# Holt Mathematics

## Know-It Notebook™

HOLT, RINEHART AND WINSTON
A Harcourt Education Company
Orlando • Austin • New York • San Diego • London

Copyright © by Holt, Rinehart and Winston

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, without permission in writing from the publisher.

Requests for permission to make copies of any part of the work should be mailed to the following address: Permissions Department, Holt, Rinehart and Winston, 10801 N MoPac Expressway, Building 3, Austin, Texas 78759.

**HOLT** and the **"Owl Design"** are trademarks licensed to Holt, Rinehart and Winston, registered in the United States of America and/or other jurisdictions.

Printed in the United States of America

**If you have received these materials as examination copies free of charge, Holt, Rinehart and Winston retains title to the materials and they may not be resold. Resale of examination copies is strictly prohibited and is illegal.**

**Possession of this publication in print format does not entitle users to convert this publication, or any portion of it, into electronic format.**

ISBN 0-03-078471-9

1 2 3 4 5 170 10 09 08 07 06

Copyright © by Holt, Rinehart and Winston. All rights reserved.

# Contents


| | |
|---|---|
| Using the Know-It Notebook | v |
| Note Taking Strategies | vii |
| Lesson 1-1 | 1 |
| Lesson 1-2 | 4 |
| Lesson 1-3 | 6 |
| Lesson 1-4 | 9 |
| Lesson 1-5 | 11 |
| Lesson 1-6 | 13 |
| Lesson 1-7 | 15 |
| Lesson 1-8 | 18 |
| Lesson 1-9 | 20 |
| Ch 1 Chapter Review | 21 |
| Ch 1 Big Ideas | 24 |
| Lesson 2-1 | 25 |
| Lesson 2-2 | 27 |
| Lesson 2-3 | 30 |
| Lesson 2-4 | 32 |
| Lesson 2-5 | 35 |
| Lesson 2-6 | 38 |
| Lesson 2-7 | 41 |
| Lesson 2-8 | 43 |
| Ch 2 Chapter Review | 46 |
| Ch 2 Big Ideas | 48 |
| Lesson 3-1 | 49 |
| Lesson 3-2 | 52 |
| Lesson 3-3 | 55 |
| Lesson 3-4 | 57 |
| Lesson 3-5 | 59 |
| Lesson 3-6 | 61 |
| Ch 3 Chapter Review | 63 |
| Ch 3 Big Ideas | 65 |
| Lesson 4-1 | 66 |
| Lesson 4-2 | 68 |
| Lesson 4-3 | 70 |
| Lesson 4-4 | 72 |
| Lesson 4-5 | 74 |
| Lesson 4-6 | 76 |
| Lesson 4-7 | 79 |
| Lesson 4-8 | 81 |
| Ch 4 Chapter Review | 84 |
| Ch 4 Big Ideas | 87 |
| Lesson 5-1 | 88 |
| Lesson 5-2 | 90 |
| Lesson 5-3 | 93 |
| Lesson 5-4 | 97 |
| Lesson 5-5 | 100 |
| Lesson 5-6 | 102 |
| Lesson 5-7 | 104 |
| Lesson 5-8 | 107 |
| Ch 5 Chapter Review | 110 |
| Ch 5 Big Ideas | 113 |
| Lesson 6-1 | 114 |
| Lesson 6-2 | 116 |
| Lesson 6-3 | 119 |
| Lesson 6-4 | 122 |
| Lesson 6-5 | 124 |
| Lesson 6-6 | 126 |
| Lesson 6-7 | 129 |
| Ch 6 Chapter Review | 132 |
| Ch 6 Big Ideas | 134 |
| Lesson 7-1 | 135 |
| Lesson 7-2 | 138 |
| Lesson 7-3 | 139 |
| Lesson 7-4 | 141 |
| Lesson 7-5 | 143 |
| Lesson 7-6 | 145 |
| Lesson 7-7 | 147 |
| Lesson 7-8 | 149 |
| Lesson 7-9 | 150 |
| Ch 7 Chapter Review | 151 |
| Ch 7 Big Ideas | 155 |
| Lesson 8-1 | 156 |
| Lesson 8-2 | 158 |
| Lesson 8-3 | 159 |
| Lesson 8-4 | 161 |
| Lesson 8-5 | 163 |
| Lesson 8-6 | 166 |
| Lesson 8-7 | 168 |
| Lesson 8-8 | 170 |
| Lesson 8-9 | 173 |
| Lesson 8-10 | 174 |
| Ch 8 Chapter Review | 176 |
| Ch 8 Big Ideas | 180 |


Copyright © by Holt, Rinehart and Winston.
All rights reserved.

Lesson 9-1 181
Lesson 9-2 183
Lesson 9-3 185
Lesson 9-4 187
Lesson 9-5 189
Lesson 9-6 191
Lesson 9-7 192
Lesson 9-8 194
Ch 9 Chapter Review 196
Ch 9 Big Ideas 200
Lesson 10-1 201
Lesson 10-2 204
Lesson 10-3 206
Lesson 10-4 208
Lesson 10-5 211
Lesson 10-6 213
Lesson 10-7 215
Lesson 10-8 217
Lesson 10-9 219
Ch 10 Chapter Review 221
Ch 10 Big Ideas 224
Lesson 11-1 225
Lesson 11-2 227
Lesson 11-3 229
Lesson 11-4 230
Lesson 11-5 232
Lesson 11-6 234
Ch 11 Chapter Review 236
Ch 11 Big Ideas 238
Lesson 12-1 239
Lesson 12-2 241
Lesson 12-3 243
Lesson 12-4 246
Lesson 12-5 248
Lesson 12-6 250
Lesson 12-7 252
Ch 12 Chapter Review 255
Ch 12 Big Ideas 257
Lesson 13-1 258
Lesson 13-2 260
Lesson 13-3 262
Lesson 13-4 264
Lesson 13-5 266
Lesson 13-6 268
Lesson 13-7 270
Ch 13 Chapter Review 272
Ch 13 Big Ideas 276
Lesson 14-1 277
Lesson 14-2 280
Lesson 14-3 283
Lesson 14-4 286
Lesson 14-5 289
Lesson 14-6 292
Ch 14 Chapter Review 294
Ch 14 Big Ideas 296

Copyright © by Holt, Rinehart and Winston.

# USING THE *KNOW-IT NOTEBOOK*™

This *Know-It Notebook* will help you take notes, organize your thinking, and study for quizzes and tests. There are *Know-It Notes*™ pages for every lesson in your textbook. These notes will help you identify important mathematical information that you will need later.

## *Know-It Notes*

### Lesson Objectives

A good note-taking practice is to know the objective the content covers.

### Vocabulary

Another good note-taking practice is to keep a list of the new vocabulary.

- Use the page references or the glossary in your textbook to find each definition.
- Write each definition on the lines provided.

### Additional Examples

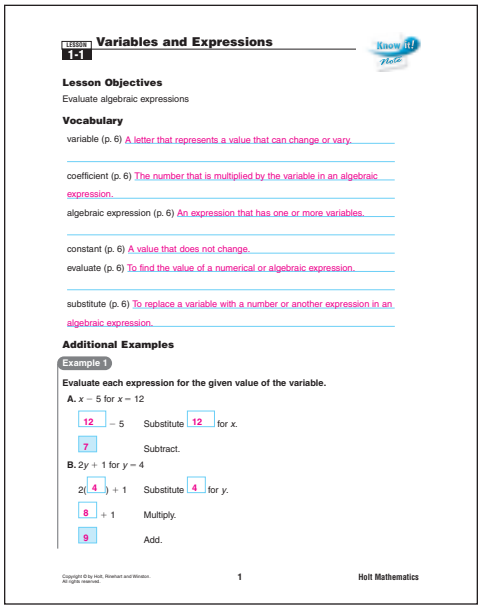
Your textbook includes examples for each math concept taught. Additional examples in the *Know-It Notebook* help you take notes so you remember how to solve different types of problems.

- Take notes as your teacher discusses each example.
- Write notes in the blank boxes to help you remember key concepts.
- Write final answers in the shaded boxes.

### Try This

Complete the Try This problems that follow some lessons. Use these to make sure you understand the math concepts covered in the lesson.

- Write each answer in the space provided.
- Check your answers with your teacher or another student.
- Ask your teacher to help you understand any problem that you answered incorrectly.



LESSON 1-1 **Variables and Expressions**

Know-It Note

**Lesson Objectives**

Evaluate algebraic expressions

**Vocabulary**

variable (p. 6) A letter that represents a value that can change or vary.

coefficient (p. 6) The number that is multiplied by the variable in an algebraic expression.

algebraic expression (p. 6) An expression that has one or more variables.

constant (p. 6) A value that does not change.

evaluate (p. 6) To find the value of a numerical or algebraic expression.

substitute (p. 6) To replace a variable with a number or another expression in an algebraic expression.

**Additional Examples**

Example 1

**Evaluate each expression for the given value of the variable.**

**A.** $x - 5$ for $x = 12$

12 − 5 Substitute 12 for $x$.

7 Subtract.

**B.** $2y + 1$ for $y = 4$

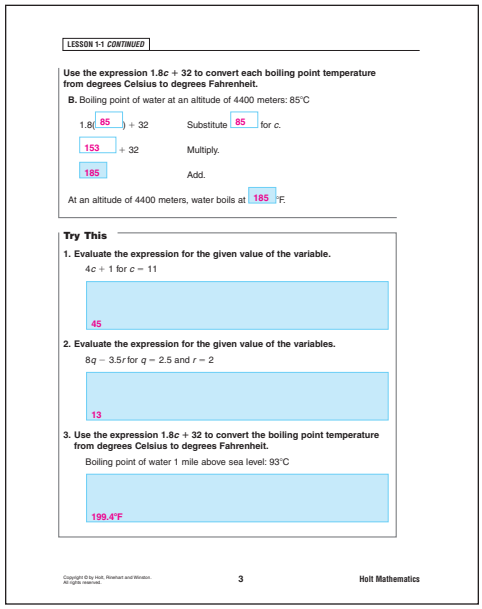
2(4) + 1 Substitute 4 for $y$.

8 + 1 Multiply.

9 Add.

Copyright © by Holt, Rinehart and Winston. All rights reserved.





LESSON 1-1 *CONTINUED*

**Use the expression $1.8c + 32$ to convert each boiling point temperature from degrees Celsius to degrees Fahrenheit.**

**B.** Boiling point of water at an altitude of 4400 meters: 85°C

1.8(85) + 32 Substitute 85 for $c$.

153 + 32 Multiply.

185 Add.

At an altitude of 4400 meters, water boils at 185 °F.

**Try This**

**1. Evaluate the expression for the given value of the variable.**

$4c + 1$ for $c = 11$

45

**2. Evaluate the expression for the given value of the variables.**

$8q - 3.5r$ for $q = 2.5$ and $r = 2$

13

**3. Use the expression $1.8c + 32$ to convert the boiling point temperature from degrees Celsius to degrees Fahrenheit.**

Boiling point of water 1 mile above sea level: 93°C

199.4°F

Copyright © by Holt, Rinehart and Winston. All rights reserved.



Copyright © by Holt, Rinehart and Winston.

## Chapter Review

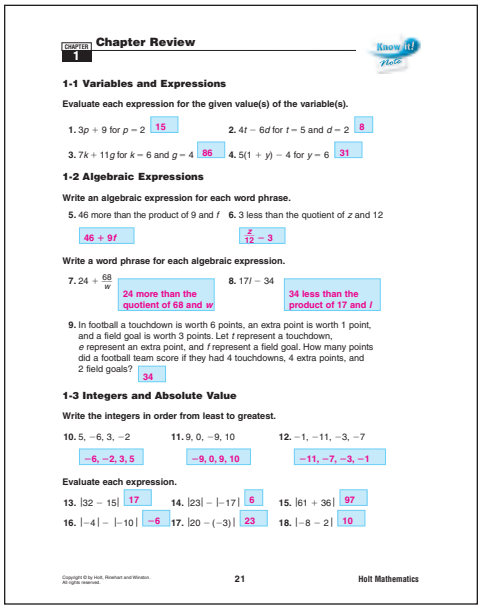
Complete Chapter Review problems that follow each chapter. This is a good review before you take the chapter test.

- Write each answer in the space provided.
- Check your answers with your teacher or another student.
- Ask your teacher to help you understand any problem that you answered incorrectly.

## Big Ideas

The Big Ideas have you summarize the important chapter concepts in your own words. You must think about and understand ideas to put them in your own words. This will also help you remember them.

- Write each answer in the space provided.
- Check your answers with your teacher or another student.
- Ask your teacher to help you understand any question that you answered incorrectly.



CHAPTER 1 **Chapter Review**

**1-1 Variables and Expressions**

**Evaluate each expression for the given value(s) of the variable(s).**

**1.** $3p + 9$ for $p = 2$ **15**

**2.** $4t - 6d$ for $t = 5$ and $d = 2$ **8**

**3.** $7k + 11g$ for $k = 6$ and $g = 4$ **86**

**4.** $5(1 + y) - 4$ for $y = 6$ **31**

**1-2 Algebraic Expressions**

**Write an algebraic expression for each word phrase.**

**5.** 46 more than the product of 9 and $f$ **$46 + 9f$**

**6.** 3 less than the quotient of $z$ and 12 **$\frac{z}{12} - 3$**

**Write a word phrase for each algebraic expression.**

**7.** $24 + \frac{68}{w}$ **24 more than the quotient of 68 and $w$**

**8.** $17l - 34$ **34 less than the product of 17 and $l$**

**9.** In football a touchdown is worth 6 points, an extra point is worth 1 point, and a field goal is worth 3 points. Let $t$ represent a touchdown, $e$ represent an extra point, and $f$ represent a field goal. How many points did a football team score if they had 4 touchdowns, 4 extra points, and 2 field goals? **34**

**1-3 Integers and Absolute Value**

**Write the integers in order from least to greatest.**

**10.** 5, −6, 3, −2 **−6, −2, 3, 5**

**11.** 9, 0, −9, 10 **−9, 0, 9, 10**

**12.** −1, −11, −3, −7 **−11, −7, −3, −1**

**Evaluate each expression.**

**13.** $|32 - 15|$ **17**

**14.** $|23| - |-17|$ **6**

**15.** $|61 + 36|$ **97**

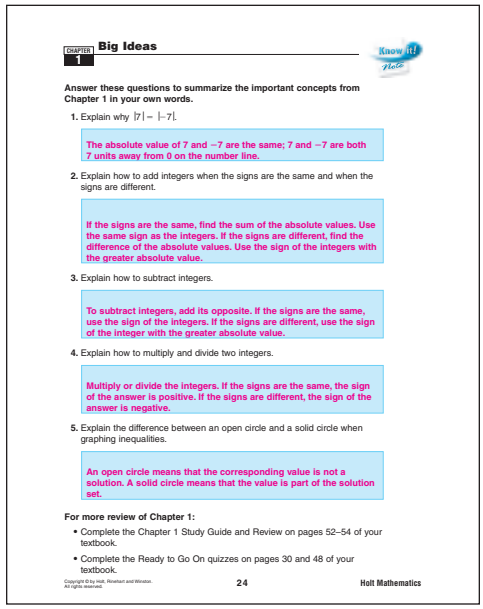
**16.** $|-4| - |-10|$ **−6**

**17.** $|20 - (-3)|$ **23**

**18.** $|-8 - 2|$ **10**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

21 Holt Mathematics



CHAPTER 1 **Big Ideas**

**Answer these questions to summarize the important concepts from Chapter 1 in your own words.**

**1.** Explain why $|7| = |-7|$.

**The absolute value of 7 and −7 are the same; 7 and −7 are both 7 units away from 0 on the number line.**

**2.** Explain how to add integers when the signs are the same and when the signs are different.

**If the signs are the same, find the sum of the absolute values. Use the same sign as the integers. If the signs are different, find the difference of the absolute values. Use the sign of the integers with the greater absolute value.**

**3.** Explain how to subtract integers.

**To subtract integers, add its opposite. If the signs are the same, use the sign of the integers. If the signs are different, use the sign of the integer with the greater absolute value.**

**4.** Explain how to multiply and divide two integers.

**Multiply or divide the integers. If the signs are the same, the sign of the answer is positive. If the signs are different, the sign of the answer is negative.**

**5.** Explain the difference between an open circle and a solid circle when graphing inequalities.

**An open circle means that the corresponding value is not a solution. A solid circle means that the value is part of the solution set.**

**For more review of Chapter 1:**

- Complete the Chapter 1 Study Guide and Review on pages 52–54 of your textbook.
- Complete the Ready to Go On quizzes on pages 30 and 48 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

24 Holt Mathematics

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

# NOTE TAKING STRATEGIES

Taking good notes is very important in many of your classes and will be even more important when you take college classes. This notebook was designed to help you get started. Here are some other steps that can help you take good notes.

**Getting Ready**

1. Use a loose-leaf notebook. You can add pages to this where and when you want to. It will help keep you organized.

**During the Lecture**

2. If you are taking notes during a lecture, write the big ideas. Use abbreviations to save time. Do not worry about spelling or writing every word. Use headings to show changes in the topics discussed. Use numbering or bullets to organize supporting ideas under each topic heading. Leave space before each new heading so that you can fill in more information later.

**After the Lecture**

3. As soon as possible after the lecture, read through your notes and add any information that will help you understand them when you review later. You should also summarize the information into key words or key phrases. This will help your comprehension and will help you process the information. These key words and key phrases will be your memory cues when you are reviewing for or taking a test. At this time you may also want to write questions to help clarify the meaning of the ideas and facts.
4. Read your notes out loud. As you do this, state the ideas in your own words and do as much as you can by memory. This will help you remember and will also help with your thinking process. This activity will help you understand the information.
5. Reflect upon the information you have learned. Ask yourself how new information relates to information you already know. Ask how this relates to your personal experience. Ask how you can apply this information and why it is important.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**Before the Test**

6. Review your notes. Don't wait until the night before the test to review. Do frequent reviews. Don't just read through your notes. Put the information in your notes into your own words. If you do this you will be able to connect the new material with material you already know, and you will be better prepared for tests. You will have less test anxiety and better recall.
7. Summarize your notes. This should be in your own words and should only include the main points you need to remember. This will help you internalize the information.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 1-1

# Variables and Expressions

## Lesson Objectives

Evaluate algebraic expressions

## Vocabulary

variable (p. 6) _____

coefficient (p. 6) _____

algebraic expression (p. 6) _____

constant (p. 6) _____

evaluate (p. 6) _____

substitute (p. 6) _____

## Additional Examples

**Example 1**

**Evaluate each expression for the given value of the variable.**

**A.** $x - 5$ for $x = 12$

$\square - 5$ Substitute $\square$ for $x$.

$\square$ Subtract.

**B.** $2y + 1$ for $y = 4$

$2(\square) + 1$ Substitute $\square$ for $y$.

$\square + 1$ Multiply.

$\square$ Add.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**Evaluate each expression for the given value of the variable.**

**C.** $6(n + 2) - 4$ for $n = 5, 6, 7$

| $n$ | Substitute | Parentheses | Multiply | Subtract |
|---|---|---|---|---|
| 5 | $6(\square + 2) - 4$ | $6(\square) - 4$ | $\square - 4$ | |
| 6 | $6(\square + 2) - 4$ | $6(\square) - 4$ | $\square - 4$ | |
| 7 | $6(\square + 2) - 4$ | $6(\square) - 4$ | $\square - 4$ | |

## Example 2

**Evaluate each expression for the given values of the variables.**

**A.** $4x + 3y$ for $x = 2$ and $y = 1$

$4(\square) + 3(\square)$ Substitute $\square$ for $x$ and $\square$ for $y$.

$\square + \square$ Multiply.

$\square$ Add.

**B.** $9r - 2p$ for $r = 3$ and $p = 5$

$9(\square) - 2(\square)$ Substitute $\square$ for $r$ and $\square$ for $p$.

$\square - \square$ Multiply.

$\square$ Subtract.

## Example 3

**Use the expression $1.8c + 32$ to convert each boiling point temperature from degrees Celsius to degrees Fahrenheit.**

**A.** Boiling point of water at sea level: 100°C

$1.8(\square) + 32$ Substitute $\square$ for $c$.

$\square + 32$ Multiply.

$\square$ Add. At sea level, water boils at $\square$°F.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**Use the expression $1.8c + 32$ to convert each boiling point temperature from degrees Celsius to degrees Fahrenheit.**

**B.** Boiling point of water at an altitude of 4400 meters: 85°C

| | |
|---|---|
| $1.8(\square) + 32$ | Substitute $\square$ for $c$. |
| $\square + 32$ | Multiply. |
| $\square$ | Add. |

At an altitude of 4400 meters, water boils at $\square$°F.

## Try This

**1. Evaluate the expression for the given value of the variable.**

$4c + 1$ for $c = 11$

**2. Evaluate the expression for the given value of the variables.**

$8q - 3.5r$ for $q = 2.5$ and $r = 2$

**3. Use the expression $1.8c + 32$ to convert the boiling point temperature from degrees Celsius to degrees Fahrenheit.**

Boiling point of water 1 mile above sea level: 93°C

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 1-2

# Write Algebraic Expressions

## Lesson Objectives

Translate between algebraic expressions and word phrases

## Additional Examples

### Example 1

**Write an algebraic expression for each word phrase.**

**A.** 9 less than a number $w$

$w$ decreased by 9

$w$ ☐ 9

☐

**B.** 3 increased by the difference of $p$ and 5

the difference of $p$ and 5

$p$ ☐ 5

3 increased by the difference of $p$ and 5

☐

### Example 2

**Write a word phrase for the algebraic expression $9 - 3c$.**

9 − 3 ☐ $c$

9 ☐ the ☐ of 3 and $c$

☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**A restaurant leased its banquet hall for a function. The cost was $10 per person. Write an algebraic expression to evaluate what the cost would be if 20, 21, 22, or 23 people attended the function.**

$10 per person ____

| *n* | Substitute | Multiply |
|---|---|---|
| 20 | $10 • (____) | ____ |
| 21 | $10 • (____) | ____ |
| 22 | $10 • (____) | ____ |
| 23 | $10 • (____) | ____ |

## Example 4

**Write a word problem that can be evaluated by the algebraic expression $27 + t$, and evaluate the expression for $t = 1.76$.**

____

$27 + t$ Write the expression.

$27 +$ ____ Substitute ____ for $t$.

____ Add.

The total cost of the sweater was ____.

## Try This

**1. A taxi-cab driver charges a base fee of $2, plus an additional $0.25 per mile. Write an expression to determine the fare.**

____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 1-3

# Integers and Absolute Value

## Lesson Objectives

Compare and order integers and evaluate expressions containing absolute values

## Vocabulary

integers (p. 14) _____

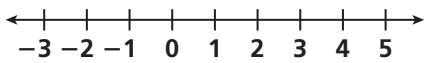
opposites (p. 14) _____

absolute value (p. 15) _____

## Additional Examples

**Example 1**

**A.** Use $<$, $>$, or $=$ to compare the scores. Aaron's score is 4, and Felicity's score is $-1$.

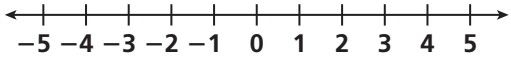



Place the scores on a number line.

_____

$-1$ is to the _____ of 4.

**B.** List the golfers' scores in order from the lowest to the highest. The scores are $-4$, 2, 5, and $-3$.




Place the scores on a number line and read them from left to right.

In order from the lowest score to the highest are _____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Write the integers 8, −5, and 4 in order from least to greatest.**

8 ☐ −5, 8 ☐ 4, and −5 ☐ 4

Compare each pair of integers.

−5 is less than both ☐ and ☐,

and 4 is less than ☐.

## Example 3

**Find the additive inverse of each integer.**

**A.** 6

☐ is the same distance from 0 as 6 on the number line.

**B.** −14

☐ is the same distance from 0 as −14 on the number line.

**C.** 0.5

☐ is the same distance from 0 as 0.5 on the number line.

## Example 4

**Evaluate each expression.**

**A.** $|-8| + |-5|$

$|-8| =$ ☐ −8 is ☐ units from 0.

$|-5| =$ ☐ −5 is ☐ units from 0.

$8 + 5 =$ ☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**Evaluate each expression.**

**B.** $|5 - 6|$

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

$\square$ $\qquad$ $-1$ is $\square$ unit from 0.

## Try This

**1. List the golfers' scores in order from the lowest to the highest. The scores are $-5$, 0, $-2$, and 1.**

**2. Write the integers 4, $-1$, and $-7$ in order from least to greatest.**

**3. What is the additive inverse of 9?**

**4. Evaluate the expression $|7 - 2|$.**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 1-4

# Adding Integers

Know it! Note

## Lesson Objectives

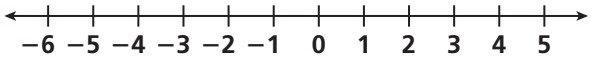
Add integers

## Additional Examples

### Example 1

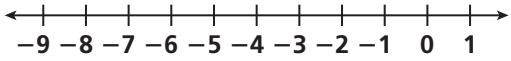
**Use a number line to find each sum.**

**A.** $(-6) + 2$




You finish at ____, so $(-6) + 2 =$ ____.

**B.** $-3 + (-6)$




You finish at ____, so $-3 + (-6) =$ ____.

### Example 2

**Add.**

**A.** $1 + (-2)$ Think: Find the ____ of 2 and 1.

____ $2 > 1$; use the sign of ____.

**B.** $(-8) + 5$ Think: Find the ____ of 8 and 5.

____ $8 > 5$; use the sign of ____.

**C.** $(-2) + (-4)$ Think: Find the ____ of 2 and 4.

____ Same sign; use the sign of the ____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Evaluate $c + 4$ for $c = -8$.**

$c + 4$

( ) $+ 4$ Replace $c$ with .

Think: Find the of 8 and 4.

$+ 4 =$ $8 > 4$; use the sign of .

## Example 4

**Meka opened a new bank account. Find her account balance after the first four transactions, listed below.**

**Deposits: \$200, \$20 Withdrawals: \$166, \$38**

$200 + 20 + (-166) + (-38)$ Use a sign for deposits and a sign for withdrawals.

$(200 + 20) + (-166 + -38)$ Group the integers with the signs.

$220 + (-204)$ Add integers within each group.

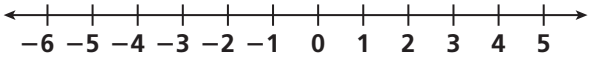
$220 > 204$; use the sign of .

Meka's account balance after the first four transactions is .

## Try This

**1. Use a number line to find the sum.**

$(-3) + 7$




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 1-5

# Subtracting Integers

Know it! Note

## Lesson Objectives

Subtract integers

## Additional Examples

### Example 1

**Subtract.**

**A.** $-7 - 4$

$-7 - 4 = -7 + (\square)$ Add the $\square$ of 4.

$= \square$ Same sign; use the sign of the integers.

**B.** $8 - (-5)$

$8 - (-5) = 8 \square 5$ Add the $\square$ of –5.

$= \square$ Same sign; use the sign of the $\square$.

**C.** $-6 - (-3)$

$-6 - (-3) = -6 \square 3$ Add the opposite of $\square$.

$= \square$ $6 > 3$; use the sign of $\square$.

### Example 2

**Evaluate each expression for the given value of the variable.**

**A.** $8 - j$ for $j = -6$

$8 - j$

$8 - (\square)$ Substitute $\square$ for $j$.

$= 8 \square 6$ Add the $\square$ of $-6$.

$= \square$ Same sign; use the sign of the $\square$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**Evaluate each expression for the given value of the variable.**

**B.** $-9 - y$ for $y = -4$

$-9 - y$

$-9 - (\square)$ Substitute $-4$ for $\square$.

$= -9 \square 4$ Add the opposite of $\square$.

$= \square$ $9 > 4$; use the $\square$ of 9.

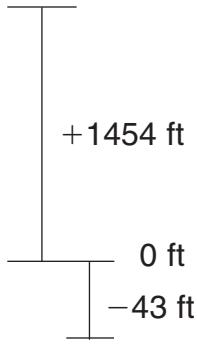
## Example 3

**The top of the Sears Tower, in Chicago, is 1454 feet above street level, while the lowest level is 43 feet below street level. How far is it from the lowest level to the top?**

$1454 - (-43)$ Subtract the distance below street level from the distance above street level.

$= 1454 + \square$ Add the opposite of $-43$.

$= \square$ Same sign; use the sign of the integers.




It is $\square$ feet from bottom to top.

## Try This

**1. Subtract.**

$-7 - (-8)$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 1-6

# Multiplying and Dividing Integers

## Lesson Objectives

Multiply and divide integers

## Additional Examples

### Example 1

**Multiply or divide.**

**A.** $-6(4)$

Signs are ____.

Answer is ____.

**B.** $-8(-5)$

Signs are the ____.

Answer is ____.

**C.** $\frac{-18}{2}$

____ are different.

Answer is ____.

**D.** $\frac{-25}{-5}$

____ are the same.

Answer is ____.

### Example 2

**Simplify.**

**A.** $3(-6 - 12)$

Subtract inside the ____.

$= 3($____$)$ Think: The signs are ____.

$=$ ____ The answer is ____.

**B.** $-5(-5 + 2)$

Subtract inside the ____.

$= -5($____$)$ Think: The ____ are the same.

$=$ ____ The answer is ____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**Simplify.**

**C.** $-2(14 - 5)$ _____ inside the parentheses.

$= -2($ _____ $)$ Think: The signs are _____.

$=$ _____ The answer is _____.

## Example 3

**A golfer plays 5 holes. On 3 holes, he has a gain of 4 strokes each. On 2 holes, he has a loss of 4 strokes each. Each gain in strokes can be represented by a positive integer, and each loss can be represented by a negative integer. Find the total net change in strokes.**

$3(4) + 2(-4)$ Add the losses to the gains.

$=$ _____ $+ ($ _____ $)$ Multiply.

$=$ _____ Add. The golfer gained _____ strokes.

## Try This

**1. Multiply or divide.**

$-3(-2)$

**2. Simplify.**

$-3(6 - 9)$

**3. Tina received an allowance of $15 a week for 5 weeks. She bought 3 CDs for $20 each. How much money does Tina have left?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 1-7

# Solving Equations by Adding or Subtracting

## Lesson Objectives

Solve equations using addition and subtraction

## Vocabulary

equation (p. 34) _____

_____

inverse operation (p. 34) _____

_____

## Additional Examples

**Example 1**

**Determine which value of *x* is a solution of the equation.**

$x + 8 = 15$; $x = 5$, 7, or 23

Substitute each value for *x* in the equation.

$x + 8 = 15$

$5 + \square \stackrel{?}{=} 15$ Substitute $\square$ for *x*.

$\square \stackrel{?}{=} 15$ ✗ So 5 _____ a solution.

$x + 8 = 15$

$\square + 8 \stackrel{?}{=} 15$ _____ 7 for *x*.

$\square \stackrel{?}{=} 15$ ✓ So 7 _____ a solution.

$x + 8 = 15$

$\square + 8 \stackrel{?}{=} 15$ Substitute 23 for $\square$.

$\square \stackrel{?}{=} 15$ ✗ So 23 _____ a solution.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Solve.**

**A.** $10 + n = 18$

$-$ ☐ $-$ ☐ Subtract ☐ from both sides.

☐ $+ n =$ ☐

$n =$ ☐ Identity ☐ of Zero:

$0 + n = n$

**B.** $p - 8 = 9$

$p - 8 = 9$

$+$ ☐ $+$ ☐ Add ☐ to both sides.

$p +$ ☐ $=$ ☐

$p =$ ☐ ☐ Property of Zero: $p + 0 = p$

## Example 3

**Jan and Alex are arguing over who gets to play a board game. If Jan, on the right, pulls with a force of 14N, what force is Alex exerting on the game if the net force is 3N?**

**1. Understand the Problem**

The **answer** is the force that ☐ is exerting on the game.

**List the important information:**

- Jan, on the right, pulls with a force of ☐.
- The net force is ☐.

**2. Make a Plan**

Write an equation and solve it. Let $f$ represent ☐ force on the game, and use the equation model.

☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**3. Solve**

$3 = f + 14$

$-14 \quad -14$ Subtract ____ from both sides.

____ $= f$

Alex is exerting ____ newtons on the game.

**4. Look Back**

Alex exerts force to the left, so the force is ____. Its absolute value is ____ than the force Jan exerts, on the right. This makes sense, since the net force is ____; thus the game is being pulled closer to ____.

## Try This

**1. Determine which value of *x* is a solution of the equation.**

$x - 4 = 13$; $x = 9$, 17, or 27

**2. Solve.**

$44 = y - 23$

**3. Danny owns 58 DVDs. This is 14 DVDs less than Macy owns. How many DVDs does Macy own?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 1-8

# Solving Equations by Multiplying or Dividing

## Lesson Objectives

Solve equations using multiplication and division

## Additional Examples

### Example 1

**Solve.**

$6x = 48$

$\square = \square$ Divide both sides by $\square$.

$x = \square$

### Example 2

**Solve.**

$\frac{b}{-4} = 5$

$\square \cdot \frac{b}{-4} = \square \cdot 5$ Multiply both sides by $\square$.

$b = \square$

### Example 3

**To go on a school trip, Helene has raised $670, which is only one-fourth of what she needs. What is the total amount needed?**

| fraction of total amount raised so far | · | total amount needed | = | amount raised so far |
|---|---|---|---|---|
| $\square$ | · | $\square$ | = | $\square$ |

$\frac{1}{4}x = 670$ Write the equation.

$\square \cdot \frac{1}{4}x = \square \cdot 670$ Multiply both sides by $\square$.

$x = \square$ Helene needs to raise a total of $\square$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 4

**Solve.**

$3x + 2 = 14$

**Step 1:** $3x + 2 = 14$

$\quad -2 \quad -2$

Subtract ☐ from both sides to isolate the term with $x$ in it.

$3x =$ ☐

**Step 2:** $\frac{3x}{\square} = \frac{12}{\square}$

$x =$ ☐

## Try This

**1. Solve.**

$\frac{1}{2}a = -9$

**2. Solve.**

$\frac{z}{-3} = 9$

**3. To purchase a new pair of running shoes, Dale has $30, which is only one-third of the amount needed. What is the total amount needed.**

**4. Solve.**

$4x - 3 = 17$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 1-9

# Introduction to Inequalities

Know it! Note

## Lesson Objectives

Solve and graph inequalities

## Vocabulary

inequality (p. 44) _____

_____

algebraic inequality (p. 44) _____

_____

solution set (p. 44) _____

_____

## Additional Examples

### Example 1

**Compare. Write < or >.**

**A.** $23 - 14 \square 6$

$\square \; \square \; 6$

**B.** $5(12) \square 70$

$\square \; \square \; 70$

### Example 2

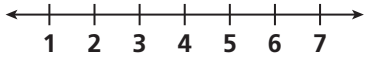
**Solve and graph each inequality.**

**A.** $x + 2.5 \leq 8$

$- \square \qquad - \square$

Subtract $\square$ from both sides.

$x \leq \square$

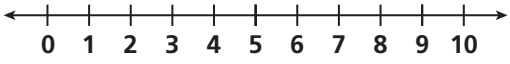



**B.** $w - 1 < 8$

$+ \square \qquad + \square$

Add $\square$ to both sides.

$w < \square$




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 1

# Chapter Review

## 1-1 Variables and Expressions

**Evaluate each expression for the given value(s) of the variable(s).**

**1.** $3p + 9$ for $p = 2$

**2.** $4t - 6d$ for $t = 5$ and $d = 2$

**3.** $7k + 11g$ for $k = 6$ and $g = 4$

**4.** $5(1 + y) - 4$ for $y = 6$

## 1-2 Algebraic Expressions

**Write an algebraic expression for each word phrase.**

**5.** 46 more than the product of 9 and $f$

**6.** 3 less than the quotient of $z$ and 12

**Write a word phrase for each algebraic expression.**

**7.** $24 + \frac{68}{w}$

**8.** $17l - 34$

**9.** In football a touchdown is worth 6 points, an extra point is worth 1 point, and a field goal is worth 3 points. Let $t$ represent a touchdown, $e$ represent an extra point, and $f$ represent a field goal. How many points did a football team score if they had 4 touchdowns, 4 extra points, and 2 field goals?

## 1-3 Integers and Absolute Value

**Write the integers in order from least to greatest.**

**10.** 5, −6, 3, −2

**11.** 9, 0, −9, 10

**12.** −1, −11, −3, −7

**Evaluate each expression.**

**13.** $|32 - 15|$

**14.** $|23| - |-17|$

**15.** $|61 + 36|$

**16.** $|-4| - |-10|$

**17.** $|20 - (-3)|$

**18.** $|-8 - 2|$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 1-4 Adding Integers

**Add.**

**19.** $-21 + 12$ **20.** $-13 + 19$ **21.** $11 + (-4)$

**Evaluate each expression for the given value of the variable.**

**22.** $12 + t$ for $t = -8$ **23.** $u + 9$ for $u = -3$ **24** $j + (-6)$ for $j = 17$

**25.** Timothy scored 114 points during his first basketball season. The second basketball season he scored 307 points. How many more points did Timothy score in his second season than his first season?

## 1-5 Subtracting Integers

**Subtract.**

**26.** $-9 - (-6)$ **27.** $-17 - 2$ **28.** $3 - (-11)$

**Evaluate each expression for the given value of the variable.**

**29.** $20 - r$ for $r = -1$ **30.** $-32 - x$ for $x = 17$ **31.** $-23 - q$ for $q = -9$

**32.** On a Wednesday in early March, the temperature rose from $-2°$F to $57°$F. By how many degrees Fahrenheit did the temperature change?

## 1-6 Multiplying and Dividing Integers

**Multiply or divide.**

**33.** $(7)(-5)$ **34.** $\frac{36}{-9}$ **35.** $(-7)(2)(-1)$

**Simplify.**

**36.** $2(-6 - 2)$ **37.** $4(3 - 7)$ **38.** $(-3)(11 - 2)$

**39.** An elevator descends 2 feet every second. Write an integer to represent the position of the elevator. Find an integer to represent the change in the elevator's position after 1.25 minutes.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 1-7 Solving Equations by Adding or Subtracting

**Solve.**

**40.** $t + 21 = 37$

**41.** $45 - h = 28$

**42.** $g - (-9) = 15$

**43.** A group of deep-sea divers ascended 574 feet before their final stop to equalize. They stopped 27 feet below the surface. What depth did they begin their ascension?

## 1-8 Solving Equations by Multiplying or Dividing

**Solve and check.**

**44.** $-7 = \frac{d}{5}$

**45.** $-4c = -28$

**46.** $15 = \frac{90}{v}$

**47.** Betsy collected 132 dolls. Betsy has 3 times as many dolls as Alicia. How many dolls does Alicia's have?

**48.** Marcus scored 6 points in his last game. This is $\frac{1}{4}$ the number of points he usually scores. How many points does Marcus usually score?

## 1-9 Introduction to Inequalities

**Compare. Write $<$ or $>$.**

**49.** $8(-2) \square 15$

**50.** $-14 - (-8) \square -5$

**51.** $7 - 18 \square -12$

**Solve.**

**52.** $k - 13 < 5$

**53.** $6 + z \geq 32$

**54.** $j - 18 > -10$

**55.** The band members need to raise $1,523 for their new uniforms. So far they have raised $978. At least how much money must the band members raise in order to purchase their new uniforms?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 1 in your own words.**

**1.** Explain why $|7| = |-7|$.

**2.** Explain how to add integers when the signs are the same and when the signs are different.

**3.** Explain how to subtract integers.

**4.** Explain how to multiply and divide two integers.

**5.** Explain the difference between an open circle and a solid circle when graphing inequalities.

**For more review of Chapter 1:**

- Complete the Chapter 1 Study Guide and Review on pages 52–54 of your textbook.
- Complete the Ready to Go On quizzes on pages 30 and 48 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 2-1

# Rational Numbers

## Lesson Objectives

Write rational numbers in equivalent forms

## Vocabulary

rational number (p. 64) _____

_____

relatively prime (p. 64) _____

_____

## Additional Examples

### Example 1

**Simplify.**

**A.** $\frac{16}{80}$

$16 = 1 \cdot 16$ ☐ is a common factor.

$80 = 5 \cdot 16$

$\frac{16}{80} = \frac{16 \div \square}{80 \div \square}$ Divide the numerator and denominator by ☐.

$= \square$

**B.** $\frac{-18}{29}$

$18 = 2 \cdot 9$ There are no ☐ factors.

$29 = 1 \cdot 29$

$\frac{-18}{29} = \square$ $-18$ and 29 are ☐ prime.

### Example 2

**Write each decimal as a fraction in simplest form.**

**A.** 5.37

$= \square$ ☐ is in the hundredths place.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**B.** 0.622

$= \frac{\square}{1000}$

2 is in the ☐ place.

$= \square$

Simplify by ☐ by the common factor 2.

## Example 3

**Write each fraction as a decimal.**

**A.** $\frac{11}{9}$

☐

The pattern repeats, so draw a bar over the 2 to indicate that this is a ☐ decimal.

The fraction $\frac{11}{9}$ is equivalent to the decimal ☐.

**B.** $\frac{7}{20}$

☐

This is a ☐ decimal.

The remainder is ☐.

The fraction $\frac{7}{20}$ is equivalent to the decimal ☐.

## Try This

**1. Simplify.**

$\frac{18}{27}$ ☐

**2. Write the decimal as a fraction in simplest form.**

8.75 ☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 2-2

# Comparing and Ordering Rational Numbers

## Lesson Objectives

Compare and order positive and negative rational numbers written as fractions, decimals, and integers

## Vocabulary

least common denominator (LCD) (p. 68) _____

## Additional Examples

**Example 1**

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

**A.** $\frac{5}{6} \square \frac{7}{10}$

**Method 1** Multiply to find the denominator.

$6 \cdot 10 = \square$

Multiply $\square$ and $\square$ to find a common denominator.

$\frac{5}{6} \cdot \frac{\square}{\square} = \frac{5 \cdot 10}{6 \cdot 10} = \frac{\square}{\square}$

Write the fractions with a common denominator.

