GLENCOE MATHEMATICS

Algebra 1

Chapter 2 Resource Masters

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Consumable Workbooks

Many of the worksheets contained in the Chapter Resource Masters booklets are available as consumable workbooks in both English and Spanish.

Study Guide and Intervention Workbook	0-07-827753-1
Study Guide and Intervention Workbook (Spanish)	0-07-827754-X
Skills Practice Workbook	0-07-827747-7
Skills Practice Workbook (Spanish)	0-07-827749-3
Practice Workbook	0-07-827748-5
Practice Workbook (Spanish)	0-07-827750-7

ANSWERS FOR WORKBOOKS The answers for Chapter 2 of these workbooks can be found in the back of this Chapter Resource Masters booklet.

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Algebra 1
Chapter 2 Resource Masters

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Teacher's Guide to Using the Chapter 2 Resource Masters

The ***Fast File*** Chapter Resource system allows you to conveniently file the resources you use most often. The *Chapter 2 Resource Masters* includes the core materials needed for Chapter 2. These materials include worksheets, extensions, and assessment options. The answers for these pages appear at the back of this booklet.

All of the materials found in this booklet are included for viewing and printing in the *Algebra 1 TeacherWorks* CD-ROM.

Vocabulary Builder Pages vii–viii include a student study tool that presents up to twenty of the key vocabulary terms from the chapter. Students are to record definitions and/or examples for each term. You may suggest that students highlight or star the terms with which they are not familiar.

WHEN TO USE Give these pages to students before beginning Lesson 2-1. Encourage them to add these pages to their Algebra Study Notebook. Remind them to add definitions and examples as they complete each lesson.

Study Guide and Intervention

Each lesson in *Algebra 1* addresses two objectives. There is one Study Guide and Intervention master for each objective.

WHEN TO USE Use these masters as reteaching activities for students who need additional reinforcement. These pages can also be used in conjunction with the Student Edition as an instructional tool for students who have been absent.

Skills Practice There is one master for each lesson. These provide computational practice at a basic level.

WHEN TO USE These masters can be used with students who have weaker mathematics backgrounds or need additional reinforcement.

Practice There is one master for each lesson. These problems more closely follow the structure of the Practice and Apply section of the Student Edition exercises. These exercises are of average difficulty.

WHEN TO USE These provide additional practice options or may be used as homework for second day teaching of the lesson.

Reading to Learn Mathematics

One master is included for each lesson. The first section of each master asks questions about the opening paragraph of the lesson in the Student Edition. Additional questions ask students to interpret the context of and relationships among terms in the lesson. Finally, students are asked to summarize what they have learned using various representation techniques.

WHEN TO USE This master can be used as a study tool when presenting the lesson or as an informal reading assessment after presenting the lesson. It is also a helpful tool for ELL (English Language Learner) students.

Enrichment There is one extension master for each lesson. These activities may extend the concepts in the lesson, offer an historical or multicultural look at the concepts, or widen students' perspectives on the mathematics they are learning. These are not written exclusively for honors students, but are accessible for use with all levels of students.

WHEN TO USE These may be used as extra credit, short-term projects, or as activities for days when class periods are shortened.

Assessment Options

The assessment masters in the *Chapter 2 Resources Masters* offer a wide range of assessment tools for intermediate and final assessment. The following lists describe each assessment master and its intended use.

Chapter Assessment

CHAPTER TESTS

- *Form 1* contains multiple-choice questions and is intended for use with basic level students.
- *Forms 2A and 2B* contain multiple-choice questions aimed at the average level student. These tests are similar in format to offer comparable testing situations.
- *Forms 2C and 2D* are composed of free-response questions aimed at the average level student. These tests are similar in format to offer comparable testing situations. Grids with axes are provided for questions assessing graphing skills.
- *Form 3* is an advanced level test with free-response questions. Grids without axes are provided for questions assessing graphing skills.

  All of the above tests include a free-response Bonus question.
- The **Open-Ended Assessment** includes performance assessment tasks that are suitable for all students. A scoring rubric is included for evaluation guidelines. Sample answers are provided for assessment.
- A **Vocabulary Test**, suitable for all students, includes a list of the vocabulary words in the chapter and ten questions assessing students' knowledge of those terms. This can also be used in conjunction with one of the chapter tests or as a review worksheet.

Intermediate Assessment

- Four free-response **quizzes** are included to offer assessment at appropriate intervals in the chapter.
- A **Mid-Chapter Test** provides an option to assess the first half of the chapter. It is composed of both multiple-choice and free-response questions.

Continuing Assessment

- The **Cumulative Review** provides students an opportunity to reinforce and retain skills as they proceed through their study of Algebra 1. It can also be used as a test. This master includes free-response questions.
- The **Standardized Test Practice** offers continuing review of algebra concepts in various formats, which may appear on the standardized tests that they may encounter. This practice includes multiple-choice, grid-in, and quantitative-comparison questions. Bubble-in and grid-in answer sections are provided on the master.

Answers

- Page A1 is an answer sheet for the Standardized Test Practice questions that appear in the Student Edition on pages 116–117. This improves students' familiarity with the answer formats they may encounter in test taking.
- The answers for the lesson-by-lesson masters are provided as reduced pages with answers appearing in red.
- Full-size answer keys are provided for the assessment masters in this booklet.

NAME _____ DATE _____ PERIOD _____

2

Reading to Learn Mathematics

Vocabulary Builder

This is an alphabetical list of the key vocabulary terms you will learn in Chapter 2. As you study the chapter, complete each term's definition or description. Remember to add the page number where you found the term. Add these pages to your Algebra Study Notebook to review vocabulary at the end of the chapter.

Vocabulary Term	Found on Page	Definition/Description/Example
absolute value		
additive inverses A·duh·tihv		
equally likely		
frequency		
integers		
irrational number ih·RA·shuh·nuhl		
line plot		
measures of central tendency		
natural number		
odds		

(continued on the next page)

NAME _____ DATE _____ PERIOD _____

2

Reading to Learn Mathematics

Vocabulary Builder *(continued)*

Vocabulary Term	Found on Page	Definition/Description/Example
opposites		
perfect square		
principal square root		
probability PRAH·buh·BIH·luh·tee		
rational number RA·shuh·nuhl		
real number		
sample space		
simple event		
square root		
stem-and-leaf plot		
whole number		

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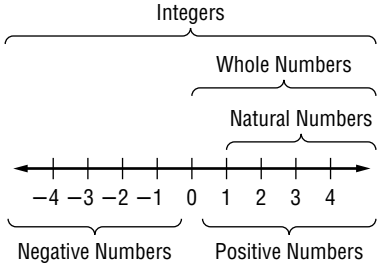
2-1 Study Guide and Intervention

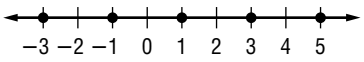
Rational Numbers on the Number Line

Graph Rational Numbers The figure at the right is part of a number line. A number line can be used to show the sets of **natural numbers**, **whole numbers**, and **integers**. **Positive numbers**, are located to the right of 0, and **negative numbers** are located to the left of 0.

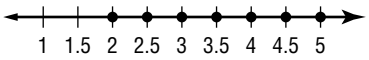


Another set of numbers that you can display on a number line is the set of **rational numbers**. A rational number can be written as $\frac{a}{b}$, where a and b are integers and $b \neq 0$. Some examples of rational numbers are $\frac{1}{4}$, $\frac{-3}{5}$, $\frac{-7}{-8}$, and $\frac{12}{-3}$.

Example 1 **Name the coordinates of the points graphed on each number line.**

a. 

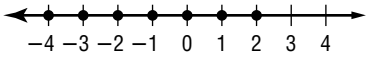
The dots indicate each point on the graph. The coordinates are {−3, −1, 1, 3, 5}

b. 

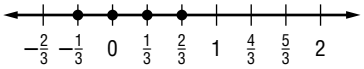
The bold arrow to the right means the graph continues indefinitely in that direction. The coordinates are {2, 2.5, 3, 3.5, 4, 4.5, 5, …}.

Example 2 **Graph each set of numbers.**

a. {…, −3, −2, −1, 0, 1, 2}

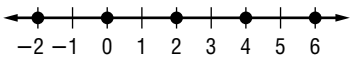


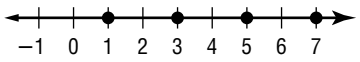
b. $\left\{-\frac{1}{3}, 0, \frac{1}{3}, \frac{2}{3}\right\}$

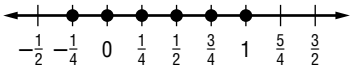


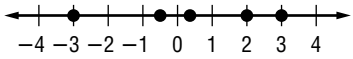
Exercises

Name the coordinates of the points graphed on each number line.

1. 

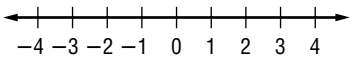
2. 

3. 

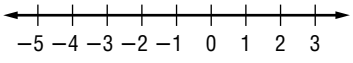
4. 

Graph each set of numbers.

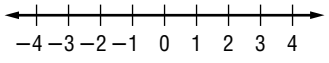
5. {−3, −1, 1, 3}



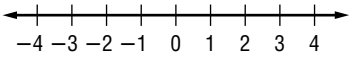
6. {−5, −2, 1, 2}



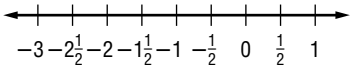
7. {integers less than 0}



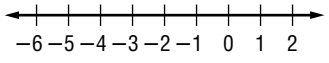
8. {…, −2, −1, 0, 1}



9. $\left\{-2\frac{1}{2}, -1\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\right\}$



10. {…, −4, −2, 0, 2, …}



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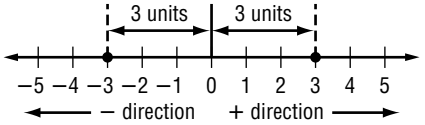
NAME _____ DATE _____ PERIOD _____

2-1 Study Guide and Intervention *(continued)*

Rational Numbers on the Number Line

Absolute Value On a number line, -3 is three units from zero in the negative direction, and 3 is three units from zero in the positive direction. The number line at the right illustrates the meaning of **absolute value**. The absolute value of a number n is the distance from zero on a number line and is represented $|n|$. For this example, $|-3| = 3$ and $|3| = 3$.



Example 1 **Find each absolute value.**

a. $|-6|$

-6 is six units from zero in the negative direction.

$|-6| = 6$

b. $\left|\frac{3}{2}\right|$

$\frac{3}{2}$ is three halves units from zero in the positive direction.

$\left|\frac{3}{2}\right| = \frac{3}{2}$

Example 2 **Evaluate $4 + |x - 2|$ if $x = 5$.**

$4 + \|x - 2\|$	$= 4 + \|5 - 2\|$	Replace x with 5.
	$= 4 + \|3\|$	$5 - 2 = 3$
	$= 4 + 3$	$\|3\| = 3$
	$= 7$	Simplify.

Exercises

Find each absolute value.

1. $|2|$ **2.** $|-5|$ **3.** $|-24|$

4. $|-1.3|$ **5.** $\left|-\frac{2}{3}\right|$ **6.** $\left|\frac{35}{41}\right|$

Evaluate each expression if $a = 5$, $b = \frac{1}{4}$, $x = 8$, and $y = 2.5$.

7. $18 + |4 - y|$ **8.** $|x + 8| + 12$ **9.** $|x - 2| + 8.2$

10. $2 + |x - 5|$ **11.** $|2.5 + y| + 12$ **12.** $|23 - x| - 9$

13. $|x - 6| + 4.5$ **14.** $10 - |a - 2|$ **15.** $|6 + b| + \frac{1}{2}$

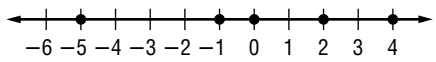
16. $\left|\frac{1}{4} + b\right| - \left|-\frac{1}{2}\right|$ **17.** $|3 + b| + a$ **18.** $|-b| + 1\frac{1}{2}$

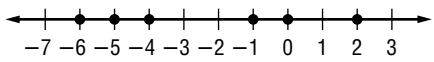
NAME _____ DATE _____ PERIOD _____

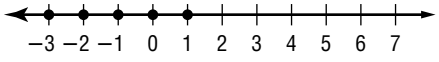
2-1 Skills Practice

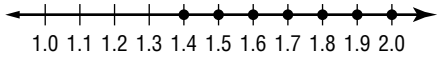
Rational Numbers on the Number Line

Name the coordinates of the points graphed on each number line.

1. 

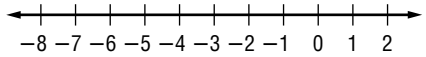
2. 

3. 

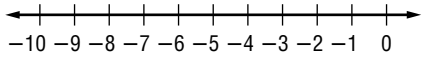
4. 

Graph each set of numbers.

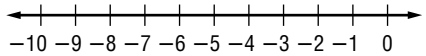
5. $\{-8, -5, -3, 0, 2\}$



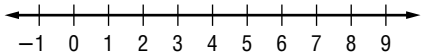
6. $\{-9, -6, -4, -3, -1\}$



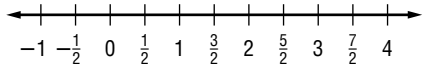
7. $\{-3, -2, -1, 0, \ldots\}$



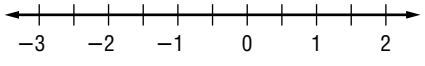
8. $\{\ldots, -1, 0, 1, 2, 3\}$



9. $\left\{-\frac{1}{2}, 0, \frac{1}{2}, 1, \frac{5}{2}\right\}$



10. $\{\ldots, -3, -2.5, -2, -1.5, -1\}$



Find each absolute value.

11. $|-9|$

12. $|15|$

13. $|-30|$

14. $\left|-\frac{5}{7}\right|$

15. $|2.4|$

16. $\left|\frac{9}{11}\right|$

Evaluate each expression if $a = 3$, $b = -10$, $c = \frac{1}{2}$, $x = 9$, $y = 1.5$, and $z = 12$.

17. $26 - |x + 6|$

18. $11 + |10 - x|$

19. $|12 - a| + 5$

20. $|a + 20| - 4$

21. $4.5 - |y|$

22. $|z - 7| + 5$

23. $14 - |b|$

24. $|b| - 2$

25. $\left|c + \frac{1}{2}\right| + 2$

26. $9 + |3.5 - y|$

Lesson 2-1

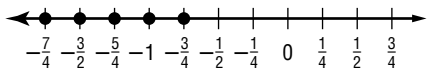
NAME _____ DATE _____ PERIOD _____

2-1 Practice

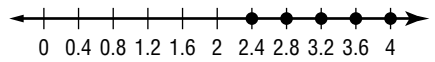
Rational Numbers on the Number Line

Name the coordinates of the points graphed on each number line.

1.

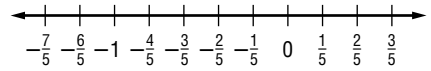


2.

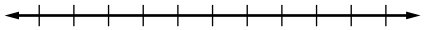


Graph each set of numbers.

3. $\left\{\ldots, -\frac{7}{5}, -\frac{6}{5}, -1, -\frac{4}{5}, -\frac{3}{5}\right\}$



4. {integers less than -4 or greater than 2}



Find each absolute value.

5. $|-11|$ **6.** $|100|$ **7.** $|-0.35|$ **8.** $\left|-\frac{28}{53}\right|$

Evaluate each expression if $a = 4$, $b = \frac{3}{5}$, $c = \frac{3}{2}$, $x = 14$, $y = 2.4$, and $z = -3$.

9. $41 - 16 - |z|$ **10.** $|3a + 20| - 15$ **11.** $|2x + 4| - 6$ **12.** $2.5 - |3.8 - y|$

13. $\left(b - \frac{1}{5}\right) + \left|-\frac{3}{10}\right|$ **14.** $\frac{2}{15} + \left|b - \frac{2}{5}\right|$ **15.** $|c - 1| - \frac{1}{3}$ **16.** $|-c| - \frac{3}{4}$

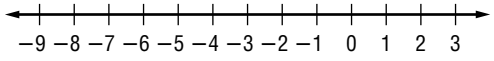
ASTRONOMY For Exercises 17–19, use the following information.

The *absolute magnitude* of a star is how bright the star would appear from a standard distance of 10 parsecs, or 32.6 light years. The lower the number, the greater the magnitude, or brightness, of the star. The table gives the magnitudes of several stars.

Star	Magnitude
Altair	2.3
Betelgeuse	−7.2
Castor	0.5
Deneb	−4.7
Pollux	0.7
Regulus	−0.3
Rigel	−8.1
Sirius	1.4

Source: www.astro.wisc.edu

17. Use a number line to order the magnitudes from least to greatest.



18. Which of the stars are the brightest and the least bright?

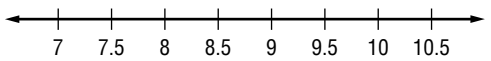
19. Write the absolute value of the magnitude of each star

20. CLIMATE The table shows the mean wind speeds in miles per hour at Daytona Beach, Florida.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
9.0	9.7	10.1	9.7	9.0	7.9	7.4	7.1	8.3	9.1	8.7	8.5

Source: National Climatic Data Center

Graph the wind speeds on a number line. Which month has the greatest mean wind speed?



NAME _____ DATE _____ PERIOD _____

2-1 Reading to Learn Mathematics

Rational Numbers on the Number Line

Pre-Activity **How can you use a number line to show data?**

Read the introduction to Lesson 2-1 at the top of page 68 in your textbook.

In the table, what does the number +0.2 tell you?

Reading the Lesson

1. Refer to the number line on page 68 in your textbook. Write *true* or *false* for each of the following statements.

a. All whole numbers are integers.

b. All natural numbers are integers.

c. All whole numbers are natural numbers.

d. All natural numbers are whole numbers.

e. All whole numbers are positive numbers.

2. Use the words *denominator*, *fraction*, and *numerator* to complete the following sentence.

You know that a number is a rational number if it can be written as a _____ that has a _____ and _____ that are integers, where the denominator is not equal to zero.

3. Explain why $\frac{-3}{7}$, $0.\overline{6}$, and 15 are rational numbers.

Helping You Remember

4. Connecting a mathematical concept to something in your everyday life is one way of remembering. Describe a situation or setting in your life that reminds you of absolute value.

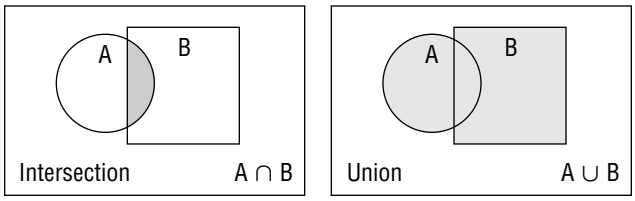
NAME _____ DATE _____ PERIOD _____

2-1 Enrichment

Intersection and Union

The intersection of two sets is the set of elements that are in both sets. The intersection of sets A and B is written A ∩ B. The union of two sets is the set of elements in either A, B, or both. The union is written A ∪ B.

In the drawings below, suppose A is the set of points inside the circle and B is the set of points inside the square. Then, the shaded areas show the intersection in the first drawing and the union in the second drawing.



Write A ∩ B and A ∪ B for each of the following.

1. A = {p, q, r, s, t}
B = {q, r, s}

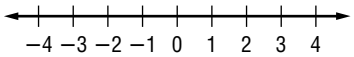
2. A = {the integers between 2 and 7}
B = {0, 3, 8}

3. A = {the states whose names start with K}
B = {the states whose capitals are Honolulu or Topeka}

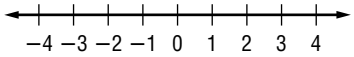
4. A = {the positive integer factors of 24}
B = {the counting numbers less than 10}

Suppose A = {numbers x such that $x < 3$}, B = {numbers x such as $x \geq -1$}, and C = {numbers x such that $x \leq 1.5$}. Graph each of the following.

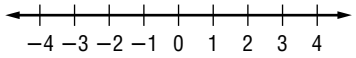
5. A ∩ B



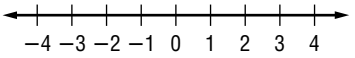
6. A ∪ B



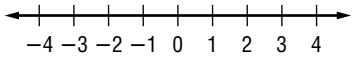
7. B ∪ C



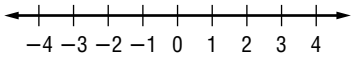
8. B ∩ C



9. (A ∩ C) ∩ B



10. A ∩ (B ∪ C)



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NAME _____ DATE _____ PERIOD _____

2-2 Study Guide and Intervention

Adding and Subtracting Rational Numbers

Add Rational Numbers

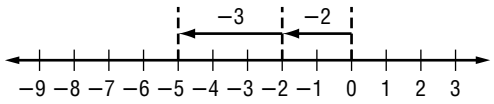
Adding Rational Numbers, Same Sign	Add the numbers. If both are positive, the sum is positive; if both are negative, the sum is negative.
Adding Rational Numbers, Different Signs	Subtract the number with the lesser absolute value from the number with the greater absolute value. The sign of the sum is the same as the sign of the number with the greater absolute value.

Example 1 **Use a number line to find the sum $-2 + (-3)$.**

Step 1 Draw an arrow from 0 to -2.

Step 2 From the tip of the first arrow, draw a second arrow 3 units to the left to represent adding -3.

Step 3 The second arrow ends at the sum -5. So $-2 + (-3) = -5$.



Example 2 **Find each sum.**

a. $\mathbf{-8 + 5}$

$$\begin{aligned} -8 + 5 &= -(|-8| - |5|) \\ &= -(8 - 5) \\ &= -3 \end{aligned}$$

b. $\mathbf{\frac{3}{4} + \left(-\frac{1}{2}\right)}$

$$\begin{aligned} \frac{3}{4} + \left(-\frac{1}{2}\right) &= \frac{3}{4} + \left(-\frac{2}{4}\right) \\ &= +\left(\left|\frac{3}{4}\right| - \left|-\frac{2}{4}\right|\right) \\ &= +\left(\frac{3}{4} - \frac{2}{4}\right) \\ &= \frac{1}{4} \end{aligned}$$

Exercises

Find each sum.

1. $12 + 24$

2. $-6 + 14$

3. $-12 + (-15)$

4. $-21.5 + 34.2$

5. $8.2 + (-3.5)$

6. $23.5 + (-15.2)$

7. $90 + (-105)$

8. $108 + (-62)$

9. $-84 + (-90)$

10. $\frac{5}{7} + \frac{1}{3}$

11. $\frac{3}{14} + \frac{6}{17}$

12. $-\frac{4}{9} + \frac{3}{5}$

13. $-\frac{2}{3} + \left(-\frac{1}{4}\right)$

14. $-\frac{1}{5} + \frac{7}{11}$

15. $-\frac{18}{40} + \left(-\frac{10}{20}\right)$

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

17. $-1.6 + (-1.8)$

18. $-0.008 + (-0.25)$

Lesson 2-2

NAME _____ DATE _____ PERIOD _____

2-2 Study Guide and Intervention *(continued)*

Adding and Subtracting Rational Numbers

Subtract Rational Numbers Every positive rational number can be paired with a negative rational number so that their sum is 0. The numbers, called **opposites**, are **additive inverses** of each other.

Additive Inverse Property	For every number a, $a + (-a) = 0$.

To subtract a rational number, add its inverse and use the rules for addition given on page 81.

Subtraction of Rational Numbers	For any numbers a and b, $a - b = a + (-b)$.

Example **Find $8.5 - 10.2$.**

$8.5 - 10.2 = 8.5 + (-10.2)$ To subtract 10.2, add its inverse.

$= -(|-10.2| - |8.5|)$ $|-10.2|$ is greater, so the result is negative.

$= -1.7$ Simplify.

Exercises

Find each difference.

1. $11 - 41$

2. $15 - (-21)$

3. $-33 - (-17)$

4. $18 - (-12)$

5. $15.5 - (-2.5)$

6. $65.8 - (-23.5)$

7. $90 - (-15)$

8. $-10.8 - (6.8)$

9. $-84 - (-72)$

10. $58.8 - (-11.2)$

11. $-18.2 - 3.2$

12. $-9 - (-5.6)$

13. $-\frac{1}{3} - \left(-\frac{3}{4}\right)$

14. $-\frac{1}{5} - \left(-\frac{4}{7}\right)$

15. $\frac{9}{4} - \frac{5}{9}$

16. $\frac{12}{23} - \left(-\frac{1}{2}\right)$

17. $-\frac{7}{8} - \left(-\frac{3}{9}\right)$

18. $\frac{24}{10} - \frac{18}{20}$

19. Sanelle was playing a video game. Her scores were $+50$, $+75$, -18, and -22. What was her final score?

20. The football team offense began a drive from their 20-yard line. They gained 8 yards, lost 12 yards and lost 2 yards before having to kick the ball. What yard line were they on when they had to kick the ball?

NAME _____ DATE _____ PERIOD _____

2-2 Skills Practice

Adding and Subtracting Rational Numbers

Find each sum.

1. $28 + 13$

2. $18 + 54$

3. $-6 + 15$

4. $-12 + 25$

5. $-14 + 11$

6. $-42 + 18$

7. $-19 + (-3)$

8. $-9 + (-17)$

9. $25 + (-30)$

10. $16 + (-20)$

11. $\frac{1}{4} + \left(-\frac{3}{4}\right)$

12. $-2.5 + 3.2$

Find each difference.

13. $31 - 12$

14. $53 - 47$

15. $17 - 20$

16. $28 - 39$

17. $-15 - 65$

18. $-27 - 13$

19. $-11 - (-12)$

20. $-25 - (-36)$

21. $-9 - (-7)$

22. $-14 - (-8)$

23. $-1.5 - 1$

24. $3.6 - 4.8$

25. $-\frac{1}{2} - \left(-\frac{1}{2}\right)$

26. $-\frac{1}{3} - \frac{1}{6}$

27. $-\frac{3}{4} + \frac{3}{2}$

28. WEATHER At 6:00 P.M., the temperature in North Fork was 28 degrees Fahrenheit. Shortly afterward, a strong cold front passed through, and the temperature dropped 36 degrees by 8:00 A.M. the next morning. What was the temperature at 8:00 A.M.?

Lesson 2-2

NAME _____ DATE _____ PERIOD _____

2-2 Practice

Adding and Subtracting Rational Numbers

Find each sum.

1. $-82 + 14$

2. $-33 + 47$

3. $-17 + (-39)$

4. $8 + (-11)$

5. $-1.7 + 3.2$

6. $-13.3 + (-0.9)$

7. $-51.8 + 29.7$

8. $7.34 + (-9.06)$

9. $\frac{5}{9} + \frac{5}{6}$

10. $-\frac{3}{5} + \frac{2}{3}$

11. $-\frac{3}{4} + \left(-\frac{3}{5}\right)$

12. $\frac{3}{8} + \left(-\frac{2}{3}\right)$

Find each difference.

13. $65 - 93$

14. $-42 - (-17)$

15. $13 - (-19)$

16. $-8 - 43$

17. $82.8 - (-12.4)$

18. $1.27 - 2.34$

19. $-9.26 - 12.05$

20. $-18.1 - (-4.7)$

21. $-\frac{1}{5} - \frac{2}{3}$

22. $\frac{4}{3} - \frac{5}{6}$

23. $-\frac{5}{2} - \left(-\frac{3}{7}\right)$

24. $\frac{1}{8} - \left(-\frac{5}{6}\right)$

FINANCE For Exercises 25–27, use the following information.

The table shows activity in Ben's checking account. The balance before the activity was $200.00. Deposits are added to an account and checks are subtracted.

Number	Date	Transaction	Amount	Balance
	5/2	deposit	52.50	252.50
101	5/10	check to Castle Music	25.50	?
102	6/1	check to Comp U Save	235.40	?

25. What is the account balance after writing check number 101?

26. What is the account balance after writing check number 102?

27. Realizing that he has just written a check for more than is in the account, Ben immediately deposits $425. What will this make his new account balance?

28. CHEMISTRY The melting points of krypton, radon, and sulfur in degrees Celsius are -156.6, -61.8, and 112.8, respectively. What is the difference in melting points between radon and krypton and between sulfur and krypton?

NAME _____ DATE _____ PERIOD _____

2-2 Reading to Learn Mathematics

Adding and Subtracting Rational Numbers

Pre-Activity **How can a number line be used to show a football team's progress?**

Read the introduction to Lesson 2-2 at the top of page 73 in your textbook.

Use *positive* or *negative* to complete the following sentences.

The five-yard penalty is shown by the _____ number -5.

The 13-yard pass is shown by the _____ number 13.

Reading the Lesson

1. To add two rational numbers, you can use a number line. Each number will be represented by an arrow.

a. Where on the number line does the arrow for the first number begin?

b. Arrows for negative numbers will point to the _____ (left/right). Arrows for positive numbers will point to the _____ (left/right).

