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.


<table>
<thead>
<tr>
<th>Word or Phrase</th>
<th>Symbol or Abbreviation</th>
<th>Word or Phrase</th>
<th>Symbol or Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>for example</td>
<td>e.g.</td>
<td>not equal</td>
<td>≠</td>
</tr>
<tr>
<td>such as</td>
<td>i.e.</td>
<td>approximately</td>
<td>≈</td>
</tr>
<tr>
<td>with</td>
<td>w/</td>
<td>therefore</td>
<td>∴</td>
</tr>
<tr>
<td>without</td>
<td>w/o</td>
<td>versus</td>
<td>vs</td>
</tr>
<tr>
<td>and</td>
<td>+</td>
<td>angle</td>
<td>∠</td>
</tr>
</tbody>
</table>

• Use a symbol such as a star (★) or an asterisk (*) to emphasis 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.
Before you read the chapter, think about what you know about expressions, equations, and functions. List three things you already know about them in the first column. Then list three things you would like to learn about them in the second column.

<table>
<thead>
<tr>
<th>K</th>
<th>What I know...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>W</th>
<th>What I want to find out...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Foldables Study Organizer**

Construct the Foldable as directed at the beginning of this chapter.

**Note Taking Tips**

- **When taking notes, write down a question mark to anything you do not understand.**
  Before your next quiz, ask your instructor to explain these sections.

- **When you take notes, be sure to listen actively.**
  Always think before you write, but don’t get behind in your note-taking. Remember to enter your notes legibly.
### Key Points

Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on properties of numbers, one fact might be that zero has no reciprocal (because any number times 0 is 0). After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1 Variables and Expressions</td>
<td></td>
</tr>
<tr>
<td>1-2 Order of Operations</td>
<td></td>
</tr>
<tr>
<td>1-3 Properties of Numbers</td>
<td></td>
</tr>
<tr>
<td>1-4 The Distributive Property</td>
<td></td>
</tr>
<tr>
<td>1-5 Equations</td>
<td></td>
</tr>
<tr>
<td>1-6 Relations</td>
<td></td>
</tr>
<tr>
<td>1-7 Functions</td>
<td></td>
</tr>
<tr>
<td>1-8 Logical Reasoning and Counterexamples</td>
<td></td>
</tr>
</tbody>
</table>
1-1 Variables and Expressions

What You’ll Learn
Scan the text under the Now heading. List two things you will learn about in this lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

New Vocabulary
Match each term with its definition.

- **algebraic expression** the quantities being multiplied in an expression involving multiplication
- **term** consists of one or more numbers and variables along with one or more arithmetic operation
- **power** the result of a multiplication expression
- **factors** symbols used to represent unspecified numbers or values in algebra
- **product** indicates the number of times the base is used as a factor
- **variables** a part of an expression that may be a number, a variable, or a product or quotient of numbers and variables

Vocabulary Link  
*Vary* is a word used in everyday English that is used to build the word *variable*. Find the definition of *vary* using a dictionary. Explain how its everyday definition can help you understand the meaning of *variable* in mathematics.
Main Idea

Write Verbal Expressions
p. 5

Write a verbal expression for each algebraic expression.

1. $4x + 10$

2. $p - 17$

3. $\frac{3y}{8}$

Write Algebraic Expressions
p. 6

A model can be used to aid in translating a verbal expression into an algebraic expression. Write an algebraic expression for the following verbal expression.

Twelve more than the product of 8 and $h$.

Helping You Remember

A classmate states that 7 less than $w$ translates to $7 - w$. You correct the classmate by saying it translates to $w - 7$. Your classmate responds by saying, “That is the same thing.” Is your classmate correct? Support your answer with examples that either disprove or support your classmate.
1-2 Order of Operations

What You’ll Learn

Skim Lesson 1-2. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Review Vocabulary

Write the correct term next to each definition. (Lesson 1-1)

- symbols used to represent unspecified numbers or values
- the result of a multiplication expression
- indicates the number of times the base is used as a factor

New Vocabulary

Define the following terms in your own words.

- evaluate
  - ______________________________________________________
  - ______________________________________________________
  - ______________________________________________________

order of operations

- ______________________________________________________
  - ______________________________________________________
  - ______________________________________________________

Vocabulary Link

Evaluate is a word that is used in everyday English. Find the definition of evaluate using a dictionary. Explain how its English definition can help you understand its meaning in mathematics.
Main Idea

Evaluate Numerical Expressions
pp. 10–11

Evaluate each expression.

1. \(3^3\) _____________________

2. \(4(2 + 3) - 8\) _____________________

3. \((4 + 2)^2 \div 2\) _____________________

Evaluate Algebraic Expressions
pp. 11–12

Complete the chart that shows the steps in evaluating an algebraic expression.

<table>
<thead>
<tr>
<th>Replace the ___________ with their assigned ___________.</th>
<th>Apply the ___________ to the expression.</th>
<th>and label your answer, if necessary.</th>
</tr>
</thead>
</table>

Helping You Remember

Complete each rung of the ladder with the correct order of operations. Start at the bottom and work your way to the top.

Please → Excuse → My Dear → Aunt Sally
1-3 Properties of Numbers

What You’ll Learn

Scan the text in Lesson 1-3. Write two facts you learned about properties of numbers as you scanned the text.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Define variables in your own words. (Lesson 1-1)

New Vocabulary Fill in each blank with the correct term or phrase.

- equivalent expressions ▶ Two numbers whose product is 1 are called multiplicative inverses or __________________________.
- reciprocals ▶ Expressions that represent the same number are __________________________.
- Additive Identity ▶ The number 1 is known as the __________________________.
- Multiplicative Identity ▶ The number 0 is known as the __________________________.

Vocabulary Link Identity is a word that is used in everyday English. Find the definition of identity using a dictionary. Explain how its English definition can help you understand its meaning in mathematics, specifically when referring to additive and multiplicative identities.
Main Idea

Properties of Equality and Identity pp. 16–17

Details

Fill in the blanks with the property used in each step.

\[5(9 + 3) \cdot (9 - 8) \cdot \frac{1}{60} + (-5 + 5)\]

\[= 5(12) \cdot (1) \cdot \frac{1}{60} + (-5 + 5)\]

\[= 5(12) \cdot (1) \cdot \frac{1}{60} + 0\]

\[-5 + 5 = 0\]

\[= 5(12) = 60\]

\[= 60 \cdot (1) = 60\]

\[= 60 \cdot \frac{1}{60} + 0\]

\[60 \cdot \frac{1}{60} = 1\]

\[= 1 + 0\]

\[= 1\]

Use Commutative and Associate Properties pp. 18–19

Use the Associative Property to write two equivalent expressions. Use the numbers 4, 6, and 9.

Use the numbers and a set of parentheses to write an addition expression.

Helping You Remember

Look up the meaning of the word *commute* in the dictionary. Find an everyday meaning that is close to the mathematical meaning and explain how it can help you remember the mathematical meaning.
1-4 The Distributive Property

What You’ll Learn

Scan Lesson 1-4. List two headings you would use to make an outline of this lesson.

1. ______________________________________________________

2. ______________________________________________________

Review Vocabulary

Write the term next to each definition.

(Lesson 1-2)

to find the value of an expression

the rules that let you know which operation to perform

New Vocabulary

In the diagram, underline the coefficient.

10y + 7

Define simplest form in your own words.

Vocabulary Link

Distribute is a word that is used in everyday English. Find the definition of distribute using a dictionary. Explain how the English definition can help you remember how distributive is used in mathematics.
Main Idea

Evaluate Expressions

Caitlin works at the Dairy Whiz Monday through Friday. She earns $8.25 per hour. The hours she worked this week are shown in the table below. Write two equivalent ways of finding her weekly pay.

<table>
<thead>
<tr>
<th>Day</th>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours</td>
<td>3</td>
<td>2</td>
<td>1¹⁄₂</td>
<td>4</td>
<td>1¹⁄₂</td>
</tr>
</tbody>
</table>

Method 1: hourly rate of pay times total hours for the week

Method 2: hourly rate of pay times daily hours worked

Simplify Expressions

Model the expression $4(x + 3)$ by using or drawing algebra tiles. Then simplify.

Helping You Remember

Write one example of evaluating an algebraic expression and explain how you simplified it.

____________________________________________________

____________________________________________________
1-5 Equations

What You’ll Learn

Skim the Examples in Lesson 1-5. Predict two things you think you will learn about this lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

New Vocabulary True or False? All open sentences are equations. Explain your answer.

Label the elements of the table with the correct terms.

<table>
<thead>
<tr>
<th>x</th>
<th>3x + 1 = 10</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>3(2) + 1 = 10</td>
<td>False</td>
</tr>
<tr>
<td>3</td>
<td>3(3) + 1 = 10</td>
<td>True</td>
</tr>
<tr>
<td>4</td>
<td>3(4) + 1 = 10</td>
<td>False</td>
</tr>
<tr>
<td>5</td>
<td>3(5) + 1 = 10</td>
<td>False</td>
</tr>
</tbody>
</table>

Vocabulary Link In mathematics, sets are collections of objects or numbers. Sets can be illustrated by real-world examples, like a chess set. Write another example of a real-world set.
Write and solve an equation for the following situation.

Mr. Ludwig wants to rent a post hole digger to build a deck. He pays a rate of $5 per hour and $12.50 for gas and insurance to rent the digger. What is the cost for a six-hour rental?

The cost of the _________ is a flat rate. The variable is the number of _________ $h$ for which he rents the digger.

Helping You Remember

Look up the word solution in a dictionary. What is one meaning that relates to the way you use the word in algebra?
What You’ll Learn  

Skim the lesson. Write two things you already know about relations.

1. __________________________________________________________
   __________________________________________________________
   __________________________________________________________

2. __________________________________________________________
   __________________________________________________________
   __________________________________________________________

New Vocabulary  Label the elements of the diagram with the correct terms.

- **x-coordinate**
- **x-axis**
- **y-coordinate**
- **y-axis**
- **ordered pair**
- **origin**

1. The numbers (3, 4) represent a(n) ____________________.
2. In the ordered pair (3, 4), 3 represents a(n) ____________.
3. In the ordered pair (3, 4), 4 represents a(n) ____________.
4. Arrow “A” is pointing to the ____________________________.
5. Arrow “B” is pointing to the ____________________________.
6. Arrow “C” is pointing to the ____________________________.
Main Idea

Represent a Relation

Complete the mapping to represent the same relation shown below.

1. table

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

2. graph

3. mapping

Graphs of a Relation

In a relation involving test grades, the more hours spent studying, the higher the grade. Identify the independent and dependent variables.

Helping You Remember

In the alphabet, x comes before y. Use this fact to describe a method for remembering how to write ordered pairs.
1-7 Functions

What You’ll Learn
Skim Lesson 1-7. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Define reciprocals in your own words.
(Lesson 1-3)

New Vocabulary Fill in the blanks with the correct term or phrase.

A graph that consists of points that are not connected is a ________________________.

A ________________________ is a function graphed with a line or a smooth curve.

A ________________________ is a relationship between input and output.

A test used to determine whether or not a graph represents a function is known as the ________________________.

Vocabulary Link Function is a word that is used in everyday English. Find the definition of function using a dictionary. Explain how the English definition can help you remember how function is used in mathematics.

______________________________________________________

______________________________________________________

______________________________________________________
Main Idea

Identify Functions
pp. 45–47

Details

Fill in each blank to tell how to determine if a relation is a function.

1. For \( f(x) = 7x - 4 \), find each value.
   1. \( f(3) \) ____________
   2. \( f(-2) \) ____________
   3. \( f(0) \) ____________
   4. \( f(-3) \) ____________

Find Function Values
p. 48

For \( f(x) = 7x - 4 \), find each value.

1. \( f(3) \) ____________
2. \( f(-2) \) ____________
3. \( f(0) \) ____________
4. \( f(-3) \) ____________

Helping You Remember

A student who was trying to help a friend remember how functions are different from relations that are not functions gave the following advice: *Just remember that functions are very strict and never give you a choice.* Explain how this might help you remember what a function is.

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________
What You’ll Learn

Scan the text under the Now heading. List two things you will learn about in this lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Write the definition next to each term.
(Lesson 1-3)

- equivalent expressions ▶
- additive identity ▶
- multiplicative identity ▶
- reciprocal ▶

New Vocabulary  Match each term with its definition.

- conditional statement  can be written in the form If A, then B
- hypothesis  the process of using facts, rules, definitions, or properties to reach a valid conclusion
- conclusion  the part of the statement immediately following the word if
- deductive reasoning  a specific case in which the hypothesis is true and the conclusion is false
- counterexample  the part of the statement that immediately follows the then

Vocabulary Link  Define the word reciprocal in your own words. (Lesson 1-3)
Main Idea

Conditional Statements
pp. 54–55

Details

Identify the hypothesis and conclusion of the statement.

If it rains...

THEN
we will have indoor recess.

Identify the if-then statement for the following equation.

6x + 5 = 47, x = 7

Find a counterexample for the conditional statement.

If \( x^4 = 16 \), then \( x = 2 \).

Helping You Remember

Write an example of a conditional statement you would use to teach someone how to identify a hypothesis and a conclusion.

__________________________________________

__________________________________________

__________________________________________
Expressions, Equations, and Functions

Tie It Together

Add details to each part of the graphic organizer.

Expressions

Evaluating an Expression

Order of Operations
1.
2.
3.
4.

Range

Domain

Relations

Definition

Algebra

Equations

Solution

Identities

Function Notation

Definition

Vertical Line Test

Functions
### Before the Test

Review the ideas you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column.

<table>
<thead>
<tr>
<th>K</th>
<th>W</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>What I know...</td>
<td>What I want to find out...</td>
<td>What I learned...</td>
</tr>
</tbody>
</table>

### Math Online
Visit glencoe.com to access your textbook, more examples, self-check quizzes, personal tutors, and practice tests to help you study for concepts in Chapter 1.

### Are You Ready for the Chapter Test?
Use this checklist to help you study.

- [ ] I used my Foldable to complete the review of all or most lessons.
- [ ] I completed the Chapter 1 Study Guide and Review in the textbook.
- [ ] I took the Chapter 1 Practice Test in the textbook.
- [ ] I used the online resources for additional review options.
- [ ] I reviewed my homework assignments and made corrections to incorrect problems.
- [ ] I reviewed all vocabulary from the chapter and their definitions.

### Study Tips
- Set goals and priorities before studying. Then study the hardest material first, and complete assignments that have due dates before others.
Before you read the chapter, think about what you know about linear equations. List three things you already know about them in the first column. Then list three things you would like to learn about them in the second column.

<table>
<thead>
<tr>
<th>K</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>What I know...</td>
<td>What I want to find out...</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

**Note Taking Tips**

- **When you take notes, circle, underline, or star anything the teacher emphasizes.**
  
  When your teacher emphasizes a concept, it will usually appear on a test, so make an effort to include it in your notes.

- **Before going to class, look over your notes from the previous class, especially if the day's topic builds from the last one.**
# Key Points

Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on ratios and proportions, one fact might be that the ratio of two measurements having different units of measure is called a rate. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-1 Writing Equations</td>
<td></td>
</tr>
<tr>
<td>2-2 Solving One-Step Equations</td>
<td></td>
</tr>
<tr>
<td>2-3 Solving Multi-Step Equations</td>
<td></td>
</tr>
<tr>
<td>2-4 Solving Equations with the Variable on Each Side</td>
<td></td>
</tr>
<tr>
<td>2-5 Solving Equations Involving Absolute Value</td>
<td></td>
</tr>
<tr>
<td>2-6 Ratios and Proportions</td>
<td></td>
</tr>
<tr>
<td>2-7 Percent of Change</td>
<td></td>
</tr>
<tr>
<td>2-8 Literal Equations and Dimensional Analysis</td>
<td></td>
</tr>
<tr>
<td>2-9 Weighted Averages</td>
<td></td>
</tr>
</tbody>
</table>
Writing Equations

What You’ll Learn

Skim Lesson 2-1. Write two things you already know about writing equations.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Define equation in your own words.
(Lesson 1-5)

New Vocabulary Define the term formula from this lesson.

Vocabulary Link Formula is a word that is used in everyday English. Find the definition of formula using a dictionary. Explain how its English definition can help you understand the meaning of formula in mathematics.
Main Idea

Write Verbal Expressions
pp. 75–76

Details

Use a model to help translate the sentence below into an equation.

Six more than a number squared is 30 less than five times the number.

Write Sentences from Equations
pp. 77–78

Translate each equation into a sentence.

1. \(7x + 2 = 30\)

2. \(p^2 + 18 = 7 - k\)

Helping You Remember

If you cannot remember all the steps of the Four-Step Problem-Solving Plan, try to remember the first letters of the first word in each step. Write those letters with their associated words.

<table>
<thead>
<tr>
<th>U</th>
<th>P</th>
<th>S</th>
<th>C</th>
</tr>
</thead>
</table>

NAME ____________________________ DATE ____________ PERIOD ____________

Lesson 2-1 (continued)
What You’ll Learn

Skim Lesson 2-2. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Define formula in your own words. (Lesson 2-1)

new vocabulary  Fill in each blank with the correct term or phrase.

equivalent equations  To find the value of the variable that makes the equation true is to ________________

solve an equation  ________________ have the same solution.

Vocabulary Link  Solution is a word that is used in everyday English. Find the definition of solution using a dictionary. Explain how its English definition can help you understand its meaning in mathematics.
Main Idea

Solving Equations Using Addition or Subtraction
pp. 83–84

Adding the same quantity to two equal or “balanced” amounts, will yield scales that remain balanced.

Details

Solving Equations Using Multiplication or Division
pp. 84–85

Solve by multiplying.

1. \( \frac{g}{4} = 7 \)
2. \( \frac{m}{-5} = 3 \)

Solve by dividing.

3. \( 9y = 108 \)
4. \( 5k = -115 \)

Helping You Remember

One way to remember something is to explain it to someone else. Write how you would explain to a classmate how to solve the equation \( \frac{2}{3}x = 12 \).
What You’ll Learn

Scan the text under the Now heading. List two things you will learn about solving multi-step equations.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Define equivalent equations in your own words. (Lesson 2-2)

____________________________________________________

____________________________________________________

New Vocabulary Write the correct term next to each definition.

__________________________________ ➤ integers in counting order
__________________________________ ➤ the study of numbers and the relationships between them
__________________________________ ➤ an equation that requires more than one step to solve

Vocabulary Link Consecutive is a word that is used in everyday English. Find the definition of consecutive using a dictionary. Explain how its English definition can help you understand the meaning of consecutive in mathematics.

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________
Main Idea

Solve Multi-Step Equations

pp. 91–92

Solve Consecutive Integer Problems

pp. 92–93

Details

Solve the equation.

$2x + 3 = 17$

Original equation

$2x + 3 = 17$

Subtract from each side.

$2x = $  

Simplify.

$\frac{2x}{2} = \frac{14}{2}$

Divide each side.

$x = $  

Simplify.

Write an equation for the following problem. Then solve the equation and answer the problem.

*Find three consecutive even integers with a sum of 48.*

Helping You Remember

Explain why working backward is a useful strategy for solving equations.

________________________________________________________________________

________________________________________________________________________
What You’ll Learn

Skim the Examples for Lesson 2-4. Predict two things you think you will learn about solving equations with the variable on each side.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Match each term with its definition. (Lessons 2-1 through 2-3)

- formula
- solve an equation
- number theory
- equivalent equations
- multi-step equations
- consecutive integers

- equations that have the same solution
- an equation that requires more than one step to solve.
- integers in counting order
- the study of numbers and the relationships between them
- a rule for the relationship between certain quantities
- finding the value of the variable that makes an equation true

New Vocabulary  Define identity in your own words.

Vocabulary Link  Identity is a word that is used in everyday English. Find the definition of identity using a dictionary. Explain how the English definition can help you remember how it is used in mathematics.
Main Idea

Variables on Each Side

pp. 97–99

Details

Complete the flow chart to describe the steps in solving the equation.

\[ 7(2x - 3) = 12x - 5 \]

- Use the __________ Property.
  \[ \underline{\text{__________}} = 12x - 5 \]

- Subtract 12x from each side and simplify.
  \[ \underline{\text{______}} - 21 = \underline{\text{______}} \]

- Add ___ to each side and simplify.
  \[ 2x = \underline{\text{______}} \]

- Divide each side by 2.
  \[ x = \underline{\text{______}} \]

Solve the equation \[ 6y + 4 = 3(2y - 10) \].

