 8.11 The student applies concepts of theoretical and experimental probability to make predictions. **(A) Find the probabilities of dependent and independent events. (B) Use theoretical probabilities and experimental results to make predictions and decisions.**

MAIN IDEA

- Find experimental probability.

BUILD YOUR VOCABULARY (pages 197–198)

A probability that is based on _____ obtained by conducting an _____ is called an **experimental probability.**

A probabililty that is based on _____ _____ is called a **theoretical probability.**

EXAMPLES **Experimental Probability**

Nikki is conducting an experiment to find the probability of getting various results when three coins are tossed. The results of her experiment are given in the table.

Result	Number of Tosses
all heads	6
two heads	36
one head	30
no heads	12

1 **What is the theoretical probability of tossing all heads on the next turn?**

The theoretical probability is _____ = _____.

2 **According to the experimental probability, is Nikki more likely to get all heads or no heads on the next toss?**

Based on the results so far, _____ heads is more likely.

Check Your Progress

Marcus is conducting an experiment to find the probability of getting various results when four coins are tossed. The results of his experiment are given in the table.

Result	Number of Tosses
all heads	6
three heads	12
two heads	20
one head	7
no heads	5

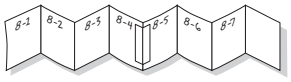
a. What is the theoretical probability of tossing all tails on the next turn?

b. According to the experiment probability, is Marcus more likely to get all heads or no heads on the next toss?

FOLDABLES™

ORGANIZE IT

Under Lesson 8-5, write a few words to compare and contrast experimental and theoretical probabilities. On the last page in your Foldable, write the key terms in the lesson and their definitions.



EXAMPLE **Experimental Probability**

3 **MARKETING** **Eight hundred adults were asked whether they were planning to stay home for winter vacation. Of those surveyed, 560 said that they were. What is the experimental probability that an adult planned to stay home for winter vacation?**

There were ____ people surveyed and ____ said that they were staying home.

The experimental probability is ____ or ____.

Check Your Progress Five hundred adults were asked whether they were planning to stay home for New Year's Eve. Of those surveyed, 300 said that they were. What is the experimental probability that an adult planned to stay home for New Year's Eve?

EXAMPLE **Use Probability to Predict**

4 **MATH TEAM** **Over the past three years, the probability that the school math team would win a meet is $\frac{3}{5}$. Is this probability experimental or theoretical? Explain.**

This is an experimental probability since it is based on what happened in the ____.

If the team wants to win 12 more meets in the next 3 years, how many meets should the team enter?

This problem can be solved using a proportion.

3 out of 5 meets were wins → $\frac{3}{5} \times \frac{12}{x}$ ← 12 out of x meets should be wins.

Solve the proportion.

$\frac{3}{5} = \frac{12}{x}$ Write the proportion.

____ = ____ Find the cross products.

____ = ____ Multiply.

____ = ____ Divide each side by ____.

$x =$ ____

They should enter ____ meets.

REVIEW IT

Explain what a proportion is and how you can solve a proportion. *(Lesson 4-3)*

Check Your Progress **Over the past three years, the probability that the school speech and debate team would win a meet is $\frac{4}{5}$.**

a. Is this probability experimental or theoretical? Explain.

b. If the team wants to win 20 more meets in the next 3 years, how many meets should the team enter?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

8–6 Problem-Solving Investigation: Act It Out

EXAMPLE Act it Out

MAIN IDEA
- Solve problems by acting them out.

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(C) Select or develop an appropriate problem-solving strategy from a variety of different types, including … acting it out… to solve a problem.**

Melvin paid for a $5 sandwich with a $20 bill. The cashier has $1, $5, and $10 bills in the register. How many different ways can Melvin get his change?

EXPLORE You know that Melvin should receive $20 – $5 or ☐ in change. You need to determine how many different ways the cashier can make $15 in change with $1, $5, and $10 bills.

PLAN Use manipulatives such as play money to act out the problem. Record the different ways the cashier can make $15 in change.

SOLVE

	$1	$5	$10
Method 1		1	1
Method 2	☐		1
Method 3	☐	☐	
Method 4		☐	
Method 5	☐	☐	
Method 6	☐		

The cashier can make the change in ☐ different ways.

CHECK Make sure each method adds up to ☐ in change.

Check Your Progress **SHOPPING** Amanda paid for an $8 CD with a $20 bill. The cashier has $1, $5, and $10 bills in the register. How many different ways can Amanda get her change?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

8–7 Simulations

TEKS 8.11 The student applies concepts of theoretical and experimental probability to make predictions. **(C) Select and use different models to simulate an event.**

MAIN IDEA

- Perform probability simulations to model real-world situations.

BUILD YOUR VOCABULARY (pages 197–198)

A **simulation** is an _____ that is designed to act out a given situation.

EXAMPLE **Describe a Simulation**

1 **SHOPPING** **A supermarket is issuing 1 of 6 different in-store discount coupons to each customer who enters the store. If the coupons are given out randomly, describe a model that could be used to simulate which coupons would be given to the first 100 customers.**

Choose a method that has _____ possible outcomes, such as _____. Let each outcome represent a different coupon.

Roll a number cube to simulate the coupons that might be given to the first 100 customers. Repeat 100 times.

Check Your Progress **SHOPPING** An electronics store is issuing 1 of 8 different in-store discount coupons to each customer who enters the store. If the coupons are given out randomly, describe a model that could be used to simulate which coupons would be given to the first 50 customers.

EXAMPLE **Describe a Simulation**

2 ORCHESTRA **The conductor of the school orchestra needs to choose 6 students at random to perform with the all-city band. If there are 36 students in the orchestra, describe a model that she could use to simulate choosing these 6 students.**

There are 36 students in the orchestra, so select objects that combined have ____ outcomes, such as ____ ____. Assign each student one of the possible outcomes.

The conductor should roll the number cube and spin the spinner at least ____ times to choose the students for the band.

Check Your Progress **NATURE HIKE** The director of a national park needs to choose 3 rangers at random to lead nature hikes this weekend. If there are 10 rangers working at the park this weekend, describe a model that he could use to simulate choosing these 3 rangers.

EXAMPLE **Describe a Simulation**

3 **SOFTBALL** **During the regular season, Keisha has had base hits 40% of her times at bat. Describe an experiment she could use to simulate her next 20 times at bat.**

The probability that Keisha will get a hit is 40% or _____, and the probability that she will not get a hit is _____ or _____. She could use a spinner with 5 sectors, 2 representing _____ _____ and 3 representing _____ _____. She would spin the spinner _____.

Check Your Progress **SALES** During the holiday season, 75% of the customers who enter a retail store make a purchase. Describe an experiment a store manager could use to simulate the next 50 customers.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

8–8 Using Sampling to Predict

MAIN IDEA

- Predict the actions of a larger group by using a sample.

TEKS 8.13 The student evaluates predictions and conclusions based on statistical data. **(A) Evaluate methods of sampling to determine validity of an inference made from a set of data. 8.14** The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(A) Identify and apply mathematics** to everyday experiences, **to activities in and outside of school,** with other disciplines, and with other mathematical topics.

BUILD YOUR VOCABULARY (pages 197–198)

A **sample** is a _____ selected group chosen for the purpose of collecting data.

The **population** is the _____ from which the samples under consideration are taken.

An **unbiased sample** is selected so that it is _____ of the entire population.

In a **stratified random sample,** the population is divided into _____, nonoverlapping groups.

In a **systematic random sample,** the items or people are selected according to a specific _____ or item interval.

In a **biased sample,** one or more parts of the population are _____ over others.

EXAMPLES Determine Validity of Conclusions

Determine whether each conclusion is valid. Justify your answer.

1 **To determine which school lunches students like most, the cafeteria staff surveyed every tenth student to walk into the cafeteria. Out of 40 students surveyed, 19 students stated that they liked the burgers best. The cafeteria staff concludes that about 50% of the students like burgers best.**

The conclusion is _____. Since the population is the students of the school, the sample is a _____ _____. It is _____.

2 **To determine what sports teenagers like, Janet surveyed the student athletes on the girls' field hockey team. Of these 65% said that they like field hockey best. Janet concluded that over half of teenagers like field hockey best.**

The conclusion is _____. The students surveyed probably prefer field hockey. This is _____.

The sample is _____ because the people are easily accessed.

Check Your Progress **Determine whether each conclusion is valid. Justify your answer.**

a. To determine what ride is most popular, every tenth person to walk through the gates of a theme park is surveyed. Out of 290 customers, 98 stated that they prefer The Zip. The park manager concludes that about a third of the park's customers prefer The Zip.

b. To determine whether people prefer dogs or cats, a researcher surveys 80 people at a dog park. Of those surveyed, 88% said that they prefer dogs, so the researcher concludes that most people pet owners prefer dogs.

EXAMPLES **Using Sampling to Predict**

3 **BOOKS** **The student council is trying to decide what types of books to sell at its annual book fair to help raise money for the eighth-grade trip. It surveys 40 students at random. The books they prefer are in the table. If 220 books are to be sold at the book fair, how many should be mysteries?**

Book Type	Number of Students
mystery	12
adventure novel	9
sports	11
short stories	8

First, determine whether the sample method is valid. The sample is _____ since the students were randomly selected. Thus, the sample _____.

$\frac{12}{40}$ or _____ of the students prefer mysteries. So, find _____.

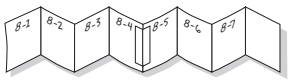
$0.30 \times$ _____ = _____

About _____ books should be mysteries.

FOLDABLES™

ORGANIZE IT

Under Lesson 8-8, list the different types of samples and how to use them to make predictions. Give examples. On the last page of your Foldable, write the key terms in the lesson and their definitions.



Check Your Progress The student shop sells pens. It surveys 50 students at random. The pens they prefer are in the table. If 300 pens are to be sold at the student shop, how many should be gel pens?

Type	Number
gel pens	22
ball point	8
glitter	10
roller balls	10

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

CHAPTER 8

BRINGING IT ALL TOGETHER

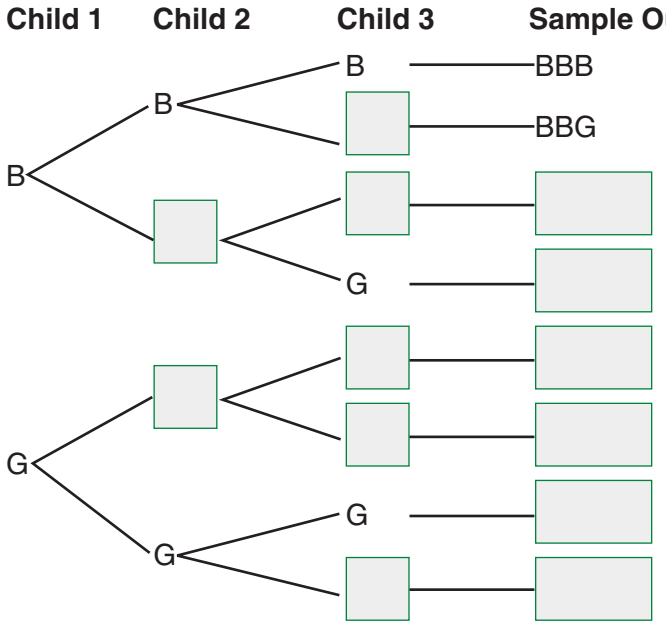
STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 8 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 8, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 197–198*) to help you solve the puzzle.

8-1

Counting Outcomes

1. Complete the tree diagram shown below for how many boys and and how many girls are likely to be in a family of three children.



2. Use the Fundamental Counting Principle to find the number of possible outcomes if there are 4 true-false questions on a test.

$\square \times \square \times \square \times \square = \square$

8-2 Permutations

3. What does the notation $P(14, 4)$ represent?

A security system has a number pad with 9 digits.

4. How many three-number passwords are available if a digit cannot be repeated?

5. If a digit can be repeated, how many passwords are available?

8-3 Combinations

6. What is the difference between a permutation and a combination?

7. Fill in the blanks to find $C(9, 4)$.

$$C(9, 4) = \frac{P(9, 4)}{\square!}$$

$$= \frac{9 \cdot \square \cdot \square \cdot \square}{4 \cdot \square \cdot \square \cdot \square} \text{ or } \square$$

8. Are there more combinations or permutations of 3 people chosen from a group of 6 people? Explain.

8-4

Probability of Compound Events

9. What is a compound event?

10. Are the events of spinning a spinner and rolling a number cube independent events? Why or why not?

A number cube is rolled and a penny is tossed. Find each probability.

11. P(4 and tails)

12. P(3 or less, heads)

8-5

Order of Operations

The table at the right shows the results of a survey.

13. How many people bought balloons?

14. How many people were surveyed?

15. What is the experimental probability that a person surveyed preferred balloons?

Item	Number of People
balloons	75
cards	15
decorations	25
cake	50

16. A bag contains 15 red marbles, 25 purple marbles, and 10 yellow marbles. Describe an experiment that you could conduct with the marbles to find an experimental probability.

8-6

Problem-Solving Investigation: Act It Out

17. **SPORTS** There are 32 tennis players in a tournament. If each losing player is eliminated from the tournament, how many tennis matches will be played during the tournament?

8-7

Simulations

For Exercises 18–20, roll two number cubes 50 times and record the sums.

18. Based on your results, what is the probability that the sum is 10?

19. Based on your results, what is the probability that the sum is 8, or that the sum is less than 4?

20. If you roll the number cubes 25 more times, which sum would you expect to see about 10% of the time?

8-8

Using Sampling to Predict

21. What you conduct a survey by asking ten students selected at random from each grade at your school what their favorite class is, what type of random sample have you taken?

22. A grocery store owner asks the shoppers in his store where they prefer to shop for groceries. What type of sample has he conducted?

CHAPTER 8 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 8.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 8 Practice Test on page 461 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 8 Study Guide and Review on pages 457–460 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 8 Practice Test on page 461.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 8 Foldable.
- Then complete the Chapter 8 Study Guide and Review on pages 457–460 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 8 Practice Test on page 461.

Student Signature

Parent/Guardian Signature

Teacher Signature

CHAPTER 9

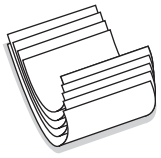
Statistics

FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with five pieces of $8\frac{1}{2}$" × 11" paper.

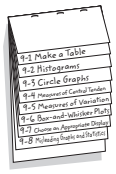
STEP 1 **Place** 4 sheets of paper $\frac{3}{4}$ inch apart.

STEP 2 **Roll** up bottom edges. All tabs should be the same size.



STEP 3 **Crease** and staple along the fold.

STEP 4 **Label** the tabs with the topics from the chapter. Label the last tab Vocabulary.



NOTE-TAKING TIP: As you take notes on a topic, it helps to write how the subject relates to your life. For example, as you learn about different kinds of statistical measures and graphs, you will understand how to evaluate statistical information presented in such places as advertisements and persuasive articles in magazines.

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 9. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
box-and-whisker plot			
circle graph			
histogram			
interquartile range			
lower quartile			

(continued on the next page)

Vocabulary Term	Found on Page	Definition	Description or Example
mean			
measures of central tendency			
measures of variation			
median			
mode			
outlier			
quartiles			
range			
upper quartile			

9–1 Problem-Solving Investigation: Make a Table

MAIN IDEA

- Solve problems by making a table.

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(C) Select or develop an appropriate problem-solving strategy from a variety of different types, including … making a table… to solve a problem.**

EXAMPLE Make a Table

The list shows the ages of 25 persons selected at random from the audience of a recent showing of a comedy movie. Make a frequency table of the ages using intervals 17–24, 25–32, 33–40, 41–48, and 49–56. What is the most common interval of attendance ages?

26	42	22	26	24
21	27	35	28	18
19	25	46	31	29
17	56	19	41	23
38	20	21	25	22

EXPLORE You have a list of ages. You need to know how many ages fall into each interval.

PLAN Make a table to show the frequency, or number, of ages in each interval.

SOLVE The greatest frequency is ages [ ], so this is the most common interval of attendance ages.

CHECK Make sure the frequency table includes each age from the list.

Check Your Progress

The list shows the favorite sports of 25 people selected at random. In the list, S represents soccer, B represents baseball, F represents football, and V represents volleyball. Make a frequency table of the favorite sports. What is the most popular sport?

