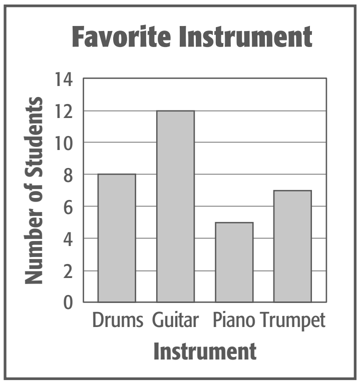
Selected Answers and Solutions

CHAPTER 0

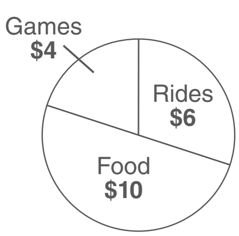
Preparing for Integrated Math I

Pretest

1. exact; \$2.68 **3.** 13 **5.** -31 **7.** 13.29 **9.** -88
11. -7 **13.** $<$ **15.** $-0.2, -\frac{1}{7}, \frac{1}{3}, 0.5$ **17.** $\frac{1}{6}$ **19.** $-\frac{4}{5}$
21. 5 **23.** $-\frac{7}{3}$ **25.** $\frac{3}{100}$ **27.** $\frac{1}{12}$ **29.** $\frac{1}{3}$ **31.** $\frac{3}{40}$
33. 17.5% **35.** 87.5% **37.** 36 in.; 81 in^2 **39.** 36 in.
41. 12.6 m; 12.6 m^2 **43.** 15 in. **45.** 60 ft^3 ; 104 ft^2
47. $\frac{4}{15}$ **49.** 12 **51.** 7:3 **53.** 18.6; 18; no mode
55. 19; 24; 19; 31
57.



59. **Money Spent at the Fair**



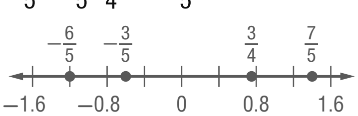
Sample answer: a circle graph would show how each category compares to the total amount spent.

Lesson 0-1

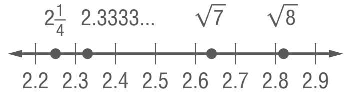
1. estimate; about 700 mi **3.** estimate; about 7 times
5. exact; \$98.75

Lesson 0-2

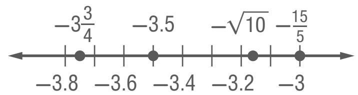
1. integers, rationals **3.** irrationals **5.** irrationals
7. rationals **9.** rationals **11.** irrationals
13. $-\frac{6}{5}, -\frac{3}{5}, \frac{3}{4}$, and $\frac{7}{5}$



15. $2\frac{1}{4}, 2.\overline{3}, \sqrt{7}$, and $\sqrt{8}$



17. $-3\frac{3}{4}, -3.5, -\sqrt{10}$, and $-\frac{15}{5}$



19. $\frac{5}{9}$ **21.** $\frac{13}{99}$ **23.** -5 **25.** ± 6 **27.** ± 1.2 **29.** $\frac{4}{7}$
31. $\frac{5}{18}$ **33.** 16 **35.** 26

Lesson 0-3

1. 5 **3.** -27 **5.** -22 **7.** -32 **9.** 22 **11.** 5 **13.** 8
15. -9 **17.** -115 **19.** 17° **21.** \$150 **23.** \$125

Lesson 0-4

1. $<$ **3.** $<$ **5.** $=$ **7.** $3.06, 3\frac{1}{6}, 3\frac{3}{4}, 3.8$
9. $-0.5, -\frac{1}{9}, \frac{1}{10}, 0.11$ **11.** $\frac{3}{5}$ **13.** $\frac{1}{16}$ **15.** 1 **17.** $2\frac{2}{3}$
19. $\frac{1}{9}$ **21.** $\frac{1}{6}$ **23.** $\frac{17}{30}$ **25.** $\frac{1}{4}$ **27.** -36.9 **29.** -19.33
31. 153.8 **33.** 93.3 **35.** $-\frac{5}{6}$ **37.** $\frac{9}{20}$ **39.** $\frac{2}{3}$ **41.** $\frac{3}{10}$

Lesson 0-5

1. 0.85 **3.** -7.05 **5.** 60 **7.** -4.8 **9.** -1.52 **11.** $\frac{6}{35}$
13. $\frac{2}{33}$ **15.** $\frac{21}{4}$ or $5\frac{1}{4}$ **17.** $-\frac{1}{2}$ **19.** $-\frac{1}{8}$ **21.** $\frac{10}{11}$
23. $\frac{5}{2}$ or $2\frac{1}{2}$ **25.** $\frac{7}{6}$ or $1\frac{1}{6}$ **27.** $-\frac{23}{14}$ or $-1\frac{9}{14}$ **29.** $-\frac{3}{16}$
31. 2 **33.** 3 **35.** $-\frac{3}{10}$ **37.** $\frac{9}{2}$ or $4\frac{1}{2}$ **39.** $\frac{11}{20}$ **41.** $\frac{5}{18}$
43. 3 slices **45.** 34 uniforms **47.** 6 ribbons

Lesson 0-6

1. $\frac{1}{20}$ **3.** $\frac{11}{100}$ **5.** $\frac{39}{50}$ **7.** $\frac{3}{500}$ **9.** 14 **11.** 40%
13. 160 **15.** 9.5 **17.** 48 **19.** 0.25% **21.** 24.5
23. 150% **25.** 90% **27.** 5% **29a.** 20 g
29b. 2350 mg **29c.** 44% **31.** 6 animals

Lesson 0-7

1. 20 m **3.** 90 in. **5.** 32 in. **7.** 29 ft **9.** 25.0 in.
11. 31.4 in. **13.** 23.2 m **15.** 848.2 in. **17.** 13.4 cm
19. 10.3 ft

Lesson 0-8

1. 6 cm^2 **3.** 120 m^2 **5.** 81 ft^2 **7.** 9 ft^2 **9.** 14.1 in^2
11. 12.6 ft^2 **13.** 50.3 cm^2 **15.** 201.1 in^2 **17.** 7 ft
19. Sample answer: 20.5 units^2 **21.** 22.1 cm^2
23. 4.0 cm^2

Lesson 0-9

1. 30 cm^3 **3.** 48 yd^3 **5.** 1404 ft^3 **7.** 20 m^3 **9.** 27 m^3
11. 2070 in^3 **13.** 1 ft **15.** 4 cm **17.** 2770.9 in^3
19a. 128 ft^3 **19b.** 80 ft^3 **19c.** 5 ft 4 in.

Lesson 0-10

1. 68 in^2 **3.** 220 mm^2 **5.** 37 ft^2 **7.** 48 m^2 **9.** 216 in^2
11. 480.7 in^2 **13.** 24 m^2 **15.** 77 ft^2 **17.** 40.8 in^2

Lesson 0-11

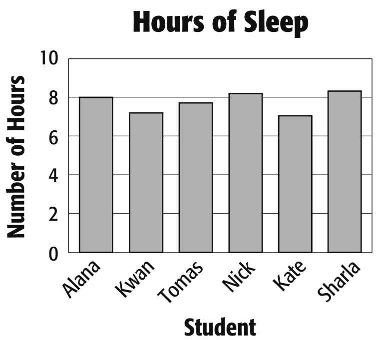
1. $\frac{4}{15}$ **3.** $\frac{1}{2}$ **5.** $\frac{5}{6}$ **7.** $\frac{1}{2}$ **9.** $\frac{2}{3}$ **11.** 20 **13.** 12 codes
15. $\frac{11}{24}$ **17.** 1:5 **19.** 13:11 **21.** 16 orders

Lesson 0-12

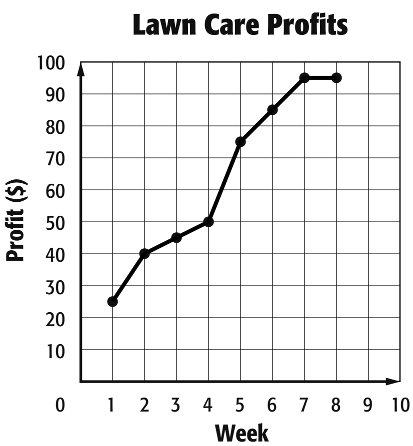
1. 5 students; 4 students; 3 students; 10 students
3. 54.75 mph; 54 mph; 53 mph; 8 mph **5.** $\approx$2.8; 2.75; 2; 4
7. 128 **9.** \$309; \$311; \$312; \$314; \$399
11. 2 books; 5 books; 10 books; 17 books; 18 books
13. 16 years old; 19 years old; 21 years old; 24 years old; 45 years old **15.** $\approx$138.3 mi, 101.5 mi; no outliers
17. $\approx$0.286, 0.296; 0.201; $\approx$0.295, 0.300; mean

Lesson 0-13

1.



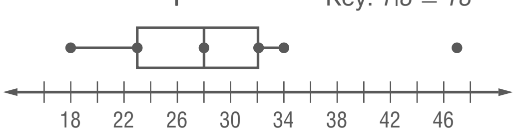
3.



5.

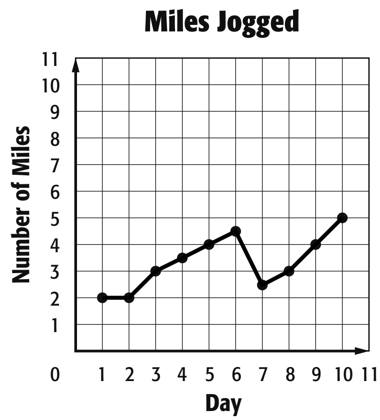
Stem	Leaf
1	8 8
2	1 3 6 6 6 8
3	0 1 1 2 3 4
4	7

Key: *1|8 = 18*

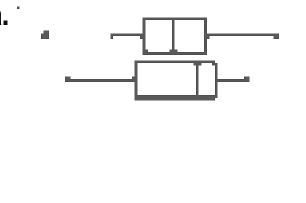


Removing 47 leaves Q_1 the same, changes Q_2 to 27 and Q_3 to 31.

7.



9a.



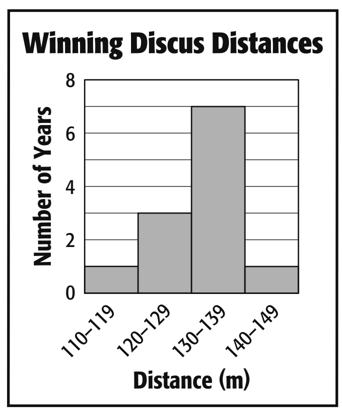
[63.8, 102.2] scl: 1

9b. Most of the data for third period are spread fairly evenly from about 80 to 89, with the lowest score being 67 and the highest score being 99. Most of the data for sixth period are between 79 and 91, with the lowest score for the class being 70 and the highest score being 94.
9c. The sixth period class has a smaller range, a higher median, and a larger interquartile range than the third period class.
11. Sample answer: a line graph would show how the cost of a seat changes during those years.

13a.

Stem	Leaf
11	9
12	4 6 9
13	0 0 3 5 6 7 8
14	0
	Key: *11 | 9 = 119*

13b.



13c. Sample answer: The histogram shows frequencies, while the stem and leaf shows all data points.

13d. Sample answer: The winning distance increased by 16 meters from 2000 to 2010. If this continues, in 2030 the winning distance will be 32 meters more than in 2010, or 172 meters. It is unreasonable to expect that every year girls will be able to throw farther and farther, at some time the distance will level off.

Posttest

1. estimate; about 10 mi **3.** -35 **5.** -61 **7.** -3.4

9. 105 **11.** -15 **13.** $>$ **15.** 2.6, $2\frac{5}{8}$, $4\frac{4}{5}$, 4.85

17. $\frac{3}{4}$ **19.** $\frac{2}{3}$ **21.** 9.1 **23.** 9.52 **25.** $\frac{5}{7}$ **27.** -2

29. $\frac{3}{16}$ **31.** 4 **33.** $\frac{4}{27}$ **35.** $-\frac{5}{12}$ **37.** $\frac{3}{50}$ **39.** 62

41. 7.6 **43.** \$24.38 **45.** 18 in.; 13.5 in^2 **47.** 13.5 m

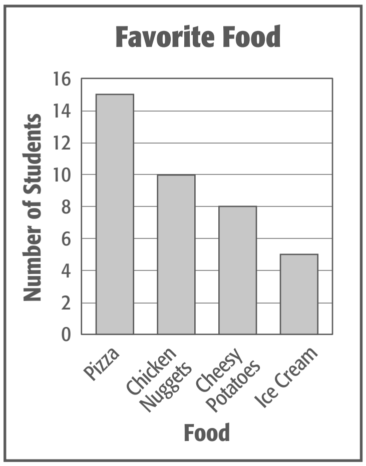
49. 22.0 cm; 38.5 cm^2 **51.** 9 m^3; 27 m^2

53. 7.8 m^3; 30.2 m^2 **55.** $\frac{7}{15}$ **57.** $\frac{3}{5}$ **59.** 3:47

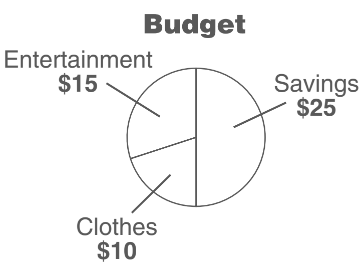
61. 6:19 **63.** 720 ways **65.** 93.4; 92; 88

67. 9; 75.5; 71; 77

69.



71.



Sample answer: a circle graph would show how each category compares to the total allowance.

CHAPTER 1

Expressions, Equations, and Functions

Chapter 1 Get Ready

1. $\frac{2}{3}$ **3.** 3 **5.** simplest form **7.** 19 **9.** $\frac{8}{11}$

11. 8.2 cm **13.** 20 m **15.** 34.02 **17.** 1.9 **19.** 0.56

Lesson 1-1

1. Sample answer: the product of 2 and *m*

3. Sample answer: *a* squared minus 18 times *b*

5. $6 - t$ **7.** $1 - \frac{r}{7}$ **9.** $n^3 + 5$

11. Sample answer: four times a number *q*

13. Sample answer: 15 plus *r*

15. Sample answer: 3 times *x* squared

17. Sample answer: 6 more than the product 2 times *a*

19. $7 + x$ **21.** $5n$ **23.** $\frac{f}{10}$ **25.** $3n + 16$ **27.** $k^2 - 11$

29. $\pi r^2 h$ **31.** Sample answer: twenty-five plus six times a number squared **33.** Sample answer: three times a number raised to the fifth power divided by two

35a. $\frac{3}{4}d$ **35b.** 21

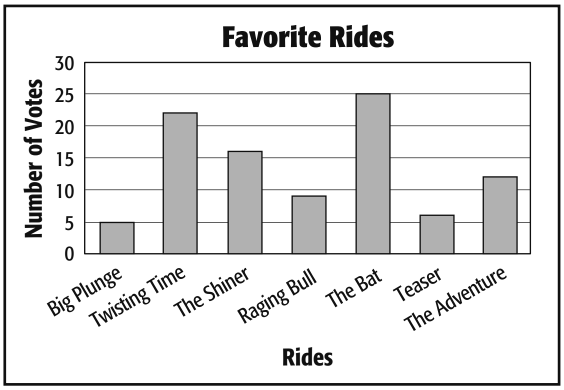
37a.

10^2	$\times$	10^1	$=$	$10 \times 10 \times 10$	$=$	10^3
10^2	$\times$	10^2	$=$	$10 \times 10 \times 10 \times 10$	$=$	10^4
10^2	$\times$	10^3	$=$	$10 \times 10 \times 10 \times 10 \times 10$	$=$	10^5
10^2	$\times$	10^4	$=$	$10 \times 10 \times 10 \times 10 \times 10 \times 10$	$=$	10^6

37b. $10^2 \times 10^x = 10^{(2 + x)}$

37c. The exponent of the product of two powers is the sum of the exponents of the powers with the same base. **39.** Sample answer: *x* is the number of minutes it takes to walk between my house and school. $2x + 15$ represents the amount of time in minutes I spend walking each day since I walk to and from school and I take my dog on a 15 minute walk. **41.** 6 **43.** D **45.** $\frac{3l}{36}$

47.



49. 5.6; 6.5; 7 **51.** 15.25; 15.5; 24

53. $\frac{21}{55}$ **55.** $\frac{20}{9}$ **57.** 1.46 **59.** 24.61 **61.** 21.16

Lesson 1-2

1. 81 **3.** 243 **5.** 22 **7.** 28 **9.** 12 **11.** 20

13. $20 + 3 \times 4.95$; \$34.85 **15.** 49 **17.** 64

19. 14 **21.** 36 **23.** 14 **25.** 142 **27.** 36 **29.** 3

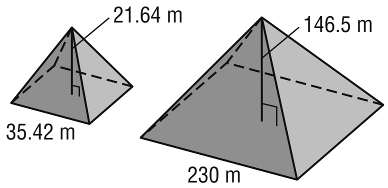
31. 1 **33.** 7 **35.** 149 **37.** $3344 - 148 = 3196$

39. 16 **41.** 729 **43.** 177 **45.** 324 **47.** 29

49. 4080 **51.** $\frac{97}{31}$ **53.** 0

55. $28(7) + 12(9.75) + 30(7) + 15(9.75)$; \$669.25

57a.



57b. Words: one third times 230 squared times 146.5 minus one third times 35.42 squared times 21.64

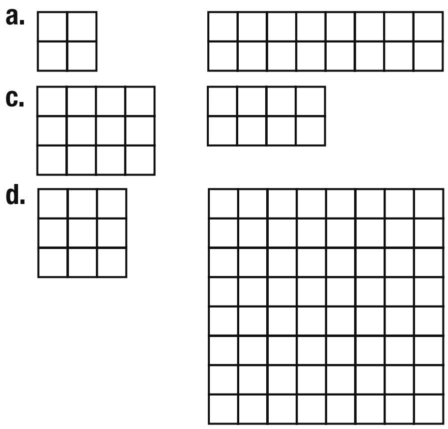
57c. $\frac{1}{3}(230)^2(146.5) - \frac{1}{3}(35.42)^2(21.64)$; 2,574,233.656 m^3

59. Curtis; Tara subtracted 10 − 9 before multiplying 4 by 10. **61.** Sample answer: $5 + 4 - 3 - 2 - 1$

63. Sample answer: Area of a trapezoid: $\frac{1}{2}h(b_1 + b_2)$; according to the order of operations you have to add the lengths of the bases together first and then multiply by the height and by $\frac{1}{2}$.

65. A **67A.** B

67B. Sample answers given.



69. 14 minus 9 times *c* **71.** the difference of 4 and *v* divided by *w* **73.** 9π units^2 **75.** $12b$ units^2 **77.** 2.57 **79.** 13.192 **81.** $\frac{2}{3}$

Lesson 1-3

1. $(1 \div 5)5 \cdot 14$
$= \frac{1}{5} \cdot 5 \cdot 14$ Substitution
$= (1) \cdot 14$ Multiplicative Inverse
$= 14$ Multiplicative Identity

3. $5(14 - 5) + 6(3 + 7)$
$= 5(9) + 6(10)$ Substitution
$= 45 + 60$ Substitution
$= 105$ Substitution

5. $23 + 42 + 37$
$= 23 + 37 + 42$ Commutative (+)
$= (23 + 37) + 42$ Associative (+)
$= 60 + 42$ Substitution
$= 102$ Substitution

7. $3 \cdot 7 \cdot 10 \cdot 2$
$= 3 \cdot 2 \cdot 7 \cdot 10$ Commutative (×)
$= (3 \cdot 2) \cdot (7 \cdot 10)$ Associative (×)
$= 6 \cdot 70$ Substitution
$= 420$ Substitution

9. $3(22 - 3 \cdot 7)$
$= 3(22 - 21)$ Substitution
$= 3(1)$ Substitution
$= 3$ Multiplicative Identity

11. $\frac{3}{4}[4 \div (7 - 4)]$
$= \frac{3}{4}[4 \div 3]$ Substitution
$= \frac{3}{4} \cdot \frac{4}{3}$ Substitution
$= 1$ Multiplicative Inverse

13. $2(3 \cdot 2 - 5) + 3 \cdot \frac{1}{3}$
$= 2(6 - 5) + 3 \cdot \frac{1}{3}$ Substitution
$= 2(1) + 3 \cdot \frac{1}{3}$ Substitution
$= 2 + 3 \cdot \frac{1}{3}$ Multiplicative Identity
$= 2 + 1$ Multiplicative Inverse
$= 3$ Substitution

15. $2 \cdot \frac{22}{7} \cdot 14^2 + 2 \cdot \frac{22}{7} \cdot 14 \cdot 7$
$= 2 \cdot \frac{22}{7} \cdot 196 + 2 \cdot \frac{22}{7} \cdot 14 \cdot 7$ Substitution
$= \frac{44}{7} \cdot 196 + \frac{44}{7} \cdot 14 \cdot 7$ Substitution
$= 1232 + 616$ Substitution
$= 1848$ Substitution
The surface area is 1848 in^2.

17. $25 + 14 + 15 + 36 =$
$25 + 15 + 14 + 36$ Commutative (+)
$= (25 + 15) + (14 + 36)$ Associative (+)
$= 40 + 50$ Substitution
$= 90$ Substitution

19. $3\frac{2}{3} + 4 + 5\frac{1}{3} = 3\frac{2}{3} + 5\frac{1}{3} + 4$ Commutative (+)
$= \left(3\frac{2}{3} + 5\frac{1}{3}\right) + 4$ Associative (+)
$= 9 + 4$ Substitution
$= 13$ Substitution

21. $4.3 + 2.4 + 3.6 + 9.7$
$= 4.3 + 9.7 + 2.4 + 3.6$ Commutative (+)
$= (4.3 + 9.7) + (2.4 + 3.6)$ Associative (+)
$= 14 + 6$ Substitution
$= 20$ Substitution

23. $12 \cdot 2 \cdot 6 \cdot 5 = 12 \cdot 6 \cdot 2 \cdot 5$ Commutative (×)
$= (12 \cdot 6) \cdot (2 \cdot 5)$ Associative (×)
$= 72 \cdot 10$ Substitution
$= 720$ Substitution

25. $0.2 \cdot 4.6 \cdot 5 = (0.2 \cdot 4.6) \cdot 5$ Associative (×)
$= 0.92 \cdot 5$ Substitution
$= 4.6$ Substitution

27. $1\frac{5}{6} \cdot 24 \cdot 3\frac{1}{11}$

$= 1\frac{5}{6}\left(24 \cdot 3\frac{1}{11}\right)$ Associative (×)

$= 1\frac{5}{6}\left(24 \cdot \frac{34}{11}\right)$ Substitution

$= 1\frac{5}{6} \cdot \frac{816}{11}$ Substitution

$= \frac{8976}{66}$ Substitution

$= 136$ Substitution

29a. Sample answer: 2(10.95) + 3(7.5) + 2(5) + 5(18.99); 2(10.95 + 5) + 3(7.5) + 5(18.99)

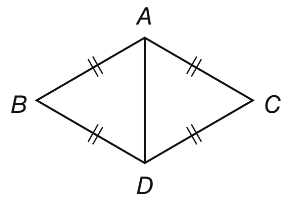
29b. $149.35

31. 20 **33.** −18 **35.** 192 **37.** Additive Identity; 35 + 0 = 35 **39.** 0; Additive Identity **41.** 7; Reflexive Property
43. 3; Multiplicative Identity
45. 2; Commutative Property

47. 3; Multiplicative Inverse

49. $108 **51.** 88 units

53a.



53b. $\overline{AD} \cong \overline{AD}$ by the Reflexive Property. The Transitive Property shows that if $\overline{AB} \cong \overline{AC}$ and $\overline{AC} \cong \overline{DC}$, then $\overline{AB} \cong \overline{DC}$, and if $\overline{AB} \cong \overline{BD}$ and $\overline{AB} \cong \overline{AC}$, then $\overline{BD} \cong \overline{AC}$.
53c. $P = x + x + x + x$
55. Sample answer: You cannot divide by 0.

57. Sometimes; when a number is subtracted by itself then it holds, but otherwise it does not.

59. $(2j)k = 2(jk)$; The other three equations illustrate the Commutative Property of Addition or Multiplication. This equation represents the Associative Property of Multiplication.

61. D **63.** C **65.** 14 **67.** 6 **69.** 26 ft; 40 ft^2

71. about 64.7 % **73.** $\frac{23}{2}$ **75.** $\frac{6}{35}$ **77.** $\frac{6}{11}$ **79.** 6

Lesson 1-4

1. 25(12 + 15); $675 **3.** $\left(6 + \frac{1}{9}\right)9$; 55

5. $g(5) + (-9)(5)$; $5g - 45$ **7.** simplified

9. $4(2x + 6)$
$= 4(2x) + 4(6)$ Distributive Property
$= 8x + 24$ Multiply.

11. 48 activities **13.** 6(4) + 6(5); 54

15. 6(6) − 6(1); 30 **17.** 14(8) − 14(5); 42

19. 4(7) − 4(2); 20 **21.** 7(500 − 3); 3479

23. $36\left(3 + \frac{1}{4}\right)$; 117 **25.** $2(x) + 2(4)$; $2x + 8$

27. $4(8) + (-3m(8))$; $32 - 24m$ **29.** $18r$ **31.** $2m + 7$

33. $34 - 68n$ **35.** $13m + 5p$ **37.** $4fg + 17g$

39. $7(a^2 + b) - 4(a^2 + b)$
$= 7a^2 + 7b - 4a^2 - 4b$ Substitution
$= 7a^2 - 4a^2 + 7b - 4b$ Commutative (+)
$= (7 - 4)a^2 + (7 - 4)b$ Distributive Prop.
$= 3a^2 + 3b$ Substitution

41. $18x + 30$ units **43.** $14m + 11g$ **45.** $12k^3 + 12k$

47. $19x + 8$ **49.** $9 - 54b$ **51.** $12c - 6cd^2 + 6d$

53. $7y^3 + y^4$ **55a.** $2(x + 3)$

55b.

Area	Factored form
$2x + 6$	$2(x + 3)$
$3x + 3$	$3(x + 1)$
$3x - 12$	$3(x - 4)$
$5x + 10$	$5(x + 2)$

55c. Divide each term of the expression by the same number. Then write the expression as a product.

57. Both; It should be considered a property of both. Both operations are used in $a(b + c) = ab + ac$.

59. Sample answer: You can use the Distributive Property to calculate quickly by expressing any number as a sum or difference of a two more convenient number. Answers should include the following: Both methods result in the correct answer. In one method you multiply then add, and in the other you add then multiply.

61. G **63.** $\frac{1}{3}$ or about 33%

65. $0.24 \cdot 8 \cdot 7.05 = (0.24 \cdot 8) \cdot 7.05$ Associative (×)
$= 1.92 \cdot 7.05$ Substitution
$= 13.536$ Substitution

67. $\frac{4[6(30) + 3(20)]}{60}$; 16 hours **69.** 21:48

71. 384 in^2 **73.** 15 **75.** 60 **77.** 192

Lesson 1-5

1. {13} **3.** {12} **5.** B **7.** −68 **9.** all real numbers

11. {12} **13.** {5} **15.** {16} **17.** {3} **19.** 14 **21.** 2

23. 2 **25.** 5 **27.** no solution **29.** all real numbers

31. 13 **33.** 41 students **35.** $C = 2836 + 3091$; 5927 Calories/day

37.

x	$3x - 2$	y
−2	3(−2) − 2	−8
−1	3(−1) − 2	−5
0	3(0) − 2	−2
1	3(1) − 2	1
2	3(2) − 2	4

39. 20 **41.** 66 **43.** 5 **45.** $c = 15$

47a. $5 = \frac{100 - 0}{r}$; 20

47b.

Intial Pressure p_1 (mm Hg)	Final Pressure p_2 (mm Hg)	Resistance r (mm Hg/L/min)	Blood Flow Rate F (L/min)
100	0	20	5
100	0	30	≈ 3.33
165	5	40	4
90	30	10	12

49. yes **51.** no **53.** yes **55.** yes

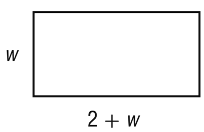
57.

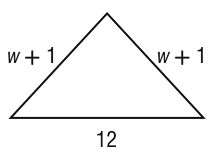
x	$3x + 5$	y
−2	$3(-2) + 5$	−1
−1	$3(-1) + 5$	2
0	$3(0) + 5$	5
1	$3(1) + 5$	8
2	$3(2) + 5$	11

59.

x	$\frac{1}{2}x + 2$	y
−2	$\frac{1}{2}(-2) + 2$	1
−1	$\frac{1}{2}(-1) + 2$	1.5
0	$\frac{1}{2}(0) + 2$	2
1	$\frac{1}{2}(1) + 2$	2.5
2	$\frac{1}{2}(2) + 2$	3

61a.





61b. perimeter of rectangle $= 2(2 + w) + 2w$ or $4 + 4w$; perimeter of triangle $= 2(w + 1) + 12 = 2w + 14$.

61c. $4 + 4w = 2w + 14$, $w = 5$ in.

63a. See students' work.

63b.

Layers	1	2	3	4	5	6	7
Cubes	4	8	12	16	20	24	28

63c. Each layer adds 4 more cubes to the tower.
63d. The number of cubes $= 4L$, where L is the number of layers in the tower.
65. Sample answer: $3x + 12 = 3(x + 4)$ **67.** Tom; Li-Cheng added 6 + 4 instead of dividing 6 by 8. She did not follow the order of operations.
69. Sample answer: $3x - 2 = -23$ **71.** C

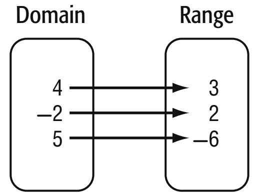
73. G **75.** 30 (500 + 750)

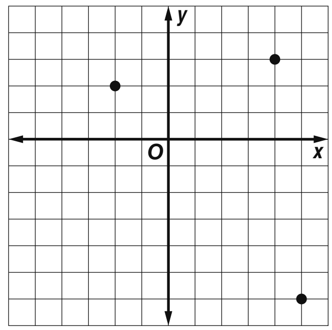
77. $p = \frac{1}{12}$; Multiplicative Inverse **79.** 1040 in^3
81. $\frac{3}{20}$ **83.** estimate; 10 gal **85.** 6.74 **87.** 1.65 **89.** $\frac{29}{28}$

Lesson 1-6

1.

x	y
4	3
−2	2
5	−6



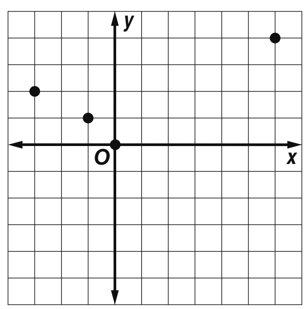


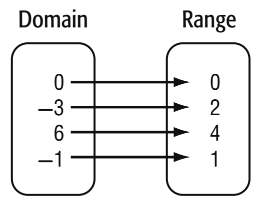
D = {−2, 4, 5}; R = {−6, 2, 3}

3. I: the temperature of the compound; D: the pressure of the compound **5.** I: number of concert tickets, D: cost of tickets
7. The track team starts by running or walking, and then stops for a short period of time, then continues at the same pace. Finally, they run or walk at a slower pace.

9.

x	y
0	0
−3	2
6	4
−1	1

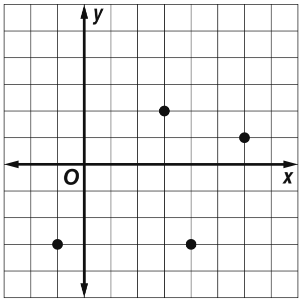


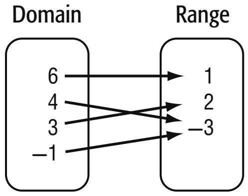


D = {0, −3, 6, −1}; R = {0, 2, 4, 1}

11.

x	y
6	1
4	−3
3	2
−1	−3

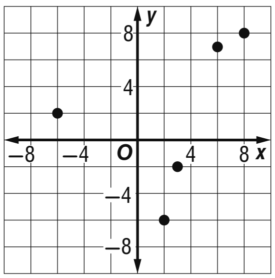


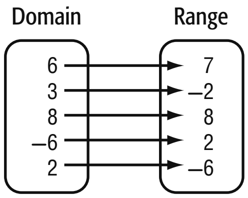


D = {6, 4, 3, −1};
R = {1, −3, 2}

13.

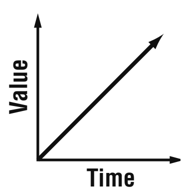
x	y
6	7
3	−2
8	8
−6	2
2	−6



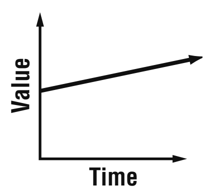


D = {−6, 2, 3, 6, 8};
R = {−6, −2, 2, 7, 8}

15. I: the number of students who attend the fiesta; D: the amount of food that there will be at the fiesta **17.** The bungee jumper starts at the maximum height then jumps. After the initial jump, the jumper bounces up and down until coming to a rest.
19. The baseball card increases in value quickly.
21. (1, 5); The dog walker earns $5 for walking 1 dog.
23. I: number of dogs walked; D: amount earned
25. (5, 6); In the year 2005, sales were about $6 million.
27. {(1, 2.50), (2, 4.50), (5, 10.50), (8, 16.50)}; D = {1, 2, 5, 8}; R = {2.50, 4.50, 10.50, 16.50} **29.** {(4, −1), (8, 9), (−2, −6), (7, −3)} **31.** {(4, −2), (−1, 3), (−2, −1), (1, 4)}
33. Sample answer:



35. Sample answer:

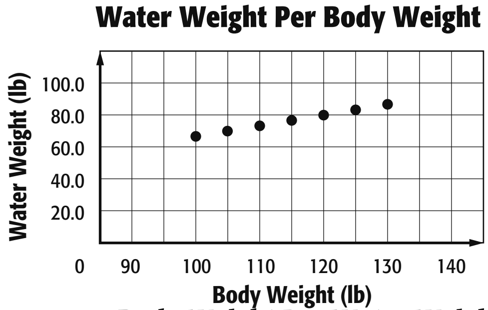


37a.

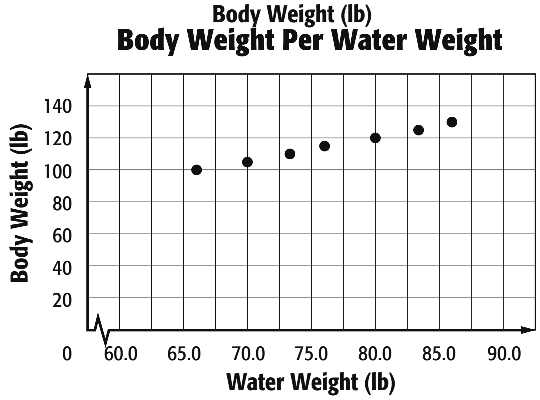
Body Weight (lb)	100	105	110	115	120	125	130
Water Weight (lb)	66.7	70	73.3	76.7	80	83.3	86.7

37b. The independent variable is b, the dependent variable is w.

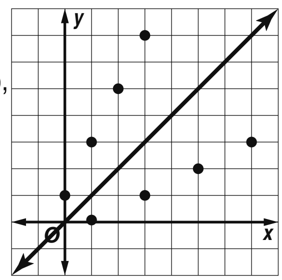
37c. D = {100, 105, 110, 115, 120, 125, 130};
R = {66.7, 70, 73.3, 76.7, 80, 83.3, 86.7}



37d.



The body weight is dependent on the water weight. As the water weight increases, the body weight also increases.
39. See students' work.
41. Reversing the coordinates gives (1, 0), (3, 1), (5, 2), and (7, 3).



Each point in the original relation is the same distance from the line as the corresponding point of the reverse relation. The graphs are symmetric about the line $y = x$

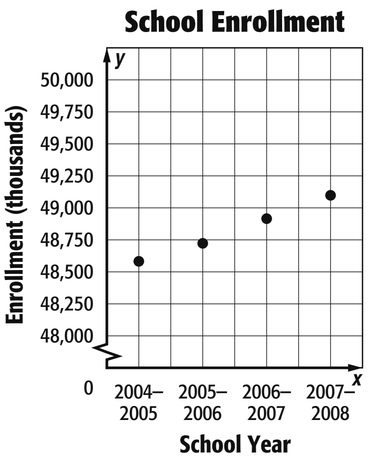
43. B **45.** (−1, −3) **47.** 2 **49.** 3 **51.** $\frac{1}{8}$

53. about 50.27 cm **55.** 64 **57.** 6.25 **59.** 49

Lesson 1-7

1. Yes; for each input there is exactly one output.
3. No; the domain value 2 is paired with 2 and −4. **5.** No; when $x = 0$, $y = 1$ and $y = 6$.
7. Yes; the graph passes the vertical line test.
9a. {(0, 48,560), (1, 48,710), (2, 48,948), (3, 49,091)}

9b.



9c. The domain is the school year and the range is the enrollment.

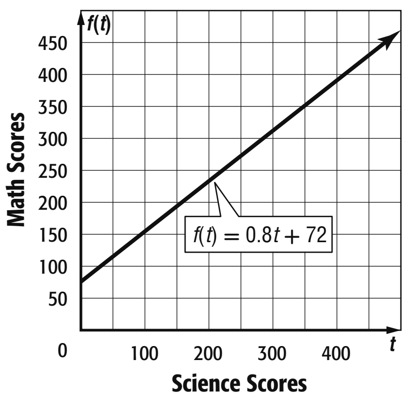
11. -11 **13.** $6r - 5$ **15.** $a^2 + 5$ **17.** $6q + 13$

19. $b^2 - 4$ **21.** No; the domain value 4 is paired with both 5 and 6. **23.** Yes; for each input there is exactly one output. **25.** Yes; the graph passes the vertical line test. **27.** yes **29.** yes **31.** yes

33. -1 **35.** 14 **37.** -4 **39.** $-8y - 3$

41. $-2c + 7$ **43.** $-10d - 15$

45a.



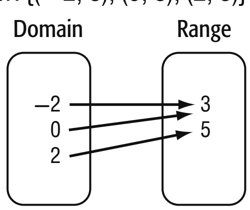
When the science score is 0, the math score is 72. For each point the science score increases, the math score increases by 0.8 point.

45b. 295

45c. The domain is the set of science scores. The range is the set of math scores.

47. yes

49. Sample answer: {(−2, 3), (0, 3), (2, 5)}



51. $f(g + 3.5) = -4.3g - 17.05$

53. Sample answer: $f(x) = 3x + 2$

55. Sample answer: You can determine whether each element of the domain is paired with exactly one element of the range. For example, if given a graph, you could use the vertical line test; if a vertical line intersects the graph more than once, then the relation that the graph represents is not a function.

57. J **59.** her first game **61.** $\frac{13}{2}$

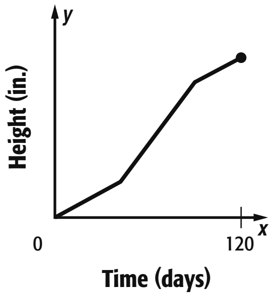
63. $4(1.99) + 10(0.25) + 4(1.85) = 17.86$, so the cost is \$17.86. **65.** sample answer: two thirds times x

67. 38.016 cm^3 **69.** 288,000 mm^3 **71.** -1

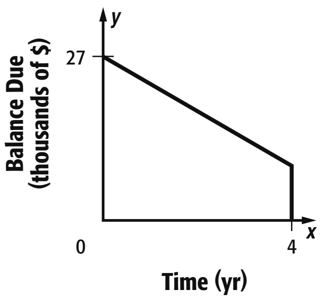
73. 40 **75.** 65

Lesson 1-8

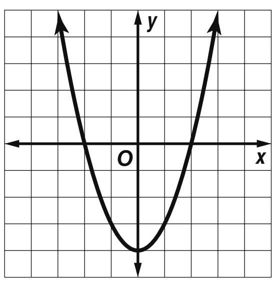
1. Nonlinear; the y-intercept is 0, so there is no change in the stock value at the opening bell. The x-intercepts are 0, about 3.2, and about 4.5, so there is no change in the stock value after 0 hours, after about 3.2 hours, and after about 4.5 hours after the opening bell. The graph has no line symmetry. The stock went up in value for the first 3.2 hours, then dropped below the starting value from about 3.2 hours until 4.5 hours, and finally went up again after 4.5 hours. The stock value starts the day increasing in value for the first 2 hours, then it goes down in value from 2 hours until 4 hours, and after 4 hours it goes up in value for the remainder of the day. The stock had a relative high value after 2 hours and then a relative low value after 4 hours. As the day goes on, the stock increases in value. **3.** Linear; the y-intercept is about 45, so the temperature was about 45°F when the measurement started. The x-intercept is about 5.5, so after about 5.5 hours, the temperature was 0°F. The graph has no line symmetry. The temperature is above zero for the first 5.5 hours, and then below zero after 5.5 hours. The temperature is going down for the entire time. There are no extrema. As the time increases, the temperature will continue to drop, which is not very likely. **5.** Nonlinear; the y-intercept is about 20, so the purchase price of the vehicle was about \$20,000. There is no x-intercept, so the value of the vehicle will never equal 0. The graph has no line symmetry. The value of the vehicle is always positive. The value of the vehicle is always decreasing. There are no extrema. As the number of years increase, the value of the vehicle decreases. **7.** Nonlinear; the y-intercept is about 100. This means that the web site had 100 hits before the time began. There is no x-intercept. The function is positive for all values of x. This means that the web site has never experienced a time of inactivity. The function is increasing for all values of x, with no relative maxima or minima. As x increases, y increases, which means that the upward trend in the number of hits is expected to continue. **9.** Nonlinear; the x- and y-intercept is 0, which means that a pendulum with no length cannot complete a swing. The function is positive and increasing for all values of x. Also, as x increases, y increases. The function has no relative minima or maxima. This means that as the pendulum gets longer, the time it takes for it to complete one full swing increases. **11.** Sample answer: The function has a y-intercept of 0 and an x-intercept of 0, indicating that the plant started with no height as a seed in the ground. The function is increasing over its domain, so that plant was always getting taller. The function has no relative extrema.



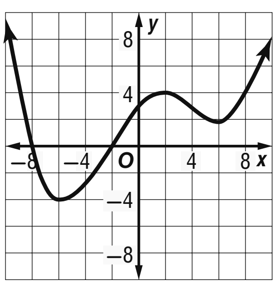
13. Sample answer: The function has a y-intercept of 27, indicating that the initial balance of the loan was $27,000. The x-intercept of 4 indicates that the loan was paid off after 4 years. The function is decreasing over its entire domain, indicting that the amount owed on the loan was always decreasing. The function has no relative extrema.



15. Sample graph:

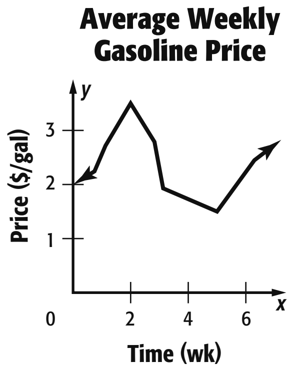


17. Sample graph:



19. As x increases or decreases, y approaches 0.

21. The graph has a relative maximum at about $x = 2$ and a relative minimum at about $x = 4.5$. This means that the weekly gasoline price spiked around week 2 at a high of about $3.50/gal and dipped around week 5 to a low of about $1.50/gal.



23. C **25.** A **27.** yes **29.** yes **31.** $d^2 + 3d$

33. $3(z - 2x)$ **35.** 49 **37.** 17.64

Chapter 1 Study Guide and Review

1. true **3.** false; not in simplest form **5.** true

7. false; multiplicative identity

9. the product of 3 and x squared

11. $x + 9$ **13.** $4x - 5$ **15.** 216

17. $2.50 + 3.25g$ **19.** 18 **21.** 2 **23.** 3 **25.** 5

27. $2.75(3) + 4.25(2)$; $16.75

29. $[5 \div (8 - 6)]\frac{2}{5}$
$= [5 \div 2]\frac{2}{5}$ Substitution
$= \frac{5}{2} \cdot \frac{2}{5}$ Substitution
$= 1$ Multiplicative Inverse

31. $2 \cdot \frac{1}{2} + 4(4 \cdot 2 - 7)$
$= 2 \cdot \frac{1}{2} + 4(8 - 7)$ Substitution
$= 2 \cdot \frac{1}{2} + 4(1)$ Substitution
$= 1 + 4(1)$ Multiplicative Inverse
$= 1 + 4$ Multiplicative Identity
$= 5$ Substitution

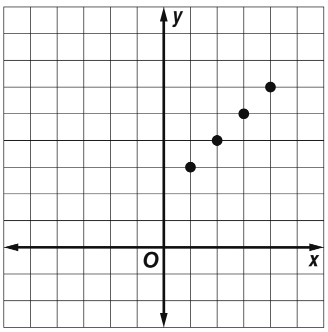
33. $7\frac{2}{5} + 5 + 2\frac{3}{5}$
$= 7\frac{2}{5} + 2\frac{3}{5} + 5$ Commutative (+)
$= (7\frac{2}{5} + 2\frac{3}{5}) + 5$ Associative (+)
$= 10 + 5$ Substitution
$= 15$ Substitution

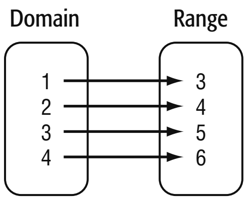
35. $5.3 + 2.8 + 3.7 + 6.2$
$= 5.3 + 3.7 + 2.8 + 6.2$ Commutative (+)
$= (5.3 + 3.7) + (2.8 + 6.2)$ Associative (+)
$= 9 + 9$ Substitution
$= 18$ Substitution

37. $(2)6 + (3)6$; 30 **39.** $8(6) - 8(2)$; 32 **41.** $-2(5) - (-2)(3)$; -4 **43.** $3(x) + 3(2)$; $3x + 6$ **45.** $6(d) - 6(3)$; $6d - 18$ **47.** $(9y)(-3) - (6)(-3)$; $-27y + 18$ **49.** $4(3 + 5 + 4)$; 48 **51.** {7} **53.** {9} **55.** {5} **57.** 9

59.

x	y
1	3
2	4
3	5
4	6

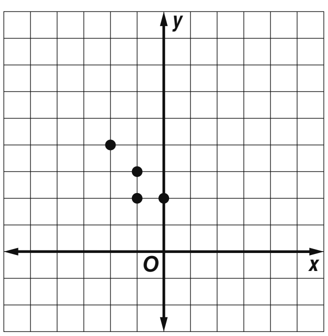


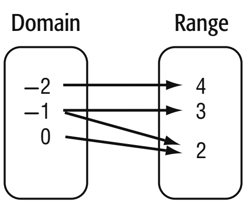


D = {1, 2, 3, 4};
R = {3, 4, 5, 6}

61.

x	y
−2	4
−1	3
0	2
−1	2





D = {−2, −1, 0};
R = {2, 3, 4}

63. {(−2, −2), (0, −3), (2, −2), (2, 0), (4, −1)}

65. function **67.** not a function **69.** 1

71. 13 **73.** $9p^2 - 3$

75. Nonlinear; the graph intersects the *y*-axis at about (0, 56), so the *y*-intercept is about 56. This means that about 56,000 U.S. patents were granted in 1980. The graph has no symmetry. The graph does not intersect the *x*-axis, so there is no *x*-intercept. This means that in no year were 0 patents granted. The function is positive for all values of *x*, so the number of patents will always have a positive value. The function is increasing for all values of *x*. The *y*-intercept is a relative minimum, so the number of patents granted was at its lowest in 1980. As *x* increases, *y* increases. As *x* decreases, *y* decreases.

CHAPTER 2

Linear Equations

Chapter 2 Get Ready

1. $3n - 4$ **3.** $2b - 11$ **5.** 2 **7.** 11 **9.** 11 **11.** \$28.40 **13.** 20% **15.** 21%

Lesson 2-1

1. $15 - 3r = 6$ **3.** $n^2 + 12 = p \div 4$ **5.** $8 + 3k = 5k - 3$ **7.** $\frac{25}{t} + 6 = 2t + 1$ **9.** $1900 + 30w = 2500$; 20 **11.** $P = 5s$ **13.** $4\pi r^2 = S$ **15.** Sample answer: The product of seven and *m* minus *q* is equal to 23.
17. Sample answer: Three times the sum of *g* and eight is the same as 4 times *h* minus 10. **19.** Sample answer: A team of gymnasts competed in a regional meet. Each member of the team won 3 medals. There were a total of 45 medals won by the team. How many team members were there?
21. $f - 5g = 25 - f$ **23.** $4(14 + c) = a^2$
25. $3 \cdot 10 = 12f$; $2\frac{1}{2}$ flats **27.** $C = \frac{5}{9}(F - 32)$
29. $I = prt$ **31.** Sample answer: Four times *m* is equal to fifty—two. **33.** Sample answer: Fifteen less than the square of *r* equals the sum of *t* and nineteen.
35. Sample answer: One third minus four fifths of *z* is four thirds of *y* cubed. **37.** Sample answer: Ashley has a credit card that charges 12% interest on the principal balance. If Ashley's payment was \$224, what was the principal balance on the credit card? **39.** Sample answer: Fred was teaching his friends a new card game. Each player gets 5 cards, and 7 cards are placed in the center of the table. Since there are 52 cards in a deck, find how many players are in the game. **41.** C **43.** D **45.** $17 = t + 3t + (t + 2)$ or $17 = 5t + 2$; 3 **47.** Sample answer: My favorite television show has 30 new episodes each year. So far eight have aired. How many new episodes are left?
49. $\ell = \frac{P - 2w}{2}$ **51.** *C* **53.** 180 m
55. Nonlinear; the graph intersects the *y*—axis at about (0, 0.8), so the *y*—intercept is about 0.8. This means that the population of Phoenix was about 800,000 in 1980. The graph has no symmetry. The graph does not intersect the *x*—axis, so there is no *x*—intercept. This means that the population will always have a positive value. The function is positive for all values of *x*. The function is increasing for all values of *x*. The *y*—intercept is a relative minimum, so the population was at its lowest in 1980. As *x* increases, *y* increases. As *x* decreases, *y* decreases.
57a. independent: number of sides; dependent: interior angle sum **57b.** Domain: all integers greater than or equal to 3; Range: all positive integer multiples of 180
59. 1,000,000 **61.** 5^3 125

Lesson 2-2

1. 28 **3.** $\frac{5}{6}$ **5.** 9 **7.** −4.1 **9.** $-3\frac{1}{4}$ **11.** 16
13. $\frac{10}{9}$ or $1\frac{1}{9}$ **15.** $-\frac{4}{7}$ **17.** \$22.75 **19.** 116 **21.** 22
23. −11 **25.** −29 **27.** −32 **29.** −7 **31.** $1\frac{1}{8}$ **33.** $1\frac{2}{7}$

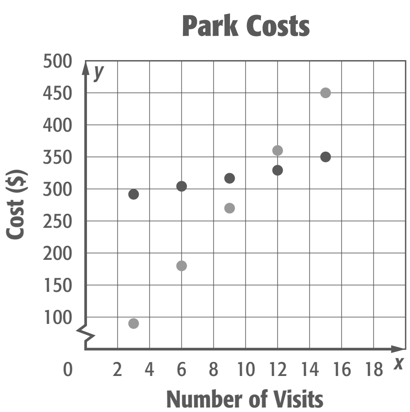
35. -708 **37.** 33 **39.** -2 **41.** $-1\frac{1}{9}$
43. $24.9 = 8.1 + t$; 16.8 hours **45.** -77 **47.** $\frac{16}{3}$
49. -10 **51.** $-\frac{10}{7}$ or $-1\frac{3}{7}$ **53.** 18 **55.** 225
57. $\frac{2}{3} = -8n; -\frac{1}{12}$ **59.** $\frac{4}{5} = \frac{10}{16}n; \frac{32}{25}$ **61.** $4\frac{4}{5}n = 1\frac{1}{5}; \frac{1}{4}$
63. $555 = 139 + p$; 416 **65.** $180 = t + 154$; 26 *s*
67. $1.6 - m = 0.8$; \$0.8 million **69.** 12 million
71a. $350 + m = 1000$; \$650 **71b.** $350 + 225 + m = 1000$; \$425 **71c.** $6t = 1000$; 167 **73.** Sample answer: $12 + n = 25$; subtract 12 from each side or add -12 to each side.
75a. Sometimes; $0 + 0 = 0$ but $2 + 2 \neq 2$. **75b.** Always; this is the Additive Identity Property.
77a. $x = \frac{12}{a}$ **77b.** $x = 15 - a$ **77c.** $x = a - 5$
77d. $x = 10a$ **79.** *C* **81.** *F* **83.** $2r + 3k = 13$
85. $m^2 - p^3 = 16$ **87.** $12(5 + 8 + 2)$; 180 hours

Lesson 2-3

1. -5 **3.** -55 **5.** 61 **7.** $12 - 2n = -34$; 23
9. $n + (n + 2) + (n + 4) = 75$; 23, 25, 27 **11.** -5
13. -5 **15.** 70 **17.** 27 **19.** 16 **21.** -61
23. $0.15m + 49.99 = 100$; $m \approx 333$; $650 + 333 = 983$ min **25.** $17 = 6x - 13$; 5 **27.** $n + (n + 2) + (n + 4) = 141$; 45, 47, 49 **29.** $n + (n + 1) + (n + 2) + (n + 3) = -142$; $-37, -36, -35, -34$ **31.** $-7\frac{3}{5}$ **33.** -72
35. 108 **37.** $\frac{4}{5}$ **39.** $\frac{33}{14}$ **41.** $7\frac{1}{4}$ yr or 7 yr 3 mo
43. 23.1 **45.** 31.6 **47.** -3.5 **49.** 5
51a. $5x + 275 = x(6 + 15 + 9)$; 11 visits
51b.

Visits	Cost for Members	Cost for Nonmembers
3	290	90
6	305	180
9	320	270
12	335	360
15	350	450

51c.



Both functions are linear. If a person is going to visit the park fewer than 11 times, it will be cheaper to be a nonmember.
53. Sample answer: A pair of designer jeans costs \$60. This is \$40 more than twice the cost of a *T*—shirt. How much is the *T*—shirt? The *T*—shirt costs \$10.

55a. No; for there to be a solution there must be a number for which $a + 4 = a + 5$.
55b. Yes; for $b = 0$, $\frac{1 + b}{1 - b} = \frac{1 + 0}{1 - 0}$ or 1.
55c. No; $c - 5 = 5 - c$ when $c = 5$. However, $\frac{c - 5}{5 - c}$ is undefined for $c = 5$ since the fraction represents division by 0. **57.** Sample answer: In order to solve the equation $4k + 20 = 236$, you would first subtract 20 from each side and then divide each side by 4.
59. 84 **61.** B **63.** 1379 **65.** Three times a number *h* is increased by 7 to equal 20. **67.** Three multiplied by a number *p* is the same as the difference of 8 times *p* and *r*.
69. The product of $\frac{1}{2}$ and *v* is equal to the product of $\frac{2}{3}$ and *v* plus 4.
71. 0; Additive Identity **73.** 4; Additive Inverse
75. 53 **77.** 1000

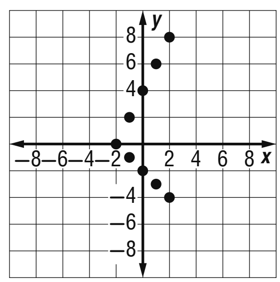
Lesson 2-4

1. 4 **3.** -7 **5.** no solution **7.** all numbers **9.** A
11. 4 **13.** 4 **15.** $2\frac{2}{5}$ **17.** 6 **19.** -5 **21.** 1 **23.** $-4, -2$
25. no solution **27.** all numbers **29.** -25 **31.** 15
33. 3 **35.** -2 **37.** $-2, 0$ **39.** 1899 DVDs/day
41a. Sample answer: $y = 2x + 4$

x	-2	-1	0	1	2
y	0	2	4	6	8

$y = -x - 2$

x	-2	-1	0	1	2
y	0	-1	-2	-3	-4

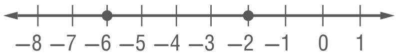


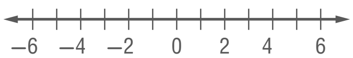
41b. -2 **41c.** Sample answer: The solution in part b is the *x*-coordinate for the point of intersection on the graph.
43. Sample answer: $2x + 1 = \frac{3}{2}x - 2$;
First I chose $\frac{3}{2}$ as the fractional coefficient. Then I chose 2 for the coefficient for the variable on the other side of the equation. After substituting -6 in for *x* on both sides, 1 must be added to the left and 2 must be subtracted from the right to balance the equation.
45a. Incorrect; the 2 must be distributed over both *g* and 5; 6.
45b. correct **45c.** Incorrect; to eliminate $-6z$ on the right side of the equals sign, $6z$ must be added to each side of the equation; 1.
47. Sample answer: If the equation has variables on both sides of the equation, you must first add or subtract one of the terms from both sides of the equation so that the variable is left on only one side of the equation. Then solving the equation uses the same steps.

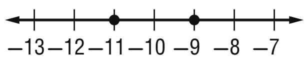
49. J **51.** A **53.** $-2\frac{2}{3}$ **55.** -15 **57.** -15 **59.** $34
61. 2; Multiplicative Identity **63.** $\frac{2}{3}$; Additive Identity
65. 7; Transitive Property **67.** $5(m + k) = 7k$ **69.** 5
71. -24 **73.** 11

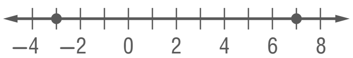
Lesson 2-5

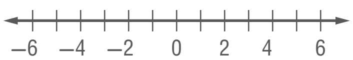
1. 15 **3.** -4
5. {4, −2}; 

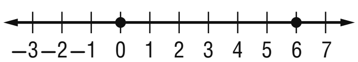
7. {−6, −2} 

9. ∅ 

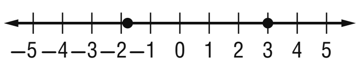
11. $|x - 1| = 3$ **13.** 6 **15.** -7.4 **17.** 8.4
19. -9.6 **21.** 0.4
23. {−11, −9}; 

25. {7, −3}; 

27. ∅ 

29. {0, 6} 

31. 11% to 19% **33.** $|x| = 4$ **35.** $|x - 1| = 4$
37. {−24, 16} 

39. $\left\{3, -\frac{9}{5}\right\}$ 

41. no solution 

43a. $|x - 52| = 2$; {50, 54} **43b.** $|x - 53| = 1$; {52, 54}
43c. 203 seconds and 214 seconds **45a.** 47 to 53 mph
45b. Sample answer: The speedometer was calibrated more accurately than the speedometer for part a.
47. $|x| = 1\frac{1}{2}$ **49.** $\left|x - \frac{1}{4}\right| = \frac{1}{4}$ **51.** $\left|x + \frac{1}{3}\right| = 1$
53a. Let h = the number of people that can clearly hear voices, $|h - 20{,}000| = 1000$. **53b.** 21,000; 19,000 **53c.** 2000
55a. 50, −50 **55b.** Sample answer:

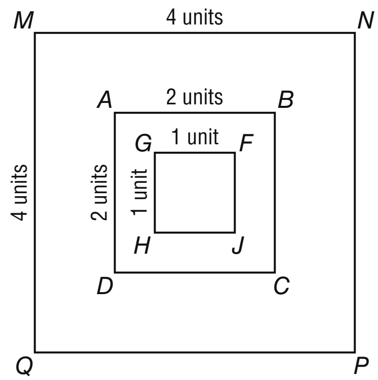
Number of questions correct	Points
0	0
1	10
2	20
3	30
4	40
5	50

55c. 50, 40, 30, 20, 10, 0, −10, −20, −30, −40, −50
57. Sometimes; when $x = -1$, the value is 0. **59.** Sometimes; when c is a negative value the inequality is true. **61.** An absolute value represents a distance from zero on a number line. A distance can never be a negative number. **63.** Wesley; the absolute value of a number cannot be a negative number.

