

**HOLT**

# **Algebra 2**

**Edward B. Burger**

**David J. Chard**

**Earlene J. Hall**

**Paul A. Kennedy**

**Steven J. Leinwand**

**Freddie L. Renfro**

**Dale G. Seymour**

**Bert K. Waits**



**HOLT, RINEHART AND WINSTON**

A Harcourt Education Company  
Orlando • Austin • New York • San Diego • London

# Algebra 2 Contents in Brief

|            |   |     |
|------------|---|-----|
| CHAPTER 1  | <b>Foundations for Functions</b>              | 2   |
| CHAPTER 2  | <b>Linear Functions</b>                       | 86  |
| CHAPTER 3  | <b>Linear Systems</b>                         | 178 |
| CHAPTER 4  | <b>Matrices</b>                               | 242 |
| CHAPTER 5  | <b>Quadratic Functions</b>                    | 310 |
| CHAPTER 6  | <b>Polynomial Functions</b>                   | 402 |
| CHAPTER 7  | <b>Exponential and Logarithmic Functions</b>  | 486 |
| CHAPTER 8  | <b>Rational and Radical Functions</b>         | 564 |
| CHAPTER 9  | <b>Properties and Attributes of Functions</b> | 650 |
| CHAPTER 10 | <b>Conic Sections</b>                         | 718 |
| CHAPTER 11 | <b>Probability and Statistics</b>             | 790 |
| CHAPTER 12 | <b>Sequences and Series</b>                   | 858 |
| CHAPTER 13 | <b>Trigonometric Functions</b>                | 924 |
| CHAPTER 14 | <b>Trigonometric Graphs and Identities</b>    | 986 |

## Student Handbook

|                             |                                 |                   |
|-----------------------------|---------------------------------|-------------------|
|                             | <b>Extra Practice</b>           | S4                |
|                             | <b>Problem Solving Handbook</b> | S46               |
|                             | <b>Skills Bank</b>              | S56               |
|                             | <b>Selected Answers</b>         | S74               |
|                             | <b>Glossary</b>                 | S118              |
|                             | <b>Index</b>                    | S162              |
| <b>Symbols and Formulas</b> |                                 | Inside Back Cover |

Copyright © 2007 by Holt, Rinehart and Winston

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

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

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

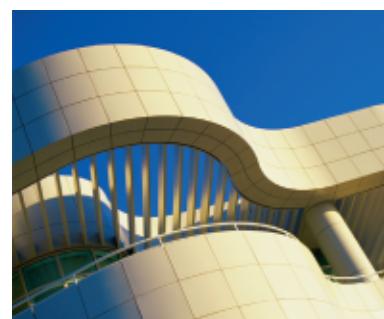
Printed in the United States of America

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

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

ISBN 0-03-035829-9

1 2 3 4 5 048 09 08 07 06



Cover photo: Getty Center, Los Angeles, CA. © Richard Cummins/SuperStock

# AUTHORS



**Edward B. Burger, Ph.D.** is Professor of Mathematics and Chair at Williams College and is the author of numerous articles, books, and videos. He has won several of the most prestigious writing and teaching awards offered by the Mathematical Association of America. Dr. Burger has appeared on NBC TV, National Public Radio, and has given innumerable mathematical performances around the world.



**Steven J. Leinwand** spent 22 years as the Mathematics Supervisor with the Connecticut Department of Education. He is currently a Principal Research Analyst at the American Institutes for Research.



**David J. Chard, Ph.D.**, is an Associate Dean of Curriculum and Academic Programs at the University of Oregon. He is the President of the Division for Research at the Council for Exceptional Children, is a member of the International Academy for Research on Learning Disabilities, and is the Principal Investigator on two major research projects for the U.S. Department of Education.



**Freddie L. Renfro, BA, MA**, has 35 years of experience in Texas education as a classroom teacher and director/coordinator of Mathematics PreK-12 for school districts in the Houston area. She has served as TEA TAAS/TAKS reviewer, team trainer for Texas Math Institutes, TEKS Algebra Institute writer, and presenter at math workshops.



**Earlene J. Hall, Ed.D.**, is the middle school mathematics supervisor for Detroit Public Schools, and an adjunct professor at Wayne State University in Detroit Michigan where she teaches graduate courses in the College of Education.



**Dale G. Seymour** is a retired mathematics teacher, author, speaker and publisher. Dale founded Creative Publications in 1968, and went on to found two other mathematics publishing companies. Creating mathematical sculptures is one of his many hobbies.



**Paul A. Kennedy, Ph.D.** is a professor in the Department of Mathematics at Colorado State University. Dr. Kennedy is a leader in mathematics education. His research focuses on developing algebraic thinking by using multiple representations and technology. He is the author of numerous publications.



**Bert K. Waits, Ph.D.**, is a Professor Emeritus of Mathematics at The Ohio State University and co-founder of T3 (Teachers Teaching with Technology), a national professional development program.

# CONTRIBUTING AUTHORS

## Linda Antinone

Fort Worth, TX

Ms. Antinone teaches mathematics at R. L. Paschal High School in Fort Worth, Texas. She has received the Presidential Award for Excellence in Teaching Mathematics and the National Radio Shack Teacher award. She has coauthored several books for Texas Instruments on the use of technology in mathematics.

## Carmen Whitman

Pflugerville, TX

Ms. Whitman travels nationally helping districts improve mathematics education. She has been a program coordinator on the mathematics team at the Charles A. Dana Center, and has served as a secondary math specialist for the Austin Independent School District.

# REVIEWERS

## Mary Anderson

Mathematics Department Chair  
Community High School District 99 South  
Downers Grove, IL

## Dave Barker

Mathematics Department Chair  
Los Alamitos High School  
Los Alamitos, CA

## MaryLane Blomquist

Mathematics Department Chair  
Kewaskum High School  
Kewaskum, WI

## William L. Bonney

Mathematics Department Chair  
Ballard High School  
Seattle, WA

## Suzanne Castren

Mathematics Teacher  
Williamsville South High School  
Williamsville, NY

## Lala Geraldine Chambers, NBCT

Mathematics Department Chair  
Forest Hill High School  
Jackson, MS

## Joan Chrismer-McNatt

Mathematics Teacher  
Clear Creek High School  
League City, TX

## Roy L. Conwell, Jr.

Mathematics Department Chair  
Sam Houston High School  
Houston, TX

## Patricia Daley

Mathematics Teacher, retired  
Fairfield High School  
Fairfield, CT

## Mohammad Elkhatib

Mathematics Department Chair  
Jones High School  
Houston Community College Instructor  
Houston, TX

## Marti Freihofer

Mathematics Department Chair  
Scott High School  
Taylor Mill, KY

## Mary Gesino

Mathematics Department Co-Chair  
R. L. Turner High School  
Carrollton, TX

## Marilyn Gutman

Mathematics Department Chair  
Mayfield High School  
Las Cruces, NM

## Jim Harrington

Supervisor of Mathematics  
Omaha Public Schools  
Omaha, NE

## Marieta W. Harris

Mathematics Specialist  
Memphis, TN

## Jere Hassberger, PhD

Mathematics Department Chair  
Saline High School  
Saline, MI

**James Patrick Herrington**  
Mathematics Department Chair  
O'Fallon Township High School  
O'Fallon, IL

**Margie Hill**  
District Coordinating Teacher for  
Mathematics, K-12  
Blue Valley USD 229  
Overland Park, KS

**Dr. Douglas Lohnas**  
Director of Mathematics  
Niskayuna Central School District  
Niskayuna, NY

**Brenda Lynch**  
Mathematics Department Chair  
Montgomery High School  
Montgomery, TX

**Dr. Charlotte May**  
Mathematics Teacher  
Austin ISD  
Austin, TX

**Ruth Harbin Miles**  
K–12 Coordinator of Mathematics  
Olathe USD 233  
Olathe, KS

**Saundra Paschal**  
Mathematics Department Chair  
Lake View High School  
San Angelo, TX

**Carolyn Randolph**  
Mathematics Department Chair  
Academic Director  
Kendrick High School  
Columbus, GA

**Sarah Ritch**  
Mathematics Department Chair  
Hebron High School  
Carrollton, TX

**Paul Schwiegerling**  
Gifted Mathematics Program  
SUNY at Buffalo  
Buffalo, NY

**Katie Smith**  
Mathematics Department Chair  
Berea High School  
Greenville, SC

**Stephanie Turner**  
Former Mathematics Teacher  
Colleyville Heritage High School  
Colleyville, TX

## FIELD TEST PARTICIPANTS

**Gerri Chambers-McGee**  
Forest Hill High School  
Jackson, MS

**Stephanie Cundiff**  
Mesa Ridge High School  
Colorado Springs, CO

**Eddie Hancock**  
Navasota High School  
Navasota, TX

**Brenda Lynch**  
Montgomery High School  
Montgomery, TX

**Lisa Pope**  
Jacobs High School  
Cincinnati, OH

**Niki Robinson**  
Navasota High School  
Navasota, TX

**Piper Singleton**  
Pershing High School  
Detroit, MI

**Dierdre M. Watkins**  
Dunwoody High School  
Dunwoody, GA

# Preparing for Standardized Tests

**Holt Algebra 2** provides many opportunities for you to prepare for standardized tests.

## Test Prep Exercises

Use the Test Prep Exercises for daily practice of standardized test questions in various formats.

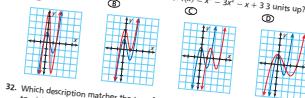
**Multiple Choice**—choose your answer.

**Gridded Response**—write your answer in a grid and fill in the corresponding bubbles.

**Short Response**—write open-ended responses that are scored with a 2-point rubric.

**Extended Response**—write open-ended responses that are scored with a 4-point rubric.

31. Which graph represents a vertical shift of  $f(x) = x^3 - 3x^2 - x + 2$  units up?



32. Which description matches the transformation from  $f(x)$  to  $g(x)$  shown?

- (A) Vertical shift  
(B) Vertical stretch  
(C) Horizontal shift  
(D) Horizontal stretch

33.  $f(x) = x^3 - 6x^2 + 6x + 1$  has three real zeros.

How many real zeros does  $f(x) - 6$  have?

- (A) 0  
(B) 1  
(C) 2  
(D) 3

34. **Extended Response** Consider the function  $f(x) = 3x^3 - 9x^2 - 3x + 9$ .

a. Use the leading coefficient and degree of  $f(x)$  to describe the end behavior.

b. Write the rule for the function  $g(x) = f(-x)$ , and describe the transformation, the transformation of  $f(x)$ . How does the end behavior of  $g(x)$  relate to that of  $f(x)$ ?

### CHALLENGE AND EXTEND

Identify the transformation(s) that would take  $f(x) = (x+2)^3 - 6$  to  $g(x)$ .

35.  $g(x) = x^3 - 6$

36.  $g(x) = (x+2)^3$

37.  $g(x) = (x-1)^3 + 2$

Find all of the roots of the polynomial equation. (Lesson 6-6)

38. For  $f(x) = x^3 - x^2 - 4x + 4$ , describe three different transformations that could be performed to obtain a function with a  $y$ -intercept of 3.

39. **Computers** An administrative assistant recorded the number of words that he typed during different time intervals. His results are in the table below. Write an equation to express this situation. Is it a function? (Lesson 1-6)

### SPiral Review

40. **Computers** An administrative assistant recorded the number of words that he typed during different time intervals. His results are in the table below. Write an equation to express this situation. Is it a function? (Lesson 1-6)

41.  $(6y + 4z^2 - 3) + (9y - 5 + 8j)$

42.  $(2x^5 - 4x + 8x^7) - (3x^4 - x^2 + 3x^6)$

43. Find all of the roots of the polynomial equation. (Lesson 6-6)

44.  $x^2 - 81 = 0$

45.  $x^4 + x^3 + 3x^2 + 10 = 0$

46.  $x^2 + 3x^4 + 2x^3 + 16x^2 - 48x - 64 = 0$

6-8 Transforming Polynomial Functions 465

If you do not understand what a word means, pencil the sentence around the word and make a logical guess.

Read each test item and answer the questions that follow.

**Item A** **Short Response** A box can be made by cutting squares from each of the four corners of a square of cardboard. The volume of a box made from a 27.5 cm by 40 cm piece of cardboard can be modeled by  $V(x) = 27.5(40 - 2x)^2x$ , where  $x$  is the length of one side of a square. Write the volume as a sum of monomials, and find the volume when  $x > 5$  centimeters.

**Item B** **Short Response** The volume of a cylindrical tank with a hemispherical top is given by the function  $V(x) = \pi r^2 h$ , where  $V$  is the volume in cubic inches and  $r$  is the radius in inches. What is the volume of the tank if the tank is 5760 $\pi$  cubic inches?

**Item C** **Multiple Choice** Which description matches the transformation from  $f$  to  $g$  shown?

**Chapter 6 TEST TACKLER Standardized Test Strategies**

**Any Question Type: Identify Key Words and Context Clues**

When reading a test item, you should pay attention to key words and context clues in the problem statement. These clues will help you provide a correct response.

**EXAMPLE 1**

**Short Response**

Write a polynomial in standard form for the volume of the rectangular prism. Find the volume when  $x = 5$  inches.

Look for key words and context clues. Identify what they mean.

Write a polynomial in standard form for the volume of the rectangular prism.

**polynomial** → a monomial or a sum or difference of monomials

**standard form** → a polynomial written with its terms in descending order by degree

**volume** → volume of a rectangular prism ( $V = lwh$ ) in cubic inches

$V(x) = x(x+1)(x+2) = x^3 + 3x^2 + 2x$  — **Standard Form**

The volume of the prism can be represented by  $V(x) = x^3 + 3x^2 + 2x$ , and when  $x = 5$ ,  $V = 210$  cubic inches

**EXAMPLE 2**

**Multiple Choice**

Paige runs a small jewelry business. From 2000 through 2005, the number of items she created was approximately  $24x + 12$ , and the average cost to make each item polynomial can be used to model Paige's total jewelry-making costs for those years?

(A)  $-0.05x^2 + 24x + 22$   
(B)  $-0.05x^2 + 24x + 2$   
(C)  $-1.2x^2 - 6x + 240x + 120$   
(D)  $-1.2x^2 - 0.6x^2 + 240x + 120$

The key words in this test item are total cost.

total cost → average cost per unit times the number of units

$= -0.05x^2 + 10$   
 $= -1.2x^2 - 0.6x^2 + 240x + 120$   
24x + 12

The correct answer is choice D.

10 Chapter 6 Polynomial Functions

The second page guides you through applications of the test-taking strategy.

## Test Tackler

Use the Test Tackler to become familiar with and practice test-taking strategies.

The first page of this feature explains and shows an example of a test-taking strategy.

# Standardized Test Prep

Use the Standardized Test Prep to apply test-taking strategies.

The Hot Tip provides test-taking tips to help you succeed on your tests.

These pages include practice with multiple choice, gridded response, short response, and extended response test items.

