

2.3 EXERCISES

HOMEWORK KEY

- = WORKED-OUT SOLUTIONS on p. WS3 for Exs. 15, 37, and 61
- ★ = STANDARDIZED TEST PRACTICE Exs. 2, 23, 30, 55, 56, 63, and 68
- ◆ = MULTIPLE REPRESENTATIONS Ex. 67

SKILL PRACTICE

EXAMPLE 1
on p. 89
for Exs. 3–8

EXAMPLE 2
on p. 90
for Exs. 9–22

1. **VOCABULARY** Copy and complete: The linear equation $y = 2x + 5$ is written in ? form.

2. ★ **WRITING** Describe how to graph an equation of the form $Ax + By = C$.

GRAPHING LINEAR FUNCTIONS Graph the equation. Compare the graph with the graph of $y = x$.

3. $y = 3x$

4. $y = -x$

5. $y = x + 5$

6. $y = x - 2$

7. $y = 2x - 1$

8. $y = -3x + 2$

SLOPE-INTERCEPT FORM Graph the equation.

9. $y = -x - 3$

10. $y = x - 6$

11. $y = 2x + 6$

12. $y = 3x - 4$

13. $y = 4x - 1$

14. $y = \frac{2}{3}x - 2$

15. $f(x) = -\frac{1}{2}x - 1$

16. $f(x) = -\frac{5}{4}x + 1$

17. $f(x) = \frac{3}{2}x - 3$

18. $f(x) = \frac{5}{3}x + 4$

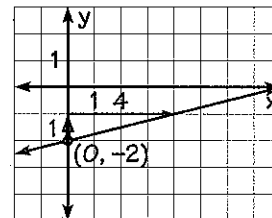
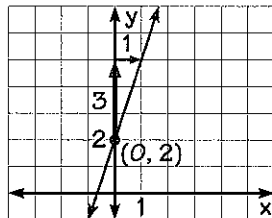
19. $f(x) = -1.5x + 2$

20. $f(x) = 3x - 1.5$

ERROR ANALYSIS Describe and correct the error in graphing the equation.

21. $y = 2x + 3$

22. $y = 4x - 2$



23. ★ **MULTIPLE CHOICE** What is the slope-intercept form of $4x - 3y = 18$?

(A) $y = \frac{3}{4}x - 6$

(B) $y = -\frac{3}{4}x - 6$

(C) $y = \frac{4}{3}x - 6$

(D) $y = -\frac{4}{3}x + 6$

EXAMPLES 4 and 5
on p. 92
for Exs. 24–42

FINDING INTERCEPTS Find the x - and y -intercepts of the line with the given equation.

24. $x - y = 4$

25. $x + 5y = -15$

26. $3x - 4y = -12$

27. $2x - y = 10$

28. $4x - 5y = 20$

29. $-6x + 8y = -36$

30. ★ **MULTIPLE CHOICE** What is the x -intercept of the graph of $5x - 6y = 30$?

(A) -5

(B) $\frac{5}{6}$

(C) 6

(D) 30

STANDARD FORM Graph the equation. Label any intercepts.

31. $x + 4y = 8$ 32. $2x - 6y = -12$ 33. $x = 4$
 34. $y = -2$ 35. $5x - y = 3$ 36. $3x + 4y = 12$
 37. $-5x + 10y = 20$ 38. $-x - y = 6$ 39. $y = 1.5$
 40. $2.5x - 5y = -15$ 41. $x = -\frac{5}{2}$ 42. $\frac{1}{2}x + 2y = -2$

CHOOSING A METHOD Graph the equation using any method.

43. $6y = 3x + 6$ 44. $-3 + x = 0$ 45. $y + 7 = -2x$
 46. $4y = 16$ 47. $8y = -2x + 20$ 48. $4x = -\frac{1}{2}y - 1$
 49. $-4x = 8y + 12$ 50. $3.5x = 10.5$ 51. $y - 5.5x = 6$
 52. $14 - 3x = 7y$ 53. $2y - 5 = 0$ 54. $5y = 7.5 - 2.5x$

55. ★ **OPEN-ENDED MATH** Write equations of two lines, one with an x -intercept but no y -intercept and one with a y -intercept but no x -intercept.

56. ★ **SHORT RESPONSE** Sketch $y = mx$ for several values of m , both positive and negative. Describe the relationship between m and the steepness of the line.

57. **REASONING** Consider the graph of $Ax + By = C$ where $B \neq 0$. What are the slope and y -intercept in terms of A , B , and C ?