65. D **67.** A **69.** $\frac{1}{2}n + 16 = \frac{2}{3}n - 4$; 120 **71.** 10 in.
73. $\frac{2}{5}n = -24$; −60 **75.** $12 = \frac{1}{5}n$; 60

Lesson 2-6

1. no **3.** no **5.** 5 **7.** ≈ 253.3 min or ≈ 4 h 13.3 min
9. yes **11.** no **13.** yes **15.** 40 **17.** 29.25 **19.** 9.8
21. 1.32 **23.** 0.84 **25.** 0.57 **27.** 6 **29.** 11
31. 156 mi **33.** about $262.59 **35.** 18
37. 0.8 **39.** 11 **41.** 130 students

43a. 2003: $\frac{35{,}361}{35{,}995}$; 2004: $\frac{36{,}012}{36{,}653}$;
2005: $\frac{37{,}092}{37{,}740}$; 2006: $\frac{37{,}776}{38{,}425}$;
2007: $\frac{38{,}159}{38{,}794}$; 2008: $\frac{38{,}201}{38{,}834}$;
2009: $\frac{38{,}605}{39{,}233}$
43b. None of the ratios form a proportion.
45a. 

45b.

ABCD		*MNPQ*		*FGHJ*	
Side length	2	Side length	4	Side length	1
Perimeter	8	Perimeter	16	Perimeter	4

45c. If the length of a side is increased by a factor, the perimeter is also increased by that factor. If the length of the sides are decreased by a factor, the perimeter is also decreased by the same factor.
47. Ratios and rates each compare two numbers by using division. However, rates compare two measurements that involve different units of measure. **49.** If the tank is about $\frac{9}{16}$ full, he has about $\frac{9}{16} \times 10$ or $5\frac{5}{8}$ gal of gas left. At 32 miles per gallon, he will be able to travel $32 \times 5\frac{5}{8}$ or 180 miles. Since Atlanta is 200 miles away, he will run out of gas about 20 miles before reaching the city if he doesn't stop to get gas. **51.** C **53.** G **55.** ∅ **57.** {10, −7} **59.** 30 years
61. −7 **63.** −48 **65.** 13 **67.** 5.5 **69.** 3.5

Lesson 2-7

1. inc.;60% **3.** inc.; 33% **5.** 146 mi **7.** $38.42
9. $53.07 **11.** $17.21 **13.** $22.10 **15.** dec.; 38%
17. dec.; 77% **19.** inc.; 127% **21.** inc.; 90%
23. $12,400 **25.** $47.48 **27.** $27.31 **29.** $10.66

31. \$76.49 **33.** \$16.42 **35.** \$11.99 **37.** \$48.04 **39.** about 20.7% increase **41a.** First girl's dress = \$15; Second girl's dress = \$25.50 **41b.** the second girl by \$0.50 **43.** milk **45.** Sample answer: A CD is on sale for \$9.99. If tax is 6.5%, what will the CD cost? **47.** Xavier; Maddie divided by the new amount instead of the original amount. **49.** Sample answer: Retail stores use percents of decrease when the prices of items are discounted in a sale; salary increases are usually given as a percent of increase. To find the percent of change, subtract the original from the new amount. Then write a proportion, comparing the change to the original amount. The answer should be written as a percent. **51.** \$72 **53.** C **55.** 12 **57.** 4 **59.** 5.6 **61.** 3 **63.** −6 **65.** −7 **67.** $0.99x + 1.29y$
69. Sample answer: Six more than twice a number *f* equals nineteen. **71.** Sample answer: The product of three and a number *a* when added to 5 is equal to the difference of 27 and two times *a*. **73.** Sample answer: The fourth power of a number *d* increased by sixty-four is three times that number *d* to the third power plus seventy-seven.

Lesson 2-8

1. $a = -\frac{c}{13}$ **3.** $k = -7n - m$ **5a.** $h = \frac{V}{\pi r^2}$ **5b.** 8 in.
7. about 0.43875 ft **9.** $c = \frac{x - b}{-d}$
11. $m = \frac{-n + p}{10}$ **13.** $v = \frac{9}{5}(z - w)$ **15.** $f = \frac{6g - 10}{d}$
17a. $v_f = at + v_i$ **17b.** 10 ft/s^2 **19.** 49.8 L
21. $t = \frac{w - 11v}{31}$ **23.** $c = \frac{-13 + f}{10 - d}$ **25.** 1.0 mm/s
27. 3.9 km/s **29.** $t - 7 = r + 6$; $t = r + 13$
31. $\frac{9}{10}g = 7 + \frac{2}{3}k$; $k = \frac{3}{2}\left[\frac{9}{10}g - 7\right]$ **33.** 5 in.
35. about 364 in^3 **37.** Sandrea; she performed each step correctly; Fernando omitted the negative sign from $-5b$.
39a. $x = \frac{y - 1}{yn - 1}$ **39b.** $y = -\frac{1}{3}x$ **41.** D
43. 15 **45.** \$101.76 **47.** **\$46.33** **49.** \$56.95
51. 1.67 **53.** 5.14 **55.** 50(7.50) + 90(5.00); \$825
57. −0.5 **59.** −1.5 **61.** 2

Lesson 2-9

1. 9 oz **3.** 10 mph **5.** 2 hours
7.a

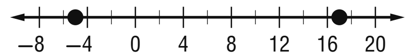
	Number	Price	Total Price
Metallic Balloons	*b*	\$2.00	2.00*b*
Bunches of Helium Balloons	*b* − 36	\$3.50	3.50(*b* − 36)

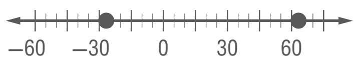
7b. $2.00b + 3.50(b - 36) = 281.00$ **7c.** 74 **7d.** 38
9. about 16.67 gal **11.** about 22.2 mph
13. $1\frac{1}{7}$ hours or 1 h 8 min 34 s **15.** 10 gal
17. about 10.89 mph **19a.** 390 mi **19b.** about 9.62 hours **21.** 33 mi **23.** Sample answer: For a 50% solution being added to a 100% solution to produce a 75% resulting solution, the quantity of each must be the same.

25. Sample answer: How many grams of salt must be added to 36 grams of a 15% salt solution to obtain a 50% salt solution? **27.** B **29.** C **31.** $\frac{-5 + b}{2b}$ **33.** $\frac{A}{2\pi r} - r$ **35.** Sample answer: The quotient of *n* and −6 is the same as the sum of two times *n* and one. **37.** Sample answer: The sum of three and twice *x* squared is equal to twenty-one. **39.** (4, 25); Sample answer: If four cars are washed, \$25 is earned. **41.** \$583.50 **43.** −2 **45.** −7 **47.** 24

Chapter 2 Study Guide and Review

1. false, variable **3.** true **5.** false, ratio **7.** false, decrease **9.** $5x + 3 = 15$ **11.** $\frac{1}{2}m^3 = 4m - 9$
13. *h* squared minus five times *h* plus six is equal to zero. **15.** width: 8 ft, length: 19 ft **17.** −5 **19.** 2.1
21. 6 **23.** 14 **25.** 6 **27.** −11 **29.** 17 **31.** 2
33. 38.1 **35.** 19, 21, 23 **37.** 3 **39.** −2 **41.** 2
43. −8 **45.** 21 **47.** 28 **49.** −144 **51.** {−5, 17}

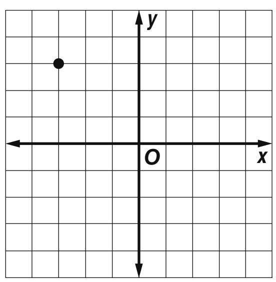


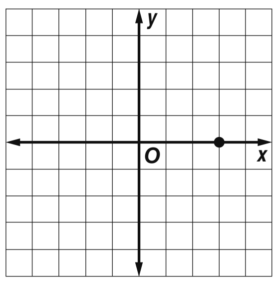
53. {−27, 63} 

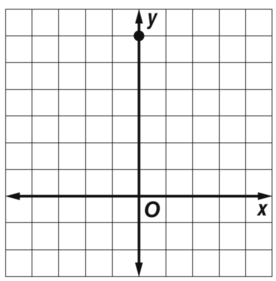
55. yes **57.** 20 **59.** 12 **61.** increase, 25%
63. decrease, 17% **65.** \$52.19 **67.** \$55.20
69. \$33.75 **71.** $y = \frac{9 - 3x}{2}$ **73.** $m = \frac{15 - 9n}{-5}$
75. $y = \frac{5}{2}(m - n)$ **77.** $h = \frac{2A}{a + b}$ **79.** 52 mph

CHAPTER 3
Linear Functions

Chapter 3 Get Ready

1. 

3. 

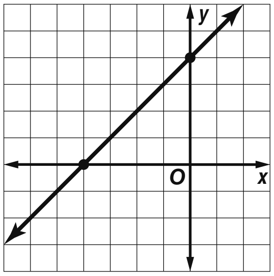
5. 

7. (3, −1) **9.** (3, 2)
11. (5, 0) **13.** $y = -3x + 1$
15. $y = \frac{5}{2}x - 6$
17. $y = -10x + 6$
19. $\frac{1}{4}$ **21.** 0 **23.** about \$13.5 million

Lesson 3-1

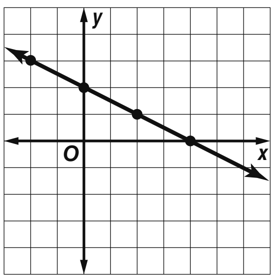
1. yes; $x - y = -5$ **3.** yes; $y = 1$ **5.** 25, -4; The x-intercept 25 means that after 25 minutes, the temperature is 0ºF. The y-intercept -4 means that at time 0, the temperature is -4ºF.

7.



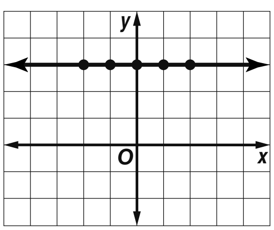
9.

x	$y = 2 - \frac{x}{2}$	y	(x, y)
-4	$y = 2 - \frac{(-4)}{2}$	4	$(-4, 4)$
-2	$y = 2 - \frac{(-2)}{2}$	3	$(-2, 3)$
0	$y = 2 - \frac{0}{2}$	2	$(0, 2)$
2	$y = 2 - \frac{2}{2}$	1	$(2, 1)$
4	$y = 2 - \frac{4}{2}$	0	$(4, 0)$



11.

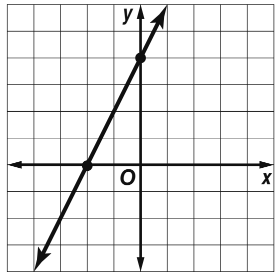
x	$y = 3$	y	(x, y)
-2	$y = 3$	3	$(-2, 3)$
-1	$y = 3$	3	$(-1, 3)$
0	$y = 3$	3	$(0, 3)$
1	$y = 3$	3	$(1, 3)$
2	$y = 3$	3	$(2, 3)$



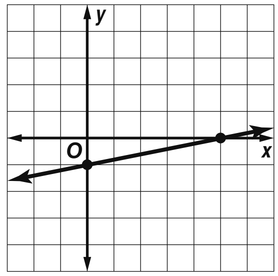
13. no **15.** no **17.** yes; $4x + y = 0$ **19.** 3, 4

21. 6, 20; The x-intercept represents the number of seconds that it takes the eagle to land. The y-intercept represents the initial height of the eagle.

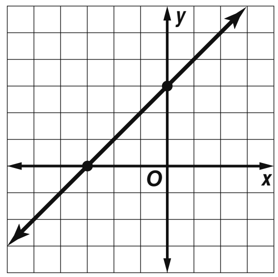
23.



25.

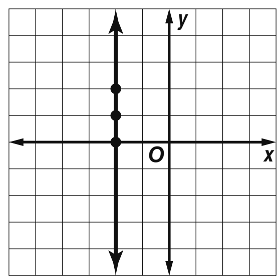


27.



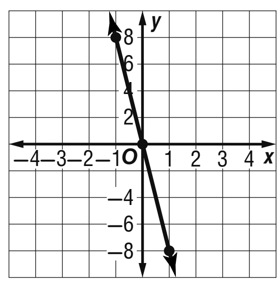
29.

x	y
-2	0
-2	1
-2	2



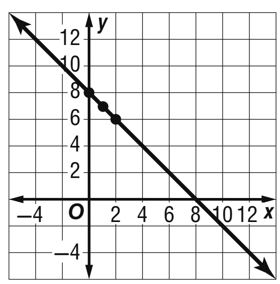
31.

x	y
-1	8
0	0
1	-8



33.

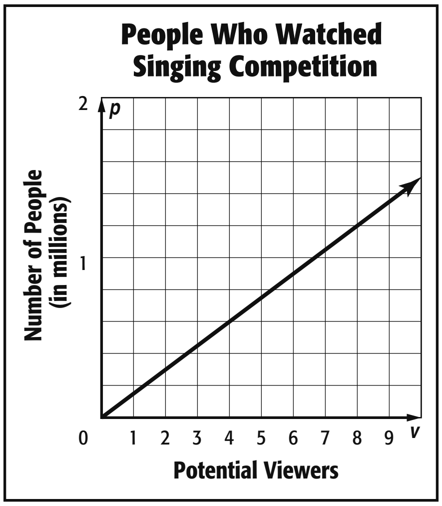
x	y
0	8
1	7
2	6



35a.

v	$p = 0.15v$	p	(v, p)
0	$p = 0.15(0)$	0	(0, 0)
2	$p = 0.15(2)$	0.3	(2, 0.3)
4	$p = 0.15(4)$	0.6	(4, 0.6)
6	$p = 0.15(6)$	0.9	(6, 0.9)
8	$p = 0.15(8)$	1.2	(8, 1.2)
10	$p = 0.15(10)$	1.5	(10, 1.5)

35b.



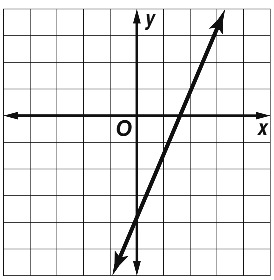
35c. ≈2.1 million

35d. There cannot be fewer than 0 viewers.

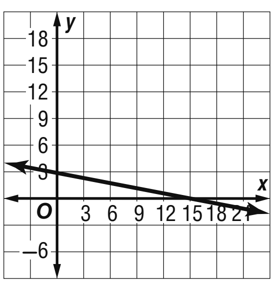
37. yes; $3x - 4y = 60$ **39.** yes; $3a = 2$

41. yes; $9m - 8n = -60$

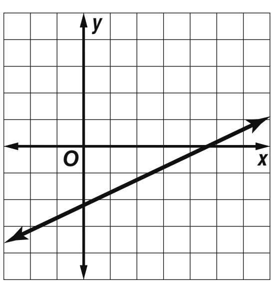
43.



45.



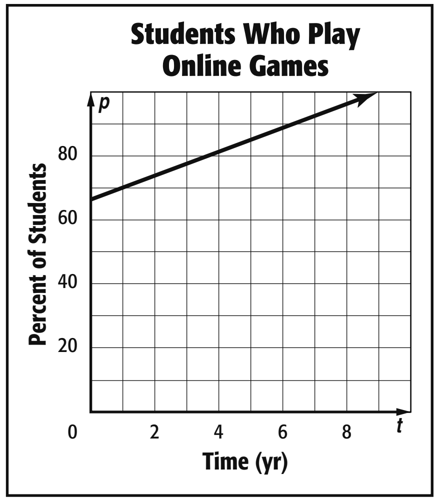
47.



49. No; Sample answer: The rental car would cost \$176. Mrs. Johnson has only \$160 to spend.

51. 3; 5 **53.** $2\frac{1}{2}$; $-1\frac{2}{3}$ **55.** 12; −3

57a.



57b. 96%

59.

Perimeter of a Square	
Side Length	**Perimeter**
1	4
2	8
3	12
4	16

Sample answer: Yes; we used the formula $P = 4s$, which is linear.

Area of a Square	
Side Length	**Area**
1	1
2	4
3	9
4	16

Sample answer: No; we used the formula $A = s^2$, which is not linear.

Volume of a Cube	
Side Length	**Volume**
1	1
2	8
3	27
4	64

Sample answer: No; we used the formula $V = s^3$, which is not linear.

61. Sample answer: $y = 8$; horizontal line

63. Sample answer: $x - y = 0$; line through (0, 0)

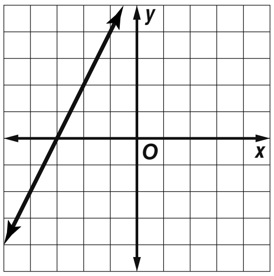
65. D **67.** \$30 **69.** 270 rolls of solid wrap, 210 rolls of print wrap **71.** $g = \frac{5 + m}{2 + h}$ **73.** $z = \frac{c - b}{2}$

75. $-\frac{23}{14}$ **77.** −56

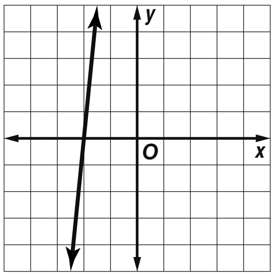
Lesson 3-2

1. 3 **3.** $\frac{1}{2}$ **5.** no solution **7.** no solution **9.** Tyrone must deliver 40 newspapers for the papers in his bag to weigh 0 pounds. **11.** −3 **13.** no solution **15.** $-\frac{10}{7}$ or $-1\frac{3}{7}$ **17.** no solutions. **19.** no solution **21.** no solution **23.** 100; She can download a total of 100 songs before the gift card is completely used. **25.** −8 **27.** $\frac{10}{3}$ or $3\frac{1}{3}$ **29.** $-\frac{34}{13}$ or $-2\frac{8}{13}$ **31.** $\frac{17}{25}$ **33.** $\frac{15}{8}$ or $1\frac{7}{8}$ **35.** 3 **37.** 4:00 P.M.

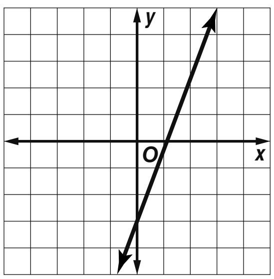
39. −3



41. −2



43. $\frac{9}{8}$ or $1\frac{1}{8}$



45a. Sample answers given:

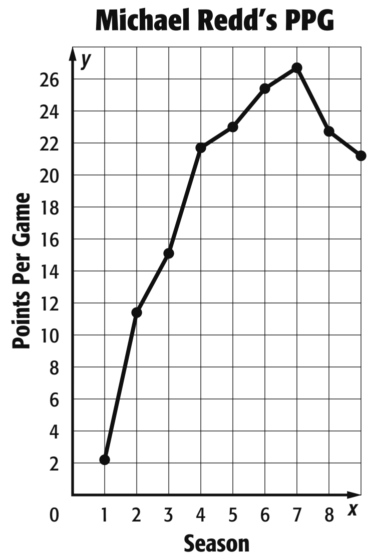
Number of Songs Downloaded	Total Cost ($)	Total Cost / Number Songs Downloaded
2	4	2
4	8	2
6	12	2
8	16	2
10	20	2

45b. increases by 4 for each 2 songs downloaded
45c. It costs $2 per song to download. **47.** 3
49. Sample answer: $3 + 4x = 0$; $y = 3 + 4x$ or $f(x) = 3 + 4x$ **51.** A **53.** B **55.** −5, 10 **57.** 7, −2
59. $3m + 2n = \frac{4}{p}$ **61.** $\frac{5}{2}$ **63.** $-\frac{1}{2}$ **65.** $\frac{2}{3}$ **67.** 11

Lesson 3-3

1. $\frac{4}{3}$ **3a.** 1.035; There was an average increase in ticket price of $1.035 per year. **3b.** Sample answer: 1998–2000; A steeper segment means a greater rate of change. **3c.** Sample answer: 1998–2000; Ticket prices show a sharp increase. **5.** No; the rate of change is not constant. **7.** −1 **9.** $\frac{7}{9}$ **11.** 0 **13.** −8 **15.** −6 **17.** $\frac{1}{2}$ **19a.** Sample answer: $P = -1221t + 19{,}820$
19b. The car value depreciates by $1221 each year.
19c. $11,273 **21.** No; the x-values do not increase at a constant rate. **23.** Yes; both the x-values and the y-values increase at a constant rate. **25.** $-\frac{3}{7}$ **27.** undefined **29.** $\frac{5}{17}$ **31.** 0 **33.** undefined **35.** $\frac{10}{3}$ **37.** $\frac{3}{4}$ **39.** 6
41. Sample answer: about −1 **43.** $\frac{15}{4}$ **45.** $-\frac{2}{3}$

47a.

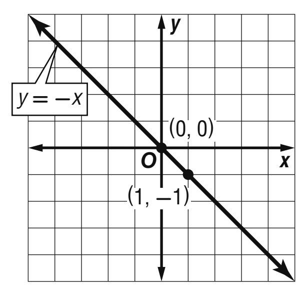


47b. Season 1 to Season 2; It is the steepest part of the graph. **47c.** The rate of change was much more dramatic or steeper in the first four years, it leveled off the next three seasons, and was negative and steeper the last two seasons.
49. See students' work. The rate of change is $2\frac{1}{4}$ inches of growth per week. **51.** Sample answer: Slope can be used to describe a rate of change. Rate of change is a ratio that describes how much one quantity changes with respect to a change in another quantity. The slope of a line is also a ratio and it is the ratio of the change in the y-coordinates to the change in the x-coordinates.
53. A **55.** $4 **57.** −6 **59.** 4 **61.** −1, 2 **63.** 12
65. $\frac{5}{16}$ **67.** 5

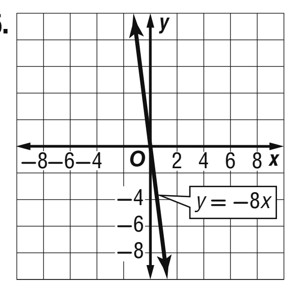
Lesson 3-4

1. $-\frac{4}{5}$; $-\frac{4}{5}$

3.

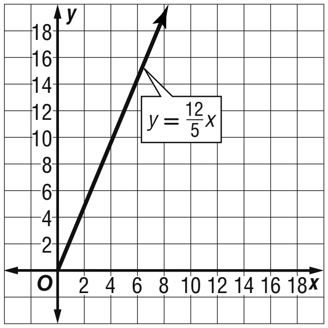


5.



7. $y = \frac{5}{4}x$; 40

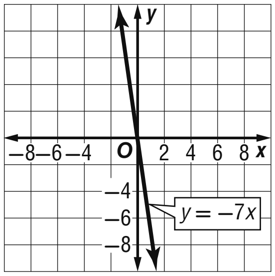
9a. $y = \frac{12}{5}x$;



9b. 40

11. -5; -5 **13.** $-\frac{1}{5}$; $-\frac{1}{5}$ **15.** -12; -12

17.



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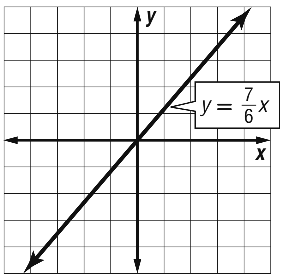

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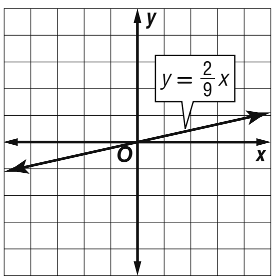
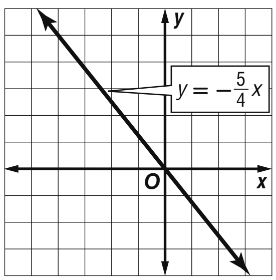


23.

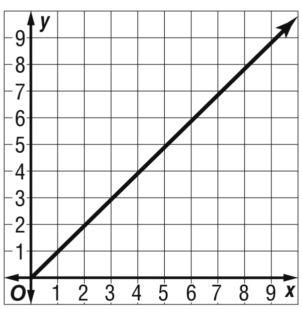


25. $y = \frac{11}{4}x$; -44 **27.** $y = 14x$; $1\frac{1}{7}$ **29a.** $y = 1800x$

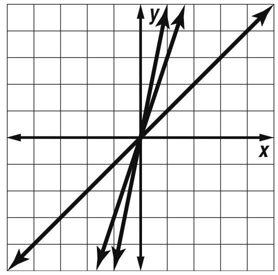
29b. 7 yr 6 mo **31.** $y = 20x$; $\frac{5}{4}$ **33.** $y = -3.75x$; -30

35. dark green **37.** lime green

39. $T = 0.99d$.



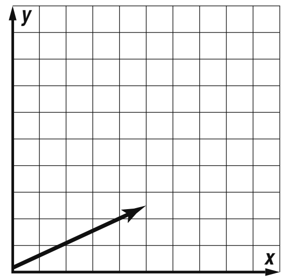
41a.



41b. Sample answer: The constant of variation, slope, and rate of change of a graph all have the same value. **41c.** Sample answer: Find the absolute value of k in each equation. The one with the greater value of $|k|$ has the steeper graph.

43. $C = 9.95n$ **45.** $z = \frac{1}{9}x$; It is the only equation that is a direct variation.

47. Sample answer: $y = 0.50x$ represents the cost of x apples. The rate of change, 0.50, is the cost per apple.



49. Neither; the slope is constant, but it is k.

51. A **53.** D **55.** 6.5; There was an average increase of 6.5 channels per year.

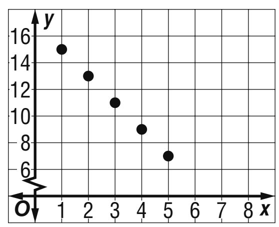
57. -7 **59.** -4 **61.** 12 **63.** 12 **65.** -2

67. -28 **69.** -12 **71.** -6 **73.** -12

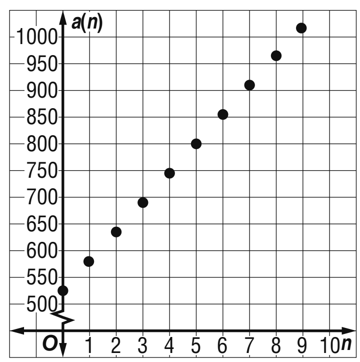
Lesson 3-5

1. No; there is no common difference. **3.** 0, -3, -6

5. $a_n = 17 - 2n$



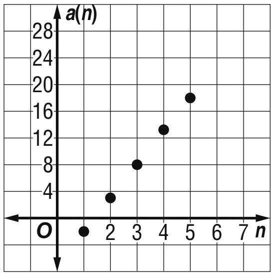
7. $a(n) = 55n + 525$



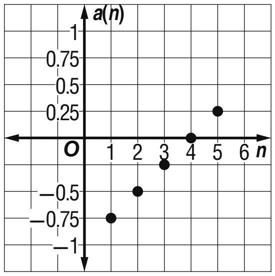
9. No; there is no common difference. **11.** Yes; the common difference is 2.6. **13.** 30, 36, 42

15. $1\frac{1}{2}$, 2, $2\frac{1}{2}$. **17.** $3\frac{7}{12}$, $4\frac{1}{3}$, $5\frac{1}{12}$

19. $a_n = 5n - 7$

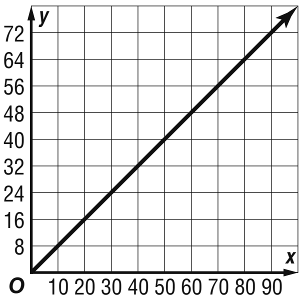


21. $a_n = 0.25n - 1$



23a. $f(n) = 0.80n$

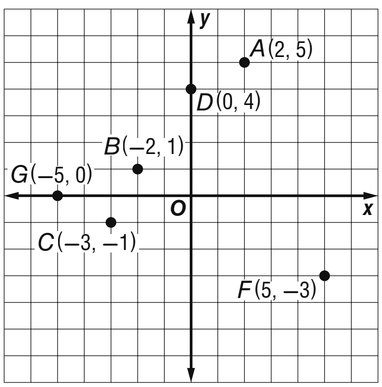
23b.



D = {10, 20, 30, 40, ...}

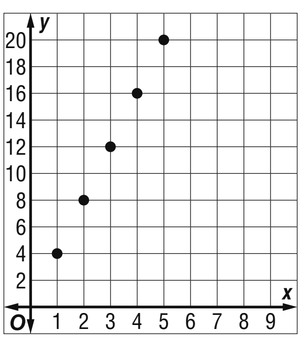
25. $f(n) = 0.25n + 5$. **27.** 77 **29.** 25,646
31a. $A_n = 2.5 + 0.5n$ **31b.** week 15 **31c.** Sample answer: No; eventually the number of miles ran per day will become unrealistic. **33.** −1 **35a.** Yes; there is a common difference.; x; $5x + 1$, $6x + 1$, $7x + 1$. **35b.** No; unless $x = 0$ there is no common difference. **37.** 8 **39.** H **41.** 3, 3 **43.** $-\frac{3}{7}$ **45.** 3
47. 2 **49.** Sample answer: $453{,}000 - d = 369{,}000$; 84,000

51–55.



Lesson 3-6

1a.



1b. $y = 4x$ **1c.** The perimeter is 4 times the length of the side.
3. $f(x) = -x + 3$

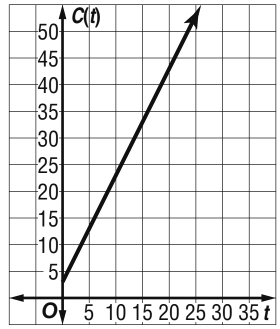
5. $f(x) = 2x$. **7.** $f(x) = 3x - 2$
9. $f(n) = 3n - 3$; nonproportional; the function does not describe a direct variation. **11.** $y = 2.25x + 2.50$

13a. Sample answer:

Number of T-shirts ordered	5	10	15	20	25
Cost ($)	13	23	33	43	53

13b. $C(t) = 2t + 3$.

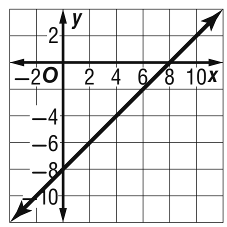
13c.



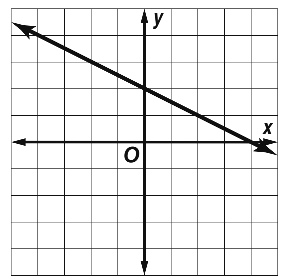
13d. The relationship is nonproportional.

15. Sample answer: 4, 7, 10, 13; add a common difference of 3; $a_n = 3n + 1$. **17.** $f(n) = 3n + 2$ is the related function for the arithmetic sequence 5, 8, 11, 14, …, but it is not proportional. The line through (1, 5) and (2, 8) does not pass through (0, 0).
19. D **21.** H **23.** 43, 53, 63 **25.** $\frac{5}{4}, \frac{11}{8}, \frac{3}{2}$
27. $y = 7x$; −12 **29a.** $V = \frac{1}{3}\pi r^2 h$
29b. about 3142 cm^3 **31.** $y = 3x - 5$

33.



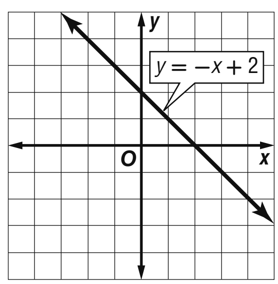
35.



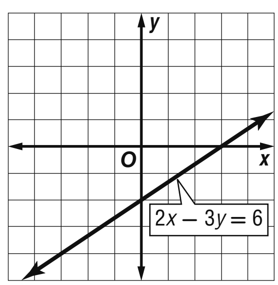
Chapter 3 Study Guide and Review

1. true **3.** false; common difference **5.** true
7. false; 0. **9.** true **11.** −8, 6

13.



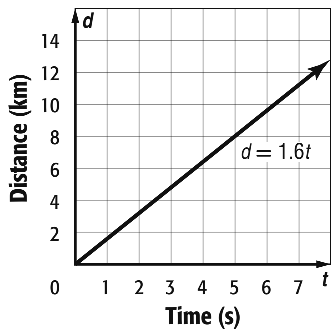
15.



17a.

t	0	1	2	3	4	5
d	0	1.6	3.2	4.8	6.4	8

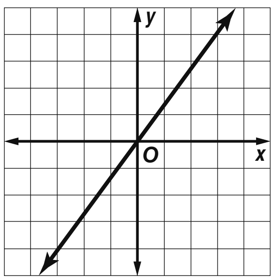
Speed of Sound



17b. about 11 km **19.** 6 **21.** $-\frac{1}{2}$

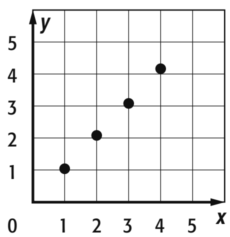
23. −7 **25.** 9 **27.** 3 **29.** $-\frac{1}{2}$ **31.** −0.05; an average decrease in cost of $0.05 per year

33.



35. $y = 7.5x$; $y = 60$
37. $y = -x$; $y = -7$
39. 26, 31, 36
41. $a_n = 5n + 1$
43. $a_n = 4820n$; 15 s

45a.



45b. $f(x) = 1.25x$
45c. $7.50

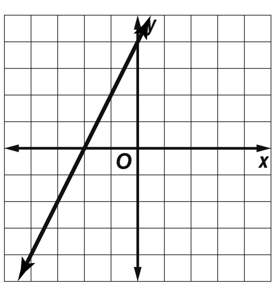
CHAPTER 4
Equations of Linear Functions

Chapter 4 Get Ready

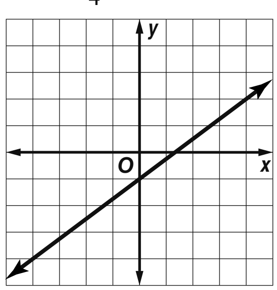
1. 13 **3.** 14 **5.** $282.50 **7.** $x = 3 + 2y$
9. $x = \frac{3}{4}y + 3$ **11.** (4, 2) **13.** (2, −4) **15.** (−3, −3)

Lesson 4-1

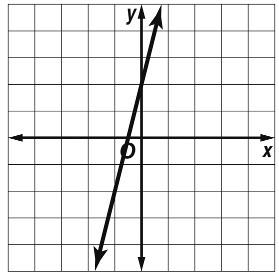
1. $y = 2x + 4$



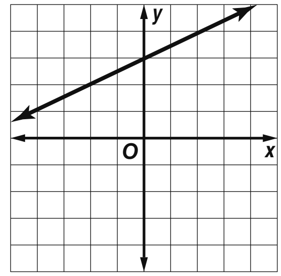
3. $y = \frac{3}{4}x - 1$



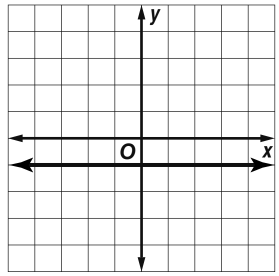
5.



7.

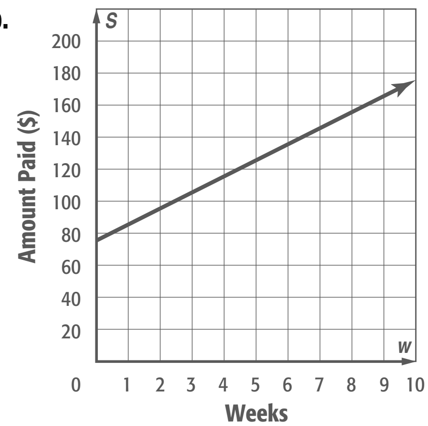


9.



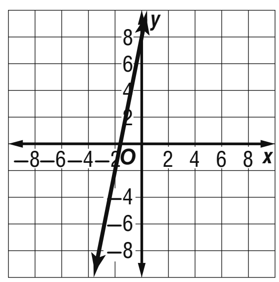
11. $y = \frac{2}{3}x + 2$ **13.** not possible **15a.** $S = 10w + 75$

15b.

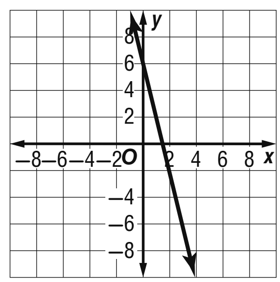


15c. $155

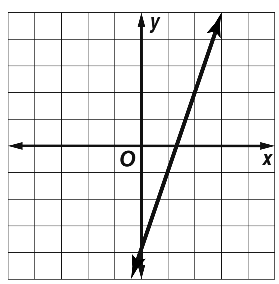
17. $y = 5x + 8$



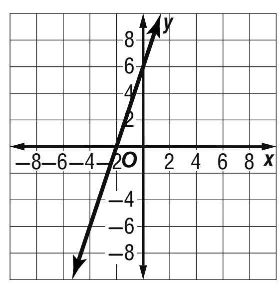
19. $y = -4x + 6$



21. $y = 3x - 4$



23.



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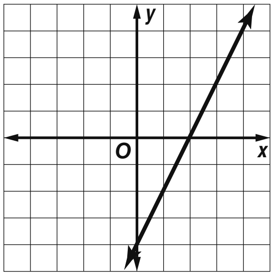

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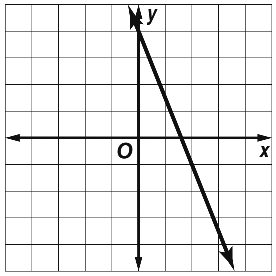

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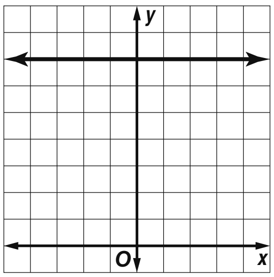

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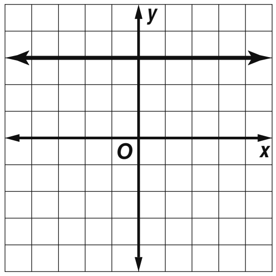
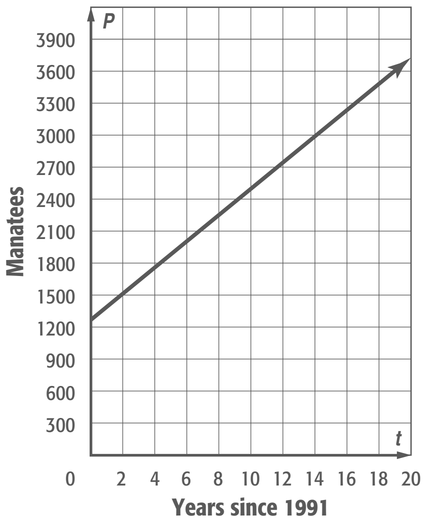


33. $y = -\frac{3}{5}x + 4$ **35.** $y = \frac{1}{2}x - 3$

37a. $P = 1267 + 123t$

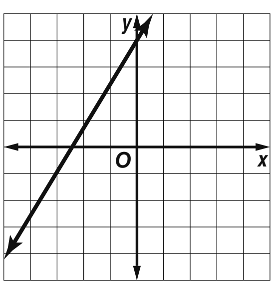
37b.



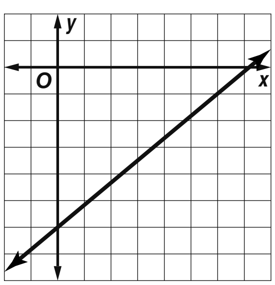
37c. 3112 manatees

39. $y = \frac{2}{3}x - 5$ **41.** $y = -\frac{3}{7}x + 2$ **43.** $y = 5$

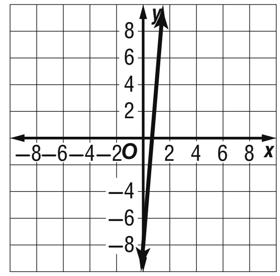
45.



47.



49.



51a. $T = 157c + 218$ **51b.** $5242 **53.** $y = 0.5x + 7.5$ **55.** $y = -1.5x - 0.25$ **57.** $y = 3x$ **59a.** $C = 45m + 145$ **59b.** the cost per month to maintain the membership

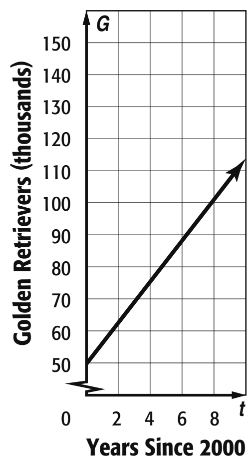
59c. the startup fee **59d.** $1225
61a. $P = 9125t + 3305$ **61b.** 12 yr **63.** No; because a vertical line has no slope, it cannot be written in slope-intercept form. **65.** Sample answer: Assume that the coefficient of y is not 0. We would first have to rewrite the equation in slope-intercept form. The rate of change is also the slope, so, the coefficient for the x-variable is the rate of change. Assume that the coefficient of y is not 0. **67.** B **69.** C **71.** $a_n = 4n - 1$; nonproportional, does not contain (0, 0) **73.** $a_n = 3n - 3$; nonproportional, does not contain (0, 0) **75a.** $25,500 **75b.** $142,500

77. $y = -4x$; -5 **79.** $y = 0.8x$; -7.5 **81.** $-\frac{2}{5}$ **83.** 0

Lesson 4-2

1. $y = 3x - 12$ **3.** $y = -x + 6$ **5.** $y = -3x + 9$
7. $y = 5x + 8$ **9a.** $C = 35p + 75$ **9b.** $600
11. $y = -x + 3$ **13.** $y = 8x - 55$ **15.** $y = 2x + 2$
17. $y = -x + 3$ **19.** $y = 7x - 16$ **21.** $y = 2x$
23a. $y = 0.2x + 0.4$ **23b.** 4.4 million **25.** $y = \frac{1}{2}x$
27. $y = -\frac{3}{4}x + 8\frac{1}{2}$ **29.** $y = \frac{2}{7}x - 2\frac{4}{7}$
31a. $G = 6.4t + 49.7$

31b.



31c. 158,500
33a. $2.75
33b. $35.40

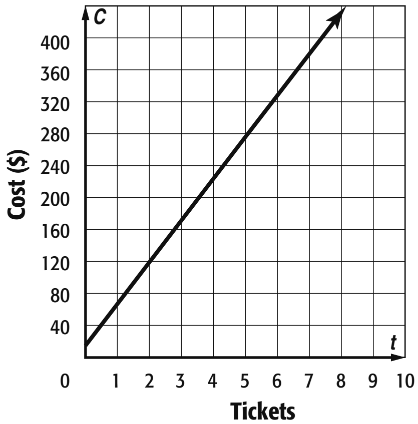
35. $y = -2\frac{2}{3}x + 10\frac{1}{3}$
37. $y = -x - \frac{7}{12}$ **39.** Yes; substituting 6 and −2 for x and y, respectively, results in and equation that is true. **41.** B; x represents the number of raffle tickets sold, y represents the total amount of money in the treasury. **43a.** 605.2 **43b.** 2032; In that year, the waste would be 0 tons. After that, the waste would be a negative amount, which is impossible.

45a. \$15; $C = 52t + 15$.

45b.

Number of tickets	3	4	6	7
Cost (\$)	171	223	327	379

45c. \$431



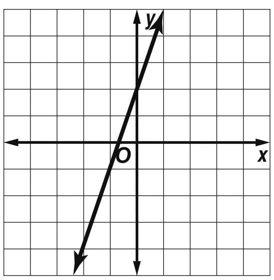
47. Jacinta; Tess switched the *x*- and *y*-coordinates on the point that she entered in Step 3.

49a. $y = -\frac{A}{B}x + \frac{C}{B}$ **49b.** slope $= -\frac{A}{B}$

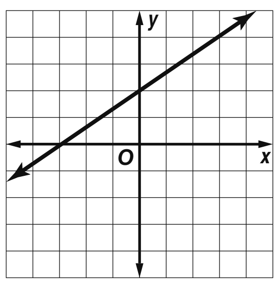
49c. *y*-intercept $= \frac{C}{B}$ **49d.** No, $B \neq 0$ **51.** Sample answer: If the problem is about something that could suddenly change, such as weather or prices, the graph could suddenly spike up. You need a constant rate of change to produce a linear graph.

53. D **55.** B

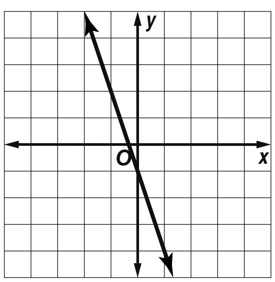
57.



59.

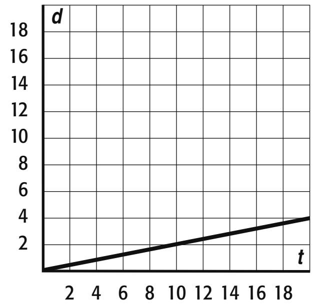


61.



63. $f(x) = -2x$

65a.



65b. about 14 seconds

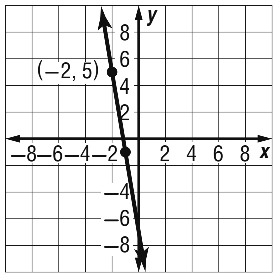
67. -22 **69.** -207

71. 1.5 **73.** 7

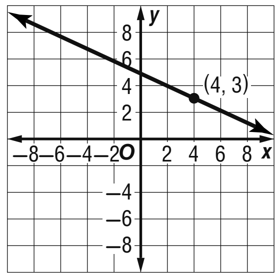
75. -1 **77.** 1

Lesson 4-3

1. $y - 5 = -6(x + 2)$

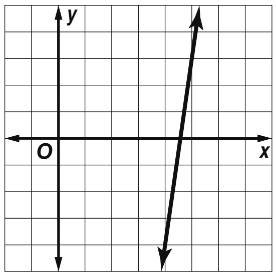


3. $y - 3 = -\frac{1}{2}(x - 4)$

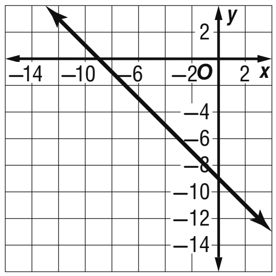


5. $5x + y = -22$ **7.** $y = 4x + 34$ **9.** $y = x + 13$

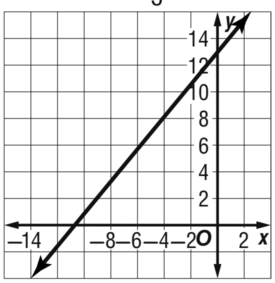
11. $y - 3 = 7(x - 5)$



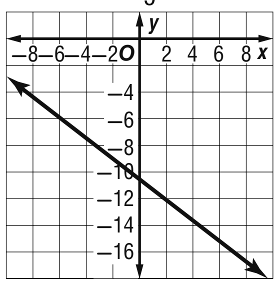
13. $y + 3 = -1(x + 6)$



15. $y - 11 = \frac{4}{3}(x + 2)$



17. $y + 9 = \frac{7}{5}(x + 2)$



19. $2x - y = 6$ **21.** $6x + y = -45$

23. $9x - 10y = 43$ **25.** $x + 6y = -7$

27. $y = -2x + 20$ **29.** $y = -6x - 47$

31. $y = \frac{1}{6}x - \frac{8}{3}$ **33.** $y = -\frac{2}{3}x - 5$

35. 24 copies **37.** $x + y = 6$ **39.** $5x + 4y = 20$

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

43. $y = x - 1$ **45.** $y = \frac{5}{6}x$ **47.** $y - 4 = \frac{4}{7}(x + 9)$; $y = \frac{4}{7}x + \frac{64}{7}$; $4x - 7y = -64$ **49.** $y + 4 = 3(x + 1)$; The slope-intercept form is not $y = 3x + 2$.

51. Sample answer: Jocari spent \$14 to go to an amusement park and ride ponies. The price she paid included admission. The 5 pony rides cost \$2 each; $y - 14 = 2(x - 5)$, $-2x + y = 4$, $y = 2x + 4$.

53. Sample answer: $y - g = \frac{j - g}{h - f}(x - f)$ **55.** B

57. J **59.** $y = x - 2$ **61.** $y = -2x + 1$ **63.** $y = -2$

65. $y = -2x + 6$ **67.** $y = \frac{1}{2}x + 3$ **69.** $y = 3$

71. Yes; there are only 364 seats. **73.** $a = \frac{v - r}{t}$

75. $b = \frac{-t + 5}{4}$

Lesson 4-4

1. $y = \frac{1}{2}x + 2\frac{1}{2}$ **3.** Slope of $\overline{AC} = \frac{1 - 7}{-2 - 5}$ or $\frac{6}{7}$; slope of $\overline{BD} = \frac{-3 - 4}{3 - (-3)}$ or $-\frac{7}{6}$; the paths are perpendicular.

5. $y = -2x$ and the other two graphs are perpendicular; slopes are opposite reciprocals; $2y = x$ and $4y = 2x + 4$ are parallel; equal slopes.

7. $y = 2x + 7$ **9.** $y = \frac{3}{2}x$ **11.** $y = x - 5$

13. $y = -5x + 2$ **15.** $y = -\frac{3}{4}x + 1\frac{1}{2}$ **17.** Yes; the line containing $\overline{AD}$ and the line containing $\overline{BC}$ have the same slope, $\frac{1}{3}$. Therefore, one pair of sides is parallel. The slope of $\overline{AB}$ is undefined and the slope of $\overline{CD}$ is $-\frac{5}{3}$. **19.** Yes; the slopes are -6 and $\frac{1}{6}$. **21.** $2x - 8y = -24$ and $4x + y = -2$ are perpendicular ; $2x - 8y = -24$ and $x - 4y = 4$ are parallel.

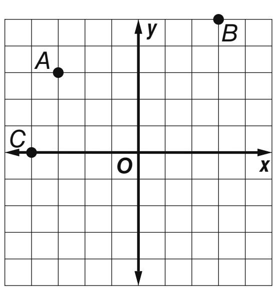
23. $y = \frac{1}{2}x - \frac{1}{2}$ **25.** $y = -3x - 7$ **27.** $y = -\frac{1}{5}x + 8\frac{3}{5}$

29. $y = 2x + 16$ **31.** $y = -\frac{1}{5}x - \frac{3}{25}$ **33.** neither

35. perpendicular **37.** neither **39.** $y = 7x$

41. Yes; the slope of the line through the hair accessories and the pottery is $-\frac{7}{2}$. The slope of the line through the endpoints of the pole is $\frac{2}{7}$, so the lines are perpendicular.

43a.



43b. Sample answer: (2, 2); $\overline{AB}$ and $\overline{CD}$ both have slope $\frac{1}{3}$, and $\overline{AC}$ and $\overline{BD}$ both have slope 3.

43c. Two; sample answer: Move C to $(-2, 0)$ and move D to $(4, 2)$. Moving C changes the slope of $\overline{AC}$ to -3. This is the opposite reciprocal of the slope of $\overline{AB}$, $\frac{1}{3}$. Moving D also changes the slope of $\overline{BD}$ so $\overline{BD}$ is perpendicular to $\overline{AB}$ and $\overline{CD}$ and it is parallel to $\overline{AC}$.

45. Sample answer: Parallel lines: similarities: The domain and range are all real numbers, the functions are both either increasing or decreasing on the entire domain, the end behavior is the same; differences: x- and y-intercepts are different. Perpendicular lines: similarities: The domain and range are all real numbers; differences: One function is increasing and the other is decreasing on the entire domain, as x decreases, y increases for one function and decreases for the other and as x increases, y increases for one function and decreases for the other. **47.** Carmen; she correctly determined the slope of the perpendicular line.

49. B **51.** B **53.** $4x - y = -5$ **55.** $5x + y = -8$

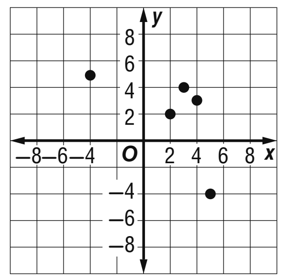
57. $5x - 6y = 14$ **59a.** $C = 10h + 15$ **59b.** \$95

61. $y = -5x - 21$ **63.** $y = 2x - 1$ **65.** $y = -5x - 6$

67. simplified **69a.** $25(5) + 10(8.5) + 35(5) + 12(8.5)$

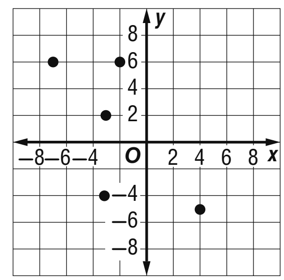
69b. \$487

71.



D = {3, 4, 2, 5, −4};
R = {4, 3, 2, −4, 5}

73.

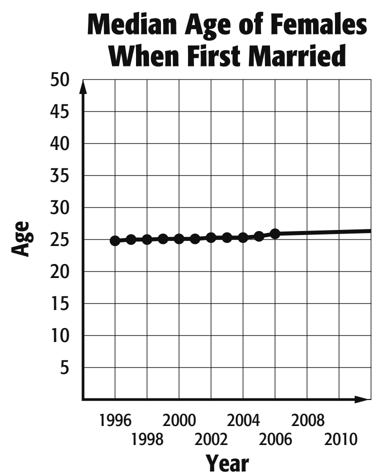


D = {−7, −3, 4, −2};
R = {6, −4, −5, 2}

Lesson 4-5

1. Positive; the longer you practice free throws, the more free throws you will make.

3a, b.



Positive; independent variable is year and dependent variable is median age of females when they were first married. **3c.** Sample answer: Using (1996, 24.8) and (2006, 25.9) and rounding, $y = 0.11x - 194.8$ **3d.** Sample answer: 27.0 **3e.** Yes, according to the equation, the median age would be 31.4, which is likely.

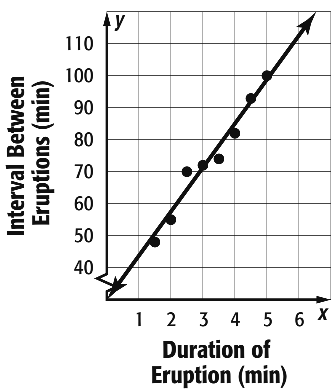
5. Negative; the taller the NBA player, the lower his 3-point shooting percentage.

7. No; various vehicles give too many varying results for there to be a correlation.

9a. $y = -648.5x + 74{,}447.5$ **9b.** 61,478 **9c.** No; the average attendance will fluctuate with other variables such as how good the team is that year.

11a. The independent variable is the interval between eruptions and the dependent variable is the duration of the eruptions. There is a positive correlation between the independent and dependent variables. See Ch.4 Answer Appendix for graph.

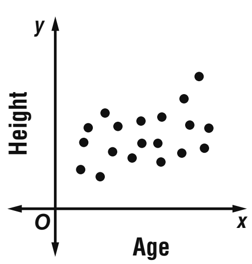
"Old Faithful"



11b. Sample answer using (2, 55) and (4, 82): $y = 13.5x + 28$; Sample answer: about 129.25 min

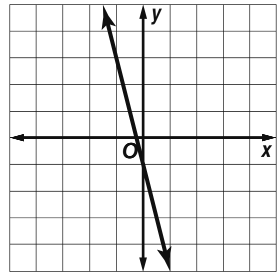
11c. Sample answer: The duration of an eruption is not dependent on the previous interval. Only the interval can be predicted by the length of the eruption.

13. Sample answer: The salary of an individual and the years of experience that they have; this would be a positive correlation because the more experience an individual has, the higher the salary would probably be. **15.** Neither; line g has the same number of points above the line and below the line. Line f is close to 2 of the points; but for the rest of the data, there are 3 points above and 3 points below the line. **17.** Sample answer: You can visualize a line to determine whether the data has a positive or negative correlation. The graph below shows the ages and heights of people. To predict a person's age given his or her height, write a linear equation for the line of fit. Then substitute the person's height and solve for the corresponding age. You can use the pattern in the scatter plot to make decisions.



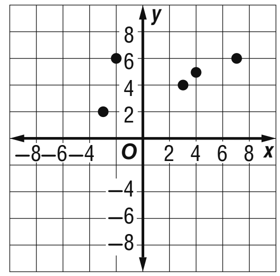
19. F **21.** 22 days
23. neither
25. perpendicular
27. $2x + y = 1$
29. $x - 2y = 12$
31. $2x + 5y = 26$

33.



35. $\frac{4}{7}$ **37.** $\frac{3}{5}$
39. 16 **41.** 1.5 h

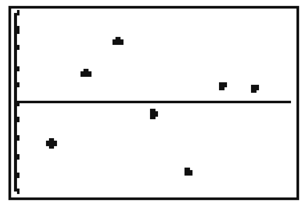
43.



$D = \{7, 3, 4, -2, -3\}$;
$R = \{6, 4, 5, 2\}$

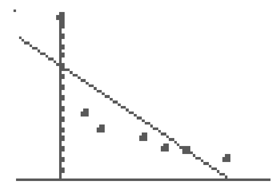
Lesson 4-6

1a. $y = 1.18x + 11$; 0.7181
1b. The residuals appear to be randomly scattered, so the regression line fits the data reasonably well.



[0, 8] scl: 1.5 by [−5, 5] scl: 1.5

3a. $y = -271.88x + 554.48$
3b. $78.69



[−0.5, 2.5] scl: 1 by [0, 785] scl: 10

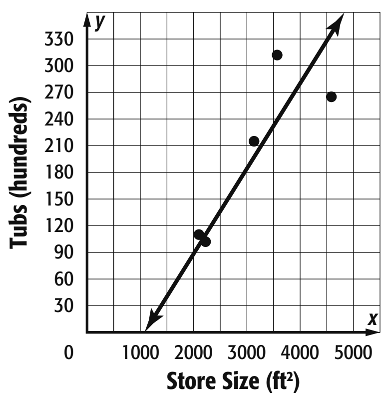
5. $y = 3.54x + 19.68$; 0.9007.

7a. $y = 601.44x + 1236.13$.

7b. about 18,076

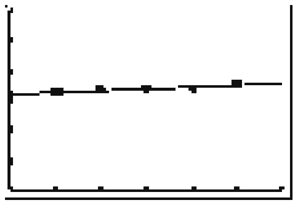
9a. $y = 0.095x - 94.58$

9b.