Helping You Remember

In addition to the examples in this section of Chapter 2, there will be other occurrences of no solutions, as well as identities where there are endless possibilities of solutions. What are the symbols for these?
What You’ll Learn
Scan the text in Lesson 2-5. Write two facts you learned about solving equations involving absolute value as you scanned the text.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary
Review Vocabulary
Label the elements of the diagram with the correct terms. (Lesson 1-1)

\[
\frac{2y^3 + 5y - 8}{A} \quad B \quad C
\]

- **algebraic expression**
- **power**
- **product**
- **variable**

1. The term \(5y\) represents a(n) ____________________.
2. Arrow “A” is pointing to a(n) ____________________.
3. Arrow “B” is pointing to a(n) ____________________.
4. Arrow “C” is pointing to a(n) ____________________.

Define **absolute value** in your own words.

____________________________________________________
____________________________________________________
____________________________________________________
Main Idea

Absolute Value Expressions
p. 103

Evaluate the following absolute value expression in the space provided.

\[ |f + 7| - 11 \text{ if } f = -9 \]

Complete the organizer below.

3 types of open sentences involving absolute value

- \[ |n| < 0 \]
- \[ |n| = 0 \]
- \[ |n| > 0 \]

Absolute Value Equations
pp. 103–105

Write an absolute value equation that fits the solution graphed below. Then, write the solution set.

Sample answer: \[ |x - 16| = 3 \]
Solution set: \{10, 16\}

Helping You Remember

What is one way you could check to see that your graph of an absolute value equation is correct?

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________

_________________________________________________________________________
What You’ll Learn
Scan Lesson 2-6. List two headings you would use to make an outline of this lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary
New Vocabulary Fill in each blank with the correct term or phrase.

- **unit** ▶ In the proportion 2:5 = 6:15, the numbers 5 and 6 are known as the ____________.

- **ratio** ▶ A(n) ____________ is an equation stating that two ratios are equal.

- **means** ▶ A(n) ____________ is a rate used when making a model of something that is too large or too small to be convenient at actual size.

- **rate** ▶ The comparison of two numbers by division is known as a(n) ____________.

- **model** ▶ A ____________ rate tells how many of one item is being compared to one of another item.

- **extremes** ▶ In the proportion 1:15 = 3:45, the numbers 1 and 45 are known as the ____________.

- **proportion** ▶ The ratio of two measurements having different units of measure is called a(n) ____________.

- **scale** ▶ A scale ____________ is a three-dimensional reproduction of an item that has been reduced in size proportionally.
Main Idea

Ratios and Proportions

Use cross products to determine whether the pair of ratios forms a proportion.

\[
\frac{3}{4} \quad \frac{4.2}{6}
\]

Solve Proportions

Use the graphic organizer below to help solve the rate of growth proportion that follows.

A women’s exercise franchise opened 336 gyms during the past 3 years. If their growth rate remains constant, how many exercise gyms will they have opened after 5 years?

Let \( g \) represent the number of gyms.

Helping You Remember

What is one way you could check to see that your graph of an absolute value equation is correct?
Percent of Change

What You’ll Learn

Scan Lesson 2-7. List two headings you would use to make an outline of this lesson.

1. __________________________________________________________
   __________________________________________________________

2. __________________________________________________________
   __________________________________________________________

Active Vocabulary

Review Vocabulary  Match each term with its definition. 
(Lesson 2-6)

- **proportion**: a ratio of two measurements having different units of measure
- **ratio**: an equation stating that two ratios are equal
- **rate**: a comparison of two numbers by division

New Vocabulary  Fill in each blank with the correct term or phrase.

_______________ is the ratio of the change in an amount to the original amount expressed as a percent.

When the new number is less than the original number, the percent of change is a percent of ________________.

When the new number is greater than the original number, the percent of change is a percent of ________________.

Vocabulary Link  *Change* is a word that is used in everyday English. Find the definition of *change* using a dictionary. Explain how the English definition can help you remember how *change* is used in mathematics.
**Main Idea**

**Percent of Change**

Use the graphic organizer to help you find the percent of change given an original amount of 30, and a final amount of 45.

**Details**

To find a percent of change:

- What is the original amount?
- What is the final amount?
- Set-up ratios.

\[
\frac{\text{change}}{\text{original}} = \frac{r}{100}
\]

The amount of change = \( \frac{15}{45} = \frac{r}{100} \) \( r \) solve for \( r \) and get \( r = \) 

Therefore, the percent of change is a \( \% \) (increase or decrease).

**Solve Problems**

Tess purchased a dress that originally cost $110. The day she made the purchase it was on sale for 20\% off. What was the sale price of her dress?

---

**Helping You Remember**

If you remember only two things about the ratio used for finding the percent of change, what should they be?

---
What You’ll Learn

Scan the text under the Now heading. List two things you will learn about in this lesson.

1. ______________________________________________________________________
   ______________________________________________________________________

2. ______________________________________________________________________
   ______________________________________________________________________

Active Vocabulary

Review Vocabulary Fill in each blank with the correct term or phrase. (Lessons 2-1, 2-4, and 2-7)

_______________ are equations that are true for all values of the variables.

The ratio of the change in an amount to the original amount expressed as a percent is known as the ________________.

A(n) ________________ is a rule for the relationship between certain quantities.

New Vocabulary Match each term with its definition.

a formula or equation that involves several variables

the process of carrying units throughout a computation

another term for dimensional analysis

Vocabulary Link Literal is a word that is used in everyday English. Find the definition of literal using a dictionary. Explain how the English definition can help you remember how literal is used in mathematics.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

Main Idea

Solve for a Specific Variable
pp. 126–127

Use Formulas
pp. 127–128

Details

Fill in the missing pieces of the graphic organizer below.

Solve for \( p \).

Isolate the terms with that variable onto one side of the equation.

\[
4p - 3q = pr + 9 \\
+ 3q = + 3q
\]

\[
4p = __________ \\
- pr = - pr
\]

Property

\[
p(4 - r) = 3q + 9
\]

each side by

\[
p(4 - r) = 3q + 9
\]

\[
4 - r = 4 - r
\]

Simplify.

\[
p = \frac{3q + 9}{4 - r}
\]

\[
r \neq __________
\]

Helping You Remember

When you give the dimensions of a rectangle, you have to tell how many units long it is and how many units wide it is. How can this help you remember what dimensional analysis involves?

The formula for the area of a rectangle is \( A = \ell w \), where \( \ell \) is its length, and \( w \) is the width. Find the length of a rectangular garden that has an area of 5400 square feet and a width of 90 feet.
2-9 Weighted Averages

What You’ll Learn

Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ________________________________
   ________________________________

2. ________________________________
   ________________________________

Active Vocabulary

New Vocabulary

Match each term with its definition.

Note: two terms have the same definition.

rate problem
When referring to a set of data, it is the sum of the product of the number of units and the value per unit divided by the sum of the number of units.

uniform motion problem
problems in which two or more parts are combined into a whole

weighted average
problems in which an object moves at a certain speed or rate

mixture problem
a statement that requires a solution, usually by means of a mathematical operation

Vocabulary Link

Problem is a word that is used in everyday English. Find the definition of problem using a dictionary. Explain how the English definition can help you remember how problem is used in mathematics.
Main Idea

Weighted Averages

In addition to the slugging average that was in the textbook, write another example of when it might be necessary to calculate a weighted average.

Details

Uniform Motion Problems

Use the table provided to aid in solving the following rate problem.

Two cyclists begin traveling from opposite ends of a 15-kilometer bike path towards each other. One of the cyclists is traveling 20 kilometers per hour, and the other cyclist is traveling 25 kilometers per hour. How much time will it take for them to meet each other?

<table>
<thead>
<tr>
<th></th>
<th>$r$</th>
<th>$t$</th>
<th>$d = rt$</th>
</tr>
</thead>
<tbody>
<tr>
<td>first cyclist</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>second cyclist</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Now write and solve an equation.

____ + ____ = 15

____ $t = 15$

$t = ___$ or ___ hour or ___ minutes

Helping You Remember

Making a table can be helpful in solving mixture problems. In your own words, explain how you use a table to solve mixture problems.

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________
Provide the indicated details in each graphic organizer.

**Using Properties of Equality to Solve One-Step Equations**

- Addition Example
- Subtraction Example
- Multiplication Example
- Division Example

**Using Properties of Equality to Solve Two-Step Equations**

1. Step 1:
2. Step 2:

**Other Forms of Linear Equations**

- Equations with Grouping Symbols and Variables on Both Sides Example
- Proportions Example
- Absolute Value Equations Example
- Literal Equations Example
Linear Equations

Before the Test

Review the ideas you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column.

<table>
<thead>
<tr>
<th>K</th>
<th>What I know…</th>
<th>W</th>
<th>What I want to find out…</th>
<th>L</th>
<th>What I learned…</th>
</tr>
</thead>
</table>

Math Online
Visit glencoe.com to access your textbook, more examples, self-check quizzes, personal tutors, and practice tests to help you study for concepts in Chapter 2.

Are You Ready for the Chapter Test?
Use this checklist to help you study.

□ I used my Foldable to complete the review of all or most lessons.
□ I completed the Chapter 2 Study Guide and Review in the textbook.
□ I took the Chapter 2 Practice Test in the textbook.
□ I used the online resources for additional review options.
□ I reviewed my homework assignments and made corrections to incorrect problems.
□ I reviewed all vocabulary from the chapter and their definitions.

Study Tips

- Review information daily to keep it fresh and to reduce the amount of last-minute studying before test day. Look over the notes from class, readings, and corrected homework to review. If you have confusion about any concepts get them cleared up before test day.
# Linear Functions

## Before You Read

Before you read the chapter, respond to these statements.

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Linear Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The graph of a linear equation is a straight line.</td>
<td>• A family of graphs is different equations that represent the same line.</td>
</tr>
<tr>
<td>• Slope and rate of change are the same thing.</td>
<td>• Slope is the change of $x$ over the change of $y$.</td>
</tr>
<tr>
<td>• The graph of a nonproportional relationship will not be a straight line.</td>
<td></td>
</tr>
</tbody>
</table>

## Foldables® Study Organizer

Construct the Foldable as directed at the beginning of this chapter.

## Note Taking Tips

- **When you take notes**, write down the math problem and each step in the solution using math symbols.
  Next to each step, write down, in your own words, exactly what you are doing.

- **It is helpful to read through your notes before beginning your homework.**
  Look over any page referenced material.
Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on solving linear equations by graphing, one fact might be that the root of an equation is any value that makes the equation true or the solution. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1 Graphing Linear Equations</td>
<td></td>
</tr>
<tr>
<td>3-2 Solving Linear Equations by Graphing</td>
<td></td>
</tr>
<tr>
<td>3-3 Rate of Change and Slope</td>
<td></td>
</tr>
<tr>
<td>3-4 Direct Variation</td>
<td></td>
</tr>
<tr>
<td>3-5 Arithmetic Sequences as Linear Functions</td>
<td></td>
</tr>
<tr>
<td>3-6 Proportional and Nonproportional</td>
<td></td>
</tr>
</tbody>
</table>

Glencoe Algebra 1
3-1 Graphing Linear Equations

What You’ll Learn
Scan Lesson 3-1. List two headings you would use to make an outline of this lesson.

1. ____________________________

2. ____________________________

Active Vocabulary
New Vocabulary Match the term with its definition by drawing a line to connect the two.

- linear equation: the x-coordinate of the point at which the graph of an equation crosses the x-axis
- standard form: a number
- x-intercept: an equation which forms a line when it is graphed
- constant: the y-coordinate of the point at which the graph of an equation crosses the y-axis
- y-intercept: a linear equation written in the form $Ax + By = C$

Vocabulary Link Determine whether each of the following is a linear equation. Using a graphing calculator, sketch a graph of each equation.

- $y = 3x - 4$
- $y = 3x^2 - 4$
- $y = 0x - 4$

Linear? Yes No Linear? Yes No Linear? Yes No
Main Idea

Identify Linear Equations and Intercepts
pp. 153–155

Write a word problem that could be represented by the table of values. Label the independent variable and the dependent variable in the table. Graph the table of values, labeling the axes appropriately.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>y</td>
<td>100</td>
<td>75</td>
<td>50</td>
<td>25</td>
<td>0</td>
</tr>
</tbody>
</table>

Word Problem

Graph Linear Equations
pp. 155–156

Describe the similarities and differences in finding the $x$-intercept of a line and finding the $y$-intercept of a line.

Similarities

Differences
What You’ll Learn

Scan the text in Lesson 3-2. Write two facts you learned about solving linear equations by graphing as you scanned the text.

1. ____________________________________________________________ ____________________________________________________________

2. ____________________________________________________________ ____________________________________________________________

Active Vocabulary

Review Vocabulary  Solve each equation for x. Label each as being consistent, inconsistent, or an identity. (Lesson 2-3).

\[
\begin{align*}
3x + 6 &= 4x - 8 \\
3x + 9 &= 3x - 8 \\
3x + 7 &= 4x + 7 - x
\end{align*}
\]

New Vocabulary  Write the definition next to each term.

- linear function ►
- parent function ►
- family of graphs ►
- root ►
- zeros ►
Main Idea

Solve by Graphing

pp. 161–163

Details

Complete the diagram to show the relationship between the words root, solution, zero, and x-intercept.

Algebraically

Equation

$3x - 8 = -4x + 6$

Graphically

Related Function

$f(x) = \text{_____}$

Solution is:

Zero of $f(x)$:

Root is:

$x$-intercept:

Estimate Solutions by Graphing

p. 163

Write a function for the situation described below. Describe how to find the zero of this function. Determine what the zero of this function represents.

The salt reserve for a city’s road crew was at 17 tons prior to the beginning of winter. Each time the roads are treated, the reserves are depleted by 3.25 tons of salt.

$f(x) = \text{_____}$

Algebraically

Graphically

What does the zero represent?
What You’ll Learn

Skim the lesson. Write two things you already know about rate of change and slope.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Write the definition of the word *ratio* and list the three ways that a ratio can be expressed. By scanning ahead, what is a ratio used to represent in this lesson?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

New Vocabulary Write the definition next to each term.

*rate of change* ▶
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

*slope* ▶
________________________________________________________________________
________________________________________________________________________
Lesson 3-3 (continued)

Main Idea

Rate of Change
pp. 170–172

Complete the table of values so that Table A has a **constant rate of change** of 20 gallons per hour and Table B has a **constant rate of change** of –15.5 inches per minute.

<table>
<thead>
<tr>
<th>Table A</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hour</strong></td>
<td><strong>Gallons</strong></td>
</tr>
<tr>
<td>1:00 P.M.</td>
<td></td>
</tr>
<tr>
<td>4:00 P.M.</td>
<td></td>
</tr>
<tr>
<td>6:00 P.M.</td>
<td>1250</td>
</tr>
<tr>
<td>10:00 P.M.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Minutes</strong></td>
<td><strong>Inches</strong></td>
</tr>
<tr>
<td>6</td>
<td>259.25</td>
</tr>
<tr>
<td>12</td>
<td>42.25</td>
</tr>
</tbody>
</table>

Find Slope
pp. 172–173

Use each of the indicated methods to calculate the slope of the line described.

- **Table A**: Use \((-1, 5)\) as \((x_1, y_1)\) and \((-4, 5)\) as \((x_2, y_2)\).
- **Table B**: Use \((-4, 5)\) as \((x_1, y_1)\) and \((-1, 5)\) as \((x_2, y_2)\).
- Plot the points to determine rise and run.

Did you get the same slope all three times?

Helping You Remember

The word *rise* is associated with going up. Sometimes going from one point to another on a graph does not involve a rise and a run but a fall and a run. Describe how you could select points so that it is always a rise from the first point to a second point.
What You’ll Learn

Skim the Examples for Lesson 3-4. Predict two things you think you will learn about direct variation.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Write another possible point on each of the lines described. Use the slope formula to justify your answer. (Lesson 3-3)

1. passes through (5, 8) with negative slope

2. passes through (5, 8) with positive slope

3. passes through (5, 8) with zero slope

4. passes through (5, 8) with no slope

5. passes through (5, 8) with slope of 2

New Vocabulary Label the equation with the correct terms.

- direct variation
- constant of variation

\[ y = kx \]
Main Idea

Direct Variation Equations
pp. 180–181

Details

Complete the diagram by writing one characteristic of direct variation in each box.

Direct Variation

Write a direct variation equation for the situation described below. Determine Amanda’s pay for 12 hours.

Amanda’s paycheck varies directly as the number of hours that she works. If Amanda works 4 hours, her paycheck is $35.

Find the constant of variation.

Write the equation.

Use the equation.

Helping You Remember

Look up the word *constant* in a dictionary. How does this definition relate to the term *constant of variation*?
Skim Lesson 3-5. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. 

2. 

Review Vocabulary
Evaluate \( f(x) = 4x + 2 \) and \( g(x) = -3x + 7 \) for \( x = -1, 0, 1, 2, 3 \). (Lesson 3-2)

<table>
<thead>
<tr>
<th>( x )</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>( f(x) )</td>
<td>\</td>
<td>\</td>
<td>\</td>
<td>\</td>
<td>\</td>
</tr>
<tr>
<td>( g(x) )</td>
<td>\</td>
<td>\</td>
<td>\</td>
<td>\</td>
<td>\</td>
</tr>
</tbody>
</table>

Describe the pattern you see in \( f(x) \).

Describe the pattern you see in \( g(x) \).

Describe the graph of the ordered pairs \((x, f(x))\). Describe the graph of the ordered pairs \((x, g(x))\).

New Vocabulary
Write the correct term beside each definition.

- the numbers in a sequence
- a sequence in which the difference in successive terms is constant
- a set of numbers in a specific order
- the difference between the terms in an arithmetic sequence
Complete each question below.

1. Determine whether the sequence 3, –7, –14, –24, –31, –41 is an arithmetic sequence. Justify your answer.

2. Determine the next four terms of the arithmetic sequence –17, –12, –7, –2, 3, ...

3. Write an equation for the $n^{th}$ term of the arithmetic sequence 14, 10, 6, 2, –2, ...

Follow the steps below to write a function to represent the arithmetic sequence described.

Anyra is collecting cans to turn into the recycling center. The arithmetic sequence $0.02, 0.04, 0.06, 0.08, ...$ represents the amount of money she earns for turning in the cans.

Use the function to determine her earnings for turning in 100 cans.

Determine the common difference.

Substitute into the $n^{th}$ term formula.

$\ a_n = a_1 + (n - 1)d$

Evaluate the function.
Lesson 3-6

Proportional and Nonproportional Relationships

What You’ll Learn
Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary
New Vocabulary Fill in the blanks with the correct terms or phrases.

inductive reasoning ► It is the process of using a ___________ to make a
general ______________. When a ______________ pattern is
found, a linear equation can be written. The relationship is
______________ if the linear equation is of the
form $y = kx$.

Vocabulary Link Explain how the use of the word
proportional in geometry can help you remember its use in
this lesson.

   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
Main Idea

Proportional Relationships
pp. 195–196

Fill in the left boxes with details to describe how to determine whether a given relationship is proportional. Complete the example shown in the right boxes.

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>y</td>
<td>−12</td>
<td>−15</td>
<td>−18</td>
<td>−21</td>
<td>−24</td>
</tr>
</tbody>
</table>

Is the relationship linear? Is the relationship linear?

Does it pass through (0, 0)? Does it pass through (0, 0)?

Write an equation and check. Write an equation and check.

Nonproportional Relationships
p. 197

Describe how proportional and nonproportional relationships are similar. Describe how they are different.
Provide details in each graphic organizer.

