Chapter 6 Linear Equations and Their Graphs

pages 280–337

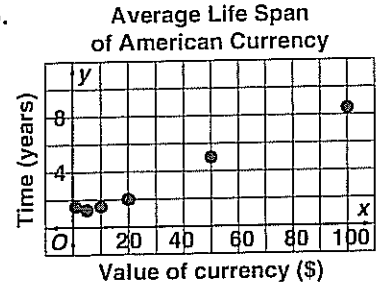
DIAGNOSING READINESS

page 280

1. 2 **2.** $2-(-3)=2+3=5$ **3.** $-\frac{3}{4}+\frac{5}{6}=-\frac{9}{12}+\frac{10}{12}=\frac{1}{12}$

4. $11+(-4)=11-4=7$ **5.** $|1-8|=|-7|=7$

6.



7.
$$3x+4x=8-x$$
$$7x=8-x$$
$$8x=8$$
$$x=1$$

8.
$$12-3d=d$$
$$12=4d$$
$$3=d$$

9.
$$6x-8=7+x$$
$$5x-8=7$$
$$5x=15$$
$$x=3$$

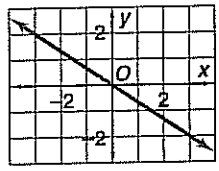
10.
$$2y-x=4$$
$$2y=x+4$$
$$y=\tfrac{1}{2}x+2$$

11.
$$3x=y+2$$
$$3x-2=y$$

12.
$$-2y-2x=4$$
$$-2y=2x+4$$
$$y=-x-2$$

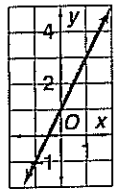
13.

x	y
−3	2
0	0
3	−2



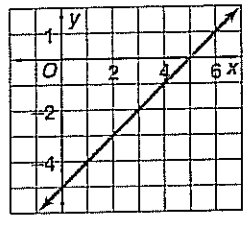
14.

x	y
−1	−1
0	1
1	3



15.

x	y
0	−5
2	−3
6	1



6-1 Rate of Change and Slope

pages 282–290

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. −12 **2.** 12 **3.** −5 **4.** 5 **5.** 2 **6.** $-\frac{1}{3}$ **7.** −3 **8.** $\frac{3}{5}$

9. $\frac{1}{4}$ **10.** −1

Investigation **1.** AB: $y_B-y_A=50-40=10$; BC: $90-50=40$; CD: $100-90=10$ **2.** AB: $x_B-x_A=50-20=30$; BC: $80-50=30$; CD: $110-80=30$

3. AB: $\frac{10}{30}=\frac{1}{3}$; BC: $\frac{40}{30}=\frac{4}{3}$; CD: $\frac{10}{30}=\frac{1}{3}$

4. Steepness is proportional to the vertical/horizontal ratio; BC is steepest because it has the highest ratio.

Check Understanding **1a.** Rate of change $=\frac{\text{change of cost}}{\text{change of days}}=\frac{120-75}{5-2}=\frac{45}{3}=15$; incremental cost is \$15 per day. **1b.** No; the rate of change for each consecutive pair of days does not have to be the same. The renter might charge a premium, or give you a bargain, for longer rentals. **2.** Rate of change is $\frac{\text{vertical change}}{\text{horizontal change}}=\frac{250-0}{5-0}=50$; speed = 50 mi/h.

3a. slope $=\frac{\text{rise}}{\text{run}}=\frac{4-1}{3-(-2)}=\frac{3}{5}$ **3b.** Slope $=\frac{1-2}{3-(-3)}=-\frac{1}{6}$; in this case the "rise" was actually a fall. **4.** The slope of $\overleftrightarrow{CD}$ is the slope of the line connecting points C and D. **4a.** slope of $\overleftrightarrow{CD}=\frac{y_D-y_C}{x_D-x_C}=\frac{7-5}{4-2}=\frac{2}{2}=1$

4b. slope of $\overleftrightarrow{PQ}=\frac{y_Q-y_P}{x_Q-x_P}=\frac{-2-4}{3-(-1)}=\frac{-6}{4}=-\frac{3}{2}$

4c. $\frac{d-b}{c-a}$ **5a.** slope $=\frac{\text{rise}}{\text{run}}=\frac{0}{\text{anything}}=0$ **5b.** Slope $=\frac{\text{rise}}{\text{run}}=\frac{\text{anything}}{0}$, which is undefined.

Exercises **1.** Rate of change $=\frac{16-7}{7-4}=\frac{9}{3}=3$; the temperature increases 3°F each hour. **2.** Rate $=\frac{23.70-19.75}{6-5}=3.95$; the cost is \$3.95 per person.

3. $\frac{15-0}{0-225}=-\frac{1}{15}\left(-\frac{1}{15}\text{ gal/mi}\right)$; the vehicle gets 15 mi per gallon. **4.** Rate $=\frac{4-0}{6-0}=\frac{2}{3}$; there are 2 lb of carbon emissions for each 3 h of television use. **5.** Rate $=\frac{1500-2500}{60-0}=-16.67$; the skydiver descends at a rate of $16\frac{2}{3}$ ft/s. **6.** Rate $=\frac{1.5-0}{6-0}=\frac{1}{4}$; the cost of oregano is \$1 for 4 oz. **7.** Search the graph for points where the line passes through the intersection of two grid lines; slope $=\frac{2-(-1)}{3-(-3)}=\frac{3}{6}=\frac{1}{2}$. **8.** $\frac{1-(-5)}{-3-(-1)}=\frac{6}{-2}=-3$

9. $\frac{2-(-2)}{3-(-3)}=\frac{2}{3}$ **10.** slope $=\frac{y_2-y_1}{x_2-x_1}=\frac{6-2}{5-3}=\frac{4}{2}=2$

11. $\frac{2-6}{3-5}=2$; slope of $\overleftrightarrow{AB}$ = slope of $\overleftrightarrow{BA}$

12. $\frac{11-8}{8-4}=\frac{3}{4}$ **13.** $\frac{-5-4}{2-(-4)}=-\frac{3}{2}$ **14.** $\frac{-2-1}{1-(-2)}=-1$

15. $\frac{-5-1}{3-(-3)} = -1$ **16.** $\frac{5-0}{1-(-8)} = \frac{5}{9}$ **17.** $\frac{5-0}{3-0} = \frac{5}{3}$

18. $\frac{1-(-5)}{-9-(-4)} = -\frac{6}{5}$ **19.** $\frac{2-0}{0-5} = -\frac{2}{5}$ **20.** $\frac{8-1}{7-(-7)} = \frac{7}{14} = \frac{1}{2}$ **21.** $\frac{-6-(-1)}{1-0} = -5$ **22.** slope $= \frac{4-4}{4-(-4)} = \frac{0}{8} = 0$ **23.** slope $= \frac{3-(-3)}{-3-(-3)} = \frac{6}{0}$: undefined **24.** slope $= \frac{4-4}{-3-3} = \frac{0}{-6} = 0$ **25.** $\frac{-3-3}{4-4} = \frac{-6}{0}$: undefined

26. slope $= \dfrac{3-\frac{1}{2}}{-5-(-5)} = \dfrac{2\frac{1}{2}}{0}$: undefined

27. $\frac{27-18}{10-0} = \frac{9}{10}$; rate of growth = 0.9 in./month

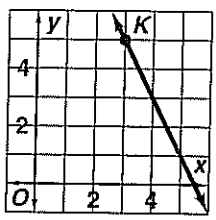
28. $\frac{78-48}{10-4} = 5$; incremental cost = \$5/person; answer is valid only in the given range. The detailed group cost schedule may have breaks at arbitrary points.

29. $\frac{120-30}{4-1} = 30$; average speed in 1 to 4 h interval = 30 mi/h **30.** slope $= \frac{y_2-y_1}{x_2-x_1} = \frac{8-1}{7-(-7)} = \frac{7}{14} = \frac{1}{2}$

31. slope $= \dfrac{\frac{2}{3}-1\frac{2}{3}}{-2-4} = \dfrac{-1}{-6} = \dfrac{1}{6}$ **32.** $\frac{2.5-3.5}{-4-0} = \frac{1}{4}$

33. $\dfrac{-2-8}{1-\frac{1}{2}} = -20$ **34.** $\dfrac{3-\frac{1}{2}}{-5-(-5)} = \dfrac{2\frac{1}{2}}{0}$; slope is undefined. **35.** $\frac{-1.25-6.25}{3-0.5} = -3$

36.



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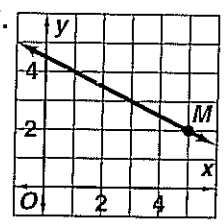

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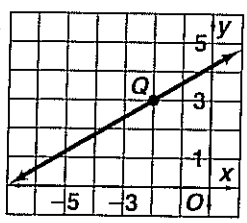

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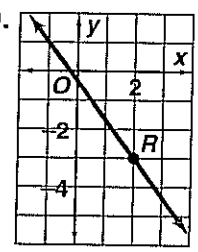
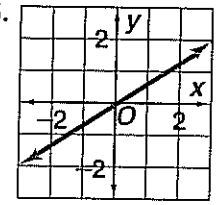


40a. C by inspection **40b.** C has greatest rate of change; A has least rate of change; the slope is a direct measure of the rate of change. **41a.** slope of $\overleftrightarrow{BA} = \frac{y_A-y_B}{x_A-x_B} = \frac{-3-(-5)}{4-1} = \frac{2}{3}$. **41b.** slope of $\overleftrightarrow{AB} = \frac{y_A-y_A}{x_B-x_A} = \frac{-5-(-3)}{1-4} = \frac{-2}{-3} = \frac{2}{3}$ **41c.** Answers may vary. Sample: Interchanging A and B changes the signs of both the numerator and denominator in the slope, so the slope is unchanged. **42.** max. slope $= \frac{\text{height reached above ground}}{\text{min. distance from wall to base of ladder}} = \frac{12}{5} = 2\frac{2}{5}; \frac{18}{5} = 3\frac{3}{5}$

43. No; the quadrant where the two points are found has nothing to do with the slope of the line through them. **44.** PQ: slope $= \frac{\text{rise}}{\text{run}} = \frac{3-2}{1-(-1)} = \frac{1}{2}$; QR: $\frac{\text{rise}}{\text{run}} = \frac{0}{3} = 0$; RS: $\frac{-5}{-1} = 5$; SP: $\frac{4}{-4} = -1$ **45.** JK: $\frac{-2}{4} = -\frac{1}{2}$; KL: $\frac{-4}{-2} = 2$; LM: $\frac{2}{-4} = -\frac{1}{2}$; MJ: $\frac{4}{2} = 2$

46.



46a. $k = \frac{2}{3}$ **46b.** slope $= \frac{2}{3}$ **46c.** Constant of variation and slope are equal. **47.** Answers may vary. Samples: **a.** (0, 0), (4, 3) **b.** (0, 0), (2, −1)

48.
$$\frac{8-4}{x-2} = -2$$
$$8-4 = -2(x-2)$$
$$4 = -2x+4$$
$$0 = -2x$$
$$0 = x$$

49.
$$\frac{8-4}{x-2} = -\frac{1}{2}$$
$$2(8-4) = -(x-2)$$
$$8 = -x+2$$
$$6 = -x$$
$$-6 = x$$

50.
$$\frac{7-3}{x-4} = 2$$
$$7-3 = 2(x-4)$$
$$4 = 2x-8$$
$$12 = 2x$$
$$6 = x$$

51.
$$\frac{8-3}{2-x} = -\frac{5}{2}$$
$$2(8-3) = -5(2-x)$$
$$10 = -10+5x$$
$$20 = 5x$$
$$4 = x$$

52.
$$\frac{4y-y}{2-(-4)} = 6$$
$$3y = 6(2+4)$$
$$3y = 36$$
$$y = 12$$

53. We presume that "undefined slope" means "slope resulting from dividing nonzero quantity by zero." Then
$$\frac{2-5}{x-3} = \frac{\text{nonzero quantity}}{0}$$
$$0(2-5) = (x-3)(\text{nonzero quantity})$$
$$0 = (x-3)(\text{nonzero quantity})$$
$$0 = x-3$$
$$3 = x$$

54–60. Counterexamples may vary. **54.** False; it can be negative or undefined. **55.** True; slopes = zero. **56.** False; slope 1 has nothing to do with passing through the origin. **57.** True; any two parallel lines have the same slope. **58.** False; the slope has nothing to do with the quadrant the line passes through. **59.** False; example is the x-axis. **60.** true **61a.** Slope $= \frac{800-0}{7.2-0} \approx 111$; rental rate is \$111/h.

61b.
$$2n \approx 111$$
$$n \approx 55.5$$

One would need about 56 customers per hour to cover rental costs. **62.** Friend found $\frac{\text{run}}{\text{rise}}$ instead of $\frac{\text{rise}}{\text{run}}$.

63. Slope $= \frac{-b-(-b)}{-a-a} = 0$ for any $a \neq 0$.

64. $\frac{-n-n}{3m-(-m)} = \frac{-2n}{4m} = -\frac{n}{2m}$ **65.** $\frac{2d-b}{c-2a}$ **66.** Slope of $\overleftrightarrow{AB} = \frac{2-3}{4-1} = -\frac{1}{3}$; $\overleftrightarrow{BC}$: $\frac{4-2}{-2-4} = -\frac{1}{3}$; yes, the segments have the same slope and pass through point B.