V	B	S	F	V
S	V	F	V	S
S	F	B	S	B
B	S	V	F	S
F	F	B	S	V

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

9–2 Histograms

MAIN IDEA
- Construct and interpret histograms.

TEKS 8.12 The student uses statistical procedures to describe data. **(C) Select and use an appropriate representation for presenting and displaying relationships among collected data, including** line plots, line graphs, stem and leaf plots, circle graphs, bar graphs, box and whisker plots, **histograms,** and Venn diagrams, with and **without the use of technology.**

BUILD YOUR VOCABULARY (pages 227–228)

A **histogram** is a type of _____ graph used to display numerical data that have been organized into _____ intervals.

EXAMPLE Construct a Histogram

1 FOOD The list shows the number of grams of caffeine in certain types of tea. Use intervals 1–20, 21–40, 41–60, 61–80, and 81–100 to make a frequency table. Then construct a histogram.

8	47	19	34	30
10	58	20	39	32
12	4	22	40	92
18	85	26	27	

Place a tally mark for each value in the appropriate interval. Then add up the tally marks to find the frequency for each interval.

To construct a histogram, follow these steps.

Step 1 Draw and label a horizontal and vertical axis. Include a title.

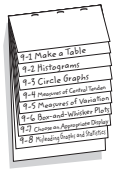
Step 2 Show the _____ from the frequency table on the _____ axis.

Step 3 For each caffeine interval, draw a bar whose height is given by the frequencies.

FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 9–2, explain the difference between a bar graph and a histogram. Describe a type of statistics that could be displayed with a histogram.

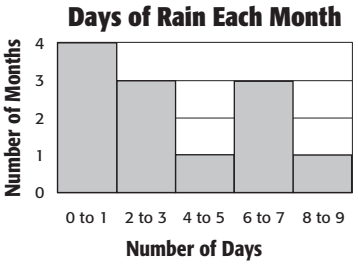


Check Your Progress The frequency table below shows the amount of caffeine in certain drinks. Draw a histogram to represent the data.

Caffeine Content of Certain Types of Drink		
Caffeine (mg)	Tally	Frequency
0–50	|||	3
51–100	||||	4
101–150	𝍸 |	6
151–200	𝍸 ||	7

EXAMPLES **Analyze and Interpret Data**

2 **WEATHER** **How many months had 6 or more days of rain?**



Three months had _____ days of rain, and one month had _____ days of rain.

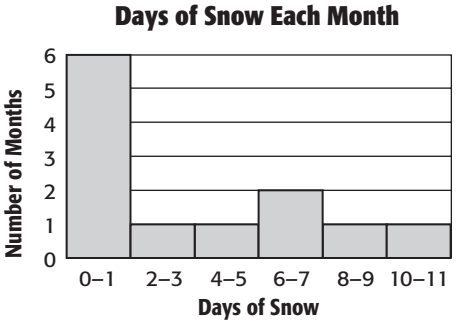
Therefore, _____ + _____ or _____ months had 6 or more days of rain.

3 **WEATHER** **How many months had exactly 2 days of rain?**

This cannot be determined from the data presented in this graph. The histogram indicates that there were _____ that had 2 or 3 days of rain, but it is impossible to tell how many months had _____ days of rain.

Check Your Progress

a. How many months had 6 or more days of snow?



b. How many months had exactly 6 days of snow?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

9–3 Circle Graphs

TEKS 8.12 The student uses statistical procedures to describe data. **(C) Select and use an appropriate representation for presenting and displaying relationships among collected data, including** line plots, line graphs, stem and leaf plots, **circle graphs,** bar graphs, box and whisker plots, histograms, and Venn diagrams, with and **without the use of technology.**

MAIN IDEA

- Construct and interpret histograms.

BUILD YOUR VOCABULARY (pages 227–228)

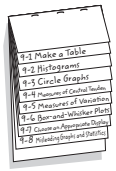
A **circle graph** is used to compare parts of a _____.

The entire _____ represents that whole.

FOLDABLES

ORGANIZE IT

Under the tab for Lesson 9–3, find an example of a circle graph from a newspaper or magazine. Explain what the graph shows.



EXAMPLE **Construct a Circle Graph from Percents**

1 TORNADOES **The table shows when tornadoes occurred in the United States from 1999 to 2001. Make a circle graph using this information.**

Tornadoes in the United States, 1999–2001	
January–March	15%
April–June	53%
July–September	21%
October–December	11%

Source: spc.noaa.gov/

Step 1 There are _____ in a circle. So, multiply each percent by 360 to find the number of degrees for each _____ of the graph.

Jan–Mar:

15% of 360 = _____ · 360 or _____

Apr–Jun:

53% of 360 = _____ · 360 or about _____

Jul–Sept:

21% of 360 = _____ · 360 or about _____

Oct–Dec:

11% of 360 = _____ · 360 or about _____

Step 2 Use a compass to draw a circle and a radius. Then use a protractor to draw a [ ] angle. This section represents January–March. From the new radius, draw the next angle. Repeat for each of the remaining angles. Label each [ ]. Then give the graph a [ ].

Check Your Progress

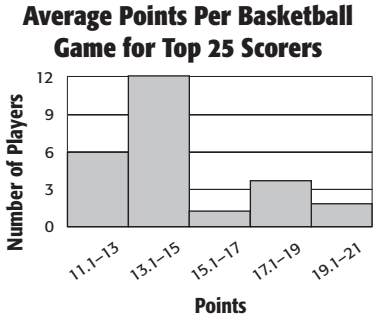
HURRICANES The table shows when hurricanes or tropical storms occurred in the Atlantic Ocean during the hurricane season of 2002. Make a circle graph using this information.

Hurricanes in the United States, 2002	
Month	**Percent**
July	7%
August	21%
September	64%
October	8%

Source: nhc.noaa.gov/

EXAMPLES Construct a Circle Graph from Data

2 BASKETBALL Construct a circle graph using the information in the histogram below.



Step 1 Find the total number of players.

$6 + \square + 1 + \square + 2 = \square$

Step 2 Find the ratio that compares the number in each point range to the total number of players. Round to the nearest hundredth.

11.1 to 13 : $6 \div 25 = \square$

13.1 to 15 : $12 \div 25 = \square$

15.1 to 17 : $1 \div 25 = \square$

17.1 to 19 : $4 \div 25 = \square$

19.1 to 21 : $2 \div 25 = \square$

Step 3 Use these ratios to find the number of degrees of each section. Round to the nearest degree if necessary.

11.1 to 13 : $\square \cdot 360 = \square$ or about $\square$

13.1 to 15 : $\square \cdot 360 = \square$ or about 173

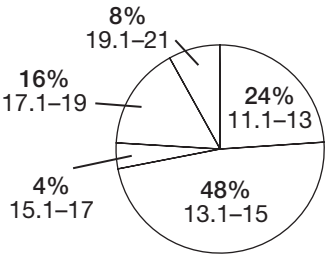
15.1 to 17 : $\square \cdot 360 = \square$ or about $\square$

17.1 to 19 : $\square \cdot 360 = \square$ or about $\square$

19.1 to 21 : $\square \cdot 360 = \square$ or about 29

Step 4 Use a compass and protractor to draw a circle and the appropriate sections. Label each section and give the graph a title. Write the ratios as percents.

Average Points Per Basketball Game for Top 25 Scorers



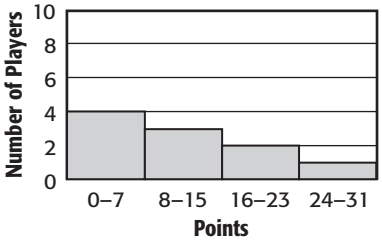
3 **Use the circle graph from Example 2 to describe the makeup of the average game scores of the 25 top-scoring basketball players.**

Almost $\frac{3}{4}$ of the players had average game scores between 11.1 and 15 points. Fewer than $\frac{1}{4}$ had average game scores greater than ____ points.

Check Your Progress

a. Construct a circle graph using the information in the histogram at right.

Average Points Per Football Game for Top 10 Scorers



b. Use the graph to describe the makeup of the average game scores of the 10 top-scoring football players.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

9–4 Measures of Central Tendency and Range

TEKS 8.12 The student uses statistical procedures to describe data. **(A) Select the appropriate measure of central tendency or range to describe a set of data and justify the choice for a particular situation.** *Also addresses TEKS 8.14(A).*

MAIN IDEA

- Find the mean, median, mode, and range of a set of data.

WRITE IT

The words *central* and *middle* have similar definitions. If mean, median, and mode are measures of central tendency, what do they measure?

BUILD YOUR VOCABULARY (pages 227–228)

Measures of central tendency are numbers that _____ a set of data.

The **mean** of a set of data is the _____ of the data _____ the number of items in the data set.

The **median** of a set of data is the _____ number of the data ordered from least to greatest, or the mean of the _____ numbers.

The **mode** of a set of data is the number or numbers that occur _____ often.

The **range** of a set of data is _____ between the greatest and least numbers in a set of data.

EXAMPLE **Find Measures of Central Tendency**

1 **The ages, in years, of the actors in a play are 4, 16, 32, 19, 27, 32. Find the mean, median, mode, and range of the data.**

Mean $\dfrac{4 + 16 + 32 + 19 + 27 + 32}{\square} = \square$

$\approx \square$

Meadian Arrange the numbers in order from _____ to _____.

4 16 19 27 32 32

$\dfrac{\square + \square}{\square} = \square$

(continued on the next page)

Mode The data has a mode of ☐.

Range 32 − 4 or ☐.

Check Your Progress The ages, in years, of the children at a daycare center are 3, 5, 3, 7, 6, 4. Find the mean, median, mode, and range of the set of data.

☐

EXAMPLES Using Appropriate Measures

2 OLYMPICS Select the appropriate measure of central tendency or range to describe the data in the table. Justify your reasoning.

Gold Medals Won by the United States at the Winter Olympics, 1924–2002			
Event	Gold Medals	Event	Gold Medals
Alpine skiing	10	Luge	2
Bobsleigh	6	Short track speed skating	3
Cross country	0	Skeleton	3
Figure skating	13	Ski jumping	0
Freestyle skiing	4	Snowboarding	2
Ice hockey	3	Speed skating	26

Find the mean, median, mode, and range of the data.

Mean $\frac{10 + 6 + 0 + 13 + 4 + 3 + 2 + 3 + 3 + 0 + 2 + 26}{\square} = \frac{\square}{\square}$

$= \square$

The mean is ☐ medals.

Median Arrange the numbers from least to greatest.

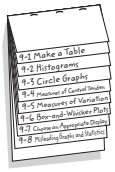
0, 0, 2, 2, 3, 3, 3, 4, 6, 10, 13, 26

The median is the middle number, or ☐ medals.

FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 9–4, record how to find the mean, median, and mode of a set of data. Explain *measures of central tendency, mean, median,* and *mode* in your own words and with examples.



Mode There is one mode, [ ].

Range 26 − 0 or [ ].

Check Your Progress Select the appropriate measure of central tendency or range to describe the data in the table. Justify your reasoning.

Country	Gold Medals (1896–2002 Summer)
United States	872
Great Britain	180
France	188
Italy	179
Sweden	136
Hungary	150
Australia	102
Finland	101
Japan	97
Romania	74
Brazil	12
Ethiopia	12

Source: infoplease.com

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

9–5 Measures of Variation

TEKS 8.12 The student uses statistical procedures to describe data. **(A) Select** the appropriate measure of central tendency or **range to describe a set of data and justify the choice for a particular situation.**

Main Idea

- Find the range and quartiles of a set of data.

Key Concepts

Range The range of a set of data is the difference between the greatest and the least numbers in the set.

Interquartile Range The interquartile range is the range of the middle half of the data. It is the difference between the upper quartile and the lower quartile.

Build Your Vocabulary (pages 227–228)

Measures of variation are used to describe the _____ of a set of data.

The **range** indicates how _____ the data are.

Quartiles are the values that divide the data into _____ equal parts.

The _____ of the lower half of a set of data is the **lower quartile.**

The median of the _____ of the set of data is the **upper quartile.**

Data that are more than _____ times the value of the interquartile range beyond the quartiles are called **outliers.**

Examples Find Measures of Variation

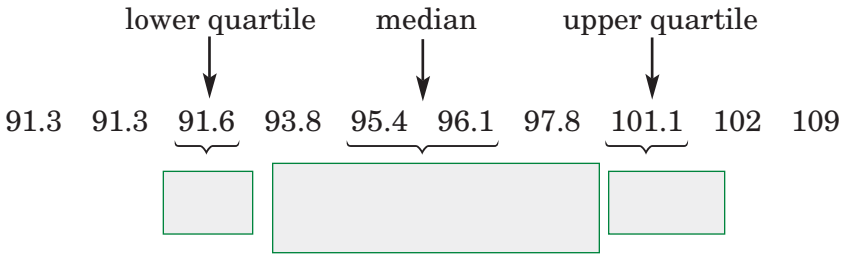
1 BASKETBALL Find the measures of variation for the data in the table.

The range is 109 − 91.3 or _____.

Points Scored by Top Ten Teams During the NBA Playoffs, 2002	
Team	**Points Scored**
Dallas	109
Minnesota	102
Sacramento	101.1
L.A. Lakers	97.8
Charlotte	96.1
New Jersey	95.4
Orlando	93.8
Indiana	91.6
Boston	91.3
Portland	91.3

Source: nba.com

Median, Upper Quartile, and Lower Quartile
Arrange the numbers in order from least to greatest.



The median is ____, the lower quartile is ____, and the upper quartile is ____.

Interquartile Range = upper quartile − lower quartile

= ____

REMEMBER IT

A small interquartile range means that the data in the middle of the set are close in value. A large interquartile range means that the data in the middle are spread out.

Check Your Progress **BASEBALL** Find the measures of variation for the data in the table.

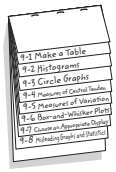
Giants Batting Average Against Anaheim in the World Series 2002	
Player	**Batting Average**
Rueter	0.500
Bonds	0.471
Snow	0.407
Bell	0.304
Lofton	0.290
Kent	0.276
Aurilia	0.250
Sanders	0.238
Santiago	0.231

Source: infoplease.com

FOLDABLES

ORGANIZE IT

Under the tab for Lesson 9–5, write what you learn about finding the range and quartiles of a set of data.



EXAMPLE **Find Outliers**

2 **CONCESSION SALES** **Find any outliers for the data in the table at the right.**

First arrange the numbers in order from least to greatest. Then find the median, upper quartile, and lower quartile.

Item Sold at Football Game Concession Stand	
Item	Number Sold
Colas	196
Diet colas	32
Water	46
Coffee	18
Candy bars	39
Hotdogs	23
Hamburgers	16
Chips	41
Popcorn	24

16 $\underbrace{18 \quad 23}$ 24 $\underbrace{32}$ 39 $\underbrace{41 \quad 46}$ 196

$\frac{18 + 23}{2} =$ ☐ 32 $\frac{41 + 46}{2} =$ ☐

Interquartile Range = ☐ − ☐ or 23

Multiply the interquartile range, 23, by 1.5. ☐ × ☐ = 34.5

Find the limits for the outliers.

Subtract 34.5 from the lower quartile. ☐ − 34.5 = ☐

Add 34.5 to the upper quartile. ☐ + 34.5 = ☐

The limits for the outliers are ☐ and ☐.

The only outlier is ☐.

Check Your Progress

Find any outliers for the data in the table at right.

☐

Items Sold at School Bookstore	
Item	Number Sold
Pens	35
Pencils	15
Erasers	20
Candy bars	93
Folders	17
School Pennants	18
Calculators	2

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

9–6 Box-and-Whisker Plots

TEKS 8.12 The student uses statistical procedures to describe data. **(C) Select and use an appropriate representation for presenting and displaying relationships among collected data, including** line plots, line graphs, stem and leaf plots, circle graphs, bar graphs, **box and whisker plots**, histograms, and Venn diagrams, with and **without the use of technology.**

MAIN IDEA

- Display and interpret data in a box-and-whisker plot.

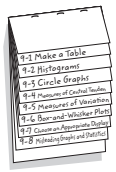
BUILD YOUR VOCABULARY (pages 227–228)

A **box-and-whisker plot** uses a _____ to show the _____ of a set of data.

