

**GLENCOE
MATHEMATICS**

Pre-Algebra

Chapter 3 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.

<i>Study Guide and Intervention Workbook</i>	0-07-827794-9
<i>Study Guide and Intervention Workbook (Spanish)</i>	0-07-827795-7
<i>Skills Practice Workbook</i>	0-07-827788-4
<i>Skills Practice Workbook (Spanish)</i>	0-07-827790-6
<i>Practice Workbook</i>	0-07-827789-2
<i>Practice Workbook (Spanish)</i>	0-07-827791-4

Answers for Workbooks The answers for Chapter 3 of these workbooks can be found in the back of this Chapter Resource Masters booklet.

Spanish Assessment Masters Spanish versions of forms 2A and 2C of the Chapter 3 Test are available in the *Pre-Algebra Spanish Assessment Masters* (0-07-830412-1).

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Pre-Algebra Chapter 3 Resource Masters

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Teacher's Guide to Using the Chapter 3 Resource Masters

The **Fast File** Chapter Resource system allows you to conveniently file the resources you use most often. The *Chapter 3 Resource Masters* includes the core materials needed for Chapter 3. 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 *Pre-Algebra 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 3-1. Encourage them to add these pages to their Pre-Algebra Study Notebook. Remind them to add definitions and examples as they complete each lesson.

Study Guide and Intervention

Each lesson in Pre-Algebra addresses one or two objectives. There is one Study Guide and Intervention master for each lesson.

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 3 Resource 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 Pre-Algebra. It can also be used as a test. This master includes free-response questions.
- The **Standardized Test Practice** offers continuing review of pre-algebra concepts in various formats, which may appear on the standardized tests that they may encounter. This practice includes multiple-choice, grid-in, and open-ended 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 142–143. 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.

3

Reading to Learn Mathematics***Vocabulary Builder***

This is an alphabetical list of key vocabulary terms you will learn in Chapter 3. As you study this chapter, complete each term's definition or description. Remember to add the page number where you found the term. Add these pages to your Pre-Algebra Study Notebook to review vocabulary at the end of the chapter.

Vocabulary Term	Found on Page	Definition/Description/Example
area		
<u>coefficient</u> koh-uh-FIHSH-ehnt		
constant		
equivalent equations		
equivalent expressions		
formula		

3

Reading to Learn Mathematics***Vocabulary Builder*** (continued)

Vocabulary Term	Found on Page	Definition/Description/Example
inverse operations		
like terms		
perimeter		
simplest form		
simplifying an expression		
term		
two-step equation		

3-1 Study Guide and Intervention

The Distributive Property

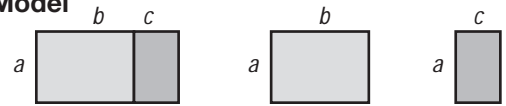
The expressions $2(1 + 5)$ and $2 \cdot 1 + 2 \cdot 5$ are equivalent expressions because they have the same value, 12. The **Distributive Property** combines addition and multiplication.

Symbols

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

$$(b + c)a = ba + ca$$

Model



The Distributive Property also combines subtraction and multiplication. Rewrite subtraction expressions as addition expressions.

Example 1

Use the Distributive Property to write each expression as an equivalent expression. Then evaluate the expression.

a. $2(6 + 3)$

$$\begin{aligned} 2(6 + 3) &= 2 \cdot 6 + 2 \cdot 3 \\ &= 12 + 6 \\ &= 18 \end{aligned}$$

b. $5(9 - 3)$

$$\begin{aligned} 5(9 - 3) &= 5 [9 + (-3)] \\ &= 5 \cdot 9 + 5 \cdot (-3) \\ &= 45 + (-15) \\ &= 30 \end{aligned}$$

The Distributive Property can also be used with algebraic expressions containing variables.

Example 2

Use the Distributive Property to write each expression as an equivalent algebraic expression.

a. $7(m + 5)$

$$\begin{aligned} 7(m + 5) &= 7m + 7 \cdot 5 \\ &= 7m + 35 \end{aligned}$$

b. $-3(n - 8)$

$$\begin{aligned} -3(n - 8) &= -3[n + (-8)] \\ &= -3 \cdot n + (-3)(-8) \\ &= -3n + 24 \end{aligned}$$

Exercises

Use the Distributive Property to write each expression as an equivalent expression. Then evaluate the expression, if possible.

1. $3(8 + 2)$

2. $2(9 + 11)$

3. $5(19 - 6)$

4. $-6(3 + 14)$

5. $(17 - 4)3$

6. $(5 + 3)7$

7. $3(d + 4)$

8. $(w - 5)4$

9. $-2(c + 7)$

3-1 Skills Practice***The Distributive Property***

Use the Distributive Property to write each expression as an equivalent expression. Then evaluate the expression.

1. $8(50 + 4)$

2. $(20 + 9)5$

3. $2(60 + 4)$

4. $7(40 - 2)$

5. $4(400 - 2)$

6. $-4(16 + 5)$

7. $-8(4 + 1)$

8. $9(24 - 19)$

9. $-3(7 - 11)$

10. $-10(12 - 4)$

11. $(21 + 9)(-5)$

12. $-7(1 - 10)$

13. $-2(1 - 6)$

14. $4(15 + 25)$

15. $15(100 + 6)$

16. $12(22 - 52)$

Use the Distributive Property to write each expression as an equivalent algebraic expression.

17. $4(d + 2)$

18. $1(u - 3)$

19. $-6(f + 5)$

20. $-2(g - 3)$

21. $3(x - 7)$

22. $8(-b + 4)$

23. $(9 - h)5$

24. $(c + 1)(-4)$

25. $-1(2 - y)$

26. $-7(a + 1)$

27. $11(k - 20)$

28. $-9(r - 1)$

29. $5(1 - b)$

30. $8(x + 12)$

31. $-6(p + 15)$

32. $4(h - 16)$

33. $-3(w - 10)$

34. $-10(c + 9)$

35. $2(11 - q)$

36. $-4(12 - f)$

37. $12(n + 2)$

38. $16(g + 1)$

39. $-8(9 + b)$

40. $-5(z - 4)$

41. $6(r - 20)$

42. $7(2 - j)$

43. $-1(m + 1)$

44. $-2(v - 8)$

45. $5(q - 16)$

46. $-10(c - 7)$

47. $-3(-x - 1)$

48. $(9 - h)(-2)$

3-1 Practice***The Distributive Property***

Use the Distributive Property to write each expression as an equivalent expression. Then evaluate the expression.

- | | | | |
|------------------|-------------------|-------------------|--------------------|
| 1. $6(80 + 1)$ | 2. $7(70 - 4)$ | 3. $(300 + 6)4$ | 4. $(100 + 10)9$ |
| 5. $5(400 - 90)$ | 6. $-8(700 - 3)$ | 7. $4(20 - 9)$ | 8. $(100 - 3)(-7)$ |
| 9. $-1(75 - 9)$ | 10. $14(21 - 11)$ | 11. $-25(80 + 2)$ | 12. $31(450 - 18)$ |

Use the Distributive Property to write each expression as an equivalent algebraic expression.

- | | | | |
|-------------------|--------------------|---------------------|-------------------|
| 13. $7(y + 11)$ | 14. $-6(t - 1)$ | 15. $-8(u - 2)$ | 16. $(r + 9)(-4)$ |
| 17. $-1(-h + 5)$ | 18. $-2(f + 3)$ | 19. $-4(b - 1)$ | 20. $1(7 - v)$ |
| 21. $-2(d - 5)$ | 22. $22(n + 10)$ | 23. $-50(z - 1)$ | 24. $-12(g + 12)$ |
| 25. $17(p + 4)$ | 26. $(k - 21)(-8)$ | 27. $(-32 - s)(-9)$ | 28. $-28(a - 5)$ |
| 29. $-20(19 - a)$ | 30. $33(d + 4)$ | 31. $-18(-q - 5)$ | 32. $-16(c + 45)$ |
| 33. $-19(v - 1)$ | 34. $-1(r + 27)$ | 35. $53(x + 11)$ | 36. $-17(-n + 1)$ |

37. PLANTS A planter weighs 2 pounds and holds 3 pounds of soil. Write two equivalent expressions for the total weight of nine planters. Then find the weight.

38. UNIFORMS A uniform costs \$42 for the sweater and \$29 for the slacks. Write two equivalent expressions for the total cost of six uniforms. Then find the cost.

3-1

Reading to Learn Mathematics***The Distributive Property*****Pre-Activity** *How are rectangles related to the Distributive Property?*

Do the activity at the top of page 98 in your textbook. Write your answers below.

a. Draw a 2-by-5 and a 2-by-4 rectangle. Find the total area in two ways.

b. Draw a 4-by-4 and a 4-by-1 rectangle. Find the total area in two ways.

c. Draw any two rectangles that have the same width. Find the total area in two ways.

d. What did you notice about the total area in each case?

Reading the Lesson

Write a definition and give an example of the new vocabulary term.

	Vocabulary	Definition	Example
1.	equivalent expressions		

2. In rewriting $3(x + 2)$, which term is “distributed” to the other terms in the expression?

Helping You Remember

3. *Distribute* is a word that is used frequently in the English language.

a. Find the definition of *distribute* in a dictionary. Write the definition.

b. Explain how the English definition can help you remember how the word *distributive* relates to mathematics.

3-1 Enrichment

What Day Was It?

To find the day of the week on which a date occurred, follow these steps.

- Use the formula $s = d + 2m + \left[\frac{3(m+1)}{5} \right] + y + \left[\frac{y}{4} \right] - \left[\frac{y}{100} \right] + \left[\frac{y}{400} \right] + 2$

where s = sum,

d = day of the month, using whole numbers from 1 to 31,

m = month, where March = 3, April = 4, and so on, up to December = 12; then January = 13 and February = 14, and

y = year except for dates in January or February when the previous year is used.

- Evaluate expressions inside the special brackets $[]$ by dividing, then discarding the remainder and using only the whole number part of the quotient.
- After finding the value of s , divide s by 7 and note the remainder.
- The remainder 0 represents Saturday, 1 represents Sunday, 2 represents Monday, and so on to 6 represents Friday.

Example

On December 7, 1941, Pearl Harbor was bombed. What day of the week was that?

Let $d = 7$, $m = 12$, and $y = 1941$.

$$s = d + 2m + \left[\frac{3(m+1)}{5} \right] + y + \left[\frac{y}{4} \right] - \left[\frac{y}{100} \right] + \left[\frac{y}{400} \right] + 2$$

$$s = 7 + 2(12) + \left[\frac{3(12+1)}{5} \right] + 1941 + \left[\frac{1941}{4} \right] - \left[\frac{1941}{100} \right] + \left[\frac{1941}{400} \right] + 2$$

$$s = 7 + 24 + \left[\frac{39}{5} \right] + 1941 + \left[\frac{1941}{4} \right] - \left[\frac{1941}{100} \right] + \left[\frac{1941}{400} \right] + 2$$

$$s = 7 + 24 + 7 + 1941 + 485 - 19 + 4 + 2$$

$$s = 2451$$

Now divide s by 7. $2451 \div 7 = 305 \text{ R}1$

Since the remainder is 1, December 7, 1941, was a Sunday.

Use the formula to solve each problem.

- Verify today's date.
- What will be the day of the week for April 13, 2012?
- On what day of the week was the signing of the Declaration of Independence, July 4, 1776?
- On what day of the week were you born?

3-2 Study Guide and Intervention

Simplifying Algebraic Expressions

term: a number, a variable, or a product of numbers and variables

coefficient: the numerical part of a term that also contains a variable

constant: term without a variable

like terms: terms that contain the same variables

Example 1

Identify the terms, like terms, coefficients, and constants in the expression $4m - 5m + n - 7$.

$$4m - 5m + n - 7 = 4m + (-5m) + n + (-7) \quad \text{Definition of subtraction}$$

$$= 4m + (-5m) + 1n + (-7) \quad \text{Identity Property}$$

terms $4m, -5m, 1n, -7$; like terms: $4m, -5m$; coefficients: $4, -5, 1$; constants: -7

When an algebraic expression has no like terms and no parentheses, we say that it is in **simplest form**.

Example 2

Simplify $6x - 5 - 2x + 7$.

$$6x - 5 - 2x + 7 = 6x + (-5) + (-2x) + 7 \quad \text{Definition of subtraction}$$

$$= 6x + (-2x) + (-5) + 7 \quad \text{Commutative Property}$$

$$= [6 + (-2)]x + (-5) + 7 \quad \text{Distributive Property}$$

$$= 4x + 2 \quad \text{Simplify.}$$

Exercises

Identify the terms, like terms, coefficients, and constants in each expression.