67. $\overleftrightarrow{GH}: \frac{3-5}{-1-3} = \frac{1}{2}$; $\overleftrightarrow{HI}: \frac{7-3}{7-(-1)} = \frac{1}{2}$; yes, the segments have the same slope and pass through the point H. **68.** $\overleftrightarrow{DE}: \frac{-1-3}{0-(-2)} = -2$; $\overleftrightarrow{EF}: \frac{1-(-1)}{2-0} = 1$; no, even though the segments pass through common point E they have different slopes and would represent a kinked curve. **69.** $\overleftrightarrow{PQ}: \frac{2-2}{-3-4} = 0$; $\overleftrightarrow{QR}: \frac{5-2}{2-(-3)} = \frac{3}{5}$; no, segments have different slopes. **70.** $\overleftrightarrow{GH}: \frac{-5-(-2)}{-1-1} = \frac{3}{2}$; $\overleftrightarrow{HI}: \frac{4-(-5)}{5-(-1)} = \frac{3}{2}$; yes, segments have same slope. **71.** $\overleftrightarrow{ST}: \frac{2-4}{0-(-3)} = -\frac{2}{3}$; $\overleftrightarrow{TX}: \frac{0-2}{-3-0} = \frac{2}{3}$; no, segments have different slopes. **72.** Mental arithmetic rejects A, B, and D. C: slope $= \frac{2-10}{22-28} = \frac{-8}{-6} = \frac{4}{3}$ ✓; the answer is C. **73.** Other point must have same value of $y = 22$; the answer is G. **74.** slope $= \frac{3}{24} = \frac{1}{8} = 0.125 = 12.5\%$ **75. A.** slope $= \frac{5-4}{-2-(-3)} = 1$ **B.** slope $= \frac{5-4}{2-3} = -1$; A is greater; the answer is A. **76.** cost $= c = 3.5n$ **77.** gross profit (before subtracting cost of overhead) $= p = 4.95q - 232$ **78.** 0 **79.** $P(2, 4, \text{or } 6) = \frac{3}{6} = \frac{1}{2}$ **80.** $\frac{2}{6} = \frac{1}{3}$ **81.** 1

82.
$$\begin{aligned} x + 3 + 2x &= -6 \\ 3x + 3 &= -6 \\ 3x &= -6 - 3 = -9 \\ x &= -3 \end{aligned}$$

83.
$$\begin{aligned} 3(2t + 5) &= -9 \\ 6t + 15 &= -9 \\ 6t &= -9 - 15 = -24 \\ t &= -4 \end{aligned}$$

84.
$$\begin{aligned} 9 &= y + 2(4y - 5) \\ 9 &= y + 8y - 10 \\ 9 &= 9y - 10 \\ 19 &= 9y \\ \frac{19}{9} &= y \end{aligned}$$

85.
$$\begin{aligned} 4n - 7(n - 9) &= 42 \\ 4n - 7n + 63 &= 42 \\ -3n &= -21 \\ n &= 7 \end{aligned}$$

86.
$$\begin{aligned} 2(7 - q) - 4 &= 0 \\ 14 - 2q - 4 &= 0 \\ 10 - 2q &= 0 \\ 10 &= 2q \\ 5 &= q \end{aligned}$$

87.
$$\begin{aligned} \tfrac{2}{5}(p + 10) &= 0 \\ p + 10 &= 0 \\ p &= -10 \end{aligned}$$

TECHNOLOGY page 290

1a. $y = 2x + 1$ (it is the most vertical). **1b.** $y = \frac{1}{2}x + 1$ (it is the most horizontal). **2. A.** II; at $x = 5$, $y = 0$ ✓ **B.** III; at $x = 2$, $y = 9$ ✓ **C.** I; at $x = 9$, $y = 8$ ✓ **3.** Answers may vary. Sample: Changing m affects the slope of the graph; m is the slope. **4.** For a positive m, the graph slants up from left to right; the slope is positive. For a negative m, the graph slants down from left to right; the slope is negative. **5.** $y = 1$; $y = -2$; $y = 2$ **6. A.** III; at $x = 0$, $y = -5$ ✓ **B.** I; at $x = 0$, $y = 0$ ✓; **C.** II; at $x = 0$, $y = 3$ ✓ **7.** Answers may vary. Sample: Changing b affects the y-intercept; indeed, b is the y-intercept (when $x = 0$, $y = b$). **8a.** The graph appears less steep (compared to Xmin = Ymin = Xmax = Ymax); the y values are compressed. **8b.** The graph appears steeper; the x values are compressed.

6-2 Slope-Intercept Form pages 291–297

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. 15 **2.** −11 **3.** 6 **4.** 5 **5.** $y = 4x + 5$ **6.** $y = -2x + 7$ **7.** $y = -4x - 3$

Check Understanding **1a.** $y = mx + b$; $m = -2$; $b = 1$ **1b.** $m = \frac{7}{6}$; $b = -\frac{3}{4}$ **1c.** $y = -\frac{4}{5}x + 0$; $m = -\frac{4}{5}$; $b = 0$ **2.** $m = -3$; $b = 4$; $y = -3x + 4$ **3.** slope $= \frac{2-0}{2-(-2)} = \frac{1}{2} = m$; y-intercept $= 1 = b$; $y = \frac{1}{2}x + 1$

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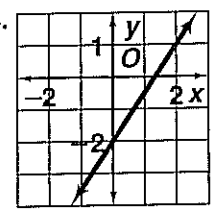

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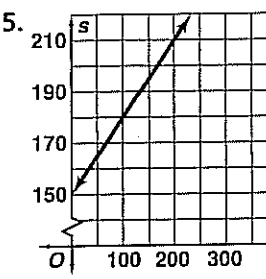
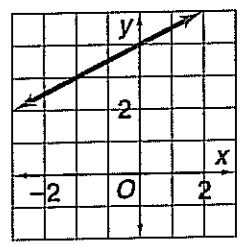


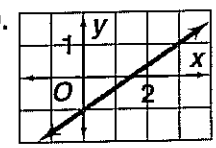
Exercises **1.** slope $= m = -2$; y-intercept $= b = 1$; **2.** $-\frac{1}{2}$; 2 **3.** 1; $-\frac{5}{4}$ **4.** 5; 8 **5.** $\frac{2}{3}$; 1 **6.** −4; 0 **7.** −1; −7 **8.** −0.7; −9 **9.** $-\frac{3}{4}$; −5 **10.** $y = \frac{2}{9}x + 3$ **11.** $y = 3x + \frac{2}{9}$ **12.** $y = \frac{9}{2}x + 3$ **13.** $y = 1$ **14.** $y = -x - 6$ **15.** $y = -\frac{2}{3}x + 5$ **16.** $y = 0.3x + 4$ **17.** $y = 0.4x + 0.6$ **18.** $y = -7x + \frac{1}{3}$ **19.** $y = -\frac{1}{5}x - \frac{2}{5}$ **20.** $y = -\frac{1}{4}x + \frac{5}{4}$ **21.** $y = \frac{8}{3}x + \frac{2}{3}$ **22.** slope $= m = \frac{-1-1}{3-0} = -\frac{2}{3}$; $b = 1$; $y = -\frac{2}{3}x + 1$ **23.** $m = \frac{3}{4}$; $b = 2$; $y = \frac{3}{4}x + 2$ **24.** $m = \frac{2-(-2)}{2-0} = \frac{4}{2} = 2$; $y = 2x - 2$ **25.** $m = \frac{2}{4} = \frac{1}{2}$; $y = \frac{1}{2}x + \frac{1}{2}$ **26.** $m = \frac{2}{-5}$; $y = -\frac{2}{5}x + 2.8$ **27.** $m = \frac{5}{4}$; $y = \frac{5}{4}x - \frac{1}{2}$

28.

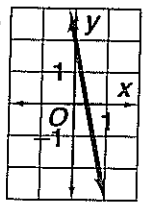


$y = \frac{1}{2}x + 4$

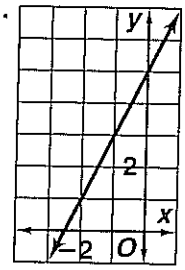
29.



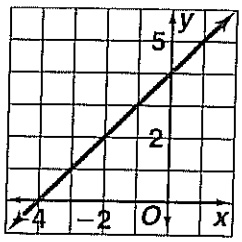
$y = \frac{2}{3}x - 1$

30. 

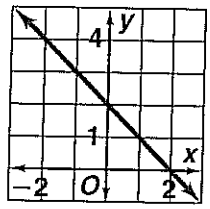
$y = -5x + 2$

31. 

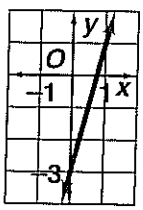
$y = 2x + 5$

32. 

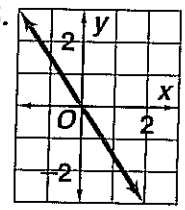
$y = x + 4$

33. 

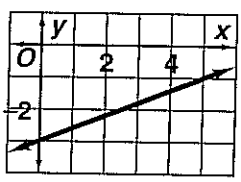
$y = -x + 2$

34. 

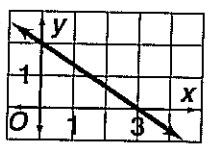
$y = 4x - 3$

35. 

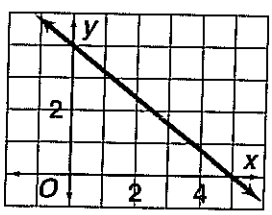
$y = -\frac{3}{2}x$

36. 

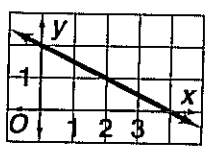
$y = \frac{2}{5}x - 3$

37. 

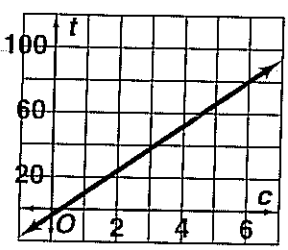
$y = -\frac{2}{3}x + 2$

38. 

$y = -\frac{4}{5}x + 4$

39. 

$y = -\frac{1}{2}x + 2$

40a. 

$t = 14c - 4$

40b. $t = 14 \cdot 6 - 4 = 80$; this checks on graph.

41.
$$y - 2 = -3x$$
$$y = -3x + 2$$
slope $= -3$; y-intercept $= 2$

42.
$$y + \tfrac{1}{2}x = 0$$
$$y = -\tfrac{1}{2}x$$
$-\frac{1}{2}; 0$

43.
$$y - 9x = \tfrac{1}{2}$$
$$y = 9x + \tfrac{1}{2}$$
$9; \frac{1}{2}$

44. $3; -9$

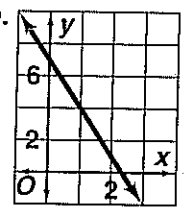
45.
$$2y - 6 = 3x$$
$$2y = 3x + 6$$
$$y = \tfrac{3}{2}x + 3$$
$\frac{3}{2}; 3$

46.
$$-2y = 6(5 - 3x)$$
$$-2y = 30 - 18x$$
$$y = 9x - 15$$
$9; -15$

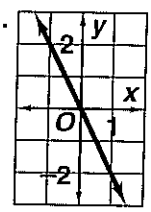
47.
$$y - d = cx$$
$$y = cx + d$$
$c; d$

48. $2 - a; a$

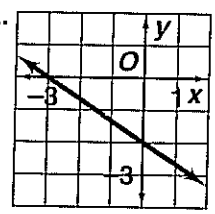
49.
$$2y + 4n = -6x$$
$$y + 2n = -3x$$
$$y = -3x - 2n$$
$-3; -2n$

50. 

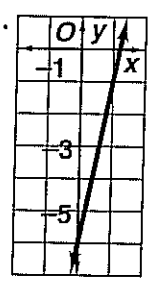
$y = 7 - 3x$

51. 

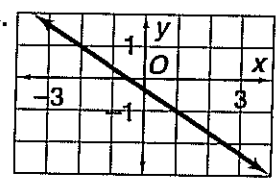
$$2y + 4x = 0$$
$$y + 2x = 0$$
$$y = -2x$$

52. 

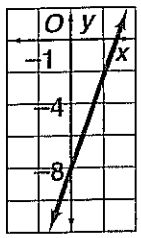
$$3y + 6 = -2x$$
$$3y = -2x - 6$$
$$y = -\tfrac{2}{3}x - 2$$

53. 

$$y + 2 = 5x - 4$$
$$y = 5x - 6$$

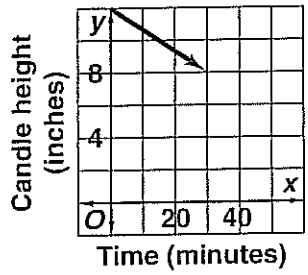
54. 

$$4x + 3y = 2x - 1$$
$$3y = -2x - 1$$
$$y = -\tfrac{2}{3}x - \tfrac{1}{3}$$

55. 

$$-2(3x - 4) + y = 0$$
$$-6x + 8 + y = 0$$
$$y = 6x - 8$$

56. The slope was used for the y-intercept, and the y-intercept was used for the slope. Fred graphed $y = x - 2$.

57a. 

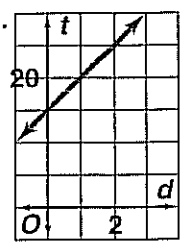
57b. slope $= \frac{8 - 12}{30 - 0} = -\frac{2}{15}$; height $= h = -\frac{2}{15}t + 12$

57c.
$$0 = -\frac{2}{15}t + 12$$
$$\frac{2}{15}t = 12$$
$$t = \frac{15}{2}(12) = 90$$

Candle will burn down to $h = 0$ after 90 min.

58a. The slope represents the weight of a gallon of fuel. **58b.** $y = 6 \cdot 25 + 2512 = 150 + 2512 = 2662$; the plane weighs 2662 lb. **59.** $4 \stackrel{?}{=} -2(-3) + 1$; no **60.** $5 \stackrel{?}{=} -\frac{1}{2}(-6) + 2$; yes **61.** $-1 \stackrel{?}{=} 0 - \frac{5}{4}$; no **62–64.** All graphs and equations have $b = 5$; need to check slope. **62.** III; slope $= 1$ **63.** I; slope $= -\frac{5}{2}$ **64.** II; slope $= -\frac{1}{2}$

65a. Since dogs age 7 times faster than people do, $p = 1$ person year is the equivalent of $d = 7$ dog years; $d = 7p$. **65b.** $p = 12$ person years are equivalent to $d = 7 \cdot 12 = 84$ years. **66a.** $t = 5d + 15$

66b. 

66c. The number of days d can't be negative, and the total charge t can't be negative. **67.** Answers may vary. Sample: Plot point $(0, 5)$; then move up 3 and right 4 and plot point $(4, 8)$; then connect the two points. **68. A.** slope $= \frac{10}{5} = 2$; **B.** slope $= \frac{8}{2} = 2$; slopes are equal.

69. Slope $= m = \frac{9 - 5}{5 - 3} = 2$; the equation is
$$y = 2x + b;$$
$$5 = 2 \cdot 3 + b$$
$$-1 = b$$
the equation is $y = 2x - 1$.

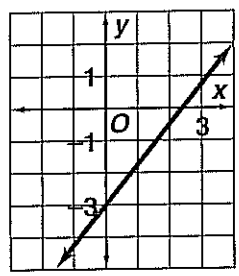
70. $m = \frac{-1 - (-13)}{2 - 5} = -4$;
$$-1 = -4 \cdot 2 + b$$
$$7 = b$$
$$y = -4x + 7$$

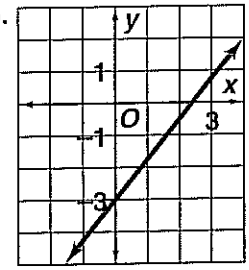
71. $m = \frac{5 - 10}{6 - (-4)} = \frac{-5}{10} = -\frac{1}{2}$;
$$5 = \left(-\tfrac{1}{2}\right)6 + b$$
$$5 = -3 + b$$
$$8 = b$$
$$y = \tfrac{1}{2}x + 8$$

72. $m = \frac{2 - 7}{-12 - 8} = \frac{1}{4}$;
$$2 = \tfrac{1}{4}(-12) + b$$
$$2 = -3 + b$$
$$5 = b$$
$$y = \tfrac{1}{4}x + 5$$

73. $m = \frac{-14 - 4}{11 - (-7)} = -1$;
$$4 = -1 \cdot (-7) + b$$
$$-3 = b$$
$$y = -x - 3$$

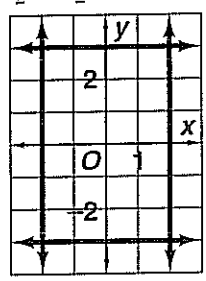
74. $m = \frac{0 - (-9)}{2 - (-1)} = 3$;
$$0 = 3 \cdot 2 + b$$
$$-6 = b$$
$$y = 3x - 6$$

75a. 

75b. 

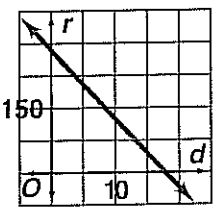
75c. Both; the parenthesis has no effect; the calculator performs the division before the multiplication.