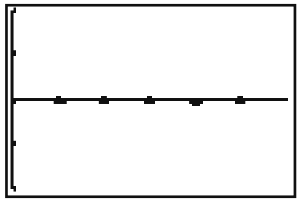
9c. about 48 tubs; about 380 tubs

11a. $y = 0.0326x + 1.598$



[0, 6] scl: 1 by [0, 3] scl: 0.5

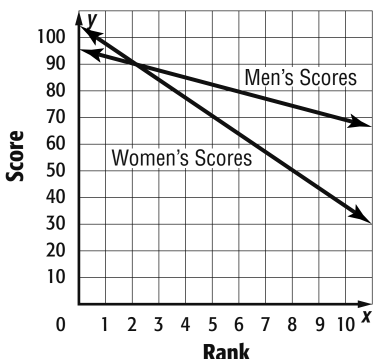
11b. The regression line is a good fit as the residuals appear to almost be on the line.



[0, 6] scl: 1 by [−2, 2] scl: 1

11c. about 2.12 million people
13a. $y = 87{,}390.5x + 4{,}018{,}431$ **13b.** about 5,591,460

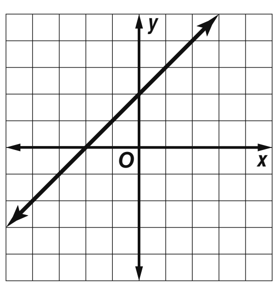
15.



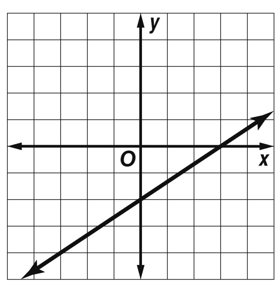
Sample answer: Men: $y = -2.92x + 95.92$; Women: $y = -7x + 106$; Women's scores have a steeper slope.

17. See students' work. **19.** C **21.** H
23a. negative correlation **23b.** \$3600
23c. No; according to the line of fit, the price would be \$0.
25. $3x - y = 1$ **27.** $2x + y = 8$
29. $2x - 3y = -21$ **31.** $\frac{4}{7}$ **33.** $\frac{3}{5}$ **35.** 3 **37.** $a^2 - a + 1$

39.



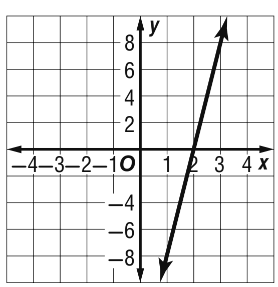
41.



Lesson 4-7

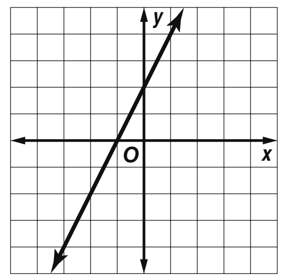
1. {(−15, 4), (−18, −8), (−16.5, −2), (−15.25, 3)}

3.



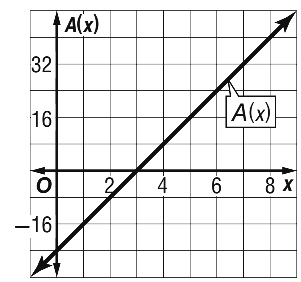
5. $f^{-1}(x) = -\frac{1}{2}x + \frac{7}{2}$ **7a.** $C^{-1}(x) = \frac{1}{70}x - \frac{60}{7}$
7b. x is Dwayne's total cost, and $C^{-1}(x)$ is the number of games Dwayne attended. **7c.** 5
9. {(−49, −4), (35, 8), (−28, −1) (7, 4)}
11. {(7.4, −3), (4, −1), (0.6, 1), (−2.8, 3), (−6.2, 5)}

13.



15. $f^{-1}(x) = -3x + 51.$
17. $f^{-1}(x) = -\frac{1}{6}x + 2$ **19.** $f^{-1}(x) = -\frac{3}{4}x - 12$
21a. $C^{-1}(x) = \frac{1}{35}x - \frac{2}{7}$ **21b.** x is the total amount collected from the Fosters, and $C^{-1}(x)$ is the number of times Chuck mowed the Fosters' lawn.
21c. 22 **23.** $f^{-1}(x) = 15 - 5x$ **25.** $f^{-1}(x) = \frac{3}{2}x + 12$
27. $f^{-1}(x) = 3x - 3$ **29.** B **31.** A
33. $f^{-1}(x) = \frac{3}{2}x - 12$ **35.** $f^{-1}(x) = \frac{1}{4}x + \frac{3}{4}$
37a. $A(x) = 8(x - 3)$ or $A(x) = 8x - 24$

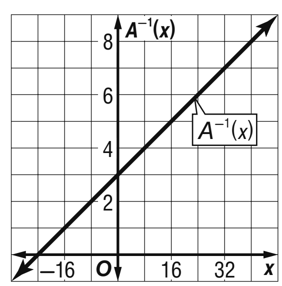
37b.



Sample answer: The domain represents possible values of x. The range represents the area of the rectangle and must be positive. This means that the domain of $A(x)$ is all real numbers greater than 3, and the range of $A(x)$ is all positive real numbers.

37c. $A^{-1}(x) = \frac{1}{8}x + 3$; x is the area of the rectangle and $A^{-1}(x)$ is the value of x in the expression for the length of the side of the rectangle $x - 3$.

37d.

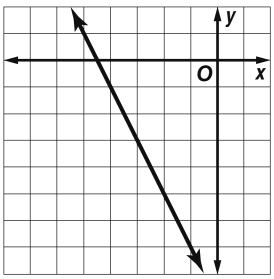


Sample answer: The domain represents the area of the rectangle and must be positive. The range represents possible values for x in the expression $x - 3$. This means that the domain of $A^{-1}(x)$ is all positive real numbers, and the range of $A^{-1}(x)$ is all real numbers greater than 3. **37e.** Sample answer: The domain of $A(x)$ is the range of $A^{-1}(x)$, and the range of $A(x)$ is the domain of $A^{-1}(x)$. **39.** $a = 2$; $b = 14$ **41.** Sometimes; sample answer: $f(x)$ and $g(x)$ do not need to be inverse functions for $f(a) = b$ and $g(b) = a$. For example, if $f(x) = 2x + 10$, then $f(2) = 14$ and if $g(x) = x - 12$, then $g(14) = 2$, but $f(x)$ and $g(x)$ are not inverse functions. However, if $f(x)$ and $g(x)$ are inverse functions, then $f(a) = b$ and $g(b) = a$. **43.** Sample answer: A situation may require substituting values for the dependent variable into a function. By finding the inverse of the function, the dependent variable becomes the independent variable. This makes the substitution an easier process. **45.** F **47.** 4.2 **49.** $y = 8.235x - 17.365$ **51.** $y = 0.325x + 0.89$ **53.** 100 **55.** 11.7 **57.** 171 **59.** −77 **61.** 100

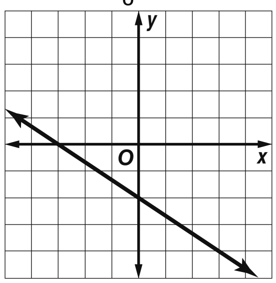
Chapter 4 Study Guide and Review

1. true **3.** true **5.** true **7.** false, inverse function
9. false, slope-intercept form

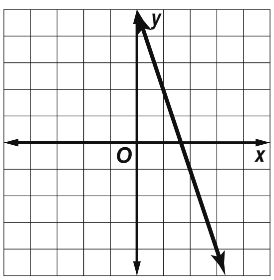
11. $y = -2x - 9$



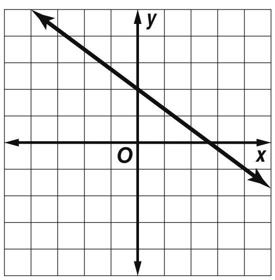
13. $y = -\frac{5}{8}x - 2$



15.



17.



19. $y = 3x - 1$ **21.** $y = \frac{2}{5}x + \frac{1}{5}$ **23.** $y = x - 3$
25. $y = \frac{1}{2}x + \frac{7}{2}$ **27.** $y = 60x + 450$ **29.** $y - 1 = -3(x + 2)$ **31.** $5x - y = 7$ **33.** $x - 2y = 11$
35. $y = 3x - 13$ **37.** $y = 5x + 2$ **39.** $y = x + 3$
41. $y = -2x - 7$ **43.** $y = -\frac{1}{3}x + \frac{14}{3}$
45. $y = -3x - 13$ **47.** positive **49.** $y = 5.36x + 11$; 65
51. {(3.5, 7), (8, 6.2), (2.7, −4), (1.4, −12)}
53. {(2.7, −4), (3.8, −1), (4.1, 0), (7.2, 3)}
55. $f^{-1}(x) = \frac{11}{5}x - 22$ **57.** $f^{-1}(x) = -\frac{1}{4}x - 3$
59. $f^{-1}(x) = -\frac{3}{2}x + \frac{3}{8}$

CHAPTER 5
Linear Inequalities

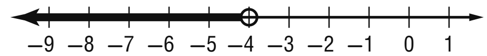
Chapter 5 Get Ready

1. −10 **3.** 24.6 **5.** −11 **7.** 21 **9.** 5 **11.** −4
13. {−29, 7} **15.** 34%, 30%

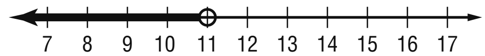
Lesson 5-1

1. $\{x \mid x > 10\}$

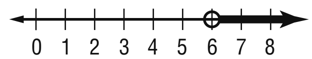
3. $\{g \mid g < -4\}$



5. $\{n \mid n < 11\}$

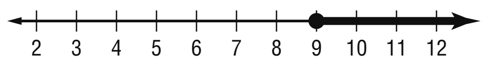


7. $\{r \mid r > 6\}$

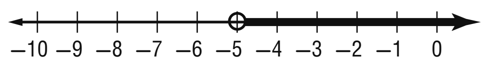


9. Sample answer: Let n = the number, $2n + 4 \geq n + 10$; $\{n \mid n \geq 6\}$.
11. no more than 92 ft

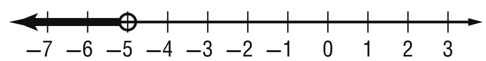
13. $\{p \mid p \geq 9\}$



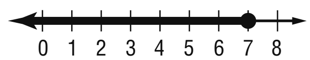
15. $\{t \mid t > -5\}$



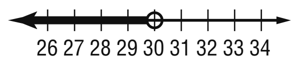
17. $\{r \mid r < -5\}$



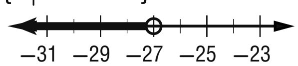
19. $\{q \mid q \leq 7\}$



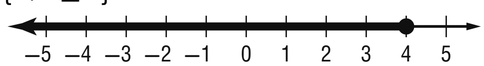
21. $\{h \mid h < 30\}$



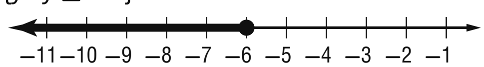
23. $\{c \mid c < -27\}$



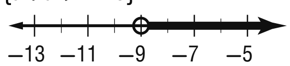
25. $\{z \mid z \leq 4\}$



27. $\{y \mid y \leq -6\}$

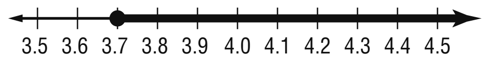


29. $\{a \mid a > -9\}$

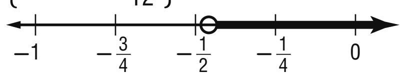


31. Let n = the number, $2n + 5 \leq n - 3$; $\{n \mid n \leq -8\}$.
33. Let n = the number, $6n - 8 < 5n + 21$; $\{n \mid n < 29\}$.

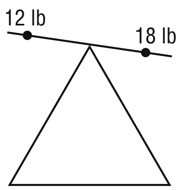
35. Sample answer: Let n = the number of online teens that do not use the Internet at school in millions; $n > 21 - 16$; $\{n \mid n > 5\}$; at least 5 million teens use the Internet but not at school.
37. Sample answer: Let t = the original water temperature; $t + 4 < 81$; $\{t \mid t < 77\}$; the water temperature was originally less than 77°.
39. Sample answer: Let m = the amount of money left on the gift card; $32 + 26 + m \leq 75$; $\{m \mid m \leq 17\}$; there will be no more than \$17 left on her gift card.
41. $\{c \mid c \geq 3.7\}$



43. $\left\{k \mid k > -\frac{5}{12}\right\}$



45a.



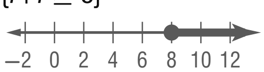
45b. 12 lb < 18 lb
45c.

	12	<	18
2×	24	<	36
3×	36	<	54
4×	48	<	72
$\frac{1}{2}$×	6	<	9
$\frac{1}{3}$×	4	<	6
$\frac{1}{4}$×	3	<	$4\frac{1}{2}$

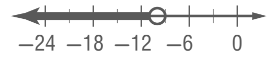
45d. If a true inequality is multiplied by a positive number, the resulting inequality is also true. If a true inequality is divided by a positive number, the resulting inequality is also true.
47 10 **49** 3 **51** 26 **53** $c < a < d < b$
55 Solving linear inequalities is similar to solving linear equations. You must isolate the variable on one side of the inequality. To graph, if the problem is a less than or a greater than inequality, an open circle is used. Otherwise a dot is used. If the variable is on the left hand side of the inequality, and the inequality sign is less than (or less than or equal to), the graph extends to the left; otherwise it extends to the right.
57 C **59** B **61** $f(x)^{-1} = \frac{1}{7}x + 4$
63 $f(x)^{-1} = -3x - 24$ **65** $y = -x - 2$
67 $y = -2x - 1$ **69** blue **71** 25 **73** $y = 7x$; \$210
75 -30 **77** $\frac{1}{10}$ **79** 16 **81** $-\frac{1}{9}$

Lesson 5-2

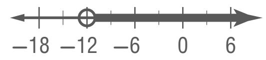
1. Let d = the number of DVDs sold; $15d > 5500$; $d > 366.67$; the band sold at least 367 DVDs.
3. $\{r \mid r \geq 8\}$



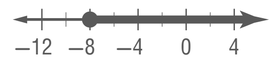
5. $\{h \mid h < -10\}$



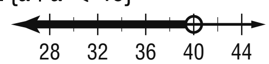
7. $\{v \mid v > -12\}$



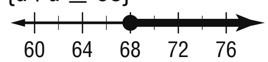
9. $\{z \mid z \geq -8\}$



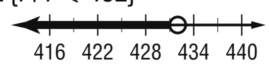
11. Let p = the number of pay periods for which Rodrigo will need to save; $25p \geq 560$; $p \geq 22.4$; Rodrigo will need to save for 23 weeks.
13. $\{a \mid a < 40\}$



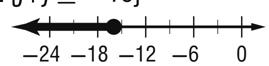
15. $\{d \mid d \geq 68\}$



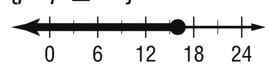
17. $\{f \mid f < 432\}$



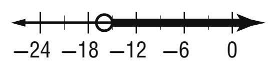
19. $\{j \mid j \leq -16\}$



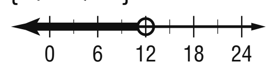
21. $\{p \mid p \leq 16\}$



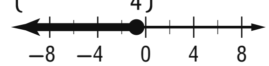
23. $\{y \mid y > -16\}$



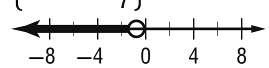
25. $\{v \mid v < 12\}$



27. $\left\{b \mid b \leq -\frac{3}{4}\right\}$

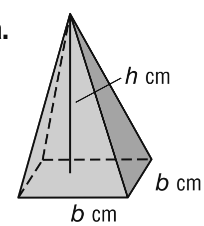


29. $\left\{f \mid f < -\frac{5}{7}\right\}$



31. no more than 4 **33.** no more than 32 people
35. b **37.** d **39.** fewer than 63 employees

41a.



41b. $h = \frac{216}{b^2}$

41c.

b	1	3	6	9	12
h	216	24	6	$\frac{8}{3}$	$\frac{3}{2}$

41d. $b < h$ when $0 < b < 6$; $b > h$ when $h < 6$.

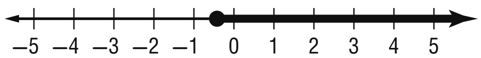
43a. $x > -\frac{5}{a}$ **43b.** $x \geq 8a$ **43c.** $x \leq -\frac{6}{a}$

45. Sometimes; the statement is true when $a > 0$ and $b < 0$.

47. Sample answer: The same processes are used when solving linear inequalities and equations that involve addition, subtraction, multiplication, or division by a positive number. However, when a linear inequality is multiplied or divided by a negative number, the inequality symbol must change directions so that the inequality remains true.

49. 10 in. **51.** C

53. $\left\{y \mid y \geq -\frac{11}{26}\right\}$



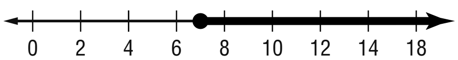
55. $f^{-1}(x) = -\frac{1}{6}x + 3$ **57.** $f^{-1}(x) = \frac{1}{4}x + \frac{5}{4}$

59. 2 hours **61.** {1, 7} **63.** 2 **65.** $\frac{33}{8}$ **67.** 3

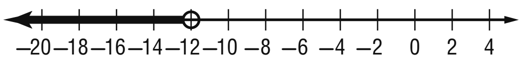
Lesson 5-3

1. $4n + 60 \leq 800$; $n \leq 185$; at most 185 lb per person

3. $\{h \mid h \geq 7\}$

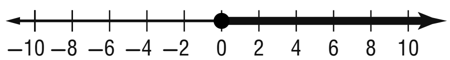


5. $\{x \mid x < -12\}$

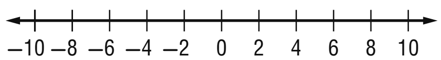


7. Sample answer: Let n = the number; $4n - 6 > 8 + 2n$; $\{n \mid n > 7\}$.

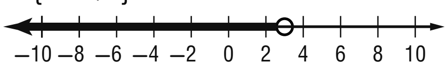
9. $\{v \mid v \geq 0\}$



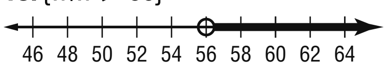
11. ∅



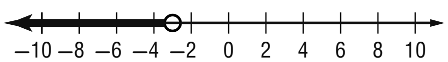
13. $\{a \mid a < 3\}$



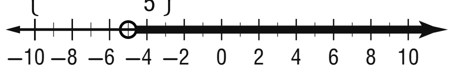
15. $\{w \mid w > 56\}$



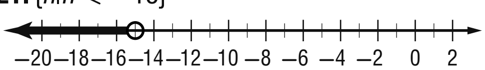
17. $\{w \mid w < -3\}$



19. $\left\{p \mid p > -\frac{24}{5}\right\}$



21. $\{h \mid h < -15\}$

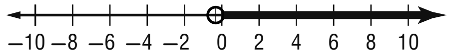


23. Sample answer: Let n = the number; $\frac{2}{3}n + 6 \geq 22$; $\{n \mid n \geq 24\}$.

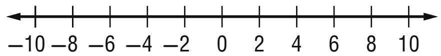
25. Sample answer: Let n = the number; $8n - 27 \leq -n + 18$; $\{n \mid n \leq 5\}$.

27. Sample answer: Let n = the number; $3(n + 7) > 5n - 13$; $\{n \mid n < 17\}$

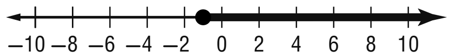
29. $\left\{n \mid n > -\frac{1}{3}\right\}$



31. ∅



33. $\{t \mid t \geq -1\}$



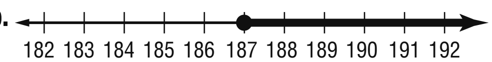
35. Sample answer: Let s = the amount of sales made, $35{,}000 + 0.08s > 65{,}000$; $\{s \mid s > 375{,}000\}$; the sales must be more than $375,000.

37.

$6(m - 3) > 5(2m + 4)$	Original inequality
$6m - 18 > 10m + 20$	Distributive Property
$6m - 18 - 6m > 10m + 20 - 6m$	Subtract $6m$ from each side.
$-18 > 4m + 20$	Simplify.
$-18 - 20 > 4m + 20 - 20$	Subtract 20 from each side.
$-38 > 4m$	Simplify.
$\frac{-38}{4} > \frac{4m}{4}$	Divide each side by 4.
$-9.5 > m$	Simplify.
$\{m \mid m < -9.5\}$	

39a. $5t + 565 \geq 1500$; $t \geq 187$

39b.



41a. $t > 104$ **41b.** $\frac{9}{5}C + 32 > 104; C > 40$

43. 1, 3, 5, 7; 3, 5, 7, 9; 5, 7, 9, 11; 7, 9, 11, 13

45. $\left\{x \mid x \geq \frac{1}{2}\right\}$ **47.** $\{m \mid m \geq 18\}$ **49.** $\{x \mid x \leq 8\}$

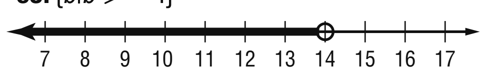
51. $\{x \mid x > -6\}$ **53.** $\{x \mid x \geq 1.5\}$ **55.** Add $3p$ and 2 to each side. The inequality becomes $9 \geq 3p$. Then divide each side by 3 to get $3 \geq p$.

57a. $\left\{x \mid x \geq -\frac{9}{2a}\right\}$ **57b.** $\left\{x \mid x > \frac{2}{1 + a}\right\}$ **57c.** $\{x \mid x < 6a\}$

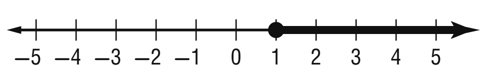
59. Sample answer: Inequalities may have many solutions, while linear equations have at most one solution. The solution set for an inequality that results in a false statement is the empty set, as in $12 < -15$. The solution set for an inequality in which any value of x results in a true statement is all real numbers, as in $12 \leq 12$.

61. G **63.** D **65.** $\{b \mid b > -4\}$

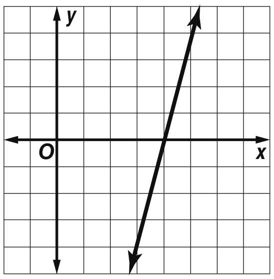
67. $\{h \mid h < 14\}$



69. $\{m \mid m \geq 1\}$



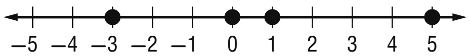
71. 4



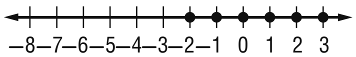
73. about 70.1 million

75. 8 **77.** 12(29.95 + 4) or 12(29.95) + 12(4); \$407.40

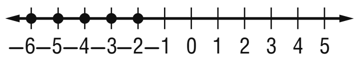
79.



81.



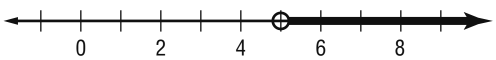
83.



Lesson 5-4

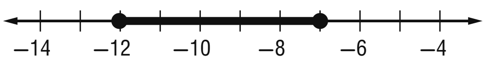
1. $\{p \mid 12 \leq p \leq 16\}$

3. $\{a \mid a > 5\}$

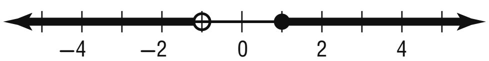


5. 11 psi $\leq x \leq$ 56 psi

7. $\{n \mid -12 \leq n \leq -7\}$.

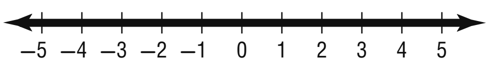


9. $\{t \mid t \geq 1$ or $t < -1\}$

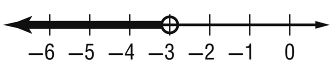


11. $\{c \mid -1 \leq c < 2\}$

13. $\{m \mid m$ is a real number.$\}$



15. $\{y \mid y < -3\}$

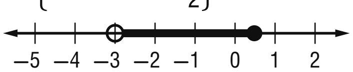


17. Sample answer: Let x = the smaller of two consecutive odd numbers, then $8 \leq 2x + 2 \leq 24$; $3 \leq x \leq 11$; 3, 5; 5, 7; 7, 9; 9, 11; 11, 13

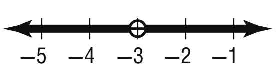
19. $-3 < x \leq 2$. **21.** $x < -4$ or $x > -3$

23. $x \leq -3$ or $x > 0$

25. $\left\{a \mid -3 < a \leq \frac{1}{2}\right\}$



27. $\{n \mid n < -3$ or $n > -3\}$



29. Sample answer: Let n = the number; $5 \leq n - 8 \leq 14$; $\{n \mid 13 \leq n \leq 22\}$. **31.** $-5n > 35$ or $-5n < 10$; $\{n \mid n < -7$ or $n > -2\}$ **33.** $t < 75$ or $t > 90$

35. $t \geq 23$ and $t \leq 33$; $23 \leq t \leq 33$.

37a. $111 \leq x \leq 130$; $131 \leq x \leq 155$ **37b.** $\varnothing$.

39. Neither; Chloe did not add 5 to 3, and Jonas did not add 5 to 7. **41.** Sample answer: $x \leq 2$ or $x \geq 4$

43. Sample answer: The speed at which a roller coaster runs while staying on the track could represent a compound inequality that is an intersection.

45. H **47.** B **49.** at least 22 subscriptions

51. 5.6 **53.** 3.94 **55.** 3.28 **57.** Yes; for each input there is exactly one output. **59.** No; the domain value −4 is paired with both −1 and 11.

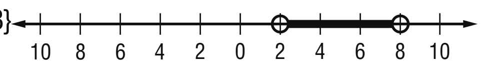
61.
$$\begin{aligned} &5 + (4 - 2^2) \\ &= 5 + (4 - 4) \\ &= 5 + 0 \\ &= 5 \end{aligned}$$

63.
$$\begin{aligned} &2(4 \cdot 9 - 3) + 5 \cdot \frac{1}{5} \\ &= 2(36 - 3) + 5 \cdot \frac{1}{5} \\ &= 2(33) + 5 \cdot \frac{1}{5} \\ &= 66 + 5 \cdot \frac{1}{5} \\ &= 66 + 1 \\ &= 67 \end{aligned}$$

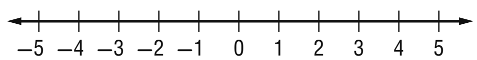
65. 3 **67.** $12\frac{2}{3}$ **69.** 30 **71.** 10

Lesson 5-5

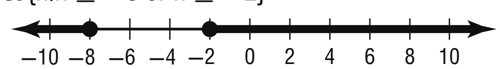
1. $\{a \mid 2 < a < 8\}$



3. $\varnothing$

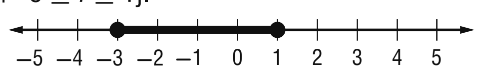


5. $\{n \mid n \leq -8$ or $n \geq -2\}$

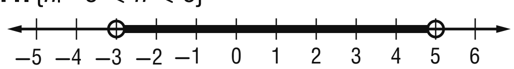


7. $\{m \mid 70.10 \leq m \leq 71.60\}$

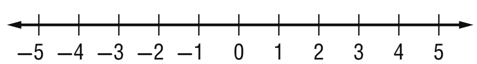
9. $\{r \mid -3 \leq r \leq 1\}$.



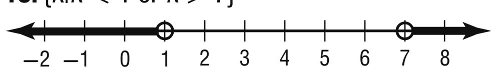
11. $\{h \mid -3 < h < 5\}$



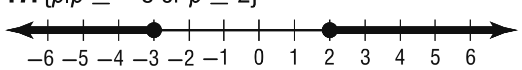
13. $\varnothing$



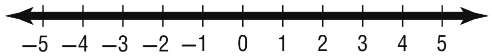
15. $\{k \mid k < 1$ or $k > 7\}$



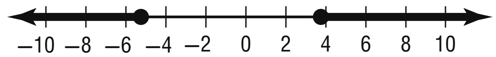
17. $\{p \mid p \leq -3$ or $p \geq 2\}$



19. {c|c is a real number.}

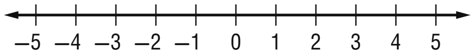


21. $\{n \mid n \leq -5\frac{1}{4} \text{ or } n \geq 3\frac{3}{4}\}$

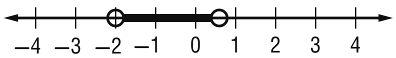


23. $\{h \mid -5\frac{2}{3} < h < 5\}$

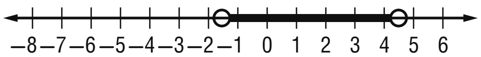
25. ∅



27. $\{r \mid -2 < r < \frac{2}{3}\}$

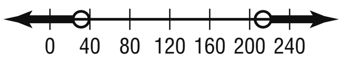


29. $\{h \mid -1.5 < h < 4.5\}$

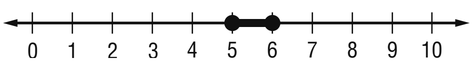


31a. $\{t \mid t < 32 \text{ or } t > 212\}$

31b.

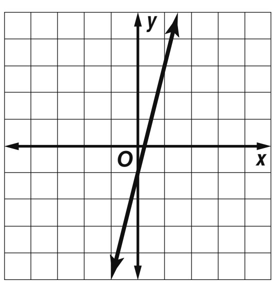


31c. $|t - 122| > 90$ **33.** $|x + 1| \leq 4$
35. $|x - 5.5| > 4.5$ **37.** $\{g \mid 47 \leq g \leq 57\}$.
39. $|t - 38| \leq 1.5$ **41.** $|c - 55| \leq 3$ **43.** Sample answer: Lucita forgot to change the direction of the inequality sign for the negative case of the absolute value. **45.** Sample answer: If $t = 0$, then the absolute value is equal to 0, not greater than 0.
47. Sample answer: When an absolute value is on the left and the inequality symbol is $<$ or $\leq$, the compound sentence uses *and*, and if the inequality symbol is $>$ or $\geq$, the compound sentence used *or*. To solve, if $|x| < n$, then set up and solve the inequalities $x < n$ and $x > -n$, and if $|x| > n$, then set up and solve the inequalities $x > n$ or $x < -n$. **49.** J **51.** B **53.** $\{t \mid 5 \leq t \leq 6\}$

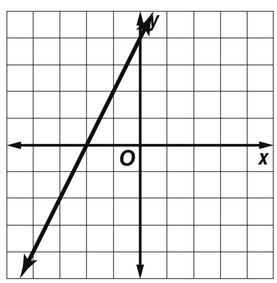


55. Sample answer: $6 + 22w \leq 87$; up to 3 withdrawals
57. 18 **59.** –20

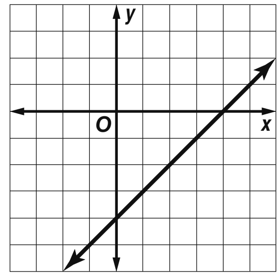
61.



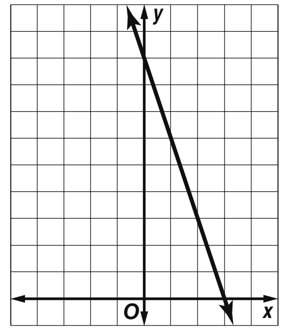
63.



65.

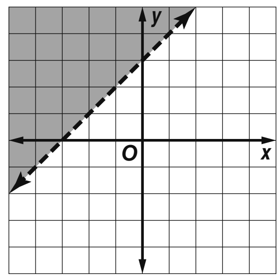


67.

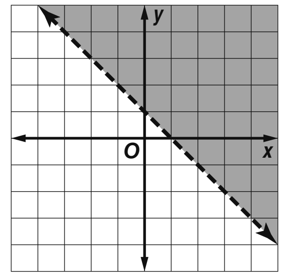


Lesson 5-6

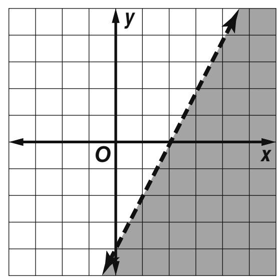
1.



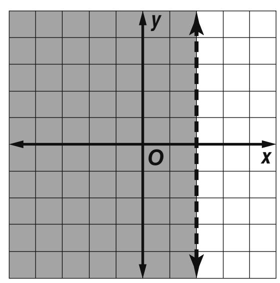
3.



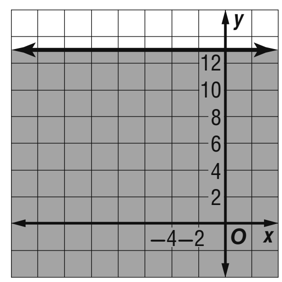
5.



7. $x < 2$

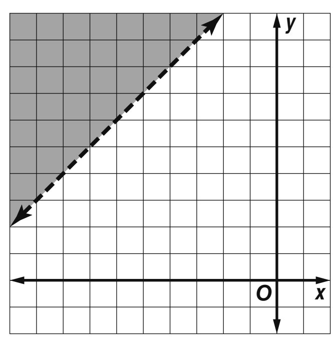


9. $y \leq 13$

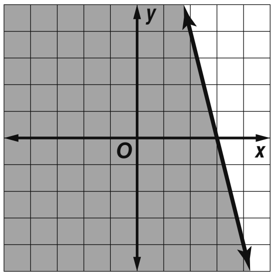


11a. $115x + 685y \geq 2300$ **11b.** Sample answer: 1 skim board and 4 surfboards

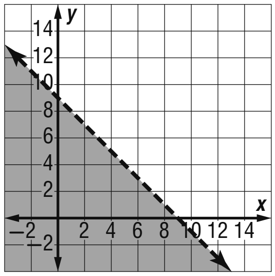
13.



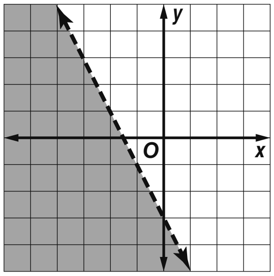
15.



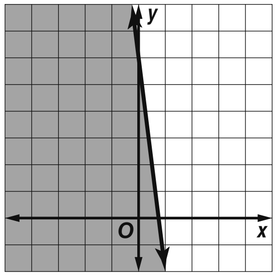
17.



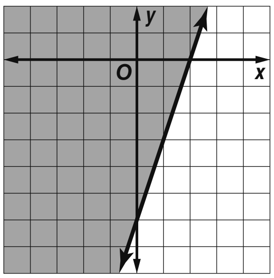
19.



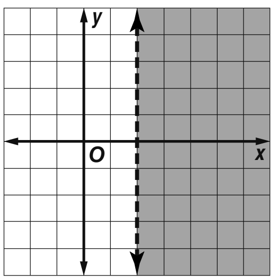
21.



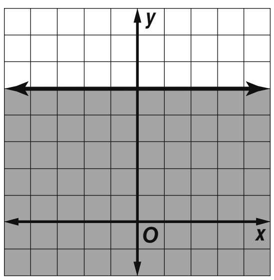
23.



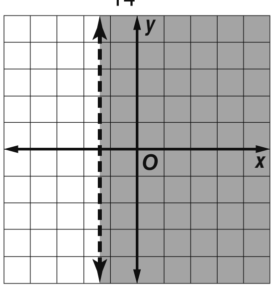
25. $x > 2$



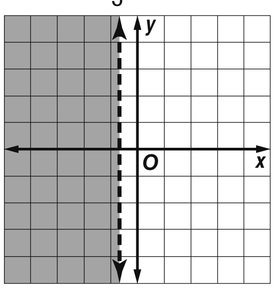
27. $y \leq 5$



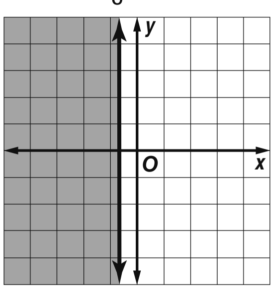
29. $x > -\frac{19}{14}$



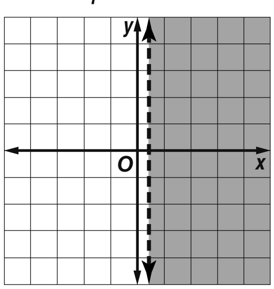
31. $x < -\frac{2}{3}$



33. $x \leq -\frac{2}{3}$

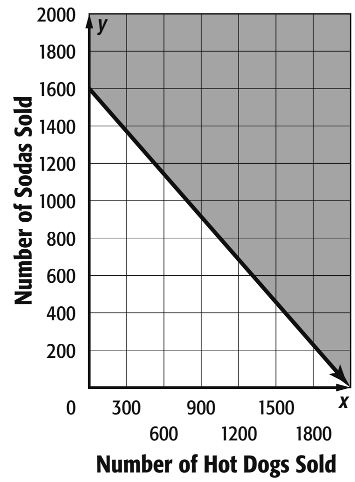


35. $x > \frac{3}{7}$



37a. $x + 1.25y \geq 2000$

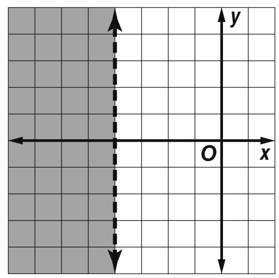
37b.



37c. Sample answer: (400, 1600), (200, 1500), (300, 1400), (400, 1300), (1000, 1000)

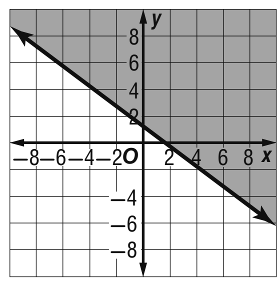
37d. Sample points should be in the shaded region of the graph in part b.

39.



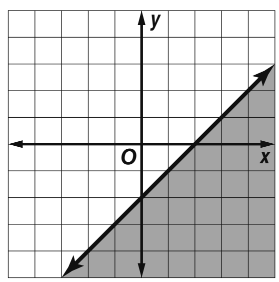
(−5, −5)

41.



(1, 1), (2, 5), (6, 0)

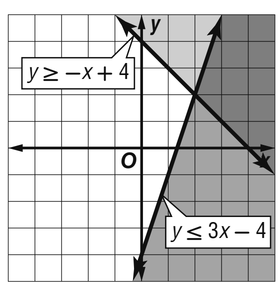
43.



(7, 5), (5, 3), (2, −5)

45a. $y \leq 3x - 4$; $y \geq -x + 4$

45b.



45c. The overlapping region represents the solutions that make both A and B true.

47. Sample answer: $y < -x + 1$

49. Sample answer: The inequality $y > 10x + 45$ represents the cost of a monthly smartphone data plan with a flat rate of $45 for the first 2 GB of data used, plus $10 per each additional GB of data used. Both the domain and range are nonnegative real numbers because the GB used and the total cost cannot be negative.

51. B **53.** F **55.** $\{y | y > 6 \text{ or } y < -2\}$

57. $\varnothing$ **59.** $\{p | 4 < p < 10\}$ **61.** $y = 8x - 11$

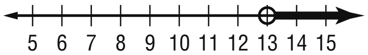
63. $y = -\frac{3}{2}x - 17$ **65.** $r = \frac{w - sm}{10}$

Chapter 5 Study Guide and Review

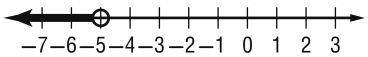
1. false; more **3.** false; intersection **5.** true

7. true **9.** true

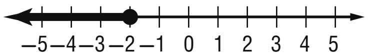
11. $\{w | w > 13\}$



13. $\{h | h < -5\}$

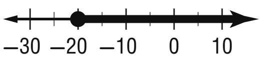


15. $\{p | p \le -2\}$



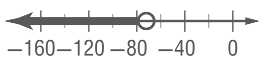
17. no more than 9

19. $\{g | g \ge -20\}$



21. $\{w | w \le 11\}$

23. $\{t | t < -72\}$



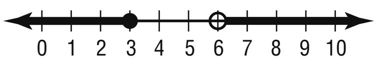
25. $\{h | h < 7\}$

27. $\{x | x \le -5\}$

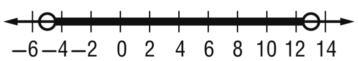
29. Sample answer: Let x = the number; $4x - 6 < -2$; $\{x | x < 1\}$.

31. $\{m | 2 < m < 9\}$

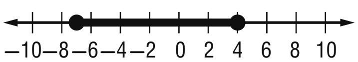
33. $\{x | x \le 3 \text{ or } x > 6\}$



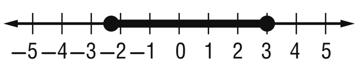
35. $\{x | -5 < x < 13\}$



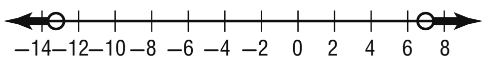
37. $\{c | -7 \le c \le 4\}$



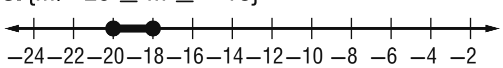
39. $\left\{d \middle| -\frac{7}{3} \le d \le 3\right\}$



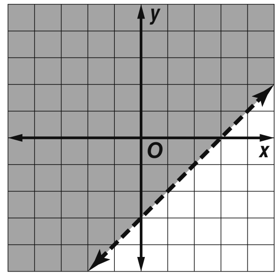
41. $\{t | t < -13 \text{ or } t > 7\}$



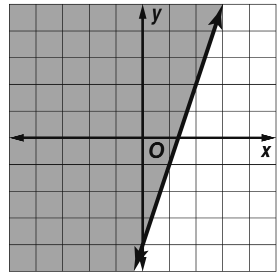
43. $\{m | -20 \le m \le -18\}$



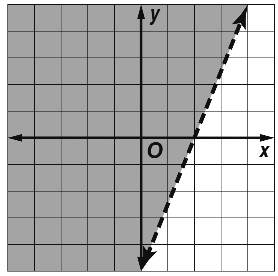
45.



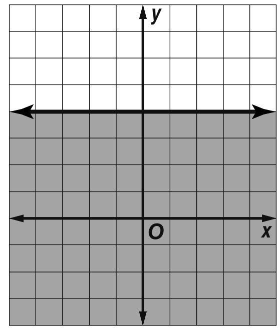
47.



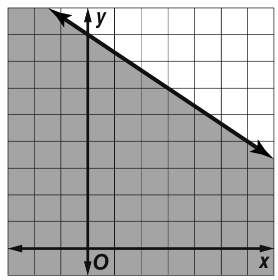
49.



51. (1, 2), (3, −2)



53. $2x + 3y \le 24$



CHAPTER 6

Systems of Linear Equations and Inequalities

Chapter 6 Get Ready

1. (4, 0) **3.** (−2, −3) **5.** (−1, −1) **7.** $x = 6 - 2y$

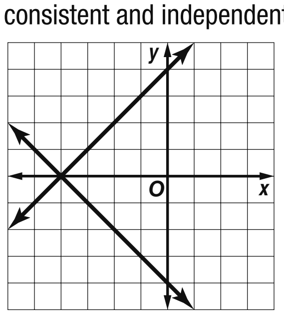
9. $m = 2n + 6$ **11.** $\ell = \frac{P - 2w}{2}$ **13.** $b = \frac{2A}{h}$

Lesson 6-1

1. consistent and independent **3.** inconsistent

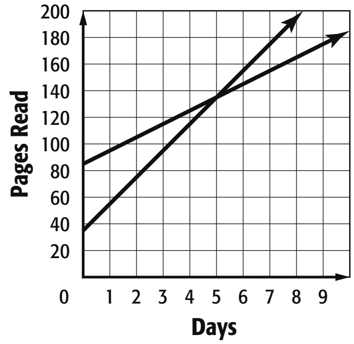
5. consistent and independent

7. 1 solution, (−4, 0)



9a. Alberto: $y = 20x + 35$; Ashanti: $y = 10x + 85$

9b.



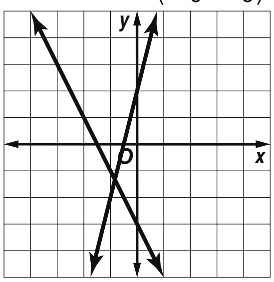
9c. (5, 135); Alberto will have read more after 5 days.

11. consistent and independent

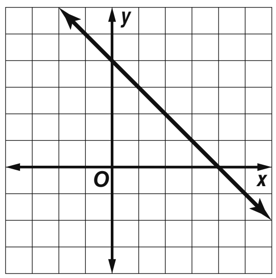
13. consistent and independent.

15. consistent and independent

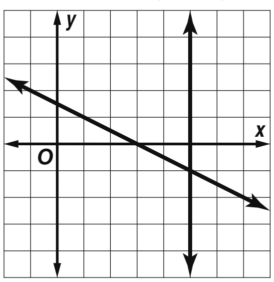
17. 1 solution; $\left(-\frac{5}{6}, -\frac{4}{3}\right)$



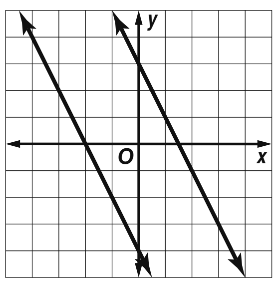
19. infinitely many



21. 1 solution; (5, −1)

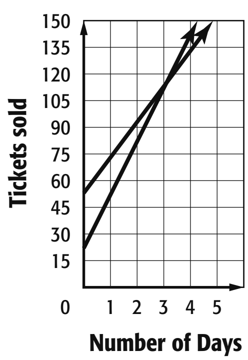


23. no solution



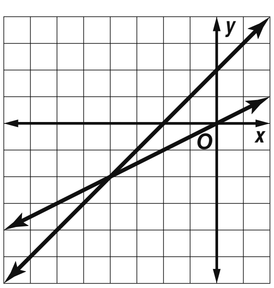
25a. Akira: $y = 30x + 22$; Jen: $y = 20x + 53$

25b.



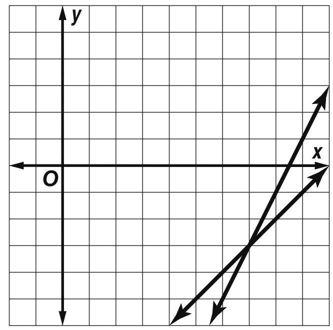
25c. (3.1, 115); After about 3 days Akira will have sold more tickets.

27.



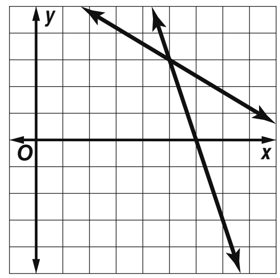
1 solution, (−4, −2)

29.

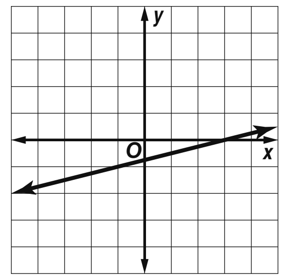


1 solution, (7, −3)

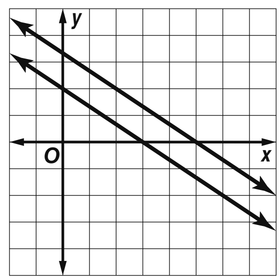
31. 1 solution, (5, 3)



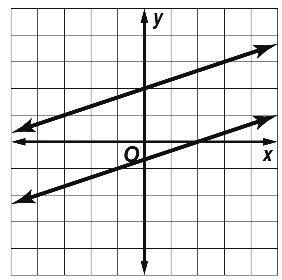
33. infinitely many



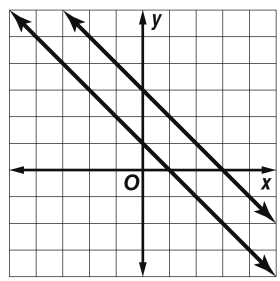
35. no solution



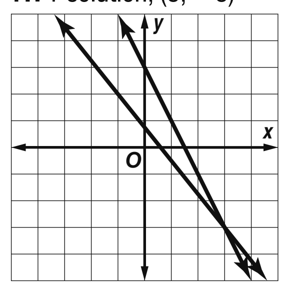
37. no solution



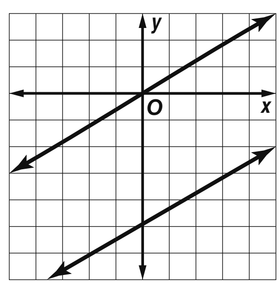
39. no solution



41. 1 solution, (3, −3)



43.



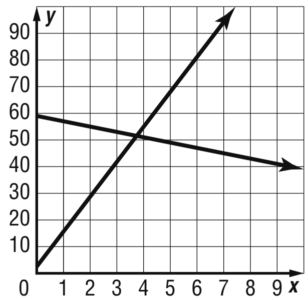
no solution

45a. Lookatme: $y = 13.1x + 2.5$;
Buyourstuff: $y = -2x + 59$

45b.

Years Since 2009	Lookatme Vistors (mln)	Buyourstuff Vistors (mln)
0	2.5	59
1	15.6	57
2	28.7	55
3	41.8	53
4	54.9	51

45c.

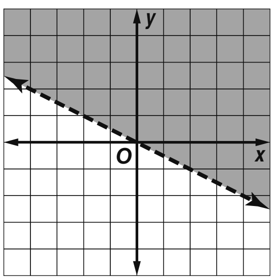


45d. sometime during 2012

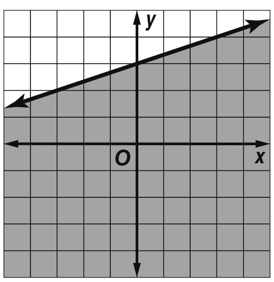
45e. D = $\{x|x \geq 0\}$; R = $\{y|y \geq 0\}$

47. Francisca; if the item is less than \$100, then \$10 off is better. If the item is more than \$100, then the 10% is better. **49.** Always; If the equations are linear and have more than one common solution, they must be consistent and dependent, which means that they have an infinite number of solutions in common. **51.** Sample answers: $y = 5x + 3$; $y = -5x - 3$; $2y = 10x - 6$ **53.** 14,745,600,000 bacteria **55.** H

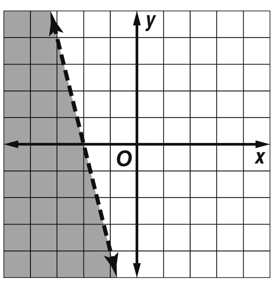
57.



59.



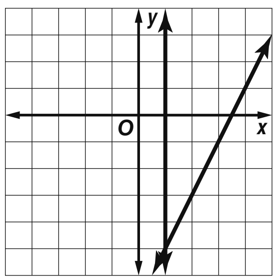
61.

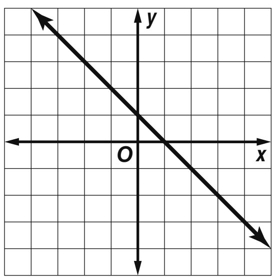


63. 1475 to 1525 books **65.** $y = -3x - 8$
67. $y = \frac{1}{2}x - 3$ **69.** 22 **71.** 92 **73.** −16 **75.** 7

Lesson 6-2

1. (5, 10) **3.** (2, 0) **5.** infinitely many
7a. $x = m\angle X$, $y = m\angle Y$; $x + y = 180$, $x = 24 + y$
7b. $x = 102°$, $y = 78°$ **9.** (2, 13) **11.** (−3, −11)
13. (−1, 0) **15.** infinitely many **17.** (2, 3) **19.** no solution
21. (2, 0) **23a.** Let x = number of years since 2000, and let y = the number of nurses; supply, $y = 5599.9x + 1{,}890{,}000$; demand, $y = 40{,}520.7x + 2{,}000{,}000$ **23b.** during 1996
25a. men: 112, 105; women: 115, 119 **25b.** $y = -0.8x + 112$; $y = 0.4x + 115$ **25c** Never; the graphs never intersect for $x > 0$. **27.** Neither; Guillermo substituted incorrectly for *b*. Cara solved correctly for *b* but misinterpreted the pounds of apples bought.
29. Sample answer: The solutions found by each of these methods should be the same. However, it may be necessary to estimate using a graph. So, when a precise solution is needed, you should use substitution.
31. An equation containing a variable with a coefficient of 1 can easily be solved for the variable. That expression can then be substituted into the second equation for the variable.
33. 5/6 **35.** C
37. one solution; (1,−5) **39.** infinitely many solutions





41. $v \geq -2$ **43.** $q \leq -40$ **45.** $t \geq 3$

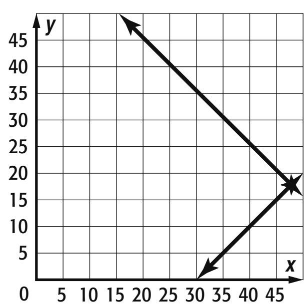
47. $55b + 15$ **49.** $11h^2 + 12h$

Lesson 6-3

1. (2, 3) **3.** (−3, 5) **5.** 6, 18 **7.** (−3, 4)
9. (−3, 1) **11.** (4, −2) **13.** (8, −7) **15.** (4, 7)
17. (4, 1.5) **19.** 5, 17 **21.** 2 and 9.
23. adult, \$5.95; children, \$3.95 **25.** (2, −1)

27. $\left(-\frac{5}{6}, 3\right)$ **29.** $\left(2\frac{7}{9}, 13\frac{1}{3}\right)$ **31a.** $x + y = 66$; $x = 30 + y$ **31b.** (48, 18) **31c.** There are 48 teams that are not from the U.S. and 18 teams that are from the U.S.

31d.



33a. Sample answer: If you choose 4 pennies and 5 paper clips, the score will be 4(3) + 5 or 17.
33b. $p + c = 9$, $3p + c = 15$, $p = 3$, $c = 6$
33c. Sample answer:

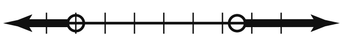
Pennies (p)	0	1	2	3	4	5
Paper clips ($9 - p$)	9	8	7	6	5	4
Points ($3p + c$)	9	11	13	15	17	19

33d. Yes; since the pennies are 3 points each, 3 of them makes 9 points. Add the 6 points from 6 paper clips and you get 15 points. **35.** The result of the statement is false, so there is no solution. **37.** Sample answer: $-x + y = 5$; I used the solution to create another equation with the coefficient of the x-term being the opposite of its corresponding coefficient. **39.** Sample answer: It would be most beneficial when one variable has either the same or opposite coefficient in each of the equations. **41.** A
43. B **45.** (15, 5) **47.** (3, 11) **49.** (−2, 2) **51.** Yes; each pair of opposite sides have the same or an undefined slope, so they are parallel. **53.** −5 **55.** −20 **57.** $11w^2 - 9w$ **59.** $-2y - 35$

Lesson 6-4

1. (3, 2) **3.** (−4, 1) **5.** 6 mph **7.** (−1, 3)
9. (−3, 4) **11.** (−2, 3) **13.** (3, 5) **15.** (1, −5)
17. (0, 1) **19.** 2, −5 **21.** (2.5, 3.25) **23.** $\left(3, \frac{1}{2}\right)$
25a. $240n + 360s = 3000$ **25b.** $90n + 120s = 1050$
25c. (5, 5); nurses and 5 support staff employees were placed. **27a.** Let $x =$ the cost of a batting token and let $y =$ the cost of a miniature golf game; $16x + 3y = 30$ and $22x + 5y = 43$. **27b**. (1.5, 2); A battingtoken costs \$1.50 and a game of miniature golf costs \$2.00. **29.** One of the equations will be a multiple of the other. **31.** Sample answer: $2x + 3y = 6$, $4x + 9y = 5$ **33.** Sample answer: It is more helpful to use substitution when one of the variables has a coefficient of 1 or if a coefficient can be reduced to 1 without turning other coefficients into fractions. Otherwise, elimination is more helpful because it will avoid the use of fractions when solving the system. **31.** G
37. D 39. (−1, −1) **41.** (9, 3) **43.** (0, 6)

45. $m \leq 13$ and $m \geq -3$

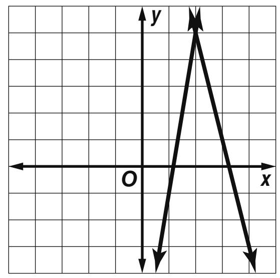

47. $w > 1$ or $w < -10$


49. $A = \frac{1}{2}bh$ **51.** $V = \ell wh$ **53.** $A = \pi r^2$

Lesson 6-5

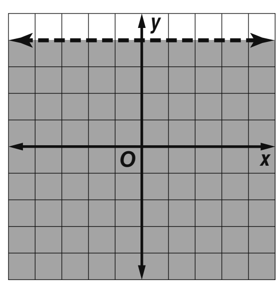
1. elim (×); (2, −5) **3.** elim (+); $\left(-\frac{1}{3}, 1\right)$
5a. $4t + 3j = 181$; $t + 2j = 94$ **5b.** substitution
5c. Each T-shirt cost \$16 and each pair of jeans cost \$39. **7.** subst.; (2, −2) **9.** elim. (−); $\left(1, -\frac{1}{2}\right)$

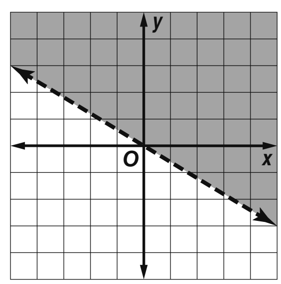
11. elim (−); (1, 3) **13.** $m + t = 40$ and $m = 3t - 4$; 29 movies, 11 television shows **15.** 880 books; If they sell this number, then their income and expenses both equal \$35,200. **17a.** Let $x =$ the cost per pound of aluminum cans, and let $y =$ the cost per pound of newspaper; $9x + 26y = 3.77$ and $9x + 114y = 4.65$. **17b.** \$0.39; This solution is reasonable. **19a.** \$1.15 **19b.** \$9.15 **21.** Sample answer: $x + y = 12$ and $3x + 2y = 29$, where x represents the cost of a student ticket for the basketball game and y represents the cost of an adult ticket; substitution could be used to solve the system; (5, 7) means the cost of a student ticket is \$5 and the cost of an adult ticket is \$7.
23. Graphing: (2, 5)



elimination by addition:
$4x + y = 13$
$6x - y = 7$
$10x = 20$
$x = 2$
$4(2) + y = 13$
$y = 5$
substitution:
$y = -4x + 13$
$6x - (-4x + 13) = 7$
$6x + 4x - 13 = 7$
$10x = 20$
$x = 2$
$4(2) + y = 13$
$y = 5$

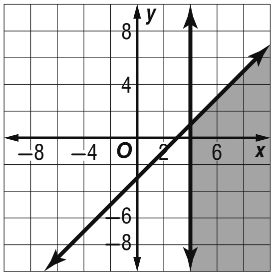
25. The third system; this system is the only one that is not a system of linear equations. **27.** A **29.** 10 ft
31. (0, 3) **33.** (2, 1)

35.


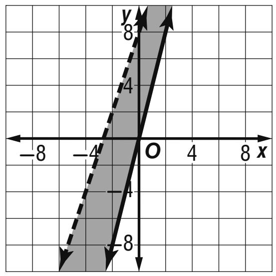
37.


39. −12.31 **41.** 6.6 **43.** −93.19

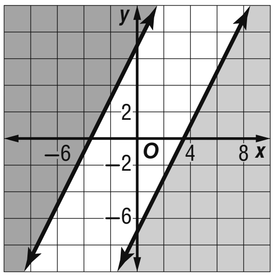
1.