1. $2 + 6a + 4a$

2. $m + 4m + 2m + 5$

3. $3c + 4d - c + 2$

4. $5h - 3g + 2g - h$

5. $3w + 4u - 6$

6. $4r - 5s + 5s - 2r$

Simplify each expression.

7. $9m + 3m$

8. $5x - x$

9. $8y + 2y + 3y$

10. $4 + m - 3m$

11. $13a + 7a + 2a$

12. $3y + 1 + 5 + 4y$

13. $8d - 4 - d + 5$

14. $10 - 4s + 2s - 3$

3-2**Skills Practice*****Simplifying Algebraic Expressions*****Simplify each expression.**

1. $7a + a$

2. $k - k$

3. $m + 3m + 8$

4. $10b - b + 1$

5. $9j + 8j - 7j$

6. $6y + 3y + 6y - 2y$

7. $3q + 2q - q$

8. $18 + 7x - 12 + 5x$

9. $12a + 3 + 18 - 9a$

10. $13c - 7 + c - d$

11. $5h + h - 4h + 1 - 2h$

12. $2(v - 5) + 7v + 4$

13. $5(r + 9) - 5$

14. $1 - 4(u - 1)$

15. $-7(w - 4) + 3w - 27$

16. $-8 - 7(y + 2)$

17. $-18(c - 1) - 18$

18. $12(n - 4) - 3n$

19. $5m - 9 + 4m$

20. $-7 + g + 1 - 6g$

21. $x - 9x + 3 + 8x - 3$

22. $6(r - 4) + r + 30 - 7r$

23. $-5 + 5a - 4 - 2a + 3a$

24. $21 - 8(v + 3) + 3 + 7v$

25. $4x - 9 + 3x + 6 - 9x - 4$

26. $p - 2 + 1 - p + 1 + 2p$

27. $-11f + 6 - f + 4 + 13f - 9$

28. $3(d - 4) + 2 - 2d + 1 - d$

29. $1 - s + 2 + 2s - 3s + 1$

30. $5 - 9k + 1 + k - 2(7 - k)$

31. $1 - g + 5 - 2g + 3(g - 2)$

32. $7h + 1 - h + 4 - 2 - 8h$

33. $-12 + 7(d - 1) + 14 - d$

3-2

Practice

Simplifying Algebraic Expressions

Simplify each expression.

1. $6y - 4 + y$

2. $8u + 2u - 3u$

3. $-12 + 5g + 8 - g$

4. $-21w + 5 + 3w - 1$

5. $r + r + r + r + r$

6. $f - 3f + 2 - f + 1$

7. $-8q + 6 + 5q - 3$

8. $h + 5h - 3 - 6h$

9. $2a - 5(a + 1)$

10. $b - 2(b - 2)$

11. $9 - t - 3(t + 3)$

12. $-8 + 5(g + 2) - 2$

13. $12m + 9 - 2m - 16$

14. $4(y - 3) + 9 - 3y$

15. $8a + b - 3a + 4b$

16. $-11x + 4 + 8x - 4 + 3x$

17. $-14y + 12(x + y) - 12x$

18. $19g - 4h + 4 - 20(g - 1)$

19. $-5(c + d) - 4d + 5c - d$

20. $(8 - b)(-3) + 6b + 12 - 10b$

21. $-p + q + 2(p + q) - p - q$

22. $-55n + 28n + 21n + 7n - n$

23. $-12z + 4(z - 9) + 30 + z$

24. $-9 + w - v + 5w + 2v + 5$

25. $-6(y - 1) + 2y + 7 - y + 4$

26. $x - 10 + y - 2(x + y) + y$

Write an expression in simplest form that represents the total amount in each situation.

27. **LUNCH** You bought 3 pieces of chicken that cost x dollars each, a salad for \$3, and a drink for \$1.

28. **SOCCER** Sal has scored g goals this season. Ben has scored four times as many goals as Sal. Chun has scored three fewer goals than Ben.

3-2

Reading to Learn Mathematics***Simplifying Algebraic Expressions***

Pre-Activity *How can you use algebra tiles to simplify an algebraic expression?*

Do the activity at the top of page 103 in your textbook. Write your answers below.

a. $3x + 2 + 4x + 3$

b. $2x + 5 + x$

c. $4x + 5 + 3$

d. $x + 2x + 4x$

Reading the Lesson

Write a definition and give an example of each new vocabulary word or phrase.

Vocabulary	Definition	Example
1. term		
2. coefficient		
3. like terms		
4. constant		
5. simplest form		
6. simplifying an expression		

7. Is $2(r + 1)$ in simplest form? Explain.

Helping You Remember

8. *Constant* is a word used in everyday English as well as in mathematics.

a. Find the definition of *constant* in a dictionary. Write the definition.

b. Explain how the English definition can help you remember how *constant* is used in mathematics.

3-2 Enrichment

Algebraic Proof

Recall that properties are statements that are true for any numbers. These properties are used to prove theorems. Use the properties you have learned to complete each proof.

Abbreviations for some properties you may need to use are listed below.

Commutative Property—Addition (CPA)

Commutative Property—Multiplication (CPM)

Associative Property—Addition (APA)

Associative Property—Multiplication (APM)

Additive Identity Property (AIP)

Multiplicative Identity Property (MIP)

Inverse Property of Addition (IPA)

Inverse Property of Multiplication (IPM)

Multiplicative Property of Zero (MPZ)

Distributive Property (DP)

Write the reason for each statement.

1. Prove: $-(y - x) = x - y$

Statement

$$\begin{aligned} -(y - x) &= -1(y - x) \\ &= -1y - (-1x) \\ &= -y - (-x) \\ &= -y + x \\ &= x + (-y) \\ &= x - y \end{aligned}$$

Reason

MIP

- a. _____
 b. _____
 c. _____
 d. _____
 e. _____

2. Prove: $3x - 4 - x = 2x - 4$

Statement

$$\begin{aligned} 3x - 4 - x &= 3x + (-4) + (-x) \\ &= 3x + (-x) + (-4) \\ &= 3x + (-1x) + (-4) \\ &= [3 + (-1)]x + (-4) \\ &= 2x + (-4) \\ &= 2x - 4 \end{aligned}$$

Reason

- a. _____
 b. _____
 c. _____
 d. _____
 e. _____
 f. _____

3. Prove: $-2x + 6 + 2x = 6$

Statement

$$\begin{aligned} -2x + 6 + 2x &= -2x + 2x + 6 \\ &= (-2 + 2)x + 6 \\ &= 0x + 6 \\ &= 0 + 6 \\ &= 6 \end{aligned}$$

Reason

- a. _____
 b. _____
 c. _____
 d. _____
 e. _____

3-3

Study Guide and Intervention

Solving Equations by Adding or Subtracting

Step 1	Identify the variable.
Step 2	To isolate the variable, add the same number to or subtract the same number from each side of the equation.
Step 3	Check the solution.

Example 1 Solve $x + 2 = 6$.

$$x + 2 = 6$$

$$x + 2 - 2 = 6 - 2 \quad \text{Subtract 2 from each side.}$$

$$x = 4$$

Check: $x + 2 = 6$

$$4 + 2 = 6$$

$$6 = 6 \checkmark$$

The solution is 4.

Example 2 Solve $x - 9 = -13$.

$$x - 9 = -13$$

$$x - 9 + 9 = -13 + 9 \quad \text{Add 9 to each side.}$$

$$x = -4$$

Check: $x - 9 = -13$

$$-4 - 9 = -13$$

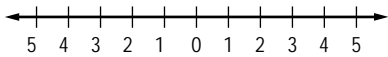
$$-13 = -13 \checkmark$$

The solution is -4.

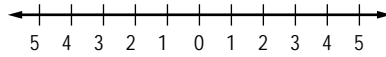
Exercises

Solve each equation. Graph the solution of each equation on the number line.

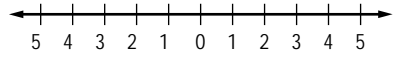
1. $x + 5 = 2$



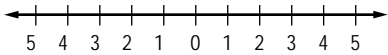
2. $11 + w = 10$



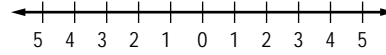
3. $k + 3 = -1$



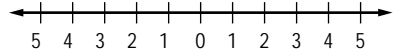
4. $m - 2 = 3$



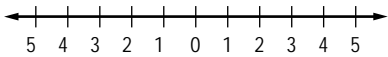
5. $a - 7 = -5$



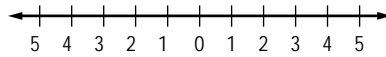
6. $b - 13 = -13$



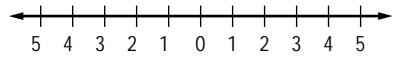
7. $-3 + h = -7$



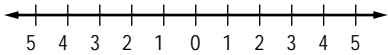
8. $-12 = y - 9$



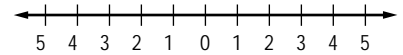
9. $2 + r = -3$



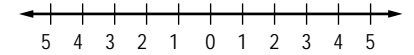
10. $9 + b = 9$



11. $7 + k = 10$



12. $g - 9 = -5$



3-3**Skills Practice*****Solving Equations by Adding or Subtracting*****Solve each equation. Check your solution.**

1. $r + 1 = -5$

2. $h + 8 = 6$

3. $t - 3 = -11$

4. $p - 5 = 9$

5. $w + 9 = -9$

6. $x - 9 = -9$

7. $a + 7 = -7$

8. $m + 9 = -7$

9. $q - 4 = 5$

10. $b + 2 = 3$

11. $n - 11 = 1$

12. $r - 1 = -3$

13. $c + 6 = 1$

14. $v - 3 = -7$

15. $z + 3 = 0$

16. $s - 8 = -1$

17. $y - 7 = -5$

18. $u - 10 = -2$

19. $g + 1 = 10$

20. $k + 4 = -9$

21. $w + 12 = -4$

22. $z - 8 = -8$

23. $d - 11 = 1$

24. $h + 3 = 10$

25. $r + 10 = -6$

26. $y + 1 = 4$

27. $f - 6 = 6$

28. $d - 2 = -8$

29. $j + 11 = 4$

30. $m - 10 = 4$

31. $q + 3 = -5$

32. $g - 4 = 0$

33. $a - 12 = -19$

34. $c + 5 = 2$

35. $h - 9 = 12$

36. $p + 14 = -1$

37. $v + 13 = -11$

38. $x + 8 = -1$

39. $y + 12 = -10$

40. $k - 16 = 7$

41. $d - 15 = -14$

42. $g - 12 = 10$

43. $b + 13 = -20$

44. $f - 15 = -1$

45. $q + 8 = 13$

46. $w - 4 = -15$

47. $r + 10 = -13$

48. $t - 11 = 11$

49. $j - 9 = -8$

50. $k + 2 = -15$

51. $n + 12 = 0$

52. $y + 9 = 14$

3-3 Practice**Solving Equations by Adding or Subtracting**

Solve each equation. Check your solution.

1. $z + 6 = -5$

2. $x - 8 = -3$

3. $c - 2 = 21$

4. $v + 9 = 0$

5. $q + 10 = -30$

6. $w + 15 = 0$

7. $z + 12 = -19$

8. $b - 11 = 8$

9. $a - 12 = 0$

10. $r + 11 = 12$

11. $p + (-9) = 33$

12. $n - 16 = -16$

13. $s + 13 = -5$

14. $t - (-15) = 21$

15. $r - 14 = -23$

16. $m + (-3) = 9$

17. $d - 19 = 1$

18. $y + 30 = -1$

19. $u - 21 = 0$

20. $k - 18 = 2$

21. $f - 23 = 23$

22. $g - 24 = -24$

23. $h + 35 = 7$

24. $j + 40 = 25$

25. $x + 3 = -15$

26. $c + 22 = -27$

27. $v - 18 = -4$

28. $b - 41 = -30$

29. $h - 10 = 19$

30. $y - (-12) = 0$

31. $g + 58 = 9$

32. $n + 29 = 4$

33. $j + (-14) = 1$

34. $p - 21 = -2$

35. $k - (-13) = -8$

36. $m + 33 = 16$

37. SAVINGS ACCOUNT Jhumpa has \$55 in her savings account. This is \$21 more than David. Write and solve an equation to find the amount David has in his savings account.

38. WEATHER The temperature fell 16° between noon and 3:00 P.M. At 3:00, the temperature was -3°F . Write an equation to determine the temperature at noon.

3-3

Reading to Learn Mathematics***Solving Equations by Adding or Subtracting***

Pre-Activity *How is solving an equation similar to keeping a scale in balance?*

Do the activity at the top of page 110 in your textbook. Write your answers below.