2. Two students added the same pair of rational numbers. Both students got the correct sum. One student used a number line. The other student used absolute value. Then they compared their work.

a. How do the arrows show which number has the greater absolute value?

b. If the longer arrow points to the left, then the sum is _____ (positive/negative). If the longer arrow points to the right, then the sum is _____ (positive/negative).

3. If two numbers are additive inverses, what must be true about their absolute values?

4. Write each subtraction problem as an addition problem.

a. $12 - 4$

b. $-15 - 7$

c. $0 - 9$

d. $-20 - 34$

Helping You Remember

5. Explain why knowing the rules for adding rational numbers can help you to subtract rational numbers.

Lesson 2-2

NAME _____ DATE _____ PERIOD _____

2-2 Enrichment

Rounding Fractions

Rounding fractions is more difficult than rounding whole numbers or decimals. For example, think about how you would round $\frac{4}{9}$ inches to the nearest quarter-inch. Through estimation, you might realize that $\frac{4}{9}$ is less than $\frac{1}{2}$. But, is it closer to $\frac{1}{2}$ or to $\frac{1}{4}$?

Here are two ways to round fractions. Example 1 uses only the fractions; Example 2 uses decimals.

Example 1

Subtract the fraction twice. Use the two nearest quarters.

$\frac{1}{2} - \frac{4}{9} = \frac{1}{18}$ $\quad \frac{4}{9} - \frac{1}{4} = \frac{7}{36}$

Compare the differences.

$\frac{1}{18} < \frac{7}{36}$

The smaller difference shows you which fraction to round to.

$\frac{4}{9}$ rounds to $\frac{1}{2}$.

Example 2

Change the fraction and the two nearest quarters to decimals.

$\frac{4}{9} = 0.4\overline{4}$, $\frac{1}{2} = 0.5$, $\frac{1}{4} = 0.25$

Find the decimal halfway between the two nearest quarters.

$\frac{1}{2}(0.5 + 0.25) = 0.375$

If the fraction is greater than the halfway decimal, round up. If not, round down.

$0.4\overline{4} > 0.3675$. So, $\frac{4}{9}$ is more than half way between $\frac{1}{4}$ and $\frac{1}{2}$.

$\frac{4}{9}$ rounds to $\frac{1}{2}$.

Round each fraction to the nearest one-quarter. Use either method.

1. $\frac{1}{3}$ **2.** $\frac{3}{7}$ **3.** $\frac{7}{11}$ **4.** $\frac{4}{15}$

5. $\frac{7}{20}$ **6.** $\frac{31}{50}$ **7.** $\frac{9}{25}$ **8.** $\frac{23}{30}$

Round each decimal or fraction to the nearest one-eighth.

9. 0.6 **10.** 0.1 **11.** 0.45 **12.** 0.85

13. $\frac{5}{7}$ **14.** $\frac{3}{20}$ **15.** $\frac{23}{25}$ **16.** $\frac{5}{9}$

NAME _____ DATE _____ PERIOD _____

2-3 Study Guide and Intervention

Multiplying Rational Numbers

Multiply Integers You can use the rules below when multiplying integers and rational numbers.

Multiplying Numbers with the Same Sign	The product of two numbers having the same sign is positive.
Multiplying Numbers with Different Signs	The product of two numbers having different signs is negative.

Example 1 **Find each product.**

a. −7(6)

The signs are different, so the product is negative.

$-7(6) = -42$

b. −18(−10)

The signs are the same, so the product is positive.

$-18(-10) = 180$

Example 2 **Simplify the expression $(-2x)5y$.**

$(-2x)5y = (-2)(5)x \cdot y$ Commutative Property (×)

$= (-2 \cdot 5)xy$ Associative Property

$= -10xy$ Simplify.

Exercises

Find each product.

1. $11(4)$ **2.** $-5(-3)$ **3.** $(-24)(-2)$

4. $(60)(-3)$ **5.** $(-2)(-3)(-4)$ **6.** $8(-15)$

7. $-15(3)$ **8.** $(12)(-10)$ **9.** $(-22)(-3)(2)$

10. $(5)(-5)(0)(4)$ **11.** $(-15)(45)$ **12.** $(-12)(-23)$

Simplify each expression.

13. $4(-2x) - 8x$ **14.** $6(-2n) - 10n$ **15.** $6(3y - y)$

16. $-3(3d + 2d)$ **17.** $-2x(2) + 2x(3y)$ **18.** $4m(-2n) + 2d(-4e)$

19. $-5(2x + x) - 3(-xy)$ **20.** $(2)(-4x + 2x)$ **21.** $(-3)(-8n - 6m)$

Lesson 2-3

NAME _____ DATE _____ PERIOD _____

2-3 Study Guide and Intervention *(continued)*

Multiplying Rational Numbers

Multiply Rational Numbers Multiplying a rational number by -1 gives you the additive inverse of the number.

Multiplicative Property of -1	The product of any number and -1 is its additive inverse.	$(-1)(5) = 5(-1) = -5$

Example 1 **Evaluate a^3b^2 if $a = -2$ and $b = -5$.**

$a^3b^2 = (-2)^3(-5)^2$ Substitution

$= (-8)(25)$ $(-2)^3 = -8$ and $(-5)^2 = 25$

$= -200$ different signs → negative product

Example 2 **Evaluate $n^2\left(-\frac{3}{5}\right)$ if $n = -\frac{1}{2}$.**

$n^2\left(-\frac{3}{5}\right) = \left(-\frac{1}{2}\right)^2\left(-\frac{3}{5}\right)$ Substitution

$= \left(\frac{1}{4}\right)\left(-\frac{3}{5}\right)$ $\left(-\frac{1}{2}\right)^2 = \left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right)$ or $\frac{1}{4}$

$= -\frac{3}{20}$ different signs → negative product

Exercises

Find each product.

1. $\frac{1}{4}(-12)$

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

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

4. $(6.0)(-0.3)$

5. $\left(-\frac{1}{2}\right)\left(-\frac{1}{3}\right)\left(-\frac{3}{4}\right)$

6. $8(-15)$

7. $-15(-4)$

8. $\left(\frac{1}{2}\right)(-10)$

9. $\left(-\frac{2}{5}\right)(-3)\left(\frac{2}{3}\right)$

10. $\left(\frac{4}{5}\right)(-2)(0)\left(\frac{1}{4}\right)$

11. $\left(-\frac{1}{3}\right)\left(\frac{4}{5}\right)$

12. $\left(-1\frac{1}{2}\right)\left(-2\frac{1}{3}\right)$

Evaluate each expression if $a = -2.5$, $b = 4.2$, $c = 5.5$, and $d = -0.2$.

13. $-2a^2$

14. $5(-2b)$

15. $-6(cd)$

16. $-2(3d + 2c)$

17. $-ad - 3c$

18. $b^2(c - 2d)$

19. $-5bcd$

20. $-3d^2 + 4$

21. $(-3)(-8a - 2b)$

NAME _____ DATE _____ PERIOD _____

2-3 Skills Practice

Multiplying Rational Numbers

Find each product.

1. $9(17)$

2. $-8(-7)$

3. $5(-7)$

4. $-4(11)$

5. $-6(-12)$

6. $7(-25)$

7. $\left(\frac{1}{2}\right)\left(\frac{2}{3}\right)$

8. $\left(-\frac{3}{5}\right)\left(\frac{1}{6}\right)$

9. $\left(-\frac{3}{8}\right)\left(-\frac{1}{2}\right)$

10. $\left(\frac{3}{4}\right)\left(-\frac{5}{8}\right)$

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

12. $(1.5)(2.2)$

13. $(-2.8)(0.5)$

14. $(2.4)(-0.6)$

15. $(-4.7)(-1.3)$

16. $(1.1)(-1.2)$

Simplify each expression.

17. $5(-2a) - 8a$

18. $-6(3x) + 12x$

19. $3(4n - n)$

20. $-4(2d - d)$

Evaluate each expression if $a = -1.2$, $b = 0.5$, $c = \frac{1}{2}$, and $d = -\frac{2}{3}$.

21. $-4ab$

22. $-3b^2$

23. $-2a^2$

24. $c^2\left(-\frac{1}{3}\right)$

25. $\frac{1}{8}d^2$

26. $-3cd$

27. STAIRCASES A staircase in an office building starts at ground level. Each step down lowers you by 7.5 inches. What is your height in relation to ground level after descending 20 steps?

Lesson 2-3

NAME _____ DATE _____ PERIOD _____

2-3 Practice

Multiplying Rational Numbers

Find each product.

1. $42(7)$

2. $-28(-17)$

3. $15(-34)$

4. $\left(-\frac{3}{4}\right)\left(\frac{7}{8}\right)$

5. $\left(-\frac{4}{5}\right)\left(-\frac{5}{6}\right)$

6. $\left(\frac{9}{10}\right)\left(\frac{5}{7}\right)$

7. $\left(-3\frac{1}{4}\right)\left(2\frac{1}{2}\right)$

8. $\left(-2\frac{2}{3}\right)\left(-1\frac{1}{6}\right)$

9. $\left(1\frac{1}{4}\right)\left(-1\frac{1}{5}\right)$

10. $(1.5)(8.8)$

11. $(6.8)(-1.3)$

12. $(-0.2)(2.8)$

13. $(-3.6)(-0.55)$

14. $6.3(-0.7)$

15. $\frac{2}{3}(-4)(9)$

Simplify each expression.

16. $5(-3a) + 18a$

17. $-8(4c) + 12c$

18. $-9(2g - g)$

19. $7(2b - 4b)$

20. $-4x(2y) + (-3b)(-2d)$

21. $-5p(-3q) + (4m)(-6n)$

Evaluate each expression if $a = -\frac{4}{5}$, $b = \frac{3}{4}$, $c = -3.4$, and $d = 0.7$.

22. $b^2\left(-\frac{2}{3}\right)$

23. $4ab$

24. $5a^2(-b)$

25. $-6d^2$

26. $cd - 3$

27. $c^2(-5d)$

28. RECIPES A recipe for buttermilk biscuits calls for $3\frac{1}{3}$ cups of flour. How many cups of flour do you need for $\frac{1}{2}$ the recipe?

COMPUTERS For Exercises 29 and 30, use the following information.

Leeza is downloading a file from a Web site at 47.3 kilobytes per second.

29. How many kilobytes of the file will be downloaded after one minute?

30. How many kilobytes will be downloaded after 4.5 minutes?

CONSERVATION For Exercises 31 and 32, use the following information.

A county commission has set aside 640 acres of land for a wildlife preserve.

31. Suppose $\frac{2}{5}$ of the preserve is marshland. How many acres of the preserve are marshland?

32. If the forested area of the preserve is 1.5 times larger than the marshland, how many acres of the preserve are forested?

NAME _____ DATE _____ PERIOD _____

2-3 Reading to Learn Mathematics

Multiplying Rational Numbers

Pre-Activity **How do consumers use multiplication of rational numbers?**

Read the introduction to Lesson 2-3 at the top of page 79 in your textbook.

- How is the amount of the coupon shown on the sales slip?
- Besides the amount, how is the number representing the coupon different from the other numbers on the sales slip?

Reading the Lesson

1. Complete: If two numbers have different signs, the one number is positive and the other number is _____.

2. Complete the table.

	Multiplication Example	Are the signs of the numbers the same or different?	Is the product positive or negative?
a.	$(-4)(9)$		
b.	$(-2)(-13)$		
c.	$5(-8)$		
d.	$6(3)$		

3. Explain what the term "additive inverse" means to you. Then give an example.

Helping You Remember

4. Describe how you know that the product of -3 and -5 is positive. Then describe how you know that the product of 3 and -5 is negative.

Lesson 2-3

NAME _____ DATE _____ PERIOD _____

2-3 Enrichment

Compound Interest

In most banks, interest on savings accounts is compounded at set time periods such as three or six months. At the end of each period, the bank adds the interest earned to the account. During the next period, the bank pays interest on all the money in the bank, including interest. In this way, the account earns interest on interest.

Suppose Ms. Tanner has \$1000 in an account that is compounded quarterly at 5%. Find the balance after the first two quarters.

Use $I = prt$ to find the interest earned in the first quarter if $p = 1000$ and $r = 5\%$. Why is t equal to $\frac{1}{4}$?

First quarter: $I = 1000 \times 0.05 \times \frac{1}{4}$

$I = 12.50$

The interest, \$12.50, earned in the first quarter is added to \$1000. The principal becomes \$1012.50.

Second quarter: $I = 1012.50 \times 0.05 \times \frac{1}{4}$

$I = 12.65625$

The interest in the second quarter is \$12.66.

The balance after two quarters is \$1012.50 + 12.66 or \$1025.16.

Answer each of the following questions.

1. How much interest is earned in the third quarter of Ms. Tanner's account?

2. What is the balance in her account after three quarters?

3. How much interest is earned at the end of one year?

4. What is the balance in her account after one year?

5. Suppose Ms. Tanner's account is compounded semiannually. What is the balance at the end of six months?

6. What is the balance after one year if her account is compounded semiannually?

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2-4 Study Guide and Intervention

Dividing Rational Numbers

Divide Integers The rules for finding the sign of a quotient are similar to the rules for finding the sign of a product.

Dividing Two Numbers with the Same Sign	The quotient of two numbers having the same sign is positive.
Dividing Two Numbers with Different Signs	The quotient of two numbers having different signs is negative.

Example 1 **Find each quotient.**

a. $\mathbf{-88 \div (-4)}$

$-88 \div (-4) = 22$ same signs → positive quotient

b. $\mathbf{\frac{-64}{8}}$

$\frac{-64}{8} = -8$ different signs → negative quotient

Example 2 **Simplify** $\mathbf{\frac{-4(-10 + 2)}{-3 + (-1)}}$.

$$\frac{-4(-10 + 2)}{-3 + (-1)} = \frac{-4(-8)}{-3 + (-1)}$$
$$= \frac{32}{-3 + (-1)}$$
$$= \frac{32}{-4}$$
$$= -8$$

Exercises

Find each quotient.

1. $-80 \div (-10)$

2. $-32 \div 16$

3. $80 \div 5$

4. $18 \div (-3)$

5. $-12 \div (-3)$

6. $8 \div (-2)$

7. $-15 \div (-3)$

8. $121 \div (-11)$

9. $-24 \div 1.5$

10. $0 \div (-8)$

11. $-125 \div (-25)$

12. $-104 \div 4$

Simplify.

13. $\frac{-2 + (-4)}{(-2) + (-1)}$

14. $\frac{5(-10 + (-2))}{-2 + 1}$

15. $\frac{-6(-6 + 2)}{-10 + (-2)}$

16. $\frac{-12(2 + (-3))}{-4 + 1}$

17. $\frac{-4(-8 + (-4))}{-3 + (-3)}$

18. $\frac{4(-12 + 4)}{-2(8)}$

Lesson 2-4

NAME _____ DATE _____ PERIOD _____

2-4 Study Guide and Intervention *(continued)*

Dividing Rational Numbers

Divide Rational Numbers The rules for division with integers also apply to division with rational numbers. To divide by any nonzero number, $\frac{c}{d}$, multiply by the reciprocal of that number, $\frac{d}{c}$.

Division of Rational Numbers	$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$

Example 1

a. Find $-5\frac{1}{3} \div 8$.

$$-5\frac{1}{3} \div 8 = -\frac{16}{3} \div \frac{8}{1}$$
$$= -\frac{16}{3} \times \frac{1}{8}$$
$$= -\frac{16}{24} \text{ or } -\frac{2}{3}$$

b. Find $\frac{-83.64}{-6.8}$.

$$\frac{-83.64}{-6.8} = 12.3$$

Example 2 **Simplify $\frac{-20a + 15}{5}$.**

$$\frac{-20a + 15}{5} = (-20a + 15) \div 5$$
$$= (-20a + 15)\left(\frac{1}{5}\right)$$
$$= -20a\left(\frac{1}{5}\right) + 15\left(\frac{1}{5}\right)$$
$$= -4a + 3$$

Exercises

Find each quotient.

1. $-\frac{1}{8} \div 2$

2. $-32 \div \frac{1}{4}$

3. $-\frac{2}{5} \div \frac{1}{5}$

4. $1.8 \div (-3)$

5. $-12.9 \div (-0.3)$

6. $\frac{3}{8} \div \left(-\frac{2}{3}\right)$

7. $-\frac{15}{32} \div \left(-\frac{3}{10}\right)$

8. $52.5 \div (-4.2)$

9. $-\frac{8}{15} \div \frac{5}{3}$

10. $105 \div (-1.5)$

11. $-12.5 \div (-2.5)$

12. $-\frac{1}{4} \div \frac{4}{3}$

Simplify each expression.

13. $\frac{-44a}{4}$

14. $\frac{16x}{2}$

15. $\frac{-144a}{6}$

16. $\frac{18a - 6b}{-3}$

17. $\frac{36a - 12}{12}$

18. $\frac{57y - 12}{3}$

Evaluate each expression if $a = -6$, $b = 2.5$, $c = -3.2$, and $d = 4.8$.

19. $\frac{ab}{d}$

20. $\frac{a + d}{b}$

21. $\frac{a - 2b}{c + d}$

NAME _____ DATE _____ PERIOD _____

2-4 Skills Practice

Dividing Rational Numbers

Find each quotient.

1. $-32 \div (-4)$

2. $-28 \div 7$

3. $-45 \div (-15)$

4. $39 \div (-3)$

5. $-56 \div 14$

6. $62 \div (-4)$

7. $-23 \div (-5)$

8. $52 \div (-8)$

9. $-90 \div 12$

10. $-16.5 \div 11$

11. $-1.44 \div 1.2$

12. $-16.2 \div (-0.4)$

13. $6 \div \left(-\frac{2}{9}\right)$

14. $-\frac{3}{4} \div \frac{1}{2}$

15. $-\frac{2}{3} \div \left(-\frac{1}{4}\right)$

16. $\frac{1}{2} \div \frac{2}{3}$

Simplify each expression.

17. $\frac{27a}{3}$

18. $\frac{216x}{12}$

19. $\frac{16c - 4}{-4}$

20. $\frac{-54z + 18}{-9}$

Evaluate each expression if $g = -4$, $h = 2.5$, $k = 1.4$, and $m = -0.8$. Round to the nearest hundredth.

21. $\frac{gh}{m}$

22. $\frac{hm}{g}$

23. $\frac{hk}{m}$

24. $hk \div gm$

25. $km \div gh$

26. $\frac{k + m}{g}$

Lesson 2-4

NAME _____ DATE _____ PERIOD _____

2-4 Practice

Dividing Rational Numbers

Find each quotient.

1. $75 \div (-15)$

2. $-323 \div (-17)$

3. $-88 \div 16$

4. $65.7 \div (-9)$

5. $-36.08 \div 8$

6. $-40.05 \div (-2.5)$

7. $-9 \div \frac{3}{5}$

8. $-\frac{5}{6} \div \left(-\frac{3}{8}\right)$

9. $\frac{14}{63} \div \left(-\frac{49}{54}\right)$

Simplify each expression.

10. $\frac{168p}{-14}$

11. $\frac{25 - 5x}{5}$

12. $\frac{3t + 12}{-3}$

13. $\frac{18x + 12y}{-6}$

14. $\frac{8k - 12h}{4}$

15. $\frac{-4c + (-16d)}{4}$

Evaluate each expression if $p = -6$, $q = 4.5$, $r = 3.6$, and $s = -5.2$. Round to the nearest hundredth.

16. $\frac{qr}{p}$

17. $\frac{rs}{q}$

18. $ps \div qr$

19. $rs \div pq$

20. $\frac{p - q}{r}$

21. $\frac{r + s}{q}$

22. EXERCISE Ashley walks $2\frac{1}{2}$ miles around a lake three times a week. If Ashley walks around the lake in $\frac{3}{4}$ hour, what is her rate of speed? (*Hint*: Use the formula $r = \frac{d}{t}$, where r is rate, d is distance, and t is time.)

23. PUBLICATION A production assistant must divide a page of text into two columns. If the page is $6\frac{3}{4}$ inches wide, how wide will each column be?

ROLLER COASTERS For Exercises 24 and 25, use the following information.

The formula for acceleration is $a = \frac{f - s}{t}$, where a is acceleration, f is final speed, s is starting speed, and t is time.

24. The Hypersonic XLC roller coaster in Virginia goes from zero to 80 miles per hour in 1.8 seconds. What is its acceleration in miles per hour per second to the nearest tenth?

Source: www.thrillride.com

25. What is the acceleration in feet per second per second? (*Hint:* Convert miles to feet and hours to seconds, then apply the formula for acceleration. 1 mile = 5280 feet)

NAME _____ DATE _____ PERIOD _____

2-4 Reading to Learn Mathematics

Dividing Rational Numbers

Pre-Activity **How can you use division of rational numbers to describe data?**

Read the introduction to Lesson 2-4 at the top of page 84 in your textbook.

- What is meant by the term *mean*?

- In the expression $\frac{(-127) + 54 + (-65)}{3}$, will the numerator be positive or negative?

Reading the Lesson

1. Explain what the term *inverse operations* means to you.

2. Write *negative* or *positive* to describe the quotient. Explain your answer.

	Expression	Negative or Positive?	Explanation
a.	$\frac{35}{-7}$		
b.	$\frac{-78}{-13}$		
c.	$\frac{(-5.6)(-2.4)}{1.92}$		

Helping You Remember

3. Explain how knowing the rules for multiplying rational numbers can help you remember the rules for dividing rational numbers.

Lesson 2-4

NAME _____ DATE_____ PERIOD _____

2-4 Enrichment

Other Kinds of Means

There are many different types of means besides the arithmetic mean. A mean for a set of numbers has these two properties:

a. It typifies or represents the set.

b. It is not less than the least number and it is not greater than the greatest number.

Here are the formulas for the arithmetic mean and three other means.

Arithmetic Mean

Add the numbers in the set. Then divide the sum by n, the number of elements in the set.

$$\frac{x_1 + x_2 + x_3 + \cdots + x_n}{n}$$

Geometric Mean

Multiply all the numbers in the set. Then find the nth root of their product.

$$\sqrt[n]{x_1 \cdot x_2 \cdot x_3 \cdot \cdots \cdot x_n}$$

Harmonic Mean

Divide the number of elements in the set by the sum of the reciprocals of the numbers.

$$\frac{n}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} + \cdots + \frac{1}{x_n}}$$

Quadratic Mean

Add the squares of the numbers. Divide their sum by the number in the set. Then, take the square root.

$$\sqrt{\frac{x_1^2 + x_2^2 + x_3^2 + \cdots + x_n^2}{n}}$$

Find the four different means to the nearest hundredth for each set of numbers.

1. 10, 100

2. 50, 60

3. 1, 2, 3, 4, 5,

4. 2, 2, 4, 4

5. Use the results from Exercises 1 to 4 to compare the relative sizes of the four types of means.

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2-5 Study Guide and Intervention

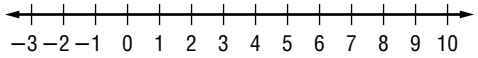
Statistics: Displaying and Analyzing Data

Create Line Plots and Stem-and-Leaf Plots One way to display data graphically is with a **line plot**. A line plot is a number line labeled with a scale that includes all the data and ×s placed above a data point each time it occurs in the data list. The ×s represent the **frequency** of the data. A **stem-and-leaf plot** can also be used to organize data. The greatest *common* place value is called the stem, and the numbers in the next greatest place value form the leaves.

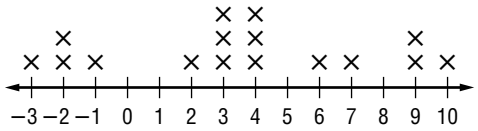
Example 1 **Draw a line plot for the data.**

−3 3 4 7 9 10 −2 3
6 4 3 9 −1 −2 4 2

Step 1 The value of the data ranges from −3 to 10, so construct a number line containing those points.



Step 2 Then place an × above the number each time it occurs.



Example 2 **Use the data below to create a stem-and-leaf plot.**

62 74 89 102 92 65 68 98 78 65
78 80 83 93 87 89 104 109 104
68 97 68 64 98 93 90 102 104

The greatest common place value is tens, so the digits in the tens place are the stems. Thus 62 would have a stem of 6 and 104 would have a stem of ten. The stem-and-leaf plot is shown below.

Stem	Leaf
6	2 4 5 5 8 8 8
7	4 8 8
8	0 3 7 9 9
9	0 2 3 3 7 8 8
10	2 2 4 4 4 9

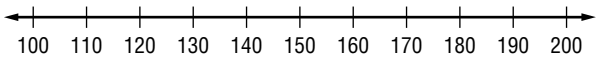
6|2 = 62

Exercises

Use the table at the right for Exercises 1–3.

Weights of Junior Varsity Wrestlers (pounds)							
170	160	135	135	160	122	188	154
108	135	140	122	103	190	154	

1. Make a line plot representing the weights of the wrestlers shown in the table at the right.



2. How many wrestlers weigh over 140 lb?

3. What is the greatest weight?

Use each set of data to make a stem-and-leaf plot.

4. 32 45 41 29 30 30 31 34 38
36 32 34 41 40 42 41 29 30

5. 102 104 99 109 108 112 115 120
112 114 98 94 96 101 100 102

Lesson 2-5

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NAME _____ DATE _____ PERIOD _____

2-5 Study Guide and Intervention *(continued)*

Statistics: Displaying and Analyzing Data

Analyze Data Numbers that represent the centralized, or middle, value of a set of data are called **measures of central tendency**. Three measures of central tendency are the **mean**, **median**, and **mode**.

	Definition	Example
Mean	Sum of the data values divided by the number of values in the data set.	Data: 24, 36, 21, 30, 21, 30; $\frac{24 + 36 + 21 + 30 + 21 + 30}{6} = 27$
Median	The middle number in a data set when the numbers are arranged in numerical order. If there is an even number of values, the median is halfway between the two middle values.	Data: 21, 21, 25, 30, 31, 42; $\frac{25 + 30}{2} = 27.5$
Mode	The number or numbers that occur most often in the set of data.	Data: 21, 21, 24, 30, 30, 36; 21 and 30 are modes

Example **Which measure of central tendency best represents the data?**

Stem	Leaf
9	4 6 8 9 9
10	0 1 2 4 8 9
11	2 2
12	0 1

9|4 =

Find the mean, median, and mode.

Mean = 105

Median = 102

Modes = 99 and 112

The median best represents the center of the data since the mean is too high.

Exercises

Find the mean, median, and mode for each data set. Then tell which best represents the data.

1.

Stem	Leaf
2	4 7 7
3	1 2 6 6 6 9
4	0
5	8 8 9

2|4 = 24

2.

Stem	Leaf
9	0 0 1 3 9
10	2 2 5
11	
12	0 3 3 8 8 9

9|0 = 90

3.

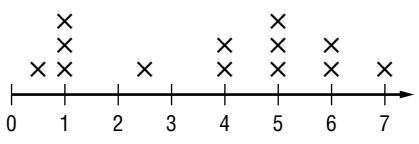
Stem	Leaf
5	0 1 9
6	2 2 5 5
7	1 3 5
8	0 3 7 7

5|0 = 50

4.

Month	Days above 90°
May	4
June	7
July	14
August	12
September	8

5.



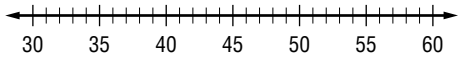
NAME _____ DATE _____ PERIOD _____

2-5 Skills Practice

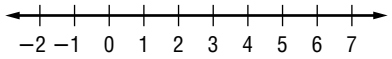
Statistics: Displaying and Analyzing Data

Use each set of data to make a line plot.

1. 59 39 50 60 45 39 59 45 31 59
55 43 39 42 59 35 31 55 43 52



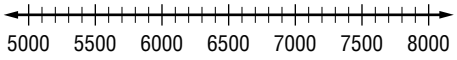
2. 5 −2 4 0 7 4 3 7 −1 4
−2 5 2 2 3 4 5 0 −2 2



INCOME For Exercises 3–5, use the list that shows the income from each assignment for a private investigator for a year.

6300	6100	7800
5600	7800	5100
6000	7200	6300
5100	6100	7800

3. Make a line plot of the data.



4. What was the median income per assignment for the investigator?

5. Does the median best represent the data?

Use each set of data to make a stem-and-leaf plot.

6. 52 68 40 74 65 68 59 75 67 73
55 63 39 42 59 35 31 59 63 42

Stem	Leaf

7. 1.5 2.3 1.7 3.0 4.1 5.3 4.7
1.9 2.2 2.8 4.3 5.2 4.1 2.2

Stem	Leaf

EMPLOYMENT For Exercises 8–10, use the list that shows the ages of employees at Watson & Sterling Publications.