**CHAPTER 6**

**STANDARDIZED TEST PREP**

**CUMULATIVE ASSESSMENT, CHAPTERS 1–6**

**Multiple Choice**

1. What is the value of entry  $a_{2,1}$ ?  
 A -3  
 B 0  
 C 4  
 D -6

2. Find the inverse of matrix N.  
 A  $\begin{bmatrix} 2 & -1 \\ -2 & 1 \end{bmatrix}$   
 B  $\begin{bmatrix} 2 & 1 \\ -2 & -1 \end{bmatrix}$   
 C  $\begin{bmatrix} 2 & -1 \\ 2 & 1 \end{bmatrix}$   
 D  $\begin{bmatrix} 2 & 1 \\ -2 & -1 \end{bmatrix}$

3. In Item 10, use the end behavior of the graph to identify the sign of the leading coefficient and the degree of the function. Then use *process of elimination* to choose the correct response.  
 A  $y = 0.25x^2 + x - 2$   
 B  $y = -0.25x^2 + x + 2$   
 C  $y = 0.25x^2 + x + 2$   
 D  $y = -0.25x^2 - x - 2$

4. Which row of Pascal's triangle gives the coefficients for the binomial expansion  $(x + 2)^4$ ?  
 A 1 2 1  
 B 1 3 3 1  
 C 1 4 4 1  
 D 1 6 to 5 1

5. Which polynomial represents an odd-degree polynomial function with a positive leading coefficient?  
 A   
 B   
 C   
 D

6. Solve the compound inequality  $-3x < 12$  and  $8x + 1 > -12x$ . Which of the following is a solution?  
 A  $x < -3$   
 B  $x < -2$   
 C  $x < -1$   
 D  $x < -4$

7. Solve the compound inequality  $-3x < 12$  and  $8x + 1 > -12x$ . Which of the following is a solution?  
 A  $x < -3$   
 B  $x < -2$   
 C  $x < -1$   
 D  $x < -4$

8. What is the value of the y-intercept of  $2x + 3y = 17$ ?  
 A 2  
 B -2  
 C 1  
 D -1

9. Find the inverse of matrix N.  
 A  $\begin{bmatrix} 2 & -1 \\ -2 & 1 \end{bmatrix}$   
 B  $\begin{bmatrix} 2 & 1 \\ -2 & -1 \end{bmatrix}$   
 C  $\begin{bmatrix} 2 & -1 \\ 2 & 1 \end{bmatrix}$   
 D  $\begin{bmatrix} 2 & 1 \\ -2 & -1 \end{bmatrix}$

10. What is the equation of the parabola shown?  
  
 A  $y = 0.25(x + 1)^2 + 2$   
 B  $y = -0.25(x + 1)^2 + 2$   
 C  $y = 0.25(x - 1)^2 + 2$   
 D  $y = -0.25(x - 1)^2 + 2$

**Gridded Response**

11. What is the degree of the polynomial  $2x^4 + 3x^3 - x^6 + 8$ ?  
 A 4  
 B 3  
 C 2  
 D 1

12. Divide by using long division. Identify the number of the remainder.  
 $(2x^3 + 6x^2 - 10x^2 - 2x^2 + 5x)$   
 $\overline{(2x^3 + 3x^2)}$

13. Complete the square for the circle  $x^2 + 3x + \underline{\hspace{2cm}}$

14. The table below shows the number of spyware viruses detected and removed from Larry's computer from January to June.

| Month            | Jan | Feb | Mar | Apr | May | Jun |
|------------------|-----|-----|-----|-----|-----|-----|
| Viruses Detected | 100 | 120 | 140 | 160 | 180 | 200 |
| Viruses Removed  | 80  | 90  | 100 | 110 | 120 | 130 |

## Countdown to Testing

Use the Countdown to Testing to practice for your state test every day.

There are 24 pages of practice for your state test. Each page is designed to be used in a week so that all practice will be completed before your state test is given.

Each week's page has five practice test items, one for each day of the week.

## Test-Taking Tips



- Get plenty of sleep the night before the test. A rested mind thinks more clearly and you won't feel like falling asleep while taking the test.
- Draw a figure when one is not provided with the problem. If a figure is given, write any details from the problem on the figure.
- Read each problem carefully. As you finish each problem, read it again to make sure your answer is reasonable.
- Review the formula sheet that will be supplied with the test. Make sure you know when to use each formula.
- First answer problems that you know how to solve. If you do not know how to solve a problem, skip it and come back to it when you have finished the others.
- Use other test-taking strategies that can be found throughout this book, such as working backward and eliminating answer choices.

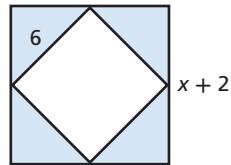
# COUNTDOWN TO TESTING

WEEK 1

## DAY 1

The figure shows a square within a square. Which expression represents the area of the shaded region of the figure in square units?

- (A)  $(x + 2)^2 - 36$     (C)  $2(x + 2) - 12$   
(B)  $(x + 2) - 6$     (D)  $(x + 2 - 6)^2$



## DAY 2

If  $x$  is a nonzero real number, which expression is equivalent to  $(x + 5) - 8$ ?

- (F)  $-8x + 5$   
(G)  $8 - (x + 5)$   
(H)  $x + (5 - 8)$   
(J)  $(x + 8) - 5$

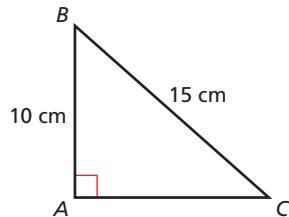
## DAY 3

If  $a$ ,  $b$ , and  $c$  are positive integers, what is the greatest common factor of the expressions  $18ab$  and  $8abc$ ?

- (A) 18  
(B)  $ab$   
(C)  $2ab$   
(D)  $72abc$

## DAY 4

$\triangle ABC$  is a right triangle.



What is the length of  $\overline{AC}$ ?

- (F) 5 cm  
(G)  $5\sqrt{5}$  cm  
(H)  $5\sqrt{13}$  cm  
(J) 25 cm

## DAY 5

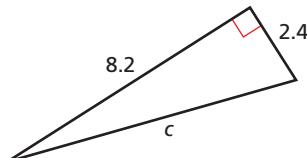
Simplify the expression  $5(x^2 + 4x) + 3(x + 6)$ .

- (A)  $12x^2 + 6$   
(B)  $12x^2 + 18$   
(C)  $5x^2 + 7x + 6$   
(D)  $5x^2 + 23x + 18$

**DAY 1**

The figure shows a right triangle. Which equation can be solved for the unknown side length  $c$ ?

- (A)  $\sqrt{8.2^2 + 2.4^2} = c$
- (B)  $\sqrt{(8.2 + 2.4)^2} = c$
- (C)  $\sqrt{8.2^2 - 2.4^2} = c$
- (D)  $\sqrt{(8.2 - 2.4)^2} = c$

**DAY 2**

What is the perimeter in units of a rectangle with a length of  $g + 8$  units and a width of  $g - 6$  units?

- (F)  $4g + 2$
- (G)  $4g + 4$
- (H)  $g^2 - 16$
- (J)  $g^2 + 2g - 16$

**DAY 3**

Which expression is equivalent to  $\frac{12x^4y^8}{9xy^4}$ ?

- (A)  $\frac{4}{3}xy^2$
- (B)  $\frac{4}{3}xy^4$
- (C)  $\frac{4}{3}x^3y^4$
- (D)  $\frac{4}{3}x^4y^2$

**DAY 4**

A particular hummingbird averages 60 wing beats per second. At this rate, how many times would the hummingbird beat its wings during an hour of flight?

- (F)  $2.16 \times 10^3$
- (G)  $2.16 \times 10^4$
- (H)  $2.16 \times 10^5$
- (J)  $2.16 \times 10^6$

**DAY 5**

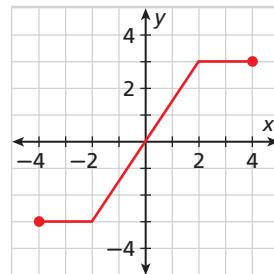
A marathon is a 26.2-mile race. Kendra's average speed during marathons is 7.2 miles per hour. Which function  $d$  represents the distance in miles Kendra has left to run in a marathon  $t$  hours after the race begins?

- (A)  $d(t) = \frac{t}{7.2} - 26.2$
- (B)  $d(t) = 26.2 - \frac{t}{7.2}$
- (C)  $d(t) = 7.2t - 26.2$
- (D)  $d(t) = 26.2 - 7.2t$

**DAY 1**

Which of the following best represents the domain of the function shown in the graph?

- (A)  $-2 \leq x \leq 2$
- (B)  $-3 \leq x \leq 3$
- (C)  $-4 \leq x \leq 4$
- (D)  $-5 \leq x \leq 5$

**DAY 2**

A diagonal of a rectangle measures 9 meters. The width of the rectangle is 6 meters. What is the length of the rectangle?

- (F)  $3\sqrt{5}$  m
- (G)  $9\sqrt{5}$  m
- (H)  $\sqrt{15}$  m
- (J)  $\sqrt{117}$  m

**DAY 3**

If  $a$  and  $b$  are integers, which expression is equivalent to  $6^a \cdot 6^b$ ?

- (A)  $6^{a+b}$
- (B)  $6^{a \cdot b}$
- (C)  $36^{a+b}$
- (D)  $36^{a \cdot b}$

**DAY 4**

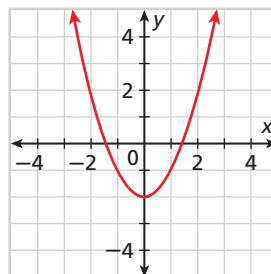
In the diagram, points  $W$ ,  $X$ ,  $Y$ , and  $Z$  are collinear,  $WX = YZ$ , and  $XY = 25$ . If  $WX$  is a whole number, which is NOT a possible value of  $WZ$ ?



- (F) 27
- (G) 30
- (H) 35
- (J) 37

**DAY 5**

What is the parent function of the function shown in the graph?

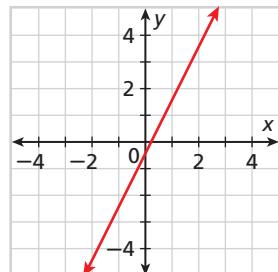


- (A)  $f(x) = x$
- (B)  $f(x) = x^2$
- (C)  $f(x) = x^3$
- (D)  $f(x) = \sqrt{x}$

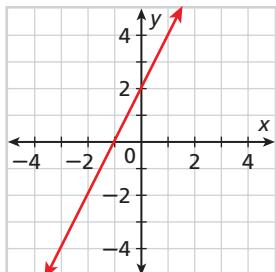
**DAY 1**

Which graph best represents the function  $f(x) = \frac{1}{2}x + 2$ ?

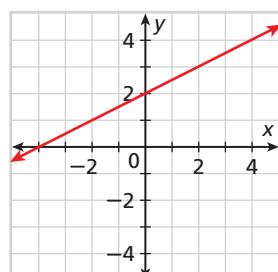
(A)



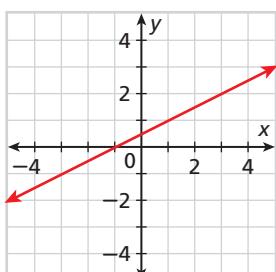
(C)



(B)



(D)

**DAY 2**

Given that  $f(x) = -6x^2 - 12x + 3$ , what is  $f(-2)$ ?

- (F) -45
- (G) 0
- (H) 3
- (J) 51

**DAY 3**

What transformation is suggested by the spokes on a stationary bicycle tire?

- (A) Rotation
- (B) Reflection
- (C) Dilation
- (D) Translation

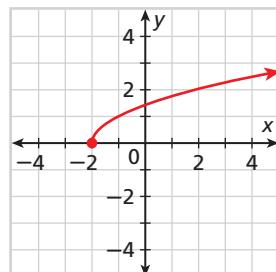
**DAY 4**

Which expression is equivalent to  $\left(\frac{6x^2y^4}{x^4y^2}\right)^3$ ?

- (F)  $216xy^5$
- (G)  $216x^2y^{10}$
- (H)  $216x^{-5}y^5$
- (J)  $216x^{-6}y^6$

**DAY 5**

What is the parent function of the graph shown?

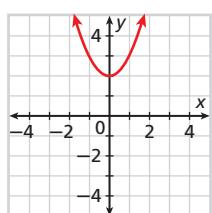


- (A)  $f(x) = x$
- (B)  $f(x) = x^2$
- (C)  $f(x) = x^3$
- (D)  $f(x) = \sqrt{x}$

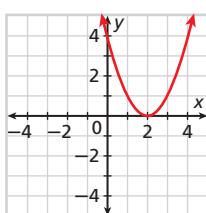
**DAY 1**

Which graph best represents the function  $f(x) = x^2$ ?

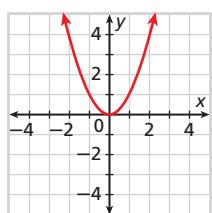
(A)



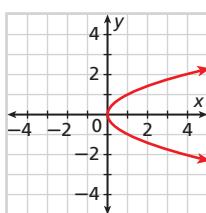
(C)



(B)



(D)

**DAY 2**

A company determines that 40% of its employees commute for more than 30 minutes each day. If 346 employees commute for more than 30 minutes, how many employees does the company have?

(F) 138

(H) 577

(G) 485

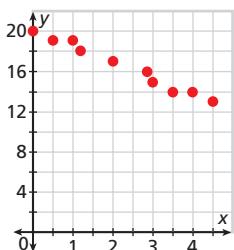
(J) 865

**DAY 3**

Solve  $4z + 16 - 3 = z - 7 + 5z$ .

(A)  $z = 0$ (B)  $z = 2.5$ (C)  $z = 10$ (D)  $z = 20$ **DAY 4**

The scatter plot shown is most likely to represent which of the following sets of data?



- (F) The age of a child and the number of toys he or she owns
- (G) The number of years in college and the amount of student loans
- (H) The number of hours spent practicing per week and the number of free throws missed per game
- (J) The duration of a movie and the cost in millions of dollars to produce it

**DAY 5**

What transformation of the graph of  $f(x) = x$  is the graph of  $g(x) = 4x$ ?

(A) Vertical stretch by a factor of 4

(B) Translation 4 units up

(C) Horizontal stretch by a factor of 4

(D) Translation 4 units right

**DAY 1**

If  $A = \frac{1}{2}bh$ , what is the value of  $A$  when  $b = 10x^3y^2$  and  $h = 15x^{-2}y^4$ ?

- (A)  $75x^{-1}y^6$       (C)  $3xy^8$   
 (B)  $75xy^6$       (D)  $150x^5y^2$

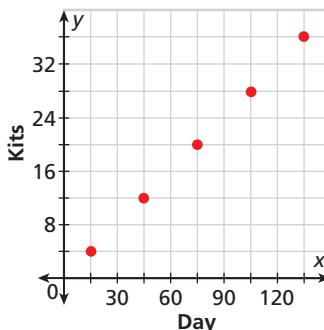
**DAY 2**

Which equation can be used to convert kilometers  $k$  to meters  $m$ ?