- a. Without looking in the bag, how can you determine the number of blocks in the bag?

- b. Explain why your method works.

Reading the Lesson

Write a definition and give an example of each new vocabulary phrase.

Vocabulary	Definition	Example
1. inverse operations		
2. equivalent equations		

3. Are $x - 2 = 8$ and $x = 6$ equivalent equations? Explain.

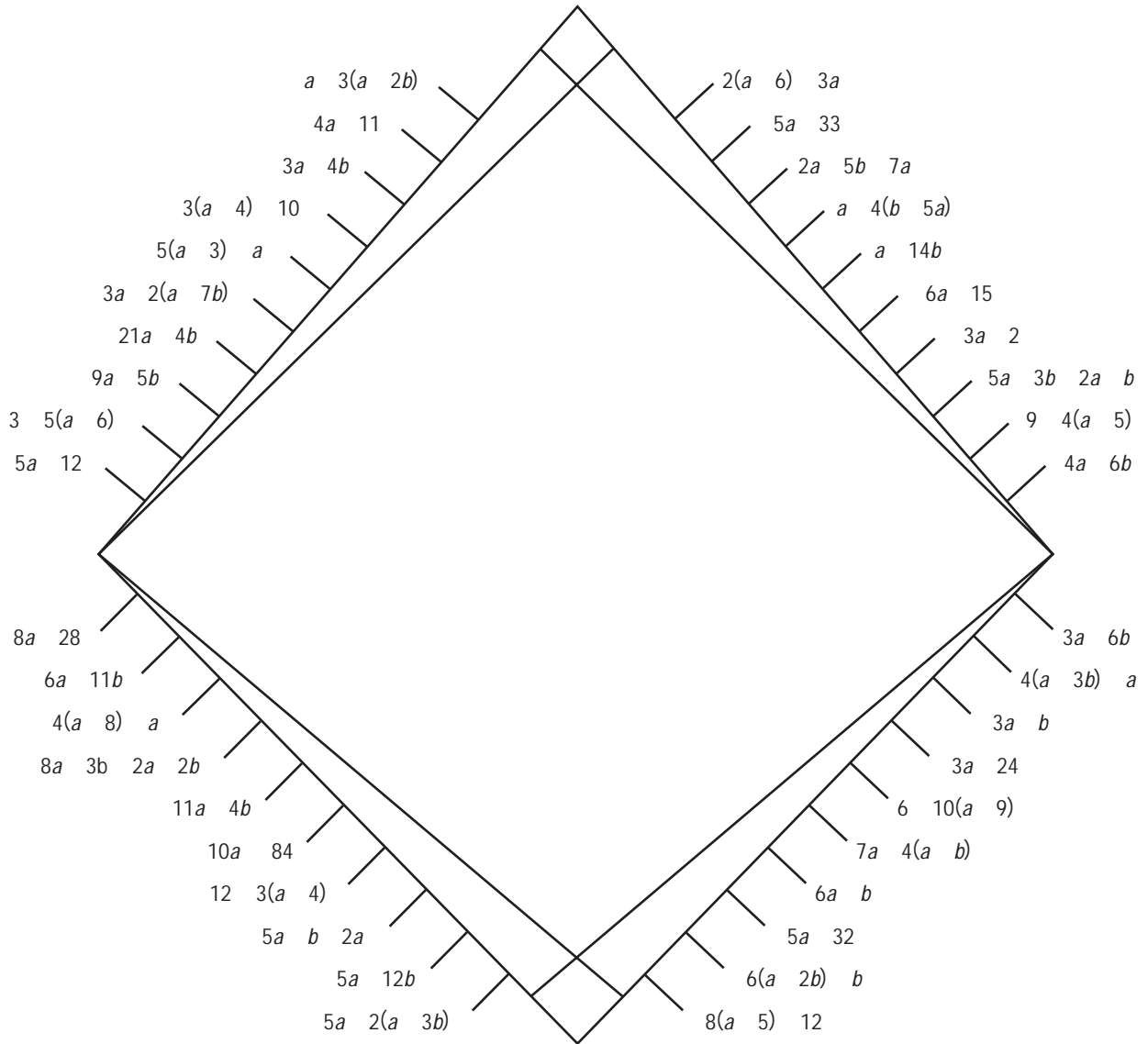
Helping You Remember

4. How is adding 2 blocks to each side of a balanced scale like the Addition Property of Equality?

3-3 Enrichment

Creating a Line Design

Connect each pair of equivalent expressions with a straight line segment. Describe the finished design.



Lesson 3-3

3-4 Study Guide and Intervention

Solving Equations by Multiplying or Dividing

- Step 1** Identify the variable.
- Step 2** To isolate the variable, multiply or divide each side of the equation by the same nonzero number to get the variable by itself.
- Step 3** Check the solution.

Example 1 Solve $-7x = 42$.

$$-7x = 42$$

$$\frac{-7x}{-7} = \frac{42}{-7} \quad \text{Divide each side by } -7.$$

$$x = -6 \quad \text{Check your solution.}$$

The solution is -6 .

Example 2 Solve $\frac{y}{2} = -2$.

$$\frac{y}{2} = -2$$

$$\left(\frac{y}{2}\right)2 = (-2)2 \quad \text{Multiply each side by } 2.$$

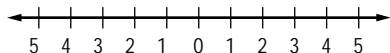
$$y = -4 \quad \text{Check your solution.}$$

The solution is -4 .

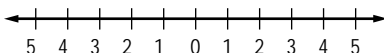
Exercises

Solve each equation. Graph the solution of each equation on the number line.

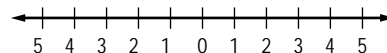
1. $-3a = 15$



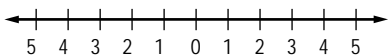
2. $-t = 5$



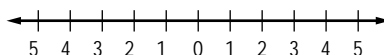
3. $-1 = \frac{n}{4}$



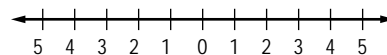
4. $7r = 28$



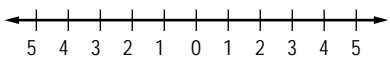
5. $0 = \frac{h}{7}$



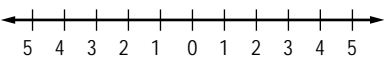
6. $24 = -8m$



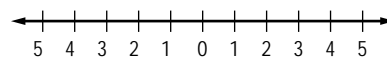
7. $-11b = 44$



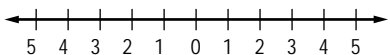
8. $\frac{a}{-2} = -1$



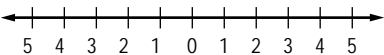
9. $12d = -48$



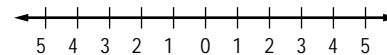
10. $-10p = 10$



11. $\frac{r}{-5} = -1$



12. $-11w = -33$



3-4**Skills Practice*****Solving Equations by Multiplying or Dividing*****Solve each equation. Check your solution.**

1. $3x = 24$

2. $\frac{m}{-5} = -15$

3. $-4f = 16$

4. $\frac{u}{2} = 12$

5. $-6a = 6$

6. $\frac{s}{-1} = 10$

7. $-2y = -2$

8. $-7z = 7$

9. $\frac{n}{8} = -24$

10. $-4r = -12$

11. $-9h = 81$

12. $\frac{c}{-10} = 1$

13. $\frac{v}{-15} = -15$

14. $\frac{m}{12} = 0$

15. $-12g = 12$

16. $\frac{w}{-4} = 0$

17. $-1f = 11$

18. $\frac{r}{-1} = 22$

19. $8d = -16$

20. $\frac{r}{15} = 45$

21. $25k = -200$

22. $-3p = 18$

23. $7j = -63$

24. $\frac{y}{-10} = 10$

25. $\frac{x}{-8} = -1$

26. $5g = -20$

27. $\frac{p}{6} = 0$

28. $7y = 7$

29. $-6q = -30$

30. $-12c = -60$

31. $-9b = 90$

32. $-4k = -120$

33. $2r = 0$

34. $-1t = 19$

35. $\frac{n}{-12} = 12$

36. $-15j = 120$

37. $\frac{u}{-11} = 11$

38. $5c = 85$

39. $-9q = -36$

40. $9z = -144$

3-4 Practice**Solving Equations by Multiplying or Dividing**

Solve each equation. Check your solution.

1. $8y = 56$

2. $\frac{w}{4} = 12$

3. $-3u = -12$

4. $\frac{r}{-5} = 15$

5. $9d = -9$

6. $-8f = 0$

7. $\frac{n}{-1} = 31$

8. $\frac{v}{14} = -7$

9. $-1b = 24$

10. $-12h = -72$

11. $\frac{r}{24} = -5$

12. $\frac{p}{-6} = -3$

13. $-15x = 90$

14. $-4g = -20$

15. $\frac{z}{20} = -1$

16. $11t = 0$

17. $23g = -92$

18. $-7d = -28$

19. $\frac{m}{-15} = 7$

20. $9k = -9$

21. $6w = 0$

22. $-4r = 120$

23. $\frac{u}{12} = 1$

24. $-11q = -99$

25. $16y = -192$

26. $\frac{n}{-8} = 0$

27. $-7j = 84$

28. $-21p = -231$

Write and solve an equation for each sentence.

29. The product of a number and -6 is -54 .

30. The quotient of a number and 6 is -14 .

31. **CLASS REPORTS** Each student needs 12 minutes to give a report. A class period is 48 minutes long. Write and solve an equation to determine the number of students who could give a report in one class period.

32. **COOKING** One pound of ground beef makes four hamburger patties. Write and solve an equation to determine how many pounds of beef are needed to make 36 hamburgers.

3-4

Reading to Learn Mathematics***Solving Equations by Multiplying or Dividing***

Pre-Activity *How are equations used to find the U.S. value of foreign currency?*

Do the activity at the top of page 115 in your textbook. Write your answers below.

- Suppose lunch in Mexico costs 72 pesos. Write an equation to find the cost in U.S. dollars.
- How can you find the cost in U.S. dollars?

Reading the Lesson

- How do you undo multiplication in an expression?
- What does the expression $\frac{x}{2}$ mean?
- Explain how to find the value of x in the equation $\frac{x}{4} = 3$. How do you check your answer?

Helping You Remember

- You have learned about four properties of equalities: Addition Property of Equality, Subtraction Property of Equality, Multiplication Property of Equality, and Division Property of Equality. In each circle, write three equations that can be solved by using the given property. Include at least one negative integer in each circle.

These equations can be solved by using the given property.

Addition Property	Subtraction Property	Multiplication Property	Division Property
○	○	○	○

3-4 Enrichment

Puzzling Equations

Solve each equation. Notice that the first equation is completed.

1. $\frac{m}{12} = 13$

2. $17v = -578$

3. $\frac{c}{75} = 18$

4. $-252d = -5796$

5. $64 \cdot w = 5568$

6. $g \div 29 = 61$

7. $p(85) = -7225$

8. $39x = 663$

9. $\frac{k}{18} = 30$

10. $\frac{z}{-94} = -32$

11. $-112q = 1456$

12. $201y = -1608$

13. $\frac{a}{14} = -17$

14. $-8045 = -5k$

15. $m \div (-105) = 8$

1. $\underline{156} = I$

2. $\underline{\quad} = A$

3. $\underline{\quad} = E$

4. $\underline{\quad} = J$

5. $\underline{\quad} = A$

6. $\underline{\quad} = M$

7. $\underline{\quad} = R$

8. $\underline{\quad} = S$

9. $\underline{\quad} = Y$

10. $\underline{\quad} = R$

11. $\underline{\quad} = O$

12. $\underline{\quad} = N$

13. $\underline{\quad} = R$

14. $\underline{\quad} = S$

15. $\underline{\quad} = H$

Use the letter beside each of your answers to decode the answer to this question.

What woman led a 125-mile march from Pennsylvania to Long Island in 1903 to bring the practice of child labor to the attention of President Theodore Roosevelt?

1769	34	3008	540

840	87	238	85	156	1609

23	13	8	1350	17

3-5

Study Guide and Intervention

Solving Two-Step Equations

A two-step equation contains two operations. To solve two-step equations, use inverse operations to undo each operation in reverse order. First, undo addition/subtraction. Then, undo multiplication/division.

ExampleSolve $\frac{c}{2} - 13 = 7$.

$$\frac{c}{2} - 13 = 7$$

$$\frac{c}{2} - 13 + 13 = 7 + 13 \quad \text{Add 13 to each side.}$$

$$\frac{c}{2} = 20$$

$$\left(\frac{c}{2}\right)2 = (20)2 \quad \text{Multiply each side by 2.}$$

$$c = 40$$

Check:

$$\frac{c}{2} - 13 = 7$$

$$\frac{40}{2} - 13 = 7$$

$$20 - 13 = 7$$

$$7 = 7 \checkmark$$

The solution is 40.