20	52	21	39	40	58	27	48	36	20	51	26
45	30	49	22	59	50	33	35	28	43	55	20

8. Make a stem-and-leaf plot of the data.

Stem	Leaf

9. Which age occurs most frequently?

10. Does the mode best represent the data? Explain.

Lesson 2-5

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NAME _____ DATE _____ PERIOD _____

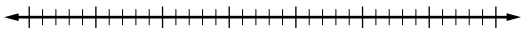
2-5 Practice

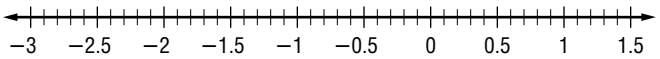
Statistics: Displaying and Analyzing Data

Use each set of data to make a line plot.

1. 72 47 62 78 49 67 80
54 47 72 55 62 47 54
62 80 47 78 72 46

2. −2 −1.3 1.5 0.1 −1.7 0.4 1.5
1 −1.3 −2 −2.9 0.1 1.3 1.2
−2.6 1.2 0.2 −1.3 −2.6

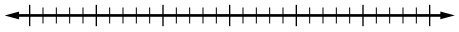




HEALTH For Exercises 3 and 4, use the list that shows the grams of saturated fat in a serving of a variety of grains such as bread, cereal, crackers, and pasta.

0.3	1.2	0.1	0.3	0.4
0.4	0.5	0.1	0.4	0.4
0.1	1.2	2.8	1.3	1.5

3. Make a line plot of the data.



4. Which measure of central tendency best describes the data? Explain.

Use each set of data to make a stem-and-leaf plot.

5. 41 53 22 50 41 27 36 57 20 31
28 52 41 33 28 27 41 52 22 30

Stem	Leaf

6. 4.1 7.3 6.9 5.7 4.8 7.3 5.6
6.0 4.4 7.5 4.6 7.9 5.1 7.7

Stem	Leaf

EMPLOYMENT For Exercises 7–10, use the lists that show survey results of students' time spent on the Internet and on the telephone for a month.

Internet								Telephone							
42	19	28	8	35	42	20	18	36	52	40	28	43	24	8	53
51	4	7	29	14	22	6		41	26	48	35	58	8	4	

7. Make a stem-and-leaf plot to compare the data.

Internet	Stem	Telephone

8. Which value appears most frequently in each set of data?

9. Is the mode the best measure to compare the data?

10. Overall, did students spend more time on the Internet or the telephone?

NAME _____ DATE _____ PERIOD _____

2-5 Reading to Learn Mathematics

Statistics: Displaying and Analyzing Data

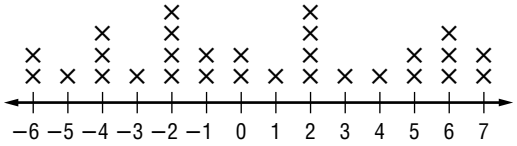
Pre-Activity **How are line plots and averages used to make decisions?**

Read the introduction to Lesson 2-5 at the top of page 88 in your textbook.

- What was the number one name for boys in all five decades?
- Look at the decade in which you were born. Is your name or the names of any of the other students in your class in the top five for that decade?

Reading the Lesson

1. Use the line plot shown below to answer the questions.



a. What are the data points for the line plot?

b. What do the three ×'s above the 6 represent?

2. Explain what is meant by the frequency of a data number.

3. Use the stem-and-leaf plot shown at the right.

a. How is the number 758 represented on the plot?

b. Explain how you know there are 23 numbers in the data.

Stem	Leaf
72	0 1 1 2 5
73	2 2 2 7 9 9
74	1 3 3
75	6 6 8 9
76	0 1 8 8 8

74|2 = 742

Helping You Remember

4. Describe how you would explain the process of finding the median and mode from a stem-and-leaf plot to a friend who missed Lesson 2-5.

Lesson 2-5

NAME _____ DATE _____ PERIOD _____

2-5 Enrichment

Runs Created

In *The 1978 Bill James Baseball Abstract*, the author introduced the "runs created" formula.

$R = \frac{(h + w)t}{(b + w)}$ where for each player h = number of hits
w = number of walks,
t = number of total bases,
b = number of at-bats, and
R = approximate number of runs a team scores due to this player's actions

1. As of June 29, 2001, Roberto Alomar of the Cleveland Indians and Seattle Mariners player Ichiro Suzuki were tied with the highest American League batting average at .351. Find the number of runs created by each player using the data below.

	h	*w*	*t*	*b*	Runs Created
Alomar	97	37	145	276	
Suzuki	121	13	159	345	

Based on this information, who do you think is the more valuable American League player? Why?

2. Carlos Lee of the Chicago White Sox and New York Yankee Bernie Williams were both batting .314. Find the number of runs created by each player using the data below.

	h	*w*	*t*	*b*	Runs Created
Lee	81	13	141	258	
Williams	74	31	123	236	

3. Why would baseball teams want to calculate the number of runs created by each of their players?

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2-6 Study Guide and Intervention

Probability: Simple Probability and Odds

Probability The **probability** of a **simple event** is a ratio that tells how likely it is that the event will take place. It is the ratio of the number of favorable outcomes of the event to the number of possible outcomes of the event. You can express the probability either as a fraction, as a decimal, or as a percent.

Probability of a Simple Event	For an event a, $P(a) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$.

Example 1 **Mr. Babcock chooses 5 out of 25 students in his algebra class at random for a special project. What is the probability of being chosen?**

$P(\text{being chosen}) = \frac{\text{number of students chosen}}{\text{total number of students}}$

The probability of being chosen is $\frac{5}{25}$ or $\frac{1}{5}$.

Example 2 **A bowl contains 3 pears, 4 bananas, and 2 apples. If you take a piece of fruit at random, what is the probability that it is *not* a banana?**

There are $3 + 4 + 2$ or 9 pieces of fruit.

There are $3 + 2$ or 5 pieces of fruit that are not bananas.

$P(\text{not banana}) = \frac{\text{number of other pieces of fruit}}{\text{total number of pieces of fruit}}$

$= \frac{5}{9}$

The probability of *not* choosing a banana is $\frac{5}{9}$.

Exercises

A card is selected at random from a standard deck of 52 cards. Determine each probability.

1. $P(10)$ **2.** $P(\text{red 2})$ **3.** $P(\text{king or queen})$

4. $P(\text{black card})$ **5.** $P(\text{ace of spades})$ **6.** $P(\text{spade})$

Two dice are rolled and their sum is recorded. Find each probability.

7. $P(\text{sum is 1})$ **8.** $P(\text{sum is 6})$ **9.** $P(\text{sum is less than 4})$

10. $P(\text{sum is greater than 11})$ **11.** $P(\text{sum is less than 15})$ **12.** $P(\text{sum is greater than 8})$

A bowl contains 4 red chips, 3 blue chips, and 8 green chips. You choose one chip at random. Find each probability.

13. $P(\text{not a red chip})$ **14.** $P(\text{red or blue chip})$ **15.** $P(\text{not a green chip})$

A number is selected at random from the list {1, 2, 3, ..., 10}. Find each probability.

16. $P(\text{even number})$ **17.** $P(\text{multiple of 3})$ **18.** $P(\text{less than 4})$

19. A computer randomly chooses a letter from the word *COMPUTER*. Find the probability that the letter is a vowel.

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NAME _____ DATE _____ PERIOD _____

2-6 Study Guide and Intervention *(continued)*

Probability: Simple Probability and Odds

Odds The odds of an event occurring is the ratio of the number of ways an event can occur (successes) to the number of ways the event cannot occur (failures).

Odds	$\frac{\text{number of successes}}{\text{number of failures}}$

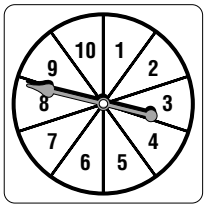
Example **A die is rolled. Find the odds of rolling a number greater than 4.**

The sample space is {1, 2, 3, 4, 5, 6}. Therefore, there are six possible outcomes. Since 5 and 6 are the only numbers greater than 4, two outcomes are successes and four are failures.

So the odds of rolling a number greater than 4 is $\frac{2}{4}$, or 1:2.

Exercises

Find the odds of each outcome if the spinner at the right is spun once.



1. multiple of 4

2. odd number

3. even or a 5

4. less than 4

5. even number greater than 5

Find the odds of each outcome if a computer randomly chooses a number between 1 and 20.

6. the number is less than 10

7. the number is a multiple of 4

8. the number is even

9. the number is a one-digit number

A bowl of money at a carnival contains 50 quarters, 75 dimes, 100 nickels, and 125 pennies. One coin is randomly selected.

10. Find the odds that a dime will not be chosen.

11. What are the odds of choosing a quarter if all the dimes are removed?

12. What are the odds of choosing a penny?

Suppose you drop a chip onto the grid at the right. Find the odds of each outcome.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

13. land on a shaded square

14. land on a square on the diagonal

15. land on square number 16

16. land on a number greater than 12

17. land on a multiple of 5

NAME _____ DATE _____ PERIOD _____

2-6 Skills Practice

Probability: Simple Probability and Odds

One chip is randomly selected from a jar containing 8 yellow chips, 10 blue chips, 7 green chips, and 5 red chips. Find each probability.

1. P(blue)

2. P(green)

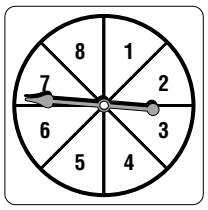
3. P(yellow or green)

4. P(blue or yellow)

5. P(not red)

6. P(not blue)

Find the probability of each outcome if the spinner is spun once.



7. P(multiple of 3)

8. P(less than 7)

9. P(odd or 2)

10. P(not 1)

A person is born in the month of June. Find each probability.

11. P(date is a multiple of 6)

12. P(date is before June 15)

13. P(before June 7 or after June 24)

14. P(not after June 5)

Find the odds of each outcome if a computer randomly picks a letter in the name *The Petrified Forest*.

15. the letter *f*

16. the letter *e*

17. the letter *t*

18. a vowel

CLASS SCHEDULES For Exercises 19–22, use the following information.

A student can select an elective class from the following: 3 in music, 5 in physical education, 2 in journalism, 8 in computer programming, 4 in art, and 6 in drama. Find each of the odds if a student forgets to choose an elective and the school assigns one at random.

19. The class is computer programming.

20. The class is drama.

21. The class is not physical education.

22. The class is not art.

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NAME _____ DATE _____ PERIOD _____

2-6 Practice

Probability: Simple Probability and Odds

One chip is randomly selected from a jar containing 13 blue chips, 8 yellow chips, 15 brown chips, and 6 green chips. Find each probability.

1. P(brown)

2. P(green)

3. P(blue or yellow)

4. P(not yellow)

A card is selected at random from a standard deck of 52 cards. Find each probability.

5. P(heart)

6. P(black card)

7. P(jack)

8. P(red jack)

Two dice are rolled and their sum is recorded. Find each probability.

9. P(sum less than 6)

10. P(sum less than 2)

11. P(sum greater than 10)

12. P(sum greater than 9)

Find the odds of each outcome if a computer randomly picks a letter in the name *The Badlands of North Dakota*.

13. the letter d

14. the letter a

15. the letter h

16. a consonant

CLASS PROJECTS For Exercises 17–20, use the following information.

Students in a biology class can choose a semester project from the following list: animal behavior (4), cellular processes (2), ecology (6), health (7), and physiology (3). Find each of the odds if a student selects a topic at random.

17. the topic is ecology

18. the topic is animal behavior

19. the topic is not cellular processes

20. the topic is not health

SCHOOL ISSUES For Exercises 21 and 22, use the following information.

A news team surveyed students in grades 9–12 on whether to change the time school begins. One student will be selected at random to be interviewed on the evening news. The table gives the results.

Grade	9	10	11	12
No change	6	2	5	3
Hour later	10	7	9	8

21. What is the probability the student selected will be in the 9th grade?

22. What are the odds the student selected wants no change?

NAME _____ DATE _____ PERIOD _____

2-6 Reading to Learn Mathematics

Probability: Simple Probability and Odds

Pre-Activity

Why is probability important in sports?

Read the introduction to Lesson 2-6 at the top of page 96 in your textbook.

Look up the definition of the word *probability* in a dictionary. Rewrite the definition in your own words.

Reading the Lesson

1. Write whether each statement is *true* or *false*. If false, replace the underlined word or number to make a true statement.

a. Probability can be written as a fraction, a decimal, or a percent.

b. The sample space of flipping one coin is heads or tails.

c. The probability of an impossible event is 1.

d. The odds against an event occurring are the odds that the event will occur.

2. Explain why the probability of an event cannot be greater than 1 while the odds of an event can be greater than 1.

Helping You Remember

3. Probabilities are usually written as fractions, decimals, or percents. Odds are usually written with a colon (for example, 1:3). How can the spelling of the word *colon* help remember this?

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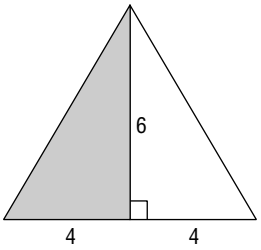
2-6 Enrichment

Geometric Probability

If a dart, thrown at random, hits the triangular board shown at the right, what is the probability that it will hit the shaded region? This can be determined by comparing the area of the shaded region to the area of the entire board. This ratio indicates what fraction of the tosses should hit in the shaded region.



$$\frac{\text{area of shaded region}}{\text{area of triangular board}} = \frac{\frac{1}{2}(4)(6)}{\frac{1}{2}(8)(6)}$$

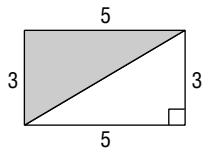
$$= \frac{12}{24} \text{ or } \frac{1}{2}$$

In general, if S is a subregion of some region R, then the probability, $P(S)$, that a point, chosen at random, belongs to subregion S is given by the following:

$$P(S) = \frac{\text{area of subregion } S}{\text{area or region } R}$$

Find the probability that a point, chosen at random, belongs to the shaded subregions of the following figures.

1.



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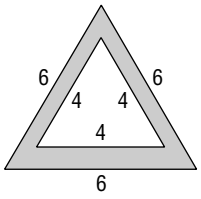

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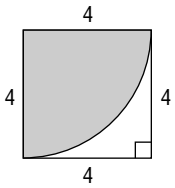

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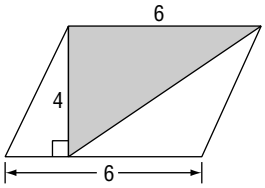

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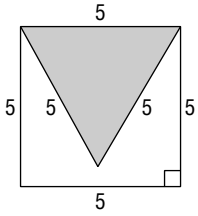

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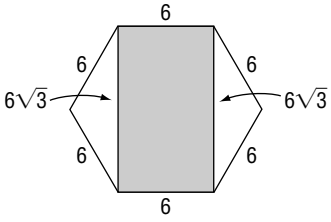

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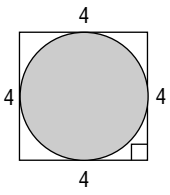

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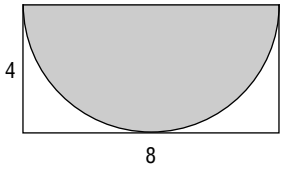
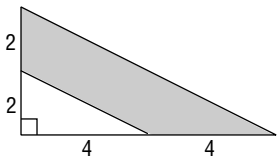


9.



NAME _____ DATE _____ PERIOD _____

2-7 Study Guide and Intervention

Square Roots and Real Numbers

Square Roots A **square root** is one of two equal factors of a number. For example, the square roots of 36 are 6 and -6, since $6 \cdot 6$ or 6^2 is 36 and $(-6)(-6)$ or $(-6)^2$ is also 36. A rational number like 36, whose square root is a rational number, is called a **perfect square**.

The symbol $\sqrt{\ }$ is a **radical sign**. It indicates the nonnegative, or **principal**, square root of the number under the radical sign. So $\sqrt{36} = 6$ and $-\sqrt{36} = -6$. The symbol $\pm\sqrt{36}$ represents both square roots.

Example 1 **Find $-\sqrt{\frac{25}{49}}$.**

$-\sqrt{\frac{25}{49}}$ represents the negative square root of $\frac{25}{49}$.

$\frac{25}{49} = \left(\frac{5}{7}\right)^2 \rightarrow -\sqrt{\frac{25}{49}} = -\frac{5}{7}$

Example 2 **Find $\pm\sqrt{0.16}$.**

$\pm\sqrt{0.16}$ represents the positive and negative square roots of 0.16.

$0.16 = 0.4^2$ and $0.16 = (-0.4)^2$

$\pm\sqrt{0.16} = \pm 0.4$

Exercises

Find each square root.

1. $\sqrt{64}$

2. $-\sqrt{81}$

3. $\sqrt{16.81}$

4. $\pm\sqrt{100}$

5. $-\sqrt{\frac{4}{25}}$

6. $-\sqrt{121}$

7. $\pm\sqrt{\frac{25}{144}}$

8. $-\sqrt{\frac{25}{16}}$

9. $\pm\sqrt{\frac{121}{100}}$

10. $-\sqrt{3600}$

11. $-\sqrt{6.25}$

12. $\pm\sqrt{0.0004}$

13. $\sqrt{\frac{144}{196}}$

14. $-\sqrt{\frac{36}{49}}$

15. $\pm\sqrt{1.21}$

NAME _____ DATE_____ PERIOD _____

2-7 Study Guide and Intervention *(continued)*

Square Roots and Real Numbers

Classify and Order Numbers Numbers such as $\sqrt{2}$ and $\sqrt{3}$ are not perfect squares. Notice what happens when you find these square roots with your calculator. The numbers continue indefinitely without any pattern of repeating digits. Numbers that cannot be written as a terminating or repeating decimal are called **irrational numbers**. The set of **real numbers** consists of the set of irrational numbers and the set of rational numbers together. The chart below illustrates the various kinds of real numbers.

Natural Numbers	{1, 2, 3, 4, …}
Whole Numbers	{0, 1, 2, 3, 4, …}
Integers	{…, −3, −2, −1, 0, 1, 2, 3, …}
Rational Numbers	{all numbers that can be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$}
Irrational Numbers	{all numbers that cannot be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$}

Example **Name the set or sets of numbers to which each real number belongs.**

a. $\frac{4}{11}$ Because 4 and 11 are integers, this number is a rational number.

b. $\sqrt{81}$ Because $\sqrt{81} = 9$, this number is a natural number, a whole number, an integer, and a rational number.

c. $\sqrt{32}$ Because $\sqrt{32} = 5.656854249\ldots$, which is not a repeating or terminating decimal, this number is irrational.

Exercises

Name the set or sets of numbers to which each real number belongs.

1. $\frac{84}{12}$ **2.** $-\frac{6}{7}$ **3.** $\frac{2}{3}$ **4.** $\sqrt{54}$

5. 3.145 **6.** $\sqrt{25}$ **7.** $0.62626262\ldots$ **8.** $\sqrt{22.51}$

Write each set of numbers in order from least to greatest.

9. $-\frac{3}{4}, -5, \sqrt{25}, \frac{7}{4}$ **10.** $\sqrt{0.09}, -0.3131\ldots, \frac{3}{5}$ **11.** $-1.\overline{25}, 0.05, -\frac{1}{4}, \sqrt{5}$

12. $\frac{5}{4}, -2, \sqrt{124}, -3.11$ **13.** $-\sqrt{1.44}, -0.35\ \frac{1}{5}$ **14.** $0.\overline{35}, 2\frac{1}{3}, -\frac{9}{5}, \sqrt{5}$

NAME _____ DATE _____ PERIOD _____

2-7 Skills Practice

Square Roots and Real Numbers

Find each square root. If necessary, round to the nearest hundredth.

1. $\sqrt{144}$

2. $-\sqrt{36}$

3. $\pm\sqrt{0.25}$

4. $-\sqrt{\frac{49}{100}}$

5. $\pm\sqrt{17}$

6. $\sqrt{2.25}$

Name the set or sets of numbers to which each real number belongs.

7. $-\frac{28}{7}$

8. $-\frac{5}{6}$

9. $\sqrt{29}$

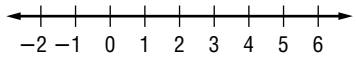
10. $\sqrt{196}$

11. $\frac{9}{13}$

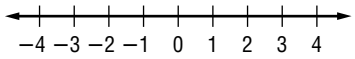
12. $\sqrt{1.8}$

Graph each solution set.

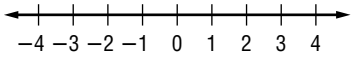
13. $x > -1$



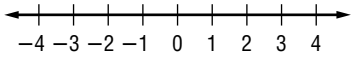
14. $x \leq 1$



15. $x < 1.5$



16. $x \geq -2.5$



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

17. $\frac{4}{9}$ ● $0.\overline{4}$

18. $0.\overline{09}$ ● $\frac{1}{90}$

19. $6.\overline{23}$ ● $\sqrt{39}$

20. $\frac{1}{8}$ ● $\frac{1}{\sqrt{8}}$

Write each set of numbers in order from least to greatest.

21. $\sqrt{5}, 2.\overline{36}, \frac{7}{3}$

22. $\frac{2}{9}, 0.\overline{21}, \sqrt{0.05}$

23. $-\sqrt{12}, -3.\overline{48}, -\sqrt{11}$

24. $0.\overline{43}, \frac{\sqrt{6}}{5}, \frac{3}{7}$

Lesson 2-7

NAME _____ DATE _____ PERIOD _____

2-7 Practice

Square Roots and Real Numbers

Find each square root. If necessary, round to the nearest hundredth.

1. $\sqrt{324}$ **2.** $-\sqrt{62}$ **3.** $\pm\sqrt{25}$ **4.** $-\sqrt{84}$

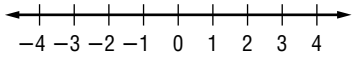
5. $\pm\sqrt{\frac{4}{289}}$ **6.** $-\sqrt{\frac{7}{12}}$ **7.** $-\sqrt{0.081}$ **8.** $\pm\sqrt{3.06}$

Name the set or sets of numbers to which each real number belongs.

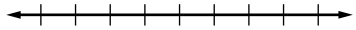
9. $\sqrt{93}$ **10.** $-\sqrt{0.0625}$ **11.** $\frac{8}{7}$ **12.** $-\frac{144}{3}$

Graph each solution set.

13. $x < -0.5$



14. $x \geq -3.5$



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

15. $0.\overline{93}$ ● $\sqrt{0.93}$ **16.** $8.\overline{17}$ ● $\sqrt{66}$ **17.** $\frac{5}{6}$ ● $\frac{\sqrt{5}}{6}$

Write each set of numbers in order from least to greatest.

18. $\sqrt{0.03}, \frac{\sqrt{2}}{8}, 0.\overline{17}$ **19.** $-\frac{84}{30}, -\sqrt{8}, -\frac{\sqrt{7}}{8}$ **20.** $-\sqrt{8.5}, -\frac{\sqrt{35}}{2}, -2\frac{19}{20}$

21. SIGHTSEEING The distance you can see to the horizon is given by the formula $d = \sqrt{1.5h}$, where d is the distance in miles and h is the height in feet above the horizon line. Mt. Whitney is the highest point in the contiguous 48 states. Its elevation is 14,494 feet. The lowest elevation, at −282 feet, is located near Badwater, California. With a clear enough sky and no obstructions, could you see from the top of Mt. Whitney to Badwater if the distance between them is 135 miles? Explain.

22. SEISMIC WAVES A *tsunami* is a seismic wave caused by an earthquake on the ocean floor. You can use the formula $s = 3.1\sqrt{d}$, where s is the speed in meters per second and d is the depth of the ocean in meters, to determine the speed of a tsunami. If an earthquake occurs at a depth of 200 meters, what is the speed of the tsunami generated by the earthquake?

NAME _____ DATE _____ PERIOD _____

2-7 Reading to Learn Mathematics

Square Roots and Real Numbers

Pre-Activity **How can using square roots determine the surface area of the human body?**

Read the introduction to Lesson 2-7 at the top of page 103 in your textbook.

The expression $\sqrt{3600}$ is read, "the square root of 3600." How would you read the expression $\sqrt{64}$?

Reading the Lesson

Complete each statement below.

1. The symbol $\sqrt{\ }$ is called a _____ and is used to indicate a nonnegative or principal square root of the expression under the symbol.

2. A _____ of an irrational number is a rational number that is close to, but not equal to, the value of the irrational number.

3. The positive square root of a number is called the _____ square root of the number.

4. A number whose positive square root is a rational number is a _____.

5. Write each of the following as a mathematical expression that uses the $\sqrt{\ }$ symbol.

a. the positive square root of 1600

b. the negative square root of 729

c. the principal square root of 3025

6. The irrational numbers and rational numbers together form the set of _____ numbers.

Helping You Remember

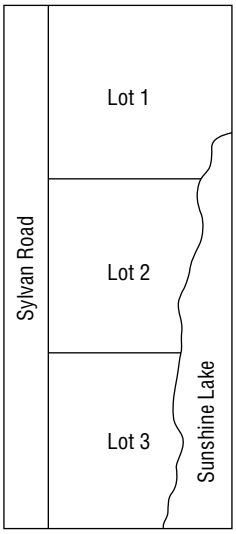
7. Use a dictionary to look up several words that begin with "ir-". What does the prefix "ir-" mean? How can this help you remember the meaning of the word *irrational*?

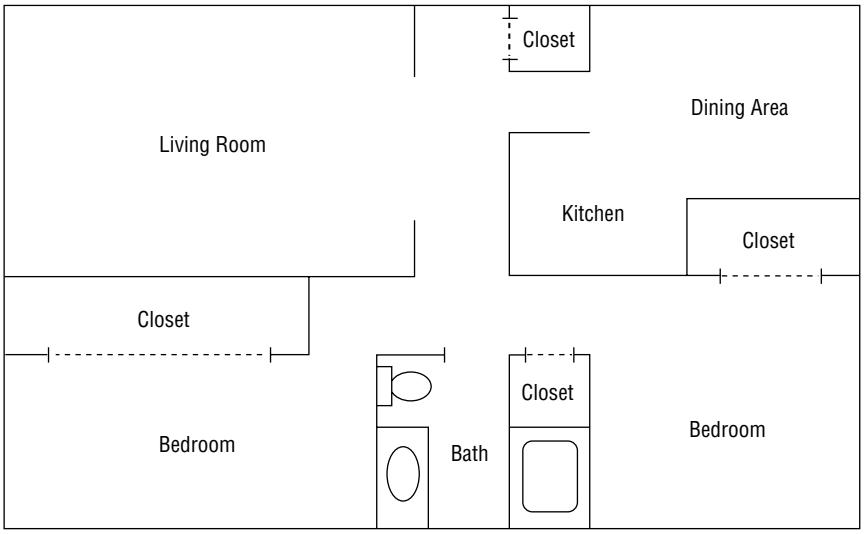
NAME _____ DATE _____ PERIOD _____

2-7 Enrichment

Scale Drawings

The map at the left below shows building lots for sale. The scale ratio is 1:2400. At the right below is the floor plan for a two-bedroom apartment. The length of the living room is 6 m. On the plan the living room is 6 cm long.





Answer each question.

1. On the map, how many feet are represented by an inch?

2. On the map, measure the frontage of Lot 2 on Sylvan Road in inches. What is the actual frontage in feet?

3. What is the scale ratio represented on the floor plan?

4. On the floor plan, measure the width of the living room in centimeters. What is the actual width in meters?

5. About how many square meters of carpeting would be needed to carpet the living room?

6. Make a scale drawing of your classroom using an appropriate scale.

7. Use your scale drawing to determine how many square meters of tile would be needed to install a new floor in your classroom.

NAME _____ DATE _____ PERIOD _____

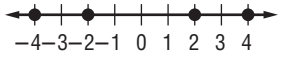
2

Chapter 2 Test, Form 1

SCORE _____

Write the letter for the correct answer in the blank at the right of each question.

1. What set of numbers is graphed below?



A. {2, 4} **B.** {–4, –2, 2, 4}
C. {−4, −3, −2, −1, 0, 1, 2, 3, 4} **D.** {0} **1.** _____

2. Find $|-10|$.
A. −10 **B.** 0 **C.** 10 **D.** 10 or −10 **2.** _____

3. Evaluate $|x| + 2$ if $x = -3$.
A. 1 **B.** −5 **C.** −1 **D.** 5 **3.** _____

For Questions 4–6, find each sum, difference, or product.

4. $-4 + (-5)$
A. 9 **B.** −9 **C.** 1 **D.** −1 **4.** _____

5. $-2 - (-7)$
A. 9 **B.** −5 **C.** −9 **D.** 5 **5.** _____

6. $(6)(-12)$
A. −6 **B.** −72 **C.** −18 **D.** −62 **6.** _____

7. Simplify the expression $-3(2n) + 4n$.
A. $-18n$ **B.** $10n$ **C.** $-2n$ **D.** $-n$ **7.** _____

8. Evaluate $6x + 3y$ if $x = \frac{2}{3}$ and $y = -\frac{1}{3}$.
A. 5 **B.** 1 **C.** 3 **D.** 4 **8.** _____

9. Find $-9 \div \frac{3}{4}$.
A. $\frac{27}{4}$ **B.** $-\frac{27}{4}$ **C.** $-\frac{3}{4}$ **D.** −12 **9.** _____

Simplify each expression.