- (F)  $m = 0.001k$       (H)  $m = 1000k$   
 (G)  $m = 0.1k$       (J)  $m = 10,000k$

**DAY 3**

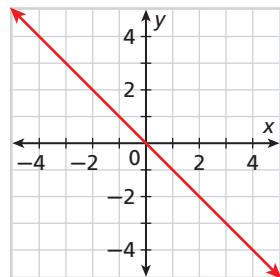
The graph shows the number of survival kits  $s$  a company sells after  $d$  days. Which function can best be used to model the data?



- (A)  $s = \frac{1}{15}d + 4$       (C)  $s = \frac{4}{15}d$   
 (B)  $s = \frac{1}{3}d - 1$       (D)  $s = \frac{1}{5}d$

**DAY 4**

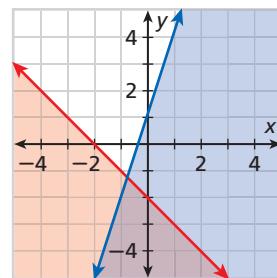
What is the equation of the line shown?



- (F)  $y = -x$   
 (G)  $y = x$   
 (H)  $y = -2x$   
 (J)  $y = 2x$

**DAY 5**

The graph represents which system of linear inequalities?



- (A)  $\begin{cases} y \leq 3x + 1 \\ y \leq -x - 2 \end{cases}$       (C)  $\begin{cases} y < 3x + 1 \\ y < -x - 2 \end{cases}$   
 (B)  $\begin{cases} y \leq x + 3 \\ y \leq -2x - 1 \end{cases}$       (D)  $\begin{cases} y < x + 3 \\ y < -2x - 1 \end{cases}$

**DAY 1**

Which equation fits the data in the table?

|     |    |    |   |    |    |
|-----|----|----|---|----|----|
| $x$ | -3 | -1 | 1 | 3  | 5  |
| $y$ | 5  | 3  | 1 | -1 | -3 |

- (A)  $y = -x + 2$     (B)  $y = 2x$     (C)  $y = x + 2$     (D)  $y = x - 2$

**DAY 2**

If  $a = \frac{1}{2}bh$  and  $\frac{1}{2}bh = 25$ , which of the following is a true statement?

- (F)  $bh = 12.5$   
 (G)  $a = 25$   
 (H)  $\frac{1}{2}bh = 25 + a$   
 (J)  $2a = 25$

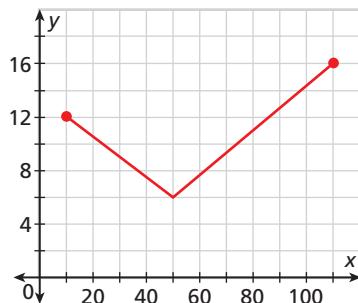
**DAY 3**

Which best illustrates the Associative Property?

- (A)  $3x^2 + 5x^2 - 6 = 3x^2 - 6 + 5x^2$   
 (B)  $x^2(3 + 5) - 6 = (3x^2 + 5x^2) - 6$   
 (C)  $3x^2 + (5x^2 - 6) = (3x^2 + 5x^2) - 6$   
 (D)  $3x^2 + (5x^2 - 6) = (-6 + 3x^2) + 5x^2$

**DAY 4**

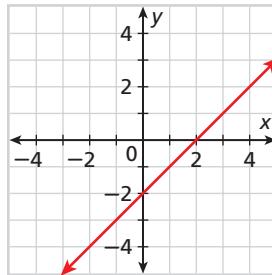
The position of a moving dot on a computer screen over time is given by the graph. What is the domain of this function?



- (F)  $\{x | 5 \leq x \leq 40\}$   
 (G)  $\{x | x \geq 10\}$   
 (H)  $\{x | 12 \leq x \leq 16\}$   
 (J)  $\{x | 10 \leq x \leq 110\}$

**DAY 5**

The graph shown represents which linear function?



- (A)  $y = x^2$   
 (B)  $y + 2 = x$   
 (C)  $y - 2 = x$   
 (D)  $2y = \frac{1}{2}x$

**DAY 1**

What is the domain of the function  $y = |x - 1|$ ?

- (A)  $\{y | y \geq 0\}$
- (B)  $\{x | x \geq 0\}$
- (C) Positive integers
- (D) All real numbers

**DAY 2**

Identify the property illustrated by the following equation.

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

- (F) Additive Inverse Property
- (G) Commutative Property
- (H) Associative Property
- (J) Distributive Property

**DAY 3**

John is  $a$  years old and his aunt is  $b$  years old. Nine years ago, John's aunt was 3 times as old as he was. Which equation represents the age relationship of these two relatives 9 years ago?

- (A)  $b = 3a$
- (B)  $b - 9 = 3(a - 9)$
- (C)  $b - 9 = 3(a - 9)$
- (D)  $b = 3(a - 9)$

**DAY 4**

Which ordered pair is the solution of the following system?

$$\begin{cases} 3x - 5y = 12 \\ 2x = 4 + 5y \end{cases}$$

- (F)  $\left(8, 2\frac{2}{5}\right)$
- (G)  $\left(3\frac{1}{5}, 2\frac{4}{5}\right)$
- (H)  $\left(16, 7\frac{1}{5}\right)$
- (J)  $\left(3\frac{2}{5}, \frac{12}{25}\right)$

**DAY 5**

Teresa has two identical CD binders that are partly filled with CDs.



contains 30 CDs  
weight: 41 oz



contains 75 CDs  
weight: 66.5 oz

How much does each binder weigh when empty, to the nearest ounce?

- (A) 1 oz
- (B) 2 oz
- (C) 24 oz
- (D) 26 oz

**DAY 1**

What is the range of the function  $f(x) = -2|x|$ ?

- (A)  $y > 0$
- (B)  $y \leq 0$
- (C)  $y \leq -2$
- (D) All real numbers

**DAY 2**

What is the solution of the system?

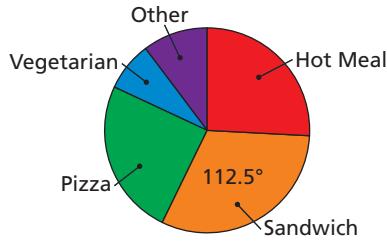
$$\begin{cases} 0.5x + 2.5y = -6.4 \\ 2x - 5y = 19.4 \end{cases}$$

- (F)  $(10.7, 2.1)$
- (G)  $(4.3, 2.15)$
- (H)  $(2.2, -3)$
- (J)  $(0.8, -3.56)$

**DAY 3**

Cafeteria lunch sales are shown in the table and circle graph. How many vegetarian meals were sold?

| Cafeteria Meals Sold |     |
|----------------------|-----|
| Hot meal             | 142 |
| Sandwich             | 170 |
| Pizza                | 135 |
| Vegetarian           | ?   |
| Other                | 55  |



(A) 28

(B) 35

(C) 42

(D) 49

**DAY 4**

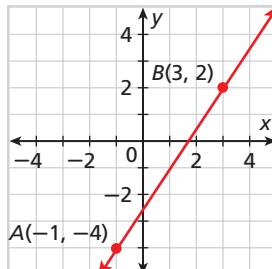
What is the missing number in the following matrix product?

$$\begin{bmatrix} 1 & 3 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} ? & -1 \\ 3 & -2 \end{bmatrix} = \begin{bmatrix} 7 & -7 \\ 8 & -3 \end{bmatrix}$$

- (F) -2
- (G) 2
- (H) 7
- (J) Cannot be determined

**DAY 5**

What is the equation of the line through the origin that is perpendicular to  $\overleftrightarrow{AB}$ ?



(A)  $y = \frac{2}{3}x$

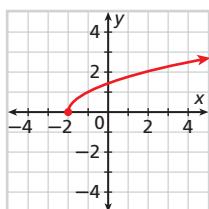
(B)  $y = -\frac{2}{3}x$

(C)  $y = \frac{3}{2}x$

(D)  $y = -\frac{3}{2}x$

**DAY 1**

Which function is shown in the graph?



- (A)  $f(x) = \sqrt{x} + 2$     (C)  $f(x) = 2\sqrt{x}$   
 (B)  $f(x) = \sqrt{x+2}$     (D)  $f(x) = \sqrt{x-2}$

**DAY 2**

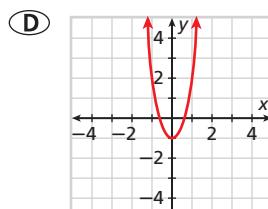
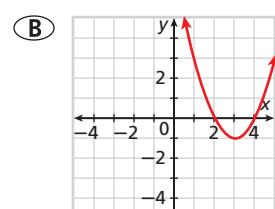
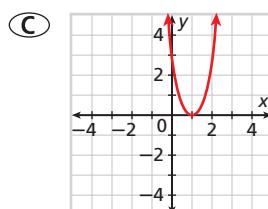
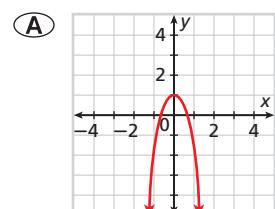
Solve the given system of equations. What is the  $y$ -value of the solution?

$$\begin{cases} -6x + 8y = -24 \\ \frac{1}{6}x - 5y = -71 \end{cases}$$

- (F) 24  
 (G) 15  
 (H) 12  
 (J) 9

**DAY 3**

Which is the graph of  $f(x) = 3x^2 - 1$ ?

**DAY 4**

Faith plans to buy no more than 200 doorknobs to sell at her home improvement store. The doorknobs will be made of either brass or wood. Faith wants to buy at most 75 brass doorknobs and at least 110 wood doorknobs. Which of the following purchases meet Faith's requirements?

- (F) 5 brass; 150 wood  
 (G) 20 brass; 90 wood  
 (H) 40 brass; 175 wood  
 (J) 80 brass; 112 wood

**DAY 5**

The equation of a least-squares line is  $y \approx 0.15x - 0.21$ . Predict the  $x$ -value that corresponds to a  $y$ -value of 20.

- (A) 95.24  
 (B) 131.93  
 (C) 134.73  
 (D) 175.13

**DAY 1**

What is the range of the function  $f(x) = -\frac{1}{4}|x - 2|$ ?

- (A)  $y \leq 0$
- (B)  $y > 0$
- (C)  $y \leq -2$
- (D)  $y > 2$

**DAY 2**

Which matrix product can be used to solve the following system?

$$\begin{cases} 4x = 2y + 6 \\ 8x + 3y = 14 \end{cases}$$

(F)  $\begin{bmatrix} 4 & -2 \\ 8 & 3 \end{bmatrix}^{-1} \begin{bmatrix} 6 \\ 14 \end{bmatrix}$     (H)  $\begin{bmatrix} 4 & -2 \\ 8 & 3 \end{bmatrix}^{-1} \begin{bmatrix} -6 \\ 14 \end{bmatrix}$   
 (G)  $\begin{bmatrix} 4 & 2 \\ 8 & 3 \end{bmatrix}^{-1} \begin{bmatrix} 6 \\ 14 \end{bmatrix}$     (J)  $\begin{bmatrix} 4 & 2 \\ 8 & 3 \end{bmatrix}^{-1} \begin{bmatrix} -6 \\ 14 \end{bmatrix}$

**DAY 3**

Video games cost \$29.99 each, and DVDs cost \$19.99 each. If Phillip has at most \$449.99 to spend, which combination of video games and DVDs is NOT a reasonable purchase?

- (A) 5 games; 14 DVDs
- (B) 10 games; 5 DVDs
- (C) 7 games; 13 DVDs
- (D) 4 games; 12 DVDs

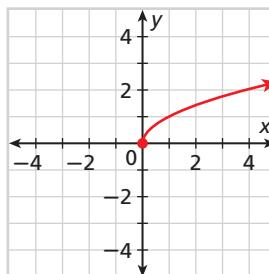
**DAY 4**

Which value is equivalent to  $30 \div 2 + \sqrt{64} - 4^3(8 - 4)^{-2}$ ?

- (F) -1
- (G) 13
- (H) 19
- (J) 535

**DAY 5**

The graph shown represents which parent function?



- (A)  $f(x) = \sqrt{x}$
- (B)  $f(x) = x^2$
- (C)  $f(x) = 2$
- (D)  $f(x) = x^3$

**DAY 1**

How is the graph of  $g(x) = |x| - 4$  transformed from the graph of  $f(x) = |x|$ ?

- (A) The graph of  $f$  is translated 4 units up.
- (B) The graph of  $f$  is translated 4 units down.
- (C) The graph of  $f$  is translated 4 units right.
- (D) The graph of  $f$  is translated 4 units left.

**DAY 2**

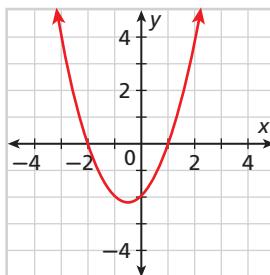
Given that  $f(x)$  is a quadratic function, find the missing value in the table.

|        |   |    |    |   |
|--------|---|----|----|---|
| $x$    | 2 | 4  | 6  | 8 |
| $f(x)$ | 3 | -1 | -6 | ? |

- (F) 0
- (G) -1
- (H) -11
- (J) -12

**DAY 3**

The following graph represents which table of data?



- |     |        |    |    |   |   |
|-----|--------|----|----|---|---|
| (A) | $x$    | -2 | -1 | 0 | 1 |
|     | $f(x)$ | 2  | -2 | 2 | 1 |
- 
- |     |        |    |    |    |   |
|-----|--------|----|----|----|---|
| (B) | $x$    | 0  | -2 | -2 | 0 |
|     | $f(x)$ | -2 | -1 | 0  | 1 |

- |     |        |    |    |    |   |
|-----|--------|----|----|----|---|
| (C) | $x$    | -2 | -1 | 0  | 1 |
|     | $f(x)$ | 0  | -2 | -2 | 0 |
- 
- |     |        |    |    |   |   |
|-----|--------|----|----|---|---|
| (D) | $x$    | -2 | -1 | 0 | 1 |
|     | $f(x)$ | -1 | 0  | 1 | 2 |

**DAY 4**

What is the domain of the function  $f(x) = -\frac{1}{2}|x - 4|$ ?

- (F) All real numbers
- (G)  $x < 0$
- (H)  $x \geq -2$
- (J)  $x > 4$

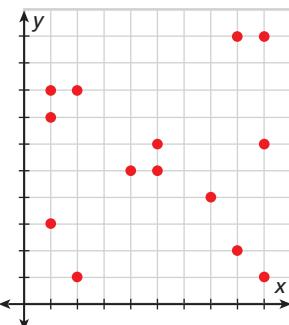
**DAY 5**

How is the graph of  $g(x) = 2(x + 1)^2$  transformed from the graph of  $f(x) = x^2$ ?

- (A) The graph of  $f$  is translated 2 units left and 1 unit up.
- (B) The graph of  $f$  is vertically compressed by a factor of  $\frac{1}{2}$  and translated 1 unit left.
- (C) The graph of  $f$  is vertically stretched by a factor of 2 and translated 1 unit up.
- (D) The graph of  $f$  is vertically stretched by a factor of 2 and translated 1 unit left.