58. **CHALLENGE** Prove that the slope of the line $y = mx + b$ is m . (Hint: First find two points on the line by choosing convenient values of x .)

PROBLEM SOLVING

EXAMPLE 3
 on p. 91
 for Exs. 59–62

59. **FITNESS** The total cost y (in dollars) of a gym membership after x months is given by $y = 45x + 75$. Graph the equation. What is the total cost of the membership after 9 months?

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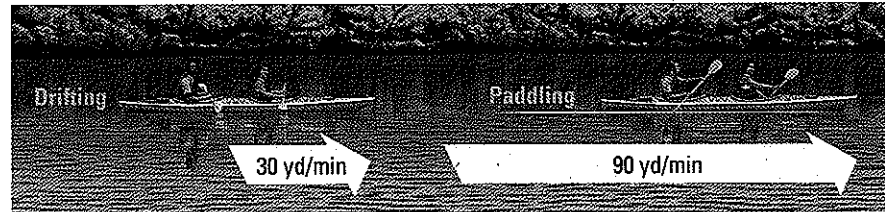
60. **CAMPING** Your annual membership fee to a nature society lets you camp at several campgrounds. Your total annual cost y (in dollars) to use the campgrounds is given by $y = 5x + 35$ where x is the number of nights you camp. Graph the equation. What do the slope and y -intercept represent?


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61. **SPORTS** Bowling alleys often charge a fixed fee to rent shoes and then charge for each game you bowl. The function $C(g) = 3g + 1.5$ gives the total cost C (in dollars) to bowl g games. Graph the function. What is the cost to rent shoes? What is the cost per game?

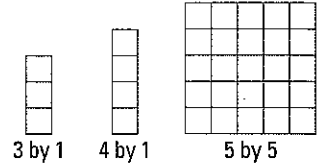
62. **PHONE CARDS** You purchase a 300 minute phone card. The function $M(w) = -30w + 300$ models the number M of minutes that remain on the card after w weeks. Describe how to determine a reasonable domain and range. Graph the function. How many minutes per week do you use the card?

63. ★ **SHORT RESPONSE** You receive a \$30 gift card to a shop that sells fruit smoothies for \$3. If you graph an equation of the line that represents the money y remaining on the card after you buy x smoothies, what will the y -intercept be? Will the line rise or fall from left to right? *Explain.*
64. **MULTI-STEP PROBLEM** You and a friend kayak 1800 yards down a river. You drift with the current partway at 30 yards per minute and paddle partway at 90 yards per minute. The trip is modeled by $30x + 90y = 1800$ where x is the drifting time and y is the paddling time (both in minutes).



- a. Graph the equation, and determine a reasonable domain and range. What do the x - and y -intercepts represent?
- b. If you paddle for 5 minutes, what is the total trip time?
- c. If you paddle and drift equal amounts of time, what is the total trip time?
65. **VOLUNTEERING** You participate in a 14 mile run/walk for charity. You run partway at 6 miles per hour and walk partway at 3.5 miles per hour. A model for this situation is $6r + 3.5w = 14$ where r is the time you run and w is the time you walk (both in hours). Graph the equation. Give three possible combinations of running and walking times.
66. **TICKETS** An honor society has \$150 to buy science museum and art museum tickets for student awards. The numbers of tickets that can be bought are given by $5s + 7a = 150$ where s is the number of science museum tickets (at \$5 each) and a is the number of art museum tickets (at \$7 each). Graph the equation. Give two possible combinations of tickets that use all \$150.
67. ♦ **MULTIPLE REPRESENTATIONS** A hot air balloon is initially 200 feet above the ground. The burners are then turned on, causing the balloon to ascend at a rate of 150 feet per minute.
- a. **Making a Table** Make a table showing the height h (in feet) of the balloon t minutes after the burners are turned on where $0 \leq t \leq 5$.
- b. **Drawing a Graph** Plot the points from the table in part (a). Draw a line through the points for the domain $0 \leq t \leq 5$.
- c. **Writing an Equation** The balloon's height is its initial height plus the product of the ascent rate and time. Write an equation representing this.
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68. ★ **EXTENDED RESPONSE** You and a friend are each typing your research papers on computers. The function $y = 1400 - 50x$ models the number y of words you have left to type after x minutes. For your friend, $y = 1200 - 50x$ models the number y of words left to type after x minutes.
- a. Graph the two equations in the same coordinate plane. *Describe* how the graphs are related geometrically.
- b. What do the x -intercepts, y -intercepts, and slopes represent?
- c. Who will finish first? *Explain.*

69. CHALLENGE You want to cover a five-by-five grid completely with x three-by-one rectangles and y four-by-one rectangles that do not overlap or extend beyond the grid.