10. $\frac{-6 + 14}{-4}$
A. −2 **B.** −5 **C.** 2 **D.** 5 **10.** _____

11. $\frac{12x - 8}{4}$
A. $12x - 2$ **B.** $-12x + 2$ **C.** $3x - 2$ **D.** $-3x + 2$ **11.** _____

Assessment

NAME _____ DATE _____ PERIOD _____

2 Chapter 2 Test, Form 1 *(continued)*

For Questions 12–14, use the list that shows the number of gold medals won by 11 countries in the 2000 Summer Olympic Games. **Source:** *World Almanac*

40, 32, 28, 16, 14, 13, 13, 11, 11, 11, 8

12. To create a line plot of this data, how many ×'s would be placed above the number line between 10 and 15?

A. 3 **B.** 6 **C.** 7 **D.** 4 **12.** _____

13. Which value occurs most frequently?

A. 40 **B.** 13 **C.** 11 **D.** 8 **13.** _____

14. Which measure of central tendency best describes the data?

A. 40 **B.** mean **C.** mode **D.** median **14.** _____

15. A 6-sided die is rolled one time. Find $P(5)$.

A. $\frac{5}{6}$ **B.** $\frac{1}{2}$ **C.** $\frac{1}{6}$ **D.** $\frac{1}{5}$ **15.** _____

16. A bowl contains 2 red chips, 3 blue chips, and 1 green chip. One chip is randomly drawn. Find $P(\text{green})$.

A. $\frac{1}{6}$ **B.** $\frac{1}{3}$ **C.** $\frac{1}{5}$ **D.** $\frac{1}{2}$ **16.** _____

17. The probability that an event will occur is $\frac{3}{5}$. What are the odds that the event will occur?

A. 5 : 3 **B.** 3 : 5 **C.** 2 : 3 **D.** 3 : 2 **17.** _____

18. Find $-\sqrt{36}$.

A. 6 **B.** -18 **C.** -6 **D.** 18 **18.** _____

19. Name the set or sets of numbers to which the real number $\frac{2}{3}$ belongs.

A. rational numbers
B. irrational numbers
C. natural numbers, rational numbers
D. natural numbers, irrational numbers **19.** _____

20. Write $0, -\frac{1}{2}, \frac{1}{2}, \frac{1}{3}, -1$ in order from least to greatest.

A. $0, -\frac{1}{2}, \frac{1}{3}, \frac{1}{2}, -1$ **B.** $-1, -\frac{1}{2}, 0, \frac{1}{3}, \frac{1}{2}$

C. $\frac{1}{2}, \frac{1}{3}, 0, -\frac{1}{2}, -1$ **D.** $-\frac{1}{2}, -1, 0, \frac{1}{2}, \frac{1}{3}$ **20.** _____

Bonus Find $\sqrt{25} - |-4|$. **B:** _____

NAME _____ DATE _____ PERIOD _____

2

Chapter 2 Test, Form 2A

SCORE _____

Write the letter for the correct answer in the blank at the right of each question.

1. What set of numbers is graphed below?

A. {0, 1, 2, 3, 4} **B.** {…, 0, 1, 2, 3, 4}
C. {−4, −3, −2, −1, 0, 1, 2, 3, 4} **D.** {0, 1, 2, 3, 4, …} **1.** _____

2. Evaluate $8 - |16 - y|$ if $y = 11$.
A. −19 **B.** 35 **C.** 3 **D.** 13 **2.** _____

3. Find $-\frac{4}{5} + \frac{3}{7}$.
A. $-\frac{13}{35}$ **B.** $-\frac{1}{2}$ **C.** $1\frac{8}{35}$ **D.** $-\frac{1}{12}$ **3.** _____

For Questions 4 and 5, find each difference.

4. $-9 - (-21)$
A. −30 **B.** 12 **C.** −12 **D.** 30 **4.** _____

5. $-7.9 - 4.3$
A. −12.2 **B.** −3.6 **C.** 12.2 **D.** 3.6 **5.** _____

6. Find $\left(\frac{5}{6}\right)\left(-\frac{3}{25}\right)$.
A. $-\frac{2}{31}$ **B.** $-\frac{2}{19}$ **C.** $-\frac{8}{31}$ **D.** $-\frac{1}{10}$ **6.** _____

7. Simplify $4m(-2n) + 6mn$.
A. 0 **B.** $8mn$ **C.** $-2mn$ **D.** $12mn$ **7.** _____

8. Evaluate $m^2 - 2nm$ if $m = 4.2$ and $n = 1.5$.
A. 0.7 **B.** 5.04 **C.** −10.35 **D.** 30.24 **8.** _____

9. Find $\frac{18}{5} \div \left(-\frac{2}{3}\right)$.
A. $-2\frac{2}{5}$ **B.** $-\frac{3}{5}$ **C.** $-\frac{16}{15}$ **D.** $-5\frac{2}{5}$ **9.** _____

Simplify each expression.

10. $\frac{2(-4 + 13)}{-2 + 5}$
A. 6 **B.** $-\frac{18}{7}$ **C.** $\frac{11}{3}$ **D.** $\frac{5}{3}$ **10.** _____

11. $\frac{-3x + 12}{-6}$
A. $\frac{1}{2}x - 2$ **B.** $-\frac{1}{2}x + 2$ **C.** $3x + 2$ **D.** $-3x - 2$ **11.** _____

Assessment

NAME _____ DATE _____ PERIOD _____

2 **Chapter 2 Test, Form 2A** *(continued)*

For Questions 12–14, use the list that shows the total number of medals won by 15 countries in the 2000 Summer Olympic Games. **Source:** *World Almanac*

57, 17, 18, 97, 28, 59, 88, 26, 38, 58, 34, 25, 23, 28, 29

12. To create a stem-and-leaf plot of this data, what values would be used for the stems?

A. 10, 20, 30, 40, 50, 60, 70, 80, 90 **B.** 17, 23, 34, 57, 88, 97

C. 1, 2, 3, 4, 5, 6, 7, 8, 9 **D.** 3, 4, 5, 6, 7, 8, 9 **12.** _____

13. How many countries won more than 42 medals?

A. 6 **B.** 4 **C.** 5 **D.** 7 **13.** _____

14. Which measure of central tendency best describes the data?

A. median **B.** mean **C.** mode **D.** 42 **14.** _____

15. A computer randomly selects an integer between 5 and 9. Find $P(2)$.

A. 1 **B.** $\frac{1}{3}$ **C.** $\frac{1}{5}$ **D.** 0 **15.** _____

For Questions 16 and 17, a bowl contains 8 red chips, 7 blue chips, and 10 green chips. One chip is randomly drawn.

16. Find P(red or blue).

A. $\frac{8}{15}$ **B.** $\frac{3}{5}$ **C.** $\frac{3}{2}$ **D.** $\frac{1}{15}$ **16.** _____

17. Find the odds of drawing a green chip.

A. 2 : 3 **B.** 2 : 5 **C.** 1 : 10 **D.** 1 : 15 **17.** _____

18. Find $\pm\sqrt{0.81}$.

A. 0.9 **B.** $\pm$0.9 **C.** 0.09 **D.** $\pm$0.09 **18.** _____

19. Name the set or sets of numbers to which the real number $-\sqrt{25}$ belongs.

A. natural numbers, irrational numbers

B. whole numbers, integers, rational numbers

C. integers, rational numbers

D. irrational numbers **19.** _____

20. Write $\sqrt{3}$, $\frac{1}{3}$, 0.3, $\frac{3}{11}$, 1 in order from least to greatest.

A. $\frac{3}{11}$, 0.3, $\frac{1}{3}$, 1, $\sqrt{3}$ **B.** $\sqrt{3}$, 1, 0.3, $\frac{3}{11}$, $\frac{1}{3}$

C. $\frac{1}{3}$, 0.3, $\frac{3}{11}$, 1, $\sqrt{3}$ **D.** 0.3, $\frac{1}{3}$, $\frac{3}{11}$, $\sqrt{3}$, 1 **20.** _____

Bonus Evaluate $3a - 8b + \sqrt{49}$ if $a = 4.1$ and $b = \frac{3}{4}$. **B:** _____

NAME _____ DATE _____ PERIOD _____

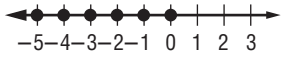
2

Chapter 2 Test, Form 2B

SCORE _____

Write the letter for the correct answer in the blank at the right of each question.

1. What set of numbers is graphed below?



A. {−5, −4, −3, −2, −1, 0, 1, 2, 3} **B.** {−5, −4, −3, −2, −1, 0}
C. {… , −5, −4, −3, −2, −1, 0} **D.** {−5, −4, −3, −2, −1, 0, …} **1.** _____

2. Evaluate $25 - |9 + a|$ if $a = 12$.
A. 4 **B.** 28 **C.** 22 **D.** 46 **2.** _____

3. Find 32.5 + (−11.2).
A. 41.3 **B.** 43.7 **C.** 20.7 **D.** 21.3 **3.** _____

For Questions 4 and 5, find each difference.

4. −12 − (−11)
A. −23 **B.** 1 **C.** −1 **D.** 23 **4.** _____

5. $\frac{4}{5} - \frac{2}{3}$
A. $\frac{2}{8}$ **B.** $\frac{2}{15}$ **C.** 1 **D.** $-\frac{8}{15}$ **5.** _____

6. Find $\left(-\frac{1}{3}\right)\left(-\frac{6}{7}\right)$.
A. $\frac{7}{10}$ **B.** $-\frac{7}{10}$ **C.** $-\frac{2}{7}$ **D.** $\frac{2}{7}$ **6.** _____

7. Simplify $-5x(3y) + 7xy$.
A. $-8xy$ **B.** $5xy$ **C.** $-xy$ **D.** $-22xy$ **7.** _____

8. Evaluate $3ab - b^2$ if $a = 3.7$ and $b = 2.1$.
A. 4.6 **B.** 18.9 **C.** 9.62 **D.** 19.11 **8.** _____

9. Find $-\frac{3}{4} \div \frac{6}{5}$.
A. $-\frac{9}{10}$ **B.** $\frac{3}{20}$ **C.** $-\frac{1}{10}$ **D.** $-\frac{5}{8}$ **9.** _____

Simplify each expression.

10. $\frac{-3(5 + 3)}{-2 + 6}$
A. $\frac{5}{4}$ **B.** −6 **C.** −3 **D.** 2 **10.** _____

11. $\frac{24k - 8}{-4}$
A. $-6k - 8$ **B.** $-6k + 2$ **C.** $-24k + 2$ **D.** $24k + 2$ **11.** _____

Assessment

2 Chapter 2 Test, Form 2B *(continued)*

For Questions 12–14, use the list which shows the number of 300 games bowled by 15 women as sanctioned by the Women's International Bowling Congress.

Source: *World Almanac*

20, 16, 23, 18, 21, 17, 27, 14, 23, 17, 21, 17, 24, 16, 19

12. To create a stem-and-leaf plot of this data, what values would be used for leaves for the stem value 2?

A. 0, 1, 1, 3, 3, 4, 7 **B.** 20, 21, 22, 23, 24, 25, 26, 27
C. 0, 1, 2, 3, 4, 5, 6, 7 **D.** 20, 21, 21, 23, 23, 24, 27 **12.** _____

13. How many of these women bowled more than twenty 300 games?

A. 8 **B.** 7 **C.** 4 **D.** 6 **13.** _____

14. Which measure of central tendency best describes the data?

A. mean **B.** mode **C.** median **D.** mean or median **14.** _____

15. A computer randomly selects an integer between 1 and 7. Find the probability of selecting a number less than 9.

A. 1 **B.** $\frac{1}{7}$ **C.** $\frac{1}{9}$ **D.** 0 **15.** _____

For Questions 16 and 17, a bowl contains 14 red chips, 9 blue chips, and 12 green chips. One chip is randomly drawn.

16. Find P(blue or green).

A. $\frac{1}{21}$ **B.** $\frac{4}{7}$ **C.** $\frac{3}{2}$ **D.** $\frac{3}{5}$ **16.** _____

17. Find the odds of drawing a red chip.

A. 2 : 5 **B.** 2 : 3 **C.** 1 : 14 **D.** 1 : 21 **17.** _____

18. Find $\sqrt{\frac{81}{256}}$.

A. $\frac{9}{16}$ **B.** $\pm\frac{9}{16}$ **C.** $\frac{3}{4}$ **D.** $\pm\frac{3}{4}$ **18.** _____

19. Name the set or sets of numbers to which the real number $\sqrt{27}$ belongs.

A. natural numbers, irrational numbers
B. rational numbers
C. irrational numbers
D. natural numbers, rational numbers **19.** _____

20. Write $-\sqrt{5}$, -0.5, $-\frac{1}{5}$, $-\frac{5}{11}$, -1 in order from least to greatest.

A. $-0.5, -\frac{1}{5}, -\frac{5}{11}, -1, -\sqrt{5}$ **B.** $-\sqrt{5}, -1, -0.5, -\frac{5}{11}, -\frac{1}{5}$
C. $-\frac{1}{5}, -\frac{5}{11}, -0.5, -1, -\sqrt{5}$ **D.** $-1, -0.5, -\frac{1}{5}, -\frac{5}{11}, -\sqrt{5}$ **20.** _____

Bonus Evaluate $|x| + \frac{xy}{z}$ if $x = -4$, $y = 3$, and $z = 6$. **B:** _____

NAME _____ DATE _____ PERIOD _____

2

Chapter 2 Test, Form 2C

SCORE _____

1. Name the coordinates of the points graphed on the number line.

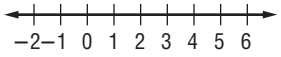
1. _____

Graph each set of numbers.

2. $\left\{-\frac{5}{2}, -\frac{1}{2}, \frac{3}{2}, 2\right\}$

3. $\{1, 3, 5, \ldots\}$

2.

3. 

Evaluate each expression if $x = -5$ and $y = 4$.

4. $|x| - 10$

5. $10 - |3 + y|$

4. _____

5. _____

Find each sum.

6. $-13 + 24$

7. $-10.5 + (-2.4)$

8. $\frac{3}{4} + \left(-\frac{7}{12}\right)$

6. _____

7. _____

8. _____

Find each difference.

9. $4.32 - (-3.79)$

10. $-\frac{5}{9} - \frac{2}{3}$

9. _____

10. _____

For Questions 11 and 12, find each product.

11. $16(-4)$

12. $\left(-\frac{4}{7}\right)\left(\frac{2}{5}\right)$

13. Simplify $5(-7a) + 12a$.

11. _____

12. _____

13. _____

Evaluate each expression if $m = -3.2$ and $n = 7.1$.

14. $-3mn$

15. $m(n - 5)$

14. _____

15. _____

Find each quotient.

16. $-44 \div 5$

17. $-\frac{6}{7} \div \left(-\frac{2}{9}\right)$

16. _____

17. _____

For Questions 18 and 19, simplify each expression.

18. $\frac{6(5 - 11)}{-3 + 12}$

19. $\frac{30w - 18}{-6}$

18. _____

19. _____

20. Evaluate $\frac{st}{4s}$ if $s = 1.3$ and $t = -5.2$.

20. _____

Assessment

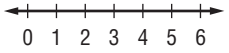
NAME _____ DATE _____ PERIOD _____

2

Chapter 2 Test, Form 2C *(continued)*

Use the list that shows the number of touchdowns scored by NFC teams during the first 7 weeks of the 2001 football season. **Source:** www.nfl.com

2, 3, 1, 5, 2, 0, 4, 3, 4, 3, 3, 4, 6, 3, 2

21. Make a line plot of the data. **21.** 

22. What is the median of the data? **22.** _____

23. Which values occur least frequently? **23.** _____

24. How many of the teams have made more than 3 touchdowns? **24.** _____

25. Does the mean, median, or mode best represent the data? Explain. **25.** _____

For Questions 26–28, a bowl contains 12 red chips, 9 blue chips, and 15 green chips. One chip is randomly drawn.

26. Find P(red or green). **26.** _____

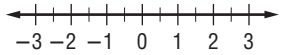
27. Find P(blue). **27.** _____

28. Find the odds of drawing a red chip **28.** _____

29. The probability that an event will not occur is $\frac{5}{12}$. What are the odds that the event will occur? **29.** _____

30. Find $\pm\sqrt{1.21}$. **30.** _____

31. Name the set or sets of numbers to which the real number $\frac{21}{3}$ belongs. **31.** _____

32. Graph the solution set $x < 2.5$. **32.** 

33. Write $-\frac{2}{9}$, 0.25, $-\sqrt{\frac{1}{9}}$, $\frac{2}{11}$, 0 in order from least to greatest. **33.** _____

Bonus Most historical records do not include a year zero. Thus, the year before A.D. 1 is labeled 1 B.C., not 0 B.C. If Rome celebrated its 1000th anniversary in A.D. 248, when was Rome founded? **B:** _____

NAME _____ DATE _____ PERIOD _____

2

Chapter 2 Test, Form 2D

SCORE _____

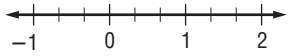
1. Name the coordinates of the points graphed on the number line.

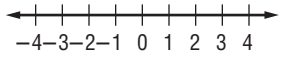
1. _____

Graph each set of numbers.

2. $\left\{-\frac{2}{3}, 0, \frac{1}{3}, \frac{4}{3}\right\}$

3. $\{\ldots, -4, -2, 0\}$

2. 

3. 

Evaluate each expression if $a = -4$ and $b = 7$.

4. $13 - |a|$

5. $14 + |b - 2|$

4. _____

5. _____

Find each sum.

6. $27 + (-14)$

7. $-15.3 + (-3.6)$

8. $-\frac{4}{9} + \frac{2}{3}$

6. _____

7. _____

8. _____

Find each difference.

9. $-7.63 - 5.18$

10. $\frac{3}{8} - \left(-\frac{3}{4}\right)$

9. _____

10. _____

For Questions 11 and 12, find each product.

11. $(-15)(7)$

12. $\left(\frac{5}{6}\right)\left(-\frac{2}{7}\right)$

11. _____

12. _____

13. Simplify $-4b - 3(6b)$.

13. _____

Evaluate each expression if $x = 4.3$ and $y = -2.7$.

14. $xy + 6$

15. $x(y - 3)$

14. _____

15. _____

Find each quotient.

16. $76 \div (-8)$

17. $-\frac{4}{5} \div \frac{8}{3}$

16. _____

17. _____

For Questions 18 and 19, simplify each expression.

18. $\frac{-8(-13 + 7)}{4 - 16}$

19. $\frac{-12w + 10}{-2}$

18. _____

19. _____

20. Evaluate $\frac{2m}{n}$ if $m = -3.6$ and $n = 4.8$.

20. _____

Assessment

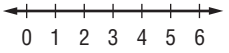
NAME _____ DATE _____ PERIOD _____

2

Chapter 2 Test, Form 2D *(continued)*

Use the list that shows the number of touchdowns scored by AFC teams during the first 7 weeks of the 2001 football season. **Source:** www.nfl.com

4, 1, 4, 4, 4, 3, 2, 1, 4, 3, 4, 5, 5, 5, 3, 2

21. Make a line plot of the data. **21.** 

22. What is the median of the data? **22.** _____

23. Which values occur least frequently? **23.** _____

24. How many of the teams made fewer than 3 touchdowns? **24.** _____

25. Does the mean best describe the set of data? Explain. **25.** _____

For Questions 26–28, a bowl contains 8 red chips, 16 blue chips, and 10 green chips. One chip is randomly drawn.

26. Find P(red or blue). **26.** _____

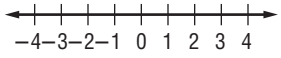
27. Find P(green). **27.** _____

28. Find the odds of drawing a blue chip. **28.** _____

29. The probability that an event will not occur is $\frac{5}{9}$. What are the odds that the event will not occur? **29.** _____

30. Find $-\sqrt{\frac{36}{169}}$. **30.** _____

31. Name the set or sets of numbers to which the real number $-\sqrt{49}$ belongs. **31.** _____

32. Graph the solution set $x \geq -1$. **32.** 

33. Write $-\sqrt{\frac{4}{9}}, \frac{4}{7}, -\frac{3}{8}$, 0.4, 0 in order from least to greatest. **33.** _____

Bonus In a local raffle the odds of winning any prize is 1 : 3, and the odds of winning the grand prize is 1 : 999. What is the ratio of grand prizes to the total number of prizes. **B:** _____

NAME _____ DATE _____ PERIOD _____

2

Chapter 2 Test, Form 3

SCORE _____

1. Name the coordinates of the points graphed on the number line. **1.** _____

For Questions 2 and 3, graph each set of numbers.

2. {… , −5, −3, −1, 1, 3, 5, …} **2.**

3. {integers less than −2 or greater than 3} **3.**

4. Evaluate $|2 + b| - a$ if $a = \frac{2}{3}$ and $b = -\frac{1}{9}$. **4.** _____

5. Find the sum of $-3\frac{1}{6}$ and $1\frac{2}{3}$. **5.** _____

6. The highest point of elevation in the state of California is 14,494 feet at Mount Whitney. The lowest point is −282 feet at Death Valley. What is the difference in elevation of these two points? **6.** _____

7. Find $-45 + (-91) + 23$. **7.** _____

8. Find $\left(-\frac{3}{7}\right) - \left(-\frac{6}{5}\right)$. **8.** _____

9. A bank in Los Angeles, California is a 40-story building. The average height of each story is 12.9 feet. How tall is the bank? **9.** _____

Evaluate each expression if $w = 12$, $x = -7$, $y = \frac{3}{4}$, and $z = -\frac{5}{6}$.

10. $4x^2 - 3w$ **10.** _____

11. $xyz - 5yz$ **11.** _____

For Questions 12 and 13, simplify each expression.

12. $\frac{-6(7 - 11)}{5(-13 + 12)}$ **12.** _____

13. $\frac{24x - 42y}{6}$ **13.** _____

14. Evaluate $\frac{(a + b)}{c}$ if $a = -6.3$, $b = 20.7$, and $c = 4.5$. **14.** _____

Assessment

Use the list that shows the number of silver medals won by 15 countries participating in the 1998 Winter Olympic Games. **Source:** *World Almanac*

9, 10, 6, 5, 5, 3, 4, 4, 1, 6, 1, 6, 2, 1, 1

15. Make a line plot of the data. **15.**

16. Which measure of central tendency best describes the data? Explain. **16.** _____

Use the list that shows the height in meters of the winning high jump for women in the Summer Olympic Games from 1936 to 2000. **Source:** *World Almanac* **17.**

1.60, 1.68, 1.67, 1.76, 1.85, 1.90, 1.82, 1.92, 1.93, 1.97, 2.02, 2.03, 2.02, 2.05, 2.01

17. Make a stem-and-leaf plot of the data.

18. Which measure of central tendency best describes the data? Explain. **18.** _____

For Questions 19–21, a state lottery game uses ping pong balls numbered 0–39. Balls with the numbers 20, 8, 7, and 1 have already been selected in the weekly drawing.

19. Find the probability of drawing a ball with a number less than 10 as the fifth ball. **19.** _____

20. Find the odds of drawing a ball with a number between 10 and 30 as the fifth ball. **20.** _____

21. Find the probability of drawing a ball with the number 42 as the fifth ball. **21.** _____

22. The probability that an event will occur is 30%. What are the odds that the event will not occur? **22.** _____

23. Find $\pm\sqrt{\frac{16}{625}}$. **23.** _____

24. Name the set or sets of numbers to which the real number $\sqrt{\frac{36}{4}}$ belongs. **24.** _____

25. Write $-\frac{2}{9}, -\frac{2}{11}, -0.2, -\sqrt{\frac{1}{16}}, -1$ in order from least to greatest. **25.** _____

Bonus Simplify $\frac{-2(4.9 + 8)}{2.5(6.4 - 4)}$. **B:** _____

NAME _____ DATE _____ PERIOD _____

2 Chapter 2 Open-Ended Assessment

SCORE _____

Demonstrate your knowledge by giving a clear, concise solution to each problem. Be sure to include all relevant drawings and justify your answers. You may show your solution in more than one way or investigate beyond the requirements of the problem.

1. a. Explain what a point on a number line represents, and how the coordinate of the point is different from the point.

b. Describe how to graph the set {3, 4, 5, …} on a number line.

2. a. Use a number line to determine if $-4 + 3$ is greater than $4 + (-3)$. Explain your reasoning.

b. Explain how subtracting a number can be done with addition, and give an example.

3. Let x and y be any real numbers. List the conditions under which the quotient $\frac{x}{y}$ is positive. Give examples to support your answer.

4. a. Construct a set of eleven numbers with a median of 10 and a mean that is less than 10. What is the mean and mode of your data?

b. Make a stem-and-leaf plot of the data created for part **a.**

5. a. Explain why the probability that an event will occur will never equal 2.

b. The odds that an event will occur are 1 : 1. Explain why the probability that the event will occur is $\frac{1}{2}$ and not 1.

6. a. Explain why $\sqrt{-49} \neq -\sqrt{49}$.

b. Give a list of six real numbers ordered from least to greatest such that the first number is a rational number, the second number is an integer, the third number is an irrational number, the fourth number is negative, the fifth number is a natural number, and the sixth number is a whole number.

Assessment

NAME _____ DATE _____ PERIOD _____

2

Chapter 2 Vocabulary Test/Review

SCORE _____

absolute value	graph	negative number	rational approximation
additive inverses	infinity	odds	rational number
back-to-back stem-and-leaf plot	integers	opposites	real number
Completeness Property	irrational number	perfect square	sample space
coordinate	line plot	positive number	simple event
equally likely	measures of central tendency	principal square root	square root
frequency	natural number	probability	stem-and-leaf plot
		radical sign	whole number

Write the letter of the term that best matches each phrase.

_____ **1.** a number that can be written in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$

_____ **2.** a number and its opposite

_____ **3.** the number of times a data item occurs in a set

_____ **4.** often used to describe sets of data because they represent a centralized or "middle" value

_____ **5.** all possible outcomes of an event

_____ **6.** outcomes for which the probabilities are equal

_____ **7.** the ratio that compares the number of ways an event can occur to the number of ways it cannot occur

_____ **8.** one of two equal factors of a number

_____ **9.** a number that cannot be written in the form $\frac{a}{b}$ where a and b are integers and $b \neq 0$

_____ **10.** the set of irrational numbers and rational numbers

a. frequency

b. measures of central tendency

c. equally likely

d. odds

e. rational number

f. square root

g. irrational number

h. additive inverses

i. real numbers

j. sample space

In your own words—
Define each term.

11. absolute value

12. opposites

NAME _____ DATE _____ PERIOD _____

2

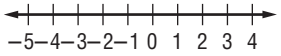
Chapter 2 Quiz

(Lessons 2–1 and 2–2)

SCORE _____

1. Name the coordinates of the points graphed on the number line.

2. Graph $\{-5, 2, 4\}$.



For Questions 3 and 4, find each absolute value.

3. $|-72|$

4. $|4.9|$

5. Evaluate $-|17 - y|$ if $y = 13$.

Find each sum.

6. $5 + (-2)$

7. $-51 + 47$

8. $\frac{1}{2} + \frac{1}{3}$

Find each difference.

9. $-54 - 23$

10. $3.1 - 1.7$

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Assessment

NAME _____ DATE _____ PERIOD _____

2

Chapter 2 Quiz

(Lessons 2–3 and 2–4)

SCORE _____

For Questions 1 and 2, find each product.

1. $7(-31)$

2. $\left(-\frac{2}{3}\right)\left(\frac{6}{7}\right)$

3. Simplify $4(7a) + 3a$.

4. Evaluate $xy - 3$ if $x = -1.2$ and $y = -2.3$.

Find each quotient.

5. $-42 \div 6$

6. $\frac{9}{5} \div \frac{3}{2}$

Simplify each expression.

7. $\frac{-5(17 - 13)}{2 - 4}$

8. $\frac{-9x - 15y}{-3}$

Evaluate each expression if $n = -2$, $m = 3.5$, and $p = \frac{3}{4}$.

9. $\frac{4}{np}$

10. $\frac{8 + m}{n}$

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

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NAME _____ DATE _____ PERIOD _____

2

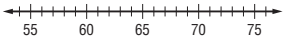
Chapter 2 Quiz

SCORE _____

(Lessons 2–5 and 2–6)

For Questions 1–3, the heights (in inches) of the students in Mrs. Graham's class are 60, 75, 58, 73, 59, 74, 59, 61, 59, 63, 62, and 61.

1. Draw a line plot for the data.

1. 

2. Which height occurs most frequently?

2. _____

3. Which measure of central tendency best describes the data? Explain.

3. _____

4. One shirt is randomly selected from a drawer containing 5 red shirts, 6 blue shirts, and 3 yellow shirts. Find $P(\text{red})$.