**DAY 1**

Which of the following best describes the correlation found in the scatter plot?



- (A) Strong positive correlation
- (B) Weak positive correlation
- (C) No correlation
- (D) Negative correlation

**DAY 2**

Which of the following best describes how to graph the function  $f(x) = (x - 7)^2 + 3$ ?

- (F) Move the parent function to the right 7 units and up 3 units.
- (G) Move the parent function to the right 3 units and down 7 units.
- (H) Move the parent function to the left 7 units and up 3 units.
- (J) Move the parent function to the right 7 units and down 3 units.

**DAY 3**

Which situation is best represented by the data?

| $t$    | 0   | 0.5 | 1  | 1.5 | 2  | 2.5 |
|--------|-----|-----|----|-----|----|-----|
| $f(t)$ | 112 | 108 | 96 | 76  | 48 | 12  |

- (A) The distance decreases by 4 miles for every 30 seconds traveled.
- (B) The height of an object above ground decreases nonlinearly over time.
- (C) As the time increases, the speed of a car increases at a constant rate.
- (D) As the time increases, the distance traveled decreases at a constant rate.

**DAY 4**

Which function is equivalent to  $f(x) = 30x^2 + 2x - 56$ ?

- (F)  $f(x) = (3x - 4)(5x + 14)$
- (G)  $f(x) = 2(3x + 4)(5x - 7)$
- (H)  $f(x) = (6x - 4)(5x + 7)$
- (J)  $f(x) = 2(3x - 4)(5x + 7)$

**DAY 5**

The height  $h$  of a football  $t$  seconds after it is kicked is given by  $h(t) = -16t^2 + 40t$ . What is a reasonable real-world domain for the situation?

- (A) all positive real numbers
- (B) all real numbers between 0 and 3
- (C) all real numbers between 0 and 2.5
- (D) all real numbers between 0 and 1.25

**DAY 1**

The length  $x$  of a rectangle is 6 feet longer than its width. What is a reasonable domain for the function that represents the area of the rectangle?

- (A) all real numbers
- (B) all positive numbers
- (C)  $x > 6$
- (D)  $0 \leq x \leq 6$

**DAY 2**

Which quadratic equation has nonreal solutions?

- (F)  $x^2 - 8x + 16 = 0$
- (G)  $4x^2 - 12x + 9 = 0$
- (H)  $-x^2 + 4x - 5 = 0$
- (J)  $x^2 - 3x - 7 = 0$

**DAY 3**

The function  $P = (h - 3)^2 + 174$  models the power, in megawatts, generated between midnight and noon by a power plant, where  $h$  represents hours after midnight. How would the graph of the function change if the minimum power generated increased to 250 megawatts?

- (A) The vertex would change to (3, 250).
- (B) The vertex would change to (250, 174).
- (C) The graph of the function would be reflected over the  $x$ -axis.
- (D) The graph of the function would be horizontally compressed.

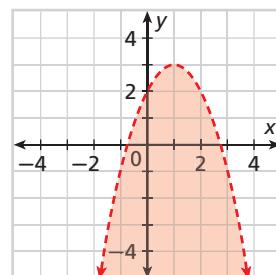
**DAY 4**

To solve the equation  $0 = x^2 + 7x - 26$  by completing the square, the first step is to add 26 to both sides of the equation. Which statement best describes the second step?

- (F) Add  $\frac{9}{4}$  to both sides.
- (G) Square the product of 7 and 2.
- (H) Take half of 7 and square it.
- (J) Rewrite the perfect square trinomial as a binomial squared.

**DAY 5**

Which quadratic inequality best represents the graph?

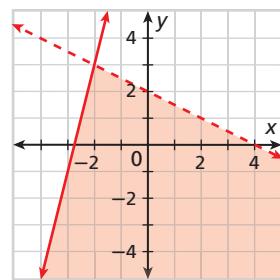


- (A)  $y < -x^2 + 2x + 2$
- (B)  $y > x^2 + 2x + 2$
- (C)  $y \leq -x^2 + 2x + 2$
- (D)  $y < x^2 - 2x + 2$

## DAY 1

The graph represents the solutions of which system of inequalities?

- |  |  |
|--|--|
| <p>(A) <math>\begin{cases} y \leq -\frac{1}{2}x + 2 \\ y \leq 4x + 11 \end{cases}</math></p> | <p>(C) <math>\begin{cases} y &gt; -\frac{1}{2}x + 2 \\ y \leq 4x + 11 \end{cases}</math></p> |
| <p>(B) <math>\begin{cases} y \leq -\frac{1}{2}x + 2 \\ y \geq 4x + 11 \end{cases}</math></p> | <p>(D) <math>\begin{cases} y &lt; -\frac{1}{2}x + 2 \\ y \leq 4x + 11 \end{cases}</math></p> |



## DAY 2

Which best describes  $g(x) = \sqrt{2(x - 1)} + 4$  as a transformation of  $f(x) = \sqrt{x}$ ?

- (F)  $g$  is  $f$  horizontally compressed by a factor of  $\frac{1}{2}$  and translated left 1 unit and up 4 units.
- (G)  $g$  is  $f$  horizontally stretched by a factor of 2 and translated right 1 unit and up 4 units.
- (H)  $g$  is  $f$  horizontally compressed by a factor of  $\frac{1}{2}$  and translated right 1 unit and up 4 units.
- (J)  $g$  is  $f$  horizontally stretched by a factor of 2 and translated left 1 unit and down 4 units.

## DAY 3

Which statement is always true of the function  $f(x) = \frac{1}{5}x + 6$ ?

- (A)  $f(x)$  is less than  $x$ .
- (B) If  $x$  is positive, then  $f(x)$  is positive.
- (C) If  $x$  is negative, then  $f(x)$  is negative.
- (D)  $f(x)$  is greater than  $x$ .

## DAY 4

The perimeter  $P$  of a rectangle with a length of  $x$  feet and a width of  $y$  feet cannot exceed 300 feet. Which is NOT a constraint of the feasible region representing  $P$ ?

- (F)  $x > 0$
- (G)  $x > 300 - y$
- (H)  $y > 0$
- (J)  $x < 150 - y$

## DAY 5

In which relationship listed are the two quantities independent of one another?

- (A) The amount of tax paid for an item and the price of the item
- (B) The number of snacks bought from a vending machine and the amount of money in the machine
- (C) The number of hours worked at \$7.25 per hour and the amount of money earned
- (D) The age of a person and the number of telephones in his or her house

**DAY 1**

What are the solutions of the equation  $3x^2 - 6x - 7 = 0$ ?

- (A)  $x = \frac{3 \pm 2i\sqrt{3}}{3}$
- (B)  $x \approx 2.8$  and  $x \approx -0.8$
- (C)  $x \approx 17$  and  $x \approx -5$
- (D)  $x \approx 3.2$  and  $x \approx -0.6$

**DAY 2**

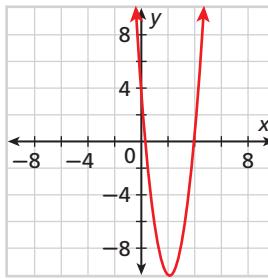
Which function best represents the data in the table?

| $x$    | -2 | -1 | 0 | 1 | 2 | 3 |
|--------|----|----|---|---|---|---|
| $f(x)$ | 25 | 13 | 5 | 1 | 1 | 5 |

- (F)  $f(x) = 2x^2 - 6x + 5$
- (G)  $f(x) = -2x^2 - 6x + 8$
- (H)  $f(x) = x^2 - 6x + 5$
- (J)  $f(x) = 2x^2 - 9x + 5$

**DAY 3**

The graph can be used to determine the solutions to which quadratic equation?



- (A)  $x^2 - 5x + 4 = 0$
- (B)  $3x^2 - 7x + 2 = 0$
- (C)  $3x^2 - 13x + 4 = 0$
- (D)  $3x^2 - 8x + 4 = 0$

**DAY 4**

At the beginning of a basketball game, the referee tosses the ball into the air with an initial vertical velocity of 24 feet per second. The ball's initial height is 5 feet above the floor. Which inequality can be used to find the time interval  $t$  for which the height of the ball is greater than 10 feet?

- (F)  $-16t^2 + 24t + 5 < 10$
- (G)  $-16t^2 + 24t + 5 > 10$
- (H)  $24t^2 - 16t + 5 > 10$
- (J)  $24t + 5 > 10$

**DAY 5**

The function  $P = -16(c - 25)^2 + 10,000$  models the profit the student council makes from a dance, where  $c$  is the cost per ticket in dollars. How does the graph of the function change if the maximum profit is made by selling the tickets for \$40?

- (A) The graph of the function would be reflected over the  $y$ -axis.
- (B) The vertex would change to  $(25, 40)$ .
- (C) The vertex would change to  $(40, 10,000)$ .
- (D) The graph of the function would not change.

**DAY 1**

The school's ticket office sells adult and student tickets to a musical. The auditorium normally holds no more than 2,500 people. There can be no more than 1,200 student tickets and no more than 1,800 adult tickets sold. If  $x$  represents the number of student tickets sold and  $y$  represents the number of adult tickets sold, which system of linear inequalities represents the possible combinations of student and adult tickets that can be sold?

- |  |   |
|--|---|
| <input type="radio"/> A $\begin{cases} x + y > 2500 \\ x + y \leq 1200 \\ y \leq 1800 \end{cases}$ | <input type="radio"/> C $\begin{cases} x + y \leq 1200 \\ x \leq 2500 \\ y \leq 1800 \end{cases}$ |
| <input type="radio"/> B $\begin{cases} x + y \geq 2500 \\ x \geq 1200 \\ y \geq 1800 \end{cases}$  | <input type="radio"/> D $\begin{cases} x + y \leq 2500 \\ x \leq 1200 \\ y \leq 1800 \end{cases}$ |

**DAY 2**

In chemistry,  $\text{pH} = -\log[\text{H}^+]$ , where  $[\text{H}^+]$  is the hydrogen ion concentration of a solution in moles per liter. What is  $[\text{H}^+]$  of a carbonated soda if its pH is 1.5?

- F  $10^{-1.5}$
- G  $10^{1.5}$
- H  $-\log 1.5$
- J  $-\log(-1.5)$

**DAY 3**

For which of the following functions does  $y$  vary directly as  $x$ ?

- A  $y = \frac{2}{x}$
- B  $y = -7x$
- C  $10 = xy$
- D  $y = x^0 - 15$

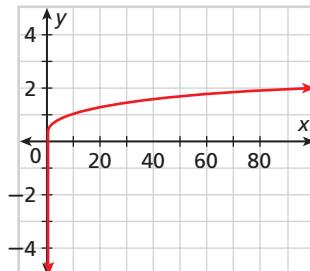
**DAY 4**

The distance a spring stretches varies directly as the amount of weight hanging from it. A weight of 60 pounds stretches the spring 15 centimeters. How heavy is the weight hanging on the spring when it stretches 12 centimeters?

- F 3 pounds
- G 12 pounds
- H 48 pounds
- J 52 pounds

**DAY 5**

The graph represents which parent function?



- A  $y = x^2$
- B  $y = x$
- C  $y = \log x$
- D  $y = e^x$

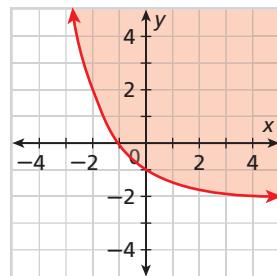
**DAY 1**

The area of a rectangular parking lot with a length of 1500 feet can be no more than 3,000,000 square feet. Which is the most reasonable domain of the function representing the parking lot's area  $A$  in square feet in terms of its width  $w$  in feet?

- (A)  $0 < w \leq 1500$
- (B)  $0 < w \leq 2000$
- (C)  $1500 < w \leq 2000$
- (D)  $1500 < w \leq 3,000,000$

**DAY 2**

Which ordered pair is NOT a solution of the exponential inequality shown in the graph?



- (F) (2, -2)
- (G) (5, 1)
- (H) (3, 3)
- (J) (0, 4)

**DAY 3**

Determine the  $y$ -value of the solution of the system of equations.

$$\begin{cases} y = 4x + 12 \\ y = 2x - 5 \end{cases}$$

- (A) -2
- (B) -3.5
- (C) -8.5
- (D) -22

**DAY 4**

Which function represents the graph of  $f(x) = \ln x$  translated 2 units right and 5 units up?

- (F)  $g(x) = \ln(x + 2) - 5$
- (G)  $g(x) = \ln(x + 5) - 2$
- (H)  $g(x) = \ln(x - 2) + 5$
- (J)  $g(x) = \ln(x - 5) + 2$

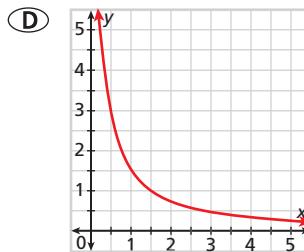
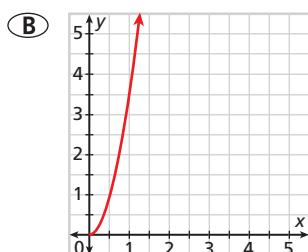
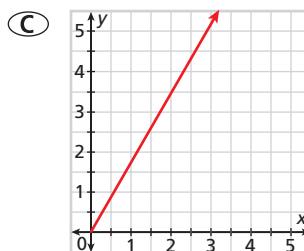
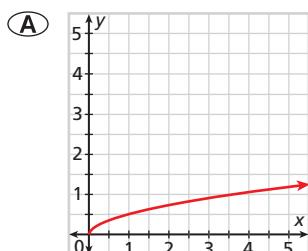
**DAY 5**

Which ordered pair is a solution of the inequality  $y > -(x - 3)^2 + 8$ ?

- (A) (5, 0)
- (B) (5, 1)
- (C) (5, 4)
- (D) (5, 6)

**DAY 1**

The radius of a circle can be determined by dividing the area by  $\pi$  and taking the square root of the result. Which graph best shows the radius as a function of the area?

**DAY 2**

Which of the following relationships would most likely be characterized by a negative correlation?

- (F) The number of DVDs purchased and the total cost
- (G) The height of a tree and its age
- (H) The number of workers on a job and the time it takes to complete the job
- (J) The age of a person and his or her hat size

**DAY 3**

What function best represents the data in the table?

| $x$ | $f(x)$ |
|-----|--------|
| 0   | -2     |
| 1   | -1     |
| 4   | 0      |
| 9   | 1      |
| 16  | 2      |

- (A)  $f(x) = x - 2$
- (B)  $f(x) = (x - 2)^2$
- (C)  $f(x) = \sqrt{x - 2}$
- (D)  $f(x) = \sqrt{x} - 2$

**DAY 4**

How does the graph of  $g(x) = \sqrt{-x}$  differ from the graph of  $f(x) = \sqrt{x}$ ?