76a. $\frac{1}{4}$; $\frac{1}{4}$ **76b.** 2; −2 **76c.** Parallel lines have the same slopes. **77.** Check students' work **78.** $2a = -1$; $a = -\frac{1}{2}$ **79.** $-\frac{1}{2}a = \frac{5}{2}$; $a = -5$ **80.** $\frac{3}{4}a = \frac{9}{16}$; $a = \frac{3}{4}$

81a. 

81b. Rectangle; sides are parallel and opposite sides are of the same length.

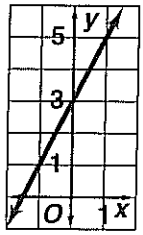
81c. Diagonal goes through origin and has slope of $\frac{3}{2}$ or $-\frac{3}{2}$; the equation is $y = \frac{3}{2}x$ OR $y = -\frac{3}{2}x$. **82a.** $r = 265 - 15d$ or $r = -15d + 265$

82b. 

82c.
$$0 = -15r + 265$$
$$15r = 265$$
$$r = \frac{265}{15} = 17.7$$

The food will be eaten up during the 18th day.

83. $b = -3$ **A.** $b = +3$ **B.** $b = +3$ **C.** $b = +3$ **D.** $b = -3$; the answer is D. **84.** Same slope: **F, G, I**; same y-intercept: **G**; the answer is G. **85.** Slope $= m = \frac{7 - 2}{6 - 0} = \frac{5}{6}$; $b = 2$; the answer is A.

86. 

slope $= m = \frac{5-3}{1-0} = 2$; $3 = 2 \cdot 0 + b$; $b = 3$; $y = 2x + 3$

87. slope $= \frac{-1-8}{5-(-2)} = -\frac{9}{7}$ **88.** $\frac{5-0}{-6-0} = -\frac{5}{6}$

89. $\frac{-3-6}{2-4} = \frac{9}{2}$ **90.** $\frac{1-2}{2-1} = -1$ **91.** $\frac{80}{100} = \frac{\text{part}}{\text{whole}} = \frac{a}{6}$, $480 = 100a$, $a = 4.8$; 4.8 billion

6-3 Standard Form pages 298–303

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

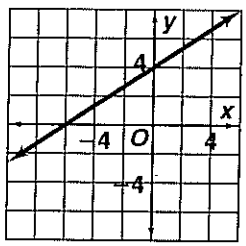
1. $y = -3x + 5$ **2.** $y = 2x + 10$ **3.** $y = x - 6$

4. $y = -5x + 2$ **5.** $y = -\frac{1}{3}x + \frac{1}{9}$ **6.** $y = \frac{2}{5}x + \frac{4}{5}$

7. $625x + 850 = 775$ **8.** $4 = 2x - 50$ **9.** $900 - 222x = 1000$

Investigation **1.** Answers may vary. Sample:

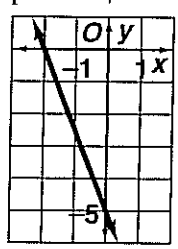
x	y
0	4
3	6
6	8
9	10

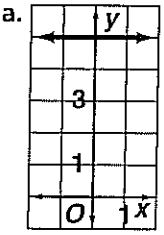
2. 

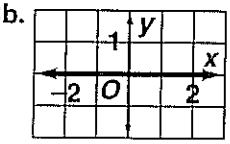
3. 4 **4.** −6 **5.** $3y = 12$; $y = 4$; $-2x = 12$; $x = -6$ **6.** Calculate the x- and y-intercepts by setting $y = 0$ and $x = 0$ respectively; plot those two points; connect the two points with a straight line.

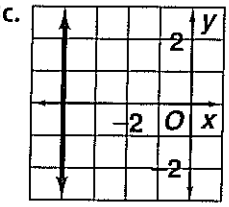
Check Understanding

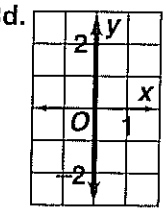
1.
$4x - 9y = -12$
x-int.: $4x - 9(0) = -12$
$4x = -12$
$x = -3$
y-int.: $4(0) - 9y = -12$
$-9y = -12$
$y = \frac{12}{9} = \frac{4}{3}$

2. $y = 0$: $5x = -10$; x-intercept $= -2$; $x = 0$: $2y = -10$; y-intercept $= -5$:


3a. 

3b. 

3c. 

3d. 

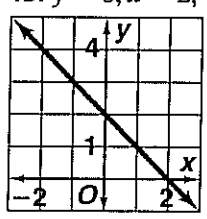
4.
$y = -\frac{2}{5}x + 1$
$5y = -2x + 5$
$2x + 5y = 5$

5. Let x = minutes spent bowling and y = minutes walking. $4x + 5y = 250$

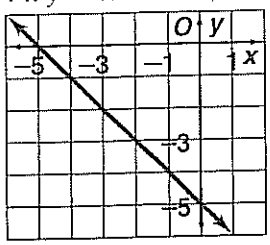
Exercises

1.
$x + 2y = 18$
x-int.: $y = 0$ $x = 18$
y-int.: $x = 0$ $2y = 18$
$y = 9$

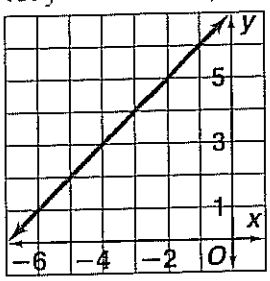
	x-intercepts	y-intercepts
2.	$y = 0$: $3x = 9$, $x = 3$;	$x = 0$: $-y = 9$, $y = -9$
3.	$y = 0$: $-5x = 30$, $x = -6$;	$x = 0$: $y = 30$
4.	$y = 0$: $-6x = -9$, $x = \frac{3}{2}$;	$x = 0$: $3y = -9$, $y = -3$
5.	$y = 0$: $4x = -18$, $x = -\frac{9}{2}$;	$x = 0$: $12y = -18$, $y = -\frac{3}{2}$
6.	$y = 0$: $9x = -72$, $x = -8$;	$x = 0$: $-6y = -72$, $y = 12$
7.	$y = 0$: $-2x = -12$, $x = 6$;	$x = 0$: $-3y = -12$, $y = 4$
8.	$y = 0$: $7x = 4$, $x = \frac{4}{7}$;	$x = 0$: $-2y = 4$, $y = -2$
9.	$y = 0$: $-8x = 40$, $x = -5$;	$x = 0$: $10y = 40$, $y = 4$
10.	$y = 0$, $2x = 10$, $x = 5$;	$x = 0$, $-5y = 10$, $y = -2$; B
11.	$y = 0$, $-2x = 10$, $x = -5$;	$x = 0$, $5y = 10$, $y = 2$; C
12.	$y = 0$, $2x = 10$, $x = 5$;	$x = 0$, $5y = 10$, $y = 2$; A
13.	$y = 0$, $x = 2$;	$x = 0$, $y = 2$



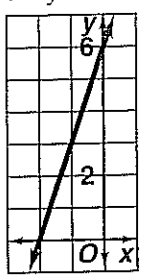
14. $y = 0$: $x = -5$; $x = 0$: $y = -5$



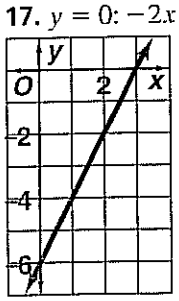
15. $y = 0$: $x = -7$; $x = 0$: $-y = -7, y = 7$



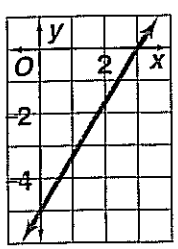
16. $y = 0$: $-3x = 6, x = -2$; $x = 0$: $y = 6$



17. $y = 0$: $-2x = -6, x = 3$; $x = 0$: $y = -6$

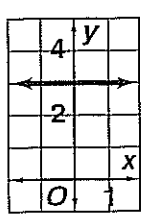


18. $y = 0$: $5x = 15, x = 3$; $x = 0$: $-3y = 15$, $y = -5$

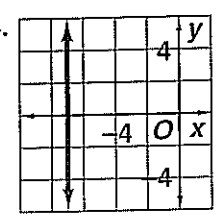


19. horizontal **20.** vertical
21. horizontal **22.** vertical

23.



24.



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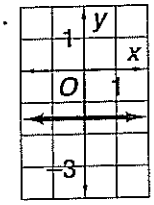

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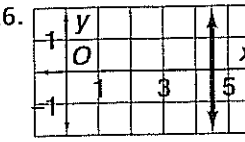


27. $y = 3x + 1$
$-3x + y = 1$

28. $y = 4x - 7$
$-4x + y = -7$
or $4x - y = 7$

29. $y = \frac{1}{2}x - 3$
$2y = x - 6$
$-x + 2y = -6$
or $x - 2y = 6$

30. $y = \frac{2}{3}x + 5$
$3y = 2x + 15$
$-2x + 3y = 15$

31. $y = -\frac{3}{4}x - 4$
$4y = -3x - 16$
$3x + 4y = -16$

32. $y = -\frac{4}{5}x - 7$
$5y = -4x - 35$
$4x + 5y = -35$

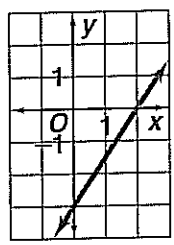
33. $y = \frac{7}{2}x + \frac{1}{4}$
$4y = 14x + 1$
$-14x + 4y = 1$

34. $y = -\frac{2}{5}x + \frac{1}{10}$
$10y = -4x + 1$
$4x + 10y = 1$

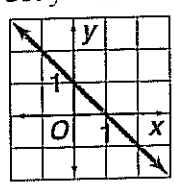
35. $y = -3x$
$3x + y = 0$

36a. Let x = number of cars, and y = number of vans or trucks. **36b.** $5x + 6.5y = 800$ **37a.** Let x = time walking (hours); let y = time running (hours). **37b.** $3x + 8y = 15$

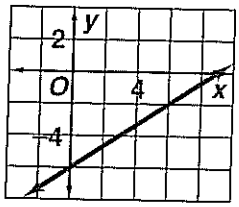
	x-intercepts	y-intercepts
38.	$y = 0$: $-3x = -6, x = 2$	$x = 0$: $2y = -6, y = -3$



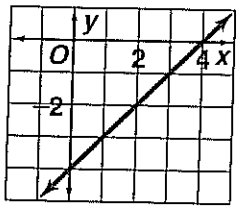
39. $y = 0$: $x = 1$ $x = 0$: $y = 1$



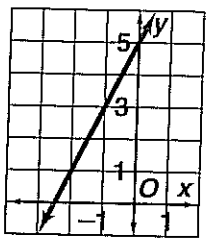
40. $y = 0$: $2x = 18$, $x = 9$ $x = 0$: $-3y = 18$, $y = -6$



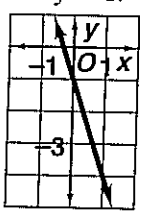
41. $y = 0$: $-x = -4$, $x = 4$ $x = 0$: $y = -4$



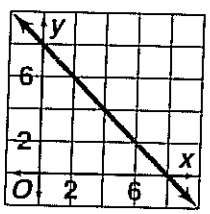
42. $y = 0$: $2x + 5 = 0$; $x = -\frac{5}{2}$ $x = 0$: $y = 5$



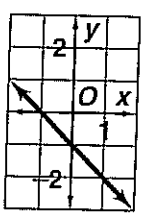
43. $y = 0$: $-3x - 1 = 0$, $x = -\frac{1}{3}$ $x = 0$: $y = -1$



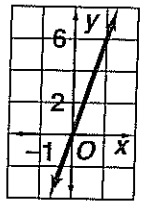
44. $y = 0$: $2 = x - 6$, $x = 8$ $x = 0$: $2 - y = -6$, $y = 8$



45. $y = 0$: $9 = 8 - x$, $x = -1$ $x = 0$: $9 + y = 8$, $y = -1$

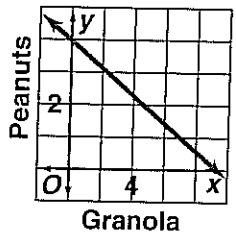


46. $y = 0$: $x = 0$ $x = 0$: $y = 0$
Slope of $y = 6x$ is 6.



47a. Let x = ounces of granola in snack mix, and y = ounces of peanuts. $3x + 7y = 28$

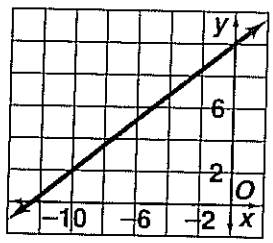
47b. $y = 0$: $3x = 28$, $x = 9\frac{1}{3}$; $x = 0$: $7y = 28$, $y = 4$



When $y = 1$, $x = 7$; you need 7 oz of granola.

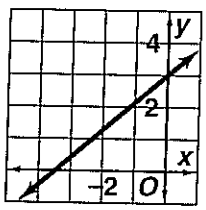
48. Let x = pounds of roast beef and y = pounds of turkey.
$4.29x + 3.99y = 30$

49.



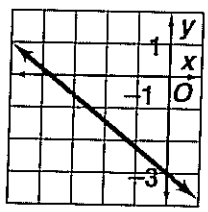
$8x - 10y = -100$
$-10y = -8x - 100$
$y = \frac{4}{5}x + 10$

50.



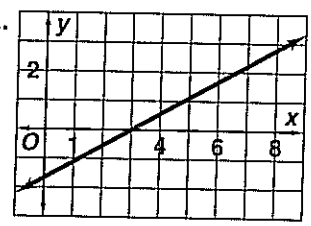
$-6x + 7y = 21$
$7y = 6x + 21$
$y = \frac{6}{7}x + 3$

51.



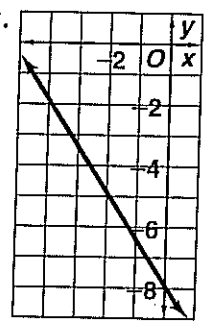
$12x + 15y = -45$
$15y = -12x - 45$
$y = -\frac{4}{5}x - 3$

52.



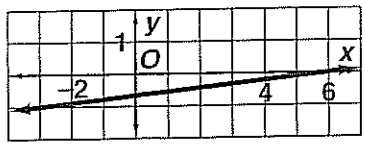
$-5x + 9y = -15$
$9y = 5x - 15$
$y = \frac{5}{9}x - \frac{5}{3}$

53.

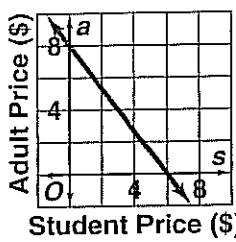


$16x + 11y = -88$
$11y = -16x - 88$
$y = -\frac{16}{11}x - 8$

54. $3x - 27y = 18$
$-27y = -3x + 18$
$y = \frac{1}{9}x - \frac{2}{3}$



55. Answers may vary. Sample: Slope-intercept form shows slope and y-intercept directly. Standard form shows sum $Ax + By$ directly, but a calculation is required to determine either intercept or slope. **56.** If $A = 0$ and $B = 0$, then $C = 0$, and the equation becomes $0 = 0$, which contains no information. **57.** The student multiplied through by 2, but forgot to change the sign of $3x$ when moving it to the other side of the equals sign. **58.** a: $y = 2$ **59.** b: $y = -2$ **60.** c: $x = 1$ **61.** d: $x = -2$ **62a.** Let s = price of student ticket and a = price of adult ticket. Total ticket sales should equal $200 + 1000 = 1200$. $200s + 150a = 1200$ **62b.** s-intercept: $a = 0$, $200s = 1200, s = 6$; a-intercept: $s = 0, 150a = 1200, a = 8$



Answers may vary. Sample: $s = \$2.00, a = \$5.33$; $s = \$3.00$, $a = \$4.00$; $s = \$4.00, a = \$2.67$; $s = \$3.00$ and $a = \$4.00$ is best choice because they are whole dollar amounts, and adults pay more.