For some problems, it may be necessary to combine like terms before solving.

Exercises

Solve each equation. Check your solution.

1. $5t + 2 = 7$

2. $2x + 5 = 9$

3. $6u - 8 = 28$

4. $8m - 7 = 17$

5. $16 = 2w + 6$

6. $50 = 6d + 8$

7. $21 = 42 + 7k$

8. $4a - 10 = 42$

9. $7c - 4 = -32$

10. $12 - 3m = 18$

11. $28 = 2h - 18$

12. $-10 = -5x - 25$

13. $\frac{m}{4} + 6 = 70$

14. $5 + \frac{p}{2} = 45$

15. $18 = \frac{g}{3} + 6$

16. $4 + \frac{n}{5} = 29$

17. $\frac{m}{7} - 9 = 5$

18. $\frac{k}{9} - 3 = -11$

19. $13 + \frac{a}{4} = -3$

20. $-3 + \frac{c}{2} = 12$

21. $\frac{v}{-3} + 8 = 22$

22. $8x - 16 + 8x = 16$

23. $12a - 14a = 8$

24. $7c - 8 - 2c = 17$

25. $6 = -y + 42 - 2y$

26. $16 + 8r - 4r + 4 = 24$

3-5 Skills Practice

Solving Two-Step Equations

Solve each equation. Check your solution.

1. $3x + 10 = 1$

2. $\frac{a}{5} + 8 = 9$

3. $8w - 12 = -4$

4. $\frac{r}{2} + 6 = 5$

5. $18 - 2q = 4$

6. $3j - 20 = 16$

7. $\frac{u}{12} - 8 = -8$

8. $7p + 11 = -31$

9. $12d + 15 = 3$

10. $4c + 20 = 0$

11. $\frac{n}{2} - 9 = -5$

12. $10b - 19 = 11$

13. $2h + 10 = -12$

14. $6k - 9 = 15$

15. $\frac{w}{-5} - 4 = -2$

16. $12 - 7y = -2$

17. $11 - 3g = 32$

18. $12s + 13 = 25$

19. $2z - 4 - z = 4$

20. $10 - 5h + 2 = 32$

21. $\frac{r}{-7} - 5 = -6$

22. $-4a + 5 - 2a - 9 = 44$

23. $\frac{w}{-3} + 6 - 1 = 2$

24. $7k - 8k = 1$

25. $7f - 24 = 25$

26. $6 - \frac{m}{6} - 8 = 0$

27. $10 - d = 19$

28. $9x + 5 - 4x = -20$

29. $3 - 4t + 11 = 2$

30. $\frac{a}{3} - 4 + 9 = 7$

31. $6q - 4 = -16$

32. $\frac{m}{8} - 12 - 3 = -12$

33. $5b + 6 - 6b + 2 = 19$

3-5

Practice

Solving Two-Step Equations

Solve each equation. Check your solution.

1. $6p + 22 = 10$

2. $\frac{r}{3} - 4 = 2$

3. $5d - 9 = -24$

4. $21q - 11 = 10$

5. $\frac{v}{-6} + 1 = 0$

6. $7h + 20 = -8$

7. $8k - 40 = 16$

8. $\frac{w}{2} - 16 = 5$

9. $\frac{s}{4} - 5 = 1$

10. $\frac{x}{8} + 7 = 9$

11. $\frac{z}{10} - 20 = -20$

12. $\frac{r}{-2} + 11 = 15$

13. $9q + 10 = 118$

14. $\frac{n}{5} - 4 = -10$

15. $6w - 125 = 1$

16. $\frac{r}{3} - 16 = 2$

17. $9y - 11 - 5y = 25$

18. $20 - 15d = 35$

19. $\frac{u}{-9} - 8 = -4$

20. $-6h + 4 - 3 + h = 11$

21. $5p - 4p = 7$

22. $18 - \frac{x}{3} = -7$

23. $21 + 9j - 10 = -277$

24. $12b - 9 + 2b - b = -87$

25. $1 + \frac{a}{-9} - 4 = 0$

26. $4w - w - 26 = 19$

27. $5 - 4y + y - 1 = -23$

28. RENTAL AGREEMENTS A furniture rental store charges a down-payment of \$100 and \$75 per month for a table. Hilde paid \$550 to rent the table. Solve $75n + 100 = 550$ to find the number of months Hilde rented the table.

29. BUSINESS At work, Jack must stuff 1000 envelopes with advertisements. He can stuff 12 envelopes in one minute, and he has 112 envelopes already finished. Solve $1000 = 12n + 112$ to find how many minutes it will take Jack to complete the task.

3-5 Reading to Learn Mathematics

Solving Two-Step Equations

Pre-Activity *How can algebra tiles show the properties of equality?*

Do the activity at the top of page 120 in your textbook. Write your answers below.

- What property is shown by removing a tile from each side?
- What property is shown by separating the tile into two groups?
- What is the solution of $2x + 1 = 9$?

Reading the Lesson

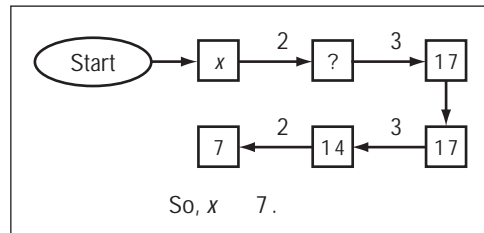
Write a definition and give an example of the new vocabulary phrase.

Vocabulary	Definition	Example
1. two-step equation		

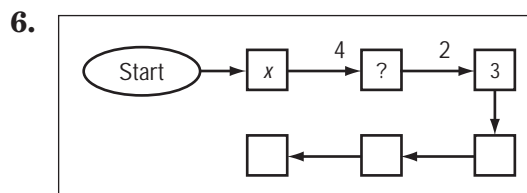
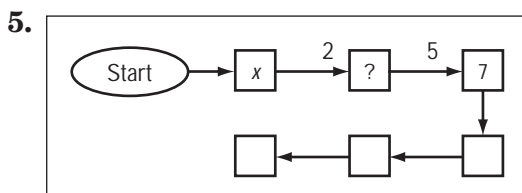
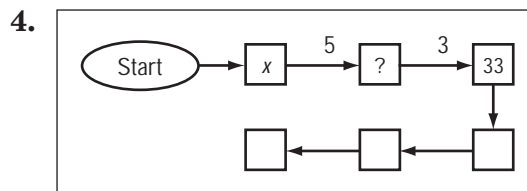
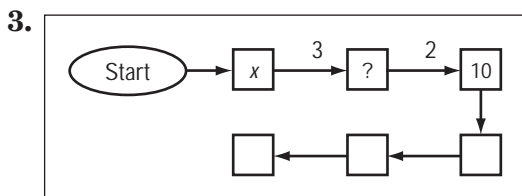
2. To solve two-step equations, use _____ to undo each operation in reverse order.

Helping You Remember

Suppose you start with a number x , multiply it by 2, add three, and the result is 17. The top row of boxes at the right represents the equation $2x + 3 = 17$. To solve the equation, you undo the operations in reverse order. This is shown in the bottom row of boxes.



Complete the bottom row of boxes in each figure. Then find the value of x .



3-5 Enrichment***Al-Khowarizmi: The Father of Algebra***

The title “Father of Algebra” should be awarded to the Arabian mathematician Al-Khowarizmi. In the ninth century, he wrote a work entitled *Hisab al-jabr-w'al muqubalah*, meaning “the science of restoring and canceling.” In this work, he gave a clear and complete explanation of how to solve an equation by performing the same operation on both sides of the equation.

In the thirteenth century, Al-Khowarizmi’s work was translated into Latin, the language of educated people in Europe, which launched algebra into the Western world. It is from the title of his work that we get the word *algebra*.

Here is an example of how Al-Khowarizmi solved an equation like $x - 5 = 10$. To solve this equation, 5 must be added, or restored, to each side. Thus, $x - 5 + 5 = 10 + 5$, or $x = 15$.

Another example of restoring can be used to solve $x + 5 = 10$. To solve this equation, -5 must be restored to each side. This is the same as subtracting 5 from each side. Thus, $x + 5 - 5 = 10 - 5$, or $x = 5$.

Here is an example of solving an equation by canceling (or dividing). To solve $3x = 9$, each side must be canceled by a factor of 3.

Thus, $\frac{3x}{3} = \frac{9}{3}$, or $x = 3$.

Solve each equation and label it with an *R* for restoring or with a *C* for canceling.

1. $x - 10 = 20$

2. $y - 3 = 2$

3. $4x = 12$

4. $5y = 15$

5. $y - 6 = 5$

6. $3x = 18$

7. $x + 2 = 3$

8. $2y = 10$

9. $3y = 21$

10. Make up your own equations to solve. Three should use restoring and three canceling.

3-6 Study Guide and Intervention**Writing Two-Step Equations**

You can use two-step equations to represent situations in which you start with a given amount and then increase it at a certain rate.

Example

PRINTING: A laser printer prints 9 pages per minute. Liza refilled the paper tray after it had printed 92 pages. In how many more minutes will there be a total of 245 pages printed?

EXPLORE You know the number of pages printed and the total number of pages to be printed. You need to find the number of minutes required to print the remaining pages.

PLAN Let m = the number of minutes. Write and solve an equation. The remaining pages to print is $9m$.

remaining pages + pages printed = total pages

$$9m + 92 = 245$$

SOLVE $9m + 92 = 245$

$$9m + 92 - 92 = 245 - 92$$

$$9m = 153$$

$$9m = \frac{153}{9}$$

$$m = 17$$

EXAMINE The remaining 153 pages will print in 17 minutes. Since $245 - 153 = 92$, the answer is correct.

Exercises

Solve each problem by writing and solving an equation.

- METEOROLOGY** During one day in 1918, the temperature in Granville, North Dakota, began at -33° and rose for 12 hours. The high temperature was about 51° . About how many degrees per hour did the temperature rise?
- SAVINGS** John has \$825 in his savings account. He has decided to deposit \$65 per month until he has a total of \$1800. In how many months will this occur?
- SKYDIVING** A skydiver jumps from an airplane at an altitude of 12,000 feet. After 42 seconds, she reaches 4608 feet and opens her parachute. What was her average velocity during her descent?
- FLOODING** The water level of a creek has risen 4 inches above its flood stage. If it continues to rise steadily at 2 inches per hour, how long will it take for the creek to be 12 inches above its flood stage?

3-6

Skills Practice***Writing Two-Step Equations***

Translate each sentence into an equation. Then find each number.

1. Eleven less than 5 times a number is 24.
2. The quotient of a number and -9 increased by 10 is 11.
3. Five less than the product of -3 and a number is -2 .
4. Fifteen more than twice a number is -23 .
5. The difference between 5 times a number and 4 is 16.
6. Nine more than -8 times a number is -7 .
7. The difference between 12 and ten times a number is -28 .
8. Seven more than three times a number is 52.
9. Eleven less than five times a number is 19.
10. Thirteen more than four times a number is -91 .
11. Seven less than twice a number is 43.

Solve each problem by writing and solving an equation.

12. **SHOPPING** The total cost of a suit and 4 ties is \$292. The suit cost \$200. Each tie cost the same amount. Find the cost of one tie.
13. **AGES** Mary's sister is 7 years older than Mary. Their combined ages add up to 35. How old is Mary?

3-6**Practice*****Writing Two-Step Equations***

Translate each sentence into an equation. Then find each number.

1. Eight less than 7 times a number is -29 .
2. Twenty more than twice a number is 52.
3. The difference between three times a number and 11 is 10.
4. One more than the difference between 18 and seven times a number is -9 .
5. Eight times a number plus 6 less than twice the number is 34.
6. 26 more than the product of a number and 17 is -42 .
7. Twelve less than the quotient of a number and 8 is -1 .

Solve each problem by writing and solving an equation.

8. **ANIMAL TRAINING** Last summer, Gary trained 32 more dogs than Zina. Together they trained 126 dogs. How many dogs did Gary train?
9. **SALES** Julius sold five times as many computers as Sam sold last year. In total, they sold 78 computers. How many computers did Julius sell?
10. **TRACK** In one season, Ana ran 18 races. This was four fewer races than twice the number of races Kelly ran. How many races did Kelly run?
11. **BASEBALL** André hit four more home runs than twice the number of home runs Larry hit. Together they hit 10 home runs. How many home runs did André hit?