$\frac{7}{10} \cdot \frac{\square}{\square} = \frac{7 \cdot 6}{10 \cdot 6} = \frac{\square}{\square}$

$\frac{50}{60} \square \frac{42}{60}$, so $\frac{5}{6} \square \frac{7}{10}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**B.** $\frac{2}{3} \square \frac{4}{5}$

**Method 2** Find the least common denominator.

3: 3, 6, 9, 12, 15, . . . 5: 5, 10, 15, . . . List multiples of 3 and 5. The LCM is $\square$.

$\frac{2}{3} \cdot \frac{\square}{\square} = \frac{2 \cdot 5}{3 \cdot 5} = \frac{\square}{\square}$ Write the fractions with a common denominator.

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

$\frac{10}{15} \square \frac{22}{15}$, so $\frac{2}{3} \square \frac{4}{5}$

## Example 2

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

**A.** $5\frac{2}{9} \square 5\frac{2}{7}$

$5\frac{2}{9} = \square$ and $5\frac{2}{7} = \square$ Write the fractions as $\square$.

$5.\overline{2} \square 5.286$, so $5\frac{2}{9} \square 5\frac{2}{7}$

**B.** $-0.44 \square -\frac{2}{5}$

$-\frac{2}{5} = \square$ Write $\square$ as a $\square$.

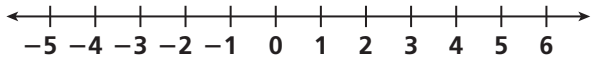
$-0.44 \square -0.4$, so $-0.44 \square -\frac{2}{5}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**The numbers $\frac{14}{4}$, $-3.4$, 6.0, and $-2.5$ represent the percentage of change in populations for four states. List these numbers in order from least to greatest.**

Place the numbers on a number line and read them from left to right




The percent changes in population from least to greatest are $-3.4$, $-2.5$, $\frac{14}{4}$, and 6.0.

## Try This

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

$\frac{1}{3}$ ▢ $\frac{1}{2}$

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

$-0.64$ ▢ $-\frac{6}{10}$

**3. The numbers $-1.2$, $\frac{7}{3}$, and 2.3 represent the percent of change in population for three states. List these numbers in order from least to greatest.**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 2-3

# Adding and Subtracting Rational Numbers

## Lesson Objectives

Add and subtract decimals and rational numbers with like denominators

## Additional Examples

### Example 1

**In August 2001 at the World University Games in Beijing, China, Jimyria Hicks ran the 200-meter dash in 24.08 seconds. Her best time at the U.S. Senior National Meet in June of the same year was 23.35 seconds. How much faster did she run in June?**

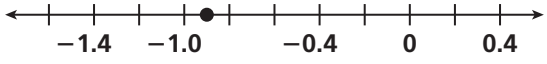
$$\begin{array}{r} 24.08 \\ -23.35 \\ \hline \end{array}$$ Align the decimals.

She ran ____ second faster in June.

### Example 2

**Use a number line to find each sum.**

**A.** $0.3 + (-1.2)$

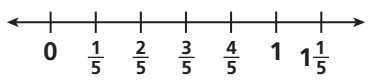



Move right ____ units.

From ____, move left ____ units.

You finish at ____, so $0.3 + (-1.2) =$ ____.

**B.** $\frac{1}{5} + \frac{2}{5}$




Move right ____ units.

From ____, move right ____ units.

You finish at ____, so $\frac{1}{5} + \frac{2}{5} =$ ____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Add or subtract. Write each answer in simplest form.**

**A.** $-\frac{2}{9} - \frac{5}{9}$

$-\frac{2}{9} - \frac{5}{9} = \frac{\square}{9} = \square$

Subtract numerators. Keep the denominator.

**B.** $\frac{6}{7} + \left(-\frac{3}{7}\right)$

$\frac{6}{7} + \left(-\frac{3}{7}\right) = \frac{\square}{7} = \square$

Add numerators. Keep the denominator.

## Example 4

**Evaluate each expression for the given value of the variable.**

**A.** $12.1 - x$ for $x = -0.1$

$12.1 - (\square)$ Substitute $\square$ for $x$.

$\square$

Think: $12.1 - (-0.1) = 12.1 \square 0.1$

**B.** $\frac{7}{10} + m$ for $m = 3\frac{1}{10}$

$\frac{7}{10} + \square$ Substitute $\square$ for $m$.

$\frac{7}{10} + \frac{\square}{10}$ $3\frac{1}{10} = \frac{3(10) + 1}{10}$ $\frac{\square}{10}$

$\frac{\square}{10} = \frac{\square}{10}$ Add numerators. Keep the denominator.

$\square$

## Try This

**1. Tom ran the 100-meter dash in 11.5 seconds last year. This year he improved his time by 0.568 seconds. How fast did Tom run the 100-meter dash this year?**

$\square$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 2-4

# Multiplying Rational Numbers

## Lesson Objectives

Multiply fractions, mixed numbers, and decimals

## Additional Examples

### Example 1

**Multiply. Write each answer in simplest form.**

**A.** $-8\left(\frac{6}{7}\right)$

$= \frac{-8 \cdot 6}{7}$

$=$ ☐ Multiply.

$=$ ☐ Simplify.

**B.** $2\left(5\frac{1}{3}\right)$

$2\left(\frac{\square}{3}\right)$ $\quad 5\frac{1}{3} = \frac{\square}{3} = \frac{\square}{3}$

$\frac{\square}{3}$ Multiply.

$\frac{\square}{3}$ Multiply.

☐ Simplify.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Multiply. Write each answer in simplest form.**

**A.** $\frac{1}{8}\left(\frac{6}{7}\right)$

$= \frac{1(6)}{8(7)}$ Multiply _____.

Multiply _____.

$= \frac{1(6)}{8(7)}$ Look for common _____: 2.

$=$ _____ Simplest form

**B.** $-\frac{2}{3}\left(\frac{9}{2}\right)$

$= \frac{-2(9)}{3(2)}$ Multiply _____.

Multiply _____.

$= \frac{-2(9)}{3(2)}$ Look for common _____: 2, 3.

$= \frac{\text{_____}}{1} =$ _____ Simplest form

## Example 3

**Multiply.**

**A.** $2(-0.51)$

$2 \cdot (-0.51) =$ _____ Product is _____ with 2 decimal places.

**B.** $(-0.4)(-3.75)$

$(-0.4) \cdot (-3.75) =$ _____ Product is _____ with _____ decimal places.

$=$ _____ You can drop the zeros after the 5.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 4

**Joy completes $\frac{1}{20}$ of her painting each day. How much of her painting does she complete in a 7-day week?**

$\frac{1}{20}(7) = \frac{1}{20}\left(\square\right)$ Write as an improper fraction.

$= \frac{\square}{20 \cdot 1}$ Multiply

$= \square$

Joy completes $\square$ of her painting in a 7-day week.

## Try This

**1. Multiply. Write the answer in simplest form.**

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

**2. Multiply. Write the answer in simplest form.**

$\frac{3}{5}\left(\frac{5}{8}\right)$

**3. Multiply.**

3.1(0.28)

**4. Ken completes $\frac{1}{10}$ of his work each day. How much work does he complete in a 5-day week?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 2-5

# Dividing Rational Numbers

## Lesson Objectives

Divide fractions and decimals

## Vocabulary

reciprocal (p. 80) _____

## Additional Examples

### Example 1

**Divide. Write each answer in simplest form.**

**A.** $\frac{5}{11} \div \frac{1}{2}$

$\frac{5}{11} \div \frac{1}{2} = \frac{5}{11} \cdot \square$ Multiply by the _____.

$= \frac{5}{11} \cdot \square$ No common _____

$= \square$ Simplest form

**B.** $2\frac{3}{8} \div 2$

$2\frac{3}{8} \div 2 = \square \div \frac{2}{1}$ Write as an _____ fraction.

$= \frac{19}{8} \square$ Multiply by the _____.

$= \frac{19 \cdot 1}{8 \cdot 2}$ No common _____.

$= \square = \square$ $19 \div 16 = 1$ R $\square$

### Example 2

**Find. $0.384 \div 0.24$.**

$0.384 \div 0.24 = \frac{0.384}{0.24}\left(\frac{100}{100}\right) = \square$

$= \square$ Divide.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Evaluate each expression for the given value of the variable.**

**A.** $\frac{5.25}{n}$ for $n = 0.15$

$\frac{5.25}{0.15} = \frac{5.25}{0.15}\left(\frac{100}{100}\right)$ 0.15 has 2 decimal places, so use ☐.

$= $ ☐ Divide.

$= $ ☐

**B.** $k \div \frac{4}{5}$ for $k = 5$

$5 \div \frac{4}{5} = \frac{5}{1} \cdot$ ☐

$= \frac{5 \cdot 5}{1 \cdot 4} =$ ☐ $=$ ☐

## Example 4

**PROBLEM SOLVING APPLICATION**

**A cookie recipe calls for $\frac{1}{2}$ cup of oats. You have $\frac{3}{4}$ cup of oats. How many batches of cookies can you bake using all of the oats you have?**

**1. Understand the Problem**

The number of batches of cookies you can bake is the number of batches using the oats that you have. List the important information:

- The amount of oats is ☐ cup.
- One batch of cookies calls for ☐ cup of oats.

**2. Make a Plan**

Set up an equation.

| amount of oats you have | ÷ | amount for one batch | = | number of batches |
|---|---|---|---|---|

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**3. Solve**

Let $n$ = number of batches.

$\frac{3}{4} \div \frac{1}{2} = n$

$\frac{3}{4} \cdot \square = n$

$\frac{6}{4}$, or $\square$ batches of the cookies.

**4. Look Back**

One cup of oats would make $\square$ batches so $1\frac{1}{2}$ is a $\square$ answer.

## Try This

**1. Divide. Write the answer in simplest form.**

$4\frac{2}{5} \div 3$

**2. Find. 0.585 ÷ 0.25.**

**3. Evaluate the expression for the given value of the variable.**

$\frac{2.55}{b}$ for $b = 0.75$

**4. A ship will use $\frac{1}{6}$ of its total fuel load for a typical round trip. If there is $\frac{5}{8}$ of a total fuel load on board now, how many complete trips can be made?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 2-6

# Adding and Subtracting with Unlike Denominators

## Lesson Objectives

Add and subtract fractions with unlike denominators

## Additional Examples

### Example 1

**Add or Subtract.**

**Method 1:**

**A.** $\frac{1}{8} + \frac{2}{7}$

Find a common _____:

$8(7) = $ ____.

$= \frac{1}{8}\left(\frac{\square}{\square}\right) + \frac{2}{7}\left(\frac{\square}{\square}\right)$ Multiply by fractions equal to ____.

$= \frac{\square}{\square} + \frac{\square}{\square}$ Rewrite with a common _____.

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

**Method 2:**

**B.** $1\frac{1}{6} - 1\frac{5}{8}$

$= \frac{\square}{\square} - \frac{13}{8}$ Write as an _____ fraction.

Multiples of 6: 6; 12; 24; 30

Multiples of 8: 8; 16; 24; 32

List the _____ of each denominator and find the ____.

$= \frac{7}{6}\frac{\square}{\square} - \frac{13}{8}\frac{\square}{\square}$ Multiply by fractions equal to ____.

$= \frac{\square}{24} - \frac{\square}{24} = -\frac{\square}{24}$ Rewrite with a _____ denominator.

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

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Evaluate $t - \frac{4}{5}$ for $t = \frac{5}{6}$.**

$t - \frac{4}{5}$

$= \square - \frac{4}{5}$ Substitute $\square$ for $t$.

$= \frac{5}{6}\square - \frac{4}{5}\square$ Multiply by fractions equal to $\square$.

$= \frac{\square}{\square} - \frac{\square}{\square}$ Rewrite with a $\square$ denominator: $6(5) = \square$.

$= \square$ Simplify.

## Example 3

**Two dancers are making necklaces from ribbon for their costumes. They need pieces measuring $13\frac{3}{4}$ inches and $12\frac{7}{8}$ inches. How much ribbon will be left over after the pieces are cut from a 36-inch length?**

$13\frac{3}{4} + 12\frac{7}{8}$ Add to find the length of the two pieces.

$= \frac{\square}{4} + \frac{\square}{8}$ Write as improper fractions. The LCD is 8.

$= \frac{\square}{8} + \frac{103}{8}$ Rewrite with common denominators.

$= \frac{\square}{8}$, or $\square$

The length of the two ribbons is $26\frac{5}{8}$ inches. Now find the amount of ribbon left over.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

$36 - 26\frac{5}{8}$ — Subtract the length of the two ribbons from the total length of ribbon.

$= \frac{36}{\square} - \frac{\square}{8}$ — Write as improper fractions. The LCD is 8.

$= \frac{\square}{8} - \frac{213}{8}$ — Rewrite with common denominators.

$= \frac{\square}{8}$, or $\square$

There will be $\square$ inches left.

## Try This

**1. Add.**

$2\frac{1}{6} + \frac{3}{4}$

**2. Evaluate $\frac{5}{9} - h$ for $h = \frac{-7}{12}$.**

**3. Michael wants to run 10 miles in three days. On Monday, he ran $2\frac{3}{4}$ miles. On Tuesday, he ran $3\frac{1}{3}$ miles. How many miles does Michael need to run on Wednesday?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 2-7

# Solving Equations with Rational Numbers

## Lesson Objectives

Solve equations with rational numbers

## Additional Examples

### Example 1

**Solve.**

**A.** $m + 4.6 = 9$

$m + 4.6 = 9$

$-\square = -\square$ Subtract $\square$ from both sides.

$m = \square$

**B.** $8.2p = -32.8$

$\frac{8.2p}{\square} = \frac{-32.8}{\square}$ Divide both sides by $\square$.

$p = \square$

**C.** $\frac{x}{1.2} = 15$

$\square \cdot \frac{x}{1.2} = \square \cdot 15$ Multiply both sides by $\square$.

$x = \square$

### Example 2

**Solve.**

**A.** $n + \frac{2}{7} = -\frac{3}{7}$

$n - \square + \frac{2}{7} = -\frac{3}{7} - \square$ Subtract $\square$ from both sides.

$n = \square$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**B.** $y - \frac{1}{6} = \frac{2}{3}$

$\square + y - \frac{1}{6} = \frac{2}{3} + \square$ Add $\square$ to both sides.

$y = \frac{\square}{6} + \frac{\square}{6}$ Find a common $\square$; 6.

$y = \square$ Simplify.

**C.** $\frac{5}{6}x = \frac{5}{8}$

$\frac{\cancel{6}}{\cancel{5}} \cdot \frac{\cancel{5}}{\cancel{6}}x = \frac{\cancel{3}}{4}\frac{\cancel{8}}{\cancel{3}} \cdot \frac{\cancel{8}^{3}}{\cancel{5}}$ Multiply both sides by $\square$.

$x = \square$ Simplify.

## Example 3

**Mr. Rios wants to prepare a dessert, but only has $2\frac{2}{3}$ tablespoons of sugar. If each serving of the dessert has $\frac{2}{3}$ tablespoon of sugar, how many servings can he make for the party?**

Convert fractions: $2\frac{2}{3} = \frac{3(2) + 2}{3} = \square$

Write an equation:

| *Amount of sugar in one serving* | • | *Total number of servings* | = | *Total amount of sugar* |
|---|---|---|---|---|
| $\frac{2}{3}$ | • | $x$ | = | $\frac{8}{3}$ |

Now solve the equation.

$\frac{2}{3} \cdot x = \frac{8}{3}$

$\frac{2}{3} \cdot \square \cdot x = \frac{8}{3} \cdot \square$ Divide both sides by $\square$. Multiply by the reciprocal, $\square$.

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

Mr. Rios can make $\square$ servings.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 2-8

# Solving Two-Step Equations

## Lesson Objectives

Solve two-step equations

## Additional Examples

### Example 1

**PROBLEM SOLVING APPLICATION**

**The mechanic's bill to repair Mr. Wong's car was $650. The mechanic charges $45 an hour for labor, and the parts that were used cost $443. How many hours did the mechanic work on the car?**

**1. Understand the Problem**

List the important information:

The answer is the number of ____ the mechanic worked on the car.

- The parts cost $____.
- The labor cost $____ per hour.
- The total bill was $____.

Let $h$ represent the hours the mechanic worked.

Total bill = Parts + Labor

____ = ____ + ____$h$

**2. Make a Plan**

Think: First the variable is multiplied by ____, and then ____ is added to the result. Work backward to solve the equation. Undo the operations in reverse order: First subtract ____ from both sides of the equation, and then divide both sides of the new equation by ____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**3. Solve**

$\square = \square + \square h$

$-\square \quad -\square$ Subtract to undo the addition.

$\square = \square h$

$\square = \square$ Divide to undo multiplication.

$\square = h$

The mechanic worked for $\square$ hours on Mr. Wong's car.

**4. Look Back**

If the mechanic worked $\square$ hours, the labor would be $45(4.6) = $207.

The sum of the parts and the labor would be $\$\square + \$\square =$ $\$\square$.

## Example 2

**Solve.**

**A.** $\frac{n}{3} + 7 = 22$

Think: First the variable is $\square$ by 3, and then 7 is $\square$.

To isolate the variable, subtract $\square$, and then multiply by $\square$.

$\frac{n}{3} + 7 = 22$

$-\square \quad -\square$ Subtract to undo addition.

$\frac{n}{3} = \square$

$\square \cdot \frac{n}{3} = \square \cdot 15$ Multiply to undo division.

$n = \square$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

***Check***

$$\frac{n}{3} + 7 = 22$$

$$\frac{\square}{3} + 7 \stackrel{?}{=} 22$$ Substitute $\square$ into the original equation.

$$\square + 7 \stackrel{?}{=} 22 \checkmark$$

**B.** $\frac{y - 4}{3} = 9$

Think: First $\square$ is subtracted from the variable, and then the result is divided by $\square$. To isolate the variable, $\square$ by 3, and then $\square$ 4.

$$\frac{y - 4}{3} = 9$$

$\square \cdot \frac{y - 4}{3} = \square \cdot 9$ Multiply to undo division.

$$y - 4 = \square$$

$+\square \quad +\square$ Add to undo subtraction.

$$y = \square$$

## Try This

**1. Problem Solving Application**

The mechanic's bill to repair your car was $850. The mechanic charges $35 an hour for labor, and the parts that were used cost $275. How many hours did the mechanic work on your car?

**2. Solve.**

$$\frac{n}{4} + 5 = 29$$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 2

# Chapter Review

## 2-1 Rational Numbers

**Simplify.**

**1.** $\frac{13}{26}$ **2.** $\frac{18}{33}$ **3.** $\frac{14}{56}$ **4.** $\frac{16}{30}$

**Write each decimal as a fraction in simplest form.**

**5.** 0.45 **6.** 1.17 **7.** −3.04 **8.** 0.725

## 2-2 Comparing and Ordering Rational Numbers

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

**9.** $\frac{5}{6}$ ■ $\frac{5}{7}$ **10.** $-\frac{21}{15}$ ■ $\frac{14}{11}$ **11.** $\frac{13}{8}$ ■ $\frac{26}{16}$ **12.** 6.5 ■ $6\frac{3}{5}$

**13.** The lengths of four student's pencils in Mr. Roberson's class are 5.75 inches, 5.8 inches, $5\frac{5}{6}$ inches, and 5.83 inches. List these measurements in order from least to greatest.

## 2-3 Adding and Subtracting Rational Numbers

**Evaluate each expression for the given value of the variable.**

**14.** 74.28 − $m$ for $m = 31.72$ **15.** $-\frac{2}{3} + t$ for $t = \frac{7}{3}$ **16.** $\frac{5}{9} + x$ for $x = -3\frac{4}{9}$

**17.** Sammie and Lance both jog home after school every day. On Thursday, they made it home in 0.75 hour. Friday, it took them $\frac{3}{5}$ of an hour. How much longer did it take Sammie and Lance to jog home on Thursday than Friday?

## 2-4 Multiplying Rational Numbers

**Multiply. Write each answer in simplest form.**

**18.** $2\frac{3}{7}(\frac{4}{5})$ **19.** 3.4(6.7) **20.** $-\frac{1}{4}(\frac{5}{6})$ **21.** −7.2(−9.1)

**22.** Kylie needs to cut 6 pieces of yarn that are each $\frac{2}{3}$ foot long. How much yarn does Kylie need?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 2-5 Dividing Rational Numbers

**Divide. Write each answer in simplest form.**

**23.** $\frac{7}{9} \div \frac{2}{3}$ **24.** $-\frac{2}{7} \div \frac{6}{5}$ **25.** $\frac{3}{4} \div -2$

**Evaluate each expression for the given value of the variable.**

**26.** $\frac{8.6}{h}$ for $h = 0.4$ **27.** $\frac{17.8}{p}$ for $p = 2$ **28.** $\frac{59.22}{l}$ for $l = 4.7$

## 2-6 Adding and Subtracting with Unlike Demoninators

**Add or Subtract.**

**29.** $\frac{1}{9} + \frac{4}{5}$ **30.** $\frac{6}{7} - \frac{1}{3}$ **31.** $3\frac{1}{4} + 1\frac{1}{6}$ **32.** $5\frac{5}{8} - 3\frac{1}{2}$

**33.** Sallie needs $4\frac{1}{4}$ cup of milk for a recipe. She has $2\frac{2}{3}$ cups of milk. How much more milk does Sallie need?

## 2-7 Solving Equations with Rational Numbers

**Solve.**

**34.** $-7.1 - y = 3.7$ **35.** $62.3 + g = 80.9$ **36.** $\frac{s}{4.6} = 11.4$ **37.** $w + \frac{6}{11} = \frac{1}{3}$

**38.** Amy watched television for $2\frac{3}{4}$ hours. Charles watched television for $\frac{1}{3}$ of the time Amy did. How long, in minutes, did Charles watch television?

## 2-8 Solving Two-Step Equations

**Solve.**

**39.** $3d + 7.3 = 31$ **40.** $\frac{c - 9}{4} = -6$ **41.** $12 + \frac{v}{2} = 17$ **42.** $\frac{1}{3}u + \frac{3}{4} = \frac{1}{6}$

**43.** Gina bought a magazine subscription. The magazine company charged \$15.75 for the subscription and \$2.15 for each issue. If Gina paid \$45.85, how many issues did she receive?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 2

# Big Ideas

**Answer these question to summarize the important concepts from Chapter 2 in your own words.**

**1.** Explain how to write $-2.54$ as a fraction in simplest terms.

**2.** Explain how to add $\frac{4}{9}$ and $\frac{2}{9}$.

**3.** Explain how to divide rational numbers in fraction form.

**4.** Explain how to solve the equation $x - \frac{1}{5} = \frac{4}{15}$.

**For more review of Chapter 2:**

- Complete the Chapter 2 Study Guide and Review on pages 106–108 of your textbook.
- Complete the Ready to Go On quizzes on pages 90 and 102 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 3-1

# Ordered Pairs

## Lesson Objectives

Write solutions of equations in two variables as ordered pairs

## Vocabulary

ordered pair (p. 118) _____

_____

## Additional Examples

**Example 1**

**Determine whether the ordered pair is a solution of $y = 4x - 1$.**

**A.** (3, 11)

$y = 4x - 1$

$\square \stackrel{?}{=} 4(\square) - 1$ Substitute $\square$ for $x$ and $\square$ for $y$.

$\square \stackrel{?}{=} \square$ ✓ A $\square$ since $11 = 11$.

(3, 11) $\square$ a solution.

**B.** (10, 3)

$y = 4x - 1$

$\square \stackrel{?}{=} 4(\square) - 1$ Substitute 10 for $\square$ and 3 for $\square$.

$\square \stackrel{?}{=} \square$ ✗

(10, 3) $\square$ a solution.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Use the given values to make a table of solutions.**

**A.** $y = x + 3$ for $x = 1, 2, 3, 4$

| $x$ | $x + 3$ | $y$ | $(x, y)$ |
|---|---|---|---|
| 1 | ☐ + 3 | ☐ | |
| 2 | ☐ + 3 | ☐ | |
| 3 | ☐ + 3 | ☐ | |
| 4 | ☐ + 3 | ☐ | |

**B.** $n = 6m - 5$ for $m = 1, 2, 3$

| $m$ | 1 | 2 | 3 |
|---|---|---|---|
| $6m - 5$ | (6)☐ − 5 | (6)☐ − 5 | (6)☐ − 5 |
| $n$ | ☐ | ☐ | ☐ |
| $(m, n)$ | | | |

## Example 3

**A salesman marks up the price of everything he sells by 20%. The equation for the sales price $p$ is $p = 1.2w$, where $w$ is wholesale cost.**

**A.** What will be the sales price of a sweater with a wholesale cost of $48?

$p = 1.2($☐$)$ The price of the sweater before the markup is $☐.

$p =$ ☐ Multiply.

The sales price of the sweater will be ☐, so (☐, ☐) is a solution of the equation.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**A salesman marks up the price of everything he sells by 20%. The equation for the sales price $p$ is $p = 1.2w$, where $w$ is wholesale cost.**

**B.** What will be the sales price of a jacket with a wholesale cost of $85?

$p = 1.2($ ____ $)$ The price of the jacket before the markup is $ ____ .

$p =$ ____ Multiply.

The sales price of the jacket will be ____, so ( ____ , ____ ) is a solution of the equation.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 3-2

# Graphing on a Coordinate Plane

## Lesson Objectives

Graph points and lines on the coordinate plane

## Vocabulary

coordinate plane (p. 122) _____

_____

*x*-axis (p. 122) _____

_____

*y*-axis (p. 122) _____

_____

quadrant (p. 122) _____

_____

*x*-coordinate (p. 122) _____

_____

*y*-coordinate (p. 122) _____

_____

origin (p. 122) _____

_____

graph of an equation (p. 123) _____

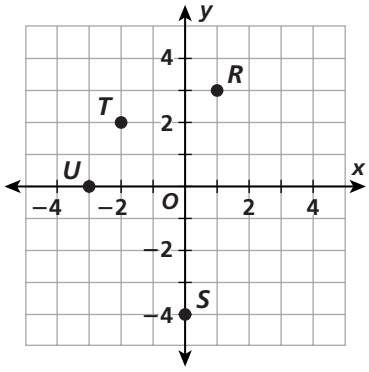
_____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Additional Examples

### Example 1

**Give the coordinates and quadrant of each point.**




Point $R$ is ( , ). Quadrant ____

____ unit right, ____ units up

Point $S$ is ( , ). Quadrant ____

____ units right, ____ units down

Point $T$ is ( , ). Quadrant ____

2 units ____, 2 units ____

Point $U$ is ( , ). Quadrant ____

3 units ____, 0 units ____

### Example 2

**Graph each point on the coordinate plane.**

**A.** (3, 4)

right ____, up ____

**B.** (4, 0)

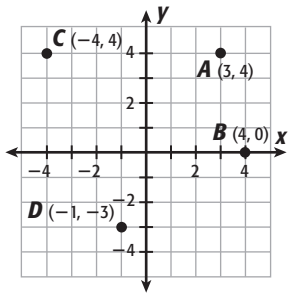
____ 4, ____ 0

**C.** (–4, 4)

____ 4, ____ 4

**D.** (–1, –3)

left ____, down ____

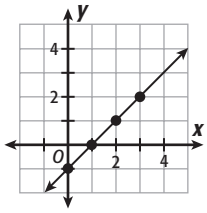



Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

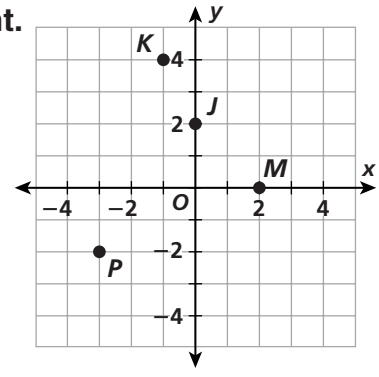
**Complete the table for $y = 2x - 3$. Graph the ordered pairs on a coordinate plane and draw a line through them.**

| $x$ | $2x - 3$ | $y$ | $(x, y)$ |
|---|---|---|---|
| 0 | (2)☐ − 3 | ☐ | ☐ |
| 1 | (2)☐ − 3 | ☐ | ☐ |
| 2 | (2)☐ − 3 | ☐ | ☐ |
| 3 | (2)☐ − 3 | ☐ | ☐ |




## Try This

**1. Give the coordinates and quadrant of each point.**




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 3-3

# Interpreting Graphs and Tables

Know it! Note

## Lesson Objectives

Interpret information given in a graph or table and make a graph to solve problems

## Additional Examples

### Example 1

**The table gives the speeds in mi/h of two cars at given times. Tell which car corresponds to the situation described below.**

| Time | 1:00 | 1:05 | 1:10 | 1:15 | 1:20 |
|---|---|---|---|---|---|
| Car 1 | 50 | 50 | 30 | 25 | 0 |
| Car 2 | 55 | 10 | 0 | 0 | 55 |

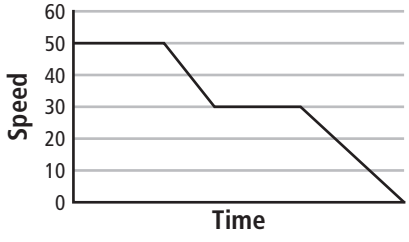
Mr. Lee is traveling on the highway. He pulls over, stops, and then gets back onto the highway.

Car ____—Mr. Lee starts to slow down after ____. After stopping, he gets back onto the highway and resumes his speed of ____ mi/h.

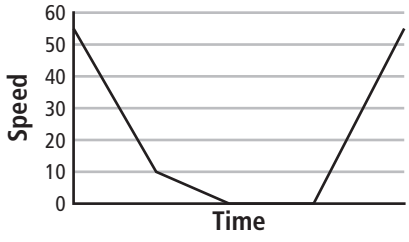
### Example 2

**Tell which graph corresponds to the situation described in Additional Example 1.**

Graph 1




Graph 2



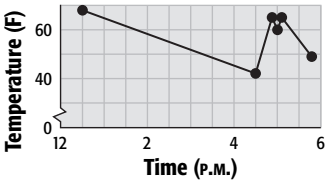

____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Create a graph that illustrates the temperature (°F) inside the car.**

| Location | Arrival | Departure |
|---|---|---|
| Work | 68° at 12:30 | 42° at 4:30 |
| Cleaners | 65° at 4:50 | 60° at 5:00 |
| Market | 65° at 5:10 | 49° at 5:40 |




## Try This

**1. The table gives the speed in mi/h of three runners at the given times. Tell which runner corresponds to the situation described below.**

| Time | 8:00 | 8:10 | 8:20 | 8:30 | 8:40 |
|---|---|---|---|---|---|
| Runner 1 | 6 | 7 | 7 | 7 | 7 |
| Runner 2 | 9 | 6 | 0 | 0 | 0 |
| Runner 3 | 8 | 3 | 8 | 3 | 8 |

Jamie begins the race, and soon feels a pain in a muscle. He is unable to complete the race.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 3-4

# Functions

Know it! Note

## Lesson Objectives

Represent functions with tables, graphs, or equations

## Vocabulary

function (p. 134) _____

input (p. 134) _____

output (p. 134) _____

domain (p. 134) _____

range (p. 134) _____

vertical line test (p. 135) _____

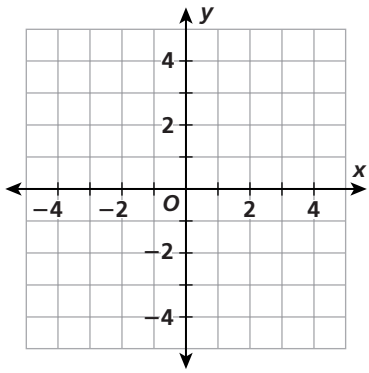
## Additional Examples

**Example 1**

**Make a table and a graph of $y = 3 - x^2$.**

Make a table of inputs and outputs. Use the table to make a graph.

| $x$ | $3 - x^2$ | $y$ |
|---|---|---|
| −2 | | |
| −1 | | |
| 0 | | |
| 1 | | |
| 2 | | |




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

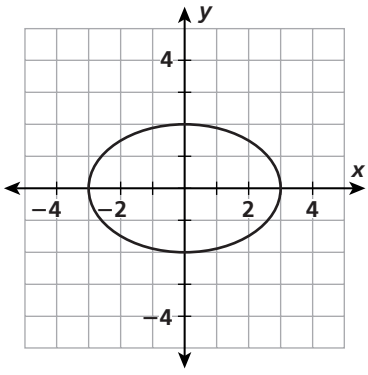
**Determine if each relationship represents a function.**

**A.**

| $x$ | 2 | 3 | 3 | 2 |
|---|---|---|---|---|
| $y$ | 3 | 4 | 5 | 6 |

The input $x = 2$ has _____ outputs, $y =$ _____ and $y =$ _____.
The input $x = 3$ also has more than one output. The relationship is _____.

**B.**

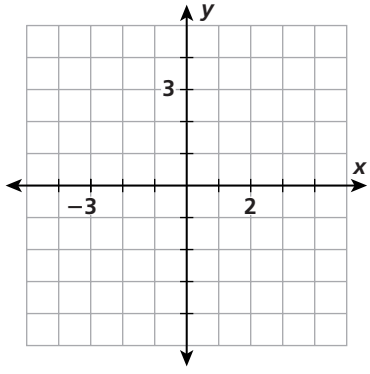



The input $x = 0$ has _____ outputs, $y =$ _____ and $y =$ _____. Other $x$-values also have more than one $y$-value. The relationship is _____.

## Try This

**1. Make a table and a graph of $y = x + 1$.**

| $x$ | $x + 1$ | $y$ |
|---|---|---|
| −1 | | |
| 0 | | |
| 1 | | |
| 2 | | |




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

# Equations, Tables, and Graphs

## Lesson Objectives

Generate different representations of the same data

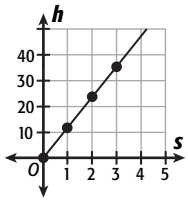
## Additional Examples

### Example 1

**The height *h* of an airplane *s* seconds from take-off is $h = 12s$. Make a table and sketch a graph of the equation.**

| *s* | *h* |
|---|---|
| 0 | 0 |
| 1 | 12 |
| 2 | 24 |
| 3 | 36 |

A _____ identifies values that make the function true.




A _____ is a visual image of the values in the table.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Use the table to make a graph and to write an equation.**

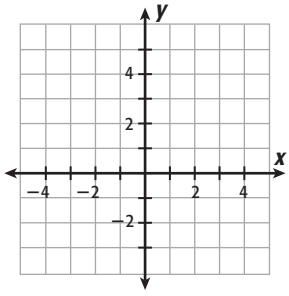
| *x* | *y* |
|---|---|
| 0 | −1 |
| 1 | 0 |
| 2 | 1 |
| 3 | 2 |

Look for a pattern in the values:

$-1 = 0 - 1$
$0 = 1 - 1$
$1 = 2 - 1$
$2 = 3 - 1$

Each value of *y* is _____ less than the value of *x*.

_____




## Example 3

**Use the graph to make a table and to write an equation.**

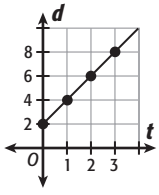
| *t* | *d* |
|---|---|
| 0 | 2 |
| 1 | 4 |
| 2 | 6 |
| 3 | 8 |

Look for a pattern in the values:

$2 = 2(0) + 2$
$4 = 2(1) + 2$
$6 = 2(2) + 2$
$8 = 2(3) + 2$

Each value of *d* is _____ more than _____ the value of *t*.

_____




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 3-6

# Arithmetic Sequences

Know it! Note

## Lesson Objectives

Identify and evaluate arithmetic sequences

## Vocabulary

sequence (p. 142) _____

term (p. 142) _____

arithmetic sequence (p. 142) _____

_____

common difference (p. 142) _____

_____

## Additional Examples

### Example 1

**Find the common difference in each arithmetic sequence.**

**A.** 11, 9, 7, 5, . . .

11, 9, 7, 5, . . . The terms _____ by ____.

The common difference is ____.

### Example 2

**Find the next three terms in the arithmetic sequence −8, −3, 2, 7, . . .**

Each term is ____ more than the previous term.

7 + 5 = ____

12 + 5 = ____ Use the common difference to find the next three terms.

17 + 5 = ____

The next three terms are: ____, ____, ____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Find a function that describes each arithmetic sequence.**

**A.** 6, 12, 18, 24, . . .

Use *y* to identify each term and *n* to identify each term's position.

| *n* | *n* • ☐ | *y* |
|---|---|---|
| 1 | 1 • ☐ | 6 |
| 2 | 2 • ☐ | 12 |
| 3 | 3 • ☐ | 18 |
| 4 | 4 • ☐ | 24 |
| *n* | *n* • ☐ | ☐ |

Multiply *n* by ☐. ☐

## Example 4

**A DVD costs $3.95 to rent, plus $0.45 for each day it is returned late. Find a function that describes the arithmetic sequence, and then find the total cost of renting the DVD and returning it 9 days late.**

| *n* | 3.95 + 0.45*n* | *y* |
|---|---|---|
| 1 | 3.95 + 0.45(1) | 4.40 |
| 2 | 3.95 + 0.45(2) | 4.85 |
| 3 | 3.95 + 0.45(3) | 5.30 |
| 4 | 3.95 + 0.45(4) | 5.75 |
| *n* | 3.95 + 0.45(*n*) | 0.45*n* + 3.95 |

☐ Write a function to find the ☐ term.

0.45(☐) + 3.95 Substitute ☐ for *n*.

☐ + 3.95 Multiply.

☐ Add.

It will cost ☐ to rent the DVD and return it 9 days late.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

# Chapter Review

## 3-1 Ordered Pairs

**Use the given values to make a table of solutions.**

**1.** $y = 3x - 1$ for $x = 1, 2, 3, 4$

**2.** $y = 4x + 3$ for $x = -4, -3, -2, -1$

**3.** Matthew's weekly salary is $250 plus $8 commission for each newspaper subscription he sells. The equation $e = 250 + 8n$ gives his total earnings $e$ for the week, where $n$ is the number of newspaper subscriptions he sold that week. How much will Matthew earn for a week when he sells 30 newspaper subscriptions?

## 3-2 Graphing on a Coordinate Plane

**Graph each point on a coordinate plane.**

**4.** $A(0.3, 2.5)$

**5.** $B(-3.7, -2\frac{1}{3})$

**6.** $C(4, -3\frac{1}{2})$

**7.** $D(-4, -6)$

**8.** An infant's heart beats 120 beats per minute. To find the number of heart beats in $m$ minutes, use the equation $b = 120m$. How many times does an infant's heart beat in 30 minutes?

## 3-3 Interpreting Graphs and Tables

**9.** The table gives the speeds in mi/h of three students who are on a bicycling trip. Tell which rider corresponds to each situation.

| Time | 9:00 | 9:30 | 10:00 | 10:30 | 11:00 | 11:30 | 12:00 |
|---|---|---|---|---|---|---|---|
| Rider A | 0 | 6 | 8 | 10 | 0 | 0 | 8 |
| Rider B | 7 | 8 | 0 | 0 | 0 | 12 | 14 |
| Rider C | 15 | 15 | 14 | 15 | 12 | 10 | 8 |

**a.** Michelle started off slowly, and decided to stop at a museum. She then picked up the pace to make up for the time she lost.

**b.** Brandon got a late start. He gradually increased his speed after he stopped to rest for lunch.

**c.** Carly started quickly. She gradually slowed down.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

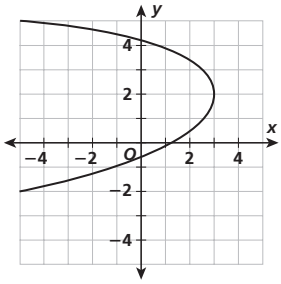
## 3-4 Functions

**Determine if each relationship is a function.**

**10.**

| $x$ | $y$ |
|---|---|
| 1 | 11 |
| 1 | 27 |
| 9 | 43 |
| 16 | 71 |

**11.**




**12.** $y = -5x^2 + 7$

## 3-5 Equations, Tables, and Graphs

**13.** Donations for a walk-a-thon are \$25 plus \$3.50 per mile walked. Let $n$ equal the number of miles walked and $d$ equal the total donation amount. Write an equation and make a table.

**14.** The amount of water being used to irrigate a cornfield is represented by the equation $g = 22m$, where $g$ is the number of gallons of water that are used and $m$ is the number of minutes since the irrigation began. Make a table and sketch a graph of the equation.

## 3-6 Arithmetic Sequences

**Find a function that describes each arithmetic sequence. Use $y$ to identify each term in the sequence and $n$ to identify each term's position.**

**15.** 6, 12, 18, 24, . . .

**16.** 2, 5, 8, 11, . . .

**17.** −4, −3, −2, −1, . . .

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 3 in your own words.**

**1.** Explain why (4, 37) is a solution to the function $y = 3x + 25$.

**2.** Explain how to graph the ordered pair $(-5, 2.5)$. Give the quadrant of the point.

**3.** Explain how to tell if a relationship is a function using the vertical line test.

**4.** Explain how to write an equation from data in a table.

**5.** Explain why 145, 126, 107, 88, . . . is an arithmetic sequence. Find the next three terms.

**For more review of Chapter 3:**

- Complete the Chapter 3 Study Guide and Review on pages 150–152 of your textbook.
- Complete the Ready to Go On quizzes on pages 132 and 146 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 4-1

# Exponents

## Lesson Objectives

Evaluate expressions with exponents

## Vocabulary

power (p. 162) _____

_____

exponential form (p. 162) _____

_____

exponent (p. 162) _____

_____

base (p. 162) _____

_____

## Additional Examples

### Example 1

**Write in exponential form.**

**A.** $4 \cdot 4 \cdot 4 \cdot 4$

$4 \cdot 4 \cdot 4 \cdot 4 =$ ☐ Identify how many times ☐ is a factor.

**B.** $(-6) \cdot (-6) \cdot (-6)$

$(-6) \cdot (-6) \cdot (-6) =$ ☐ Identify how many times $(-6)$ is used as a ☐.

### Example 2

**Evaluate.**

**A.** $3^5$

$3^5 =$ ☐ Find the product of ☐ 3's.

$=$ ☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**B.** $(-3)^5$

$(-3)^5 =$ ____ Find the product of ____ $-3$'s.

$=$ ____

## Example 3

**Evaluate $x(y^x - z^y) + x^y$ for $x = 4$, $y = 2$, and $z = 3$.**

$x(y^x - z^y) + x^y$

$4(2^4 - 3^2) + 4^2$ Substitute ____ for $x$, ____ for $y$, and ____ for $z$.