FOLDABLES

ORGANIZE IT

Under the tab for Lesson 9–6, collect data from the Internet, such as number of homeruns hit by the players of a baseball team. Draw a box-and-whisker plot to display the data.



EXAMPLE 1 **Draw a Box-and-Whisker Plot**

POPULATION **Use the data in the table at the right to construct a box-and-whisker plot.**

World's Most Populous Cities	
City	Population (millions)
Tokyo	34.8
New York	20.2
Seoul	19.9
Mexico City	19.8
Sao Paulo	17.9
Bombay	17.9
Osaka	17.9
Los Angeles	16.2
Cairo	14.4
Manila	13.5

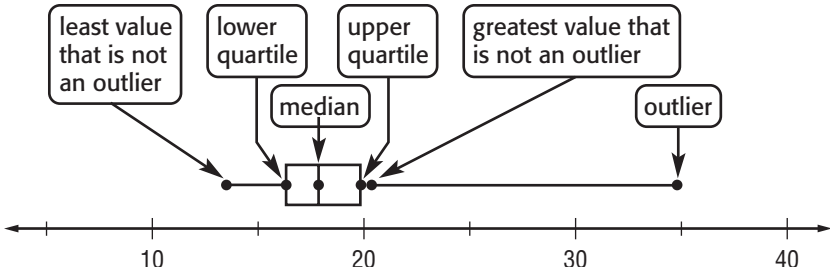
Source: *Time Almanac*

Step 1 Draw a _____ that includes the least and greatest number in the data.

Step 2 Mark the extremes, the _____, and the upper and lower _____ above the number line. Since the data have an outlier, mark the greatest value that is not an _____.

Step 3 Draw the box and whiskers.

(continued on the next page)



Check Your Progress

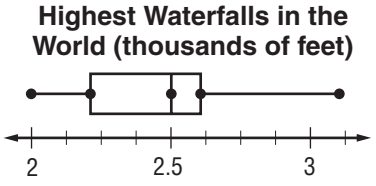
Use the data in the table at the right to draw a box-and-whisker plot.

Most Populous U.S. Cities	
City	Population (in millions)
New York	8.0
Los Angeles	3.7
Chicago	2.9
Houston	2.0
Philadelphia	1.5
Phoenix	1.3
San Diego	1.2
Dallas	1.2

Source: infoplease.com

EXAMPLE **Interpret Data**

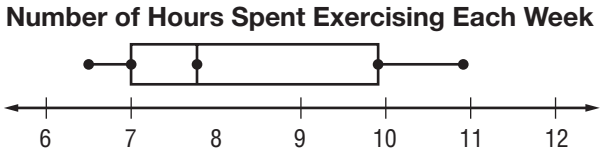
2 **WATERFALLS** **What do the lengths of the parts of the box-and-whisker plot below tell you about the data?**



Source: *Time Almanac*

Data in the _____ quartile are more spread out than the data in the _____ quartile. You can see that data in the _____ quartile are the most spread out because the whisker is _____ than other parts of the plot.

Check Your Progress What do the lengths of the parts of the box-and-whisker plot below tell you about the data?



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

9–7 Select an Appropriate Display

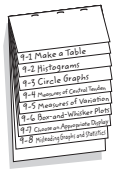
MAIN IDEA

- Choose an appropriate display for a set of data.

FOLDABLES

ORGANIZE IT

Under the tab for Lesson 9–7, make a table of data from your science or social studies textbook. Draw a circle graph and bar graph displaying the data. Discuss which graph is most appropriate.



TEKS 8.12 The student uses statistical procedures to describe data. **(C) Select and use an appropriate representation for presenting and displaying relationships among collected data, including line plots, line graphs, stem and leaf plots, circle graphs, bar graphs, box and whisker plots, histograms, and Venn diagrams,** with and without the use of technology. **8.15** The student communicates about Grade 8 mathematics through informal and mathematical language, representations, and models. **(B) Evaluate the effectiveness of different representations to communicate ideas.**

EXAMPLE Choose an Appropriate Display

Choose an appropriate type of display for each situation. Then make a display.

1 FARMS Select an appropriate display to show the acreage of farms in Maine. Justify your answer.

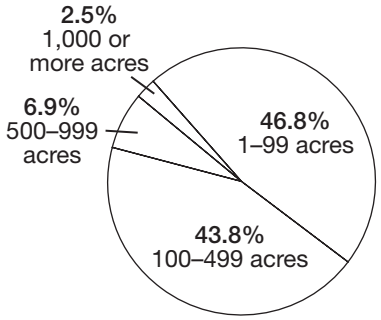
Farms in Maine by Size	
1–99 acres	46.8%
100–499 acres	43.8%
500–999 acres	6.9%
1,000 or more acres	2.5%

Source: ers.usda.gov

This data deals with percents that have a sum of _____.

A _____ would be a good way to show percents.

Farms in Maine by Size



2 SCHOOLS Select an appropriate display to show students' favorite school subjects. Justify your reasoning. Then construct the display.

Favorite School Subject	
math	𝍸 𝍸 𝍸 ||
history	𝍸 |||
science	𝍸 𝍸
English	𝍸 ||
other	𝍸 |

In this case, there are specific categories. If you want to show the specific number, use a _____ or a _____.

Remember It

There are many ways to display the same data. However, often one of those ways makes the data easier to understand than do the other ways.

Check Your Progress

a. Select an appropriate display to show favorite types of television programs. Justify your answer. Then construct the display.

Favorite Type of Television Program	
sitcom	54%
reality	22%
news	10%
game show	8%
cartoon	6%

b. Select an appropriate display to show students' favorite hobbies. Then construct the display.

Hobby	Number of Students
reading	10
sports	5
listening to music	10
photography	7
other	18

Homework Assignment

Page(s):

Exercises:

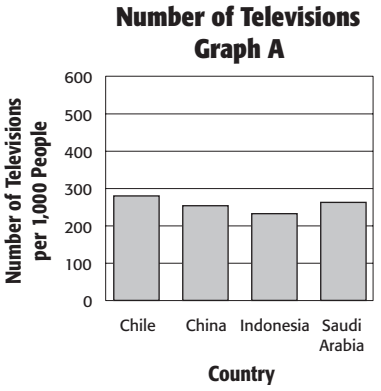
9–8 Misleading Graphs and Statistics

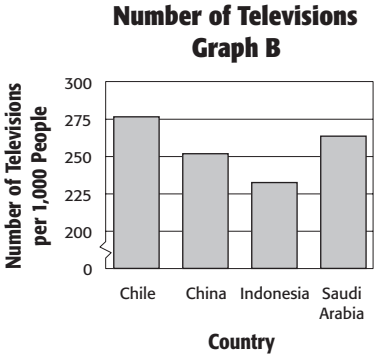
MAIN IDEA
- Recognize when graphs and statistics are misleading.

TEKS 8.13 The student evaluates predictions and conclusions based on statistical data. **(A)** Evaluate methods of sampling to determine validity of an inference made from a set of data. **(B) Recognize misuses of graphical or numerical information and evaluate predictions and conclusions based on data analysis.** *Also addresses TEKS 8.12(A).*

EXAMPLE Identify a Misleading Graph

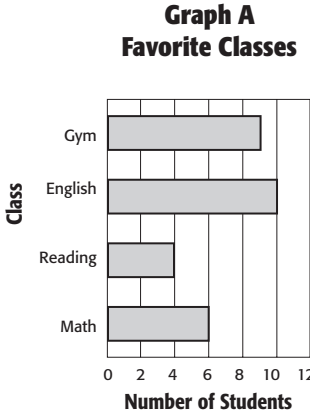
1 TELEVISIONS Which graph below could be used to indicate a greater difference in number of televisions? Explain.

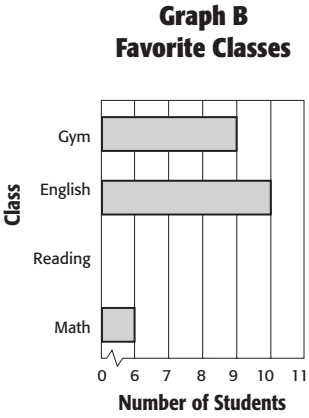




Both graphs show the order from greatest to least number of televisions per 1,000 people in Chile, Saudi Arabia, China, and Indonesia. However, the intervals in graph B represent _____ instead of _____ like graph A. Graph B shows a greater difference in televisions.

Check Your Progress Which graph below could be used to show a greater difference in favorite classes?

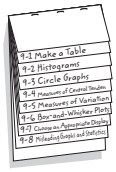




FOLDABLES™

ORGANIZE IT

Under the tab for Lesson 9–8 record what you learn about recognizing misleading statistics or graphs. Try to collect an example of misleading statistics or graphs in print. Glue or tape them into your Foldable and explain how and why they are misleading.



EXAMPLE **Identify Different Uses of Statistics**

2 **GYMNASTICS** **The scores for girls on a team competing on vault at a meet are 8.3, 8.5, 8.5, 8.8, 9.0, and 9.2.**

Predict which measure—mean, median, mode or range—the team would use to make its results look best.

Find the mean, median, and mode of the vault scores.

Mean $\frac{\text{sum of values}}{\text{number or values}} =$ ☐ or about ☐

Median $\frac{8.5 + 8.8}{2} = \frac{17.3}{2}$ or ☐

Mode ☐

Range ☐ – ☐ or ☐

A gymnastics team would most likely want to show the highest average in scores. The ☐ shows the highest event score, ☐.

Check Your Progress The scores for girls on a team competing in the short program are 5.2, 5.5, 5.5, 5.9, 5.8, and 6.0. Predict which measure—mean, median, mode, or range—the team would use to make its results look best.

☐

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

CHAPTER 9

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 9 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 9, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 227–228*) to help you solve the puzzle.

9-1

Problem-Solving Investigation: Make a Table

1. **MONEY** The list shows weekly allowances for a group of 13- and 14-year-olds. Organize the data in a table using intervals \$2.01–\$3.00, \$3.01–\$4.00, \$4.01–\$5.00, and so on. What is the most common interval of allowance amounts?

\$2.50	\$3.00	\$3.75	\$4.25	\$4.25
\$4.50	\$4.75	\$4.75	\$5.00	\$5.00
\$5.00	\$5.00	\$5.50	\$5.50	\$5.75
\$5.80	\$6.00	\$6.00	\$6.00	\$6.50
\$6.75	\$7.00	\$8.50	\$10.00	\$10.00
\$12.00	\$15.00			

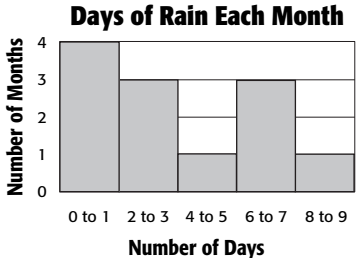
9-2

Histograms

Use the histogram at the right.

2. How many months have less than two days of rain? ____

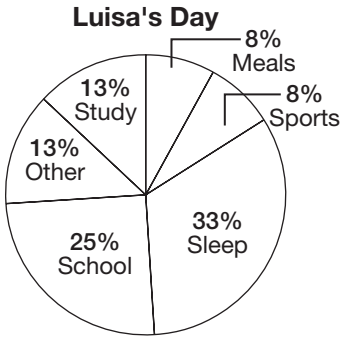
3. How many months had between two and seven days of rain? ____



9-3

Circle Graphs

Use the circle graph at the right.



4. What percent of her time does Luisa spend studying? _____

5. How many degrees are in the section that represents sports?

_____

9-4

Measures of Central Tendency

6. Name the three most common measures of central tendency.

_____

7. Which measure of central tendency best represents the data? Why? 9, 9, 20, 22, 25, 27

_____

9-5

Measures of Variation

Complete.

8. Measures of variation describe the _____ of data.

9. The _____ of a set of data is the difference between the greatest and the least numbers in the set.

10. The _____ range is the difference between the upper and lower quartiles.

9-6

Box-and-Whisker Plots

11. Draw a box-and-whisker plot for the data. 1, 1, 1, 2, 3, 3, 4, 5, 5

9-7

Choosing an Appropriate Display

Choose the letter that best matches the type of display to its use.

12. Line Graph

13. Bar Graph

14. Histogram

15. Line Plot

a. shows the frequency of data that has been organized into equal intervals

b. shows the number of items in specific categories in the data using bars

c. shows change over a period of time

d. shows how many times each number occurs in the data

9-8

Misleading Graphs and Statistics

16. When writing an employment ad for an automotive dealership, would it be best to use the mean, median, or mode of the number of cars sold to encourage a commissioned salesperson to apply for the job?

Wagner Automotive Sales			
Month	Cars Sold	Month	Cars Sold
Jan.	16	July	44
Feb.	5	Aug.	40
March	34	Sept.	38
April	49	Oct.	45
May	47	Nov.	48
June	79	Dec.	38

CHAPTER 9 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 9.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 9 Practice Test on page 521 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 9 Study Guide and Review on pages 516–520 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 9 Practice Test on page 521.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 9 Foldable.
- Then complete the Chapter 9 Study Guide and Review on pages 516–520 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 9 Practice Test on page 521.

Student Signature

Parent/Guardian Signature

Teacher Signature

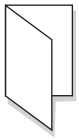
CHAPTER 10

Algebra: More Equations and Inequalities

FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

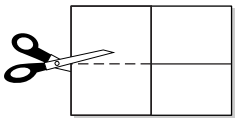
Begin with a plain sheet of 11" × 17" paper.

STEP 1 **Fold** in half lengthwise.

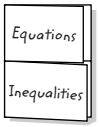


STEP 2 **Fold** again from top to bottom.

STEP 3 **Open** and cut along the second fold top make two tabs.



STEP 4 **Label** each tab as shown.



NOTE-TAKING TIP: When you take notes, define new terms and write about the new concepts you are learning in your own words. Write your own examples that use the new terms and concepts.

CHAPTER 10

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 10. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
arithmetic sequence			
coefficient			
common difference			
constant			
equivalent expressions			
like terms			
simplest form			
simplifying the expression			
term			
two-step equation			

10–1 Simplifying Algebraic Expressions

TEKS 8.16 The student uses logical reasoning to make conjectures and verify conclusions. **(B) Validate his/her conclusions using mathematical properties** and relationships. *Also addresses TEKS 8.16(A).*

MAIN IDEA

- Use the Distributive Property to simplify algebraic expressions.

BUILD YOUR VOCABULARY (page 255)

Equivalent expressions are expressions that have the _____ regardless of the value of the variable.

EXAMPLE **Write Equivalent Expressions**

1 **Use the Distributive Property to rewrite $3(x + 5)$.**

$3(x + 5) = 3(x) + 3(5)$

$= 3x +$ _____ Simplify.

Check Your Progress **Use the Distributive Property to rewrite each expression.**

a. $2(x + 6)$

b. $(a + 6)3$

EXAMPLES **Write Expressions with Subtraction**

Use the Distributive Property to rewrite each expression.

2 **$(q - 3)9$**

$(q - 3)9 = [q + (-3)]9$ Rewrite $q - 3$ as $q + (-3)$

$= (\quad)9 + (\quad)9$ Distributive Property.

$=$ _____ $+ (\quad)$ Simplify.

$=$ _____ $-$ _____ Definition of subtraction.

3 **$-3(z - 7)$**

$-3(z - 7) = -3[z + (-7)]$ Rewrite $z - 7$ as $z + (-7.)$

$= -3(z) + (-3)(-7)$ Distributive Property

$= -3z +$ _____ Simplify.

REVIEW IT

What is the sign of the product when you multiply two integers with different signs? with the same sign? *(Lesson 1-6)*

Check Your Progress **Use the Distributive Property to rewrite each expression.**

a. $(q - 2)8$

b. $-2(z - 4)$

BUILD YOUR VOCABULARY (page 255)

When a plus sign separates an algebraic expression into parts, each part is called a **term.**

The numeric factor of a term that contains a is called the **coefficient** of the variable.

Like terms are terms that contain the variable.

A term without a is called a **constant.**

EXAMPLE **Identify Parts of an Expression**

4 **Identify the terms, like terms, coefficients, and constants in $3x - 5 + 2x - x$.**

$3x - 5 + 2x - x$

$= 3x + \left(\quad\right) + 2x + \left(\quad\right)$ Definition of Subtraction

$= 3x + (-5) + 2x + (-1x)$ Identity Property; $-x = -1x$

The terms are $3x$, , $2x$, and $-x$. The like terms are $3x$, $2x$, and . The coefficients are 3, , and -1. The constant is .