4. _____

5. A weather forecast states that the probability of snow the next day is 75%. What are the odds that it will snow?

5. _____

NAME _____ DATE _____ PERIOD _____

2

Chapter 2 Quiz

SCORE _____

(Lesson 2–7)

Find each square root.

1. $-\sqrt{49}$ **2.** $\sqrt{0.36}$ **3.** $\pm\sqrt{\frac{121}{25}}$

1. _____

2. _____

For Questions 4 and 5, name the set or sets of numbers to which each real number belongs.

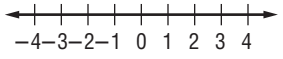
3. _____

4. $\frac{28}{4}$ **5.** $-\sqrt{13}$

4. _____

6. Graph the solution set $x \geq 1.3$.

5. _____

6. 

For Questions 7 and 8, replace ● with <, >, or = to make each sentence true.

7. $0.6 \bullet \frac{2}{3}$ **8.** $\sqrt{11} \bullet 3.\overline{31}$

7. _____

8. _____

9. Write $-\frac{1}{3}, \frac{1}{\sqrt{10}}, 0.3, -\frac{4}{9}$ in order from least to greatest.

9. _____

10. Standardized Test Practice Which of the following is a true statement?

A. $\frac{1}{\sqrt{3}} > \frac{1}{\sqrt{2}}$ **B.** $\sqrt{5} > \sqrt{7}$ **C.** $\frac{1}{\sqrt{2}} < \sqrt{2}$ **D.** $\sqrt{9} < \sqrt{8}$

10. _____

NAME _____ DATE _____ PERIOD _____

2

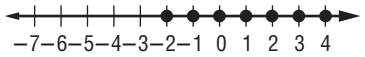
Chapter 2 Mid-Chapter Test

SCORE _____

(Lessons 2–1 through 2–4)

Part I ***Write the letter for the correct answer in the blank at the right of each question.***

1. What set of numbers is graphed at the right?



A. {−2, −1, 0, 1, 2, 3, 4} **B.** {… , −2, −1, 0, 1, 2, 3, 4}
C. {−2, −1, 0, 1, 2, 3, 4, …} **D.** {0, 1, 2, 3, 4} **1.** _____

2. Evaluate $15 - |a|$ if $a = -6$.
A. 21 **B.** −21 **C.** −9 **D.** 9 **2.** _____

3. Find $-1.07 + 0.12$.
A. −1.19 **B.** −0.95 **C.** 1.19 **D.** 0.95 **3.** _____

4. Find $-\frac{1}{4} - \frac{3}{8}$.
A. $-\frac{5}{8}$ **B.** $-\frac{1}{8}$ **C.** $\frac{1}{8}$ **D.** $\frac{5}{8}$ **4.** _____

5. Simplify the expression $-2(-7m) + 3m$.
A. $-11m$ **B.** $-6m$ **C.** $12m$ **D.** $17m$ **5.** _____

6. Evaluate $x^2 + 3y$ if $x = -\frac{1}{2}$ and $y = -\frac{5}{6}$.
A. $-3\frac{1}{2}$ **B.** $1\frac{1}{6}$ **C.** $-2\frac{1}{4}$ **D.** $2\frac{5}{12}$ **6.** _____

7. Simplify $\frac{6r + 18}{-6}$.
A. $-r + 18$ **B.** $-r - 3$ **C.** $-18r$ **D.** $6r - 3$ **7.** _____

Part II

8. Graph {integers less than or equal to −2}. **8.**

9. Find $-61 - 18$. **9.** _____

10. Find $\frac{1}{5} + \frac{1}{2}$. **10.** _____

11. Find $-6(-12)$. **11.** _____

12. Find $\frac{9}{2} \div \left(-\frac{4}{3}\right)$. **12.** _____

For Questions 13 and 14, evaluate each expression if $u = -7$, and $v = 3.9$

13. $\frac{28}{u} - (-2)$ **13.** _____

14. uv **14.** _____

15. Evaluate $|z| + 0.13$ if $z = -0.45$. **15.** _____

Assessment

NAME _____ DATE _____ PERIOD _____

2

Chapter 2 Cumulative Review

(Chapters 1–2)

1. Write an algebraic expression for the verbal expression *seven more than the square of a number*. (Lesson 1–1) **1.** _____

2. Evaluate $3a(a + b)$ if $a = 4$ and $b = 3$. (Lesson 1–2) **2.** _____

For Questions 3 and 4, simplify each expression. **3.** _____

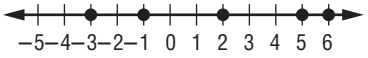
3. $6a + 11a - 3$ (Lesson 1–5)

4. $2(4 + 2x) + 6$ (Lesson 1–6) **4.** _____

5. Identify the hypothesis and conclusion of the statement. Then write the statement in if-then form. *I'll go to the store when I finish my homework*. (Lesson 1–7) **5.** _____

6. As the weather gets warmer, the beaches become more crowded. Draw a reasonable graph that shows the number of people at the beach as the temperature increases. Let the horizontal axis show the temperature and the vertical axis show the number of people. (Lesson 1–8) **6.**

7. Name the coordinates of the points graphed on the number line. (Lesson 2–1)



7. _____

8. Evaluate $12 + |x + 11|$, if $x = 13$. (Lesson 2–1) **8.** _____

9. Find $32.4 + (-14.6)$. (Lesson 2–2) **9.** _____

10. Find $31 - 17$. (Lesson 2–2) **10.** _____

11. Find $\left(\frac{2}{5}\right)\left(-\frac{3}{7}\right)$. (Lesson 2–3) **11.** _____

12. Simplify $\frac{12t - 18}{6}$. (Lesson 2–4) **12.** _____

13. Use the data to make a line plot. (Lesson 2–5) **13.**
46 42 45 41 42 40 44 46 42 40 47

14. A card is selected from a standard deck of cards. Determine P(black ace). (Lesson 2–6) **14.** _____

15. Write $-\sqrt{5}, \frac{57}{25}, -\frac{9}{4}, 2.\overline{24}$ in order from least to greatest. (Lesson 2–7) **15.** _____

NAME _____ DATE _____ PERIOD _____

2 Standardized Test Practice

(Chapters 1–2)

Part I: Multiple Choice

Instructions: Fill in the appropriate oval for the best answer.

1. Evaluate $x^2 + y^2 + z$, if $x = 7$, $y = 6$, and $z = 4$. (Lesson 1–2)

A. 17 **B.** 101 **C.** 89 **D.** 59 **1.** Ⓐ Ⓑ Ⓒ Ⓓ

2. Find the solution set for $5(7 - x) < 18$ if the replacement set is $\{0, 1, 2, 3, 4, 5, 6\}$. (Lesson 1–3)

E. $\{4, 5, 6\}$ **F.** $\{0, 1, 2, 3\}$ **G.** $\{2, 3, 4\}$ **H.** $\{5, 6\}$ **2.** Ⓔ Ⓕ Ⓖ Ⓗ

3. Using the Distributive Property to find $9\left(5\frac{2}{3}\right)$ would give which expression? (Lesson 1–5)

A. $9(5) + \frac{2}{3}$ **B.** $9\left(\frac{17}{3}\right)$ **C.** $9(5) + 9\left(\frac{2}{3}\right)$ **D.** $9(5)\left(\frac{2}{3}\right)$ **3.** Ⓐ Ⓑ Ⓒ Ⓓ

4. Identify the conclusion of the statement. (Lesson 1–7)
If you are at the Grand Canyon, then you are in Arizona.

E. you are at the Grand Canyon **F.** you are in America
G. you are not in Arizona **H.** you are in Arizona **4.** Ⓔ Ⓕ Ⓖ Ⓗ

5. Evaluate $|26 - r| + 7$ if $r = 9$. (Lesson 2–1)

A. 45 **B.** 10 **C.** 22 **D.** 24 **5.** Ⓐ Ⓑ Ⓒ Ⓓ

6. Simplify $6a(-4b)$. (Lesson 2–3)

E. $2ab$ **F.** $-24ab$ **G.** $-2a$ **H.** $24b$ **6.** Ⓔ Ⓕ Ⓖ Ⓗ

7. Simplify $\frac{17 + 15}{8}$. (Lesson 2–4)

A. $\frac{17}{6} + \frac{15}{8}$ **B.** 4 **C.** $3\frac{5}{8}$ **D.** $\frac{33}{8}$ **7.** Ⓐ Ⓑ Ⓒ Ⓓ

8. Which set of data was used to make the stem-and-leaf plot? (Lesson 2–5)

E. 14, 245, 36 **F.** 4, 4, 5, 6
G. 14, 24, 25, 36 **H.** 1.4, 2.4, 2.5, 3.6 **8.** Ⓔ Ⓕ Ⓖ Ⓗ

Stem	Leaf
1	4
2	4 5
3	6

1 | 4 = 14

9. What is the probability that a number chosen at random from the domain $\{-3, -2, -1, 0, 1, 2, 3\}$ will satisfy the inequality $3 - 2x < 5$? (Lesson 2–6)

A. $\{0, 1, 2, 3\}$ **B.** $\frac{3}{7}$ **C.** $\frac{4}{7}$ **D.** $\frac{5}{7}$ **9.** Ⓐ Ⓑ Ⓒ Ⓓ

10. Which number is greater than $\sqrt{3}$ and less than 1.9? (Lesson 2–7)

E. 1.72 **F.** $-1.\overline{82}$ **G.** $\frac{9}{5}$ **H.** $\frac{39}{20}$ **10.** Ⓔ Ⓕ Ⓖ Ⓗ

Assessment

NAME _____ DATE _____ PERIOD _____

2 Standardized Test Practice *(continued)*

Part 2: Grid In

Instructions: Enter your answer by writing each digit of the answer in a column box and then shading in the appropriate oval that corresponds to that entry.

11. Evaluate 12^3. (Lesson 1–1)

12. Evaluate $3.7 + 7.4 + 8.6 + 2.3$. (Lesson 1–6)

11.

	/	/	
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

12.

	/	/	
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

13. Kendrick needs to mix two types of flour for his secret cookie dough. If he adds $\frac{3}{4}$ cup of one type of flour to $\frac{1}{8}$ cup of the second type of flour, how much flour in cups does he have? (Lesson 2–2)

14. Dalila ran 5.3 miles yesterday, but only ran 3.7 miles this morning. How far must she run this afternoon to run the same distance today as she ran yesterday? (Lesson 2–2)

13.

	/	/	
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

14.

	/	/	
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Part 3: Quantitative Comparison

Instructions: Compare the quantities in columns A and B. Shade in
(A) if the quantity in column A is greater;
(B) if the quantity in column B is greater;
(C) if the quantities are equal; or
(D) if the relationship cannot be determined from the information given.

	Column A	Column B	
15.	$4(3 + 2) \div 2$	$4(3) + 2 \div 2$	**15.** (A) (B) (C) (D)
	(Lesson 1–2)		
16.	$8 \cdot 0 + 2 \cdot \frac{1}{2}$	$8 \cdot \frac{1}{8} + 2 \cdot 0$	**16.** (A) (B) (C) (D)
	(Lesson 1–4)		
17.	$\lvert -10 \rvert$	$\lvert -6 \rvert + \lvert -3 \rvert$	**17.** (A) (B) (C) (D)
	(Lesson 2–1)		

NAME _____ DATE _____ PERIOD _____

2 Standardized Test Practice

Student Record Sheet *(Use with pages 116–117 of the Student Edition.)*

Part 1 Multiple Choice

Select the best answer from the choices given and fill in the corresponding oval.

1 Ⓐ Ⓑ Ⓒ Ⓓ	**4** Ⓐ Ⓑ Ⓒ Ⓓ	**7** Ⓐ Ⓑ Ⓒ Ⓓ
2 Ⓐ Ⓑ Ⓒ Ⓓ	**5** Ⓐ Ⓑ Ⓒ Ⓓ	**8** Ⓐ Ⓑ Ⓒ Ⓓ
3 Ⓐ Ⓑ Ⓒ Ⓓ	**6** Ⓐ Ⓑ Ⓒ Ⓓ	**9** Ⓐ Ⓑ Ⓒ Ⓓ

Part 2 Short Response/Grid In

Solve the problem and write your answer in the blank.

For Questions 11 and 12, also enter your answer by writing each number or symbol in a box. Then fill in the corresponding oval for that number or symbol.

10 _____

11 _____ (grid in)

12 _____ (grid in)

13 _____

14 _____

11

	/	/	
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

12

	/	/	
.	.	.	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Part 3 Quantitative Comparison

Select the best answer from the choices given and fill in the corresponding oval.

15 Ⓐ Ⓑ Ⓒ Ⓓ

16 Ⓐ Ⓑ Ⓒ Ⓓ

17 Ⓐ Ⓑ Ⓒ Ⓓ

18 Ⓐ Ⓑ Ⓒ Ⓓ

Part 4 Open-Ended

Record your answers for Questions 19–20 on the back of this paper.

Answers

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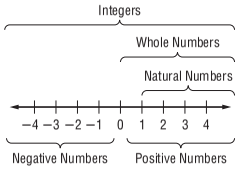
NAME _____ DATE _____ PERIOD ____

2-1 Study Guide and Intervention

Rational Numbers on the Number Line

Graph Rational Numbers The figure at the right is part of a number line. A number line can be used to show the sets of **natural numbers**, **whole numbers**, and **integers**. **Positive numbers**, are located to the right of 0, and **negative numbers** are located to the left of 0.

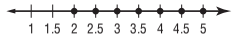


Another set of numbers that you can display on a number line is the set of **rational numbers**. A rational number can be written as $\frac{a}{b}$, where a and b are integers and $b \neq 0$. Some examples of rational numbers are $\frac{1}{4}$, $\frac{-3}{5}$, $\frac{-7}{-8}$, and $\frac{12}{-3}$.

Example 1 **Name the coordinates of the points graphed on each number line.**

a.

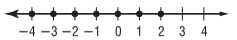
The dots indicate each point on the graph. The coordinates are {−3, −1, 1, 3, 5}

b. 

The bold arrow to the right means the graph continues indefinitely in that direction. The coordinates are {2, 2.5, 3, 3.5, 4, 4.5, 5, …}.

Example 2 **Graph each set of numbers.**

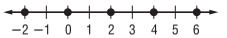
a. {..., −3, −2, −1, 0, 1, 2}



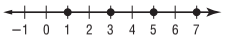
b. $\left\{-\frac{1}{3}, 0, \frac{1}{3}, \frac{2}{3}\right\}$

Exercises

Name the coordinates of the points graphed on each number line.

1. 

{−2, 0, 2, 4, 6}

2. 

{1, 3, 5, 7, ...}

3.

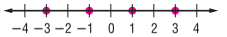
$\left\{-\frac{1}{4}, 0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1\right\}$

4.

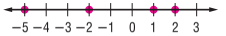
$\left\{-3, -\frac{1}{2}, \frac{1}{3}, 2, 3\right\}$

Graph each set of numbers.

5. {−3, −1, 1, 3}



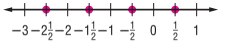
6. {−5, −2, 1, 2}



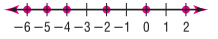
7. {integers less than 0}

8. {..., −2, −1, 0, 1}

9. $\left\{-2\frac{1}{2}, -1\frac{1}{2}, -\frac{1}{2}, \frac{1}{2}\right\}$



10. {..., −4, −2, 0, 2, ...}



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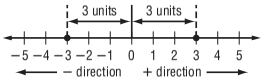
2-1 Study Guide and Intervention *(continued)*

Rational Numbers on the Number Line

Absolute Value On a number line, −3 is three units from zero in the negative direction, and 3 is three units from zero in the positive direction. The number line at the right illustrates the meaning of **absolute value**. The absolute value of a number n is the distance from zero on a number line and is represented $|n|$. For this example, $|-3| = 3$ and $|3| = 3$.



Example 1 **Find each absolute value.**

a. $|-6|$

−6 is six units from zero in the negative direction.

$|-6| = 6$

b. $\left|\frac{3}{2}\right|$

$\frac{3}{2}$ is three halves units from zero in the positive direction.

$\left|\frac{3}{2}\right| = \frac{3}{2}$

Example 2 **Evaluate $4 + |x - 2|$ if $x = 5$.**

$4 + \|x - 2\|$	$= 4 + \|5 - 2\|$	Replace x with 5.
	$= 4 + \|3\|$	$5 - 2 = 3$
	$= 4 + 3$	$\|3\| = 3$
	$= 7$	Simplify.

Exercises

Find each absolute value.

1. $|2|$ 2

2. $|-5|$ 5

3. $|-24|$ 24

4. $|-1.3|$ 1.3

5. $\left|-\frac{2}{3}\right|$ $\frac{2}{3}$

6. $\left|\frac{35}{41}\right|$ $\frac{35}{41}$

Evaluate each expression if $a = 5$, $b = \frac{1}{4}$, $x = 8$, and $y = 2.5$.

7. $18 + |4 - y|$ 19.5

8. $|x + 8| + 12$ 28

9. $|x - 2| + 8.2$ 14.2

10. $2 + |x - 5|$ 5

11. $|2.5 + y| + 12$ 17

12. $|23 - x| - 9$ 6

13. $|x - 6| + 4.5$ 6.5

14. $10 - |a - 2|$ 7

15. $|6 + b| + \frac{1}{2}$ $6\frac{3}{4}$

16. $\left|\frac{1}{4} + b\right| - \left|-\frac{1}{2}\right|$ 0

17. $|3 + b| + a$ $8\frac{1}{4}$

18. $|-b| + 1\frac{1}{2}$ $1\frac{3}{4}$

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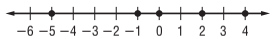
NAME _____ DATE _____ PERIOD ____

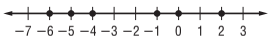
2-1 Skills Practice

Rational Numbers on the Number Line

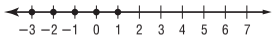
Name the coordinates of the points graphed on each number line.

1. 

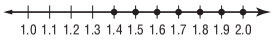
{−5, −1, 0, 2, 4}

2. 

{−6, −5, −4, −1, 0, 2}

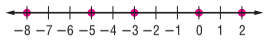
3. 

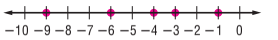
{..., −3, −2, −1, 0, 1}

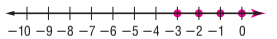
4. 

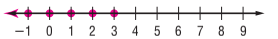
{1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, ...}

Graph each set of numbers.

5. {−8, −5, −3, 0, 2}


6. {−9, −6, −4, −3, −1}


7. {−3, −2, −1, 0, ...}


8. {..., −1, 0, 1, 2, 3}


9. $\left\{-\frac{1}{2}, 0, \frac{1}{2}, 1, \frac{5}{2}\right\}$

10. {..., −3, −2.5, −2, −1.5, −1}

Find each absolute value.

11. $|-9|$ 9
12. $|15|$ 15
13. $|-30|$ 30
14. $\left|-\frac{5}{7}\right|$ $\frac{5}{7}$
15. $|2.4|$ 2.4
16. $\left|\frac{9}{11}\right|$ $\frac{9}{11}$

Evaluate each expression if $a = 3$, $b = -10$, $c = \frac{1}{2}$, $x = 9$, $y = 1.5$, and $z = 12$.

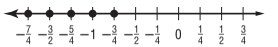
17. $26 - |x + 6|$ 11
18. $11 + |10 - x|$ 12
19. $|12 - a| + 5$ 14
20. $|a + 20| - 4$ 19
21. $4.5 - |y|$ 3
22. $|z - 7| + 5$ 10
23. $14 - |b|$ 4
24. $|b| - 2$ 8
25. $\left|c + \frac{1}{2}\right| + 2$ 3
26. $9 + |3.5 - y|$ 11

NAME _____ DATE _____ PERIOD ____

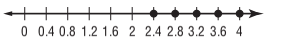
2-1 Practice (Average)

Rational Numbers on the Number Line

Name the coordinates of the points graphed on each number line.

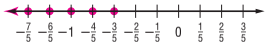
1. 

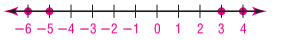
$\left\{..., -\frac{7}{4}, -\frac{3}{2}, -\frac{5}{4}, -1, -\frac{3}{4}\right\}$

2. 

{2.4, 2.8, 3.2, 3.6, 4, ...}

Graph each set of numbers.

3. $\left\{..., -\frac{7}{5}, -\frac{6}{5}, -1, -\frac{4}{5}, -\frac{3}{5}\right\}$


4. {integers less than −4 or greater than 2}


Find each absolute value.

5. $|-11|$ 11
6. $|100|$ 100
7. $|-0.35|$ 0.35
8. $\left|-\frac{28}{53}\right|$ $\frac{28}{53}$

Evaluate each expression if $a = 4$, $b = \frac{3}{5}$, $c = \frac{3}{2}$, $x = 14$, $y = 2.4$, and $z = -3$.

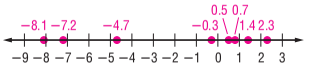
9. $41 - 16 - |z|$ 22
10. $|3a + 20| - 15$ 17
11. $|2x + 4| - 6$ 26
12. $2.5 - |3.8 - y|$ 1.1
13. $\left(b - \frac{1}{5}\right) + \left|-\frac{3}{10}\right|$ $\frac{7}{10}$
14. $\frac{2}{15} + \left|b - \frac{2}{5}\right|$ $\frac{1}{3}$
15. $|c - 1| - \frac{1}{3}$ $\frac{1}{6}$
16. $|-c| - \frac{3}{4}$ $\frac{3}{4}$

ASTRONOMY For Exercises 17–19, use the following information.

The *absolute magnitude* of a star is how bright the star would appear from a standard distance of 10 parsecs, or 32.6 light years. The lower the number, the greater the magnitude, or brightness, of the star. The table gives the magnitudes of several stars.

Star	Magnitude
Altair	2.3
Betelgeuse	−7.2
Castor	0.5
Deneb	−4.7
Pollux	0.7
Regulus	−0.3
Rigel	−8.1
Sirius	1.4

Source: www.astro.wisc.edu

17. Use a number line to order the magnitudes from least to greatest.


18. Which of the stars are the brightest and the least bright?
brightest: Rigel; least bright: Altair

19. Write the absolute value of the magnitude of each star
2.3, 7.2, 0.5, 4.7, 0.7, 0.3, 8.1, 1.4

20. **CLIMATE** The table shows the mean wind speeds in miles per hour at Daytona Beach, Florida.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
9.0	9.7	10.1	9.7	9.0	7.9	7.4	7.1	8.3	9.1	8.7	8.5

Source: National Climatic Data Center

Graph the wind speeds on a number line. Which month has the greatest mean wind speed?
March

Answers

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NAME _____ DATE _____ PERIOD ____

2-1

Reading to Learn Mathematics

Rational Numbers on the Number Line

Pre-Activity **How can you use a number line to show data?**

Read the introduction to Lesson 2-1 at the top of page 68 in your textbook.

In the table, what does the number +0.2 tell you?

The level of the Brazos River increased by 0.2 foot in 24 hours.

Reading the Lesson

1. Refer to the number line on page 68 in your textbook. Write *true* or *false* for each of the following statements.

a. All whole numbers are integers. **true**

b. All natural numbers are integers. **true**

c. All whole numbers are natural numbers. **false**

d. All natural numbers are whole numbers. **true**

e. All whole numbers are positive numbers. **false**

2. Use the words *denominator*, *fraction*, and *numerator* to complete the following sentence.

You know that a number is a rational number if it can be written as a _____**fraction**_____ that has a _____**numerator**_____ and _____**denominator**_____ that are integers, where the denominator is not equal to zero.

3. Explain why $\frac{-3}{7}$, $0.\overline{6}$, and 15 are rational numbers.

Each number is in or can be written in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$. $0.\overline{6}$ can be written as $\frac{2}{3}$, and 15 can be written as $\frac{15}{1}$.

Helping You Remember

4. Connecting a mathematical concept to something in your everyday life is one way of remembering. Describe a situation or setting in your life that reminds you of absolute value.

Sample answer: The distance from each goal line to the 50-yard line is 50 yards.

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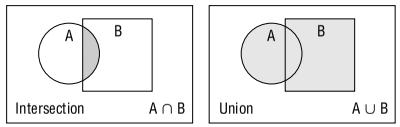
2-1

Enrichment

Intersection and Union

The intersection of two sets is the set of elements that are in both sets. The intersection of sets A and B is written A ∩ B. The union of two sets is the set of elements in either A, B, or both. The union is written A ∪ B.

In the drawings below, suppose A is the set of points inside the circle and B is the set of points inside the square. Then, the shaded areas show the intersection in the first drawing and the union in the second drawing.



Write A ∩ B and A ∪ B for each of the following.

1. A = {p, q, r, s, t} **A ∩ B = {*q*, *r*, *s*}**
B = {q, r, s} **A ∪ B = {*p*, *q*, *r*, *s*, *t*}**

2. A = {the integers between 2 and 7} **A ∩ B = {3}**
B = {0, 3, 8} **A ∪ B = {0, 3, 4, 5, 6, 8}**

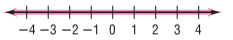
3. A = {the states whose names start with K} **A ∩ B = {Kansas}**
B = {the states whose capitals are Honolulu or Topeka} **A ∪ B = {Hawaii, Kansas, Kentucky}**

4. A = {the positive integer factors of 24} **A ∩ B = {1, 2, 3, 4, 6, 8}**
B = {the counting numbers less than 10} **A ∪ B = {1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 24}**

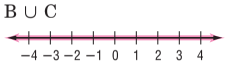
Suppose A = {numbers x such that $x < 3$}, B = {numbers x such as $x \geq -1$}, and C = {numbers x such that $x \leq 1.5$}. Graph each of the following.

5. A ∩ B

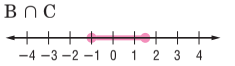
6. A ∪ B



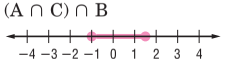
7. B ∪ C



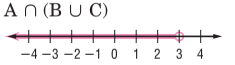
8. B ∩ C



9. (A ∩ C) ∩ B



10. A ∩ (B ∪ C)



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NAME _____ DATE _____ PERIOD ____

2-2 Study Guide and Intervention

Adding and Subtracting Rational Numbers

Add Rational Numbers

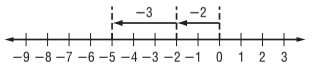
Adding Rational Numbers, Same Sign	Add the numbers. If both are positive, the sum is positive; if both are negative, the sum is negative.
Adding Rational Numbers, Different Signs	Subtract the number with the lesser absolute value from the number with the greater absolute value. The sign of the sum is the same as the sign of the number with the greater absolute value.

Example 1 **Use a number line to find the sum $-2 + (-3)$.**

Step 1 Draw an arrow from 0 to -2.

Step 2 From the tip of the first arrow, draw a second arrow 3 units to the left to represent adding -3.

Step 3 The second arrow ends at the sum -5. So $-2 + (-3) = -5$.



Example 2 **Find each sum.**

a. $-8 + 5$

$$\begin{aligned} -8 + 5 &= -(|-8| - |5|) \\ &= -(8 - 5) \\ &= -3 \end{aligned}$$

b. $\frac{3}{4} + \left(-\frac{1}{2}\right)$

$$\begin{aligned} \frac{3}{4} + \left(-\frac{1}{2}\right) &= \frac{3}{4} + \left(-\frac{2}{4}\right) \\ &= +\left(\left|\frac{3}{4}\right| - \left|-\frac{2}{4}\right|\right) \\ &= +\left(\frac{3}{4} - \frac{2}{4}\right) \\ &= \frac{1}{4} \end{aligned}$$

Exercises

Find each sum.

1. $12 + 24$ **36**
2. $-6 + 14$ **8**
3. $-12 + (-15)$ **-27**
4. $-21.5 + 34.2$ **12.7**
5. $8.2 + (-3.5)$ **4.7**
6. $23.5 + (-15.2)$ **8.3**
7. $90 + (-105)$ **-15**
8. $108 + (-62)$ **46**
9. $-84 + (-90)$ **-174**
10. $\frac{5}{7} + \frac{1}{3}$ **$\frac{22}{21}$ or $1\frac{1}{21}$**
11. $\frac{3}{14} + \frac{6}{17}$ **$\frac{135}{238}$**
12. $-\frac{4}{9} + \frac{3}{5}$ **$\frac{7}{45}$**
13. $-\frac{2}{3} + \left(-\frac{1}{4}\right)$ **$-\frac{11}{12}$**
14. $-\frac{1}{5} + \frac{7}{11}$ **$\frac{24}{55}$**
15. $-\frac{18}{40} + \left(-\frac{10}{20}\right)$ **$-\frac{19}{20}$**
16. $-\frac{3}{5} + \left(-\frac{5}{6}\right)$ **$-\frac{43}{30}$ or $-1\frac{13}{30}$**
17. $-1.6 + (-1.8)$ **-3.4**
18. $-0.008 + (-0.25)$ **-0.258**

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2-2 Study Guide and Intervention *(continued)*

Adding and Subtracting Rational Numbers

Subtract Rational Numbers

Every positive rational number can be paired with a negative rational number so that their sum is 0. The numbers, called **opposites**, are **additive inverses** of each other.