$= 4($____ $-$ ____ $) +$ ____ Evaluate the ____.

$= 4($____ $) + 16$ ____ inside the parentheses.

$=$ ____ $+ 16$ ____ from left to right.

$=$ ____ ____ from left to right.

## Example 4

**The number of diagonals of an $n$-sided figure is $\frac{1}{2}(n^2 - 3n)$. Use the formula to find the number of diagonals for a 7-sided figure.**

$\frac{1}{2}(n^2 - 3n)$

$\frac{1}{2}(7^2 - 3 \cdot 7)$ Substitute the number of sides for $n$.

$\frac{1}{2}($____ $-$ ____ $)$ Simplify inside the ____.

$\frac{1}{2}($____ $)$ ____ inside the parentheses.

____ ____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 4-2

# Look for a Pattern in Integer Exponents

## Lesson Objectives

Evaluate expressions with negative exponents and evaluate the zero exponent

## Additional Examples

### Example 1

**Evaluate the powers of 10.**

**A.** $10^{-2}$

$10^{-2} = \frac{1}{10 \cdot 10}$

$10^{-2} =$ ☐ $=$ ☐

**B.** $10^{-1}$

$10^{-1} = \frac{1}{10}$

$10^{-1} =$ ☐ $=$ ☐

### Example 2

**A.** Evaluate $5^{-3}$

$\frac{1}{5^3}$ Write the ☐; change the ☐ of the exponent.

$\frac{1}{5} \cdot \frac{1}{5} \cdot \frac{1}{5}$ Find the product of ☐ $\frac{1}{5}$'s.

☐

**B.** $(-10)^{-3}$

$= \left(\frac{1}{-10}\right)^3$ Write the ☐; change the ☐ of the exponent.

$= \frac{1}{-10} \cdot \frac{1}{-10} \cdot \frac{1}{-10}$ Find the product of three ☐'s.

$=$ ☐ $= -0.001$ Simplify.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Evaluate $5 - (6 - 4)^{-3} + (-2)^0$.**

$5 - (6 - 4)^{-3} + (-2)^0$

$= 5 - (\square)^{-3} + (-2)^0$ Subtract inside the $\square$.

$= 5 - (\square) + 1$ Evaluate the $\square$.

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

## Try This

**1. Evaluate the power of 10.**

$10^{-8}$

**2. Evaluate $(-4)^{-6}$.**

**3. Evaluate $10 + (5 + 3)^{-2} + 5^0$.**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 4-3

# Properties of Exponents

## Lesson Objectives

Apply the properties of exponents

## Additional Examples

### Example 1

**Multiply. Write the product as one power.**

**A.** $6^6 \cdot 6^3$

[ ] [ ] exponents.

[ ]

**B.** $n^5 \cdot n^7$

[ ] [ ] exponents.

[ ]

**C.** $2^5 \cdot 2$

[ ] [ ] exponents.

[ ]

**D.** $24^4 \cdot 24^4$

[ ] [ ] exponents.

[ ]

### Example 2

**Divide. Write the quotient as one power.**

**A.** $\frac{7^5}{7^3}$

[ ] [ ] exponents.

[ ]

**B.** $\frac{x^{10}}{x^9}$

[ ] Subtract [ ].

[ ] Think: $x^1 =$ [ ]

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Simplify.**

**A.** $(5^4)^2$

exponents.

**B.** $(6^7)^9$

exponents.

**C.** $\left(\left(\frac{2}{3}\right)^{12}\right)^{-3}$

exponents.

**D.** $(17^2)^{-20}$

exponents.

## Try This

**1. Multiply. Write the product as one power.**

$4^2 \cdot 4^4$

**2. Divide. Write the quotient as one power.**

$\frac{9^9}{9^2}$

**3. Simplify.**

$(5^{-2})^{-3}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 4-4

# Scientific Notation

## Lesson Objectives

Express large and small numbers in scientific notation and compare two numbers written in scientific notation

## Vocabulary

scientific notation (p. 174) _____

_____

## Additional Examples

**Example 1**

**Write each number in standard notation.**

**A.** $1.35 \times 10^5$

$1.35 \times 10^5$

$1.35 \times$ ☐ $10^5 =$ ☐

☐ Think: Move the decimal right ☐ places.

**B.** $2.7 \times 10^{-3}$

$2.7 \times 10^{-3}$

$2.7 \times$ ☐ $10^{-3} =$ ☐

$2.7$ ☐ $1000$ ☐ by the reciprocal.

☐ Think: Move the decimal ☐ 3 places.

**C.** $-2.01 \times 10^4$

$-2.01 \times 10^4$

$-2.01 \times$ ☐ $10^4 =$ ☐

☐ Think: Move the decimal right ☐ places.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Write 0.00709 in scientific notation.**

0.00709

[ ] Move the decimal to get a number between [ ] and [ ].

7.09 × 10 Set up [ ] notation.

Think: The decimal needs to move left to change 7.09 to 0.00709, so the exponent will be [ ].

Think: The decimal needs to move [ ] places.

So 0.00709 written in scientific notation is [ ] × [ ].

**Check** [ ] × [ ] = 7.09 × 0.001 = 0.00709

## Example 3

**A pencil is 18.7 cm long. If you were to lay 10,000 pencils end-to-end, how many millimeters long would they be? Write the answer in scientific notation.**

1 cm = [ ] mm

18.7 cm = [ ] mm Multiply each side by [ ].

187 mm × 10,000 Find the total length.

[ ] [ ].

[ ] Set up scientific notation.

Think: The decimal needs to move [ ] to change 1.87 to 1,870,000, so the exponent will be [ ].

Think: The decimal needs to move [ ] places.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 4-5

# Squares and Square Roots

## Lesson Objectives

Find square roots

## Vocabulary

principal square root (p. 182) _____

_____

perfect square (p. 182) _____

_____

## Additional Examples

**Example 1**

**Find the two square roots of each number.**

**A.** 49

$\sqrt{49} =$ ☐ ☐ is a square root, since $7 \cdot 7 =$ ☐.

$-\sqrt{49} =$ ☐ ☐ is also a square root, since $-7 \cdot (-7) =$ ☐.

**B.** 100

$\sqrt{100} =$ ☐ ☐ is a square root, since $10 \cdot 10 =$ ☐.

$-\sqrt{100} =$ ☐ ☐ is also a square root, since $-10 \cdot (-10) =$ ☐.

**C.** 225

$\sqrt{225} =$ ☐ ☐ is a square root, since $15 \cdot 15 =$ ☐.

$-\sqrt{225} =$ ☐ ☐ is also a square root, since $-15 \cdot (-15) =$ ☐.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A square window has an area of 169 square inches. How wide is the window?**

Find the square root of ____ to find the length of the window. Use the ____ square root; a negative square root has no meaning.

____ $= 169$

So $\sqrt{169} =$ ____.

The window is ____ inches wide.

## Example 3

**Evaluate each expression.**

**A.** $3\sqrt{36} + 7$

$3\sqrt{36} + 7 = 3(\square) + 7$ Evaluate the ____ root.

$= \square + 7$ Multiply.

$=$ ____ Add.

**B.** $\sqrt{\frac{25}{16}} + \frac{3}{4}$

$\frac{\sqrt{25}}{\sqrt{16}} + \frac{3}{4}$ Rewrite $\sqrt{\frac{25}{10}}$ as $\frac{\sqrt{25}}{\sqrt{16}}$.

$= \square + \frac{3}{4}$ Evaluate the ____ roots.

$=$ ____ Add.

## Try This

**1. Find the two square roots of the number.**

144

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 4-6

# Estimating Square Roots

## Lesson Objectives

Estimate square roots to a given number of decimal places and solve problems using square roots

## Additional Examples

### Example 1

**Each square root is between two integers. Name the integers.**

**A.** $\sqrt{55}$

Think: What are ☐ squares close to 55?

$7^2 =$ ☐ $\quad 49 < 55$

$8^2 =$ ☐ $\quad 64 > 55$

$\sqrt{55}$ is between ☐ and ☐. ☐ $< \sqrt{55} <$ ☐

**B.** $-\sqrt{90}$

Think: What are perfect ☐ close to 90?

$(-9)^2 =$ ☐ $\quad 81 < 90$

$(-10)^2 =$ ☐ $\quad 100 > 90$

$-\sqrt{90}$ is between ☐ and ☐. ☐ $< -\sqrt{90} <$ ☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

### PROBLEM SOLVING APPLICATION

**You want to sew a fringe on a square tablecloth with an area of 500 square inches. Calculate the length of each side of the tablecloth and the length of fringe you will need to the nearest tenth of an inch.**

1. **Understand the Problem**
   First find the length of a side. Then you can use the length of a side to find the _____, the length of fringe around the tablecloth.

2. **Make a Plan**
   The length of a side, in inches, is the number that you multiply by itself to get _____. To be accurate, find this number to the nearest tenth. If you do not know a step-by-step method for finding $\sqrt{500}$, use guess and check.

3. **Solve**
   Because 500 is between $22^2$ and $23^2$, the square root of 500 is between _____ and _____.

| Guess 22.5 | Guess 22.2 | Guess 22.4 | Guess 22.3 |
|---|---|---|---|
| $22.5^2 = 506.25$ | $22.2^2 = 492.84$ | $22.4^2 = 501.76$ | $22.3^2 = 497.29$ |
| Too high | Too low | Too high | Too low |
| Square root is between 22 and 22.5 | Square root is between 22.2 and 22.5 | Square root is between 22.2 and 22.4 | Square root is between 22.3 and 22.4 |

The square root is between 22.3 and 22.4. To round to the nearest tenth, look at the next decimal place. Consider 22.35.

$22.35^2 =$ _____ Too _____

The square root must be greater than 22.35, so round up.

To the nearest tenth, $\sqrt{500}$ is about _____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

The length of each side of the tablecloth is about ____ in.

The length of a side of the tablecloth is ____ inches, to the nearest tenth of an inch. Now estimate the length around the tablecloth.

____ • 22.4 = ____ Perimeter = 4 • side

You will need about ____ inches of fringe.

**4. Look Back**

The length 90 inches divided by 4 is ____ inches. A 22.5-inch square has an area of ____ square inches, which is close to 500, so the answers are reasonable.

## Example 3

**Use a calculator to find $\sqrt{600}$. Round to the nearest tenth.**

Using a calculator, $\sqrt{600} \approx$ ____ . . . Rounded, $\sqrt{600}$ is ____.

## Try This

**The square root is between two integers. Name the integers.**

**1. $\sqrt{80}$**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 4-7

# The Real Numbers

## Lesson Objectives

Determine if a number is rational or irrational

## Vocabulary

irrational number (p. 191) _____

real number (p. 191) _____

Density Property (p. 192) _____

## Additional Examples

**Example 1**

**Write all names that apply to each number.**

**A.** $\sqrt{5}$ 5 is a _____ number that is not a perfect _____.

**B.** $-12.75$ $-12.75$ is a _____ decimal.

**C.** $\frac{\sqrt{16}}{2}$ $\frac{\sqrt{16}}{2} = \frac{4}{2} = 2$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**State if the number is rational, irrational, or not a real number.**

**A.** $\sqrt{15}$

15 is a ____ number that is not a perfect ____.

____

**B.** $\frac{0}{3}$ $\frac{0}{3} =$ ____

____

**C.** $\sqrt{-4}$

____

**D.** $\sqrt{\frac{4}{9}}$ $\left(\frac{2}{3}\right)\left(\frac{2}{3}\right) = \frac{4}{9}$

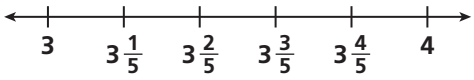
____

## Example 3

**Find a real number between $3\frac{2}{5}$ and $3\frac{3}{5}$.**

There are many solutions. One solution is halfway between the two numbers. To find it, add the numbers and divide by 2.

$(3\frac{2}{5} + 3\frac{3}{5}) \div 2 =$ ____ $\frac{\text{____}}{5} \div 2 =$ ____ $\div 2 =$ ____.




A real number between $3\frac{2}{5}$ and $3\frac{3}{5}$ is ____.

## Try This

**1. Write all names that apply to the number.**

$\sqrt{9}$

____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 4-8

# The Pythagorean Theorem

## Lesson Objectives

Use the Pythagorean Theorem to solve problems

## Vocabulary

Pythagorean Theorem (p. 196) _____

_____

legs (p. 196) _____

_____

hypotenuse (p. 196) _____

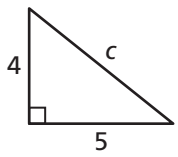
_____

## Additional Examples

### Example 1

**Find the length of each hypotenuse.**

**A.**




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

$\square^2 + \square^2 = c^2$ Substitute for $a$ and $b$.

$\square + \square = c^2$ Simplify powers.

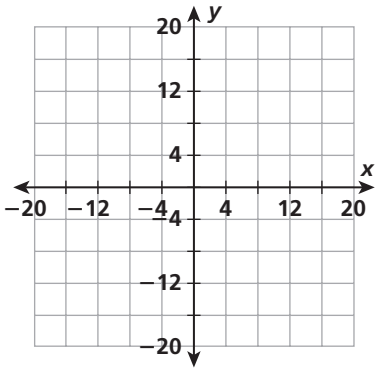
$\square = c^2$

$\square = c$ Solve for $c$; $c = \sqrt{c^2}$.

$\square \approx c$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**B. triangle with coordinates (1, −2), (1, 7), (13, −2)**




The points form a right triangle with $a = 9$ and $b = 12$.

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

$\square^2 + \square^2 = c^2$ Substitute for $a$ and $b$.

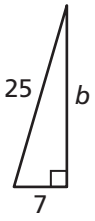
$\square + \square = c^2$ Simplify $\square$.

$\square = c^2$ $\square$.

$\square = c$ Find the $\square$ square root.

## Example 2

**Solve for the unknown side in the right triangle.**




$a^2 + b^2 = c^2$ $\square$ Theorem

$\square^2 + b^2 = \square$ Substitute for $a$ and $c$.

$\square + b^2 = \square$ Simplify powers.

$-\ \square$ $-\ \square$

$b^2 = \square$

$b = \square$ $\sqrt{576} = 24$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Two airplanes leave the same airport at the same time. The first plane flies to a landing strip 350 miles south, while the other plane flies to an airport 725 miles west. How far apart are the two planes after they land?**

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

$\square^2 + \square^2 = c^2$ Substitute for $a$ and $b$.

$\square + \square = c^2$ Simplify $\square$.

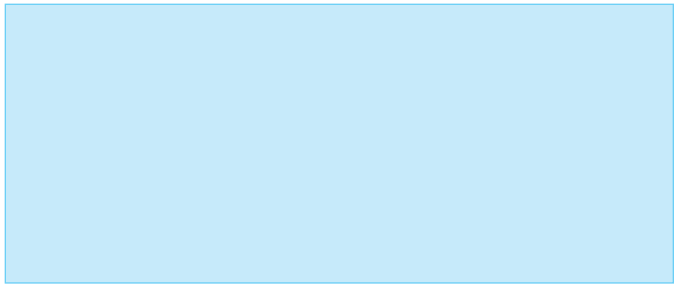
$\square = c^2$ $\square$.

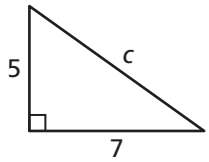
$\square \approx c$ Find the $\square$ square root.

The planes are about 805 miles apart after they land.

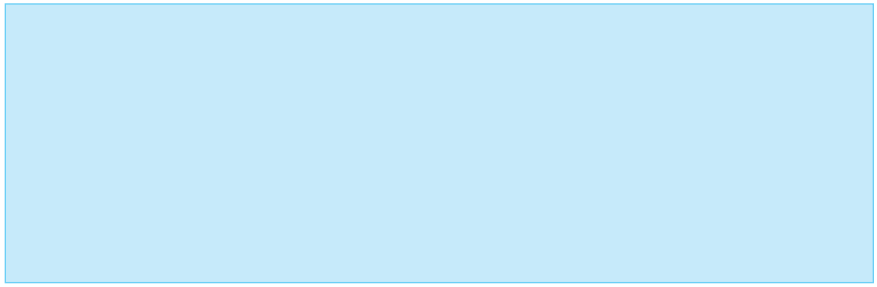
## Try This

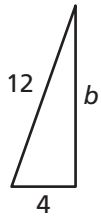
**1. Find the length of the hypotenuse.**






**2. Solve for the unknown side in the right triangle.**






Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 4

# Chapter Review

## 4-1 Exponents

**Evaluate.**

**1.** $4^3$ **2.** $2^5$ **3.** $(-6)^4$ **4.** $-7^3$

**Write in exponential form.**

**5.** 10 **6.** $9 \cdot 9 \cdot 9 \cdot q \cdot q$ **7.** $-26 \cdot -26 \cdot -26$ **8.** $5c \cdot 5c \cdot 5c \cdot 5c$

## 4-2 Look for a Pattern in Integer Exponents

**Evaluate the powers of 10.**

**9.** $10^{-4}$ **10.** $10^0$ **11.** $10^{-5}$ **12.** $10^{-3}$

**Evaluate.**

**13.** $(-2)^{-4}$ **14.** $-3^{-2}$ **15.** $4^{-5}$ **16.** $10 - 5^0 + (4 + 1)^{-2} - (2 - 1)^{-1}$

## 4-3 Properties of Exponents

**Multiply. Write the product as one power.**

**17.** $6^2 \cdot 6^5$ **18.** $y^{10} \cdot y^{10}$ **19.** $8^1 \cdot 8^0$ **20.** $a^4 \cdot a^{-3}$

**Divide. Write the quotient as one power.**

**21.** $\frac{3^5}{3^3}$ **22.** $\frac{p^{11}}{p^6}$ **23.** $\frac{r^7}{r^{-14}}$ **24.** $\frac{c^{-5}}{c^{-2}}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 4-4 Scientific Notation

**Write each number in standard notation.**

**25.** $4.6 \times 10^{8}$

**26.** $-2.3 \times 10^{-3}$

**27.** $5.55 \times 10^{10}$

**Write each number in scientific notation.**

**28.** 7,456,000,000

**29.** −3,000,000,000,000

**30.** 0.000000204

**31.** The distance from Earth to Mars is 7,839,000 km. A satellite traveled from Earth to Mars 100 times. How many km did the satellite travel? Write your answer in scientific notation.

## 4-5 Squares and Square Roots

**Find the two square roots of each number.**

**32.** 36

**33.** 625

**34.** 900

**35.** 289

**Evaluate each expression.**

**36.** $\sqrt{49} - 10$

**37.** $\sqrt{\frac{64}{16}}$

**38.** $\sqrt{49} \cdot \sqrt{4}$

## 4-6 Estimating Square Roots

**Each square root is between two integers. Name the integers.**

**39.** $\sqrt{5}$

**40.** $-\sqrt{43}$

**41.** $\sqrt{1{,}000}$

**42.** $\sqrt{75}$

**Use a calculator to find each value. Round to the nearest tenth.**

**43.** $\sqrt{63}$

**44.** $\sqrt{105}$

**45.** $\sqrt{28.7}$

**46.** $\sqrt{56}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 4-7 The Real Numbers

**Write all names that apply to each number.**

**47.** $\sqrt{81}$

**48.** $\sqrt{11}$

**49.** 3.75

**50.** $-4$

**State if the number is rational, irrational, or not a real number.**

**51.** $\sqrt{36}$

**52.** $\sqrt{\frac{16}{25}}$

**53.** $\frac{5}{0}$

**54.** $\sqrt{13}$

**Find a real number between each pair of numbers.**

**55.** $6\frac{1}{4}$ and $6\frac{1}{2}$

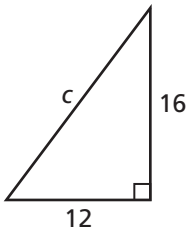
**56.** 2.87 and $\frac{32}{11}$

**57.** $\frac{2}{5}$ and $\frac{2}{3}$

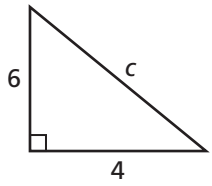
## 4-8 The Pythagorean Theorem

**Find the length of each hypotenuse to the nearest tenth.**

**58.**

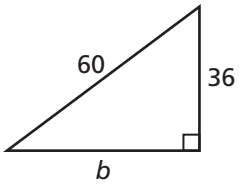



**59.**

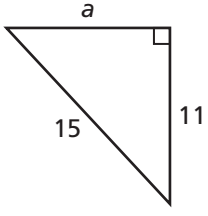



**Solve for the unknown side of each right triangle to the nearest tenth.**

**60.**




**61.**




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 4 in your own words.**

**1.** Explain how to evaluate $3^6$.

**2.** Explain the difference between $3.56 \times 10^8$ and $3.56 \times 10^{-8}$.

**3.** Explain why $\sqrt{81} = \pm 9$.

**4.** Explain $\sqrt{-25} \neq \pm 5$.

**5.** Explain how to estimate $\sqrt{60}$.

**6.** Explain why $0.\overline{3}$ is a rational number.

**For more review of Chapter 4:**

- Complete the Chapter 4 Study Guide and Review on pages 204–206 of your textbook.
- Complete the Ready to Go On quizzes on pages 180 and 200 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 5-1

# Ratios and Proportions

## Lesson Objectives

Find equivalent ratios to create proportions

## Vocabulary

ratio (p. 216) _____

equivalent ratios (p. 216) _____

proportion (p. 216) _____

## Additional Examples

### Example 1

**Find two ratios that are equivalent to each given ratio.**

**A.** $\frac{9}{27}$

$\frac{9}{27} = \frac{9 \cdot 2}{27 \cdot 2} =$ ☐

$\frac{9}{27} = \frac{9 \div 9}{27 \div 9} =$ ☐

Multiply or divide the ☐ and ☐ by the same nonzero number.

Two ratios equivalent to $\frac{9}{27}$ are ☐ and ☐.

### Example 2

**Simplify to tell whether the ratios form a proportion.**

**A.** $\frac{3}{27}$ and $\frac{2}{18}$

$\frac{3}{27} = \frac{3 \div \square}{27 \div \square} =$ ☐

$\frac{2}{18} = \frac{2 \div \square}{18 \div \square} =$ ☐

Since ☐ = ☐, the ratios ☐ in proportion.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**At 4°C, four cubic feet of silver has the same mass as 42 cubic feet of water. At 4°C, would 210 cubic feet of water have the same mass as 20 cubic feet of silver?**

$\frac{4}{42} \stackrel{?}{=} \frac{20}{210}$

$\frac{4}{42} = \frac{4 \div \square}{42 \div \square} = \square$ Divide.

$\frac{20}{210} = \frac{20 \div \square}{210 \div \square} = \square$ Divide.

Since $\square = \square$, the masses of silver and water $\square$ in proportion.

## Try This

**1. Find two ratios that are equivalent to the given ratio.**

$\frac{8}{16}$

**2. Simplify to tell whether the ratios form a proportion.**

$\frac{14}{49}$ and $\frac{16}{36}$

**3. For every fifty dollars Janice earns, she gives $5 to charity. For every $20 Brenda earns, she gives $4 to charity. Do the girls give the same proportion of their earned money to charity?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 5-2

# Ratios, Rates, and Unit Rates

## Lesson Objectives

Work with rates and ratios

## Vocabulary

rate (p. 220) _____

_____

unit rate (p. 220) _____

_____

unit price (p. 221) _____

_____

## Additional Examples

**Example 1**

**Geoff can type 30 words in half a minute. How many words can he type in 1 minute?**

$\frac{\square \text{ words}}{\square \text{ minute}}$ Write the rate.

$\frac{\square \text{ words} \cdot 2}{\square \text{ minute} \cdot 2} = \frac{\square \text{ words}}{\square \text{ minute}}$ Multiply to find words per minute.

Geoff can type ☐ words in one minute.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A.** Five cubic meters of copper has a mass of 44,800 kilograms. What is the density of copper?

$\frac{\square\ \text{kg}}{\square\ \text{m}^3}$ Write the rate.

$\frac{\square\ \text{kg} \div 5}{\square\ \text{m}^3 \div 5}$ Divide to find kilograms per 1 $\text{m}^3$.

$\frac{\square\ \text{kg}}{\square\ \text{m}^3}$

Copper has a density of $\square$ $\text{kg/m}^3$.

**B.** A piece of gold with a volume of 0.5 cubic meters weighs 9650 kilograms. What is the density of gold?

$\frac{\square\ \text{kg}}{\square\ \text{m}^3}$ Write the rate.

$\frac{\square\ \text{kg} \cdot 2}{\square\ \text{m}^3 \cdot 2}$ Multiply to find kilograms per 1 $\text{m}^3$.

$\frac{\square\ \text{kg}}{\square\ \text{m}^3}$

Gold has a density of $\square$ $\text{kg/m}^3$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Estimate each unit rate.**

**A.** 468 students to 91 computers

$\frac{468 \text{ students}}{91 \text{ computers}} \approx \frac{\square \text{ students}}{\square \text{ computers}}$ Choose a number close to 468 that is divisible by 91.

$\approx \frac{\square \text{ students}}{\square \text{ computer}}$ Divide to find students per computer.

468 students to 91 computers is approximately $\square$ students per computer.

**B.** 313 feet in 8 seconds

$\frac{313 \text{ feet}}{8 \text{ seconds}} \approx \frac{\square \text{ feet}}{\square \text{ seconds}}$ Choose a number close to 313 that is divisible by 8.

$\approx \frac{\square \text{ feet}}{\square \text{ second}}$ Divide to find feet per second.

313 feet in 8 seconds is approximately $\square$ feet per second.

## Example 4

**A.** Pens can be purchased in a 5-pack for \$1.95 or a 15-pack for \$6.20. Which is the better buy?

$\frac{\text{price for package}}{\text{number of pens}} = \frac{\$\square}{\square \text{ pens}} = \square$ per pen Divide the price by the number of pens.

$\frac{\text{price for package}}{\text{number of pens}} = \frac{\$\square}{\square \text{ pens}} \approx \square$ per pen

The better buy is the package of $\square$ for $\square$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 5-3

# Dimensional Analysis

## Lesson Objectives

Use one or more conversion factors to solve rate problems

## Vocabulary

conversion factor (p. 224) _____

## Additional Examples

**Example 1**

**Find the appropriate factor for each conversion.**

**A.** feet to yards

There are ☐ feet in 1 yard. To convert feet to yards, multiply the number of feet by $\frac{\square\ \text{yd}}{\square\ \text{ft}}$.

**B.** pounds to ounces

There are ☐ ounces in 1 pound. To convert pounds to ounces, multiply the number of pounds by $\frac{\square\ \text{oz}}{\square\ \text{lb}}$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**The average American uses 580 pounds of paper per year. Find the number of pounds of paper the average American uses per month, to the nearest tenth.**

The problem gives the ratio 580 pounds to 1 year and asks for an answer in pounds per month.

$\frac{580 \text{ lb}}{1 \text{ yr}} \cdot \frac{1 \text{ yr}}{12 \text{ mo}}$ — Multiply the ratio by the _____ factor.

$= \frac{\square \text{ lb}}{\square \text{ mo}}$ — Cancel yr units.

$= \square$ lb per month — Divide 580 by 12.

The average American uses _____ pounds of paper per month.

## Example 3

**PROBLEM SOLVING APPLICATION**

**A car traveled 60 miles on a road in 2 hours. How many feet per second was the car traveling?**

**1. Understand the Problem**

The problem is stated in units of miles and hours. The question asks for the answer in units of feet and seconds. You will need to use several conversion factors.

List the important information:

- Miles to feet → $\frac{\square \text{ ft}}{\square \text{ mi}}$
- Hours to minutes → $\frac{\square \text{ h}}{\square \text{ min}}$
- Minutes to seconds → $\frac{\square \text{ min}}{\square \text{ s}}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**2. Make a Plan**

Multiply by each _____ factor separately, or simplify the problem and multiply by several _____ factors at once.

**3. Solve**

First, convert 60 miles in 2 hours into a unit rate.

$$\frac{60 \text{ mi}}{2 \text{ h}} = \frac{(60 \div 2) \text{ mi}}{(2 \div 2) \text{ h}} = \frac{\square \text{ mi}}{\square \text{ h}}$$

Create a single conversion factor to convert hours directly to seconds:

hours to minutes $\rightarrow \frac{\square \text{ h}}{\square \text{ min}}$; minutes to seconds $\rightarrow \frac{\square \text{ min}}{\square \text{ s}}$

$$\text{hours to seconds} = \frac{1 \text{ h}}{60 \cancel{\text{ min}}} \cdot \frac{1 \cancel{\text{ min}}}{60 \text{ s}} = \frac{\square \text{ h}}{\square \text{ s}}$$

$\frac{30 \text{ mi}}{1 \text{h}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{1 \text{ h}}{3600 \text{ s}}$ Set up the _____ factors.

Do not include the numbers yet. Notice what happens to the units.

$\frac{\text{mi}}{\text{h}} \cdot \frac{\text{ft}}{\text{mi}} \cdot \frac{\text{h}}{\text{s}}$ Simplify. Only _____ remains.

$\frac{30 \text{ mi}}{1 \text{h}} \cdot \frac{5280 \text{ ft}}{1 \text{ mi}} \cdot \frac{1 \text{ h}}{3600 \text{ s}}$ Multiply.

$$\frac{30 \cdot 5280 \text{ ft} \cdot 1}{1 \cdot 1 \cdot 3600 \text{ s}} = \frac{158{,}400 \text{ ft}}{3600 \text{ s}} = \frac{\square \text{ ft}}{\square \text{ s}}$$ Multiply.

The car was traveling _____ feet per second.

**4. Look Back**

A rate of _____ ft/s is less than 50 ft/s. A rate of 60 miles in 2 hours is 30 mi/h or 0.5 mi/min.

Since 0.5 mi/min is less than 3000 ft/60 s or 50 ft/s and 44 ft/s is less than 50 ft/s, then 44 ft/s is a reasonable answer.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 4

**A strobe lamp can be used to measure the speed of an object. The lamp flashes every $\frac{1}{100}$ of a second. A camera records the object moving 52 cm between flashes. How fast is the object moving in m/s?**

$\frac{52 \text{ cm}}{\frac{1}{100} \text{ s}}$

Use rate = $\frac{\square}{\square}$.

$\frac{52 \text{ cm}}{\frac{1}{100} \text{ s}} = \frac{100 \cdot 52 \text{ cm}}{100 \cdot \frac{1}{100} \text{ s}}$

Multiply top and bottom by $\square$ to eliminate the fraction.

$= \frac{\square \text{ cm}}{\square \text{ s}}$

Now convert centimeters per second to $\square$ per second.

$\frac{\square \text{ cm}}{\square \text{ s}} \cdot \frac{1 \text{ m}}{\square \text{ cm}}$

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

$= \square$

The object moved $\square$ m/s.

## Try This

**1. Find the appropriate factor for the conversion.**

minutes to seconds

**2. Sam drives his car 23,000 miles per year. Find the number of miles he drives per month.**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 5-4

# Solving Proportions

## Lesson Objectives

Solve proportions

## Vocabulary

cross product (p. 229) _____

## Additional Examples

### Example 1

**Tell whether the ratios are proportional.**

**A.** $\frac{6}{15} \stackrel{?}{=} \frac{4}{10}$

$6 \times 10 = 60$ $\quad 15 \times 4 = 60$ Find _____ products.

_____ = _____

Since the cross products are _____, the ratios _____ proportional.

**B.** A mixture of fuel for a certain small engine should be 4 parts gasoline to 1 part oil. If you combine 5 quarts of oil with 15 quarts of gasoline, will the mixture be correct?

$\frac{4 \text{ parts gasoline}}{1 \text{ part oil}} \stackrel{?}{=} \frac{15 \text{ quarts gasoline}}{5 \text{ quarts oil}}$ Set up ratios.

_____ · _____ = 20 $\quad$ _____ · _____ = _____ Find the cross _____.

_____ ≠ _____

The ratios _____ equal. The mixture _____ correct.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Solve the proportion $\frac{\$x}{1 \text{ item}} = \frac{\$48}{3 \text{ items}}$.**

$\frac{\$x}{1 \text{ item}} = \frac{\$48}{3 \text{ items}}$

$\frac{\$x}{1 \text{ item}} = \frac{\$48 \div \square}{1 \text{ item}}$ Find the ____.

$x = \$\square$ The ____ are equal because the ____ are equal.

## Example 3

**Solve the proportion $\frac{y}{21} = \frac{1}{3}$.**

$\frac{y}{21} = \frac{1}{3}$

$\frac{y}{21} = \frac{(1 \cdot 7)}{(3 \cdot 7)}$ Multiply to write the fractions with the ____.

$\frac{y}{21} = \frac{7}{21}$ The ____ are equal because the ____ are equal.

$y = \square$

## Example 4

**J & A Department Store is selling 3 pairs of children's socks for $5. Mrs. Wagner wants to buy a dozen pairs of socks. How much will this cost?**

1 dozen socks = 12 socks

$\frac{3}{\$5} = \frac{12}{\$d}$

$\frac{12 \text{ socks}}{3 \text{ socks}} = 4$ Divide to find the ____.

$\$5 \cdot 4 = \square$ Multiply by the ____ to find *d*.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 5

**Allyson weighs 55 lbs and sits on a seesaw 4 ft away from its center. If Marco sits 5 ft away from the center and the seesaw is balanced, how much does Marco weigh?**

$\frac{\text{mass 1}}{\text{length 2}} = \frac{\text{mass 2}}{\text{length 1}}$ Set up the _____.

$\frac{\square}{\square} = \frac{\square}{\square}$ Let $x$ represent Marco's weight.

$\square \cdot \square = \square x$ Find the cross products.

$\square = \square x$ Multiply.

$\frac{220}{\square} = \frac{5x}{\square}$ Solve. Divide both sides by $\square$.

$\square = x$

Marco weighs $\square$ lb.

## Try This

**1. Tell whether the ratios are proportional.**

$\frac{5}{10} \stackrel{?}{=} \frac{2}{4}$

**2. Solve the proportion $\frac{\$x}{\text{10 item}} = \frac{\$123}{\text{30 items}}$.**

**3. Solve the proportion.**

$\frac{14}{g} = \frac{2}{3}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 5-5

# Similar Figures

## Lesson Objectives

Determine whether figures are similar; use scale factors; find missing dimensions in similar figures

## Vocabulary

similar (p. 238) _____

_____

congruent angles (p. 238) _____

_____

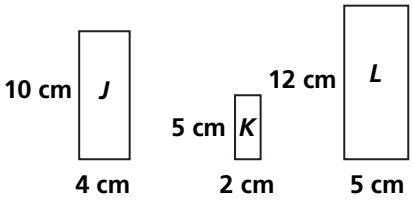
scale factor (p. 239) _____

_____

## Additional Examples

**Example 1**

**Which rectangles are similar?**




First, look at the corresponding angles. Are they congruent?

All the angles of the rectangles have angle measures of ☐°.

Compare the ratios of corresponding ☐ in rectangles *J*, *K*, and *L* to see if they are equal.

$J = \frac{\square}{\square}$ $K = \frac{\square}{\square}$ $L = \frac{\square}{\square}$

☐ and ☐ are similar.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A picture 10 in. tall and 14 in. wide is to be scaled to 1.5 in. tall to be displayed on a Web page. How wide should the picture be on the Web page for the two pictures to be similar?**

To find the _____ factor, divide the known measurement of the scaled picture by the corresponding measurement of the original picture.

0.15 $\frac{1.5}{10} =$ _____

Then multiply the width of the original picture by the scale factor.

2.1 $14 \cdot 0.15 =$ _____

The picture should be _____ in. wide.

## Example 3

**A T-shirt design includes an isosceles triangle with side lengths 4.5 in, 4.5 in., and 6 in. An advertisement shows an enlarged version of the triangle with two sides that are each 3 ft. long. What is the length of the third side of the triangle in the advertisement?**

Set up a proportion.

$$\frac{\text{____ in.}}{\text{____ ft}} = \frac{\text{____ in.}}{\text{____ ft}}.$$

$4.5 \text{ in.} \cdot x \text{ ft} = 3 \text{ ft} \cdot 6 \text{ in.}$ Find the _____ products.

$4.5 \text{ in.} \cdot x \text{ ft} = 3 \text{ ft} \cdot 6 \text{ in.}$ in. • ft is on both sides

$4.5x = 3 \cdot 6$ Cancel the units.

$4.5x = 18$ Multiply.

$x =$ _____ $=$ _____ Solve for $x$.

The third side of the triangle is _____ ft long.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 5-6

# Dilations

## Lesson Objectives

Identify and create dilations of plane figures

## Vocabulary

dilation (p. 244) _____

_____

center of dilation (p. 244) _____

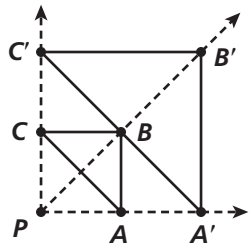
_____

## Additional Examples

### Example 1

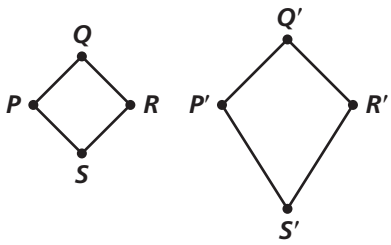
**Tell whether each transformation is a dilation.**

**A.**




The transformation _____ a dilation.

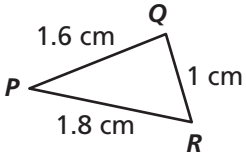
**B.**

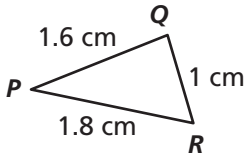



The transformation _____ a dilation. The figure is distorted.

### Example 2

**Dilate the figure by a scale factor of 1.5 with *P* as the center of dilation.**

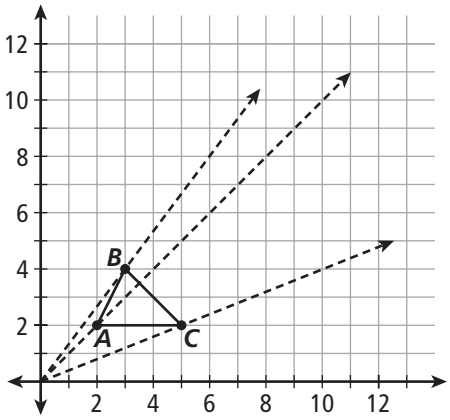



Multiply each side by _____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3




**A. Dilate the figure in Example 3A on page 245 by a scale factor of 2. What are the vertices of the image?**

Multiply the coordinates by ☐ to find the vertices of the image.

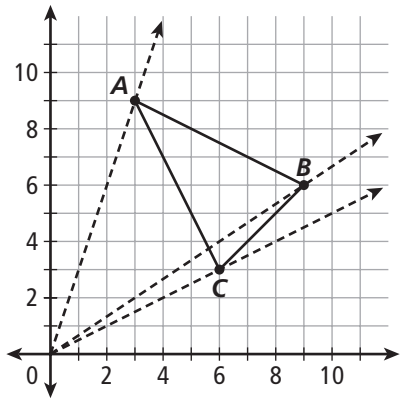
$\triangle ABC$ $\triangle A'B'C'$

$A(2, 2) \rightarrow A'(2 \cdot$ ☐ $, 2 \cdot$ ☐ $) \rightarrow A'$ ( , )

$B(3, 4) \rightarrow B'(3 \cdot$ ☐ $, 4 \cdot$ ☐ $) \rightarrow B'$ ( , )

$C(5, 2) \rightarrow C'(5 \cdot$ ☐ $, 2 \cdot$ ☐ $) \rightarrow C'$ ( , )

The vertices of the image are $A'$ ( , ), $B'$ ( , ), and $C'$ ( , ).




**B. Dilate the figure in Example 3B by a scale factor of $\frac{1}{3}$. What are the vertices of the image?**

Multiply the coordinates by ☐ to find the vertices of the image.

$\triangle ABC$ $\triangle A'B'C'$

$A(3, 9) \rightarrow A'(3 \cdot$ ☐ $, 9 \cdot$ ☐ $) \rightarrow A'$ ( , )

$B(9, 6) \rightarrow B'(9 \cdot$ ☐ $, 6 \cdot$ ☐ $) \rightarrow B'$ ( , )

$C(6, 3) \rightarrow C'(6 \cdot$ ☐ $, 3 \cdot$ ☐ $) \rightarrow C'$ ( , )

The vertices of the image are $A'$ ( , ), $B'$ ( , ), and $C'$ ( , ).

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 5-7

# Indirect Measurement

## Lesson Objectives

Find measures indirectly by applying the properties of similar figures

## Vocabulary

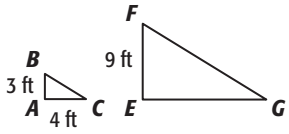
indirect measurement (p. 248) _____

_____

## Additional Examples

### Example 1

**Triangles *ABC* and *EFG* are similar. Find the length of side *EG*.**




Triangles ☐ and ☐ are similar.

$\frac{EG}{AC} = \frac{EF}{AB}$ Set up a proportion.

$\frac{x}{\square} = \frac{9}{\square}$ Substitute ☐ for *AC*, ☐ for *EF*, and ☐ for *AB*.

$\frac{\square}{\square} = \frac{\square}{\square}$ Find the ☐.

$\frac{3x}{\square} = \frac{36}{\square}$ Divide both sides by ☐.

$x =$ ☐

The length of side *EG* is ☐ ft.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

### PROBLEM SOLVING APPLICATION

**A 30-ft building casts a shadow that is 75 ft long. A nearby tree casts a shadow that is 35 ft long. How tall is the tree?**

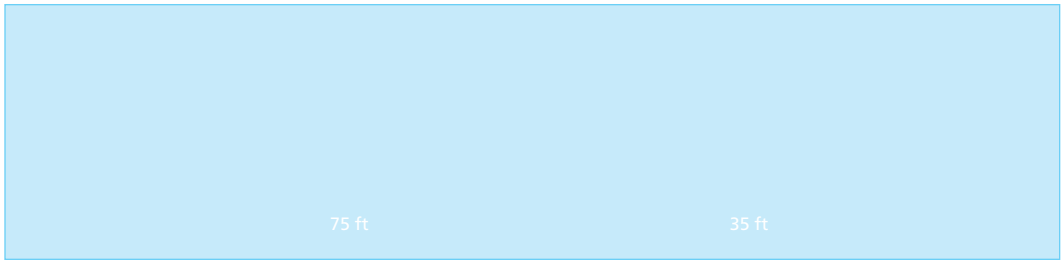
**1. Understand the Problem**

The **answer** is the _____ of the tree.
List the important information:

- The height of the building is _____ ft.
- The length of the building's shadow is _____ ft.
- The length of the tree's shadow is _____ ft.