- Explain why x and y must be whole numbers that satisfy the equation $3x + 4y = 25$.
- Find all solutions (x, y) of the equation in part (a) such that x and y are whole numbers.
- Do all the solutions from part (b) represent combinations of rectangles that can actually cover the grid? Use diagrams to support your answer.

MIXED REVIEW

Evaluate the expression for the given value of the variable. (p. 10)

70. $3n - 10$ when $n = 5$ 71. $-4x + 16$ when $x = -2$ 72. $2(11 - 5p)$ when $p = 4$
 73. $(4q + 5)(2q)$ when $q = -1$ 74. $m^2 - 4m$ when $m = -3$ 75. $(d + 1)^2 - d$ when $d = 6$

Tell whether the relation is a function. Explain. (p. 72)

76. $(-2, -7), (0, 3), (1, -2), (-2, 13), (3, -12)$ 77. $(1, 3), (0, 0), (2, -2), (-3, 6), (-2, -2)$

Find the slope of the line passing through the given points. (p. 82)

78. $(1, -3), (5, 0)$ 79. $(-2, 1), (6, -7)$ 80. $(4, 4), (8, 4)$
 81. $(2, 5), (-5, 8)$ 82. $(6, -3), (1, -13)$ 83. $(2.5, 0), (-3.5, -4)$

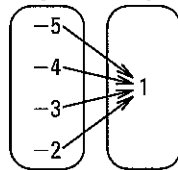
PREVIEW

Prepare for
Lesson 2.4
in Exs. 78–83.

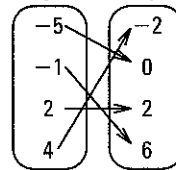
QUIZ for Lessons 2.1–2.3

Tell whether the relation is a function. Explain. (p. 72)

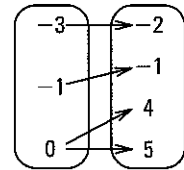
1. Input Output



2. Input Output



3. Input Output



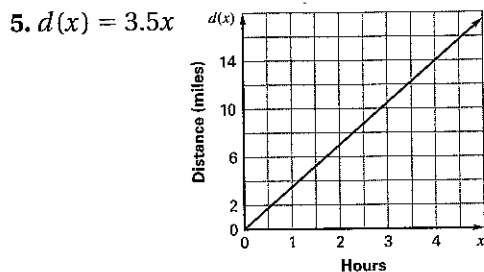
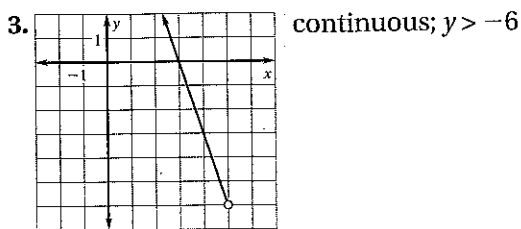
Tell whether the lines are *parallel*, *perpendicular*, or *neither*. (p. 82)

4. Line 1: through $(-3, -7)$ and $(1, 9)$ 5. Line 1: through $(2, 7)$ and $(-1, -2)$
 Line 2: through $(-1, -4)$ and $(0, -2)$ Line 2: through $(3, -6)$ and $(-6, -3)$

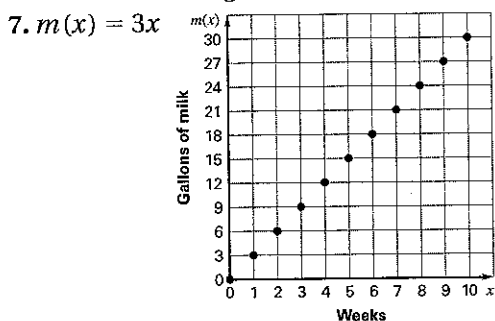
Graph the equation. (p. 89)