3-6

Reading to Learn Mathematics

Writing Two-Step Equations

Pre-Activity *How are equations used to solve real-world problems?*

Do the activity at the top of page 126 in your textbook. Write your answers below.

- a. Let n represent the number of minutes. Write an expression that represents the cost when your call lasts n minutes
- b. Suppose your monthly cost was 299¢. Write and solve an equation to find the number of minutes you used the calling card.
- c. Why is your equation considered to be a two-step equation?

Reading the Lesson

Refer to Example 3 on page 127. Read the Explore and Plan steps. Then complete the following.

1. Suppose you have already saved \$75 and plan to save \$5 a week.
 - a. Complete the table below.
2. Suppose you have already saved \$25 and plan to save \$10 each week.
 - a. Complete the table below.

Week	Amount Saved (\$)
0	$5(0) + \underline{\quad} = \underline{\quad}$
1	$5(1) + \underline{\quad} = \underline{\quad}$
2	$5(2) + \underline{\quad} = \underline{\quad}$
3	$5(3) + \underline{\quad} = \underline{\quad}$
n	$5(n) + \underline{\quad} = \underline{\quad}$

- b. Write an equation that represents how many weeks it will take you to save \$100.

Week	Amount Saved (\$)
0	
1	
2	
3	
n	

- b. Write an equation that represents how many weeks it will take you to save \$175.

3-6 Enrichment

Systems of Equations

A **system of equations** is a set of equations with the same variables. The equations shown below are an example of one kind of system of equations.

$$\begin{aligned}y &= x + 2 \\ 3x - 5 &= 16\end{aligned}$$

The solution of this system must be a pair of numbers, x and y , that make both equations true.

To solve this type of system, first solve the equation that contains only one variable. Then substitute that answer into the second equation and solve for the remaining variable.

Example Solve each system of equations.

a. $y = x + 2$
 $3x - 5 = 16$

Solve $3x - 5 = 16$ first.

$$\begin{aligned}3x - 5 &= 16 \\ 3x - 5 + 5 &= 16 + 5 \\ 3x &= 21 \\ \frac{3x}{3} &= \frac{21}{3} \\ x &= 7\end{aligned}$$

Substitute 7 for x in the other equation.

$$\begin{aligned}y &= x + 2 \\ y &= 7 + 2 \text{ or } 9\end{aligned}$$

The solution is $x = 7$ and $y = 9$.

b. $4d - 1 = 19$
 $c = d - 3$

Solve $4d - 1 = 19$ first.

$$\begin{aligned}4d - 1 &= 19 \\ 4d - 1 + 1 &= 19 + 1 \\ 4d &= 20 \\ \frac{4d}{4} &= \frac{20}{4} \\ d &= 5\end{aligned}$$

Substitute 5 for d in the other equation.

$$\begin{aligned}c &= d - 3 \\ c &= 5 - 3 \text{ or } 2\end{aligned}$$

The solution is $c = 2$ and $d = 5$.

Solve each system of equations.

1. $40 - 2t = 10$
 $3t - s = 35$

2. $4a + 2b = 22$
 $25 = 11a - 8$

3. $82.5 = 1.5s$
 $d = 3s + 35$

4. $\frac{m}{5} + 1.5 = 2$
 $7m + n = 17.5$

5. $6x + \frac{y}{2} = 43$
 $22 + 3x = 43$

6. $\frac{c}{5} + p = 4$
 $20 = 4p - 3$

3-7

Study Guide and Intervention

Using Formulas

The formula $d = rt$ relates distance d , rate r , and time t , traveled.

Example 1

Find the distance traveled if you drive at 40 miles per hour for 3 hours.

$$d = rt$$

$$d = 40 \times 3 \quad \text{Replace } r \text{ with 40 and } t \text{ with 3.}$$

$$d = 120 \quad \text{The distance traveled is 120 miles.}$$

The formula $P = 2(\ell + w)$ relates perimeter P , length ℓ , and width w for a rectangle.

The formula $A = \ell w$ relates area A , length ℓ , and width w for a rectangle.

Example 2

Find the perimeter and area of a rectangle with length 7 feet and width 2 feet.

$$P = 2(\ell + w)$$

$$A = \ell \cdot w$$

$$P = 2(7 + 2)$$

$$A = 7 \cdot 2$$

$$P = 2(9)$$

$$A = 14$$

$$P = 18$$

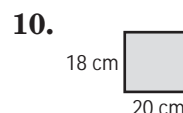
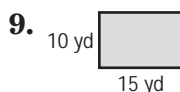
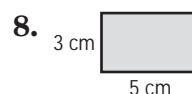
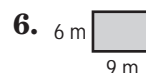
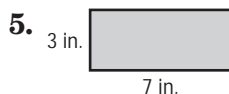
The area is 14 square feet.

The perimeter is 18 feet.

Exercises

- TRAIN TRAVEL** How far does a train travel in 12 hours at 48 miles per hour?
- TRAVEL** How long does it take a car traveling 40 miles per hour to go 200 miles?
- BICYCLING** What is the rate, in miles per hour, of a bicyclist who travels 56 miles in 4 hours?
- RACING** How long will it take a driver to finish a 980-mile rally race at 70 miles per hour?

Find the perimeter and area of each rectangle.

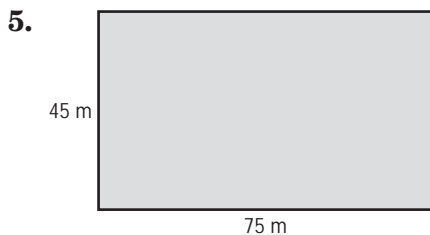
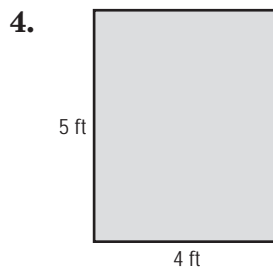
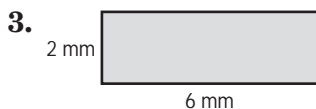


3-7 Skills Practice

Using Formulas

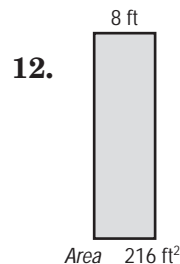
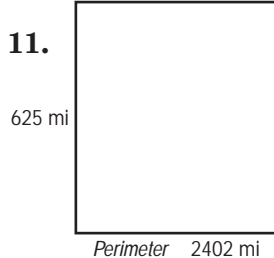
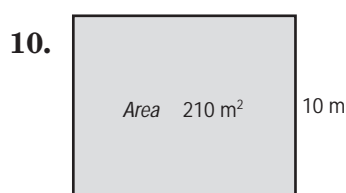
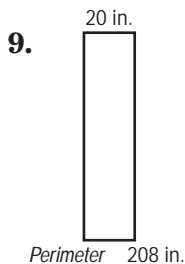
- AIR TRAVEL** A plane is traveling 9 miles per minute. How much time is needed to travel 216 miles?
- JOGGING** What is the rate, in feet per second, of a girl who jogs 315 feet in 45 seconds?

Find the perimeter and area of each rectangle.



- a rectangle that is 21 inches long and 13 inches wide
- a square that is 25 centimeters on each side

Find the missing dimension of each rectangle.



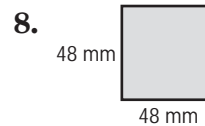
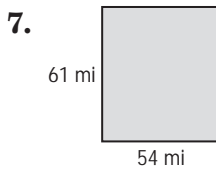
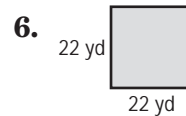
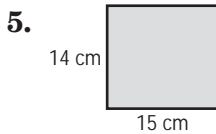
- The perimeter of a rectangle is 100 centimeters. Its width is 9 centimeters. Find its length.
- The area of a rectangle is 319 square kilometers. Its width is 11 kilometers. Find its length.

3-7 Practice

Using Formulas

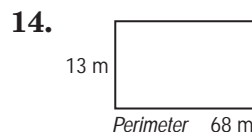
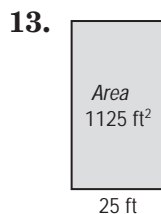
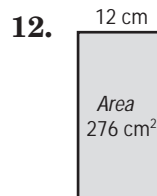
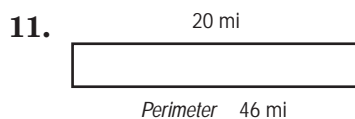
- AIR TRAVEL** What is the rate, in miles per hour, of a plane that travels 1680 miles in 3 hours?
- TRAVEL** A train is traveling at 54 miles per hour. How long will it take to go 378 miles?
- SWIMMING** What is the rate, in feet per second, of a swimmer who crosses a 164-foot-long pool in 41 seconds?
- BALLOONING** A balloon is caught in a wind traveling at 25 feet per second. If the wind is constant, how long will it take the balloon to travel 1000 feet?

Find the perimeter and area of each rectangle.



- a rectangle that is 92 meters long and 18 meters wide
- a rectangle that is 30 inches long and 29 inches wide

Find the missing dimension in each rectangle.



- GEOMETRY** The area of a rectangle is 1260 square inches. Its length is 36 inches. Find the width.

3-7

Reading to Learn Mathematics***Using Formulas*****Pre-Activity** *Why are formulas important in math and science?*

Do the activity at the top of page 131 in your textbook. Write your answers below.

- a. Write an expression for the distance traveled by a duck in t hours.
- b. What disadvantage is there in showing the data in a table?
- c. Describe an easier way to summarize the relationship between the speed, time, and distance.

Reading the Lesson

Vocabulary	Definition	Example
1. formula		
2. perimeter		
3. area		

Write a definition and give an example of each new vocabulary word.

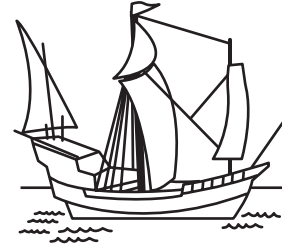
Helping You Remember

4. The word *perimeter* is composed of the prefix *peri-* and the suffix *-meter*.
 - a. Find the definitions of *peri-* and *-meter* in a dictionary. Write their definitions.
 - b. Find two other words in a dictionary that begin with the prefix *peri-*. Write their definitions.
 - c. Explain how your definitions can help you remember how perimeter is used in mathematics.

3-7 Enrichment

Mathematics and Social Studies

Since the discovery that Earth is round, people have been fascinated with the prospect of making ever faster trips around the world. Ferdinand Magellan's ship *Victoria* set sail on September 20, 1519, and completed the first voyage around the world about three years later on September 6, 1522. With more consistent modes of transportation came new records in circling Earth.



Solve each problem by finding the average speed it took to circle Earth. Use 24,900 miles to approximate the distance around Earth.


- 1. DIRIGIBLE** In 1929, Graf Zeppelin made the first round-the-world dirigible flight in 21 days, 8 hours on the *LZ127*. What was the Zeppelin's average speed in miles per hour?
- 2. AIRPLANE** Air Force bomber *Lucky Lady II* made the first nonstop flight around the world in 1949. The flight took 94 hours. What was the average speed of the *Lucky Lady II* on that trip?
- 3. SPACESHIP** In 1961, Yuri Gagarin and Bherman Titov of Russia each circled Earth in a little over an hour and 45 minutes. At what speed must one travel to circle Earth at its surface in an hour and a half?

AIRCRAFT In Exercises 4–6, assume that each aircraft travels at a constant rate. Use 24,900 miles as the distance traveled. How long would it take each aircraft to circle Earth?

- 4.** a commercial plane of the 1930s traveling at 168 mph
- 5.** a Boeing 707 cruising at 640 mph
- 6.** a Concorde flying at 1450 mph
- 7. BALLOONING** Jules Verne wrote about circling Earth in a hot air balloon in his novel (1873). Suppose it were possible for a hot air balloon to circle Earth in 80 days. What would be the average speed in miles per hour?