**2. Make a Plan**

Use the information to _____.




**3. Solve**

Draw a diagram. Then draw the dashed lines to form triangles. The building and its shadow and the tree and its shadow form similar _____ triangles.

$\frac{h}{\square} = \frac{\square}{\square}$

Corresponding sides of similar figures are _____.

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

Find the _____.

$\frac{75h}{\square} = \frac{1050}{\square}$

Divide both sides by _____.

$h = \square$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

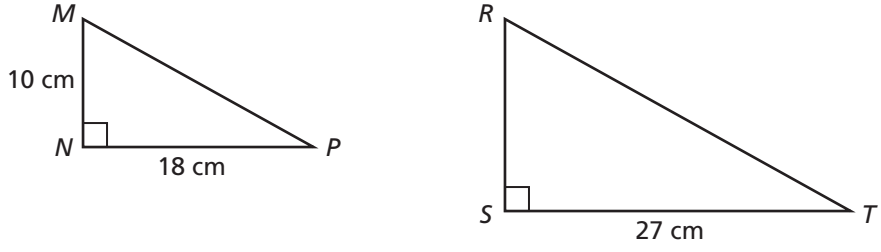
The height of the tree is approximately ____ ft.

**4. Look Back**

Since $\frac{\square}{\square} = \frac{4}{10}$, the building's shadow is $\frac{4}{10}$ of its height. So, the tree's shadow should also be $\frac{4}{10}$ of its height and $\frac{4}{10}$ of ____ is approximately 6.

## Try This

**1. Triangles *MNP* and *RST* are similar. Find the length of side *RS*.**




**2. A 5-ft tall student casts a shadow that is 7 ft long. A nearby light pole casts a shadow that is 21 ft long. How tall is the light pole?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 5-8

# Scale Drawings and Scale Models

## Lesson Objectives

Make comparisons between and find dimensions of scale drawings, models, and actual objects

## Vocabulary

scale drawing (p. 252) _____

scale (p. 252) _____

scale model (p. 253) _____

reduction (p. 253) _____

enlargement (p. 253) _____

## Additional Examples

**Example 1**

**The length of an object on a scale drawing is 2 cm, and its actual length is 8 m. The scale is 1 cm: __ m. What is the scale?**

$\frac{1 \text{ cm}}{x \text{ m}} = \frac{\square \text{ cm}}{\square \text{ m}}$ Set up proportion using $\frac{\text{scale length}}{\text{actual length}}$.

$1 \cdot \square = x \cdot \square$ Find the cross products.

$\square = 2x$

$\square = x$ Divide both sides by $\square$.

The scale is 1 cm: $\square$ m.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Under a 1000:1 microscope view, an amoeba appears to have a length of 8 mm. What is its actual length?**

$\frac{1000}{1} = \frac{8 \text{ mm}}{x \text{ mm}}$ Set up a proportion using $\frac{\text{scale length}}{\text{actual length}}$.

$\square \cdot x = \square \cdot \square$ Find the cross products.

$x = \square$ Divide both sides by $\square$.

The actual length of the amoeba is $\square$ mm.

## Example 3

**A model of a 27 ft tall house was made using the scale 2 in:3 ft. What is the height of the model?**

$\frac{2 \text{ in.}}{3 \text{ ft}} = \frac{2 \text{ in.}}{\square \text{ in.}} = \frac{1 \cancel{\text{in.}}}{18 \cancel{\text{in.}}} = \square$ Find the $\square$ factor.

The scale factor for the model is $\square$. Now set up a proportion.

$\frac{1}{18} = \frac{h \text{ in.}}{324 \text{ in.}}$ Convert: 27 ft = $\square$ in.

$\square = 18h$ Find the cross products.

$\square = h$ Divide both sides by $\square$.

The height of the model is $\square$ in.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 4

**A DNA model was built using the scale 5 cm:0.0000001 mm. If the model of the DNA chain is 20 cm long, what is the length of the actual chain?**

$\frac{5 \text{ cm}}{0.0000001 \text{ mm}} = \frac{50 \text{ mm}}{0.0000001 \text{ mm}} = 500{,}000{,}000$ Find the scale factor.

The scale factor for the model is 500,000,000. This means the model is 500 million times larger than the actual chain.

$\frac{500{,}000{,}000}{1} = \frac{20 \text{ cm}}{x \text{ cm}}$ Set up a proportion.

$\square x = \square \cdot \square$ Find the cross products.

$x = \square$ Divide both sides by $\square$.

The length of the DNA chain is $\square$ cm.

## Try This

1. **The length of an object on a scale drawing is 4 cm, and its actual length is 12 m. The scale is 1 cm: __ m. What is the scale?**

2. **Under a 1000:1 microscope view, a stentor appears to have a length of 12 mm. What is the actual length?**

3. **A model of a 24 ft tall bridge was made using the scale 4 in:2 ft. What is the height of the model?**

4. **A DNA model was built using the scale 3 cm:0.0000001 mm. If the model of the DNA chain is 18 cm long, what is the length of the actual chain?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 5

# Chapter Review

## 5-1 Ratios and Proportions

**Find two ratios that are equivalent to each given ratio.**

**1.** $\frac{3}{7}$ **2.** $\frac{21}{17}$ **3.** $\frac{5}{12}$ **4.** $\frac{8}{7}$

**Simplify to tell whether the ratios form a proportion.**

**5.** $\frac{3}{4}$ and $\frac{21}{29}$ **6.** $\frac{5}{13}$ and $\frac{2.5}{6.5}$ **7.** $\frac{33}{81}$ and $\frac{22}{54}$

**8.** Tony's gas tank holds 18 gallons of gas. His gas tank has 8 gallons of gas in it. Is this equivalent to $\frac{5}{9}$ of the gas tank? If not, what amount of gas is equivalent to $\frac{5}{9}$ of the gas tank? Explain.

## 5-2 Ratios, rates, and Unit Rates

**9.** Jeff runs at a rate of 6 miles/hour. How far can he run in $1\frac{1}{2}$ hours?

**10.** The mass of 2 $cm^3$ of gold is 38.6 grams. Find the density of the gold.

**Estimate the unit rate.**

**11.** $3\frac{1}{2}$ sticks of butter for 3 dozen cookies **12.** 95 students in 4 classes

**Find the unit price for each offer and tell which is the better buy.**

**13.** 8 oz. can of sauce for $1.09

48 oz. can for sauce for $4.99

**14.** 6 bagels for $4.25

1 dozen bagels for $7.99

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 5-3 Dimensional Analysis

**Find the appropriate factor for each conversion.**

**15.** feet to yards

**16.** meters to kilometers

**17.** hour to minutes

**Use conversion factors to find each unit to the nearest hundredth.**

**18.** 16 pints to quarts

**19.** 600 lb. to tons

**20.** $3\frac{1}{2}$ miles to feet

**21.** 288 oz. to pounds

## 5-4 Solving Proportions

**Solve each proportion.**

**22.** $\frac{\$15}{3 \text{ books}} = \frac{\$d}{18 \text{ books}}$

**23.** $\frac{9}{30} = \frac{n}{16}$

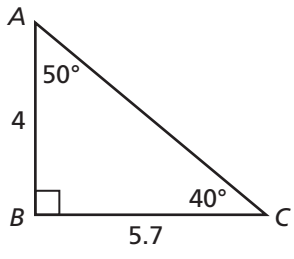
**24.** $\frac{13}{x} = \frac{4}{16}$

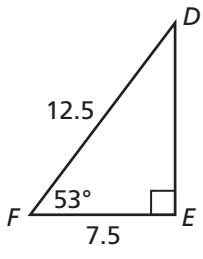
**25.** $\frac{\$12}{21 \text{ pounds}} = \frac{\$r}{136.5 \text{ pounds}}$

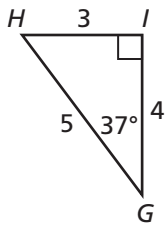
**26.** Liza and Taylor are on a seesaw. Liza weighs 40 pounds and is 6 feet from the fulcrum. If Taylor weighs 44 pounds, how far should she sit from the fulcrum to balance the seesaw?

## 5-5 Similar Figures

**27.** Which triangles are similar?



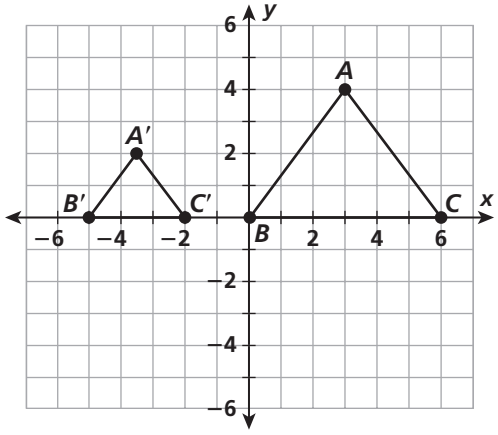

**28.** An isosceles triangle has a base of 15 meters and legs measuring 12 meters. How long are the legs in a similar triangle with a base of 8 meters?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

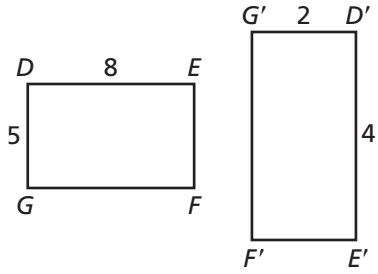
## 5-6 Dilations

**Tell whether each transformation is a dilation.**

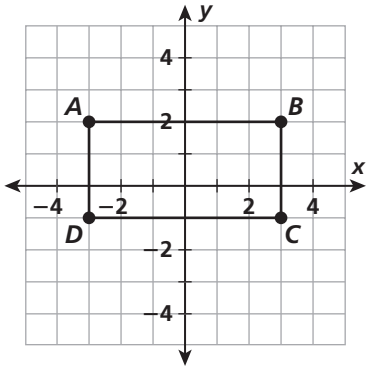
**29.**




**30.**




**31.** Dilate the figure by a scale factor of 0.5 the origin as the center of dilation. What are the vertices of the image?




## 5-7 Indirect Measurement

**32.** A house casts a shadow of 20 ft. At the same time, a 14 ft. flagpole casts a shadow of 8.75 ft. How tall is the house?

**33.** A 30 ft. tree casts a shadow of 12 ft. A 6 ft. 3 in. man is standing nearby. How long is his shadow?

## 5-8 Scale Drawings and Scale Models

**34.** On the blueprint of a house, the family room is a 6 in. by 4 in. rectangle. If the blueprint has a scale of 1 in. = 2.5 ft., what are the dimensions of the actual room?

**35.** The scale of a drawing is $\frac{1}{4}$ in.:5 ft. Find the length of a drawing with an actual length of 15 ft.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 5

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 5 in your own words.**

**1.** Explain how to find two ratios equivalent to $\frac{12}{6}$.

**2.** Explain how to solve the proportion $\frac{40}{15} = \frac{30}{x}$ using equivalent fractions.

**3.** The length of an object on a scale drawing is 5 in., and its actual length is 50 ft. Explain how to find the scale.

**For more review of Chapter 5:**

- Complete the Chapter 5 Study Guide and Review on pages 262–264 of your textbook.
- Complete the Ready to Go On quizzes on pages 234 and 258 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 6-1

# Relating Decimals, Fractions, and Percents

## Lesson Objectives

Compare and order decimals, fractions, and percents

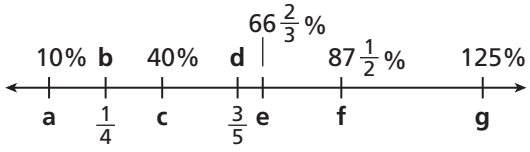
## Vocabulary

percent (p. 274) _____

## Additional Examples

**Example 1**

**Find the missing ratio or percent equivalent for each letter on the number line.**




a: $10\% = \frac{\square}{100} = \square$

b: $\frac{1}{4} = 0.\square = \square\%$

c: $40\% = \frac{\square}{100} = \frac{\square}{10} = \square$

d: $\frac{3}{5} = 0.\square = \square\%$

e: $66\frac{2}{3}\% = 0.\square = \square$

f: $87\frac{1}{2}\% = 0.\square = \frac{\square}{1000} = \square$

g: $125\% = \square = \square = \square$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

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

**A.** $\frac{1}{4}$ ☐ 40%

$\frac{1}{4} = 0.$☐ $=$ ☐% — Write as a percent.

☐% ☐ 40% — Compare.

$\frac{1}{4}$ ☐ 40%

## Example 3

**Write 0.075%, $\frac{3}{4}$, 0.41, and 100% in order from least to greatest.**

$\frac{3}{4} =$ ☐ $=$ ☐% and $0.41 =$ ☐% — Write as percents.

☐% $<$ ☐% $<$ ☐% $<$ ☐% — Compare.

☐

## Example 4

**Gold that is 24 karat is 100% pure gold. Gold that is 14 karat is 14 parts pure gold and 10 parts another metal, such as copper, zinc, silver, or nickel. What percent of 14 karat gold is pure gold?**

$\frac{\text{parts pure gold}}{\text{total parts}} \rightarrow \frac{\square}{\square} = \frac{\square}{\square}$ — Set up a ratio and simplify.

$\frac{7}{12} =$ ☐ $\div$ ☐ $=$ ☐ $=$ ☐%

So 14 karat gold is ☐% pure gold.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 6-2

# Estimating with Percents

## Lesson Objectives

Estimate percents

## Vocabulary

estimate (p. 278) _____

compatible numbers (p. 278) _____

benchmark (p. 278) _____

## Additional Examples

**Example 1**

**Estimate.**

**A.** 21% of 66

$21\% = \square \approx \frac{20}{100}$ Use $\square$ numbers, 20 and 100.

$\approx \square$ Simplify.

$66 \approx 65$ Use $\square$ numbers, 65 and 5.

$\frac{1}{5} \cdot 65 = \square$ Use mental math: $65 \div 5$.

So 21% of 66 is about $\square$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**Estimate.**

**B.** 36% of 120

36% ≈ ____ % ____.

≈ ____ % + ____ % Break the percent into two benchmarks.

35% • 120 = (____ % + ____ %) • 120 Set up an equation.

= 25% • 120 + 10% • 120 Use ____ Property.

= ____ + ____ 25% of 120 is ____, and 10% of 120 is ____.

= ____

36% of 120 is about ____.

## Example 2

**PROBLEM SOLVING APPLICATION**

**Maria took her mother out to lunch for her birthday. The total cost of their food, drinks, and dessert was $20.15. If the sales tax is 7% and Maria wants to leave a 15% tip, about how much should she pay?**

**1. Understand the Problem**

The answer is the ____ Maria should pay for the lunch.
List the important information:

- Their meal cost a total of $____.
- The sales tax rate is ____%.
- Maria wants to leave a tip of ____%.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**2. Make a Plan**

Think: Sales tax and tip together are 22% of Maria's total (7% + 15% = 22%). The numbers $20.15 and 22% are difficult to work with. Use compatible numbers: $____ is close to $20.15; ____% is close to 22%.

**3. Solve**

$20 • 20% = $20 • 0.2 = $____

$20.15 + $____ = $____

Maria should pay ____.

**4. Look Back**

To determine whether $24.15 is a reasonable estimate of what Maria should pay, use a calculator to find the tax and the tip for $20.15. $20.15 • 1.22 = $24.583, so $24.15 is a reasonable estimate.

## Example 3

**A printing company has determined that approximately 6% of the books it prints have errors. Out of a printing run of 2050 books, the production manager estimates that 250 books have errors. Estimate to see if the manager's number is reasonable. Explain.**

6% • 2050 ≈ ____% of ____ Use ____.

≈ 0.05 • 2000 Write ____% as a decimal.

≈ ____ Multiply.

Because ____, the manager's estimate is ____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 6-3

# Finding Percents

## Lesson Objectives

Find percents

## Additional Examples

### Example 1

**A. What percent of 92 is 66?**

**Method 1:** Set up a proportion to find the percent.

Think: What number is to 100 as ☐ is to 92?

$\frac{\text{number}}{100} = \frac{\text{part}}{\text{whole}}$ Set up a ☐.

$\frac{n}{100} = \frac{\square}{92}$ Substitute.

$n \cdot 92 = 100 \cdot \square$ Find the cross ☐.

$92n = \square$ Simplify.

$\frac{92n}{92} = \frac{\square}{92}$ Divide both sides by 92.

$n \approx \square$ Simplify.

66 is approximately ☐% of 92.

***Check***

$\frac{\square}{100} = \frac{\square}{92}$ Substitute 71.7 for $n$.

$6600 \approx 6596.4$ Simplify.

So 66 is approximately ☐% of 92.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**B. What percent of 220 is 88?**

**Method 2:** Set up an equation to find the percent.

$p \cdot$ ☐ $=$ ☐ Set up an equation.

$\frac{220p}{\square} = \frac{\square}{\square}$ Divide both sides by ☐.

$p =$ ☐ 0.4 is ☐%.

88 is ☐% of 220.

***Check***

☐% $\cdot$ 220 $\stackrel{?}{=}$ 88 Substitute 40% for $p$.

☐ $\cdot$ 220 $\stackrel{?}{=}$ 88 Write a decimal and multiply.

$88 = 88$ √

**Example 2**

**Four friends volunteered to cut the grass around their neighbor's house. Jay cut 23% of the grass, Aimee cut $\frac{1}{5}$ of the grass, Ken cut 0.31 of the grass, and Bryn cut the rest. What percent of the grass did Bryn cut?**

First, find what percent of the work Jay, Aimee, and Ken did.

$\frac{1}{5} =$ ☐%, and $0.31 =$ ☐%

Next, subtract the percents from 100% to find the remaining percent.

100% − ☐% − ☐% − ☐% = ☐%

Bryn cut ☐% of the grass.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**The city of Dallas, Texas has a population of approximately 1,189,000 people. The population of the city of Austin, Texas is 55% of the population of Dallas. To the nearest thousand, what is the population of Austin?**

Choose a method: Set up an equation.

*Think:* What number is 55% of 1,189,000?

$n$ = 55% of ____ Set up an equation.

$n$ = ____ • 1,189,000 Write ____ % as a decimal.

$n$ = ____ Simplify.

$n \approx$ ____ Round to the nearest ____.

The population of Austin is about ____.

## Example 4

**After a drought, a reservoir had only $66\frac{2}{3}$% of the average amount of water. If the average amount of water is 57,000,000 gallons, how much water was in the reservoir after the drought?**

Choose a method: Set up an equation.

Think: What number is $66\frac{2}{3}$% of 57,000,000?

$w = 66\frac{2}{3}\% \cdot$ ____ Set up an equation.

$w$ = ____ • 57,000,000 $66\frac{2}{3}$% is equivalent to ____.

$w = \frac{114{,}000{,}000}{3} =$ ____

The reservoir contained ____ gallons of water after the drought.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 6-4

# Finding a Number When the Percent is Known

## Lesson Objectives

Find a number when the percent is known

## Additional Examples

### Example 1

**60 is 12% of what number?**

Set up an equation to find the number.

$60 = 12\% \cdot \square$ Set up an equation.

$60 = 0.12\square$ $12\% = \frac{\square}{100}$

$\square = \square n$ Divide both sides by $\square$.

$\square = n$ 60 is 12% of $\square$.

### Example 2

**Anna earned 85% on a test by answering 17 questions correctly. If each question was worth the same amount, how many questions were on the test?**

Choose a method: Set up a proportion to find the number.

Think: 85 is to $\square$ as 17 is to what number?

$\square = \frac{17}{n}$ Set up a $\square$.

$85 \cdot n = \square \cdot 17$ Find the cross $\square$.

$85n = \square$

$n = \frac{\square}{85}$ Solve for $n$.

$n = \square$

There were $\square$ questions on the test.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**B. A fisherman caught a lobster that weighed 11.5 lb. This was 70% of the weight of the largest lobster that fisherman had ever caught. What was the weight, to the nearest tenth of a pound, of the largest lobster the fisherman had ever caught?**

Choose a method: Set up an equation.

Think: 11.5 is ____ % of what number?

$11.5 = ____\% \cdot n$ Set up an equation.

$11.5 = 0.____ \cdot n$ $70\% = 0.____$

$____ = n$ Solve for $n$.

$____ \approx n$

The largest lobster the fisherman had ever caught was about ____ lb.

## Try This

**1. 75 is 25% of what number?**

**2. Tom earned 80% on a test by answering 20 questions correctly. If each question was worth the same amount, how many questions were on the test?**

**3. When Bart was 12, he was approximately 85% of the weight he is now. If Bart was 120 lb, how heavy is he now, to the nearest tenth of a pound?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 6-5

# Percent Increase and Decrease

## Lesson Objectives

Find percent increase and decrease

## Vocabulary

percent change (p. 294) _____

_____

percent increase (p. 294) _____

_____

percent decrease (p. 294) _____

_____

## Additional Examples

**Example 1**

**Find the percent increase or decrease from 16 to 12.**

This is percent decrease.

$16 - 12 =$ ☐ First find the amount of ☐.

Think: What percent is ☐ of 16?

$\frac{\text{amount of decrease}}{\text{original amount}} \rightarrow \frac{\square}{16}$ Set up the ratio.

$\frac{4}{16} =$ ☐ Find the decimal form.

$=$ ☐ % Write as a percent.

From 16 to 12 is a ☐ % ☐.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A. When Jim was exercising, his heart rate went from 70 beats per minute to 98 beats per minute. What was the percent increase?**

$98 - 70 =$ ☐ First find the amount of change.

*Think:* What percent of 28 is 70?

$\frac{\text{amount of increase}}{\text{original amount}} = \frac{\square}{\square}$ Set up the ratio.

$\frac{\square}{\square} = \square = \square\%$ Find the decimal form. Write as a percent.

Jim's heart rate ☐ by ☐% when he was exercising.

## Example 3

**A. Sarah bought a DVD player originally priced at $450 that was on sale for 20% off. What was the sale price?**

$\$450 \cdot 20\%$ First find ☐% of $450.

$\$450 \cdot 0.\square = \$\square$ $20\% = 0.\square$

The amount of decrease is $☐.

Think: The reduced price is $☐ less than $450.

$\$450 - \$\square = \$\square$ Subtract the amount of decrease.

The sale price of the DVD player was $☐.

## Try This

**1. Find the percent increase or decrease from 15 to 20.**

☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 6-6

# Applications of Percents

## Lesson Objectives

Find commission, sales tax, and percent of earnings

## Vocabulary

commission (p. 298) _____

commission rate (p. 298) _____

sales tax (p. 298) _____

## Additional Examples

**Example 1**

**A real-estate agent is paid a monthly salary of $900 plus commission. Last month he sold one condominium for $65,000, earning a 4% commission on the sale. How much was his commission? What was his total pay last month?**

First find his commission.

4% • $[ ] = $c$ commission rate • sales = commission

0.04 • [ ] = $c$ Change the percent to a decimal.

[ ] = $c$ Solve for $c$.

He earned a commission of $[ ] on the sale.

Now find his total pay for last month.

$[ ] + $[ ] = $[ ] commission + salary = total pay

His total pay for last month was $[ ].

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**If the sales tax rate is 6.75%, how much tax would Adrian pay if he bought two CDs at $16.99 each and one DVD for $36.29?**

CD: 2 at $16.99 → $ ____

DVD: 1 at $36.29 → $ ____

$ ____ Total price

0.0675 • 70.27 = 4.743225 Convert tax rate to a decimal and multiply by the total price.

Adrian would pay $ ____ in sales tax.

## Example 3

**Anna earns $1500 monthly. Of that, $114.75 is withheld for Social Security and Medicare. What percent of Anna's earnings are withheld for Social Security and Medicare?**

Think: What percent of $ ____ is $114.75?

Solve by proportion:

$$\frac{n}{\square} = \frac{114.75}{\square}$$

$n$ • ____ = ____ • 114.75 Find the cross products.

____ = ____ Divide both sides by ____.

$n$ = ____

$n$ = ____

____ % of Anna's earnings is withheld for Social Security and Medicare.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 4

**A furniture sales associate earned $960 in commission in May. If his commission is 12% of sales, how much were his sales in May?**

Think: $960 is ☐% of what number?

Solve by equation:

$960 = 0.12 \cdot s$ Let $s$ = total sales.

$\frac{960}{\square} = s$ Divide each side by ☐.

The associate's sales in May were $☐.

## Try This

1. **A car sales agent is paid a monthly salary of $700 plus commission. Last month she sold one sports car for $50,000, earning a 5% commission on the sale. How much was her commission? What was her total pay last month?**

2. **Amy rents a hotel room for $45 per night. She rents for two nights and pays a sales tax of 13%. How much tax did she pay?**

3. **BJ earns $2500 monthly. Of that, $500 is withheld for income tax. What percent of BJ's earnings are withheld for income tax?**

4. **A sales associate earned $770 in commission in May. If his commission is 7% of sales, how much were his sales in May?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 6-7

# Simple Interest

## Lesson Objectives

Compute simple interest

## Vocabulary

interest (p. 302) _____

simple interest (p. 302) _____

_____

principal (p. 302) _____

rate of interest (p. 302) _____

## Additional Examples

### Example 1

**To buy a car, Jessica borrowed $15,000 for 3 years at an annual simple interest rate of 9%. How much interest will she pay if she pays the entire loan off at the end of the third year? What is the total amount that she will repay?**

First, find the interest she will pay.

$I = P \cdot r \cdot t$ Use the formula.

$I =$ ☐ $\cdot$ ☐ $\cdot$ ☐ Substitute. Use 0.09 for 9%.

$I =$ ☐ Solve for $I$.

Jessica will pay $☐ in interest.

You can find the total amount $A$ to be repaid on a loan by adding the principal $P$ to the interest $I$.

$P + I = A$ principal + interest = amount

☐ $+$ ☐ $= A$ Substitute.

☐ $= A$ Solve for $A$.

Jessica will repay a total of $☐ on her loan.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Nancy invested $6000 in a bond at a yearly rate of 3%. She earned $450 in interest. How long was the money invested?**

$I = P \cdot r \cdot t$ Use the formula.

$\square = \square \cdot \square \cdot t$ Substitute.

$\square = \square t$ Simplify.

$\square = t$ Solve for $t$.

The money was invested for $\square$ years, or $\square$ years $\square$ months.

## Example 3

**John's parents deposited $1000 into a savings account as a college fund when he was born. How much will John have in his account after 18 years at a yearly simple interest rate of 3.25%?**

$I = P \cdot r \cdot t$ Use the formula.

$I = \square \cdot \square \cdot 18$ Substitute. Use $\square$ for 3.25%

$I = \square$ Solve for $I$.

Now you can find the total.

$P + I = A$ Use the formula.

$\square + \square = A$ Substitute.

$\square = A$ Solve for A.

John will have $\square$ in his college fund after 18 years.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 4

**Mr. Johnson borrowed $8000 for 4 years to make home improvements. If he repaid a total of $10,320, at what interest rate did he borrow the money?**

$P + I = A$ Use the formula.

$\square + I = \square$

$I = 10{,}320 - 8000 = \square$ Find the amount of interest.

He paid $\$\square$ in interest. Use the amount of interest to find the interest rate.

$I = P \cdot r \cdot t$ Use the formula.

$\square = \square \cdot r \cdot \square$ Substitute.

$\square = \square \cdot r$ Multiply.

$\frac{2320}{\square} = r$ Divide both sides by 32,000.

$\square = r$

Mr. Johnson borrowed the money at an annual rate of $\square$%, or $\square$%.

## Try This

1. **To buy a laptop computer, Elaine borrowed $2,000 for 3 years at an annual simple interest rate of 5%. How much interest will she pay if she pays the entire loan off at the end of the third year? What is the total amount that she will repay?**

2. **Laura invested $7500 in a bond at a yearly rate of 1.5%. She earned $450 in interest. How long was the money invested?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 6

# Chapter Review

## 6-1 Relating Decimals, Fractions, and Percents

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

**1.** $\frac{1}{5}$ ▢ 25%

**2.** 0.42 ▢ 41%

**3.** 0.075 ▢ $7\frac{1}{2}\%$

## 6-2 Estimating with Percents

**Estimate.**

**4.** 75% of 195

**5.** 49% of 19

**6.** 40% of 219

**7.** A grade school has 407 students. Approximately 41% of the students walk to school. Estimate how many students walk to school.

## 6-3 Finding Percents

**Find each number to the nearest tenth.**

**8.** What is 35% of 340?

**9.** What percent of 80 is 18?

**10.** A son earns 62% of what his father earns. If the son earns $52,000, how much does his father earn to the nearest dollar?

## 6-4 Finding a Number When the Percent Is Known

**Find each number to the nearest whole number.**

**11.** 13 is 52% of what number?

**12.** 11 is 12.5% of what number?

**13.** An elephant can run 36% as fast as a cheetah. If a chetah can run 70 mph, how fast can an elephant run to the nearest whole number?

**14.** A quarterback completed 54% of his passes for the season. If he threw 369 passes in the season, how many passes did he complete to the nearest whole number?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 6-5 Percent Increase and Decrease

**Find each percent increase or decrease to the nearest percent.**

**15.** From 32 to 20

**16.** From 65 to 130

**17.** From 142 to 86

**18.** From 17 to 56

**19.** A television was marked 30% off. The original price was $1,999. What was the reduced price of the television?

**20.** Sales at a grocery store increase 22% during the month of December. If the monthly sales are usually $300,000, how much are the sales in December?

## 6-6 Applications of Percents

**Find each commission or sales tax to the nearest cent.**

**21.** total sales: $16,000
commission: 3.75%

**22.** total sales: $21,500
sales tax: 6.75%

**23.** A realtor earns a 3% commission on each house sold. If a realtor sold two houses for $179,500 and $214,000, what was the total commission?

**24.** A car salesman earned $918.75 from a commission rate of 3.75% on the sale of a car. What was the price of the car?

## 6-7 Simple Interest

**Find the interest and total amount to the nearest tenth.**

**25.** $650 at 4.5% per year for 4 years

**26.** $2,250 at 3% per year for 2 years

**27.** John borrowed $25,000 to fix his porch. The bank charged him a simple interest rate of 7.75%. How much will John owe if he pays the bank back in 5 years?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 6

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 6 in your own words.**

**1.** Explain how to convert $\frac{3}{8}$ to a percent.

**2.** Explain how to solve "34 is 25% of what number?".

**3.** Explain how to find the percent increase or decrease from 200 to 145.

**4.** Explain how to find the interest and total amount of $400 at 7.5% per year for 8 years.

**For more review of Chapter 6:**

- Complete the Chapter 6 Study Guide and Review on pages 312–314 of your textbook.
- Complete the Ready to Go On quizzes on pages 292 and 308 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 7-1

# Points, Lines, Planes, and Angles

## Lesson Objectives

Classify and name figures

## Vocabulary

point (p. 324) _____

line (p. 324) _____

_____

plane (p. 324) _____

segment (p. 324) _____

ray (p. 324) _____

_____

angle (p. 325) _____

_____

right angle (p. 325) _____

acute angle (p. 325) _____

_____

obtuse angle (p. 325 _____

_____

complementary angles (p. 325) _____

_____

supplementary angles (p. 325) _____

_____

vertical angles (p. 325) _____

_____

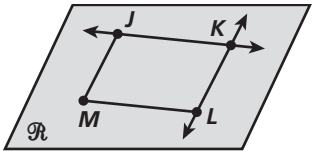
congruent (p. 325) _____

_____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Additional Examples

### Example 1




**A. Name 4 points in the figure.**

**B. Name a line in the figure.**

Any ____ points on a line can be used.

**C. Name a plane in the figure.**

Any ____ points in the plane that form a triangle can be used.

**D. Name four segments in the figure.**

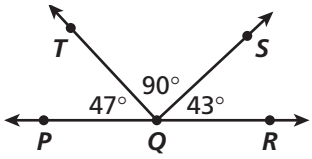
Write the 2 points in any order, for example ____ or ____.

**E. Name four rays in the figure.**

Write the ____ first.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2




**A. Name a right angle in the figure.**

**B. Name two acute angles in the figure.**

**C. Name two obtuse angles in the figure.**

m∠*SQP* = ° , m∠*RQT* = °

**D. Name a pair of complementary angles in the figure.**

m∠*TQP* + m∠*RQS* = ° + ° = 90°

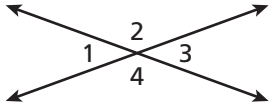
**E. Name two pairs of supplementary angles in the figure.**

m∠*TQP* + m∠*TQS* = ° + ° = 180°

m∠*SQP* + m∠*SQR* = ° + ° = 180°

## Example 3

**In the figure, ∠1 and ∠3 are vertical angles, and ∠2 and ∠4 are vertical angles.**




**A.** If m∠1 = 37°, find m∠3.

The measures of ∠1 and ∠2 add to 180° because they are

, so m∠2 = ° − ° = ° .

The measures of ∠2 and ∠3 add to 180° because they are

, so m∠3 = ° − ° = ° .

**B.** If m∠4 = *y*°, find m∠2.

m∠3 = 180° − *y*°

m∠2 = 180° − (180° − *y*°)

= 180° − 180° + *y*° Distributive Property

= m∠2 m∠4

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 7-2

# Parallel and Perpendicular Lines

Know it! Note

## Lesson Objectives

Identify parallel and perpendicular lines and the angles formed by a transversal

## Vocabulary

parallel lines (p. 330) _____

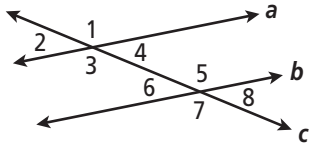
perpendicular lines (p. 330) _____

transversal (p. 330) _____

## Additional Examples

### Example 1

**Measure the angles formed by the transversal and parallel lines. Which angles seem to be congruent?**

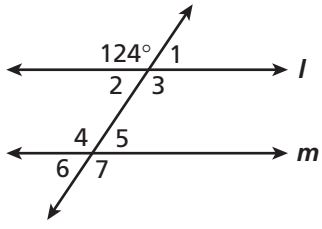



∠1, ∠3, ∠5, and ∠7 all measure 150°.

∠2, ∠4, ∠6, and ∠8 all measure ____°.

### Example 2

**In the figure, line *l* ∥ line *m*. Find the measure of each angle.**




**A.** ∠4

m∠4 = ____°

All obtuse angles in the figure are ____.

**B.** ∠2

m∠2 + 124° = ____°

∠2 is ____ to the angle 124°.

−____° −____°

m∠2 = ____°

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 7-3

# Angles in Triangles

Know it! Note

## Lesson Objectives

Find unknown angles in triangles

## Vocabulary

Triangle Sum Theorem (p. 336) _____

acute triangle (p. 336) _____

right triangle (p. 336) _____

obtuse triangle (p. 336) _____

equilateral triangle (p. 337) _____

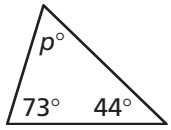
isosceles triangle (p. 337) _____

scalene triangle (p. 337) _____

## Additional Examples

**Example 1**

**A. Find *p* in the acute triangle.**




$\square^\circ + \square^\circ + p = \square^\circ$

$\square^\circ + p = \square^\circ$

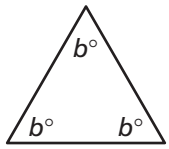
$-\ 117^\circ \qquad -\ 117^\circ$

$p = \square^\circ$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A. Find the angle measures in the equilateral triangle.**




$3b° =$ ____ ° Triangle ____ Theorem

$\frac{3b°}{\square} = \frac{180°}{\square}$ Divide both sides by ____.

$b° =$ ____ °

## Example 3

**The second angle in a triangle is six times as large as the first. The third angle is half as large as the second. Find the angle measures and draw a possible picture.**

Let $x°$ = the first angle measure. Then $6x°$ = second angle measure, and $\frac{1}{2}(6x°) = 3x°$ = third angle measure.

$x° + 6x° + 3x° =$ ____ ° Triangle ____ Theorem

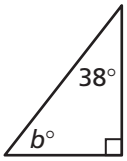
$\frac{10x°}{\square} = \frac{180°}{\square}$ Combine ____ terms. Divide both sides by ____.

$x° =$ ____ °

The angles measure ____ °, ____ °, and ____ °. The triangle is an obtuse ____ triangle.

## Try This

**1. Find *b* in the right triangle.**




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 7-4

# Classifying Polygons

Know it! Note

## Lesson Objectives

Classify and find angles in polygons

## Vocabulary

polygon (p. 341) _____

_____

regular polygon (p. 342) _____

_____

trapezoid (p. 342) _____

_____

parallelogram (p. 342) _____

rectangle (p. 342) _____

rhombus (p. 342) _____

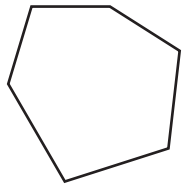
square (p. 342) _____

_____

## Additional Examples

**Example 1**

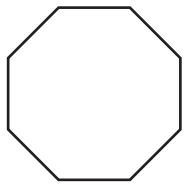
**A.** Find the sum of the angle measures in a hexagon.



Divide the figure into _____.

_____ · 180° = _____° _____ triangles

**B.** Find the sum of the angle measures in an octagon.



Divide the figure into _____.

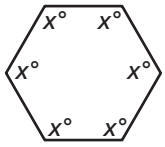
_____ · 180° = _____° _____ triangles

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Find the angle measures in the regular polygon.**

**A.** ☐ congruent angles




$6x = 180°(6 - 2)$

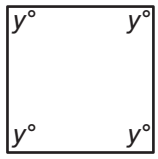
$6x = 180°($☐$)$

$6x =$ ☐°

$\frac{6x}{☐} = \frac{720°}{☐}$

$x =$ ☐°

**B.** ☐ congruent angles




$4y = 180°(4 - 2)$

$4y = 180°($☐$)$

$4y =$ ☐°

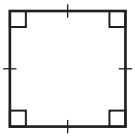
$\frac{4y}{☐} = \frac{360°}{☐}$

$y =$ ☐°

## Example 3

**Give all the names that apply to each figure.**

**A.**



☐ ☐-sided polygon

☐ 2 pairs of ☐ sides

☐ 4 ☐ angles

☐ 4 ☐ sides

☐ 4 ☐ sides and 4 ☐ angles

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 7-5

# Coordinate Geometry

Know it! Note

## Lesson Objectives

Identify polygons in the coordinate plane

## Vocabulary

slope (p. 347) _____

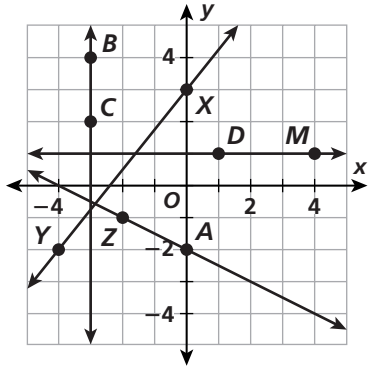
rise (p. 347) _____

run (p. 347) _____

## Additional Examples

### Example 1

**Determine if the slope of each line is positive, negative, 0, or undefined. Then find the slope of each line.**




**A.** $\overleftrightarrow{XY}$

_____ slope;

slope of $\overleftrightarrow{XY}$ = $\frac{\square}{\square}$ = ____

**B.** $\overleftrightarrow{ZA}$

_____ slope;

slope of $\overleftrightarrow{ZA}$ = $\frac{\square}{\square}$ = ____

**C.** $\overleftrightarrow{BC}$

slope of $\overleftrightarrow{BC}$ is _____

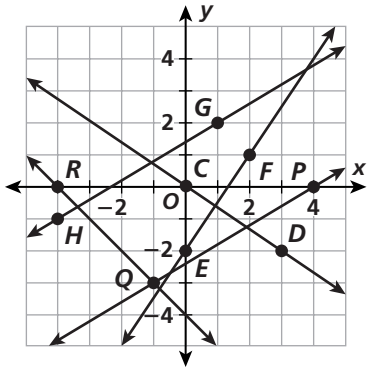
**D.** $\overleftrightarrow{DM}$

slope of $\overleftrightarrow{DM}$ = $\frac{\square}{3}$ = ____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Which lines are parallel?**
**Which lines are perpendicular?**




slope of $\overleftrightarrow{EF} = \frac{3}{\square}$

slope of $\overleftrightarrow{GH} = \frac{3}{\square}$

slope of $\overleftrightarrow{PQ} = \frac{3}{\square}$

slope of $\overleftrightarrow{CD} = \frac{\square}{\square}$ or $\square$

slope of $\overleftrightarrow{QR} = \frac{\square}{\square}$ or $-1$

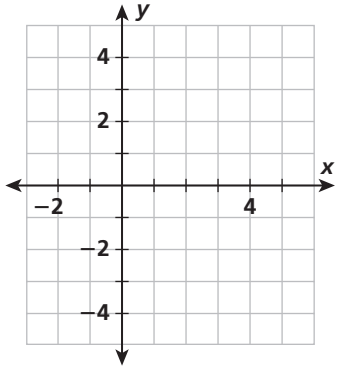
$\square \parallel \square$ The slopes are $\square$. $\frac{3}{5} = \frac{3}{5}$

$\square \perp \square$ The slopes have a $\square$ of $-1$: $\frac{3}{2} \cdot -\frac{2}{3} = -1$

## Example 3

**Graph the quadrilateral with the given vertices. Give all of the names that apply to the quadrilateral.**

$A(3, -2)$, $B(2, -1)$, $C(4, 3)$, $D(5, 2)$




$\overline{BC} \parallel \overline{AD}$ and $\overline{BA} \parallel \overline{CD}$

$\square$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 7-6

# Congruence

## Lesson Objectives

Use properties of congruent figures to solve problems

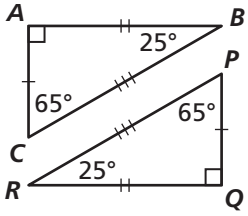
## Vocabulary

correspondence (p. 354) _____

## Additional Examples

### Example 1

**Write a congruence statement for the pair of polygons.**

A. 


