CHAPTER 8

Think & Discuss *(p. 455)*

1. *Sample answer:* pantographs, dilations, and projections

2. About 2 times larger. Measuring each fish from nose to tail, the smaller fish is $\frac{12}{16}$ in., the larger $\frac{17}{16}$ in., so $\frac{22}{16} \div \frac{12}{16} = \frac{11}{6} = 1.8\overline{3}$.

Skill Review *(p. 456)*

1. $2 \cdot 10 + 2 \cdot 6 = 32$

2. $13 + 11 + 7 = 31$

3. $22 + 18 + 20 + 31 = 91$

4. $\frac{2-0}{4-0} = \frac{2}{4} = \frac{1}{2}$

5. $\frac{5-2}{6-(-1)} = \frac{3}{7}$

6. $\frac{-8-3}{-4-0} = \frac{-11}{-4} = \frac{11}{4}$

Lesson 8.1

Activity (p. 457)

1. *Sample answer:*

Thumb	2.5 in.
Wrist	5.75 in.
Neck	12.5 in.

2. 5.75:2.5 ; 12.5:5.75
23:10 ; 50:23

3. The neck:wrist ratio is about the same as the wrist:thumb ratio.

4. Answers may vary.

5. No; if all the units of measure are the same, they do not affect the ratio.

8.1 Guided Practice (p. 461)

1. means; extremes

2. $3 \cdot \frac{12 \text{ in.}}{1}$:18 in.
36 in.:18 in.
2:1

3. $\frac{10}{x+6} = \frac{4}{x}$
$10x = 4(x+6)$
$10x = 4x + 24$
$6x = 24$
$x = 4$

4. 8:2 ; 2:8
4:1 ; 1:4

5. 8:10
4:5

6. $\frac{2}{x} = \frac{3}{9}$
$\frac{x}{2} = \frac{9}{3}$
$x = 2\left(\frac{9}{3}\right)$
$x = 6$

7. $\frac{5}{8} = \frac{6}{z}$
$5z = 48$
$z = 9.6 \text{ or } \frac{48}{5}$

8. $\frac{2}{b+3} = \frac{4}{b}$
$2b = 4(b+3)$
$2b = 4b + 12$
$-2b = 12$
$b = -6$

9. $\frac{x}{27} = \frac{2}{9}$
$9x = 54$
$x = 6$

8.1 Practice and Applications (pp. 461–464)

10. $\frac{16}{24} = \frac{2}{3}$ **11.** $\frac{48}{8} = \frac{6}{1}$ **12.** $\frac{22}{52} = \frac{11}{26}$

13. $\frac{6}{9} = \frac{2}{3}$ **14.** $\frac{16 \text{ mm}}{20 \text{ mm}} = \frac{4}{5}$ **15.** $\frac{7.5 \text{ cm}}{10 \text{ cm}} = \frac{3}{4}$

16. $\frac{12 \text{ in.}}{2 \text{ ft}} = \frac{12 \text{ in.}}{2 \cancel{\text{ft}} \cdot \frac{12 \text{ in.}}{1 \cancel{\text{ft}}}} = \frac{12 \text{ in.}}{24 \text{ in.}} = \frac{1}{2}$

17. $\frac{3 \text{ ft}}{12 \text{ in.}} = \frac{3 \cancel{\text{ft}}\left(\frac{12 \text{ in.}}{1 \cancel{\text{ft}}}\right)}{12 \text{ in.}} = \frac{36 \text{ in.}}{12 \text{ in.}} = \frac{3}{1}$

18. $\frac{60 \text{ cm}}{1 \text{ m}} = \frac{60 \text{ cm}}{1 \cancel{\text{m}}\left(\frac{100 \text{ cm}}{1 \cancel{\text{m}}}\right)} = \frac{60 \text{ cm}}{100 \text{ cm}} = \frac{3}{5}$

19. $\frac{350 \text{ g}}{1 \text{ kg}} = \frac{350 \text{ g}}{1 \cancel{\text{kg}}\left(\frac{1000 \text{ g}}{1 \cancel{\text{kg}}}\right)} = \frac{350 \text{ g}}{1000 \text{ g}} = \frac{7}{20}$