**Linear Functions**

**Tie It Together**

- **Equations**
  - Steepness:
    - Negative:

- **Graphs**
  - Direct Variation:
    - Formula: \( \frac{y_2 - y_1}{x_2 - x_1} \)
  - Horizontal Lines:
  - Vertical Lines:
  - Zeros/Roots/Solutions
  - Appearance/Forms
  - \( y \)-intercept
  - \( x \)-intercept

**Verbal Description:**

**Positive:**

**Steepness:**

**Negative:**
Linear Functions

Before the Test

Now that you have read and worked through the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Linear Functions</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The graph of a linear equation is a straight line.</td>
<td></td>
</tr>
<tr>
<td>• A family of graphs is different equations that represent the same line.</td>
<td></td>
</tr>
<tr>
<td>• Slope and rate of change are the same thing.</td>
<td></td>
</tr>
<tr>
<td>• Slope is the change of $x$ over the change of $y$.</td>
<td></td>
</tr>
<tr>
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</tr>
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☐ I took the Chapter 3 Practice Test in the textbook.
☐ I used the online resources for additional review options.
☐ I reviewed my homework assignments and made corrections to incorrect problems.
☐ I reviewed all vocabulary from the chapter and their definitions.

Study Tips
• When studying for tests, create and use graphic organizers to show relationships between concepts.
Before you read the chapter, think about what you know about linear functions and relations. List three things you already know about them in the first column. Then list three things you would like to learn about them in the second column.

<table>
<thead>
<tr>
<th>K</th>
<th>What I know…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>W</th>
<th>What I want to find out…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note Taking Tips**

- **As soon as possible, go over your notes.**
  Clarify any ideas that were not complete.

- **If you find it difficult to write and pay attention at the same time, write down key words only.**
  Then go back and complete your notes.
# Linear Functions and Relations

## Key Points

Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on scatter plots and lines of fit, one fact might be that scatter plots can show whether there is a trend in a set of data. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-1  Graphing Equations in Slope-Intercept Form</td>
<td></td>
</tr>
<tr>
<td>4-2  Writing Equations in Slope-Intercept Form</td>
<td></td>
</tr>
<tr>
<td>4-3  Writing Equations in Point-Slope Form</td>
<td></td>
</tr>
<tr>
<td>4-4  Parallel and Perpendicular Lines</td>
<td></td>
</tr>
<tr>
<td>4-5  Scatter Plots and Lines of Fit</td>
<td></td>
</tr>
<tr>
<td>4-6  Regression and Median-Fit Lines</td>
<td></td>
</tr>
<tr>
<td>4-7  Special Functions</td>
<td></td>
</tr>
</tbody>
</table>
What You’ll Learn

Skim Lesson 4-1. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Identify the slope and y-intercept of lines A, B, C, and D. (Lessons 3-1 and 3-3)

<table>
<thead>
<tr>
<th>Line</th>
<th>Slope</th>
<th>y-intercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

New Vocabulary Label the diagram using the terms at the left.

slope-intercept form ➤
y-intercept ➤
slope ➤
independent variable ➤
dependent variable ➤

\[ y = mx + b \]
Main Idea

Slope-Intercept Form
pp. 214–216

Details

Complete each step in the chart below. Add details to each step for clarification.

Write the equation in _____________ form, if needed.

Identify the _______ and the _________.

Plot the ____________ on a coordinate plane.

Plot another _______ using the ________.

Modeling Real-World Data
pp. 216–217

Write a linear equation to determine the price of gas after the year 2008, if the price of gas in 2008 is $3.16 per gallon and the price increases by $0.55 per year.

<table>
<thead>
<tr>
<th>slope or rate of change</th>
<th>y-intercept or starting value</th>
<th>linear equation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>( y = mx + b )</td>
</tr>
</tbody>
</table>
4-2 Writing Equations in Slope-Intercept Form

What You’ll Learn
Skim the lesson. Write two things you already know about writing equations in slope-intercept form.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary
Review Vocabulary Rewrite each equation in slope-intercept form. Circle the slope and underline the y-intercept. (Lesson 4-1)

<table>
<thead>
<tr>
<th>Equation</th>
<th>Slope</th>
<th>y-intercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>2y + 5x = -8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3y + 5x = 5x + 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>y + 5x = 4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

New Vocabulary Fill in each blank with the correct terms. A process in which you use a ________________ equation to make ________________ about a value that is outside the range of a given set of ________________

Vocabulary Link Look up the word extrapolate in the dictionary. Write the non-mathematical definition of the word, a synonym for the word, and then use the word extrapolate in a non-mathematical sentence.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Main Idea

Write an Equation Given the Slope and a Point

Write the equation of the line that passes through (2, 4) and (-7, 5).

Write an Equation Given Two Points

Write the equation of the line that passes through (2, 4) and (-7, 5).

Helping You Remember

In your own words, explain how you would answer a question that asks you to write the slope-intercept form of an equation.
4-3 Writing Equations in Point-Slope Form

What You’ll Learn
Scan the text in Lesson 4-3. Write two facts you learned about equations in point-slope form as you scanned the text.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

New Vocabulary
Label the diagram using the terms at the left.

Vocabulary Link
Write the point-slope formula and the slope formula below. Explain how the two formulas are related.

<table>
<thead>
<tr>
<th>slope formula</th>
<th>point-slope form</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>y − y₁ = m(x − x₁)</td>
</tr>
</tbody>
</table>

How are they related?
Main Idea

Point-Slope Form
p. 231

Write the equation of the line in slope-intercept form that passes through (−4, 5) and (6, −5) using the two different methods. Which method do you prefer? Explain.

Details

Use the point-slope form.

Find the slope of the line.

Use the point-slope intercept form to find b.

Place a check mark in each box in which the specified characteristic applies. Describe the graphing method that you would use for each form identified as being convenient.

<table>
<thead>
<tr>
<th>Form</th>
<th>Slope is easily identifiable.</th>
<th>The y-intercept is easily identifiable.</th>
<th>convenient form for graphing</th>
</tr>
</thead>
<tbody>
<tr>
<td>point-slope form</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>slope-intercept form</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>standard form</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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What You’ll Learn

Skim the Examples for Lesson 4-4. Predict two things you think you will learn about parallel and perpendicular lines.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Write the slope formula, and then write a verbal description of how to use the slope formula. (Lesson 3-3)

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

New Vocabulary Write the correct term beside each definition.

_________________________ ▶ lines in the same plane that never intersect and have the same slope

_________________________ ▶ lines that intersect at right angles and have slopes that are opposite reciprocals
Main Idea

Parallel Lines  p. 237
Write an equation for each line described in slope-intercept form.
1. \(x\)-intercept of 3; \(y\)-intercept of \(-1\)
2. parallel to the line in Exercise 1
3. intersects the line in Exercise 1 at the \(y\)-intercept

Perpendicular Lines  pp. 238–240
Given two equations in standard form, determine whether the lines are parallel, perpendicular, or neither.

Write each equation in slope-intercept form.

\[
\begin{align*}
3x - 4y &= 12 \\
y &= \ldots x - 3
\end{align*}
\]

\[
\begin{align*}
6y &= 8x - 12 \\
y &= \ldots x - 2
\end{align*}
\]

Are the slopes the same?

- yes, parallel
- no, neither

Are the slopes opposite reciprocals?

- yes, perpendicular

Helping You Remember

Explain to another person how you would use the \(y\)-intercept and slope to graph a linear equation.

____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
4-5 Scatter Plots and Lines of Fit

What You’ll Learn

Skim Lesson 4-5. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. ____________________________________________________________
   ____________________________________________________________

2. ____________________________________________________________
   ____________________________________________________________

Active Vocabulary

New Vocabulary

Match the term with its definition by drawing a line to connect the two.

- **bivariate data**: a set of bivariate data graphed as ordered pairs on a coordinate plane
- **line of fit**: a set of data which contains two variables
- **scatter plot**: the process of using a linear equation to predict values inside the range of a set of data
- **linear interpolation**: a line which closely approximates the scatter plot for a set of data

Vocabulary Link

Circle each word which would likely describe the given statistical relationship.

1. the amount of allowance and the number of CDs owned by fifteen students randomly selected from an algebra class
   negative  positive  no  weak  strong correlation

2. the height in inches and the number of hours spent sleeping each week for ten adults selected at random
   negative  positive  no  weak  strong correlation

3. the number of hours worked and the number of hours spent watching TV each week by nine teenagers selected at random
   negative  positive  no  weak  strong correlation
Main Idea

Investigate Relationships Using Scatter Plots
p. 245

Details

Describe a real-world situation and a set of corresponding data that would show a strong positive correlation. Describe the meaning of the correlation in terms of the real-world situation.

Situation:

Correlation Meaning:

Use Lines of Fit pp. 246–247

Make a scatter plot and describe the correlation. Determine a line of fit for the data. Use the line of fit to predict the number of hours exercised per week by a 15-year-old.

The table shows the number of hours spent exercising per week and the age of a random sample of seven people.

<table>
<thead>
<tr>
<th>age</th>
<th>18</th>
<th>26</th>
<th>32</th>
<th>38</th>
<th>52</th>
<th>59</th>
</tr>
</thead>
<tbody>
<tr>
<td>hours</td>
<td>10</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>1.5</td>
<td>1</td>
</tr>
</tbody>
</table>

line of best fit
4-6 Regression and Median-Fit Lines

What You’ll Learn
Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________

2. ______________________________________________________

Active Vocabulary
New Vocabulary Write the definition next to each term.

best-fit line ►

linear regression ►

correlation coefficient ►

median-fit line ►

Vocabulary Link Consider the statement “There is a strong correlation between smoking cigarettes and developing lung cancer.” Explain this statement mathematically and indicate a probable value for the correlation coefficient.

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________
Lesson 4-6 (continued)

Main Idea

Equations of Best-Fit Lines  
Record the keystrokes required to perform linear regression on your calculator. Provide details as necessary.

- entering the data
- performing regression
- graphing the scatter plot and regression line

Equations of Median-Fit Lines  
Use your graphing calculator to determine the median-fit line for the following set of data. Use this equation to perform both a linear interpolation and a linear extrapolation.

<table>
<thead>
<tr>
<th>number of ads</th>
<th>2</th>
<th>5</th>
<th>8</th>
<th>8</th>
<th>10</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>sales ($ thousands)</td>
<td>2</td>
<td>4</td>
<td>7</td>
<td>6</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

median-fit equation: 
interpolation | extrapolation

Helping You Remember  
Explain how each of the following terms are related: scatter plot, line of fit, best-fit line, regression line, and median-fit line
Scan Lesson 4-7. List two headings you would use to make an outline of this lesson.

1. ........................................................
   ........................................................

2. ........................................................
   ........................................................

**Review Vocabulary** Graph each on a number line. *(Lesson 2-5)*

- $|x| < 4$
- all integers whose absolute value is greater than 2

**New Vocabulary** Match the term with its definition by drawing a line to connect the two.

- **piecewise-defined function**  a function whose graph consists of disjointed line segments
- **step function**  a function when given $x$, returns the greatest integer less than or equal to $x$
- **piecewise linear function**  a function written using two or more expressions
- **absolute value function**  a function which contains an algebraic expression within absolute value symbols
- **greatest integer function**  a function written using one expression which results in a graph that consists of multiple lines
Main Idea

Step Functions
pp. 261–262

Evaluate each expression.

1. \([8.7]\)

2. \([-8.2] + [16.2]\)

3. \([12.1] + 8\)

4. \([18.9 + 12.6]\)

Provide either the graph or the function notation for each piecewise-defined function. Identify the domain and range for each.

Absolute Value Functions
pp. 262–264

Helping You Remember
Explain how you can use a number line to find the value of the greatest integer function for any real number.
Provide details for each titled graphic organizer. Supply a title and details for graphic organizers that are blank.

### Equation of a Line

<table>
<thead>
<tr>
<th>General Equation</th>
<th>Point-Slope Form</th>
<th>Slope-Intercept Form</th>
<th>Standard Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using to Graph a Line</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using to Write the Equation of a Line</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Bivariate Data

- Positive
- Negative
- None
- Lines of Fit

### Correlation

- Scatter Plot
- Estimate Values
- Extrapolation
- Interpolation

### Lines of Best Fit

- Regression Line
- Median-fit Line
Linear Functions and Relations

Before the Test

Review the ideas you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column.

<table>
<thead>
<tr>
<th>K</th>
<th>What I know…</th>
<th>W</th>
<th>What I want to find out…</th>
<th>L</th>
<th>What I learned…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Math Online: Visit glencoe.com to access your textbook, more examples, self-check quizzes, personal tutors, and practice tests to help you study for concepts in Chapter 4.

Are You Ready for the Chapter Test?

Use this checklist to help you study.

☐ I used my Foldable to complete the review of all or most lessons.
☐ I completed the Chapter 4 Study Guide and Review in the textbook.
☐ I took the Chapter 4 Practice Test in the textbook.
☐ I used the online resources for additional review options.
☐ I reviewed my homework assignments and made corrections to incorrect problems.
☐ I reviewed all vocabulary from the chapter and their definitions.

Study Tips

• Make up an invented sentence (acrostic) to remember lists or sequences. Please Excuse My Dear Aunt Sally is one acronym for remembering the order of operations (parentheses, exponents, multiply and divide, add and subtract).
Before you read the chapter, respond to these statements.
1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

### Before You Read

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Linear Inequalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Inequalities are solved by isolating the variable.</td>
<td></td>
</tr>
<tr>
<td>• If both sides of an inequality are multiplied by a negative number, the inequality sign is reversed.</td>
<td></td>
</tr>
<tr>
<td>• A graph of an inequality has an open circle when the symbol is “greater than or equal to”.</td>
<td></td>
</tr>
<tr>
<td>• The order of operations does not apply when solving inequalities.</td>
<td></td>
</tr>
<tr>
<td>• Inequalities with absolute values are undefined.</td>
<td></td>
</tr>
</tbody>
</table>

**Foldables® Study Organizer**

Construct the Foldable as directed at the beginning of this chapter.

**Note Taking Tips**

- **Remember to study your notes daily.**
  Reviewing small amounts at a time will help you retain the information.

- **When you take notes, it may be helpful to sit as close as possible to the front of the class.**
  There are fewer distractions and it is easier to hear.
Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on solving inequalities by addition and subtraction, one fact might be that when solving inequalities, the goal is to isolate the variable on one side of the inequality. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-1  Solving Inequalities by Addition and Subtraction</td>
<td></td>
</tr>
<tr>
<td>5-2  Solving Inequalities by Multiplication and Division</td>
<td></td>
</tr>
<tr>
<td>5-3  Solving Multi-Step Inequalities</td>
<td></td>
</tr>
<tr>
<td>5-4  Solving Compound Inequalities</td>
<td></td>
</tr>
<tr>
<td>5-5  Inequalities Involving Absolute Value</td>
<td></td>
</tr>
<tr>
<td>5-6  Graphing Inequalities in Two Variables</td>
<td></td>
</tr>
</tbody>
</table>
5-1 Solving Inequalities by Addition and Subtraction

What You’ll Learn

Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary

Write a word description for each inequality symbol and write a true mathematical sentence using the symbol. (Lesson 1-1)

1. > __________________________
   __________________________

2. < __________________________
   __________________________

3. ≥ __________________________
   __________________________

4. ≤ __________________________
   __________________________

New Vocabulary

Label the parts of the set builder notation below using the phrases given at the left. Show the set builder notation on the number line.

such that ►

the set of all numbers b ►

b is less than or equal to 5 ►

{b | b ≤ 5}
### Main Idea

#### Solve Inequalities by Addition

pp. 283–284

Fill in the chart with the missing solution set representations.

<table>
<thead>
<tr>
<th>Verbal Description</th>
<th>Set Builder Notation</th>
<th>Graphical Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>all numbers greater than 3</td>
<td>${x \mid x &lt; -3}$</td>
<td>~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~</td>
</tr>
</tbody>
</table>

#### Solve Inequalities by Subtraction

pp. 284–285

Write a linear inequality to represent the following problem. Solve the inequality. Provide a complete sentence to answer the problem.

*Raul needs at least $150 to purchase a digital audio player. Currently, Raul has $102. How much more money does Raul need before he can purchase a digital audio player?*

Inequality:  
Solution:  
Answer the problem:

### Helping You Remember

Teaching someone else can help you remember something. Explain how you would teach another student to solve the inequality $2x + 4 \leq 3x$.  

________________________________________________________________________

________________________________________________________________________
What You’ll Learn
Scan Lesson 5-2. List two headings you would use to make an outline of this lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Review Vocabulary
Explain how the Multiplication Property of Equality and the Division Property of Equality can both be used to solve the equation $3x = 24$. (Lesson 2-2)

Active Vocabulary

Vocabulary Link
Solve the inequality below by following the outlined steps.

$-18 > -3x$

Add 3x to each side.

Add 18 to each side.

Divide each side by 3.
Main Idea

Solve Inequalities by Multiplication
pp. 290–291

Compare and contrast the process for solving the inequalities \(-\frac{1}{3}x > -12\) and \(\frac{1}{3}x > 12\) and for showing the solutions sets on a number line.

Similarities: ____________________________

______________________________

______________________________

Differences: ____________________________

______________________________

______________________________

______________________________

______________________________

Classify each inequality listed in the chart below.

\(3x > -12, \ -4x < 15, \ -\frac{2}{3}x \leq -15, \ x - 5 > -15, \ \frac{1}{4}x \geq -8, \ -x > 9, \ x + 14 < -6, \ \frac{3}{2}x > -7\)

<table>
<thead>
<tr>
<th>The inequality symbol is not reversed when solving.</th>
<th>The inequality symbol is reversed when solving.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What You’ll Learn

Skim the Examples for Lesson 5-3. Predict two things you think you will learn about solving multi-step inequalities.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Review Vocabulary

Use the Distributive Property to simplify each expression. (Lesson 1-3)

1. $3(2x - 7)$
2. $-4x + 2(3x + 1)$
3. $2(x + 5) + 3(2x + 1)$
4. $-4(2x - 6) - (x + 7)$

Vocabulary Link

Fill in a missing term in each equation to satisfy the given solution. Justify your answer by solving each equation.

1. $4x - 12 = 6x + \square$ Solution: $x = -2$
2. $2x - 10 = 2x + \square$ Solution: $\emptyset$
3. $3x + 11 = \square + 11$ Solution: {all real numbers}
Main Idea

Solve each inequality using the indicated first step. Show the solution set using set builder notation and on a number line.

**Details**

Solve Multi-Step Inequalities

pp. 296–297

Solve Inequalities

Involving the Distributive Property

pp. 297–298

- 5 - 6z \geq 13
  - Subtract 5 from each side.
  - 5 - 6z \geq 13
  - Add 6z to each side.

Helping You Remember

Make a checklist of steps for solving inequalities.

- ________________________________
  - ________________________________
  - ________________________________
  - ________________________________
  - \( \emptyset \):
    - ________________________________
    - ________________________________
    - ________________________________
    - ________________________________
What You’ll Learn

Skim the lesson. Write two things you already know about solving compound inequalities.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Match each verbal description to the correct inequality symbol. (Lesson 1-1).

- $x \geq 12$  is no more than 12
- $12 < x$  is less than 12
- $x \leq 12$  is at least 12
- $x < 12$  is more than 12

New Vocabulary  Write the correct term beside each definition.

- ▶ Corresponds to the word “and”. Solutions are common to both inequalities in a compound inequality.
- ▶ The name given to two inequalities considered together.
- ▶ Corresponds to the word “or”. Solutions are from one, the other, or both inequalities in a compound inequality.

Vocabulary Link  Shade the intersection of sets $A$ and $B$ in Diagram I. Shade the union of sets $A$ and $B$ in Diagram II.
Main Idea

Inequalities Containing and  

p. 304

Details

Complete the diagram to solve the inequality.

To be on the Tiny Tigers Tennis Team, a child must be at least 6 years old, but less than 9 years old. Write two compound inequalities: one representing the ages of children who can be on the team, and the other representing the ages of children who cannot be on the team.

Children on the team: __________

Children not on the team: __________

Helping You Remember

One way to remember something is to connect it to something that is familiar to you. Write two true compound statements about yourself, one using the word and and other using the word or.