Check Your Progress Identify the terms, like terms, coefficients, and constants in $6x - 2 + x - 4x$.

BUILD YOUR VOCABULARY (page 255)

An algebraic expression is in **simplest form** if it has no _____ and no _____.

When you use properties to _____ like terms, you are **simplifying the expression.**

EXAMPLES Simplify Algebraic Expressions

Simplify each expression.

5 $6n - n$

$6n$ and n are _____ terms.

$6n - n = 6n -$ _____ Identity Property; $n =$ _____

$= (6 - 1)n$ Distributive Property

$=$ _____ Simplify.

6 $8z + z - 5 = 9z + 2$

$8z$, z, and _____ are like terms. 25 and _____ are also like terms.

$8z + z - 5 - 9z + 2$

$= 8z + z +$ (_____) $+$ (_____) $+ 2$ Definition of subtraction.

$= 8z + z + (-9z) + (-5) + 2$ Commutative Property

$= [8 + 1 + (-9)]$ _____ $+ [(-5) + 2]$ Distributive Property

$= 0z +$ _____ Simplify.

$=$ _____

Check Your Progress

Simplify each expression.

a. $7n + n$

_____

b. $6s + 2 - 10s$

_____

c. $6z + z - 2 - 8z + 2$

_____

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

10–2 Solving Two-Step Equations

TEKS 8.5 The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A)** Predict, **find, and justify solutions to application problems using appropriate** tables, graphs, and **algebraic equations.**

MAIN IDEA

- Solve two-step equations.

BUILD YOUR VOCABULARY (page 255)

A **two-step equation** contains ____.

REMEMBER IT

Two-step equations can also be solved using models. Refer to page 534 of your textbook.

EXAMPLES **Solve Two-Step Equations**

1 **Solve $5x + 1 = 26$.**

Use the Subtraction Property of Equality.

$5x + 1 = 26$ Write the equation.

$\square - \square$ Subtract $\square$ from each side.

$5x \quad = 25$

Use the Division Property of Equality.

$5x = 25$

$\frac{5x}{\square} = \frac{25}{\square}$ Divide each side by $\square$.

$x = \square$ Simplify.

2 **Solve $-4 = \frac{1}{3}z + 2$.**

$-4 = \frac{1}{3}z + 2$ Write the equation.

$-4 - \square = \frac{1}{3}z + 2 - \square$ Subtract $\square$ from each side.

$\square = \frac{1}{3}z$ Simplify.

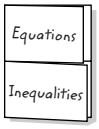
$\square(-6) = \square \cdot \frac{1}{3}z$ Multiply each side by $\square$.

$\square = z$ Simplify.

FOLDABLES

ORGANIZE IT

Under the "Equations" tab, include examples of how to solve a two step equation. You can use your notes later to tell someone else what you learned in this lesson.



Check Your Progress **Solve each equation.**

a. $3x + 2 = 20$

b. $-5 = \frac{1}{2}z + 8$

EXAMPLE **Equations with Negative Coefficients**

3 **Solve $8 - 3x = 14$.**

$8 - 3x = 14$	Write the equation.
$8 + (\square) = 14$	Definition of subtraction.
$8 - 8 + (\square) = 14 - 8$	Subtract 8 from each side.
$-3x = 6$	Simplify.
$\frac{-3x}{\square} = \frac{6}{\square}$	Divide each side by $\square$.
$x = -2$	Simplify

REMEMBER IT

When you are solving an equation, watch for the negative signs. In Example 3, the coefficient of the variable, x, is -3, not $+3$. So, divide each side by -3 to solve for x.

Check Your Progress Solve $5 - 2x = 11$.

REVIEW IT

Simplify $-c + 4c$.

EXAMPLE **Combine Like Terms First**

4 **Solve $14 = -k + 3k - 2$.**

$14 = -k + 3k - 2$	Write the equation.
$14 = -1k + 3k - 2$	☐ Property; $-k = 1k$
$14 =$ ☐ $- 2$	Combine like terms; $-1k + 3k = (-1 + 3)k$ or $2k$.
$14 +$ ☐ $= 2k - 2 +$ ☐	Add ☐ to each side.
$16 = 2k$	Simplify.
$\frac{16}{\square} = \frac{2k}{\square}$	Divide each side by ☐.
$8 = k$	Simplify.

Check Your Progress Solve $10 = -n + 4n - 5$.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

10–3 Writing Two-Step Equations

TEKS 8.4 The student makes connections among various representations of a numerical relationship. **The student is expected to generate a different representation of data given another representation of data (such as** a table, graph, **equation**, or verbal description). *Also addresses TEKS 8.14(D).*

MAIN IDEA

- Write two-step equations that represent real-life situations.

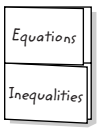
REVIEW IT

What are at least two words that will tell you that a sentence can be written as an equation? *(Lesson 1-7)*

FOLDABLES

ORGANIZE IT

Record the main ideas, definitions of vocabulary words, and other notes as you learn how to write two-step equations. Write your notes under the "Equations" tab.



EXAMPLES Translate Sentences Into Equations

Translate each sentence into an equation.

	Sentence	Equation
1	Three more than half a number is 15.	$\frac{1}{2}n + \square = 15$
2	Nineteen is two more than five times a number.	$19 = \square + 2$
3	Eight less that twice a number is -35.	$\square - 8 = -35$

EXAMPLE Write and Solve a Two-Step Equation

4 **TRANSPORTATION** **A taxi ride costs $3.50 plus $2 for each mile traveled. If Jan pays $11.50 for the ride, how many miles did she travel?**

Words $\downarrow$ **Variables** $\downarrow$ **Equation**

\$3.50 plus \$2 per mile equals \$11.50.

Let m represent the miles driven.

$3.50 + 2m = 11.50$

$\square + \square = 11.50$ Write the equation.

$3.50 - \square + 2m = 11.50 - \square$ Subtract $\square$ from each side.

$2m = 8$ Simplify.

$\frac{\square}{\square} = \frac{\square}{\square}$ Divide each side by $\square$.

$m = \square$ Simplify.

Jan traveled $\square$ miles.

Check Your Progress **Translate each sentence into an equation.**

a. Five more than one third a number is 7.

b. Fifteen is three more than six times a number.

c. Six less that three times a number is −22.

d. A rental car costs $100 plus $0.25 for each mile traveled. If Kaya pays $162.50 for the car, how many miles did she travel?

EXAMPLE

5 **DINING** **You and your friend spent a total of $33 for dinner. Your dinner cost $5 less than your friend's. How much did you spend for dinner?**

Words Your friend's dinner plus your dinner equals $33.

Variables Let f represent the cost of your friend's dinner.

Equation $f + f - 5 = 33$

$\square = 33$ Write the equation.

$\square - 5 = 33$ Combine like terms.

$2f - 5 + 5 = 33 + 5$ Add 5 to both sides.

$2f = \square$ Simplify.

(continued on the next page)

$\square = \square$ Divide each side by $\square$.

$f = \square$ Simplify.

Your friend spent $\square$ on dinner. So you spent $\square$ on dinner.

Check Your Progress **DINING** You and your friend spent a total of $48 for dinner. Your dinner cost $4 more than your friend's. How much did you spend for dinner?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

10–4 Sequences

TEKS 8.5 The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A)** Predict, **find, and justify solutions to application problems using appropriate tables,** graphs, **and algebraic equations. (B) Find and evaluate an algebraic expression to determine any term in an arithmetic sequence (with a constant rate of change).**

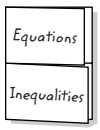
MAIN IDEA

- Write algebraic expressions to determine any term in an arithmetic sequence.

FOLDABLES™

ORGANIZE IT

In your Foldable, explain how to determine whether a sequence is arithmetic.



BUILD YOUR VOCABULARY (page 255)

A **sequence** is an _____ of numbers.

Each number in a _____ is called a **term.**

An **arithmetic sequence** is a sequence in which the _____ between any two consecutive terms is the same.

The difference between any two _____ in an _____ sequence is called the **common difference.**

EXAMPLE Identify Arithmetic Sequences

1 **State whether the sequence 23, 15, 7, −1, −9 . . . is arithmetic. If it is, state the common difference. Write the next three terms of the sequence.**

−3, 15, 7, −1, 9

−8 −8 −8 −8

Notice that 15 − 23 = −8, 7 − 15 = −8, and so on.

The terms have a common _____ of −8, so the sequence is _____.

Continue the pattern to find the next three terms.

−9, _____, _____, _____

−8 −8 −8

The next three terms are _____, _____, and _____.

Check Your Progress State whether the sequence 29, 27, 25, 23, 21, . . . is arithmetic. If it is, state the common difference. Write the next three terms of the sequence.

EXAMPLE **Describe an Arithmetic Sequence**

2 **Write an expression that can be used to find the *n*th term of the sequence 0.6, 1.2, 1.8, 2.4, ... Then write the next three terms.**

Use a table to example the sequence.

Term Number (*n*)	1	2	3	4
Term	0.6	1.2	1.8	2.4

The terms have a common difference of 0.6. Also, each term is _____ times its term number.

An expression that can be used to find the *n*th term is _____.

The next three terms are _____, _____, and _____.

Check Your Progress Write an expression that can be used to find the *n*th term of the sequence 1.5, 3, 4.5, 6, ... Then write the next three terms.

EXAMPLE

3 TRANSPORTATION **This arithmetic sequence shows the cost of a taxi ride for 1, 2, 3, and 4 miles. What would be the cost of a 9-mile ride?**

Miles	Cost ($)
1	5.25
2	7.00
3	8.75
4	10.50

The common difference between the costs is ____. This implies that the expression for the nth mile is ____. Compare each cost to the value of ____ for each number of miles.

Each cost is 3.50 more than ____. So, the expression ____ is the cost of a taxi ride for n miles. To find the cost of a 9-mile ride, let c represent the cost. Then write and solve an equation for $n = 9$.

Miles	Cost ($)	1.75n
1	5.25	1.75
2	7.00	3.50
3	8.75	5.25
4	10.50	7.00

$c = 1.75n + 3.50$ Write the equation.

$c = 1.75$ ____ $+ 3.50$ Replace n with ____.

$c =$ ____ $+ 3.50$ or ____ Simplify.

It would cost ____ for a 9-mile taxi ride.

Check Your Progress **TRANSPORTATION** This arithmetic sequence shows the cost of a taxi ride for 1, 2, 3, and 4 miles. What would be the cost of a 15-mile ride?

Miles	Cost ($)
1	6.00
2	7.50
3	9.00
4	10.50

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

10–5 Solving Equations with Variables on Each Side

TEKS 8.5 The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A)** Predict, **find, and justify solutions to application problems using appropriate** tables, graphs, and **algebraic equations.**

MAIN IDEA
- Solve equations with variables on each side.

EXAMPLE 1 Equations with Variables on Each Side

Solve $7x + 4 = 9x$.

$7x + 4 = 9x$ — Write the equation.

$7x - \square + 4 = 9x - \square$ — Subtract $\square$ from each side.

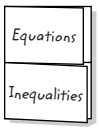
$\square = \square$ — Simplify by combining like terms.

$\square = \square$ — Divide each side by $\square$.

Check Your Progress Solve $3x + 6 = x$.

FOLDABLES™ ORGANIZE IT

Describe in your own words the steps to follow when you solve an equation with variables on both sides. Write an example of such an equation and solve it.



EXAMPLE 2 Equations with Variables on Each Side

Solve $3x - 2 = 8x + 13$.

$3x - 2 = 8x + 13$ — Write the equation.

$3x - \square - 2 = 8x - \square + 13$ — Subtract $\square$ from each side.

$-5x - 2 = 13$ — Simplify.

$-5x - 2 + \square = 13 + \square$ — Add $\square$ to each side.

$\square = \square$ — Simplify.

$x = \square$ — Divide each side by $\square$.

Check Your Progress Solve $4x - 3 = 5x + 7$.

EXAMPLE

3 GEOMETRY **The measure of an angle is 8 degrees more than its complement. If x represents the measure of the angle and $90 - x$ represents the measure of its complement, what is the measure of the angle?**

Words ▼ **Variables** ▼ **Equation**

8 less than the measure of an angle equals the measure of its complement

Let x and $90 - x$ represent the measures of the angles

$x - 8 = 90 - x$

$\square = \square$	Write the equation.
$x - 8 \square = 90 \square - x$	Add $\square$ to each side.
$x = 98 - x$	Simplify.
$x + \square = 98 - x \square$	Add $\square$ to each side.
$\square = 98$	Simplify.
$\square = \square$	Divide each side by $\square$.
$x = \square$	Simplify.

The measure of the angle is $\square$.

Check Your Progress **GEOMETRY** The measure of an angle is 12 degrees less than its complement. If x represents the measure of the angle and $90 - x$ represents the measure of its complement, what is the measure of the angle?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

10–6 Problem-Solving Investigation: Guess and Check

EXAMPLE

MAIN IDEA

- Solve problems by guessing and checking.

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(C) Select or develop an appropriate problem-solving strategy from a variety of different types, including… systematic guessing and checking… to solve a problem.**

THEATER 120 tickets were sold for the school play. Adult tickets were sold for $8 each, and child tickets were sold for $5 each. The total earned from ticket sales was $840. How many tickets of each type were sold?

EXPLORE You know the cost of each type of ticket, the total number of tickets sold, and the total income from ticket sales.

PLAN Use a systematic guess and check method to find the number of each type of ticket.

SOLVE Find the combination that gives 120 total tickets and $840 in sales. In the list, a represents adult tickets sold, and c represents child tickets sold.

a	c	$8a + 5c$	Check
50	70	$8(50) + 5(70) = 750$	too low
60		$8(60) +$ ☐ $=$ ☐	

CHECK So ☐ adult tickets and ☐ child tickets were sold.

Check Your Progress **THEATER** 150 tickets were sold for the school play. Adult tickets were sold for $7.50 each, and child tickets were sold for $4 each. The total earned from ticket sales was $915. How many tickets of each type were sold?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

10–7 Inequalities

MAIN IDEA
- Write and graph inequalities.

Preparation for TEKS A.1 The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways. **(C)** Describe functional relationships for given problem situations and **write** equations or **inequalities to answer questions arising from the situations.**

EXAMPLES Write Inequalities with < or >.

Write an inequality for each sentence.

1 SPORTS Members of the little league team must be under 14 years old.

Let a = person's age.

a ☐ 14

2 CONSTRUCTION The ladder must be over 30 feet tall to reach the top of the building.

Let h = ladder's height.

h ☐ 30

Check Your Progress **Write an inequality for each sentence.**

a. Members of the peewee football team must be under 10 years old.

☐

b. The new building must be over 300 feet tall.

☐

EXAMPLES Write Inequalities with ≤ or ≥

Write an equality for each sentence.

3 POLITICS The president of the United States must be at least 35 years old.

Let a = president's age.

a ☐ 35

4 CAPACITY A theater can hold a maximum of 300 people.

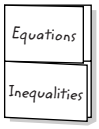
Let p = theater's capacity.

p ☐ 300

FOLDABLES

ORGANIZE IT

Record the main ideas about how to write inequalities. Include examples to help you remember. Write your notes under the "Inequalities" tab.



Check Your Progress **Write an inequality for each sentence.**

a. To vote, you must be at least 18 years old.

b. A football stadium can hold a maximum of 10,000 people.

EXAMPLES **Determine the Truth of an Inequality**

For the given value, state whether the inequality is true or false.

5 $x - 4 < 6, x = 0$

$x - 4 < 6$ Write the inequality.

$\square - 4 \stackrel{?}{<} 6$ Replace x with $\square$.

$\square < 6$ Simplify.

Since $\square$ is less than $\square$, $\square < \square$ is $\square$.

6 $3x \geq 4, x = 1$

$3x \geq 4$ Write the inequality.

$3\square \stackrel{?}{\geq} 4$ Replace x with 1.

$\square \not\geq 4$ Simplify.

Since $\square$ is not greater than or equal to 4, the sentence is $\square$.

WRITE IT

Write in words what the symbols <, >, ≤, and ≥ mean.