20. $\frac{2 \text{ mi}}{3000 \text{ ft}} = \frac{2 \cancel{\text{mi}}\left(\frac{5280 \text{ ft}}{1 \cancel{\text{mi}}}\right)}{3000 \text{ ft}} = \frac{10{,}560 \text{ ft}}{3000 \text{ ft}} = \frac{88}{25}$

21. $\frac{6 \text{ yd}}{10 \text{ ft}} = \frac{6 \cancel{\text{yd}}\left(\frac{3 \text{ ft}}{1 \cancel{\text{yd}}}\right)}{10 \text{ ft}} = \frac{18 \text{ ft}}{10 \text{ ft}} = \frac{9}{5}$

22. $\frac{2 \text{ lb}}{20 \text{ oz}} = \frac{2 \cancel{\text{lb}}\left(\frac{16 \text{ oz}}{1 \cancel{\text{lb}}}\right)}{20 \text{ oz}} = \frac{32 \text{ oz}}{20 \text{ oz}} = \frac{8}{5}$

23. $\frac{400 \text{ m}}{0.5 \text{ km}} = \frac{400 \text{ m}}{0.5 \cancel{\text{km}}\left(\frac{1000 \text{ m}}{1 \cancel{\text{km}}}\right)} = \frac{400 \text{ m}}{500 \text{ m}} = \frac{4}{5}$

24. $\frac{20 \text{ oz}}{4 \text{ lb}} = \frac{20 \text{ oz}}{4 \cancel{\text{lb}}\left(\frac{16 \text{ oz}}{1 \cancel{\text{lb}}}\right)} = \frac{20 \text{ oz}}{64 \text{ oz}} = \frac{5}{16}$

25. $\frac{AB}{CD} = \frac{2}{3}$ **26.** $\frac{BD}{CF} = \frac{7}{7} = 1$

27. $\frac{BF}{AD} = \frac{11}{9}$

28. $\frac{CF}{AB} = \frac{7}{2}$

29. $2(5x) + 2(2x) = 84$

$2(7x) = 84$

$14x = 84$

$x = 6$

$5(6) = 30$ ft;
$2(6) = 12$ ft

30. $4x(3x) = 108$

$12x^2 = 108$

$x^2 = 9$

$x = \pm 3$

Since length must be positive $x = 3$.