________________________________________________________________________

________________________________________________________________________
Inequalities Involving Absolute Value

What You’ll Learn
Scan the text in Lesson 5-5. Write two facts you learned about inequalities involving absolute value as you scanned the text.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Solve each absolute value equation. (Lesson 2-5)

1. \(|x| = 12\)  2. \(|x| - 5 = -20\)

3. \(4|x - 6| = 16\)  4. \(|3x - 1| + 2 = 18\)

Vocabulary Link  Shade the areas on the coordinate planes which meet the conditions. Describe the shape of the shaded region.

<table>
<thead>
<tr>
<th>Description</th>
<th>Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>all points 3 units from A</td>
<td>all points, at most, 3 units from A</td>
<td>all points between 2 and 3 units from A</td>
</tr>
</tbody>
</table>

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Main Idea

Inequalities Involving Absolute Value
pp. 310–311

Complete the chart below for solving absolute value inequalities.

<table>
<thead>
<tr>
<th>Inequality</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inequality</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inequality</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inequality</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Give each inequality.

<table>
<thead>
<tr>
<th>Inequality</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Helping You Remember

Recall that \(|x|\) tells you how many units the number \(x\) is from zero on the number line. Explain the meaning of \(|x| = n\), \(|x| < n\) and \(|x| > n\) by using the idea of the distance from \(x\) to zero.
What You’ll Learn

Skim Lesson 5-6. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

New Vocabulary  Write the definition next to each term.

boundary ➤ ______________________________________________________
   ______________________________________________________
   ______________________________________________________

half-plane ➤ ______________________________________________________
   ______________________________________________________
   ______________________________________________________

closed half-plane ➤ ______________________________________________________
   ______________________________________________________
   ______________________________________________________

open half-plane ➤ ______________________________________________________
   ______________________________________________________
   ______________________________________________________
Main Idea

Graph Linear Inequalities
pp. 315–316

Details

Sequence the steps for graphing a linear inequality by placing one step in each box. Add details in the box next to each step.

Shade the graph, Graph the boundary line, Determine if the boundary line is solid or shaded, Pick a point not on the line to test, Check a point not in the shaded region.

Solve Linear Inequalities
pp. 316–317

Use an inequality in two variables to solve \(-2x - 3 \leq -5\).

Write the related function.

Graph the function.

Pick/Test a Point. Shade the graph.
Provide the indicated details in the graphic organizer.

**Using Properties of Inequality to Solve One-Step Inequalities**

- **Addition Example**
- **Subtraction Example**
- **Multiplication Example**
- **Division Example**

**Using Properties of Inequality to Solve Two-Step Inequalities**

**Step 1:**

**Step 2:**

**Compound Inequalities**

- **Intersection Example**
- **Union Example**
- **Absolute Value Equations Example**
- **Absolute Value Equations Example**
Before the Test

Now that you have read and worked through the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Linear Inequalities</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Inequalities are solved by isolating the variable.</td>
<td></td>
</tr>
<tr>
<td>• If both sides of an inequality are multiplied by a negative number, the inequality sign is reversed.</td>
<td></td>
</tr>
<tr>
<td>• A graph of an inequality has an open circle when the symbol is “greater than or equal to”.</td>
<td></td>
</tr>
<tr>
<td>• The order of operations does not apply when solving inequalities.</td>
<td></td>
</tr>
<tr>
<td>• Inequalities with absolute values are undefined.</td>
<td></td>
</tr>
</tbody>
</table>

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Are You Ready for the Chapter Test?
Use this checklist to help you study.

☐ I used my Foldable to complete the review of all or most lessons.
☐ I completed the Chapter 5 Study Guide and Review in the textbook.
☐ I took the Chapter 5 Practice Test in the textbook.
☐ I used the online resources for additional review options.
☐ I reviewed my homework assignments and made corrections to incorrect problems.
☐ I reviewed all vocabulary from the chapter and their definitions.

Study Tips

• On handouts, homework, and workbooks that can be written in, underline and highlight significant information.
Before You Read

Before you read the chapter, think about what you know about systems of linear equations and inequalities. List three things you already know about them in the first column. Then list three things you would like to learn about them in the second column.

<table>
<thead>
<tr>
<th>K</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What I know...</strong></td>
<td><strong>What I want to find out...</strong></td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

**Note Taking Tips**

- **If your instructor points out definitions or procedures from your text, write a reference page in your notes.**
  You can then write these referenced items in their proper place in your notes after class.

- **When you take notes, listen or read for main ideas.**
  Then record concepts, define terms, write statements in if-then form, and write paragraph proofs.
Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on graphing systems of equations, one fact might be that if a consistent system has an infinite number of solutions, it is dependent. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-1  Graphing Systems of Equations</td>
<td></td>
</tr>
<tr>
<td>6-2  Substitution</td>
<td></td>
</tr>
<tr>
<td>6-3  Elimination Using Addition and Subtraction</td>
<td></td>
</tr>
<tr>
<td>6-4  Elimination Using Multiplication</td>
<td></td>
</tr>
<tr>
<td>6-5  Applying Systems of Linear Equations</td>
<td></td>
</tr>
<tr>
<td>6-6  Organizing Data Using Matrices</td>
<td></td>
</tr>
<tr>
<td>6-7  Using Matrices to Solve Systems of Equations</td>
<td></td>
</tr>
<tr>
<td>6-8  Systems of Inequalities</td>
<td></td>
</tr>
</tbody>
</table>
6-1 Graphing Systems of Equations

What You’ll Learn
Scan the text under the *Now* heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Make a table of values which satisfy the equation $x + y = 13$. *(Lesson 3-1)*

<table>
<thead>
<tr>
<th>$x$</th>
<th>$-5$</th>
<th>$-4$</th>
<th>$-3$</th>
<th>$-2$</th>
<th>$-1$</th>
<th>$0$</th>
<th>$1$</th>
<th>$2$</th>
<th>$3$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>$18$</td>
<td>$17$</td>
<td>$16$</td>
<td>$15$</td>
<td>$14$</td>
<td>$13$</td>
<td>$12$</td>
<td>$11$</td>
<td>$10$</td>
</tr>
</tbody>
</table>

Is it possible to make a table that shows all ordered pairs that satisfy this equation? Justify your answer.

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

How can you show all of the ordered pairs for the equation?

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________

New Vocabulary  Match the term with its definition by drawing a line.

- **consistent**: a set of two or more equations that contain the same variables
- **inconsistent**: a system of equations that has at least one solution
- **system of equations**: a system of equations that has an infinite number of solutions
- **independent**: a system of equations that has exactly one solution
- **dependent**: a system of equations that has no solutions
Main Idea

Possible Number of Solutions  
Add a line to each graph so that the given condition is satisfied.

<table>
<thead>
<tr>
<th>Consistent</th>
<th>Independent</th>
<th>Dependent</th>
<th>Inconsistent</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Consistent Graph" /></td>
<td><img src="image2" alt="Independent Graph" /></td>
<td><img src="image3" alt="Dependent Graph" /></td>
<td><img src="image4" alt="Inconsistent Graph" /></td>
</tr>
</tbody>
</table>

Solve by Graphing  
Solve the system of equations by graphing.

**Step 1**  
Solve for $y$ in each equation.

- $2x + y = 9$
- $2x - 5y = 15$

**Step 2**  
Graph each equation.

**Step 3**  
Find the solution. The lines intersect at point _____.

Helping You Remember  
Describe how you can solve a system of equations by graphing.

__________________________________________

__________________________________________

__________________________________________
What You’ll Learn

Scan the text in Lesson 6-2. Write two facts you learned about solving systems by substitution as you scanned the text.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Solve the equation after substituting the given value for each variable. (Lesson 2-3)

1. $3x + 7y = 8$, given $x = -2$  
2. $-2y + 2x = 12$, given $y = 0$

3. $y - \frac{2}{3x} = 9$, given $x = -6$  
4. $0.5y + 6x = -5$, given $y = 4$

New Vocabulary  Write the definition next to each term.

substitution

Vocabulary Link  Describe when it would be more convenient to use substitution than graphing for solving a system of equations.
Main Idea

Solve by Substitution
pp. 342–344

Details

Solve the system of equations twice using the substitution method. In the first column, solve for $x$ initially. In the second, solve for $y$ initially.

Write a system of equations to represent the following problem. Identify the variables. Solve the system.

A total of 150 tickets were sold for the annual concert. Student tickets were $4 and non-student tickets were $8. If the total revenue was $840, how many tickets of each type were sold?

Solution

Helping You Remember

What is usually the first step in solving a system of equations by substitution?
What You’ll Learn
Scan Lesson 6-3. List two headings you would use to make an outline of this lesson.

1. ____________________________________________________________
   ____________________________________________________________

2. ____________________________________________________________
   ____________________________________________________________

Active Vocabulary

Review Vocabulary  Match each linear equation with the appropriate form. (Lessons 4-2 and 4-3)

- slope-intercept form  \( y = -\frac{3}{4}x + 3 \)
- point-slope form  \( 3x + 4y = 12 \)
- standard form  \( y + 3 = (x - 8) \)

Do these equations represent the same line? Justify your answer.

   ____________________________________________________________

   ____________________________________________________________

   ____________________________________________________________

New Vocabulary  Fill in the blanks with the correct term or phrase.

- elimination  It is a method to _________ a system in which the equations are written so that like _________ with the same or opposite coefficients are _________. The equations are _________ or subtracted to eliminate one ___________. The value for one variable is found and is __________ into one of the equations to solve for the other variable.
Main Idea

Elimination Using Addition
pp. 348–349

Details

Solve each system of equations using the addition method. Fill in both the verbal and mathematical missing steps.

Given

\begin{align*}
-5y + 3x &= -9 \\
4x + 5y &= 23 \\
3x &= 4y + 11 \\
2y &= 3x - 7
\end{align*}

Line up the variables and coefficients.

\[
\begin{align*}
\phantom{\text{7x = 14}} \\
\phantom{\text{7x = 14}} \\
\phantom{\text{7x = 14}} \\
\phantom{\text{7x = 14}}
\end{align*}
\]

\[
\begin{align*}
7x &= 14 \\
\phantom{\text{7x = 14}} \\
\phantom{\text{7x = 14}} \\
\phantom{\text{7x = 14}}
\end{align*}
\]

Solve the one-variable equation.

\[
\begin{align*}
3(2) - 5y &= -9 \\
-5y &= -15 \\
y &= 3
\end{align*}
\]

\[
\begin{align*}
(1, -2)
\end{align*}
\]

Elimination Using Subtraction
pp. 350–351

Create a system of equations which has a solution of (2, 4) and can be solved using the subtraction method.

Helping You Remember

Tell how you can decide whether to use addition or subtraction to eliminate a variable in a system of equations.
6-4 Elimination Using Multiplication

What You’ll Learn
Skim Lesson 6-4. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. ____________________________________________________
   ____________________________________________________

2. ____________________________________________________
   ____________________________________________________

Active Vocabulary
Review Vocabulary Write the property of equality which is represented by each example. (Lessons 1-3)

4x = 9 is equivalent to 4x – 18 = –9.

3x + 2y = 12 is equivalent to 6x + 4y = 24.

3x = 12 is equivalent to 3x + 8 = 20.

Vocabulary Link Add the two linear equations to create a third. Graph all three equations on the same plane. What happens?

2x – 3y = –8
–x + 2y = 6
Main Idea

Elimination Using Multiplication  
pp. 355–356

Details

Write a system of equations to represent the following problem. Identify the variables. Solve the system using elimination.

On Monday, Arnold paid $3.40 for three donuts and two coffees. On Tuesday, he paid $3.60 for two donuts and three coffees. On Wednesday, he bought one donut and one coffee. What was his bill for one donut and one coffee?

Let \( d = \)  
Let \( c = \)

Helping You Remember

If you are going to solve a system by elimination, how do you decide whether you will need to multiply one or both equations by a number?
What You’ll Learn

Skim the Examples for Lesson 6-5. Predict two things you think you will learn about applying systems of equations.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Solve the system of equations using each of the four methods. (Lessons 6-1 through 6-4)

\[ x - 2y = 4; \ x - y = 3 \]

<table>
<thead>
<tr>
<th>Graphing</th>
<th>Substitution</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Graphing Diagram" /></td>
<td><img src="image" alt="Substitution Diagram" /></td>
</tr>
</tbody>
</table>

Solution: ______________________________________

Solution: ______________________________________

Elimination Using Subtraction

Elimination Using Multiplication

Solution: ______________________________________

Solution: ______________________________________
Main Idea

**Determine the Best Method**
pp. 362–363

Details

Summarize when to use each of the following methods in your own words.

- **Substitution**
- **Graphing**
- **Methods for Solving Systems of Equations**
- **Addition and Subtraction with Multiplication**
- **Addition and Subtraction**

**Apply Systems of Linear Equations**
p. 364

**Write a word problem that could be represented by the following system of equations. Identify each variable.**

\[4b + 3m = 1.45; 2b + 5m = 1.25\]

**b =**

**m =**

**Word Problem**
6-6 Organizing Data Using Matrices

What You’ll Learn

Skim the lesson. Write two things you already know about organizing data using matrices.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

New Vocabulary Write the correct term beside each definition.

________________________ ▶ the number of rows and columns in a matrix, written as $m \times n$, where $m$ is the number of rows and $n$ is the number of columns

________________________ ▶ a constant that is multiplied by a matrix

________________________ ▶ the name given to each number in a matrix

________________________ ▶ a rectangular array of variables or constants in horizontal rows and columns

________________________ ▶ the operation of multiplying each element of a matrix by the scalar

Vocabulary Link Explain how scalar multiplication is similar to using the Distributive Property in an algebraic expression. Explain how matrix addition/subtraction is similar to combining like terms in an algebraic expression.

Scalar multiplication & Distributive Property

Matrix addition/subtraction & combining like terms
Main Idea

Organize Data Using Matrices
pp. 369–370

Use matrix $A$ to answer the following questions.

$$A = \begin{bmatrix} -2 & 7 & -10 & 1 & 12 \\ 3 & 0.5 & 2 & -1 & -5 \\ 5 & 6 & 0 & 4 & 0.75 \end{bmatrix}$$

What are the dimensions of Matrix $A$? ____________

What is the element in row 2, column 4? ____________

What is the position of the circled element? ____________

What is the sum of the elements in column 3? ____________

What is the sum of the elements in row 1? ____________

Matrix Operations
pp. 370–371

Perform each matrix operation.

$$-3 \begin{bmatrix} -2 \\ 1 \end{bmatrix} - 4 \begin{bmatrix} 4 \\ 7 \end{bmatrix} = \begin{bmatrix} \end{bmatrix}$$

$$\begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix} - \begin{bmatrix} 5 & -1 \\ 3 & 8 \end{bmatrix} = \begin{bmatrix} \end{bmatrix}$$
6-7 Using Matrices to Solve Systems of Equations

What You’ll Learn
Skim the Examples for Lesson 6-7. Predict two things you think you will learn about using matrices to solve systems of equations.

1. ______________________________________________________

2. ______________________________________________________

Active Vocabulary

Review Vocabulary  Eliminate the indicated variable for each system. Do not solve the system. (Lesson 6-4)

\[
\begin{align*}
2x - 3y &= -13 \\
5x - 12y &= -46
\end{align*}
\]
Eliminate \(x\).
Multiply 1st equation by ____.
Multiply 2nd equation by ____.

\[
\begin{align*}
4x + 3y &= 48 \\
3x + 2y &= 34
\end{align*}
\]
Eliminate \(y\).
Multiply 1st equation by ____.
Multiply 2nd equation by ____.

New Vocabulary  Fill in each box with the correct term.

- constant
- coefficient
- identity matrix
- augmented matrix
Main Idea

Augmented Matrices
p. 376

Write a system of equations from the augmented matrices. Use \( x \) and \( y \) as the variables.

\[
\begin{bmatrix}
4 & 8 & 1 \\
3 & -1 & 5
\end{bmatrix}
\]

Use an augmented matrix to solve the system of equations \( x - y = 12 \) and \( 2x + y = 3 \). Fill in the missing steps.

\[
\begin{bmatrix}
1 & -1 & 12 \\
2 & 1 & 3
\end{bmatrix}
\]

Make the 2nd element in the 1st row a 0 by adding the 2nd row to the 1st.

\[
\begin{bmatrix}
1 & 0 & 5 \\
2 & 1 & 3
\end{bmatrix}
\]

Make the 1st element in the 2nd row a 0 by multiplying the 1st row by \(-2\) and adding to the 2nd.

\[
\begin{bmatrix}
\phantom{1} & \phantom{1} & \phantom{1} \\
\phantom{1} & \phantom{1} & \phantom{1}
\end{bmatrix}
\]

Write the solution.

Helping You Remember

A student in your class is having difficulty understanding why the goal of row reduction is to achieve an identity matrix. How can you explain this to the student?
**What You’ll Learn**

Scan the text under the *Now* heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

**Active Vocabulary**

**New Vocabulary** Fill in the blank with the correct term or phrase.

It is a set of __________ or more inequalities with the same __________. The solution of the system is the set of __________ that satisfy all of the inequalities in the system. These ordered pairs are the __________ of the graphs of each individual inequality.

**Vocabulary Link** Intersecting regions can be represented using a Venn diagram. Place the terms “solutions of $y > 2x - 4$”, “solutions of $y \leq -0.5x + 3$”, and “solutions of $y > 2x - 4$ and $y \leq -0.5x + 3$” in the Venn diagram below.

How could you use the Venn diagram to represent “solutions of $y > 2x - 4$ or $y \leq -0.5x + 3$”? 

_________________________________________________________________
Main Idea

Systems of Inequalities
pp. 382–383

Sequence the steps for solving a system of inequalities. Solve the two systems of inequalities.

Graph the first inequality and shade appropriately, Write both lines in slope-intercept form, Determine the intersections of the shaded regions, Graph the second inequality and shade appropriately.

Example 1

\[ y > x - 1 \]
\[ y < x + 3 \]

Example 2

\[ 4x - 3y \leq 3 \]
\[ 2x + y \geq 2 \]

Helping You Remember

Describe how you would explain the process of using a graph to solve a system of inequalities to a friend.
Systems of Linear Equations and Inequalities

**Tie It Together**

Fill in each graphic organizer. Add details if space permits.

### Solving Systems of Equations

<table>
<thead>
<tr>
<th>Method</th>
<th>How to Use</th>
<th>When to Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Substitution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elimination with Addition/Subtraction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elimination with Multiplication</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Possible Solution Sets**

- Algebraically Solved
  - Graphically Solved
- Algebraically Solved
  - Graphically Solved
- Algebraically Solved
  - Graphically Solved
**CHAPTER 6**

**Systems of Linear Equations and Inequalities**

**Before the Test**

Review the ideas you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column.

<table>
<thead>
<tr>
<th>K</th>
<th>W</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>What I know…</td>
<td>What I want to find out…</td>
<td>What I learned…</td>
</tr>
</tbody>
</table>

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- I took the Chapter 6 Practice Test in the textbook.
- I used the online resources for additional review options.
- I reviewed my homework assignments and made corrections to incorrect problems.
- I reviewed all vocabulary from the chapter and their definitions.

**Study Tips**

- Use the SQ3R method of reading: Survey, Question, Read, Recite, and Review. Survey the text by previewing the headings, boldface words, and examples. Ask questions about what you survey, read with purpose, recite out loud the main points and concepts without looking at the text, and review your text notes or use the chapter review at the end of the chapter.
Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Polynomials</th>
</tr>
</thead>
<tbody>
<tr>
<td>• To multiply exponents with the same base, find the product of the base and the exponents.</td>
<td>• A simplified expression is without fractions, duplicate bases, and powers of powers.</td>
</tr>
<tr>
<td>• A base with a negative exponent is written with a positive exponent when it is a denominator.</td>
<td>• To subtract polynomials, subtract like terms.</td>
</tr>
<tr>
<td>• To multiply polynomials, use the Commutative Property.</td>
<td></td>
</tr>
</tbody>
</table>

Foldables Study Organizer

Construct the Foldable as directed at the beginning of this chapter.

Note Taking Tips

• When taking notes, writing a paragraph that describes the concepts, the computational skills, and the graphics will help you to understand the math in the lesson.