63. $3x - 5y = 7$
$-5y = -3x + 7$
$y = \frac{3}{5}x - \frac{7}{5}$

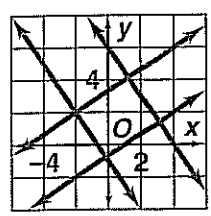
slope $= m = \frac{3}{5}$

$2y - 9x = 8$; $x = 0$: $2y = 8$, y-intercept $= 4$

Equation is $y = \frac{3}{5}x + 4$. This exercise shows that the standard form is not so very useful.

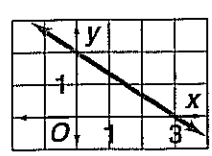
64. x-intercepts: $y = 0$; $x = -5; -\frac{3}{2}; \frac{3}{2}; \frac{11}{3} = 3\frac{2}{3}$

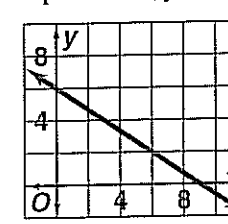
y-intercepts: $x = 0$; $y = \frac{10}{3} = 3\frac{1}{3}; -\frac{2}{3}; -1; \frac{11}{2} = 5\frac{1}{2}$



The figure looks like a square, but it would be hard to prove it. Slopes are $\frac{2}{3}$ and $-\frac{3}{2}$; their product is -1; the lines are perpendicular (see textbook, p. 312).

65a. x-intercepts: $y = 0$; $x = 3, 9$; y-intercepts: $x = 0$; $y = 2, 6$





65b. $2x + 3y = a$
$3y = -2x + a$
$y = -\frac{2}{3}x + \frac{a}{3}$

Slope $= -\frac{2}{3}$ for any value of a.

65c. See 65a above. Intercepts for second equation are three times those of the first.

66. $y = -\frac{2}{3}x + 6$
$3y = -2x + 18$
$2x + 3y = 18$ The answer is C.

67. $Ax + By = C$
$By = -Ax + C$
$y = -\frac{A}{B}x + \frac{C}{B}$ The answer is H.

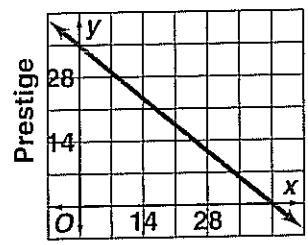
68. Let y = weight of basket with apples; let x = number of apples in basket. Slope $= \frac{\text{pounds}}{\text{apples}} = \frac{4 - 2}{12 - 4} = \frac{1}{4}$.

Equation is $y = \frac{1}{4}x + b$.
$2 = \left(\frac{1}{4}\right)4 + b$
$b = 2 - 1 = 1$

Equation is $y = \frac{1}{4}x + 1$.
$4y = x + 4$
$x - 4y = -4$

69a. $48x + 56y = 2008$

69b. $y = 0$: $x = \frac{2008}{48} = 41.8$; $x = 0$: $y = \frac{2008}{56} = 35.9$



69c. Try $x = 1$, $y = \frac{2008 - 48}{56} = 35$ (integer!).

sum = 2008 = constant

48(change in x) + 56(change in y) = 0

$\frac{\text{change in } y}{\text{change in } x} = \frac{-48}{56} = \frac{-6}{7}$

If x and y are integers, when x increases by 7 units, y will decrease by 6 units. Answers should include three of the following:

x (Supreme)	y (Prestige)
1	35
8	29
15	23
22	17
29	11
36	5

70. $-3 \stackrel{?}{=} -2 - 1$; yes **71.** $-1 \stackrel{?}{=} 2 \cdot 6 - 15$; no
72. $-7 \stackrel{?}{=} -3(-5) - 8$; no **73.** $P = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$
74. $P = \frac{1}{6} \cdot \frac{3}{6} = \frac{1}{12}$

75. $\frac{a}{5} = \frac{12}{15}$
$\frac{a}{5} = \frac{4}{5}$
$a = 4$

76. $\frac{2}{8} = \frac{w}{9}$
$9\left(\frac{2}{8}\right) = w$
$w = \frac{9}{4} = 2.25$

77. $\frac{x+2}{4} = \frac{3}{8}$

$x + 2 = 4\left(\frac{3}{8}\right) = \frac{3}{2}$

$x = \frac{3}{2} - 2 = -\frac{1}{2} = -0.5$

78. $\frac{14}{4m} = \frac{16}{5m+9}$

$\frac{7}{2m} = \frac{16}{5m+9}$

$7(5m + 9) = 2m \cdot 16$

$35m + 63 = 32m$

$3m + 63 = 0$

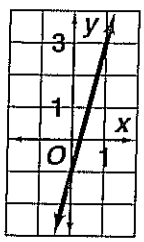
$3m = -63$

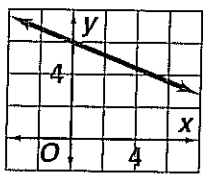
$m = -21$

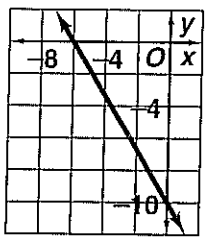
CHECKPOINT QUIZ 1 *page 303*

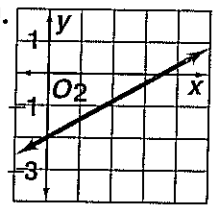
1. slope $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{-2-3}{6-(-1)} = -\frac{5}{7}$ 2. $\frac{2-5}{0-4} = \frac{3}{4}$

3. $\frac{-7-(-3)}{-1-(-2)} = -4$ 4. $\frac{5-(-4)}{-5-4} = -1$ 5. $\frac{1021-534}{1994-1990} =$ 121.75; the rate of change = \$121.75 billion per year.

6. 

7. 

8. 

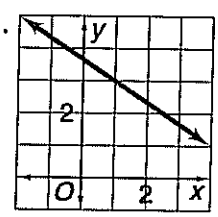
9. 

10. The graphs have the same y-intercepts ($y = 5$); they have different slopes $\left(3, \frac{2}{3}, \frac{3}{5}\right)$.

6-4 Point-Slope Form and Writing Linear Equations *pages 304–309*

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. -2 2. $\frac{1}{2}$ 3. 2 4. $-3x + 15$ 5. $5x + 10$ 6. $-\frac{4}{9}x + \frac{8}{3}$

Check Understanding 1. 

2. $y - (-8) = \frac{2}{5}(x - 10)$

$y + 8 = \frac{2}{5}(x - 10)$

3a. slope $= \frac{8}{3}$; $y - (-5) = \frac{8}{3}([x - (-1)]$

$y + 5 = \frac{8}{3}(x + 1)$

3b. $y + 5 = \frac{8}{3}x + \frac{8}{3}$

$y = \frac{8}{3}x + \frac{8}{3} - 5$

$y = \frac{8}{3}x - 2\frac{1}{3}$

3c. They are the same.

4. Slopes are $\frac{4}{10} = \frac{2}{5}$; $\frac{2}{5}$; $\frac{6}{15} = \frac{2}{5}$; yes, tabulated relationship is linear because the slopes are all the same. Point-slope equations are

$y - (-7) = \frac{2}{5}[x - (-11)]$

$y + 7 = \frac{2}{5}(x + 11)$;

$y - (-3) = \frac{2}{5}[x - (-1)]$

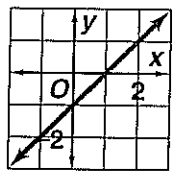
$y + 3 = \frac{2}{5}(x + 1)$;

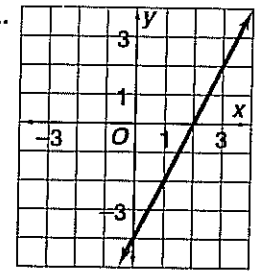
$y - (-1) = \frac{2}{5}(x - 4)$

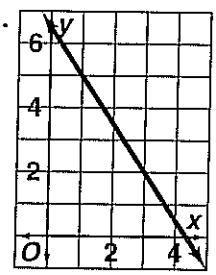
$y + 1 = \frac{2}{5}(x - 4)$;

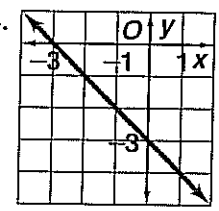
$y - 5 = \frac{2}{5}(x - 19)$

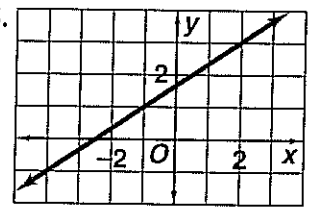
5. Yes, relationship is linear because all three slopes are $\frac{100}{-6} = -\frac{50}{3}$. Four different point-slope equations could be written. Sample: $y - 3030 = -\frac{50}{3}(x - 68)$

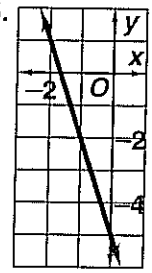
Exercises 1. 

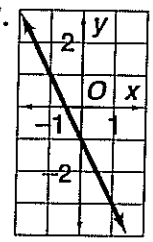
2. 

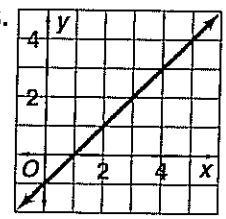
3. 

4. 

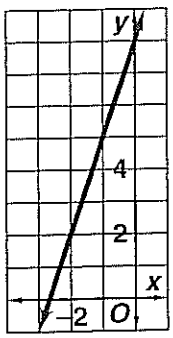
5. 

6. 

7. 

8. 

9.



10. $(x_1, y_1) = (3, -4); m = 6$

$$y - y_1 = m(x - x_1)$$
$$y - (-4) = 6(x - 3)$$
$$y + 4 = 6(x - 3)$$

11. $y - 2 = -\frac{5}{3}(x - 4)$ **12.** $y - 2 = \frac{4}{5}x$

13.
$$y - (-7) = -\frac{3}{2}[x - (-2)]$$
$$y + 7 = -\frac{3}{2}(x + 2)$$

14. $y = x - 4$ **15.** $y + 8 = -3(x - 5)$ **16.** $y - 2 = 0$ or $y = 2$ **17.** $y + 8 = -\frac{1}{5}(x - 1)$ **18.** $y - 1 = \frac{2}{3}(x + 6)$

19–30. The point-slope equation could be written using either of the two points. We will use the first.

19. slope $= m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 0}{1 - (-1)} = 1$

$$y - 0 = 1[x - (-1)]$$
$$y = x + 1;$$
$$y = x + 1$$

20. $m = \frac{0 - 5}{0 - 3} = \frac{5}{3}$;

$$y - 5 = \frac{5}{3}(x - 3);$$
$$y - 5 = \frac{5}{3}x - 5$$
$$y = \frac{5}{3}x$$

21. $m = \frac{-8 - (-2)}{9 - 4} = -\frac{6}{5}$;

$$y + 2 = -\frac{6}{5}(x - 4);$$
$$y + 2 = -\frac{6}{5}x + \frac{24}{5}$$
$$y = -\frac{6}{5}x + \frac{14}{5}$$

22. $m = \frac{5 - (-4)}{-3 - 6} = -1$;

$$y + 4 = -(x - 6);$$
$$y = -x + 2$$

23. $m = \frac{-6 - (-5)}{-7 - (-1)} = \frac{1}{6}$;

$$y + 5 = \frac{1}{6}(x + 1);$$
$$y = \frac{1}{6}x - \frac{29}{6}$$

24. $m = \frac{-2 - (-4)}{3 - (-3)} = \frac{1}{3}$;

$$y + 4 = \frac{1}{3}(x + 3);$$
$$y + 4 = \frac{1}{3}x + 1$$
$$y = \frac{1}{3}x - 3$$

25. $m = \frac{-4 - 7}{1 - 2} = 11$;

$$y - 7 = 11(x - 2);$$
$$y - 7 = 11x - 22$$
$$y = 11x - 15$$

26. $m = \frac{1 - 6}{5 - (-2)} = -\frac{5}{7}$;

$$y - 6 = -\frac{5}{7}(x + 2);$$
$$y - 6 = -\frac{5}{7}x - 1\frac{3}{7}$$
$$y = -\frac{5}{7}x + 4\frac{4}{7}$$

27. $m = \frac{5 - (-8)}{-2 - 3} = -\frac{13}{5}$;

$$y + 8 = -\frac{13}{5}(x - 3);$$
$$y + 8 = -\frac{13}{5}x + 7\frac{4}{5}$$
$$y = -\frac{13}{5}x - \frac{1}{5}$$

28. $m = \frac{2 - \frac{1}{2}}{3 - 1} = \frac{3}{4}$;

$$y - \frac{1}{2} = \frac{3}{4}(x - 1);$$
$$y - \frac{1}{2} = \frac{3}{4}x - \frac{3}{4}$$
$$y = \frac{3}{4}x - \frac{1}{4}$$

29. $m = \frac{4 - 2}{-\frac{3}{2} - \frac{1}{2}} = -1$;

$$y - 2 = -\left(x - \frac{1}{2}\right);$$
$$y = -x + \frac{5}{2}$$

30. $m = \frac{3 - 1.1}{7 - 0.2} = \frac{1.9}{6.8}$;

$$y - 1.1 = \frac{1.9}{6.8}(x - 0.2);$$
$$y - 1.1 = \frac{1.9}{6.8}x - \frac{0.38}{6.8}$$
$$y = \frac{1.9}{6.8}x - \frac{0.38}{6.8} + 1.1$$
$$y = \frac{1.9}{6.8}x + \frac{7.1}{6.8}$$

31–35. For each linear table four different point-slope equations can be written. Samples are shown.

31. yes; slopes $= \frac{-12}{6} = \frac{-6}{3} = \frac{-8}{4} = -2$; $y - 9 = -2(x + 4)$ **32.** yes; slopes $= \frac{24}{8} = \frac{21}{7} = \frac{18}{6} = 3$; $y - 40 = 3(x - 5)$ **33.** No; slopes are $\frac{3}{2}, \frac{9}{3} = 3, \frac{36}{6} = 6$ which aren't equal. **34.** yes; slopes $\frac{20}{2} = \frac{30}{3} = \frac{40}{4} = 10$; $y - 75 = 10(x - 10)$ **35.** No; slopes $= \frac{16}{2}, \frac{17}{2}, \frac{17}{2}$ which aren't equal.