- (F) The graph is reflected across the  $x$ -axis.
- (G) The graph is reflected across the  $y$ -axis.
- (H) The graph is rotated  $180^\circ$  about the origin.
- (J) The graph is shifted 4 units down.

**DAY 5**

Where does a hole occur in the graph of  $f(x) = \frac{(x + 4)(x - 6)}{(x + 2)(x - 6)(x + 3)}$ ?

- (A)  $x = 6$
- (B)  $x = -2$
- (C)  $x = -3$
- (D)  $x = -4$

**DAY 1**

The speed of a sound wave traveling through a thin rod is given by the formula  $v = \sqrt{\frac{Y}{p}}$ , where  $v$  is the speed of the waves in meters per second,  $Y$  is  $8.0 \times 10^{10}$  pascals, and  $p$  is the density of the rod in kilograms per cubic meter. If you know the value of  $v$ , which equation can you use to determine  $p$ ?

- (A)  $p = \sqrt{\frac{Y}{v}}$
- (B)  $p = \frac{Y}{v^2}$
- (C)  $p = \frac{\sqrt{Y}}{v}$
- (D)  $p = (Yv)^2$

**DAY 2**

Martha invested \$12,000 and earned \$840 in interest in one year. She invested some of the money in an account that pays 8% per year and the rest of it in an account that pays 5% per year. Which system can be used to find the amount she invested at each rate?

- (F)  $\begin{cases} x - y = 12,000 \\ 0.08x - 0.05y = 840 \end{cases}$
- (G)  $\begin{cases} y = 12,000 - x \\ 0.08x + 0.05y = 12,000 - 840 \end{cases}$
- (H)  $\begin{cases} xy = 12,000 \\ 0.08x - 0.05y = 840 \end{cases}$
- (J)  $\begin{cases} y = 12,000 - x \\ 0.08x + 0.05y = 840 \end{cases}$

**DAY 3**

Which is the graph of  $f(x) = \ln x$ ?

- |            |            |
|------------|------------|
| <p>(A)</p> | <p>(C)</p> |
| <p>(B)</p> | <p>(D)</p> |

**DAY 4**

Which function represents a reflection of  $f(x) = 2^x$  across the  $y$ -axis?

- (F)  $g(x) = -2^x$
- (H)  $g(x) = 2^{-x}$
- (G)  $g(x) = \left(\frac{1}{2}\right)^x$
- (J)  $g(x) = \left(\frac{1}{x}\right)^2$

**DAY 5**

Which equation is equivalent to  $12^{-x} = 24$ ?

- (A)  $\log_{24} 12 = x$
- (C)  $\log_{12} 24 = -x$
- (B)  $\log_x 24 = 12$
- (D)  $\log_{-x} 12 = 24$

**DAY 1**

The range of a quadratic function is  $\{y|y \leq 4\}$ . What is the range of the same function after translation 3 units up?

- (A)  $\{y|y \leq 1\}$
- (B)  $\{y|y \geq 1\}$
- (C)  $\{y|y \leq 7\}$
- (D)  $\{y|y \geq 7\}$

**DAY 2**

Which function represents a translation of  $f(x) = 2^x$  six units right?

- (F)  $g(x) = 2^x - 6$
- (G)  $g(x) = 2^{x-6}$
- (H)  $g(x) = 2^x + 6$
- (J)  $g(x) = 2^{x+6}$

**DAY 3**

What is the domain of the function  $f(x) = -\sqrt{7-x}$ ?

- (A)  $x \geq -7$
- (B)  $x \leq -7$
- (C)  $x \geq 7$
- (D)  $x \leq 7$

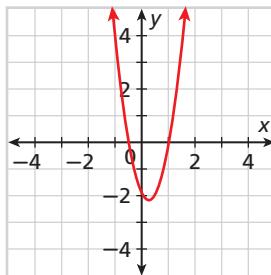
**DAY 4**

Which transformation was NOT applied to the graph of  $f(x) = \sqrt{x}$  to obtain  $g(x) = -4\sqrt{6}(x+3)$ ?

- (F) Vertical translation 3 units up
- (G) Reflection across the  $x$ -axis
- (H) Vertical stretch by a factor of 4
- (J) Horizontal compression by a factor of  $\frac{1}{6}$ .

**DAY 5**

Which quadratic function is represented by the graph?



- (A)  $f(x) = 4x^2 - 2x - 2$
- (B)  $f(x) = x^2 - 2$
- (C)  $f(x) = (x+1)(x-1)$
- (D)  $f(x) = (x-2)^2 - 2$

**DAY 1**

Francisco wants to make a scatter plot to determine if there is a correlation between duration of a construction highway project and the number of managers assigned to the project. Which table would be best for Francisco to organize his findings?

- (A) 

| Duration of Project |  |  |
|---------------------|--|--|
| Manager Names       |  |  |
- (B) 

| Number of Managers |  |  |
|--------------------|--|--|
| Project Number     |  |  |
- (C) 

| Duration of Project |  |  |
|---------------------|--|--|
| Number of Managers  |  |  |
- (D) 

| Project Number |  |  |
|----------------|--|--|
| Manager Names  |  |  |

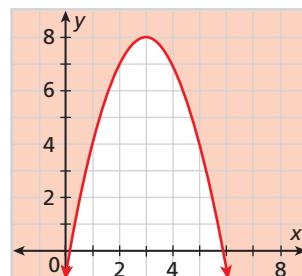
**DAY 2**

Bobby is on a biking trip that consists of 55 miles on paved roads and 18 miles on unpaved roads. He is able to bike twice as fast on paved roads as on unpaved roads. Which function represents the total time  $T$  in hours that Bobby needs to complete the trip in terms of his average speed on unpaved roads  $x$  in miles per hour?

- (F)  $T(x) = \frac{55}{x} + \frac{18}{2x}$
- (G)  $T(x) = \frac{55}{2x} + \frac{18}{x}$
- (H)  $T(x) = \frac{55}{x} - \frac{37}{2x}$
- (J)  $T(x) = \frac{55}{x} - \frac{18}{2x}$

**DAY 3**

The graph of the inequality  $y \geq -(x - 3)^2 + 8$  is shown below. Which of the given points is not in the solution region?



- (A)  $(-2, -3)$
- (B)  $(1, 7)$
- (C)  $(3, 4)$
- (D)  $(6, 5)$

**DAY 4**

Solve  $\sqrt{x + 14} \leq x - 16$ .

- (F)  $x \geq 16$
- (G)  $-16 \leq x \leq 22$
- (H)  $x \leq -22$
- (J)  $x \geq 22$

**DAY 5**

What is the relationship between the graph of the function  $y = x^2 - 4x$  and the graph of its inverse?

- (A) Reflection across the line  $y = x$
- (B) Translation of 4 units down
- (C)  $180^\circ$  rotation about the origin
- (D) Vertical stretch by a factor of 4

**DAY 1**

What is the domain of  $f(x) = \frac{3x + 5}{x^2 + 3x - 18}$ ?

- (A) All real numbers
- (B) All real numbers except  $-6$
- (C) All real numbers except  $3$
- (D) All real numbers except  $3$  and  $-6$

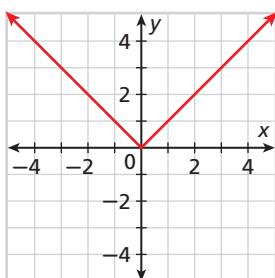
**DAY 2**

One leg of a right triangle measures  $9$  ft and the hypotenuse measures  $15$  ft. Which equation can you use to find the length of the third side of the triangle?

- (F)  $b = \sqrt{15^2 - 9^2}$
- (G)  $b^2 = \sqrt{15^2 - 9^2}$
- (H)  $b = \sqrt{15^2 + 9^2}$
- (J)  $b^2 = \sqrt{15^2 + 9^2}$

**DAY 3**

Which parent function is shown in the graph?



- (A)  $f(x) = e^x$
- (B)  $f(x) = \ln x$
- (C)  $f(x) = \sqrt{x}$
- (D)  $f(x) = |x|$

**DAY 4**

Which function does NOT include the values  $-2$ ,  $4$ ,  $8$ , and  $12$  in the domain?

- (F)  $f(x) = \sqrt{12x + 24}$
- (G)  $f(x) = \sqrt{7(x - 4)}$
- (H)  $f(x) = \sqrt{x^2 + 5x + 6}$
- (J)  $f(x) = \sqrt{\frac{2}{x^2 + 1}}$

**DAY 5**

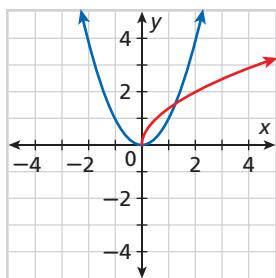
A parabola is a conic section formed by the intersection of a plane and a(n) \_\_\_\_\_.

- (A) circle
- (B) hyperbola
- (C) double cone
- (D) ellipse

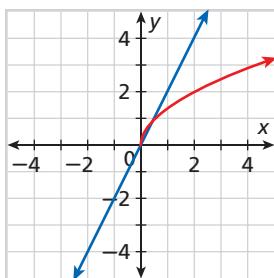
**DAY 1**

Which graph can be used to determine the solution of  $x^2 = \sqrt{2x}$ ?

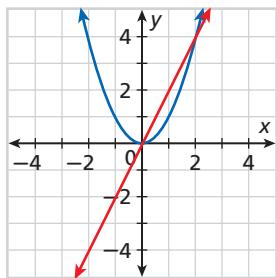
(A)



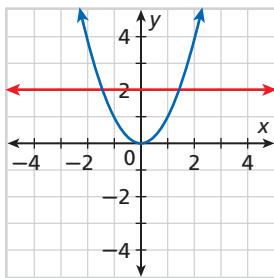
(C)



(B)



(D)

**DAY 2**

Solve  $\frac{x}{x-2} = \frac{3x}{x+2}$ .

- (F)  $x = 2$  or  $x = -2$
- (G)  $x = 0$  or  $x = 3$
- (H)  $x = 0$  or  $x = 4$
- (J) No real solution

**DAY 3**

The population of Warren County is 55,000 and is growing at a rate of 3.8% per decade. Which of the following expressions represents the population of Warren County after  $n$  decades?

- (A)  $55,000(3.8)^n$
- (B)  $55,000(1.38)^n$
- (C)  $55,000(1.038)^n$
- (D)  $55,000 + (3.8)^n$

**DAY 4**

What value of  $x$  makes the equation  $3 = 1 + \log(2x)$  true?

- (F) 1
- (G) 10
- (H) 50
- (J) 100

**DAY 5**

The equation  $\frac{x^2}{100} - \frac{y^2}{64} = 1$  represents which conic section?

- (A) Circle
- (B) Hyperbola
- (C) Parabola
- (D) Ellipse

# Foundations for Functions

 go.hrw.com

Online Resources

KEYWORD: MB7 TOC

## ARE YOU READY? ..... 3

**Properties and Operations**

|  |  |    |
|--|--|----|
| <b>1-1</b>                             | Sets of Numbers .....  | 6  |
| <b>1-2</b>                             | Properties of Real Numbers .....   | 14 |
| <b>Connecting Algebra to Geometry:</b> |  |    |
|  | The Pythagorean Theorem .....  | 20 |
| <b>1-3</b>                             | Square Roots .....   | 21 |
| <b>1-4</b>                             | Simplifying Algebraic Expressions .....  | 27 |
| <b>LAB</b>                             | <b>Explore Negative Exponents</b>  | 33 |
| <b>1-5</b>                             | Properties of Exponents .....  | 34 |
| <b>MULTI-STEP TEST PREP</b> .....      |  | 42 |
| <b>READY To Go On? QUIZ</b> .....      |  | 43 |

**Introduction to Functions**

|                                   |  |    |
|-----------------------------------|--|----|
| <b>1-6</b>                        | Relations and Functions .....          | 44 |
| <b>1-7</b>                        | Function Notation .....                | 51 |
| <b>LAB</b>                        | <b>Chess Translations</b> .....        | 58 |
| <b>1-8</b>                        | Exploring Transformations .....        | 59 |
| <b>1-9</b>                        | Introduction to Parent Functions ..... | 67 |
| <b>MULTI-STEP TEST PREP</b> ..... |  | 74 |
| <b>READY To Go On? QUIZ</b> ..... |  | 75 |
| Study Guide: Preview .....        |  | 4  |
| Reading and Writing Math .....    |  | 5  |
| Study Guide: Review .....         |  | 76 |
| Chapter Test .....                |  | 80 |

**Tools for Success****Reading Math** 6, 8, 15, 34, 52**Writing Math** 12, 19, 25, 32, 41, 49, 56, 65, 73**Vocabulary** 3, 4, 10, 24, 38, 47, 54, 63, 70, 76**Study Strategy** 5**Know-It Notes** 6, 9, 14, 15, 16, 22, 23, 29, 35, 38, 46, 53, 59, 60, 61, 62, 67, 70**Graphic Organizers** 6, 9, 16, 23, 29, 38, 46, 53, 62, 70**Homework Help Online** 10, 17, 24, 30, 38, 47, 54, 63, 70**Test Prep Exercises** 13, 19, 26, 32, 41, 50, 56, 65–66, 73**Multi-Step Test Prep** 11, 18, 25, 31, 40, 42, 49, 56, 64, 71, 74**College Entrance Exam Practice** 81**Test Tackler** 82**Standardized Test Prep** 84

# Table of Contents

# Linear Functions

CHAPTER

**2**

**ARE YOU READY?** ..... 87

## Linear Equations and Inequalities

**2-1** Solving Linear Equations and Inequalities ..... 90

**2-2** Proportional Reasoning ..... 97

### Connecting Algebra to Geometry:

Percent Increase and Decrease ..... 104

**2-3** Graphing Linear Functions ..... 105

**LAB** **Explore Graphs and Windows**  ..... 113

**2-4** Writing Linear Functions ..... 115

**2-5** Linear Inequalities in Two Variables ..... 124

**MULTI-STEP TEST PREP** ..... 132

**READY TO GO ON? QUIZ** ..... 133

## Applying Linear Functions

**2-6** Transforming Linear Functions ..... 134

### Connecting Algebra to Data Analysis:

Statistical Graphs ..... 141

**2-7** Curve Fitting with Linear Models ..... 142

**2-8** Solving Absolute-Value Equations and Inequalities ..... 150

**LAB** **Solve Absolute-Value Equations**  ..... 157

**2-9** Absolute-Value Functions ..... 158

**MULTI-STEP TEST PREP** ..... 164

**READY TO GO ON? QUIZ** ..... 165

Study Guide: Preview ..... 88

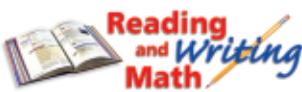
Reading and Writing Math ..... 89

Study Guide: Review ..... 166

Chapter Test ..... 170

Problem Solving On Location: Pennsylvania ..... 176

## Tools for Success



**Reading Math** 89, 97, 99, 150

**Writing Math** 95, 102, 111, 122, 139, 148, 155, 162

**Vocabulary** 87, 88, 94, 100, 109, 128, 146, 154, 161, 166



**Know-It Notes** 90, 93, 97, 100, 108, 116, 117, 119, 143, 151, 152, 158, 159

**Graphic Organizers** 93, 100, 109, 120, 127, 137, 145, 153, 160

**Homework Help Online** 94, 100, 109, 120, 128, 138, 146, 154, 161



**Test Prep Exercises** 96, 103, 112, 123, 130–131, 140, 149, 156, 163

**Multi-Step Test Prep** 95, 102, 111, 122, 129–130, 132, 139, 148, 155, 162, 164

**College Entrance Exam Practice** 171

**Test Tackler** 172

**Standardized Test Prep** 174

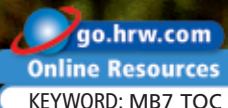
go.hrw.com

Online Resources

KEYWORD: MB7 TOC

**CHAPTER****3**

# Linear Systems



KEYWORD: MB7 TOC

**ARE YOU READY? ..... 179**

## Linear Systems in Two Dimensions

|  |  |            |
|--|--|------------|
| <b>3-1</b>                                   | Using Graphs and Tables to Solve Linear Systems..... | <b>182</b> |
| <b>3-2</b>                                   | Using Algebraic Methods to Solve Linear Systems..... | <b>190</b> |
| <b>Connecting Algebra to Geometry:</b>       |  |            |
|  | Properties of Polygons .....                         | <b>198</b> |
| <b>3-3</b>                                   | Solving Systems of Linear Inequalities.....          | <b>199</b> |
| <b>3-4</b>                                   | Linear Programming .....                             | <b>205</b> |
| <b>MULTI-STEP TEST PREP</b> ..... <b>212</b> |  |            |
| <b>READY To Go ON? QUIZ</b> ..... <b>213</b> |  |            |