• Before each lesson, skim through the lesson and write any questions that come to mind in your notes.

As you work through the lesson, record the answer to your question.
## Polynomials

### Key Points

Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on dividing monomials, one fact might be that the order of magnitude of a quantity is the number rounded to the nearest power of 10. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-1  Multiplying Monomials</td>
<td></td>
</tr>
<tr>
<td>7-2  Dividing Monomials</td>
<td></td>
</tr>
<tr>
<td>7-3  Scientific Notation</td>
<td></td>
</tr>
<tr>
<td>7-4  Polynomials</td>
<td></td>
</tr>
<tr>
<td>7-5  Adding and Subtracting Polynomials</td>
<td></td>
</tr>
<tr>
<td>7-6  Multiplying a Polynomial by a Monomial</td>
<td></td>
</tr>
<tr>
<td>7-7  Multiplying Polynomials</td>
<td></td>
</tr>
<tr>
<td>7-8  Special Products</td>
<td></td>
</tr>
</tbody>
</table>

---

**Chapter 7**

Glencoe Algebra 1

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What You’ll Learn  
Skim the Examples for Lesson 7-1. Predict two things you think you will learn about multiplying monomials.

1. __________________________________________

2. __________________________________________

Vocabulary Link  The word constant has a place in a number of real-world applications. Think of a real-world example where you would describe something as constant. Then look up the word and explain how its everyday meaning relates to its mathematical meaning.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Active Vocabulary  
New Vocabulary  Fill in each blank with the correct term or phrase.

constant ▸  A constant is a monomial that is a ________________.

monomial ▸  A monomial is a number, a ________________, or the product of a number and one or more variables with nonnegative integer ________________.
Complete the table by circling the property of powers that can be used to simplify each expression. Then simplify the expression.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Property</th>
<th>Simplified Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>$(w^3)^6$</td>
<td>Product of Powers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power of a Power</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power of a Product</td>
<td></td>
</tr>
<tr>
<td>$c^2 \cdot c^4$</td>
<td>Product of Powers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power of a Power</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power of a Product</td>
<td></td>
</tr>
<tr>
<td>$(2mn)^3$</td>
<td>Product of Powers</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power of a Power</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Power of a Product</td>
<td></td>
</tr>
</tbody>
</table>

Simplify each expression.

1. $(2mn^2)^2 (3m^2n^4)^3$
2. $(4c^2d^3)^2 \left[(-3c^2d^4)^3\right]^2$

Helping You Remember

Write an example of each of the three properties of powers discussed in this lesson. Then, using the examples, explain how the property is used to simplify them.

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________
7-2 Dividing Monomials

What You’ll Learn

Skim the lesson. Write two things you already know about dividing monomials.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

New Vocabulary

Write the correct term next to each definition or expression.

\[
\left( \frac{c}{5} \right)^0 = 1
\]

for a given quantity, the number rounded to the nearest power of 10

\[
a^{-2} = \frac{1}{a^2}
\]

Vocabulary Link

Look up the definition of magnitude. Tell how the meaning compares to the order of magnitude of a quantity.
Main Idea

Quotients of Monomials
pp. 408–410

Complete the table by circling the property of powers that can be used to simplify each expression. Then simplify the expression.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Property</th>
<th>Simplified Expression</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \frac{a^2b^4}{ab^2} )</td>
<td>Quotient of Powers</td>
<td>( \frac{a^2b^2}{a} )</td>
</tr>
<tr>
<td></td>
<td>Power of a Quotient</td>
<td></td>
</tr>
<tr>
<td>( \left( \frac{4z^3}{5} \right)^2 )</td>
<td>Quotient of Powers</td>
<td>( \frac{16z^6}{25} )</td>
</tr>
<tr>
<td></td>
<td>Power of a Quotient</td>
<td></td>
</tr>
</tbody>
</table>

Simplify Expressions
pp. 411–412

Simplify each expression. Assume that no denominator is equal to zero.

1. \( \left( \frac{7c^2d^5}{21c^2d^2} \right)^0 \)

2. \( \frac{(m^{-1}n^3)^{-4}}{m^3n^3} \)

Helping You Remember

Describe how you would help a friend who needs to simplify the expression \( \frac{4x^2}{2x^5} \).
What You’ll Learn

Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Review Vocabulary

Write the definition next to each term. (Lesson 7-1)

constant ▶

monomial ▶

New Vocabulary

Write the definition of the term.

scientific notation ▶

____________________________________________________
   ______________________________________________________
   ______________________________________________________
Main Idea

Scientific Notation

Follow the steps below to write $5.18 \times 10^7$ in standard form.

**Step 1:** Identify the exponent.  
\[ n = \quad \]

**Step 2:** Move the decimal point $n$ places to the right.  
\[ 5.18 \times 10^7 \rightarrow \quad \]

**Step 3:** Rewrite using commas.  
\[ 5.18 \times 10^7 = \quad \]

Products and Quotients in Scientific Notation

Evaluate each expression. Express the results in both scientific notation and standard form.

1. \[ (1.3 \times 10^{-6})(5.2 \times 10^8) \]
2. \[ \frac{2.04 \times 10^9}{1.2 \times 10^{13}} \]

Helping You Remember

A good way to remember a mathematical concept is to explain it to someone else. How would you tell a friend to write the decimal 0.00000012 using scientific notation?

1. 
2. 
3. 
4. 
5. 
6.

Chapter 7 120  Glencoe Algebra 1
7-4 Polynomials

What You’ll Learn

Skim Lesson 7-4. Predict two things that you expect to learn based on the headings and figures in the lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

New Vocabulary

Write the correct term next to each definition.

_________________________ ▶ a monomial or the sum or difference of monomials, each called a term

_________________________ ▶ the coefficient of the first term of a polynomial when written in standard form

_________________________ ▶ the sum of the exponents of all the variables of a monomial

_________________________ ▶ the sum or difference of three monomials

_________________________ ▶ the form of a polynomial that is written with the terms in order from greatest degree to least degree

_________________________ ▶ the sum or difference of two monomials

_________________________ ▶ the greatest degree of any term in a polynomial
Main Idea

Degree of a Polynomial

pp. 424–425

Details

Complete the table below for each monomial, binomial, or trinomial.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Number of Terms</th>
<th>Monomial, Binomial, or Trinomial?</th>
</tr>
</thead>
<tbody>
<tr>
<td>$32x^2y$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$4x + 2y - 6$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$9x^2 - 81y^2$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$-7$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$8y + 3$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Polynomials in Standard Form

pp. 425–426

Write each polynomial in standard form. Identify the leading coefficient.

1. $y^2 + 32 - y + 4y^3$
   __________________________

2. $32 - x^4 + 10x^2$
   __________________________

3. $5z + 7z^2 + 6$
   __________________________

4. $12a^2 - 15 - 8a + 9a^6$
   __________________________

Helping You Remember

Use a dictionary to find the meaning of the terms *ascending* and *descending*. Write their meanings and then describe a situation in your everyday life that relates to them.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
What You’ll Learn  
Scan the text in Lesson 7-5. Write two facts you learned about adding and subtracting polynomials as you scanned the text.

1. ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

2. ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

Active Vocabulary  
Review Vocabulary  Fill in each blank with the correct term or phrase. (Lessons 7-1 and 7-4)

polynomial  ► A polynomial is a monomial or the sum or difference of monomials, each called a ________________ of the polynomial.

constant  ► A constant is a ________________ that is a real number.

binomial  ► A binomial is the sum or ________________ of two monomials.

leading coefficient  ► The leading coefficient of a polynomial is the coefficient of the first term when written in ________________.

monomial  ► A monomial is a ________________, a variable, or the ________________ of a number and one or more variables with nonnegative integer exponents.
Main Idea

Add Polynomials

p. 433

Find each sum.

1. \((3x^2 + 8) + (4x^2 - 6x)\) ________________________

2. \((-x^3 + 5x) + (2x^3 + 10x)\) ________________________

3. \((4x^2 - x + 2) + (x^2 - 3x - 8)\) ________________________

4. \((3x^4 + 2x^2 + 1) + (x^3 - 5x - 4)\) ________________________

Subtract Polynomials

pp. 434–435

Compare and contrast the processes of adding and subtracting polynomials by listing any similarities and differences.

Helping You Remember

A good way to gain a greater understanding of a mathematical process is to relate it to previously learned processes. Describe how adding and subtracting polynomials vertically is like adding and subtracting decimals vertically.

Adding and Subtracting Polynomials

Similarities

Differences
Scan Lesson 7-6. List two headings you would use to make an outline of the lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Label the diagram with the correct terms. (Lesson 7-4)

leading coefficient

degree

$12x^4 - x^3 + 2x + 5$

Match the term with its definition by drawing a line to connect the two. (Lessons 7-2 and 7-4)

order of magnitude  the sum or difference of two monomials

trinomial  for a given quantity, the number rounded to the nearest power of 10

degree of a monomial  the sum of the exponents of all the variables of a monomial

binomial  the sum or difference of three monomials
Main Idea

Polynomial Multiplied by Monomial
pp. 439–440

Follow the steps below to find $-2x^2(5x^2 - 3x + 1)$.

**Step 1:** Write the original expression.

**Step 2:** Use the Distributive Property.

**Step 3:** Multiply the terms.

**Step 4:** Simplify the expression.

Details

Solve Equations with Polynomial Expressions
p. 441

Solve the equation below for $m$. Show your work.

$m(m - 4) - m(m + 2) = -4m - 10$

$m = ____$

Helping You Remember

Use the equation $2x(x - 5) + 3x(x + 3) = 5x(x + 7) - 9$ to show how you would explain the process of solving equations with polynomial expressions to another algebra student.
7-7 Multiplying Polynomials

What You’ll Learn

Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Review Vocabulary

Write the definition next to each term. (Lessons 7-1 and 7-2)

order of magnitude ▶
   ______________________________________________________
   ______________________________________________________

constant ▶
   ______________________________________________________

New Vocabulary

Fill in each blank with the correct term or phrase.

FOIL method ▶ To multiply two binomials using the FOIL method, find the sum of the products of $F$ the ________________, $O$ the outer terms, $I$ the inner terms, and $L$ the ________________.

quadratic expression ▶ A quadratic expression is an expression in one ____________ with a degree of 2.
Lesson 7-7 (continued)

Main Idea

Multiply Binomials

Use the FOIL method to find the product

\((x + 8)(x - 5)\).

First terms:

\(\) __________

Outer terms:

\(\) __________

Inner terms:

\(\) __________

Last terms:

\(\) __________

The product is _____________________.

Multiply Polynomials

Use the Distributive Property to find the product

\((x + 1)(x^2 + x - 1)\). Show your work.

Helping You Remember

Think of a method for remembering all the product combinations used in the FOIL method for multiplying two binomials. Describe your method using words or a diagram.
Scan the text in Lesson 7-8. Write two facts you learned about special products as you scanned the text.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Review Vocabulary Match the term with its definition by drawing a line to connect the two. (Lessons 7-1, 7-3, 7-4, and 7-7)

- **monomial**: an expression in one variable with a degree of 2
- **quadratic expression**: a monomial or the sum or difference of monomials, each called a **term**
- **polynomial**: a form of a number that is written as $a \times 10^n$, where $1 \leq a < 10$ and $n$ is an integer
- **scientific notation**: a number, a variable, or the product of a number and one or more variables with nonnegative integer exponents

Review Vocabulary Label the diagram with the correct terms. (Lesson 7-7)

- **first**
- **outer**
- **inner**
- **last**

$$(x - 2)(x + 3) = x^2 + 3x - 2x - 6$$
Main Idea

Squares of Sums and Differences
pp. 453–454

Details

Complete the tables to illustrate two special products.

<table>
<thead>
<tr>
<th>Square of a Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Words</strong></td>
</tr>
<tr>
<td>The square of (a + b) is __________________________</td>
</tr>
<tr>
<td>__________________________</td>
</tr>
<tr>
<td><strong>Symbols</strong></td>
</tr>
<tr>
<td>((a + b)^2 = a^2 + 2ab + b^2)</td>
</tr>
<tr>
<td><strong>Example</strong></td>
</tr>
<tr>
<td>((n + 5)^2 = n^2 + 10n + 25)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Square of a Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Words</strong></td>
</tr>
<tr>
<td>The square of (a - b) is __________________________</td>
</tr>
<tr>
<td>__________________________</td>
</tr>
<tr>
<td><strong>Symbols</strong></td>
</tr>
<tr>
<td>((a - b)^2 = a^2 - 2ab + b^2)</td>
</tr>
<tr>
<td><strong>Example</strong></td>
</tr>
<tr>
<td>((h - 7)^2 = h^2 - 14n + 49)</td>
</tr>
</tbody>
</table>

Product of a Sum and a Difference
p. 455

Find the product \((p - 2)(p + 2)\). Show your work.

Helping You Remember

Explain how the FOIL method can help you remember how many terms are in the special products studied in this lesson.
## Polynomials

### Tie It Together

Fill in the graphic organizer with details from the chapter.

### Laws of Exponents/Powers

<table>
<thead>
<tr>
<th>Law</th>
<th>Notation</th>
<th>Verbal Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product of Powers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power of Powers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power of a Product</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quotient of Powers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power of a Quotient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero Exponent Property</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Exponent Property</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Now that you have read and worked through the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Systems of Linear Equations and Inequalities</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• To multiply exponents with the same base, find the product of the base and the exponents.</td>
<td></td>
</tr>
<tr>
<td>• A simplified expression is without fractions, duplicate bases, and powers of powers.</td>
<td></td>
</tr>
<tr>
<td>• A base with a negative exponent is written with a positive exponent when it is a denominator.</td>
<td></td>
</tr>
<tr>
<td>• To subtract polynomials, subtract like terms.</td>
<td></td>
</tr>
<tr>
<td>• To multiply polynomials, use the Commutative Property.</td>
<td></td>
</tr>
</tbody>
</table>

Math Online Visit glencoe.com to access your textbook, more examples, self-check quizzes, personal tutors, and practice tests to help you study for concepts in Chapter 7.

Are You Ready for the Chapter Test?
Use this checklist to help you study.

- I used my Foldable to complete the review of all or most lessons.
- I completed the Chapter 7 Study Guide and Review in the textbook.
- I took the Chapter 7 Practice Test in the textbook.
- I used the online resources for additional review options.
- I reviewed my homework assignments and made corrections to incorrect problems.
- I reviewed all vocabulary from the chapter and their definitions.

Study Tips
- Use flash cards to study for tests by writing the concept on one side of the card and its definition on the other.
Before you read the chapter, think about what you know about factoring and quadratic equations. List three things you already know about them in the first column. Then list three things you would like to learn about them in the second column.

<table>
<thead>
<tr>
<th>K</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>What I know...</td>
<td>What I want to find out...</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

Note Taking Tips

- When you take notes, always write clear and concise notes so they can be easily read when studying for a quiz or exam.
- A visual study guide like the Foldable shown above helps you organize what you know and remember what you have learned.
  You can use them to review main ideas or keywords.
Chapter 8

Factoring and Quadratic Equations

Key Points

Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on monomials and factoring, one fact might be that the product of the common prime factors is called their greatest common factor. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-1 Monomials and Factoring</td>
<td></td>
</tr>
<tr>
<td>8-2 Using the Distributive Property</td>
<td></td>
</tr>
<tr>
<td>8-3 Quadratic Equations: $x^2 + bx + c = 0$</td>
<td></td>
</tr>
<tr>
<td>8-4 Quadratic Equations: $ax^2 + bx + c = 0$</td>
<td></td>
</tr>
<tr>
<td>8-5 Quadratic Equations: Differences of Squares</td>
<td></td>
</tr>
<tr>
<td>8-6 Quadratic Equations: Perfect Squares</td>
<td></td>
</tr>
</tbody>
</table>
What You’ll Learn

Skim the lesson. Write two things you already know about monomials and factoring.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

New Vocabulary

Fill in each blank with the correct term or phrase.

factored form ▶ A monomial is in factored form when it is expressed as the ________ of prime numbers and __________, and no variable has an exponent greater than 1.

greatest common factor (GCF) ▶ Two or more whole numbers may have some __________ prime factors. The greatest common factor (GCF) is the greatest ________ that is a factor of both original numbers.

Vocabulary Link You have likely learned how to find the greatest common factor of two whole numbers before. Describe how finding the greatest common factor of two monomials is similar.

   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
### Main Idea

**Factor Monomials**  
Factor each monomial completely.

1. \(-8x^3y\)
2. \(15c^2d^2\)
3. \(36kp^4\)
4. \(-9x^2yz^2\)
5. \(-16a^4b\)
6. \(20r^3s^2\)

### Details

**Greatest Common Factor**  
Write each monomial as a product of its prime factors. Circle any common factors to find the GCF.

\[14m^3n^2q = \]  
\[21m^2nq^3 = \]  
GCF:  

### Helping You Remember

How can the two words that make up the term *prime factorization* help you remember what the term means?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
8-2 Using the Distributive Property

What You’ll Learn

Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

New Vocabulary Write the definition next to each term.

factoring

factoring by grouping

Zero Product Property
Main Idea

Use the Distributive Property to Factor
pp. 476–477

Details

Complete the following table illustrating when a polynomial can be factored by grouping.

### Factoring by Grouping

<table>
<thead>
<tr>
<th>Words</th>
<th>A polynomial can be factored by grouping only if all of the following conditions exist.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Symbols</td>
<td></td>
</tr>
</tbody>
</table>

Solve Equations by Factoring
pp. 478–479

Solve the following equation by factoring.

\[ 4x^2 + 20x = 0 \]

\[ ( ) ( ) = 0 \]

\[ \underline{ } = 0 \text{ or } \underline{ } = 0 \]

\[ x = \underline{ } \text{ or } x = \underline{ } \]

### Helping You Remember

A good way to remember a mathematical concept is to explain it to somebody else. How would you help a classmate understand when it is possible to use the Zero Product Property to solve an equation? Give an example of an equation that can be solved using the Zero Product Property.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8-3 Quadratic Equations: $x^2 + bx + c = 0$

What You’ll Learn

Skim Lesson 8-3. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Review Vocabulary

Match the term with its definition by drawing a line to connect the two. (Lessons 8-1 and 8-2)

- **factored form**: a process that involves finding the completely factored form of a polynomial
- **factoring**: the largest number that is a factor of two numbers
- **greatest common factor (GCF)**: a monomial that is expressed as the product of prime numbers and variables, where no variable has an exponent greater than 1

New Vocabulary

Write the correct term next to the definition.

- a type of equation that can be written in the standard form $ax^2 + bx + c = 0$, where $a \neq 0$
Main Idea

Factor $x^2 + bx + c$
pp. 485–487

Factor $x^2 + 10x + 16$ by making an organized list of the factors of 16.

<table>
<thead>
<tr>
<th>Factors of 16</th>
<th>Sum of factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$x^2 + 10x + 16 = (\_\_\_) (\_\_\_)$

Solve Equations by Factoring
p. 488

Solve the quadratic equation $x^2 - 6x - 40 = 0$ by factoring.

$(\_\_\_\_)(\_\_\_\_) = 0$

$\_\_\_\_\_ = 0$ or $\_\_\_\_\_ = 0$

$x = \_\_\_\_\_\_\_\_\_\_$ or $x = \_\_\_\_\_\_\_\_\_\_$

Helping You Remember
If you are using the pattern $(x + m)(x + n)$ to factor a trinomial of the form $x^2 + bx + c$, how can you use your knowledge of multiplying integers to help you remember whether $m$ and $n$ are positive or negative?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
8-4 Quadratic Equations: \( ax^2 + bx + c = 0 \)

What You’ll Learn

Scan the text in Lesson 8-4. Write two facts you learned about quadratic equations of the form \( ax^2 + bx + c = 0 \) as you scanned the text.