Check Your Progress **For the given value, state whether the inequality is *true* or *false*.**

a. $x - 5 < 8, x = 16$

b. $2x \geq 9, x = 5$

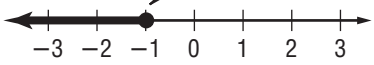
EXAMPLES Graph an Inequality

Graph each inequality on a number line.

7 $n \leq -1$

Place a [ ] circle at -1. Then draw a line and an arrow to the [ ].

The closed circle means the number -1 is included in the graph.



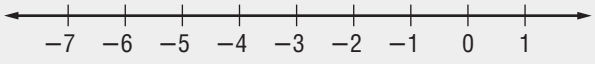
8 $n > -1$

Place an [ ] circle at -1. Then draw a line and an arrow to the [ ].

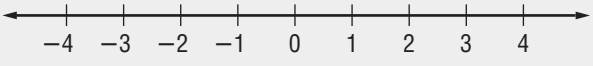
The open circle means -1 is *not* included in the graph.

Check Your Progress **Graph each inequality on a number line.**

a. $n \leq -3$



b. $n > -3$



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

CHAPTER 10

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 10 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 10, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*page 255*) to help you solve the puzzle.

10-1 Simplifying Algebraic Expressions

1. Simplify the expression $3x - 4 - 8x + 2$ by writing the missing information:

[ ] and [ ] are like terms. [ ] and [ ] are also like terms.

$3x - 4 - 8x + 2 = 3x +$ [ ] $- 8x + 2$ Definition of subtraction

$=$ $3x +$ [ ] $+ (-4) + 2$ Commutative Property

$=$ [ ] $x + -4 + 2$ Distributive Property

$=$ [ ] Simplify.

10-2 Solving Two-Step Equations

2. Define *two-step equation*.

What is the first step in solving each equation?

3. $3y - 2 = 16$ **4.** $5 - 6x = -19$ **5.** $32 = 4b + 6 - b$

10-3

Writing Two-Step Equations

Write each sentence as an algebraic equation.

6. Four less than six times a number is −40.

7. The quotient of a number and 9, decreased by 3 is equal to 24.

8. Jennifer bought 3 CDs, each having the same price. Her total for the purchase was $51.84, which included $3.84 in sales tax. Find the price of each CD.

Let p represent

Equation: Price of 3 CDs + =

+ = 51.84

$3p + 3.84 -$ = 51.84 −

=

= $\frac{48}{3}$

$p =$

10-4

Sequences

State whether each sequence is arithmetic. Write *yes* or *no*. If it is, state the common difference. Write the next three terms of the sequence.

9. 3, 7, 11, 15, 19, ...

10. 5, −15, 45, −135, 405, ...

11. 5, −1, −7, −13, −19, ...

12. $4\frac{1}{2}$, 3, $1\frac{1}{2}$, 0, $-1\frac{1}{2}$, ...

10-5

Solving Equations with Variables on Each Side

Solve each equation.

13. $3x + 2 = 2x + 5$

14. $6x - 2 = 3x$

15. $7x - 2 = 9x + 6$

10-6

Problem-Solving Investigation: Guess and Check

16. PROMOTIONS A sports drink company is offering free mountain bikes to people who collect enough points by buying bottles of the drink. You earn 5 points when you buy a 20-ounce bottle, and you earn 10 points when you buy a 32-ounce bottle. To get the bike, you need to have 915 points. What is the least number of bottles of sports drink you would have to buy in order to get the bike?

17. NUMBER THEORY The product of a number and its next two consecutive whole numbers is 60. What are the numbers?

10-7

Inequalities

Write an inequality for each sentence using the symbol <, >, ≤, or ≥.

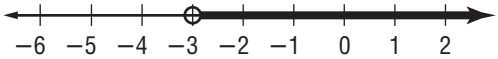
18. Children under the age of 2 fly free.

19. You must be at least 12 years old to go on the rocket ride.

Write the solution shown by each graph.

20.

21.



CHAPTER 10 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 10.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 10 Practice Test on page 567 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 10 Study Guide and Review on pages 563–566 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 10 Practice Test on page 567.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 10 Foldable.
- Then complete the Chapter 10 Study Guide and Review on pages 563–566 of your textbook.
- If you are unsure of any concepts or skills, refer back to the specific lesson(s).
- You may also want to take the Chapter 10 Practice Test on page 567.

Student Signature

Parent/Guardian Signature

Teacher Signature

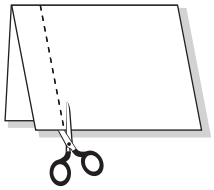
CHAPTER 11

Algebra: Linear Functions

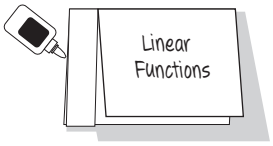
FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

Begin with seven sheets of $8\frac{1}{2}$" × 11" paper.

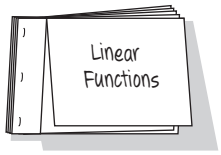
STEP 1 **Fold** a sheet of paper in half lengthwise. Cut a 1" tab along the left edge through one thickness.



STEP 2 **Glue** the 1" tab down. Write the title of the lesson on the front tab.



STEP 3 **Repeat** Steps 1–2 for the remaining sheets of paper. Staple together to form a booklet.



NOTE-TAKING TIP: When you begin studying a chapter in a textbook, first skim through the chapter to become familiar with the topics. As you skim, write questions about what you don't understand and what you'd like to know. Then, as you read the chapter, write answers to your questions.

CHAPTER 11

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 11. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
constant of variation			
direct variation			
domain			
function			
function table			
line of fit			

(continued on the next page)

Vocabulary Term	Found on Page	Definition	Description or Example
linear function			
range			
rise			
run			
scatter plot			
slope			
slope-intercept form			
y-intercept			

11–1 Functions

Main Idea

- Complete function tables.

TEKS 8.4 The student makes connections among various representations of a numerical relationship. **The student is expected to generate a different representation of data given another representation of data** (such as a table, graph, **equation,** or verbal description). **8.5** The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A) Predict, find,** and justify **solutions to application problems using appropriate tables,** graphs, and **algebraic equations.**

Build Your Vocabulary (pages 279–280)

A _____ where one thing _____ another is called a **function**.

Example Find a Function Value

Find each function value.

1 $f(4)$ **if** $f(x) = x - 8$

$f(x) = x - 8$ — Write the function.

$f(\square) = \square - 8$ — Substitute $\square$ for x into the function rule.

$= \square$ — Simplify.

So, $f(4) = \square$.

2 $f(-6)$ **if** $f(x) = 3x + 4$

$f(x) = 3x + 4$ — Write the function.

$f(\square) = 3(\square) + 4$ — Substitute $\square$ for x into the function rule.

$f(\square) = \square + 4$ — Multiply.

$= \square$ — Simplify.

So, $f(-6) = \square$.

Check Your Progress **Find each function value.**

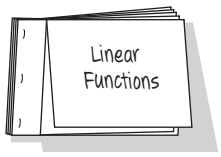
a. $f(2)$ if $f(x) = x - 7$

b. $f(-2)$ if $f(x) = 2x + 6$

Foldables

Organize It

In your Foldable, write how you would find the value of a function. You may wish to include an example.



BUILD YOUR VOCABULARY (pages 279–280)

The variable for the ____ of a function is called the **independent variable**.

The variable for the ____ of a function is called the **dependent variable**.

The set of ____ values in a function is called the **domain**.

The set of ____ values in a function is called the **range**.

EXAMPLE **Make a Function Table**

3 **Complete the function table for $f(x) = 4x - 1$. Then state the domain and the range of the function.**

Substitute each value of x, or ____, into the function rule.

Then simplify to find the ____.

Input x	Rule $4x - 1$	Output $f(x)$
-3		
-2		
-1		
0		
1		

$f(x) = 4x - 1$

$f(-3) =$ ____ or ____

$f(-2) =$ ____ or ____

$f(-1) =$ ____ or ____

$f(0) =$ ____ or ____

$f(1) =$ ____ or ____

Input x	Rule $4x - 1$	Output $f(x)$
-3		
-2		
-1		
0		
1		

The domain is ____.

The range is ____.

Check Your Progress

Complete the function table for $f(x) = 3x - 2$. Then state the domain and the range of the function.

Input x	Rule $3x - 2$	Output $f(x)$
-3		
-2		
-1		
0		
1		

EXAMPLE **Functions with Two Variables**

4 PARKING FEES **The price for parking at a city lot is \$3.00 plus \$2.00 per hour. Write a function using two variables to represent the price of parking for h hours. Then determine how much would it cost to park at the lot for 2 hours.**

Words Cost of parking equals \$3.00 plus \$2.00 per hour.

Function $p =$ ☐ + ☐

The function $p =$ ☐ represents the situation.

Substitute ☐ for h into the function rule.

$p =$ ☐ + ☐

$p = 3 + 2$☐ or ☐

It will cost ☐ to park for 2 hours.

Check Your Progress **TAXI** The price of a taxi ride is \$5.00 plus \$4.00 per hour. Write a function using two variables to represent the price of riding a taxi for h hours. Then determine how much would it cost for a 3-hour taxi ride.

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

11–2 Representing Linear Functions

MAIN IDEA

- Graph linear functions by using function tables and plotting points.

TEKS 8.4 The student makes connections among various representations of a numerical relationship. **The student is expected to generate a different representation of data given another representation of data (such as a table,** graph, **equation, or verbal description). 8.5** The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A) Predict, find,** and justify **solutions to application problems using appropriate** tables, **graphs,** and algebraic equations. *Also addresses TEKS 8.7(D).*

EXAMPLE

1 **MUSIC** **During a clearance sale, a music store is selling CDs for \$3 and tapes for \$1. Graph the function $3x + y = 6$ to find how many CDs and tapes Bill can buy with \$6.**

First, rewrite the equation by solving for y.

$3x + y = 6$ Write the equation.

$3x - \square + y = 6 - \square$ Subtract $\square$ from each side.

$y = 6 - 3x$ Simplify.

Choose values for x and substitute them to find y. Then graph the ordered pairs.

x	$y = 6 - 3x$	y	(x, y)
0	$y = 6 - 3\square$		
1	$y = 6 - 3\square$		
2	$y = 6 - 3\square$		

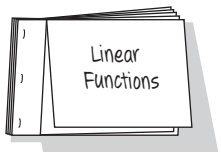
He cannot buy negative numbers of CDs or tapes, so the solutions are $\square$ CDs and $\square$ tapes, $\square$ CD and $\square$ tapes, or $\square$ CDs and $\square$ tapes.

Check Your Progress **BAKE SALE** During a bake sale, a plate of brownies is sold for \$2 and a plate of cookies is sold for \$1. Graph the function $2x + y = 4$ to find how many plates of brownies and cookies Craig can buy with \$4.

FOLDABLES™

ORGANIZE IT

In your Foldable, include a linear function and its graph.



EXAMPLE **Graph a Function**

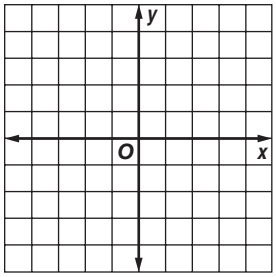
2 **Graph $y = x - 3$.**

Step 1 Choose some values for x. Make a function table. Include a column of ordered pairs of the form (x, y).

x	$x - 3$	y	(x, y)
0	$\square - 3$	$\square$	$\square$
1	$\square - 3$	$\square$	$\square$
2	$\square - 3$	$\square$	$\square$
3	$\square - 3$	$\square$	$\square$

Step 2 Graph each ordered pair.

Draw a line that passes through each point. Note that the ordered pair for any point on this line is a solution of $y = x - 3$. The line is the complete graph of the function.



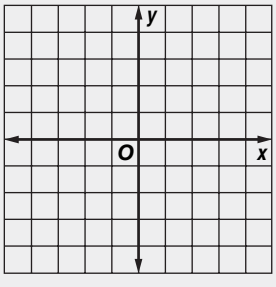
Check It appears from the graph that $(-1, -4)$ is also a solution. Check this by substitution.

$y = x - 3$ Write the function.

$\square \stackrel{?}{=} \square - 3$ Replace x and y.

$\square = \square$ Simplify.

Check Your Progress Graph $y = x - 2$.



BUILD YOUR VOCABULARY (pages 279–280)

A function in which the graph of solutions forms a [ ] is called a **linear function**.

The value of x where the graph crosses the [ ] is called the ***x*-intercept**.

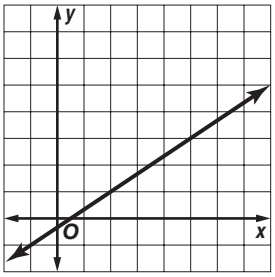
The value of y where the graph crosses the [ ] is called the ***y*-intercept**.

EXAMPLE

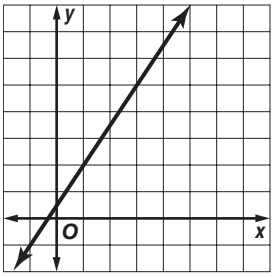
3 TEST EXAMPLE **Which line graphed below best represents the table of values for the ordered pairs (x, y)?**

x	y
0	1
1	3
2	5
3	7

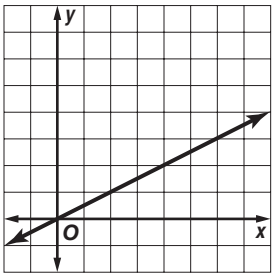
A



C



B



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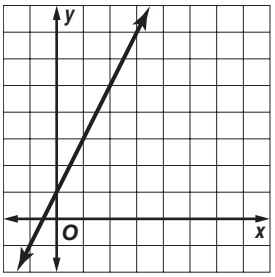


Read the Test Item

You need to decide which of the four graphs represents the data in the table.

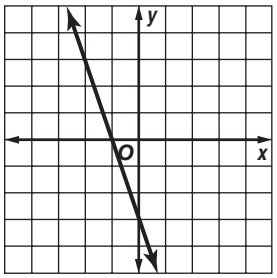
Solve the Test Item

The values in the table represent the ordered pairs [ ], [ ], [ ] and [ ]. Test the ordered pairs with each graph. Graph [ ] is the only graph which contains all these ordered pairs. The answer is [ ].

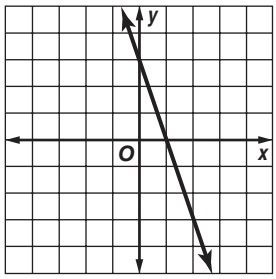
Check Your Progress **Which line graphed below best represents the table of values for the ordered pairs (x, y)?**

x	y
0	3
1	0
2	−3
3	−6

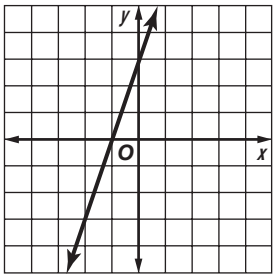
A



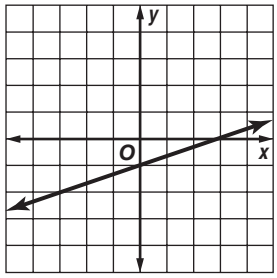
C



B



D



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

11–3 The Slope Formula

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(D) Use multiplication by a constant factor (unit rate) to represent proportional relationships.** *Also addresses TEKS 8.3(B), 8.14(A).*

MAIN IDEA
- Find the slope of a line using the slope formula.

BUILD YOUR VOCABULARY (pages 279–280)

Slope is the ____ of the **rise**, or ____ change, to the **run**, or ____ change.

EXAMPLE

1 ACCESS RAMPS **The access ramp from the sidewalk to the door of a hotel rises 8 inches for every horizontal change of 96 inches. What is the slope of the access ramp?**

slope = ____ Definition of slope

= ____ rise = ____ inches, run = ____ inches

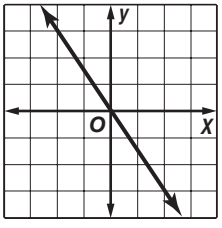
= ____ Simplify.

The slope of the access ramp is ____.

Check Your Progress **ACCESS RAMPS** The access ramp from the sidewalk to the door of an office building rises 14 inches for every horizontal change of 210 inches. What is the slope of the access ramp?