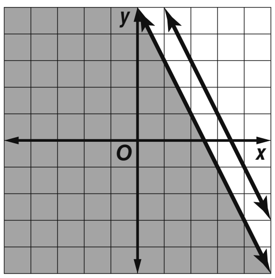
3.



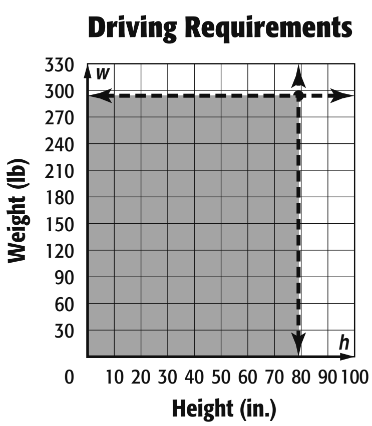
5. no solution



7.

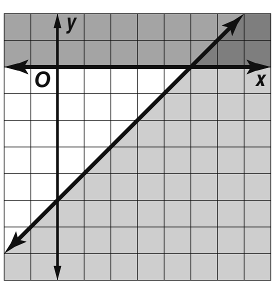


9a. Let $h =$ the height of the driver in inches and $w =$ the weight of the driver in pounds; $h < 79$ and $w < 295$.

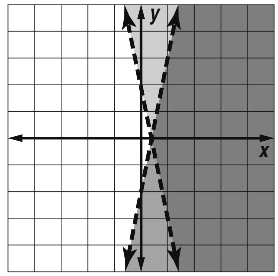


9b. Sample answer: 72 in. and 220 lb **9c.** Yes, the point falls in the overlapping region.

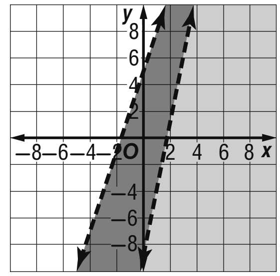
11.



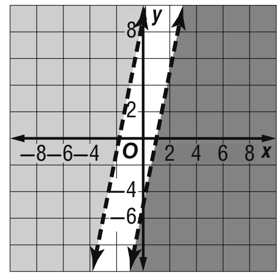
13.



15.



17. no solution



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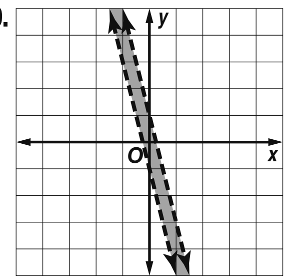

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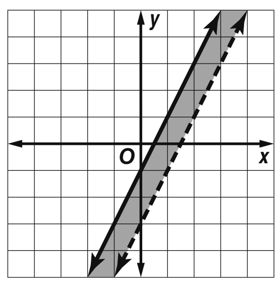
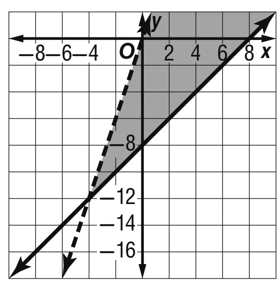
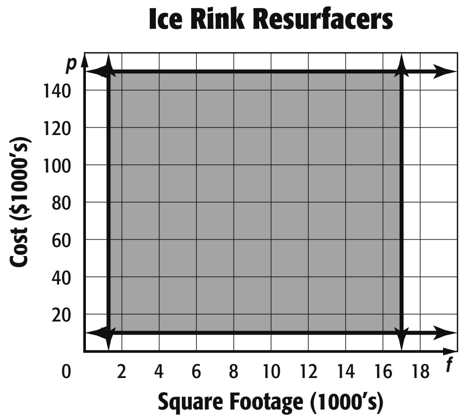


23.

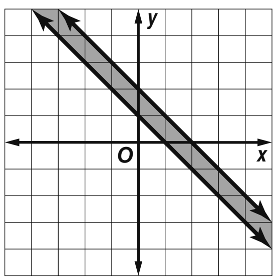


25a. Let $f =$ square footage and let $p =$ price; $1000 \leq f \leq 17{,}000$ and $10{,}000 \leq p \leq 150{,}000$

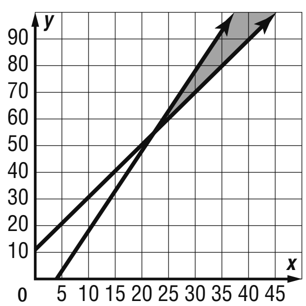


25b. Sample answer: an ice resurfacer for a rink of 5000 ft^2 and a price of $20,000 **25c.** Yes; the point satisfies each inequality.

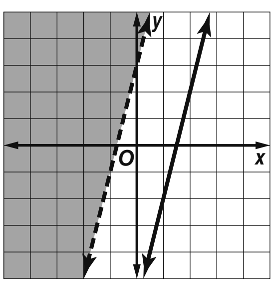
27.



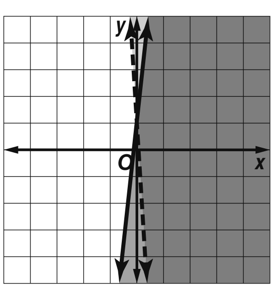
29.



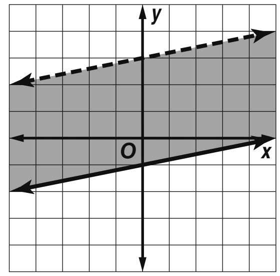
31.



33.

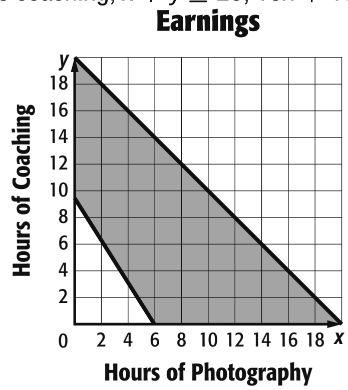


35.



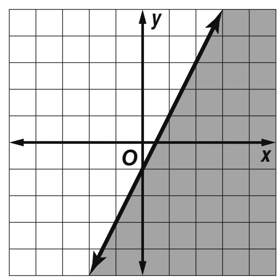
37a. Let $x =$ the hours worked for the photographer, let $y =$ the hours coaching, $x + y \leq 20$, $15x + 10y \geq 90$.

37b.

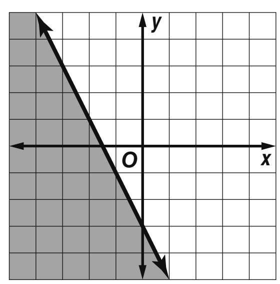


37c. Sample answer: 6 hours at the photographer, 10 hours of coaching; 8 hours at the photographer, 10 hours of coaching **37d.** No; the point does not fall in the shaded region. She would not earn enough money. **39.** Sometimes; sample answer: $y > 3$, $y < -3$ will have no solution, but $y > -3$, $y < 3$ will have solutions. **41.** Sample answer: $3x - y < -4$
43. Sample answer: The yellow region represents the beats per minute below the target heart rate. The blue region represents the beats per minute above the target heart rate. The green region represents the beats per minute within the target heart rate. Shading in different colors clearly shows the overlapping solution set of the system of inequalities. **45.** D **47.** A **49.** (4, 3) **51.** (4, −3)

53.



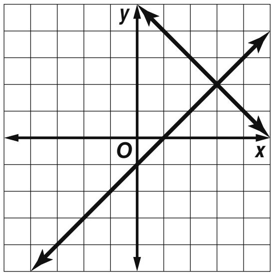
55.



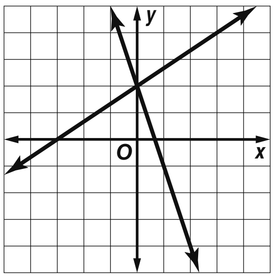
57. 16

Chapter 6 Study Guide and Review

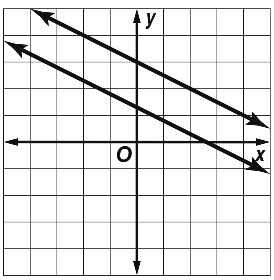
1. true **3.** false; dependent **5.** true **7.** false; system of inequalities
9. one; (3, 2)



11. one; (0, 2)

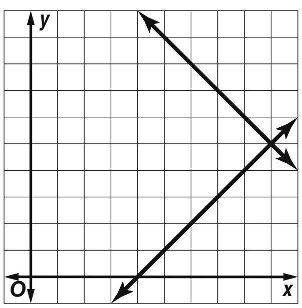


13.



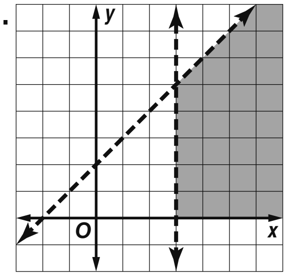
no solution

15. Sample answer: Let x be one number and y the other number; $x + y = 14$; $x - y = 4$; 9 and 5

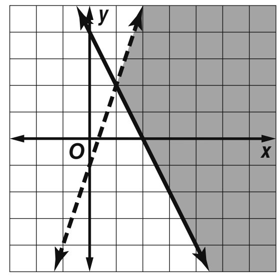


17. (2, −10) **19.** (2, −6) **21.** (−3, 4) **23.** (9, 4)
25. (4, −2) **27.** $\left(\frac{1}{2}, 6\right)$ **29.** (−3, 5) **31.** Sample answer: Let f be the first type of card and let c be the second type of card; $f + c = 24$, $f + 3c = 50$; 11 \$1 cards and 13 \$3 cards.
33. (5, 7) **35.** (2, 5) **37.** (6, −1) **39.** (1, −2) **41.** Subs.; (2, −6) **43.** Subs.; (24, −4) **45.** Elim (−)**;** (−2, 1) **47.** Elim (×)**;** (2, 5) **49.** Sample answer: Let d represent the dimes and let q represent the quarters; $d + q = 25$, $0.10d + 0.25q = 4$; 15 dimes, 10 quarters

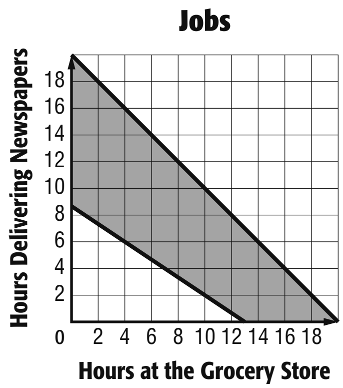
51.



53.



55.



CHAPTER 7
Exponents and Exponential Functions

Chapter 7 Get Ready

1. 4^5 **3.** 6^2 **5.** b^6 **7.** $\left(\frac{1}{3}\right)^8$ or $\frac{1}{3^8}$ **9.** 4π m^2
11. 24 in^2 **13.** 25 **15.** −64 **17.** $\frac{1}{16}$

Lesson 7-1

1. Yes; constants are monomials. **3.** No; there is a variable in the denominator. **5.** Yes; this is a product of a number and variables. **7.** k^4

9.
$$\begin{aligned} 2q^2(9q^4) &= (2 \cdot 9)(q^2 \cdot q^4) \\ &= 18q^{2+4} \\ &= 18q^6 \end{aligned}$$

11. 3^8 or 6561 **13.** $16a^8b^{18}c^2$ **15.** $81p^{20}t^{24}$
17. $800x^8y^{12}z^4$ **19.** $-18g^7h^3j^{10}$ **21.** Yes; constants are monomials. **23.** No; there is addition and more than one term. **25.** Yes; this can be written as the product of a number and a variable.

27. $(q^2)(2q^4) = 2(q^2 \cdot q^4)$
$= 2q^{2+4}$
$= 2q^6$

29. $9w^8x^{12}$ **31.** $7b^{14}c^8d^6$ **33.** $j^{20}k^{28}$ **35.** 2^8 *or* 256
37. $4096r^{12}t^6$ **39.** $20c^5d^5$ **41.** $16a^{21}$ **43.** $512g^{27}h^{18}$
45. $294p^{27}r^{19}$ **47.** $30a^5b^7c^6$ **49.** $0.25x^6$ **51.** $-\frac{27}{64}c^3$
53. $-9x^3y^9$ **55.** $2{,}985{,}984r^{28}w^{32}$ **57a.** $0.12c$
57b. $280 **59.** $15x^7$ **61a.** $16\pi p^9$

61b. Sample answer:

Radius	Height
$4p$	p^7
$4p^2$	p^5
$2p^3$	$4p^3$
$2p^4$	$4p$
$2p$	$4p^7$

61c. $32\pi p^9$.

63a.

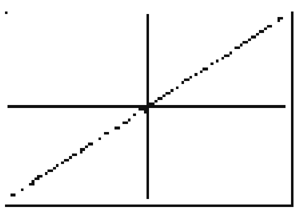
Power	3^4	3^3	3^2	3^1	3^0	3^{-1}	3^{-2}	3^{-3}	3^{-4}
Value	81	27	9	3	1	$\frac{1}{3}$	$\frac{1}{9}$	$\frac{1}{27}$	$\frac{1}{81}$

63b. 1 and $\frac{1}{5}$ **63c.** $\frac{1}{a^n}$ **63d.** Any nonzero number raised to the zero power is 1.

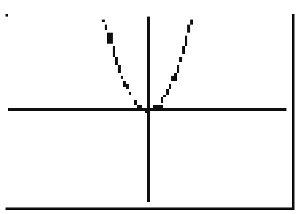
65a.

Equation	Related Expression	Power of x	Linear or Nonlinear
$y = x$	x	1	linear
$y = x^2$	x^2	2	nonlinear
$y = x^3$	x^3	3	nonlinear

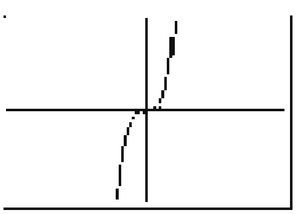
65b.



[−10, 10] scl: 1 by [−10, 10] scl: 1



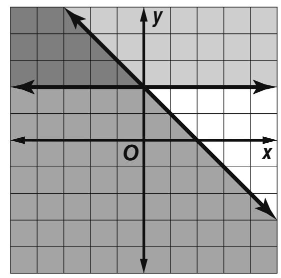
[−10, 10] scl: 1 by [−10, 10] scl: 1



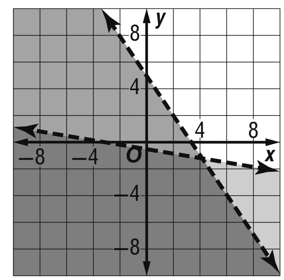
[−10, 10] scl: 1 by [−10, 10] scl: 1

65c. See chart for above. **65d.** If the power of x is 1, the equation or its related expression is linear. Otherwise, it is nonlinear. **67.** Sample answer: The area of a circle or $A = \pi r^2$, where the radius r, can be used to find the area of any circle. The area of a rectangle or $A = w \cdot \ell$, where w is the width and ℓ is the length, can be used to find the area of any rectangle. **69.** F **71.** The x-intercept does not change.

73.



75.



77. $\{p \mid 28 \le p \le 32\}$ **79.** 8 **81.** −7.05 **83.** 13

Lesson 7-2

1. t^3u^3 **3.** mr^3 **5.** ghm **7.** xyz **9.** $\frac{4a^6b^{10}}{9}$

11. $\frac{32c^{15}d^{25}}{3125g^{10}}$ **13.** 1 **15.** $\frac{g^2h^4}{f^3}$ **17.** $\frac{a^5c^{13}}{3b^9}$

19. m^2p **21.** $\frac{r^4p^2}{4m^3t^4}$ **23.** $\frac{9x^2y^8}{25z^4}$ **25.** $\frac{p^6t^{21}}{1000}$ **27.** a^2b^7c

29. $\frac{16r^{12}t^{24}}{625u^{36}}$ **31.** 1 **33.** $\frac{p^4r^2}{t^3}$ **35.** $\frac{-f}{4}$ **37.** k^2mp^2 **39.** $\frac{3t^7}{u^6v^2}$

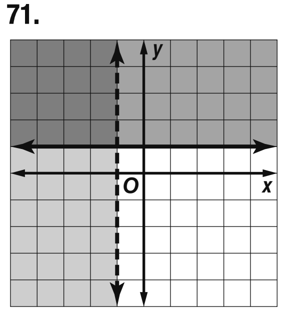
41. $\frac{r^3}{t^2x^{10}}$ **43.** 10^6; 10^8; about 10^2 or 100 times as many users as hosts

45. $-\frac{w^9}{3}$ **47.** $1600k^{13}$ **49.** $\frac{5q}{r^6t^3}$ **51.** $\frac{4g^{12}}{h^4}$ **53.** $\frac{4x^8y^4}{z^6}$

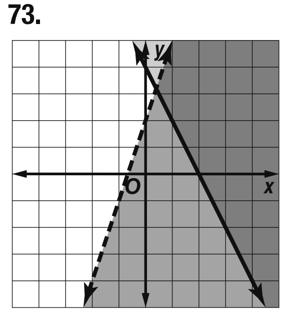
55. $\frac{16z^2}{y^8}$ **57.** 100 **59a.** $\left(\frac{1}{6}\right)^d$. **59b.** 6^{-d}

61. Sometimes; sample answer: The equation is true when $x = 0$, $y = 2$, and $z = 3$, but it is false when $x = 1$, $y = 2$, and $z = 3$.
63. $\frac{1}{x^n} = \frac{x^0}{x^n} = x^{0-n} = x^{-n}$
65. The Quotient of Powers Property is used when dividing two powers with the same base. The exponents are subtracted. The Power of a Quotient Property is used to find the power of a quotient. You find the power of the numerator and the power of the denominator. **67.** J **69.** B

71.



73.



75. $h > 5$ **77.** $u \leq 35$ **79.** $n \geq -2$ **81.** 87 **83.** 121
85. 10,000 **87.** 125 **89.** 4096

Lesson 7-3

1. $\sqrt{12}$ **3.** $33^{\frac{1}{2}}$ **5.** 8 **7.** 7 **9.** 49 **11.** 1296 **13.** 4
15. 5.5 **17.** $\sqrt{15}$ **19.** $4\sqrt{k}$ **21.** $26^{\frac{1}{2}}$ **23.** $2(ab)^{\frac{1}{2}}$
25. 2 **27.** 6 **29.** 0.1 **31.** 11 **33.** 15 **35.** $\frac{1}{3}$ **37.** 4
39. 243 **41.** 625 **43.** $\frac{27}{1000}$ **45.** 5 **47.** $\frac{1}{2}$ **49.** $\frac{3}{2}$
51. 8 **53.** 8 **55.** $\frac{3}{2}$ **57.** 4 ft **59.** $\sqrt[3]{17}$ **61.** $7\sqrt[3]{b}$ **63.** $29^{\frac{1}{3}}$
65. $2a^{\frac{1}{3}}$ **67.** 0.3 **69.** a **71.** 16 **73.** $\frac{1}{3}$ **75.** $\frac{1}{27}$ **77.** $\frac{1}{\sqrt{k}}$
79. 12 **81.** -5 **83.** $-\frac{3}{2}$ **85a.** 440 Hz
85b. A below middle C, the 37th note
87. Size 3, 204.0 to 230.2 in^3; Size 4, 268.5 to 299.9 in^3; Size 5, 333.6 to 382.4 in^3
89. Sample answer: $2^{\frac{1}{2}}$ and $4^{\frac{1}{4}}$ **91.** $-1, 0, 1$
93. Sample answer: 2 is the principal fourth root of 16 because 2 is positive and $2^4 = 16$. **95.** G **97.** B
99. c^4d^6 **101.** b^2 **103.** 1 **105.** $y = 3x - 1$ **107.** $y = -2x - 12$ **109.** $y = \frac{2}{3}x + 7$ **111.** 1000 **113.** 0.1

Lesson 7-4

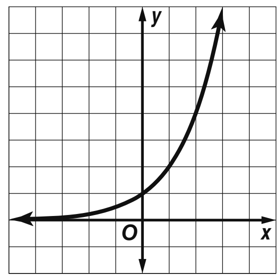
1. 1.85×10^8 **3.** 5.64×10^{-4} **5.** 1.3×10^{10}
7. 19,800,000 **9.** 0.00000003405 **11.** 1.74×10^{15}; 1,740,000,000,000,000 **13.** 4.7138×10^{-2}; 0.047138
15. 4.5×10^3; 4500 **17.** 8.5×10^{-13}; 0.00000000000085 **19a.** 0.01, 0.000001
19b. 1×10^{-2}, 1×10^{-6} **19c.** 0.00000000001; 1×10^{-11} **21.** 5.86×10^7 **23.** 1.3×10^{-6} **25.** 7.09×10^{-10} **27.** 6.5×10^9 **29.** 94,000,000 **31.** 0.0005
33. 0.00000622 **35.** 11,000,000 **37.** 8×10^7; 80,000,000.
39. 4.68×10^6 4,680,000 **41.** 2.2×10^7; 22,000,000
43. 1.96×10^{12}; 1,960,000,000,000 **45.** 6.89×10^5; 689,000
47. 9×10^{-4}; 0.0009 **49.** 5×10^{-6}; 0.000005
51. 5.184×10^{15}; 5,184,000,000,000,000 **53.** 3.969×10^{-9}; 0.000000003969 **55.** 2.74185×10^5; 274,815
57. 6.1×10^{-8}; 0.000000061 **59.** 1.7889×10^{-6}; 0.0000017889 **61.** 4.7008×10^3; 4700.8 **63.** 3×10^5

65.

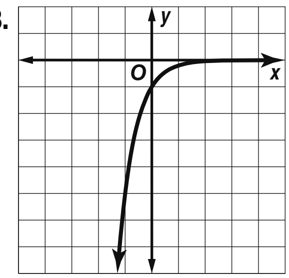
Time	Kilometers Traveled
1 day	2.592×10^{10}
1 week	1.8144×10^{11}
1 month	7.776×10^{11}
1 year	9.4608×10^{12}

67. about 44.7 persons/ km^2
69a. corn: 9.29×10^7, 92,900,000; soybeans: 6.41×10^7, 64,100,000; cotton: 1.11×10^7, 11,100,000
69b. about 1.4493×10^0; 1.4493 **69c.** about 8.3694×10^0; 8.3694 **71.** Pete; Syreeta moved the decimal point in the wrong direction. **73.** Always; if the numbers are $a \times 10^m$ and $b \times 10^n$ in scientific notation, then $1 \leq a < 10$ and $1 \leq b < 10$. So $1 \leq ab < 100$. **75.** Sample answer: Divide the numbers to the left of the $\times$ symbols. Then divide the powers of 10. If necessary, rewrite the results in scientific notation. To convert that to standard form, check to see if the exponent is positive or negative. If positive, move the decimal point to the right, and if negative, to the left. The number of places to move the decimal point is the absolute value of the exponent. Fill in with zeros as needed.
77. H **79.** B **81.** 8^3 or 512 **83.** r^6t^5 **85.** $\frac{25d^6g^4}{9h^8}$
87. 10^5 **89.** 4 **91.** 0 **93.** -75

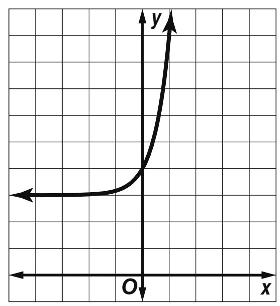
Lesson 7-5

1.


1;
D = {all real numbers};
R = $\{y|y > 0\}$

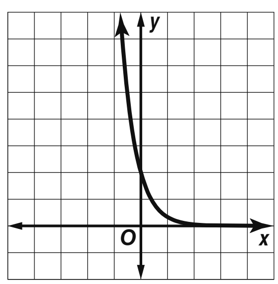
3.


-1;
D = {all real numbers};
R = $\{y|y < 0\}$

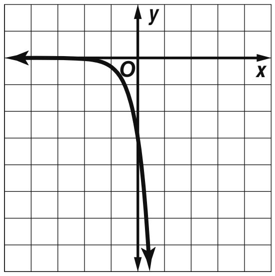
5.


4;
D = {all real numbers};
R = $\{y|y > 3\}$

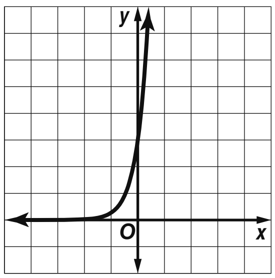
7a. D = $\{d|d \geq 0\}$, the number of days is greater than or equal to 0; R = $\{y|y \geq 100\}$, the number of fruit flies is greater than or equal to 100. **7b.** about 198 fruit flies **9.** Yes; the domain values are at regular intervals, and the range values have a common factor of 4.

11.


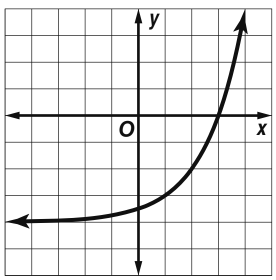
2;
D = {all real numbers};
R = $\{y|y > 0\}$

13. 

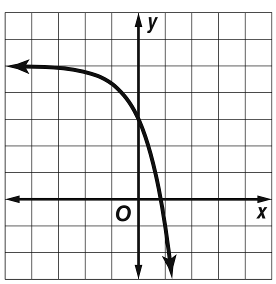
-3;
D = {all real numbers};
R = $\{y \mid y < 0\}$

15. 

3;;
D = {all real numbers};
R = $\{y \mid y > 0\}$

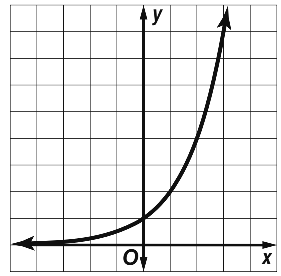
17. 

The y-intercept is -3.5;
D = {all real numbers};
R = $\{y \mid y > -4\}$

19. 

The y-intercept is 3;
D = {all real numbers};
R = $\{y \mid y < 5\}$

21. No; the domain values are at regular intervals, but the range values do not have a positive common factor.
23. Yes; the domain values are at regular intervals, and the range values have a common factor of 2. **25.** about 506% bigger than the original **27.** exponential **29.** linear **31.** neither **33.** about 198 students **35.** a vertical stretch by a factor of 3 **37.** a translation down 3 units **39.** a vertical stretch by a factor of 5 and a reflection over the x-axis. **41.** $f(x) = 3(2)^x$ **43.** Sample answer: The number of teams competing in a basketball tournament can be represented by $y = 2^x$, where the number of teams competing is y and the number of rounds is x.



The y-intercept of the graph is 1. The graph increases quickly for $x > 0$. With an exponential model, each team that joins the tournament will play all of the other teams. If the scenario were modeled with a linear function, each team that joined would play a fixed number of teams.

45. Sample answer: First, look for a pattern by making sure that the domain values are at regular intervals and the range values differ by a common factor. **47.** B
49. A **51.** 2.52×10^2, 252 **53.** 7
55. $\frac{1}{2}$ **57.** 7776 **59.** 32 km^2/min^2 **61.** $(-5, 20)$
63. 9, 11, 13 **65.** 16.5, 19, 21.5 **67.** $\frac{7}{2}, \frac{17}{4}, 5$

Lesson 7-6

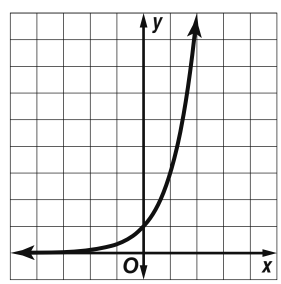
1. about \$37,734.73 **3a.** $y = 2200(0.98)^t$ **3b.** about 1624 **5.** about 92,095,349

7. about \$7898.97

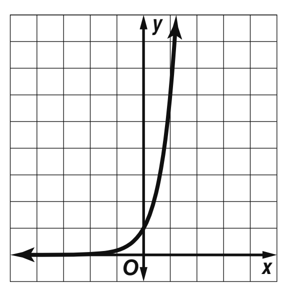
9. Sample answer: No; she will have about \$199.94 in the account in 4 years.

11. about 506,575

13a. $I = 247{,}900(1.014)^t$ **13b.** about \$288,864
15a. $w(t) = 19{,}000(0.995)^t$ **15b.** $p(t) = 300t$
15c. $C(t) = 300t + 19000(0.995)^t$; The function represents the number of gallons of water in the pool at any time after the hose is turned on.
15d. about 7.3 h. **17.** about 9.2 yr **19.** Sample answer: Exponential models can grow without bound, which is usually not the case of the situation that is being modeled. For instance, a population cannot grow without bound due to space and food constraints. Therefore, when using a model, the situation that is being modeled should be carefully considered when used to make decisions.
21. C **23.** D

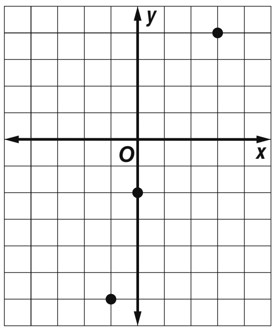
25. 

1;
D = {all real numbers},
R = $\{y \mid y > 0\}$

27. 

1;
D = {all real numbers},
R = $\{y \mid y > 0\}$ **29.** 3.01×10^{10}; 30,100,000,000
31. 1.21×10^{-4}; 0.000121
33. 1.9154×10^0; 1.9154
35. parallel **37.** neither
39. \$14.77 **41.** \$37.45

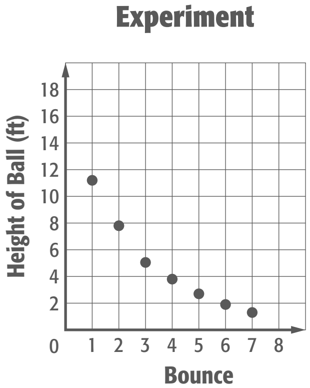
43.



Lesson 7-7

1. Geometric; the common ratio is $\frac{1}{5}$.
3. Arithmetic; the common difference is 3.
5. 160, 320, 640 **7.** $-\frac{1}{16}, -\frac{1}{64}, -\frac{1}{256}$ **9.** $a_n = -6 \cdot (4)^{n-1}$; -1536 **11.** $a_n = 72 \cdot \left(\frac{2}{3}\right)^{n-1}$; $\frac{4096}{2187}$

13.



15. Arithmetic; the common difference is 10.
17. Geometric; the common ratio is $\frac{1}{2}$.
19. Neither; there is no common ratio or difference.
21. $\frac{4}{3}, \frac{4}{9}, \frac{4}{27}$. **23.** $\frac{25}{4}, \frac{25}{16}, \frac{25}{64}$ **25.** $-2, \frac{1}{4}, -\frac{1}{32}$
27. 134,217,728 **29.** −1,572,864 **31.** 19,683

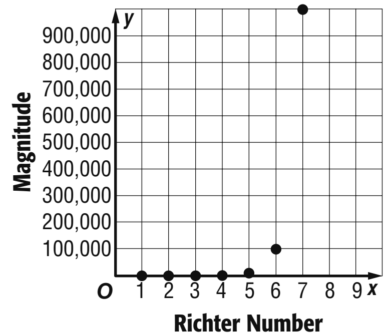
33a. Yes; the common ratio is 2.
33b. The second option; she would earn $511, which is much more than she would earn with the first option.

35. 9; $\frac{1}{3}$

37a.

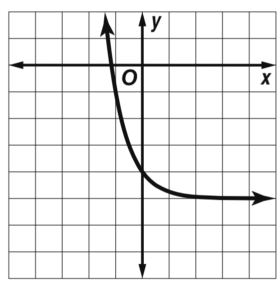
Richter Number (x)	Increase in Magnitude (y)	Rate of Change (slope)
1	1	—
2	10	9
3	100	90
4	1,000	900
5	10,000	9000

37b.



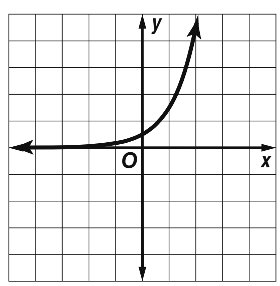
37c. The graph appears to be exponential. The rate of change between any two points does not match any others.
37d. $y = 1 \cdot (10)^{x-1}$ **39.** Neither; Haro calculated the exponent incorrectly. Matthew did not calculate $(-2)^8$ correctly.
41. Sample answer: When graphed, the terms of a geometric sequence lie on a curve that can be represented by an exponential function. They are different in that the domain of a geometric sequence is the set of natural numbers, while the domain of an exponential function is all real numbers. Thus, geometric sequences are discrete, while exponential functions are continuous. **43.** B **45.** 15 dimes and 20 quarters
47. 162, 486, 1458
49. $\frac{1}{16}, -\frac{1}{32}, \frac{1}{64}$ **51.** 0.1296, 0.07776, 0.046656

53.



−4;
D = {all real numbers}; numbers};
R = {y|$y > -5$}

55.



$\frac{1}{2}$;
D = {all real numbers};
R = {y|$y > 0$}

57. at least $3747 **59.** $y = -3x - \frac{2}{3}$ **61.** $y = \frac{1}{2}x - 9$
63. $y = -6x - 7$ **65.** $11a - 2$ **67.** $19w^2 + w$
69. $64t - 96$

Lesson 7-8

1. 16, 13, 10, 7, 4 **3.** $a_1 = 1$, $a_n = a_{n-1} + 5$, $n \geq 2$
5a. $a_1 = 10$, $a_n = 0.6a_{n-1}$, $n \geq 2$
5b. $a_n = 10(0.6)^{n-1}$

7. $a_1 = 13$, $a_n = a_{n-1} + 5$, $n \geq 2$.

9. $a_n = 22(4)^{n-1}$ **11.** 48, −16, 16, 0, 8 **13.** 12, 15, 24, 51, 132 **15.** $\frac{1}{2}$, 2, $\frac{7}{2}$, 5, $\frac{13}{2}$ **17.** $a_1 = 27$, $a_n = a_{n-1} + 14$, $n \geq 2$ **19.** $a_1 = 100$, $a_n = 0.8a_{n-1}$, $n \geq 2$
21. $a_1 = 81$, $a_n = \frac{1}{3}a_{n-1}$, $n \geq 2$

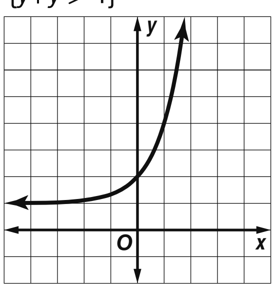
23. $a_1 = 3$, $a_n = 4a_{n-1}$, $n \geq 2$ **25.** $a_n = 38\left(\frac{1}{2}\right)^{n-1}$

27a. 1, 5, 25, 125, 625 **27b.** $a_1 = 1$, $a_n = 5a_{n-1}$, $n \geq 2$
27c. 78,125 **29a.** $a_1 = 10$, $a_n = 1.1a_{n-2}$, $n \geq 2$
29b. 16.1 ft **31.** Both; sample answer: The sequence can be written as the recursive formula $a_1 = 2$, $a_n = (-1)a_{n-1}$, $n \geq 2$. The sequence can also be written as the explicit formula $a_n = 2(-1)^{n-1}$. **33.** False; sample answer: A recursive formula for the sequence 1, 2, 3, … can be written as $a_1 = 1$, $a_n = a_{n-1} + 1$, $n \geq 2$ or as $a_1 = 1$, $a_2 = 2$, $a_n = a_{n-2} + 2$, $n \geq 3$. **35.** Sample answer: In an explicit formula, the nth term a_n is given as a function of n. In a recursive formula, the nth term a_n is found by performing operations to one or more of the terms that precede it. **37.** G **39.** F **41.** −54, 81, −121.5 **43.** −64, 32, −16 **45.** 1500; 7500; 37,500
47. adults: $14; children: $10 **49.** $4x - y = 16$
51. $x - 3y = -18$ **53.** $2x + 7y = 26$ **55.** $10x - 64$
57. simplified **59.** simplified

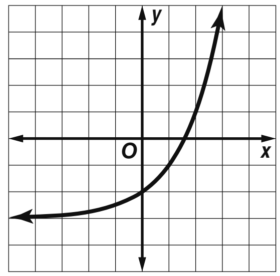
Chapter 7 Study Guide and Review

1. monomial **3.** cube root **5.** scientific notation
7. recursive formula **9.** exponential decay **11.** x^9
13. $20a^6b^6$ **15.** $64r^{18}t^6$ **17.** $8x^{15}$ **19.** $45\pi x^4$
21. $\frac{27x^3y^9}{8z^3}$ **23.** $\frac{c^6}{a^3}$ **25.** x^6 **27.** $\frac{6}{yx^3}$ **29.** 7 **31.** 5
33. 64 **35.** 2401 **37.** 5 **39.** 2.3×10^6
41. about 9.1×10^{-2}

43. y-intercept 2; D = {all real numbers};
R = $\{y \mid y > 1\}$

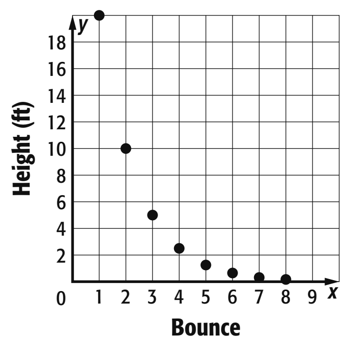


45. y-intercept −2; D = {all real numbers};
R = $\{y \mid y > -3\}$



47. $3053.00 **49.** −1, 1, −1 **51.** 32, 16, 8
53. $a_n = 3(3)^{n-1}$

55. Basketball Rebound



57. 3, 12, 30, 66, 138 **59.** $a_1 = 32$, $a_n = 0.5a_{n-1}$, $n \geq 2$

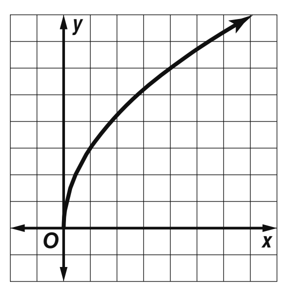
CHAPTER 8
Radical Functions, Rational Functions, and Equations

Chapter 8 Get Ready

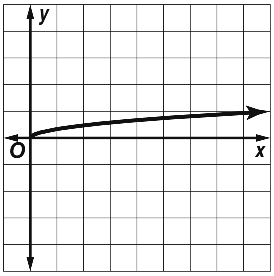
1. 9.06 **3.** 3.87 **5.** 10 ft **7.** $13x - 3y$
9. $3m + 3n + 10$ **11.** 0, 2 **13.** 2, 5 **15.** 10

Lesson 8–1

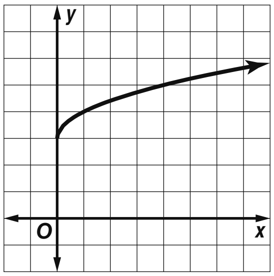
1. vertical stretch of $y = \sqrt{x}$
D = $\{x \mid x \geq 0\}$, R = $\{y \mid y \geq 0\}$



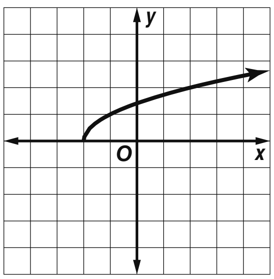
3. vertical compression of $y = \sqrt{x}$; D = $\{x \mid x \geq 0\}$, R = $\{y \mid y \geq 0\}$



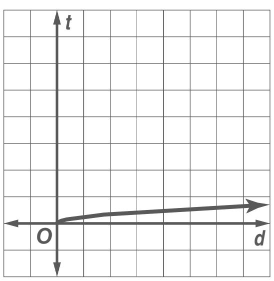
5. translated up 3 units; D = $\{x \mid x \geq 0\}$, R = $\{y \mid y \geq 3\}$



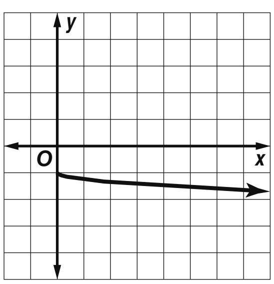
7. translated left 2 units; D = $\{x \mid x \geq -2\}$, R = $\{y \mid y \geq 0\}$



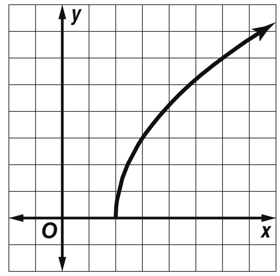
9. D = $\{d \mid d \geq 0\}$, R = $\{t \mid t \geq 0\}$.



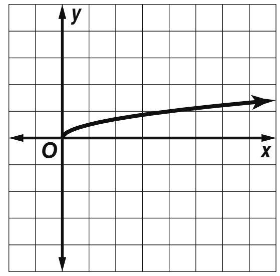
11. vertical compression of $\sqrt{x}$, and reflected across the x—axis and translated down 1 unit; D = $\{x \mid x \geq 0\}$, R = $\{y \mid y \leq -1\}$



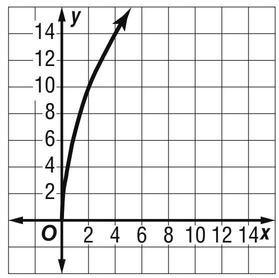
13. translated right 2 units and vertical stretch of $\sqrt{x}$; D = $\{x \mid x \geq 2\}$, R = $\{y \mid y \geq 0\}$



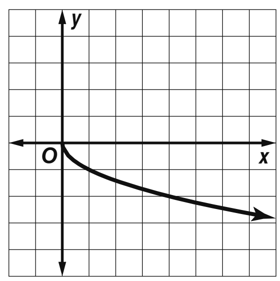
15. vertical compression of $\sqrt{x}$; D = $\{x \mid x \geq 0\}$, R = $\{y \mid y \geq 0\}$



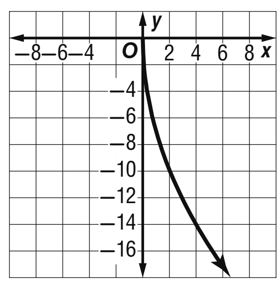
17. vertical stretch of $\sqrt{x}$; D = $\{x \mid x \geq 0\}$, R = $\{y \mid y \geq 0\}$



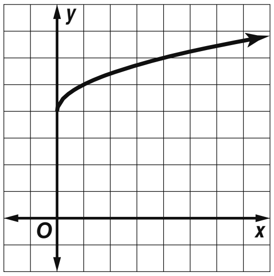
19. reflected across the x—axis; D = $\{x \mid x \geq 0\}$, R = $\{y \mid y \leq 0\}$



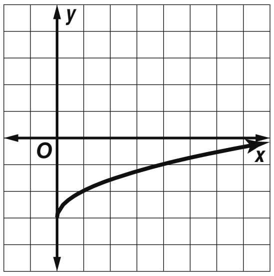
21. vertical stretch of $\sqrt{x}$ and and reflected across x—axis; D = $\{x \mid x \geq 0\}$, R = $\{y \mid y \leq 0\}$



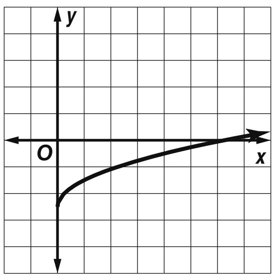
23. translated up 4 units; D = {x | $x \geq 0$}, R = {y | $y \geq 4$}



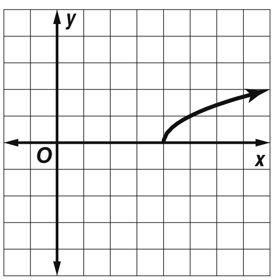
25. translated down 3 units; D = {x | $x \geq 0$}, R = {y | $y \geq -3$}



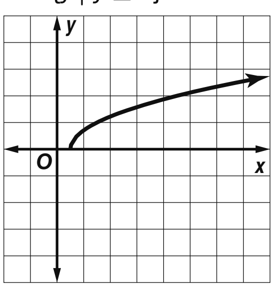
27. translated down 2.5 units;
D = {x | $x \geq 0$}, R = {y | $y \geq -2.5$}



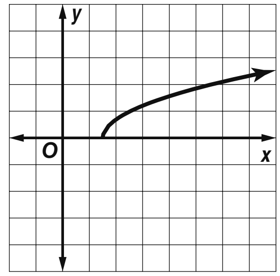
29. translated right 4 units;
D = {x | $x \geq 4$}, R = {y | $y \geq 0$}



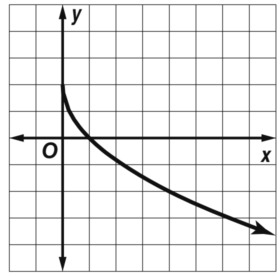
31. translated right 0.5 unit;
D = {x | $x \geq 0.5$}, R = {y | $y \geq 0$}



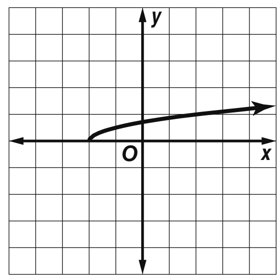
33. translated right 1.5 units;
D = {x | $x \geq 1.5$}, R = {y | $y \geq 0$}



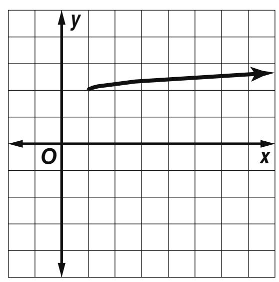
35. vertical stretch of $y = \sqrt{x}$, reflected across the x–axis, and translated down 2 units; D = {x | $x \geq 0$}, R = {y | $y \leq 2$}



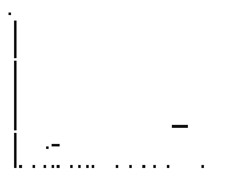
37. vertical compression of $y = \sqrt{x}$ and translated left 2 units; D = {x | $x \geq -2$}, R = {y | $y \geq 0$}



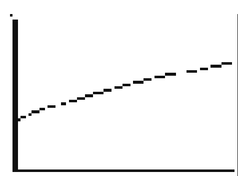
39. vertical compression of $y = \sqrt{x}$ and translated up 2 units and right 1 unit; D = {x | $x \geq 1$}, R = {y | $y \geq 2$}



41.



43a.



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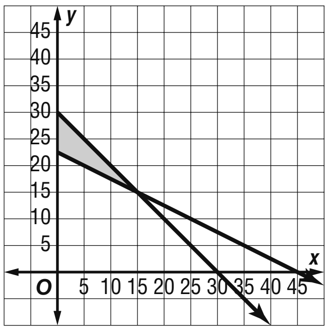
43b. about 363.3 m/s **43c.** When t is 65°C, c is about 368.8 m/s,

so this 10—degree increase results in an increase in speed of about 5.5 m/s.
45. False; sample answer: The domain of $y = \sqrt{x + 3}$ includes -1, -2, and -3. **47.** Sample answer: The domain is limited because square roots of negative numbers are imaginary; therefore the radicand must be nonnegative. Since the principal square root of a nonnegative number is a nonnegative number, the range will be nonnegative. **49.** $y = \sqrt{x} + 3$; it is a translation of $y = \sqrt{x}$; the other equations represent vertical stretches or compressions. **51.** The value of a is negative. For the function to have negative y-values, the value of a must be negative.
53. A **55.** D

57a.


57b. Sample answer: walk: 15 min, jog: 15 min; walk: 10 min, jog: 20 min; walk: 5 min, jog: 25 min

59. $2 \cdot 2 \cdot 7 \cdot n \cdot n \cdot n$ **61.** $2 \cdot 3 \cdot 5 \cdot 5 \cdot r \cdot t$

63. $3 \cdot 3 \cdot 5 \cdot 5 \cdot a \cdot a \cdot a \cdot b \cdot b \cdot c$

Lesson 8-2

1. $2\sqrt{6}$ **3.** 10 **5.** $3\sqrt{6}$ **7.** $2x^2y^3\sqrt{15y}$

9. $3b^2|c|\sqrt{11ab}$ **11.** $\frac{9 - 3\sqrt{5}}{4}$ **13.** $\frac{2 + 2\sqrt{10}}{-9}$

15. $\frac{24 + 4\sqrt{7}}{29}$ **17.** $2\sqrt{13}$ **19.** $6\sqrt{2}$ **21.** $9\sqrt{3}$

23. $5\sqrt{2}$ **25.** $12\sqrt{14}$ **27.** $15|t|$ **29.** $2|a|b\sqrt{7b}$

31. $21m\sqrt{7mp}$ **33.** $2a^3|b|\sqrt{5b}$

35a. $v = 8\sqrt{h}$

35b. about 92.6 ft/s

35c. $\frac{4\sqrt{2}}{t^2}$

39. $\frac{2c\sqrt{51ac}}{9a}$ **41.** $\frac{3\sqrt{15}}{20}$ **43.** $\frac{35 - 7\sqrt{3}}{22}$

45. $\frac{6\sqrt{3} + 9\sqrt{2}}{2}$ **47.** $\frac{5\sqrt{6} - 5\sqrt{3}}{3}$ **49a.** $I = \frac{\sqrt{PR}}{R}$

49b. about 3.9 amps

51.

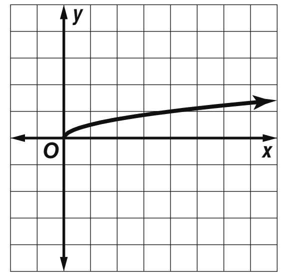
Distance	3	6	9	12	15
Height	6	24	54	96	150

53a. 3 **53b.** $2\sqrt[3]{5}$ **53c.** $5\sqrt[3]{6}$

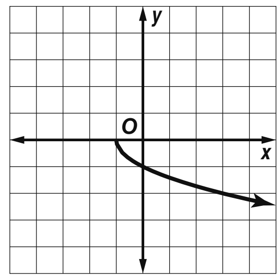
55. Sample answer: $1 + \sqrt{2}$ and $1 - \sqrt{2}$; $(1 + \sqrt{2}) \cdot (1 - \sqrt{2}) = 1 - 2 = -1$

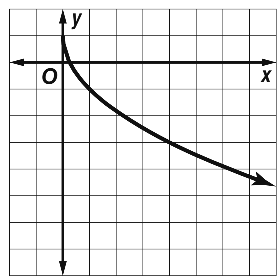
57. No radicals can appear in the denominator of a fraction. So, rationalize the denominator to get rid of the radicand in the denominator. Then check if any of the radicands have perfect square factors other than` 1. If so, simplify. **59.** H **61.** 507.50

63. vertical compression of $y = \sqrt{x}$, $D = \{x|x \geq 0\}$, $R = \{y|y \geq 0\}$



65. reflected across the x—axis and translated left 1 unit; $D = \{x|x \geq -1\}$, $R = \{y|y \leq 0\}$



67.


stretched vertically, reflected across the x—axis, and translated up 1 unit; $D = \{x|x \geq 0\}$, $R = \{y|y \leq 1\}$

69. Sample answer: Let t = the number of tomato varieties for which they do not produce seeds, $t + 200 > 10{,}000$; $\{t|\ t > 9800\}$.

71. $2^3 \cdot 11$ **73.** 31 **75.** $2 \cdot 3^2 \cdot 5$

Lesson 8-3

1. $9\sqrt{5}$ **3.** $-5\sqrt{7}$ **5.** $8\sqrt{5}$ **7.** $5\sqrt{2} + 2\sqrt{3}$

9. $72\sqrt{3}$ **11.** $\sqrt{21} + 3\sqrt{6}$ **13.** $14.5 + 3\sqrt{15}$

15. $11\sqrt{6}$ **17.** $3\sqrt{2}$ **19.** $5\sqrt{10}$

21. $60 + 32\sqrt{10}$ **23.** $3\sqrt{5} + 6 - \sqrt{30} - 2\sqrt{6}$

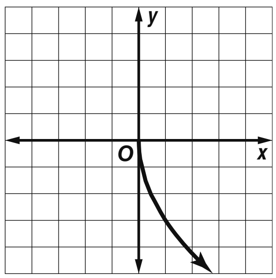
25. $5\sqrt{5} + 5\sqrt{2}$ **27.** $\frac{-4\sqrt{5}}{5}$ **29.** $\sqrt{2}$ **31.** $14 - 6\sqrt{5}$

33a. 0 ft/s **33b.** Sample answer: In the formula, we are taking the square root of the difference, not the square root of each term. **35.** $\sqrt{170}$; about 13 amps
37. Irrational; irrational; no rational number could be added to or multiplied by an irrational number so that the result is rational. **39.** Sample answer: You can use the FOIL method. You multiply the first terms within the parentheses. Then you multiply the outer terms within the parentheses. Then you would multiply

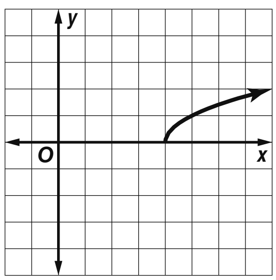
the inner terms within the parentheses. And, then you would multiply the last terms within each parentheses. Combine any like terms and simplify any radicals. For example, answer: $(\sqrt{2}+\sqrt{3})(\sqrt{5}+\sqrt{7}) = \sqrt{10}+\sqrt{14}+\sqrt{15}+\sqrt{21}$. **41.** C
43. C **45.** $2\sqrt{6}$ **47.** $5ab^2\sqrt{2ab}$

49. $3cd^2f^2\sqrt{7cf}$

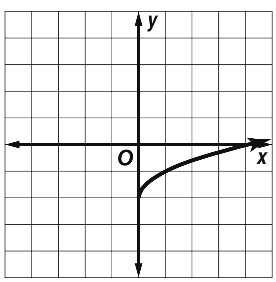
51. stretched vertically and reflected across the x–axis; $D = \{x \mid x \geq 0\}$, $R = \{y \mid y \leq 0\}$



53. translated right 4 units; $D = \{x \mid x \geq 4\}$, $R = \{y \mid y \geq 0\}$



55. translated down 2 units; $D = \{x \mid x \geq 0\}$, $R = \{y \mid y \geq -2\}$

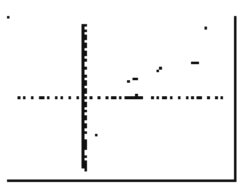


57. -0.5 **59.** 18.7 **61.** 24

Lesson 8-4

1. $r = \frac{\sqrt{\pi x}}{2\pi}$ **3.** 2 **5.** 10 **7.** 6 **9.** 100 **11.** 39 **13.** 17
15. 3 **17.** 6 **19.** 7 **21a.** 52 ft **21b.** Increases; sample answer: If the length is longer, the quotient and square root will be a greater number than before. **23.** no solution
25. 235.2 **27.** 3

29a.



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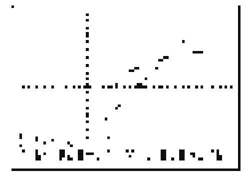
29b. See students' work.

29c.



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31. Jada; Fina had the wrong sign for $2b$ in the fourth step
33. Sample answer: In the first equation, you have to isolate the radical first by subtracting 1 from each side. Then square each side to find the value of x. In the second equation, the radical is already isolated, so square each side to start. Then subtract 1 from each side to solve for x. **35.** Sometimes; the equation is true for $x \geq 2$, but false for $x < 2$. **37.** Sample answer: Add or subtract any expressions that are not in the radicand from each side. Multiply or divide any values that are not in the radicand to each side. Square each side of the equation. Solve for the variable as you did previously. See students' examples. **39.** C **41.** D
43. $4\sqrt{3}$

45. $42\sqrt{2}$ **47.** $\frac{c^2\sqrt{5cd}}{2|d^3|}$

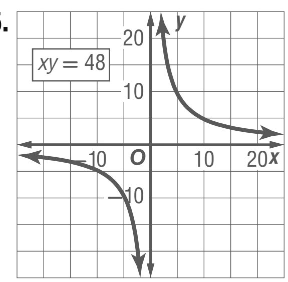
49. Yes; 12 is a real number and therefore a monomial.
51. No; $a - 2b$ shows subtraction, not multiplication alone of numbers and variables.
53. No; $\frac{x}{y^2}$ has a variable in the denominator.

55. 81 **57.** 1024 **59.** $\frac{w^6}{81}$

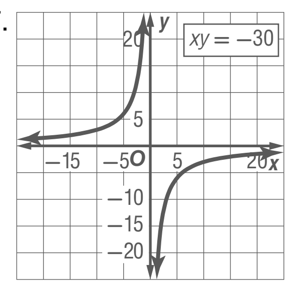
Lesson 8-5

1. Direct; the data in the table can be represented by the equation $y = 2x$ **3.** Inverse; $xy = 4$.

5.

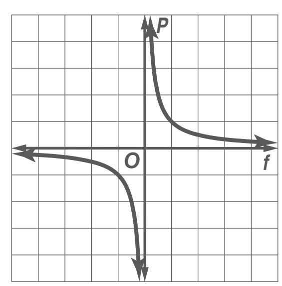


7.



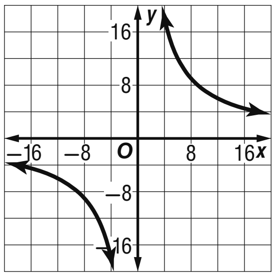
9. 16 **11.** -7.5

13a.

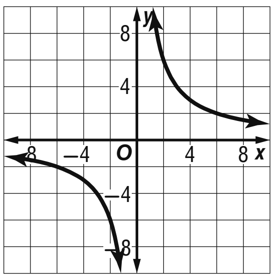


13b. 5 to -2.5 diopters **15.** Direct; $y = -3x$
17. Inverse; $xy = -40$ **19.** Inverse; $xy = \frac{1}{4}$

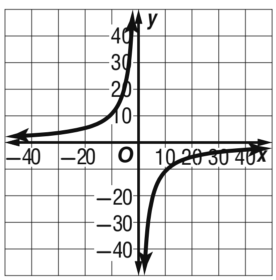
21. Direct; $y = 9x$ **23.** $xy = 72$



25. $xy = 12$



27. $xy = -108$



29. 15 **31.** -3 **33.** 9.6 **35.** approximately 311 cycles per second **37.** Direct; the number of lemonades times the cost per lemonade equals the total cost. So the ratio $\frac{\text{total cost}}{\text{number of lemonades}}$ is a constant \$1.50.

39. Inverse; the number of friends times the number of tokens per person equals the constant 30.

41. Inverse; $xy = 21$ **43.** Direct; $y = \frac{1}{2}x$

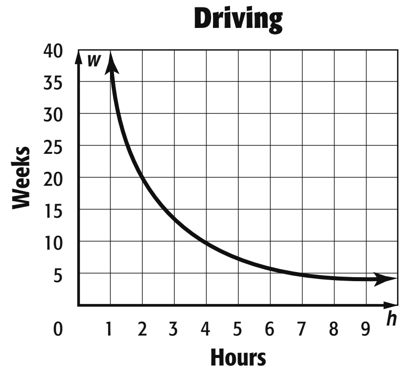
45. 18.4 **47.** 2.5 **49.** \$4

51a.

Hours per Week *h*	Number of Weeks *w*
1	40
2	20
4	10
5	8
8	5
10	4

51b. The number of weeks decreases.