36–38. Two different equations may be written for each graph. **36.** $m = \frac{3}{4}$; $y - 2 = \frac{3}{4}(x - 1)$ **37.** $m = \frac{2}{5}$; $y + 3 = \frac{2}{5}(x - 1)$ **38.** $m = -\frac{5}{7}$; $y = -\frac{5}{7}(x - 5)$

39–53. Two point-slope equations can be written for each problem. **39.** slope $= m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 4}{-1 - 1} = \frac{3}{2}$;

$$y - 4 = \frac{3}{2}(x - 1);$$
$$2y - 8 = 3x - 3$$
$$-3x + 2y = 5$$

40. $m = \frac{-3 - (-3)}{-2 - 6} = 0$;

$$y + 3 = 0;$$
$$y = -3$$

41. $m = \frac{-2 - 0}{-1 - 0} = 2$;

$$y = 2x;$$
$$-2x + y = 0$$

42. $m = \frac{2 - 2}{-4 - 0} = 0$;

$$y - 2 = 0;$$
$$y = 2$$

43. $m = \frac{3-6}{3-(-6)} = -\frac{1}{3}$;

$$y - 6 = -\tfrac{1}{3}(x + 6);$$
$$3y - 18 = -x - 6$$
$$x + 3y - 18 = -6$$
$$x + 3y = 12$$

44. $m = \frac{5-3}{-1-2} = -\frac{2}{3}$;

$$y - 3 = -\tfrac{2}{3}(x - 2);$$
$$3y - 9 = -2x + 4$$
$$2x + 3y - 9 = 4$$
$$2x + 3y = 13$$

45. $m = \frac{4-(-3)}{3-5} = -\frac{7}{2}$;

$$y + 3 = -\tfrac{7}{2}(x - 5);$$
$$2y + 6 = -7x + 35$$
$$7x + 2y + 6 = 35$$
$$7x + 2y = 29$$

46. $m = \frac{7-2}{-1-2} = -\frac{5}{3}$;

$$y - 2 = -\tfrac{5}{3}(x - 2)$$
$$3y - 6 = -5x + 10$$
$$5x + 3y - 6 = 10$$
$$5x + 3y = 16$$

47. $m = \frac{-1-1}{5-(-7)} = -\frac{1}{6}$;

$$y - 1 = -\tfrac{1}{6}(x + 7);$$
$$6y - 6 = -x - 7$$
$$x + 6y - 6 = -7$$
$$x + 6y = -1$$

48. $m = \frac{-2-4}{-4-(-8)} = -\frac{3}{2}$;

$$y - 4 = -\tfrac{3}{2}(x + 8);$$
$$2y - 8 = -3x - 24$$
$$3x + 2y - 8 = -24$$
$$3x + 2y = -16$$

49. $m = \frac{-6-4}{-3-2} = 2$;

$$y - 4 = 2(x - 2)$$
$$y - 4 = 2x - 4$$
$$-2x + y = 0$$

50. $m = \frac{5-3}{4-5} = -2$;

$$y - 3 = -2(x - 5)$$
$$y - 3 = -2x + 10$$
$$2x + y - 3 = 10$$
$$2x + y = 13$$

51. $m = \frac{0-1}{-3-0} = \frac{1}{3}$;

$$y - 1 = \tfrac{1}{3}x;$$
$$3y - 3 = x$$
$$-x + 3y - 3 = 0$$
$$-x + 3y = 3$$

52. $m = \frac{-5-4}{0-(-2)} = -\frac{9}{2}$;

$$y - 4 = -\tfrac{9}{2}(x + 2)$$
$$2y - 8 = -9x - 18$$
$$9x + 2y = -10$$

53. $m = \frac{-1-2}{1-6} = \frac{3}{5}$;

$$y - 2 = \tfrac{3}{5}(x - 6);$$
$$5y - 10 = 3x - 18$$
$$-3x + 5y - 10 = -18$$
$$-3x + 5y = -8$$

54a. Let x = depth (ft), and let y = total pressure (atm) at depth x. Slope $= m = \frac{3-1}{-66-0} = -\frac{1}{33}$.

$$y - 1 = -\tfrac{1}{33}(x - 0)$$
$$y = -\tfrac{1}{33}x + 1$$

54b. $y = -\frac{1}{33}(-100) + 1 = 4.03$; total pressure is about 4 atmospheres.

55. Let y = CO emission in million metric tons; let x = years after 1900.

$$y = -2.6x + b$$
$$79 = -2.6(91) + b$$
$$79 = -236.6 + b$$
$$b = 79 + 236.6 = 315.6$$
$$y = -2.6x + 315.6$$

56a.

$$y - y_1 = m(x - x_1)$$
$$y - (-6) = 2[x - (-4)]$$
$$y + 6 = 2(x + 4)$$

56b. There is only one equation in generic form shown above. There are an infinite number of equations with numerical values substituted for the slope m, which is not determined by the one point. **57.** The graph of $y - 12 = 8(x - 2)$ goes through the point $(2, 12)$ and has a slope $m = 8$. The graph of $y + 12 = 8(x + 2)$ would have the same slope, and go through the point $(-2, -12)$. **58.** The cited equation goes through the point $(1, 5)$. But $11 - 5 = 2(4 - 1)$, so the graph also goes through $(4, 11)$. **59a–c.** Answers may vary. Samples are given. **59a.** $y = x + 1$ **59b.** $-x + y = 1$ **59c.** $y - 1 = 1(x - 0)$. For a given graph, equations (a) and (b) are unique, but there are endless forms (c) for the same graph.

60a. slope $= m = \frac{356-332}{40-0} = \frac{24}{40} = \frac{3}{5}$;
at $x = 0$, $y = 332$; $y = \frac{3}{5}x + 332$

60b. $y = \frac{3}{5}(15) + 332 = 341$; 341 m/s

60c. $y = \frac{3}{5}(60) + 332 = 368$; 368 m/s **61.** $m = 7$;

$$y - (-5) = 7[x - (-3)]$$
$$y + 5 = 7(x + 3)$$
$$y + 5 = 7x + 21$$
$$y = 7x + 16$$

62. $x = 0$: $y - 5 = -2$
y-intercept: $y = 3$
Slope of line through $(1, 3)$ and $(0, 3) = \frac{3-3}{0-1} = 0$; the equation is $y = 0x + 3$ or $y = 3$.

63. $y = 0$: $9 = 3(x - 4)$
$9 = 3x - 12$
$21 = 3x$
x-intercept: $7 = x$
Slope of line through $(2, -2)$ and $(7, 0)$ is $\frac{0-(-2)}{7-2} = \frac{2}{5}$; the equation is $y - (-2) = \frac{2}{5}(x - 2)$.

$$y + 2 = \tfrac{2}{5}x - \tfrac{4}{5}$$
$$y = \tfrac{2}{5}x - \tfrac{14}{5}$$

64. slope $= \frac{1.5}{4} = \frac{3}{8}$; linear function is

(4, 14): $y - 14 = \frac{3}{8}(x - 4)$

$y - 14 = \frac{3}{8}x - \frac{3}{2}$

$y = \frac{3}{8}x + 12\frac{1}{2}$

also $8y = 3x + 100$

$3x = 8y - 100$

$x = \frac{8}{3}y - 33\frac{1}{3}$

64a. $y = \frac{3}{8}(6) + 12\frac{1}{2} = \frac{9}{4} + 12\frac{1}{2} = 14\frac{3}{4} = 14.75$

64b. $y = \frac{3}{8}(120) + 12\frac{1}{2} = 57\frac{1}{2} = 57.5$

64c. $x = \frac{8}{3}(11) - 33\frac{1}{3} = 29\frac{1}{3} - 33\frac{1}{3} = -4$

64d. $x = \frac{8}{3}(50) - 33\frac{1}{3} = 133\frac{1}{3} - 33\frac{1}{3} = 100$

65. slope $= \frac{1}{2}$ **66.** $x = 0$: $y + 3 = 12$, y-intercept $= 9$

67. $y = 0$: $3x - 7 = 0, 3x = 7$, x-intercept $= \frac{7}{3}$

68. $y - 1 = -\frac{4}{5}(x - 3)$

$5y - 5 = -4x + 12$

$4x + 5y = 17$ Coefficient of x is 4.

69. $y = -\frac{5}{2}x + \frac{2}{3}$

$6y = -15x + 4$

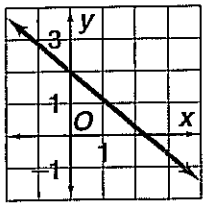
$15x + 6y = 4$ Coefficient of y is 6.

70–75. To do the graphing we need x- and y-intercepts.

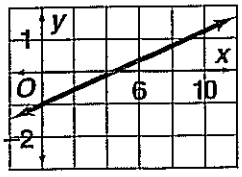
x-intercepts: $y = 0$ y-intercepts: $x = 0$

70. $6x = 14, x = \frac{7}{3}$ $7y = 14, y = 2$

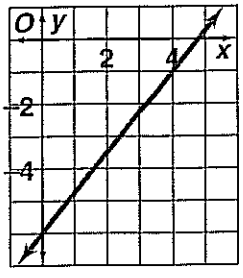
Plot points $\left(\frac{7}{3}, 0\right)$ and $(0, 2)$, and draw a straight line through them.



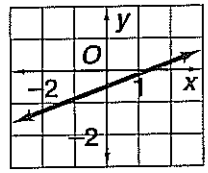
71. $-2x = -9, x = \frac{9}{2}$ $9y = -9, y = -1$



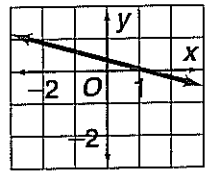
72. $5x = 24, x = 4\frac{4}{5}$ $-4y = 24, y = -6$



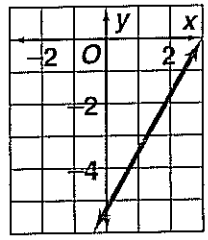
73. $3x = 4, x = 1\frac{1}{3}$ $-8y = 4, y = -\frac{1}{2}$



74. $5x = 6, x = 1\frac{1}{5}$ $18y = 6, y = \frac{1}{3}$



75. $-7x = -21, x = 3$ $4y = -21, y = -5\frac{1}{4}$



76. 5; 3, 8 **77.** $\frac{2}{6}; \frac{3}{2}, \frac{11}{6}$ **78.** 0.07; 2.66, 2.73

79. −0.05; −3.35, −3.4 **80.** 17; 69, 86 **81.** 4; 5, 9

READING MATH *page 310*

a. slope = 2; y-intercept = 5 **b.** $y = 0$: $50x = 100$, x-intercept = 2; $x = 0$: $25y = 100$, y-intercept = 4

c. $y - 4 = 2[x - (-3)]$; point is $(-3, 4)$; slope = 2.

6-5 Parallel and Perpendicular Lines *pages 311–317*

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. $\frac{2}{1} = 2$ **2.** $\frac{3}{4}$ **3.** $-\frac{5}{2}$ **4.** $-\frac{5}{7}$ **5.** $\frac{5}{3}$; 4 **6.** $\frac{5}{3}$; −8 **7.** 6; 0 **8.** 6; 2

Check Understanding

1. $-6x + 8y = -24$

$8y = 6x - 24$

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

Yes, slopes are the same and y-intercepts are different.

2. slope = 3; $y - (-6) = 3(x - 2)$

$y + 6 = 3x - 6$

$y = 3x - 12$

3. Given slope $= \frac{3}{4}$; new slope $= -\frac{4}{3}$; the equation is

$y - 8 = -\frac{4}{3}(x - 1)$

$y - 8 = -\frac{4}{3}x + \frac{4}{3}$

$y = -\frac{4}{3}x + 9\frac{1}{3}$

4. Slope = 2; second bike path passes through $(0, 4)$:

$y - 4 = 2(x - 0)$

$y = 2x + 4$

Exercises **1.** $\frac{1}{2}$ **2.** $-\frac{2}{3}$ **3.** 1 **4.** 0 (coefficient of x)

5.
$$3x + 4y = 12$$
$$4y = -3x + 12$$
$$y = -\frac{3}{4}x + 3$$
Slope of parallel line is $-\frac{3}{4}$.

6. $y = 7x - 5$; slope $= 7$

7.
$$-4x + 3y = 21$$
$$3y = 4x + 21$$
$$y = \frac{4}{3}x + 7$$
Slopes are $\frac{4}{3}$, 4; no.

8.
$$3x + 2y = 8$$
$$2y = -3x + 8$$
$$y = -\frac{3}{2}x + 4$$
Yes, slopes are the same and y-intercepts are different.

9.
$$x - 3y = 6$$
$$-3y = -x + 6$$
$$y = \frac{1}{3}x - 2$$
Yes, slopes are the same and y-intercepts are different.

10.
$$5x - 10y = 15$$
$$-10y = -5x + 15$$
$$y = \frac{1}{2}x - \frac{3}{2}$$
No, slopes are different.

11.
$$21x + 7y = 14$$
$$7y = -21x + 14$$
$$y = -3x + 2$$
Yes, slopes are the same and y-intercepts are different.

12.
$$-3x + 4y = 8$$
$$4y = 3x + 8$$
$$y = \frac{3}{4}x + 2$$
Yes, slopes are the same and y-intercepts are different.

13.
$$y - 0 = 6(x - 0)$$
$$y = 6x$$

14.
$$y - 0 = -3(x - 3)$$
$$y = -3x + 9$$

15.
$$y - 5 = -2[x - (-3)]$$
$$y - 5 = -2x - 6$$
$$y = -2x - 1$$

16.
$$y - (-6) = -\frac{7}{2}[x - (-4)]$$
$$y + 6 = -\frac{7}{2}x - 14$$
$$y = -\frac{7}{2} - 20$$

17.
$$y - (-5) = 0.5(x - 8)$$
$$y + 5 = 0.5x - 4$$
$$y = 0.5x - 9$$

18.
$$y - (-3) = -\frac{2}{3}(x - 5)$$
$$y + 3 = -\frac{2}{3}x + 3\frac{1}{3}$$
$$y = -\frac{2}{3}x + \frac{1}{3}$$

19. $-\frac{1}{2}$ **20.** $\frac{1}{3}$ **21.** $-\frac{5}{7}$ **22.** Negative reciprocal of $-\frac{1}{5}$ is 5.

23.
$$2x + 3y = 5$$
$$3y = -2x + 5$$
$$y = -\frac{2}{3}x + \frac{5}{3}$$
Slope is $\frac{3}{2}$. **24.** Given slope $= 0$; new slope $= \frac{\text{nonzero quantity}}{0}$, which is undefined.