EXAMPLE **Find Slope Using a Graph**

2 Find the slope of the line



Choose two points on the line. The vertical change is −3 units while the horizontal change is 2 units.

slope $= \frac{\text{rise}}{\text{run}}$ Definition of slope

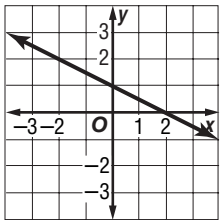
$=$ ☐ rise $=$ ☐, run $=$ ☐

The slope of the line is ☐.

Check Your Progress

Find the slope of the line.

☐



EXAMPLE **Find Slope Using a Table**

3 **The points given in the table lie on a line. Find the slope of the line. Then graph the line.**

x	–3	–1	1	3
y	–2	1	4	7

slope $= \frac{\text{change in } y}{\text{change in } x}$

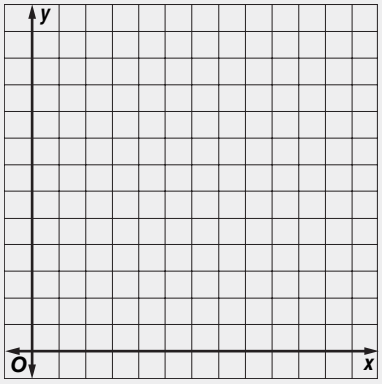
$=$ ☐

$=$ ☐

The slope is ☐.

☐

Check Your Progress The points given in the table below lie on a line. Find the slope of the line. Then graph the line.



x	y
2	5
5	7
8	9
11	11

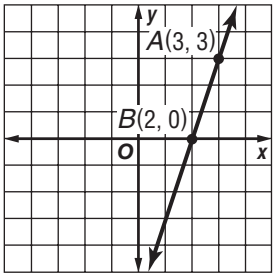
EXAMPLE **Positive Slope**

4 **Find the slope of the line that passes through $A(3, 3)$ and $B(2, 0)$.**

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Definition of slope

$m = \frac{0 - 3}{2 - 3}$ $(x_1, y_1) = (3, 3)$ $(x_2, y_2) = (2, 0)$

$m = \frac{3}{1}$ or 3 Simplify.



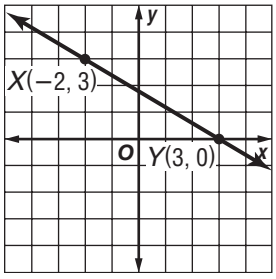
EXAMPLE **Negative Slope**

5 **Find the slope of the line that passes through $X(-2, 3)$ and $Y(3, 0)$.**

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Definition of slope

$m = \frac{\square}{\square}$ $(x_1, y_1) = (-2, 3)$ $(x_2, y_2) = (3, 0)$

$m = \frac{-3}{5}$ or $-\frac{3}{5}$ Simplify.



Check Your Progress **Find the slope of the line that passes through each pair of points.**

a. $C(1, 2)$ and $D(2, 6)$

b. $E(-3, -4)$ and $F(0, -2)$

c. $G(-2, 5)$ and $H(4, -7)$

d. $J(0, 8)$ and $K(4, -2)$

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

11–4 Direct Variation

MAIN IDEA
- Use direct variation to solve problems.

TEKS 8.2 The student selects and uses appropriate operations to solve problems and justify solutions. **(D) Use multiplication by a constant factor (unit rate) to represent proportional relationships. 8.3** The student identifies proportional or non-proportional linear relationships in problem situations and solves problems. **(A) Compare and contrast** proportional and **non-proportional linear relationships.** *Also addresses TEKS 8.3(B), 8.5(A).*

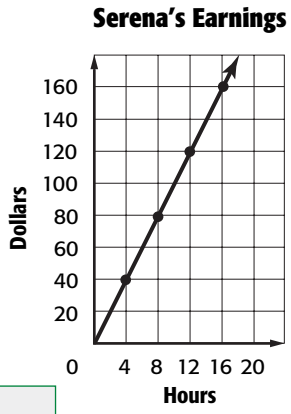
BUILD YOUR VOCABULARY (pages 279–280)

When two variable quantities have a _____, their relationship is called a **direct variation.**

The constant ratio is called the _____.

EXAMPLE **Find a Constant Ratio**

1 EARNINGS **The amount of money Serena earns at her job varies directly as the number of hours she works. Determine the amount Serena earns per hour.**



Since the graph of the data forms a line, the rate of change _____.

Use the graph to find _____.

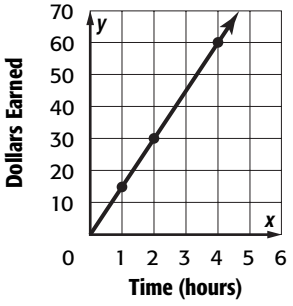
$\frac{\text{amount earned}}{\text{hours worked}} \rightarrow$ _____ _____ _____

Serena earns _____.

Check Your Progress

EARNINGS The amount of money Elizabeth earns at her job varies directly as the number of hours she works. Determine the amount Elizabeth earns per hour.

_____



KEY CONCEPT

In a direct variation, the ratio of y to x is constant. This can be stated as y *varies directly with* x. A direct variation can be represented algebraically as $k = \frac{y}{x}$ or $y = kx$ where $k \neq 0$.

EXAMPLE **Solve a Direct Variation**

2 **SHOPPING** **A grocery store sells 4 cans of soup for $5. How much would it cost to buy 8 cans?**

METHOD 1 Use an equation.

Write an equation of direct variation. Let x represent the number of cans and let y represent the cost.

$y = kx$	Direct variation
$\square = k\square$	$y = \square$, $x = \square$
$1.25 = k$	Simplify.
$y = \square$	Substitute for $\square$.

Use the equation to find y when $x = 8$.

$y = 1.25x$	
$y = 1.25\square$	$x = \square$
$y = \square$	Multiply.

METHOD 2 Use a proportion.

cans → $\frac{4}{5} = \frac{8}{y}$ ← cans
cost → cost

$\square = \square$	Find the cross products.
$4y = 40$	Multiply.
$\frac{4y}{4} = \frac{40}{4}$	Divide each side by 4.
$y = \square$	Simplify.

It would cost $\square$ to buy 8 cans.

Check Your Progress **SHOPPING** A grocery store sells 6 apples for $2.70. How much would it cost to buy 10 apples?

EXAMPLES Identify Direct Variation

Determine whether each linear function is a direct variation. If so, state the constant of variation.

3

Days, x	2	4	6	8
Hours worked, y	16	32	54	72

Compare the ratios to check for a common ratio.

$\frac{\text{hours}}{\text{days}}$ → [ ] [ ] [ ] [ ]

The ratios are [ ], so the function is [ ].

4

Hours, x	3	6	9	12
Miles, y	25.5	51	76.5	102

Compare the ratios to check for a common ratio.

$\frac{\text{miles}}{\text{hours}}$ → [ ] [ ] [ ] [ ]

Since the ratios are [ ], the function is a direct variation. The constant of variation is [ ].

Check Your Progress **Determine whether the linear function is a direct variation. If so, state the constant of variation.**

a.

Days, x	1	2	3	4
Hours worked, y	8	16	24	32

[ ]

b.

Hours, x	2	4	6	8
Miles, y	15	25	35	45

[ ]

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

11–5 Slope-Intercept Form

MAIN IDEA

- Graph linear equations using the slope and *y*-intercept.

TESK 8.3 The student identifies proportional or non-proportional linear relationships in problem situations and solves problems. **(A) Compare and contrast** proportional and **non-proportional linear relationships. 8.4** The student makes connections among various representations of a numerical relationship. **The student is expected to generate a different representation of data given another representation of data** (such as a table, **graph, equation,** or verbal description).

BUILD YOUR VOCABULARY (pages 279–280)

Slope-intercept form is when an equation is written in the form ____, where m is the ____ and b is the ____.

EXAMPLES Find the Slopes and *y*-intercepts of Graphs

State the slope and the *y*-intercept of the graph of each equation.

1 $y = \frac{3}{4}x - 5$

$y = \frac{3}{4}x + (\quad)$ Write the equation in the form $y = mx + b$.

$y = mx + b$ $m = \frac{3}{4}$, $b =$ ____

The slope of the graph is ____, and the *y*-intercept is ____.

2 $2x + y = 8$

$2x + y = 8$ Write the original equation.

$-$ ____ $-$ ____ Subtract ____ from each side.

$y =$ ____ Simplify.

$y =$ ____ Write the equation in the form $y = mx + b$.

$y = mx + b$ $m =$ ____, $b =$ ____

The slope of the graph is ____ and the *y*-intercept is ____.

Check Your Progress **State the slope and the *y*-intercept of the graph of each equation.**

a. $y = \frac{1}{4}x - 2$

b. $3x + y = 5$

EXAMPLE **Graph an Equation**

3 **Graph $y = \frac{2}{3}x + 2$ using the slope and *y*-intercept.**

Step 1 Find the slope and *y*-intercept.

$$y = \frac{2}{3}x + 2$$

slope $= \frac{2}{3}$

y-intercept $= 2$

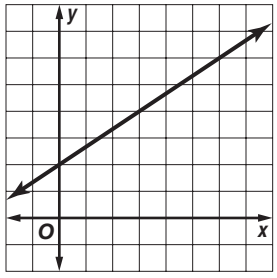
Step 2 Graph the *y*-intercept .

Step 3 Use the slope to locate a second point on the line.

$$m = \frac{2}{3}$$

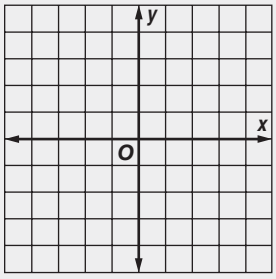
change in *y*: up 2 units

change in *x*: right 3 units



Step 4 Draw a line through the two points.

Check Your Progress Graph $y = \frac{1}{3}x + 3$ using the slope and *y*-intercept.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

11–6 Writing Linear Equations

MAIN IDEA
- Write linear equations in slope-intercept form.

TEKS 8.4 The student makes connections among various representations of a numerical relationship. **The student is expected to generate a different representation of data given another representation of data (**such as a table, graph, **equation,** or verbal description**). 8.5** The student uses graphs, tables, and algebraic representations to make predictions and solve problems. **(A)** Predict, **find, and justify solutions to application problems using appropriate tables, graphs, and algebraic equations.** *Also addresses TEKS 8.7(D).*

EXAMPLE 1 Write an Equation

Write an equation in slope-intercept form for a line with slope 3 and a *y*-intercept at −4.

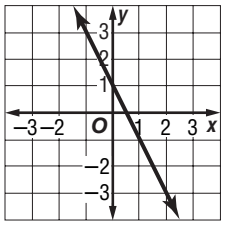
$y = mx + b$ Slope-intercept form

$y =$ ☐ Replace m with ☐ and b with ☐.

Check Your Progress Write an equation in slope-intercept form for a line with slope 7 and a *y*-intercept at −2.

EXAMPLE 2 Write an Equation From a Graph

Write an equation in slope-intercept form for the line graphed.

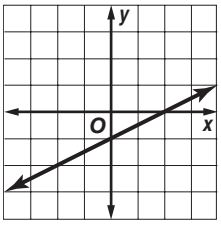


The *y*-intercept is ☐. From ☐, you can go down ☐ and right ☐ to another point on the line. So, the slope is ☐.

$y = mx + b$ Slope-intercept form

$y =$ ☐ Replace m with ☐ and b with ☐.

Check Your Progress Write an equation in slope-intercept form for the line graphed.



EXAMPLE **Write an Equation From a Table**

3 WAGES **This table shows the wages of a temporary worker in an office. Write an equation in slope-intercept form to represent how much money y the worker earns each hour x.**

Hours	Wages ($)
1	15
2	25
3	35
4	45

Step 1 Choose the coordinates of any two points to find the slope m, which is also the rate of change.

Let $(x_1, y_1) = (1, 15)$ and let $(x_2, y_2) = (2, 25)$.

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Definition of slope

$m =$ ☐ $(x_1, y_1) =$ ☐,

$(x_2, y_2) =$ ☐

$m =$ ☐ Simplify.

Step 2 Find the y-intercept b. Use the slope and the coordinates of any point, (4, 45) for example.

$y = mx + b$ Slope-intercept form

☐ $= 10$ ☐ $+ b$ $(x, y) =$ ☐, $m =$ ☐

☐ $=$ ☐ $+ b$ Multiply.

☐ $= b$ Subtract 40 from each side.

Step 3 Substitute the slope and y-intercept.

$y = mx + b$ Slope-intercept form

$y =$ ☐ $m =$ ☐, $b =$ ☐

Check Your Progress

WAGES This table shows the wages of an employee in a retail store. Write an equation in slope-intercept form to represent how much money y the employee earns each hour x.

Hours	Wages ($)
1	12
2	20
3	28
4	36

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

11–7 Problem-Solving Investigation: Use a Graph

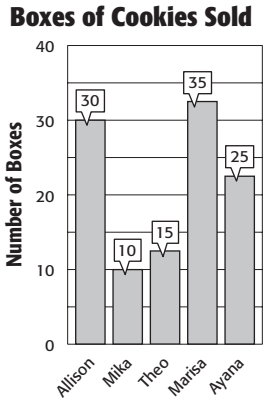
MAIN IDEA

- Solve problems by using a graph.

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(B) Use a problem-solving model that incorporates understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness.**

EXAMPLE Use a Graph

The graph shows how many boxes of cookies were sold by five students for a school fundraiser. How many boxes did the students sell altogether?



EXPLORE The graph shows you how many boxes were sold by each of five students. You want to know the total number of boxes sold by the students.

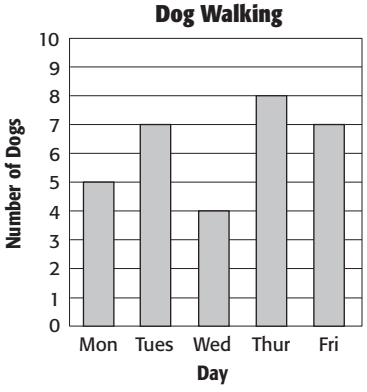
PLAN Use the graph to add the numbers of boxes sold.

SOLVE ☐ + ☐ + ☐ + ☐ + ☐ = ☐

The students sold ☐ altogether.

CHECK Look at the numbers at the top of each bar. Double check your sum.

Check Your Progress **PETS** The graph shows how many dogs Edmond walked each day this week. How many dogs did he walk altogether during the week?



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

11–8 Scatter Plots

TEKS 8.12 The student uses statistical procedures to describe data. **(B) Draw conclusions and make predictions by analyzing trends in scatterplots.**

MAIN IDEA
- Construct and interpret scatter plots.

BUILD YOUR VOCABULARY (pages 279–280)

A **scatter plot** is a graph that shows the between _____ sets of data.

A **line of fit** is a line that is very close to _____ of the data points in a scatter plot.

EXAMPLE **Identify a Relationship**

Explain whether a scatter plot of the data for the following might show a *positive*, *negative*, or *no relationship*.

1. **cups of hot chocolate sold at a concession stand and the outside temperature**

As the temperature decreases, the number of cups of hot chocolate sold _____. Therefore, the scatter plot might show a _____ relationship.

2. **birthday and number of sports played**

The number of sports played does not depend on your birthday. Therefore, the scatter plot shows _____ relationship.

Check Your Progress **Determine whether a scatter plot of the data for the following might show a *positive*, *negative*, or *no relationship*.**

a. number of cups of lemonade sold at a concession stand and the outside temperature

b. age and the color of your hair

EXAMPLE **Line of Fit**

ZOOS **The table at the right shows the average and maximum longevity of various animals in captivity.**

3 **Make a scatter plot using the data. Then draw a line that best seems to represent the data.**

Longevity (years)	
Average	Maximum
12	47
25	50
15	40
8	20
35	70
40	77
41	61
20	54

Source: *Walker's Mammals of the World*

4 **Write an equation for this line of fit.**

The line passes through points at ☐ and ☐.

Use these points to find the slope of the line.

$m = \frac{y_2 - y_1}{x_2 - x_1}$ Definition of slope

$m =$ ☐ $(x_1, y_1) =$ ☐, $(x_2\ y_2) =$ ☐

$m =$ ☐ Simplify.

The slope is ☐, and the y-intercept is ☐.

Use the slope and the y-intercept to write the equation.

$y = mx + b$ Slope-intercept form

$y =$ ☐ $x +$ ☐ $m =$ ☐, $b =$ ☐

The equation for the line of fit is ☐.