6. $y = -5x + 3$ 7. $x = 10$ 8. $4x + 3y = -24$

9. **ROWING SPEED** In 1999, Tori Murden became the first woman to row across the Atlantic Ocean. She rowed a total of 3333 miles during her crossing. The distance d rowed (in miles) can be modeled by $d = 41t$ where t represents the time rowed (in days) at an average rate of 41 miles per day. Graph the function, and determine a reasonable domain and range. Then estimate how long it took Tori Murden to row 1000 miles. (p. 72)



domain: $x \geq 0$, range: $d(x) \geq 0$; continuous



domain: whole numbers, range: multiples of 3; discrete

2.2 Skill Practice (pp. 86–87) 1. slope $3\frac{3}{2}$; rises

5. $-\frac{5}{3}$; falls 7. -4 ; falls 9. $\frac{7}{4}$; rises 11. undefined; is vertical 13. 0; is horizontal 15. The x and y coordinates were not subtracted in the correct order; $\frac{-1 - (-3)}{2 - (-4)} = \frac{1}{3}$. 19. neither 21. perpendicular

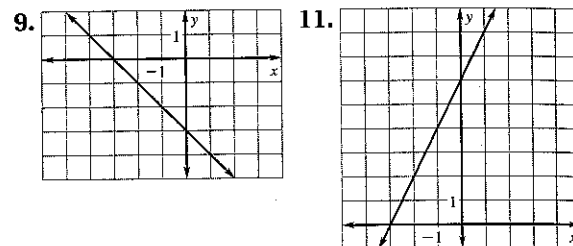
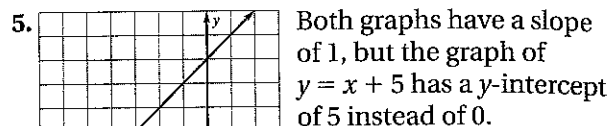
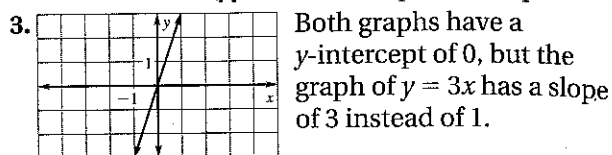
23. parallel 25. 13 mi/gal 27. 2 m/sec 29. 2 31. $\frac{1}{6}$

33. $-\frac{3}{2}$ 35. No; no. *Sample answer:* The slope of $\overrightarrow{PQ} = \frac{2 - 1}{-3 - (-1)} = -\frac{1}{2}$. The slope of $\overrightarrow{QR} = \frac{1 - 0}{-1 - 1} = -\frac{1}{2}$. The slope of $\overrightarrow{ST} = \frac{-1 - (-2)}{3 - 5} = -\frac{1}{2}$.

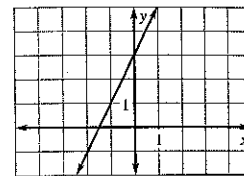
2.2 Problem Solving (pp. 87–88) 41. $\frac{7}{12}$ 43. 6.5%

47. a. $\frac{3}{8}$ b. yes c. $\frac{1}{8}$

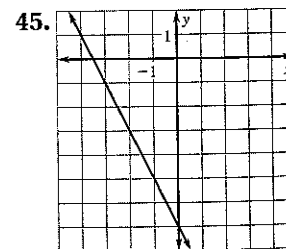
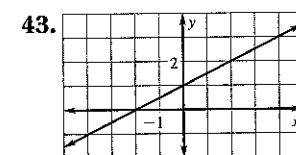
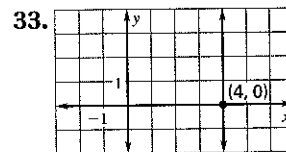
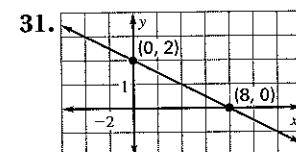
2.3 Skill Practice (pp. 93–94) 1. slope-intercept



21. The slope and y -intercept were switched around.

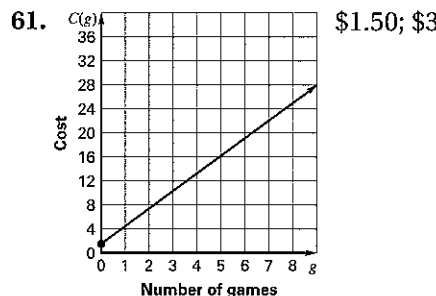
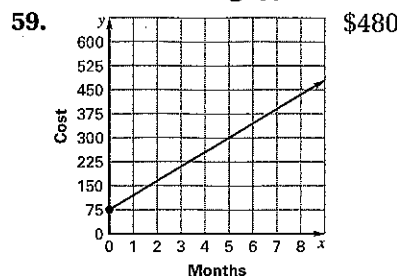