The first triangle can be named triangle *ABC*. To complete the congruence statement, the vertices in the second triangle have to be written in _____ of the _____.

$\angle A \cong \angle$ _____, so $\angle A$ corresponds to $\angle$ _____.

$\angle B \cong \angle$ _____, so $\angle B$ corresponds to $\angle$ _____.

$\angle C \cong \angle$ _____, so $\angle C$ corresponds to $\angle$ _____.

The congruence statement is triangle _____ $\cong$ triangle _____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**In the figure, quadrilateral *VWXY* ≅ quadrilateral *JKLM*.**

**A.** Find *a*.

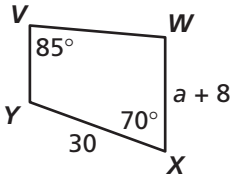
$a + 8 = 24$

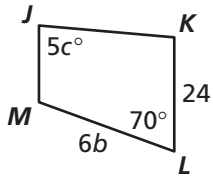
$\underline{-8} \quad \underline{-8}$

Subtract 8 from both sides.

$a =$ ☐

$\overline{WX} \cong$ ☐




**B.** Find *b*.

$6b = 30$

$\frac{6b}{6} = \frac{30}{6}$ Divide both sides by 6.

$b =$ ☐

$\overline{ML} \cong$ ☐

**C.** Find *c*.

$5c = 85$

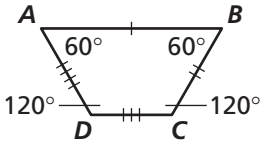
$\frac{5c}{5} = \frac{85}{5}$ Divide both sides by 5.

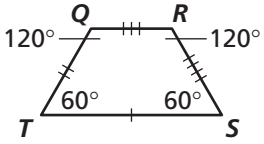
$c =$ ☐

$\angle$☐ $\approx \angle$☐

## Try This

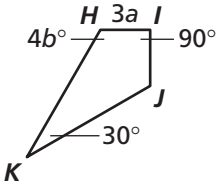
**1. Write a congruence statement for the pair of polygons.**

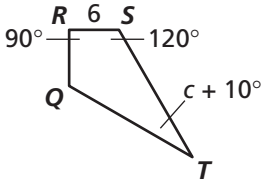



☐

**2. In the figure, quadrilateral *JIHK* ≅ quadrilateral *QRST*.**
Find *c*.




☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 7-7

# Transformations

## Lesson Objectives

Transform plane figures using translations, rotations, and reflections

## Vocabulary

transformation (p. 358) _____

translation (p. 358) _____

rotation (p. 358) _____

center of rotation (p. 358) _____

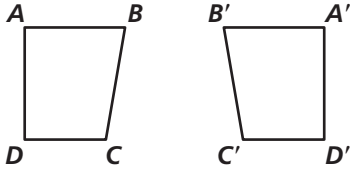
reflection (p. 358) _____

image (p. 358) _____

## Additional Examples

**Example 1**

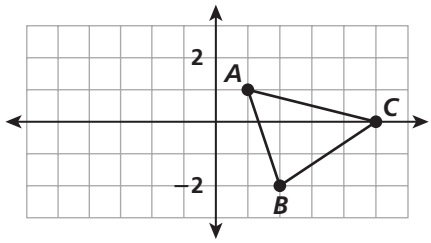
**Identify as a translation, rotation, reflection, or none of these.**




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

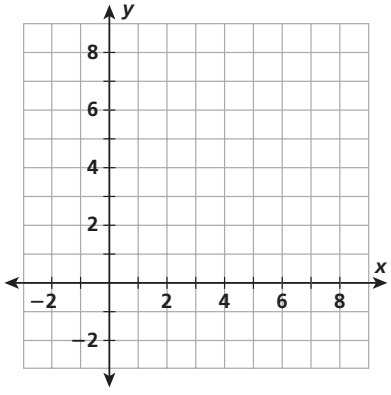
**Draw the image of a triangle with vertices *A*(1, 1), *B*(2, −2), and *C*(5, 0) after a 180° counterclockwise rotation around (0, 0).**




## Example 3

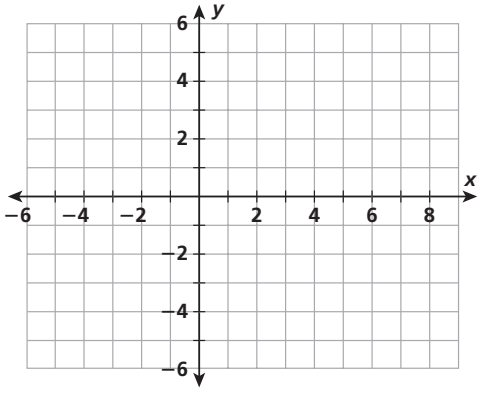
**Rectangle *HIJK* has vertices *H*(0, 2), *I*(4, 2), *J*(4, 4), and *K*(0, 4). Find the coordinates of the image of the indicated point after each transformation.**

**A.** translation 2 units up, point *H*




*H′* _____

**B.** 90° rotation around (0, 0), point *I*




*I′* _____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 7-8

# Symmetry

Know it! Note

## Lesson Objectives

Identify symmetry in figures

## Vocabulary

line symmetry (p. 364) _____

line of symmetry (p. 364) _____

rotational symmetry (p. 365) _____

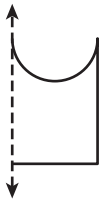
## Additional Examples

### Example 1

**Complete each figure. The dashed line is the line of symmetry.**

**A.**

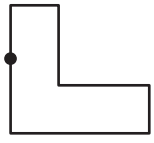
**B.**



### Example 2

**Complete each figure. The point is the center of rotation.**

**A.** 2-fold



The figure coincides with itself every ____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 7-9

# Tessellations

## Lesson Objectives

Create tessellations

## Vocabulary

tessellation (p. 368) _____

_____

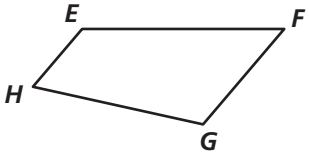
regular tessellation (p. 368) _____

_____

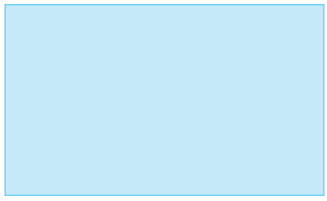
## Additional Examples

### Example 1

**Create a tessellation with quadrilateral *EFGH*.**




There must be a copy of each angle of quadrilateral *EFGH* at every vertex.



### Example 2

**Use rotations to create a variation of the tessellation in Additional Example 1.**

**Step 1:** Find the midpoint of a side.

**Step 2:** Make a new edge for half of the side.

**Step 3:** Rotate the new edge around the midpoint to form the edge of the other half of the side.

**Step 4:** Repeat with the other sides.

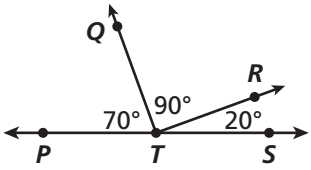
**Step 5:** Use the figure to make a tessellation.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

Know it! Note

## 7-1 Points, Lines, Planes, and Angles

**Use the diagram to name each geometric figure.**



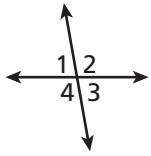

**1.** two obtuse angles

**2.** two acute angles

**In the figure, ∠1 and ∠3 are vertical angles, and ∠2 and ∠4 are vertical angles.**

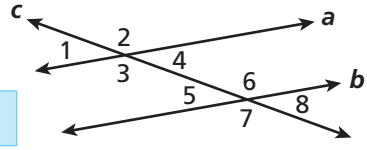
**3.** If m∠2 = 100°, find m∠1.

**4.** If m∠2 = 100°, find m∠4.




## 7-2 Parallel and Perpendicular Lines

**In the figure, line *a* ∥ line *b*.**




**5.** Name all angles congruent to ∠6.

**6.** Name all angles congruent to ∠8.

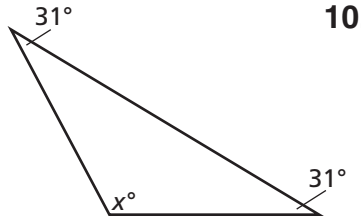
**7.** Which line is the transversal?

**8.** Name three pairs of supplementary angles.

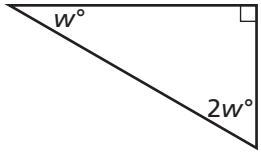
## 7-3 Triangles

**Find the value of each variable.**

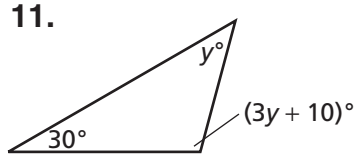
**9.**




**10.**




**11.**




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 7-4 Polygons

**Find the sum of the angle measures of each polygon. Then, if the polygon is regular, find the measure of each angle.**

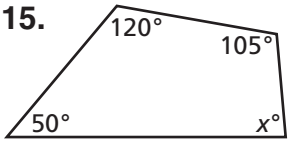
**12.** 14-gon

**13.** 13-gon

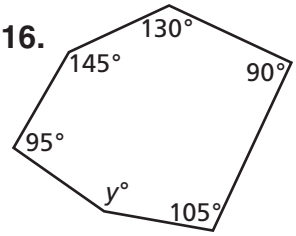
**14.** octagon

**Find the value of each variable.**

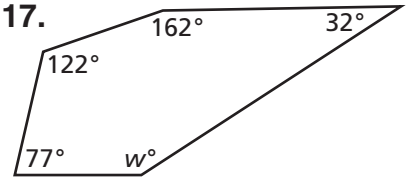
**15.**




**16.**




**17.**




## 7-5 Coordinate Geometry

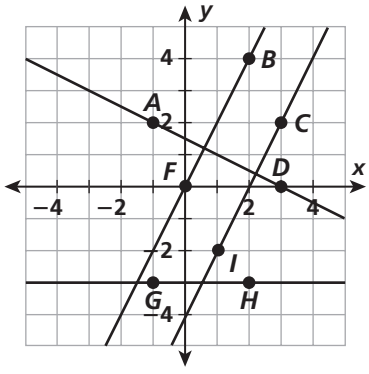
**Determine if the slope of each line is positive, negative, 0, or undefined. Then find the slope of each line.**

**18.** $\overleftrightarrow{AD}$

**19.** $\overleftrightarrow{BF}$

**20.** $\overleftrightarrow{AG}$

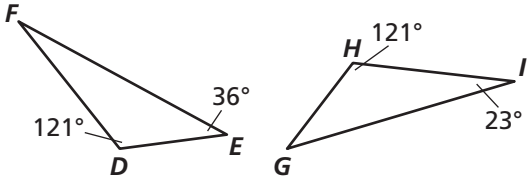
**21.** $\overleftrightarrow{GH}$



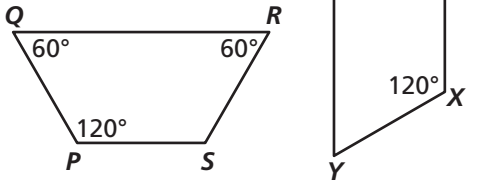

## 7-6 Congruence

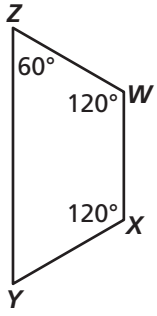
**Write a congruence statement for each pair of polygons.**

**22.**




**23.**

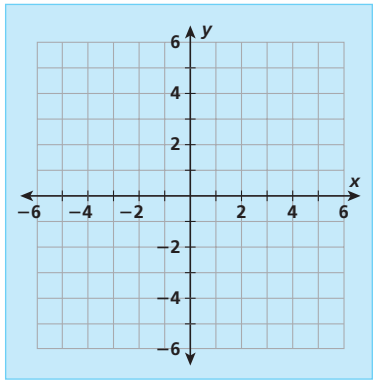



Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 7-7 Transformations

**Draw the image of the quadrilateral *ABCD* with vertices (2, 1), (2, 3), (4, 6) and (5, 2) after each transformation.**




**24.** translation 6 units down

**25.** reflection across *y*-axis

**26.** reflection across *x*-axis

**27.** 180° rotation around (0, 0)

**Give the coordinates of each point after a reflection across the given axis.**

**28.** (3, 5) *x*-axis

**29.** (−4, 2) *x*-axis

**30.** (−3, −4) *y*-axis

**Give the coordinates of each point after a 180° rotation around (0, 0).**

**31.** (1, 3)

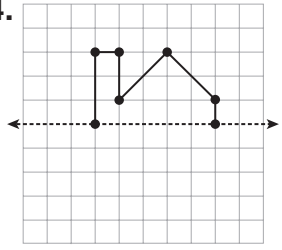
**32.** (2, −4)

**33.** (−*p*, *q*)

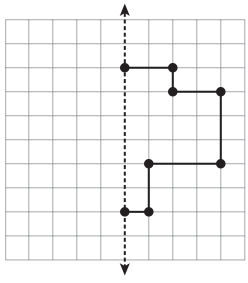
## 7-8 Symmetry

**Complete each figure. The dashed line is the line of symmetry.**

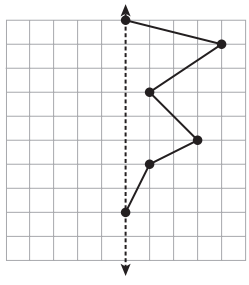
**34.**

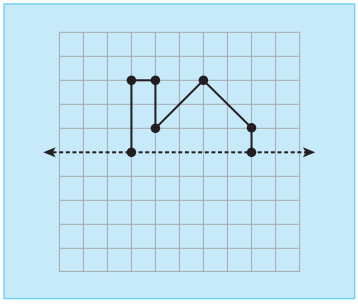


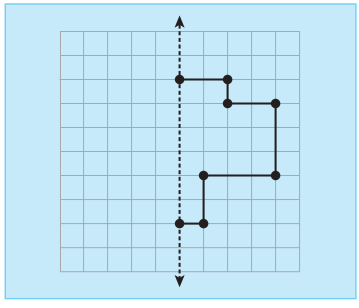
**35.**

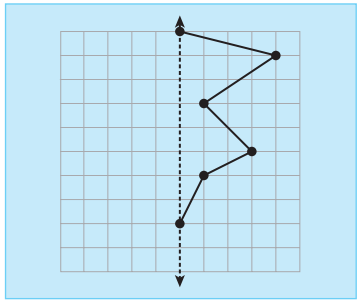


**36.**







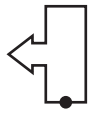


Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**Complete each figure. The point is the center of rotation.**

**37.** 4-fold

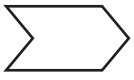
**38.** 2-fold



## 7-9 Tessellations

**Use the shape to create a tessellation.**

**39.**



**40.** A piece is removed from one side of a square and translated to the opposite side. Will this shape tessellate?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

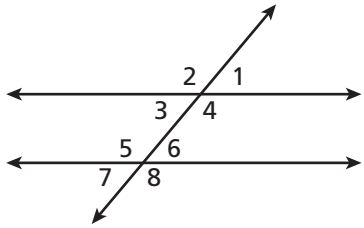
# Big Ideas

Know it! Note

**Answer these questions to summarize the important concepts from Chapter 7 in your own words.**

**1.** Explain the difference between complementary angles and supplementary angles.

**2.** If ∠1 is 50°, explain how to find m∠5.




**3.** If the measures of two angles in a triangle are 43° and 74°, explain how to find the measure of the third angle.

**4.** Explain how to use rotations to create a variation of a tessellation.

**For more review of Chapter 7:**

- Complete the Chapter 7 Study Guide and Review on pages 376–378 of your textbook.
- Complete the Ready to Go On quizzes on pages 352 and 372 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 8-1

# Perimeter & Area of Rectangles & Parallelograms

## Lesson Objectives

Find the perimeter and area of rectangles and parallelograms

## Vocabulary

perimeter (p. 388) _____

_____

area (p. 389) _____

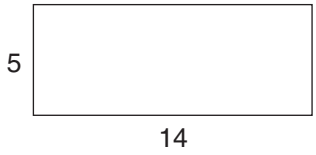
_____

## Additional Examples

### Example 1

**Find the perimeter of each figure.**

**A.**




$P =$ ☐ $+$ ☐ $+$ ☐ $+$ ☐ Add all side lengths.

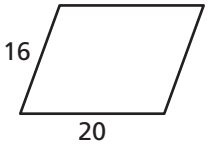
$=$ ☐ units

or $P = 2b + 2h$ Perimeter of rectangle

$= 2($☐$) + 2($☐$)$ Substitute ☐ for $b$ and ☐ for $h$.

$= 28 + 10 =$ ☐ units

**B.**




$P =$ ☐ $+$ ☐ $+$ ☐ $+$ ☐

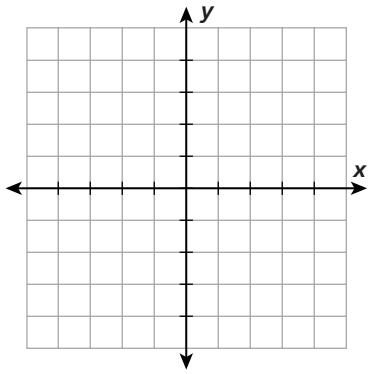
$=$ ☐ units

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Graph and find the area of the figure with the given vertices.**

**A.** $(-1, -2), (2, -2), (2, 3), (-1, 3)$



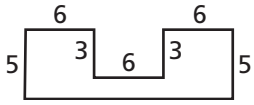

$A = bh$ Area of a rectangle

$= \square \cdot \square$ Substitute $\square$ for $b$ and $\square$ for $h$.

$= \square$ units$^2$

## Example 3

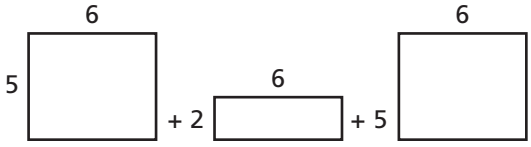
**Find the perimeter and area of the figure.**




The length of the side that is not labeled is the same as the total length of the opposite side, or $\square + \square + \square$, which equals $\square$.

$P = \square + \square + \square + \square + \square + \square + \square + \square$

$= \square$ units




The length of the middle rectangle (above) is $5 - \square = \square$.

$A = (6 \cdot \square) + (6 \cdot \square) + (6 \cdot \square)$ Add the areas together.

$= \square + \square + \square$

$= \square$ square units

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 8-2

# Perimeter and Area of Triangles and Trapezoids

## Lesson Objectives

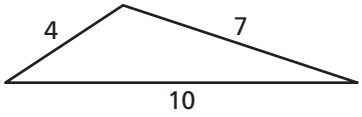
Find the perimeter and area of triangles and trapezoids

## Additional Examples

### Example 1

**Find the perimeter of each figure.**

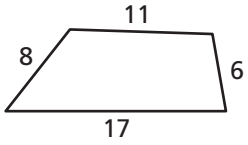
**A.**




$P =$ ☐ $+$ ☐ $+$ ☐ Add all sides.

$=$ ☐ units

**B.**

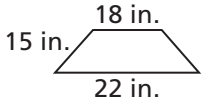



$P =$ ☐ $+$ ☐ $+$ ☐ $+$ ☐ Add all sides.

$=$ ☐ units

### Example 2

**Find the missing measurement for the trapezoid with perimeter 71 in.**




$P =$ ☐ $+$ ☐ $+$ ☐ $+ d$

$71 =$ ☐ $+ d$ Substitute ☐ for $P$.

$-55 \quad -55$ Subtract ☐ from both sides.

$16 = \quad d$

$d =$ ☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 8-3

# Circles

## Lesson Objectives

Find the circumference and area of circles

## Vocabulary

circle (p. 400) _____

radius (p. 400) _____

diameter (p. 400) _____

circumference (p. 400) _____

## Additional Examples

### Example 1

**Find the circumference of each circle, both in terms of $\pi$ and to the nearest tenth. Use 3.14 for $\pi$.**

**A.** circle with a radius of 4 m

$C = 2\pi r$

$= 2\pi(\square)$

$= \square\,\pi$ m $\approx \square$ m

**B.** circle with a diameter of 3.3 ft

$C = \pi d$

$= \pi(\square)$

$= \square\,\pi$ ft $\approx \square$ ft

### Example 2

**Find the area of each circle, both in terms of $\pi$ and to the nearest tenth. Use 3.14 for $\pi$.**

**A.** circle with a radius of 4 in.

$A = \pi r^2 = \pi(\square^2)$

$= \square\,\pi$ in$^2 \approx \square$ in$^2$

**B.** circle with a diameter of 3.3 m

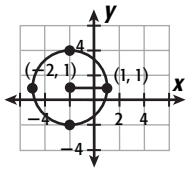
$A = \pi r^2 = \pi(\square^2)$ $\quad \frac{d}{2} = \square$

$= \square\,\pi$ m$^2 \approx \square$ m$^2$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Graph the circle with center (−2, 1) that passes through (1, 1). Find the area and circumference, both in terms of $\pi$ and to the nearest tenth. Use 3.14 for $\pi$.**




$A = \pi r^2$

$= \pi(\square)^2$

$= \square\pi$ units$^2$

$\approx \square$ units$^2$

$C = \pi d$

$= \pi(\square)$

$= \square\pi$ units

$\approx \square$ units

## Example 4

**A Ferris wheel has a diameter of 56 feet and makes 15 revolutions per ride. How far would someone travel during a ride? Use $\frac{22}{7}$ for $\pi$.**

$C = \pi d = \pi(\square) \approx \frac{22}{7}\left(\frac{\square}{1}\right) = \square$ Find the circumference.

The distance traveled is the circumference of the Ferris wheel time the number of revolutions, or about $\square \cdot \square \approx \square$ ft.

## Try This

**1. Find the circumference of the circle, both in terms of $\pi$ and to the nearest tenth. Use 3.14 for $\pi$.**

circle with a diameter of 4.25 in.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 8-4

# Drawing Three-Dimensional Figures

Know it! Note

## Lesson Objectives

Draw and identify parts of three-dimensional figures

## Vocabulary

face (p. 408) _____

edge (p. 408) _____

_____

vertex (p. 408) _____

_____

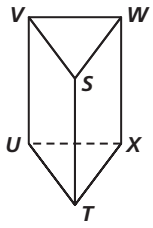
orthogonal views (p. 408) _____

_____

## Additional Examples

**Example 1**

**Name the vertices, edges, and faces of the three-dimensional figure shown.**




The vertices are: _____.

The edges are: _____.

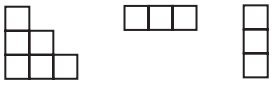
The faces are triangles _____, and rectangles _____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Draw the figure shown in the front, top, and side views.**

Front Top Side



From the front and sides views, there appears to be _____ cube in the top level, in the _____ corner. The top view shows the bottom layer has _____ cubes.

## Example 3

**Draw the front, top, and side views of the figure.**

**Front:** The figure looks like a row of 3 squares on the bottom with _____ square on top of the leftmost square and 2 squares on top of the rightmost square.

**Top:** The figure looks like a row of _____ squares.

**Side:** The figure looks like a column of _____ squares.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 8-5

# Volume of Prisms and Cylinders

Know it! Note

## Lesson Objectives

Find the volume of prisms and cylinders

## Vocabulary

prism (p. 413) _____

_____

cylinder (p. 413) _____

_____

## Additional Examples

### Example 1

**Find the volume of each figure to the nearest tenth. Use 3.14 for $\pi$.**

**A.** A rectangular prism with base 2 cm by 5 cm and height 3 cm.

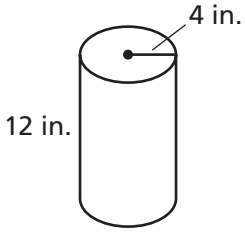
$B =$ ☐ $\cdot$ ☐ $=$ ☐ cm$^2$ Area of ☐

$V = Bh$ ☐ of a prism

$=$ ☐ $\cdot$ ☐

$=$ ☐ cm$^3$

**B.**




$B = \pi($☐$^2) =$ ☐ $\pi$ in$^2$ ☐ of base

$V = Bh$ Volume of a ☐

$=$ ☐ $\pi \cdot$ ☐

$=$ ☐ $\pi \approx$ ☐ in$^3$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A. A juice box measures 3 in. by 2 in. by 4 in. Explain whether tripling the length, width, or height of the box would triple the amount of juice the box holds.**

| Original Dimensions | Triple the Length | Triple the Width | Triple the Height |
|---|---|---|---|
| $V = lwh$ | $V = (3l)wh$ | $V = l(3w)h$ | $V = lw(3h)$ |
| $= \square \cdot \square \cdot \square$ | $= \square \cdot 2 \cdot 4$ | $= 3 \cdot \square \cdot 4$ | $= 3 \cdot 2 \cdot \square$ |
| $= \square$ in$^3$ | $= \square$ in$^3$ | $= \square$ in$^3$ | $= \square$ in$^3$ |

The original box has a volume of $\square$ in$^3$. You could triple the volume to $\square$ in$^3$ by tripling any one of the dimensions. So tripling the length, width, or height $\square$ triple the amount of juice the box holds.

## Example 3

**A drum company advertises a snare drum that is 4 inches high and 12 inches in diameter. Estimate the volume of the drum.**

$r = \frac{d}{2} = \frac{\square}{2} = \square$

$V = (\pi r^2)h$

$= (3.14)(\square)^2(\square)$

$= (3.14)(\square)(4)$

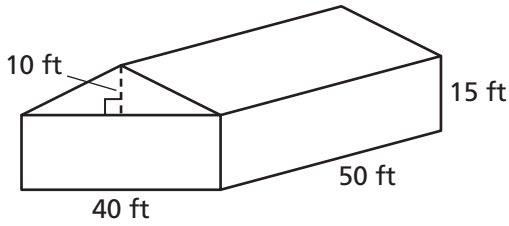
$= \square \cdot 4$

$= \square \approx \square$ in$^3$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 4

**Find the volume of the barn.**




| Volume of barn | = | Volume of rectangular prism | + | Volume of triangular prism |
|---|---|---|---|---|

$V = (40)(50)(15) + \frac{1}{2}(40)(10)(50)$

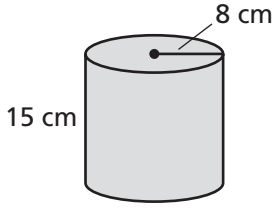
$= \quad + \quad$

$= \quad$ ft$^3$

The volume is 40,000 ft$^3$.

## Try This

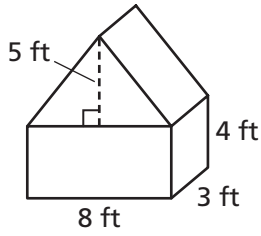
**1. Find the volume of the figure to the nearest tenth.**




**2. A garbage container measures 2 ft by 3 ft by 7 ft. Explain whether doubling the length, width, or height of the container would double the amount of garbage the container holds.**

**3. A drum company advertises a bass drum that is 9 inches high and 19 inches in diameter. Estimate the volume of the drum.**

**4. Find the volume of the figure.**




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 8-6

# Volume of Pyramids and Cones

## Lesson Objectives

Find the volume of pyramids and cones

## Vocabulary

pyramid (p. 420) _____

_____

cone (p. 420) _____

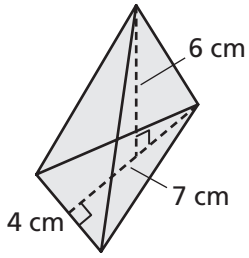
_____

## Additional Examples

### Example 1

**Find the volume of each figure. Use 3.14 for $\pi$.**

**A.**

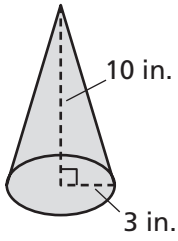



$B = \frac{1}{2}(\square \cdot \square) = \square$ cm$^2$

$V = \frac{1}{3} \cdot \square \cdot \square$ $\qquad V = \frac{1}{3}Bh$

$V = \square$ cm$^3$

**B.**




$B = \pi(\square^2) = \square\pi$ in$^2$

$V = \frac{1}{3} \cdot \square\pi \cdot \square$ $\qquad V = \frac{1}{3}Bh$

$V = \square\pi \approx \square$ in$^3$ $\qquad$ Use 3.14 for $\square$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A cone has a radius of 3 ft. and a height of 4 ft. Explain whether tripling the height would have the same effect on the volume of the cone as tripling the radius.**

| Original Dimensions | Triple the Height | Triple the Radius |
|---|---|---|
| $V = \frac{1}{3}\pi r^2 h$ | $V = \frac{1}{3}\pi r^2(3h)$ | $V = \frac{1}{3}\pi(3r)^2 h$ |
| $= \frac{1}{3}\pi(3^2)4$ | $= \frac{1}{3}\pi(3^2)(3 \cdot 4)$ | $= \frac{1}{3}\pi(3 \cdot 3)^2(4)$ |
| $\approx$ | $\approx$ | $\approx$ |

When the height of the cone is tripled, the volume is _____. When the radius is tripled, the volume becomes _____ times the original volume.

## Example 3

**The Pyramid of Kukulcán in Mexico is a square pyramid. Its height is 24 m and its base has 55 m sides. Find the volume of the pyramid.**

$B =$ _____$^2 =$ _____ $m^2$ $\quad A = bh$

$V = \frac{1}{3}($_____$)($_____$)$ $\quad V = \frac{1}{3}bh$

$V =$ _____ $m^3$

## Example 4

**Use a calculator to find the volume of a cone to the nearest cubic centimeter if the radius of the base is 15 cm and the height is 64 cm.**

Use the *pi* button on your calculator to find the area of the base.

2nd [π] [^] [×] 15 [$x^2$] ENTER $\quad B = \pi r^2$

Next, with the area of the base still displayed, find the volume of the cone.

[×] 64 [×] [(] 1 [÷] 3 [)] ENTER $\quad V = \frac{1}{3}bh$

The volume of the cone is approximately _____ $cm^3$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 8-7

# Surface Area of Prisms and Cylinders

## Lesson Objectives

Find the surface area of prisms and cylinders

## Vocabulary

surface area (p. 427) _____

_____

lateral face (p. 427) _____

_____

lateral surface (p. 427) _____

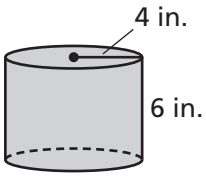
_____

## Additional Examples

**Example 1**

**Find the surface area of each figure.**

**A.**

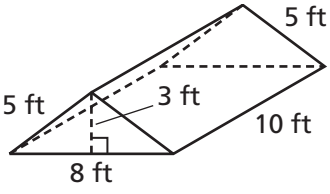



$S = 2\pi r^2 + 2\pi rh$

$= 2\pi(\square^2) + 2\pi(\square)(\square)$

$= \square\pi$ in$^2 \approx \square$ in$^2$

**B.**




$S = 2B + P = 2(\square \cdot \square \cdot \square) + (\square)(\square)$

$= \square$ ft$^2$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A cylinder has diameter 8 in. and height 3 in. Explain whether tripling the height would have the same effect on the surface area as tripling the radius.**

| Original Dimensions | Triple the Height | Triple the Radius |
|---|---|---|
| $S = 2\pi r^2 + 2\pi rh$<br>$= 2\pi(4)^2 + 2\pi(4)(3)$<br>$= 56\pi$ in$^2 \approx$ ____ | $S = 2\pi r^2 + 2\pi r(3h)$<br>$= 2\pi(4)^2 + 2\pi(4)(9)$<br>$= 104\pi$ in$^2 \approx$ ____ | $S = 2\pi(3r)^2 + 2\pi(3r)h$<br>$= 2\pi(12)^2 + 2\pi(12)(3)$<br>$= 360\pi$ in$^2 \approx$ ____ |

They ____ have the same effect. Tripling the radius would increase the surface area ____ than tripling the height.

## Example 3

**A cylindrical soup can is 7.6 cm in diameter and 11.2 cm tall. What is the area of the label that covers the side of the can?**

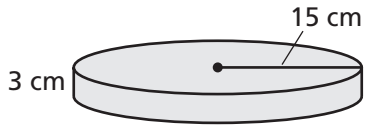
$L = 2\pi rh$ Only the lateral surface needs to be covered.

$= 2\pi($____$)($____$)$ diameter $= 7.6$, so $r =$ ____

$=$ ____ $\pi \approx$ ____ cm$^3$

## Try This

**1. Find the surface area of the figure.**




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 8-8

# Surface Area of Pyramids and Cones

## Lesson Objectives

Find the surface area of pyramids and cones

## Vocabulary

slant height (p. 432) _____

_____

regular pyramid (p. 432) _____

_____

right cone (p. 432) _____

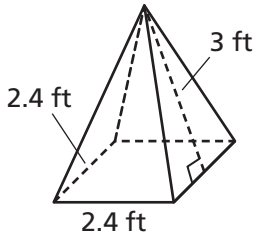
_____

## Additional Examples

**Example 1**

**Find the surface area of the figure to the nearest tenth.**

**A.**




$S = B + \frac{1}{2}Pl$

$= (\square \cdot \square) + \frac{1}{2}(\square)(\square)$

$= \square$ ft$^2$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

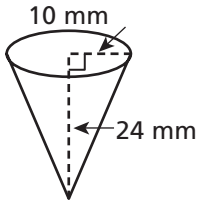
**A cone has diameter 8 in. and slant height 3 in. Explain whether tripling the slant height would have the same effect on the surface area as tripling the radius.**

| Original Dimensions | Triple the Slant Height | Triple the Radius |
|---|---|---|
| $S = \pi r^2 + \pi rl$<br>$= \pi(4)^2 + \pi(4)(3)$<br>$= 28\pi$ in$^2 \approx$ ____ | $S = \pi r^2 + \pi r(3l)$<br>$= \pi(4)^2 + \pi(4)(9)$<br>$= 52\pi$ in$^2 \approx$ ____ | $S = \pi(3r)^2 + \pi(3r)l$<br>$= \pi(12)^2 + \pi(12)(3)$<br>$= 180\pi$ in$^2 \approx$ ____ |

They ____ have the same effect. Tripling the radius would increase the surface area ____ than tripling the slant height.

## Example 3

**The upper portion of an hourglass is approximately an inverted cone with the given dimensions. What is the lateral surface area of the upper portion of the hourglass?**




The slant height, radius, and depth of the hourglass form a ____ triangle.

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

$\square^2 + \square^2 = l^2$

$\square = l^2$

$l = \square$

$L = \pi rl$ Lateral surface area

$= \pi(\square)(\square) = \square\pi \approx$ ____ mm$^2$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 8-9

# Spheres

Know it! Note

## Lesson Objectives

Find the volume and surface area of spheres

## Vocabulary

sphere (p. 436) _____

_____

hemisphere (p. 436) _____

_____

great circle (p. 436) _____

_____

## Additional Examples

### Example 1

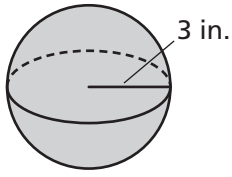
**Find the volume of a sphere with radius 12 cm, both in terms of $\pi$ and to the nearest tenth of a unit. Use 3.14 for $\pi$.**

$V = \left(\frac{4}{3}\right)\pi r^3$ _____ of a sphere

$= \left(\frac{4}{3}\right)\pi(\square^3)$ Substitute $\square$ for $r$.

$= \square\,\pi$ cm$^3 \approx \square$ cm$^3$

### Example 2




**Find the surface area, both in terms of $\pi$ and to the nearest tenth of a unit. Use 3.14 for $\pi$.**

$S = 4\pi r^2$ _____ area of a sphere

$= 4\pi(\square^2)$ Substitute $\square$ for $r$.

$= \square\,\pi$ in$^2 \approx \square$ in$^2$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Compare the volumes and surface areas of a sphere with radius 42 cm and a rectangular prism measuring 44 × 84 × 84 cm.**

**Sphere:**

$V = \left(\frac{4}{3}\right)\pi r^3 = \left(\frac{4}{3}\right)\pi(\square^3)$

$\approx \left(\frac{4}{3}\right)\left(\frac{22}{7}\right)$ ☐

$\approx$ ☐ $\text{cm}^3$

$S = 4\pi r^2 = 4\pi(\square^2)$

$=$ ☐ $\pi$

$\approx$ ☐ $\left(\frac{22}{7}\right)$

$\approx$ ☐ $\text{cm}^2$

**Rectangular Prism:**

$V = lwh$

$= (\square)(\square)(\square)$

$=$ ☐ $\text{cm}^3$

$S = 2lw + 2lh + 2wh$

$= 2(\square)(\square) +$

$2(\square)(\square) +$

$2(\square)(\square)$

$=$ ☐ $\text{cm}^2$

The sphere and the prism have approximately the same ☐,

but the prism has a ☐ surface area.

## Try This

1. **Find the volume of a sphere with radius 3 cm, both in terms of $\pi$ and to the nearest tenth of a unit.**

2. **The moon has a radius of 1,738 km. Find the surface area, both in terms of $\pi$ and to the nearest tenth.**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 8-10

# Scaling Three-Dimensional Figures

## Lesson Objectives

Make scale models of solid figures

## Vocabulary

capacity (p. 440) _____

_____

## Additional Examples

### Example 1

**A 3 cm cube is built from small cubes, each 1 cm on an edge. Compare the following values.**

**A.** the edge lengths of the large and small cubes

$$\frac{\text{3 cm cube}}{\text{1 cm cube}} \rightarrow \frac{\square}{\square}\ \frac{\text{cm}}{\text{cm}} = \square$$

Ratio of corresponding $\square$

The edges of the large cube are $\square$ times as long as the edges of the small cube.

### Example 2

**A box is in the shape of a rectangular prism. The box is 4 ft tall, and its base has a length of 3 ft and a width of 2 ft. For a 6 in. tall model of the box, find the following.**

**A.** What is the scale factor of the model?

$$\frac{\text{6 in.}}{\text{4 ft}} = \frac{\text{6 in.}}{\square\ \text{in.}} = \square$$

Convert and simplify.

The scale factor of the model is $\square$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**It takes 30 seconds for a pump to fill a cubic container whose edge measures 1 ft. How long does it take for the pump to fill a cubic container whose edge measures 2 ft?**

$V =$ ☐ ft $\cdot$ ☐ ft $\cdot$ ☐ ft $=$ ☐ $ft^3$ — Find the volume of the larger container.

Set up a proportion and solve.

$\frac{30}{1\ ft^3} = \frac{x}{\square\ ft^3}$ — Cancel units.

☐ $\cdot$ ☐ $=$ ☐ — Multiply.

☐ $= x$ — Calculate the fill time.

It takes ☐ seconds, or ☐ minutes to fill the larger container.

## Try This

**1. A 2 cm cube is built from small cubes, each 1 cm on an edge. Compare the following values.**

the edge lengths of the large and small cubes

**2. A box is in the shape of a rectangular prism. The box is 8 ft tall, and its base has a length of 6 ft and a width of 4 ft. For a 6 in. tall model of the box, find the following.**

What is the scale factor of the model?

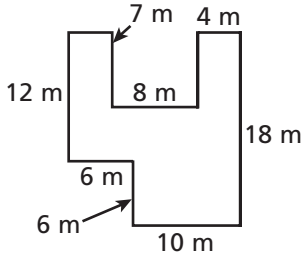
**3. It takes 45 seconds for a machine to fill a cubic box whose edge measures 1 yd. How long does it take for the machine to fill a cubic box whose edge measures 5 yd?**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

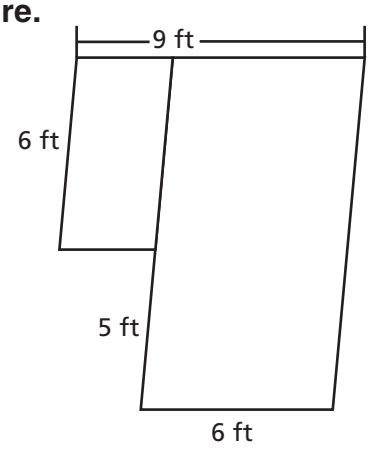
## 8-1 Perimeter and Area of Rectangles and Parallelograms

**Find the perimeter and area of each figure.**

**1.**




**2.**




**3.** The dance floor at a graduation dinner reception is a rectangular shape with dimensions 16 ft by 28 ft. What is the area of the dance floor?

## 8-2 Perimeter and Area of Triangles and Trapezoids

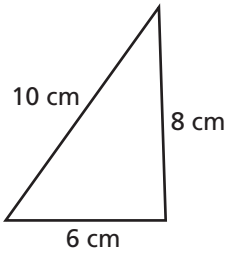
**Find the area of each figure with the given dimensions.**

**4.** triangle: $b = 9$, $h = 15$

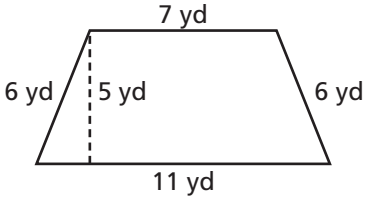
**5.** trapezoid: $b_1 = 7$, $b_2 = 12$, $h = 5$

**Find the perimeter of each figure.**

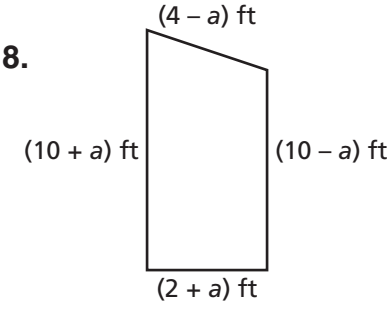
**6.**




**7.**




**8.**



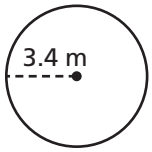

**9.** The perimeter of a triangle is 46.9 ft. Two of its sides measure 14.8 ft and 21.2 ft, respectively. What is the length of its third side of the triangle?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

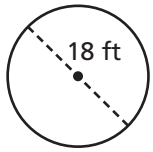
## 8-3 Circles

**Find the circumference and area of each circle to the nearest tenth. Use 3.14 for $\pi$.**

**10.**




**11.**




**12.**

**Find the radius of each circle with the given measurement.**

**13.** $C = 85\pi$ in.

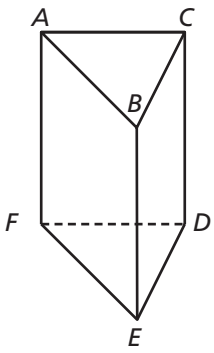
**14.** $A = 256\pi$ cm$^2$

**15.** $A = 179.56\pi$ m$^2$

## 8-4 Drawing Three-Dimensional Figures

**Name the vertices, edges, and faces of the three-dimensional figure shown.**

**16.**




**Use isometric dot paper to sketch each figure.**

**17.** a cube 3 units on each side

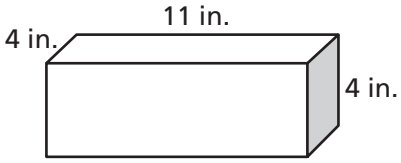
**18.** a rectangular box 4 units high, with a base 3 units by 5 units

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

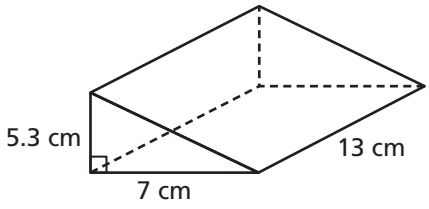
## 8-5 Volume of Prisms and Cylinders

**Find the volume of each figure to the nearest tenth.**

**19.**




**20.**




**21.** A can of soup has a radius 3.5 in. and a height 8 in. Explain whether increasing the radius 4 times would increase the volume by 4 times.