$4(3) = 12$ cm;
$3(3) = 9$ cm

31. $1x + 4x + 7x = 180$

$12x = 180$

$x = 15$

$1(15°) = 15°;\ 4(15°) = 60°;\ 7(15°) = 105°$

32. $2x + 15x + 19x = 180$

$36x = 180$

$x = 5$

$2(5°) = 10°;\ 15(5°) = 75°;\ 19(5°) = 95°$

33. $\frac{x}{4} = \frac{5}{7}$

$7x = 20$

$x = \frac{20}{7}$

34. $\frac{y}{8} = \frac{9}{10}$

$10y = 72$

$y = \frac{72}{10} = \frac{36}{5}$

35. $\frac{7}{z} = \frac{10}{25}$

$\frac{z}{7} = \frac{25}{10}$

$z = 7\left(\frac{25}{10}\right)$

$z = \frac{175}{10} = \frac{35}{2}$

36. $\frac{4}{b} = \frac{10}{3}$

$\frac{b}{4} = \frac{3}{10}$

$b = 4\left(\frac{3}{10}\right)$

$b = \frac{12}{10} = \frac{6}{5}$

37. $\frac{30}{5} = \frac{14}{c}$

$30c = 70$

$c = \frac{70}{30} = \frac{7}{3}$

38. $\frac{16}{3} = \frac{d}{6}$

$\frac{3}{16} = \frac{6}{d}$

$3d = 96$

$d = 32$

39. $\frac{5}{x+3} = \frac{4}{x}$

$5x = 4(x + 3)$

$5x = 4x + 12$

$x = 12$

40. $\frac{4}{y-3} = \frac{8}{y}$

$4y = 8(y - 3)$

$4y = 8y - 24$

$-4y = -24$

$y = 6$

41. $\frac{7}{2z+5} = \frac{3}{z}$

$7z = 3(2z + 5)$

$7z = 6z + 15$

$z = 15$

42. $\frac{3x-8}{6} = \frac{2x}{10}$

$10(3x - 8) = 6(2x)$

$30x - 80 = 12x$

$18x = 80$

$x = \frac{80}{18} = \frac{40}{9}$

43. $\frac{5y-8}{7} = \frac{5y}{6}$

$6(5y - 8) = 35y$

$30y - 48 = 35y$

$-5y = 48$

$y = -\frac{48}{5}$

44. $\frac{4}{2z+6} = \frac{10}{7z-2}$

$4(7z - 2) = 10(2z + 6)$

$28z - 8 = 20z + 60$

$8z = 68$

$z = \frac{68}{8} = \frac{17}{2}$

45. $\frac{6}{x} = \frac{3}{8}$

$\frac{x}{6} = \frac{8}{3}$

$x = 6\left(\frac{8}{3}\right)$

$x = \frac{48}{3} = 16$

46. $\frac{y+7}{40} = \frac{4}{5}$

$5(y + 7) = 160$

$5y + 35 = 160$

$5y = 125$

$y = 25$

47. $\frac{12}{z-3} = \frac{2}{3}$

$\frac{z-3}{12} = \frac{3}{2}$

$2(z - 3) = 36$

$2z - 6 = 36$

$2z = 42$

$z = 21$

48. Venus because $\frac{9}{10}$ is closest to 1.

49. Venus: $\frac{x}{140} = \frac{9}{10}$;

$10x = 1260$

$x = 126$ lb

Mars: $\frac{x}{140} = \frac{38}{100}$;

$100x = 5320$

$x \approx 53$ lb

Jupiter: $\frac{x}{140} = \frac{236}{100}$;

$100x = 33{,}040$

$x \approx 330$ lb

Pluto: $\frac{x}{140} = \frac{7}{100}$

$100x = 980$

$x \approx 10$ lb

50. $\frac{46}{x} = \frac{38}{100}$

$\frac{x}{46} = \frac{100}{38}$

$x = 46\left(\frac{100}{38}\right)$

$x \approx 121$ lb

51. $120 \text{ ft}\left(\frac{12 \text{ in.}}{1 \text{ ft}}\right) = 1440$ in.

52. $\dfrac{35 \text{ in.}}{1440 \text{ in.}} = \dfrac{x}{9 \text{ ft}\left(\dfrac{12 \text{ in.}}{1 \text{ ft}}\right)}$

$\dfrac{35}{1440} = \dfrac{x}{108}$

$3780 = 1440x$

$x \approx 2.6 \text{ in.}$

53. $\dfrac{35 \text{ in.}}{1440 \text{ in.}} = \dfrac{x}{3.5 \text{ ft}\left(\dfrac{12 \text{ in.}}{1 \text{ ft}}\right)}$