25.
$$y - 0 = -\frac{1}{2}(x - 0)$$
$$y = -\frac{1}{2}x$$

26.
$$y - 6 = -(x - 4)$$
$$y = -x + 10$$

27.
$$y - 2 = 3(x - 4)$$
$$y = 3x - 10$$

28. given
$$3x + 5y = 7$$
$$5y = -3x + 7$$
$$y = -\frac{3}{5}x + \frac{7}{5}$$
given slope $= -\frac{3}{5}$; new slope $= \frac{5}{3}$;
$$y - 2 = \frac{5}{3}[x - (-1)]$$
$$y - 2 = \frac{5}{3}x + \frac{5}{3}$$
$$y = \frac{5}{3}x + \frac{11}{3}$$

29. given
$$-10x + 8y = 3$$
$$8y = 10x + 3$$
$$y = \frac{5}{4}x + \frac{3}{8}$$
given slope $= \frac{5}{4}$; new slope $= -\frac{4}{5}$;
$$y - 12 = -\frac{4}{5}(x - 15)$$
$$y - 12 = -\frac{4}{5}x + 12$$
$$y = -\frac{4}{5} + 24$$

30. given
$$4x - 2y = 9$$
$$-2y = -4x + 9$$
$$y = 2x - \frac{9}{2}$$
given slope $= 2$; new slope $= -\frac{1}{2}$;
$$y - (-2) = -\frac{1}{2}(x - 8)$$
$$y + 2 = -\frac{1}{2}x + 4$$
$$y = -\frac{1}{2} + 2$$

31. Handel Street slope $= \frac{4 - 0}{0 - 5} = -\frac{4}{5}$; slope of new street $= \frac{5}{4}$;
$$y - 1 = \frac{5}{4}(x - 0)$$
$$y = \frac{5}{4}x + 1$$

32. perpendicular **33.** parallel **34.** perpendicular **35.** neither **36.** parallel **37.** We can't use slope test here because slope of $x = 2$ is infinite (undefined); $x = 2$ is parallel to the y axis and $y = 9$ is parallel to the x axis, so the lines are perpendicular.

38. $y = -2x + 2$; $y = -2x + 5$; parallel

39.
$$3x - 5y = 3$$
$$-5y = -3x + 3$$
$$y = \frac{3}{5}x - \frac{3}{5};$$
$$-5x + 3y = 8$$
$$3y = 5x + 8$$
$$y = \frac{5}{3}x + \frac{8}{3};$$
Lines are neither parallel or perpendicular.

40.
$$4x - 3y = 36$$
$$-3y = -4x + 36$$
$$y = \frac{4}{3}x - 12$$
$$3x + 4y = 20$$
$$4y = -3x + 20$$
$$y = -\frac{3}{4}x + 5$$
Slopes $\frac{4}{3}$, $-\frac{3}{4}$ are perpendicular.

41. Slopes are $\frac{2}{5}$, $-\frac{2}{5}$; neither. **42.** Answers may vary. Sample: the x and y coefficients are the same; mental math says slopes are $\frac{7}{3}$.

43. Slopes are $-\frac{4}{5}$.

upper:
$$y - 3 = -\tfrac{4}{5}[x - (-3)]$$
$$y - 3 = -\tfrac{4}{5}x - \tfrac{12}{5}$$
$$y = -\tfrac{4}{5}x + \tfrac{3}{5};$$

lower:
$$y - 1 = -\tfrac{4}{5}(x + 6)$$
$$y - 1 = -\tfrac{4}{5}x - 4\tfrac{4}{5}$$
$$y = -\tfrac{4}{5}x - 3\tfrac{4}{5}$$

44. red: slope $= \frac{1}{3}$;
$$y - 3 = \tfrac{1}{3}(x - 5)$$
$$y - 3 = \tfrac{1}{3}x - \tfrac{5}{3}$$
$$y = \tfrac{1}{3}x + \tfrac{4}{3};$$

blue: slope $= -3$;
$$y - 4 = -3(x - 1)$$
$$y - 4 = -3x + 3$$
$$y = -3x + 7$$

45. red: slope $= -\frac{1}{2}$; $y = -\frac{1}{2}x$; blue: slope $= 2$; $y = 2x$

46. slopes $= \frac{2}{5}$;

upper:
$$y - 1 = \tfrac{2}{5}(x - 1)$$
$$y - 1 = \tfrac{2}{5}x - \tfrac{2}{5}$$
$$y = \tfrac{2}{5}x + \tfrac{3}{5};$$

lower:
$$y + 3 = \tfrac{2}{5}(x - 3)$$
$$y + 3 = \tfrac{2}{5}x - \tfrac{6}{5}$$
$$y = \tfrac{2}{5}x - \tfrac{21}{5}$$

47. $y = 4$; $y = 2$

48. red: slope $= -1$;
$$y - 1 = -1(x - 0)$$
$$y = -x + 1$$

blue: slope $= 1$, $y = x$

49. slope $= \frac{5}{4}$ **50.** Answers may vary. Sample: The avenues are not quite straight. Near "Massachusetts" and "Pennsylvania," the slopes are both very close to $-\frac{2}{5}$. **51.** Answers may vary. Sample: $\frac{5}{4} \cdot \left(-\frac{2}{5}\right) = -\frac{1}{2}$, $\neq -1$ **52a.** The x and y scales are not the same.

52b. The lines appear perpendicular. **53.** Answers may vary. Sample: since $y = 4x - 1$, any other line with a slope of 4 is parallel. **54.** No; the slopes are $-\frac{2}{7}$ and $-\frac{7}{2}$, which are not equal. **55.** No; the slopes are $-\frac{8}{3}$ and $\frac{8}{3}$, whose product $\neq -1$. **56.** Yes; they have the same slopes (0) and different y-intercepts. **57.** False; the product of their slopes can't be negative. **58.** Yes; their slopes can be equal. **59.** False; all direct variations go through the point $(0, 0)$. If they have the same slope, they are the same line, not parallel lines. **60.** Yes; both $\overleftrightarrow{AD}$ and $\overleftrightarrow{BC}$ are vertical, so they are parallel. Slopes of $\overleftrightarrow{AB}$ and $\overleftrightarrow{DC}$ are both $\frac{2}{5}$, so they are parallel.

61. No; the slopes of opposite sides are not equal.

62. Yes; the slopes of $\overleftrightarrow{PQ}$ and $\overleftrightarrow{SR}$ are both $-\frac{1}{2}$, so they are parallel. The slopes of $\overleftrightarrow{PS}$ and $\overleftrightarrow{QR}$ are both $-\frac{3}{2}$, so they are parallel. **63.** The slopes of $\overleftrightarrow{AB}$ and $\overleftrightarrow{DC}$ are both $\frac{2}{5}$. The slopes of $\overleftrightarrow{AD}$ and $\overleftrightarrow{BC}$ are both $-\frac{5}{2}$. The product $\left(\frac{2}{5}\right) \cdot \left(-\frac{5}{2}\right) = -1$, so the corners form right angles, and the figure is a rectangle. ($ABCD$ is a square.)

64. The slopes of $\overleftrightarrow{KL}$ and $\overleftrightarrow{NM}$ are both $-\frac{1}{6}$. The slopes of $\overleftrightarrow{CD}$ and $\overleftrightarrow{CD}$ are both 5. So the figure is a parallelogram, but the product is $-\frac{5}{6}$, which is a little different from -1, so the figure is not a rectangle (but almost!). **65.** The slopes of $\overleftrightarrow{PQ}$ and $\overleftrightarrow{SR}$ are both $\frac{1}{2}$. The slopes of $\overleftrightarrow{PS}$ and $\overleftrightarrow{QR}$ are both -2. The product is -1, so the figure is a rectangle. **66.** You must draw the figure to identify which are opposite sides and which lines are diagonals. $\overleftrightarrow{BC}$ and $\overleftrightarrow{AD}$ both have slopes of zero. $\overleftrightarrow{AB}$ and $\overleftrightarrow{DC}$ both have slopes of $\frac{4}{3}$. The diagonal $\overleftrightarrow{BD}$ has a slope of -2, and the diagonal $\overleftrightarrow{AC}$ has a slope of $\frac{1}{2}$, so the diagonals are perpendicular. The figure $ABCD$ is a rhombus. **67.** $\overleftrightarrow{RP}$ has a slope of $\frac{2}{3}$. $\overleftrightarrow{RQ}$ has a slope of $-\frac{3}{2}$. The product of the slopes is -1, so the sides are perpendicular, the angle $\angle PRQ$ is a right angle, and the figure is a right triangle. **68.** Slopes are both $\frac{a}{b}$ and the lines are parallel. **69.** The slopes are $-\frac{a}{b}$ and $\frac{b}{a}$; the product is -1 so the lines are perpendicular.

70. red: slope $= -\frac{3}{8}$;
$$y + 1 = -\tfrac{3}{8}(x + 3)$$
$$y + 1 = -\tfrac{3}{8}x - \tfrac{9}{8}$$
$$y = -\tfrac{3}{8}x - \tfrac{17}{8};$$

blue: slope $= \frac{8}{3}$;
$$y + 1 = \tfrac{8}{3}(x + 3)$$
$$y + 1 = \tfrac{8}{3}x + 8$$
$$y = \tfrac{8}{3}x + 7$$

71. red: slope $= \frac{1}{2}$;
$$y + 4 = \tfrac{1}{2}(x + 2)$$
$$y + 4 = \tfrac{1}{2}x + 1$$
$$y = \tfrac{1}{2}x - 3;$$

blue: slope $= -2$;
$$y + 1 = -2(x - 4)$$
$$y + 1 = -2x + 8$$
$$y = -2x + 7$$

72.
$$3x + 12y = 8$$
$$12y = -3x + 8$$
$$y = -\tfrac{1}{4}x + \tfrac{2}{3};$$
$$6y = kx - 5$$
$$y = \tfrac{k}{6}x - \tfrac{5}{6};$$

parallel if $-\frac{1}{4} = \frac{k}{6}$ or $k = -\frac{3}{2} = -1.5$; perpendicular if $4 = \frac{k}{6}$ or $k = 24$

73. Slope must be $-\frac{3}{2}$; the answer is D. **74.** Slope of original equation is $-\frac{1}{2}$; slope of parallel line is $-\frac{1}{2}$; the answer is F. **75.** First plot points A, B, C. Answers A, B, and D can be eliminated by inspection. The answer is C: point D is $(p, q) = (4, 6)$. Check: Slope of $\overleftrightarrow{AB}$ = $\frac{-1-2}{2-0} = -\frac{3}{2}$; slope of $\overleftrightarrow{DC}$ is $\frac{6-3}{4-6} = -\frac{3}{2}$ ✓; slope of $\overleftrightarrow{BC} = \frac{3-(-1)}{6-2} = 1$; slope of $\overleftrightarrow{AD}$ is $\frac{2-6}{0-4} = 1$ ✓

76.
$$2x + y = 3$$
$$y = -2x + 3$$

slope $= -2$; slope of other line is

$$\frac{2-6}{1-x} = -2$$
$$-4 = -2(1-x)$$
$$-4 = -2 + 2x$$
$$-2 = 2x$$
$$-1 = x$$

77. A. slope $= -5$ **B.** slope $= -5$; the answer is C.

78. A. slopes are $-\frac{4}{3}$ and $-\frac{3}{4}$; product is $+1$; the answer is A. **79. A.** slope $= \frac{3}{6} = \frac{1}{2}$; the answer is B.

80.
$$(x_1, y_1) = (0, 4); m = 3;$$
$$y - y_1 = m(x - x_1)$$
$$y - 4 = 3(x - 0)$$
$$y = 3x + 4$$

81.
$$y - 0 = -4[x - (-2)]$$
$$y = -4x - 8$$

82.
$$y - (-3) = \frac{3}{4}(x - 5)$$
$$y + 3 = \frac{3}{4}(x - 5)$$

83. $y + 9 = -\frac{2}{3}(x + 1)$ **84.** $y - 4 = -\frac{3}{5}(x + 6)$

85. $y - 11 = \frac{1}{2}(x - 7)$ **86.** $A(3) = 2 \cdot 3 + 1 = 7$; $A(5) = 2 \cdot 5 + 1 = 11$; $A(7) = 2 \cdot 7 + 1 = 15$

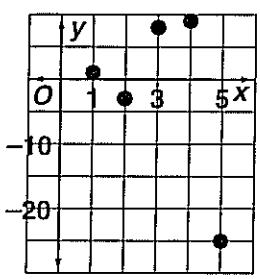
87. $3 - 4 \cdot 3 = -9$; $3 - 4 \cdot 5 = -17$; $3 - 4 \cdot 7 = -25$

88. Yes; the x's don't repeat so there can be no duplication. **89.** yes; no repetition **90.** No; x's repeat; two y's for $x = 5$. **91.** yes; no repetition

6-6 Scatter Plots and Equations of Lines pages 318–324

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1.



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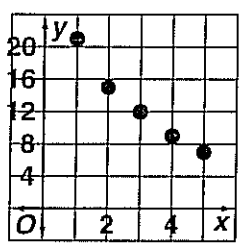
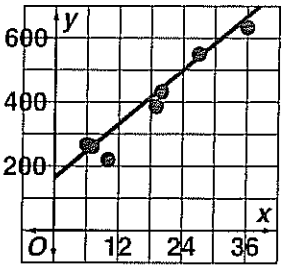


Check Understanding 1. When drawing a trend line through scattered data, adjust the line so that some of the points fall on one side of the line and some on the other.



Answers may vary. Sample: Slope $= \frac{500-250}{24-6} = \frac{250}{18} = 13.9 \approx 14$;

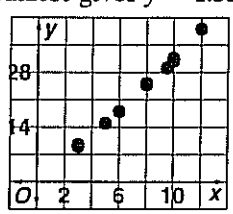
$$y - 250 = 14(x - 6)$$
$$y - 250 = 14x - 84$$
$$y = 14x + 166$$

at $x = 14$, $y = 14 \cdot 14 + 166 = 362$; 362 calories

2. x = year after 1900 $= 91, 92, \ldots 99$; y = gross in $ billion; calculator gives correlation coefficient $r \approx 0.9751$; number near 1.0000 shows good correlation and low scatter. Calculator gives equation $y = 0.33x - 25.35$.

Exercises 1–6. Trend lines may vary. Samples are given. **1.** Trend line goes through points $(91, 52.5)$ and $(92, 54.5)$. Slope is $\frac{54.5-52.5}{92-91} = 2$. Equation is $y - 52.5 = 2(x - 91)$. **2.** Trend line goes through points $(5, 52.5)$ and $(40, 650)$. Slope is $\frac{650-100}{40-5} = 15.71$. Equation is $y - 100 = 15.71(x - 5)$. **3.** Trend line goes through points $(69.9, 16.4)$ and $(73.0, 18.4)$. Slope is $\frac{18.4-16.4}{73.0-69.9} = 0.64$. Equation is $y - 16.4 = 0.64(x - 69.9)$. **4.** Trend line goes through points $(1, 85)$ and $(5, 24)$. Slope is $\frac{24-85}{5-1} = -15.25$. Equation is $y - 85 = -15.25(x - 1)$. **5.** Trend line goes through $(240, 5)$ and $(310, 9)$. Slope $= \frac{9-5}{310-240} = 0.057 \approx 0.06$. The equation is $y - 5 = 0.06(x - 240)$. **6.** The scatter is large; the trend line does not go through any data points. Calculator gives approximately $y \approx 1.6x - 80$. **7.** Let x = latitude, y = temp. Calculator gives $y = -1.06x + 92.31$; $r = -0.9701709306$. **8.** Let the year $x = 80, 85, \ldots, 98$, y = sales. Calculator gives $y = 10.60x - 772.66$; $r = 0.990733298$. **9.** Let the year $x = 80, 84, \ldots, 98$, y = time. Calculator gives $y = -2.29x + 613.93$; $r = -0.8108238756$. **10.** Let x = respiration, y = heart rate. Calculator gives $y = 2.64x + 70.51$; $r = 0.9900170523$. **11.** Let x = air temperature, y = wind-chill temperature. Calculator gives $y = 1.35x - 31.42$; $r = 0.999808967$.