Additive Inverse Property	For every number a, $a + (-a) = 0$.

To subtract a rational number, add its inverse and use the rules for addition given on page 81.

Subtraction of Rational Numbers	For any numbers a and b, $a - b = a + (-b)$.

Example **Find $8.5 - 10.2$.**

$$\begin{aligned} 8.5 - 10.2 &= 8.5 + (-10.2) && \text{To subtract 10.2, add its inverse.} \\ &= -(|-10.2| - |8.5|) && |-10.2| \text{ is greater, so the result is negative.} \\ &= -1.7 && \text{Simplify.} \end{aligned}$$

Exercises

Find each difference.

1. $11 - 41$ **-30**
2. $15 - (-21)$ **36**
3. $-33 - (-17)$ **-16**
4. $18 - (-12)$ **30**
5. $15.5 - (-2.5)$ **18**
6. $65.8 - (-23.5)$ **89.3**
7. $90 - (-15)$ **105**
8. $-10.8 - (6.8)$ **-17.6**
9. $-84 - (-72)$ **-12**
10. $58.8 - (-11.2)$ **70**
11. $-18.2 - 3.2$ **-21.4**
12. $-9 - (-5.6)$ **-3.4**
13. $-\frac{1}{3} - \left(-\frac{3}{4}\right)$ **$\frac{5}{12}$**
14. $-\frac{1}{5} - \left(-\frac{4}{7}\right)$ **$\frac{13}{35}$**
15. $\frac{9}{4} - \frac{5}{9}$ **$\frac{61}{36}$ or $1\frac{25}{36}$**
16. $\frac{12}{23} - \left(-\frac{1}{2}\right)$ **$\frac{47}{46}$ or $1\frac{1}{46}$**
17. $-\frac{7}{8} - \left(-\frac{3}{9}\right)$ **$-\frac{13}{24}$**
18. $\frac{24}{10} - \frac{18}{20}$ **$\frac{3}{2}$ or $1\frac{1}{2}$**

19. Sanelle was playing a video game. Her scores were $+50$, $+75$, -18, and -22. What was her final score? **$+85$**

20. The football team offense began a drive from their 20-yard line. They gained 8 yards, lost 12 yards and lost 2 yards before having to kick the ball. What yard line were they on when they had to kick the ball? **14-yard line**

Answers

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2-2 Skills Practice

Adding and Subtracting Rational Numbers

Find each sum.

1. $28 + 13$
41

2. $18 + 54$
72

3. $-6 + 15$
9

4. $-12 + 25$
13

5. $-14 + 11$
-3

6. $-42 + 18$
-24

7. $-19 + (-3)$
-22

8. $-9 + (-17)$
-26

9. $25 + (-30)$
-5

10. $16 + (-20)$
-4

11. $\frac{1}{4} + \left(-\frac{3}{4}\right)$
$-\frac{1}{2}$

12. $-2.5 + 3.2$
0.7

Find each difference.

13. $31 - 12$
19

14. $53 - 47$
6

15. $17 - 20$
-3

16. $28 - 39$
-11

17. $-15 - 65$
-80

18. $-27 - 13$
-40

19. $-11 - (-12)$
1

20. $-25 - (-36)$
11

21. $-9 - (-7)$
-2

22. $-14 - (-8)$
-6

23. $-1.5 - 1$
-2.5

24. $3.6 - 4.8$
-1.2

25. $-\frac{1}{2} - \left(-\frac{1}{2}\right)$
0

26. $-\frac{1}{3} - \frac{1}{6}$
$-\frac{1}{2}$

27. $-\frac{3}{4} + \frac{3}{2}$
$\frac{3}{4}$

28. WEATHER At 6:00 P.M., the temperature in North Fork was 28 degrees Fahrenheit. Shortly afterward, a strong cold front passed through, and the temperature dropped 36 degrees by 8:00 A.M. the next morning. What was the temperature at 8:00 A.M.? $-8°F$

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2-2 Practice (Average)

Adding and Subtracting Rational Numbers

Find each sum.

1. $-82 + 14$ -68

2. $-33 + 47$ 14

3. $-17 + (-39)$ -56

4. $8 + (-11)$ -3

5. $-1.7 + 3.2$ 1.5

6. $-13.3 + (-0.9)$ -14.2

7. $-51.8 + 29.7$ -22.1

8. $7.34 + (-9.06)$ -1.72

9. $\frac{5}{9} + \frac{5}{6}$ $\frac{25}{18}$ or $1\frac{7}{18}$

10. $-\frac{3}{5} + \frac{2}{3}$
$\frac{1}{15}$

11. $-\frac{3}{4} + \left(-\frac{3}{5}\right)$
$-\frac{27}{20}$ or $-1\frac{7}{20}$

12. $\frac{3}{8} + \left(-\frac{2}{3}\right)$
$-\frac{7}{24}$

Find each difference.

13. $65 - 93$ -28

14. $-42 - (-17)$ -25

15. $13 - (-19)$ 32

16. $-8 - 43$ -51

17. $82.8 - (-12.4)$ 95.2

18. $1.27 - 2.34$ -1.07

19. $-9.26 - 12.05$ -21.31

20. $-18.1 - (-4.7)$ -13.4

21. $-\frac{1}{5} - \frac{2}{3}$ $-\frac{13}{15}$

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

23. $-\frac{5}{2} - \left(-\frac{3}{7}\right)$
$-\frac{29}{14}$ or $-2\frac{1}{14}$

24. $\frac{1}{8} - \left(-\frac{5}{6}\right)$
$\frac{23}{24}$

FINANCE For Exercises 25–27, use the following information.

The table shows activity in Ben's checking account. The balance before the activity was $200.00. Deposits are added to an account and checks are subtracted.

Number	Date	Transaction	Amount	Balance
	5/2	deposit	52.50	252.50
101	5/10	check to Castle Music	25.50	?
102	6/1	check to Comp U Save	235.40	?

25. What is the account balance after writing check number 101? $227.00

26. What is the account balance after writing check number 102? $-$8.40

27. Realizing that he has just written a check for more than is in the account, Ben immediately deposits $425. What will this make his new account balance? $416.60

28. CHEMISTRY The melting points of krypton, radon, and sulfur in degrees Celsius are -156.6, -61.8, and 112.8, respectively. What is the difference in melting points between radon and krypton and between sulfur and krypton? 94.8°C and 269.4°C

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2-2

Reading to Learn Mathematics

Adding and Subtracting Rational Numbers

Pre-Activity **How can a number line be used to show a football team's progress?**

Read the introduction to Lesson 2-2 at the top of page 73 in your textbook.

Use *positive* or *negative* to complete the following sentences.

The five-yard penalty is shown by the ___negative___ number −5.

The 13-yard pass is shown by the ___positive___ number 13.

Reading the Lesson

1. To add two rational numbers, you can use a number line. Each number will be represented by an arrow.

a. Where on the number line does the arrow for the first number begin? at 0

b. Arrows for negative numbers will point to the ___left___ (left/right). Arrows for positive numbers will point to the ___right___ (left/right).

2. Two students added the same pair of rational numbers. Both students got the correct sum. One student used a number line. The other student used absolute value. Then they compared their work.

a. How do the arrows show which number has the greater absolute value?

The number with the greater absolute value matches the longer arrow.

b. If the longer arrow points to the left, then the sum is ___negative___ (positive/negative). If the longer arrow points to the right, then the sum is ___positive___ (positive/negative).

3. If two numbers are additive inverses, what must be true about their absolute values?

The absolute values of the two numbers are equal.

4. Write each subtraction problem as an addition problem.

a. $12 - 4$ $12 + (-4)$

b. $-15 - 7$ $-15 + (-7)$

c. $0 - 9$ $0 + (-9)$

d. $-20 - 34$ $-20 + (-34)$

Helping You Remember

5. Explain why knowing the rules for adding rational numbers can help you to subtract rational numbers.

Sample answer: Since subtraction is the same as adding the opposite, you can change every subtraction problem to an addition problem. Then you can use the rules for adding rational numbers to get the final answer.

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2-2

Enrichment

Rounding Fractions

Rounding fractions is more difficult than rounding whole numbers or decimals. For example, think about how you would round $\frac{4}{9}$ inches to the nearest quarter-inch. Through estimation, you might realize that $\frac{4}{9}$ is less than $\frac{1}{2}$. But, is it closer to $\frac{1}{2}$ or to $\frac{1}{4}$?

Here are two ways to round fractions. Example 1 uses only the fractions; Example 2 uses decimals.

Example 1

Subtract the fraction twice. Use the two nearest quarters.

$\frac{1}{2} - \frac{4}{9} = \frac{1}{18}$ $\frac{4}{9} - \frac{1}{4} = \frac{7}{36}$

Compare the differences.

$\frac{1}{18} < \frac{7}{36}$

The smaller difference shows you which fraction to round to.

$\frac{4}{9}$ rounds to $\frac{1}{2}$.

Example 2

Change the fraction and the two nearest quarters to decimals.

$\frac{4}{9} = 0.44\overline{4}$, $\frac{1}{2} = 0.5$, $\frac{1}{4} = 0.25$

Find the decimal halfway between the two nearest quarters.

$\frac{1}{2}(0.5 + 0.25) = 0.375$

If the fraction is greater than the halfway decimal, round up. If not, round down.

$0.44\overline{4} > 0.3675$. So, $\frac{4}{9}$ is more than half way between $\frac{1}{4}$ and $\frac{1}{2}$.

$\frac{4}{9}$ rounds to $\frac{1}{2}$.

Round each fraction to the nearest one-quarter. Use either method.

1. $\frac{1}{3}$ $\frac{1}{4}$ **2.** $\frac{3}{7}$ $\frac{1}{2}$ **3.** $\frac{7}{11}$ $\frac{3}{4}$ **4.** $\frac{4}{15}$ $\frac{1}{4}$

5. $\frac{7}{20}$ $\frac{1}{4}$ **6.** $\frac{31}{50}$ $\frac{1}{2}$ **7.** $\frac{9}{25}$ $\frac{1}{4}$ **8.** $\frac{23}{30}$ $\frac{3}{4}$

Round each decimal or fraction to the nearest one-eighth.

9. 0.6 $\frac{5}{8}$ **10.** 0.1 $\frac{1}{8}$ **11.** 0.45 $\frac{1}{2}$ **12.** 0.85 $\frac{7}{8}$

13. $\frac{5}{7}$ $\frac{3}{4}$ **14.** $\frac{3}{20}$ $\frac{1}{8}$ **15.** $\frac{23}{25}$ $\frac{7}{8}$ **16.** $\frac{5}{9}$ $\frac{1}{2}$

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2-3

Study Guide and Intervention

Multiplying Rational Numbers

Multiply Integers You can use the rules below when multiplying integers and rational numbers.

Multiplying Numbers with the Same Sign	The product of two numbers having the same sign is positive.
Multiplying Numbers with Different Signs	The product of two numbers having different signs is negative.

Example 1 **Find each product.**

a. −7(6)

The signs are different, so the product is negative.

$-7(6) = -42$

b. −18(−10)

The signs are the same, so the product is positive.

$-18(-10) = 180$

Example 2 **Simplify the expression $(-2x)5y$.**

$(-2x)5y = (-2)(5)x \cdot y$ Commutative Property (×)

$= (-2 \cdot 5)xy$ Associative Property

$= -10xy$ Simplify.

Exercises

Find each product.

1. $11(4)$ — 44
2. $-5(-3)$ — 15
3. $(-24)(-2)$ — 48
4. $(60)(-3)$ — −180
5. $(-2)(-3)(-4)$ — −24
6. $8(-15)$ — −120
7. $-15(3)$ — −45
8. $(12)(-10)$ — −120
9. $(-22)(-3)(2)$ — 132
10. $(5)(-5)(0)(4)$ — 0
11. $(-15)(45)$ — −675
12. $(-12)(-23)$ — 276

Simplify each expression.

13. $4(-2x) - 8x$ — −16x
14. $6(-2n) - 10n$ — −22n
15. $6(3y - y)$ — 12y
16. $-3(3d + 2d)$ — −15d
17. $-2x(2) + 2x(3y)$ — −4x + 6xy
18. $4m(-2n) + 2d(-4e)$ — −8mn − 8de
19. $-5(2x + x) - 3(-xy)$ — −15x + 3xy
20. $(2)(-4x + 2x)$ — −4x
21. $(-3)(-8n - 6m)$ — 24n + 18m

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2-3

Study Guide and Intervention *(continued)*

Multiplying Rational Numbers

Multiply Rational Numbers Multiplying a rational number by −1 gives you the additive inverse of the number.

Multiplicative Property of −1	The product of any number and −1 is its additive inverse.	$(-1)(5) = 5(-1) = -5$

Example 1 **Evaluate a^3b^2 if $a = -2$ and $b = -5$.**

$a^3b^2 = (-2)^3(-5)^2$ Substitution

$= (-8)(25)$ $(-2)^3 = -8$ and $(-5)^2 = 25$

$= -200$ different signs → negative product

Example 2 **Evaluate $n^2\left(-\frac{3}{5}\right)$ if $n = -\frac{1}{2}$.**

$n^2\left(-\frac{3}{5}\right) = \left(-\frac{1}{2}\right)^2\left(-\frac{3}{5}\right)$ Substitution

$= \left(\frac{1}{4}\right)\left(-\frac{3}{5}\right)$ $\left(-\frac{1}{2}\right)^2 = \left(-\frac{1}{2}\right)\left(-\frac{1}{2}\right)$ or $\frac{1}{4}$

$= -\frac{3}{20}$ different signs → negative product

Exercises

Find each product.

1. $\frac{1}{4}(-12)$ — −3
2. $\left(-\frac{1}{5}\right)\left(-\frac{2}{3}\right)$ — $\frac{2}{15}$
3. $\left(-\frac{2}{7}\right)\left(\frac{2}{5}\right)$ — $-\frac{4}{35}$
4. $(6.0)(-0.3)$ — −1.8
5. $\left(-\frac{1}{2}\right)\left(-\frac{1}{3}\right)\left(-\frac{3}{4}\right)$ — $-\frac{1}{8}$
6. $8(-15)$ — −120
7. $-15(-4)$ — 60
8. $\left(\frac{1}{2}\right)(-10)$ — −5
9. $\left(-\frac{2}{5}\right)(-3)\left(\frac{2}{3}\right)$ — $\frac{4}{5}$
10. $\left(\frac{4}{5}\right)(-2)(0)\left(\frac{1}{4}\right)$ — 0
11. $\left(-\frac{1}{3}\right)\left(\frac{4}{5}\right)$ — $-\frac{4}{15}$
12. $\left(-1\frac{1}{2}\right)\left(-2\frac{1}{3}\right)$ — $3\frac{1}{2}$

Evaluate each expression if $a = -2.5$, $b = 4.2$, $c = 5.5$, and $d = -0.2$.

13. $-2a^2$ — −12.5
14. $5(-2b)$ — −42
15. $-6(cd)$ — 6.6
16. $-2(3d + 2c)$ — −20.8
17. $-ad - 3c$ — −17
18. $b^2(c - 2d)$ — 104.076
19. $-5bcd$ — 23.1
20. $-3d^2 + 4$ — 3.88
21. $(-3)(-8a - 2b)$ — −34.8

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2-3 Skills Practice

Multiplying Rational Numbers

Find each product.

1. $9(17)$ **153**
2. $-8(-7)$ **56**
3. $5(-7)$ **-35**
4. $-4(11)$ **-44**
5. $-6(-12)$ **72**
6. $7(-25)$ **-175**
7. $\left(\frac{1}{2}\right)\left(\frac{2}{3}\right)$ **$\frac{1}{3}$**
8. $\left(-\frac{3}{5}\right)\left(\frac{1}{6}\right)$ **$-\frac{1}{10}$**
9. $\left(-\frac{3}{8}\right)\left(-\frac{1}{2}\right)$ **$\frac{3}{16}$**
10. $\left(\frac{3}{4}\right)\left(-\frac{5}{8}\right)$ **$-\frac{15}{32}$**
11. $\left(-\frac{5}{6}\right)\left(-\frac{2}{3}\right)$ **$\frac{5}{9}$**
12. $(1.5)(2.2)$ **3.3**
13. $(-2.8)(0.5)$ **-1.4**
14. $(2.4)(-0.6)$ **-1.44**
15. $(-4.7)(-1.3)$ **6.11**
16. $(1.1)(-1.2)$ **-1.32**

Simplify each expression.

17. $5(-2a) - 8a$ **$-18a$**
18. $-6(3x) + 12x$ **$-6x$**
19. $3(4n - n)$ **$9n$**
20. $-4(2d - d)$ **$-4d$**

Evaluate each expression if $a = -1.2$, $b = 0.5$, $c = \frac{1}{2}$, and $d = -\frac{2}{3}$.

21. $-4ab$ **2.4**
22. $-3b^2$ **-0.75**
23. $-2a^2$ **-2.88**
24. $c^2\left(-\frac{1}{3}\right)$ **$-\frac{1}{12}$**
25. $\frac{1}{8}d^2$ **$\frac{1}{18}$**
26. $-3cd$ **1**

27. **STAIRCASES** A staircase in an office building starts at ground level. Each step down lowers you by 7.5 inches. What is your height in relation to ground level after descending 20 steps? **-150 in. or -12 ft 6 in.**

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2-3 Practice (Average)

Multiplying Rational Numbers

Find each product.

1. $42(7)$ **294**
2. $-28(-17)$ **476**
3. $15(-34)$ **-510**
4. $\left(-\frac{3}{4}\right)\left(\frac{7}{8}\right)$ **$-\frac{21}{32}$**
5. $\left(-\frac{4}{5}\right)\left(-\frac{5}{6}\right)$ **$\frac{2}{3}$**
6. $\left(\frac{9}{10}\right)\left(\frac{5}{7}\right)$ **$\frac{9}{14}$**
7. $\left(-3\frac{1}{4}\right)\left(2\frac{1}{2}\right)$ **$-\frac{65}{8}$ or $-8\frac{1}{8}$**
8. $\left(-2\frac{2}{3}\right)\left(-1\frac{1}{6}\right)$ **$\frac{28}{9}$ or $3\frac{1}{9}$**
9. $\left(1\frac{1}{4}\right)\left(-1\frac{1}{5}\right)$ **$-\frac{3}{2}$ or $-1\frac{1}{2}$**
10. $(1.5)(8.8)$ **13.2**
11. $(6.8)(-1.3)$ **-8.84**
12. $(-0.2)(2.8)$ **-0.56**
13. $(-3.6)(-0.55)$ **1.98**
14. $6.3(-0.7)$ **-4.41**
15. $\frac{2}{3}(-4)(9)$ **-24**

Simplify each expression.

16. $5(-3a) + 18a$ **$3a$**
17. $-8(4c) + 12c$ **$-20c$**
18. $-9(2g - g)$ **$-9g$**
19. $7(2b - 4b)$ **$-14b$**
20. $-4x(2y) + (-3b)(-2d)$ **$-8xy + 6bd$**
21. $-5p(-3q) + (4m)(-6n)$ **$15pq + (-24mn)$**

Evaluate each expression if $a = -\frac{4}{5}$, $b = \frac{3}{4}$, $c = -3.4$, and $d = 0.7$.

22. $b^2\left(-\frac{2}{3}\right)$ **$-\frac{3}{8}$**
23. $4ab$ **$-\frac{12}{5}$ or $-2\frac{2}{5}$**
24. $5a^2(-b)$ **$-\frac{12}{5}$ or $-2\frac{2}{5}$**
25. $-6d^2$ **-2.94**
26. $cd - 3$ **-5.38**
27. $c^2(-5d)$ **-40.46**

28. **RECIPES** A recipe for buttermilk biscuits calls for $3\frac{1}{3}$ cups of flour. How many cups of flour do you need for $\frac{1}{2}$ the recipe? **$1\frac{2}{3}$ c**

COMPUTERS For Exercises 29 and 30, use the following information.

Leeza is downloading a file from a Web site at 47.3 kilobytes per second.

29. How many kilobytes of the file will be downloaded after one minute? **2838 kilobytes**
30. How many kilobytes will be downloaded after 4.5 minutes? **12,771 kilobytes**

CONSERVATION For Exercises 31 and 32, use the following information.

A county commission has set aside 640 acres of land for a wildlife preserve.

31. Suppose $\frac{2}{5}$ of the preserve is marshland. How many acres of the preserve are marshland? **256 acres**
32. If the forested area of the preserve is 1.5 times larger than the marshland, how many acres of the preserve are forested? **384 acres**

Answers

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2-3

Reading to Learn Mathematics

Multiplying Rational Numbers

Pre-Activity **How do consumers use multiplication of rational numbers?**

Read the introduction to Lesson 2-3 at the top of page 79 in your textbook.

- How is the amount of the coupon shown on the sales slip? **−1.00**
- Besides the amount, how is the number representing the coupon different from the other numbers on the sales slip?

It is negative.

Reading the Lesson

1. Complete: If two numbers have different signs, the one number is positive and the other number is **negative**.

2. Complete the table.

	Multiplication Example	Are the signs of the numbers the same or different?	Is the product positive or negative?
a.	(−4)(9)	**different**	**negative**
b.	(−2)(−13)	**the same**	**positive**
c.	5(−8)	**different**	**negative**
d.	6(3)	**the same**	**positive**

3. Explain what the term "additive inverse" means to you. Then give an example.

The product of any number and −1 is its additive inverse; $-\frac{2}{3} \cdot (-1) = \frac{2}{3}$.

Helping You Remember

4. Describe how you know that the product of −3 and −5 is positive. Then describe how you know that the product of 3 and −5 is negative.

Sample answer: The signs are the same; the signs are different.

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2-3

Enrichment

Compound Interest

In most banks, interest on savings accounts is compounded at set time periods such as three or six months. At the end of each period, the bank adds the interest earned to the account. During the next period, the bank pays interest on all the money in the bank, including interest. In this way, the account earns interest on interest.

Suppose Ms. Tanner has $1000 in an account that is compounded quarterly at 5%. Find the balance after the first two quarters.

Use $I = prt$ to find the interest earned in the first quarter if $p = 1000$ and $r = 5\%$. Why is t equal to $\frac{1}{4}$?

First quarter: $I = 1000 \times 0.05 \times \frac{1}{4}$

$I = 12.50$

The interest, $12.50, earned in the first quarter is added to $1000. The principal becomes $1012.50.

Second quarter: $I = 1012.50 \times 0.05 \times \frac{1}{4}$

$I = 12.65625$

The interest in the second quarter is $12.66.

The balance after two quarters is $1012.50 + 12.66 or $1025.16.

Answer each of the following questions.

1. How much interest is earned in the third quarter of Ms. Tanner's account? **$I = \$12.81$**

2. What is the balance in her account after three quarters? **$1037.97**

3. How much interest is earned at the end of one year? **$I = \$12.97$**

4. What is the balance in her account after one year? **$1050.94**

5. Suppose Ms. Tanner's account is compounded semiannually. What is the balance at the end of six months? **$1025.00**

6. What is the balance after one year if her account is compounded semiannually? **$1050.63**

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2-4 Study Guide and Intervention

Dividing Rational Numbers

Divide Integers The rules for finding the sign of a quotient are similar to the rules for finding the sign of a product.

Dividing Two Numbers with the Same Sign	The quotient of two numbers having the same sign is positive.
Dividing Two Numbers with Different Signs	The quotient of two numbers having different signs is negative.

Example 1 **Find each quotient.**

a. $-88 \div (-4)$

$-88 \div (-4) = 22$ same signs → positive quotient

b. $\frac{-64}{8}$

$\frac{-64}{8} = -8$ different signs → negative quotient

Example 2 **Simplify** $\frac{-4(-10+2)}{-3+(-1)}$.

$$\frac{-4(-10+2)}{-3+(-1)} = \frac{-4(-8)}{-3+(-1)}$$
$$= \frac{32}{-3+(-1)}$$
$$= \frac{32}{-4}$$
$$= -8$$

Exercises

Find each quotient.

1. $-80 \div (-10)$ **8**
2. $-32 \div 16$ **−2**
3. $80 \div 5$ **16**
4. $18 \div (-3)$ **−6**
5. $-12 \div (-3)$ **4**
6. $8 \div (-2)$ **−4**
7. $-15 \div (-3)$ **5**
8. $121 \div (-11)$ **−11**
9. $-24 \div 1.5$ **−16**
10. $0 \div (-8)$ **0**
11. $-125 \div (-25)$ **5**
12. $-104 \div 4$ **−26**

Simplify.

13. $\frac{-2+(-4)}{(-2)+(-1)}$ **2**
14. $\frac{5(-10+(-2))}{-2+1}$ **60**
15. $\frac{-6(-6+2)}{-10+(-2)}$ **−2**
16. $\frac{-12(2+(-3))}{-4+1}$ **−4**
17. $\frac{-4(-8+(-4))}{-3+(-3)}$ **−8**
18. $\frac{4(-12+4)}{-2(8)}$ **2**

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2-4 Study Guide and Intervention *(continued)*

Dividing Rational Numbers

Divide Rational Numbers The rules for division with integers also apply to division with rational numbers. To divide by any nonzero number, $\frac{c}{d}$, multiply by the reciprocal of that number, $\frac{d}{c}$.

Division of Rational Numbers	$\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \times \frac{d}{c}$

Example 1

a. Find $-5\frac{1}{3} \div 8$.

$$-5\frac{1}{3} \div 8 = -\frac{16}{3} \div \frac{8}{1}$$
$$= -\frac{16}{3} \times \frac{1}{8}$$
$$= -\frac{16}{24} \text{ or } -\frac{2}{3}$$

b. Find $\frac{-83.64}{-6.8}$.

$\frac{-83.64}{-6.8} = 12.3$

Example 2 **Simplify** $\frac{-20a+15}{5}$.

$$\frac{-20a+15}{5} = (-20a+15) \div 5$$
$$= (-20a+15)\left(\frac{1}{5}\right)$$
$$= -20a\left(\frac{1}{5}\right) + 15\left(\frac{1}{5}\right)$$
$$= -4a + 3$$

Exercises

Find each quotient.

1. $-\frac{1}{8} \div 2$ $-\frac{1}{16}$
2. $-32 \div \frac{1}{4}$ **−128**
3. $-\frac{2}{5} \div \frac{1}{5}$ **−2**
4. $1.8 \div (-3)$ **−0.6**
5. $-12.9 \div (-0.3)$ **43**
6. $\frac{3}{8} \div \left(-\frac{2}{3}\right)$ $-\frac{9}{16}$
7. $-\frac{15}{32} \div \left(-\frac{3}{10}\right)$ $\frac{25}{16}$ or $1\frac{9}{16}$
8. $52.5 \div (-4.2)$ **−12.5**
9. $-\frac{8}{15} \div \frac{5}{3}$ $-\frac{8}{25}$
10. $105 \div (-1.5)$ **−70**
11. $-12.5 \div (-2.5)$ **5**
12. $-\frac{1}{4} \div \frac{4}{3}$ $-\frac{3}{16}$

Simplify each expression.

13. $\frac{-44a}{4}$ $-11a$
14. $\frac{16x}{2}$ $8x$
15. $\frac{-144a}{6}$ $-24a$
16. $\frac{18a-6b}{-3}$ $-6a+2b$
17. $\frac{36a-12}{12}$ $3a-1$
18. $\frac{57y-12}{3}$ $19y-4$

Evaluate each expression if $a = -6$, $b = 2.5$, $c = -3.2$, and $d = 4.8$.

19. $\frac{ab}{d}$ **−3.125**
20. $\frac{a+d}{b}$ **−0.48**
21. $\frac{a-2b}{c+d}$ **−6.875**

Answers

NAME _____ DATE _____ PERIOD ____

2-4 Skills Practice

Dividing Rational Numbers

Find each quotient.

1. $-32 \div (-4)$ **8**
2. $-28 \div 7$ **−4**
3. $-45 \div (-15)$ **3**
4. $39 \div (-3)$ **−13**
5. $-56 \div 14$ **−4**
6. $62 \div (-4)$ **−15.5**
7. $-23 \div (-5)$ **4.6**
8. $52 \div (-8)$ **−6.5**
9. $-90 \div 12$ **−7.5**
10. $-16.5 \div 11$ **−1.5**
11. $-1.44 \div 1.2$ **−1.2**
12. $-16.2 \div (-0.4)$ **40.5**
13. $6 \div \left(-\frac{2}{9}\right)$ **−27**
14. $-\frac{3}{4} \div \frac{1}{2}$ $-\frac{3}{2}$ **or** $-1\frac{1}{2}$
15. $-\frac{2}{3} \div \left(-\frac{1}{4}\right)$ $\frac{8}{3}$ **or** $2\frac{2}{3}$
16. $\frac{1}{2} \div \frac{2}{3}$ $\frac{3}{4}$

Simplify each expression.