51c. $hw = 40$ or $w = \frac{40}{h}$



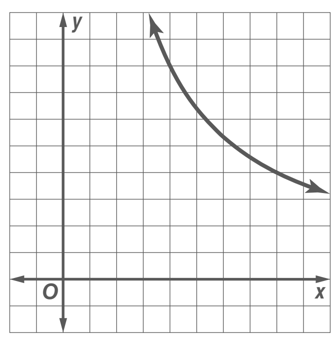
53. direct variation **55.** Sample answer: Newton's Law of Gravitational Force is an example of an inverse variation that models realworld situations. The gravitational force exerted on two objects is inversely proportional to the square of the distances between the two objects. The force exerted on the two objects, times the square of the distance between the two objects, is equal to the gravitational constant times the masses of the two objects. **57.** B **59.** C **61.** Positive; it means the more you study, the better your test score.

63. -4.4 **65.** 1.2 **67.** 7^2 or 49 **69.** $\frac{q^4}{2q^5}$
71. $\frac{4a^4b^2}{c^6}$ **73.** $\frac{1}{mn}$

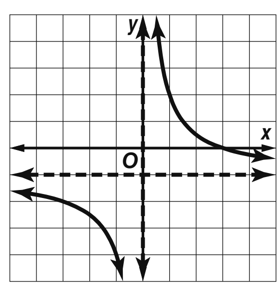
Lesson 8-6

1. $x = 0$ **3.** $x = 1$

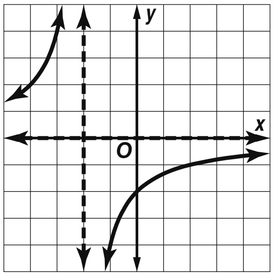
5.



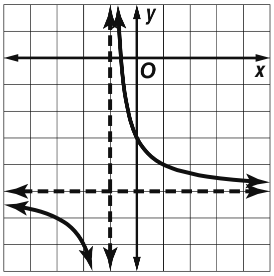
7. $x = 0$; $y = -1$



9. $x = -2$; $y = 0$

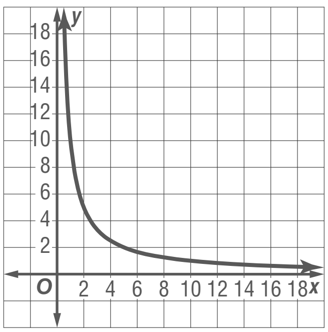


11. $x = -1$; $y = -5$

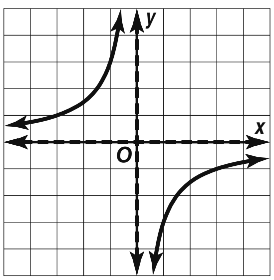


13. $x = 8$ **15.** $x = -6$ **17.** $x = -5$ **19.** $x = -7$

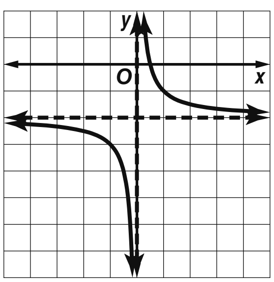
21.



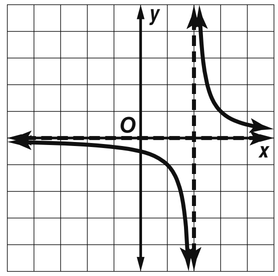
23. $x = 0$; $y = 0$



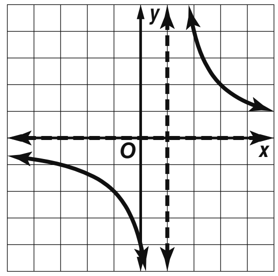
25. $x = 0$; $y = -2$



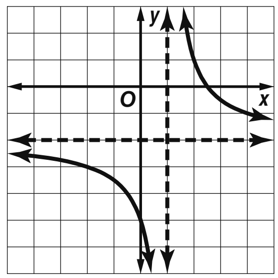
27. $x = 2$; $y = 0$



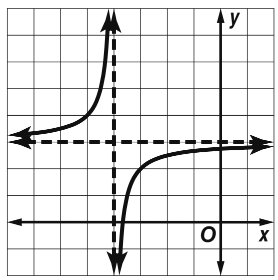
29. $x = 1$; $y = 0$



31. $x = 1$; $y = -2$



33. $x = -4$; $y = 3$



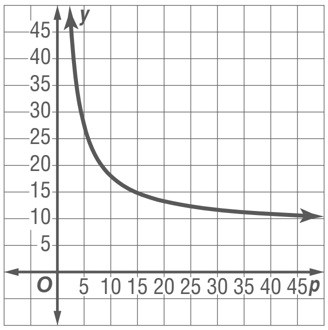
35a. $x = 3$ and $y = 2$

35b. $y = \frac{1}{x - 3} + 2$

37a. Sample answer: The total cost of the trip equals the cost of a ticket plus the cost of the star-naming package divided by the number of people.

37b. $y = \frac{95}{p} + 8.50$

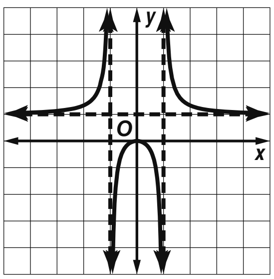
37c.



Sample answer: The end behavior indicates that as the number of people increases, the cost per person approaches 0. Since there is no x-intercept, the cost per person will never be 0.

37d. Sample answer: 15 people

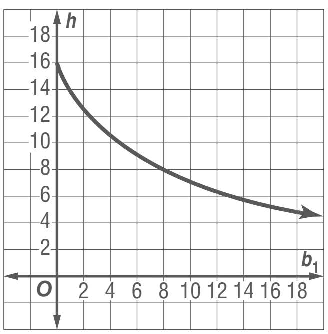
39.



$x = -1, x = 1; y = 1$

41a. D = {all positive real numbers};
R = {all positive real numbers}

41b.



41c. about 7 units

43. The graph of $y = \frac{1}{x+5} - 2$ is the graph of $y = \frac{1}{x}$ translated 5 units to the left and 2 units down.

45. False; sample answer: The graph of $y = \frac{1}{x}$ has no x- or y-intercepts.

47. Sample answer: Vertical asymptotes occur at values that make the denominator 0; horizontal asymptotes occur at $y = c$ for any rational function of the form

$y = \frac{a}{x-b} + c$.

49. 45 seconds **51.** D **53.** $\sqrt{465}$ or about 21.56 mi

55. $(w + 16)(w - 3)$ **57.** $(3 + a)(24 + a)$

59. $(d - 2)(d - 5)$ **61.** $(n + 9)(n - 6)$

61. $(n + 9)(n - 6)$ **63.** $(4b - 3)(6b + 1)$

65. $2(x - 3)(.3x + 2)$

Lesson 8-7

1. -2 **3.** $-\frac{4}{5}$ **5.** -3

7. $\frac{15}{38}$ hour or about 0.4 hour

9. 8 **11.** $\frac{2}{3}$ **13.** -13 **15.** 0 **17.** $-2, 3$

19. no solution; extraneous: 1

21. $\frac{15}{8}$ hours or $1\frac{7}{8}$ hours **23.** 26.2 hours **25a.** line

25b. $f(x) = \frac{x(x+5)(x-6)}{x-6}$
$= x + 5$

25c. -5 **27a.** parabola **27b.** $f(x) = x^2 + 6x + 12$
27c. no real zeros **29a.** $s = r - w$; $s = r + w$

29b. $d = t(r - w)$, $d = t(r + w)$; $t = \frac{d}{r-w}$, $t = \frac{d}{r+w}$

31a. $h = \frac{kp}{c}$ **31b.** 4 hours

33. $-1 \pm \sqrt{7}$; extraneous: 0, -2 **35.** $\frac{50}{11}$

37. The extraneous solution of a rational equation is an excluded value of one of the expressions in the equation.

39. Sample answer: $\frac{x}{x-8} = 0$

41. D **43.** D **45.** about 2,172,453

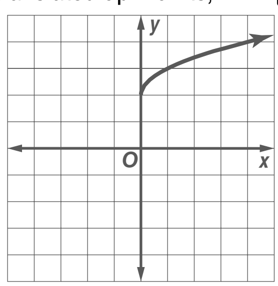
47. $\{p \mid 28 \leq p \leq 32\}$ **49.** 3.75×10^{-5}

51. $7.50 + 1.25t + 0.15(7.50 + 1.25t) \leq 13$; 3 or fewer toppings **53.** $\{r \mid r > 49\}$ **55.** 0.3 **57.** 0.75

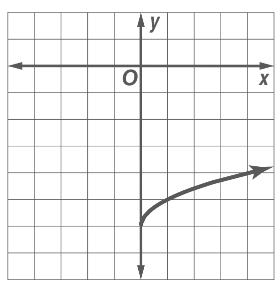
Chapter 8 Study Guide and Review

1. false; $12\sqrt{2}$ **3.** true **5.** true **7.** true

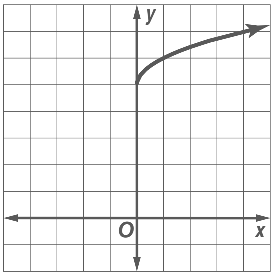
9. translated up 2 units; $D = \{x \mid x \geq 0\}$ $R = \{y \mid y \geq -2\}$



11. translated down 6 units; $D = \{x \mid x \geq 0\}$,
$R = \{y \mid y \geq -6\}$

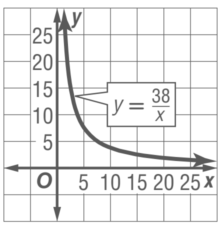


13. translated up 5 units; $D = \{x \mid x \geq 0\}$, $R = \{y \mid y \geq 5\}$



15. $6|x|y^3\sqrt{y}$ **17.** $3\sqrt{2}$ **19.** $21 - 8\sqrt{5}$ **21.** $\frac{5\sqrt{2}}{|a|}$
23. $-6 - 3\sqrt{5}$ **25.** about 2.15 hours or 2 hours and 9 minutes **27.** $2\sqrt{6} - 4\sqrt{3}$ **29.** $5\sqrt{2} + 5\sqrt{3}$
31. $-2\sqrt{30} + 19\sqrt{2}$ **33.** about 250.95 ft/s
35. -41 **37.** $\frac{4}{3}$ **39.** 5 **41.** $\frac{1}{3}$ **43.** $-\frac{9}{16}$ **45.** 3 **47.** 2

49.



The vertical asymptote is at $x = 0$ and the horizontal asymptote is at $y = 0$.

51. $-\frac{70}{3}$ **53.** no solution **55.** $\frac{12}{5}$ or $2\frac{2}{5}$ hours

CHAPTER 9
Statistics and Probability

Chapter 9 Get Ready

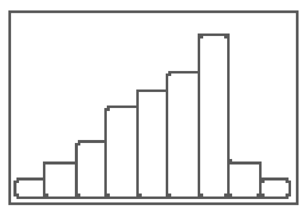
1. $\frac{3}{7}$ **3.** $\frac{4}{7}$ **5.** $\frac{1}{6}$ **7.** $\frac{5}{6}$ **9.** $\frac{7}{256}$ **11.** $\frac{84}{625}$
13. 82.4% **15.** 85.6% **17.** 35%

Lesson 9-1

1. sample: 1000 college students; population: all college students in the United States; sample statistic: mean of the money spent on books in a year by the sample; population parameter: mean of money spent on books by all college students in the United States **3.** 4.98; Sample answer: The standard deviation is relatively high due to outliers 0 and 20. **5.** sample: 1003 voters in Mercy County; population: all voters in Mercy County; sample statistic: the number of people in the sample who would vote for the incumbent candidate; population parameter: the number of people in the county who would vote for the incumbent candidate **7.** sample: stratified random sample of 2500; population: high school students in the country; sample statistic: how much money the 2500 students spent each month; population parameter: how much money all the students in the country spent each month **9.** 14; Sample answer: On average, each day's attendance is 14 people from the mean of 94 people. The mean absolute deviation is affected by outliers 45 and 166. **11.** 2.1; Sample answer: With a mean of 77.875, the standard deviation of about 2.1 suggests that there is a very little deviation to the data. Therefore, you can conclude that Carla's archery scores are pretty consistent. **13a.** Sample answer: Movie A had a mean of about 7.2 with a standard deviation of about 0.81. Movie B had a mean of about 6.8 with a standard deviation of about 2.86. While both movies had a mean rating of close to 7, the ratings for Movie B had more variability. In other words, some people really liked it while others didn't like it at all. The ratings for Movie A were much more consistent. **13b.** Movie A: Sample answer: The reviews are consistent and all are between 6 and 8. You would prefer this movie if you want to see a movie that, while it isn't anyone's favorite, you can assume that it will be decent.
Movie B: Sample answer: While some people didn't like the movie at all, others loved it. You would prefer this movie if you hope to be one of the people that love it.
15a. ≈16.9 min, ≈41.4 seconds **15b.** The sample is the first 15 finishers of the race. The population is all of the people who ran the race. **15c.** The data is quantitative. No, since the sample is the top 15 runners in the race, it is not random. So, it would not be accurate to apply the mean and standard deviation of the running times to the population. **17.** Sometimes; if the samples are truly random, they would rarely contain identical elements and the mean and standard deviation would differ. If the sample produces identical elements, the mean and standard deviation would be the same. **19.** Sample answer: Any set of data with identical terms. For example: 5, 5, 5, 5, 5, 5, 5. **21.** Both are calculated statistical values that show how each data value deviates from the mean of the data set. The mean absolute deviation is calculated by taking the mean of the absolute values of the differences between each number and the mean of the data set. To find the standard deviation, you square each difference and then take the square root of the mean of the squares. **23.** 125 **25.** C **27.** 31; 21; 15; 36 **29.** 11; 21; 18; 25 **31.** 10; 11; 9.5; 13

Lesson 9-2

1.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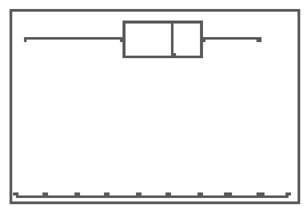
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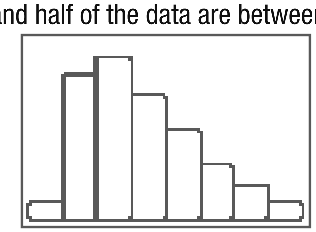
negatively skewed

3. Sample answer: The distribution is skewed, so use the five-number summary. The range is 92 − 52 or 40. The median is 65, and half of the data are between 59.5 and 74.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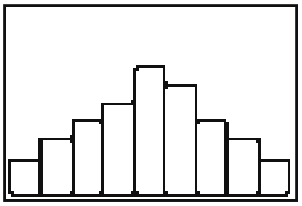
5.



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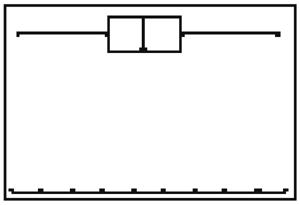

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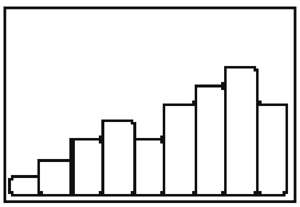
symmetric

7. Sample answer: The distribution is skewed, so use the five-number summary. The range is 53 − 12 or 41. The median is 39.5, and half of the data are between 28 and 48.



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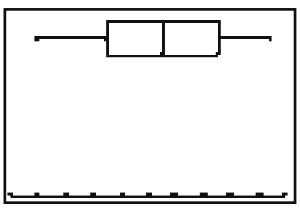
9. Sample answer: The distribution is symmetric, so use the mean and standard deviation to describe the center and spread. The mean temperature is 52.8° with a standard deviation of about 4.22°.



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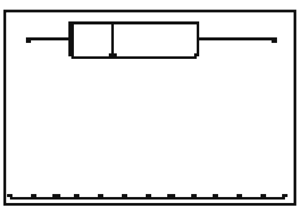
11a.



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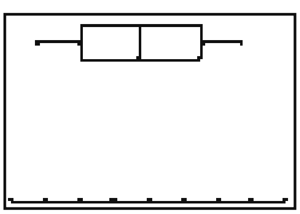
Sample answer: The distribution is skewed, so use the five-number summary. The range is $18.50 − $7.75 or $10.75. The median price is $11.50, and half of the prices are between $9.63 and $15.13.

11b.



[7, 15] scl: 1 by [0, 5] scl: 1

Sample answer: The distribution is symmetric, so use the mean and standard deviation. The mean is about $10.67 with a standard deviation of about $1.84.

13. i **15.** Sample answer: A bimodal distribution is a distribution of data that is characterized by having data divided into two clusters, thus producing two modes, and having two peaks. The distribution can be described by summarizing the center and spread of each cluster of data. **17.** Sample answer: In a symmetrical distribution, the majority of the data is located near the center of the distribution. The mean of the distribution is also located near the center of the distribution. Therefore, the mean and standard deviation should be used to describe the data. In a skewed distribution, the majority of the data lies either on the right or left side of the distribution. Since the distribution has a tail or may have outliers, the mean is pulled away from the majority of the data. The median is less affected. Therefore, the five-number summary should be used to describe the data. **19.** F **21a.** $3w = 2\ell + 3$; $4\ell = 12 + P$ **21b.** 21 in., 15 in. **21c.** 315 in^2
23. sample: random sample of 100 seniors; population: all seniors at North Boyton High School; sample statistic: the mean amount of money the sample spent on prom; population parameter: the mean amount of money seniors at North Boyton High School spent on prom

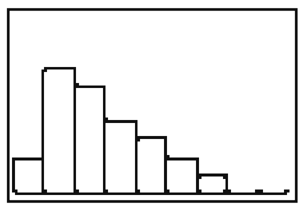
25. $f^{-1}(x) = -\frac{1}{5}x + \frac{17}{5}$ **27.** $f^{-1}(x) = -7x - 7$
29. $f^{-1}(x) = -\frac{5}{3}x + 20$ **31.** $\frac{4}{11}$ **33.** $\frac{7}{11}$ **35.** $\frac{1}{2}$

Lesson 9-3

1. 3.5, 3.5, 1, 8, 2.4 **3.** 17.3, 16.5, 9, 30, 9.4

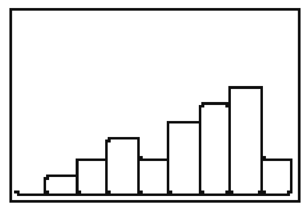
5a.

Kyle's Distances



[17, 19.25] scl: 0.25 by [0, 10] scl: 1

Mark's Distances



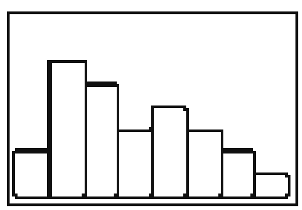
[17, 19.25] scl: 0.25 by [0, 10] scl: 1

Kyle, positively skewed; Mark, negatively skewed

5b. Sample answer: The distributions are skewed, so use the five-number summaries. Kyle's upper quartile is 17.98, while Mark's lower quartile is 18.065. This means that 75% of Mark's distances are greater than 75% of Kyle's distances. Therefore, we can conclude that overall, Mark's distances are higher than Kyle's.
7. 60.9, 60, 60, 14, 4.7 **9.** 22.5, 21.5, no mode, 24, 7.4
11. 36.8, 38, 12, 56, 20.0 **13.** 26.8, 27.2, 29.6, 10.4, 3.5

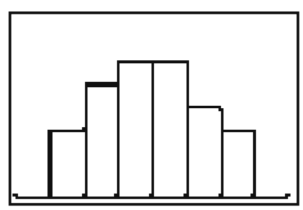
15a.

1st Period



[200, 600] scl: 50 by [0, 8] scl: 1

6th Period

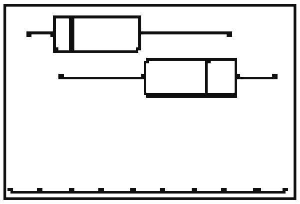


[200, 600] scl: 50 by [0, 8] scl: 1

1st period, positively skewed; 6th period, symmetric

15b. Sample answer: One distribution is symmetric and the other is skewed, so use the five-number summaries. The lower quartile for 1st period is 291 pages, while the minimum for 6th period is 294 pages. This means that the lower 25% of data for 1st period is lower than any data from 6th period. The range for 1st period is 578 − 206 or 372 pages. The range for 6th period is 506 − 294 or 212 pages. The median for 1st period is about 351 pages, while the median for 6th period is 392 pages. This means, that while the median for 6th period is greater, 1st period's pages have a greater range and include greater values than 1st period.

17a.



[1.5, 6] scl: 0.5 by [0, 5] scl: 1

Leon, positively skewed; Cassie, negatively skewed

17b. Sample answer: The distributions are skewed, so use the five-number summaries. The lower quartile for Leon's times is 2.2 minutes, while the minimum for Cassie's times is 2.3 minutes. This means that 25% of Leon's times are less than all of Cassie's times. The upper quartile for Leon's times is 3.6 minutes, while the lower quartile for Cassie's times is 3.7 minutes. This means that 75% of Leon's times are less than 75% of Cassie's time. Overall, we can conclude that Leon completed the brainteasers faster than Cassie.

19a. 52.96, 53, 53, 19, 6.08 **19b.** 47.96, 48, 48, 19, 6.08

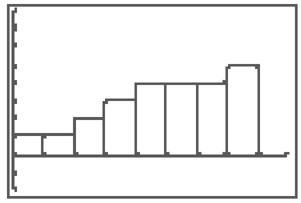
21. $37,750. **23.** Sample answer: Histograms show the frequency of values occurring within set intervals. This makes the shape of the distribution easy to recognize. However, no specific values of the data set can be identified from looking at a histogram, and the overall spread of the data can be difficult to determine. The box-and-whisker plots show the data divided into four sections. This aids when comparing the spread of one set of data to another. However, the box-and-whisker plots are limited because they cannot display the data any more specifically than showing it divided into four sections. **25.** Sample answer: The mean and standard deviation are used to describe symmetric distributions. If both distributions are symmetric, then the mean and standard deviation will be used to compare the two distributions. If one of the distributions is skewed, the mean and standard deviation are no longer the best statistics to use to describe the distribution. Therefore, if one or both of the distributions is skewed, the five-number summaries should be used to compare the two distributions. **27.** $m\angle A = 36°$, $c \approx 9.9$, $a \approx 5.8$ **29.** D **31.** 5.58; Sample answer: The standard deviation is relatively high compared to the mean of 6.4 due to the outlier 23. If this outlier were removed, the new mean of the data would be about 5.2 with a standard deviation of about 3.51. **33.** 4 **35.** 0 **37.** 1

Chapter 9 Study Guide and Review

1. permutation **3.** Theoretical probability

1. 0.88; Sample answer: On average, the number of sidewalks that Ben shovels each day is 0.88 away from the mean of 3.4. **3.** The day customers had a mean of about 9.6 times per month with a standard deviation of about 3.5. The night customers had a mean of about 11.7 times per month with a standard deviation of about 2.5. The night customers had a higher average and their data values were more consistent.

5.

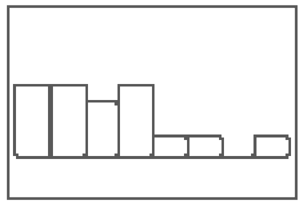


[0, 90] scl: 10 by [−2, 8] scl: 1

negatively skewed

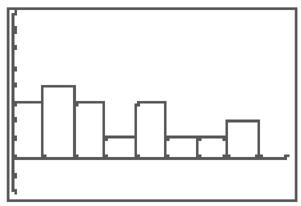
7. 7. 22.5, 21.5, no mode, 24, 7.4

9a. Ms. Miller:



[9, 17] scl: 1 by [−2, 8] scl: 1

Ms. Anderson:



[0, 9] scl: 1 by [−2, 8] scl: 1

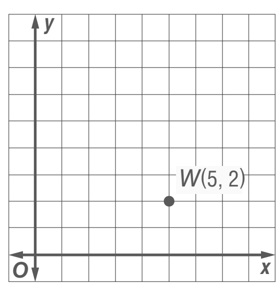
9b. Sample answer: Use the five-number summaries. The range for Ms. Miller is 7. The median is 11. Half of the data are between 10 and 12. The range for Ms. Anderson is 7. The median is 2. Half of the data are between 1 and 4. All of the data in Ms. Anderson's distribution are less than all of the data in Ms. Miller's distribution. Therefore, Ms. Miller will more than likely hand out more disciplinary actions than Ms. Anderson.

CHAPTER 10

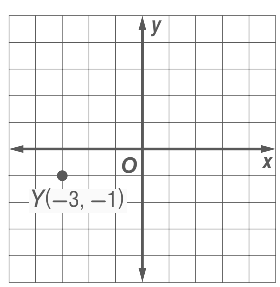
Tools of Geometry

Chapter 10 Get Ready

1.



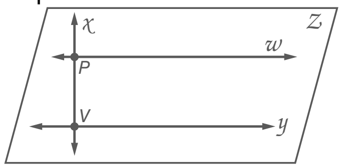
3.



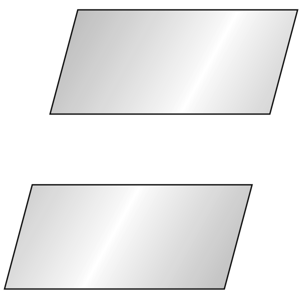
5. e5 **7.** $6\frac{29}{36}$ **9.** $5\frac{2}{15}$ **11.** 81 **13.** 153 **15.** 6

Lesson 10-1

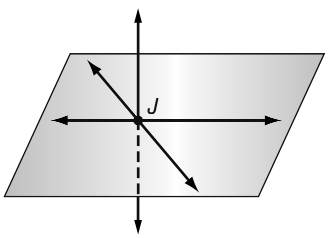
1. Sample answer: *m* **3.** *B* **5.** plane
7. Sample answer:



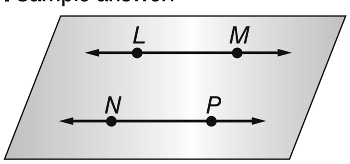
9. Sample answer: *A, H,* and *B* **11.** Yes; points *B, D,* and *F* lie in plane *BDF*. **13.** Sample answer: *n* and *q*
15. *R* **17.** Sample answer: point *P* **19.** points *A* and *P*
21. Yes; line *n* intersects line *q* when the lines are extended.
23. intersecting lines **25.** two planes intersecting in a line
27. point **29.** line **31.** intersecting planes
33. Sample answer:



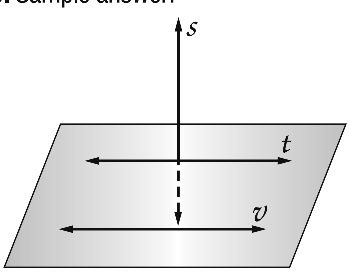
35. Sample answer:



37. Sample answer:

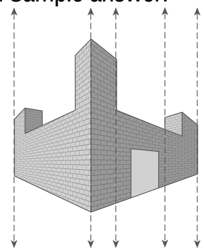


39. Sample answer:

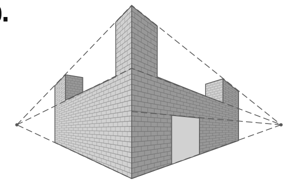


41. edges **43.** Sample answer: *M* and *N* **45.** No; they do not have any lines in common. **47.** No; *V* does not lie in the same plane. **49a.** point **49b.** line

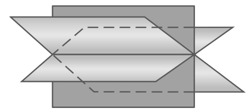
51a. Sample answer:



51b.



51c. Sample answer: They get closer together.
51d. See students' work. **53.** Sample answer: The airplanes are in different horizontal planes.
55a. $\frac{1}{4}$ **55b.** 1
57. Sample answer:



59. 4 **61.** Sample answer: A table is a finite plane. It is not possible to have a real-life object that is an infinite plane because all real-life objects have boundaries. **63.** H
65. B **67.** (6, 4) **69.** between 1.4 and 1.6 hours, inclusive
71. 16 **73.** 1 **75.** $\frac{1}{m^3 b^3}$
77. $\{z \mid -8 < z < -2\}$ **79.** $\{y \mid y \geq 5.5 \text{ or } y \leq -2.5\}$
81. $\{c \mid -2.2 \leq c \leq 3\}$ **83.** > **85.** < **87.** >

Lesson 10-2

1. 5.7 cm or 57 mm **3.** $1\frac{7}{8}$ in. **5.** 3.8 in.
7. $x = 3$; $BC = 6$
9. $\overline{AG} \cong \overline{FG}$, $\overline{BG} \cong \overline{EG}$, $\overline{CG} \cong \overline{DG}$ **11.** 3.8 mm
13. $\frac{15}{16}$ in. **15.** 1.1 cm **17.** 1.5 in. **19.** 4.2 cm
21. $c = 18$; $YZ = 72$ **23.** $a = 4$; $YZ = 20$
25. $n = 4\frac{1}{3}$; $YZ = 1\frac{2}{3}$ **27.** Yes **29.** no **31.** yes
33. $\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{DE} \cong \overline{DG} \cong \overline{BG} \cong \overline{CG}$, $\overline{AH} \cong \overline{HG} \cong \overline{GF} \cong \overline{FE}$, $\overline{BH} \cong \overline{DF}$, $\overline{AC} \cong \overline{EC}$, $\overline{AG} \cong \overline{HF} \cong \overline{GE}$
35. Sample answer: $\overline{BD} \cong \overline{CE}$; $\overline{BD} \cong \overline{PQ}$; $\overline{YZ} \cong \overline{JK}$; $\overline{PQ} \cong \overline{RS}$; $\overline{GK} \cong \overline{KL}$ **37.** If point *B* is between points *A* and *C*, and you know *AB* and *BC*, add *AB* and *BC* to find *AC.* If you know *AB* and *AC*, subtract *AB* from *AC* to find *BC*. **39.** $JK = 12$, $KL = 16$ **41.** Units of measure are used to differentiate between size and distance, as well as for precision. An advantage is that the standard of measure of a cubit is always available. A disadvantage is that a cubit would vary in length depending on whose arm was measured. **43.** D **45.** D **47.** Sample answer: plane *CDF* **49.** points *C*, *B*, and *F* **51** $x + y = 180$; $x = y + 24$; 102°, 78° **53.** $y - 6 = -7(x + 3)$ **55.** 7 **57.** 8 **59.** 16

Lesson 10-3

1. 8 **3.** $\sqrt{148}$ or about 12.2 units. **5.** $\sqrt{58}$ or about 7.6 units **7.** −3 **9.** (4, −5.5) **11.** (−4, 9) **13.** 5 **15.** 9 **17.** 12 **19.** $\sqrt{89}$ or about 9.4 units **21.** $\sqrt{58}$ or about 7.6 units **23.** $\sqrt{208}$ or about 14.4 units **25.** $\sqrt{65}$ or about 8.1 units **27.** $\sqrt{53}$ or about 7.3 units **29.** $\sqrt{18}$ or about 4.2 units **31.** 4.5 mi **33.** 6 **35.** −4.5 **37.** 3 **39.** (18.5, 5.5) **41.** (−6.5, −3) **43.** (−4.2, −10.4)

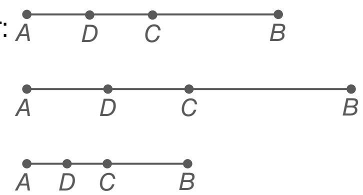
45. $\left(-\frac{1}{2}, \frac{1}{2}\right)$

47. $A(1, 6)$ **49.** $C(16, -4)$ **51.** $C(-12, 13.25)$ **53.** 58 **55.** 4.5 **57a.** (47, −25) **57b.** ≈ 53.2 ft **59.** =AVERAGE(B2, D2) **61.** (−5, 0), (7, 0)

63. $\left(-1\frac{1}{2}, -1\right)$ **65.** ±5

67a. Sample answer:

67b. Sample answer:



67c. Sample answer:

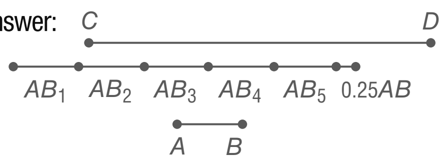
line	*AB* (cm)	*AC* (cm)	*AD* (cm)
1	4	2	1
2	6	3	1.5
3	3	1.5	0.75

67d. $AC = \frac{1}{2}x$, $AD = \frac{1}{4}x$

67e. Sample answer: If *n* midpoints are found, then the smallest segment will have a measure of $\frac{1}{2n}x$.

69. Sample answer: Sometimes; when the point (x_1, y_1) has coordinates (0, 0)

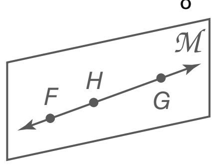
71. Sample answer:



Draw $\overline{AB}$. Next, draw a construction line and place point *C* on it. From point *C*, strike 6 arcs in succession of length *AB*. On the sixth $\overline{AB}$ length, perform a segment bisector two times to create a $\frac{1}{4}AB$ length. Label the endpoint *D*.

73. C **75.** C **77.** $2\frac{1}{8}$ in.

79.



81. 5 **83.** 7.5 **85.** $3\frac{3}{4}$

Lesson 10-4

1. *U* **3.** ∠*XYU*, ∠*UYX* **5.** acute; 40 **7.** right; 90 **9.** 156 **11a.** 45; When joined together, the angles form a right angle, which measures 90. If the two angles that form this right angle are congruent, then the measure of each angle is 90 ÷ 2 or 45. The angle of the cut is an acute angle. **11b.** The joint is the angle bisector of the frame angle. **13.** *P* **15.** *M* **17.** $\overrightarrow{NV}$, $\overrightarrow{NM}$ **19.** $\overrightarrow{RP}$, $\overrightarrow{RQ}$ **21.** ∠*TPQ*

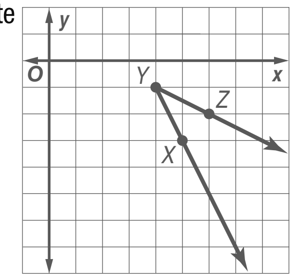
23. ∠*TPN*, ∠*NPT*, ∠*TPM*, ∠*MPT* **25.** ∠4 **27.** *S*, *Q*

29. Sample answer: ∠*MPR* and ∠*PRQ*

31. 90, right **33.** 45, acute **35.** 135, obtuse

37. 27 **39.** 16 **41.** 47 **43a.** about 50 **43b.** about 140 **43c.** about 20 **43d.** 0

45. acute



47a. about 110; obtuse. **47b.** about 85; acute

47c. about 15; If the original path of the light is extended, the measure of the angle the original path makes with the refracted path represents the number of degrees the path of the light changed. The sum of the measure of this angle and the measure of *m*∠3 is 180. The measure of ∠3 is 360 − (110 + 85) or 165, so the measure of the angle the original path makes with the refracted path is 180 − 165 or 15. **49.** The two angles formed are acute angles. Sample answer: With my compass at point *A*, I drew an arc in the interior of the angle. With the same compass setting, I drew an arc from point *C* that intersected the arc from point *A*. From the vertex, I drew $\overrightarrow{BD}$. I used the same compass setting to draw the intersecting arcs, so $\overrightarrow{BD}$ bisects ∠*ABC* or the measurement of ∠*ABD* and ∠*DBC* are the same. Therefore, $\overrightarrow{BD}$ bisects ∠*ABC*.

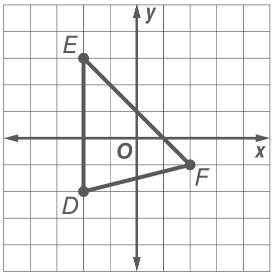
51. Sometimes; sample answer: For example, if you add an angle measure of 4 and an angle measure of 6, you will have an angle measure of 10, which is still acute. But if you add angles with measure of 50 and 60, you will have an obtuse angle with a measure of 110. **53.** Sample answer: To measure an acute angle, you can fold the corner of the paper so that the edges meet. This would bisect the angle, allowing you to determine whether the angle was between 0° and 45° or between 45° and 90°. If the paper is folded two more times in the same manner and cut off this corner of the paper, the fold lines would form the increments of a homemade protractor that starts at 0° on one side and progresses in 90 ÷ 8 or 11.25° increments, ending at the adjacent side, which would indicate 90°. You can estimate halfway between each fold line, which would give you an accuracy of 11.25° ÷ 2 or about 6°. The actual measure of the angle shown is 52°. An estimate between 46° and 58° would be acceptable.

55. Sample answer: Leticia's survey does not represent the entire student body because she did not take a random sample; she only took a sample of students from one major. **57.** E **59.** 8.25 **61.** 15.81 **63.** 10.07 **65.** $x = 11$; $ST = 22$ **67.** 36 **69.** $5\frac{1}{3}$ **71.** 33

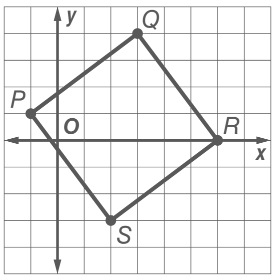
Selected Answers and Solutions

Lesson 10-6

1. pentagon; concave; irregular **3.** octagon; regular **5.** hexagon; irregular **7.** ≈ 40.2 cm; ≈ 128.7 cm^2 **9.** C **11.** triangle; convex; regular **13.** octagon; concave; irregular **15.** hendecagon; concave; irregular **17.** 7.8 m; ≈ 3.1 m^2 **19.** 26 in.; 42.3 in^2 **21.** ≈ 18.9 cm; ≈ 14.6 cm^2 **23.** ≈ 2.55 in.
25. triangle; $P = 5 + \sqrt{32} + \sqrt{17}$ or about 14.78 units; $A = 10$ $units^2$



27. quadrilateral or square; $P = 20$ units; $A = 25$ $units^2$

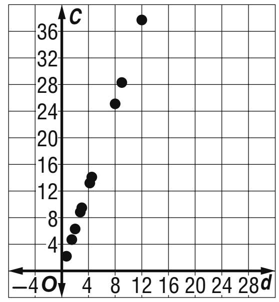


29a. 14 ft **29b.** 12 ft^2 **29c.** The perimeter doubles; the area quadruples. The perimeter of a rectangle with dimensions 6 ft and 8 ft is 28 ft, which is twice the perimeter of the original figure since 2 • 14 ft = 28 ft. The area of a rectangle with dimensions 6 ft and 8 ft is 48 ft^2, which is four times the area of the original figure, since 4 • 12 ft^2 = 48 ft^2. **29d.** The perimeter is halved; the area is divided by 4. The perimeter of a rectangle with dimensions 1.5 ft and 2 ft is 7 ft, which is half the perimeter of the original figure, since $\frac{1}{2}$ • 14 ft = 7 ft. The area of a rectangle with dimensions 1.5 ft and 2 ft is 3 ft^2, which is $\frac{1}{4}$ the area of the original figure, since $\frac{1}{4}$ • 12 ft^2 = 3 ft^2. 31. 60 yd, 6 yd
33. 25.1 in. to 31.4 in.; 50.3 in^2 to 78.5 in^2
35. 21.2 m **37.** $2\pi\sqrt{32}$ or about 35.5 units
39. $12\sqrt{6}$ or about 29.4 in. **41.** 108 in.; 729 in^2

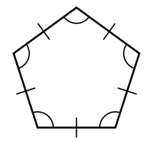
43a–b. S

Object	d (cm)	C (cm)	$\frac{C}{d}$
1	3	9.4	3.13
2	9	28.3	3.14
3	4.2	13.2	3.14
4	12	37.7	3.14
5	4.5	14.1	3.13
6	2	6.3	3.15
7	8	25.1	3.14
8	0.7	2.2	3.14
9	1.5	4.7	3.13
10	2.8	8.8	3.14

43c. Sample answer:



43d. Sample answer: $C = 3.14d$; the equation represents a formula for approximating the circumference of a circle. The slope represents an approximation for pi.
45. 290.93 $units^2$
47. Sample answer: The pentagon is convex, since no points of the lines drawn on the edges are in the interior. The pentagon is regular since all of the angles and sides were constructed with the same measurement, making them congruent to each other.



49. Sample answer: If a convex polygon is equiangular but not also equilateral, then it is not a regular polygon. Likewise, if a polygon is equiangular and equilateral, but not convex, then it is not a regular polygon. **51.** F **53.** C **55.** No; we do not know anything about these measures. **57.** Yes; they form a linear pair. **59.** 37 **61.** 56.5

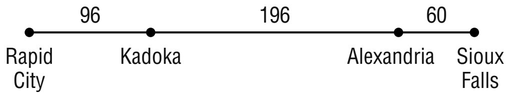
Lesson 10-7

1.

Statements	Reasons
a. $\overline{AB} \cong \overline{FE}$, $\overline{BC} \cong \overline{ED}$	a. Given
b. $AB \cong$ FE, BC ≅ ED	b. Definition of congruent segments
c. AB + FE = BC + ED	c. Addition Property of Equality
d. AB + BC = AC FE + ED = FD	d. Segment Addition Postulate
e. AC = FD	e. Substitution
f. $\overline{AC} \cong \overline{FD}$	f. Definition of Congruence

3. Given: $\overline{WP} \cong \overline{YP}, \overline{ZP} \cong \overline{XP}$
Prove: $WP + ZP = YP + XP$
Proof:
Statements (Reasons)
1. $\overline{WP} \cong \overline{YP}$; $\overline{ZP} \cong \overline{XP}$ (Given)
2. $WP = YP$, $ZP = XP$ (Definition of Congruence)
3. $WP + ZP = YP + XP$ (Addition Property of Equality)

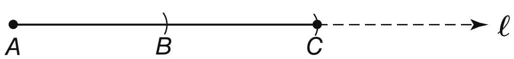
5. Given: $\overline{AB} \cong \overline{CD}$
Prove: $\overline{CD} \cong \overline{AB}$
Proof:
Statements (Reasons)
1. $\overline{AB} \cong \overline{CD}$ (Given)
2. $AB = CD$ (Def. of ≅ segs.)
3. $CD = AB$ (Symm. Prop.)
4. $\overline{CD} \cong \overline{AB}$ (Def. of ≅ segs.)

7a. 

7b. We are given that all of the points are collinear. Since Kadoka is 96 miles from Rapid City and Sioux Falls is 352 miles from Rapid City, Kadoka is between Rapid City and Sioux Falls. Since Alexandria is 292 miles from Rapid City, and Kadoka is 96 miles from Rapid City, Kadoka is between Alexandria and Rapid City. Since Sioux Falls is 352 miles from Rapid City and Alexandria is 292 miles from Rapid City, Alexandria is between Kadoka and Sioux Falls. Therefore, from west to east, the cities are Rapid City, Kadoka, Alexandria, and Sioux Falls.

9. Given: $\overline{AC} \cong \overline{AD}$ and $\overline{ED} \cong \overline{BC}$
Prove: $\overline{AE} \cong \overline{AB}$
Proof:
Statements (Reasons)
1. $\overline{AC} \cong \overline{AD}$ and $\overline{ED} \cong \overline{BC}$ (Given)
2. AC = AD, ED = BC (Definition of Congruence)
3. AE + ED = AD, AB + BC = AC (Segment Addition Postulate)
4. AE + ED = AB + BC (Substitution)
5. $AE = AB$ (Subtraction Property of Equality)
6. $\overline{AE} \cong \overline{AB}$ (Definition of Congruence)

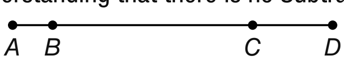
11. Given: Q is the midpoint of $\overline{PR}$,S is the midpoint of $\overline{RT}$, and $\overline{QR} \cong \overline{RS}$.
Prove: $PT = 4QR$
Proof:
Statements (Reasons)
1. Q is the midpoint of $\overline{PR}$,S is the midpoint of $\overline{RT}$, and $\overline{QR} \cong \overline{RS}$.(Given)
2. $PQ = QR$ and $RS = ST$ (Definition of midpoint)
3. $QR = RS$ (Definition of Congruence)
4. $PT = PQ + QR + RS + ST$ (Segment Addition Postulate)
5. $QR = ST$ (Transitive. Property)
6. $PT = QR + QR + QR + QR$ (Substitution)
7. $PT = 4QR$ (Simplify)

13. 

Sample answer: I placed an initial point A on a line ℓ and constructed a point B on the line so that AB is equal to PQ. Using point B as an initial point, I marked point C on the line so that BC is also equal to PQ. The length of the whole segment AC is $AB + BC$ according to the Additional Postulate and $AB = BC = PQ$. Using substitution $AC = PQ + PQ$, or $AC = 2PQ$, so $\overline{AC}$ is twice as long as $\overline{PQ}$.

15. Neither are correct. Mary stated the correct property but incorrectly stated that $\overline{AB} \cong \overline{DE}$, when it should have been $\overline{AB} \cong \overline{DG}$. Susan stated the correct congruence but gave the wrong reason.

17. Student answers will vary, but should convey their understanding that there is no Subtraction Property of Congruence.

19. 

21. D **23.** 18 **25a.** Yes; each is the product of variables and/or a real number. **25b.** 27 ft^3; 54 ft^2
25c. 6 units **25d.** 1:8 **27.** 7 **29.** 15

Lesson 10-8

1. $m\angle 1 = 90$; $m\angle 3 = 54$ **3.** $m\angle 4 = 126$; $m\angle 5 = 54$

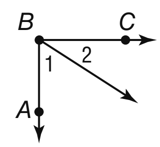
5. Given: $\angle 1 \cong \angle 5$
Prove: $\angle 3 \cong \angle 7$
Proof:
Statements (Reasons)
1. $\angle 1 \cong \angle 5$ (Given)
2. $\angle 1$ and $\angle 3$ are supplementary $\angle 5$ and $\angle 7$ are supplementary (Two adjacent angles that form a straight angle are supplementary.)
3. $\angle 3 \cong \angle 7$ (Angles supplementary to congruent angles are congruent.)

7. Given: $\angle 4 \cong \angle 6$
Prove: $\angle 5 \cong \angle 7$
Proof:
Statements (Reasons)
1. $\angle 4 \cong \angle 6$ (Given)
2. $\angle 4 \cong \angle 5$
$\angle 6 \cong \angle 7$
(Vertical angles are congruent.)
3. $\angle 5 \cong \angle 7$ (Transitive Property of Congruence)

9. $m\angle 1 = m\angle 4 = 45°$, $m\angle 3 = 72$ **11.** $m\angle 9 = 120$, $m\angle 10 = 60$ **13.** $m\angle 6 = 63$, $m\angle 7 = 117$

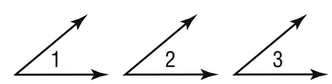
15. Given: $\angle 4 \cong \angle 7$
Prove: $\angle 7$ and $\angle 5$ are supplementary.
Proof:
Statements (Reasons)
1. $\angle 4 \cong \angle 7$ (Given)
2. $\angle 4$ and $\angle 5$ are a linear pair (Definition of a linear pair)
3. $\angle 4$ and $\angle 5$ are supplementary. (If two angles for a linear pair, then they are supplementary angles.)
4. $\angle 7$ and $\angle 5$ are supplementary. (Substitution)

17. Given: $\angle ABC$ is a right angle.
Prove: $\angle 1$ and $\angle 2$ are complementary angles.



Proof:
Statements (Reasons)
1. $\angle ABC$ is a right angle. (Given)
2. $m\angle ABC = 90$ (Def. of rt. ∠s)
3. $m\angle ABC = m\angle 1 + m\angle 2$ (∠ Add. Post.)
4. $90 = m\angle 1 + m\angle 2$ (Subst.)
5. $\angle 1$ and $\angle 2$ are complementary angles. (Def. of comp. ∠s)

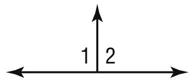
19. Given: $\angle 1 \cong \angle 2$, $\angle 2 \cong \angle 3$
Prove: $\angle 1 \cong \angle 3$



Proof:
Statements (Reasons)
1. $\angle 1 \cong \angle 2$, $\angle 2 \cong \angle 3$ (Given)
2. $m\angle 1 = m\angle 2$, $m\angle 2 = m\angle 3$ (Def. of ≅ ∠s)
3. $m\angle 1 = m\angle 3$ (Trans. Prop.)
4. $\angle 1 \cong \angle 3$ (Def. of ≅ ∠s)

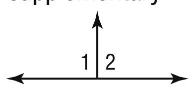
21. Given: $\angle 1 \cong \angle 4$
Prove: $\angle 2 \cong \angle 3$
Proof:
<u>Statements (Reasons)</u>
1. $\angle 1 \cong \angle 4$ (Given)
2. $\angle 1 \cong \angle 2$, $\angle 3 \cong \angle 4$ (Vert. angles are congruent.)
4. $\angle 2 \cong \angle 3$ (Transitive Property)

23. Given: $\angle 1$ and $\angle 2$ are rt. $\angle$s.
Prove: $\angle 1 \cong \angle 2$
Proof:



<u>Statements (Reasons)</u>
1. $\angle 1$ and $\angle 2$ are rt. $\angle$s. (Given)
2. $m\angle 1 = 90$, $m\angle 2 = 90$ (Def. of rt. $\angle$s)
3. $m\angle 1 = m\angle 2$ (Subst.)
4. $\angle 1 \cong \angle 2$ (Def. of $\cong$ $\angle$s)

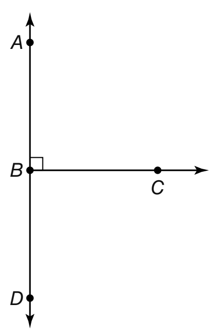
25. Given: $\angle 1 \cong \angle 2$, $\angle 1$ and $\angle 2$ are supplementary.
Prove: $\angle 1$ and $\angle 2$ are rt. $\angle$s.
Proof:



<u>Statements (Reasons)</u>
1. $\angle 1 \cong \angle 2$, $\angle 1$ and $\angle 2$ are supplementary. (Given)
2. $m\angle 1 + m\angle 2 = 180$ (Def. of supp. $\angle$s)
3. $m\angle 1 = m\angle 2$ (Def. of $\cong$ $\angle$s)
4. $m\angle 1 + m\angle 1 = 180$ (Subst.)
5. $2(m\angle 1) = 180$ (Subst.)
6. $m\angle 1 = 90$ (Div. Prop.)
7. $m\angle 2 = 90$ (Subst. (steps 3, 6))
8. $\angle 1$ and $\angle 2$ are rt. $\angle$s. (Def. of rt. $\angle$s)

27. $\angle ABC$ is a right angle, so its measure is 90°. $\angle 1$ and $\angle 2$ form $\angle ABC$. Subtracting the $m\angle 1$ from 90 equals 45. Thus $\angle 2$ equals 45. Therefore $\angle 1 \cong \angle 2$. An angle bisector cuts an angle into two congruent parts. Since $\angle 1 \cong \angle 2$, then $\overrightarrow{BR}$ bisects $\angle ABC$. **29.** Since angles 1 and 2 form a linear pair, angles 1 and 2 are supplementary angles. Angle 2 is a right angle, so angle 1 is 90°. Therefore, line l is perpendicular to line m, by definition of perpendicular lines.

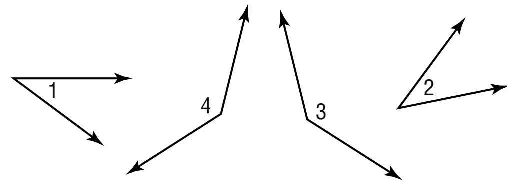
31.



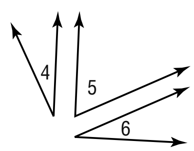
m$\angle$ABD = 180. If angle *ABC* is a right angle and angle *DBC* is congruent to it, then angle *DBC* is a right angle. Two right angles have a total of 180°.

33. The second case of the Congruent Supplement Theorem is "Angles supplementary to congruent angles are congruent". The second case of the Congruent Complement Theorem is "Angles supplementary to the same angle are congruent".Second case of Congruent Supplement Theorem

Given: $\angle 1$ and $\angle 3$ are supplementary
$\angle 2$ and $\angle 4$ are supplementary
$\angle 3 \cong \angle 4$
Prove: $\angle 1 \cong \angle 2$



Proof:
<u>Statements (Reasons)</u>
a. $\angle 1$ and $\angle 3$ are supplementary
$\angle 2$ and $\angle 4$ are supplementary
$\angle 3 \cong \angle 4$ (Given)
b. $m\angle 1 + m\angle 3 = 180$
$m\angle 2 + m\angle 4 = 180$
(Definition of Supplementary Angles)
c. $m\angle 1 + m\angle 3 = m\angle 2 + m\angle 4$ (Substitution)
d. $m\angle 3 = m\angle 4$ (Definition of Congruence)
e. $m\angle 1 = m\angle 2$ (Subtraction Property of Equality)
f. $\angle 1 \cong \angle 2$ (Definition of Congruence)
Second case of Congruent Supplement Theorem
Given: $\angle 4$ and $\angle 5$ are complementary
$\angle 5$ and $\angle 6$ are complementary
Prove: $\angle 4 \cong \angle 6$



Proof:
<u>Statements (Reasons)</u>
a. $\angle 4$ and $\angle 5$ are complementary
$\angle 5$ and $\angle 6$ are complementary (Given)
b. $m\angle 4 + m\angle 5 = 90$
$m\angle 5 + m\angle 6 = 90$
(Definition of Complementary Angles)
c. $m\angle 4 + m\angle 5 = m\angle 5 + m\angle 6$ (Substitution)
d. $m\angle 5 = m\angle 5$ (Reflexive Property of Congruence)
e. $m\angle 4 = m\angle 6$ (Subtraction Property of Equality)
f. $\angle 4 \cong \angle 6$ (Definition of Congruence)

35. Sample answer: Since protractors have the scale for both acute and obtuse angles along the top, the supplement is the measure of the given angle on the other scale. **37.** A **39.** B **41.** Subtratcion Prop. **43.** Substitution **45.** true **47.** true **49.** line n **51.** point *W* **53.** Yes; it intersects both m and n when all three lines are extended.

Chapter 10 Study Guide and Review

1. point *P* **3.** point *W* **5.** line **7.** $x = 6$, $XP = 27$ **9.** yes **11.** 1.5 mi **13.** 10 **15.** (16, −6.5) **17.** (−27, 16) **19.** G **21.** $\overrightarrow{CA}$ and $\overrightarrow{CH}$ **23.** Sample answer: $\angle A$ and $\angle B$ are right, $\angle E$ and $\angle C$ are obtuse, and $\angle D$ is acute. **25.** dodecahedron; concave; irregular

27. Option 1 = 12,000 ft²;
Option 2 = 12,100 ft²;
Option 3 ≈ 15, 393.8 ft²;
Option 3 provides the greatest area.

29. Statements (Reasons)
1. AB = DC (Given)
2. BC = BC (Refl. Prop.)
3. AB + BC = DC + BC (Add. Prop.)
4. AB + BC = AC, DC + BC = DB (Seg. Add. Post.)
5. AC = DB (Subs.)

31. 90 **33.** 53

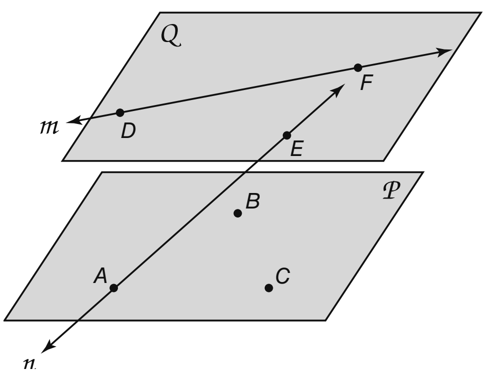
CHAPTER 11
Parallel and Perpendicular Lines

Chapter 11 Get Ready

1. 4 **3.** Yes, points *C* and *D* lie in plane *CBD*.
5. 113 **7.** 90 **9.** −1 **11.** $\frac{1}{3}$

Lesson 11-1

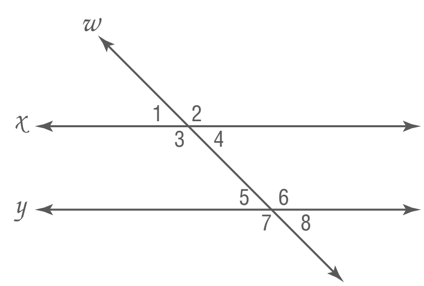
1. *TUV* **3.** $\overline{YX}, \overline{TU}, \overline{ZW}$ **5.** alternate exterior
7. alternate interior **9.** line *n*; corresponding
11. line *m*; consecutive interior **13.** $\overline{CL}$, $\overline{EN}$, $\overline{BK}$, $\overline{AJ}$
15. $\overline{EN}$, $\overline{AJ}$, $\overline{DM}$, $\overline{NM}$, $\overline{NJ}$, $\overline{JK}$, or $\overline{ML}$
17. $\overline{KL}$, $\overline{CL}$, $\overline{BK}$, $\overline{ML}$, $\overline{DM}$, $\overline{NM}$, $\overline{KJ}$ **19.** $\overline{JK}$ **21.** line s; corresponding **23.** line t; alternate interior **25.** line t; alternate exterior **27.** line t; consecutive interior
29. line s; alternate exterior **31.** line b; vertical
33. line c; alternate interior **35.** line f; corresponding
37a. Sample answer: Since the lines are coplanar and they cannot touch, they are parallel. **37b.** Line q is a transversal of lines p and m. **39.** skew **41.** parallel
43. intersecting **45a.** parallel **45b.** coplanar **45c.** skew
47a.



47b. parallel **47c.** skew **49.** Sometimes; $\overleftrightarrow{AB}$ intersects $\overleftrightarrow{EF}$ depending on where the planes intersect. **51.** B **53.** (0, 4), (−6, 0) **55.** $m\angle 9 = 86$, $m\angle 10 = 94$ **57.** $m\angle 19 = 140$, $m\angle 20 = 40$
59. 90 **61.** 45

Lesson 11-2

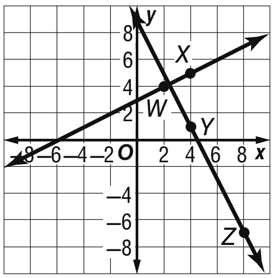
1. $m\angle 4 = 85$ Corresponding angles are congruent.
3. $m\angle 7 = 95$ Angles 2 and 7 are supplementary angles.
5. $m\angle 3 = 70$ Interior angles on the same side of the transversal are supplementary. **7.** $x = 115$ Supplementary angles; $y = 115$ Alternate interior angles are congruent. **9.** $x = 55$ Alternate interior angles are congruent. **11.** $m\angle 3 = 23$ Vertical angles are congruent. **13.** $m\angle 8 = 23$ Vertical angles are congruent.
15. $m\angle 2 = 140$ Angles 1, 2, and 3 form a straight angle.
17. $m\angle 5 = 140$ Vertical angles are congruent. **19.** Angles1 and 2 are congruent because corresponding angles are congruent.
21. Angles 2 and 4 are supplementary because they form a linear pair **23.** $y = 117$ Corresponding angles are congruent; $x = 51$ Supplementary angles. **25.** $x = 42$ Supplementary angles.
27. $x = 60$ Alternate interior angles are congruent; $y = 14$ Two interior angles on the same side of the transversal are supplementary. **29a.** $m \parallel n$; ℓ is a transversal. **29b.** Def. of linear pair **29c.** ∠1 and ∠3 are supplementary. ∠2 and ∠4 are supplementary. **29d.** Alt. Int. ∠s Theorem
29e. Substitution **29f.** ∠1 and ∠2 are supp. ∠3 and ∠4 are supp. **31.** Angles 3 and 7 are congruent. Corresponding angles are congruent. **33.** Angles 5 and 6 are complementary. Two angles that form a right angle are complementary. **35a.** The even-numbered angles are congruent because alternate interior angles are congruent. **35b.** The odd-numbered angles are congruent because alternate interior angles are congruent.
35c. The two angles will be complementary. If a line is perpendicular to one of two parallel lines, then it is perpendicular to the other. Perpendicular lines form right angles. **37.** $x = 25$
39. This picture is an example of the picture that the student might draw.