5 **Use the equation to predict the maximum longevity for an animal with an average longevity of 33 years.**

$y = \frac{3}{2}x + 17.5$ Equation for the line of fit

$y = \frac{3}{2}$ ☐ $+ 17.5$ or ☐

The maximum longevity is about ☐.

Check Your Progress

The table shows the average hourly earnings of U.S. production workers since 1995.

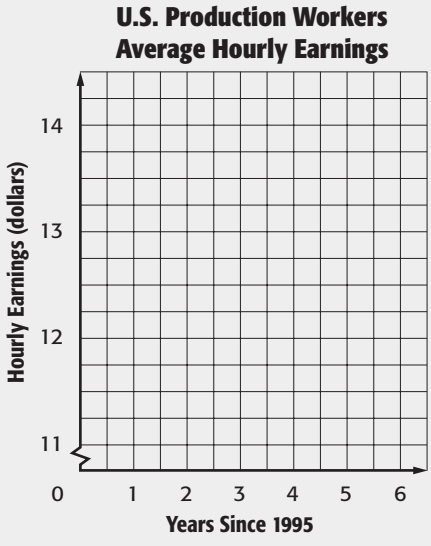
a. Make a scatter plot using the data.

b. Write an equation for the best-fit line using points (0, 11.43) and (5, 13.76).

c. Use the equation to predict the average hourly earnings of U.S. production workers in 2004.

U.S. Production Workers Earnings	
Year Since 1995	Average Hourly Earnings
0	$11.43
1	$11.82
2	$12.28
3	$12.78
4	$13.24
5	$13.76
6	$14.32

Source: *The World Almanac*



Homework Assignment

Page(s):

Exercises:

CHAPTER 11

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 11 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 11, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 279–280*) to help you solve the puzzle.

11-1 Functions

Match each description with the word it describes.

a. independent variable
b. dependent variable
c. domain
d. range

1. an output value of a function ____
2. the set of values of the dependent variable ____
3. the underlined letter in $f(x) = 2\underline{x} + 5$ ____
4. Complete the function table for $fx = 2x + 2$. Then give the domain and range.

Domain: ____

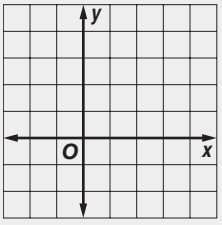
Range: ____

x	$2x + 2$	$f(x)$
-2		
0		
1		
3		

11-2 Graphing Linear Functions

5. Complete the function table. Then graph $y = -x + 2$.

x	$-x + 2$	y	(x,y)
-2			
0			
1			
3			



11-3

The Slope Formula

Find the slope of the line that passes through each pair of points.

6. $A(1, -2), B(4, 4)$ **7.** $C(1, 2), D(3, -2)$ **8.** $E(-1, 2), F(2, 2)$

11-4

Direction Variation

Determine whether each linear function is a direct variation. If so, state the constant of variation.

9.

hours, *x*	1	2	3	4
wages, *y*	$6	$12	$18	$24

10.

length, *x*	1	3	5	7
width, *y*	2	6	10	14

11.

hours, *x*	5	6	7	8
miles, *y*	480	415	350	285

12.

minutes, *x*	3	6	8	12
pages, *y*	66	132	176	264

11-5

Slope-Intercept Form

State the slope and the y-intercept for the graph of each equation.

13. $y = -3x + 4$ **14.** $y = \frac{2}{3}x - 7$ **15.** $\frac{1}{2}x + y = 8$

11-6

Writing Linear Equations

Write an equation in slope-intercept form for each line given the slope and a point on the line.

16. slope = 3, y-intercept = -2

17. slope = -1, y-intercept = 5

18. slope = $\frac{2}{3}$, (1, 4)

19. slope = $-\frac{1}{2}$, (-2, -2)

11-7

Problem-Solving Investigation: Use a Graph

20. **SHOPPING** The Buy Online Company charges \$1.50 per pound plus \$2 for shipping and handling. The Best Catalog Company charges \$1 per pound plus \$5 for shipping and handling. Use a graph to determine the weight at which the shipping and handling will be the same for both companies.

11-8

Scatter Plots

21. Complete. A scatter plot that shows a negative relationship will have a pattern of data points that go _____.

Write whether a scatter plot of the data for the following might show a *positive*, *negative*, or *no relationship*.

22. favorite color and type of pet

23. the amount of rain and the water level of a pond

CHAPTER 11 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 11.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 11 Practice Test on page 625 of you textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 11 Study Guide and Review on pages 621–624 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 11 Practice Test on page 625.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 11 Foldable.
- Then complete the Chapter 11 Study Guide and Review on pages 621–624 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 11 Practice Test on page 625.

Student Signature

Parent/Guardian Signature

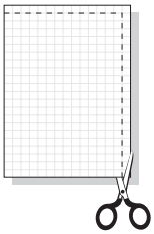
Teacher Signature

CHAPTER 12

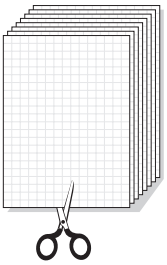
Algebra: Nonlinear Functions and Polynomials

FOLDABLES™ Use the instructions below to make a Foldable to help you organize your notes as you study the chapter. You will see Foldable reminders in the margin of this Interactive Study Notebook to help you in taking notes.

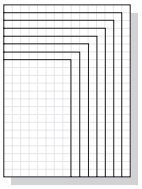
Begin with eight sheets of grid paper.



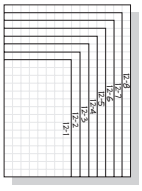
STEP 1 **Cut** off one section of the grid paper along both the long and short edges.



STEP 2 **Cut** off two sections from the second sheet, three sections from the third sheet, and so on to the 8th sheet.



STEP 3 **Stack** the sheets from narrowest to widest.



STEP 4 **Label** each of the right tabs with a lesson number.

NOTE-TAKING TIP: When you take notes, define new terms and write about the new concepts you are learning in your own words. Write your own examples that use the new terms and concepts.

CHAPTER 12

Build Your Vocabulary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 12. As you complete the study notes for the chapter, you will see Build Your Vocabulary reminders to complete each term's definition or description on these pages. Remember to add the textbook page number in the second column for reference when you study.

Vocabulary Term	Found on Page	Definition	Description or Example
monomial			
nonlinear function			
polynomial			
quadratic function			

12–1 Linear and Nonlinear Functions

Preparation for TEKS A.5 The student understands that linear functions can be represented in different ways and translates among their various representations. **(A) Determine whether or not given situations can be represented by linear functions.**

MAIN IDEA

- Determine whether a function is linear or nonlinear.

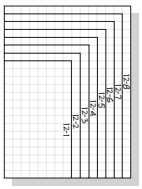
BUILD YOUR VOCABULARY (page 305)

Nonlinear functions do not have [ ] rates of change. Therefore, their graphs are not straight lines.

FOLDABLES

ORGANIZE IT

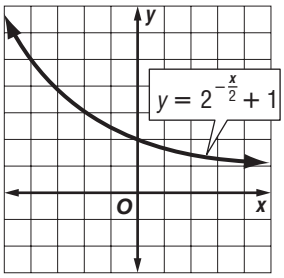
Explain how to identify linear and nonlinear functions using graphs, equations, and tables on the Lesson 12-1 section of your Foldable.



EXAMPLES **Identify Functions Using Graphs**

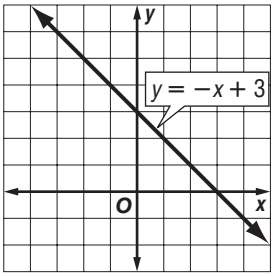
Determine whether each graph represents a *linear* or *nonlinear* function. Explain.

1



The graph is a curve, not a straight line. So it represents a [ ] function.

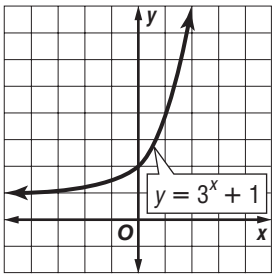
2



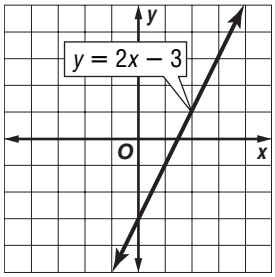
The graph is a straight line. So it represents a [ ] function.

Check Your Progress **Determine whether each graph represents a *linear* or *nonlinear* function. Explain.**

a.



b.



EXAMPLES Identify Functions Using Equations

Determine whether each equation represents a *linear* or *nonlinear* function. Explain.

3 $y = 5x^2 + 3$

Since x is raised to the _____ power, the equation cannot be written in the form $y = mx + b$. So, this function is _____.

4 $y - 4 = 5x$

Rewrite the equation as $y =$ _____. This equation is _____ since it is of the form $y = mx + b$.

Check Your Progress **Determine whether each equation represents a *linear* or *nonlinear* function. Explain.**

a. $y = x^2 - 1$

b. $y = x$

EXAMPLES Identify Functions Using Tables

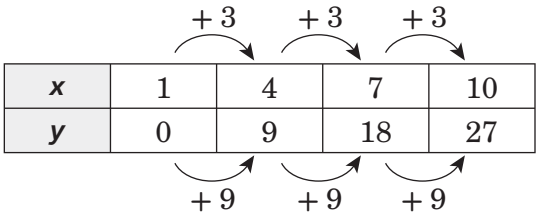
Determine whether each table represents a *linear* or *nonlinear* function. Explain.

5

		+2	+2	+2
x	2	4	6	8
y	2	20	54	104
		+18	+34	+50

As x increases by _____, y increases by a greater amount each time. The rate of change is not _____, so this function is _____.

6



As x increases by ____, y increases by ____ each time. The rate of change is ____, so this function is ____.

Check Your Progress **Determine whether each table represents a *linear* or *nonlinear* function. Explain.**

a.

x	1	3	5	7
y	3	7	11	15

b.

x	1	2	3	4
y	1	8	27	64

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

12–2 Graphing Quadratic Functions

Preparation for TEKS A.2 The student uses the properties and attributes of functions. **(A)** Identify and sketch the general forms of linear ($y = x$) and **quadratic ($y = x^2$) parent functions.**

MAIN IDEA

- Graph quadratic functions.

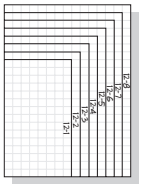
BUILD YOUR VOCABULARY (page 305)

A **quadratic function** is a function in which the [ ] power of the [ ] is [ ].

FOLDABLES

ORGANIZE IT

Record what you learn about graphing quadratic functions and using the graphs to solve problems on the Lesson 12-2 section of your Foldable.

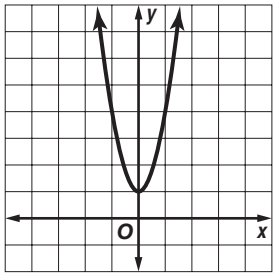


EXAMPLE **Graph Quadratic Functions**

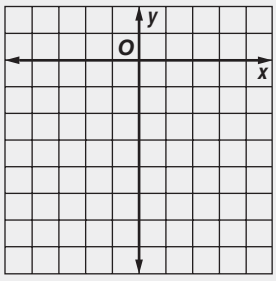
1 **Graph $y = 5x^2$.**

To graph a quadratic function, make a table of values, plot the ordered pairs, and connect the points with a smooth curve.

x	$5x^2$	y	(x, y)
-2	$5(-2)^2 =$ [ ]	[ ]	$(-2,$ [ ]$)$
-1	$5(-1)^2 =$ [ ]	[ ]	$(-1,$ [ ]$)$
0	$5(0)^2 =$ [ ]	[ ]	$(0,$ [ ]$)$
1	$5(1)^2 =$ [ ]	[ ]	$(1,$ [ ]$)$
2	$5(2)^2 =$ [ ]	[ ]	$(2,$ [ ]$)$



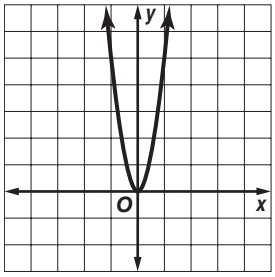
Check Your Progress Graph $y = -3x^2$.



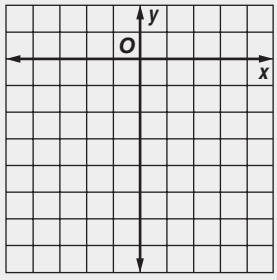
EXAMPLE **Graph Quadratic Functions**

2 **Graph $y = 3x^2 + 1$.**

x	$3x^2 + 1$	y	(x, y)
-2	$3(-2)^2 + 1 =$ ☐	☐	$(-2,$ ☐$)$
-1	$3(-1)^2 + 1 = 4$	4	$(-1, 4)$
0	$3(0)^2 + 1 =$ ☐	☐	$(0,$ ☐$)$
1	$3(1)^2 + 1 = 4$	4	$(1, 4)$
2	$3(2)^2 + 1 = 13$	13	$(2, 13)$



Check Your Progress Graph $y = -2x^2 - 1$.



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

12–3 Simplifying Polynomials

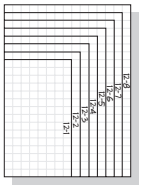
Main Idea
- Simplify polynomials.

Preparation for TEKS A.4 The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations. **(A)** Find specific function values, **simplify polynomial expressions,** transform and solve equations, and factor **as necessary in problem situations. (B) Use the commutative, associative, and distributive properties to simplify algebraic expressions.**

FOLDABLES

Organize It

In the Lesson 12-3 section of your Foldable, include an example of a polynomial that needs to be simplified. Then explain how to simplify the polynomial.



Build Your Vocabulary (page 305)

A **monomial** is a number, a variable, or a _____ of a number and one or more variables.

An algebraic expression that is the _____ or _____ of one or more _____ is called a **polynomial.**

Examples Simplify Polynomials

1 **Simplify $3r + 8p - 6q - r$.**

The like terms in this expression are _____ and _____.

$3r + 8p - 6q - r$ Write the polynomial.

$= 3r + 8p - 6q +$ _____ Definition of subtraction

$= [3r + (-r)] + 8p - 6q$ Group _____.

$=$ _____ $+ 8p - 6q$ Simplify by combining like terms.

2 **Simplify $-6x^2 + 14 + 3x$.**

There are no like terms in the expression.

Therefore, $-6x^2 + 14 + 3x$ is in _____ form.

Check Your Progress **Simplify each polynomial. If the polynomial cannot be simplified, write simplest form.**

a. $2r + 7p - 3q - 5r$

b. $-2x^2 + 4 + x$

Remember It

To be consistent, write the results of simplifying polynomials in standard form, with the powers of the variable decreasing from left to right.

3 **Simplify $2x + 8x^2 - 9x + 3 - 2x^2$.**

$2x + 8x^2 + (-9x) + 3 + (-2x^2)$

$= [8x^2 + (\quad)] + [2x + (\quad)] + 3$

$= \quad + (\quad) + 3$

$= \quad - 7x + 3$

Thus, $2x + 8x^2 - 9x + 3 - 2x^2 =$.

Check Your Progress Simplify $3x + 2x^2 - 6x + 2 - 3x^2$.

Homework Assignment

Page(s):

Exercises:

12–4 Adding Polynomials

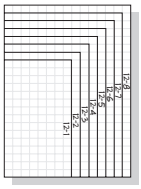
MAIN IDEA
- Add polynomials.

Preparation for TEKS A.4 The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations. **(A)** Find specific function values, **simplify polynomial expressions**, transform and solve equations, and factor **as necessary in problem situations. (B) Use the commutative, associative, and distributive properties to simplify algebraic expressions.**

FOLDABLES

ORGANIZE IT

Record what you learn about adding polynomials in the Lesson 12-4 section of your Foldable.



EXAMPLES Add Polynomials

1 **Find $(9x + 2) + (7x + 12)$.**

Add horizontally.

$(9x + 2) + (7x + 12)$

$= (9x + 7x) + (2 + 12)$ Associative and Commutative Properties

$=$ ☐ $+$ ☐

The sum is ☐.

2 **Find $(4x^2 + 11x - 3) + (-2x^2 + 5x - 7)$.**

Add vertically.

$4x^2 + 11x - 3$

$(+)\ -2x^2 + 5x - 7$

☐ $+ 16x$ ☐

The sum is ☐.