$\dfrac{35}{1440} = \dfrac{x}{42}$

$\dfrac{1440}{35} = \dfrac{42}{x}$

$1440x = 1470$

$x \approx 1.0 \text{ in.}$

54. $\dfrac{j}{24} = \dfrac{3}{4}$

$4j = 72$

$j = 18$

55. $\dfrac{3m + 6}{m} = \dfrac{4}{1}$

$3m + 6 = 4m$

$-m = -6$

$m = 6$

56. $\dfrac{k + 2}{2k} = \dfrac{5}{7}$

$7(k + 2) = 5(2k)$

$7k + 14 = 10k$

$3k = 14$

$k = \dfrac{14}{3}$ or $4\dfrac{2}{3}$

57. $\dfrac{RQ}{36} = \dfrac{1}{3}$

$3(RQ) = 36$

$RQ = 12$

$ST = \sqrt{36^2 + 15^2}$

$ST = \sqrt{1521}$

$ST = 39$

$\dfrac{5}{SU} = \dfrac{1}{3}$

$\dfrac{SU}{5} = \dfrac{3}{1}$

$SU = 5\left(\dfrac{3}{1}\right)$

$SU = 15$

$PQ = \sqrt{5^2 + 12^2}$

$PQ = \sqrt{169}$

$PQ = 13$

58. $\dfrac{PR}{9} = \dfrac{1}{3}$

$3(PR) = 9$

$PR = 3$

$(RQ)^2 = 10^2 - 3^2$

$(RQ)^2 = 91$

$RQ = \sqrt{91}$

$\dfrac{10}{ST} = \dfrac{1}{3}$

$\dfrac{ST}{10} = \dfrac{3}{1}$

$ST = 10\left(\dfrac{3}{1}\right)$

$ST = 30$

$(UT)^2 = 30^2 - 9^2$

$(UT)^2 = 819$

$UT = \sqrt{819} = 3\sqrt{91}$

59. $6 \text{ ft}\left(\dfrac{12 \text{ in.}}{1 \text{ ft}}\right)$: 6 in.

72:6

12:1

60. $\dfrac{x}{6 \text{ ft}} = \dfrac{6 \text{ ft}}{6 \text{ in.}\left(\dfrac{1 \text{ ft}}{12 \text{ in.}}\right)}$

$\dfrac{x}{6} = \dfrac{6}{0.5}$

$0.5x = 36$

$x = 72 \text{ ft}$

61. $\dfrac{72 \text{ ft}}{6 \text{ in.}\left(\dfrac{1 \text{ ft}}{12 \text{ in.}}\right)} = \dfrac{72 \text{ ft}}{0.5 \text{ ft}} = \dfrac{144}{1}$

62. $\dfrac{3}{4} = \dfrac{6}{x}$

$3x = 24$

$x = 8$

$AC = x = 8;$

$AB = x + 2 = 8 + 2 = 10$

63. $\dfrac{4}{5} = \dfrac{16}{y}$

$4y = 80$

$y = 20$

$EF = y = 20;$

$DF = y + 4 = 20 + 4 = 24$

64. $\dfrac{b}{b + 3} = \dfrac{5}{6}$

$6b = 5(b + 3)$

$6b = 5b + 15$

$b = 15$

$GH = HR = b = 15;$

$GR = b + 3 = 15 + 3 = 18$

65. Let x = number of pounds of compost.

$\dfrac{5}{3} = \dfrac{30 \text{ lb}}{x}$

$5x = 90$

$x = 18 \text{ lb}$ D

66. $2x + 3x + 7x = 180$

$12x = 180$

$x = 15$

$2(15°) = 30°, 3(15°) = 45°, 7(15°) = 105°$ D

67. $\dfrac{AB}{24} = \dfrac{2}{3}$

$3(AB) = 48$

$AB = 16$

Let $BC = x$, then $CD = 24 - x$ and $AC = x + 16$.

$\dfrac{24 - x}{x + 16} = \dfrac{1}{9}$

$9(24 - x) = x + 16$

$216 - 9x = x + 16$

$-10x = -200$

$x = 20$

$AC = x + 16 = 20 + 16 = 36$

8.1 Mixed Review (p. 464)

68. $m\angle X = m\angle S = 20°$

69. $m\angle V + 20° + 65° = 180°$

$m\angle V + 85° = 180°$

$m\angle V = 95°$

70. $m\angle T = m\angle W = 65°$ **71.** $m\angle U = m\angle V = 95°$

72. $\overline{WV}$

73. $\left(\frac{-2 + (-1)}{2}, \frac{1 + 5}{2}\right)$ and $\left(\frac{-1 + 3}{2}, \frac{5 + 1}{2}\right)$

$\left(-1\frac{1}{2}, 3\right)$ $(1, 3)$

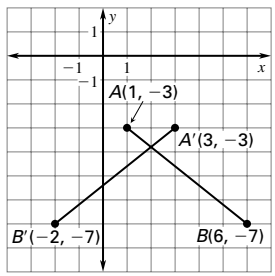
74. $\left(\frac{1 + 1}{2}, \frac{1 + (-5)}{2}\right)$ and $\left(\frac{1 + 6}{2}, \frac{1 + (-4)}{2}\right)$

$(1, -2)$ $\left(3\frac{1}{2}, -1\frac{1}{2}\right)$

75. $\left(\frac{-2 + 1}{2}, \frac{3 + 4}{2}\right)$ and $\left(\frac{1 + 2}{2}, \frac{4 + (-2)}{2}\right)$

$\left(-\frac{1}{2}, 3\frac{1}{2}\right)$ $\left(1\frac{1}{2}, 1\right)$

76.