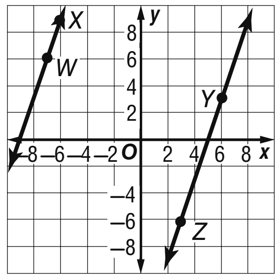
39a. 2 and 4; 4 and 6; 2 and 8; 6 and 8; Supplementary 2 and 6; 4 and 8; Congruent **39b** 1 and 3; 1 and 7; 3 and 5; 5 and 7; Supplementary 1 and 5; 3 and 7; Congruent
39c. 28 **39d.** Congruent or Supplementary
39e. 12 out of 28 = $\frac{3}{7}$ **39f.** 16 out of 28 = $\frac{4}{7}$
41. In both theorems, a pair of angles is formed when two parallel lines are cut by a transversal. however, in the Alternate Exterior Angles Theorem, each pair of alternate exterior angles that is formed are congruent, whereas in the Consecutive Exterior Angles Theorem, each pair of angles formed is supplementary.
43. $x = 131$ and $y = 7$ or $x = 99$; $y = 9$ **45.** C
47. I and II **49.** Skew lines; the planes are flying in different directions and at different altitudes.
51. $m\angle 6 = 43$, $m\angle 7 = 90$ **53.** $\frac{1}{2}$ **55.** $-\frac{5}{7}$ **57.** $\frac{4}{3}$

1. −1 **3.** $\frac{6}{5}$

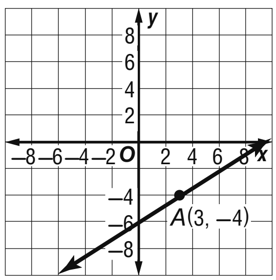
5. perpendicular



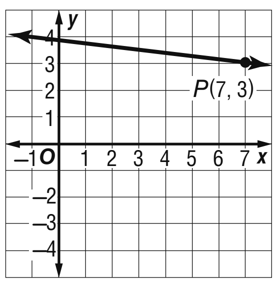
7. parallel



9.



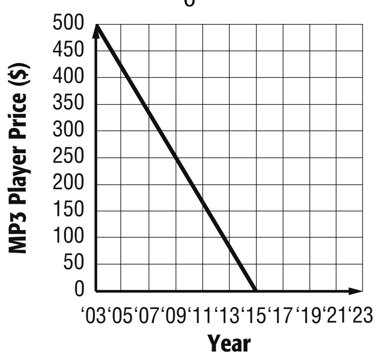
11.



13. $-\frac{3}{7}$ **15.** 8 **17.** undefined **19.** 1 **21.** 0

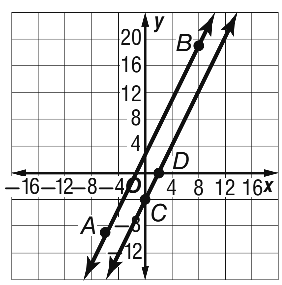
23. undefined **25.** $-\frac{1}{6}$

27a.

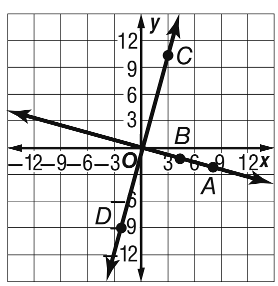


27b. $41.50
27c. $84

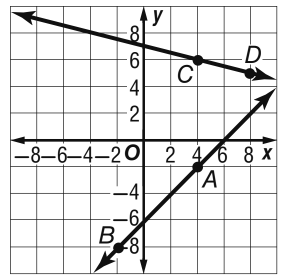
29. parallel



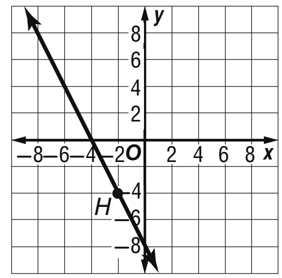
31. perpendicular



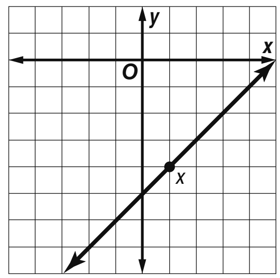
33. neither



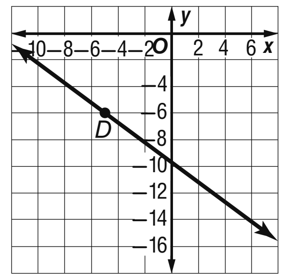
35.



37.

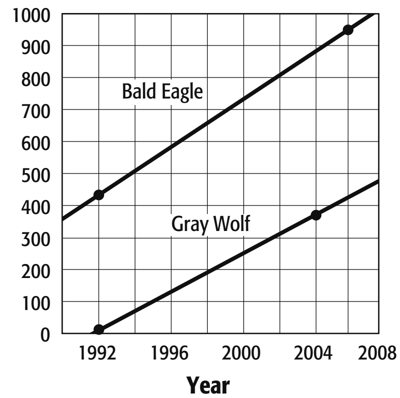


39.



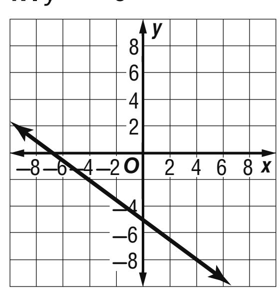
41. Line 2 **43.** Line 2 **45a.** the bald eagle

45b.

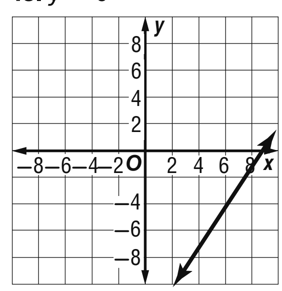


45c. 1189 bald eagles; 494 gray wolves

47. $y = -8$



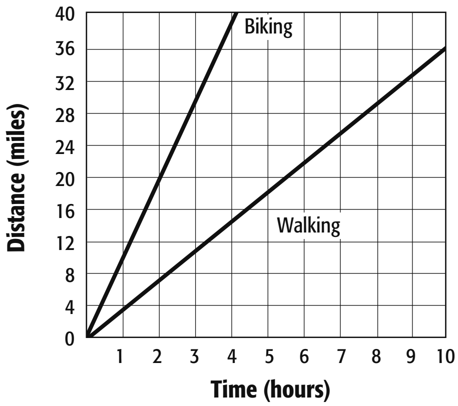
49. $y = 0$



51a.

Time (hours)	Distance Walking (miles)	Distance Riding Bikes (miles)
0	0	0
1	3.5	10
2	7	20
3	10.5	30
4	14	40

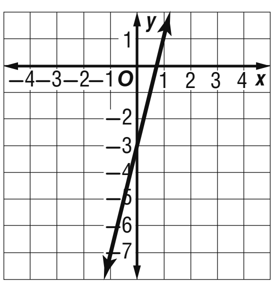
51a. Use the table from part a to create a graph with time on the horizontal axis and distance on the vertical axis.



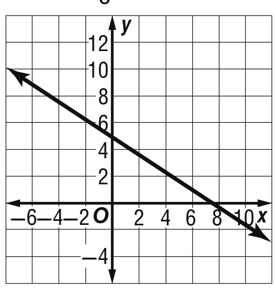
51c. their speed **51d.** Sample answer: Yes, they can make it if they ride their bikes. If they walk, it takes over two hours to go eight miles, so they wouldn't be home in time and they wouldn't get to spend any time in the store. If they ride their bikes, they can travel there in 24 minutes. If they spend 30 minutes in the store and spend 24 minutes riding home, the total amount of time they will use is $24 + 30 + 24 = 78$ minutes, which is 1 hour and 18 minutes. **53.** Terrell; Hale subtracted the x-coordinates in the wrong order. **55.** The Sears Tower has a vertical or undefined and the Leaning Tower of Pisa has a positive slope. **57.** Sample answer: (4, −3) and (5, −5) lie along the same line as point X and Y. The slope between all of the points is −2. To find additional points, you can take any point on the line and subtract 2 from the y—coordinate and add 1 to the x—coordinate. **59.** 2 : 5 **61.** C **63.** 123 **65.** 57 **67.** *ABC*, *ABQ*, *PQR*, *CDS*, *APU*, *DET* **69.** 6 **71.** $y = -2x + 3$

Lesson 11-4

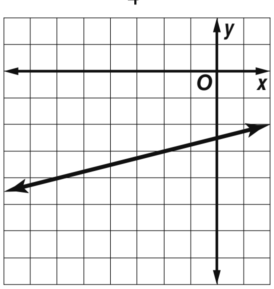
1. $y = 4x - 3$



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



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

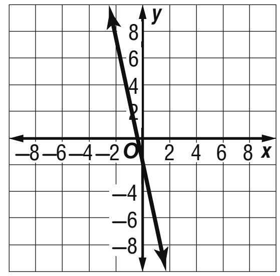


7. $y = \frac{5}{4}x - 1$

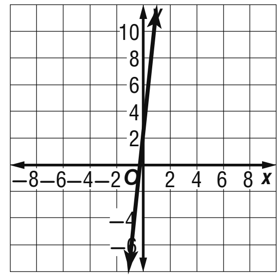
9. $y = \frac{9}{7}x - \frac{19}{7}$

11. $y = 4x + 9$

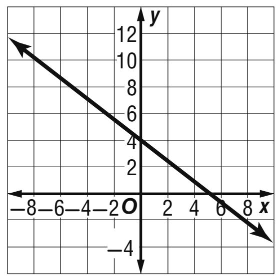
13. $y = -5x - 2$



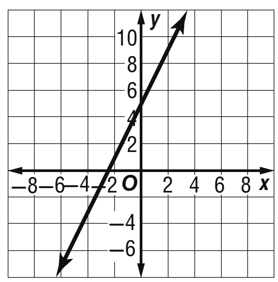
15. $y = 9x + 2$



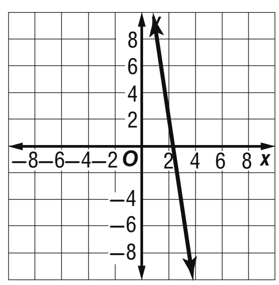
17. $y = -\frac{3}{4}x + 4$



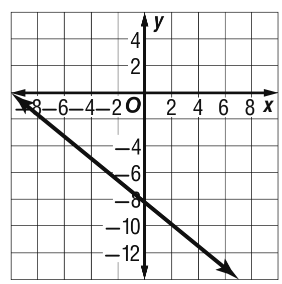
19. $y - 11 = 2(x - 3)$



21. $y - 9 = -7(x - 1)$



23. $y + 6 = -\frac{4}{5}(x + 3)$



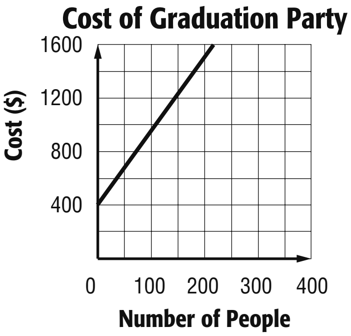
25. $y = -4$ **27.** $x = -3$ **29.** $y = -\frac{3}{4}x + 3$

31. $y = -\frac{10}{3}x + \frac{38}{3}$ **33.** $y = \frac{3}{2}x - \frac{1}{2}$ **35.** $y = \frac{2}{3}x - 2$

37. $y = -2x - 18$ **39.** $y = -\frac{2}{3}x + 6$

41a. $y = 5.5x + 400$

41b. Let the x-axis represent the number of people and the y-axis represent the total cost.



41c. \$1445 **41d.** 290

43. p **45.** n, p, or r **47.** perpendicular **49.** neither
51. $x = -8$ **53.** $C = 15(x - 1) + 40$ or $C = 15x + 25$
55. 14
57. Sample answer: $y = 2x - 1$, $y = -\frac{1}{2}x - \frac{17}{2}$
59. Sample answer: When given the slope and y-intercept, the slope-intercept form is easier to use. When given two points, the point-slope form is easier to use. When given the slope and a point, the point-slope form is easier to use.

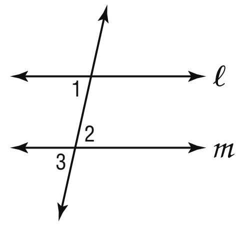
61. H **63.** E **65.** 2 **67.** $x = 3$, $y \approx 26.33$
69. Gas—O—Rama is also a quarter mile from Lacy's home; the two gas stations are half a mile apart.
71. consecutive interior **73.** alternate exterior

Lesson 11-5

1. $\ell \parallel m$; Corresponding angles are congruent, then the lines are parallel.
3. $\ell \parallel k$; Alternate exterior angles are congruent, then the lines are parallel. **5.** 20 **7.** it is possible. One possible yes, explanation would be to measure the angles formed by the frame and the bench. If they are the same size (90°) on both sides, then the benches are parallel. **9.** $a \parallel b$; Alternate exterior angles are congruent, then the lines are parallel. **11.** $c \parallel d$; Interior angles on the same side of the transversal are supplementary, then the lines are parallel. **13.** $c \parallel d$; Alternate interior angles are congruent, then the lines are parallel. **15.** $c \parallel d$; Corresponding angles are congruent, then the lines are parallel. **17.** $x = 15$. Corresponding angles are congruent, then the lines are parallel. **19.** $x = 40$. Interior angles on the same side of the transversal are supplementary, then the lines are parallel. **21.** $x = 36$. Alternate exterior angles are congruent, then the lines are parallel.
23a. $\angle 1$ and $\angle 2$ are supplementary.
23b. Def. of linear pair **23c.** $\angle 2$ and $\angle 3$ are supplementary; Suppl. Thm. **23d.** $\cong$ Suppl. Thm.
23e. Converse of Corr. $\angle$s Post.
25. Proof:
Statements (Reasons)
1. $\angle 1 \cong \angle 3$; $\overline{AB} \parallel \overline{CD}$ (Given)
2. $\angle 1 \cong \angle 2$ (If the lines are parallel, alternate interior angles are congruent.)
3. $\angle 2 \cong \angle 3$ (Transitive Property)
4. $\overline{AC} \parallel \overline{BD}$ (If corresponding angles are congruent, then the lines are parallel.)

27. Proof:
Statements (Reasons)
1. $\angle TQR \cong \angle TSR$; $m\angle R + m\angle TSR = 180$ (Given)
2. $m\angle TQR = m\angle TSR$ (Definition of Congruent Angles)
3. $m\angle R + m\angle TQR = 180$ (Substitution)
4. $\overline{QT} \parallel \overline{RS}$ (If two interior angles on the same side of the transversal are supplementary, then the lines are parallel.)

29. The slots are parallel to each other. If two lines are perpendicular to the same line, then they are parallel to each other.
31. Given: $\angle 1 \cong \angle 2$



Prove: $\ell \parallel m$

Statements (Reasons)
1. $\angle 1 \cong \angle 2$ (Given)
2. $\angle 2 \cong \angle 3$ (Vertical $\angle$s are $\cong$)
3. $\angle 1 \cong \angle 3$ (Transitive Prop.)
4. $\ell \parallel m$ (If corr $\angle$s are $\cong$, then lines are $\parallel$.)

33. These lines are parallel because the corresponding angles are congruent.
35. These lines are not parallel because the alternate exterior angles are not congruent.
37. The point (0, 5) is on the line $y = 2x + 5$. A line that is perpendicular to the line $y = 2x + 5$ has a slope of $\frac{1}{2}$. The equation of the perpendicular line is $y = \frac{1}{2}x + 5$. The point of intersection of $y = \frac{1}{2}x + 5$ and $y = 2x - 1$ is (4, 7). Use the distance formula to find the distance between (0,5) and (4,7). The distance is $\sqrt{20} = 2\sqrt{5}$ or approximately 4.47 units.

39. Proof:
Statements (Reasons)
1. $w \parallel x$; $x \parallel y$ (Given)
2. $\angle 2 \cong \angle 3$; $\angle 3 \cong \angle 4$ (If parallel lines are cut by a transversal, corresponding angles are congruent.)
3. $\angle 2 \cong \angle 4$ (Transitive Property)
4. $w \parallel y$ (If corresponding angles are congruent, then the lines are parallel.)

41a. Proof:
Statements (Reasons)
1. $m\angle 5 + m\angle 2 = 180$ (Given)
2. $m\angle 2 + m\angle 3 = 180$ (Definition of linear pair.)
3. $\angle 5 \cong \angle 3$ (Two angles supplementary to the same angle are congruent to each other.)
4. $b \parallel c$ (If alternate exterior angles are congruent, then the lines are parallel.)

41b. Proof:
Statements (Reasons)
1. $a \parallel b$; $m\angle 1 + m\angle 5 = 180$ (Given)
2. $\angle 1 \cong \angle 5$ (If two parallel lines are cut by a transversal, then alternate interior angles are congruent.)
3. $m\angle 1 = m\angle 5$ (Definition of Congruent angles)
4. $m\angle 5 + m\angle 5 = 180$ (Substitution)
5. $2m\angle 5 = 180$ (Addition Property)
6. $m\angle 5 = 90$ (Division Property of Equality)
7. $t \perp b$ (Perpendicular lines are formed by right angles.)

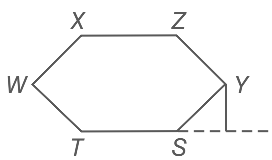
43. This statement is sometimes true. It would be true if both angles were right angles. Otherwise, the supplementary angles would not be congruent.

45. G **47.** J **49.** $y = \frac{4}{5}x - 9$ **51.** 6 hours
53. 8.6 m; ≈ 3.5 m^2

55. 10, 8.3

Lesson 11-6

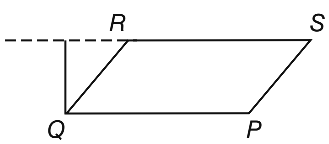
1.



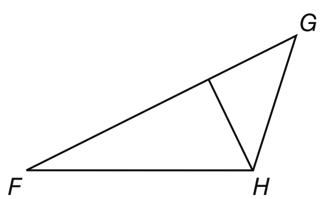
3. The formation should be that of two parallel lines that are also parallel to the 50-yard line; the band members have formed two lines that are equidistant from the 50-yard line, so by Theorem 3.9, the two lines formed are parallel.

5. $\sqrt{10}$ units **7.** $2\sqrt{5}$ units

9.



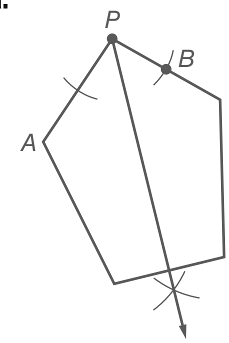
11.



13. No; a driveway perpendicular to the road would be the shortest. The angle the driveway makes with the road is less than 90°, so it is not the shortest possible driveway.
15. $\sqrt{2}$ units **17.** 6 units **19.** $\sqrt{10}$ units
21. 6 units **23.** $\sqrt{26}$ units **25.** 21 units
27. $4\sqrt{17}$ units **29.** $\sqrt{14.76}$ units **31.** 5 units
33. 6 units **35.** He can conclude that the right and left sides of the bulletin board are not parallel, since the perpendicular distance between one line and any point on the other line must be equal be the same anywhere on the lines for the two lines to be parallel.
37. See students' work. **39a.** See students' work.

39b. Place point C any place on line m. The area of the triangle is $\frac{1}{2}$ the height of the triangle times the length of the base of the triangle. The numbers stay constant regardless of the location of C on line m. **39c** 16.5 in^2 **41.** Shenequa; the distance between points A and C is 1.2 cm. The distance between points B and D is 1.35 cm. Since the lines are not equidistant everywhere, the lines will eventually intersect when extended.
43. $a = \pm 1$; $y = \frac{1}{2}x + 6$ and $y = \frac{1}{2}x + \frac{7}{2}$ or $y = -\frac{1}{2}x + 6$ and $y = -\frac{1}{2}x + \frac{7}{2}$

45a.



45b. Sample answer: Using a protractor, the measurement of the constructed angle is equal to 90. So, the line constructed from vertex P is perpendicular to the nonadjacent side chosen.
45c. Sample answer: The same compass setting was used to construct points A and B. Then the same compass setting was used to construct the perpendicular line to the side chosen. Since the compass setting was equidistant in both steps a perpendicular line was constructed. **47.** Sample answer: First the line perpendicular to the pair of parallel lines is found. Then the point of intersection is found between the perpendicular line and the other line not used in the first step. Last, the Distance Formula is used to determine the distance between the pair of intersection points. This value is the distance between the pair of parallel lines.
49. C **51.** B **53.** $y + 1 = \frac{1}{4}(x - 3)$
55. $y - 3 = -(x + 2)$

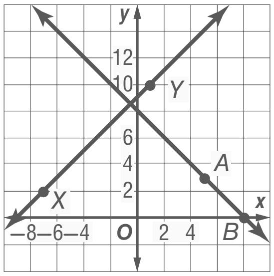
57. Given: $AB = BC$
Prove: $AC = 2BC$
Statements (Reasons)
1. $AB = BC$ (Given)
2. $AC = AB + BC$ (Seg. Add. Post.)
3. $AC = BC + BC$ (Substitution)
4. $AC = 2BC$ (Substitution)

59. 25 **61.** $\sqrt{221} \approx 14.9$ **63.** 17

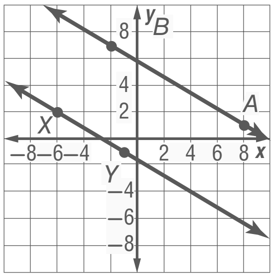
Chapter 11 Study Guide and Review

1. false; parallel **3.** true **5.** true **7.** false; congruent **9.** corresponding **11.** alternate exterior **13.** skew lines **15.** 57; $\angle 5 \cong \angle 13$ by Corr. ∠s Post. and $\angle 13$ and $\angle 14$ form a linear pair. **17.** 123; $\angle 11 \cong \angle 5$ by Alt. Int. ∠s Thm and $\angle 5 \cong \angle 1$ by Alt. Ext. ∠s Thm. **19.** 57; $\angle 1 \cong \angle 3$ by Corr. ∠s Post. and $\angle 3$ and $\angle 6$ form a linear pair.

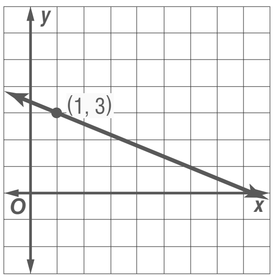
21. perpendicular



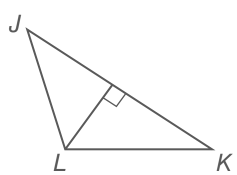
23. parallel



25.



27. $y + 9 = 2(x - 4)$ **29.** $y = 5x - 3$
31. $y = -\frac{2}{3}x + 10$ **33.** $C = 20h + 50$ **35.** none
37. $v \parallel z$; Alternate Exterior Angles Converse Thm.
41.



CHAPTER 12
Congruent Triangles

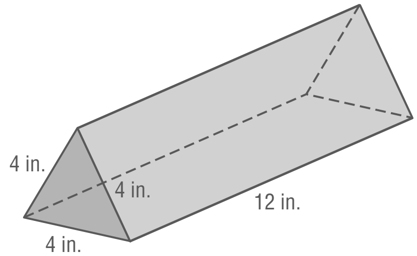
Chapter 12 Get Ready

1. right **3.** obtuse **5.** 84°; alternate exterior angles
7. ≈10.8 **9.** ≈18.0 **11.** 144.2 miles

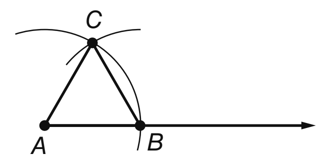
Lesson 12-1

1. right **3.** equiangular **5.** obtuse; $\angle BDC > 90°$
7. isosceles **9.** equilateral **11.** scalene **13.** $x = 5$, $QR = RS = QS = 25$ **15.** obtuse **17.** right **19.** acute
21. obtuse **23.** acute **25.** right **27.** equilateral
29. scalene **31.** scalene **33.** scalene **35.** equilateral
37. $x = 3$, $FG = GH = HF = 19$

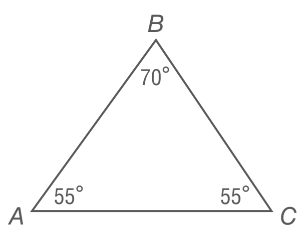
39. Because the base of the prism formed is an equilateral triangle, the mirror tile must be cut into three strips of congruent width. Since the original tile is a 12-inch square, each strip will be 12 inches long by 12 ÷ 3 or 4 inches wide.

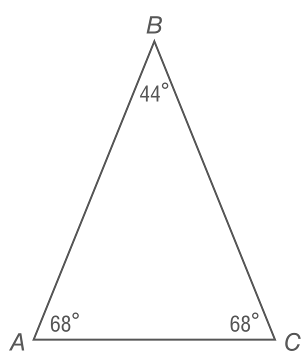


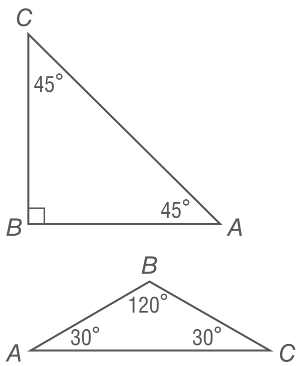
41. isosceles obtuse **43.** scalene; $XZ = 3\sqrt{5}$, $XY = \sqrt{113}$, $YZ = 2\sqrt{26}$ **45.** isosceles; $XZ = 2$, $XY = 2\sqrt{2}$, $YZ = 2$
47. Given: $m\angle ADC = 120$
Prove: = $\triangle DBC$ is acute.
Proof: $\angle ADC$ and $\angle BDC$ form a linear pair. $\angle ADC$ and $\angle BDC$ are supplementary because if two angles form a linear pair, then they are supplementary. So, $m\angle ADC + m\angle BDC = 180$. We know $m\angle ADC$ 120, so by substitution, $120 + m\angle BDC = 180$. Subtract to find that $m\angle BDC = 60$. We already know that $\angle B$ is acute because $\triangle ABC$ is acute. $\angle BCD$ must also be acute because $\angle C$ is acute and $m\angle C = m\angle ACD + m\angle BCD$. $\triangle DBC$ is acute by definition. **49.** $x = 15$; $FG = 35$, $GH = 35$, $HF = 35$ **51.** $x = 3$; $MN = 13$, $NP = 13$, $PM = 11$
53.



Sample answer: In $\triangle ABC$, $AB = BC = AC = 1.3$ cm. Since all sides have the same length, they are all congruent. Therefore the triangle is equilateral. $\triangle ABC$ was constructed using AB as the length of each side. Since the arc for each segment is the same, the triangle is equilateral.
55a. Sample answer:







55b.

$m\angle A$	$m\angle C$	$m\angle B$	Sum of Angle Measures
55	55	70	180
68	68	44	180
45	45	90	180
30	30	120	180

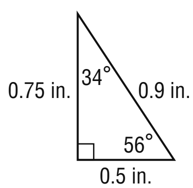
55c. Sample answer: In an isosceles triangle, the angles opposite the congruent sides have the same measure. The sum of the measures of the angles of an isosceles triangle is 180.

55d. x and $180 - 2x$; If the measures of the angles opposite the congruent sides of an isosceles triangle have the same measure, then if one angle measures x, then the other angle also measures x. The sum of the measures of the angles of an isosceles triangle is 180, thus the measure of the third angle is $180 - 2x$.

57. Never; all equiangular triangles have three 60° angles, so they do not have a 90° angle. Therefore they cannot be right triangles.

59. Never; all equilateral triangles are also equiangular, which means all of the angles are 60°. A right triangle has one 90° angle.

61. Sample answer:

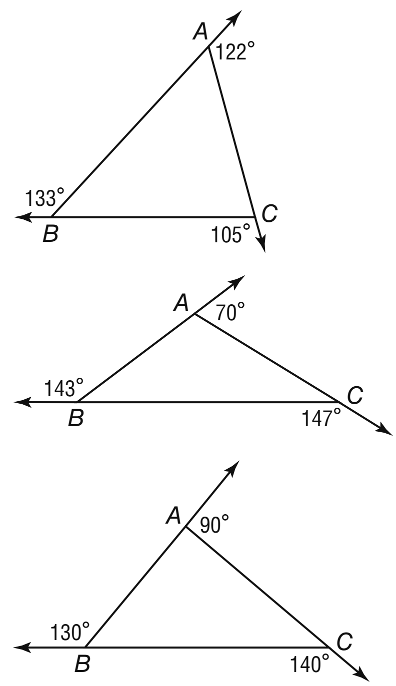


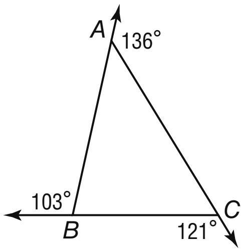
63. Not possible; all equilateral triangles have three acute angles. **65.** A **67.** 13.5 **69.** 7 **71.** $2\sqrt{5}$
73. Two lines in a plane that are perpendicular to the same line are parallel. **75.** Plane *AEB* intersects with plane *N* in $\overline{AB}$. **77.** Points *D*, *C*, and *B* lie in plane *N*, but point *E* does not lie in plane *N*. Thus, they are not coplanar. **79.** cons. int. **81.** alt. ext.

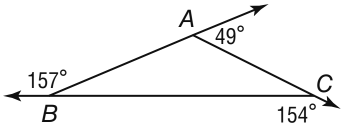
Lesson 12-2

1. $m\angle 1 = 61°$ **3.** 85° **5.** 57° **7.** 75° **9.** 58°
11. 148° **13.** $m\angle 1 = 20°$ **15.** $m\angle 1 = m\angle 2 = 55°$; $m\angle 3 = 107°$ **17.** 79° **19.** 23° **21.** $x = 51$; $m\angle CAB = 102°$; $m\angle ABC = 41°$ **23.** 60° **25.** 35° **27.** 57° **29.** 33° **30.** 57 **31.** $x = 18$. The angles are 18° and 72°. **33.** Each base angle is 80° and the apex angle is 20°.
35. Given: $\triangle MNO$ $\angle M$ is a right angle.
Prove: There can be at most one right angle in a triangle.
Proof: In $\triangle MNO$, *M* is a right angle. $m\angle M + m\angle N + m\angle O = 180$. $m\angle M = 90$, so $m\angle N + m\angle O = 90$. If *N* were a right angle, then $m\angle O = 0$. But that is impossible, so there cannot be two right angles in a triangle.
Given: $\triangle PQR$ $\angle P$ is obtuse.
Prove: There can be at most one obtuse angle in a triangle.
Proof: In $\angle PQR$, $\angle P$ is obtuse. So $m\angle P > 90$. $m\angle P + m\angle Q + m\angle R$ 180. It must be that $m\angle Q + m\angle R < 90$. So, $\angle Q$ and $\angle R$ must be acute. **37.** $m\angle 1 = 62.5°$; $m\angle 2 = 20°$; $m\angle 3 = 97.5°$; $m\angle 4 = 40°$; $m\angle 5 = 105°$; $m\angle 6 = 42.5°$; $m\angle 7 = 75°$; $m\angle 8 = 62.5°$ **39.** The measures of the angles are 21° and 69°.
41. $z < 28$; Sample answer: Since the sum of the measures of the angles of a triangle is 189 and $m\angle X = 152$, $152 + m\angle Y + m\angle Z = 180$, so $m\angle Y + m\angle Z = 28$. If $m\angle Y = 0$, then $m\angle Z = 28$. But since an angle must have a measure greater than 0, $m\angle Z$ must be less than 28, so $z < 28$.
43. **Proof: Statements (Reasons)**
1. *ABCDEF* is a hexagon. (Given)
2. $m\angle B + m\angle 1 + m\angle 10 = 180$ $m\angle 2 + m\angle 3 + m\angle 9 = 180$ $m\angle 8 + m\angle 4 + m\angle 5 = 180$
   $m\angle F + m\angle 6 + m\angle 7 = 180$ (Angle Sum Theorem)
3. $m\angle B + m\angle 1 + m\angle 10 + m\angle 2 + m\angle 3 + m\angle 9 + m\angle 8 + m\angle 4 + m\angle 5 + m\angle F + m\angle 6 + m\angle 7 = 720$ (Addition Property)
4. $m\angle 1 + m\angle 2 = m\angle BCD$
   $m\angle 3 + m\angle 4 = m\angle CDE$
   $m\angle 5 + m\angle 6 = m\angle DEF$
   $m\angle 7 + m\angle 8 + m\angle 9 + m\angle 10 = m\angle FAB$ (Angle Addition)
5. $m\angle B + m\angle BCD + m\angle CDE + m\angle DEF + m\angle F + m\angle FAB = 720$ (Substitution)

45a. Sample answer:





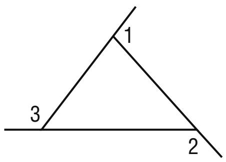


45b. Sample answer:

∠1	∠2	∠3	Sum
122	105	133	360
70	147	143	360
90	140	130	360
136	121	103	360
49	154	157	360

45c. Sample answer: The sum of the measures of the exterior angles of a triangle is 360.

45d. $m\angle 1 + m\angle 2 + m\angle 3 = 360$



45e. The Exterior Angle Theorem tells us that $m\angle 3 = m\angle BAC + m\angle BCA$, $m\angle 2 = m\angle BAC + m\angle CBA$, $m\angle 1 = m\angle CBA + m\angle BCA$. Through substitution, $m\angle 1 + m\angle 2 + m\angle 3 = m\angle CBA + m\angle BCA + m\angle BAC + m\angle CBA + m\angle BAC + m\angle BCA$. Which can be simplified to $m\angle 1 + m\angle 2 + m\angle 3 = 2m\angle CBA + 2m\angle BCA + 2m\angle BAC$. The Distributive Property can be applied and gives $m\angle 1 + m\angle 2 + m\angle 3 = 2(m\angle CBA + m\angle BCA + m\angle BAC)$. The Triangle Angle-Sum Theorem tells us that $m\angle CBA + m\angle BCA + m\angle BAC = 180$. Through substitution we have $m\angle 1 + m\angle 2 + m\angle 3 = 2(180) = 360$.

47. $a = 180 - 112 = 68°$; $b + c = 112$ and b and c are congruent; $2b = 112$; $b = 56°$. Both b and c are 56°.
49. The classification can not be determined.
51. D **53.** G **55.** equiangular **57.** right
59. 3 units **61.** Substitution Property
63. Transitive Property

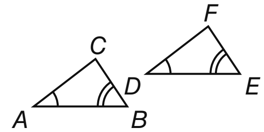
Lesson 12-3

1. $\angle A \cong \angle F$; $\angle B \cong \angle E$; $\angle C \cong \angle D$; $\angle CGA \cong \angle DGF \overline{AG}$; $\cong \overline{FG}$; $\overline{AB} \cong \overline{FE}$; $\overline{BC} \cong \overline{ED}$; $\overline{CG} \cong \overline{DG}$ polygon $ABCG \cong$ polygon $FEDG$ **3.** 22 **5.** $x = 17.5$ CPCTC **7.** Because Y is the midpoint of $\overline{XV}$ and $\overline{WZ}$, then $\overline{WY} \cong \overline{ZY}$ and $\overline{XY} \cong \overline{VY}$. Two parallel lines cut by a transversal have alternate interior angles congruent. Thus, $\angle X \cong \angle V$; $\angle W \cong \angle Z$. $\angle XYW \cong \angle VYZ$ because vertical angles are congruent. Since all corresponding angles and corresponding sides are congruent, then $\triangle WYX \cong \triangle ZYV$.

9. $\angle W \cong \angle Y$; $\angle XZW \cong \angle XYZ$; $\angle WXZ \cong \angle YXZ$; $\overline{XZ} \cong \overline{XZ}$; $\overline{XW} \cong \overline{XY}$; $\overline{WZ} \cong \overline{YZ}$; $\triangle XWZ \cong \triangle XYZ$ **11.** $\overline{AB} \cong \overline{FE}$; $\overline{BD} \cong \overline{EC}$; $\overline{AD} \cong \overline{FC}$; $\angle A \cong \angle F$; $\angle B \cong \angle E$; $\angle D \cong \angle C$; $\triangle ABD \cong \triangle FEC$ **13.** 39 **15.** 11 **17.** $x = 8$, $y = 1$

19. Given: $\angle A \cong \angle D$
$\angle B \cong \angle E$

Prove: $\angle C \cong \angle F$



Proof:

Statements (Reasons)

1. $\angle A \cong \angle D$, $\angle B \cong \angle E$ (Given)
2. $m\angle A = m\angle D$, $m\angle B = m\angle E$ (Def. of ≅ ∡)
3. $m\angle A + m\angle B + m\angle C = 180$, $m\angle D + m\angle E + m\angle F = 180$ (∠ Sum Theorem)
4. $m\angle A + m\angle B + m\angle C = m\angle D + m\angle E + m\angle F$ (Trans. Prop.)
5. $m\angle D + m\angle E + m\angle C = m\angle D + m\angle E + m\angle F$ (Subst.)
6. $m\angle C = m\angle F$ (Subt. Prop.)
7. $\angle C \cong \angle F$ (Def. of ≅ ∡)

21. Proof:

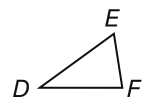
Statements (Reasons)

1. Parallelogram $PQRS$ (Given)
2. $\overline{PQ} \cong \overline{RS}$; $\overline{PS} \cong \overline{RQ}$; $\angle P \cong \angle R$ (Definition of a Parallelogram)
3. $\overline{PS} \parallel \overline{RQ}$ (Opposite sides of a parallelogram are parallel.)
4. $\angle PQS \cong \angle RSQ$; $\angle PSQ \cong \angle RQS$ (Parallel lines cut by a transversal, alternate interior angles are congruent.)
5. $\triangle PQS \cong \triangle RSQ$ (Definition of Congruent Triangle)

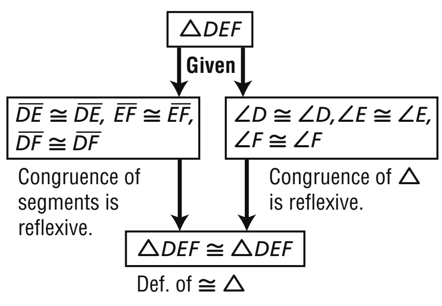
23. Sample answer: All of the shirts will be congruent because they will be printed with the same stencil. According to the transitive property of congruence, the images will be congruent to each other.

25. Given: $\triangle DEF$

Prove: $\triangle DEF \cong \triangle DEF$



Proof:



27. $x = 13$, $y = 8$ **29a.** $\overline{AB} \cong \overline{CB}$, $\overline{AB} \cong \overline{DE}$, $\overline{AB} \cong \overline{FE}$, $\overline{CB} \cong \overline{DE}$, $\overline{CB} \cong \overline{FE}$, $\overline{DE} \cong \overline{FE}$, $\overline{AC} \cong \overline{DF}$
29b. 40 ft **29c.** 80 **31a.** Two different sized triangles.
31b. Sample answer: $\triangle ABC \cong \triangle EFD$ or $\triangle ABF \cong ACD$
31c. Sample answer: $\triangle ABF \cong ACD$ or $\triangle BAC \cong \triangle FED$

31d. $FD = 4$ because corresponding parts of congruent triangles are congruent. **31e**. $m\angle E = 90$; The triangles are isosceles triangles. The angles opposite those sides are congruent. IN this case, they are both 45°, which makes $\angle E$ a right angle.
33. Sample answer: When naming congruent triangles, it is important that the corresponding vertices be in the same location for both triangles. For example if $\triangle ABC$ is congruent to $\triangle DEF$, then $\angle A$ corresponds with $\angle D$, $\angle B$ corresponds with $\angle E$, and $\angle C$ corresponds with $\angle F$. **35.** Sometimes; This statement is only true if the sides of the triangles are the same. **37.** Always; There is only one way that a triangle can be drawn with three given line segments. **39.** $x = 5.2$, $y = 15.6$
41. B **43.** H **45.** 106 **47.** 16 **49.** $JK = \sqrt{34}$, $KL = 2\sqrt{17}$, $JL = \sqrt{34}$; isosceles
51. $JK = \sqrt{145}$, $KL = 4\sqrt{34}$, $JL = 35$; scalene

Lesson 12-4

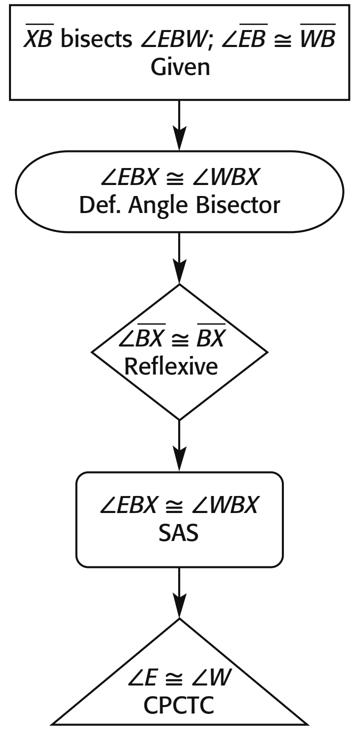
1. Given the length of the three sides, there is only one way that those three lengths can be put together. Once they are put together, they cannot be distorted. Each triangle would be the same size. When you attached them together, they would form a smooth surface. Sample answer: 3 legged seat or step stool; tripod on the element of an electric stove; camera tripod; easel, etc.
3. Because $\triangle TQR$ is equilateral, $\overline{TQ} \cong \overline{SQ}$. This gives us $\triangle RSQ \cong \triangle UTQ$ by SAS.
5. By the reflexive property, $\overline{XZ} \cong \overline{XZ}$. Therefore, $\triangle XYZ \cong \triangle ZWX$ by SSS.
7. Proof:

Statements (Reasons)

1. C is the midpoint of $\overline{BD}$; $AB = ED$; $\overline{AB} \perp \overline{BD}$; $\overline{ED} \perp \overline{BD}$ (Given)
2. $BC = DC$ (Definition of midpoint)
3. $\overline{AB} \cong \overline{ED}$; $\overline{BC} \cong \overline{DC}$ (Definition of congruence)
4. $\angle EDC$ and $\angle ABC$ are right angles (Definition of perpendicular lines)
5. $\angle EDC \cong \angle ABC$ (All right angles are congruent)
6. $\triangle ABC \cong \triangle EDC$ (SAS)

9. Use the distance formula. $QS = 4$; $MO = 2\sqrt{5}$;triangles are not congruent. **11.** Use the distance formula. $MN = QR = NO = RS = \sqrt{10}$; $MO = QS = 2\sqrt{5}$; The triangles are congruent by SSS.
13. By definition of rectangle, opposite sides are congruent and all four angles are right angles. All right angles are congruent. This makes $\overline{AB} \cong \overline{DE}$; $\angle ABC \cong \angle EDC$. Because C is the midpoint of $\overline{BD}$, then $BC = DC$. Segments with the same length are congruent, so $\overline{BC} \cong \overline{DC}$. By SAS, $\triangle ABC \cong \triangle EDC$.
15. Because the two line segments bisect each other, $AX = BX$ and $WX = PX$. Since the length of the line segments are equal, then $\overline{AX} \cong \overline{BX}$; $\overline{WX} \cong \overline{PX}$. $\angle AXW$ and $\angle BXP$ are vertical angles. Vertical angles are congruent, so $\angle AXW \cong \angle BXP$. $\triangle AXW \cong \triangle BXP$ by SAS. $\angle A \cong \angle B$ by CPCTC. **17.** not possible **19.** not possible

21. Proof:



23a. Proof:

Statements (Reasons)

1. Square $HFST$ (Given)
2. $\overline{ST} \cong \overline{FH}$; $\overline{TH} \cong \overline{FH}$ (All of the sides of a square are congruent.)
3. $\overline{SH} \cong \overline{FT}$ (Diagonals of a square are congruent.)
4. $\triangle HSF \cong \triangle TFH$ (SSS)
5. $\overline{SH} \cong \overline{FT}$ (CPCTC)
6. $SH = FT$ (Definition of Congruence.)

23b. **Proof:**

Statements (Reasons)

1. Square $HFST$ (Given)
2. $\overline{ST} \cong \overline{SF}$; $\overline{TH} \cong \overline{FH}$ (All of the sides of a square are congruent.)
3. $\overline{SH} \cong \overline{SH}$ (Reflexive Property)
4. $\triangle SHT \cong \triangle SHF$ (SSS)
5. $\angle SHT \cong \angle SHF$ (CPCTC)
6. $\angle SHT = \angle SHF$ (Definition of Congruence.)

25. **Proof:**

Statements (Reasons)

1. $\triangle EAB \cong \triangle DCB$ (Given)
2. $\overline{AE} \cong \overline{CD}$; $\overline{AB} \cong \overline{CB}$; $\overline{DB} \cong \overline{EB}$ (CPCTC)

3. $\overline{ED} \cong \overline{ED}$ (Reflexive Property)

4. $AB = CB$; $DB = EB$ (Definition of Congruent Segments)

5. $AB + DB = CB + EB$ (Addition Property of Equality)

6. $AD = AB + DB$; $CE = CB + EB$ (Segment Addition)

7. $AD = CE$ (Substitution)

8. $\overline{AD} \cong \overline{CE}$ (Definition of Congruent Segments)

9. $\triangle EAD \cong \triangle DCE$ (SSS)

27. $x = 6$; $y = 4$

29a. Sample answer: Method 1: You could use the Distance Formula to find the length of each of the sides, then use the SSS congruence Postulate to prove the triangles congruent.
Method 2: You could find the slopes of $\overline{ZX}$ and $\overline{WY}$ to prove that they are perpendicular and that $\angle WYZ$ and $\angle WYX$ are both right angles. You can use the distance formula to prove the $\overline{XY}$ is congruent to $\overline{ZY}$. The triangles share leg $\overline{WY}$, thus SAS congruence proves that the triangles are congruent. Sample Answer: I think that method one is easier because you can find the distance by counting the squares for sides ZY and XY, and use the distance formula for WZ and WX.

29b. Sample Answer: $WY = WY = 7$; $ZY = XY = 7$;

$$WZ = \sqrt{(1-8)^2 + (3-10)^2} = \sqrt{49+49} = 7\sqrt{2};$$

$$WX = \sqrt{(1-8)^2 + (3-10)^2} = \sqrt{49+49} = 7\sqrt{2};$$

$\triangle WYZ \cong \triangle WYX$ by SSS Congruence.

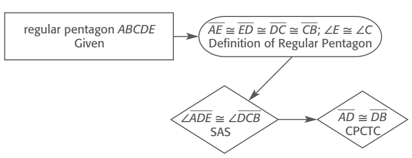
31. Neither is correct. There is not information to make a conclusion. **33.** Sometimes. Sample answer: This is true if the corresponding congruent sides are the legs of the triangle because this would be the same as SAS. If the corresponding congruent sides are a leg and a hypotenuse, then neither SAS nor SSS would apply. **35.** F

37. D **39.** 18 **41.** $y = -\frac{1}{5}x - 4$ **43.** $y = x + 3$

45. Transitive Prop. **47.** Substitution Prop.

Lesson 12-5

1.



3. If two parallel lines are cut by a transversal, alternate interior angles are congruent. Thus,
$\angle 1 \cong \angle 3$; $\angle 2 \cong \angle 4$. $\overline{RW} \cong \overline{RW}$ by the reflexive property. $\triangle RWV \cong \triangle WRT$ by ASA congruence.

5a. We know $\angle BAE$ and $\angle DCE$ are congruent because they are both right angles. $\overline{AE}$ is congruent to $\overline{EC}$ by the Midpoint Theorem. From the Vertical Angles Theorem, $\angle DEC \cong \angle BEA$. By ASA, the surveyor knows that $\triangle DCE \cong \triangle BAE$. By CPCTC, $\overline{DC} \cong \overline{AB}$, so the surveyor can measure $\overline{DC}$ and know the distance between A and B.

5b. 690 m; Since $DC = 690$ m and $\overline{DC} \cong \overline{AB}$, then by the definition of congruence, $AB = 690$ m.

7. Proof: Two lines perpendicular to the same line are parallel to each other. Therefore, $\overline{BC} \parallel \overline{AD}$. When parallel lines are cut by a transversal, alternate interior angles are congruent; $\angle BCA \cong \angle DAC$; $\angle BAC \cong \angle DCA$. The two triangles share side AC, so the reflexive property gives $\overline{AC} \cong \overline{AC}$. By ASA, $\triangle ACD \cong \triangle CAB$.

9. Proof:

Statements (Reasons)

1. $\overline{HZ} \parallel \overline{ET}$; $\overline{AG} \cong \overline{BD}$; $\angle A \cong \angle B$ (Given)
2. $\angle EDA \cong \angle HGA$; $\angle ZGB \cong \angle TDB$ (Parallel lines cut by transversal, corresponding angles are congruent.)
3. $\angle HGA \cong \angle TDB$ (Parallel lines cut by a transversal, alternate exterior angles are congruent.)
4. $\angle EDA \cong \angle ZGB$ (Transitive)
5. $AG = BD$ (Definition of Congruence)
6. $GD = GD$ (Reflexive)
7. $AG + GD = BD + GD$ (Addition Property)
8. $AG + GD + AD$; $BD + DG = BG$ (Segment Addition)
9. $AD = BG$ (Substitution)
10. $\overline{AD} \cong \overline{BG}$ (Definition of congruence)
11. $\triangle ADE \cong \triangle BGZ$ (ASA)

11. Proof:

Statements (Reasons)

1. $\overline{AY} \cong \overline{BA}$; $\overline{ZX} \parallel \overline{BC}$ (Given)
2. $\angle ZAY \cong \angle CAB$ (Vertical angles are congruent.)
3. $\angle ZYA \cong \angle CBA$ (Parallel lines cut by a transversal, alternate interior angles are congruent.)
4. $\triangle ZAY \cong \triangle CAB$ (ASA)
5. $\overline{YZ} \cong \overline{BC}$ (CPCTC)

13a. $\angle HJK \cong \angle GFK$ since all right angles are congruent. We are given that $\overline{JK} \cong \overline{KF}$. $\angle HKJ$ and $\angle FKG$ are vertical angles, so $\angle HKJ \cong \angle FKG$ by the Vertical Angles Theorem. By ASA, $\triangle HJK \cong \triangle GFK$, so $\overline{FG} \cong \overline{HJ}$ by CPCTC.

13b. No; $HJ = 1425$ m, so $FG = 1425$ m. If the regatta is to be 1500 m, the lake is not long enough, since $1425 < 1500$.

15. $x = 7$; $y = 5$

17. Proof:

Statements (Reasons)

1. $\overleftrightarrow{RS}$ bisects $\angle CSA$ and $\angle CHA$ (Given)
2. $\overline{SH} \cong \overline{SH}$ (Reflexive)
3. $\angle SHC \cong \angle SHA$; $\angle CSH \cong \angle ASH$ (Definition of Angle Bisector)
4. $\triangle CHS \cong \triangle AHS$ (ASA)

19. Proof:

Statements (Reasons)

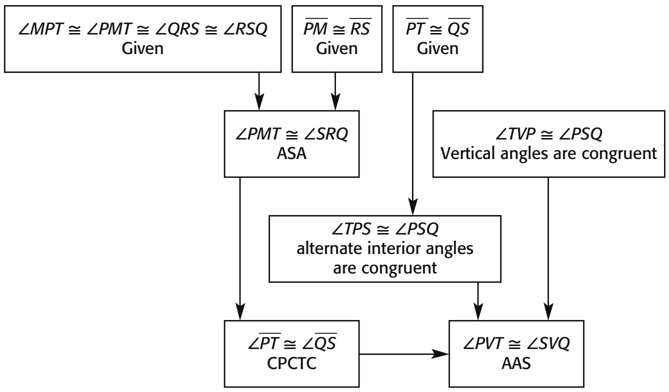
1. $\angle CED \cong \angle CFD$; $\overline{CD}$ bisects $\angle ECF$ (Given)
2. $\angle ECD \cong \angle FCD$ (Definition of Angle Bisector)
3. $\overline{CD} \cong \overline{CD}$ (Reflexive)
4. $\triangle CED \cong \triangle CFD$ (AAS)

21a. The two types of triangles that are used would be isosceles and right.

21b. At least two sides and an angle or two angles and a side are needed to prove that the triangles are congruent.

23. Lorenzo is correct. The triangles cannot be congruent. Even though all of the corresponding angles are congruent, the lengths of the sides are not congruent. Therefore, the triangles are not congruent.

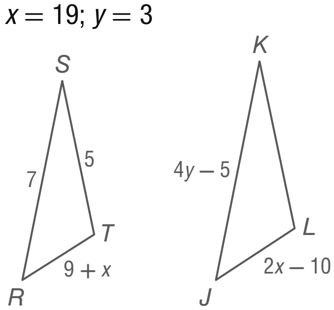
25. Proof:



27. B **29.** J

31. $AB = \sqrt{125}$, $BC = \sqrt{221}$, $AC = \sqrt{226}$, $XY = \sqrt{125}$, $YZ = \sqrt{221}$, $XZ = \sqrt{226}$. The corresponding sides have the same measure and are congruent. $\triangle ABC \cong \triangle XYZ$ by SSS.

33. $x = 19$; $y = 3$



35. Proof:

Statements (Reasons)

1. $\angle 2 \cong \angle 1$, $\angle 1 \cong \angle 3$ (Given)
2. $\angle 2 \cong \angle 3$ (Trans. Prop.)
3. $AB \parallel DE$ (If alt. int. ∠s are ≅, lines are ∥.)

Lesson 12-6

1. $\angle ABD \cong \angle ADB$ **3.** 22 **5.** $x = 5$

7. Statements (Reasons)

1. $\overline{DA} \cong \overline{DC}$ (Given)
2. $\angle DAC \cong \angle DCA$ (Isosceles Triangle Theorem)
3. $\angle BAD \cong \angle BCD$ (Given)
4. $\angle BAC \cong \angle BCA$ (Angle Addition)
5. $m\angle ABC + m\angle BAC + m\angle BCA = 180°$ (Triangle Sum Theorem)
6. $m\angle ABC = 60$ (Given)
7. $60 + m\angle BAC + m\angle BAC = 180$ (Substitution)
8. $60 + 2m\angle BAC = 180$ (Simplify)
9. $2m\angle BAC = 120$ (Subtract 60 from each side)
10. $m\angle BAC = 60$ (Divide both sides by 2)
11. $m\angle BCA = 60$ (Substitution)
12. $\triangle ABC$ is equiangular ($m\angle ABC = 60$, $m\angle BAC = 60$, $m\angle BCA = 60$.)
13. $\triangle ABC$ is equilateral. (Equilateral Triangle Corollary)

9. $\overline{AF} \cong \overline{FB}$ **11.** $\overline{ED} \cong \overline{EC}$ **13.** $\angle HCD \cong \angle HDC$

15. 13 **17.** 45° **19.** $x = 4$, $y = 7$ **21.** $x = 2$

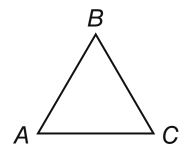
23. Proof: We are given that $\triangle HNJ \cong \triangle HMP$ and $\triangle JNK \cong \triangle MPL$, so we know that $\overline{HN} = \overline{HP}$ and $\overline{NK} = \overline{PL}$ since they are corresponding parts of congruent triangles. $\overline{HN} + \overline{NK} = \overline{HP} + \overline{PL}$ by the segment addition postulate. Also,. $\overline{HN} + \overline{NK} = \overline{HK}$ and $\overline{HP} + \overline{PL} = \overline{HL}$. Then by substitution, $\overline{HK} =$ HL. Therefore, $\triangle HKL$ is an isosceles triangle. By the Isosceles triangle theorem, $m\angle HKL = m\angle HLK$.

25. Sample Answer: I used a ruler to draw a line segment of 4 inches. Then I used a protractor to make a 60° angle and draw another 4 inch line segment. After that I connected the two endpoints.

27. 134° **29.** 67°

31. Proof: We are given that $m\angle BKC = m\angle BCK$, so $\triangle BKC$ is an isosceles triangle. By the isosceles triangle theorem, $\overline{BK} \cong \overline{BC}$. $\overline{BT}$ is perpendicular to $\overline{KC}$, so by the angle sum theorem, $m\angle KBT = m\angle CBT$. By *AAS*, $\triangle KBT \cong \triangle CBT$. Thus $\overline{KT} \cong \overline{TC}$, by *CPCTC*. Therefore the tree is half way between Kay and Charlie.

33. Case I



Given: $\triangle ABC$ is an equilateral triangle.

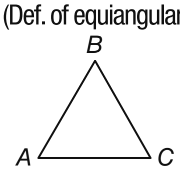
Prove: $\triangle ABC$ is an equiangular triangle.

Proof:

Statements (Reasons)

1. $\triangle ABC$ is an equilateral triangle. (Given)
2. $\overline{AB} \cong \overline{AC} \cong \overline{BC}$ (Def. of equilateral △)
3. $\angle A \cong \angle B \cong \angle C$ (Isosceles △ Th.)
4. $\triangle ABC$ is an equiangular triangle. (Def. of equiangular)

Case II



Given: $\triangle ABC$ is an equiangular triangle.

Prove: $\triangle ABC$ is an equilateral triangle.