17. $\frac{27a}{3}$ $9a$
18. $\frac{216x}{12}$ $18x$
19. $\frac{16c - 4}{-4}$ $-4c + 1$
20. $\frac{-54z + 18}{-9}$ $6z + (-2)$

Evaluate each expression if $g = -4$, $h = 2.5$, $k = 1.4$, and $m = -0.8$. Round to the nearest hundredth.

21. $\frac{gh}{m}$ **12.5**
22. $\frac{hm}{g}$ **0.5**
23. $\frac{hk}{m}$ **−4.38**
24. $hk \div gm$ **1.09**
25. $km \div gh$ **0.11**
26. $\frac{k + m}{g}$ **−0.15**

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2-4 Practice (Average)

Dividing Rational Numbers

Find each quotient.

1. $75 \div (-15)$ **−5**
2. $-323 \div (-17)$ **19**
3. $-88 \div 16$ **−5.5**
4. $65.7 \div (-9)$ **−7.3**
5. $-36.08 \div 8$ **−4.51**
6. $-40.05 \div (-2.5)$ **16.02**
7. $-9 \div \frac{3}{5}$ **−15**
8. $-\frac{5}{6} \div \left(-\frac{3}{8}\right)$ $\frac{20}{9}$ **or** $2\frac{2}{9}$
9. $\frac{14}{63} \div \left(-\frac{49}{54}\right)$ $-\frac{12}{49}$

Simplify each expression.

10. $\frac{168p}{-14}$ $-12p$
11. $\frac{25 - 5x}{5}$ $5 - x$
12. $\frac{3t + 12}{-3}$ $-t + (-4)$
13. $\frac{18x + 12y}{-6}$ $-3x + (-2y)$
14. $\frac{8k - 12h}{4}$ $2k - 3h$
15. $\frac{-4c + (-16d)}{4}$ $-c + (-4d)$

Evaluate each expression if $p = -6$, $q = 4.5$, $r = 3.6$, and $s = -5.2$. Round to the nearest hundredth.

16. $\frac{qr}{p}$ **−2.7**
17. $\frac{rs}{q}$ **−4.16**
18. $ps \div qr$ **1.93**
19. $rs \div pq$ **0.69**
20. $\frac{p - q}{r}$ **−2.92**
21. $\frac{r + s}{q}$ **−0.36**

22. **EXERCISE** Ashley walks $2\frac{1}{2}$ miles around a lake three times a week. If Ashley walks around the lake in $\frac{3}{4}$ hour, what is her rate of speed? (*Hint*: Use the formula $r = \frac{d}{t}$, where r is rate, d is distance, and t is time.) $3\frac{1}{3}$ **mi/h**

23. **PUBLICATION** A production assistant must divide a page of text into two columns. If the page is $6\frac{3}{4}$ inches wide, how wide will each column be? $3\frac{3}{8}$ **in.**

ROLLER COASTERS For Exercises 24 and 25, use the following information.

The formula for acceleration is $a = \frac{f - s}{t}$, where a is acceleration, f is final speed, s is starting speed, and t is time.

24. The Hypersonic XLC roller coaster in Virginia goes from zero to 80 miles per hour in 1.8 seconds. What is its acceleration in miles per hour per second to the nearest tenth? **Source:** www.thrillride.com **about 44.4 mi/h per second**

25. What is the acceleration in feet per second per second? (*Hint:* Convert miles to feet and hours to seconds, then apply the formula for acceleration. 1 mile = 5280 feet) **about 3911.1 ft/s per second**

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2-4

Reading to Learn Mathematics

Dividing Rational Numbers

Pre-Activity **How can you use division of rational numbers to describe data?**

Read the introduction to Lesson 2-4 at the top of page 84 in your textbook.

- What is meant by the term *mean*?

  the sum of a set of data items divided by the number of data items.

- In the expression $\frac{(-127) + 54 + (-65)}{3}$, will the numerator be positive or negative?

  negative

Reading the Lesson

1. Explain what the term *inverse operations* means to you.

Sample answer: Inverse operations are operations that undo one another.

2. Write *negative* or *positive* to describe the quotient. Explain your answer.

	Expression	Negative or Positive?	Explanation
a.	$\frac{35}{-7}$	negative	The signs of the two numbers are different.
b.	$\frac{-78}{-13}$	positive	The signs of the two numbers are the same.
c.	$\frac{(-5.6)(-2.4)}{1.92}$	positive	After multiplying, the signs of the numbers being divided are the same.

Helping You Remember

3. Explain how knowing the rules for multiplying rational numbers can help you remember the rules for dividing rational numbers.

Sample answer: Both rules state that the *answer* (product for multiplication, quotient for division) is positive if the signs are the same and negative if the signs are different.

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2-4

Enrichment

Other Kinds of Means

There are many different types of means besides the arithmetic mean. A mean for a set of numbers has these two properties:

a. It typifies or represents the set.

b. It is not less than the least number and it is not greater than the greatest number.

Here are the formulas for the arithmetic mean and three other means.

Arithmetic Mean

Add the numbers in the set. Then divide the sum by n, the number of elements in the set.

$$\frac{x_1 + x_2 + x_3 + \cdots + x_n}{n}$$

Geometric Mean

Multiply all the numbers in the set. Then find the nth root of their product.

$$\sqrt[n]{x_1 \cdot x_2 \cdot x_3 \cdot \cdots \cdot x_n}$$

Harmonic Mean

Divide the number of elements in the set by the sum of the reciprocals of the numbers.

$$\frac{n}{\frac{1}{x_1} + \frac{1}{x_2} + \frac{1}{x_3} + \cdots + \frac{1}{x_n}}$$

Quadratic Mean

Add the squares of the numbers. Divide their sum by the number in the set. Then, take the square root.

$$\sqrt{\frac{x_1^2 + x_2^2 + x_3^2 + \cdots + x_n^2}{n}}$$

Find the four different means to the nearest hundredth for each set of numbers.

1. 10, 100

***A* = 55** ***G* = 31.62**
***H* = 18.18** ***Q* = 71.06**

2. 50, 60

***A* = 55** ***G* = 54.77**
***H* = 54.55** ***Q* = 55.23**

3. 1, 2, 3, 4, 5,

***A* = 3** ***G* = 2.61**
***H* = 2.19** ***Q* = 3.32**

4. 2, 2, 4, 4

***A* = 3** ***G* = 2.83**
***H* = 2.67** ***Q* = 3.16**

5. Use the results from Exercises 1 to 4 to compare the relative sizes of the four types of means.

From least to greatest, the means are the harmonic, geometric, arithmetic, and quadratic means.

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2-5 Study Guide and Intervention

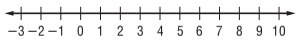
Statistics: Displaying and Analyzing Data

Create Line Plots and Stem-and-Leaf Plots One way to display data graphically is with a **line plot**. A line plot is a number line labeled with a scale that includes all the data and ×s placed above a data point each time it occurs in the data list. The ×s represent the **frequency** of the data. A **stem-and-leaf plot** can also be used to organize data. The greatest *common* place value is called the stem, and the numbers in the next greatest place value form the leaves.

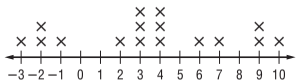
Example 1 **Draw a line plot for the data.**

−3 3 4 7 9 10 −2 3
6 4 3 9 −1 −2 4 2

Step 1 The value of the data ranges from −3 to 10, so construct a number line containing those points.



Step 2 Then place an × above the number each time it occurs.



Example 2 **Use the data below to create a stem-and-leaf plot.**

62 74 89 102 92 65 68 98 78 65
78 80 83 93 87 89 104 109 104
68 97 68 64 98 93 90 102 104

The greatest common place value is tens, so the digits in the tens place are the stems. Thus 62 would have a stem of 6 and 104 would have a stem of ten. The stem-and-leaf plot is shown below.

Stem	Leaf
6	2 4 5 5 8 8 8
7	4 8 8
8	0 3 7 9 9
9	0 2 3 3 7 8 8
10	2 2 4 4 4 9

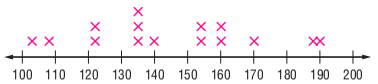
6|2 = 62

Exercises

Use the table at the right for Exercises 1–3.

Weights of Junior Varsity Wrestlers (pounds)							
170	160	135	135	160	122	188	154
108	135	140	122	103	190	154	

1. Make a line plot representing the weights of the wrestlers shown in the table at the right.



2. How many wrestlers weigh over 140 lb? 7

3. What is the greatest weight? 190 lb

Use each set of data to make a stem-and-leaf plot.

4. 32 45 41 29 30 30 31 34 38
36 32 34 41 40 42 41 29 30

Stem	Leaf
2	9 9
3	0 0 0 1 2 2 4 4 6 8
4	0 1 1 1 2 5

2|9 = 29

5. 102 104 99 109 108 112 115 120
112 114 98 94 96 101 100 102

Stem	Leaf
9	4 6 8 9
10	0 1 2 2 4 8 9
11	2 2 4 5
12	0

9|4 = 94

Lesson 2-5

NAME _____ DATE _____ PERIOD ____

2-5 Study Guide and Intervention *(continued)*

Statistics: Displaying and Analyzing Data

Analyze Data Numbers that represent the centralized, or middle, value of a set of data are called **measures of central tendency**. Three measures of central tendency are the **mean**, **median**, and **mode**.

	Definition	Example
Mean	Sum of the data values divided by the number of values in the data set.	Data: 24, 36, 21, 30, 21, 30; $\frac{24+36+21+30+21+30}{6} = 27$
Median	The middle number in a data set when the numbers are arranged in numerical order. If there is an even number of values, the median is halfway between the two middle values.	Data: 21, 21, 25, 30, 31, 42; $\frac{25+30}{2} = 27.5$
Mode	The number or numbers that occur most often in the set of data.	Data: 21, 21, 24, 30, 30, 36; 21 and 30 are modes

Example **Which measure of central tendency best represents the data?**

Stem	Leaf
9	4 6 8 9 9
10	0 1 2 4 8 9
11	2 2
12	0 1

9|4 = 94

Find the mean, median, and mode.
Mean = 105
Median = 102
Modes = 99 and 112
The median best represents the center of the data since the mean is too high.

Exercises

Find the mean, median, and mode for each data set. Then tell which best represents the data.

1.

Stem	Leaf
2	4 7 7
3	1 2 6 6 6 9
4	0
5	8 8 9

2|4 = 24

mean = 38.7;
median = 36;
mode = 36;
median or mode

2.

Stem	Leaf
9	0 0 1 3 9
10	2 2 5
11	
12	0 3 3 8 8 9

9|0 = 90

mean = 108.8
median = 103.5
modes = 90, 102, 123, 128; mean or median

3.

Stem	Leaf
5	0 1 9
6	2 2 5 5
7	1 3 5
8	0 3 7 7

5|0 = 50

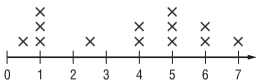
mean = 69.3;
median = 68;
mode = 62, 65, 87;
mean or median

4.

Month	Days above 90°
May	4
June	7
July	14
August	12
September	8

mean = 9;
median = 8;
mode = none;
mean or median

5.



mean = 3.7;
median = 4;
mode = 1 and 5;
median

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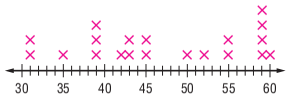
2-5 Skills Practice

Statistics: Displaying and Analyzing Data

Use each set of data to make a line plot.

1. 59 39 50 60 45 39 59 45 31 59
55 43 39 42 59 35 31 55 43 52

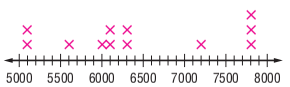


2. 5 −2 4 0 7 4 3 7 −1 4
−2 5 2 2 3 4 5 0 −2 2

INCOME For Exercises 3–5, use the list that shows the income from each assignment for a private investigator for a year.

6300	6100	7800
5600	7800	5100
6000	7200	6300
5100	6100	7800

3. Make a line plot of the data.



4. What was the median income per assignment for the investigator? **$6200**

5. Does the median best represent the data?
Yes; the incomes of $7800 (the mode) are far to the right on the plot, and also make the mean too high.

Use each set of data to make a stem-and-leaf plot.

6. 52 68 40 74 65 68 59 75 67 73
55 63 39 42 59 35 31 59 63 42

Stem	Leaf
3	1 5 9
4	0 2 2
5	2 5 9 9 9
6	3 3 5 7 8 8
7	3 4 5

6|5 = 65

7. 1.5 2.3 1.7 3.0 4.1 5.3 4.7
1.9 2.2 2.8 4.3 5.2 4.1 2.2

Stem	Leaf
1	5 7 9
2	2 2 3 8
3	0
4	1 1 3 7
5	2 3

2|2 = 2.2

EMPLOYMENT For Exercises 8–10, use the list that shows the ages of employees at Watson & Sterling Publications.

20	52	21	39	40	58	27	48	36	20	51	26
45	30	49	22	59	50	33	35	28	43	55	20

8. Make a stem-and-leaf plot of the data.

Stem	Leaf
2	0 0 0 1 2 6 7 8
3	0 3 5 6 9
4	0 3 5 8 9
5	0 1 2 5 8 9

4|5 = 45

9. Which age occurs most frequently? **20**

10. Does the mode best represent the data? Explain. **No; the mode is the lowest value of the data.**

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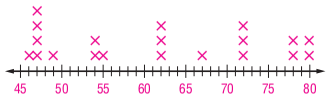
2-5 Practice (Average)

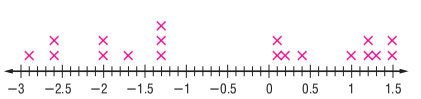
Statistics: Displaying and Analyzing Data

Use each set of data to make a line plot.

1. 72 47 62 78 49 67 80
54 47 72 55 62 47 54
62 80 47 78 72 46



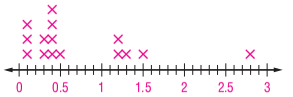
2. −2 −1.3 1.5 0.1 −1.7 0.4 1.5
1 −1.3 −2 −2.9 0.1 1.3 1.2
−2.6 1.2 0.2 −1.3 −2.6



HEALTH For Exercises 3 and 4, use the list that shows the grams of saturated fat in a serving of a variety of grains such as bread, cereal, crackers, and pasta.

0.3	1.2	0.1	0.3	0.4
0.4	0.5	0.1	0.4	0.4
0.1	1.2	2.8	1.3	1.5

3. Make a line plot of the data.



4. Which measure of central tendency best describes the data? Explain. **The mode and median, both 0.4. The mean is too high because of the value 2.8.**

Use each set of data to make a stem-and-leaf plot.

5. 41 53 22 50 41 27 36 57 20 31
28 52 41 33 28 27 41 52 22 30

Stem	Leaf
2	0 2 2 7 7 8 8
3	0 1 3 6
4	1 1 1 1
5	0 2 2 3 7

3|3 = 33

6. 4.1 7.3 6.9 5.7 4.8 7.3 5.6
6.0 4.4 7.5 4.6 7.9 5.1 7.7

Stem	Leaf
4	1 4 6 8
5	1 6 7
6	0 9
7	3 3 5 7 9

7|7 = 7.7

EMPLOYMENT For Exercises 7–10, use the lists that show survey results of students' time spent on the Internet and on the telephone for a month.

Internet								Telephone							
42	19	28	8	35	42	20	18	36	52	40	28	43	24	8	53
51	4	7	29	14	22	6		41	26	48	35	58	8	4	

7. Make a stem-and-leaf plot to compare the data.

Internet	Stem	Telephone
8 7 6 4	0	4 8 8
9 8 4	1	
9 8 2 0	2	4 6 8
5	3	5 6
2 2	4	0 1 3 8
1	5	2 3 8

5|1 = 51 *2|6 = 26*

8. Which value appears most frequently in each set of data? **Internet: 42; telephone: 8**

9. Is the mode the best measure to compare the data? **Explain. No; it is too high for the Internet and too low for the telephone.**

10. Overall, did students spend more time on the Internet or the telephone? **telephone**

Answers

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2-5

Reading to Learn Mathematics

Statistics: Displaying and Analyzing Data

Pre-Activity **How are line plots and averages used to make decisions?**

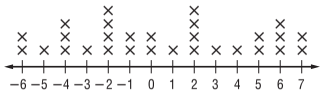
Read the introduction to Lesson 2-5 at the top of page 88 in your textbook.

- What was the number one name for boys in all five decades? **Michael**
- Look at the decade in which you were born. Is your name or the names of any of the other students in your class in the top five for that decade?

See students' work.

Reading the Lesson

1. Use the line plot shown below to answer the questions.



a. What are the data points for the line plot?

−6, −5, −4, −3, −2, −1, 0, 1, 2, 3, 4, 5, 6, 7

b. What do the three ×'s above the 6 represent?

6 occurs in the data set 3 times.

2. Explain what is meant by the frequency of a data number.

how many times the data number occurs

3. Use the stem-and-leaf plot shown at the right.

Stem	Leaf
72	0 1 1 2 5
73	2 2 2 7 9 9
74	1 3 3
75	6 6 8 9
76	0 1 8 8 8

74 | 2 = 742

a. How is the number 758 represented on the plot? ***75 | 8***

b. Explain how you know there are 23 numbers in the data.

There are 23 leaves.

Helping You Remember

4. Describe how you would explain the process of finding the median and mode from a stem-and-leaf plot to a friend who missed Lesson 2-5.

Sample answer: To find the median, count the number of leaves, then find the number in the middle. To find the mode, identify the leaf that occurs most frequently and use the stem and key to identify the data number.

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2-5

Enrichment

Runs Created

In *The 1978 Bill James Baseball Abstract*, the author introduced the "runs created" formula.

$R = \frac{(h + w)t}{(b + w)}$ where for each player h = number of hits

w = number of walks,

t = number of total bases,

b = number of at-bats, and

R = approximate number of runs a team scores due to this player's actions

1. As of June 29, 2001, Roberto Alomar of the Cleveland Indians and Seattle Mariners player Ichiro Suzuki were tied with the highest American League batting average at .351. Find the number of runs created by each player using the data below.

	h	*w*	*t*	*b*	Runs Created
Alomar	97	37	145	276	**62**
Suzuki	121	13	159	345	**60**

Based on this information, who do you think is the more valuable American League player? Why?

Sample answer: Alomar, because he creates more runs.

2. Carlos Lee of the Chicago White Sox and New York Yankee Bernie Williams were both batting .314. Find the number of runs created by each player using the data below.

	h	*w*	*t*	*b*	Runs Created
Lee	81	13	141	258	**49**
Williams	74	31	123	236	**48**

3. Why would baseball teams want to calculate the number of runs created by each of their players?

Sample answer: To help make decisions about starting line-ups; To help make decisions about trading players.

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2-6 Study Guide and Intervention

Probability: Simple Probability and Odds

Probability The **probability** of a **simple event** is a ratio that tells how likely it is that the event will take place. It is the ratio of the number of favorable outcomes of the event to the number of possible outcomes of the event. You can express the probability either as a fraction, as a decimal, or as a percent.

Probability of a Simple Event	For an event a, $P(a) = \frac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$.

Example 1 **Mr. Babcock chooses 5 out of 25 students in his algebra class at random for a special project. What is the probability of being chosen?**

$P(\text{being chosen}) = \frac{\text{number of students chosen}}{\text{total number of students}}$

The probability of being chosen is $\frac{5}{25}$ or $\frac{1}{5}$.

Example 2 **A bowl contains 3 pears, 4 bananas, and 2 apples. If you take a piece of fruit at random, what is the probability that it is *not* a banana?**

There are $3 + 4 + 2$ or 9 pieces of fruit.

There are $3 + 2$ or 5 pieces of fruit that are not bananas.

$P(\text{not banana}) = \frac{\text{number of other pieces of fruit}}{\text{total number of pieces of fruit}}$

$= \frac{5}{9}$

The probability of *not* choosing a banana is $\frac{5}{9}$.

Exercises

A card is selected at random from a standard deck of 52 cards. Determine each probability.

1. $P(10)$ $\frac{1}{13}$
2. $P(\text{red 2})$ $\frac{1}{26}$
3. $P(\text{king or queen})$ $\frac{2}{13}$
4. $P(\text{black card})$ $\frac{1}{2}$
5. $P(\text{ace of spades})$ $\frac{1}{52}$
6. $P(\text{spade})$ $\frac{1}{4}$

Two dice are rolled and their sum is recorded. Find each probability.

7. $P(\text{sum is 1})$ 0
8. $P(\text{sum is 6})$ $\frac{5}{36}$
9. $P(\text{sum is less than 4})$ $\frac{1}{12}$
10. $P(\text{sum is greater than 11})$ $\frac{1}{36}$
11. $P(\text{sum is less than 15})$ 1
12. $P(\text{sum is greater than 8})$ $\frac{5}{18}$

A bowl contains 4 red chips, 3 blue chips, and 8 green chips. You choose one chip at random. Find each probability.

13. $P(\text{not a red chip})$ $\frac{11}{15}$
14. $P(\text{red or blue chip})$ $\frac{7}{15}$
15. $P(\text{not a green chip})$ $\frac{7}{15}$

A number is selected at random from the list {1, 2, 3, …, 10}. Find each probability.

16. $P(\text{even number})$ $\frac{1}{2}$
17. $P(\text{multiple of 3})$ $\frac{3}{10}$
18. $P(\text{less than 4})$ $\frac{3}{10}$
19. A computer randomly chooses a letter from the word *COMPUTER*. Find the probability that the letter is a vowel. $\frac{3}{8}$

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2-6 Study Guide and Intervention *(continued)*

Probability: Simple Probability and Odds

Odds The odds of an event occurring is the ratio of the number of ways an event can occur (successes) to the number of ways the event cannot occur (failures).

Odds	$\frac{\text{number of successes}}{\text{number of failures}}$

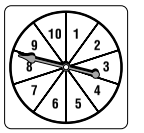
Example **A die is rolled. Find the odds of rolling a number greater than 4.**

The sample space is {1, 2, 3, 4, 5, 6}. Therefore, there are six possible outcomes. Since 5 and 6 are the only numbers greater than 4, two outcomes are successes and four are failures.

So the odds of rolling a number greater than 4 is $\frac{2}{4}$, or 1:2.

Exercises

Find the odds of each outcome if the spinner at the right is spun once.



1. multiple of 4 1:4
2. odd number 1:1
3. even or a 5 3:2
4. less than 4 3:7
5. even number greater than 5 3:7

Find the odds of each outcome if a computer randomly chooses a number between 1 and 20.

6. the number is less than 10 9:11
7. the number is a multiple of 4 1:3
8. the number is even 1:1
9. the number is a one-digit number 9:11

A bowl of money at a carnival contains 50 quarters, 75 dimes, 100 nickels, and 125 pennies. One coin is randomly selected.

10. Find the odds that a dime will not be chosen. 11:3
11. What are the odds of choosing a quarter if all the dimes are removed? 2:9
12. What are the odds of choosing a penny? 5:9

Suppose you drop a chip onto the grid at the right. Find the odds of each outcome.

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

13. land on a shaded square 1:1
14. land on a square on the diagonal 1:1
15. land on square number 16 1:15
16. land on a number greater than 12 1:3
17. land on a multiple of 5 3:13

Answers

NAME _____ DATE _____ PERIOD ____

2-6

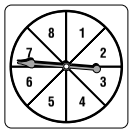
Skills Practice

Probability: Simple Probability and Odds

One chip is randomly selected from a jar containing 8 yellow chips, 10 blue chips, 7 green chips, and 5 red chips. Find each probability.

1. P(blue) $\frac{1}{3} \approx 33\%$
2. P(green) $\frac{7}{30} \approx 23\%$
3. P(yellow or green) $\frac{1}{2} = 50\%$
4. P(blue or yellow) $\frac{3}{5} = 60\%$
5. P(not red) $\frac{5}{6} \approx 83\%$
6. P(not blue) $\frac{2}{3} \approx 67\%$

Find the probability of each outcome if the spinner is spun once.



7. P(multiple of 3) $\frac{1}{4} = 25\%$
8. P(less than 7) $\frac{3}{4} = 75\%$
9. P(odd or 2) $\frac{5}{8} = 62.5\%$
10. P(not 1) $\frac{7}{8} = 87.5\%$

A person is born in the month of June. Find each probability.

11. P(date is a multiple of 6) $\frac{1}{6} \approx 17\%$
12. P(date is before June 15) $\frac{7}{15} \approx 47\%$
13. P(before June 7 or after June 24) $\frac{2}{5} = 40\%$
14. P(not after June 5) $\frac{1}{6} \approx 17\%$

Find the odds of each outcome if a computer randomly picks a letter in the name *The Petrified Forest*.

15. the letter f 2:16 or 1:8
16. the letter e 4:14 or 2:7
17. the letter t 3:15 or 1:5
18. a vowel 7:11

CLASS SCHEDULES For Exercises 19–22, use the following information.

A student can select an elective class from the following: 3 in music, 5 in physical education, 2 in journalism, 8 in computer programming, 4 in art, and 6 in drama. Find each of the odds if a student forgets to choose an elective and the school assigns one at random.

19. The class is computer programming. 8:20 or 2:5
20. The class is drama. 6:22 or 3:11
21. The class is not physical education. 23:5
22. The class is not art. 24:4 or 6:1

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2-6

Practice (Average)

Probability: Simple Probability and Odds

One chip is randomly selected from a jar containing 13 blue chips, 8 yellow chips, 15 brown chips, and 6 green chips. Find each probability.

1. P(brown) $\frac{5}{14} \approx 36\%$
2. P(green) $\frac{1}{7} \approx 14\%$
3. P(blue or yellow) $\frac{1}{2} = 50\%$
4. P(not yellow) $\frac{17}{21} \approx 81\%$

A card is selected at random from a standard deck of 52 cards. Find each probability.

5. P(heart) $\frac{1}{4} = 25\%$
6. P(black card) $\frac{1}{2} = 50\%$
7. P(jack) $\frac{1}{13} \approx 8\%$
8. P(red jack) $\frac{1}{26} \approx 4\%$

Two dice are rolled and their sum is recorded. Find each probability.

9. P(sum less than 6) $\frac{5}{18} \approx 28\%$
10. P(sum less than 2) $0 = 0\%$
11. P(sum greater than 10) $\frac{1}{12} \approx 8\%$
12. P(sum greater than 9) $\frac{1}{6} \approx 17\%$

Find the odds of each outcome if a computer randomly picks a letter in the name *The Badlands of North Dakota*.

13. the letter d 3:21 or 1:7
14. the letter a 4:20 or 1:5
15. the letter h 2:22 or 1:11
16. a consonant 16:8 or 2:1

CLASS PROJECTS For Exercises 17–20, use the following information.

Students in a biology class can choose a semester project from the following list: animal behavior (4), cellular processes (2), ecology (6), health (7), and physiology (3). Find each of the odds if a student selects a topic at random.

17. the topic is ecology 6:16 or 3:8
18. the topic is animal behavior 4:18 or 2:9
19. the topic is not cellular processes 20:2 or 10:1
20. the topic is not health 15:7

SCHOOL ISSUES For Exercises 21 and 22, use the following information.

A news team surveyed students in grades 9–12 on whether to change the time school begins. One student will be selected at random to be interviewed on the evening news. The table gives the results.

Grade	9	10	11	12
No change	6	2	5	3
Hour later	10	7	9	8

21. What is the probability the student selected will be in the 9th grade? $\frac{8}{25} = 32\%$
22. What are the odds the student selected wants no change? 16:34 or 8:17

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2-6

Reading to Learn Mathematics

Probability: Simple Probability and Odds

Pre-Activity **Why is probability important in sports?**

Read the introduction to Lesson 2-6 at the top of page 96 in your textbook.

Look up the definition of the word *probability* in a dictionary. Rewrite the definition in your own words.

Sample answer: the likelihood of something happening

Reading the Lesson

1. Write whether each statement is *true* or *false*. If false, replace the underlined word or number to make a true statement.

a. Probability can be written as a fraction, a decimal, or a percent. **true**

b. The sample space of flipping one coin is heads or tails. **true**

c. The probability of an impossible event is 1. **false; 0**

d. The odds against an event occurring are the odds that the event will occur. **false; will not**

2. Explain why the probability of an event cannot be greater than 1 while the odds of an event can be greater than 1.

Sample answer: To find the probability of an event, you compare a part of the sample space to the whole sample space. When you find the odds of an event, you compare the number of favorable outcomes to the number of unfavorable outcomes. In some situations, there may be more favorable than unfavorable outcomes.