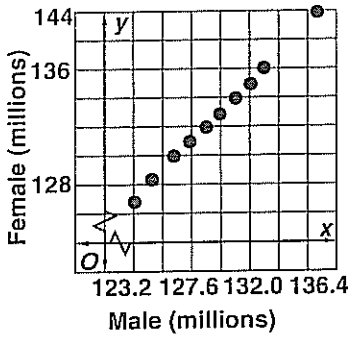
12a.



12b. Trend line goes through points $(8, 25)$ and $(10, 31.5)$. Slope is $\frac{31.5-25}{10-8} = 3.25$. The equation is $y - 25 = 3.25(x - 8)$. **12c.** The approximate slope 3.25 is the ratio of y (circumference) to x (diameter).

12d.
$$45 = 3.29x - 1$$
$$46 = 3.29x$$
$$14 \approx x$$

13a.



13b. Let x = male population, y = female population. Trend line goes through first and last points. Slope is $\frac{143{,}368 - 129{,}197}{138{,}054 - 122{,}956} = 0.9386$. The equation is $y - 129{,}197 = 0.9386(x - 122{,}956)$ or $y = 0.9386x + 13{,}790$.

13c. $x = 138{,}476$;
$y = 0.9386(138{,}476) + 13{,}790$
$= 143{,}800$

The female population would be about 143,800 thousand.

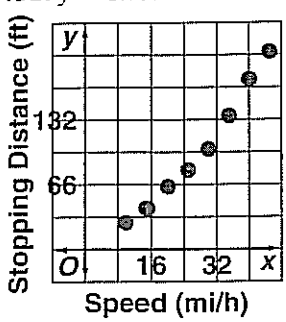
13d. Answers may vary. Sample: No; the year is too far in the future. **14a.** Check students' work.

14b. $r = 1.000$ (perfect correlation) **15.** Answers may vary. Sample: positive slope; as temperature increases, more students are absent. **16a.** Let x = math, y = science. Calculator gives $y = 0.61x + 35.31$, $r = 0.5751586027$. **16b.** No; the population of students is small and the correlation is weak. **17.** Let x = year after 1900; y = sales in \$ billions. Calculator gives $y = 0.37x - 28.66$. In 2010, $x = 110$; $y = 0.37(110) + 28.66 = 12.04$; sales would be \$12.04 billion. **18a.** Let x = weight (lbs); y = pulse (per minute). Calculator gives $y = -16.7x + 297.6$ **18b.** $r \approx -0.67$ **18c.** No; the correlation coefficient is not close to 1.00 or -1.00; there is much scatter of the data about the linear model (it would be wise to make a graph and not just trust your calculator).

19a. (2, 3) and (6, 6); slope $= \frac{6-3}{6-2} = 0.75$;

$y - 3 = 0.75(x - 2)$
$y - 3 = 0.75x - 1.5$
$y = 0.75x + 1.5$

19b. $y = 0.75x + 1.21$. Slope is same but red line is lower.

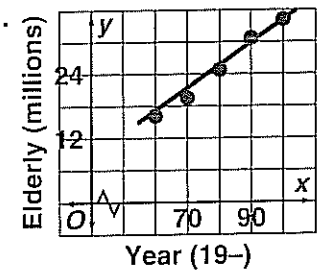


20a. Let x = speed, y = stopping distances. Calculator gives $y = 4.82x - 29.65$. **20b.** At 90 mi/h, $x = 90$, $y = 4.82(90) - 29.65 = 404$; predict a stopping distance of 404 ft. **20b.** $y = 4.95 \cdot 90 - 39.6 = 406$ (406 ft) **20c.** The data show a curving trend; a parabola might fit better than a straight line; the speed of 90 mi/h is far off our chart.

21. Any point with coordinates $(x, -2)$; the answer is B.

22. Slope $= \frac{-4 - 4}{1 - (-3)} = -2$; this matches only H. Check: $2(-3) + 4 = -2$ ✓; $2 \cdot 1 + (-4) = -2$ ✓

23a.



23b. Let x = year after 1900. Two points on the trend line are (62, 18) and (90, 30). Slope $= \frac{30 - 18}{90 - 62} = 0.429$.

$y - 18 = 0.429(x - 62)$
$y - 18 = 0.429x - 26.6$
$y = 0.429x - 8.6$

23c. In 2005, $x = 105$. $y = 0.429 \cdot 105 - 8.6 = 36.4$; predict elderly population in 2005 will be 36.4 million.

24. slope $= m = 5$;

$y - (-3) = 5(x - 2)$
$y + 3 = 5(x - 2)$

25. $y - 5 = -x$ **26.** slope $= -\frac{2}{3}$; $y - 4 = -\frac{2}{3}(x + 1)$

27. $y + 4 = -\frac{1}{2}(x - 3)$ **28.** $y + 1 = -2(x + 2)$

29. $y - 2 = \frac{2}{3}(x + 1)$

30.
$1 + 5x + 1 > x + 9$
$5x > x + 7$
$4x > 7$
$x > 1\frac{3}{4}$

31.
$7x + 3 < 2x + 28$
$5x + 3 < 28$
$5x < 25$
$x < 5$

32.
$4x + 4 > 2 + 2x$
$2x + 4 > 2$
$2x > -2$
$x > -1$

33.
$4x + 3 \leq 2x - 7$
$2x + 3 \leq -7$
$2x \leq -10$
$x \leq -5$

34.
$-x + 5 < 3x - 1$
$5 < 4x - 1$
$6 < 4x$
$\frac{3}{2} < x$

35.
$2x > 7x - 3 - 4x$
$0 > x - 3$
$3 > x$

CHECKPOINT QUIZ 2 *page 324*

1. $y - 4 = -\frac{1}{4}(x - 3)$ **2.** $y + 3 = 18x$

3.
$y - (-5) = 0[x - (-7)]$
$y = -5$

4. slope $= \frac{-4 - (-6)}{-1 - 2} = -\frac{2}{3}$; $y + 6 = -\frac{2}{3}(x - 2)$

5. slope $= -1$; $y - 4 = -(x - 5)$ **6.** slope $= -\frac{3}{2}$; $y - 6 = -\frac{3}{2}(x + 2)$ **7.** slope $= \frac{1}{4}$; $y - 2 = \frac{1}{4}x$

8. slope $= -\frac{3}{2}$; $y - 2 = -\frac{3}{2}(x + 6)$

9. Trend line goes through (2, 12) and (5, 28), so slope is $\frac{28 - 12}{5 - 2} = 5.33$. The equation is $y - 12 = 5.33(x - 2)$.

10. Calculator gives $y = -6.07x + 62.71$.

6-7 Graphing Absolute Value Equations pages 325–329

Check Skills You'll Need For complete solutions see *Daily Skills Check and Lesson Quiz Transparencies* or *Presentation Pro CD-ROM.*

1. 5 2. 5 3. 18 4. 12

5.

x	y
0	6
1	5
2	4
3	3

6.

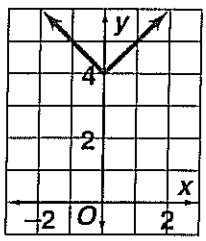
x	y
0	1
1	2
2	3
3	4

7.

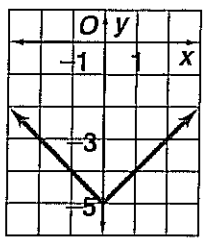
x	y
0	1
1	2
−1	0
−2	1

Check Understanding **1.** Answers may vary. Samples:
1a. same shape; y-intercept = 3 instead of 0
1b. same shape; y-intercept = −3 instead of 0

2a.

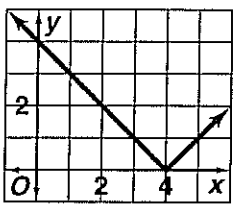


2b.

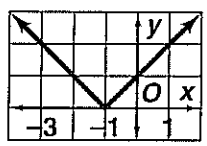


3a. $y = |x| + 2$ **3b.** $y = |x| - 5$

4a.



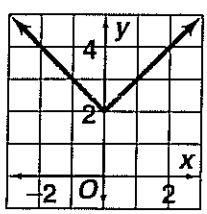
4b.



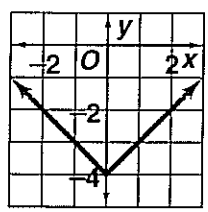
5a. $y = |x - 5|$ **5b.** $y = |x + 7|$

Exercises **1–3.** Answers may vary. Samples: **1.** same shape; shifted 3 units up **2.** same shape; shifted 3 units down **3.** same shape; shifted 7 units down

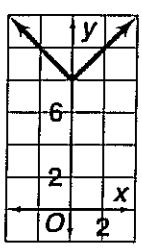
4.



5.



6.



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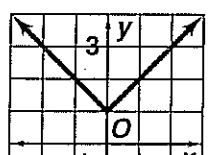

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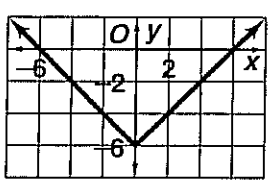
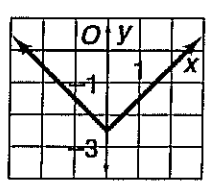
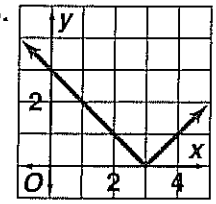


9.



10. $y = |x| + 9$ **11.** $y = |x| - 6$ **12.** $y = |x| + 0.25$
13. $y = |x| + \frac{5}{2}$ **14.** $y = |x| + 5.90$ **15.** $y = |x| - 1$

16.



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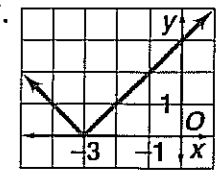

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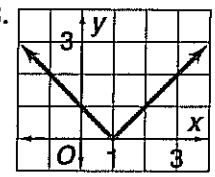

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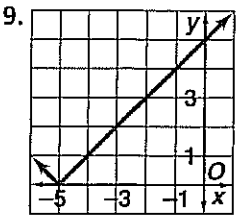

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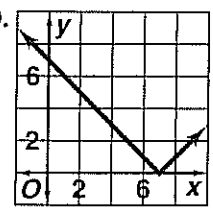

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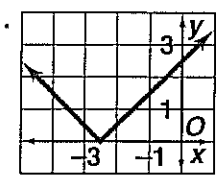
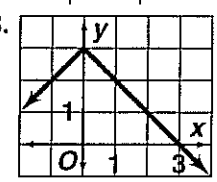


22. $y = |x + 9|$ **23.** $y = |x - 9|$ **24.** $y = \left|x - \frac{5}{2}\right|$
25. $y = \left|x + \frac{3}{2}\right|$ **26.** $y = |x + 0.5|$ **27.** $y = |x - 8.2|$

28.



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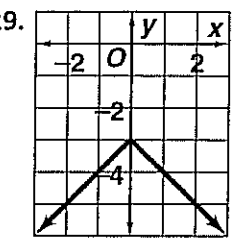
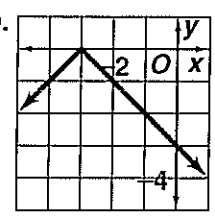
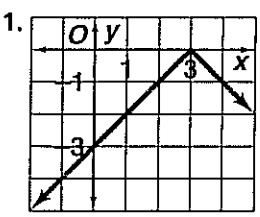


30.

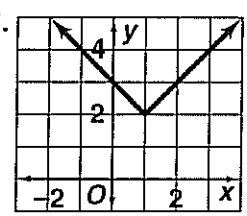


31.

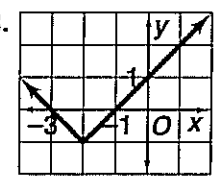


32. $y = -|x| + 2$ **33.** $y = -|x + 2.25|$ **34.** $y = -x - \frac{3}{2}$
35. $y = -|x - 4|$ **36.** Shifted right 2 and up 1; the answer is B.

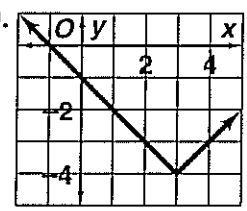
37.



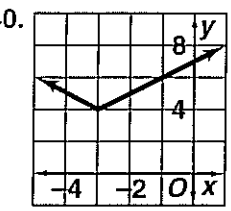
38.

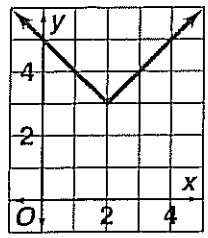


39.



40.

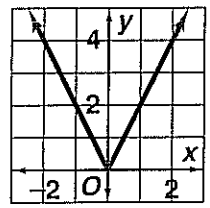


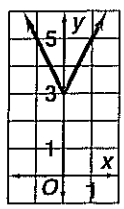
41a. 

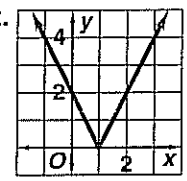
41b. right 2 and up 3: (2, 3)
41c. Answers may vary. Sample: The x-coordinate is the horizontal translation; the y-coordinate is the vertical translation. **41d.** Use (a, b) for the vertex. Graph $y = x$ and $y = -x$ above the vertex.

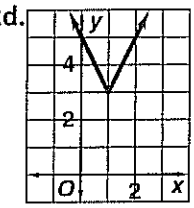
42a.

x	$y = \lvert 2x \rvert$
−2	4
−1	2
0	0
1	2
2	4

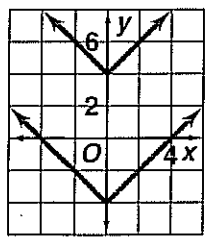


42b. 

42c. 

42d. 

43a. $y = |x|$; $y = 1$ **43b.** What are the limits on the values of x? -1 and 1. **43c.** red: $y = -\frac{1}{2}x$; blue: $y = -\frac{1}{2}x + 2$ **44.** B **45.** H **46.** Draw graphs; find intersection at $(-1, 4)$. Check: $|-1 - 3| = 4$ ✓; $|-1 + 5| = 4$ ✓; the answer is A.
47. For $y = |x - 3| + 5$, when $x = 3$, $y = |3 - 3| + 5 = |0| + 5 = 5$; the answer is G.

48a, b. 

48c. Part (a) graph is shifted 8 units up to get part (b) graph.

49–50. Tables show constant differences; data form exact linear pattern with perfect correlation $r = 1.000$. Let x = year after 1900 and y = sales in \$1000.