Proof:

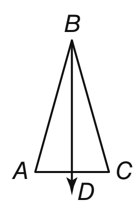
Statements (Reasons)

1. $\triangle ABC$ is an equiangular triangle. (Given)
2. $\angle A \cong \angle B \cong \angle C$ (Def. of equiangular △)
3. $\overline{AB} \cong \overline{AC} \cong \overline{BC}$ (If 2 ∠s of a △ are ≅ then the sides opp. those ∠s are ≅.)
4. $\triangle ABC$ is an equilateral triangle. (Def. of equilateral)

35. Given: $\triangle ABC$; $\angle A \cong \angle C$

Prove: $\overline{AB} \cong \overline{CB}$

Proof:



Statements (Reasons)

1. Let $\overrightarrow{BD}$ bisect $\angle ABC$. (Protractor Post.)
2. $\angle ABD \cong \angle CBD$ (Def. of ∠ bisector)
3. $\angle A \cong \angle C$ (Given)

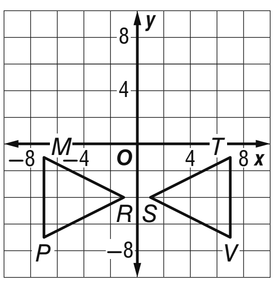
4. $\overline{BD} \cong \overline{BD}$ (Refl. Prop.)
5. $\triangle ABD \cong \triangle CBD$ (AAS)
6. $\overline{AB} \cong \overline{CB}$ (CPCTC)

37. $s = 7$ **39.** 90° **41.** 90°
43. Proof:
$\overline{CZ} = \overline{CY} = \overline{CX}$ since they are all radii of the same circle. Since $\overline{CZ} = \overline{CY}$, $\triangle YCZ$ is an isosceles triangle with vertex angle $m\angle YCZ = 120$. By the triangle sum theorem and the isosceles triangle theorem we have $m\angle CYZ = m\angle CZY = 30$. Since $\overline{CZ}$ bisects $\angle XZY$ we also have $m\angle CZX = 30$. Since $\overline{CZ} = \overline{CX}$, $\triangle XCZ$ is an isosceles triangle. So by the isosceles triangle theorem $m\angle CXZ = 30$. By AAS, $\triangle YCZ \cong \triangle XCZ$, so $\overline{YZ} = \overline{XZ}$, by CPCTC. Since $\overline{CY} = \overline{CX}$, $\triangle XCY$ is an isosceles triangle. Since $m\angle XCY + m\angle YCZ + m\angle ZCX = 360$ and $m\angle YCZ$ and $m\angle ZCX = 120$, $m\angle XCY = m\,120$. Therefore by the triangle sum theorem, $m\angle CYZ = m\angle XYC = 30$, so by ASA $\triangle YCZ \cong \triangle XCY$. Thus, $\overline{XY} = \overline{YZ} = \overline{XZ}$ and $\triangle XYZ$ is equilateral.

45. never **47.** You only need to be given the measure of one angle. If you are given the measure of one of the base angles, then you know the other base angle also has this measure and then you can use the triangle sum theorem to find the vertex angle. If you are given the measure of the vertex angle you can divide 180 minus this value by 2 to find the measure of each base angle.
49. D **51.** F **53.** $\triangle ADC \cong \triangle ABC$; since $\overline{AC} \cong \overline{AC}$, the two triangles are congruent by AAS.
55. $SU = \sqrt{2}$, $TU = \sqrt{26}$, $ST = \sqrt{20}$, $XZ = \sqrt{10}$, $YZ = \sqrt{26}$, $XY = \sqrt{68}$; the corresponding sides are not congruent; the triangles are not congruent. **57.** 6
59. No; *A, C,* and *J* lie in plane *ABC,* but *D* does not.

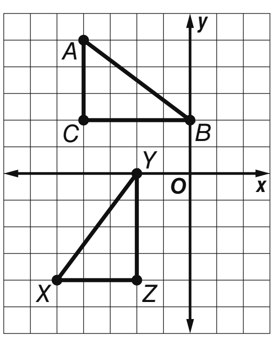
Lesson 12-7

1. translation **3.** reflection **5.** $\triangle LKJ$ is a reflection of $\triangle XYZ$. $XY = 7$, $YZ = 8$, $XZ = \sqrt{113}$, $KJ = 8$, $LJ = \sqrt{113}$, $LK = 7$. $\triangle XYZ \cong \triangle LKJ$ by SSS. **7.** reflection **9.** translation, reflection, or rotation
11. rotation **13.** translation **15.** rotation
17.



$\triangle TVS$ is a reflection of $\triangle MPR$. $MP = 6$, $PR = \sqrt{45}$, $MR = \sqrt{45}$, $ST = \sqrt{45}$, $TV = 6$, $SV = \sqrt{45}$. $\triangle MPR \cong \triangle TVS$ by SSS.

19.

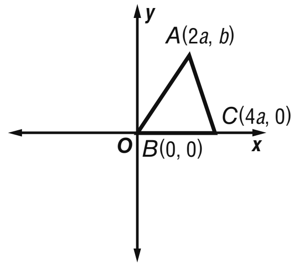


$\triangle XYZ$ is a rotation of $\triangle ABC$. $AB = 5$, $BC = 4$, $AC = 3$, $XY = 5$, $YZ = 4$, $XZ = 3$. Since $AB = XY$, $BC = YZ$, and $AC = XZ$, $\overline{AB} \cong \overline{XY}$, $\overline{BC} \cong \overline{YZ}$, and $\overline{AC} \cong \overline{XZ}$, $\triangle ABC \cong \triangle XYZ$ by SSS.

21. rotation **23.** reflection **25.** rotation
27. Rotation; the knob is the center of rotation. **29a.** reflections or rotations. **29b.** rotations. **31a.** translation, reflection
31b. Sample answer: The triangles must be either isosceles or equilateral. When triangles are isosceles or equilateral, they have a line of symmetry, so reflections result in the same figure.
33. Sample answer: A person looking in a mirror sees a reflection of himself or herself.
35. Sample answer: A faucet handle rotates when you turn the water on. **37.** no; 75% **39.** J **41.** 4
43. 10 **45.** (7.5, −9) **47.** (−19, 5)
49. (1.5, −2)

Lesson 12-8

1.



3. M(0, 0), N(0, 2a)
5. Proof: By the distance formula the length of

$\overline{WX} = \sqrt{(0-0)^2 + (5b-0)^2} = 5b$,

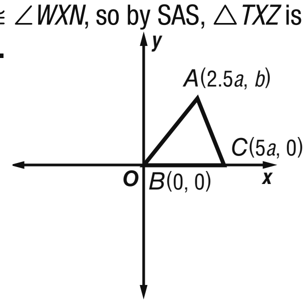
$\overline{TX} = \sqrt{(0-0)^2 + (10b-0)^2} = 10b$,

$\overline{XP} = \sqrt{(0-12a)^2 + (0-0)^2} = 12a$,

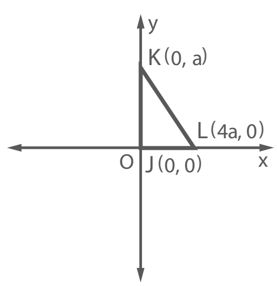
$\overline{XN} = \sqrt{(0-24a)^2 + (0-0)^2} = 24a$.

So the ratio of $\overline{WX}$ to $\overline{TX}$ is $\frac{1}{2}$ and the ratio of $\overline{XP}$ to $\overline{XN}$ is $\frac{1}{2}$. $\angle TXN \cong \angle WXN$, so by SAS, $\triangle TXZ$ is similar to $\triangle WXY$.

7.



9.



11. Solution: **13.** $X(0, 3b)$, $L(-2a, 0)$, $P(2a, 0)$
15. $T(-5\sqrt{3}a, 0)$, $G(5\sqrt{3}a, 0)$, $M(0, b)$

17. $A(0,0), S(3a, \frac{8}{3}b), V(6a, 0)$
19. Proof:

We set place an isosceles triangle on the coordinate plane as shown.

We want to show that $\triangle ABD \cong \triangle ACD$. $\overline{AD} \cong \overline{AD}$ by the reflexive property. Since D is located at the origin, A is on the y-axis and C is on the x-axis, $\angle ADC = 90$. Also, since B is on the x-axis, $\angle ADB = 90$. Therefore, $\angle ADC \cong \angle ADB$.

$DC = \sqrt{(0 - a)^2 + (0 - 0)^2} = a.$

$BD = \sqrt{(-a - 0)^2 + (0 - 0)^2} = a.$

Thus $\overline{DC} \cong \overline{BD}$. Therefore by SAS, $\triangle ABD \cong \triangle ACD$.

21. Proof:

$ZS = \sqrt{(0 - 6a)^2 + (0 - 0)^2} = 6a$

$ZR = \sqrt{(0 - 6a)^2 + (0 - 3)^2} = \sqrt{36a^2 + 9}$

$RS = \sqrt{(6a - 6a)^2 + (0 - 3)^2} = 3$

$ZY = \sqrt{(0 - -18a)^2 + (0 - 0)^2} = 18a$

$XY = \sqrt{(-18a - -18a)^2 + (9 - 0)^2} = 9$

$XZ = \sqrt{(-18a - 0)^2 + (9 - 0)^2} = 3\sqrt{36a^2 + 9}$

Since $\frac{ZS}{ZY} = 3, \frac{ZR}{XZ} = 3$, and $\frac{RS}{XY} = 3$, so $\triangle XYZ$ is similar to $\triangle RSZ$

23. Solution:

$CU = \sqrt{(39.98 - 40.79)^2 + (82.98 - 77.86)^2} = 5.18$

$CE = \sqrt{(39.98 - 41.88)^2 + (82.98 - 87.62)^2} = 5.01$

$EU = \sqrt{(41.88 - 40.79)^2 + (87.62 - 77.86)^2} = 9.82$

These cities form a scalene triangle.

25. Slope of $XY = \frac{3b}{2a}$

Slope of $YZ = -\frac{a}{b}$

Slope of $XZ = \frac{2b}{3a}$

The triangle is not a right triangle because no pair of lines is perpendicular.

27. Proof: The first step is to label the coordinates of each location. Let R represent the roller coaster, M represent the merry go round and B represent the bumper cars. If the slopes of the lines connecting the rides are opposite reciprocals then the triangle is a right triangle.

The slope of $RM = \frac{3 - -1}{3 - 2} = 4$

The slope of $RB = \frac{0 - -1}{-2 - 2} = -\frac{1}{4}$

So $m\angle MRB = 90$ and the triangle formed by these three rides is a right triangle.

29. Proof: The first step is to label the coordinates of each location. Let S represent start, C represent the beginning of the cycling and E represent the end of the swim. If no two sides of $\triangle SCE$ are congruent, then these three points form a scalene triangle. We will use the distance formula and a calculator to find the distance between each location.

$S(0,0), C(10, 0), E(10, 41.5)$

$SC = \sqrt{(0 - 10)^2 + (0 - 0)^2} = 10$

$CE = \sqrt{(10 - 10)^2 + (0 - 41.5)^2} = 41.5$

$SE \sqrt{(0 - 10)^2 + (0 - 41.5)^2} \approx 42.68$

Since each side is a different length, $\triangle SCE$ is scalene. Therefore, the triangle formed by these three points is scalene.

31. Proof: Let the original triangle and resulting triangle be placed on a coordinate plane as shown:

$AB = \sqrt{(a - 0)^2 + (0 - b)^2} = \sqrt{a^2 + b^2}$

$AC = \sqrt{(a - c)^2 + (b - 0)^2} = \sqrt{a^2 - 2ac + c^2 + b^2}$

$BC = \sqrt{(c - 0)^2 + (0 - 0)^2} = c$

$DE = \sqrt{(2a - 0)^2 + (0 - 2b)^2} = 2\sqrt{a^2 + b^2}$

$DF = \sqrt{(2a - 2c)^2 + (2b - 0)^2} = 2\sqrt{a^2 - 2ac + c^2 + b^2}$

33. 66 **35.** G **37.** $\angle TSR \cong \angle TRS$
39. $\triangle RQV \cong \triangle SQV$ **41.** 4.2 **43.** 3.6

Lesson 12-9

1. 56 in., 180 in^2 **3.** 64 cm, 207.8 cm^2 **5.** 43.5 in., 20 in^2 **7.** 28.5 in., 33.8 in^2 **9.** 11 cm **11.** 76 ft, 315 ft^2 **13.** 69.9 m, 129.9 m^2 **15.** 174.4 m, 1520 m^2 **17.** 727.5 ft^2 **19.** 338.4 cm^2 **21.** 480 m^2 **23.** 55,948 mi^2 **25.** b = 12 cm; h = 3 cm **27.** b = 11 m; h = 8 m **29.** 1 pint yellow, 3 pints of blue **31.** 9.19 in.; 4.79 in2 **33.** 36 units^2; Graph the parallelogram, then measure the length of the base and the height and calculate the area. **35a.** 10.9 units^2

35b. $\sqrt{s(s - a)(s - b)(s - c)} \stackrel{?}{=} \frac{1}{2}bh$

$$\sqrt{15(15 - 5)(15 - 12)(15 - 13)} \stackrel{?}{=} \frac{1}{2}(5)(12)$$

$$\sqrt{15(10)(3)(2)} \stackrel{?}{=} 30$$

$$\sqrt{900} \stackrel{?}{=} 30$$

$$30 = 30$$

37. 15 units^2; Sample answer: I inscribed the triangle in a 6-by-6 square. I found the area of the square and subtracted the areas of the three right triangles inside the square that were positioned around the given triangle. The area of the given triangle is the difference, or 15 units^2. **39.** Sample answer: The area will not change as K moves along line p. Since lines m and p are parallel, the perpendicular distance between them is constant. That means that no matter where K is on line p, the perpendicular distance to line p, or the height of the triangle, is always the same. Since point J and L are not moving, the distance between them, or the length of the base, is constant. Since the height of the triangle and the base of the triangle are both constant, the area will always be the same.
41. Sample answer: To find the area of the parallelogram, you can measure the height $\overline{PT}$ and then measure one of the bases $\overline{PQ}$ or $\overline{SR}$ and multiply the height by the base to get the area. You can also measure the height $\overline{SW}$ and measure one of the bases $\overline{QR}$ or $\overline{PS}$ and then multiply the height by the base to get the area. It doesn't matter which side you choose to use as the base, as long as you use the height that is perpendicular to that base to calculate the area.
43. 6 **45.** B

47. sample: random sample of 100 seniors; population: all seniors at North Boyton High School; sample statistic: the mean amount of money the sample spent on prom; population parameter: the mean amount of money seniors at North Boyton High School spent on prom

49. $f^{-1}(x) = -\frac{1}{5}x + \frac{17}{5}$ **51.** $f^{-1}(x) = -7x - 7$

53. $f^{-1}(x) = -\frac{5}{3}x + 20$ **55.** 9 **57.** 12

Chapter 12 Study Guide and Review

1. true **3.** true **5.** false; base **7.** true **9.** false; coordinate proof **11.** obtuse **13.** right **15.** $x = 6$, $JK = KL = JL = 24$ **17.** 70 **19.** 82

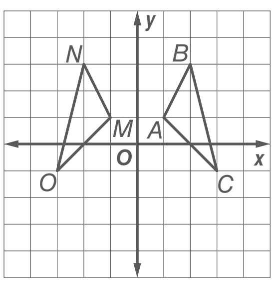
21. $\angle D \cong \angle J$, $\angle A \cong \angle F$, $\angle C \cong \angle H$, $\angle B \cong \angle G$, $\overline{AB} \cong \overline{FG}$, $\overline{BC} \cong \overline{HG}$, $\overline{DC} \cong \overline{JH}$, $\overline{DA} \cong \overline{JF}$; polygon $ABCD \cong$ polygon $FGHJ$

23. $\triangle BFG \cong \triangle CGH \cong \triangle DHE \cong \triangle AEF$, $\triangle EFG \cong \triangle FGH \cong \triangle GHE \cong \triangle HEF$

25. **Statements (Reasons)**
1. $\overline{WY}$ bisects both $\angle XWZ$ and $\angle XYZ$. (Given)
2. $\angle XWY \cong \angle ZWY$ (Def. of $\angle$ Bisector)
3. $\overline{WY} \cong \overline{WY}$ (Reflexive Property)
4. $\angle XYW \cong \angle ZYW$ (Def. of $\angle$ Bisector)
5. $\angle WXY \cong \angle WZY$ (ASA)

27. 76 **29.** translation **31.** reflection

33. Reflection



CHAPTER 13
Quadrilaterals

Chpater 13 Get Ready

1. 150 **3.** 54 **5.** 137 **7.** $x = 1$, $WX = XY = YW = 9$

9. Des Moines to Phoenix = 1153 mi, Des Moines to Atlanta = 738 mi, Phoenix to Atlanta = 1591 mi

Lesson 13-1

1a. 135 **1b.** 58 cm **1c.** 45 **3.** $z = 7$ **5.** $p = 5$, $q = 2$

7. Proof:

Statements (Reasons):
1. ▱$ABCD$, (Given)
2. $AB \parallel CD$; $AC \parallel BD$ (Definition of parallelogram)
3. $\angle A$ is a right angle. (Given)
4. $m\angle A + m\angle C = 180$ (Consecutive interior angles are supplementary)
5. $m\angle C = 90$ (Solving for $m\angle C$)
6. $m\angle A + m\angle B = 180$ (Consecutive interior angles are supplementary)
7. $m\angle B = 90$ (Solving for $m\angle B$)
8. $m\angle B + m\angle D = 180$ (Consecutive interior angles are supplementary)
9. $m\angle D = 90$ (Solving for $m\angle D$)
10. B, $\angle C$, and $\angle D$ are right angles ($m\angle C = 90$, $m\angle B = 90$, $m\angle D = 90$)

9. 108° **11.** 72° **13a.** 1 inch **13b.** $\frac{1}{2}$ inch **13c.** 132 **13d.** 48 **15.** $x = 148$, $z = 32$ **17.** $x = 8$, $y = -3$ **19.** $s = -1$, $q = 4$ **21.** (0, 3)

23. Proof:

Statements (Reasons):
1. $ABCD$ is a parallelogram (Given)
2. $\angle BAD \cong \angle BCD$ (Opposite sides of a parallelogram are congruent)
3. $ABDE$ is a parallelogram (Given)
4. $AB \parallel ED$ (Definition of a parallelogram)
5. $\angle BAD \cong \angle ADE$ (Alternate interior angles are congruent)
6. $\angle BCD \cong \angle ADE$ (Transitive property)
7. $\overline{AB} \cong \overline{DC}$ (Opposite sides of a parallelogram are congruent)
8. $\overline{AB} \cong \overline{ED}$ (Opposite sides of a parallelogram are congruent)
9. $\overline{DC} \cong \overline{ED}$ (Transitive property)
10. $\angle AED \cong \angle ABD$ (Opposite angles of a parallelogram are congruent)
11. $\angle ABD \cong \angle BDC$ (Alternate interior angles are congruent)
12. $\triangle ADE \cong \triangle BCD$ (ASA)

25. Proof:

Statements (Reasons)
1. ▱$GKLM$ (Given)
2. $\overline{GK} \parallel \overline{ML}$, $\overline{GM} \parallel \overline{KL}$ (Opp. sides of a ▱ are $\parallel$.)
3. $\angle G$ and $\angle K$ are supplementary, $\angle K$ and $\angle L$ are supplementary, $\angle L$ and $\angle M$ are supplementary, and $\angle M$ and $\angle G$ are supplementary. (Cons. int. ∡ are suppl.)

27. Proof:

Statements (Reasons)
1. ▱$PQRS$ (Given)
2. Draw an auxiliary segment $\overline{PR}$ and label angles 1, 2, 3, and 4 as shown. (Diagonal of $\overline{PQRS}$)
3. $\overline{PQ} \parallel \overline{SR}$, $\overline{PS} \parallel \overline{QR}$ (Opp. sides of a ▱ are $\parallel$.)
4. $\angle 1 \cong \angle 2$, and $\angle 3 \cong \angle 4$ (Alt. int. ∡ Thm.)
5. $\overline{PR} \cong \overline{RP}$ (Refl. Prop.)
6. $\triangle QPR \cong \triangle SRP$ (ASA)
7. $\overline{PQ} \cong \overline{RS}$, $\overline{QR} \cong \overline{SP}$ (CPCTC)

29a. $\overline{QP} = \sqrt{(11-3)^2 + (5-7)^2} = 2\sqrt{17}$

$\overline{WY} = \sqrt{(10-2)^2 + (-2-0)^2} = 2\sqrt{17}$

$\overline{QW} = \sqrt{(3-2)^2 + (7-0)^2} = 5\sqrt{2}$

$\overline{PY} = \sqrt{(11-10)^2 + (5--2)^2} = 5\sqrt{2}$

29b. $\left(\frac{13}{2}, \frac{5}{2}\right)$

29c. Slope of $\overline{QP} = \frac{7-5}{3-11} = -\frac{1}{4}$

Slope of $\overline{QW} = \frac{7-0}{3-2} = 7$

Slope of $\overline{WY} = \frac{-2-0}{10-2} = -\frac{1}{4}$

Slope of $\overline{PY} = \frac{5--2}{11-10} = 7$

Since the opposite sides of *QPWY* are parallel, *QPWY* is a parallelogram.

31. 20 **33.** 2 **35.** 115

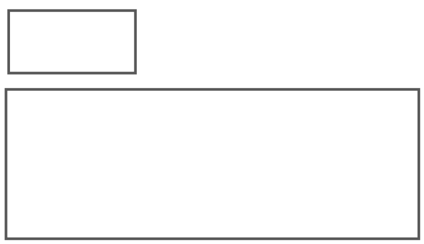
37. Proof:

Statements (Reasons):

1. ▱*EFGH* (Given)
2. $\overline{EH} \cong \overline{GF}$ (Opposite sides of a parallelogram are congruent.)
3. $\overline{EF} \cong \overline{HG}$ (Opposite sides of a parallelogram are congruent.)
4. $\overline{HJ}$ bisects $\overline{EF}$, $\overline{EK}$ bisects $\overline{HG}$. (Given)
5. $\overline{EJ} \cong \overline{GK}$ ($\overline{HJ}$ bisects $\overline{EF}$, $\overline{EK}$ bisects $\overline{HG}$ and $\overline{EF} \cong \overline{HG}$)
6. $\angle JEH \cong \angle KGF$ (Opposite angles of a parallelogram are congruent.)
7. $\triangle EJH \cong \triangle GKF$ (SAS)

39. Sample answer: $\triangle ABE \cong \triangle CDE$, $\triangle BEC \cong \triangle DEA$, $\triangle ABC \cong \triangle CDA$, $\triangle BAD \cong \triangle DCB$

41. Sample answer:



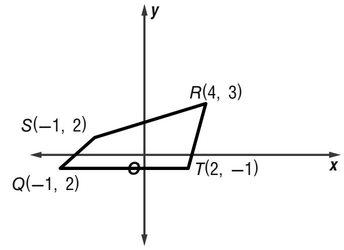
43. Rectangles are always parallelograms because the opposite sides of rectangles are always parallel, but parallelograms are only sometimes rectangles because some parallelograms do not have right angles and a rectangle must have four right angles.

45. 13 **47.** B **49.** 123 **51.** 57 **53.** *ABC, ABQ, PQR, CDS, APU, DET* **55.** 6 **57.** diagonal; $-\frac{4}{5}$

Lesson 13-2

1. No; none of the tests for ▱ are fulfilled.
3. Luke can measure the table top to make sure that the opposite sides have the same length. If the opposite sides of the table top have the same length and the legs are in the corners of the table top the legs would form a parallelogram.
5. $x = 30$; $y = 45$ **7.** Yes, this is a parallelogram because the slope of $FG = -\frac{1}{4}$ and the slope of $JH = -\frac{1}{4}$. Also, the slope of $HG = 1$ and the slope of $JF = 1$, so the opposite sides of the quadrilateral are parallel. **9.** Not a parallelogram because opposite angles are not congruent. **11.** Yes, each pair of opposite sides are congruent. **13.** No, none of the tests for ▱ are fulfilled.

15. No it is not a parallelogram. The slope of *SR* is $\frac{1}{5}$ and the slope of *QT* is 1 so these opposite sides are not parallel.



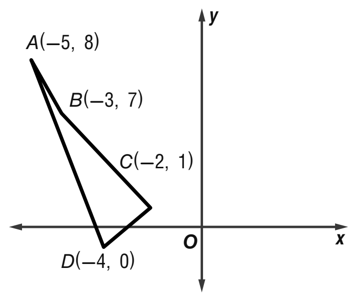
17. No this is not a parallelogram.

$\overline{AB} = \sqrt{(-5-3)^2 + (8-7)^2} = \sqrt{65}$,

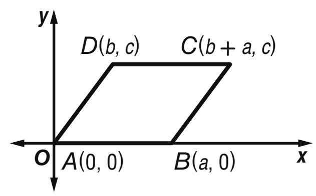
$\overline{CB} = \sqrt{(-2-3)^2 + (1-7)^2} = \sqrt{61}$,

$\overline{BD} = \sqrt{(-3-4)^2 + (7-0)^2} = \sqrt{50}$,

$\overline{DA} = \sqrt{(-4-5)^2 + (0-8)^2} = \sqrt{65}$. Since the opposite sides are not congruent this is not a parallelogram.



19. Given: $\overline{AB} \cong \overline{CD}$, $\overline{AD} \cong \overline{BC}$
Prove: *ABCD* is a parallelogram.



Proof:

slope of $AD = \frac{c-0}{b-0} = \frac{c}{b}$

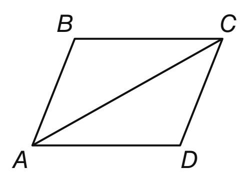
The slope of $\overline{AB}$ is 0.

slope of $\overline{BC} = \frac{c-0}{b+a-a} = \frac{c}{b}$

The slope of $\overline{CD}$ is 0.

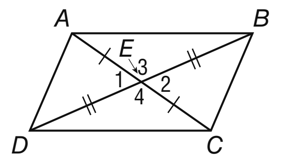
Therefore, $\overline{AD} \parallel \overline{BC}$ and $\overline{AB} \parallel \overline{CD}$. So by definition of a parallelogram, *ABCD* is a parallelogram.

21. Given: $\angle A \cong \angle C$, $\angle B \cong \angle D$
Prove: *ABCD* is a parallelogram.



Proof: Draw $\overline{AC}$ to form two triangles. The sum of the angles of one triangle is 180, so the sum of the angles for two triangles is 360. So, $m\angle A + m\angle B + m\angle C + m\angle D = 360$. Since $\angle A \cong \angle C$ and $\angle B \cong \angle D$, $m\angle A = m\angle C$ and $m\angle B = m\angle D$. By substitution, $m\angle A + m\angle A + m\angle B + m\angle B = 360$. So, $2(m\angle A) + 2(m\angle B) = 360$. Dividing each side by 2 yields $m\angle A + m\angle B = 180$. So, the consecutive angles are supplementary and $\overline{AD} \parallel \overline{BC}$. Likewise, $2(m\angle A) + 2(m\angle D) = 360$ or $m\angle A + m\angle D = 180$. So, these consecutive angles are supplementary and $\overline{AB} \parallel \overline{DC}$. Opposite sides are parallel, so *ABCD* is a parallelogram.

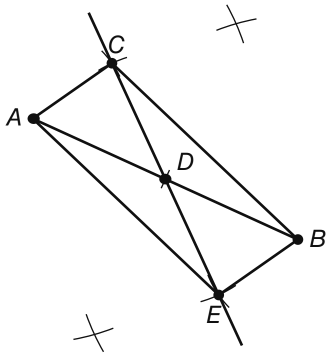
23. Given: $\overline{AE} \cong \overline{EC}$, $\overline{DE} \cong \overline{EB}$
Prove: *ABCD* is a parallelogram.



Proof:
Statements (Reasons)

1. $\overline{AE} \cong \overline{EC}$, $\overline{DE} \cong \overline{EB}$ (Given)
2. $\angle 1 \cong \angle 2$, $\angle 3 \cong \angle 4$ (Vertical $\angle$s are $\cong$.)
3. $\triangle ABE \cong \triangle CDE$, $\triangle ADE \cong \triangle CBE$ (SAS)
4. $\overline{AB} \cong \overline{DC}$, $\overline{AD} \cong \overline{BC}$ (CPCTC)
5. *ABCD* is a parallelogram. (If both pairs of opp. sides are $\cong$, then quad is a ▱.)

25. By Theorem 13.9, if the diagonals of a quadrilateral bisect each other, then the quadrilateral is a parallelogram. Begin by drawing and bisecting a segment $\overline{AB}$. Then draw a line that intersects the first segment through its midpoint *D*. Mark a point *C* on one side of this line and then construct a segment $\overline{DE}$ congruent to $\overline{CD}$ on the other side of *D*. You now have intersecting segments which bisect each other. Connect point *A* to point *C*, point *C* to point *B*, point *B* to point *E*, and point *E* to point *A* to form ▱*ACBE*.



27. $E(-b, c)$, $G(a, 0)$

29. Coordinate Proof: The diagonals of a parallelogram bisect each other, so the midpoint of

the diagonals is $E\left(\frac{a+b}{2}, \frac{c}{2}\right)$.

$$\overline{DE} = \sqrt{\left(b - \frac{a+b}{2}\right)^2 - \left(c - \frac{c}{2}\right)^2} = \frac{1}{2}\sqrt{(a-b)^2 - c^2},$$

$$\overline{AE} = \sqrt{\left(0 - \frac{a+b}{2}\right)^2 - \left(0 - \frac{c}{2}\right)^2}$$

$$= \frac{1}{2}\sqrt{a^2 + 2ab + b^2 - c^2},$$

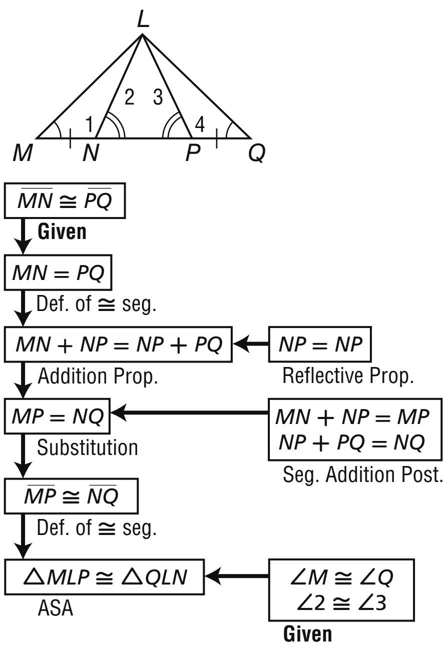
$$\overline{CE} = \sqrt{\left(a + b - \frac{a+b}{2}\right)^2 - \left(c - \frac{c}{2}\right)^2}$$

$$= \frac{1}{2}\sqrt{a^2 + 2ab + b^2 - c^2},$$

$$\overline{BE} = \sqrt{\left(a - \frac{a+b}{2}\right)^2 - \left(0 - \frac{c}{2}\right)^2} = \frac{1}{2}\sqrt{(a-b)^2 - c^2},$$

therefore $\overline{DE} \cong \overline{BE}$ and $\overline{AE} \cong \overline{CE}$. Since the opposite sides of parallelograms are congruent we know that $\overline{DA} \cong \overline{CB}$ and $\overline{DC} \cong \overline{AB}$. Thus by SSS, $\triangle DEC \cong \triangle BEA$ and $\triangle AED \cong \triangle CEB$. So we have shown that the diagonals of a parallelogram create two pairs of congruent triangles.

31. Sandy is correct because none of the tests for ▱ are fulfilled. **33.** sometimes **35.** $a = 20$, $b = 7$, $c = 12$
37. B **39.** F **41.** (1, 0.5) **43.** -5
45. $-\frac{4}{3} \approx -1.3$ **47.** $x = 16$, $y = 8.7$
49.Proof:



51. not perpendicular

Lesson 13-3

1. 3 feet **3.** 57 **5.** 35 **7.** Proof: We are given that *DEFG* is a rectangle, so by definition of a rectangle, $DE \parallel GF$ and $DG \parallel EF$. Since *DH* is part of *DG* and *EJ* is part of *EF*, $DH \parallel EJ$. We are also given that $HJ \parallel GF$, so by the transitive property, $DE \parallel HJ$. Thus *DEJH* is a parallelogram. Since *DEFG* is a rectangle, $m\angle E = 90$. When a parallelogram has one right angle it must have four right angles. Therefore, *DEJH* is a rectangle.

9. Yes, $DF = \sqrt{(5-3)^2 + (10-6)^2} = \sqrt{20}$ and

$CE = \sqrt{(6-2)^2 + (7-9)^2} = \sqrt{20}$. Since the

diagonals are congruent *CDEF* is a rectangle.
11. 13 inches **13.** 155 **15.** 72 **17.** 19 **19.** 22

21. Proof:

Statements (Reasons)

1. *ABCD* is a rectangle (Given)
2. $m\angle A = m\angle B = m\angle C = m\angle D = 90$ (Definition of a rectangle)
3. $\overline{AB} \cong \overline{DC}$, $\overline{AD} \cong \overline{BC}$ (Definition of a rectangle)
4. *M* is the midpoint of $\overline{AB}$, *N* is the midpoint of $\overline{BC}$, *O* is the midpoint of $\overline{DC}$, and *P* is the midpoint of $\overline{AD}$. (Given)
5. $\overline{AM} \cong \overline{MB} \cong \overline{DO} \cong \overline{OC}$; $\overline{AP} \cong \overline{PD} \cong \overline{BN} \cong \overline{NC}$ (Definition of midpoint)
6. $\triangle AMP \cong \triangle MBN \cong \triangle OCN \cong \triangle ODP$. (SAS)
7. $\overline{PM} \cong \overline{MN} \cong \overline{NO} \cong \overline{PO}$ (CPCTC)
8. $\overline{MNOP}$ is a parallelogram. (Opposite sides are congruent.)

23. No *JKLM* is not a rectangle. The slope of $JK = -\frac{1}{4}$, the slope of $KL = 1$, the slope of $ML = \frac{1}{2}$, and the slope of $MJ = -\frac{3}{2}$.
Since opposite sides are not parallel, *JKLM* is not even a parallelogram so it can't be a rectangle.

25. Yes, $QS = \sqrt{(-6 - -3)^2 + (-1 - -8)^2} = \sqrt{58}$ and $TR = \sqrt{(-8 - -1)^2 + (-7 - -4)^2} = \sqrt{58}$. Since the diagonals are congruent *QRST* is a rectangle.
27. 65 **29.** 25 **31.** 50 **33.** 6 **35.** Ariel can use the tape measure to confirm the opposite sides have the same length and that the diagonals have the same length. This would confirm the bottom of the box is a rectangle. **37.** Scott is correct because $\angle KLM$ and $\angle LMN$ are alternate interior angles.
39. Sample answer: (0, 0), (3, 0), (4, 0) **41.** A
43. 112 **45.** $x = 2, y = 41$ **47.** $x = 2, y = 7$
49. $\angle ACF$ and $\angle AFC$ **51.** $\overline{AJ}$ and $\overline{AL}$ **53.** $\sqrt{53}$
55. $7\sqrt{2}$

Lesson 13-4

1. 11
3. Proof:

Statements (Reasons)

1. *LMNP* is a rhombus (Given)
2. $\overline{LM} \cong \overline{MN}$ (All sides of a rhombus are congruent.)
3. $\overline{LQ} \cong \overline{QN}$ (Diagonals of a rhombus bisect eachother)
4. $\angle MLQ \cong \angle MNQ$ (Diagonals of a rhombus bisect the angles.)
5. $\triangle LQM \cong \triangle NQM$ (SAS)

5. Rhombus, rectangle, and square. *XYWZ* has four congruent sides and right angles. **7.** 25 **9.** 60
11. 14
13. Proof:

Statements (Reasons)

1. $m\angle LMQ = m\angle QPN$ (Given)
2. $LM \parallel PN$ (Alt. Int. angles are congruent.)
3. $m\angle NMQ = m\angle LPQ$ (Given)
4. $LP \parallel MN$ (Alt. Int. angles are congruent.)
5. *LMNP* is a parallelogram (Opp. Sides are parallel)
6. $LM = PN$ and $LP = MN$ (Opp. Sides of a parallelogram are congruent.)
7. $\overline{LM} \cong \overline{MN}$ (Given)
8. $LM = PN = LP = MN$ (Transitive property)
9. *LMNP* is a rhombus (*LMNP* is a parallelogram with congruent sides.)

15. Proof:

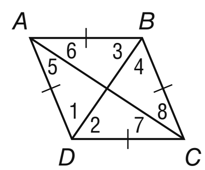
Statements (Reasons)

1. *LMPQ* is a parallelogram (Given)
2. $\overline{LM} \cong \overline{QO}$, $\overline{LQ} \cong \overline{MO}$ (Opp. Sides of a parallelogram are congruent.)
3. *K* bisects *LM*, *N* bisects *MO*, *P* bisects *OQ* and *R* bisects *LQ*. (Given)
4. $\overline{LK} \cong \overline{KM}$, $\overline{MN} \cong \overline{NO}$, $\overline{QP} \cong \overline{PO}$, $\overline{LR} \cong \overline{RQ}$ (Def. of bisects)
5. $\overline{LK} \cong \overline{KM} \cong \overline{QP} \cong \overline{PO}$, $\overline{LR} \cong \overline{RQ} \cong \overline{MN} \cong \overline{NO}$ (Transitive property)
6. $\angle M \cong \angle Q$, $\angle L \cong \angle O$ (Opp. Angles of a parallelogram are congruent.)
7. $\angle L \cong \angle M$ (Given)
8. $\angle M \cong \angle Q \cong \angle L \cong \angle O$ (Transitive property)
9. $\triangle KLR \cong \triangle PQR \cong \triangle PON \cong \triangle KMN$ (SAS)
10. $\overline{KR} \cong \overline{RP} \cong \overline{PN} \cong \overline{NK}$ (CPCTC)
11. *KNPR* is a rhombus (*KNPR* is a quadrilateral with 4 congruent sides)

17. No, it could be a rectangle. Lisa must confirm the sides are congruent or that the diagonals are perpendicular. **19.** rhombus, the diagonals are perpendicular **21.** Square, rectangle, rhombus; all sides are congruent and perpendicular **23.** 120

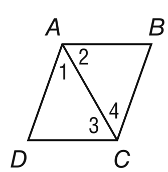
25. 30 **27.** 14 **29.** 45 **31.** rhombus

33. Given: *ABCD* is a rhombus.
Prove: Each diagonal bisects a pair of opposite angles.



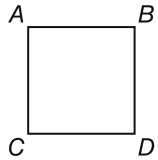
Proof: We are given that *ABCD* is a rhombus. By definition of rhombus, *ABCD* is a parallelogram. Opposite angles of a parallelogram are congruent, so $\angle ABC \cong \angle ADC$ and $\angle BAD \cong \angle BCD$. $\overline{AB} \cong \overline{BC} \cong \overline{CD} \cong \overline{DA}$ because all sides of a rhombus are congruent. $\triangle ABC \cong \triangle ADC$ by SAS. $\angle 5 \cong \angle 6$ and $\angle 7 \cong \angle 8$ by CPCTC. $\triangle BAD \cong \triangle BCD$ by SAS.
$\angle 1 \cong \angle 2$ and $\angle 3 \cong \angle 4$ by CPCTC. By definition of angle bisector, each diagonal bisects a pair of opposite angles.

35. If a diagonal of a parallelogram bisects an angle of a parallelogram, then the parallelogram is a rhombus.
Given: *ABCD* is a parallelogram; diagonal $\overline{AC}$ bisects $\angle DAB$ and $\angle BCD$.
Prove: ▱*ABCD* is a rhombus.



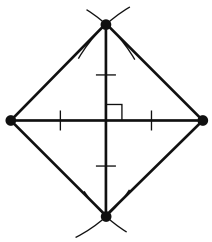
Proof: It is given that *ABCD* is a parallelogram. Since opposite sides of a parallelogram are parallel, $\overline{AB} \parallel \overline{DC}$. By definition, $\angle 2$ and $\angle 3$ are alternate interior angles of parallel sides $\overline{AB}$ and $\overline{DC}$. Since alternate interior angles are congruent, $\angle 2 \cong \angle 3$. Congruence of angles is symmetric, therefore $\angle 3 \cong \angle 2$. it is given that $\overline{AC}$ bisects $\angle DAB$ and $\angle BCD$, so $\angle 1 \cong \angle 2$ and $\angle 3 \cong \angle 4$ by definition. By the Transitive Property, $\angle 1 \cong \angle 3$ and $\angle 2 \cong \angle 4$. The sides opposite congruent angles in a triangle are congruent, therefore, $\overline{AD} \cong \overline{DC}$ and $\overline{AB} \cong \overline{BC}$. So, since a pair of consecutive sides of the parallelogram are congruent, *ABCD* is a rhombus.

37. Given: *ABCD* is a rectangle and a rhombus.
Prove: *ABCD* is a square.



Proof: We know that *ABCD* is a rectangle and a rhombus. *ABCD* is a parallelogram, since all rectangles and rhombi are parallelograms. By the definition of a rectangle, $\angle A$, $\angle B$, $\angle C$, and $\angle D$ are right angles. By the definition of a rhombus, all of the sides are congruent. Therefore, *ABCD* is a square since *ABCD* is a parallelogram with all four sides congruent and all the angles are right.

39.



Sample answer: If the diagonals of a parallelogram are congruent and perpendicular, then the parallelogram is a square.

41. Proof. Any square can be placed on a coordinate axis as shown in the diagram with the vertices $A(0, 0)$, $B(2a, 0)$, $C(0, 2a)$ and $D(2a, 2a)$. The midpoint of the diagonals is at $E(a, a)$. The length of each side of *ABCD* is $2a$. The lengths of *BE*, *DE*, *EC*, and *EA* are all a. The diagonals of a square are perpendicular, so $m\angle BED = m\angle DEC = m\angle CEA = m\angle AEB = 90$. Therefore, $\triangle BED \cong \triangle DEC \cong \triangle CEA \cong \triangle AEB$ by SAS. **43.** 3” × 3”

45. The statement is false because a rhombus does not have to have right angles.
The converse is: If a quadrilateral is a square, then it is a rhombus. This is true because a square must be a parallelogram and all the sides are congruent.
The inverse is: If a quadrilateral is not a rhombus, then it is not a square. This is true because a square must be a parallelogram and it must have four congruent sides, so it is always a rhombus.
The contrapositive: If a quadrilateral is not a square, then it is not a rhombus. This is not true because a rhombus does not have to have right angles. **47.** Melissa is correct. Since $AE = ED$, all angles must be congruent, so the quadrilateral has right angles and it must be a square. **49.** You can prove that one angle is a right and 2 adjacent sides are congruent. You can prove the diagonals are congruent and are perpendicular. **51a.** 153 cm^2 **51b.** 5 cm **51c.** $2.5g$ **53.** D **55.** 104 **57.** No; none of the tests for parallelograms are fulfilled.

59. Yes; one pair of opposite sides is parallel and congruent. **61.** 2 **63.** $\frac{5}{4}$

Lesson 13-5

1. 60

3. Slope of $\overline{JM} = \frac{10-10}{3-8} = 0$,
Slope of $\overline{KL} = \frac{6-6}{2-11} = 0$
Since the slopes of $\overline{JM}$ and $\overline{KL}$ are equal, $(JM)^- \parallel (KL)^-$.
Slope of $\overline{JK} = \frac{10-6}{3-2} = 4$,
Slope of $\overline{ML} = \frac{10-6}{8-11} = -\frac{4}{3}$
Since the slopes of $\overline{JK}$ and $\overline{ML}$ are not equal, $\overline{JK}$ and $\overline{ML}$ are not parallel. Since quadrilateral *JKLM* has only one pair of opposite sides that are parallel, quadrilateral *JKLM* is a trapezoid.

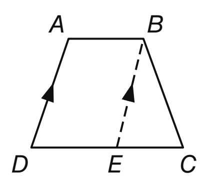
5. 11 **7.** 13 **9.** 130 **11.** 60

13. Slope of $EF = \frac{3 - -1}{0 - -4} = 1$,
Slope of $GH = \frac{-8-2}{-3-7} = 1$, so $EF \parallel GH$
Slope of $FG = \frac{-1 - -8}{-4 - -3} = -7$,
Slope of $EH = \frac{3-7}{0-2} = 2$, *EFGH* is a trapezoid.
$FG = \sqrt{(-4 - -3)^2 + (-1 - -8)^2} = \sqrt{50}$,
$EH = \sqrt{(0-7)^2 + (3-2)^2} = \sqrt{50}$. *EFGH* is an isosceles trapezoid.

15. Slope of $RQ = \frac{9-5}{1-2} = \frac{4}{5}$,
Slope of $NP = \frac{0-8}{2-12} = \frac{4}{5}$, so $RQ \parallel NP$
Slope of $RN = \frac{5-0}{2-2} =$ undefined,
Slope of $QP = \frac{9-8}{7-12} = \frac{-1}{5}$, *NPQR* is a trapezoid.
$RN = \sqrt{(2-2)^2 + (5-0)^2} = 5$,
$QP = \sqrt{(7-12)^2 + (9-8)^2} = \sqrt{26}$.
NPQR is not an isosceles trapezoid.

17. 4 **19.** 12 **21.** 20 **23.** 80 **25.** 160

27. Given: *ABCD* is a trapezoid; $\angle D \cong \angle C$.
Prove: Trapezoid *ABCD* is isosceles.

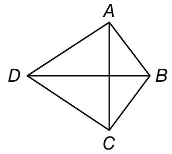


Proof: By the Parallel Postulate, we can draw the auxillary line $\overline{EB} \parallel \overline{AD}$. $\angle D \cong \angle BEC$, by the Corr. ∠s Thm. We are given that $\angle D \cong \angle C$, so by the Trans. Prop, $\angle BEC \cong \angle C$. So, $\triangle EBC$ is isosceles and $\overline{EB} \cong \overline{BC}$. From the def. of a trapezoid, $\overline{AB} \parallel \overline{DE}$. Since both pairs of opposite sides are parallel, *ABED* is a parallelogram.

So, $\overline{AD} \cong \overline{EB}$. By the Transitive Property, $\overline{BC} \cong \overline{AD}$. Thus, *ABCD* is an isosceles trapezoid.

29. Given: *ABCD* is a kite with $\overline{AB} \cong \overline{BC}$ and $\overline{AD} \cong \overline{DC}$.

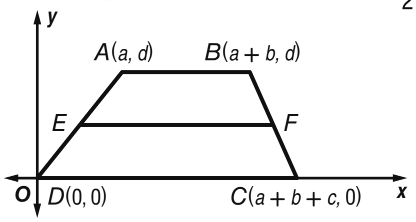
Prove: $\overline{BD} \perp \overline{AC}$



Proof: We know that $\overline{AB} \cong \overline{BC}$ and $\overline{AD} \cong \overline{DC}$. So, *B* and *D* are both equidistant from *A* and *C*. If a point is equidistant from the endpoints of a segment, then it is on the perpendicular bisector of the segment. The line that contains *B* and *D* is the perpendicular bisector of $\overline{AC}$, since only one line exists through two points. Thus, $\overline{BD} \perp \overline{AC}$.

31. Given: *ABCD* is a trapezoid with median $\overline{EF}$.

Prove: $\overline{EF} \parallel \overline{AB}$ and $\overline{EF} \parallel \overline{DC}$ and $EF = \frac{1}{2}(AB + DC)$



Proof:

By the definition of the median of a trapezoid, *E* is the midpoint of $\overline{AD}$ and *F* is the midpoint of $\overline{BC}$.

Midpoint *E* is $\left(\frac{a+0}{2}, \frac{d+0}{2}\right)$ or $\left(\frac{a}{2}, \frac{d}{2}\right)$.

Midpoint *F* is $\left(\frac{a+b+a+b+c}{2}, \frac{d+0}{2}\right)$ or $\left(\frac{2a+2b+c}{2}, \frac{d}{2}\right)$.

The slope of $\overline{AB} = 0$, the slope of $\overline{EF} = 0$, and the slope of $\overline{DC} = 0$. Thus, $\overline{EF} \parallel \overline{AB}$ and $\overline{EF} \parallel \overline{DC}$.

$AB = \sqrt{[(a+b)-a]^2 + (d-d)^2} = \sqrt{b^2}$ or b

$DC = \sqrt{[(a+b+c)-0]^2 + (0-0)^2}$

$= \sqrt{(a+b+c)^2}$ or $a+b+c$

$EF = \sqrt{\left(\frac{2a+2b+c-a}{2}\right) + \left(\frac{d}{2} - \frac{d}{2}\right)^2}$

$= \sqrt{\left(\frac{a+2b+c}{2}\right)^2}$ or $\frac{a+2b+c}{2}$

$\frac{1}{2}(AB + DC) = \frac{1}{2}[b + (a+b+c)]$

$= \frac{1}{2}(a + 2b + c)$

$= \frac{a+2b+c}{2}$

$= EF$

Thus, $\frac{1}{2}(AB + DC) = EF$.

33. 15 **35.** 75 **37.** 105 **39.** 5 **41.** 16 **43.** 50 **45.** 130 **47.** 155

49. Proof:

Statements (Reasons)

1. $\angle BAD \cong \angle EDA$ (Given)
2. $AB \parallel ED$ (Alt. Int. angles are congruent.)
3. *ABCE* is a trapezoid. (Definition of a trapezoid)
4. $\triangle AED \cong \triangle BCD$ (Given)
5. $\overline{AE} \cong \overline{BC}$ (*CPCTC*)
6. *ABCE* is an isosceles trapezoid (Definition of an isosceles trapezoid.)

51. Never **53.** Sometimes **55.** Always

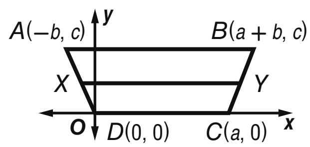
57.

Quadrilateral	**Also** is…
Example: Rectangle	**Parallelogram**
Rhombus	**Parallelogram**
Square	**Rhombus,** rectangle, **parallelogram**
Isosceles Trapezoid	**Trapezoid**
Trapezoid	**None**
Kite	**none**

59. Parallelogram; opposite sides are parallel, no right angles, no consecutive sides are congruent.

61. Given: *ABCD* is a trapezoid with median $\overline{XY}$.

Prove: $\overline{XY} \parallel \overline{AB}$ and $\overline{XY} \parallel \overline{DC}$



Proof:

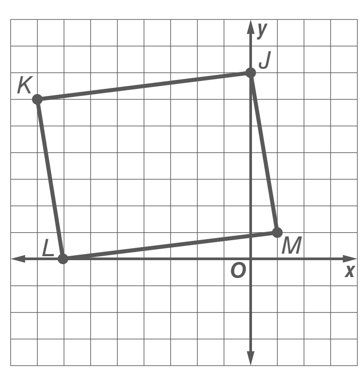
The midpoint of $\overline{AD}$ is *X*. The coordinates are $\left(\frac{-b}{2}, \frac{c}{2}\right)$.

The midpoint of $\overline{BC}$ is $Y\left(\frac{2a+b}{2}, \frac{c}{2}\right)$.

The slope of $\overline{AB} = 0$, the slope of $\overline{XY} = 0$, and the slope of $\overline{DC} = 0$. Thus, $\overline{XY} \parallel \overline{AB}$ and $\overline{XY} \parallel \overline{DC}$.

63. Never **65.** Matt is correct because each pair of base angles is congruent. **67.** Parallelograms and trapezoids are both quadrilaterals. The sum of the angles of both a parallelogram and a trapezoid is 360. Parallelograms have 2 pairs of parallel sides but a trapezoid only has 1 pair of parallel sides. Opposite sides of parallelograms are congruent, but no sides of a trapezoid have to be congruent. **69.** 76 **71.** B **73.** 18 **75.** 9

77. No; slope of $\overline{JK} = \frac{1}{8}$ = slope of $\overline{LM}$ and slope of $\overline{KL} = -6$ = slope of $\overline{MJ}$. So, *JKLM* is a parallelogram. The product of the slopes of consecutive sides $\neq -1$, so the consecutive sides are not perpendicular. Thus, *JKLM* is not a rectangle.



79. 0 **81.** undefined

Chapter 13 Study Guidy Rewiew

1. false, both pairs of base angles

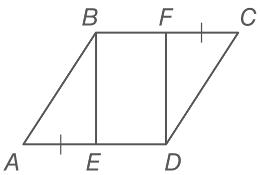
3. false, diagonal **5.** true **7.** false, trapezoid

9. false, nonparallel **11.** 18 **13.** 115°

15. $x = 37$, $y = 6$ **17.** yes, Theorem 6.11

19. Given: ▱*ABCD*, $\overline{AE} \cong \overline{CF}$

Prove: Quadrilateral *EBFD* is a parallelogram.



1. *ABCD* is a parallelogram, $\overline{AE} \cong \overline{CF}$ (Given)
2. $AE = CF$ (Def. of ≅ segs)
3. $\overline{BC} \cong \overline{AD}$ (Opp. sides of a ▱ are ≅)
4. $BC = AD$ (Def. of ≅ segs)
5. $BC = BF + CF$, $AD = AE + ED$ (Seg. Add. Post.)
6. $BF + CF = AE + ED$ (Subst.)
7. $BF + AE = AE + ED$ (Subst.)
8. $BF = ED$ (Subt. Prop.)
9. $\overline{BF} \cong \overline{ED}$ (Def. of ≅ segs)
10. $\overline{BF} \parallel$ ED (Def. of ▱)
11. Quadrilateral EBFD is a parallelogram. (If one pair of opposite sides is parallel and congruent then it is a parallelogram.)

21. $x = 5$, $y = 12$ **23.** 33 **25.** 64 **27.** 6 **29.** 55
31. 35 **33.** Rectangle, rhombus, square; all sides are ≅, consecutive are ⊥. **35.** 19.2
37a. Sample answer: The legs of the trapezoids are part of the diagonals of the square. The diagonals of a square bisect opposite angles, so each base angle of a trapezoid measures 45°. One pair of sides is parallel and the base angles are congruent.

37b. $16 + 8\sqrt{2} \approx 27.3$ in.

CHAPTER 14

Similarity, Transformations, and Symmetry

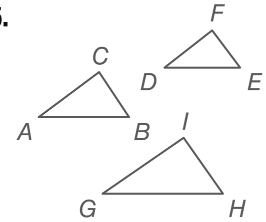
Chapter 14 Get Ready

1. 4 or −4 **3.** −37 **5.** 64 **7.** 64.5

Lesson 14-1

1. Not similar **3.** Not similar **5.** D **7.** $\Delta WXY \sim \Delta MLJ$, $x = 30$
9. $\triangle ACB \sim \triangle ECD$ by SAS
11. $\triangle WXY \sim \triangle TRS$ by AA **13.** $\triangle ABD \sim \triangle EBC$ by AA
15. $\triangle ABC \sim \triangle DFE$; 10
17. $\triangle WXY \sim \triangle PZY$; $WX = 9$; $XZ = 17$ **19.** $\triangle GHD \sim \triangle KJD$; $DK = 6$; $HJ = \sqrt{48} + \sqrt{27}$
21. 220ft **23.** 18.1 feet

25.



Reflexive Property of Similarity
Given: $\triangle ABC$
Prove: $\triangle ABC \sim \triangle ABC$
Proof:
Statements (Reasons)
1. $\triangle ABC$ (Given)
2. $\angle A \cong \angle A$, $\angle B \cong \angle B$ (Refl. Prop.)
3. $\triangle ABC \sim \triangle ABC$ (AA Similarity)

Symmetric Property of Similarity
Given: $\triangle ABC \sim \triangle DEF$
Prove: $\triangle DEF \sim \triangle ABC$
Statements (Reasons)
1. $\triangle ABC \sim \triangle DEF$ (Given)
2. $\angle A \cong \angle D$, $\angle B \cong \angle E$ (Def. of ∼ polygons)
3. $\angle D \cong \angle A$, $\angle E \cong \angle B$ (Symm. Prop.)
4. $\triangle DEF \sim \triangle ABC$ (AA Similarity)

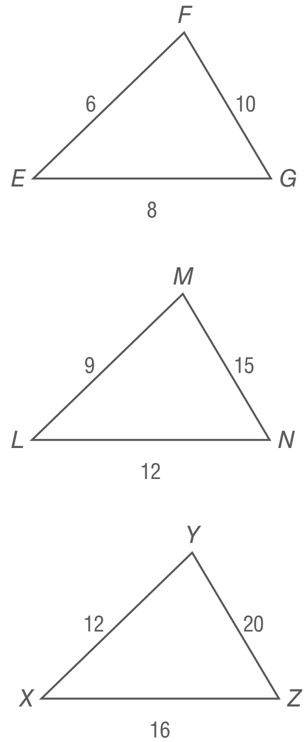
Transitive Property of Similarity
Given: $\triangle ABC \sim \triangle DEF$ and $\triangle DEF \sim \triangle GHI$
Prove: $\triangle ABC \sim \triangle GHI$
Statements (Reasons)
1. $\triangle ABC \sim \triangle DEF$, $\triangle DEF \sim \triangle GHI$ (Given)
2. $\angle A \cong \angle D$, $\angle B \cong \angle E$, $\angle D \cong \angle G$, $\angle E \cong \angle H$ (Def. of ∼ polygons)
3. $\angle A \cong \angle G$, $\angle B \cong \angle H$ (Trans. Prop.)
4. $\triangle ABC \sim \triangle GHI$ (AA Similarity)

Given: $\triangle ABC$
Prove: $\triangle ABC \sim \triangle ABC$
Statements (Reasons)
1. $\triangle ABC$ (Given)
2. $\angle A \cong \angle A$, $\angle B \cong \angle B$ (Refl. Prop.)
3. $\triangle ABC \sim \triangle ABC$ (AA Similarity)

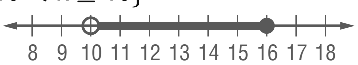
27. Proof:
Statements (Reasons)
1. *LMNP* is a kite (Given)
2. $AP = AM$ (Definition of a kite)
3. $PQ = QM$ (Diagonals of a kite bisect each other)
4. $AQ = AQ$ (Reflexive property)
5. $\triangle APQ \sim \triangle AMQ$ (SSS Similarity)
3. $\frac{AP}{AM} = \frac{PQ}{QM}$ (Definition of similar triangles.)

29. Solution: The triangles are not similar.
$AB = \sqrt{(7-1)^2 + (5 - -7)^2} = \sqrt{261}$,
$AC = \sqrt{(1-1)^2 + (8 - -7)^2} = 15$,
$BC = \sqrt{(7-8)^2 + (5-1)^2} = \sqrt{17}$,
$EB = \sqrt{(7-3)^2 + (5 - -3)^2} = \sqrt{80}$,
$FB = \sqrt{(7-3)^2 + (5-7)^2} = \sqrt{20}$,
$\frac{AB}{EB} = \frac{\sqrt{261}}{\sqrt{80}} = \frac{\sqrt{29}}{3}$, $\frac{BC}{BF} = \frac{\sqrt{261}}{\sqrt{80}} = \frac{\sqrt{17}}{\sqrt{20}}$, since these sides

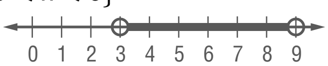
31. 12.5 feet
33. Proof: All isosceles right triangles must have angles with measures of 45-45-90, so they are all similar by AA.
35. Sample Answer:



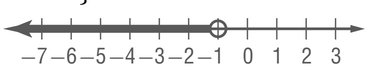
35b.
35c. The perimeters of similar triangles have the same scale factor as the similar triangles.
37. Sample answer: I know they are similar because all of the sides are proportional.
39. $x = 3$, $y = 4$.
41. D **43.** J
45. $\{k \mid 10 < k \leq 16\}$



47. $\{x \mid 3 < x < 9\}$



49. $\{h \mid h < -1\}$

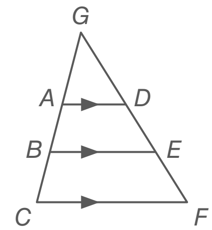


51. $y - 210 = 5(x - 12)$; $150 **53.** not possible
55. SSS

Lesson 14-2

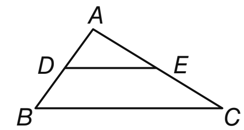
1. 5 **3.** Yes; because $\frac{XW}{WY} = \frac{XV}{XZ}$. **5.** 19
7. $\frac{2}{3}$ ft **9.** $x = 4$; $y = 5$ **11.** 68
13. 90 **15.** No, because $\frac{AD}{DB} \neq \frac{AE}{EC}$
17. Yes, because $\frac{AD}{DB} = \frac{AE}{EC}$ **19.** 20° **21.** 38
23. 36 feet **25.** $x = 15$; $y = 17$ **27.** $x = 7$; $y = 13$

29. Given: $\overleftrightarrow{AD} \parallel \overleftrightarrow{BE} \parallel \overleftrightarrow{CF}$, $\overline{AB} \cong \overline{BC}$
Prove: $\overline{DE} \cong \overline{EF}$



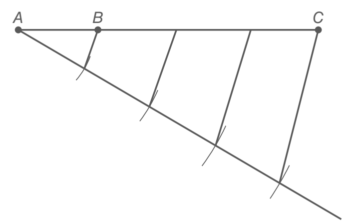
Proof:
From Corollary 14.1, $\frac{AB}{BC} = \frac{DE}{EF}$.
Since $\overline{AB} \cong \overline{BC}$, $AB = BC$ by definition of congruence.
Therefore, $\frac{AB}{BC} = 1$.
By substitution, $1 = \frac{DE}{EF}$. Thus, $DE = EF$. By definition of congruence, $\overline{DE} \cong \overline{EF}$.