## 8-6 Volume of Pyramids and Cones

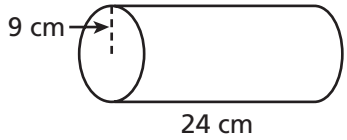
**22.** Kerri made cone-shaped containers. The diameter of the container is 7 in. and the height is 11 in. What is the volume of the container to the nearest tenth?

**23.** Hector built a pyramid in his backyard. The base is a square, with sides that are 8 ft long. The height of the pyramid is 6.5 ft. Explain whether doubling the height of the pyramid would double the volume of the pyramid.

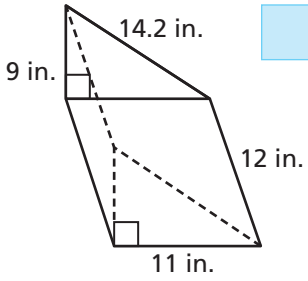
## 8-7 Surface Area of Prisms and Cylinders

**Find the surface area of each figure with the given dimensions to the nearest tenth. Use 3.14 for $\pi$.**

**24.**




**25.**




**26.** Jillian wants to make a box that is 6 in. by 6 in. by 22 in. How many square inches of cardboard does she need?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 8-8 Surface Area of Pyramids and Cones

**Find the surface area of each figure with the given dimensions. Use 3.14 for $\pi$.**

**27.** regular square pyramid:
base perimeter = 60 yd
slant height = 6 yd

**28.** cone:
radius = 18.4 m
slant height = 32 m

## 8-9 Spheres

**Find the missing measurements of each sphere, both in terms of $\pi$ and to the nearest tenth. Use 3.14 for $\pi$.**

**29.** radius = 8.6 in.
volume = ?
surface area = ?

**30.** diameter = 4.6 mm
volume = ?
surface area = ?

## 8-10 Scaling Three-Dimensional Figures

**A 10 cm cube is built from small cubes, each 2 cm on a side. Compare the following values.**

**31.** the surface area of the two cubes

**32.** the volumes of the two cubes

**33.** A bath tub measures 60 in. by 30 in. by 18 in. It takes 54 minutes to fill with water. A larger bath tub measures 68 in. by 36 in. by 20 in. About how long will it take to fill the larger bath tub with water?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 8

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 8 in your own words.**

1. Explain how to find the area of a trapezoid with bases 3 inches and 7 inches, and height 6 inches.

2. Explain how to find the circumference of a circle with radius 6 meters.

3. Explain how to find the volume of a cone with radius 3 feet and height 8 feet.

4. Explain how to find the surface area of a cylinder with diameter 6 inches and height 7 inches.

**For more review of Chapter 8:**

- Complete the Chapter 8 Study Guide and Review on pages 450–452 of your textbook.
- Complete the Ready to Go On quizzes on pages 404 and 444 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 9-1

# Samples and Surveys

Know it! Note

## Lesson Objectives

Identify sampling methods and recognize biased samples

## Vocabulary

population (p. 462) _____

sample (p. 462) _____

biased sample (p. 463) _____

_____

random sample (p. 462) _____

_____

systematic sample (p. 462) _____

_____

stratified sample (p. 462) _____

_____

convenience sample (p. 462) _____

_____

voluntary-response sample (p. 462) _____

_____

## Additional Examples

**Example 1**

**Identify the sampling method used.**

**A.** In a county survey, Democratic Party members whose names begin with the letter D are chosen.

_____ The _____ is to survey members whose names begin with D.

**B.** A telephone company randomly chooses customers to survey about its service.

_____ Customers are chosen by _____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Identify the population and the sample. Give a reason why the sample could be biased.**

**A.** A record store manager asks customers who make a purchase how many hours of music they listen to each day.

| Population | Sample | Possible Bias |
|---|---|---|
| | | Customers who make a purchase might be more ____ in music than others in the store. |

## Try This

**1. Identify the sampling method used.**

In a county survey, families with 3 or more children are chosen.

**2. Identify the population and the sample. Give a reason why the sample could be biased.**

People attending a baseball game were asked if they support the construction of a new stadium in the city.

| Population | Sample | Possible Bias |
|---|---|---|
| | | People that attend a baseball game are more likely to ____ the construction of a new stadium. |

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 9-2

# Organizing Data

## Lesson Objectives

Organize data in tables and stem-and-leaf plots

## Vocabulary

stem-and-leaf plot (p. 467) _____

back-to-back stem-and-leaf plot (p. 468) _____

line plot (p. 467) _____

Venn diagram (p. 468) _____

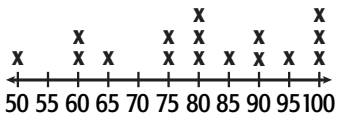
## Additional Examples

### Example 1

**Use a line plot to organize the math exam scores.**

| Student Test Scores | | | |
|---|---|---|---|
| 100 | 95 | 75 | 80 |
| 60 | 100 | 60 | 75 |
| 90 | 85 | 80 | 100 |
| 50 | 90 | 65 | 80 |

Find the least value, ____, and the greatest value, ____, in the data set. Then draw a number line from ____ to ____. Place an "*x*" above each number on the number line for each time it appears in the data set.




There are ____ numbers in the data set and ____ *x*'s above the number line.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**List the data values in the stem-and-leaf plot.**

| | |
|---|---|
| 1 | 2 5 |
| 4 | 0 1 1 |
| 5 | 2 7 9 |

*Key: 1|2 means 12*

The data values are

## Example 3

**Use the given data to make a back-to-back stem-and-leaf plot.**

| U.S. Representatives for Selected States, 1950 and 2000 | | | | | |
|---|---|---|---|---|---|
| | IL | MA | MI | NY | PA |
| 1950 | 25 | 14 | 18 | 43 | 31 |
| 2000 | 19 | 10 | 15 | 29 | 19 |

## Example 4

**Make a Venn diagram to show how many 8th grade students play soccer.**

| Survey Results | | | |
|---|---|---|---|
| Grade | Sport | Grade | Sport |
| 6 | baseball | 8 | tennis |
| 6 | tennis | 7 | soccer |
| 8 | soccer | 7 | baseball |
| 8 | baseball | 6 | soccer |
| 7 | soccer | 8 | soccer |

Draw two circles. Label one circle “8th Grader” and the other circle “Soccer Player”. The region that overlaps represents the characteristics that are shared by both sets of data.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 9-3

# Measures of Central Tendency

## Lesson Objectives

Find appropriate measures of central tendency

## Vocabulary

mean (p. 472) _____

median (p. 472) _____

mode (p. 472) _____

outlier (p. 472) _____

range (p. 472) _____

## Additional Examples

**Example 1**

**Find the mean, median, mode, and range of the data set.**

21, 21, 28, 29, 30, 28, 32

**mean:** 21 + 21 + 28 + 29 + 30 + 28 + 32 = ☐

☐ the values.

$\frac{189}{\square} = \square$

Divide by ☐, the number of values.

**median:** 21 21 28 28 29 30 32
*3 values* *3 values*

☐ the values.

☐

**mode:** ☐ The values ☐ occur two times.

**range:** ☐ − ☐ = ☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Determine and find the most appropriate measure of central tendency or range for each situation. Justify your answer.**

**A.** Competitors received the following scores for their performance in a gymnastic competition: 9.0, 8.3, 8.5, 9.1, 8.2, 8.9, 8.2, 9.0, 8.8, 8.3, 9.2, 9.0, 8.6. What score occurred most often?

Find the mode.

[ ], [ ], [ ], [ ], 8.5, 8.6, 8.8, 8.9, [ ], [ ], [ ], 9.1, 9.2

List the scores in [ ].

Underline the scores that appear more than [ ].

Nine appears most frequently. The [ ] is [ ].

## Example 3

**Employees at a store earned $275, $330, $290, $300, $350, $365, and $310 during one week. What measure of central tendency or range would make the salaries look the highest?**

Find each measure of central tendency and range of the data set.

mean: $\frac{\$275 + \$330 + \$290 + \$300 + \$350 + \$365 + \$310}{7} =$

$\frac{\$2{,}220}{7} \approx \$$[ ]

median: $275, $290, $300, $[ ], $330, $350, $365

Underline the [ ] value.

mode: There is [ ] mode.

range: $\$310 - \$275 = \$$[ ]

The [ ] would make the salaries look the highest.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 9-4

# Variability

## Lesson Objectives

Find measures of variability

## Vocabulary

variability (p. 476) _____

quartile (p. 476) _____

box-and-whisker plot (p. 477) _____

## Additional Examples

**Example 1**

**Find the first and third quartiles of each data set.**

**A.** 15, 83, 75, 12, 19, 74, 21

[ ] [ ] 21, [ ] [ ] [ ] the values.

first quartile: [ ]

third quartile: [ ]

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Use the given data to make a box-and-whisker plot.**

21, 25, 15, 13, 17, 19, 19, 21

**Step 1.** Order the data and find the smallest value, first quartile, median, third quartile, and largest value.

**smallest value:** ☐

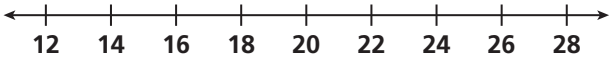
**first quartile:** $\frac{\square + \square}{2} = \square$

**median:** $\frac{\square + \square}{2} = \square$

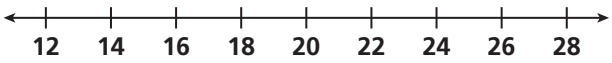
**third quartile:** $\frac{\square + \square}{2} = \square$

**largest value:** ☐

**Step 2.** Draw a number line and plot a point above each value from Step 1.




**Step 3.** Draw the box and whiskers.




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 9-5

# Displaying Data

## Lesson Objectives

Display data in bar graphs, histograms, and line graphs

## Vocabulary

double-bar graph (p. 485) _____

frequency table (p. 485) _____

histogram (p. 485) _____

double-line graph (p. 486) _____

## Additional Examples

### Example 1

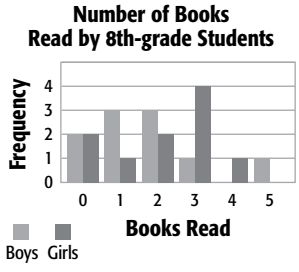
**Make a double-bar graph.**

The following are the number of books read in one month by some boys and girls in Grade 8:

| Books read | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Boys | 2 | 3 | 3 | 1 | 0 | 1 |
| Girls | 2 | 1 | 2 | 4 | 1 | 0 |

The frequencies are the _____ of the bars in the bar graph.

Use a different _____ to represent each gender.




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

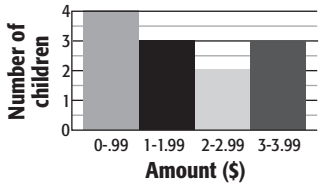
## Example 2

**Jimmy asked 12 children how much money they received from the tooth fairy. Use the data to make a histogram.**

0.35 2.00 0.75 2.50 1.50 3.00 0.25 1.00 1.00 3.50 0.50 3.00

First, make a _____ table with intervals of $1.00.

Then make a _____.




## Example 3

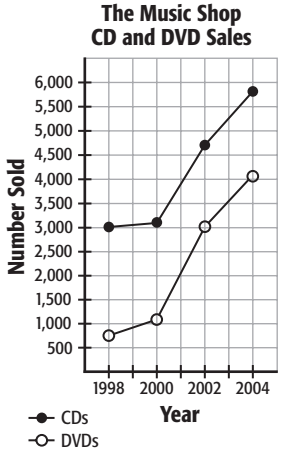
**Make a double-line graph of the given data. Use the graph to estimate the number of CDs and DVDs sold in 2003.**

Create two sets of ordered pairs and plot them on a grid. Connect each set of points with different color lines

Then find the points on the graph that correspond to 2003. The graph shows about _____ CDs sold and _____ DVDs sold.

**The Music Shop CD and DVD Sales**

| Year | CDs sold | DVDs sold |
|---|---|---|
| 1998 | 3002 | 735 |
| 2000 | 3098 | 1057 |
| 2002 | 4685 | 3010 |
| 2004 | 5804 | 4047 |




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 9-6

# Misleading Graphs and Statistics

Know it! Note

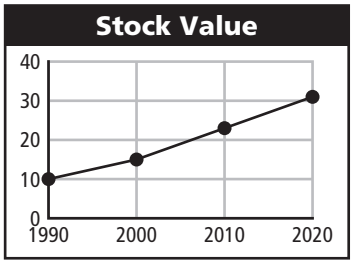
## Lesson Objectives

Recognize misleading graphs and statistics

## Additional Examples

### Example 1

**Explain why the graph is misleading.**




The graph suggests that the stock will continue to increase through _____, but there's no way to foresee the _____.

### Example 2

**Explain why each statistic is misleading.**

**A.** Four out of five dentists surveyed preferred UltraClean toothpaste.

This statement does not give the _____ size or state what UltraClean toothpaste was _____ with.

**B.** Shopping at Save-a-Lot can save you up to $100 a month!

The words *save up to $100* mean that the _____ you can save is $100, but there is no _____ that you will save that amount.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 9-7

# Scatter Plots

## Lesson Objectives

Create and interpret scatter plots

## Vocabulary

scatter plot (p. 494) _____

correlation (p. 494) _____

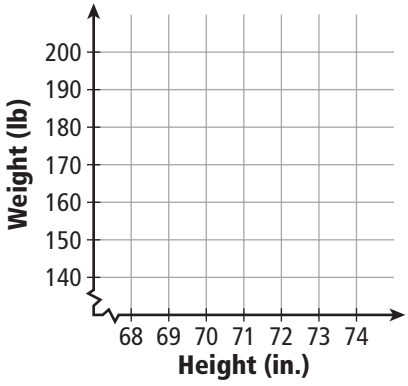
line of best fit (p. 494) _____

## Additional Examples

**Example 1**

**Use the given data to make a scatter plot of the weight and height of each member of a basketball team.**

| Height (in.) | Weight (lb) |
|---|---|
| 71 | 170 |
| 68 | 160 |
| 70 | 175 |
| 73 | 180 |
| 74 | 190 |




The points on the scatter plot are (_____), (_____), (_____), (_____), and (_____).

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Do the data sets have a positive, a negative, or no correlation?**

**A.** the size of a jar of baby food and the number of jars of baby food a baby will eat

_____ correlation: The _____ food in each jar, the _____ number of jars of baby food a baby will eat.

**B.** the speed of a runner and the number of races she wins

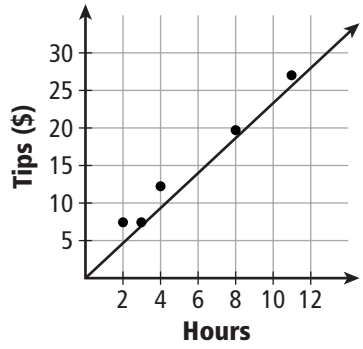
_____ correlation: The _____ the runner, the _____ races she will win.

**C.** the size of a person and the number of fingers he has

_____ correlation: The size of a person _____ affect the number of fingers he has.

## Example 3

**Use the data to predict how much a worker will earn in tips in 10 hours.**




According to the graph a worker who works 10 hours should earn about $_____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 9-8

# Choosing the Best Representation of Data

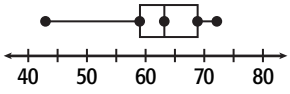
## Lesson Objectives

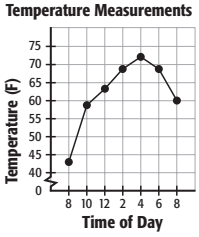
Select the best representation for a set of data

## Additional Examples

### Example 1

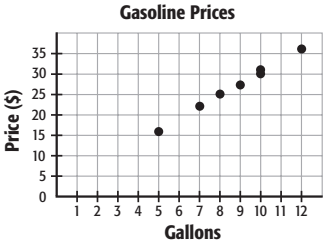
**A. Which graph is a better display of the data on temperature?**

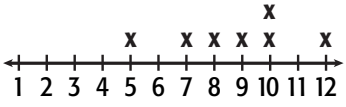



The _____ is the better representation of the change of data over _____.

**B. Which graph is a better display of the two data sets?**




Since the question asks about the relationship of two data sets, the _____ is the better representation.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**The Singer family keeps the budget shown below for their monthly expenses. Choose an appropriate data display and draw the graph. Which two categories account for one-fifth of their budget?**

| | |
|---|---|
| Groceries | $400 |
| Utilities | $330 |
| Mortgage | $850 |
| Clothing | $200 |
| Entertainment | $100 |
| Auto | $500 |
| Savings | $500 |
| Misc. | $120 |

### 1. Understand the Problem

You are looking for the best data display and the two categories that account for one-fifth of the budget.

### 2. Make a Plan

You need to compare each category to the whole. Find the percentage of each category and make a _____ graph.

### 3. Solve

Make a circle graph. To find which two categories account for one-fifth of the budget, convert one-fifth to a percent. One-fifth equals _____%. The two categories that add to 20% are _____ or _____ and _____.

### 4. Look Back

Look at the table. Saving or auto plus entertainment equals $_____, which is about 20% or one-fifth of the budget.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

# Chapter Review

## 9-1 Samples and Surveys

**Identify the sampling method used.**

1. Every odd numbered house address on a street is surveyed.

2. A raffle ticket is drawn at the church festival.

3. For her school project, Lori phoned her friends to ask them their favorite ice cream flavor.

**Identify the population and sample. Give a reason the sample could be biased.**

4. A television talk show asks its viewers to phone or e-mail their opinion on a topic.

5. The Pretzel Factory asks 100 of its weekend customers to rate its products' qualities.

## 9-2 Organizing Data

6. Use a line plot to organize the data of the number of children in each household in the Glennshire Park neighborhood.

| Number of Children per Household | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 1 | 2 | 1 | 4 | 3 | 5 | 4 | 6 | 2 | 3 | 7 | 4 |

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**7.** Make a Venn diagram to show how many of the twelve households surveyed use only liquid fabric softener.

**Survey Results:** liquid, liquid, dryer sheets, liquid, dryer sheets, dryer sheets, both, dryer sheets, dryer sheets, both, both, liquid

## 9-3 Measures of Central Tendency

**Determine and find the most appropriate measure of central tendency or range for each situation.**

**8.** The scores on the social studies test were: 68, 74, 83, 98, 100, 78, 77, 87, 42, 93, and 88. What best describes the middle of these scores?

**9.** The number of pets in each of the surveyed households is: 1, 2, 1, 0, 1, 5, 0, 1, 0, 0, 0, 2, 1, 3, 1, 1. What number appears most often?

**10.** The annual salaries of the graduating class are shown in the table. What was the spread in salaries?

| | | | |
|---|---|---|---|
| $28,500 | $60,150 | $38,900 | $74,000 |
| $25,760 | $41,410 | $13,300 | $55,000 |

**11.** The number of faxes received by a hospital during a week was 718, 725, 716, 730, 714, 721, and 713. Which measure of data would make the number of received faxes seem the highest?

## 9-4 Variability

**Find the first and third quartiles for the data set.**

**12.** 38, 51, 43, 64, 27, 48, 55

**13.** 29, 65, 89, 57, 85, 37, 52, 68, 45

**Use the given data to make a box-and-whisker plot.**

**14.** 8, 4, 5, 7, 9, 10, 6, 5, 8, 11, 12, 8, 9, 5, 7, 8, 7, 6, 5, 5, 4

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 9-5 Displaying Data

**15. Make a double-bar graph.**

| Number of Hits per Game | | |
|---|---|---|
| Game | Team A | Team B |
| 1 | 9 | 8 |
| 2 | 11 | 14 |
| 3 | 12 | 9 |
| 4 | 15 | 12 |
| 5 | 10 | 10 |

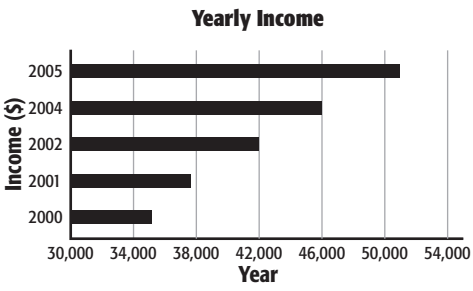
## 9-6 Misleading Graphs and Statistics

**Explain why the statistic is misleading.**

**16.** A housing development features newly built homes. The developer places a sign at the community's entryway stating, "Homes for sale starting from $200,000." The homes built in the development so far have sold for $295,000; $338,000; $427,000; and $389,000.

**Explain why the graph is misleading.**

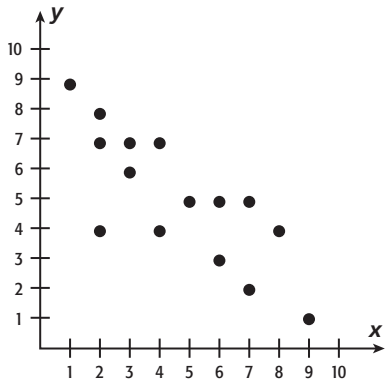
**17.**




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 9-7 Scatter Plots

**18.** Does the scatter plot indicate a positive, a negative, or no correlation?




**19.** Does the following data set have a positive, a negative, or no correlation? The number of gallons of fuel in the tank of a school bus and the number of students on board

## 9-8 Choosing the Best Representation of Data

**20.** The seventh-grade band sold candy as a fund raiser. Its members sold 1,000 units of candy. Of those sold, 500 were chocolate, 300 were fruit-flavored, 150 were nutty, and 50 were chewy. Choose an appropriate data display and draw the graph. What percent of the candy units sold was chocolate?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 9 in your own words.**

**1.** Explain how to find the mean, median, mode, and range of the data set.

45, 53, 78, 29, 84, 25, 74, 57, 29, 36

**2.** Explain how graphs can be misleading.

**3.** Explain when you should use different types of graphs.

**For more review of Chapter 9:**

- Complete the Chapter 9 Study Guide and Review on pages 510–512 of your textbook.
- Complete the Ready to Go On quizzes on pages 482 and 506 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-1

# Probability

Know it! Note

## Lesson Objectives

Find the probability of an event by using the definition of probability

## Vocabulary

experiment (p. 522) _____

trial (p. 522) _____

outcome (p. 522) _____

sample space (p. 522) _____

event (p. 522) _____

probability (p. 522) _____

impossible (p. 522) _____

certain (p. 522) _____

## Additional Examples

**Example 1**

**Give the probability for the outcome.**

**A.** The basketball team has a 70% chance of winning.

The probability of winning is $P(\text{win}) =$ ____ % = ____. The probabilities must add to ____, so the probability of not winning is $P(\text{lose}) =$ ____ − ____ = ____, or ____ %.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A quiz contains 5 true or false questions. Suppose you guess randomly on every question. The table below gives the probability of each score.**

| Score | Probability |
|---|---|
| 0 | 0.031 |
| 1 | 0.156 |
| 2 | 0.313 |
| 3 | 0.313 |
| 4 | 0.156 |
| 5 | 0.031 |

**A.** What is the probability of guessing 3 or more correct?

The event "3 or more correct" consists of the outcomes ☐, ☐, and ☐.

$P(\text{3 or more correct}) = 0.\square + 0.\square + 0.\square$

$= \square$

## Example 3

**PROBLEM SOLVING APPLICATION**

**Six students are in a race. Ken's probability of winning is 0.2. Lee is twice as likely to win as Ken. Roy is $\frac{1}{4}$ as likely to win as Lee. Tracy, James, and Kadeem all have the same chance of winning. Create a table of probabilities for the sample space.**

**1. Understand the Problem**

The answer will be a table of probabilities. Each probability will be a number from 0 to 1. The probabilities of all outcomes add to 1. List the important information:

- $P(\text{Ken}) = \square$
- $P(\text{Lee}) = 2 \cdot P(\text{Ken}) = 2 \cdot 0.2 = \square$
- $P(\text{Roy}) = \frac{1}{4} \cdot P(\text{Lee}) = \frac{1}{4} \cdot = \square$
- $P(\text{Tracy}) = P(\text{James}) = P(\text{Kadeem})$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**2. Make a Plan**

You know the probabilities add to 1, so use the strategy write an equation. Let $p$ represent the probability for Tracy, James, and Kadeem.

$P(\text{Ken}) + P(\text{Lee}) + P(\text{Roy}) + P(\text{Tracy}) + P(\text{James}) + P(\text{Kadeem}) = 1$

$0.2 + 0.4 + 0.1 + p + p + p = 1$

$0.7 + 3p = 1$

**3. Solve**

$0.7 + 3p = \quad 1$

$- \square \qquad - \square$ Subtract $\square$ from both sides.

$3p = \square$

$\frac{3p}{\square} = \frac{0.3}{\square}$ Divide both sides by $\square$.

$p = \square$

| Outcome | Ken | Lee | Roy | Tracy | James | Kadeem |
|---|---|---|---|---|---|---|
| Probability | | | | | | |

**4. Look Back**

Check that the probabilities add to 1.

$0.2 + 0.4 + 0.1 + 0.1 + 0.1 + 0.1 = 1$ ✓

## Try This

**1. Give the probability for the outcome.**

The softball team has a 55% chance of winning.

| Outcome | Win | Lose |
|---|---|---|
| Probability | | |

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-2

# Experimental Probability

## Lesson Objectives

Estimate probability using experimental methods

## Vocabulary

experimental probability (p. 451) _____

_____

## Additional Examples

### Example 1

**A. A marble is randomly drawn out of a bag and then replaced. The table shows the results after fifty draws.**

| Outcome | Green | Red | Yellow |
|---|---|---|---|
| Draw | 12 | 15 | 23 |

**Estimate the probability of drawing a red marble.**

$$\text{probability} \approx \frac{\text{number of } \square \text{ marbles}}{\text{total number of draws}} = \frac{\square}{\square} = \square$$

The probability of drawing a red marble is about ☐, or ☐.

**B. Estimate the probability of drawing a green marble.**

$$\text{probability} \approx \frac{\text{number of } \square \text{ marbles}}{\text{total number of draws}} = \frac{\square}{\square} = \square$$

The probability of drawing a green marble is about ☐, or ☐.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**A marble is randomly drawn out of a bag and then replaced. The table shows the results after fifty draws.**

| Outcome | Green | Red | Yellow |
|---|---|---|---|
| Draw | 12 | 15 | 23 |

**C. Estimate the probability of drawing a yellow marble.**

$$\text{probability} \approx \frac{\text{number of } \square \text{ marbles}}{\text{total number of draws}} = \frac{\square}{\square} = \square$$

The probability of drawing a yellow marble is about $\square$, or $\square$%.

## Example 2

**Use the table to compare the probability that the Huskies will win their next game with the probability that the Knights will win their next game.**

| Team | Wins | Games |
|---|---|---|
| Huskies | 79 | 138 |
| Cougars | 85 | 150 |
| Knights | 90 | 146 |

$$\text{probability} \approx \frac{\text{number of wins}}{\text{number of games}}$$

$$\text{probability for a Huskies win} \approx \frac{\square}{\square} \approx \square$$

$$\text{probability for a Knights win} \approx \frac{\square}{\square} \approx \square$$

The Knights are $\square$ likely to win their next game than the Huskies.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-3

# Use a Simulation

## Lesson Objectives

Use a simulation to estimate probability

## Vocabulary

simulation (p. 532) _____

_____

random numbers (p. 532) _____

_____

## Additional Examples

**Example 1**

**PROBLEM SOLVING APPLICATION**

**A dart player hits the bull's-eye 25% of the times that he throws a dart. Estimate the probability that he will make at least 2 bull's-eyes out of his next 5 throws.**

1. **Understand the Problem**

   The answer will be the _____ that he will make at least 2 bull's-eyes out of his next 5 throws. List the important information:

   - The probability that the player will hit the bull's-eye is _____.

2. **Make a Plan**

   Use a _____ to model the situation. Use digits grouped in pairs. The numbers 01–25 represent a bull's-eye, and the numbers 26–00 represent an unsuccessful attempt. Each group of 10 digits represent one trial.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 87244 | 11632 | 85815 | 61766 | 19579 | 28186 | 18533 | 42633 |
| 74681 | 65633 | 54238 | 32848 | 87649 | 85976 | 13355 | 46498 |
| 53736 | 21616 | 86318 | 77291 | 24794 | 31119 | 48193 | 44869 |
| 86585 | 27919 | 65264 | 93557 | 94425 | 13325 | 16635 | 28584 |
| 18394 | 73266 | 67899 | 38783 | 94228 | 23426 | 76679 | 41256 |
| 39917 | 16373 | 59733 | 18588 | 22545 | 61378 | 33563 | 65161 |
| 96916 | 46278 | 78210 | 13906 | 82794 | 01136 | 60848 | 98713 |

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**3. Solve**

Starting on the third row of the table and using 10 digits for each trial yields the following data:

| | | | | | |
|---|---|---|---|---|---|
| 53 | 73 | 62 | | | bull's eyes |
| 86 | 31 | 87 | 72 | 91 | bull's eyes |
| | 79 | 43 | | | bull's eyes |
| 48 | | 34 | 48 | 69 | bull's eyes |
| 86 | 58 | 52 | 79 | | bull's eyes |
| 65 | 26 | 49 | 35 | 57 | bull's eyes |
| 94 | 42 | 51 | 33 | | bull's eyes |
| | 63 | 52 | 85 | 84 | bull's eyes |
| | 39 | 47 | 32 | 66 | bull's eyes |
| 67 | 89 | 93 | 87 | 83 | bull's eyes |

Out of the 10 trials, _____ trials represented two or more bull's-eyes.

Based on this simulation, the probability of making at least 2 bull's-eyes out of his next 5 throws is about _____, or _____%.

**4. Look Back**

Hitting the bull's-eye at a rate of 20% means the player hits about _____ bull's-eyes out of every 100 throws. This ratio is equivalent to 2 out of 10 throws, so he should make at least 2 bull's-eyes most of the time. The answer is reasonable.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-4

# Theoretical Probability

Know it! Note

## Lesson Objectives

Estimate probability using theoretical methods

## Vocabulary

theoretical probability (p. 540) _____

_____

equally likely (p. 540) _____

fair (p. 540) _____

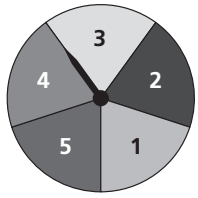
_____

mutually exclusive (p. 542) _____

_____

## Additional Examples

### Example 1




**An experiment consists of spinning this spinner once. Find the probability of each event.**

**A.** $P(4)$ The spinner is _____, so all 5 outcomes are equally likely.

The probability of spinning a 4 is $P(4) =$ _____.

**B.** $P$(even number) There are _____ outcomes in the event of spinning an even number: _____ and _____.

$$P(\text{spinning an even number}) = \frac{\text{number of possible } ____ \text{ numbers}}{5} = ____$$

### Example 2

**An experiment consists of rolling one fair number cube and flipping a coin. Find the probability of each event.**

**A.** Show a sample space that has all outcomes equally likely.

The outcome of rolling a 5 and flipping heads can be written as the ordered pair (5, H). There are _____ possible outcomes.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Stephany has 2 dimes and 3 nickels. How many pennies should be added so that the probability of drawing a nickel is $\frac{3}{7}$?**

Adding pennies will ____ the number of possible outcomes.

Let $x$ equal the number of ____.

$\frac{3}{\square} = \frac{3}{7}$ Set up a proportion.

$3(5 + x) = 3(7)$ Find the cross products.

$15 + \square = \square$ Multiply.

$\square = \square$ Subtract $\square$ from both sides.

$\frac{3x}{\square} = \frac{6}{\square}$ Divide both sides by $\square$.

$x = \square$

Stephany should add $\square$ pennies so that the probability of drawing a nickel is $\frac{3}{7}$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 4

**Suppose you are playing a game in which you roll two fair dice. If you roll a total of five you will win. If you roll a total of two, you will lose. If you roll anything else, the game continues. What is the probability that the game will end on your next roll?**

It is impossible to roll a total of 5 and a total of 2 at the same time, so the events are _____ exclusive. Add the probabilities to find the probability of the game ending on your next roll.

The event "total = 5" consists of _____ outcomes, _____, so $P(\text{total} = 5) =$ _____.

The event "total = 2" consists of _____ outcome, _____,

so $P(\text{total} = 2) =$ _____.

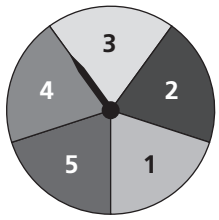
$P(\text{game ends}) = P(\text{total} = 5) + P(\text{total} = 2)$

$= ____ + ____ = ____$

The probability that the game will end is _____, or about _____%.

## Try This

**1. An experiment consists of spinning this spinner once. Find the probability of the event.**




$P(\text{odd number})$

_____

**2. An experiment consists of flipping two coins. Find the probability of the event.**

$P(\text{one head and one tail})$

_____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-5

# Independent and Dependent Events

## Lesson Objectives

Find the probabilities of independent and dependent events

## Vocabulary

compound event (p. 545) _____

independent events (p. 545) _____

dependent events (p. 545) _____

## Additional Examples

**Example 1**

**Determine if the events are dependent or independent.**

**A.** getting tails on a coin toss and rolling a 6 on a number cube

Tossing a coin does not affect rolling a number cube, so the two events are _____.

**Example 2**

**Three separate boxes each have one blue marble and one green marble. One marble is chosen from each box.**

**A.** What is the probability of choosing a blue marble from each box?

The outcome of each choice does not affect the outcome of the other choices, so the choices are _____.

In each box, $P(\text{blue}) =$ _____.

$P(\text{blue, blue, blue}) =$ _____ $\cdot$ _____ $\cdot$ _____ $=$ _____ $=$ _____ Multiply.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**The letters in the word *dependent* are placed in a box.**

**A.** If two letters are chosen at random, what is the probability that they will both be consonants?

$P$(first consonant) = ☐ = ☐

If the first letter chosen was a consonant, now there would be 5 consonants and a total of 8 letters left in the box. Find the probability that the second letter chosen is a consonant.

$P$(second consonant) = ☐

☐ • ☐ = ☐ Multiply.

The probability of choosing two letters that are both consonants is ☐.

**B.** If two letters are chosen at random, what is the probability that they will both be consonants or both be vowels?

The probability of two consonants was calculated in Additional Example 3A. Now find the probability of getting two vowels.

$P$(vowel) = ☐ = ☐ Find the probability that the first letter chosen is a vowel.

If the first letter chosen is a vowel, there are now only ☐ vowels and ☐ total letters left.

$P$(vowel) = ☐ = ☐ Find the probability that the second letter chosen is a vowel.

$\frac{1}{3} \cdot \frac{1}{4} =$ ☐ Multiply.

The events of both letters being consonants or both being vowels are mutually exclusive, so you can add their probabilities.

$\frac{5}{12} +$ ☐ = ☐ = ☐ $P$(consonants) + $P$(vowels)

The probability of both letters being consonants or both being vowels is ☐.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-6

# Making Decisions and Predictions

## Lesson Objectives

Use probability to make decisions and predictions

### Example 1

**A. The table shows the satisfaction rating in a business's survey of 500 customers. Of their 240,000 customers, how many should the business expect to be unsatisfied?**

| Pleased | Satisfied | Unsatisfied |
|---|---|---|
| 126 | 339 | 35 |

$\frac{\text{number of unsatisfied customers}}{\text{total number of customers}} = \frac{\square}{\square} = \square$ Find the probability of a customer being $\square$.

$\frac{7}{100} = \square$ Set up a proportion.

$7 \cdot \square = 100n$ Find the cross products.

$\frac{\square}{100} = \frac{100n}{100}$ Solve for $n$.

$\square = n$

The business should expect $\square$ customers to be unsatisfied.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**B. Jared randomly draws a card from a 52-card deck and tries to guess what it is. If he tries this 1040 times over the course of his life, what is the best prediction for the amount of times it actually works?**

$\frac{\text{number of possible correct guesses}}{\text{total possible outcomes}} = \square$ Find the theoretical probability of Jared guessing the correct card.

$\frac{1}{52} = \square$ Set up a proportion.

$1 \cdot \square = 52n$ Find the cross products.

$\frac{\square}{10} = \frac{52n}{52}$ Solve for $n$.

$\square = n$

Jared can expect to guess the correct card $\square$ times in his life.

## Example 2

**In a game, two players each flip a coin. Player A wins if exactly one of the two coins is heads. Otherwise, player B wins. Determine whether the game is fair.**

List all possible outcomes.

H, H
H, T
T, H
T, T

Find the theoretical probability of each player's winning.

$P$(player A winning) $= \square = \square$ There are $\square$ combinations of exactly one of the two coins landing on heads.

$P$(player B winning) $= \square = \square$ There are $\square$ combinations of the coin not landing on exactly one head.

Since the $P$(player A winning) = $P$(player B winning), the game is $\square$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-7

# Odds

## Lesson Objectives

Convert between probabilities and odds

## Vocabulary

odds in favor (p. 554) _____

odds against (p. 554) _____

## Additional Examples

### Example 1

**In a club raffle, 1,000 tickets were sold, and there were 25 winners.**

**A.** Estimate the odds in favor of winning this raffle.

The number of _____ outcomes is 25, and the number of _____ outcomes is 1000 − 25 = 975. The odds in favor of winning this raffle are about _____ to _____, or _____ to _____.

**B.** Estimate the odds against winning this raffle.

The odds in _____ of winning this raffle are 1 to 39, so the odds against winning this raffle are about _____ to _____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A. If the odds in favor of winning a CD player in a school raffle are 1:49, what is the probability of winning a CD player?**

$P(\text{CD player}) = \frac{1}{1 + 49} =$ ____

On average there is 1 win for every ____ losses, so someone wins 1 out of every ____ times.

**B. If the odds against winning the grand prize are 11,999:1, what is the probability of winning the grand prize?**

If the odds ____ winning the grand prize are 11,999:1, then the odds in favor of winning the grand prize are ____.

$P(\text{grand prize}) = \frac{1}{1 + 11{,}999} =$ ____ $\approx$ ____

## Example 3

**A. The probability of winning a free dinner is $\frac{1}{20}$. What are the odds in favor of winning a free dinner?**

On average, 1 out of every ____ people wins, and the other 19 people lose. The odds in favor of winning the meal are 1:(20 − 1), or ____.

**B. The probability of winning a door prize is $\frac{1}{10}$. What are the odds against winning a door prize?**

On average, ____ out of every 10 people wins, and the other 9 people lose. The odds against the door prize are (10 − 1):1, or ____.

## Try This

**1. Of the 1750 customers at an arts and crafts show, 25 will win door prizes. Estimate the odds in favor of winning a door prize.**

____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-8

# Counting Principles

## Lesson Objectives

Find the number of possible outcomes in an experiment

## Vocabulary

Fundamental Counting Principle (p. 558) _____

tree diagram (p. 559) _____

Addition Counting Principle (p. 559) _____

## Additional Examples

**Example 1**

**License plates are being produced that have a single letter followed by three digits.**

**A.** Find the number of possible license plates.

Use the _____ Counting Principle.

| letter | first digit | second digit | third digit |
|---|---|---|---|
| ■ | ■ | ■ | ■ |
| ____ choices | ____ choices | ____ choices | ____ choices |

____ · ____ · ____ · ____ = ____

The number of possible 1-letter, 3-digit license plates is ____.

**B.** Find the probability that a license plate has the letter Q.

$P(\text{Q}\blacksquare\blacksquare\blacksquare) = \frac{1 \cdot 10 \cdot 10 \cdot 10}{\phantom{000}} = \frac{1}{26} \approx$ ____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**License plates are being produced that have a single letter followed by three digits.**

**C.** Find the probability that a license plate does not contain a 3.

There are ☐ choices for any digit except 3.

26 • ☐ • ☐ • ☐ = ☐ possible license plates without a 3.

$P(\text{no 3}) = \frac{\square}{26{,}000} = \square = \square$

## Example 2

**You have a photo that you want to mat and frame. You can choose from a blue, purple, red, or green mat and a metal or wood frame. Describe all of the ways you could frame this photo with one mat and one frame.**

You can find all of the possible outcomes by making a tree ☐.

There should be ☐ • ☐ = ☐ different ways to frame the photo.

Each "branch" of the tree diagram represents a different way to frame the photo. The ways shown in the branches could be written as ☐

☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 10-9

# Permutations and Combinations

## Lesson Objectives

Find permutations and combinations

## Vocabulary

factorial (p. 563) _____

_____

permutation (p. 563) _____

combination (p. 564) _____

## Additional Examples

### Example 1

**Evaluate each expression.**

**A.** 9!

$\square \cdot \square \cdot \square \cdot \square \cdot \square \cdot \square \cdot \square \cdot \square \cdot \square \cdot \square = \square$

### Example 2

**Jim has 6 different books.**

**A.** Find the number of orders in which the 6 books can be arranged on a shelf.

The number of books is $\square$.

$$\underset{\uparrow}{\square}P\underset{\uparrow}{\square} = \frac{\square!}{(\square - \square)!} = \frac{\square!}{\square!} = \frac{\square}{\square} = \square$$

The books are arranged $\square$ at a time.