1. ____________________________
   ____________________________
   ____________________________
   ____________________________

2. ____________________________
   ____________________________
   ____________________________
   ____________________________

New Vocabulary

Write the definition next to the term.

prime polynomial

Vocabulary Link

Recall the definition of a prime number. Describe how this definition relates to the definition of a prime polynomial.
Main Idea

Factor

Follow the steps below to factor the polynomial

\[ 2x^2 + 9x + 10. \]

**Details**

**Step 1** Apply the pattern of factoring by grouping to write the desired form.

\[ 2x^2 + 9x + 10 = 2x^2 + \underline{} + \underline{} + 10 \]

**Step 2** Find two numbers that have a product of \(2 \times 10\) or \(20\) and a sum of \(9\).

<table>
<thead>
<tr>
<th>Factors of twenty</th>
<th>Sum of factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Step 3** Use grouping to find the factors.

Check your answer.

\[ 2x^2 + 9x + 10 = (\underline{}) + (\underline{}) \]

Solve Equations by Factoring

Solve each equation. Check your solutions.

1. \( 2x^2 + 5x - 3 = 0 \)
2. \( 3x^2 - 10x - 8 = 0 \)

\[ x = \underline{} \quad x = \underline{} \]

Helping You Remember

A good way to remember a mathematical procedure is to recite the steps of the procedure. What are the steps you would use to find the factors of a trinomial written in the form \(ax^2 + bx + c = 0\)?
What You’ll Learn

Skim the Examples for Lesson 8-5. Predict two things you think you will learn about polynomials and quadratic equations that are differences of squares.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

New Vocabulary Circle each polynomial below that represents a difference of squares.

- difference of squares
- \(x^2 - 15\)
- \(4b^2 - 49\)
- \(3x^2 - 81\)
- \(100n^2 - 1\)
- \(16p^2 - 25\)
- \(8r^2 - 12\)
- \(256t^2 - 16\)
- \(25h^2 - 4\)

Vocabulary Link Describe how you can use the term difference of squares to recognize when a polynomial is of this form.

- ______________________________________________________
- ______________________________________________________
- ______________________________________________________
Main Idea

Factor Differences of Squares
pp. 499–500

Details

Model the process of factoring a polynomial that is a difference of squares by completing the following table.

<table>
<thead>
<tr>
<th>Difference of Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbols</td>
</tr>
<tr>
<td>Examples</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Solve Equations by Factoring
p. 501

Solve $4n^2 - 25 = 0$ for $n$. Show your work.

Helping You Remember
A good way to remember a new mathematical concept is to explain it to a friend. Suppose a classmate is having difficulty remembering how to factor a difference of squares. How would you explain this concept to her?
What You’ll Learn

Scan Lesson 8-6. List two headings you would use to make an outline of this lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Write the correct term next to each definition. (Lessons 8-1, 8-2, 8-3, and 8-4)

_________________________ ▶ a monomial that is expressed as the product of prime numbers and variables, and no variable has an exponent greater than 1

_________________________ ▶ a process that involves writing a polynomial as the product of its factors

_________________________ ▶ a type of equation that can be written in the standard form $ax^2 + bx + c = 0$, where $a \neq 0$

_________________________ ▶ a polynomial that cannot be written as a product of two polynomials with integral coefficients

New Vocabulary  Fill in the blank with the correct term or phrase.

perfect square trinomials ▶ Perfect square trinomials are trinomials that are the squares of ____________.
Main Idea

Factor Perfect Square Trinomials
pp. 505–507

Details

Model the process of factoring a polynomial that is a perfect square trinomial by completing the table.

<table>
<thead>
<tr>
<th>Factoring Perfect Square Trinomials</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Symbols</strong></td>
</tr>
<tr>
<td>$a^2 + 2ab + b^2 = (\underline{\quad})^2$</td>
</tr>
<tr>
<td>$a^2 - 2ab + b^2 = (\underline{\quad})^2$</td>
</tr>
<tr>
<td><strong>Examples</strong></td>
</tr>
<tr>
<td>$x^2 + 8x + 16 = (\underline{\quad})^2$</td>
</tr>
<tr>
<td>$b^2 - 10b + 25 = (\underline{\quad})^2$</td>
</tr>
</tbody>
</table>

Solve Equations with Perfect Squares
pp. 507–509

Use the Square Root Property to solve the equation $(x + 3)^2 = 100$. Check your solutions.

Helping You Remember

Sometimes it is easier to remember a set of instructions if you can state them in a short sentence or phrase. Summarize the conditions that must be met in order for a trinomial to be factored as a perfect square trinomial.

__________________________________________________________________________________________

__________________________________________________________________________________________

__________________________________________________________________________________________
Chapter 8

Factoring and Quadratic Equations

Tie It Together

Fill in the graphic organizer. Use examples from the chapter to add details if space permits.

Solving Quadratic Equations

Step 1

Step 2

Step 3

Step 4

Strategies for Factoring Quadratics

Greatest Common Factor

Difference of Two Squares

Trinomial Factoring

Trinomials of the Form $x^2 + bx + c$

Trinomials of the Form $ax^2 + bx + c$

Perfect Square Trinomials
Factoring and Quadratic Equations

Before the Test

Review the ideas you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column.

<table>
<thead>
<tr>
<th>K</th>
<th>What I know…</th>
<th>W</th>
<th>What I want to find out…</th>
<th>L</th>
<th>What I learned…</th>
</tr>
</thead>
</table>

Are You Ready for the Chapter Test?

Use this checklist to help you study.

☐ I used my Foldable to complete the review of all or most lessons.
☐ I completed the Chapter 8 Study Guide and Review in the textbook.
☐ I took the Chapter 8 Practice Test in the textbook.
☐ I used the online resources for additional review options.
☐ I reviewed my homework assignments and made corrections to incorrect problems.
☐ I reviewed all vocabulary from the chapter and their definitions.

Study Tips

• To answer a multiple-choice question, read all of the answer choices first. Cross out any choices that you know are not correct, and look for hints in other parts of the test for clues to the answer. Don’t change the answer you decide upon unless you know it is not correct.
Quadratic and Exponential Functions

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Quadratic and Exponential Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The graph of a quadratic function is a parabola.</td>
<td>• The graph of a quadratic function is a parabola.</td>
</tr>
<tr>
<td>• When ( a &lt; 0 ) in a quadratic function, the parabola opens up and has a minimum value.</td>
<td>• When ( a &lt; 0 ) in a quadratic function, the parabola opens up and has a minimum value.</td>
</tr>
<tr>
<td>• The graph of ( f(-x) ) flips the graph ( f(x) = x^2 ) across the ( x )-axis.</td>
<td>• The graph of ( f(-x) ) flips the graph ( f(x) = x^2 ) across the ( x )-axis.</td>
</tr>
<tr>
<td>• Factoring, using square roots, graphing, and the quadratic formula are methods to solve quadratic functions.</td>
<td>• Factoring, using square roots, graphing, and the quadratic formula are methods to solve quadratic functions.</td>
</tr>
<tr>
<td>• In an exponential function, the base is a variable and the exponent is a constant.</td>
<td>• In an exponential function, the base is a variable and the exponent is a constant.</td>
</tr>
</tbody>
</table>

Foldables Study Organizer

Construct the Foldable as directed at the beginning of this chapter.

Note Taking Tips

• When you take notes, draw a visual (graph, diagram, picture, chart) that presents the information introduced in the lesson in a concise, easy-to-study format.

• In addition to writing important definitions in your notes, be sure to include your own examples of the concepts presented.
Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on transformations of quadratic functions, one fact might be that a transformation changes the position or size of a figure. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-1  Graphing Quadratic Functions</td>
<td></td>
</tr>
<tr>
<td>9-2  Solving Quadratic Equations by Graphing</td>
<td></td>
</tr>
<tr>
<td>9-3  Transformations of Quadratic Functions</td>
<td></td>
</tr>
<tr>
<td>9-4  Solving Quadratic Equations by Completing the Square</td>
<td></td>
</tr>
<tr>
<td>9-5  Solving Quadratic Equations by Using the Quadratic Formula</td>
<td></td>
</tr>
<tr>
<td>9-6  Exponential Functions</td>
<td></td>
</tr>
<tr>
<td>9-7  Growth and Decay</td>
<td></td>
</tr>
<tr>
<td>9-8  Geometric Sequences as Exponential Functions</td>
<td></td>
</tr>
<tr>
<td>9-9  Analyzing Functions with Successive Differences and Ratios</td>
<td></td>
</tr>
</tbody>
</table>
9-1 Graphing Quadratic Functions

**What You’ll Learn**

Skim Lesson 9-1. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

**Active Vocabulary**

**New Vocabulary** Write the correct term next to each definition.

- a function with a graph that is not a straight line
- a nonlinear function that can be written in the form \( f(x) = ax^2 + bx + c \), where \( a \neq 0 \)
- the form of a quadratic function when it is written as \( f(x) = ax^2 + bx + c \)
- the shape of the graph of a quadratic function
- the central line about which a parabola is symmetric
- the point of intersection between a parabola and its axis of symmetry
- the lowest point on a parabola
- the highest point on a parabola
Main Idea

Characteristics of Quadratic Functions
pp. 525–528

Fill in the boxes with the correct terms.

Graph the quadratic function \( f(x) = x^2 + 3x + 2 \) on the coordinate grid below.

Helping You Remember

Look up the word *vertex* in a dictionary. You will find that it comes from the Latin word *vertere*, which means to turn. How can you use the idea of “to turn” to remember the vertex of a parabola?
9-2 Solving Quadratic Equations by Graphing

What You’ll Learn
Scan Lesson 9-2. List two headings you would use to make an outline of this lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary
Review Vocabulary Match each term with its definition by drawing a line to connect the two. (Lesson 9-1)

- **nonlinear function**: the shape of the graph of a quadratic function
- **minimum**: the central line about which a parabola is symmetric
- **parabola**: a function with a graph that is not a straight line
- **axis of symmetry**: the point of intersection between a parabola and its axis of symmetry
- **vertex**: the lowest point on a parabola

New Vocabulary Write the definition next to the term.

- **double root**: ____________________________________________
  __________________________________________________________
  __________________________________________________________
Lesson 9-2 (continued)

Main Idea

Solve by Graphing

**Details**

Complete the following table illustrating the number and nature of the solutions of a quadratic equation.

<table>
<thead>
<tr>
<th>Solutions of Quadratic Equations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of real solutions</strong></td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
</tbody>
</table>

Estimate Solutions

**Helping You Remember**

Describe how you can remember that the word *zero* is used when you are talking about functions, but the word *root* is used when you are talking about equations.

Describe how you can remember that the word *zero* is used when you are talking about functions, but the word *root* is used when you are talking about equations.

Solve by Graphing pp. 537–538

Estimate Solutions p. 539

Helping You Remember

Describe how you can remember that the word *zero* is used when you are talking about functions, but the word *root* is used when you are talking about equations.

Solve the quadratic equation below by graphing. If integral roots cannot be found, estimate the roots to the nearest tenth.

\[ x^2 + 3x - 2 = 0 \]
**What You’ll Learn**

Skim the lesson. Write two things you already know about transformations of quadratic functions.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

**New Vocabulary**

Fill in each blank with the correct term or phrase.

- **dilation** ▶ A dilation makes the graph narrower or wider than the ________________.

- **reflection** ▶ A reflection flips a figure over a ________________.

- **transformation** ▶ A transformation changes the ________________ or ________________ of a figure.

- **translation** ▶ A translation moves a figure ________________, down, or ________________. 
Main Idea

Translations
p. 544

Describe how the graph of each function is related to the graph of \( f(x) = x^2 \).

1. \( f(x) = x^2 - 6 \)
2. \( f(x) = x^2 + \frac{1}{2} \)

__________________  __________________
__________________  __________________

Complete the table below by naming and describing each transformation of \( f(x) \).

<table>
<thead>
<tr>
<th>Transformation:</th>
<th>Transformation:</th>
</tr>
</thead>
</table>

Helping You Remember

A good way to remember mathematical terms is to relate them to a term you already know. Translations are often called "slides," and reflections are often called "flips." Explain how these terms accurately describe the corresponding transformations of parabolas.

____________________________________
____________________________________
____________________________________
____________________________________
____________________________________
____________________________________
What You’ll Learn

Scan the text in Lesson 9-4. Write two facts you learned about solving quadratic equations by completing the square as you scanned the text.

1. ________________________________
   ________________________________
   ________________________________
   ________________________________

2. ________________________________
   ________________________________
   ________________________________
   ________________________________

Active Vocabulary

Review Vocabulary Label each diagram with the correct term to describe the transformation. (Lesson 9-3)

- dilation ▶
- translation ▶

New Vocabulary Fill in the blank with the correct term or phrase.

- completing the square ▶

Any quadratic expression in the form $x^2 + bx$ can be made into a ______________________ trinomial by using a method called completing the square.
Main Idea

Complete the Square

Complete the following table to show the steps that you must follow to complete the square.

<table>
<thead>
<tr>
<th>Completing the Square</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Words</strong></td>
</tr>
<tr>
<td>To complete the square for any quadratic expression of the form $x^2 + bx$, follow the steps below.</td>
</tr>
<tr>
<td><strong>Step 1</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Symbols</strong></td>
</tr>
<tr>
<td>$x^2 + bx +$</td>
</tr>
</tbody>
</table>

Solve Equations by Completing the Square

Solve $x^2 + 6x = 27$ by completing the square. Show your work.

Helping You Remember

How is completing the square related to the method you use to determine whether a trinomial is a perfect square trinomial?
What You’ll Learn

Skim the Examples for Lesson 9-5. Predict two things you think you will learn about solving quadratic equations by using the quadratic formula.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Review Vocabulary

Write the correct term next to each definition. (Lesson 9-1)

__________________________________________________________________ ➤ the shape of the graph of a quadratic function

__________________________________________________________________ ➤ the central line about which a parabola is symmetric

__________________________________________________________________ ➤ the highest point on a parabola

New Vocabulary

Write the correct term next to each definition.

__________________________________________________________________ ➤ the formula that gives the solutions to the general quadratic equation, \( ax^2 + bx + c = 0 \), as

\[
x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}
\]

__________________________________________________________________ ➤ the expression under the radical sign in the quadratic formula, \( b^2 - 4ac \)
Lesson 9-5 (continued)

Main Idea

Quadratic Formula
pp. 558–561

Solve the equation \( x^2 + 5x + 3 = 0 \) by using the Quadratic Formula. Determine the exact solutions. Show your work.

The Discriminant
p. 561

Complete the following table to show the relationship between the discriminant of a quadratic equation and its solutions and graph.

<table>
<thead>
<tr>
<th>The Discriminant</th>
<th>Value</th>
<th>Number of real solutions</th>
<th>Relationship between graph and the x-axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>( b^2 - 4ac &gt; 0 )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( b^2 - 4ac = 0 )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( b^2 - 4ac &lt; 0 )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Helping You Remember

To help remember the methods for solving a quadratic equation, explain how you would choose the best method for solving a form of the quadratic equation \( ax^2 + bx + c = 0 \).
9-6 Exponential Functions

What You’ll Learn
Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary
Review Vocabulary Match the term with its definition by drawing a line to connect the two. (Lessons 9-1, 9-2, and 9-3)

reflection the point of intersection between a parabola and its axis of symmetry

double root a transformation that moves a figure up, down, or diagonally

translation two zeroes of a quadratic equation that are the same number

vertex a transformation that flips a figure over a line

New Vocabulary Write the definition next to the term.

exponential function
Main Idea

Graph Exponential Functions
pp. 567–569

Details

Complete the following table of function values and use it to help you graph the exponential function $y = 2^x$.

<table>
<thead>
<tr>
<th>$x$</th>
<th>$2^x$</th>
<th>$y$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Graph Exponential Functions
pp. 567–569

Identify Exponential Behavior
p. 569

Determine whether the set of data shown below displays exponential behavior. Write yes or no. Explain why or why not.

<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y$</td>
<td>128</td>
<td>64</td>
<td>32</td>
<td>16</td>
<td>8</td>
<td>4</td>
</tr>
</tbody>
</table>
What You’ll Learn

Skim the Examples for Lesson 9-7. Predict two things you think you will learn about growth and decay.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

New Vocabulary Fill in each blank with the correct term or phrase.

- **compound interest**
  - Compound interest is interest ____________ or ____________ on both the initial investment and previously ____________ interest.

- **exponential decay**
  - In exponential decay, the original ____________ decreases by the same ____________ over a period of time.

- **exponential growth**
  - In exponential growth, the original amount ____________ by the same percent over a period of time.

Vocabulary Link Think of some real-world examples that involve exponential growth and decay.

__________________________________________________________________________
__________________________________________________________________________
__________________________________________________________________________
### Main Idea

**Exponential Growth**
pp. 573–574

Label each of the parts of the general equation for exponential growth shown below. Use the terms *initial amount, final amount, time, and growth rate.*

\[ y = a(1 + r)^t \]

**Exponential Decay**

p. 574

Suppose a particular species of bird on an island is decreasing at an annual rate of 5.4%. The species originally had a population of 12,600.

a. Write an equation to represent the decrease in population.

b. Estimate the number of birds on the island after 4 years.

### Helping You Remember

A good way to help you remember a new concept is to explain it in your own words. The general equations for exponential growth and exponential decay are very similar. Explain how you can determine if an equation represents exponential growth or exponential decay.
What You’ll Learn

Skim the lesson. Write two things you already know about geometric sequences as exponential functions.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

New Vocabulary
Write the definition next to each term.

common ratio ►
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

geometric sequence ►
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
Lesson 9-8 (continued)

Main Idea

Recognize Geometric Sequences
pp. 580–581

Determine whether each sequence is arithmetic, geometric, or neither. Explain.

1. 12, 9, 6, 3, 0, …

2. 3, –6, 12, –24, 48, …

Geometric Sequences and Functions
pp. 581–582

What is the 12th term of the geometric sequence 6, 12, 24, 48,…?

Step 1: Compare consecutive terms to find the common ratio.

Step 2: Write an equation to model the sequence.

Step 3: Evaluate the formula for \( n = 12 \).

\[
r = \ ________________
\]

\[
a_n = \ ________________
\]

\[
a_{12} = \ ________________
\]
What You’ll Learn

Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Write the correct term next to each definition. (Lessons 9-1, 9-3, 9-4, 9-5, 9-6, and 9-8)

- a function with a graph that is not a straight line
- the form of a quadratic function when it is written as
  \[ f(x) = ax^2 + bx + c \]
- a transformation that makes a function wider or narrower than the parent function
- the expression under the radical sign in the quadratic formula, \( b^2 - 4ac \)
- a function of the form \( y = ab^x \), where \( a \neq 0 \), \( b > 0 \), and \( b \neq 1 \)
- the ratio of two consecutive terms in a geometric sequence
Main Idea

### Identify Functions
pp. 586–587

**Details**

Complete the table below by writing the general form of each function and sketching a sample graph.

<table>
<thead>
<tr>
<th>Linear, Quadratic, and Exponential Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Linear Function</strong></td>
</tr>
<tr>
<td>( y = mx + b )</td>
</tr>
</tbody>
</table>

**Helping You Remember**

A good way to remember a mathematical concept is to explain it in your own words. Explain how you can determine the type of a function simply by looking at its graph.

-----

**Write Equations**
pp. 587–588

**Details**

Determine which model best describes the data in the table. Then write an equation for the function that models the data.

<table>
<thead>
<tr>
<th>( x )</th>
<th>(-5)</th>
<th>(-4)</th>
<th>(-3)</th>
<th>(-2)</th>
<th>(-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( y )</td>
<td>160</td>
<td>80</td>
<td>40</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>
Quadratic and Exponential Functions

Tie It Together

Fill in each graphic organizer paying attention to the depicted relationships between the organizers. Add details for each organizer.