31. Given: $\frac{DB}{AD} = \frac{EC}{AE}$
Prove: $\overline{DE} \parallel \overline{BC}$

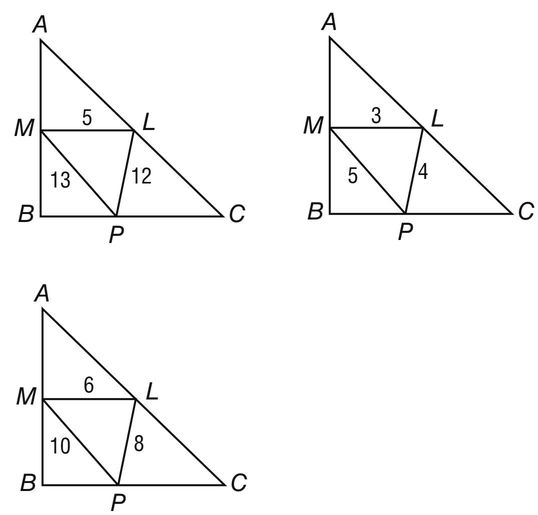


Proof:
Statements (Reasons)
1. $\frac{DB}{AD} = \frac{EC}{AE}$ (Given)
2. $\frac{AD}{AD} + \frac{DB}{AD} = \frac{AE}{AE} + \frac{EC}{AE}$ (Add. Prop.)
3. $\frac{AD + DB}{AD} = \frac{AE + EC}{AE}$ (Subst.)
4. $AB = AD + DB$, $AC = AE + EC$ (Seg. Add. Post.)
5. $\frac{AB}{AD} = \frac{AC}{AE}$ (Subst.)
6. $\angle A \cong \angle A$ (Refl. Prop.)
7. $\triangle ADE \cong \triangle ABC$ (SAS Similarity)
8. $\angle ADE \cong \angle ABC$ (Def. of ~ polygons)
9. $\overline{DE} \parallel \overline{BC}$ (If corr. ∠s are ≅, then the lines are ∥.)

33. 100 **35.** 31, 15 **37.** 14, 98 **39.** 8 feet. **41.** 16
43. 3.25"
45. Sample answer:



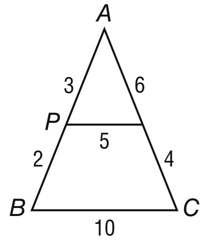
47a. Sample answer:



47b.

Triangle	*ML*	*LP*	*MP*	$\triangle MLP$ right triangle?
1	5	12	13	Yes
2	3	4	5	Yes
3	6	8	10	Yes

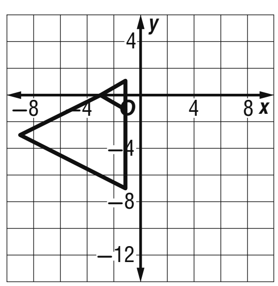
47c. The midsegments of a right triangle form a right triangle.
49. Yes because $\angle LPQ$ and $\angle LMN$ are corresponding angles.
51. Sample answer:



53. 8 **55.** G **57.** $\triangle ABE \sim \triangle CDE$ by AA Similarity; 6.25
59. $\triangle WZT \sim \triangle WXY$ by AA Similarity; 7.5
61. $\overline{QR} \parallel \overline{TS}$, $\overline{QT} \nparallel \overline{RS}$; *QRST* is an isosceles trapezoidsince $RS = \sqrt{26} = QT$.
63. $\{y \mid y > -11\}$ **65.** $\{k \mid k > -9\}$ **67.** $\{z \mid z \geq -48\}$
69. $\frac{2}{3}$ **71.** 2.1 **73.** 8.7

Lesson 14-3

1. enlargement, scale factor $= \frac{5}{2}$
3. Yes it is a dilation because the dimensions are proportional. The scale factor is $\frac{1}{20}$
5. $\overline{YV} = 5$, $\overline{YZ} = 10$, $\overline{WY} = 12$, $\overline{XY} = 24$, $\angle XYZ$ and $\angle WYV$ are right angles. Since $\frac{YV}{YZ} = \frac{1}{2}$, $\frac{WY}{XY} = \frac{1}{2}$, $\triangle XYZ \sim \triangle WYV$ by SAS.
7. reduction, scale factor $= \frac{1}{2}$
9. reduction, scale factor $= \frac{2}{5}$ **11.** reduction
13. It is not a dilation because the corresponding sides are not proportional.
15.



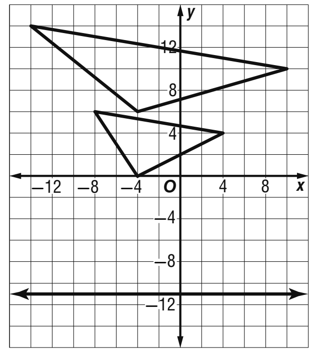
$\overline{XY} = \sqrt{5}$, $\overline{YZ} = \sqrt{5}$, $\overline{XZ} = \sqrt{5}$, $\overline{XW} = 4\sqrt{5}$, $\overline{WV} = 4\sqrt{5}$, $\overline{VX} = 4\sqrt{5}$

$\frac{XW}{XY} = 4$, $\frac{WV}{YZ} = 4$, $\frac{VX}{XZ} = 4$

Since

$\frac{XW}{XY} = \frac{WV}{YZ} = \frac{VX}{XZ}$, by SSS, $XYZ \sim XWV$.

17.



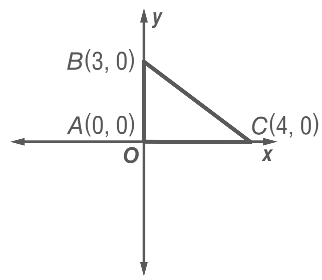
$\overline{JK} = 2\sqrt{37}$, $\overline{KM} = 2\sqrt{17}$, $\overline{JM} = 4\sqrt{2}$, $\overline{RS} = 4\sqrt{37}$, $\overline{ST} = 4\sqrt{17}$, $\overline{RT} = 8\sqrt{2}$

$\frac{RS}{JK} = 2$, $\frac{ST}{KM} = 2$, $\frac{RT}{JM} = 2$

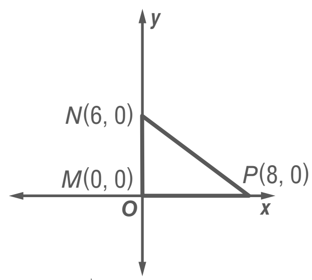
Since

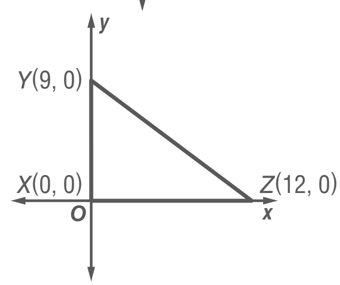
$\frac{RS}{JK} = \frac{ST}{KM} = \frac{RT}{JM}$, by SSS, $JKM \sim RST$.

19. $N(-12, 0)$
21a.



21b.

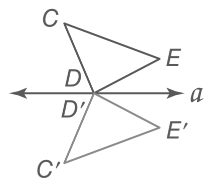




23. Sometimes. **25.** Sometimes.
27. You can use the distance formula to find the lengths of the sides of the figures and then compare the ratios of corresponding sides to see if they are proportional. If they are proportional then you know that one of them is the dilation of the other.
29. $\frac{1}{2}$ **31.** E **33.** yes; $\frac{AC}{BD} = \frac{AE}{BE} = \frac{2}{3}$ **35.** 10 **37.** 13
39. 5 **41.** 167.5 **43.** 1.43

Lesson 14-4

1.



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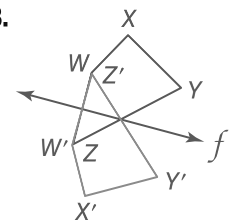
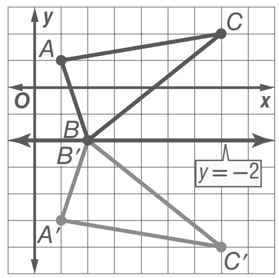


5.



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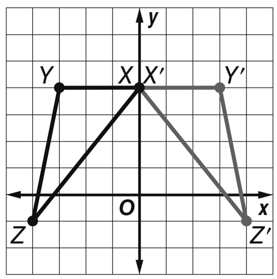
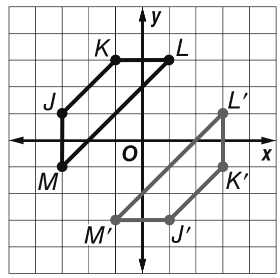


9.



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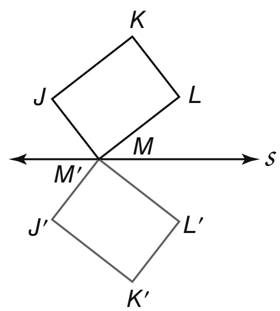
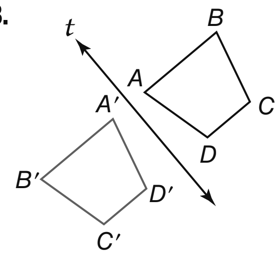


13.



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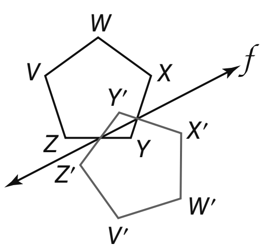

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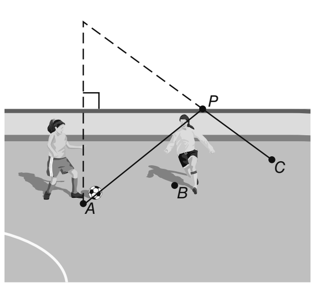

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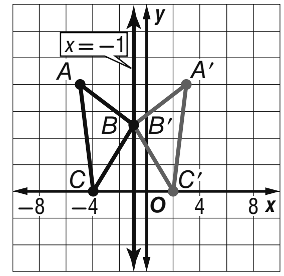

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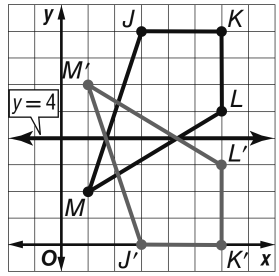

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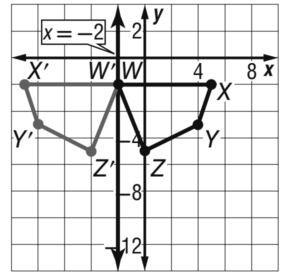

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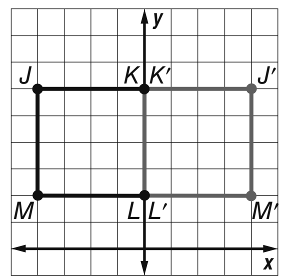
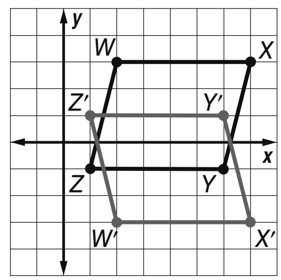


27.



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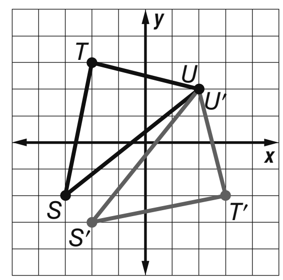

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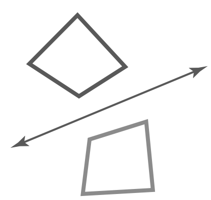

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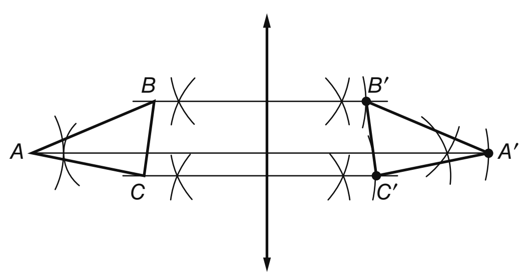
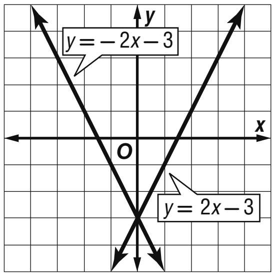


35a. the water **35b.** finite plane

37.



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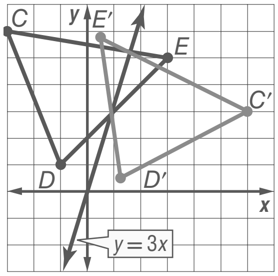

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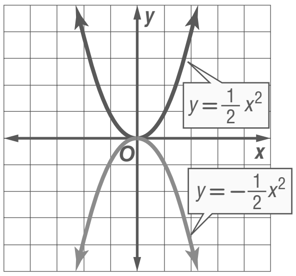

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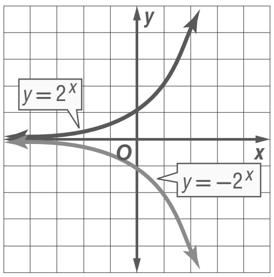


45. Jamil; sample answer: When you reflect a point across the *x*-axis, the reflected point is in the same place horizontally, but not vertically. When (2, 3) is reflected across the *x*-axis, the coordinates of the reflected point are (2, −3) since it is in the same location horizontally, but the other side of the *x*-axis vertically. **47.** (a, b)

49. The slope of the line connecting the two points is $\frac{3}{5}$. The Midpoint Formula can be used to find the midpoint between the two points, which is $\left(\frac{3}{2}, \frac{3}{2}\right)$. Using the point-slope form, the equation of the line is $y = -\frac{5}{3}x + 4$. (The slope of the bisector is $-\frac{5}{3}$ because it is the negative reciprocal of the slope $\frac{3}{5}$.)

51. Construct *P*, *Q*, *R* collinear with *Q* between *P* and *R*. Draw line ℓ, then construct perpendicular lines from *P*, *Q*, and *R* to line ℓ. Show equidistance or similarity of slope.

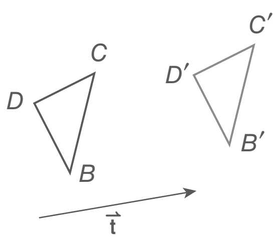
53. B **55.** E **57.** $t < 18$ or $t > 22$ **59.** $y = \frac{1}{5}x + 6$

61. 15 lb **63.** $2\sqrt{13} \approx 7.2, 146.3°$

65. $2\sqrt{122} \approx 22.1, 275.2°$

Lesson 14-5

1.



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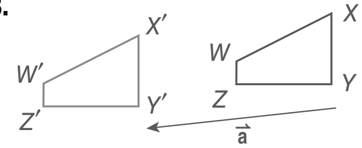

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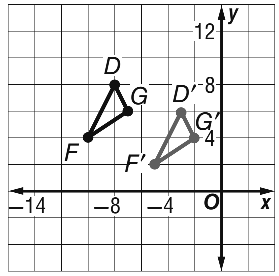
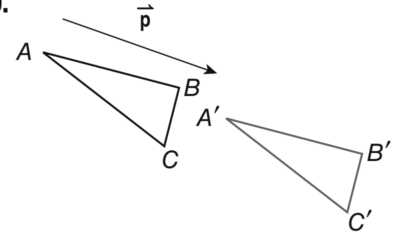
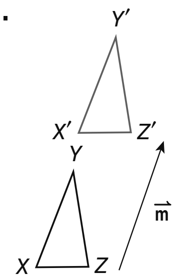


7. $(x, y) \rightarrow (x + 3, y - 5)$

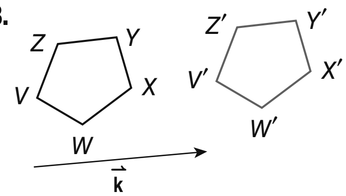
9.



11.



13.



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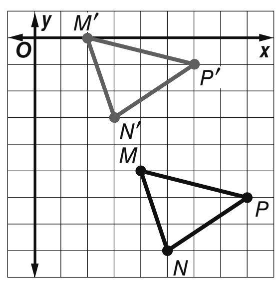

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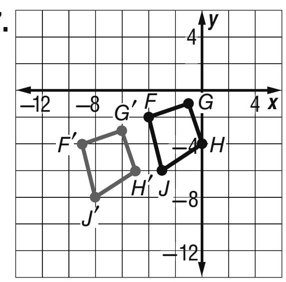

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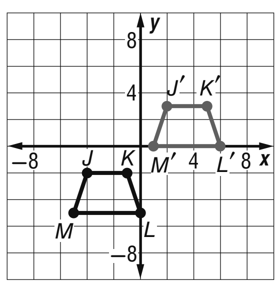
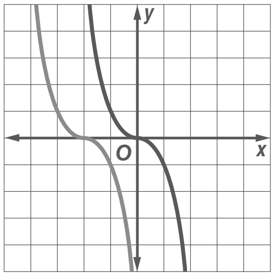
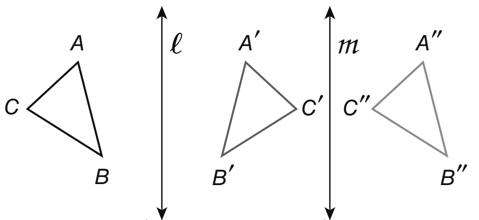


21. $\langle -12, 17\rangle$ **23.** $\langle 3, -5\rangle$ **25.** They move to the right 13 seats and back one row; $\langle 13, -1\rangle$.

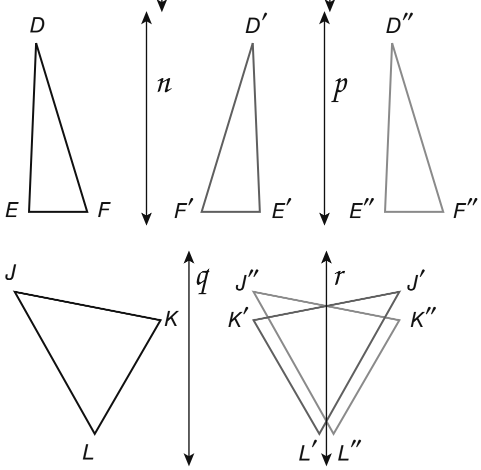
27. $y = -(x + 2)^3$



29a.



29b.



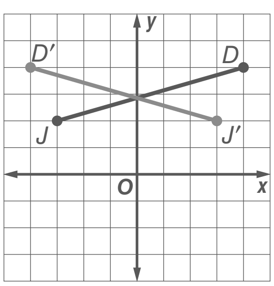
29c. Sample answers given.

29d. Sample answer: The composition of two reflections in vertical lines can be described by a horizontal translation that is twice the distance between the two vertical lines.

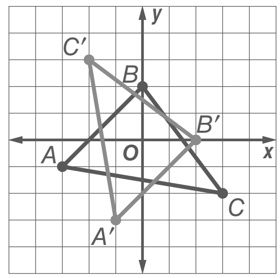
31. $y = m(x - a) + 2b$; $2b - ma$

33. Sample answer: Both vector notation and function notation describe the distance a figure is translated in the horizontal and vertical directions. Vector notation does not give a rule in terms of initial location, but function notation does. For example, the translation a units to the right and b units up from the point (x, y) would be written $\langle a, b\rangle$ in vector notation and $(x + a, y + b)$ in function notation. **35.** D **37.** F

39.



41.

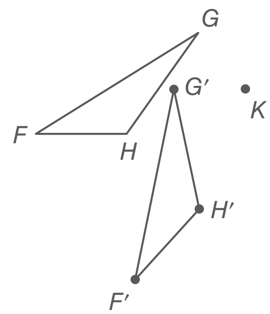


43. $f(x) = 4x$ **45.** 100 **47.** 80 **49.** obtuse; 110

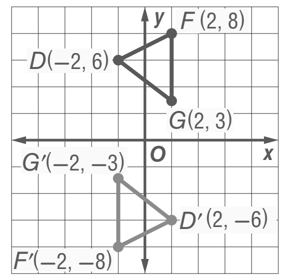
51. acute; 20

Lesson 14-6

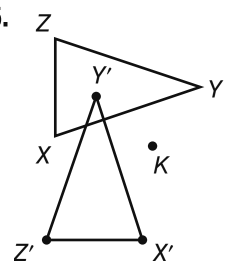
1.



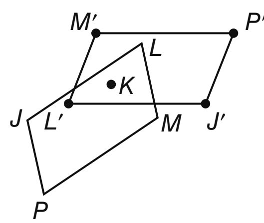
3.



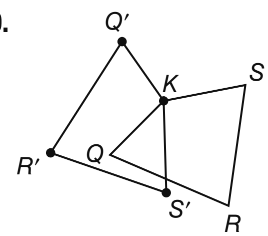
5.



7.

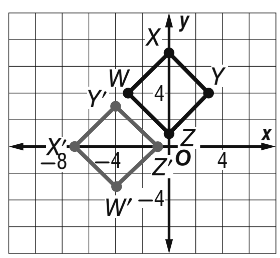


9.

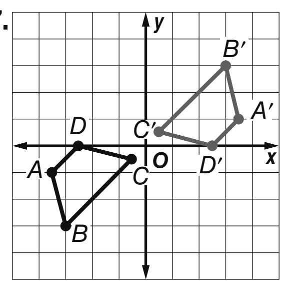


11. 120°; 360° ÷ 6 petals = 60° per petal. Two petal turns is 2 • 60° or 120°. **13.** 154.2°; 360° ÷ 7 petals = 51.4° per petal. Three petal turns is 3 • 51.4° or 154.2°.

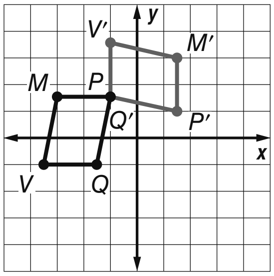
15.



17.

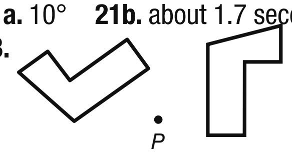


19.



21a. 10° **21b.** about 1.7 seconds

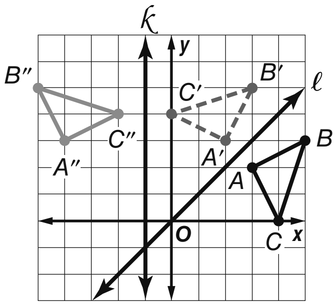
23.



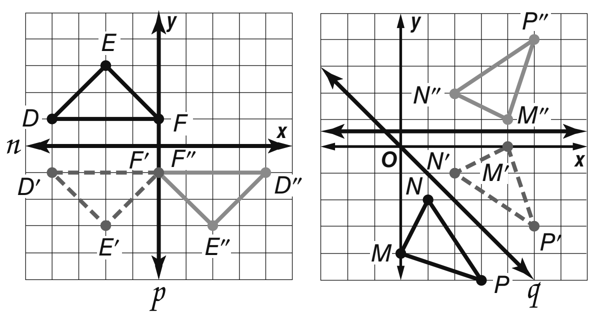
125°

25. $y = -x + 2$; parallel **27.** $y = -x - 2$; collinear **29.** x-intercept: $y = 2x + 4$; y-intercept: $y = 2x + 4$ **31.** $(2, -4)$

33a.



33b.

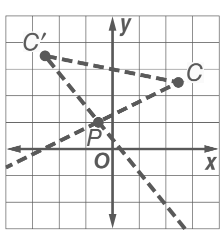


33c.

Angle of Rotation Between Figures		Angle Between Intersecting Lines	
△*ABC* and △*A″B″C″*	90°	ℓ and *m*	45°
△*DEF* and △*D″E″F″*	180°	*n* and *p*	90°
△*MNP* and △*M″N″P″*	90°	*q* and *r*	45°

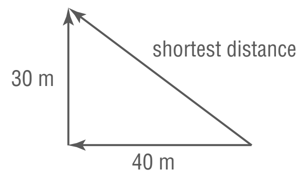
33d. Sample answer: The measure of the angle of rotation about the point where the lines intersect is twice the measure of the angle between the two intersecting lines.

35. Sample answer: $(-1, 2)$; Since △$CC'P$ is isosceles and the vertex angle of the triangle is formed by the angle of rotation, both $m\angle PCC'$ and $m\angle PC'C$ are 40° because the base angles of isosceles triangles are congruent. When you construct a 40° angle with a vertex at C and a 40° angle with a vertex at C', the intersection of the rays forming the two angles intersect at the point of rotation, or $(-1, 2)$.

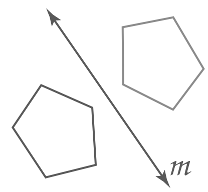


37. No; sample answer: When a figure is reflected about the x-axis, the x-coordinates of the transformed figure remain the same, and the y-coordinates are negated. When a figure is rotated 180° about the origin, both the x- and y-coordinates are negated. Therefore, the transformations are not equivalent. **39.** D **41.** J

43. 50 mi



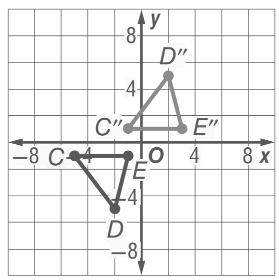
45.



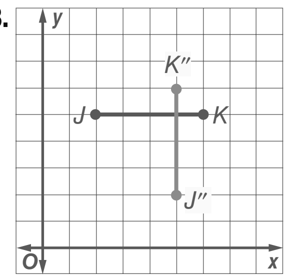
47. reflection **49.** rotation or reflection

Lesson 14-7

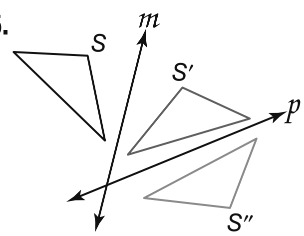
1.



3.

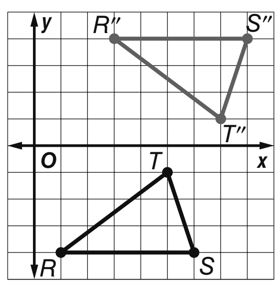


5.

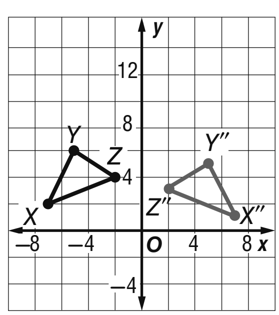


rotation clockwise 100° about the point where lines m and p intersect.

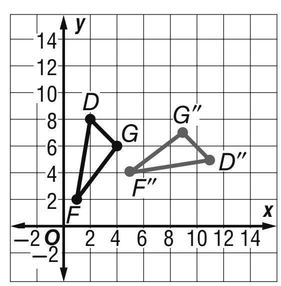
7.



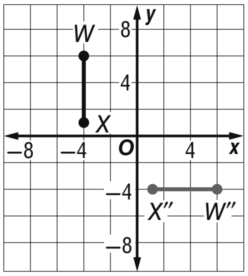
9.



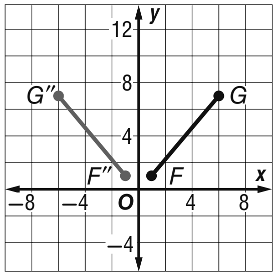
11.



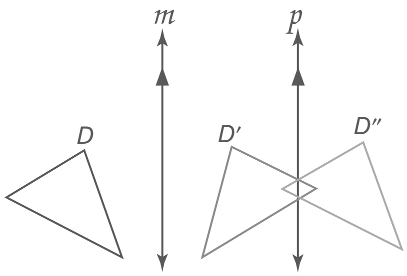
13.



15.

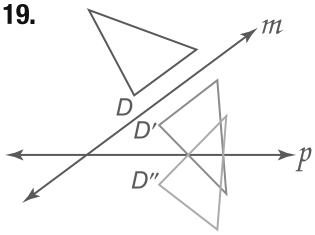


17.



horizontal translation 4 cm to the right.

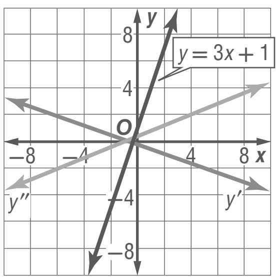
19.



70° rotation about the point where lines m and p intersect

21. translation **23.** reflection

25.



27. $A''(3, 1)$, $B''(2, 3)$, $C''(1, 0)$ **a**

29. translation and a 90° rotation

31. $(x + 5.5, y)$ reflected in the line that separates the left prints from the right prints **33.** double reflection **35.** rotation 180° about the origin and reflection in the x-axis

37. Proof: We are given that line ℓ and line m intersect at point P and that A is not on line ℓ or line m. Reflect A over line m to A' andreflect A' over line ℓ to A''. By the definition of reflection, line m is the perpendicular bisector of $\overline{AA'}$ at R, and line ℓ is the perpendicular bisector of $\overline{A'A''}$ at S. $\overline{AR} \cong \overline{A'R}$ and $\overline{A'S} \cong \overline{A''S}$ by the definition of a perpendicular bisector. Through any two points there is exactly one line, so we can draw auxiliary segments $\overline{AP}$, $\overline{A'P}$, and $\overline{A''P}$. $\angle ARP$, $\angle A'RP$, $\angle A'SP$ and $\angle A''SP$ are right angles by the definition of perpendicular bisectors. $\overline{RP} \cong \overline{RP}$ and $\overline{SP} \cong \overline{SP}$ by the Reflexive Property. $\triangle ARP \cong \triangle A'RP$ and $\triangle A'SP \cong \triangle A''SP$ by the SAS Congruence Postulate. Using CPCTC, $\overline{AP} \cong \overline{A'P}$ and $\overline{A'P} \cong \overline{A''P}$, and $\overline{AP} \cong \overline{A''P}$ by the Transitive Property. By the definition of a rotation, A'' is the image of A after a rotation about point P. Also using CPCTC, $\angle APR \cong \angle A'PR$ and $\angle A'PS \cong \angle A''PS$. By the definition of congruence, $m\angle APR = m\angle A'PR$ and $m\angle A'PS = m\angle A''PS$. $m\angle APR + m\angle A'PR + m\angle A'PS + m\angle A''PS = m\angle APA''$ and $m\angle A'PS + m\angle A'PR = m\angle SPR$ by the Angle Addition Postulate. $m\angle A'PR + m\angle A'PR + m\angle A'PS + m\angle A'PS = m\angle APA''$ by Substitution, which simplifies to $2(m\angle A'PR + m\angle A'PS) = m\angle APA''$. By Substitution, $2(m\angle SPR) = m\angle APA''$.

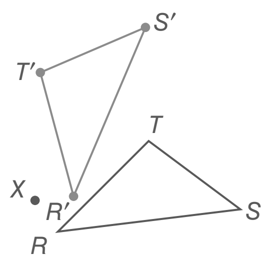
39. Sample answer: No; there are not invariant points in a glide reflection because all of the points are translated along a vector. Perhaps for compositions of transformations, there may be invariant points when a figure is rotated and reflected, rotated twice, or reflected twice

41. Yes; sample answer: If a segment with endpoints (a, b) and (c, d) is to be reflected about the x-axis, the coordinates of the endpoints of the reflected image are $(a, -b)$ and $(c, -d)$. If the segment is then reflected about the line $y = x$, the coordinates of the endpoints of the final image are $(-b, a)$ and $(-d, c)$. If the original image is first reflected about $y = x$, the coordinates of the endpoints of the reflected image are (b, a) and (d, c). If the segment is then reflected about the x-axis, the coordinates of the endpoints of the final image are $(b, -a)$ and $(d, -c)$.

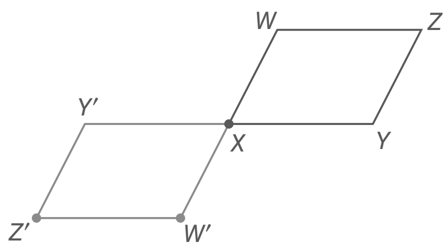
43. Sometimes; Sample answer: When two rotations are performed on a single image, the order of the rotations does not affect the final image when the two rotations are centered at the same point.

45. A **47.** H

49.

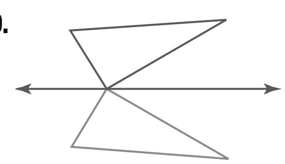


51.

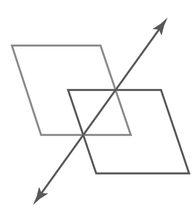


53. yes; −8 **55.** yes; −1 **57.** yes; 4

59.

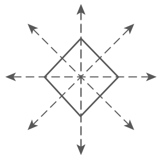


61.

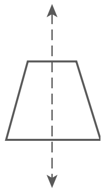


Lesson 14-8

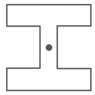
1. yes; 4



3. yes; 1

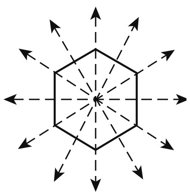


5. yes; 2; 180°

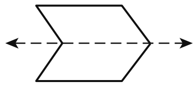


7a. no horizontal; 36 vertical **7b.** yes; 36 or 10° **9.** no

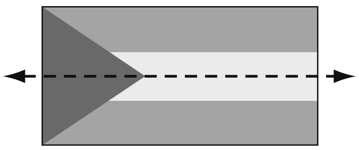
11. yes; 6



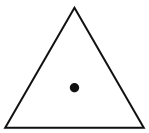
13. yes; 1



15. no **17.** yes; 1

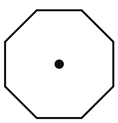


19. yes; 3; 120°



21. No

23. yes; 8; 45°



25. yes; 8; 45° **27.** both **29.** both

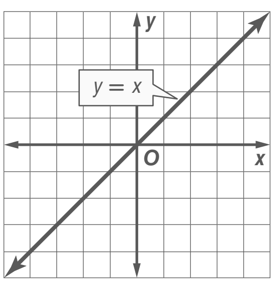
31. no horizontal, infinitely many vertical

33. 1 horizontal, infinitely many vertical

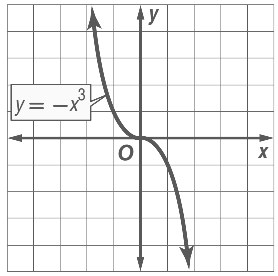
35. line and rotational

37. line and rotational

39. rotational; 2; 180°;line symmetry; $y = -x$



41. rotational; 2; 180°



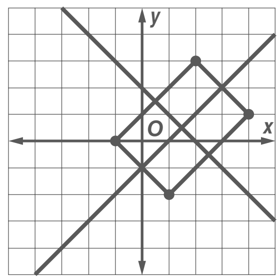
43. plane and axis; 180 **45a.** 3 **45b.** 3

45c.

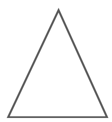
Polygon	Lines of Symmetry	Order of Symmetry
equilateral triangle	3	3
square	4	4
regular pentagon	5	5
regular hexagon	6	6

45d. Sample answer: A regular polygon with *n* sides has *n* lines of symmetry and order of symmetry *n*.

47. Sample answer: (−1, 0), (2, 3), (4, 1), and (1, −2)



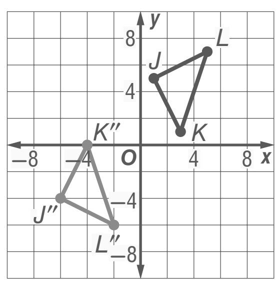
49.



Sample answer: An isosceles triangle has line symmetry from the vertex angle to the base of the triangle, but it does not have rotational symmetry because it cannot be rotated from 0° to 360° and map onto itself.

51. B **53.** H

55.

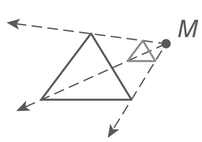


57. (7, −7)

59. enlargement; 2

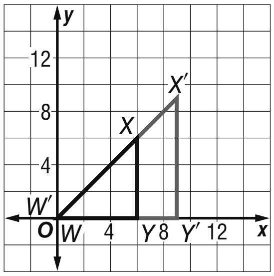
Lesson 14-9

1.

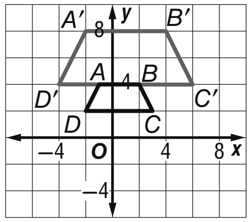


3. enlargement; $\frac{4}{3}$; 2

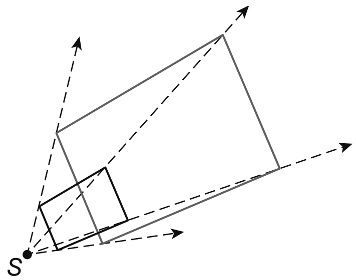
5.



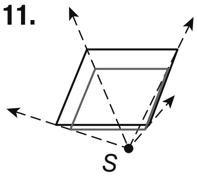
7.



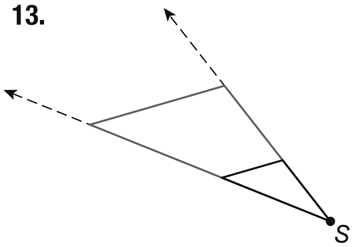
9.



11.



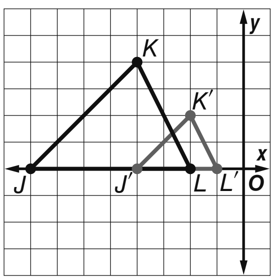
13.



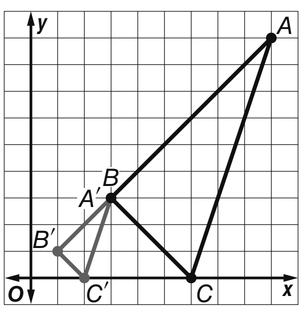
15. enlargement; 2; 4.5 **17.** reduction; $\frac{3}{4}$; 3.5

19. 15×; The insect's image length in millimeters is 3.75 • 10 or 37.5 mm. The scale factor of the dilation is $\frac{37.5}{2.5}$ or 15.

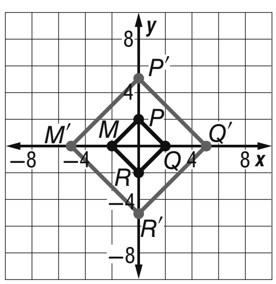
21.



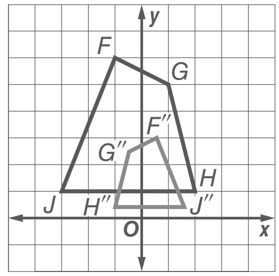
23.



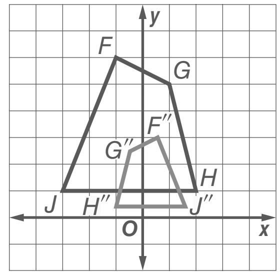
25.



27a.



27b.



27c. no

27d. Sometimes; sample answer: For the order of a composition of a dilation centered at the origin and a reflection to be unimportant, the line of reflection must contain the origin, or must be of the form $y = mx$.

29. No; sample answer: The measures of the sides of the rectangles are not proportional, so they are not similar and cannot be a dilation.

31a. surface area: 88 cm^2; volume: 48 cm^3

31b. surface area: 352 cm^2; volume: 384 cm^3

31c. surface area: 22 cm^2; volume: 6 cm^3

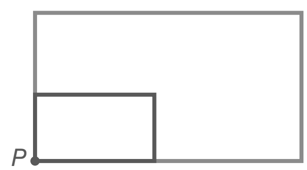
31d. surface area: 4 times greater after dilation with scale factor 2; $\frac{1}{4}$ as great after dilation with scale factor $\frac{1}{2}$. Volume: 8 times greater after dilation with scale factor 2; $\frac{1}{8}$ as great after dilation with scale factor $\frac{1}{2}$.

31e. The surface area of the preimage would be multiplied by r^2. The volume of the preimage would be multiplied by r^3.

33a. $1\frac{1}{3}$

33b. 1.77 mm^2; 3.14 mm^2

35. $\frac{11}{5}$



37. $y = 4x - 3$

39a. Always; sample answer: Since a dilation of 1 maps an image onto itself, all four vertices will remain invariant under the dilation.

39b. Always; sample answer: Since the rotation is centered at *B*, point *B* will always remain invariant under the rotation.

39c. Sometimes: sample answer: If one of the vertices is on the *x*-axis, then that point will remain invariant under reflection. If two vertices are on the *x*-axis, then the two vertices located on the *x*-axis will remain invariant under reflection.

39d. Never; when a figure is translated, all points move an equal distance. Therefore, no points can remain invariant under translation.

39e. Sometimes; sample answer: If one of the vertices of the triangle is located at the origin, then that vertex would remain invariant under the dilation. If none of the vertices are located at the origin, then no points will remain invariant under the dilation.

41. Sample answer: Translations, reflections, and rotations produce congruent figures because the sides and angles of the preimage are congruent to the corresponding sides and angles of the image. Dilations produce similar figures, because the angles of the preimage and the image are congruent and the sides of the preimage are proportional to the corresponding sides of the image. A dilation with a scale factor of 1 produces an equal figure because the image is mapped onto its corresponding parts in the preimage. **43.** A **45.** D **47.** yes; 1 **49.** translation along $\langle -1, 8\rangle$ and reflection in the y-axis **51.** 29.5 **53.** 72.7

Chapter 14 Study Guide and Review

1. composition of transformations **3.** dilation

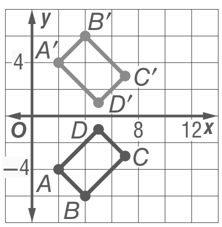
5. line of reflection **7.** translation **9.** reflection

11. Yes, $\triangle IJK \sim \triangle HFG$ by the SSS ~ Thm.

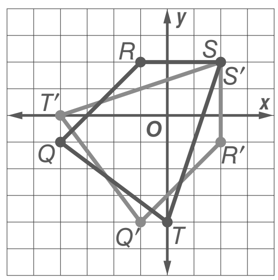
13. Yes, $\triangle TUV \sim \triangle TSR$ by the AA ~ Post.

15. 9.6 **17.** 275 ft **19.** enlargement; 2

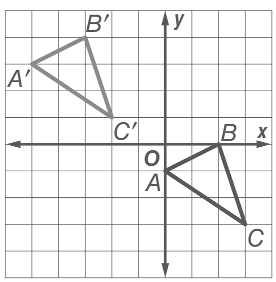
21.



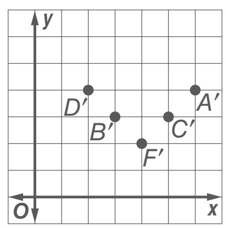
23.



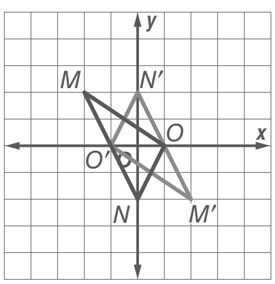
25.



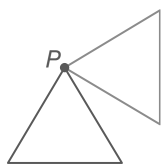
27.



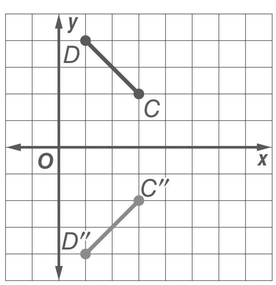
29.



31. 90°

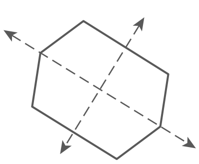


33.

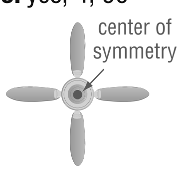


35. Sample answer: translation right and down, translation of result right and up.

37. yes; 2



39. yes; 4; 90°



41. 4 **43.** reduction; 8.25; 0.45

CHAPTER 15
Circles

Chapter 15 Get Ready

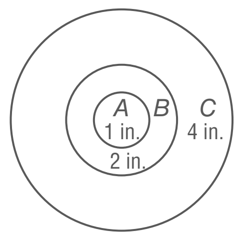
1. 130 **3.** 15.58 **5.** 82.8 **7.** \$5.85 **9.** 8.5 ft

11. $-3, 4$

Lesson 15-1

1. $\odot A$ **3.** 5 inches **5.** 14 feet **7.** Radius = 4", Circumference = 25.13" **9.** 13π

11. KM **13.** 16 cm **15.** 76 inches.
17. 28 cm **19.** 22 **21.** 30 **23.** $r = 1.27$", $d = 2.54$"
25. $r = 28.01$ inches, $d = 56.02$ inches
27. $r = 32.00$ m, $d = 64.00$ m
29. $2\sqrt{17}\pi$ cm **31.** 17π yd **33.** $\sqrt{97}\pi$ in.
35a. 12.57 ft **35b.** 4.6 feet
37. $r = 11.46x$ yd, $d = 22.92x$ yd
39. $r = 7x$ units, $C = 43.98$ units. **41.** congruent
43. 60 **45a.** Sample answer:



45b. Sample answer

Circle	Radius	Ratio of Radius and Radius of Circle *A*	Circum ference	Ratio of Circumference and Circumference of Circle *A*
A	1	1	2π	1
B	2	2	4π	2
C	4	4	8π	4

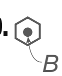
45c. The ratio of two circles circumferences is the same as the ratio of their radii.

47a. 62.83 inches **47b.** 3.14 inches

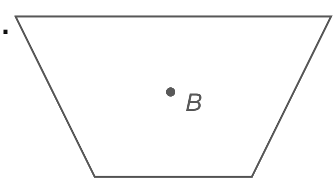
49. Always. **51.** Explain. Sometimes. If the two points are directly opposite each other on the circle then the distance between them is the same as the diameter, otherwise they are closer.

53. $x = 3$ **55.** 40.8 **57.** J

59.



61.



63. no **65.** no **67.** 90 **69.** 20

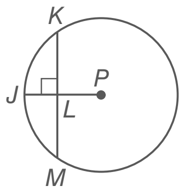
Lesson 15-2

1. 15 **3.** 45 **5.** 75 **7.** 90 **9.** 13 **11.** 7

13. 22 **15.** Yes, because they are chords of the circle that are equidistant from the center. **17.** $24 - 2\sqrt{119}$

19. 6.32 **21.** 18

23. Given: $\odot P$, $\overline{KM} \perp \overline{JP}$
Prove: $\overline{JP}$ bisects $\overline{KM}$ and $\widehat{KM}$.



Proof:

Statements (Reasons)

1. $\overline{KM} \perp \overline{JP}$ (Given)

2. Draw radii $\overline{PK}$ and $\overline{PM}$. (2 points determine a line.)

3. $\overline{PK} \cong \overline{PM}$ (All radii of a $\odot$ are $\cong$.)

4. $\overline{PL} \cong \overline{PM}$.(Reflex. Prop. of $\cong$)

5. $\angle PLM$ and $\angle PLK$ are right $\angle$s. (Def. of $\perp$)

6. $\angle PLM \cong \angle PLK$ (All right $\angle$s are $\cong$.)

7. $\triangle PLM \cong \triangle PLK$ (SAS)

8. $\overline{ML} \cong \overline{KL}$ (CPCTC)

9. $\overline{PJ}$ bisects $\overline{KM}$. (Def. of bisect)

10. $\angle MPJ \cong \angle KPJ$ (CPCTC)

11. $\overline{MJ} \cong \overline{KJ}$ (In the same circle, two arcs are congruent if their corresponding central angles are congruent.)

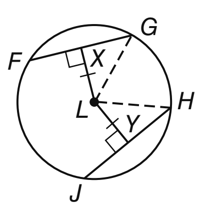
12. $\overline{JP}$ bisects $\widehat{KM}$. (Def. of bisect)

25. Proof:
Statements (Reasons)

1. $\odot C$, $\overline{AB} \perp \overline{XY}$ (Given)
2. $\overline{CX} \cong \overline{CY}$ (All radii of a $\odot$ are $\cong$.)
3. $\overline{CZ} \cong \overline{CZ}$ (Reflexive Prop.)
4. $\angle XZC$ and $\angle YZC$ are rt. $\angle$s (Definition of $\perp$ lines)
5. $\triangle XZC \cong \triangle YZC$ (HL)
6. $\overline{XZ} \cong \overline{YZ}$, $\angle XCZ \cong \angle YCZ$ (CPCTC)
7. $\widehat{XB} \cong \widehat{YB}$ (If central $\angle$s are $\cong$, intercepted arcs are $\cong$.)

27. Given: $\odot L$, $\overline{LX} \perp \overline{FG}$, $\overline{LY} \perp \overline{JH}$, $\overline{LX} \cong \overline{LY}$

Prove: $\overline{FG} \cong \overline{JH}$



Proof:

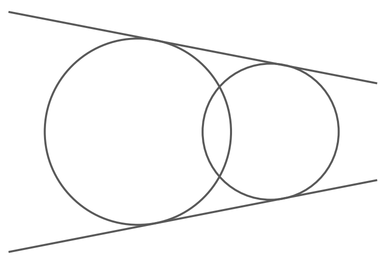
Statements (Reasons):

1. $\overline{LG} \cong \overline{LH}$ (All radii of a $\odot$ are $\cong$.)
2. $\overline{LX} \perp \overline{FG}$, $\overline{LY} \perp \overline{JH}$, $\overline{LX} \cong \overline{LY}$ (Given)
3. $\angle LXG$ and $\angle LYH$ are right $\angle$s. (Definition of $\perp$ lines)
4. $\triangle XGL \cong \triangle YHL$ (HL)
5. $\overline{XG} \cong \overline{YH}$ (CPCTC)
6. $XG = YH$ (Definition of $\cong$ segments)
7. $2(XG) = 2(YH)$ (Multiplication Property)
8. $\overline{LX}$ bisects $\overline{FG}$; $\overline{LY}$ bisects $\overline{JH}$. (A radius $\perp$ to a chord bisects the chord.)
9. $FG = 2(XG)$, $JH = 2(YH)$ (Definition of segment bisector)
10. $FG = JH$ (Substitution)
11. $\overline{FG} \cong \overline{JH}$ (Definition of $\cong$ segments)

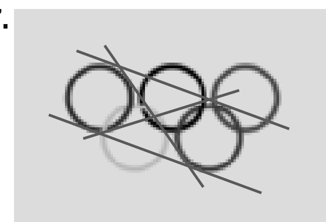
29. 11 **31.** 5 **33.** Alex is correct. Using the Pythagorean theorem we find that DC is 8 inches, so AC is 16 inches.
35. $x = 7$, $y = 4$ **37.** D **39.** 6 ft 3 in. **41.** 275 in.
43. $a_n = 1(2)^{n-1}$; 64 **45.** $a_n = 4(-3)^{n-1}$; 2916
47. $a_n = 22(2)^{n-1}$; 1408 **49.** ± 11

Lesson 15-3

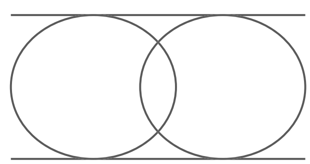
1.



3. No; because $3^2 + 4^2 \neq 6^2$
5. 50
7.



9. no common tangent
11.

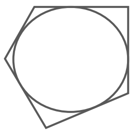


13. No; because $9^2 + 12^2 \neq 16^2$
15. Yes; because $45^2 + 200^2 = 205$
17. 25
19. 21
21. 7
23. 10 inches
25. $x = 4$, perimeter = 64".
27. 24
29a. Proof. We are given that $\triangle ABC$ is equilateral, so $AB = BC = AC$. We also are given that D is the midpoint of AB, so $AD = DB$. By Theorem 15.6, $AE = AD$. Since $\triangle ABC$ is equilateral, $m\angle A = 60$. By the triangle sum theorem, $m\angle D = m\angle E = 60$. Thus $\triangle ADE$ is equilateral, so $DE = AD$. Also by Theorem 15.6, $DB = BF$. Also, $m\angle B = 60$ and $\triangle BDF$ is an equilateral triangle, so $DF = BD$. By

the transitive property, $DF = DE$. Since $\triangle BDF$ and $\triangle ADE$ are both equilateral triangles, $m\angle BDF = 60$ and $m\angle ADE = 60$, so since ADB is a straight angle, $m\angle EDF = 60$. Therefore by the triangle sum theorem, $m\angle DEF = m\angle FED = 60$ and $\triangle DEF$ is an equilateral triangle. **31.** 24 points of tangency, 3' by 3'

33. Proof: Assume that l is not tangent to $\odot S$. Since l intersects $\odot S$ at T, it must intersect the circle in another place. Call this point Q. Then $ST = SQ$. $\triangle STQ$ is isosceles, so $\angle T \cong \angle Q$. Since $ST \perp l$, $\angle T$ and $\angle Q$ are right angles. This contradicts that a triangle can only have one right angle. Therefore, is tangent to $\odot S$.

35. Sample answer:



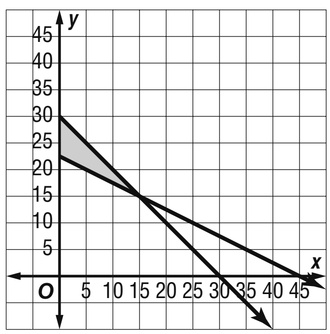
37. $x = 4$, $y = 8$

39. We can use a radius out to the point of tangency and other line from the center of circle to the tangent to form a triangle. If the triangle is a right triangle then the line was tangent to the circle. We can use the Pythagorean Theorem to test if the triangle is a right triangle.

41. $6\sqrt{2}$ or about 8.5 in **43.** D **45.** 7

47. Yes; $\triangle AEC \sim \triangle BDC$ by AA Similarity.

49a.



49b. Sample answer: walk: 15 min, jog: 15 min; walk: 10 min, jog: 20 min; walk: 5 min, jog: 25 min

51. 110 **53.** 58

Lesson 15-4

1. $(x - 4)^2 + y^2 = 9$ **3.** $x^2 + y^2 = 32$

5. $(x + 2)^2 + (y - 1)^2 = 9$ **7.** Center $(-1, 2)$; $r = 4$

9. Center is at (2, 2); $r = 5$; $(x - 2)^2 + (y - 2)^2 = 25$

11. (1, 0) and (3, 2) **13.** $x^2 + y^2 = 49$

15. $x^2 + (y + 2)^2 = 100$ **17.** $(x - 6)^2 + (y + 3)^2 = 36$

19. $(x - 4)^2 + (y - 5)^2 = 5$ **21.** $x^2 + y^2 = 3600$

23. Center (0, 0); $r = 7$ **25.** Center $(-3, -4)$; $r = \sqrt{10}$

27. $(x - 2)^2 + (y + 5)^2 = 16$ **29.** $(2\sqrt{5}, \sqrt{5})$and $(-2\sqrt{5} -\sqrt{5})$ **31.** $(2, -5)$ and $(-2, -1)$

33. $(\sqrt{2}, 2\sqrt{2})$ and $(-\sqrt{2}, 2\sqrt{2})$ **35.** $(x - 1)^2 + (y - 1)^2 = 25$ **37a.** $x^2 + y^2 = 360{,}000$ **37b.** $x^2 + y^2 = 2{,}250{,}000$

39a. $(x - 5)^2 + (y + 4)^2 = 36$ **39b.** No, She is more than 6 miles from the pizza shop.

41. The equation for the circle is $x^2 + y^2 = 16$. Substituting the point, yields $(2)^2 + (2\sqrt{3})$? 16; $16 = 16$; therefore, this point is on the circle. **43.** $(x + 6)^2 + (y - 1)^2 = 49$ **45.** $(x - 2)\ 2 + (y + 2)\ 2 = 16$. Sample answer: Moving 3 units left is the same as subtracting 3 from the x coordinate; i.e. $5 - 3 = 2$. Moving 5 units up is the same as adding 5 to the y coordinate; i.e. $-7 + 5 = -2$.
47. Method 1: Draw a circle of radius 200 centered on each station. Method 2: Use the Pythagorean theorem to identify stations that are more than 200 miles apart. Using Method 2, plot the points representing the stations on a graph. Stations that are more than 4 units apart on the graph will be more than 200 miles apart and will thus be able to use the same frequency. Assign station A to the first frequency. Station B is within 4 units of station A, so it must be assigned the second frequency. Station C is within 4 units of both stations A and B, so it must be assigned a third frequency. Station D is also within 4 units of stations A, B, and C, so it must be assigned a fourth frequency, Station is E is $\sqrt{29}$ or about 5.4 units away from station A, so it can share the first frequency. Station F is $\sqrt{29}$ or about 5.4 units away from station B, so it can share the second frequency. Station G is $\sqrt{32}$ or about 5.7 units away from station C, so it can share the third frequency. Therefore, the least number of frequencies that can be assigned is 4. **49.** $(1.6, -1.2)$ **51.** A **53.** Step 1 **55.** Positive; as time goes on, more people use electronic tax returns. **57.** 28.3 ft
59. 32 cm; 64 cm^2

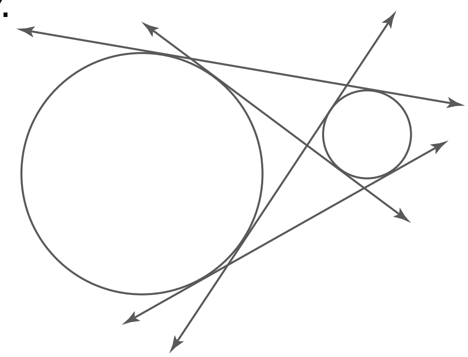
Chapter 15 Study Guide and Review

1. false; chord **3.** false; point of tangency **5.** false; congruent **7.** $\overline{DM}$ or $\overline{DP}$

9. 13.69 cm; 6.84 cm **11.** 34.54 ft; 17.27 ft **13.** 8

15. 8.94

17.



19. $(x + 2)^2 + (y + 4)^2 = 25$ **21.** $x^2 + y^2 = 1156$