## Linear Systems in Three Dimensions

|  |  |            |
|--|--|------------|
| <b>3-5</b>                             | Linear Equations in Three Dimensions .....     | <b>214</b> |
| <b>Connecting Algebra to Geometry:</b> |  |            |
|  | Views of Solid Figures.....                    | <b>219</b> |
| <b>3-6</b>                             | Solving Linear Systems in Three Variables..... | <b>220</b> |
|  | <b>Explore Parametric Equations</b> .....      | <b>227</b> |
|  | <b>Multi-Step Test Prep</b> .....              | <b>228</b> |
|  | <b>READY To Go ON? QUIZ</b> .....              | <b>229</b> |
| <b>EXT</b>                             | Parametric Equations .....                     | <b>230</b> |
|  | Study Guide: Preview.....                      | <b>180</b> |
|  | Reading and Writing Math.....                  | <b>181</b> |
|  | Study Guide: Review .....                      | <b>232</b> |
|  | Chapter Test .....                             | <b>236</b> |

## Tools for Success

**Reading Math** 191**Writing Math** 181, 188, 196, 203, 210, 217, 225**Vocabulary** 179, 180, 186, 194, 202, 209, 216, 232**Know-It Notes** 184, 206, 220**Graphic Organizers** 185, 194, 201, 208, 216, 224**Homework Help Online** 186, 194, 202, 209, 216, 224**Test Prep Exercises** 188–189, 196–197, 203–204, 211, 218, 226**Multi-Step Test Prep** 188, 196, 203, 210, 212, 217, 225, 228**College Entrance Exam Practice** 237**Test Tackler** 238**Standardized Test Prep** 240

# Matrices

## ARE YOU READY? ..... 243

### Matrix Operations

|  |   |     |
|--|---|-----|
| <b>4-1</b>                             | Matrices and Data .....                             | 246 |
| <b>4-2</b>                             | Multiplying Matrices .....                          | 253 |
| <b>Connecting Algebra to Geometry:</b> |   |     |
|  | Transformations .....                               | 261 |
| <b>4-3</b>                             | Using Matrices to Transform Geometric Figures ..... | 262 |
| <b>MULTI-STEP TEST PREP</b> .....      |   | 268 |
| <b>READY To Go On? QUIZ</b> .....      |   | 269 |

### Using Matrices to Solve Systems

|   |   |     |
|---|---|-----|
| <b>4-4</b>  | Determinants and Cramer's Rule .....  | 270 |
| <b>4-5</b>  | Matrix Inverses and Solving Systems .....   | 278 |
| <b>LAB</b>  | <b>Use Spreadsheets with Matrices to Solve Systems</b>  | 286 |
| <b>4-6</b>  | Row Operations and Augmented Matrices .....   | 287 |
| <b>MULTI-STEP TEST PREP</b> .....                 |   | 294 |
| <b>READY To Go On? QUIZ</b> .....                 |   | 295 |
| <b>EXT</b>  | <b>Networks and Matrices</b> .....  | 296 |
| Study Guide: Preview .....                        |   | 244 |
| Reading and Writing Math .....                    |   | 245 |
| Study Guide: Review .....                         |   | 298 |
| Chapter Test .....                                |   | 302 |
| Problem Solving On Location: South Carolina ..... |   | 308 |

### Tools for Success



- Reading Math** 245, 262, 270  
**Writing Math** 245, 252, 259, 266, 276, 284, 292, 297  
**Vocabulary** 243, 244, 250, 257, 265, 274, 282, 291, 298



- Know-It Notes** 247, 249, 254, 271, 273, 279, 288  
**Graphic Organizers** 249, 256, 264, 274, 281, 290  
**Homework Help Online** 250, 257, 265, 274, 282, 291



- Test Prep Exercises** 252, 260, 267, 276, 284–285, 293  
**Multi-Step Test Prep** 251–252, 258–259, 266, 268, 276, 284, 292–293, 294  
**College Entrance Exam Practice** 303  
**Test Tackler** 304  
**Standardized Test Prep** 306

# CHAPTER

# 5

go.hrw.com  
Online Resources

KEYWORD: MB7 TOC



# Quadratic Functions

**ARE YOU READY?** ..... 311

## Quadratic Functions and Complex Numbers

|  |   |     |
|--|---|-----|
| <b>LAB</b>                                     | <b>Explore Parameter Changes</b>                      | 314 |
| 5-1  | Using Transformations to Graph Quadratic Functions    | 315 |
| 5-2  | Properties of Quadratic Functions in Standard Form    | 323 |
| <b>Connecting Algebra to Previous Courses:</b> |   |     |
|  | Factoring Quadratic Expressions                       | 331 |
| <b>LAB</b>                                     | <b>Explore Graphs and Factors</b>                     | 332 |
| 5-3  | Solving Quadratic Equations by Graphing and Factoring | 333 |
| 5-4  | Completing the Square                                 | 341 |
| <b>Connecting Algebra to Geometry:</b>         |   |     |
|  | Areas of Composite Figures                            | 349 |
| 5-5  | Complex Numbers and Roots                             | 350 |
| 5-6  | The Quadratic Formula                                 | 356 |
| <b>MULTI-STEP TEST PREP</b>                    |   |     |
|  | READY TO GO ON? QUIZ                                  | 365 |

## Applying Quadratic Functions

|                             |                                     |     |
|-----------------------------|-------------------------------------|-----|
| 5-7                         | Solving Quadratic Inequalities      | 366 |
| 5-8                         | Curve Fitting with Quadratic Models | 374 |
| 5-9                         | Operations with Complex Numbers     | 382 |
| <b>MULTI-STEP TEST PREP</b> |                                     |     |
|                             | READY TO GO ON? QUIZ                | 391 |
| Study Guide: Preview        |                                     |     |
|                             | Reading and Writing Math            | 312 |
|                             | Study Guide: Review                 | 392 |
|                             | Chapter Test                        | 396 |

## Tools for Success



**Reading Math** 334, 341, 367, 375

**Writing Math** 321, 329, 339, 347, 354, 362, 372, 380, 388

**Vocabulary** 311, 312, 320, 328, 338, 345, 353, 361, 370, 377, 386, 392



**Study Strategy** 313

**Know-It Notes** 315, 316, 317, 318, 319, 323, 324, 326, 327, 334, 336, 337, 341, 342, 343, 344, 350, 352, 356, 358, 360, 366, 370, 377, 382, 385

**Graphic Organizers** 319, 327, 337, 344, 351, 352, 360, 370, 377, 385

**Homework Help Online** 320, 328, 338, 345, 353, 361, 370, 377, 386



**Test Prep Exercises** 322, 330, 340, 347–348, 355, 363, 373, 381, 389

**Multi-Step Test Prep** 321, 329, 339, 347, 354, 362, 364, 372, 378, 388, 390

**College Entrance Exam Practice** 397

**Test Tackler** 398

**Standardized Test Prep** 400

# Polynomial Functions



## ARE YOU READY? ..... 403

### Operations with Polynomials

|  |  |     |
|--|--|-----|
| <b>6-1</b>   | Polynomials .....  | 406 |
| <b>Connecting Algebra to Number Theory:</b>          |  |     |
|  | Pascal's Triangle .....                                  | 413 |
| <b>6-2</b>   | Multiplying Polynomials.....                             | 414 |
| <b>Connecting Algebra to Geometry: Nets.....</b> 421 |  |     |
| <b>6-3</b>   | Dividing Polynomials.....                                | 422 |
| <b>LAB</b>   | <b>Explore the Sum and Difference of Two Cubes</b> ..... | 429 |
| <b>6-4</b>   | Factoring Polynomials.....                               | 430 |
| <b>MULTI-STEP TEST PREP</b> .....                    |  |     |
| <b>READY TO GO ON? QUIZ</b> .....                    |  |     |

### Applying Polynomial Functions

|  |   |     |
|--|---|-----|
| <b>6-5</b>                                       | Finding Real Roots of Polynomial Equations.....   | 438 |
| <b>6-6</b>                                       | Fundamental Theorem of Algebra.....               | 445 |
| <b>LAB</b>                                       | <b>Explore End Behavior</b> .....                 | 452 |
| <b>6-7</b>                                       | Investigating Graphs of Polynomial Functions..... | 453 |
| <b>6-8</b>                                       | Transforming Polynomial Functions .....           | 460 |
| <b>6-9</b>                                       | Curve Fitting with Polynomial Models .....        | 466 |
| <b>MULTI-STEP TEST PREP</b> .....                |   |     |
| <b>READY TO GO ON? QUIZ</b> .....                |   |     |
| Study Guide: Preview..... 404                    |   |     |
| Reading and Writing Math..... 405                |   |     |
| Study Guide: Review .....                        |   |     |
| Chapter Test .....                               |   |     |
| Problem Solving On Location: New Jersey..... 484 |   |     |

### Tools for Success



**Reading Math** 456

**Writing Math** 412, 420, 427, 434, 444, 450, 459, 464, 471

**Vocabulary** 403, 404, 410, 426, 442, 457, 474



**Study Strategy** 405

**Know-It Notes** 407, 416, 423, 424, 430, 431, 439, 441, 445-447, 453, 455, 460, 466

**Graphic Organizers** 409, 417, 425, 432, 442, 448, 456, 463, 468

**Homework Help Online** 410, 418, 426, 433, 442, 449, 457, 463, 469



**Test Prep Exercises** 412, 420, 428, 434, 444, 451, 459, 465, 471

**Multi-Step Test Prep** 411, 419, 427, 434, 436, 443, 450, 458, 464, 470, 472

**College Entrance Exam Practice** 479

**Test Tackler** 480

**Standardized Test Prep** 482

## CHAPTER

## 7

 go.hrw.com  
Online Resources

KEYWORD: MB7 TOC

# Exponential and Logarithmic Functions

**ARE YOU READY?** ..... 487

## Exponential Functions and Logarithms

|   |   |     |
|---|---|-----|
| 7-1   | Exponential Functions, Growth and Decay ..... | 490 |
|  | Explore Inverses of Functions .....           | 497 |
| 7-2   | Inverses of Relations and Functions .....     | 498 |
| 7-3   | Logarithmic Functions.....                    | 505 |
| 7-4   | Properties of Logarithms .....                | 512 |
|   | MULTI-STEP TEST PREP .....                    | 520 |
|   | <b>READY TO GO ON? QUIZ</b> .....             | 521 |

## Applying Exponential and Logarithmic Functions

|  |   |     |
|--|---|-----|
| 7-5  | Exponential and Logarithmic Equations and Inequalities .. | 522 |
|  | <b>Connecting Algebra to Probability:</b>                 |     |
|  | Exponents in Probability .....                            | 529 |
|  | Explore the Rule of 72 .....                              | 530 |
| 7-6  | The Natural Base, e .....                                 | 531 |
| 7-7  | Transforming Exponential and Logarithmic Functions .....  | 537 |
| 7-8  | Curve Fitting with Exponential and Logarithmic Models ..  | 545 |
|  | MULTI-STEP TEST PREP .....                                | 552 |
|  | <b>READY TO GO ON? QUIZ</b> .....                         | 553 |
|  | Study Guide: Preview .....                                | 488 |
|  | Reading and Writing Math .....                            | 489 |
|  | Study Guide: Review .....                                 | 554 |
|  | Chapter Test .....  | 558 |

## Tools for Success



**Reading Math** 489, 505

**Writing Math** 489, 495, 503, 510, 518, 527, 535, 543, 550

**Vocabulary** 487, 488, 493, 501, 509, 526, 534, 548, 554



**Know-It Notes** 506, 512, 513, 514, 532, 537, 538

**Graphic Organizers** 493, 501, 508, 515, 525, 533, 541, 547

**Homework Help Online** 493, 501, 509, 516, 526, 534, 541, 548



**Test Prep Exercises** 495–496, 503–504, 510–511, 519, 528, 536, 544, 550

**Multi-Step Test Prep** 494–495, 502–503, 510, 517–518, 520, 527–528, 535, 543, 550, 552

**College Entrance Exam Practice** 559

**Test Tackler** 560

**Standardized Test Prep** 562

# Rational and Radical Functions

**ARE YOU READY?** ..... 565

## Rational Functions

|                             |  |     |
|-----------------------------|--|-----|
| <b>LAB</b>                  | <b>Model Inverse Variation</b>   | 568 |
| <b>8-1</b>                  | Variation Functions  | 569 |
| <b>8-2</b>                  | Multiplying and Dividing Rational Expressions  | 577 |
| <b>8-3</b>                  | Adding and Subtracting Rational Expressions  | 583 |
| <b>LAB</b>                  | <b>Explore Holes in Graphs</b>  | 591 |
| <b>8-4</b>                  | Rational Functions   | 592 |
| <b>8-5</b>                  | Solving Rational Equations and Inequalities  | 600 |
| <b>MULTI-STEP TEST PREP</b> |  | 608 |
| <b>READY TO GO ON? QUIZ</b> |  | 609 |