Quadratic Equations – Solution Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Graphing</th>
<th>Factoring</th>
<th>Square Root Property</th>
<th>Completing the Square</th>
<th>Quadratic Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Graphing a Quadratic

Vertex

Axis of Symmetry

Shape

Possible Discriminant Values and Solution Details

Using Equations to Model Data . . . Given a Table of Values

Linear Data
Form: Detecting:

Quadratic Data
Form: Detecting:

Exponential Data
Form: Detecting:
Quadratic and Exponential Functions

Before the Test

Now that you have read and worked through the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Quadratic and Exponential Functions</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The graph of a quadratic function is a parabola.</td>
<td></td>
</tr>
<tr>
<td>• When ( a &lt; 0 ) in a quadratic function, the parabola opens up and has a minimum value.</td>
<td></td>
</tr>
<tr>
<td>• The graph of ( f(-x) ) flips the graph ( f(x) = x^2 ) across the ( x )-axis.</td>
<td></td>
</tr>
<tr>
<td>• Factoring, using square roots, graphing, and the quadratic formula are methods to solve quadratic functions.</td>
<td></td>
</tr>
<tr>
<td>• In an exponential function, the base is a variable and the exponent is a constant.</td>
<td></td>
</tr>
</tbody>
</table>

Math Online Visit glencoe.com to access your textbook, more examples, self-check quizzes, personal tutors, and practice tests to help you study for concepts in Chapter 9.

Are You Ready for the Chapter Test?

Use this checklist to help you study.

☐ I used my Foldable to complete the review of all or most lessons.
☐ I completed the Chapter 9 Study Guide and Review in the textbook.
☐ I took the Chapter 9 Practice Test in the textbook.
☐ I used the online resources for additional review options.
☐ I reviewed my homework assignments and made corrections to incorrect problems.
☐ I reviewed all vocabulary from the chapter and their definitions.

Study Tips

• If possible, rewrite your notes. Not only can you make them clearer and neater, rewriting them will help you remember the information.
Radical Functions and Geometry

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Radical Functions and Geometry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• The graph of a square root function includes both positive and negative values.</td>
</tr>
<tr>
<td></td>
<td>• $\tan A = \frac{\text{opposite}}{\text{adjacent}}$</td>
</tr>
<tr>
<td></td>
<td>• The product of two conjugates is a rational number.</td>
</tr>
<tr>
<td></td>
<td>• In a Pythagorean triplet, two or three numbers can be equal.</td>
</tr>
<tr>
<td></td>
<td>• The midpoint formula is derived from the Pythagorean Theorem.</td>
</tr>
</tbody>
</table>

Foldables Study Organizer
Construct the Foldable as directed at the beginning of this chapter.

Note Taking Tips

• Take notes in such a manner that someone who did not understand the topic will understand after reading what you have written.
• When you take notes, write a summary of the lesson, or write in your own words what the lesson was about.
### Chapter 10

**Radical Functions and Geometry**

#### Key Points

Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on the Pythagorean Theorem, one fact might be that in a right triangle, the side opposite the right angle is the hypotenuse. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-1 Square Root Functions</td>
<td></td>
</tr>
<tr>
<td>10-2 Simplifying Radical Expressions</td>
<td></td>
</tr>
<tr>
<td>10-3 Operations with Radical Expressions</td>
<td></td>
</tr>
<tr>
<td>10-4 Radical Equations</td>
<td></td>
</tr>
<tr>
<td>10-5 The Pythagorean Theorem</td>
<td></td>
</tr>
<tr>
<td>10-6 The Distance and Midpoint Formulas</td>
<td></td>
</tr>
<tr>
<td>10-7 Similar Triangles</td>
<td></td>
</tr>
<tr>
<td>10-8 Trigonometric Ratios</td>
<td></td>
</tr>
</tbody>
</table>
What You’ll Learn

Skim the lesson. Write two things you already know about square root functions.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

New Vocabulary

Match the term with its definition by drawing a line to connect the two.

- radicand: a function that contains a variable under a radical sign
- radical function: a function that contains the square root of a variable
- square root function: the expression under the radical sign

Vocabulary Link

Recall that the square root of a negative number is not defined to be a real number. Explain what effect this has on the domain of a square root function.
Main Idea

Dilations of Radical Functions
p. 605

Graph \( f(x) = \frac{1}{2} \sqrt{x} \). State the domain and range.

\[
\begin{align*}
\text{Step 1: Make a table of function values.} \\
\begin{array}{c|c|c|c|c|c}
\hline
x  & 0 & 1 & 4 & 9 & 16 \\
\hline
f(x) & & & & & \\
\hline
\end{array}
\end{align*}
\]

\[
\begin{align*}
\text{Step 2: Plot the points on a coordinate grid.} \\
\text{Step 3: Connect the points with a smooth curve.}
\end{align*}
\]

Reflections and Translations of Radical Functions
pp. 606–607

The velocity of an object dropped from a height of \( h \) meters is given by the function \( v = \sqrt{2gh} \), where \( g \) is the constant, 9.8 meters per second squared. What is the velocity of an object when it hits the ground if it is dropped from a height of 100 meters? Show your work and round your answer to the nearest tenth.

\[ v \approx \underline{ \hspace{2cm} } \text{ m/s} \]

Helping You Remember

Suppose a classmate is having difficulty remembering how to graph a square root function. What advice would you give him about how to select suitable domain values?
What You’ll Learn

Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

2. ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________
   ______________________________________________________________________

Review Vocabulary

Write the definition next to the term. (Lesson 10-1)

radicand ▶
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________

Active Vocabulary

New Vocabulary Fill in each blank with the correct term or phrase.

conjugate ▶ Binomials of the form \( a \sqrt{b} + c \sqrt{d} \) and ______________ are called conjugates.

radical expression ▶ A radical expression contains a ______________, such as a square root.

rationalizing the denominator ▶ Rationalizing the denominator of a fraction with a radical eliminates all __________ from the ______________.
Main Idea

Product Property of Square Roots
pp. 612–613

Quotient Property of Square Roots
pp. 613–614

Details

Complete the following table to illustrate the Product Property of Square Roots.

<table>
<thead>
<tr>
<th>Product Property of Square Roots</th>
</tr>
</thead>
</table>
| **Words** | For any nonnegative real numbers $a$ and $b$, the square roots of $ab$ is equal to  
|          |                                                                 |
|          |                                                                 |
| **Symbols** | $\sqrt{ab} =$  
|            |                                                                 |
| **Symbols** | $\sqrt{16 \cdot 25} =$  |

Simplify the expression $\frac{2}{4 + \sqrt{5}}$. Show your work.

Helping You Remember

What should you remember to check for when you want to determine if a radical expression is in simplest form?

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________
What You’ll Learn

Skim the Examples for Lesson 10-3. Predict two things you think you will learn about operations with radical expressions.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Write the correct term next to each definition. (Lessons 10-1 and 10-2)

_________________ ▶ a function that contains the square root of a variable
_________________ ▶ an expression that contains a radical, such as a square root
_________________ ▶ the expression under the radical sign
_________________ ▶ binomials of the form $a\sqrt{b} + c\sqrt{d}$ and $a\sqrt{b} - c\sqrt{d}$
_________________ ▶ a function that contains a variable under a radical sign
_________________ ▶ a process that eliminates all radicals from the denominator of a fraction
Main Idea

Add or Subtract Radical Expressions
pp. 619–620

Details

Simplify each expression in the table illustrating how adding and subtracting radical expressions is similar to adding and subtracting monomials.

<table>
<thead>
<tr>
<th>Monomials</th>
<th>Radical Expressions</th>
</tr>
</thead>
<tbody>
<tr>
<td>(6b + 3b) = (6\sqrt{2} + 3\sqrt{2}) =</td>
<td>(12\sqrt{3} - 5\sqrt{3}) =</td>
</tr>
<tr>
<td>(12m - 5m) = (12\sqrt{3} - 5\sqrt{3}) =</td>
<td>(12\sqrt{3} - 5\sqrt{3}) =</td>
</tr>
</tbody>
</table>

Multiply Radical Expressions
pp. 620–621

Simplify each expression. Show your work.

1. \(6\sqrt{5} (2\sqrt{5})\)
2. \(2\sqrt{3} (6\sqrt{7} - \sqrt{7})\)

Helping You Remember
How can you use what you know about adding and subtracting monomials to help you remember how to add and subtract radical expressions?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
10-4 Radical Equations

What You’ll Learn

Scan Lesson 10-4. List two headings you would use to make an outline of this lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

New Vocabulary Fill in each blank with the correct term or phrase.

radical equations ► Equations that contain variables in the ________________, like $h = 1.34\sqrt{\ell}$, are called radical equations.

extraneous solutions ► Squaring each side of an equation sometimes produces a ________________ that is not a solution of the original ________________. These are called extraneous solutions.

Vocabulary Link Look up the definition of extraneous in a dictionary. Describe how this definition applies to the concept of extraneous solutions.

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________

________________________________________________________________
Main Idea

Radical Equations

pp. 624–625

Details

Solve the equation \( \sqrt{n} + 4 + 2 = 5 \). Show your work.

Extraneous Solutions

p. 625

Follow the steps below to solve the equation \( x = \sqrt{x + 3} - 1 \). Check your solutions.

Step 1: Isolate the radical on one side.

Step 2: Square each side to eliminate the radical.

Step 3: Solve. Check for extraneous solutions.

solution(s): ________  extraneous solution(s): ________

Helping You Remember

Acronyms can be a useful tool for remembering the steps in a mathematical process. For example, the acronym FOIL reminds you to multiply the First, Outer, Inner, and Last terms when multiplying two binomials. How can you use the letters ISC to remember the three steps in solving a radical equation?
What You’ll Learn

1. Skim Lesson 10-5. Predict two things that you expect to learn based on the headings and the Key Concept box.

   1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

   2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary  Write the definition next to each term. (Lessons 10-1 and 10-4)

radical function ➤

radical equation ➤

New Vocabulary  Match the term with its definition by drawing a line to connect the two.

converse  the two shorter sides of a right triangle

hypotenuse  the result when the hypothesis and conclusion of an if-then statement are exchanged

legs  a group of three whole numbers that satisfy the equation $c^2 = a^2 + b^2$, where $c$ is the greatest number

Pythagorean Triple  the side opposite the right angle in a right triangle
Main Idea

The Pythagorean Theorem

Label the sides of the right triangle shown using the terms leg and hypotenuse. Then write an equation to demonstrate the Pythagorean Theorem.

Details

Right Triangles

Circle the sets of numbers below that represent Pythagorean triples.

1. 5, 12, 13  
2. 18, 24, 30
3. 16, 32, 34  
4. 30, 40, 50
5. 9, 40, 41  
6. 8, 12, 20

Helping You Remember

Think of a word or phrase that you can associate with the Pythagorean Theorem to help you remember the equation $c^2 = a^2 + b^2$. 
What You’ll Learn

Scan the text in Lesson 10-6. Write two facts you learned about the distance and midpoint formulas as you scanned the text.

1. ______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

2. ______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

Active Vocabulary

New Vocabulary Write the definition next to each term.

Distance Formula ➤

midpoint ➤

Midpoint Formula ➤

Vocabulary Link Think of how the word distance is used in everyday life. How does this compare to the concept of distance on the coordinate plane?

_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________
_______________________________________________________________________

NAME ________________________ DATE ___________ PERIOD ___________
Main Idea

Distance Formula
pp. 636–637

Complete the following steps to find the distance between points $A(2, 9)$ and $B(-4, 6)$.

$d =$ Distance Formula

$d =$ Substitute $A(2, 9)$, $B(-4, 6)$.

$d =$ Simplify.

$d =$ Evaluate squares.

$d =$ or about Simplify.

Midpoint Formula
p. 638

Find the coordinates of the midpoint of segment $CD$.

$M \left( \begin{array}{c} \quad \end{array} \right)$

Helping You Remember

Sometimes it is easier to remember a formula if you can state it in words. How can you state the Distance Formula in easy-to-remember words?

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________

________________________________________
10-7 Similar Triangles

What You’ll Learn
Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Review Vocabulary
Write the correct term next to each definition. (*Lessons 10-2, 10-5, and 10-6*)

- a formula that is used to find the distance between two points on the coordinate plane
- an expression that contains a radical sign, such as a square root
- the side opposite the right angle in a right triangle
- the point is equidistant from both endpoints of a line segment

New Vocabulary
Fill in each blank with the correct term or phrase.

*similar triangles* ▶ Similar triangles have the same _____________, but not necessarily the same _____________.

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Main Idea

Similar Triangles
pp. 642–643

The triangles below are similar. Write a similarity statement and a proportion showing the relationships between the sides.

\[
\frac{RS}{WX} = \frac{RT}{XY} \quad \text{or} \quad \frac{85}{85} = \frac{50}{50}
\]

Details

Find Unknown Measures
pp. 643–644

Solve for \( x \) in the figure below.

\[
x = \frac{12 \times 13}{3} = 52
\]

Helping You Remember

A good way to remember a mathematical procedure is to relate it to another concept. How can you use the idea that the corresponding sides of similar triangles are proportional to help you remember how to find the unknown lengths of the sides of similar triangles?

\[
\text{Helping You Remember}
\]

\[
\text{Helping You Remember}
\]

\[
\text{Helping You Remember}
\]

\[
\text{Helping You Remember}
\]
What You’ll Learn

Scan Lesson 10-8. List two headings you would use to make an outline of this lesson.

1. ___________________________________________________________________
   ___________________________________________________________________

2. ___________________________________________________________________
   ___________________________________________________________________

Active Vocabulary

New Vocabulary Write the correct term next to each definition.

______________  ▶ the ratio of the opposite leg to the hypotenuse of a right triangle

______________  ▶ a function that has a rule given by a trigonometric ratio

______________  ▶ the measure of ∠A if sin A is known

______________  ▶ the study of triangle measurement

______________  ▶ the measure of ∠A if tan A is known

______________  ▶ finding all unknown sides and angles of a right triangle

______________  ▶ the ratio of the adjacent leg to the hypotenuse of a right triangle

______________  ▶ the measure of ∠A if cos A is known

______________  ▶ a ratio of the lengths of two sides of a right triangle

______________  ▶ the ratio of the opposite leg to the adjacent leg of a right triangle
Trigonometric Ratios
pp. 649–650

Complete the chart to show the trigonometric ratios for angles $R$ and $S$.

<table>
<thead>
<tr>
<th>$\sin R =$</th>
<th>$\sin S =$</th>
<th>$\cos R =$</th>
<th>$\cos S =$</th>
<th>$\tan R =$</th>
<th>$\tan S =$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use a calculator to find the measure of $\angle M$ to the nearest tenth.

$m \angle M \approx \quad$
Fill in details in each the organizer.

Pythagorean Theorem → Geometry Formulas → Trigonometric Ratios

Distance Formula → Midpoint Formula

Sine → Cosine → Tangent

Product Property → Quotient Property → General Shape → Domain → Transformations

Simplifying Square Roots → Graphing Square Root Functions

Radical Equations

Operations with Radical Expressions

Add/Subtract → Multiply

Solution Strategies → Extraneous Solutions
Before the Test

Now that you have read and worked through the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Radical Functions and Geometry</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The graph of a square root function includes both positive and negative values.</td>
<td></td>
</tr>
<tr>
<td>• The product of two conjugates is a rational number.</td>
<td></td>
</tr>
<tr>
<td>• In a Pythagorean triplet, two or three numbers can be equal.</td>
<td></td>
</tr>
<tr>
<td>• The midpoint formula is derived from the Pythagorean Theorem.</td>
<td></td>
</tr>
</tbody>
</table>

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☐ I used the online resources for additional review options.
☐ I reviewed my homework assignments and made corrections to incorrect problems.
☐ I reviewed all vocabulary from the chapter and their definitions.

Study Tips

- To prepare to take lecture notes, make a column to the left about 2 inches wide. Use this column to write additional information from your text, place question marks, and to summarize information.
Before you read the chapter, think about what you know about rational functions and equations. List three things you already know about them in the first column. Then list three things you would like to learn about them in the second column.

<table>
<thead>
<tr>
<th>K</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>What I know...</td>
<td>What I want to find out...</td>
</tr>
</tbody>
</table>

Construct the Foldable as directed at the beginning of this chapter.

**Note Taking Tips**

- **When taking notes, place a question mark next to anything you do not understand.**
  Then be sure to ask questions before any quizzes or tests.

- **When you take notes in geometry, be sure to make comparisons among the different formulas and concepts.**
  For example, how are pyramids and cones similar? Different? This will help you learn the material.
Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on rational functions, one fact might be that a line that the graph of a function approaches is called an asymptote. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-1 Inverse Variation</td>
<td></td>
</tr>
<tr>
<td>11-2 Rational Functions</td>
<td></td>
</tr>
<tr>
<td>11-3 Simplifying Rational Expressions</td>
<td></td>
</tr>
<tr>
<td>11-4 Multiplying and Dividing Rational Expressions</td>
<td></td>
</tr>
<tr>
<td>11-5 Dividing Polynomials</td>
<td></td>
</tr>
<tr>
<td>11-6 Adding and Subtracting Rational Expressions</td>
<td></td>
</tr>
<tr>
<td>11-7 Mixed Expressions and Complex Fractions</td>
<td></td>
</tr>
<tr>
<td>11-8 Rational Equations and Functions</td>
<td></td>
</tr>
</tbody>
</table>
Lesson 11-1
Inverse Variation

What You’ll Learn
Skim the Examples for Lesson 11-1. Predict two things you think you will learn about inverse variation.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

New Vocabulary
Fill in each blank with the correct term or phrase.

inverse variation ➤ A relationship between $x$ and $y$ that can be represented by the equation ______ or ______ is an inverse variation.

product rule ➤ The equation ______ is called the product rule for inverse variations.

Vocabulary Link
Look up the word inverse in a dictionary. Explain how the definition applies to an inverse variation equation.

____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________
____________________________________________________
Main Idea

Identify and Use Inverse Variations
pp. 670–672

determine whether the data in the table represent an inverse or a direct variation. Explain.

<table>
<thead>
<tr>
<th>x</th>
<th>4</th>
<th>8</th>
<th>12</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>y</td>
<td>36</td>
<td>18</td>
<td>12</td>
<td>9</td>
</tr>
</tbody>
</table>

Graph Inverse Variations
pp. 672–673

Sketch a sample direct and inverse variation on the coordinate grids below, and complete the table.

<table>
<thead>
<tr>
<th>Direct Variation</th>
<th>Inverse Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Direct Variation Grid" /></td>
<td><img src="image" alt="Inverse Variation Grid" /></td>
</tr>
</tbody>
</table>

Helping You Remember

A good way to help you remember mathematical concepts is to state them in your own words. To remember how to set up a proportion to solve a problem involving inverse variation, write a sentence describing the form the proportion should have.
What You’ll Learn

Skim the lesson. Write two things you already know about rational functions.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

New Vocabulary  Write the definition next to each term.

asymptote ▶

excluded value ▶

rational function ▶

Vocabulary Link  Explain why the term rational is used to describe a rational function.
Main Idea

Identify Excluded Values
pp. 678–679

Details

State the excluded value for each function.

1. \( y = \frac{7}{x + 6} \)

2. \( y = \frac{-5}{4x - 20} \)

3. \( y = \frac{4}{3x + 21} \)

4. \( y = \frac{-1}{-2x - 8} \)

Identify and Use Asymptotes
pp. 679–680

The rational function \( y = \frac{1}{x - 3} + 2 \) is graphed below. Identify the asymptotes.

Helping You Remember

A good way to remember a mathematical concept is to explain it to someone else. Suppose a classmate is having difficulty finding the excluded values of a rational function. How would you explain the process?

_________________________________________________________________________________

_________________________________________________________________________________

_________________________________________________________________________________
**What You’ll Learn**

Scan the text under the *Now* heading. List two things you will learn about in the lesson.

1. ____________________________________________________________________________
2. ____________________________________________________________________________

**Active Vocabulary**

**Review Vocabulary** Match the term with its definition by drawing a line to connect the two. (*Lessons 11-1 and 11-2*)

- **rational function** a line that the graph of a rational function approaches, but never crosses or touches
- **asymptote** a relationship between $x$ and $y$ that can be represented by the equation $y = \frac{k}{x}$ or $xy = k$
- **inverse variation** a value that results in zero in the denominator of a rational function
- **excluded value** a function that can be described by the equation $y = \frac{p}{q}$, where $p$ and $q$ are polynomials and $q \neq 0$

**New Vocabulary** Write the correct term next to the definition.

- ____________________________________________________________________________

an algebraic fraction whose numerator and denominator are polynomials, such as $\frac{2x - 1}{x^2 + 5x + 9}$
Main Idea

Identify Excluded Values
pp. 684–685

Follow the steps below to find the excluded values for the rational expression \( \frac{-12}{b^2 - 49} \).