Lesson 8.2

8.2 Guided Practice (p. 468)

1. $\frac{a}{x} = \frac{x}{b}$ **2.** $y + 5$ **3.** $\frac{6}{2}$; or 3

4. $\frac{r}{s} = \frac{6}{15}$ and $\frac{15}{s} = \frac{6}{r}$

$15r = 6s$ $15r = 6s$ (cross product property)

The equations are equal, therefore the statement is true.

5. $\frac{3}{x} = \frac{x}{12}$

$x^2 = 36$

$x = \sqrt{36}$

$x = 6$

6. $\frac{2}{3} = \frac{6}{DE}$

$2(DE) = 18$

$DE = 9$

7. $\frac{1}{1.9} = \frac{6}{x}$

$x = 11.4$ ft

8. $\frac{7}{13}$; use stripes as a height unit measure $\left(\frac{7 \text{ stripes}}{13 \text{ stripes}}\right)$.

8.2 Practice and Applications (pp. 468–471)

9. $\frac{x}{y}$ **10.** $\frac{6}{34} = \frac{3}{17}$ **11.** $\frac{y + 12}{12}$

12. $\frac{x + y}{y}$

13. By Property of proportions 4, the statement is true.

14. If $\frac{3}{4} = \frac{p}{r}$, then $\frac{4}{3} = \frac{r}{p}$ by the reciprocal property. The statement is false.

15. By Property of proportions 3, the statement is true.

16. $\frac{12 + m}{12} = \frac{12}{12} + \frac{m}{12} = 1 + \frac{m}{12}$. Similarly, $\frac{3 + n}{n} = 1 + \frac{3}{n}$. Then $1 + \frac{m}{12} = 1 + \frac{3}{n}$ and the statement $\frac{m}{12} = \frac{3}{n}$ is true by the subtraction property of equality.

17. $\frac{3}{x} = \frac{x}{27}$

$x^2 = 81$

$x = \sqrt{81}$

$x = 9$

18. $\frac{4}{x} = \frac{x}{16}$

$x^2 = 64$

$x = \sqrt{64}$

$x = 8$

19. $\frac{7}{x} = \frac{x}{28}$

$x^2 = 196$

$x = \sqrt{196}$

$x = 14$

20. $\frac{2}{x} = \frac{x}{40}$

$x^2 = 80$

$x = \sqrt{80}$

$x = 4\sqrt{5}$

21. $\frac{8}{x} = \frac{x}{20}$

$x^2 = 160$

$x = \sqrt{160}$

$x = 4\sqrt{10}$

22. $\frac{5}{x} = \frac{x}{15}$

$x^2 = 75$

$x = \sqrt{75}$

$x = 5\sqrt{3}$

23. $\frac{20}{x} = \frac{16}{9}$

$16x = 180$

$x = \frac{180}{16} = \frac{45}{4} = 11\frac{1}{4}$

24. $\frac{24 - 6}{6} = \frac{x}{3}$

$\frac{18}{6} = \frac{x}{3}$

$6x = 54$

$x = 9$

25. $\frac{4}{x} = \frac{6}{10}$

$6x = 40$

$x = \frac{40}{6} = \frac{20}{3} = 6\frac{2}{3}$

26. $\frac{7}{7 + 2} = \frac{x}{x + 5}$

$\frac{7}{9} = \frac{x}{x + 5}$

$7(x + 5) = 9x$

$7x + 35 = 9x$

$-2x = -35$

$x = \frac{35}{2} = 17\frac{1}{2}$

27. $\frac{16 - x}{x} = \frac{12}{9}$

$9(16 - x) = 12x$

$144 - 9x = 12x$

$-21x = -144$

$x = \frac{144}{21} = \frac{48}{7} = 6\frac{6}{7}$

28. $\frac{x + 6}{6} = \frac{4 + 6}{4}$

$\frac{x + 6}{6} = \frac{10}{4}$

$4(x + 6) = 60$

$4x + 24 = 60$

$4x = 36$

$x = 9$

29. Using $\frac{26}{16}$ in. for the width

$\frac{x \text{ ft}}{\frac{26}{16} \text{ in.}} = \frac{1 \text{ ft}}{\frac{1}{16} \text{ in.}}$