3 **Find $(15x^2 + 4) + (9x - 13)$.**

$(15x^2 + 4) + (9x - 13) = 15x^2 +$ ☐ $+ (4 - 13)$ Group like terms.

$= 15x^2 + 9x -$ ☐ Simplify.

The sum is $15x^2 + 9x -$ ☐.

4 **Find $(3x^2 + 14x - 9) + (-6x + 1)$.**

$3x^2 + 14x - 9$

$(+)\ -\ 6x + 1$

Leave a space because there is no other term like $3x^2$.

☐ $+\ 8x$ ☐

The sum is ☐.

WRITE IT

Explain why it is helpful when adding polynomials to leave a space when there is no other term like another.

Check Your Progress **Add.**

a. $(5x + 1) + (3x + 10)$

b. $(x^2 + 3x - 6) + (-3x^2 + 4x - 3)$

c. $(5x^2 + 2) + (2x - 9)$

d. $(2x^2 + 4x - 7) + (-3x + 5)$

EXAMPLE **Use Polynomials to Solve a Problem**

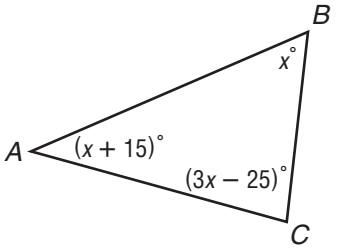
5 TEST EXAMPLE Which expression best describes the sum of the angle measures?

A $(2x + 15)°$

B $(3x - 25)°$

C $(5x - 10)°$

D $(5x + 40)°$



Read the Test Item

The figure is a triangle. Each angle measure is given in terms of x.

Solve the Test Item

Add the polynomials representing the angle measures to find the correct expression.

$(x + 15) + x + (3x - 25)$

$= \left(x + \square\right) + \left(15 \square\right)$ Group like terms.

$= \square$ Simplify.

The sum of the measures can be represented by the expression $\square$. The answer is $\square$.

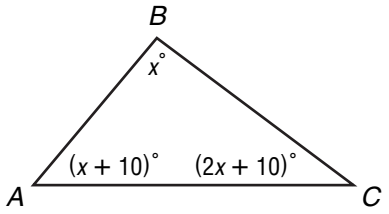
Check Your Progress **TEST EXAMPLE** Which expression best describes the sum of the angle measures?

A $(3x + 20)°$

B $(4x + 20)°$

C $(4x + 25)°$

D $(5x + 25)°$



HOMEWORK ASSIGNMENT

Page(s):

Exercises:

12–5 Subtracting Polynomials

MAIN IDEA
- Subtract polynomials.

Preparation for TEKS A.4 The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations. **(A)** Find specific function values, **simplify polynomial expressions,** transform and solve equations, and factor **as necessary in problem situations. (B) Use the commutative, associative, and distributive properties to simplify algebraic expressions.**

EXAMPLES Subtract Polynomials

Subtract.

1 $(8c + 3) - (6c + 2)$

$$\begin{array}{rl} & 8c + 3 \\ (-) & 6c + 2 \\ \hline & 2c + 1 \end{array}$$

Align the terms.
Subtract.

The difference is ____.

2 $(-2d^2 + 6d - 11) - (-3d - 4)$

$$\begin{array}{rl} & -2d^2 + 6d - 11 \\ (-) & \quad -3d + 4 \\ \hline & -2d^2 + 9d - 15 \end{array}$$

Align like terms.
Subtract.

The difference is ____.

EXAMPLES Subtract Using the Additive Inverse

3 **Find $(6z + 1) - (2z - 5)$.**

The additive inverse of $2z - 5$ is ____.

$(6z + 1) - (2z - 5)$

$= (6z + 1) + (-2z + 5)$ To subtract $(2z - 5)$, add $(-2z + 5)$.

$= (6z - 2z) + (1 + 5)$ Group like terms.

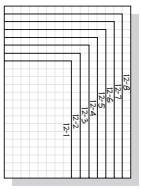
$= 4z + 6$ Simplify by combining like terms.

The difference is ____.

FOLDABLES

ORGANIZE IT

Record what you learn about subtracting polynomials in the Lesson 12-5 section of your Foldable.



4 **Find $(10f^2 - 15) - (-5f + 3.)$**

The additive inverse of $-5f + 3$ is ____.

$$\begin{array}{rl} & 10f^2 \quad -15 \\ (-) & \quad -5f + 3 \\ \hline \end{array} \longrightarrow \begin{array}{rl} & 10f^2 \quad -15 \\ (+) & \quad 5f - 3 \\ \hline & 10f^2 + 5f - 18 \end{array}$$

The difference is ____.

Check Your Progress **Subtract.**

a. $(6c + 5) - (2c + 2)$

b. $(5d^2 + 2d + 10) - (-5d + 8)$

c. $(11z + 2) - (3z - 6)$

d. $(12f^2 - 5) - (-2f + 4)$

EXAMPLE **Use Polynomials to Solve a Problem**

5 EXPERIMENTS **Students are rolling identical marbles down two side-by-side ramps. The marble on ramp A rolls $3t^2 + 11t$ inches in t seconds. The marble on ramp B rolls $2t^2 + 4t$ inches in t seconds. How far apart are the marbles after 6 seconds?**

Write an expression for the difference of the distances traveled by each marble.

$$\begin{array}{rr} & 3t^2 + 11t \\ (-) & 2t^2 + 4t \end{array} \longrightarrow \begin{array}{rr} & 3t^2 + 11t \\ (+) & 2t^2 + 4t \\ \hline & t^2 + 7t \end{array}$$

Now evaluate this expression for a time of 6 seconds.

$t^2 + 7t = (\square)^2 + 7(\square)$ Replace t with $\square$.

$= \square + 42$ or 78 Simplify.

After $\square$ seconds, the cars are $\square$ inches apart.

Check Your Progress Students are rolling identical marbles down two side-by-side ramps. The marble on ramp A rolls $4t^2 + 12t$ inches in t seconds. The marble on ramp B rolls $t^2 + 2t$ inches in t seconds. How far apart are the marbles after 5 seconds?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

12–6 Multiplying and Dividing Monomials

MAIN IDEA

- Multiply and divide monomials.

KEY CONCEPT

Product of Powers To multiply powers with the same base, add their exponents.

FOLDABLES™ In the Lesson 12–6 section of your Foldable, record the product of powers rule.

EXAMPLE **Multiply Powers**

1 **Find $7^6 \cdot 7^2$. Express using exponents.**

$7^6 \cdot 7^2 = 7^{6+2}$ The common base is ☐.

$=$ ☐ ☐ the exponents.

Check $7^6 \cdot 7^2 = (7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7) \cdot (7 \cdot 7)$

$= 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$

$=$ ☐

Check Your Progress Find $2^5 \cdot 2^4$. Express using exponents.

EXAMPLE **Multiply Monomials**

2 **Find $7x^2(11x^4)$. Express using exponents.**

$7x^2\,(11x^4) = (7 \cdot 11)$ ☐ Comm. and Assoc. Properties.

$=$ ☐ (x^{2+4}) The common base is ☐.

$=$ ☐ ☐ the exponents.

Check Your Progress Find $3x^2(-5x^5)$. Express using exponents.

Preparation for TEKS A.3 The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations. **(A) Use symbols to represent unknowns and variables. A.11** The student understands there are situations modeled by functions that are neither linear nor quadratic and models the situations. **(A) Use patterns to generate the laws of exponents and apply them in problem-solving situations.**

KEY CONCEPT

Quotient of Powers To divide powers with the same base, subtract their exponents.

EXAMPLES Divide Powers

Divide. Express using exponents.

3 $\frac{6^{12}}{6^2}$

$\frac{6^{12}}{6^2} = 6^{12-2}$ The common base is ☐.

$= \square$ Simplify.

4 $\frac{a^{14}}{a^8}$

$\frac{a^{14}}{a^8} = a^{14-8}$ The common base is ☐.

$= \square$ Simplify.

Check Your Progress

Divide. Express using exponents.

a. $\frac{3^{10}}{3^4}$

b. $\frac{x^{11}}{x^3}$

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

12–7 Problem-Solving Investigation: Make a Model

MAIN IDEA

- Solve problems by making a model.

TEKS 8.14 The student applies Grade 8 mathematics to solve problems connected to everyday experiences, investigations in other disciplines, and activities in and outside of school. **(C) Select or develop an appropriate problem-solving strategy from a variety of different types, including drawing a picture…to solve a problem.**

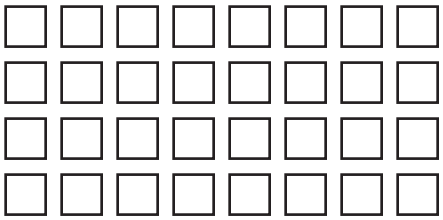
EXAMPLE Make a Model

DESKS **Caitlyn is responsible for arranging desks in her classroom. There are 32 desks, and she wants to have twice as many desks in each row as she has in each column. Use a model to determine how many desks she should put in each row and how many rows she will need.**

EXPLORE You know Caitlyn has 32 desks.

PLAN Experiment by arranging 32 tiles into different rows and columns until you have ____ as many tiles in each row as are in each column.

SOLVE



The correct arrangement is ____ rows with ____ desks in each row.

CHECK Check to see if the arrangement meets Caitlyn's original requirements.

Check Your Progress **TABLES** Mrs. Wilson wants to arrange tables into a square that is open in the middle and has 8 tables on each side. How many tables will she need altogether?

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

12–8 Multiplying Monomials and Polynomials

Main Idea

- Multiply monomials and polynomials.

Preparation for TEKS A.3 The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations. **(A) Use symbols to represent unknowns and variables. A.11** The student understands there are situations modeled by functions that are neither linear nor quadratic and models the situations. **(A) Use patterns to generate the laws of exponents and apply them in problem-solving situations.**

EXAMPLES Use the Distributive Property

1 **Find $y(y + 12)$.**

$y(y + 12) = y(\square) + y(\square)$ Distributive Property

$= \square + \square$ $y \cdot y = \square$

The answer is $\square$.

2 **Find $-6x(x + 3)$.**

$-6x(x + 3) = -6x(\square) + (-6x)(\square)$ Distributive Property

$= -6x^2 + (-18x)$ $-6 \cdot x \cdot x = -6x^2$

$= \square$ Definition of subtraction

The answer is $\square$.

Check Your Progress **Multiply.**

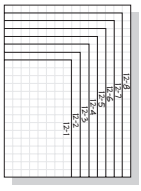
a. $y(y + 3)$

b. $-2x(x + 6)$

FOLDABLES

ORGANIZE IT

In the Lesson 12-8 section of your Foldable, explain the Distributive Property. Be sure to include an example.



EXAMPLES Use the Product of Powers Rule

3 **Find $7w(w^2 + 6)$.**

$7w(w^2 + 6)$

$= \square (w^2) + \square (6)$ Distributive Property

$= \square + \square$ $7w(w^2) = 7w^{1+2}$ or $\square$

The answer is $\square$.

4 **Find $9t(t^2 + 6t - 4)$.**

$9t(t^2 + 6t - 4)$

$= 9t[t^2 + 6t + (-4)]$	Rewrite $t^2 + 6t - 4$ *as* $t^2 + 6t + (-4)$.
$= 9t(t^2) +$ ☐ $+ 9t(-4)$	Distributive Property
$=$ ☐ $+$ ☐ $+$ ☐	Simplify.
$=$ ☐	Definition of subtraction

The answer is ☐.

Check Your Progress **Multiply.**

a. $3w(w^2 - 8)$

b. $5t(t^2 + 7t - 6)$

HOMEWORK ASSIGNMENT

Page(s):

Exercises:

CHAPTER 12

BRINGING IT ALL TOGETHER

STUDY GUIDE

FOLDABLES™	VOCABULARY PUZZLEMAKER	BUILD YOUR VOCABULARY
Use your **Chapter 12 Foldable** to help you study for your chapter test.	To make a crossword puzzle, word search, or jumble puzzle of the vocabulary words in Chapter 12, go to: glencoe.com	You can use your completed **Vocabulary Builder** (*pages 305*) to help you solve the puzzle.

12-1 Linear and Nonlinear Functions

Write *linear* or *nonlinear* to name the kind of function described.

1. constant rate change

2. graph that is a curve

3. power of x may be greater than one

4. equation has the form $y = mx + b$

5. Name the kind of function represented. Explain your reasoning.

x	−3	0	3	6
y	10	1	10	37

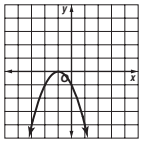
12-2 Graphing Quadratic Functions

Determine whether each equation represents a quadratic function. Write *yes* or *no*.

6. $y = 3x - 5$

7. $y = 6 - x^2$

8.



9. Explain how to graph a quadratic function.

12-3

Simplifying Polynomials

Write *true* or *false* beside each statement. If the statement is false, write the correct word in place of the underlined word.

10. The product of $4y$ and $-6y$ is a polynomial.

11. The expression $x + 5$ is a polynomial with two terms.

12. To simplify a polynomial, combine exponents.

Simplify each polynomial. If the polynomial cannot be simplified, write *simplest form*.

13. $2x^2 + 3x - x^2 + 4$ **14.** $6c - 4d - 1$ **15.** $8 + 3a - 10 - a + 2b$

12-4

Adding Polynomials

Determine whether each vertical addition can be performed as written. Explain.

16.
$$\begin{array}{r} x^2 + 5x - 6 \\ (+)\ 2x^2 + 3x + 4 \end{array}$$

17.
$$\begin{array}{r} x^2 + 6 \\ (+)\ 2x^2 - x \end{array}$$

Rewrite each sum of polynomials vertically. Then add.

18. $(3d^2 + 14d - 2) + (-d^2 + 3d + 5)$ **19.** $(2n^2 + 3) + (n^2 - 5n + 1)$

12-5

Subtracting Polynomials

Rewrite each difference of polynomials as a sum of polynomials. Then add.

20. $(7x + 5) + (4x - 3)$ **21.** $(-3c^2 + 2c - 1) - (-c^2 - c - 2)$

22. $(m^2 + 3m - 6) - (m^2 + 1)$

23. $(-6s + 9) - (4s^2 + 2s - 3)$

12-6

Multiplying and Dividing Monomials

Complete each sentence.

24. To multiply powers with the same base, ____ their exponents.

25. To divide powers with the same base, ____ their exponents.

Multiply or divide. Express using exponents.

26. $5^2 \cdot 5^6$

27. $(8x^3)(-3x^9)$

28. $\frac{2^5}{2^2}$

29. $\frac{18a^7}{6a^3}$

12-7

Problem-Solving Investigation: Make a Model

30. **DESIGN** Edu-Toys is designing a new package to hold a set of 30 alphabet blocks. Each block is a cube with each side of the cube being 2 inches long. Give two possible dimensions for the package.

12-8

Multiplying Monomials and Polynomials

31. Explain what is done at each step in the following problem.

$3x(x^2 + 5x - 2)$

$= 3x[x^2 + 5x + (-2)]$

$= 3x(x^2) + 3x(5x) + 3x(-2)$

$= 3x^3 + 15x^2 + (-6x)$

$= 3x^3 + 15x^2 - 6x$

CHAPTER 12 Checklist

ARE YOU READY FOR THE CHAPTER TEST?

Math Online

Visit **glencoe.com** to access your textbook, more examples, self-check quizzes, and practice tests to help you study the concepts in Chapter 12.

Check the one that applies. Suggestions to help you study are given with each item.

☐ **I completed the review of all or most lessons without using my notes or asking for help.**

- You are probably ready for the Chapter Test.
- You may want to take the Chapter 12 Practice Test on page 669 of your textbook as a final check.

☐ **I used my Foldable or Study Notebook to complete the review of all or most lessons.**

- You should complete the Chapter 12 Study Guide and Review on pages 665–668 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 12 Practice Test on page 669.

☐ **I asked for help from someone else to complete the review of all or most lessons.**

- You should review the examples and concepts in your Study Notebook and Chapter 12 Foldable.
- Then complete the Chapter 12 Study Guide and Review on pages 665–668 of your textbook.
- If you are unsure of any concepts or skills, refer to the specific lesson(s).
- You may also want to take the Chapter 12 Practice Test on page 669.

Student Signature

Parent/Guardian Signature

Teacher Signature