25. x -intercept: -15 , y -intercept: -3 27. x -intercept: 5, y -intercept: -10 29. x -intercept: 6, y -intercept: -4.5

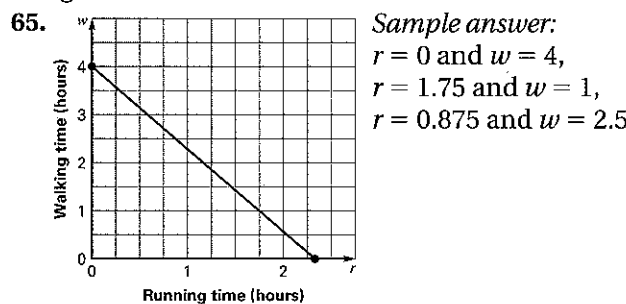


55. *Sample answer:* $x = 3$, $y = -2$ 57. slope: $-\frac{A}{B}$
 y -intercept: $\frac{C}{B}$

2.3 Problem Solving (pp. 94–96)

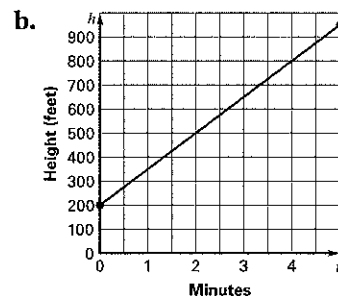


63. 30; fall; the value of the card will decrease after you buy each smoothie, so the line will fall from left to right.



67. a.

t (minutes)	h (feet)
0	200
1	350
2	500
3	650
4	800
5	950

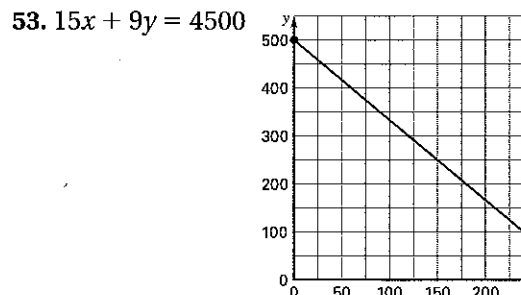


c. $h(t) = 150t + 200$

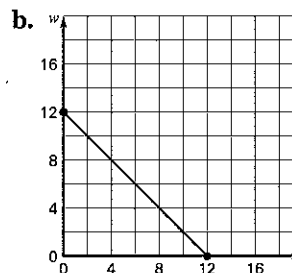
- 2.4 Skill Practice** (pp. 101–103) 1. standard 3. $y = 2$
 5. $y = 6x$ 7. $y = -\frac{5}{4}x + 7$ 9. $y = 4x - 2$ 11. $y = 2x + 11$
 13. $y = -9x + 85$ 15. $y = -\frac{4}{7}x + 1$ 17. $y = -\frac{1}{3}x - 2$
 19. The x - and y -coordinates were transposed;
 $y - 1 = -2(x - 5)$, $y - 1 = -2x + 10$, $y = -2x + 11$.
 21. $y = -x + 8$ 23. $y = -3x + 13$ 25. $y = -\frac{1}{4}x - \frac{1}{4}$

27. $y = -2x + 6$ 29. $y = -\frac{1}{4}x + \frac{19}{4}$ 31. $y = -3x + 11$
 33. $y = -\frac{2}{3}x + 7$ 35. $y = 5x + 23$ 37. $y = -3x + 17.5$
 41. $-4x + y = -3$ 43. $4x - 5y = -7$ 45. $4x + 3y = 32$
 47. *Sample answer:* $y = -\frac{1}{2}x + 8$

2.4 Problem Solving (pp. 103–104) 51. $n = 15t + 50$



Find the point on the line where x is 200 then the corresponding y -coordinate is how many student tickets were sold. 55. $y = 1.66x + 21.62$; \$48.18
 57. a. $2\ell + 2w = 24$



c. *Sample answer:*

ℓ	w
6	6
7	5
8	4
9	3
10	2

2.4 Problem Solving Workshop (p. 105) 1. $y = 4x + 7$

3. $y = -\frac{1}{2}x + 16$ 5. $y = 32.14x + 1764.36$

2.5 Skill Practice (pp. 109–110) 1. *Sample answer:*
 If $y = ax$, then a is the constant of variation. a is a constant ratio of y to x for all ordered pairs (x, y) .