There are $\square$ permutations. This means there are $\square$ orders in which the 6 books can be arranged on the shelf.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Mary wants to join a book club that offers a choice of 10 new books each month.**

**A.** If Mary wants to buy 2 books, find the number of different pairs she can buy.

$\square$ possible books

$\square C \square = \frac{\square!}{\square!\,(\square - \square)!} = \frac{\square!}{\square!\,\square!}$

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

$\square$ books chosen at a time

There are $\square$ combinations. This means that Mary can buy $\square$ different pairs of books.

**B.** If Mary wants to buy 7 books, find the number of different sets of 7 books she can buy.

10 possible books

$_{10}C_7 = \frac{\square!}{\square!(\square - \square)!} = \frac{\square!}{\square!\,\square!}$

$= \frac{10 \cdot 9 \cdot 8 \cdot \cancel{7} \cdot \cancel{6} \cdot \cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}}{(\cancel{7} \cdot \cancel{6} \cdot \cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1})\,(3 \cdot 2 \cdot 1)} = \square$

There are $\square$ combinations. This means that there are $\square$ different 7-book sets Mary can buy.

## Try This

**1. Evaluate the expression.**

$\frac{9!}{(8 - 2)!}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 10-1 Probability

**Use the table to find the probability of each event.**

| Outcome | A | B | C | D |
|---|---|---|---|---|
| Probability | 0.6 | 0.05 | 0.25 | 0.1 |

**1.** C occurring

**2.** D not occurring

**3.** A or C occurring

**4.** B, C, or D occurring

**5.** There are 4 students in a race. Horace has a 40% chance of winning. Paul, Lance, and Jameson all have the same chance of winning. Create a table of probabilities for the sample space.

## 10-2 Experimental Probability

**An experiment consists of spinning a spinner with the colors red, green, blue, and yellow. The experiment is repeated 200 times with the following results.**

| Outcome | red | green | blue | yellow |
|---|---|---|---|---|
| Spins | 59 | 22 | 106 | 13 |

**6.** Estimate the probability of each outcome. Create a table of probability for the sample space.

**7.** Find $P$(blue or green).

**8.** Find $P$(not yellow).

**9.** Find $P$(red, blue, or yellow).

**10.** Find $P$(not red).

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 10-3 Use a Simulation

**Use the table of random numbers to simulate each situation. Use at least 10 trials for each situation.**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 94359 | 90831 | 14668 | 51470 | 40580 | 73381 | 04399 | 33936 |
| 99546 | 20034 | 79807 | 95189 | 22097 | 36948 | 20508 | 93515 |
| 10801 | 61812 | 54898 | 85558 | 97708 | 27830 | 27521 | 12179 |
| 05258 | 72237 | 01256 | 42111 | 30763 | 97220 | 02881 | 83781 |
| 68186 | 78930 | 14752 | 66547 | 98113 | 22486 | 26686 | 48012 |

**11.** At a local school, 58% of the tenth-grade students participate in a school sport. Estimate the probability that at least 6 out of 10 randomly selected tenth-grade students participate in a school sport.

**12.** A town has a 7% chance of a day with a temperature below 0°F. Estimate the probability that at least 1 day has a temperature below 0°F during the first 10 weeks of the calendar year.

## 10-4 Theoretical Probability

**An experiment consists of rolling two fair number cubes. Find the probability of each event.**

**13.** *P*(product shown = 12)

**14.** *P*(two prime numbers)

## 10-5 Independent and Dependent Events

**15.** An experiment consists of tossing three fair coins, two quarters and a dime. Determine whether the outcome of the events is dependent or independent. Find the probability of heads on both quarters and tails on the dime.

**16.** A jar contains 10 blue marbles and 6 purple marbles. If three marbles are chosen at random, what is the probability that the first two will be purple and the next will be blue?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 10-6 Making Decisions and Predictions

**17.** A spinner is divided into fourths with two sections reading "1;" one section reading "2;" and the last section reading "Go Back 1." Players use the spinner for a game. Suppose the spinner is spun 75 times. Predict how many times it will land on "Go Back 1."

**18.** A bag is filled with 9 green marbles, 5 yellow marbles, and 4 orange marbles. Player A wins if a green marble is drawn from the bag. Player B wins if a green marble is not drawn from the bag. Determine whether the game is fair.

## 10-7 Odds

**Woodrow Wilson High School is holding a raffle for a new computer. Samantha bought 13 of the 11,396 tickets sold.**

**19.** What are the odds in favor of Samantha winning the raffle?

**20.** What is the probability of Samantha winning the raffle?

## 10-8 Counting Principles

**License plate combinations in Ohio contain 3 letters followed by 4 digits. All numbers are equally likely.**

**21.** Find the number of possible license plate combinations in Ohio.

**22.** Find the probability of being assigned the license plate combination BEC 1312.

## 10-9 Permutations and Combinations

**Evaluate each expression.**

**23.** $5!$

**24.** $\frac{8!}{4!}$

**25.** $\frac{7!}{(4-2)!}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 10

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 10 in your own words.**

1. A marble is randomly drawn out of a bag and then replaced. There were 40 red marbles drawn, 65 green marbles drawn, 85 blue marbles drawn, and 10 yellow marbles drawn from the bag. Explain how to find the probability of randomly drawing a blue marble from the bag.

2. An experiment consists of rolling a fair number cube. Explain how to find the probability of rolling an odd number.

3. An experiment consists of tossing three coins. Explain how to find the probability of each coin landing on heads.

4. Explain the difference between a permutation and a combination.

**For more review of Chapter 10:**

- Complete the Chapter 10 Study Guide and Review on pages 572–574 of your textbook.
- Complete the Ready to Go On quizzes on pages 538 and 568 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 11-1

# Simplifying Algebraic Expressions

## Lesson Objectives

Combine like terms in an expression

## Vocabulary

term (p. 584) _____

like term (p. 584) _____

equivalent expression (p. 584) _____

simplify (p. 585) _____

## Additional Examples

**Example 1**

**Combine like terms.**

**A.** $14a - 5a$

$14a - 5a$

Identify ☐ terms.

☐

Combine coefficients: ☐ − ☐ = ☐

**Example 2**

**Combine like terms.**

**A.** $9x + 3y - 2x + 5$

$9x + 3y - 2x + 5$

Identify ☐ terms.

☐

Combine coefficients: ☐ − ☐ = 7

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Simplify $6(5 + n) - 2n$.**

$6(5 + n) - 2n$

$6(5) + 6(n) - 2n$ ____ Property

____ $+ 6n - 2n$ $6n$ and $2n$ are ____ terms.

____ $+$ ____ $n$ Combine coefficients: $6 - 2 =$ ____

## Example 4

**Solve $x + 3x = 48$.**

$x + 3x = 48$ Identify like terms. The coefficient of $x$ is ____.

____ $x = 48$ Combine coefficients: ____ $+$ ____ $=$ ____.

$\frac{4x}{\square} = \frac{48}{\square}$ Divide both sides by ____.

$x =$ ____ Simplify.

## Try This

**1. Combine like terms.**

$5c + 8 - 4c - 2 - c$

**2. Combine like terms.**

$9d + 7c - 4d - 2c$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 11-2

# Solving Multi-Step Equations

## Lesson Objectives

Solve multi-step equations

## Additional Examples

### Example 1

**Solve.**

$8x + 6 + 3x - 2 = 37$

$\square x + \square = 37$ Combine like terms.

$-4 \quad -4$ Subtract to undo $\square$.

$\square x = 33$

$\frac{11x}{11} = \frac{33}{11}$ $\square$ to undo multiplication.

$x = \square$

### Example 2

**Solve.**

**A.** $\frac{5n}{4} + \frac{7}{4} = -\frac{3}{4}$

Multiply both sides by 4 to clear fractions, and then solve.

$\square\left(\frac{5n}{4} + \frac{7}{4}\right) = \square\left(\frac{-3}{4}\right)$

$4\left(\frac{5n}{4}\right) + 4\left(\frac{7}{4}\right) = 4\left(\frac{-3}{4}\right)$ $\square$ Property.

$\square n + \square = \square$

$-7 \quad -7$ $\square$ to undo addition.

$\square n = \square$

$\frac{5n}{5} = \frac{-10}{5}$ Divide to undo $\square$.

$n = \square$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**On Monday, David rides his bicycle *m* miles in 2 hours. On Tuesday, he rides three times as far in 5 hours. If his average speed for two days is 12 mi/h, how far did he ride on the second day? Round your answer to the nearest tenth of a mile.**

David's average speed is his ☐ speeds for the two days divided by ☐.

$$\frac{\text{Day 1 speed} + \text{Day 2 speed}}{2} = \text{average speed}$$

$$\frac{\frac{m}{2} + \frac{3m}{5}}{2} = 12$$ Substitute $\frac{m}{2}$ for Day 1 speed and $\frac{3m}{5}$ for Day 2 speed.

$$\square\left(\frac{\frac{m}{2} + \frac{3m}{5}}{2}\right) = \square(12)$$ Multiply both sides by ☐.

$$\square\left(\frac{m}{2} + \frac{3m}{5}\right) = \square(24)$$ Multiply both sides by the LCD ☐.

$$\square m + \square m = \square$$ Simplify.

$$\frac{11m}{11} = \frac{240}{11}$$ Combine like terms. Divide both sides by ☐.

$$m = \square$$

On the second day, he rode $3m$, or $3 \cdot$ ☐ $=$ ☐ miles.

## Try This

**1. Solve.**

$9x + 5 + 4x - 2 = 42$

**2. Solve.**

$\frac{5x}{9} + \frac{x}{3} - \frac{13}{9} = \frac{1}{3}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 11-3

# Solving Equations with Variables on Both Sides

## Lesson Objectives

Solve equations with variables on both sides of the equal sign

## Additional Examples

### Example 1

**Solve.**

**A.** $4x + 6 = x$

$-$ ☐ $-$ ☐ Subtract ☐ from both sides.

$6 =$ ☐ $x$

$\frac{6}{\square} = \frac{-3x}{\square}$ Divide both sides by ☐.

$\square = x$

### Example 2

**Solve.**

**A.** $10z - 15 - 4z = 8 - 2z - 15$

☐ $- 15 = -2z -$ ☐ Combine like terms.

$+$ ☐ $+$ ☐ Add ☐ to both sides.

☐ $- 15 =$ $-7$

$+$ ☐ $+$ ☐ Add ☐ to both sides.

$8z =$ ☐

$\frac{8z}{\square} = \frac{8}{\square}$ Divide both sides by ☐.

$z =$ ☐

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 11-4

# Solving Inequalities by Multiplying or Dividing

## Lesson Objectives

Solve and graph inequalities by using multiplication or division

## Additional Examples

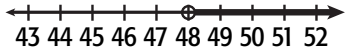
### Example 1

**Solve and graph.**

**A.** $12 < \frac{a}{4}$

$\square \cdot 12 < \square \cdot \frac{a}{4}$ Multiply both sides by $\square$.

$\square$, or $\square$




***Check***

According to the graph, 49 should be a solution because $49 > 48$, and 47 should not be a solution because $47 < 48$.

$12 \overset{?}{<} \frac{a}{4}$ $12 \overset{?}{>} \frac{a}{4}$

$12 < \frac{49}{4}$ Substitute 49 for $a$. $12 > \frac{47}{4}$ Substitute 47 for $a$.

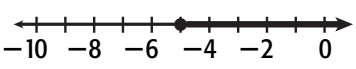
$12 < \square$ √ $12 > \square$ *x*

So 49 $\square$ a solution. So 47 $\square$ a solution.

**B.** $-9b \leq 45$

$\frac{-9b}{\square} \geq \frac{45}{\square}$ Divide both sides by $\square$; change $\leq$ to $\geq$.

$\square$




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A rock-collecting club needs to make at least $500. They are buying rocks for $2.50 and selling them for $4.00. What is the least number of rocks the club must sell to make their goal?**

**1. Understand the Problem**

The answer is the number of rocks the rock-collecting club must sell to make at least $500. List the important information:

- The rock-collecting club needs to make at least $\square$.
- They are buying rocks for $\square$.
- They are selling rocks for $\square$.

Show the relationship of the information:

(the price for selling a rock $-$ the price for buying a rock) $\cdot$ the number of rocks sold $\geq$ $500

**2. Make a Plan**

Use the relationship to write an inequality. Let $x$ represent the number of rocks sold.

($\square$ $-$ $\square$) $\cdot$ $x \geq$ $500

**3. Solve**

($4.00 $-$ $2.50) $\cdot$ $x \geq$ $500

$1.50 $\cdot$ $x \geq$ $500

$$\frac{\$1.50x}{\$\square} \geq \frac{\$500}{\$\square}$$

$x \geq \square$

At least $\square$ rocks must be sold to meet the goal.

**4. Look Back**

Selling 1 rock would make $\square$ for the rock-collecting club; selling 334 rocks would make $1.50 $\cdot$ 334 = $\square$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 11-5

# Solving Two-Step Inequalities

## Lesson Objectives

Solve two-step inequalities and graph the solutions of an inequality on a number line

## Additional Examples

### Example 1

**Solve and graph.**

**A.** $4x + 1 > 13$

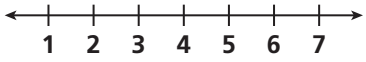
$4x + 1 > 13$

$-\square \quad -\square$ Subtract $\square$ from both sides.

$4x > \square$

$\frac{4x}{\square} > \frac{12}{\square}$ Divide both sides by $\square$.

$x > \blacksquare$




**B.** $-9x + 7 \geq 25$

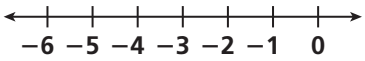
$-9x + 7 \geq 25$

$-\square \quad -\square$ Subtract $\square$ from both sides.

$-9x \geq \square$

$\frac{-9x}{\square} \; \square \; \frac{18}{\square}$ Divide both sides by $\square$; change $\square$ to $\square$.

$x \; \square \; \blacksquare$




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Solve $\frac{2x}{5} + \frac{3}{4} \geq \frac{9}{10}$ and graph the solution.**

$\square\left(\frac{2x}{5} + \frac{3}{4}\right) \geq \square\left(\frac{9}{10}\right)$ Multiply by the LCD, $\square$.

$\square\left(\frac{2x}{5}\right) + \square\left(\frac{3}{4}\right) \geq \square\left(\frac{9}{10}\right)$ Distributive Property.

$\square + \square \geq \square$ Combine like terms.

$- \square \quad - \square$ Subtract $\square$ from both sides.

$\square \geq \square$

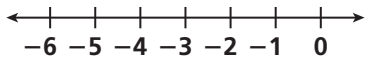
$\frac{8x}{\square} \geq \frac{3}{\square}$ Divide both sides by $\square$.

$x \geq \square$

## Try This

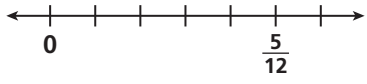
**1. Solve and graph.**

$-4x + 2 \geq 18$




**2. Solve and graph.**

$\frac{3x}{5} + \frac{1}{4} \geq \frac{5}{10}$




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 11-6

# Systems of Equations

## Lesson Objectives

Solve systems of equations

## Vocabulary

system of equations (p. 608) _____

_____

solution of a system of equations (p. 608) _____

_____

## Additional Examples

### Example 1

**Solve each system of equations.**

**A.** $y = 4x - 6$

$y = x + 3$

$y = y$

$y = 4x - 6$ $\qquad$ $y = x + 3$

$4x - 6 = x + 3$

Solve the equation to find $x$.

$4x - 6 = x + 3$

$-$ ☐ $\qquad$ $-$ ☐ $\qquad$ Subtract ☐ from both sides.

$3x - 6 = 3$

$+$ ☐ $\qquad$ $+$ ☐ $\qquad$ Add ☐ to both sides.

$3x =$ ☐

$x =$ ☐

To find $y$, substitute ☐ for $x$ in one of the original equations.

$y = x + 3 =$ ☐ $+ 3 =$ ☐

The solution is ( , ).

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Solve the system of equations.**

**A.** $x + 4y = -10$
$x - 3y = 11$

$x + 4y = -10$ $\qquad$ $x - 3y = 11$

$-4y \qquad -4y \qquad\qquad -3y \qquad -3y$

$x = \square - \square \qquad\qquad x = \square + \square$

Solve both equations for $\square$.

$-10 - 4y = 11 + 3y$

$+\square \qquad +\square$ Add $\square$ to both sides.

$-10 = 11 + \square$

$-11 \qquad -11$ Subtract $\square$ from both sides.

$\square = 7y$

$\frac{-21}{\square} = \frac{7y}{\square}$ Divide both sides by $\square$.

$\square = y$

$x = -10 - 4y$

$= -10 - 4(\square)$ Substitute $\square$ for $y$.

$= -10 + \square = \square$

The solution is $(\square)$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 11-1 Simplifying Algebraic Expressions

**Combine like terms.**

**1.** $6b + 11b$

**2.** $8c + 4 - 3c$

**3.** $5p + 7 - 3p - 2 + 6p$

**4.** $7t + 4w + 8 - t$

**5.** $9f + 6g - 4f - 2g + 2$

**6.** $14u + 5w + 4 - 3u + 4w$

**Solve.**

**7.** $12z - 5z = 56$

**8.** $4r + 8r = 168$

**9.** $9y - y = 88$

**10.** A rectangle has length $7y$ and width $3y$. Write and simplify an expression for the perimeter of the rectangle.

## 11-2 Solving Multi-Step Equations

**Solve.**

**11.** $6t + 5t - 2t + 8 = 71$

**12.** $-53 = 5f + 8f + 12$

**13.** $42 - 4s - 7s = 207$

**14.** $\frac{15j}{28} - \frac{9j}{14} = \frac{9}{7}$

**15.** The sum of two consecutive even numbers is 74. What are the two numbers? Explain your solution.

## 11-3 Solving Equations with Variables on Both Sides

**Solve and check.**

**16.** $7e + 9 = 9e - 3$

**17.** $18v - 2 = -8 + 21v$

**18.** $4(3z + 10) = 5z - 9$

**19.** $3(2x - 5) - 15 = 4x + 3.2 - 8x$

**20.** $\frac{1}{4}(4b + 12) = 7b - 12 - b$

**21.** $\frac{d}{24} + 3.5 + 4d = \frac{5}{12} - \frac{7d}{24} + \frac{11}{12}$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 11-4 Solving Inequalities by Multiplying or Dividing

**Write and solve an algebraic inequality.**

**22.** Five times a number is greater than 65.

**23.** The quotient of some number and 6 is less than 20.

**24.** The product of $-8$ and a number is at least 88.

**25.** Nicole can save \$5.50 of her weekly allowance. To save \$48 for a concert ticket, what is the least number of weeks that she must save her allowance?

## 11-5 Solving Two-Step Inequalities

**Solve and graph.**

**26.** $2j + 14 \leq -26$

**27.** $11 - 9p \leq 92$

**28.** $8k + 15 > 19$

**29.** Heather is trying to decide which health club to join. Fitness Pros offers a membership of \$39.95 per month, while Fit for Life offers a membership fee of \$55 to join, plus \$34.95 per month. After how many months would the membership at Fit for Life be more economical than a membership at Fitness Pros?

## 11-6 Systems of Equations

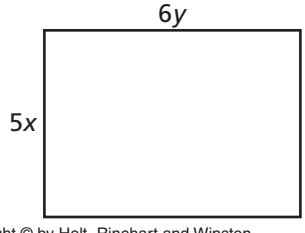
**Solve each system of equations.**

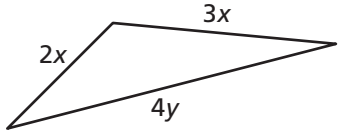
**30.** $2y + 2x = 10$
$4x + 4y = 16$

**31.** $4x + 2y = 14$
$-3x - 8y = 9$

**32.** $6x + 8y = -6$
$x - 10y = -69$

**33.** The rectangle has a perimeter of 166 units. The perimeter of the triangle is 67 units. Find $x$ and $y$.




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 11

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 11 in your own words.**

**1.** Explain how to simplify the expression $4(7x - 3) + 2x$.

**2.** Explain how to solve the equation $6x + 10 + 12x - 14 = 50$.

**3.** Explain how to solve the equation $4b + 8 - 6b = -18 + 2b + 10$.

**4.** Explain how to solve the inequality $12 \leq \frac{c}{-5}$.

**5.** Explain what an open circle and a closed circle means when graphing inequalities on a number line.

**For more review of Chapter 11:**

- Complete the Chapter 11 Study Guide and Review on pages 616–618 of your textbook.
- Complete the Ready to Go On quizzes on pages 598 and 612 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 12-1

# Graphing Linear Equations

Know it! Note

## Lesson Objectives

Identify and graph linear equations

## Vocabulary

linear equation (p. 628) _____

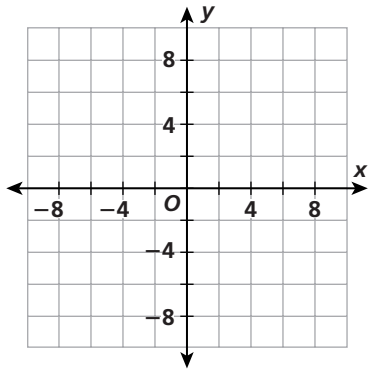
## Additional Examples

### Example 1

**Graph each equation and tell whether it is linear.**

**A.** $y = 3x - 1$

| $x$ | $3x - 1$ | $y$ | $(x, y)$ |
|---|---|---|---|
| $-2$ | $3$ ☐ $- 1$ | ☐ | ☐ |
| $-1$ | $3$ ☐ $- 1$ | ☐ | ☐ |
| $0$ | $3$ ☐ $- 1$ | ☐ | ☐ |
| $1$ | $3$ ☐ $- 1$ | ☐ | ☐ |
| $2$ | $3$ ☐ $- 1$ | ☐ | ☐ |




The equation $y = 3x - 1$ is ☐ equation because it is the graph of a ☐ line and each time $x$ increases by ☐ unit, $y$ increases by ☐ units.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A lift on a ski slope rises according to the equation $a = 130t + 6250$, where $a$ is the altitude in feet and $t$ is the number of minutes that a skier has been on the lift. Five friends are on the lift. What is the altitude of each person if they have been on the ski lift for the times listed in the table? Draw a graph that represents the relationship between the time on the lift and the altitude.**

| $t$ | $a = 130t + 6250$ | $a$ | $(t, a)$ |
|---|---|---|---|
| 4 minutes | $a = 130(\quad) + 6250$ | | ( , ) |
| 3 minutes | $a = 130(\quad) + 6250$ | | ( , ) |
| 2 minutes | $a = 130(\quad) + 6250$ | | ( , ) |
| 1.5 minutes | $a = 130(\quad) + 6250$ | | ( , ) |
| 1 minute | $a = 130(\quad) + 6250$ | | ( , ) |

The approximate altitude's are Anna, _____ ft; Tracy _____ ft; Kwani, _____ ft; Tony, _____ ft; and George, _____ ft. This is a linear equation because when $t$ increases by 1 unit, $a$ increases by _____ units.

| Skier | Time on Lift |
|---|---|
| Anna | 4 minutes |
| Tracy | 3 minutes |
| Kwani | 2 minutes |
| Tony | 1.5 minutes |
| George | 1 minute |

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 12-2

# Slope of a Line

## Lesson Objectives

Find the slope of a line and use slope to understand and draw graphs

## Additional Examples

### Example 1

**Find the slope of the line that passes through (−2, −3) and (4, 6).**

Let $(x_1, y_1)$ be (−2, −3) and $(x_2, y_2)$ be (4, 6).

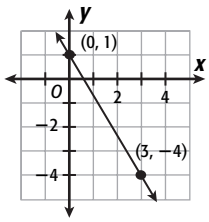
$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{\square - (\square)}{\square - \square} = \square = \square$$

The slope of the line is ____.

### Example 2

**Determine whether the graph shows a constant or variable rate of change. Explain your reasoning.**

**A.**




The graph shows a ____ rate of change. The slope between any two points is always the ____.

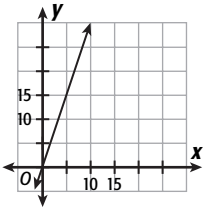
Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**The table shows the total cost of fruit per pound purchased at the grocery store. Use the data to make a graph. Find the slope of the line and explain what it shows.**

| Cost of Fruit | |
|---|---|
| **Pounds** | **Cost** |
| 0 | 0 |
| 5 | 15 |
| 10 | 30 |
| 15 | 45 |

Plot the data points and connect them. Put _____ on the *x*-axis and _____ on the *y*-axis.




Find the slope of the line.

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{15 - 0}{5 - 0} = \frac{15}{5} =$ _____

Substitute 15 for $y_2$, 0 for $y_1$, 5 for $x_2$, and 0 for $x_1$.

The slope of the line is _____. This means for every pound of fruit, you will pay another $_____.

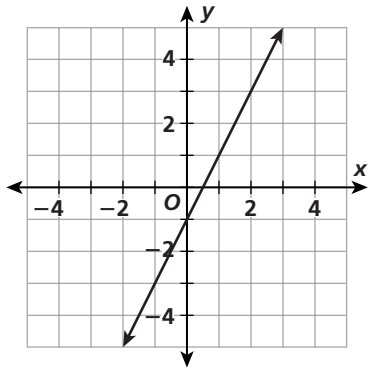
## Try This

**1. Find the slope of the line that passes through (−4, −6) and (2, 3).**

_____

**2. Determine whether the graph shows a constant or variable rate of change.**

_____




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 12-3

# Using Slopes and Intercepts

Know it! Note

## Lesson Objectives

Use slopes and intercepts to graph linear equations

## Vocabulary

*x*-intercept (p. 638) _____

_____

*y*-intercept (p. 638) _____

_____

slope-intercept form (p. 639) _____

_____

## Additional Examples

**Example 1**

**Find the *x*-intercept and *y*-intercept of the line $4x - 3y = 12$. Use the intercepts to graph the equation.**

Find the *x*-intercept ($y =$ ☐).

$4x - 3y = 12$

$4x - 3(\square) = 12$

$4x = 12$

$\frac{4x}{4} = \frac{12}{4}$

$x =$ ☐

The *x*-intercept is ☐.

Find the *y*-intercept ($x =$ ☐).

$4x - 3y = 12$

$4(\square) - 3y = 12$

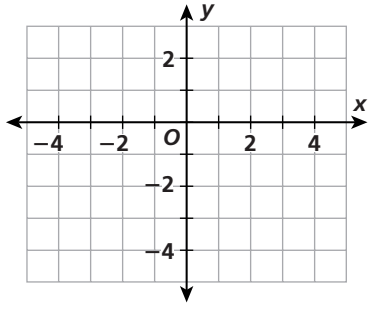
$-3y = 12$

$\frac{-3y}{-3} = \frac{12}{-3}$

$y =$ ☐

The *y*-intercept is ☐.

The graph of $4x - 3y = 12$ is the line that crosses the *x*-axis at the point (☐, ☐) and the *y*-axis at the point (☐, ☐).




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Write each equation in slope-intercept form, and then find the slope and *y*-intercept.**

**A.** $2x + y = 3$

$2x + y = 3$

$-$ ☐ $-$ ☐ Subtract ☐ from both sides.

$y = 3 - 2x$

Rewrite to match slope-intercept form.

$y =$ ☐ The equation is in ☐-intercept form.

$m =$ ☐ $b =$ ☐

The slope of the line $2x + y = 3$ is ☐, and the *y*-intercept is ☐.

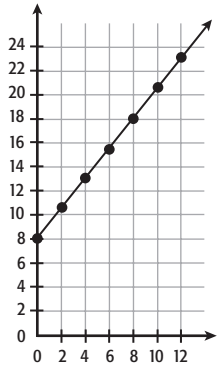
## Example 3

**A video club charges $8 to join, and $1.25 for each DVD that is rented. The linear equation $y = 1.25x + 8$ represents the amount of money *y* spend after renting *x* DVDs. Graph the equation by using the slope and *y*-intercept.**

$y = 1.25x + 8$ The equation is in slope-intercept form.

$m =$ ☐ $b =$ ☐

The slope of the line is ☐, and the *y*-intercept is ☐. The line crosses the *y*-axis at (0, 8) and moves ☐ 1.25 units for every 1 unit it moves ☐.




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 4

**Write the equation of the line that passes through (3, −4) and (−1, 4) in slope-intercept form.**

Find the slope.

$\frac{y_2 - y_1}{x_2 - x_1} = \frac{\square - (\square)}{\square - \square} = \square = \square$ The slope is $\square$.

Choose either point and substitute it along with the slope into the slope-intercept form.

$y = mx + b$

$\square = \square + b$ Substitute −1 for $x$, 4 for $y$, and −2 for $m$.

$\square = \square + b$ Simplify.

Solve for $b$.

$4 = 2 + b$

$-\square \quad -\square$ Subtract $\square$ from both sides.

$\square = b$

Write the equation of the line, using $\square$ for $m$ and $\square$ for $b$.

$y = \square$

## Try This

**1. Find the *x*-intercept and *y*-intercept of the line $8x - 6y = 24$. Use the intercepts to graph the equation.**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 12-4

# Point-Slope Form

## Lesson Objectives

Find the equation of a line given one point and the slope

## Vocabulary

point-slope form (p. 644) _____

_____

_____

_____

## Additional Examples

**Example 1**

**Use the point-slope form of the equation to identify a point the line passes through and the slope of the line.**

**A.** $y - 7 = 3(x - 4)$

$y - y_1 = m(x - x_1)$

$y -$ ☐ $=$ ☐$(x -$ ☐$)$ The equation is in ☐-slope form.

$m = 3$ Read the value of $m$ from the equation.

$(x_1, y_1) =$ (☐) Read the point from the equation.

The line defined by $y - 7 = 3(x - 4)$ has slope ☐, and passes through the point (☐).

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Write the point-slope form of the equation with the given slope that passes through the indicated point.**

**A.** the line with slope 4 passing through (5, −2)

$y - y_1 = m(x - x_1)$

$[y - (\square)] = \square(x - \square)$ Substitute $\square$ for $x_1$, $\square$ for $y_1$, and $\square$ for $m$.

$y + \square = \square(x - \square)$

The equation of the line with slope 4 that passes through (5, −2) in point-slope form is $\square$.

## Try This

**1. Use the point-slope form of the equation to identify a point the line passes through and the slope of the line.**

$y - 2 = \frac{2}{3}(x + 3)$

**2. Write the point-slope form of the equation with the given slope that passes through the indicated point.**

the line with slope 2 passing through (2, −2)

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 12-5

# Direct Variation

## Lesson Objectives

Recognize direct variation by graphing tables of data and checking for constant ratios.

## Vocabulary

direct variation (p. 650) _____

_____

constant of proportionality (p. 650) _____

_____

## Additional Examples

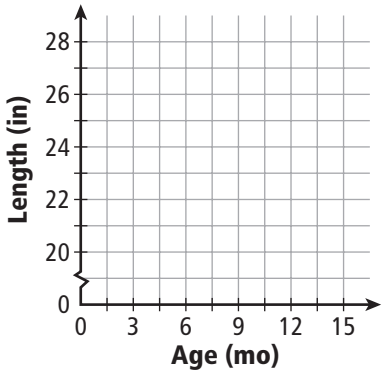
### Example 1

**Determine whether the data set shows direct variation.**

**A.**

| Adam's Growth Chart | | | | |
|---|---|---|---|---|
| Age (mo) | 3 | 6 | 9 | 12 |
| Length (in.) | 22 | 24 | 25 | 27 |

Make a graph that shows the relationship between Adam's age and his length.




You can also compare ratios to see if a direct _____ occurs.

$\frac{22}{3} \stackrel{?}{=} \frac{27}{12}$ → 81, 264

_____ ≠ _____

The ratios are _____.

The relationship of the data is _____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Find each equation of direct variation, given that *y* varies directly with *x*.**

**A.** *y* is 54 when *x* is 6

$y = kx$ — *y* varies ____ with *x*.

____ $= k \cdot$ ____ — Substitute for *x* and *y*.

____ $= k$ — Solve for *k*.

$y =$ ____ — Substitute ____ for *k* in the original equation.

**B.** *x* is 12 when *y* is 15

$y = kx$ — *y* varies ____ with *x*.

____ $= k \cdot$ ____ — Substitute for *x* and *y*.

____ $= k$ — Solve for *k*.

$y =$ ____ — Substitute ____ for *k* in the original equation.

## Try This

**1. Determine whether the data set shows direct variation.**

| Kyle's Basketball Shots | | | |
|---|---|---|---|
| Distance (ft) | 20 | 30 | 40 |
| Number of Baskets | 5 | 3 | 0 |

**2. Find the equation of direct variation, given that *y* varies directly with *x*.**

*y* is 7 when *x* is 3

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 12-6

# Graphing Inequalities in Two Variables

## Lesson Objectives

Graph inequalities on the coordinate plane

## Vocabulary

boundary line (p. 655) _____

_____

linear inequality (p. 655) _____

_____

## Additional Examples

### Example 1

**Graph each inequality.**

**A.** $y < x - 1$

First graph the boundary line $y = x - 1$. Since no points that are on the line are solutions of $y < x - 1$, make the line [ ]. Then determine on which side of the line the solutions lie.

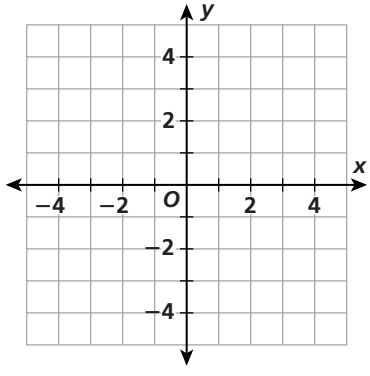
(0, 0) Test a point not on the line.

$y < x - 1$

[ ] $\overset{?}{<}$ [ ] $- 1$ Substitute [ ] for $x$ and [ ] for $y$.

[ ] $\overset{?}{<}$ [ ]

Since $0 < -1$ is not true, (0, 0) is not a solution of $y < x - 1$. Shade the side of the line that does not include (0, 0).




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A successful screenwriter can write no more than seven and a half pages of dialogue each day. Graph the relationship between the number of pages the writer can write and the number of days. At this rate, would the writer be able to write a 200-page screen play in 30 days?**

First find the equation of the line that corresponds to the inequality.
A screenwriter can write no more than 7.5 pages of dialogue each day.

$y \overset{?}{\leq} 7.5x$ The $y$-intercept is ____.

Graph the boundary line $y = 7.5x$. Since points on the line are solutions of $y \leq x$, make the line ____.

Shade the part of the coordinate plane in which the rest of the solutions of $y \leq 7.5x$ lie.

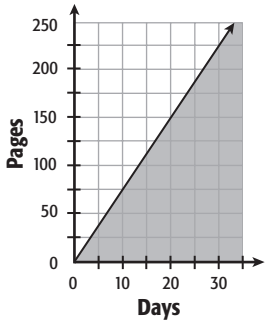
(20, 50) Choose any point not on the line.

$y \overset{?}{\leq} 7.5x$

$50 \overset{?}{\leq} 7.5($____$)$ Substitute ____ for $x$ and ____ for $y$.

$50 \overset{?}{\leq}$ ____ $\surd$

Since $50 \leq 150$ is true, (20, 50) is a solution of $y \leq 7.5x$. Shade the part on the side of the lie that includes points (20, 50).




The point (30, 200) is included in the shaded area, so the screenwriter would be able to write a 200-page screen play in 30 days.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 12-7

# Lines of Best Fit

## Lesson Objectives

Recognize relationships in data and find the equation of a line of best fit

## Additional Examples

### Example 1

**Plot the data and find a line of best fit.**

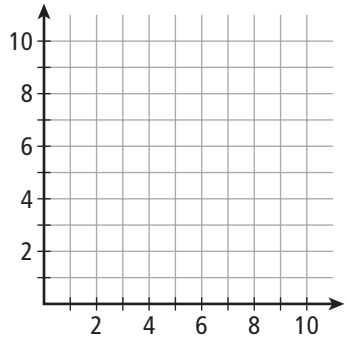
| $x$ | 4 | 7 | 3 | 8 | 8 | 6 |
|---|---|---|---|---|---|---|
| $y$ | 4 | 5 | 2 | 6 | 7 | 4 |

Plot the data points and find the mean of the $x$- and $y$-coordinates.

$x_m = \dfrac{4 + 7 + 3 + 8 + 8 + 6}{\square} = \square$

$y_m = \dfrac{4 + 5 + 2 + 6 + 7 + 4}{\square} = \square$

$(x_m, y_m) = (\square)$




Draw a line through $(6, 4\frac{2}{3})$ that best represents the data.

Estimate and plot the coordinates of another point on that line, such as (8, 6). Find the equation of the line.

$m = \dfrac{\square - \square}{\square - \square} = \square = \square$ Find the slope.

$y - y_1 = m(x - x_1)$ Use point-slope form.

$y - \square = \square(x - \square)$ Substitute.

$y = \square x + \square$

The equation of a line of best fit is $\square$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Find a line of best fit for the Main Street Elementary annual softball toss. Use the equation of the line to predict the winning distance in 2006. Let $x = 0$ represent the year 1990. Is it reasonable to make this prediction? Explain.**

| Year | Distance (ft) |
|---|---|
| 1990 | 98 |
| 1992 | 101 |
| 1994 | 103 |
| 1997 | 106 |
| 2002 | 107 |

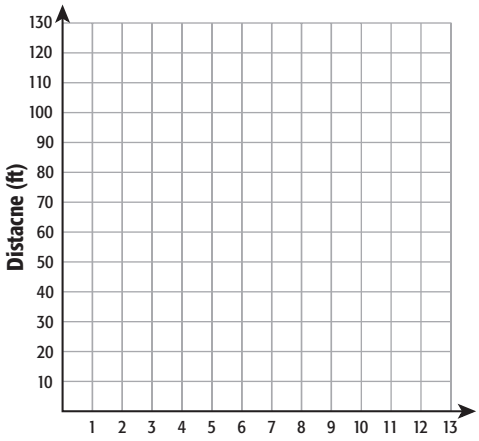
Let 1990 represent the year 0. The first point then is, ____, and the last point is ____. Plot the data points and find the mean of the *x*- and *y*-coordinates.

$$x_m = \frac{0 + 2 + 4 + 7 + 12}{5} = \square$$

$$y_m = \frac{98 + 101 + 103 + 106 + 107}{5} = \square$$

$$(x_m, y_m) = (\square, \square)$$

Draw a line through (5, 103) that best represents the data.




Estimate and plot the coordinates of another point on that line, (10, 107).

Find the equation of that line.

$$m = \frac{107 - 103}{10 - 5} = \frac{4}{5} = \square$$

$$y - y_1 = m(x - x_1)$$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

$y -$ ____ $= 0.8(x -$ ____ $)$

$y - 103 = 0.8x -$ ____

$y = 0.8x +$ ____

The equation of a line of best fit is ____.

To predict the winning distance in 2006, substitute ____ for $x$.

$y = 0.8($____$) + 99$

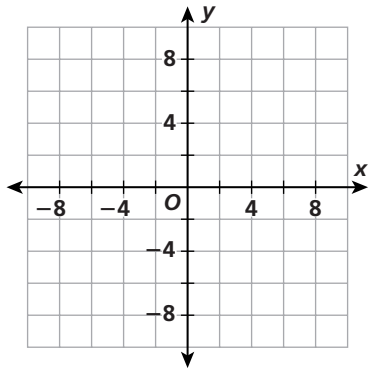
$y =$ ____

The winning distance in 2006 will be about ____ ft. It is ____ for a toss of 112 ft because the distances have been ____ since 1990.

## Try This

**1. Plot the data and find a line of best fit.**

| $x$ | −1 | 0 | 2 | 6 | −3 | 8 |
|---|---|---|---|---|---|---|
| $y$ | −1 | 0 | 3 | 7 | −7 | 4 |




**2. Predict the winning weight lift in 2010.**

| Year | 1990 | 1995 | 1997 | 1998 | 2000 |
|---|---|---|---|---|---|
| Lift (lb) | 100 | 120 | 130 | 140 | 170 |

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 12-1 Graphing Linear Equations

**Evaluate each equation for $x = -1$, 0, and 1. Then graph the equation.**

**1.** $y = 3x$

**2.** $y = -2x + 1$

**3.** $y = x + 3$

## 12-2 Slope of a Line

**Find the slope of the line that passes through each pair of points.**

**4.** $(-4, -5)$ and $(2, 4)$

**5.** $(-4, 4)$ and $(1, 3)$

**6.** $(3, 2)$ and $(4, 6)$

## 12-3 Using Slopes and Intercepts

**Find the *x*-intercept and *y*-intercept of each line. Use the intercepts to graph the equation.**

**7.** $3x + 3y = -9$

**8.** $8x = 24 + 12y$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 12-4 Point-Slope Form

**Use the point-slope form of each equation to identify a point the line passes through and the slope of the line.**

**9.** $y - 8 = 4(x - 7)$ **10.** $y + 14 = 3(x + 6)$ **11.** $y + 11 = -\frac{1}{4}(x - 9)$

## 12-5 Direct Variation

**Find each equation of direct variation, given that *y* varies directly with *x*.**

**12.** *y* is 98 when *x* is 14 **13.** *y* is 8 when *x* is 64

## 12-6 Graphing Inequalities in Two Variables

**14. a.** Graph the inequality $y \leq 2x - 3$.

**b.** Name an ordered pair that is a solution of the inequality.

**c.** Is (4, 6) a solution of $y \leq 2x - 3$?

## 12-7 Lines of Best Fit

**Plot the data and find a line of best fit.**

**15.** The table shows the U.S. postage stamp cost over several years.

| Year | 1971 | 1981 | 1991 | 2001 |
|---|---|---|---|---|
| Cost of Stamp (cents) | 8 | 20 | 29 | 34 |

**a.** Draw a line of best fit for the U.S. postage stamp cost data. (Use 1971 to represent 0 on the *x*-axis)

**b.** Use the point (10, 20) to write the equation of the line of best fit.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

Know it! Note

**Answer these questions to summarize the important concepts from Chapter 12 in your own words.**

**1.** Tell whether $y = -5x + 4$ is a linear equation. Explain.

**2.** Explain how to find the slope of a line that passes through (4, 9) and (–1, 8).

**3.** Explain how to write the point-slope form of a line with slope 6 passing through $(5, -2)$.

**4.** Explain the steps in estimating the equation of a line of best fit.

**For more review of Chapter 12:**

- Complete the Chapter 12 Study Guide and Review on pages 670–672 of your textbook.
- Complete the Ready to Go On quizzes on pages 648 and 664 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 13-1

# Arithmetic Sequences

## Lesson Objectives

Find terms in an arithmetic sequence

## Additional Examples

### Example 1

**Determine if each sequence could be arithmetic. If so, give the common difference.**

**A.** 5, 8, 11, 14, 17, . . .

5, 8, 11, 14, 17, . . .