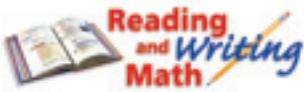
## Radical Functions

|  |  |     |
|--|--|-----|
| <b>8-6</b>                             | Radical Expressions and Rational Exponents | 610 |
| <b>Connecting Algebra to Geometry:</b> |  |     |
| Area and Volume Relationships          |  | 618 |
| <b>8-7</b>                             | Radical Functions                          | 619 |
| <b>8-8</b>                             | Solving Radical Equations and Inequalities | 628 |
| <b>MULTI-STEP TEST PREP</b>            |  | 636 |
| <b>READY TO GO ON? QUIZ</b>            |  | 637 |
| Study Guide: Preview                   |  | 566 |
| Reading and Writing Math               |  | 567 |
| Study Guide: Review                    |  | 638 |
| Chapter Test                           |  | 642 |
| Problem Solving on Location: Michigan  |  | 648 |

go.hrw.com  
Online Resources  
KEYWORD: MB7 TOC



## Tools for Success



- Reading Math** 570, 610
- Writing Math** 575, 582, 590, 599, 607, 612, 617, 627, 634
- Vocabulary** 565, 566, 573, 580, 588, 597, 605, 614, 624, 632, 638



- Study Strategy** 567
- Know-It Notes** 573, 578, 580, 584, 587, 592, 593, 594, 596, 604, 611, 612, 614, 620, 621, 623, 628, 632
- Graphic Organizers** 573, 580, 587, 596, 604, 614, 623, 632
- Homework Help Online** 573, 580, 588, 597, 605, 614, 624, 632



- Test Prep Exercises** 575–576, 582, 590, 599, 607, 617, 627, 635
- Multi-Step Test Prep** 575, 581, 589, 598, 606, 608, 616, 626, 634, 636
- College Entrance Exam Practice** 643
- Test Tackler** 644
- Standardized Test Prep** 646

## CHAPTER

# 9

go.hrw.com  
Online Resources  
KEYWORD: MB7 TOC

# Properties and Attributes of Functions

ARE YOU READY? ..... 651

## Functions and Their Graphs

|                      |                                       |     |
|----------------------|---------------------------------------|-----|
| 9-1                  | Multiple Representations of Functions | 654 |
| 9-2                  | Piecewise Functions                   | 662 |
| LAB                  | Graph Piecewise Functions             | 670 |
| 9-3                  | Transforming Functions                | 672 |
| MULTI-STEP TEST PREP |                                       | 680 |
| READY TO GO ON? QUIZ |                                       | 681 |

## Functional Relationships

|   |                                |     |
|---|--------------------------------|-----|
| 9-4   | Operations with Functions      | 682 |
| Connecting Algebra to Geometry:<br>Using Geometric Formulas |                                | 689 |
| 9-5   | Functions and Their Inverses   | 690 |
| LAB   | Explore Differences and Ratios | 697 |
| 9-6   | Modeling Real-World Data       | 698 |
| MULTI-STEP TEST PREP  |                                | 706 |
| READY TO GO ON? QUIZ  |                                | 707 |
| Study Guide: Preview  |                                | 652 |
| Reading and Writing Math                                    |                                | 653 |
| Study Guide: Review   |                                | 708 |
| Chapter Test  |                                | 712 |

## Tools for Success



**Reading Math** 653, 683  
**Writing Math** 660, 668, 678, 687,  
695, 704  
**Vocabulary** 651, 652, 666, 686, 708



**Know-It Notes** 656, 672, 673, 682, 683,  
690, 692, 698  
**Graphic Organizers** 658, 665, 676, 685,  
693, 701  
**Homework Help Online** 658, 666, 676,  
686, 693, 702



**Test Prep Exercises** 661, 668–669,  
679, 688, 695–696, 705  
**Multi-Step Test Prep** 660, 668, 677,  
680, 687, 695, 704, 706  
**College Entrance Exam Practice** 713  
**Test Tackler** 714  
**Standardized Test Prep** 716

# CHAPTER 10

go.hrw.com  
Online Resources

KEYWORD: MB7 TOC

# Conic Sections

**ARE YOU READY?** ..... 719

## Exploring Conic Sections

|  |                                      |     |
|--|--------------------------------------|-----|
| <b>10-1</b>                            | Introduction to Conic Sections       | 722 |
| <b>10-2</b>                            | Circles                              | 729 |
| <b>Connecting Algebra to Geometry:</b> |                                      |     |
|  | Surface Area and Volume              | 735 |
| <b>10-3</b>                            | Ellipses                             | 736 |
| <b>LAB</b>                             | <b>Locate the Foci of an Ellipse</b> | 743 |
| <b>10-4</b>                            | Hyperbolas                           | 744 |
| <b>10-5</b>                            | Parabolas                            | 751 |
| <b>MULTI-STEP TEST PREP</b> ..... 758  |                                      |     |
| <b>READY TO GO ON? QUIZ</b> ..... 759  |                                      |     |

## Applying Conic Sections

|   |                            |     |
|---|----------------------------|-----|
| <b>10-6</b>                                     | Identifying Conic Sections | 760 |
| <b>LAB</b>                                      | <b>Conic-Section Art</b>   | 767 |
| <b>10-7</b>                                     | Solving Nonlinear Systems  | 768 |
| <b>MULTI-STEP TEST PREP</b> ..... 776           |                            |     |
| <b>READY TO GO ON? QUIZ</b> ..... 777           |                            |     |
| Study Guide: Preview ..... 720                  |                            |     |
| Reading and Writing Math ..... 721              |                            |     |
| Study Guide: Review ..... 778                   |                            |     |
| Chapter Test ..... 782                          |                            |     |
| Problem Solving on Location: Illinois ..... 788 |                            |     |

## Tools for Success



**Writing Math** 727, 734, 742, 749, 757, 765, 774

**Vocabulary** 719, 720, 726, 732, 740, 748, 755, 772, 778



**Study Strategy** 721

**Know-It Notes** 724, 729, 737, 738, 745, 746, 752, 753, 760, 761,

**Graphic Organizers** 725, 731, 739, 747, 754, 763, 771

**Homework Help Online** 726, 732, 740, 748, 755, 764, 772



**Test Prep Exercises** 728, 734, 742, 750, 757, 766, 774

**Multi-Step Test Prep** 726, 733, 741, 749, 756, 758, 765, 773, 776

**College Entrance Exam Practice** 783

**Test Tackler** 784

**Standardized Test Prep** 786

**CHAPTER****11**go.hrw.com  
Online Resources

KEYWORD: MB7 TOC

# Probability and Statistics

**ARE YOU READY? ..... 791****Probability**

|  |  |     |
|--|--|-----|
| <b>11-1</b>                            | Permutations and Combinations .....  | 794 |
| <b>Connecting Algebra to Geometry:</b> |  |     |
|  | Relative Area.....   | 801 |
| <b>11-2</b>                            | Theoretical and Experimental Probability .....   | 802 |
| <b>LAB</b>                             | <b>Explore Simulations</b>  | 810 |
| <b>11-3</b>                            | Independent and Dependent Events.....  | 811 |
| <b>11-4</b>                            | Compound Events .....  | 819 |
| <b>MULTI-STEP TEST PREP</b>            |  |     |
| <b>READY To Go On? QUIZ</b> ..... 827  |  |     |

**Data Analysis and Statistics**

|                                       |  |     |
|---------------------------------------|--|-----|
| <b>11-5</b>                           | Measures of Central Tendency and Variation .....   | 828 |
| <b>LAB</b>                            | <b>Collect Experimental Data</b>  | 836 |
| <b>11-6</b>                           | Binomial Distributions .....   | 837 |
| <b>MULTI-STEP TEST PREP</b>           |  |     |
| <b>READY To Go On? QUIZ</b> ..... 845 |  |     |
| <b>EXT</b>                            | Normal Distributions .....   | 846 |
| Study Guide: Preview..... 792         |  |     |
| Reading and Writing Math..... 793     |  |     |
| Study Guide: Review ..... 848         |  |     |
| Chapter Test ..... 852                |  |     |

**Tools for Success**

- Reading Math** 793, 830, 847  
**Writing Math** 793, 799, 808, 817, 824, 832, 842  
**Vocabulary** 791, 792, 798, 806, 815, 822, 833, 840, 848



- Know-It Notes** 794, 795, 797, 802, 803, 805, 811, 812, 819, 820, 837, 838  
**Graphic Organizers** 797, 806, 814, 822, 832, 840  
**Homework Help Online** 798, 806, 815, 822, 833, 840



- Test Prep Exercises** 800, 809, 817, 824–825, 835, 842–843  
**Multi-Step Test Prep** 799–800, 808, 816–817, 824, 826, 835, 841–842, 844  
**College Entrance Exam Practice** 853  
**Test Tackler** 854  
**Standardized Test Prep** 856

# CHAPTER

# 12

# Sequences and Series

**ARE YOU READY?** ..... 859

## Exploring Arithmetic Sequences and Series

|                                      |                                 |     |
|--------------------------------------|---------------------------------|-----|
| 12-1                                 | Introduction to Sequences       | 862 |
| Connecting Algebra to Geometry:      |                                 |     |
| Geometric Patterns and Tessellations |                                 | 869 |
| 12-2                                 | Series and Summation Notation   | 870 |
| <b>LAB</b>                           | Evaluate Sequences and Series   | 878 |
| 12-3                                 | Arithmetic Sequences and Series | 879 |
| MULTI-STEP TEST PREP                 |                                 | 888 |
| READY TO GO ON? QUIZ                 |                                 | 889 |

go.hrw.com  
Online Resources

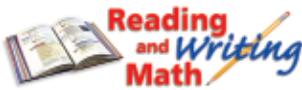
KEYWORD: MB7 TOC

## Exploring Geometric Sequences and Series

|                                     |  |     |
|-------------------------------------|--|-----|
| 12-4                                | Geometric Sequences and Series                       | 890 |
| <b>LAB</b>                          | Explore Infinite Geometric Series                    | 899 |
| 12-5                                | Mathematical Induction and Infinite Geometric Series | 900 |
| MULTI-STEP TEST PREP                |  | 908 |
| READY TO GO ON? QUIZ                |  | 909 |
| <b>EXT</b>                          | Area Under a Curve                                   | 910 |
| Study Guide: Preview                |  | 860 |
| Reading and Writing Math            |  | 861 |
| Study Guide: Review                 |  | 912 |
| Chapter Test                        |  | 916 |
| Problem Solving on Location: Nevada |  | 922 |



## Tools for Success



- Reading Math** 862
- Writing Math** 861, 868, 876, 886, 897, 906
- Vocabulary** 859, 860, 865, 874, 884, 895, 904, 912



- Know-It Notes** 871, 880, 882, 891–893, 901, 902
- Graphic Organizers** 865, 873, 883, 894, 903
- Homework Help Online** 865, 874, 884, 895, 904



- Test Prep Exercises** 868, 876–877, 886–887, 897–898, 906–907
- Multi-Step Test Prep** 867, 876, 886, 888, 897, 906, 908
- College Entrance Exam Practice** 917
- Test Tackler** 918
- Standardized Test Prep** 920

**CHAPTER****13** go.hrw.com  
Online Resources  
KEYWORD: MB7 TOC

# Trigonometric Functions

ARE YOU READY? ..... 925

## Trigonometry and Angles

### Connecting Algebra to Geometry:

|   |     |
|---|-----|
| Special Right Triangles .....   | 928 |
| <b>13-1</b> Right-Angle Trigonometry .....  | 929 |
| <b>13-2</b> Angles of Rotation .....  | 936 |
| <b>LAB Explore the Unit Circle</b>  | 942 |
| <b>13-3</b> The Unit Circle .....   | 943 |
| <b>13-4</b> Inverses of Trigonometric Functions .....   | 950 |
| <b>MULTI-STEP TEST PREP</b> .....   | 956 |
| <b>READY To Go On? QUIZ</b> .....   | 957 |

## Applying Trigonometric Functions

|                                      |     |
|--------------------------------------|-----|
| <b>13-5</b> The Law of Sines .....   | 958 |
| <b>13-6</b> The Law of Cosines ..... | 966 |
| <b>MULTI-STEP TEST PREP</b> .....    | 974 |
| <b>READY To Go On? QUIZ</b> .....    | 975 |

|                                |     |
|--------------------------------|-----|
| Study Guide: Preview .....     | 926 |
| Reading and Writing Math ..... | 927 |
| Study Guide: Review .....      | 976 |
| Chapter Test .....             | 980 |

## Tools for Success

**Reading Math** 927, 943, 950, 951, 959**Writing Math** 935, 941, 948, 955, 964, 972**Vocabulary** 925, 926, 933, 939, 947, 953, 976**Know-It Notes** 929–930, 932, 936, 938, 943, 944, 945, 946, 951, 953, 958, 959–960, 962, 966, 969, 970**Graphic Organizers** 932, 938, 944, 945, 946, 953, 962, 970**Homework Help Online** 933, 939, 947, 953, 962, 970**Test Prep Exercises** 935, 941, 948, 955, 965, 973**Multi-Step Test Prep** 934, 940, 948, 955, 956, 964, 972, 974**College Entrance Exam Practice** 981**Test Tackler** 982**Standardized Test Prep** 984

# Trigonometric Graphs and Identities

**ARE YOU READY?** ..... 987

## Exploring Trigonometric Graphs

|                                   |   |      |
|-----------------------------------|---|------|
| <b>14-1</b>                       | Graphs of Sine and Cosine .....               | 990  |
| <b>14-2</b>                       | Graphs of Other Trigonometric Functions ..... | 998  |
| <b>MULTI-STEP TEST PREP</b> ..... |   | 1004 |
| <b>READY TO GO ON? QUIZ</b> ..... |   | 1005 |

## Trigonometric Identities

|  |   |      |
|--|---|------|
| <b>LAB</b>                             | <b>Graph Trigonometric Identities</b>  ..... | 1006 |
| <b>Connecting Algebra to Geometry:</b> |   |      |
|  | Angle Relationships .....   | 1007 |
| <b>14-3</b>                            | Fundamental Trigonometric Identities .....  | 1008 |
| <b>14-4</b>                            | Sum and Difference Identities .....   | 1014 |
| <b>14-5</b>                            | Double-Angle and Half-Angle Identities .....  | 1020 |
| <b>14-6</b>                            | Solving Trigonometric Equations .....   | 1027 |
| <b>MULTI-STEP TEST PREP</b> .....      |   | 1034 |
| <b>READY TO GO ON? QUIZ</b> .....      |   | 1035 |

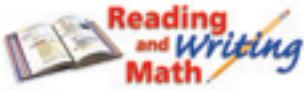
|   |      |
|---|------|
| Study Guide: Preview .....              | 988  |
| Reading and Writing Math .....          | 989  |
| Study Guide: Review .....               | 1036 |
| Chapter Test .....                      | 1040 |
| Problem Solving On Location: Ohio ..... | 1046 |

go.hrw.com  
Online Resources

KEYWORD: MB7 TOC



## Tools for Success



|                     |                                   |
|---------------------|-----------------------------------|
| <b>Reading Math</b> | 1010, 1022                        |
| <b>Writing Math</b> | 997, 1003, 1012, 1019, 1025, 1033 |
| <b>Vocabulary</b>   | 987, 988, 995, 1017, 1036         |



|                             |  |
|-----------------------------|--|
| <b>Study Strategy</b>       | 989  |
| <b>Know-It Notes</b>        | 991, 998–1000, 1008, 1014, 1016, 1020, 1022, |
| <b>Graphic Organizers</b>   | 994, 1001, 1010, 1017, 1023, 1030            |
| <b>Homework Help Online</b> | 995, 1001, 1011, 1017, 1024, 1031            |



|                                       |   |
|---------------------------------------|---|
| <b>Test Prep Exercises</b>            | 997, 1003, 1013, 1019, 1026, 1033             |
| <b>Multi-Step Test Prep</b>           | 996, 1002, 1004, 1012, 1018, 1025, 1032, 1034 |
| <b>College Entrance Exam Practice</b> | 1041  |
| <b>Test Tackler</b>                   | 1042  |
| <b>Standardized Test Prep</b>         | 1044  |

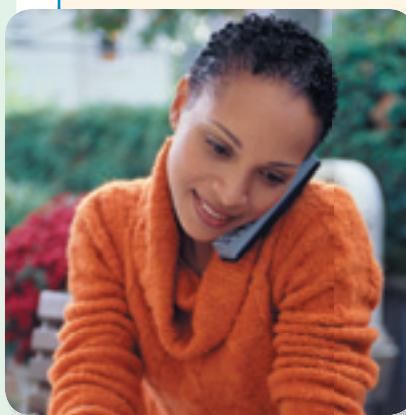
# WHO USES MATHEMATICS?