3 Chapter 3 Test, Form 1

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

- Which property of equality is used to solve $k - 7 = 12$?
 A. addition B. distributive C. multiplication D. division 1. _____
- Rewrite $(7 + 4)3$ using the Distributive Property.
 A. $7 + 3 \cdot 4 + 3$ B. $3 \cdot 7 \times 3 \cdot 4$
 C. $7 \cdot 3 + 4 \cdot 3$ D. $(7 + 3) + (4 + 3)$ 2. _____
- Which expression is equivalent to $-4(x - 3)$?
 A. $-4x + 12$ B. $4x - 12$ C. $-4x - 12$ D. $-4x + (-12)$ 3. _____
- Translate the sentence *the product of m and 5 is 30* into an equation.
 A. $m - 5 = 30$ B. $5m = 30$ C. $\frac{m}{5} = 30$ D. $m + 5 = 30$ 4. _____
- Simplify $15n - 4 + 2n$.
 A. $13n - 4$ B. $-17n - 4$ C. $17n - 4$ D. $17n + 4$ 5. _____
- Find the area of a rectangle with length 9 feet and width 3 feet.
 A. 27 ft^2 B. 25 ft^2 C. 21 ft^2 D. 24 ft^2 6. _____
- Choose the equation whose solution is graphed below.
 A. $3x + 19 = 4$ B. $4x - 19 = 4$
 C. $2x + 11 = 4$ D. $4x - 11 = 8$  7. _____
- Solve $y + 6 = 18$.
 A. -12 B. 24 C. 3 D. 12 8. _____
- Find the solution of $h - 13 = -7$.
 A. 6 B. -20 C. 20 D. 7 9. _____
- What is the solution of $d + 9 = -4$?
 A. 5 B. -14 C. -13 D. -5 10. _____
- A rectangle has a length of 12 centimeters and a width of 7 centimeters. What is its perimeter?
 A. 84 cm B. 38 cm C. 19 cm D. 31 cm 11. _____

3 Chapter 3 Test, Form 1 (continued)

12. Find the solution of $6w = 72$.
A. 12 B. 16 C. 432 D. 422 12. _____
13. Solve $-48 = 8m$.
A. -8 B. 6 C. 40 D. -6 13. _____
14. What is the solution of $\frac{k}{-2} = -12$?
A. 24 B. -24 C. 96 D. -96 14. _____
15. Suppose a race car travels at an average rate of 165 miles per hour for 3 hours. What distance did the race car travel?
A. 495 mi B. 168 mi C. 405 mi D. 55 mi 15. _____
16. What is the speed in miles per hour of a cyclist who travels 63 miles in 7 hours?
A. 7 mph B. 9 mph C. 6 mph D. 8 mph 16. _____
17. Simplify $5m - 3 - 9m + 4$.
A. $-4m - 1$ B. $4m + 1$ C. $4m - 1$ D. $-4m + 1$ 17. _____
18. What is the solution of $6h - 5h + 3 = -2$?
A. -1 B. 1 C. -5 D. -5 18. _____
19. The wingspan of a ghost bat is 12 more than twice that of a vampire bat. Suppose a ghost bat has a wingspan of 28 inches. Which equation can be used to find the wingspan of a vampire bat?
A. $x + 2 + 12 = 28$ B. $2x + 12 = 28$
C. $2x - 12 = 28$ D. $12x + 2 = 28$ 19. _____
20. A true crab has 4 fewer than twice the number of legs that a hermit crab has. The hermit crab has 6 legs. How many legs does the true crab have?
A. 4 B. 6 C. 1 D. 8 20. _____
- Bonus** Which runs faster, a reindeer that covers 9 miles in 15 minutes or a zebra that covers 20 miles in 30 minutes? **B:** _____

3 Chapter 3 Test, Form 2A

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

- Name the property of equality that is used to solve $-8x = -72$.
 A. addition B. subtraction C. distributive D. division 1. _____
- Translate *the difference of a number and 7 is -8* into an equation.
 A. $7 - n = -8$ B. $\frac{n}{7} = -8$ C. $n - 7 = -8$ D. $n - (-7) = -8$ 2. _____
- Rewrite $(2 + 6)5$ using the Distributive Property.
 A. $2 \cdot 5 \times 6 \cdot 5$ B. $2 \cdot 5 + 2 \cdot 6$ C. $2 \cdot 5 + 6 \cdot 5$ D. $2 \cdot 5 + 6$ 3. _____
- Which expression is equivalent to $-4(m - 3)$?
 A. $-4m - 12$ B. $4m + 12$ C. $-4m - 7$ D. $-4m + 12$ 4. _____

Simplify each expression.

- $3x - 4y + 3x + 2y$
 A. $-2y$ B. $6x - 2y$ C. $6x + 2y$ D. $-6x - 2y$ 5. _____
- $2(x + 4) + 3x$
 A. $5x + 8$ B. $2x + 4$ C. $5x + 4$ D. $2x + 8$ 6. _____

Solve each equation.

- $n + 5 = -13$
 A. -8 B. -18 C. 8 D. 18 7. _____
- $23 = 15 + h$
 A. 8 B. -8 C. 32 D. 38 8. _____
- $k - 35 = -16$
 A. -51 B. 51 C. 19 D. -19 9. _____
- Ryan studied x hours for his history exam. His twin brother Rick studied 2 hours more. Which expression represents how long Rick studied?
 A. $x + 2$ B. $2x$ C. $x - 2$ D. $x + (-2)$ 10. _____
- Which expression has a constant of 3?
 A. $3x + 3y$ B. $3m + 2$ C. $2y + y$ D. $3a + 3$ 11. _____
- Find the perimeter of a square that is 12 centimeters on each side.
 A. 24 cm B. 48 cm C. 60 cm D. 144 cm 12. _____
- The area of a rectangle is 168 square feet. If its length is 14 feet, what is its width?
 A. 14 ft B. 70 ft C. 64 ft D. 12 ft 13. _____

3 Chapter 3 Test, Form 2A *(continued)*

14. How far does a jet travel if it flies 530 miles per hour for 2 hours?
 A. 265 mi B. 1020 mi C. 1060 mi D. 530 mi 14. _____

15. How long will it take a plane to fly 310 miles at 124 miles per hour?
 A. 2 h B. 2.5 h C. 3 h D. 3.5 h 15. _____

Solve each equation.

16. $-3q = 54$
 A. 18 B. -17 C. -18 D. -162 16. _____

17. $\frac{g}{-7} = -14$
 A. 98 B. -98 C. -21 D. 2 17. _____

18. Name the first step in solving $2x - 5 = 37$.
 A. Add 5 to each side. B. Subtract 5 from each side.
 C. Divide each side by 2x. D. Subtract 2x from each side. 18. _____

Solve each equation.

19. $3c + 5 = 23$
 A. 3 B. 7 C. 18 D. 6 19. _____

20. $-56 = 8 - 2w$
 A. 32 B. 128 C. -32 D. 24 20. _____

21. $\frac{m}{4} - 6 = 15$
 A. 60 B. 9 C. 84 D. 36 21. _____

22. $d - 4d + 6 = 33$
 A. -9 B. 8 C. -8 D. 9 22. _____

23. A racquetball court has an area of 800 square feet. Its width is 20 feet. What is the length of the racquetball court?
 A. 60 ft B. 16,000 ft C. 380 ft D. 40 ft 23. _____

24. Elisa has \$55 and saves an additional \$12 per week. Which equation can be used to find how many weeks it will take until she has \$343?
 A. $343 + 12w = 55$ B. $55 + 12w = 343$
 C. $12w - 55 = 343$ D. $55 + w = 343$ 24. _____

25. Refer to Question 24. How long will take Elisa to save \$175?
 A. 10 weeks B. 24 weeks C. 19 weeks D. 21 weeks 25. _____

Bonus A rectangle whose length is 5 inches has an area of 20 square inches. What is the perimeter of the rectangle? **B:** _____

3 Chapter 3 Test, Form 2B

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

- Name the property of equality that is used to solve $10 = x - 8$.
 A. addition B. subtraction C. multiplication D. division 1. _____
- Translate *the sum of a number and 5 is -2* into an equation.
 A. $n + 5 = -2$ B. $\frac{n}{5} = -2$
 C. $n - 5 = -2$ D. $n + (-5) = -2$ 2. _____
- Rewrite $4(3 + 7)$ using the Distributive Property.
 A. $4 \cdot 3 \times 4 \cdot 7$ B. $4 \cdot 3 + 4 \cdot 7$ C. $4 \cdot 3 + 7$ D. $4 + 3 \cdot 4 + 7$ 3. _____
- Which expression is equivalent to $-8(k + 2)$?
 A. $-8k + 16$ B. $8k + 16$ C. $-8k - 6$ D. $-8k - 16$ 4. _____

Simplify each expression.

- $2x + 7y - 5x - 3y$
 A. $3y + 4x$ B. $-3y + 4x$ C. $-3x + 4y$ D. $-3x - 4y$ 5. _____
- $5x + 4(x + 8)$
 A. $4x + 32$ B. $9x + 12$ C. $9x + 8$ D. $9x + 32$ 6. _____

Solve each equation.

- $n - 6 = -15$
 A. -9 B. -21 C. 9 D. 21 7. _____
- $17 + k = 8$
 A. -25 B. 9 C. -9 D. -8 8. _____
- $-18 = m - 22$
 A. 4 B. -40 C. -4 D. -5 9. _____
- Consuela worked on her art project for h hours. Dion worked on his art project 3 hours less. Which expression represents how long Dion worked?
 A. $h - 3$ B. $3 - h$ C. $3h$ D. $h - (-2)$ 10. _____
- Which expression has a constant of 6?
 A. $3m + 3m$ B. $3 + 6n$ C. $6n + 6m$ D. $6n + 6$ 11. _____
- Find the perimeter of a square that is 11 centimeters on each side.
 A. 121 cm B. 44 cm C. 33 cm D. 22 cm 12. _____
- The area of a rectangle is 128 square feet. If its width is 8 feet, what is its length?
 A. 12 ft B. 16 ft C. 56 ft D. 1024 ft 13. _____

3 Chapter 3 Test, Form 2B *(continued)*

14. How far does a jet travel if it flies 453 miles per hour for 3 hours?
A. 151 mi B. 906 mi C. 1359 mi D. 1259 mi 14. _____

15. How long will it take a plane to fly 183 miles at 122 miles per hour?
A. 1 h B. 1.5 h C. 2 h D. 2.5 h 15. _____

Solve each equation.

16. $-4q = 52$
A. 13 B. -12 C. -13 D. -208 16. _____

17. $\frac{g}{-3} = -18$
A. 6 B. 54 C. -54 D. -6 17. _____

18. Name the first step in solving $3x + 6 = 42$.
A. Add 6 to each side. B. Subtract 6 from each side.
C. Multiply each side by 3. D. Subtract $3x$ from each side. 18. _____

Solve each equation.

19. $5c - 4 = 41$
A. 8 B. 7 C. 9 D. -9 19. _____

20. $-50 = 6 - 7w$
A. 7 B. -8 C. -7 D. 8 20. _____

21. $\frac{m}{8} - 5 = 12$
A. 56 B. 136 C. -56 D. -136 21. _____

22. $k - 3k + 9 = 37$
A. -7 B. 14 C. -14 D. -23 22. _____

23. A billiards table has an area of 5000 square inches. Its width is 50 inches. What is the length of the billiards table?
A. 25 in. B. 500 in. C. 100 in. D. 2450 in. 23. _____

24. Ana has \$75 and saves an additional \$13 per week. Which equation can be used to find how many weeks it will take until she has \$452?
A. $75 + w = 452$ B. $75 + 13w = 452$
C. $13w - 75 = 452$ D. $452 + 13w = 75$ 24. _____

25. Refer to Question 24. How long will take Ana to save \$335?
A. 25 weeks B. 27 weeks C. 20 weeks D. 29 weeks 25. _____

Bonus If a baseball mitt costs m dollars and a cap costs b dollars, write two expressions that show the cost of mitts and caps for 15 players.

B: _____

3 Chapter 3 Test, Form 2C

For Questions 1–3, use the Distributive Property to write each expression as an equivalent expression.

1. $2(9 + 4)$

1. _____

2. $5(a - 1)$

2. _____

3. $(x + 7)3$

3. _____

4. Identify the like terms in $14q + r + 6 + 3q$.

4. _____

5. List the constant(s) in $2x + 5 + y$.

5. _____

Solve each equation.

6. $t + 12 = 19$

6. _____

7. $20 = m - 5$

7. _____

8. $c - 7 = 11$

8. _____

9. $6r = 24$

9. _____

10. $-8 = a + 3$

10. _____

11. $\frac{h}{-7} = 8$

11. _____

12. $-81 = -9k$

12. _____

13. $-6 = \frac{r}{5}$

13. _____

14. $3x + 8 = 23$

14. _____

15. $6y - 12 = 30$

15. _____

16. $\frac{b}{4} + 5 = 2$

16. _____

17. $-23 = \frac{y}{3} - 17$

17. _____

3 Chapter 3 Test, Form 2C *(continued)*

Simplify each expression.

18. $3n + 7 - 2n + 8$

18. _____

19. $9(b + 1) - 6b$

19. _____

For Questions 20 and 21, translate each sentence into an equation. Then find each number.