Find the difference of each term and the term before it.

The sequence could be _____ with a common difference of _____.

**B.** 1, 3, 6, 10, 15, . . .

1, 3, 6, 10, 15, . . .

Find the difference of each term and the term before it.

The sequence is not _____.

### Example 2

**Find the given term in each arithmetic sequence.**

**A.** 10th term: 1, 3, 5, 7, . . .

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

$a$ ____ = ____ + (____ − 1)____

$a$ ____ = ____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**The senior class held a bake sale. At the beginning of the sale, there was $20 in the cash box. Each item in the sale costs 50 cents. At the end of the sale, there was $63.50 in the cash box. How many items were sold during the bake sale?**

Identify the arithmetic sequence: $20, $20.50, $21, …

$a_1 =$ ☐ Let $a_1 =$ ☐ = amount of money in cash box after the first sale.

$d =$ ☐ $d =$ ☐ = common difference

$a_n =$ ☐ $a_n =$ ☐ = amount of money in cash box at the end of the bake sale.

Let $n$ represent the number of items sold during the bake sale. Use the formula for arithmetic sequence.

$a_n = a_1 + (n - 1)d$ Solve for $n$.

☐ = ☐ + $(n - 1)$☐ Substitute the given values.

$63.50 = 20.50 +$ ☐ $n -$ ☐ Distributive Property

$63.50 =$ ☐ $+ 0.50n$ Combine like terms.

☐ $= 0.50n$ Subtract ☐ from both sides.

☐ $= n$ Divide both sides by ☐.

There were ☐ items sold during the bake sale.

## Try This

**1. Determine if the sequence could be arithmetic. If so, give the common difference.**

11, 22, 33, 44, 55, . . .

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 13-2

# Geometric Sequences

## Lesson Objectives

Find terms in a geometric sequence

## Vocabulary

geometric sequence (p. 687) _____

_____

common ratio (p. 687) _____

_____

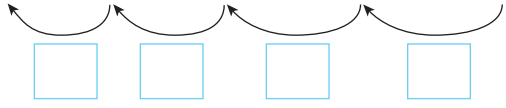
## Additional Examples

**Example 1**

**Determine if each sequence could be geometric. If so, give the common ratio.**

**A.** 1, 5, 25, 125, 625, . . .

1, 5, 25, 125, 625, . . .

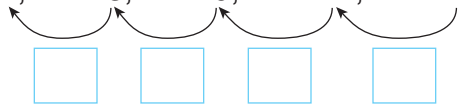


Divide each term by the term before it.

The sequence could be a _____ with a common ratio of _____.

**B.** 1, 3, 9, 12, 15, . . .

1, 3, 9, 12, 15, . . .



Divide each term by the term before it.

The sequence is not _____.

**C.** 81, 27, 9, 3, 1, . . .

81, 27, 9, 3, 1, . . .

Divide each term by the term before it.

The sequence could be _____ with a common ratio of _____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Find the given term in each geometric sequence.**

**A.** 11th term: −2, 4, −8, 16, . . .

$r = \frac{\square}{\square} = \square$

$a_n = a_1 r^{n-1}$

$a_{\square} = \square(\square)^{\square} = -2(1024) = \square$

## Example 3

**Tara sells computers. She has the option of earning (1) $50 per sale or (2) $1 for the first sale, $2 for the second sale, $4 for the third sale, and so on, where each sale is worth twice as much as the previous sale. If Tara estimates that she can sell 10 computers a week, which option should she choose?**

If Tara chooses $50 per sale, she will get a total of $\square$($\square$) = $\square$.

If Tara chooses the second option, her earnings for just the 10th sell will be more than earnings of all the earnings in option 1.

$a_{\square} = (\$\square)(\square)^{\square} = \$1(\square) = \$\square$

Option 1 gives Tara more money in the beginning, but option 2 gives her a larger total amount.

## Try This

1. **Determine if the sequence could be geometric. If so, give the common ratio.**
   2, 4, 12, 24, 96, . . .

2. **Find the given term in the geometric sequence.**
   11th term: 100, 70, 49, 34.3, . . .

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 13-3

# Other Sequences

## Lesson Objectives

Find patterns in sequences

## Vocabulary

first differences (p. 693) _____

_____

second differences (p. 693) _____

_____

Fibonacci sequence (p. 603) _____

_____

## Additional Examples

### Example 1

**Use first and second differences to find the next three terms in each sequence.**

**A.** 1, 8, 19, 34, 53, . . .

| Sequence | 1 | 8 | 19 | 34 | 53 | | | |
|---|---|---|---|---|---|---|---|---|
| 1st Differences | | | | | | | | |
| 2nd Differences | | | | | | | | |

The next three terms are ____, ____, ____.

### Example 2

**Give the next three terms in each sequence, using the simplest rule you can find.**

**A.** 1, 2, 1, 1, 2, 1, 1, 1, 2, . . .

One possible rule is to have ____ 1 in front of the 1st 2, ____ 1s in front of the 2nd 2, ____ 1s in front of the 3rd 2, and so on.

The next three terms are ____, ____, ____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Find the first five terms of the sequence defined by $a_n = n(n - 2)$.**

$a_1 =$ ☐ ( ☐ $- 2) =$ ☐

$a_2 =$ ☐ ( ☐ $- 2) =$ ☐

$a_3 =$ ☐ ( ☐ $- 2) =$ ☐

$a_4 =$ ☐ ( ☐ $- 2) =$ ☐

$a_5 =$ ☐ ( ☐ $- 2) =$ ☐

The first five terms are ☐, ☐, ☐, ☐, ☐.

## Example 4

**Suppose *a*, *b*, *c*, and *d* are four consecutive numbers in the Fibonacci sequence. Complete the following table and guess the pattern.**

| *a*, *b*, *c*, *d* | $\frac{b}{a}$ | $\frac{d}{c}$ |
|---|---|---|
| 3, 5, 8, 13 | $\frac{\square}{\square} \approx$ ☐ | $\frac{\square}{\square} \approx$ ☐ |
| 13, 21, 34, 55 | $\frac{\square}{\square} \approx$ ☐ | $\frac{\square}{\square} \approx$ ☐ |
| 55, 89, 144, 233 | $\frac{\square}{\square} \approx$ ☐ | $\frac{\square}{\square} \approx$ ☐ |

The ratios are approximately equal to ☐ (the golden ratio).

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 13-4

# Linear Functions

## Lesson Objectives

Identify linear functions

## Vocabulary

linear function (p. 700) _____

_____

function notation (p. 700) _____

_____

## Additional Examples

**Example 1**

**Determine whether the function $f(x) = 2x^3$ is linear.**

$f(x) = 2x^3$

Graph the function.



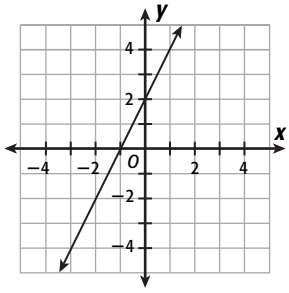
$f(x) = 2x^3$ _____ represent a linear function because its graph _____ a straight line.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Write a rule for each linear function.**

**A.**




**Step 1** Identify the *y*-intercept *b* from the graph.

$b =$ ☐

**Step 2** Locate another point $(x, y)$

(1, 4)

**Step 3** Substitute the *x*- and *y*-values into the equation $f(x) = mx + b$, and solve for *m*.

☐ $= m($☐$) +$ ☐

☐ $= m$

The rule is $f(x) =$ ☐$x +$ ☐ or ☐.

## Example 3

**A video club costs $15 to join. Each video that is rented costs $1.50. Find a rule for the linear function that describes the total cost of renting videos as a member of the club, and find the total cost of renting 12 videos.**

$f(x) = mx +$ ☐

The *y*-intercept is the cost for joining the video club, $15.

☐ $= m($☐$) + 15$

The cost for renting 1 video is $15 + $1.5 or $16.50.

☐ ☐

$1.5 = m$

The rule for the function is ☐.

The cost for renting 12 videos is $f($☐$) = 1.5($☐$) + 15 =$ $☐.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 13-5

# Exponential Functions

## Lesson Objectives

Identify and graph exponential functions

## Vocabulary

exponential function (p. 704) _____

exponential growth (p. 705) _____

exponential decay (p. 705) _____

## Additional Examples

**Example 1**

**Create a table for the exponential function $f(x) = 3 \cdot 2^x$, and use it to graph the function.**

| $x$ | $y$ |
|---|---|
| −2 | |
| −1 | |
| 0 | |
| 1 | |
| 2 | |

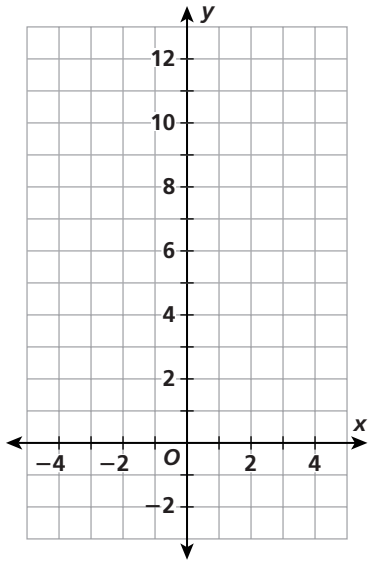
$3 \cdot 2^{\square} = 3 \cdot \square$

$3 \cdot 2^{\square} = 3 \cdot \square$

$3 \cdot 2^{\square} = 3 \cdot \square$

$3 \cdot 2^{\square} = 3 \cdot \square$

$3 \cdot 2^{\square} = 3 \cdot \square$




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A bacterial culture contains 5000 bacteria, and the number of bacteria doubles each day. How many bacteria will be in the culture after a week?**

| Day | Mon | Tue | Wed | Thu |
|---|---|---|---|---|
| Number of days $x$ | 0 | 1 | 2 | 3 |
| Number of bacteria $f(x)$ | 5000 | 10,000 | 20,000 | 40,000 |

$f(x) = p \cdot a^x$

$f(x) = \square \cdot a^x$ $\qquad f(0) = p$

$f(x) = \square \cdot \square^x$ $\qquad f(1) = 5000 \cdot a^1 = 10{,}000$, so $a = 2$.

A week is 7 days so let $x = 7$.

$f(7) = 5000 \cdot 2^{\square} = \square$ Substitute $\square$ for $x$.

If the number of bacteria doubles each day, there will be $\square$ bacteria in the culture after a week.

## Example 3

**Bohrium-267 has a half-life of 15 seconds. Find the amount that remains from a 16 mg sample of this substance after 2 minutes.**

| Seconds | 0 | 15 | 30 | 45 |
|---|---|---|---|---|
| Number of Half-lives $x$ | 0 | 1 | 2 | 3 |
| Bohrium-267 $f(x)$ (mg) | 16 | 8 | 4 | 2 |

$f(x) = p \cdot a^x$

$f(x) = \square \cdot a^x$ $\qquad f(0) = p$

$f(x) = \square \cdot \left(\square\right)^x$ $\qquad f(1) = 16 \cdot a^1 = 8$, so $a = \left(\frac{1}{2}\right)$.

Since 2 minutes = 120 seconds, divide 120 seconds by 15 seconds to find the number of half-lives: $x = 8$.

$f(8) = 16 \cdot \left(\frac{1}{2}\right)^{\square}$ Substitute $\square$ for $x$.

There is $\square$ mg of Bohrium-267 left after 2 minutes.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 13-6

# Quadratic Functions

## Lesson Objectives

Identify and graph quadratic functions

## Vocabulary

quadratic function (p. 708) _____

parabola (p. 708) _____

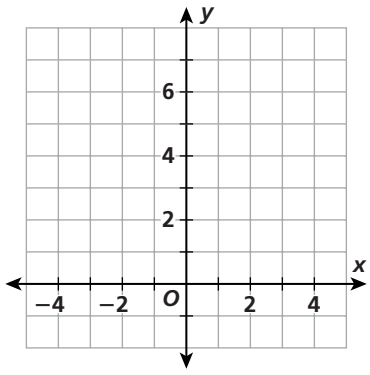
## Additional Examples

### Example 1

**Create a table for each quadratic function, and use it to graph the function.**

**A.** $f(x) = x^2 + 1$

| $x$ | $f(x) = x^2 + 1$ |
|---|---|
| −2 | |
| −1 | |
| 0 | |
| 1 | |
| 2 | |




Plot the points and connect them with a smooth curve.

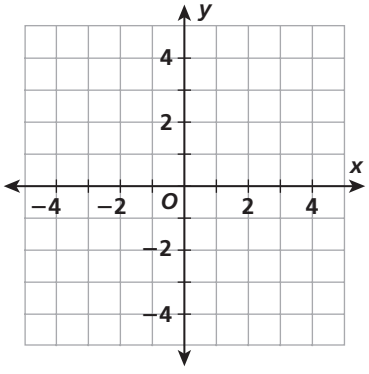
Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A reflecting surface of a television antenna was formed by rotating the parabola $f(x) = 0.1x^2$ about its axis of symmetry. If the antenna has a diameter of 4 feet, about how much higher are the sides than the center?**

First create a table of values. Then graph the reflecting surface.

| $x$ | $f(x)$ |
|---|---|
| −2 | 0.1 (□)$^2$ = □ |
| −1 | 0.1 (□)$^2$ = □ |
| 0 | 0.1 (□)$^2$ = □ |
| 1 | 0.1 (□)$^2$ = □ |
| 2 | 0.1 (□)$^2$ = □ |




The center of the antenna is at $x =$ □, and the height is □ ft. If the diameter of the antenna is 4 ft, the highest point on the side is at $x =$ □. The height is $f($□$) = 0.1($□$)^2 =$ □ ft. The sides are about □ ft higher than the center.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 13-7

# Inverse Variation

## Lesson Objectives

Recognize inverse variation by graphing tables of data

## Vocabulary

inverse variation (p. 714) _____

_____

_____

## Additional Examples

**Example 1**

**Determine whether the relationship is an inverse variation.**

The table shows how 24 cookies can be divided equally among different numbers of students.

| Number of Students | 2 | 3 | 4 | 6 | 8 |
|---|---|---|---|---|---|
| Number of Cookies | 12 | 8 | 6 | 4 | 3 |

$2(12) =$ ____; $3(8) =$ ____; $4(6) =$ ____; $6(4) =$ ____; $8(3) =$ ____

$xy =$ ____ The product is always the same.

The relationship is an _____ variation: $y = \frac{\text{____}}{x}$.

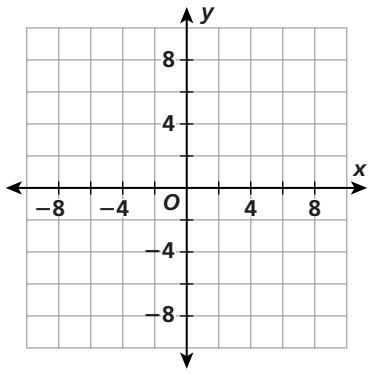
Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**Create a table. Then graph each inverse variation function.**

**A.** $f(x) = \frac{4}{x}$

| $x$ | $y$ |
|---|---|
| $-4$ | |
| $-2$ | |
| $-1$ | |
| $-\frac{1}{2}$ | |
| $\frac{1}{2}$ | |
| 1 | |
| 2 | |
| 4 | |




## Example 3

**As the pressure on the gas in a balloon changes, the volume of the gas changes.**

| Pressure ($lb/in^2$) | 5 | 10 | 15 | 20 |
|---|---|---|---|---|
| Volume ($in^3$) | 300 | 150 | 100 | 75 |

**Find the inverse variation function and use it to find the resulting volume when the pressure is 30 $lb/in^2$.**

You can see from the table that $xy = 5($ $)$ $=$ $\quad$. So $y =$ $\quad$. If the volume pressure is 30 $lb/in^2$, then balloons volume will be $y = \frac{1500}{\quad} =$ $\quad$ $lb/in^3$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

# Chapter Review

## 13-1 Terms of Arithmetic Sequences

**Find the next three terms of each arithmetic sequence.**

**1.** 18, 26, 34, 42,…

**2.** −26, −11, 4, 19,…

**3.** 94, 72, 50, 28,…

**Find the first five terms of each arithmetic sequence.**

**4.** $a_1 = 5,\ d = 3$

**5.** $a_1 = 3,\ d = 7$

**6.** $a_1 = 2,\ d = \frac{2}{5}$

**7.** The 8th term of an arithmetic sequence is 264. The common difference is 36. What are the first 3 terms of the arithmetic sequence?

## 13-2 Terms of Geometric Sequences

**Find the next three terms of each geometric sequence.**

**8.** $a_1 = 64$, common ratio $= \frac{1}{4}$

**9.** $a_1 = 7$, common ratio $= -3$

**Find the first five terms of each geometric sequence.**

**10.** $a_1 = 4,\ r = -1$

**11.** $a_1 = 100,\ r = \frac{3}{2}$

**12.** $a_1 = 48,\ r = -2$

**13.** A home that was purchased for $95,000 is appreciating at a rate of 5% per year. This means that the home is worth 5% more than it was the previous year. At this rate, what will be the value of the home after 4 years?

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 13-3 Other Sequences

**Use the first and second differences to find the next three terms in each sequence.**

**14.** 7, 11, 19, 31, 47, 67, 91,…

**15.** 8, 17, 33, 52, 78, 107, 143, …

**Give the next three terms in each sequence using the simplest rule you can find.**

**16.** 1, 6, 4, 9, 7, 12, 10,…

**17.** 1; 32; 243; 1,024;…

## 13-4 Linear Functions

**Determine whether each function is linear.**

**18.** $f(x) = 6 - x$

**19.** $f(x) = \frac{1}{4}x + 2$

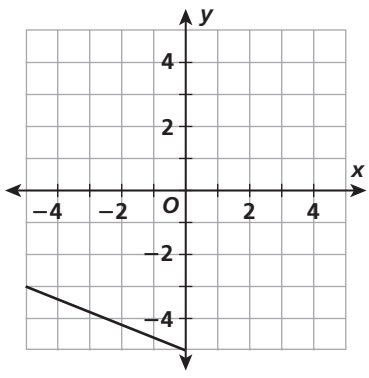
**20.** $f(x) = -x^2$

**Write a rule for each linear function.**

**21.**

| $x$ | −1 | 0 | 1 | 2 |
|---|---|---|---|---|
| $y$ | 3 | 5 | 7 | 9 |

**22.**




Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 13-5 Exponential Functions

**For each exponential function, find $f(-2)$, $f(0)$, and $f(2)$.**

**23.** $f(x) = 3^x \cdot -2$

**24.** $f(x) = 0.5^x$

**25.** $f(x) = 8^x$

**26.** $f(x) = 60 \cdot (\frac{1}{4})^x$

**Write the equation of the exponential function that passes through the given points. Use the form $f(x) = p \cdot a^x$.**

**27.** (0, 3) and (1, 12)

**28.** (0, 8) and (1, 40)

**29.** (0, 20) and (1, 5)

**Graph the exponential function of the form $f(x) = p \cdot a^x$.**

**30.** $p = 8$, $a = \frac{1}{4}$

**31.** $p = -2$, $a = 3$

**32.** $p = 20$, $a = 0.5$

## 13-6 Quadratic Functions

**Find $f(-2)$, $f(0)$, and $f(2)$ for each quadratic function.**

**33.** $f(x) = x^2 + 8$

**34.** $f(x) = x^2 + 4x$

**35.** $f(x) = 5x^2 - 9x + 4$

**36.** $f(x) = \frac{x^3}{4} - 3$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**Create a table for each quadratic function, and use it to find the *x*-intercepts.**

**37.** $f(x) = (x - 3)(x + 1)$

**38.** $f(x) = x(x + 2)$

## 13-7 Inverse Variation

**Determine whether the relationship is an inverse variation.**

**39.** The table shows the time it takes to get to the freeway depending on the speed of the car.

| Speed of Car (miles/hr) | 60 | 50 | 40 | 30 | 20 |
|---|---|---|---|---|---|
| Time (min) | 5 | 6 | 7.5 | 10 | 15 |

**Find the inverse variation equation, given that *x* and *y* vary inversely.**

**40.** $y = 6$ when $x = 4$

**41.** $y = 2$ when $x = 8$

**42.** $y = 3$ when $x = 15$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 13

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 13 in your own words.**

**1.** Explain how to determine if the sequence is arithmetic.

5, 7, 9, 11, 13, 15, …

**2.** Explain how to determine if the sequence is geometric.

120, 60, 30, 15, …

**3.** Explain the difference between an exponential growth function and an exponential decay function.

**4.** Explain how to determine if a relationship is an inverse variation.

**For more review of Chapter 13:**

- Complete the Chapter 13 Study Guide and Review on pages 722–724 of your textbook.
- Complete the Ready to Go On quizzes on pages 698 and 718 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 14-1

# Polynomials

## Lesson Objectives

Classify polynomials by degree and by the number of terms

## Vocabulary

monomial (p. 734) _____

polynomial (p. 734) _____

binomial (p. 734) _____

trinomial (p. 734) _____

degree of a polynomial (p. 645) _____

## Additional Examples

**Example 1**

**Determine whether each expression is a monomial.**

**A.** $\sqrt{2} \cdot x^3y^4$

3 and 4 are [ ] numbers

**B.** $3x^3\sqrt{y}$

$y$ does not have an [ ] that is a whole number

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 2

**A.** $xy^2$

Polynomial with ____ term.

**B.** $2x^2 - 4y^{-2}$

A variable with a exponent.

**C.** $3x^5 + 2.2x^2 - 4$

Polynomial with ____ terms.

**D.** $a^2 + b^2$

Polynomial with ____ terms.

## Example 3

**Find the degree of each polynomial.**

**A.** $x + 4$

$x$ + 4

Degree ____ Degree ____

The degree of $x + 4$ is ____.

**B.** $5x - 2x^2 + 6$

$5x$ − $2x^2$ + 6

Degree ____ Degree ____ Degree ____

The degree of $5x - 2x^2 + 6$ is ____.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 4

**The height in feet after *t* seconds of a rocket launched straight up into the air from a 40-foot platform at velocity *v* is given by the polynomial $-16t^2 + vt + 40$. Find the height after 10 seconds of a rocket launched at a velocity of 275 ft/s.**

$-16t^2 + vt + 40$ — Write the polynomial expression for height.

$-16(\square)^2 + \square(\square) + 40$ — Substitute 10 for *t* and 275 for *v*.

$\square + \square + 40$ — Simplify.

$\square$

The rocket is $\square$ ft high 10 seconds after launching.

## Try This

**1. Determine whether each expression is a monomial.**

$2w \cdot p^3y^8$

**2. Classify the expression as a monomial, a binomial, a trinomial, or not a polynomial.**

$4x^2 + 7z^4$

**3. Find the degree of the polynomial.**

$x + 4x^4 + 2y$

**4. The height in meters after *t* seconds of a baseball thrown straight up into the air from a *s* meters off the ground at velocity *v* after *t* seconds is given by the polynomial $-16t^2 + vt + s$. Find the height of the baseball launched from a 5 m platform at 60 m/s after 3 seconds.**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 14-2

# Simplifying Polynomials

## Lesson Objectives

Simplify polynomials

## Additional Examples

### Example 1

**Identify the like terms in each polynomial.**

**A.** $5x^3 + y^2 + 2 - 6y^2 + 4x^3$

$5x^3 + y^2 + 2 - 6y^2 + 4x^3$ Identify like terms.

Like terms: $5x^3$ and ____, $y^2$ and ____

**B.** $3a^3b^2 + 3a^2b^3 + 2a^3b^2 - a^3b^2$

$3a^3b^2 + 3a^2b^3 + 2a^3b^2 - a^3b^2$ Identify ____ terms.

Like terms: ____, ____, and ____

**C.** $7p^3q^2 + 7p^2q^3 + 7pq^2$

$7p^3q^2 + 7p^2q^3 + 7pq^2$ Identify ____.

There are ____ like terms.

### Example 2

**Simplify.**

**A.** $4x^2 + 2x^2 + 7 - 6x + 9$

$4x^2 + 2x^2 - 6x + 7 + 9$ Arrange in descending order.

$4x^2 + 2x^2 - 6x + 7 + 9$ Identify like terms.

____ Combine coefficients:

$4 + 2 = 6$ and $7 + 9 = 16$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**B.** $3n^5m^4 - 6n^3m + n^5m^4 - 8n^3m$

$3n^5m^4 + n^5m^4 - 6n^3m - 8n^3m$ Arrange in descending order.

$3n^5m^4 + n^5m^4 - 6n^3m - 8n^3m$ Identify like terms.

Combine coefficients:

$3 + 1 = 4$ and $-6 - 8 = -14$

## Example 3

**Simplify.**

**A.** $3(x^3 + 5x^2)$

$3(x^3 + 5x^2)$ Distributive Property

$3 \cdot x^3 + 3 \cdot 5x^2$

**B.** $-4(3m^3n + 7m^2n) + m^2n$

$-4(3m^3n + 7m^2n) + m^2n$ Distributive Property

$-4 \cdot 3m^3n - 4 \cdot 7m^2n + m^2n$

$-12m^3n - 28m^2n + m^2n$

Combine like terms.

## Example 4

**The surface area of a right cylinder can be found by using the expression $2\pi(r^2 + rh)$, where $r$ is the radius and $h$ is the height. Use the Distributive Property to write an equivalent expression.**

$2\pi(r^2 + rh) =$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Try This

**1. Identify the like terms in the polynomial.**

$4y^4 + y^2 + 2 - 8y^2 + 2y^4$

**2. Simplify.**

$2x^3 + 5x^3 + 6 - 4x + 9$

**3. Simplify.**

$-2(6m^3p + 8m^2p) + m^2p$

**4. The surface area of a right cone can be found by using the expression $\pi r(r + l)$, where $r$ is the radius and $l$ is the slant height. Use the Distributive Property to write an equivalent expression.**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 14-3

# Adding Polynomials

## Lesson Objectives

Add polynomials

## Additional Examples

### Example 1

**Add.**

**A.** $(5x^3 + x^2 + 2) + (4x^3 + 6x^2)$

$5x^3 + x^2 + 2 + 4x^3 + 6x^2$ Associative Property

$\square x^3 + \square x^2 + 2$ Combine $\square$ terms.

**B.** $(6x^3 + 8y^2 + 5xy) + (4xy - 2y^2)$

$6x^3 + 8y^2 + 5xy + 4xy - 2y^2$ Associative Property

$\square$ Combine $\square$ terms.

**C.** $(3x^2y - 5x) + (4x + 7) + 6x^2y$

$3x^2y - 5x + 4x + 7 + 6x^2y$ Associative Property

$\square x^2y - \square + 7$ Combine $\square$ terms.

### Example 2

**Add.**

**A.** $(4x^2 + 2x + 11) + (2x^2 + 6x + 9)$

$4x^2 + 2x + 11$

$+ 2x^2 + 6x + 9$ Place like terms in columns.

$\square$ Combine $\square$ terms.

**B.** $(3mn^2 - 6m + 6n) + (5mn^2 + 2m - n)$

$3mn^2 - 6m + 6n$

$+ 5mn^2 + 2m - n$ Place like $\square$ in columns.

$\square$ Combine $\square$ terms.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

**C.** $(-x^2y^2 + 5x^2) + (-2y^2 + 2) + (x^2 + 8)$

$-x^2y^2 + 5x^2$

$-2y^2 + 2$

$+ \quad x^2 \quad + 8$

Place like [ ] in columns.

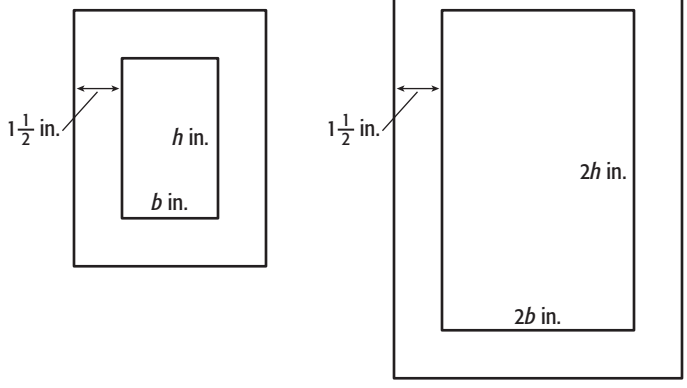
[ ]

Combine [ ] terms.

## Example 3

**Rachel wants to frame two photographs. The first photograph has dimensions *b* inches and *h* inches, and each dimension of the other photograph is twice the corresponding dimensions of the first. She needs enough wood for the frames to cover both perimeters, and the width of the wood is $1\frac{1}{2}$ inches. Find an expression for the length of wood she needs to frame both photographs.**

The amount of wood Rachel needs equals the perimeter of the both frames. Draw a diagram to help you determine the dimensions of the frame.




perimeter of first photograph $= 2($[ ] $+$ [ ]$) + 2($[ ] $+$ [ ]$)$

$=$ [ ] $+ 3 + 2h +$ [ ]

$= 2b + 2h +$ [ ]

perimeter of second photograph $= 2($[ ] $+$ [ ]$) + 2($[ ] $+$ [ ]$)$

$= 4b +$ [ ] $+$ [ ] $+ 3$

$= 4b + 4h +$ [ ]

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

perimeter of both photographs $= 2b + 2h + 6 + 4b + 4h + 6$

$= \square + \square + \square$

Rachel will need $\square$ inches of wood to frame both photographs.

## Try This

**1. Add.**

$(3y^4 + y^2 + 6) + (5y^4 + 2y^2)$

**2. Add.**

$(4mn^2 + 6m + 2n) + (2mn^2 - 2m - 2n)$

**3. Miguel wants to frame a poster. The poster is 14 inches by 18 inches. The frame has a width of *f*. Find an expression for the perimeter of the frame.**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 14-4

# Subtracting Polynomials

## Lesson Objectives

Subtract polynomials

## Additional Examples

### Example 1

**Find the opposite of each polynomial.**

**A.** $8x^3y^4z^2$

$-(8x^3y^4z^2)$

The opposite of $a$ is .

**B.** $-3x^4 + 8x^2$

$-(-3x^4 + 8x^2)$

Distribute the sign.

**C.** $9a^6b^4 + a^4b^2 - 1$

$-(9a^6b^4 + a^4b^2 - 1)$

Distribute the sign.

### Example 2

**Subtract.**

**A.** $(5x^2 + 2x - 3) - (3x^2 + 8x - 4)$

$= (5x^2 + 2x - 3)$ ( $3x^2$ $8x$ $4)$ Add the opposite.

$= 5x^2 + 2x - 3 - 3x^2 - 8x + 4$ Property.

= Combine like terms.

**B.** $(b^2 + 4b - 1) - (7b^2 - b - 1)$

$= (b^2 + 4b - 1)$ ( $7b^2$ $b$ $1)$ Add the opposite.

$= b^2 + 4b - 1 - 7b^2 + b + 1$ Property.

= Combine like terms.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Subtract.**

**A.** $(2n^2 - 4n + 9) - (6n^2 - 7n + 5)$

$(2n^2 - 4n + 9)$ $\quad 2n^2 - 4n + 9$

$-(6n^2 - 7n + 5) \rightarrow + \ -6n^2 + 7n - 5$

[ ] Add the opposite.

**B.** $(10x^2 + 2x - 7) - (x^2 + 5x + 1)$

$(10x^2 + 2x - 7)$ $\quad 10x^2 + 2x - 7$

$-(x^2 + 5x + 1) \rightarrow + \ -x^2 - 5x - 1$

[ ] Add the opposite.

**C.** $(6a^4 - 3a^2 - 8) - (-2a^4 + 7)$

$(6a^4 - 3a^2 - 8)$ $\quad 6a^4 - 3a^2 - 8$

$-(-2a^4 \quad + 7) \rightarrow + \ 2a^4 \quad - 7$

[ ]

## Example 4

**Suppose the cost in dollars of producing *x* bookcases is given by the polynomial $250 + 128x$, and the revenue generated from sales in given by the polynomial $216x - 75$. Find a polynomial expression for the profit from producing and selling *x* bookcases, and evaluate the expression for $x = 95$.**

$216x - 75 - (250 + 128x)$ revenue − cost

$216x - 75 + ($[ ] $-$ [ ]$)$ Add the opposite.

$216x - 75 - 250 - 128x$ Associative Property

[ ]$x -$ [ ] Combine like terms.

The profit is given by the polynomial [ ].

For $x = 95$,

$88($[ ]$) - 325 =$ [ ] The profit is $[ ].

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Try This

**1. Find the opposite of the polynomial.**

$-4a^2 + 4a^4$

**2. Subtract.**

$(c^3 + 2c^2 + 3) - (4c^3 - c^2 - 1)$

**3. Subtract.**

$(4r^3 + 4r + 6) - (6r^3 + 3r + 3)$

**4. Suppose the cost in dollars of producing $x$ batting gloves is given by the polynomial $16 - 3x$, and the revenue generated from sales in given by the polynomial $23 + 5x$. Find a polynomial expression for the profit from producing and selling $x$ batting gloves, and evaluate the expression for $x = 105$.**

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 14-5

# Multiplying Polynomials by Monomials

## Lesson Objectives

Multiply polynomials by monomials

## Additional Examples

### Example 1

**Multiply.**

**A.** $(2x^3y^2)(6x^5y^3)$

$(2x^3y^2)(6x^5y^3)$

_____ _____ coefficients and _____ exponents.

**B.** $(9a^5b^7)(-2a^4b^3)$

$(9a^5b^7)(-2a^4b^3)$

_____ Multiply _____ and add _____.

### Example 2

**Multiply.**

**A.** $3m(5m^2 + 2m)$

$3m(5m^2 + 2m)$ Multiply each term in parentheses by _____.

_____

**B.** $-6x^2y^3(5xy^4 + 3x^4)$

$-6x^2y^3(5xy^4 + 3x^4)$ Multiply each term in parentheses by _____.

_____

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

### PROBLEM SOLVING APPLICATION

**The length of a picture in a frame is 8 in. less than three times its width. Find the length and width if the area is 60 in$^2$.**

**1. Understand the Problem**

If the width of the frame is $w$ and the length is $3w - 8$, then the area is _____ or length times width. The answer will be a value of $w$ that makes the area of the frame equal to _____ in$^2$.

**2. Make a Plan**

You can make a table of values for the polynomial to try to find the value of a $w$. Use the _____ Property to write the expression $w(3w - 8)$ another way. Use substitution to complete the table.

**3. Solve**

$w(3w - 8) =$ _____ $w^2 -$ _____ $w$ _____ Property

| $w$ | 3 | 4 | 5 | 6 |
|---|---|---|---|---|
| $3w^2 - 8w$ | | | | |

The width should be _____ in. and the length should be _____ in.

**4. Look Back**

If the width is _____ inches and the length is _____ times that minus 8, or 10 inches, then the area would be $6 \cdot 10 =$ _____ in$^2$. The answer is reasonable.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Try This

**1. Multiply.**

$(5r^4s^3)(3r^3s^2)$

**2. Multiply.**

$-3a^3b^2(4ab^3 + 4a^2)$

**3. Problem Solving Application**

The height of a triangle is twice its base. Find the base and the height if the area is 144 $in^2$.

**1. Understand the Problem**

The formula for the _____ of a triangle is one-half base times height. Since the base $b$ is equal to 2 times height, $h = 2b$. Thus the area would be $\frac{1}{2}b(2b)$. The answer will be a value of $b$ that makes the area equal to _____ $in^2$.

**2. Make a Plan**

You can make a table of values for the polynomial to find the value of $b$. Write the expression $\frac{1}{2}b(2b)$ another way. Use substitution to complete the table.

**3. Solve**

**4. Look Back**

If the height is twice the base, and the base is 12 in., the height would be 24 in. The area would be $\frac{1}{2} \cdot 12 \cdot 24 = 144$ $in^2$. The answer is reasonable.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

LESSON 14-6

# Multiplying Binomials

## Lesson Objectives

Multiply binomials

## Vocabulary

FOIL (p. 762) _____

## Additional Examples

### Example 1

**Multiply.**

**A.** $(n - 2)(m - 8)$

$(n - 2)(m - 8)$ FOIL

**B.** $(x + 3)(x + z)$

$(x + 3)(x + z)$ FOIL

### Example 2

**An 8 in. by 10 in. photo has a wooden frame that extends $x$ in. beyond each side. Represent the area of the frame in terms of $x$.**

Area of Frame = Total Area − Area of Photo

$= (8 + 2x)(10 + 2x) - (8)(10)$

$= \square + \square x + \square x + \square x^2 - \square$

$= \square x + \square x^2$

The frame area is $\square x + \square x^2$ in.$^2$.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## Example 3

**Multiply.**

**A.** $(x + 6)^2$

$(x + 6)(x + 6)$

$\square + \square + \square + \square$

$\square$

**B.** $(n - m)^2$

$(n - m)(n - m)$

$\square - \square - \square + \square$

$\square$

## Try This

**1. Multiply.**

$(r - 4)(s - 6)$

$\square$

**2. An 18 ft by 32 ft swimming pool has a deck around it that extends *x* ft beyond each side. Represent the area of the deck around the swimming pool in terms of *x*.**

$\square$

**3. Multiply.**

$(r - 3)^2$

$\square$

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 14-1 Polynomials

**Classify each expression as a monomial, a binomial, a trinomial, or not a polynomial. If it is a polynomial, give its degree.**

**1.** $-7x^4$

**2.** $-\frac{5}{x} + 2$

**3.** $5x^{0.3} + 4x$

**4.** $\frac{8}{9}x - \frac{4}{5}x^2$

**5.** $3z^5 + 5z^2 - 6z$

**6.** $-6$

**7.** $\frac{2y^3}{6x^2}$

**8.** $8y - 6$

**9.** The volume of a box with length $x$, width $x + 3$, and height $2x - 1$ is given by the trinomial $2x^3 + 5x^2 - 3x$. What is the volume of the box if the length is 3 inches?

## 14-2 Simplifying Polynomials

**Simplify.**

**10.** $4r^2 - 8r + 7r^2 + 6r - 5$

**11.** $-7x^2y + 8xy - 9xy^2 - 6x^2y + 3xy^2$

**12.** $3(x^2 - 4x + 3) - 7x + 1$

**13.** $4yz + y^3z^2 + 2(3y^3z^2 - 5yz)$

## 14-3 Adding Polynomials

**Add.**

**14.** $(4a^2b - 3ab + 2) + (8ab - 3a^2b)$

**15.** $(7f + 2) + (4f^2 - 3f + 6)$

**16.** $(3g^3 + 7g - 5g^5) + (10g^5 + 8g^3 - 3g)$

**17.** $(6p^2 + 2p - 9) + (3p^2 - 5p + 4)$

**18.** The cost of baking $n$ cakes is given by the polynomial $2.5n^2 + n + 2$. The cost of packaging $n$ cakes is $0.1n^2 + 0.3n + 1.5$. Write and simplify an expression for the total cost of baking and packaging $n$ cakes.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

## 14-4 Subtracting Polynomials

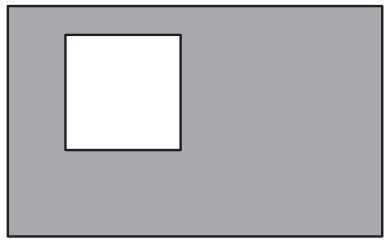
**Subtract.**

**19.** $(12b^2 + 5b + 3) - (3b^2 - 4b - 7)$

**20.** $(9x^2y^2 - 4xy^2 + 8x^2y - xy) - (2x^2y - 5x^2y^2 + 2xy)$

**21.** $(8r^2s^2 + 6rs - 6r + 7) - (3r^2s^2 + 2r - 9s - 5)$

**22.** The area of the rectangle is $3b^2 - 2b + 5$ cm$^2$. The area of the square is $2b^2 - 3b + 1$ cm$^2$. What is the area of the shaded region?



## 14-5 Multiplying Polynomials and Monomials

**Multiply.**

**23.** $(5p^3q^2)(3pq^4)$

**24.** $-6a^4(2a^2 + 3a)$

**25.** $b^5(b^3c^2 + c - b^2)$

**26.** $(6mn)(8m^3n^2 + 3m^2n^3 - 2mn^4)$

**27.** A rectangle has a base length of $2xy^2$ and a height of $3x^2 - xy + 5$. Write and simplify an expression for the area of the rectangle. Then find the area of the rectangle if $x = 1$ and $y = 2$.

## 14-6 Multiplying Binomials

**Multiply.**

**28.** $(k - 5)(k - 8)$

**29.** $(c - 10)(c + 10)$

**30.** $(3v - 6)^2$

**31.** $(4p + 7)(2p - 9)$

**32.** $(5a + b)(a + 7b)$

**33.** $(4s + 11t)^2$

**34.** A painting measures 16 in. by 20 in. There is a frame of $x$ in. around the painting. Find the total area of the frame and the painting.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.

CHAPTER 14

# Big Ideas

**Answer these questions to summarize the important concepts from Chapter 14 in your own words.**

**1.** Explain why $2\sqrt{x}$ is not a monomial.

**2.** Explain how to simplify the polynomial.
$a^3 + 4a^5 - 3a^2 + 2 - 6a^2 + 8a^5$

**3.** Explain how to subtract the polynomials horizontally.
$(b^3 - 7 + b^2) - (4b + 3 - 3b^3)$

**4.** Explain how to multiply the polynomial by the monomial.
$0.5y^2(yz^5 - 8xy^3)$

**5.** Explain how to multiply the binomials using the FOIL method.
$(7c - 3)(c + 9)$

**For more review of Chapter 14:**

- Complete the Chapter 14 Study Guide and Review on pages 772–774 of your textbook.
- Complete the Ready to Go On quizzes on pages 744 and 766 of your textbook.

Copyright © by Holt, Rinehart and Winston.
All rights reserved.