49. Slope $= \frac{57 - 27}{94 - 88} = 5$; equation is
$y - 27 = 5(x - 88)$
or better $y = 5(x - 88) + 27$
or $y = 5x - 413$

50. Slope $= \frac{71 - 47}{96 - 90} = 4$; equation is
$y - 47 = 4(x - 90)$
or $y = 4(x - 90) + 47$
or $y = 4x - 313$

51. $\begin{bmatrix} 5 & 3 \\ 1 & 2 \end{bmatrix} + \begin{bmatrix} 7 & 2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 5 + 7 & 3 + 2 \\ 1 + 1 & 2 + 4 \end{bmatrix} = \begin{bmatrix} 12 & 5 \\ 2 & 6 \end{bmatrix}$

52. $\begin{bmatrix} -3 & 2 \\ -7 & 4 \end{bmatrix} + \begin{bmatrix} 7 & -1 \\ 8 & 0 \end{bmatrix} = \begin{bmatrix} -3 + 7 & 2 + (-1) \\ -7 + 8 & 4 + 0 \end{bmatrix} = \begin{bmatrix} 4 & 1 \\ 1 & 4 \end{bmatrix}$

53. $\begin{bmatrix} -5.6 & 9.8 \\ -4.2 & 3.2 \end{bmatrix} + \begin{bmatrix} 8.1 & 4.2 \\ 2.2 & 7.5 \end{bmatrix} =$
$\begin{bmatrix} -5.6 + 8.1 & 9.8 + 4.2 \\ -4.2 + 2.2 & 3.2 + 7.5 \end{bmatrix} = \begin{bmatrix} 2.5 & 14.0 \\ -2 & 10.7 \end{bmatrix}$

TEST-TAKING STRATEGIES *page 330*

1. Slopes: $\overline{LM}$: $\frac{0 - 0}{10 - 4} = 0$; $\overline{MN}$: $\frac{5 - 0}{7 - 10} = -\frac{5}{3}$; $\overline{NL}$: $\frac{0 - 5}{4 - 7} = \frac{5}{3}$; sum of slopes $= -\frac{5}{3} + \frac{5}{3} = 0$

2. Let x = distance $\overline{AB}$. Draw diagram on a straight line. $\overline{BC} = 6 + 2x$. $\overline{AC} = 2 + 4x$

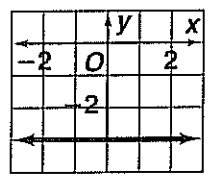
$$\overline{AB} + \overline{BC} = \overline{AC}$$
$$x + 6 + 2x = 2 + 4x$$
$$6 = 2 + x$$
$$4 = x$$

$\overline{AB} = 4$ miles

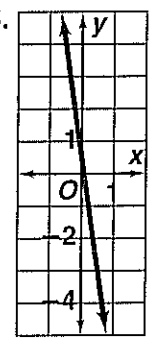
3. Assume that the sides of the rectangle are aligned with the x- and y-axes. Draw diagram. It's easy to see that $\overline{QR}$ and $\overline{PS}$ are parallel with the x axis, and $\overline{QP}$ and $\overline{RS}$ are parallel with the y-axis. Perimeter = 12 units.

CHAPTER REVIEW *pages 331–333*

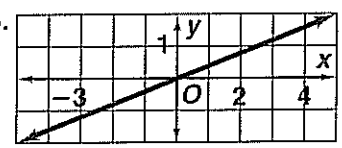
1. perpendicular **2.** parallel **3.** translation **4.** slope
5. y-intercept **6.** 3 lb 5 oz = 53 oz; rate $= \frac{53 - 5}{6 - 0} = 8$; rate = 8 oz/mo **7.** rate $= \frac{14 - 0.5}{5 - 1} = 3.375$; rate = 3.375 in./wk **8.** Rate $= \frac{35 - 5}{6 - 0} = 5$; speed is 5 mi/h.
9. $\frac{1.25 - 8.75}{6 - 0} = -1.25$; gasoline decreases 1.25 gal/h.
10. Rate of change = zero; height is constant at 150 ft and does not change. **11.** slope $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{-4 - (-2)}{-5 - 3} = \frac{1}{4}$ **12.** Slope $= \frac{2.6 - (-1)}{4.5 - 4.5} = \frac{3.6}{0}$, which is undefined (infinite). **13.** slope $= \frac{-2 - 5}{-5 - 2} = 1$

14. 

$y = mx + b = 0x + (-3) = -3$

15. 

$y = -7x + \frac{1}{2}$

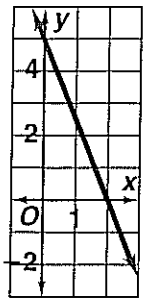
16. 

$y = \frac{2}{5}x$

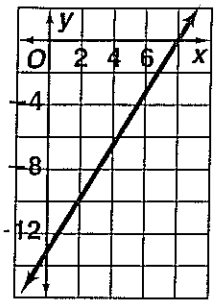
17. slope $= \frac{-2 - 1}{3 - (-3)} = -\frac{1}{2}$; $y = -\frac{1}{2}x - \frac{1}{2}$

18. slope $= \frac{-2 - (-4)}{4 - (-4)} = \frac{1}{4}$; $y = \frac{1}{4}x - 3$

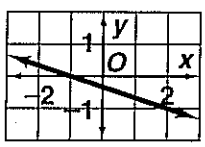
x-intercepts: $y = 0$	y-intercepts: $x = 0$
19. $5x = 10, x = 2$	$2y = 10, y = 5$



20. $6.5x = 52; x = 8$	$-4y = 52, y = -13$



21. $x = -1$	$3y = -1, y = -\frac{1}{3}$



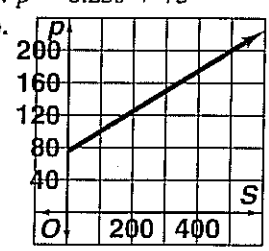
22. $y - (-2) = 2(x - 1)$
$y + 2 = 2(x - 1)$

23. $y + 2 = \frac{3}{4}(x - 1)$ **24.** $y + 2 = -3(x - 1)$

25. $y + 2 = 0$ **26.** slope $= \frac{3 - 1}{4 - (-2)} = \frac{1}{3}$; $y - 3 = \frac{1}{3}(x - 4)$ or $y - 1 = \frac{1}{3}(x + 2)$ **27.** slope $= \frac{-4 - 2}{5 - 0} = -\frac{6}{5}$; $y + 4 = -\frac{6}{5}(x - 5)$ or $y - 2 = -\frac{6}{5}x$ **28.** slope $= \frac{-1 - 0}{-3 - (-1)} = \frac{1}{2}$; $y = \frac{1}{2}(x + 1)$ or $y + 1 = \frac{1}{2}(x + 3)$

29a. $p = 0.25s + 75$

29b.



29c. $p = 0.25(800) + 75 = 275$; pay is \$275.
29d. p-intercept = (value of p when $s = 0$) = 75; this is the weekly pay when no sales are made.

30. $m = 5$; $y + 1 = 5(x - 2)$
or $y = 5x - 11$

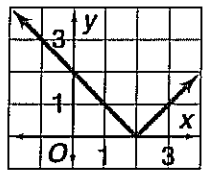
31. $m = \frac{1}{3}$; $y - 5 = \frac{1}{3}(x - 3)$
or $y = \frac{1}{3}x + 4$

32. $m = 9$; $y + 5 = 9x$
or $y = 9x - 5$

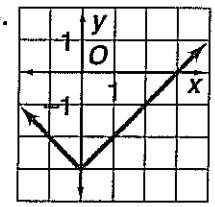
33. $m = -\frac{1}{8}$ $y - 10 = -\frac{1}{8}(x - 4)$
or $y = -\frac{1}{8}x + 10\frac{1}{2}$

34a. Let x = years after 1900 and y = weight in pounds. Calculator gives $y = 1.28x - 60.2$. **34b.** When $x = 110$, $y = 1.28(110) - 60.2 = 80.6$; predict poultry consumption = 80.6 lb/person.

35.



36.

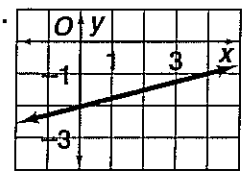


37. B **38.** None of the figures; D is a graph of $y = |x + 2|$. **39.** C **40.** None of the figures; A is a graph of $y = -2.5|x|$.

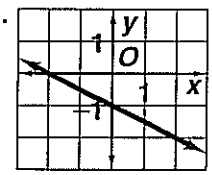
CHAPTER TEST page 334

1. False; a rate of change could also be negative or 0.
2. False; a vertical line has an undefined (infinite) rate of change. **3.** slope $= \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 3}{3 - 4} = -5$ **4.** slope $= \frac{-1 - 1}{6 - (-2)} = -\frac{1}{4}$

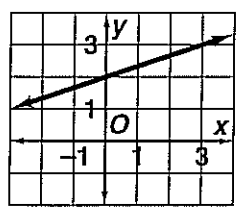
5.



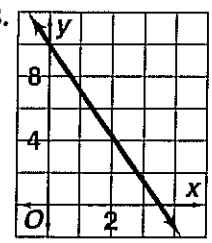
6.



7.



8.



9. $-7y = 8x - 3$
$y = -\frac{8}{7}x + \frac{3}{7}$

10. $x - 3y = -18$
$-3y = -x - 18$
$y = \frac{1}{3}x + 6$

11. $5x + 4y = 100$
$4y = -5x + 100$
$y = -\frac{5}{4}x + 25$

12. $9x = 2y + 13$
$-2y + 9x = 13$
$-2y = -9x + 13$
$y = \frac{9}{2}x - \frac{13}{2}$

x-intercepts: $y = 0$	y-intercepts: $x = 0$
13. $3x = -24; x = -8$	$4y = -24; y = -6$
14. $-6x = -8; x = \frac{4}{3}$	$2y = -8; y = -4$
15. $-5x = 60; x = -12$	$10y = 60; y = 6$
16. $x = 1$	$y = 1$

17. $y - y_1 = m(x - x_1)$
$y - (-7) = \frac{8}{3}[x - (-2)]$
$y + 7 = \frac{8}{3}(x + 2)$

18. $y + 8 = 3(x - 4)$ **19.** $y - 3 = -\frac{1}{2}x$ **20.** $y = -5(x - 9)$ **21.** slope $= \frac{-6 - 9}{-2 - 4} = \frac{5}{2}$; $y - 9 = \frac{5}{2}(x - 4)$ or $y + 6 = \frac{5}{2}(x + 2)$ **22.** slope $= \frac{10 - 0}{3 - (-1)} = \frac{5}{2}$; $y = \frac{5}{2}(x + 1)$ or $y - 10 = \frac{5}{2}(x - 3)$ **23.** slope $= \frac{-8 - (-8)}{-9 - 5} = 0$; $y + 8 = 0$ **24.** slope $= \frac{5 - 7}{1 - 0} = -2$; $y - 7 = -2x$ or $y - 5 = -2(x - 1)$ **25.** Slope of perpendicular line $= -\frac{1}{-2.5} = 0.4 = \frac{2}{5}$; A, B, C have this slope. D has slope $\frac{5}{2}$; the answer is D.

26. $y - (-1) = 5(x - 2)$
$y = 5x - 11$

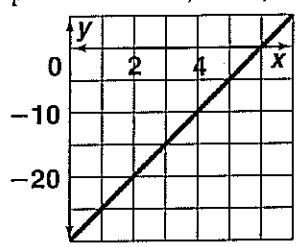
27. slope $= 0$; $y = 6$

28. $m = \frac{1}{2}$; $y - 0 = \frac{1}{2}(x - 4)$
$y = \frac{1}{2}x - 2$

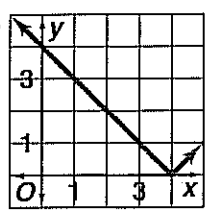
29. Graph of $x = -7$ is parallel to y-axis; perpendicular line is parallel to x-axis; $y =$ constant; $y = 2$. **30.** any equation of form $y = 0.5x + b$, where $b \neq 10$ **31a.** $y = 5x - 30$ **31b.** x-intercept: $5x - 30 = 0$; $x = 6$; y-intercept $= -30$

32. $y = |x| - 2$

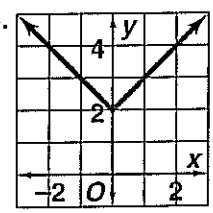
33. $y = |x - \frac{3}{4}|$



34.



35.



36–37. Let x = years after 1900. **36a.** Calculator gives $y = 0.0436x + 15.34$. **36b.** for $x = 110$, $y = 0.0436(110) + 15.34 \approx 20.1$; 20,100 municipalities **37a.** Calculator gives $y = -0.197x + 31.95$. **37b.** for $x = 110$, $y = -0.197(110) + 31.95 \approx 10.30$; 10,300 school districts

STANDARDIZED TEST PREP *page 335*

1. $\frac{74.25}{9} = \frac{x}{15}$
$x = 15\left(\frac{74.25}{9}\right) = 123.75$

The answer is B.

2. $5x - 4 < 12$
$5x < 16$
$x < 3\frac{1}{5}$

The answer is I.

3. Perp. line is $y - 6 = -\frac{1}{3}x$. **A.** $3 - 6 \stackrel{?}{=} -\frac{1}{3}(9)$? yes; **B.** $3 - 6 \stackrel{?}{=} -\frac{1}{3}(-9)$? no; **C.** $-3 - 6 \stackrel{?}{=} -\frac{1}{3}(9)$? no; **D.** $-3 - 3 \stackrel{?}{=} -\frac{1}{3}(-9)$? No; the answer is A.

4. $b = a + 1$; $c = a + 2$;

I. $a + a + 2 \stackrel{?}{<} 2(a + 1)$?
$2 \stackrel{?}{<} 2$? no

II. $a + a + 1 \stackrel{?}{<} a + 2$?
$a \stackrel{?}{<} 1$? no $(a = 1, 2, 3, \ldots)$

III. $a + a + 2 \stackrel{?}{>} 2(a + 1)$?
$2 \stackrel{?}{>} 2$? no

IV. $a + 1 + a + 2 \stackrel{?}{>} a$?
$a \stackrel{?}{>} -3$? yes

The answer is G.

5. A and B have negative slopes; C has infinite (undefined) slope; the answer is D (positive slope).

6. $6(4x - 3) = -54$
$24x - 18 = -54$
$24x = -36$
$x = \frac{-36}{24} = -1.5$

The answer is G.

7. $f(-2) = -3(-2) + 4 = 10$; the answer is D.

8. $\left(\frac{800 \text{ ft}}{1 \text{ min}}\right)\left(\frac{1 \text{ mile}}{5280 \text{ ft}}\right)\left(\frac{60 \text{ min}}{1 \text{ h}}\right) = 9.09$ mi/h; the answer is H.

9. A **10.** A: $x = 0, 6y = 2, y = 3$; B: $x = 0, 9y = 2, y = \frac{2}{9}$; the answer is A. **11. A.** slope $= \frac{1 - (-5)}{-3 - 2} = -\frac{6}{5}$

B. slope $= \frac{12}{15} = \frac{4}{5}$; the answer is B.

12. $2(19.95) + 250(.15) = 77.4$; cost is \$77.40. **13.** Let x = number of tulip bulbs.
$\frac{x}{175} = \frac{2}{5}$
$x = 175\left(\frac{2}{5}\right) = 70$

The answer is $70 + 175 = 245$ bulbs.

14. $\frac{x}{9} = \frac{260}{5}$
$x = 9\left(\frac{260}{5}\right) = 468$; 468 mi

15. slope $= \frac{4 - (-1)}{3 - 2} = 5$;
$y - (-1) = 5(x - 2)$
$y + 1 = 5x - 10$
$y = 5x - 11$
or $y - 4 = 5(x - 3)$
$y - 4 = 5x - 15$
$y = 5x - 11$

16. slope $= -\frac{5}{2}$;
$y - (-3) = -\frac{5}{2}(x - 2)$
$y + 3 = -\frac{5}{2}x + 5$
$y = -\frac{5}{2}x + 2$

17. $-3 \leq 2x + 1$ and $2x + 1 < 7$
$-4 \leq 2x$ | $2x < 6$
$-2 \leq x$ and $x < 3$
$-2 \leq x < 3$