20. Nineteen is 5 less than twice a number.

20. _____

21. Four more than the quotient of a number and 3 is 11.

21. _____

22. How far does a train travel if it goes 90 miles per hour for 4 hours?

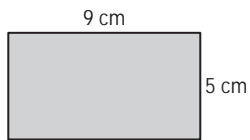
22. _____

23. In 1978, a powerboat broke the water speed record by traveling approximately 4147 miles in 13 hours. About how fast was the average speed of the boat?

23. _____

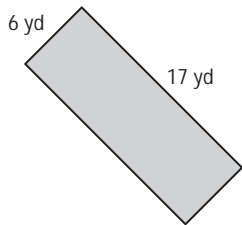
Find the perimeter and area of each rectangle.

24.



24. _____

25.



25. _____

Bonus Tiger Woods won \$1,008,000 for his first place win of the Masters Tournament in 2001. This was about double what he received in 1997 for winning the same tournament. Write and solve an equation to find the amount of his winnings for the Masters Tournament in 1997.

B: _____

3 Chapter 3 Test, Form 2D

For Questions 1–3, use the Distributive Property to write each expression as an equivalent expression.

1. $3(2 + 7)$ 1. _____

2. $6(n - 4)$ 2. _____

3. $(y + 9)2$ 3. _____

4. Identify the like terms in $8 + 5r - r + 1$. 4. _____

5. List the constant(s) in $6 + 2a + 3a + b$. 5. _____

Solve each equation.

6. $4 + x = 26$ 6. _____

7. $h - 12 = 7$ 7. _____

8. $6 = d + 18$ 8. _____

9. $-35 = 5t$ 9. _____

10. $y - 18 = -14$ 10. _____

11. $\frac{b}{3} = 11$ 11. _____

12. $-7g = -56$ 12. _____

13. $9 = \frac{k}{-6}$ 13. _____

14. $6t + 1 = 31$ 14. _____

15. $-3x - 7 = 14$ 15. _____

16. $15 = \frac{w}{5} + 17$ 16. _____

17. $\frac{n}{2} - 9 = 2$ 17. _____

3 Chapter 3 Test, Form 2D *(continued)*

Simplify each expression.

18. $10 + m - 8 - 4m$

18. _____

19. $2c + 4(c + 3)$

19. _____

For Questions 20 and 21, translate each sentence into an equation. Then find each number.

20. Translate the following sentence into an equation and solve.
Thirteen more than 8 times a number is -3 .

20. _____

21. Six less than the quotient of a number and 5 is 1.

21. _____

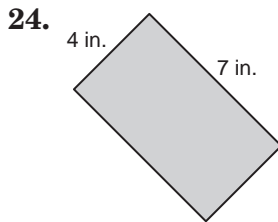
22. How far does a cyclist travel if she rides 14 miles per hour for 3 hours?

22. _____

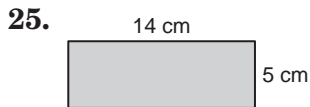
23. How long would it take a stagecoach to travel 64 miles if its rate is 16 miles per hour?

23. _____

Find the perimeter and area of each rectangle.



24. _____



25. _____

Bonus The area of Lake Michigan is 9420 square miles less than the area of Lake Superior, which is about one-fifth the size of the Caspian Sea (about 150,000 sq mi). Write and solve an equation to find the approximate area of Lake Michigan.

B: _____

3 Chapter 3 Test, Form 3

Use the Distributive Property to write each expression as an equivalent expression.

1. $6(n + 5)$

1. _____

2. $-2(k + 8)$

2. _____

3. $(r - 7)3$

3. _____

4. $9(x + y)$

4. _____

Simplify each expression.

5. $5x - 9 + 6x + 1$

5. _____

6. $2h + g + 4h$

6. _____

7. $7(r + 3) + 8r$

7. _____

8. $a + 4(b - 3a)$

8. _____

9. $x - 5(y - x)$

9. _____

Solve each equation. Check your solution.

10. $12 = b + 3$

10. _____

11. $m - 34 = 15$

11. _____

12. $27 = \frac{r}{-4}$

12. _____

13. $28 + x = 15$

13. _____

14. $-17g = -136$

14. _____

15. $q - 13 = -50$

15. _____

Translate each sentence into an equation. Then find each number.

16. Forty-eight equals the product of 6 and a number.

16. _____

17. A number plus 14 equals -11 .

17. _____

18. The quotient of a number and 5 equals -16 .

18. _____

19. Twelve less than twice a number equals -8 .

19. _____

3 Chapter 3 Test, Form 3 *(continued)*

Solve each equation.

20. $3t + 17 = 11$

20. _____

21. $-6k - 15 = -57$

21. _____

22. $\frac{c}{4} - 6 = 20$

22. _____

23. $4y - 6 + y = -21$

23. _____

24. $41 = 7r + 5 - r$

24. _____

25. $\frac{x}{5} - 9 = -2$

25. _____

26. Translate the following sentence into an equation and solve.
Sixteen less than the quotient of a number and 7 is 3.

26. _____

27. Antonio is saving money to buy a CD player that costs \$120. He has already saved \$50 and plans to save \$10 each week. How many weeks will Antonio need to save?

27. _____

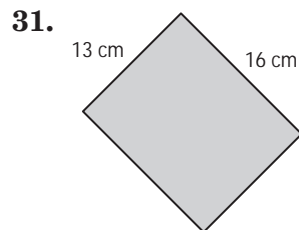
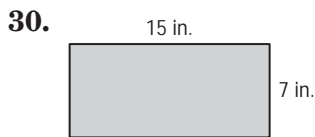
28. How far does a motorist travel if he drives 55 miles per hour for 3 hours?

28. _____

29. What is the speed in miles per hour of a train that travels 320 miles in 4 hours?

29. _____

Find the perimeter and area of each rectangle.



30. _____

31. _____

32. a square that is 21 meters on each side

32. _____

33. a 12-foot by 28-foot rectangle

33. _____

Bonus Tanya and Jason went to the library, which was 5 miles away. Tanya left on her bike at 3:00 P.M. She traveled at a rate of 15 mph. Jason left at 3:15 P.M. by car. He traveled at 30 mph. Who got to the library first? Explain.

B: _____

3 Chapter 3 Open-Ended Assessment

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 problems.

1. Consider the equation $10x + 18 = 48$.
 - a. Add 4 to each side of the equation. Tell, in your own words, how you know that the two sides of the equation are still equal.
 - b. How are the solutions of the original equation and the equation in part **a** related? What does the term *equivalent equations* mean?
 - c. Use subtraction, multiplication, and division to form three equations equivalent to the original equation.
 - d. Solve the original equation. Explain each step in finding the solution.
2. Solve $ay + b = c$ for y . Explain each step in the process.
3. Poloma is planning a new vegetable garden. She has 70 feet of fencing with which to enclose the garden. If she wants to obtain the greatest possible area, what are the dimensions of the garden? Explain your reasoning.
4. Make up a problem that can be represented by the equation $5x + 10 = 55$.

Addition Property of Equality	Division Property of Equality	like terms	Subtraction Property of Equality
area	equivalent equations	Multiplication Property of Equality	term
coefficient	equivalent expressions	perimeter	two-step equation
constant	formula	simplest form	
Distributive Property	inverse operations	simplifying an expression	

Underline the term that best completes each statement.

- The statement $a(b + c) = ab + ac$ is an example of the (*Distributive Property, Multiplication Property of Equality*).
- A term without a variable is a (*coefficient, constant*).
- The expression $3x + 8 + 4x + 2x$ has three (*like terms, terms*).
- An algebraic expression is in simplest form if it has no parentheses and no (*like terms, constants*).
- To undo the addition of 4 in the expression $x + 4$, you would subtract 4. This is an example of (*inverse operations, simplest form*).
- The equations $x + 5 = 9$ and $x = 4$ are equivalent equations because they have the same (*solution, variable*).
- The number in front of a variable is the (*constant, coefficient*).
- A two-step equation contains two (*operations, like terms*).
- The (*area, perimeter*) of a figure is the measure of the distance around it.
- The (*area, perimeter*) of a figure is measured in square units.

In your own words—**Define each term.**

11. formula

12. equivalent expressions

3 Chapter 3 Quiz

(Lessons 3-1 and 3-2)

SCORE _____

Use the Distributive Property to write each expression.

- | | |
|----------------|----------|
| 1. $5(3 + 8)$ | 1. _____ |
| 2. $4(n + 2)$ | 2. _____ |
| 3. $-2(x + 6)$ | 3. _____ |
| 4. $(t - 7)3$ | 4. _____ |

Identify the like terms in each expression.

- | | |
|-----------------------|----------|
| 5. $12n - 6 + p + 6n$ | 5. _____ |
| 6. $3 + a + 9a - 4$ | 6. _____ |

Simplify each expression.

- | | |
|--------------------|-----------|
| 7. $4x + 5x$ | 7. _____ |
| 8. $9r - r$ | 8. _____ |
| 9. $6 + 3y - 1$ | 9. _____ |
| 10. $3(a + 2) + a$ | 10. _____ |

3 Chapter 3 Quiz

(Lessons 3-3 and 3-4)

SCORE _____

Solve each equation.

- | | | |
|--|-----------------------|----------|
| 1. $3 + c = 15$ | 2. $7 = t + 11$ | 1. _____ |
| | | 2. _____ |
| 3. $x - 24 = 10$ | 4. $16 = q - 5$ | 3. _____ |
| | | 4. _____ |
| 5. $4n = 48$ | 6. $-32 = 2y$ | 5. _____ |
| | | 6. _____ |
| 7. $\frac{z}{5} = 6$ | 8. $\frac{a}{7} = -9$ | 7. _____ |
| | | 8. _____ |
| 9. Write and solve an equation for the sentence.
The sum of -10 and a number is -17 . | | 9. _____ |

10. **Standardized Test Practice** What value of x makes

$\frac{x}{3} = -12$ a true statement?

- A. 4 B. 36 C. -4 D. -36 10. _____

3 Chapter 3 Quiz

SCORE _____

*(Lessons 3-5 and 3-6)***Solve each equation.**

1. $3n + 2 = 11$

1. _____

2. $14 = 4x - 6$

2. _____

3. $7 = \frac{x}{5} - 3$

3. _____

4. $19 = 3r - 7 - 5r$

4. _____

5. Courtney paid \$1.44 to mail some photographs to her friend first-class. The Post Office charges 34 cents for the first ounce, and 22 cents for each additional ounce. Solve $34 + 22w = 144$ to find how much Courtney's package weighed.

5. _____

Translate each sentence into an equation. Then find the number.

6. Five more than twice a number is 9.

6. _____

7. Three times a number less 12 is 6.

7. _____

8. Sixteen decreased by three times a number is 7.

8. _____

9. Nine more than the quotient of a number and 4 is
- -5
- .

9. _____

10. An electrician charges \$45 to make a house call. For each hour of labor, she charges an additional \$30. How many hours did she work if the repair bill was \$195?

10. _____

3 Chapter 3 Quiz

SCORE _____

(Lesson 3-7)

1. How far does a truck driver travel if he drives 65 miles per hour for 3 hours?

1. _____

2. What is the speed in miles per hour of a balloon that travels 24 miles in 2 hours?

2. _____

Find the perimeter and area of each rectangle.

3. a rectangle that is 15 meters long and 8 meters wide

3. _____

4. a square that is 26 centimeters on each side

4. _____

5. a 4-inch by 7-inch rectangle

5. _____

Chapter 3 Mid-Chapter Test*(Lessons 3-1 through 3-4)***Part I** Write the letter for the correct answer in the blank at the right of each question.

1. Name the property of equality that is used to solve $\frac{x}{-4} = 16$.
- A. addition B. subtraction C. multiplication D. division 1. _____
2. Translate *the product of 5 and a number is -55* into an equation.
- A. $5 - n = -55$ B. $\frac{n}{5} = -55$ C. $55 - n = 5$ D. $5n = -55$ 2. _____
3. Rewrite $(8 + 3)4$ using the Distributive Property.
- A. $8 \cdot 4 \times 3 \cdot 4$ B. $8 \cdot 4 + 3 \cdot 4$ C. $8 \cdot 4 + 8 \cdot 3$ D. $8 \cdot 4 \cdot 3$ 3. _____
4. Which expression is equivalent to $-2(r - 8)$?
- A. $-2r + 16$ B. $2r - 16$ C. $-2r - 6$ D. $-2r + 6$ 4. _____

Simplify each expression.