$\frac{1}{16}x = \frac{26}{16}$

$x = \frac{16}{1}\left(\frac{26}{16}\right)$

$x = 26 \approx 25$ feet

30. Using $\frac{38}{16}$ in. for the length

$\frac{x \text{ ft}}{\frac{38}{16} \text{ in.}} = \frac{1 \text{ ft}}{\frac{1}{16} \text{ in.}}$

$\frac{1}{16}x = \frac{38}{16}$

$x = \frac{16}{1}\left(\frac{38}{16}\right)$

$x = 38 \approx 40$ feet

31. $\frac{x}{643} = \frac{0.308}{1.000}$

$x = 198$ hits

32. $\frac{22.76}{1} = \frac{x}{500}$

$x = 11{,}380$ rubles

33. $\frac{1 - (-1)}{1 - (-4)} = \frac{5 - 1}{x - 1}$

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

$2(x - 1) = 20$

$2x - 2 = 20$

$2x = 22$

$x = 11$

34. $\frac{18 - 8}{6 - 2} = \frac{y - 18}{8 - 6}$

$\frac{10}{4} = \frac{y - 18}{2}$

$20 = 4(y - 18)$

$20 = 4y - 72$

$92 = 4y$

$y = 23$

35. Each side of the equation represents the slope of the line through two of the points. If the points are collinear, the slopes are the same.

36.

$\frac{a}{b} = \frac{c}{d}$	Given
$ad = bc$	Cross product property
$\frac{ad}{cd} = \frac{bc}{cd}$	Division property of equality
$\frac{a}{c} = \frac{b}{d}$	Simplify.

37.

$\frac{a}{b} = \frac{c}{d}$	Given
$\frac{a}{b} + 1 = \frac{c}{d} + 1$	Addition property of equality
$\frac{a}{b} + \frac{b}{b} = \frac{c}{d} + \frac{d}{d}$	Inverse property of multiplication
$\frac{a + b}{b} = \frac{c + d}{d}$	Addition of fractions

38. $\frac{1}{12} = \frac{x}{15}$

$12x = 15$

$x = \frac{5}{12} = \frac{5}{4} = 1\frac{1}{4}$ ft

39. $\frac{1}{12} = \frac{2}{x}$

$x = 24$ ft

40. $\frac{1}{12} = \frac{3}{x}$

$x = 36$ feet

Sample answer: Construct a ramp consisting of two ramps in opposite directions, each 18 ft long. The first should be 3 ft high at its beginning and $1\frac{1}{2}$ ft high at its end, for a rise:run ratio of $\frac{1}{12}$. The second would be $1\frac{1}{2}$ ft high at its beginning and at ground level at its end. The second ramp would also have a rise:run ratio of $\frac{1}{12}$.

41. The map distance is about $\frac{6}{16}$ or $\frac{3}{8}$ inch.

$\frac{x \text{ mi}}{\frac{3}{8} \text{ in.}} = \frac{6.7 \text{ mi}}{1 \text{ in.}}$

$x = \frac{3}{8}(6.7)$

$x \approx 2\frac{1}{2}$ miles

42. The map distance is about $\frac{20}{16}$ or $1\frac{1}{4}$ inches.

$\frac{x \text{ mi}}{1\frac{1}{4} \text{ in.}} = \frac{6.7 \text{ mi}}{1 \text{ in.}}$

$x = \frac{5}{4}(6.7)$

$x \approx 8\frac{3}{8}$ miles

43. If the two sizes share a dimension, the shorter dimension of A5 paper must be the longer dimension of A6 paper. That is, the length of A6 paper must be 148 mm. Let x be the width of A6 paper; 148 is the geometric mean of x and 210.