Helping You Remember

3. Probabilities are usually written as fractions, decimals, or percents. Odds are usually written with a colon (for example, 1:3). How can the spelling of the word *colon* help remember this?

Sample answer: The word *colon* has the letter "o" as its only vowel, and the word *odds* also has the letter "o" as its only vowel.

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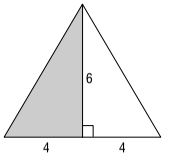
2-6

Enrichment

Geometric Probability

If a dart, thrown at random, hits the triangular board shown at the right, what is the probability that it will hit the shaded region? This can be determined by comparing the area of the shaded region to the area of the entire board. This ratio indicates what fraction of the tosses should hit in the shaded region.



$$\frac{\text{area of shaded region}}{\text{area of triangular board}} = \frac{\frac{1}{2}(4)(6)}{\frac{1}{2}(8)(6)}$$

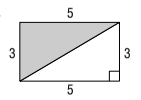
$$= \frac{12}{24} \text{ or } \frac{1}{2}$$

In general, if S is a subregion of some region R, then the probability, $P(S)$, that a point, chosen at random, belongs to subregion S is given by the following:

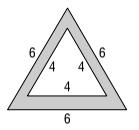
$$P(S) = \frac{\text{area of subregion } S}{\text{area or region } R}$$

Find the probability that a point, chosen at random, belongs to the shaded subregions of the following figures.

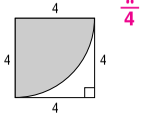
1. $\frac{1}{2}$



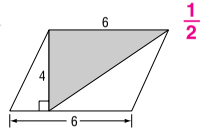
2. $\frac{5}{9}$



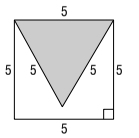
3. $\frac{\pi}{4}$



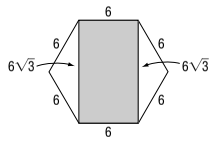
4. $\frac{1}{2}$



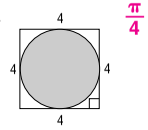
5. $\frac{\sqrt{3}}{4}$



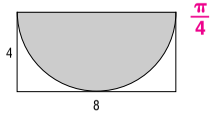
6. $\frac{2}{3}$



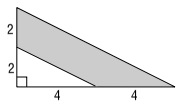
7. $\frac{\pi}{4}$



8. $\frac{\pi}{4}$



9. $\frac{3}{4}$



Answers

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2-7 Study Guide and Intervention

Square Roots and Real Numbers

Square Roots A **square root** is one of two equal factors of a number. For example, the square roots of 36 are 6 and -6, since $6 \cdot 6$ or 6^2 is 36 and $(-6)(-6)$ or $(-6)^2$ is also 36. A rational number like 36, whose square root is a rational number, is called a **perfect square**.

The symbol $\sqrt{\ }$ is a **radical sign**. It indicates the nonnegative, or **principal**, square root of the number under the radical sign. So $\sqrt{36} = 6$ and $-\sqrt{36} = -6$. The symbol $\pm\sqrt{36}$ represents both square roots.

Example 1 **Find $-\sqrt{\frac{25}{49}}$.**

$-\sqrt{\frac{25}{49}}$ represents the negative square root of $\frac{25}{49}$.

$\frac{25}{49} = \left(\frac{5}{7}\right)^2 \rightarrow -\sqrt{\frac{25}{49}} = -\frac{5}{7}$

Example 2 **Find $\pm\sqrt{0.16}$.**

$\pm\sqrt{0.16}$ represents the positive and negative square roots of 0.16.

$0.16 = 0.4^2$ and $0.16 = (-0.4)^2$

$\pm\sqrt{0.16} = \pm 0.4$

Exercises

Find each square root.

1. $\sqrt{64}$ 8
2. $-\sqrt{81}$ -9
3. $\sqrt{16.81}$ 4.1
4. $\pm\sqrt{100}$ ± 10
5. $-\sqrt{\frac{4}{25}}$ $-\frac{2}{5}$
6. $-\sqrt{121}$ -11
7. $\pm\sqrt{\frac{25}{144}}$ $\pm\frac{5}{12}$
8. $-\sqrt{\frac{25}{16}}$ $-\frac{5}{4}$
9. $\pm\sqrt{\frac{121}{100}}$ $\pm\frac{11}{10}$
10. $-\sqrt{3600}$ -60
11. $-\sqrt{6.25}$ -2.5
12. $\pm\sqrt{0.0004}$ ± 0.02
13. $\sqrt{\frac{144}{196}}$ $\frac{6}{7}$
14. $-\sqrt{\frac{36}{49}}$ $-\frac{6}{7}$
15. $\pm\sqrt{1.21}$ ± 1.1

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2-7 Study Guide and Intervention *(continued)*

Square Roots and Real Numbers

Classify and Order Numbers Number such as $\sqrt{2}$ and $\sqrt{3}$ are not perfect squares. Notice what happens when you find these square roots with your calculator. The numbers continue indefinitely without any pattern of repeating digits. Numbers that cannot be written as a terminating or repeating decimal are called **irrational numbers**. The set of **real numbers** consists of the set of irrational numbers and the set of rational numbers together. The chart below illustrates the various kinds of real numbers.

Natural Numbers	{1, 2, 3, 4, ...}
Whole Numbers	{0, 1, 2, 3, 4, ...}
Integers	{..., −3, −2, −1, 0, 1, 2, 3, ...}
Rational Numbers	{all numbers that can be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$}
Irrational Numbers	{all numbers that cannot be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$}

Example **Name the set or sets of numbers to which each real number belongs.**

a. $\frac{4}{11}$ Because 4 and 11 are integers, this number is a rational number.

b. $\sqrt{81}$ Because $\sqrt{81} = 9$, this number is a natural number, a whole number, an integer, and a rational number.

c. $\sqrt{32}$ Because $\sqrt{32} = 5.656854249\ldots$, which is not a repeating or terminating decimal, this number is irrational.

Exercises

Name the set or sets of numbers to which each real number belongs.

1. $\frac{84}{12}$ natural, whole, integer, rational
2. $-\frac{6}{7}$ rational
3. $\frac{2}{3}$ rational
4. $\sqrt{54}$ irrational
5. 3.145 rational
6. $\sqrt{25}$ natural, whole, integer, rational
7. 0.62626262... rational
8. $\sqrt{22.51}$ irrational

Write each set of numbers in order from least to greatest.

9. $-\frac{3}{4}, -5, \sqrt{25}, \frac{7}{4}$ $-5, -\frac{3}{4}, \frac{7}{4}, \sqrt{25}$
10. $\sqrt{0.09}, -0.3131\ldots, \frac{3}{5}$ $-0.3131\ldots, \sqrt{0.09}, \frac{3}{5}$
11. $-1.\overline{25}, 0.05, -\frac{1}{4}, \sqrt{5}$ $-1.\overline{25}, -\frac{1}{4}, 0.05, \sqrt{5}$
12. $\frac{5}{4}, -2, \sqrt{124}, -3.11$ $-3.11, -2, \frac{5}{4}, \sqrt{124}$
13. $-\sqrt{1.44}, -0.35\ \frac{1}{5}$ $-\sqrt{1.44}, -0.35, \frac{1}{5}$
14. $0.\overline{35}, 2\frac{1}{3}, -\frac{9}{5}, \sqrt{5}$ $-\frac{9}{5}, 0.\overline{35}, \sqrt{5}, 2\frac{1}{3}$

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2-7 Skills Practice

Square Roots and Real Numbers

Find each square root. If necessary, round to the nearest hundredth.

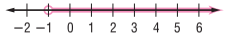
1. $\sqrt{144}$ 12
2. $-\sqrt{36}$ −6
3. $\pm\sqrt{0.25}$ ±0.5
4. $-\sqrt{\frac{49}{100}}$ $-\frac{7}{10}$
5. $\pm\sqrt{17}$ ±4.12
6. $\sqrt{2.25}$ 1.5

Name the set or sets of numbers to which each real number belongs.

7. $-\frac{28}{7}$
   integer, rational
8. $-\frac{5}{6}$
   rational
9. $\sqrt{29}$
   irrational
10. $\sqrt{196}$
    natural, whole, integer, rational
11. $\frac{9}{13}$
    rational
12. $\sqrt{1.8}$
    irrational

Graph each solution set.

13. $x > -1$



14. $x \leq 1$

15. $x < 1.5$

16. $x \geq -2.5$

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

17. $\frac{4}{9}$ ● $0.\overline{4}$ =
18. $0.0\overline{9}$ ● $\frac{1}{90}$ >
19. $6.2\overline{3}$ ● $\sqrt{39}$ <
20. $\frac{1}{8}$ ● $\frac{1}{\sqrt{8}}$ <

Write each set of numbers in order from least to greatest.

21. $\sqrt{5}, 2.\overline{36}, \frac{7}{3}$ $\sqrt{5}, \frac{7}{3}, 2.\overline{36}$
22. $\frac{2}{9}, 0.\overline{21}, \sqrt{0.05}$ $0.\overline{21}, \frac{2}{9}, \sqrt{0.05}$
23. $-\sqrt{12}, -3.\overline{48}, -\sqrt{11}$
    $-3.\overline{48}, -\sqrt{12}, -\sqrt{11}$
24. $0.\overline{43}, \frac{\sqrt{6}}{5}, \frac{3}{7}$ $\frac{3}{7}, 0.43, \frac{\sqrt{6}}{5}$

NAME _____ DATE _____ PERIOD ____

2-7 Practice (Average)

Square Roots and Real Numbers

Find each square root. If necessary, round to the nearest hundredth.

1. $\sqrt{324}$ 18
2. $-\sqrt{62}$ −7.87
3. $\pm\sqrt{25}$ ±5
4. $-\sqrt{84}$ −9.17
5. $\pm\sqrt{\frac{4}{289}}$ $\pm\frac{2}{17}$
6. $-\sqrt{\frac{7}{12}}$ −0.76
7. $-\sqrt{0.081}$ −0.28
8. $\pm\sqrt{3.06}$ ±1.75

Name the set or sets of numbers to which each real number belongs.

9. $\sqrt{93}$ irrational
10. $-\sqrt{0.0625}$ rational
11. $\frac{8}{7}$ rational
12. $-\frac{144}{3}$ integer, rational

Graph each solution set.

13. $x < -0.5$

14. $x \geq -3.5$

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

15. $0.9\overline{3}$ ● $\sqrt{0.93}$ <
16. $8.1\overline{7}$ ● $\sqrt{66}$ >
17. $\frac{5}{6}$ ● $\frac{\sqrt{5}}{6}$ >

Write each set of numbers in order from least to greatest.

18. $\sqrt{0.03}, \frac{\sqrt{2}}{8}, 0.\overline{17}$
    $0.\overline{17}, \sqrt{0.03}, \frac{\sqrt{2}}{8}$
19. $-\frac{84}{30}, -\sqrt{8}, -\frac{\sqrt{7}}{8}$
    $-\sqrt{8}, -\frac{84}{30}, -\frac{\sqrt{7}}{8}$
20. $-\sqrt{8.5}, -\frac{\sqrt{35}}{2}, -2\frac{19}{20}$
    $-\frac{\sqrt{35}}{2}, -2\frac{19}{20}, -\sqrt{8.5}$

21. **SIGHTSEEING** The distance you can see to the horizon is given by the formula $d = \sqrt{1.5h}$, where d is the distance in miles and h is the height in feet above the horizon line. Mt. Whitney is the highest point in the contiguous 48 states. Its elevation is 14,494 feet. The lowest elevation, at −282 feet, is located near Badwater, California. With a clear enough sky and no obstructions, could you see from the top of Mt. Whitney to Badwater if the distance between them is 135 miles? Explain. **Yes; you can see about 149 miles from the top of Mt. Whitney to an elevation of −282 feet.**

22. **SEISMIC WAVES** A *tsunami* is a seismic wave caused by an earthquake on the ocean floor. You can use the formula $s = 3.1\sqrt{d}$, where s is the speed in meters per second and d is the depth of the ocean in meters, to determine the speed of a tsunami. If an earthquake occurs at a depth of 200 meters, what is the speed of the tsunami generated by the earthquake? **about 43.8 m/s**

Answers

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NAME _____ DATE _____ PERIOD ____

2-7

Reading to Learn Mathematics

Square Roots and Real Numbers

Pre-Activity **How can using square roots determine the surface area of the human body?**

Read the introduction to Lesson 2-7 at the top of page 103 in your textbook.

The expression $\sqrt{3600}$ is read, "the square root of 3600." How would you read the expression $\sqrt{64}$?

the square root of 64

Reading the Lesson

Complete each statement below.

1. The symbol $\sqrt{\ }$ is called a _____radical sign_____ and is used to indicate a nonnegative or principal square root of the expression under the symbol.

2. A _____rational approximation_____ of an irrational number is a rational number that is close to, but not equal to, the value of the irrational number.

3. The positive square root of a number is called the _____principal_____ square root of the number.

4. A number whose positive square root is a rational number is a _____perfect square_____.

5. Write each of the following as a mathematical expression that uses the $\sqrt{\ }$ symbol.

   a. the positive square root of 1600 $\sqrt{1600}$

   b. the negative square root of 729 $-\sqrt{729}$

   c. the principal square root of 3025 $\sqrt{3025}$

6. The irrational numbers and rational numbers together form the set of _____real_____ numbers.

Helping You Remember

7. Use a dictionary to look up several words that begin with "ir-". What does the prefix "ir-" mean? How can this help you remember the meaning of the word *irrational*?

Sample answer: The prefix "ir-" means *not*. So an irrational number is a number that is not a rational number.

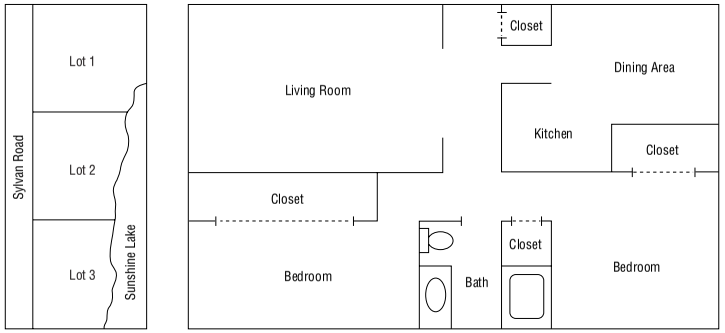
NAME _____ DATE _____ PERIOD ____

2-7

Enrichment

Scale Drawings

The map at the left below shows building lots for sale. The scale ratio is 1:2400. At the right below is the floor plan for a two-bedroom apartment. The length of the living room is 6 m. On the plan the living room is 6 cm long.



Answer each question.

1. On the map, how many feet are represented by an inch?
   200 ft

2. On the map, measure the frontage of Lot 2 on Sylvan Road in inches. What is the actual frontage in feet?
   200 ft

3. What is the scale ratio represented on the floor plan?
   1:100

4. On the floor plan, measure the width of the living room in centimeters. What is the actual width in meters?
   4 m

5. About how many square meters of carpeting would be needed to carpet the living room?
   24 m^2

6. Make a scale drawing of your classroom using an appropriate scale.
   Answers will vary.

7. Use your scale drawing to determine how many square meters of tile would be needed to install a new floor in your classroom.
   Answers will vary.

Glencoe Algebra 1

Chapter 2 Assessment Answer Key

Form 1

Page 117

1. B
2. C
3. D
4. B
5. D
6. B
7. C
8. C
9. D
10. A
11. C

Page 118

12. B
13. C
14. D
15. C
16. A
17. D
18. C
19. A
20. B

B: 1

Form 2A

Page 119

1. D
2. C
3. A
4. B
5. A
6. D
7. C
8. B
9. D
10. A
11. A

(continued on the next page)

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Chapter 2 Assessment Answer Key

Form 2A *(continued)*
Page 120

12. C
13. C
14. A
15. D
16. B
17. A
18. B
19. C
20. A

B: 13.3

Form 2B
Page 121

1. C
2. A
3. D
4. C
5. B
6. D
7. A
8. B
9. D
10. B
11. B

Page 122

12. A
13. D
14. D
15. A
16. D
17. B
18. A
19. C
20. B

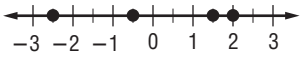
B: 2

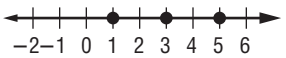
Chapter 2 Assessment Answer Key

Form 2C

Page 123

1. $\{-4, -1, 0, 2, 3, 5\}$

2. 

3. 

4. -5

5. 3

6. 11

7. -12.9

8. $\frac{1}{6}$

9. 8.11

10. $-\frac{11}{9}$ or $-1\frac{2}{9}$

11. -64

12. $-\frac{8}{35}$

13. $-23a$

14. 68.16

15. -6.72

16. -8.8

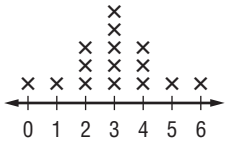
17. $\frac{27}{7}$ or $3\frac{6}{7}$

18. -4

19. $-5w + 3$

20. -1.3

Page 124

21. 

22. 3

23. $0, 1, 5, 6$

24. 5

25. They are all the same, so all of them represent the data well.

26. $\frac{3}{4}$ or 75%

27. $\frac{1}{4}$ or 25%

28. $1 : 2$

29. $7 : 5$

30. ± 1.1

31. natural numbers, whole numbers, integers, and rational numbers

32.

33. $-\sqrt{\frac{1}{9}}, -\frac{2}{9}, 0, \frac{2}{11}, 0.25$

B: 752 B.C.

Answers

Chapter 2 Assessment Answer Key

Form 2D

Page 125

1. $\{-5, -1, 0, 1, 3, 4\}$

2.

3.

4. 9

5. 19

6. 13

7. −18.9

8. $\frac{2}{9}$

9. −12.81

10. $\frac{9}{8}$ or $1\frac{1}{8}$

11. −105

12. $-\frac{5}{21}$

13. $-22b$

14. −5.61

15. −24.51

16. −9.5

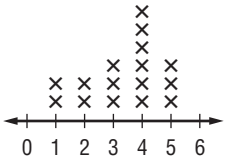
17. $-\frac{3}{10}$

18. −4

19. $6w - 5$

20. −1.5

Page 126

21. 

22. 4

23. 1, 2

24. 4

25. No; the mean is lower than the cluster of most of the values.

26. $\frac{12}{17}$ or about 71%

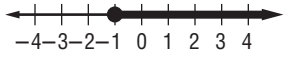
27. $\frac{5}{17}$ or about 29%

28. 8 : 9

29. 5 : 4

30. $-\frac{6}{13}$

31. integers and rational numbers

32. 

33. $-\sqrt{\frac{4}{9}}, -\frac{3}{8}, 0, 0.4, \frac{4}{7}$

B: $\frac{1}{250}$

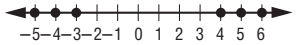
Chapter 2 Assessment Answer Key

Form 3

Page 127

1. $\left\{-1, -\frac{1}{3}, \frac{2}{3}, \frac{4}{3}\right\}$

2.

3. 

4. $1\frac{2}{9}$

5. $-\frac{3}{2}$ or $-1\frac{1}{2}$

6. 14,776 ft

7. −113

8. $\frac{27}{35}$

9. 516 ft

10. 160

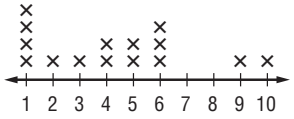
11. $\frac{15}{2}$ or $7\frac{1}{2}$

12. −4.8

13. $4x - 7y$

14. 3.2

Page 128

15. 

16. Sample answer: Median or mean; the mode is too low.

17.

Stem	Leaf
16	0 7 8
17	6
18	2 5
19	0 2 3 7
20	1 2 2 3 5

16 | 7 = 1.67

18. Sample answer: Median; the mode is too high.

19. $\frac{7}{36}$ or about 19%

20. 1 : 1

21. 0

22. 7 : 3

23. $\pm\frac{4}{25}$

24. natural numbers, whole numbers, integers, and rational numbers

25. $-1, -\sqrt{\frac{1}{16}}, -\frac{2}{9}, -0.2, -\frac{2}{11}$

B: −4.3

Answers

Chapter 2 Assessment Answer Key

Page 129, Open-Ended Assessment
Scoring Rubric

Score	General Description	Specific Criteria
4	**Superior** A correct solution that is supported by well-developed, accurate explanations	• Shows thorough understanding of the concepts of *graphing rational numbers, adding, subtracting, and dividing rational numbers, displaying and analyzing data, simple probability and odds, square roots,* and *classifying and ordering real numbers.* • Uses appropriate strategies to solve problems. • Computations are correct. • Written explanations are exemplary. • Graphs are accurate and appropriate. • Goes beyond requirements of some or all problems.
3	**Satisfactory** A generally correct solution, but may contain minor flaws in reasoning or computation	• Shows an understanding of the concepts of *graphing rational numbers, adding, subtracting, and dividing rational numbers, displaying and analyzing data, simple probability and odds, square roots,* and *classifying and ordering real numbers.* • Uses appropriate strategies to solve problems. • Computations are mostly correct. • Written explanations are effective. • Graphs are mostly accurate and appropriate. • Satisfies all requirements of problems.
2	**Nearly Satisfactory** A partially correct interpretation and/or solution to the problem	• Shows an understanding of most of the concepts of *graphing rational numbers, adding, subtracting, and dividing rational numbers, displaying and analyzing data, simple probability and odds, square roots,* and *classifying and ordering real numbers.* • May not use appropriate strategies to solve problems. • Computations are mostly correct. • Written explanations are satisfactory. • Graphs are mostly accurate. • Satisfies the requirements of most of the problems.
1	**Nearly Unsatisfactory** A correct solution with no supporting evidence or explanation	• Final computation is correct. • No written explanations or work is shown to substantiate the final computation. • Graphs may be accurate but lack detail or explanation. • Satisfies minimal requirements of some of the problems.
0	**Unsatisfactory** An incorrect solution indicating no mathematical understanding of the concept or task, or no solution is given	• Shows little or no understanding of the concepts of *graphing rational numbers, adding, subtracting, and dividing rational numbers, displaying and analyzing data, simple probability and odds, square roots,* and *classifying and ordering real numbers.* • Does not use appropriate strategies to solve problems. • Computations are incorrect. • Written explanations are unsatisfactory. • Graphs are inaccurate or inappropriate. • Does not satisfy requirements of problems. • No answer may be given.

Chapter 2 Assessment Answer Key

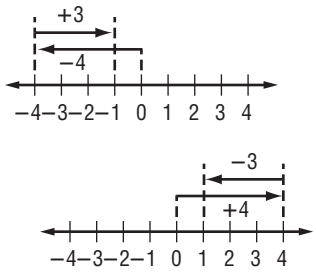
Page 129, Open-Ended Assessment
Sample Answers

In addition to the scoring rubric found on page A28, the following sample answers may be used as guidance in evaluating open-ended assessment items.

1a. The student should explain that the point on a number line represents the location of a number relative to the rest of the real numbers. The coordinate of a point is the number that the point represents.

1b. Sample answer: Draw a number line with tick marks labeled from –5 to 5. Plot points at 3, 4, and 5. Make the right arrow bold to represent that the graph continues indefinitely in that direction.

2a.



Since $-4 + 3$ lies to the left of $4 + (-3)$ on a number line, the number $-4 + 3$ is not greater than $4 + (-3)$.

2b. The student should explain that subtracting a number is the same as adding the opposite of the number, thus making it possible to subtract by adding. Sample answer: $2 - 1 = 2 + (-1) = 1$

3. If x and y are both positive, then $\frac{x}{y}$ is positive: $x = 4, y = 2, \frac{x}{y} = \frac{4}{2} = 2$.

If x and y are both negative, then $\frac{x}{y}$ is positive: $x = -6, y = -3, \frac{-6}{-3} = 2$.

4a. Sample answer: {1, 1, 2, 4, 5, 10, 11, 12, 13, 14, 15}; mean is 8; mode is 1.

4b. The student should use the set of data created for part **a**.

Sample answer:

Stem	Leaf
0	1 1 2 4 5
1	0 1 2 3 4 5

0 | 1 = 01

5a. The probability that an event will occur is defined to be the number of favorable outcomes divided by the total number of possible outcomes. The number of favorable outcomes is always less than or equal to the total number of possible outcomes. Thus, this quotient is always less than or equal to 1, which means it can never equal 2.

5b. The odds that an event will occur is the ratio of the number of ways an event can occur to the number of ways the event cannot occur. The total number of possible outcomes is the sum of the number of ways an event can occur and the number of ways the event cannot occur. Thus, if the odds that an event will occur is 1 : 1, then the probability that the event will occur is $\frac{1}{1+1} = \frac{1}{2}$.

6a. The student should recognize that, since there is no real number that can be multiplied by itself to produce a negative number, $\sqrt{-49}$ is not a real number. However, $-\sqrt{49}$ is the negative square root of 49, or -7.

6b. Sample answer: $-2.1, -2, -\sqrt{2}, -1, 1, 2$

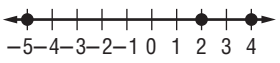
Answers

Chapter 2 Assessment Answer Key

Vocabulary Test/Review
Page 130

1. e
2. h
3. a
4. b
5. j
6. c
7. d
8. f
9. g
10. i
11. The absolute value of any number n is its distance from zero on the number line.
12. A pair of numbers consisting of a positive rational number and a negative rational number with a sum of zero.

Quiz (Lessons 2–1 and 2–2)
Page 131

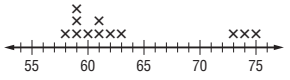
1. {…, −4, −3, −2, −1, 0, 1}
2. 

3. 72
4. 4.9
5. −4
6. 3
7. −4
8. $\frac{5}{6}$
9. −77
10. 1.4

Quiz (Lessons 2–3 and 2–4)
Page 131

1. −217
2. $-\frac{4}{7}$
3. $31a$
4. −0.24
5. −7
6. $\frac{6}{5}$ or $1\frac{1}{5}$
7. 10
8. $3x + 5y$
9. $-\frac{8}{3}$ or $-2\frac{2}{3}$
10. −5.75

Quiz (Lessons 2–5 and 2–6)
Page 132

1. 

2. 59
3. Sample answer: Median; the mode is too low and the mean is too high.
4. $\frac{5}{14}$
5. 3 : 1

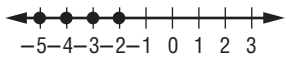
Quiz (Lesson 2–7)
Page 132

1. −7
2. 0.6
3. $\pm\frac{11}{5}$
4. natural numbers, whole numbers, integers, and rational numbers
5. irrational numbers
6.

7. <
8. >
9. $-\frac{4}{9}, -\frac{1}{3}, 0.3, \frac{1}{\sqrt{10}}$
10. C

Chapter 2 Assessment Answer Key

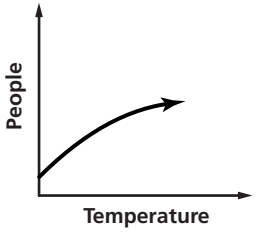
Mid-Chapter Test
Page 133

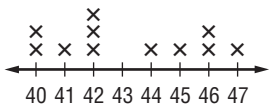
1. C
2. D
3. B
4. A
5. D
6. C
7. B
8. 

9. -79
10. $\frac{7}{10}$
11. 72
12. $-\frac{27}{8}$ or $-3\frac{3}{8}$
13. -2
14. -27.3
15. 0.58

Cumulative Review
Page 134

1. $x^2 + 7$
2. 84
3. $17a - 3$
4. $4x + 14$
5. hypothesis: I finish my homework; conclusion: I'll go to the store; If I finish my homework, then I'll go to the store.
6. Sample answer:



7. $-3, -1, 2, 5, 6$
8. 36
9. 17.8
10. 14
11. $-\frac{6}{35}$
12. $2t - 3$
13. 

14. $\frac{1}{26}$
15. $-\frac{9}{4}, -\sqrt{5}, 2.2\overline{4}, \frac{57}{25}$

Answers

Chapter 2 Assessment Answer Key

Standardized Test Practice

Page 135

1. A B **C** D

2. **E** F G H

3. A B **C** D

4. E F G **H**

5. A B C **D**

6. E **F** G H

7. A **B** C D

8. E F **G** H

9. A B **C** D

10. E F **G** H

Page 136

11.

1	7	2	8
.	/ .	/ .	.
	0	0	0
1	1	1	1
2	2	**2**	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	**7**	7	7
8	8	8	**8**
9	9	9	9

12.

2	2		
.	/ .	/ .	.
	0	0	0
1	1	1	1
2	**2**	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

13.

7	1	8	
.	/ .	/ .	.
	0	0	0
1	**1**	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	**8**	8
9	9	9	9

14.

1	.	6	
.	/ **.**	/ .	.
	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	**6**	6
7	7	7	7
8	8	8	8
9	9	9	9

15. A **B** C D

16. A B **C** D

17. **A** B C D