5. $5m - 4n + 5m + 6n$
- A. $2n$ B. $-10m - 2n$ C. $10m - 2n$ D. $10m + 2n$ 5. _____
6. $5x + 3(x - 2)$
- A. $3x - 6$ B. $8x - 6$ C. $8x - 2$ D. $5x - 2$ 6. _____

Part II**Solve each equation.**

7. $y + 4 = 17$ 7. _____
8. $-19 + k = 6$ 8. _____
9. $36 = -3z$ 9. _____
10. $21 = \frac{t}{3}$ 10. _____
11. A tool kit costs \$14 for a hammer, \$20 for a screwdriver set, and \$11 for a measuring tape. Write two equivalent expressions for the total cost of 3 tool kits. Then find the cost. 11. _____
12. In 1997, people living in Alaska used about 1200 million BTUs of energy per person, which was about 5 times as many BTUs as the people living in California used. Write and solve an equation to find how many BTUs Californians used per person in 1997. 12. _____

3 Chapter 3 Cumulative Review

(Chapters 1–3)

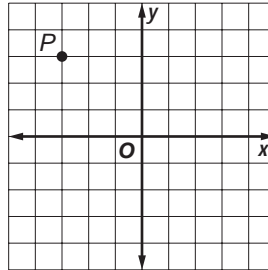
1. The temperature drops an average of 1°C for every 100 meters that a hot air balloon rises. If the temperature is 25°C on the ground, what is the approximate temperature 1200 meters above the ground? (Lesson 1-1) 1. _____

2. Find the value of $4 + 20 \div 5$. (Lesson 1-2) 2. _____

3. Evaluate $14 - c + 3d$ if $c = 6$ and $d = 2$. (Lesson 1-3) 3. _____

4. Name the property shown by $(8 \cdot 2) \cdot 3 = 8 \cdot (2 \cdot 3)$. (Lesson 1-4) 4. _____

5. Name the ordered pair for point P .
(Lesson 2-6)



5. _____

6. State whether a scatter plot showing age and height of students would show a *positive*, *negative*, or *no* relationship.
(Lesson 1-7)

6. _____

7. Simplify $|-6| + |-7|$. (Lesson 2-1) 7. _____

Simplify each expression. (Lessons 2-2 and 2-3)

8. $7m + (-15)m$ 8. _____

9. $9c - (-24c)$ 9. _____

Find each product or quotient. (Lessons 2-4 and 2-5)

10. $-8(-4)$ 11. $-35 \div 5$ 10. _____

12. Name the quadrant in which $P(-2, -4)$ lies. (Lesson 2-5) 12. _____

13. Use the Distributive Property to rewrite $-3(p + 5)$. (Lesson 3-1) 13. _____

14. Simplify $2y + 8 + 7y - 1$. (Lesson 3-2) 14. _____

For Questions 15–17, solve each equation.

(Lessons 3-3, 3-4, and 3-5)

15. $12 = t - 8$ 15. _____

16. $14w = -70$ 16. _____

17. $3n + 10 = -2$ 17. _____

18. Nine more than 5 times a number is -11 . Write an equation and find the number. (Lesson 3-6) 18. _____

19. Find the perimeter and area of a 6-inch by 7-inch rectangle.
(Lesson 3-7) 19. _____

3

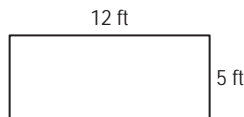
Standardized Test Practice

(Chapters 1–3)

Part 1: Multiple Choice

Instructions: Fill in the appropriate oval for the best answer.

1. Evaluate $r - s + 4$ if $r = 23$ and $s = 18$. (Lesson 1-3)
 A. 45 B. -1 C. 9 D. 1 1. (A) (B) (C) (D)
2. Rewrite the expression $(9 \cdot p) \cdot 2$ using the Commutative Property. (Lesson 1-4)
 E. $9 \cdot p \cdot 2$ F. $p \cdot (9 \cdot 2)$ G. $9 \cdot (p \cdot 2)$ H. $2 \cdot (9 \cdot p)$ 2. (E) (F) (G) (H)
3. Choose an inequality that compares the number of days in a month and 45 days. (Lesson 2-1)
 A. $m > 45$ B. $m < 45$
 C. $45 = m$ D. none of these 3. (A) (B) (C) (D)
4. Find the product of -5 and $4x$. (Lesson 2-4)
 E. $-20x$ F. $20x$ G. $-\frac{4}{5}x$ H. $\frac{5}{4}x$ 4. (E) (F) (G) (H)
5. Evaluate the expression $ac + bc$ if $a = -2$, $b = 5$, and $c = 3$. (Lesson 2-3)
 A. 9 B. 21 C. 5 D. -5 5. (A) (B) (C) (D)
6. Find the average of the test scores: 55, 75, 75, 70, 75. (Lesson 2-5)
 E. 20 F. 72.5 G. 70 H. 75 6. (E) (F) (G) (H)
7. Name the quadrant in which the graph of $(-3, 5)$ lies. (Lesson 2-6)
 A. I B. II C. III D. IV 7. (A) (B) (C) (D)
8. Which is the simplified form of $(15z + 7) - 3z$? (Lesson 3-2)
 E. $12z + 7$ F. $9z - 7$ G. $9z + 7$ H. $-45z - 21$ 8. (E) (F) (G) (H)
9. Solve $-48 = 6m$. (Lesson 3-4)
 A. -6 B. 8 C. -52 D. -8 9. (A) (B) (C) (D)
10. Solve $\frac{a}{3} = -21$. (Lesson 3-4)
 E. 63 F. -7 G. 7 H. -63 10. (E) (F) (G) (H)
11. Which expression is equivalent to $5(n + 2) - 3(n + 2)$? (Lesson 3-2)
 A. $2n + 4$ B. $2n + 16$ C. $2n$ D. $2n - 4$ 11. (A) (B) (C) (D)
12. What is the perimeter of the rectangle?
 (Lesson 3-7)
 E. 60 ft F. 17 ft
 G. 34 ft H. 29 ft



12. (E) (F) (G) (H)

3 Standardized Test Practice *(continued)*

13. What is the solution of $-6 = m + 8$? (Lesson 3-3)
A. 2 **B.** 14 **C.** -14 **D.** -2 **13.** (A) (B) (C) (D)
14. Solve $-54 = -4n + 2$. (Lesson 3-5)
E. 13 **F.** 14 **G.** -56 **H.** -14 **14.** (E) (F) (G) (H)
15. Find the area of a square that is 14 centimeters on each side.
 (Lesson 3-7)
A. 42 cm^2 **B.** 28 cm^2 **C.** 144 cm^2 **D.** 196 cm^2 **15.** (A) (B) (C) (D)
16. What is the solution of $-6w = 72$? (Lesson 3-4)
E. 12 **F.** -432 **G.** -12 **H.** 432 **16.** (E) (F) (G) (H)

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.

17. Find the next number in the pattern. (Lesson 1-1)
 $-8, -2, 2, 4, \dots$

17.

	/	/	
.	.	.	.
0	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

18.

	/	/	
.	.	.	.
0	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

18. Evaluate $-3st$ if $s = 4$ and $t = -6$. (Lesson 2-4)

Part 3: Short Response

Instructions: Write your answer in the blank at the right of each question.

19. A water company charges a family a \$10.50 monthly service fee, plus \$2.00 for each unit of water used. (Lesson 1-3)
a. Let n represent the number of units. Write an expression that represents the total monthly cost when the family uses n units of water. **19.** _____

- b.** Suppose the family has a water bill of \$26.50 for one month. Write and solve an equation to find the number of units used that month.
20. The ordered pairs $(-1, 3)$, $(3, 3)$, and $(3, -5)$ are coordinates of three of the vertices of a rectangle. Find the area of the rectangle. (Lesson 2-6) **20.** _____

Unit 1 Test

(Chapters 1–3)

SCORE _____

- Bacterial populations can grow to enormous numbers in a matter of a few hours with the right conditions. If a bacterial colony doubles its size every 15 minutes, how many bacteria will be present after 1 hour if the colony began with 4 bacteria?
- Find the value of $6[(20 - 4) - (8 \cdot 2)]$.

1. _____

2. _____

For Questions 3 and 4, evaluate each expression if $m = 2$, $p = 7$, and $t = 4$.

3. _____

3. $\frac{tp}{m}$

4. $8p - (t + 5m)$

4. _____

- Name the property shown by the statement.
 $7 \cdot 3 \cdot 4 \cdot = 3 \cdot 4 \cdot 7$

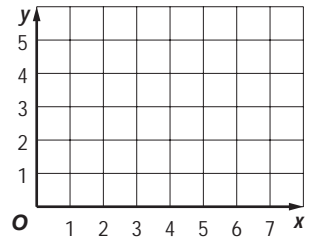
5. _____

- Write an equation and solve. *A number increased by 7 is 29.*

6. _____

- Express the relation $\{(0, 3), (4, 1), (3, 1), (4, 3)\}$ as a table and as a graph.

7. _____

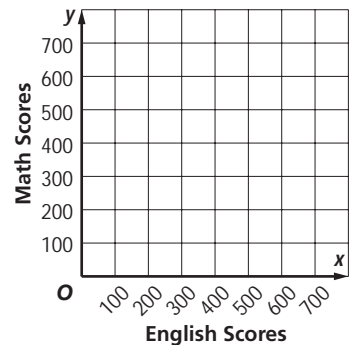


The table shows SAT test scores for a group of students who took an SAT review course together.

- Make a scatter plot of the data. Does there appear to be a relationship between the scores? Explain.

Student	English	Math
Jerrod	660	540
Becca	570	570
Wallace	610	680
David	710	520
Raul	510	700
Keesha	450	510

8. **SAT Scores**



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

9. $|-28| \bullet -18$

9. _____

10. $-2 + 7 \bullet -9 + 1$

10. _____

Unit 1 Test *(continued)*

(Chapters 1–3)

11. What is the sum of $-2 + 9 + (-12)$? 11. _____

For Questions 12 and 13, evaluate each expression if $x = 5$, $y = 2$, and $z = -4$.

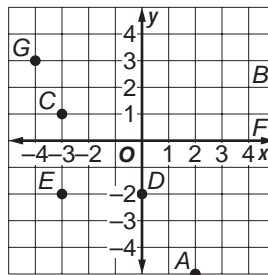
12. $z - 8$ 12. _____

13. $x - y - z$ 13. _____

14. Simplify $-9j(5)(3k)$. 14. _____

15. Find the average (mean) of $-6, -11, 20, 14, -9, 2, 4$. 15. _____

Name the ordered pair for each point graphed on the coordinate plane at the right.



16. A 16. _____

17. C 17. _____

18. A package of soccer accessories costs \$25 for cleats, \$14 for shin guards, and \$12 for a ball. Write two equivalent expressions for the total cost of 9 accessory packages. Then find the cost. 18. _____

19. Salvador bought 3 pounds of oranges that cost x cents per pound, a cucumber for $59¢$, and 2 bananas for $35¢$. Write an expression in simplest form that represents the amount he spent. 19. _____

20. The difference between the highest and lowest elevations in Africa is 6051 meters. The lowest elevation is -156 meters. Write and solve an equation to find the highest elevation in Africa. 20. _____

21. When you divide a number by 7, the result is -6 . Write and solve an equation for this sentence. 21. _____

Solve each equation.

22. $7z - 3 + 2z = 33$ 22. _____

23. $-11 = r + 7 - 3r$ 23. _____

24. The quotient of a number and -6 , plus 9, is -33 . Translate this sentence into an equation, then find the number. 24. _____

25. An 8400-gallon water tank is being drained at the rate of 300 gallons per hour. How long will it take the tank to empty? 25. _____

3 Standardized Test Practice

Student Record Sheet (Use with pages 142–143 of the Student Edition.)

Part 1 Multiple Choice

Select the best answer from the choices given and fill in the corresponding oval.

1 (A) (B) (C) (D)

4 (A) (B) (C) (D)

7 (A) (B) (C) (D)

10 (A) (B) (C) (D)

2 (A) (B) (C) (D)

5 (A) (B) (C) (D)

8 (A) (B) (C) (D)

11 (A) (B) (C) (D)

3 (A) (B) (C) (D)

6 (A) (B) (C) (D)

9 (A) (B) (C) (D)

Part 2 Short Response/Grid In

Solve the problem and write your answer in the blank.

For Questions 13–16 and 18, also enter your answer by writing each number or symbol in a box. Then fill in the corresponding oval for that number or symbol.

12 _____

13 _____ (grid in)

14 _____ (grid in)

15 _____ (grid in)

16 _____ (grid in)

17 _____

18 _____ (grid in)

19 _____

13

	/	/	
.	.	.	.
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	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

	/	/	
.	.	.	.
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

16

	/	/	
.	.	.	.
0	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

18

	/	/	
.	.	.	.
0	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 Open Ended

Record your answers for Questions 20–21 on the back of this paper.