The Career Path features are a set of interviews with young adults who are either preparing for or just beginning in different career fields. These people share what math courses they studied in high school, how math is used in their field, and what options the future holds. Also, many exercises throughout the book highlight the different skills used in various career fields.

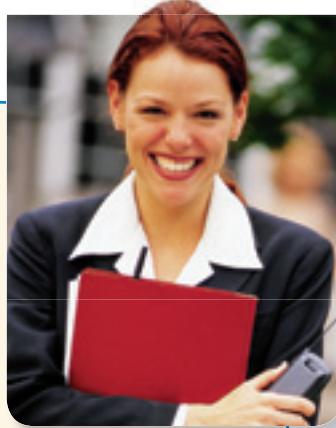
## Career Path

### Career Applications

- Advertising** 31, 138, 209
- Archaeology** 727
- Architecture** 589, 741, 885
- Art** 24, 266, 961
- Astronomy** 128, 517, 948
- Aviation** 187, 359, 763
- Biology** 147, 615, 704
- Business** 62, 126, 654
- Chemistry** 10, 284, 572
- Communication** 101, 755, 756
- Design** 266
- Ecology** 432, 549, 971
- Economics** 197, 703, 775
- Engineering** 345, 756, 946
- Environment** 102, 508, 534
- Film** 376
- Finance** 468, 527, 661
- Forestry** 450, 541, 660
- Genetics** 823, 841, 843
- Geology** 12, 515, 773
- Government** 576, 800
- Graphic Design** 260
- Landscape Design** 457
- Law Enforcement** 1002
- Marketing** 128, 440
- Medicine** 408, 494, 996
- Meteorology** 142, 528, 615
- Music** 511, 527, 613
- Nutrition** 145, 273, 574
- Oceanography** 69, 996, 1032
- Paleontology** 148, 533
- Photography** 72, 293, 527
- Psychology** 155
- Radio** 772
- Real Estate** 703, 894



**ECONOMIST** *p. 277*  
Economists help people prepare for the future by analyzing political and business trends and data, and then making predictions. Look on page 277 to learn about the type of training you need for this career path.



**REAL ESTATE AGENT** *p. 551*  
Buying or selling a home can be a complicated process, but real estate agents work with buyers and sellers to make sure transactions go smoothly. Look at the Career Path on page 551 to see how to become a real estate agent.



**NURSING STUDENT** *p. 877*  
The demand for nurses is expected to increase in the future because doctors and patients alike depend on their assistance and expertise. The Career Path on page 877 describes what it is like to be a nursing student.

# WHY LEARN MATHEMATICS?

Links to interesting topics may accompany real-world applications in the examples or exercises. For a complete list of all applications in *Holt Algebra 2*, see page S162 in the Index.



## Real-World

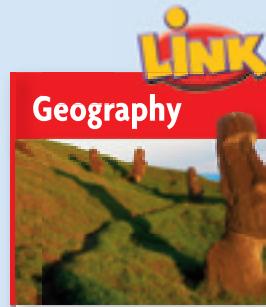
- Aerospace** 362
- Archaeology** 727
- Archery** 581
- Architecture** 589
- Aviation** 187, 954
- Biology** 39, 329, 615, 694, 834
- Chemistry** 72



Aerogel has been called the world's lowest density solid. It is 99.8% air and is an excellent heat insulator. As shown above, a layer of aerogel can prevent a flame from melting crayons.

- Clocks** 885
- Collectibles** 896
- Communication** 31
- Diving** 258
- Earthquakes** 687
- Ecology** 535
- Engineering** 756
- Entertainment** 64, 339, 443, 574

- Fireworks** 940
- Forestry** 450
- Fractals** 387
- Geography** 25, 275



Easter Island, a South Pacific island of Chile, contains more than 600 stone statues. The statues were carved between A.D. 1600 and 1730. Most of the heads actually have torsos that have become buried over time.

- Geology** 427, 773
- Health** 458
- History** 139, 494, 733, 741
- Hobbies** 102
- Ice Skating** 606
- Literature** 95
- Math History** 18, 121, 210, 292, 354, 380, 419, 517, 598, 703, 765, 842, 866, 875, 934, 1002
- Medicine** 543, 996

- Meteorology** 111
- Money** 48
- Music** 527, 799
- Navigation** 964
- Performing Arts** 1032
- Pets** 667
- Physics** 502, 626, 749, 1025
- Recreation** 55
- Safety** 677
- Sculpture** 155
- Sports** 346
- Television** 823
- Tennis** 816



Wimbledon has been played annually since 1877 at the All England Lawn Tennis and Croquet Club.

- Tornadoes** 633
- Whales** 659

**Architecture**

Andrea Palladio stated that his preferred room shapes were squares, diamonds, and rectangles with precise length-to-width ratios. Some of these shapes can be seen above in Il Redentore church that Palladio designed.

**Rooms with a Width of 30 ft**

| Length-to-Width Ratio | Length (ft) | Height (ft) |
|-----------------------|-------------|-------------|
| 2:1                   | 30          | 30          |
| 3:2                   | 45          | 30          |
| 4:3                   | 40          | 30          |
| 5:3                   | 50          | 30          |
| $\sqrt{2}:1$          | 30          | 30          |

**43.** Simplify. Assume that all expressions are defined.

$$\frac{x+2}{x-2} \cdot \frac{x-6}{x+2}$$

**44.** Simplify.

$$\frac{3x-4}{5x+3}$$

**45.** Simplify.

$$\frac{\frac{1}{2}x + \frac{2}{3}x}{x-3}$$

**46. Architecture** The Renaissance architect Andrea Palladio preferred that the length and width of rectangular rooms be limited to certain ratios. These ratios are listed in the table. Palladio also believed that the height of a room with vaulted ceilings should be the harmonic mean of the length and width.

- The harmonic mean of two positive numbers  $a$  and  $b$  is equal to  $\frac{2ab}{a+b}$ . Simplify this expression.
- Complete the table for a rectangular room with a width of 30 feet that meets Palladio's requirements for its length and height. If necessary, round to the nearest tenth.
- What if...?** A Palladian room has a length-to-width ratio of 4:3. If the length of this room is doubled, what effect should this change have on the room's width and height, according to Palladio's principles?

# HOW TO STUDY ALGEBRA 2

This book has many features designed to help you learn and study effectively. Becoming familiar with these features will prepare you for greater success on your exams.

## Learn

The **vocabulary** is listed at the beginning of every lesson.

Look for the **Know-It-Note** icons to identify important information.

**Properties of Quadratic Functions in Standard Form**

**Objectives:** Define, identify, and graph quadratic functions. Identify and use vertex form to find the maximum or minimum of quadratic functions to solve problems.

**Axes of Symmetry:** axis of symmetry standard form vertex form maximum value

**Why learn this?** Quadratic functions can be used to find the maximum power generated by the engine of a rocket.

**Axis of Symmetry:** The axis of symmetry is the line through the vertex of a parabola that divides the parabola into two congruent halves.

**WORDS**

| WORDS            | ALGEBRA   |
|------------------|---|
| axis of symmetry | The quadratic function $f(x) = ax^2 + bx + c$ is symmetric about its axis of symmetry $x = -\frac{b}{2a}$ . |

**EXAMPLE 1** Identifying the Axis of Symmetry

Identify the axis of symmetry for the graph of  $f(x) = 2(x + 2)^2 - 3$ .

Rewrite the function to find the value of  $b$ .  
 $f(x) = 2(x + 2)^2 - 3$   
 $Because b = 4, the axis of symmetry is the vertical line  $x = -2$ .$

**Check:** Analyze the graph on a graphing calculator. The parabola is symmetric about the vertical line  $x = -2$ .

**Exercise 1** Identify the axis of symmetry for the graph of  $f(x) = (x - 3)^2 + 1$ .

Study the **examples** to apply new concepts and skills. Examples include stepped out solutions.

Test your understanding of examples by trying the **Check It Out** problems. Check your work in the Selected Answers.

## Practice

Use a **graphic organizer** to summarize each lesson.

Refer to the examples from the lesson to solve the **Guided Practice** exercises.

**THINK AND DISCUSS**

- Describe how to determine if a data set is quadratic.
- Explain how a parabolic function is a good model for the path of an object.
- GET ORGANIZED

Organize the information in the graphic organizer. Compare the models presented in the lesson.

**Quadratic Model**    **When Appropriate**    **Procedure**

| Quadratic Model   | When Appropriate | Procedure |
|-------------------|------------------|-----------|
| Exact model       |                  |           |
| Approximate model |                  |           |

**GUIDED PRACTICE**

**SEE EXAMPLE 1** p. 374

1. Vocabulary How does a quadratic model differ from a linear model? Determine whether each data set could represent a quadratic function. Explain.

**SEE EXAMPLE 2** p. 375

2. Write a quadratic function that fits each set of points.

**SEE EXAMPLE 3** p. 376

3. Hobbes The cost of mounting different-sized photos is shown in the table. Find a quadratic function for the cost given the average side length. (For an  $n$ -in.  $\times$  10-in. photo, the average side length is  $\sqrt{n^2 + 10^2}$  in.) Estimate the cost of mounting a  $24 \times 30$ -in. photo.

**PRACTICE AND PROBLEM SOLVING**

Determine whether each data set could represent a quadratic function. Explain.

**SEE EXAMPLE 4** p. 377

12.  $\begin{array}{|c|c|} \hline x & 0 & 2 & 4 & 6 & 8 & 10 \\ \hline f(x) & -1 & 2 & 12 & 24 & 42 & 62 \\ \hline \end{array}$  13.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline \end{array}$  14.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 2 & 5 & 10 & 17 & 26 \\ \hline \end{array}$  15.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline \end{array}$  16.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  17.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  18.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  19.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  20.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  21.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  22.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  23.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  24.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  25.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  26.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  27.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  28.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  29.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  30.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  31.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  32.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  33.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  34.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  35.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  36.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  37.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  38.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  39.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  40.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  41.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  42.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  43.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  44.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  45.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  46.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  47.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  48.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  49.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  50.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  51.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  52.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  53.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  54.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  55.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  56.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  57.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  58.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  59.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  60.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  61.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  62.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  63.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  64.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  65.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  66.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  67.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  68.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  69.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  70.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  71.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  72.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  73.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  74.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  75.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  76.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  77.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  78.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  79.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  80.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  81.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  82.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  83.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  84.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  85.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  86.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  87.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  88.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  89.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  90.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  91.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  92.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  93.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  94.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  95.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  96.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  97.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  98.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$  99.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 3 & 6 & 10 & 15 \\ \hline \end{array}$  100.  $\begin{array}{|c|c|} \hline x & 0 & 1 & 2 & 3 & 4 & 5 \\ \hline f(x) & 0 & 1 & 4 & 9 & 16 & 25 \\ \hline \end{array}$

If you get stuck, use the Internet for **Homework Help Online**.

## Review

Study and review **vocabulary** from the entire chapter.

**Vocabulary**

- absolute value of a complex number ..... 382
- axis of symmetry ..... 323
- binomial ..... 336
- completing the square ..... 324
- complex conjugate ..... 352
- complex number ..... 351
- complex plane ..... 382
- conjugate ..... 351
- discriminant ..... 357
- imaginary number ..... 358
- imaginary part ..... 358
- imaginary unit ..... 358
- maximum value ..... 328
- minimum value ..... 328
- model ..... 324
- quadratic function ..... 315
- quadratic inequality in two variables ..... 318
- quadratic model ..... 376
- quadratic regression ..... 376
- real part ..... 351
- root of an equation ..... 334
- standard form ..... 324
- vertex ..... 311
- vertex form ..... 318
- vertex of a parabola ..... 318
- zero of a function ..... 333

Complete the sentences below with vocabulary words from the box.

- The number  $5i$  can be classified as both a(n) real and a(n) imaginary number.
- The value of the input  $x$  that makes the output  $f(x)$  equal to zero is called the zero of the function.
- The vertex is the point at which the parabola intersects the axis of symmetry.
- The type and number of solutions to a quadratic equation can be determined by finding the discriminant.
- When a parabola opens upward, the y-value of the vertex is the minimum value of a quadratic function.
- The axis of symmetry is reflected across the x-axis and the graph of  $f(x) = -x^2 - 2x$ .
- The graph of  $f(x) = \frac{1}{2}x^2 + 3x - 4$  is a guide, describe the transformations, and then graph each function.
- $f(x) = 2(x - 2)^$



# Focus on Problem Solving



## The Problem Solving Plan

Mathematical problems are a part of daily life. You need to use a good problem-solving plan to be a good problem solver. The plan used in this textbook is outlined below.



### UNDERSTAND the Problem

You must first make sure you understand the problem you are asked to solve.

- **What are you asked to find?** Restate the question in your own words.
- **What information is given?** Identify the key facts given in the problem.
- **What information do you need?** Determine which facts are needed to answer the question.
- **Do you have all the information needed?** Determine if you need further information.
- **Do you have too much information?** Determine if there is unnecessary information and eliminate it from your list of key facts.



### Make a PLAN

Plan how to use the information you are given.

- **What problem solving strategy would best fit this problem?** Choose an appropriate problem solving strategy and decide how you will use it.
- **Have you solved similar problems?** Think about similar problems you have solved successfully.



### SOLVE

Use your plan to solve the problem. Show the steps in the solution. Write a final statement that gives the solution to the problem.



### LOOK BACK

Check your answer against the original problem.

- **Have you answered the original question?** Make sure you have answered the original question.
- **Is the answer reasonable?** The answer must make sense in relation to the question.
- **Are your calculations correct?** Check to make sure your calculations are accurate.
- **Can you use another strategy or solve the problem in another way?** Using another strategy is a good way to check your answer.