Step 1: Set the denominator equal to zero.

Step 2: Factor the expression.

Step 3: Solve for the excluded values.

Details

Simplify Expressions
pp. 685–687

Simplify the expression \( \frac{x^2 + 3x - 18}{x - 3} \). State the excluded value(s).

Helping You Remember

Mathematical concepts are often built on ideas that you learned in previous classes. Explain how you can use what you know about simplifying fractions for rational numbers to remember how to simplify rational expressions.

____________________________________________________________________

____________________________________________________________________

____________________________________________________________________
11-4 Multiplying and Dividing Rational Expressions

What You’ll Learn
Scan the text in Lesson 11-4. Write two facts you learned about multiplying and dividing rational expressions as you scanned the text.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary
Review Vocabulary Label the diagram with the correct terms.
(Lesson 11-2)

asymptotes ▶

rational function ▶

Review Vocabulary Write the definition next to the term.
(Lesson 11-1)

product rule (for inverse variations) ▶
Main Idea

Multiply Rational Expressions
pp. 692–693

Follow the steps below to simplify \( \frac{1}{n^2 - 25} \cdot \frac{n^2 + 7n + 10}{n + 2} \).

Step 1: Factor the numerators and denominators.

Step 2: Cross out common factors.

Step 3: Simplify the expression.

Divide Rational Expressions
pp. 693–694

Find the quotient \( \frac{6x - 12}{x^2} \div (x - 2) \).

Helping You Remember

Suppose a friend was absent when the class was studying how to multiply rational expressions. Tell how you can explain to your friend the procedure for multiply rational expressions.
11-5 Dividing Polynomials

What You’ll Learn

Skim Lesson 11-5. Predict two things that you expect to learn based on the headings and figures in the lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary

Review Vocabulary Write the definition next to each term. (Lessons 11-1, 11-2, and 11-3)

asymptote ▶
   ______________________________________________________
   ______________________________________________________

excluded value ▶
   ______________________________________________________
   ______________________________________________________

rational expression ▶
   ______________________________________________________
   ______________________________________________________

inverse variation ▶
   ______________________________________________________
Main Idea

**Divide Polynomials by Monomials**

p. 700

Find each quotient. Show your work.

1. \( (5x^2 - 10x) \div 5x \)

2. \( (2n^2 - 9n + 4) \div 2n \)

3. \( (12m^2 + 9m) \div -3m \)

4. \( (4y^2 + 18y - 6) \div 6y \)

**Divide Polynomials by Binomials**

pp. 701–702

Find \((h^2 + 6h - 40) \div (h - 4)\) by using long division. Show your work.

Helping You Remember

There are several methods you can use to divide polynomials by binomials. If you want to remember one method that you can always use to divide a polynomial by a binomial, which method should you select? Explain.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
11-6 Adding and Subtracting Rational Expressions

What You’ll Learn

Scan Lesson 11-6. List two headings you would use to make an outline of this lesson.

1. ____________________________________________
   ____________________________________________

2. ____________________________________________
   ____________________________________________

Active Vocabulary

Review Vocabulary Write the correct term next to each definition. (Lessons 1-1, 11-2, and 11-3)

an algebraic fraction whose numerator and denominator are polynomials

a value that results in zero and the denominator of a rational

the quantities being multiplied in an expression involving multiplication

the result of a multiplication expression

New Vocabulary Fill in each blank with the correct term or phrase.

To add or subtract fractions with unlike ________________, you need to rename ________________ using the least common multiple of the denominators, called the least common denominator (LCD).

The least common multiple (LCM) is the least _____________ that is a ________________ of two or more numbers or polynomials.
Main Idea

Add and Subtract Rational Expressions with Like Denominators

pp. 706–707

Find each sum.

1. \( \frac{3k}{k - 2} + \frac{4}{k - 2} \)

2. \( \frac{4n}{2n + 5} + \frac{3n}{2n + 5} \)

Details

Add and Subtract Rational Expressions with Unlike Denominators

pp. 707–710

Complete the table below to illustrate the steps involved in subtracting rational expressions with unlike denominators.

<table>
<thead>
<tr>
<th>Add or Subtract Rational Expressions with Unlike Denominators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
</tr>
<tr>
<td><strong>Step 2</strong></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
</tr>
</tbody>
</table>

Helping You Remember

How can you use what you know about addition and subtraction of rational numbers that have like denominators to remember how to add and subtract rational expressions that have like denominators?

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________
Lesson 11-7
Mixed Expressions and Complex Fractions

What You’ll Learn
Scan the text in Lesson 11-7. Write two facts you learned about mixed expressions and complex fractions as you scanned the text.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary
New Vocabulary Label the expressions with the correct terms. Write mixed expression or complex fraction in each blank.

- complex fraction
  \( \frac{5 - \frac{2}{x - 1}}{2 + \frac{3}{x} - \frac{2}{x^2}} \)

- mixed expression
  \( \frac{x - 1}{\frac{2 - \frac{5}{x + 2}}{3x^2y^3}} \)
Main Idea

Simplify Mixed Expressions
p. 714

Write \(4 + \frac{5}{x + 3}\) as a rational expression. Show your work.

Details

Follow the steps below to simplify \(\frac{c^2d^3}{b^4} - \frac{b^3}{c^3d^2}\).

1. Write the complex fraction as a division expression.

2. Multiply by the reciprocal.

3. Divide out common factors and simplify.

Helping You Remember

Describe an easy way to recognize a mixed expression.
What You’ll Learn

Skim the Examples for Lesson 11-8. Predict two things you think you will learn about rational equations.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

New Vocabulary

Fill in each blank with the correct term or phrase.

extraneous solution ➤ When a solution of a rational equation results in ______________________ in the ______________________, that solution must be excluded. Such solutions are called extraneous solutions.

rational equation ➤ A rational equation contains one or more rational ______________________.

rate problem ➤ Rational equations can be used to solve rate problems, such as problems involving ________________.

work problem ➤ You can use ________________ to solve work problems, or problems involving work rates.
Main Idea

Solve Rational Equations
pp. 720–722

Details

Solve the rational equation \( \frac{4}{x - 3} = \frac{6}{x - 2} \). Check the solution.

Use Rational Equations to Solve Problems
pp. 722–723

Raymond can mow a lawn in 45 minutes using a push mower. Alex can mow the same lawn in 20 minutes using a riding mower. How long would it take them to mow the lawn working together?

Step 1: Find the portion of the job each person does in 1 minute.

Raymond: 
Alex: 

Step 2: Write a rational equation.

Step 3: Solve for \( t \). Round to the nearest tenth of a minute.

Helping You Remember

A good way to remember an approach to a mathematical concept is to associate a word with it. Think of a word that can help you remember that multiplying by the LCD is one method you can use to solve a rational equation.

__________________________

__________________________
Rational Functions and Equations

Tie It Together

Fill in the graphic organizer. Add details if space permits.

<table>
<thead>
<tr>
<th>Shape of Parent Function</th>
<th>Domain Restrictions</th>
<th>Horizontal Asymptote</th>
<th>Vertical Asymptote</th>
</tr>
</thead>
</table>

Graphing Rational Functions

- Multiply/Divide
- Solution Strategies

Operations on Rational Expressions

- Add/Subtract

Dividing Polynomials

- Dividing by a monomial
- Dividing by a binomial

Rational Functions

Rational Equations

Extraneous Solutions
Rational Functions and Equations

Before the Test

Review the ideas you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column.

<table>
<thead>
<tr>
<th>K</th>
<th>What I know…</th>
<th>W</th>
<th>What I want to find out…</th>
<th>L</th>
<th>What I learned…</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Math Online Visit glencoe.com to access your textbook, more examples, self-check quizzes, personal tutors, and practice tests to help you study for concepts in Chapter 11.

Are You Ready for the Chapter Test?

Use this checklist to help you study.

☐ I used my Foldable to complete the review of all or most lessons.
☐ I completed the Chapter 11 Study Guide and Review in the textbook.
☐ I took the Chapter 11 Practice Test in the textbook.
☐ I used the online resources for additional review options.
☐ I reviewed my homework assignments and made corrections to incorrect problems.
☐ I reviewed all vocabulary from the chapter and their definitions.

Study Tips

- Complete reading assignments before class. Write down or circle any questions you may have about what was in the text.
Statistics and Probability

Before You Read

Before you read the chapter, respond to these statements.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Before You Read</th>
<th>Statistics and Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Unbiased surveys are random.</td>
<td></td>
</tr>
<tr>
<td>• The sum of the probabilities for all values of x is 1.</td>
<td></td>
</tr>
<tr>
<td>• A graph that shows a cluster of data about the mean is an average distribution.</td>
<td></td>
</tr>
<tr>
<td>• Theoretical probability is the frequency of an outcome to the total number of events or trials.</td>
<td></td>
</tr>
<tr>
<td>• In a permutation, order matters; but in a combination, order does not matter.</td>
<td></td>
</tr>
</tbody>
</table>

Foldables® Study Organizer

Construct the Foldable as directed at the beginning of this chapter.

Note Taking Tips

• When you take notes, it is often a good idea to use symbols to emphasize important concepts.

• When taking notes, make annotations.
  Annotations are usually notes taken in the margins of books you own to organize the text for review or study.
# Key Points

Scan the pages in the chapter and write at least one specific fact concerning each lesson. For example, in the lesson on statistics and parameters, one fact might be that a parameter is a measure that describes a characteristic of a population. After completing the chapter, you can use this table to review for your chapter test.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Fact</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-1 Designing a Survey</td>
<td></td>
</tr>
<tr>
<td>12-2 Analyzing Survey Results</td>
<td></td>
</tr>
<tr>
<td>12-3 Statistics and Parameters</td>
<td></td>
</tr>
<tr>
<td>12-4 Permutations and Combinations</td>
<td></td>
</tr>
<tr>
<td>12-5 Probability of Compound Events</td>
<td></td>
</tr>
<tr>
<td>12-6 Probability Distributions</td>
<td></td>
</tr>
<tr>
<td>12-7 Probability Simulations</td>
<td></td>
</tr>
</tbody>
</table>
Lesson 12-1

What You’ll Learn

Scan Lesson 12-1. List two headings you would use to make an outline of this lesson.

1. ______________________________________________________________________
   ______________________________________________________________________

2. ______________________________________________________________________
   ______________________________________________________________________

Active Vocabulary

New Vocabulary Write the correct term next to each definition.

- ___________ ▶ a sample that favors one group over another
- ___________ ▶ a method of data collection in which a process is implemented and responses are studied
- ___________ ▶ a method of data collection in which a sample is observed for certain patterns or behaviors
- ___________ ▶ the entire group about which conclusions are to be drawn
- ___________ ▶ a portion of a larger group
- ___________ ▶ a sample that is equally likely to be chosen as any other sample from the population
- ___________ ▶ a method of data collection in which responses are gathered from a sample of the population

Vocabulary Link Bias is a word that is used in everyday English. Find the definition of bias using a dictionary. Write how the definition of bias can help you remember the mathematical definition of biased sample.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Main Idea

Design a Survey

A supermarket manager is interested in finding out whether or not shoppers would like an exotic foods section. He distributes 500 questionnaires to people shopping in the store.

a. Identify the sample, and determine the population from which it was selected.

b. Classify the type of data collection used by the store manager.

Sampling Techniques

Describe each random sampling technique shown in the table using your own words.

<table>
<thead>
<tr>
<th>Random Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td>simple random sample</td>
</tr>
<tr>
<td>stratified random sample</td>
</tr>
<tr>
<td>systematic random sample</td>
</tr>
</tbody>
</table>

Helping You Remember

To remember what a stratified random sample is, look up the word *stratified* in a dictionary. What everyday meaning do you find that seems closest to the mathematical meaning presented in this lesson?
What You’ll Learn
Scan the text in Lesson 12-2. Write two facts you learned about analyzing survey results as you scanned the text.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

New Vocabulary
Fill in each blank with the correct term or phrase.

Data from a survey can be summarized according to three measures of central tendency: the ____________, the ____________, and the ______________.

Vocabulary Link
Explain the meaning of central tendency in your own words. Describe how the mean, median, and mode can each be used to describe the central tendency of a data set.

   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________
Main Idea

Find each measure of central tendency for the data set below. Show your work.
{8, 12, 9, 17, 13, 11, 12, 10, 7}

<table>
<thead>
<tr>
<th>Measures of Central Tendency</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
</tr>
<tr>
<td>median</td>
</tr>
<tr>
<td>mode</td>
</tr>
</tbody>
</table>

Details

A recreation commission wants to determine the most popular weekend activities. One Saturday, every 10th person at a local park is surveyed about their favorite weekend activities, and a conclusion is drawn. Evaluate the validity of the survey and conclusion.

Question: What is your favorite weekend activity?
Conclusion: Spending time at the park is the most popular weekend activity.
What You’ll Learn
Scan the text under the Now heading. List two things you will learn about in the lesson.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary
New Vocabulary Write the correct term next to each definition.

_____________________ ▶ the average of the absolute values of the differences between
the mean and each value in the data set

_____________________ ▶ the range, quartiles, and interquartile range

_____________________ ▶ a measure that describes a characteristic of the population

_____________________ ▶ data that can be given as a numerical value

_____________________ ▶ data that cannot be given as a numerical value

_____________________ ▶ a measure that describes a characteristic of the sample

_____________________ ▶ using the statistics of a sample to draw conclusions about
  the entire population

_____________________ ▶ a value that shows how the data deviates from the mean of
  the set of data

_____________________ ▶ the square of the standard deviation
A random sample of 500 pet owners in the United States is surveyed about the number of times they visit the veterinarian each year. The mean number of visits is calculated. Identify the sample and the population. Then describe the sample statistic and the population parameter.

Sample: ______________________________________

Population: __________________________________

Statistic: ____________________________________

Parameter: __________________________________

Follow the steps below to find the standard deviation of the data set {5, 7, 8, 10, 5}.

Step 1: Find the mean of the data set.

Step 2: Find the variance of the data.

Step 3: Take the square root of the variance.

A good way to remember a mathematical concept is to explain it to somebody else. Suppose a classmate is having difficulty distinguishing between quantitative and qualitative data. Explain the difference to him and give an example of each.

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________
What You’ll Learn
Scan Lesson 12-4. Predict two things that you expect to learn based on the headings and the Key Concept box.

1. ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________

Active Vocabulary
New Vocabulary Write the definition next to each term.

combination ►

factorial ►

permutation ►

sample space ►

Vocabulary Link Permutation is a word that is used in everyday English. Find the definition of permutation using a dictionary. Write how the definition of permutation can help you remember the mathematical definition of a permutation.

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________

________________________________________________________
Main Idea

Permutations

Tina has 4 chores to do today. Complete the following table to determine the number of different ways Tina can do her chores if she does one at a time.

<table>
<thead>
<tr>
<th>Number of Permutations</th>
<th>Choices for 1st chore</th>
<th>Choices for 2nd chore</th>
<th>Choices for 3rd chore</th>
<th>Choices for 4th chore</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fundamental Counting Principle</strong></td>
<td>( P = )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

There are ______ different ways Tina can do her chores if she does one at a time.

Combinations

There are 10 players on a basketball team. How many different 5-player starting lineups are possible? Show your work.

Helping You Remember

To help you remember how the terms *permutation* and *combination* are different, think of everyday words that start with the letters P and C that illustrate the meaning of each term. Explain how the words illustrate the two terms.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
12-5 Probability of Compound Events

What You’ll Learn

Skim the lesson. Write two things you already know about probability of compound events.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

New Vocabulary

Match the term with its definition by drawing a line to connect the two.

- compound event: events in which the outcome of one event does not affect the outcome of the other event
- conditional probability: an event that is made up of two or more simple events
- dependent events: events that cannot occur at the same time
- independent events: events in which the outcome of one event affects the outcome of the other event
- mutually exclusive events: the probability that an event will occur, given that another event has already occurred

Vocabulary Link

Think of the meaning of the word dependent. Explain how this makes sense in the context of dependent events.

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________

____________________________________________________
Main Idea

Independent and Dependent Events
pp. 771–772

Model the probability of two independent events by sketching a Venn diagram in the box below.

Details

A number cube labeled 1 through 6 is rolled. Find each probability.

1. \( P(1 \text{ or } 4) \)

2. \( P(\text{even number}) \)

Helping You Remember

Look up the following terms in a dictionary. Write the definitions that best relate to the way these terms are used in probability.

Independent

Dependent

Exclusive

Inclusive
What You’ll Learn

Skim the Examples for Lesson 12-6. Predict two things you think you will learn about probability distributions.

1. ____________________________________________________________________________
   ____________________________________________________________________________

2. ____________________________________________________________________________
   ____________________________________________________________________________

Active Vocabulary

New Vocabulary Fill in each blank with the correct term or phrase.

- **discrete random variable** ➤ A discrete random variable is a random variable with a ________________ number of possibilities.

- **expected value** ➤ Expected value is the sum of all possible values for a random variable, each value multiplied by its _____________.

- **probability distribution** ➤ A probability distribution is the probability of every possible value of the _________________.

- **probability histogram** ➤ A probability histogram is a histogram that displays a probability _________________.

- **random variable** ➤ A random variable is a variable with a value that is the ________________ of a random event.
Main Idea

Random Variables and Probability

p. 779

The table shows the grade distribution on a final exam. Find the probability that a randomly chosen student earned a B.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>6</td>
</tr>
<tr>
<td>B</td>
<td>12</td>
</tr>
<tr>
<td>C</td>
<td>9</td>
</tr>
<tr>
<td>D</td>
<td>1</td>
</tr>
</tbody>
</table>

Probability Distributions

p. 780

Complete the following table to show the probability distribution for the number of heads when three coins are tossed.

<table>
<thead>
<tr>
<th>Probability Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Heads</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>

Helping You Remember

Sometimes remembering a simple example is a good way for you to remember a more complicated mathematical concept. Show how you can use the outcomes of tossing a coin to describe how the probabilities of the possible outcomes add up to 1.
What You’ll Learn
Scan the text in Lesson 12-7. Write two facts you learned about probability simulations as you scanned the text.

1. ______________________________________________________
   ______________________________________________________
   ______________________________________________________

2. ______________________________________________________
   ______________________________________________________
   ______________________________________________________
   ______________________________________________________

Active Vocabulary
New Vocabulary Write the definition next to each term.

experimental probability ►
   ______________________________________________________
   ______________________________________________________

relative frequency ►
   ______________________________________________________
   ______________________________________________________

simulation ►
   ______________________________________________________
   ______________________________________________________

theoretical probability ►
   ______________________________________________________
Main Idea

Theoretical and Experimental Probability

Claire correctly answered 17 questions out of 20 on a multiple choice test. What is the experimental probability that she answers a question correctly? Express your answer as a percent.

Performing Simulations

A field goal kicker on a football team typically makes 2 out of 3 field goal attempts. Describe how to simulate a field goal attempt. Perform the simulation and predict the number of field goals the kicker will make in his next 20 attempts.

<table>
<thead>
<tr>
<th>Roll</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Helping You Remember

Mathematical concepts are easier to remember if you can explain them in your own words. How would you describe the difference between theoretical probability and experimental probability?
Fill in each graphic organizer with a term from the chapter.
Probability and Statistics

Before the Test

Now that you have read and worked through the chapter, think about what you have learned and complete the table below. Compare your previous answers with these.

1. Write an A if you agree with the statement.
2. Write a D if you disagree with the statement.

<table>
<thead>
<tr>
<th>Statistics and Probability</th>
<th>After You Read</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Unbiased surveys are random.</td>
<td></td>
</tr>
<tr>
<td>• The sum of the probabilities for all values of $x$ is 1.</td>
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☐ I took the Chapter 12 Practice Test in the textbook.
☐ I used the online resources for additional review options.
☐ I reviewed my homework assignments and made corrections to incorrect problems.
☐ I reviewed all vocabulary from the chapter and their definitions.

Study Tips

- Be an active listener in class. Take notes, circle or highlight information that your teacher stresses, and ask questions when ideas are unclear to you.