$\frac{x}{148} = \frac{148}{210}$

$210x = 21{,}904$

$x \approx 104$ mm

44. If $\frac{1}{8}$ of the fish are tetras, then $\frac{7}{8}$ are not tetras, so

$24 \times \frac{7}{8} \times \frac{2}{3} = 14$. D

45. *Sample answer:* $\frac{W}{L} = \frac{3}{1}$

$W = 3L$

$\frac{W + 6}{L} = \frac{5}{1}$

$W + 6 = 5L$

$3L + 6 = 5L$

$-2L = -6$

$L = 3$

$W = 3(3) = 9$ games

C

46. a. $1 + \sqrt{5} = 2 + x$

$-1 + \sqrt{5} = x$

b. $\frac{1 + \sqrt{5}}{2} = \frac{2}{x}$

$\frac{1 + \sqrt{5}}{2} = \frac{2}{-1 + \sqrt{5}}$

$-1 + 5 = 4$

$4 = 4$

So 2 is the geometric mean of $1 + \sqrt{5}$ and $-1 + \sqrt{5}$.

c. $\frac{1 + \sqrt{5}}{2} \approx \frac{1 + 2.236068}{2}$

≈ 1.618034

8.2 Mixed Review (p. 471)

47. Area $= lw$

$= 4 \cdot 3$

$= 12 \text{ m}^2$

48. Area $= s^2$

$= 3^2$

$= 9 \text{ cm}^2$

49. Area $= \frac{1}{2}bh$

$= \frac{1}{2}(13)(4)$

$= 26 \text{ cm}^2$

50. $r = 5.5$ ft

Area $= \pi r^2$

$\approx (3.14)(5.5)^2$

$\approx 95 \text{ ft}^2$

51. $m\angle C = m\angle B = 115°$

$m\angle A = m\angle D = 180° - 115° = 65°$

52. $m\angle A = 180° - 71° = 109°$

$m\angle C = 180° - 128° = 52°$

53. $m\angle C = m\angle D = 80°$

$m\angle A = m\angle B = 180° - 80° = 100°$

54. $m\angle C = m\angle D = 67°$

$m\angle A = m\angle B = 180° - 67° = 113°$

55. $m\angle B = m\angle A = 41°$

$m\angle C = m\angle D = 180° - 41° = 139°$

56. $m\angle A = m\angle D = 90°$

$m\angle B = 180° - 120° = 60°$

57. A regular pentagon has 5 lines of symmetry (one from each vertex to the midpoint of the opposite side) and rotational symmetries of 72° and 144°, clockwise and counterclockwise, about the center of the pentagon.

Developing Concepts Activity (p. 472)

Exploring the Concept

1. Photo 1: 4.2 cm; photo 2: 3.0 cm

2. $\frac{4.2}{3.0} = 1.4$ **3.** Both have measure 30°.

4. $\frac{30°}{30°} = 1$

5. Measurements will vary.

Measurement	*Photo 1*	*Photo 2*	*Ratio*
AB	4.2 cm	3.0 cm	$\frac{4.2}{3} = 1.4$
AF	7.8 cm	5.4 cm	$\frac{7.8}{5.4} \approx 1.4$
CD	4.0 cm	2.8 cm	$\frac{4}{2.8} \approx 1.4$
$m\angle 1$	30°	30°	1
$m\angle 2$	106°	106°	1
Perimeter of Photo	24.8 cm	17.2 cm	$\frac{24.8}{17.2} \approx 1.4$

Drawing Conclusions:

1. $5(1.4) = 7$ cm **2.** 35°

3. Any two corresponding lengths or corresponding perimeters have the same ratio; corresponding $\measuredangle$s are $\cong$.

4. The ratio of two corresponding areas is the square of the ratio of corresponding lengths.

Lesson 8.3

8.3 Guided Practice (p. 475)

1. No; the figures are $\cong$ only if the scale factor is 1.

2. No; the lengths of corresponding sides are not proportional; $\frac{15}{10} \neq \frac{8}{3}$.

3. Yes; corresponding $\measuredangle$s can be shown to be $\cong$ by the Interior Angles of a Quad. Thm., and lengths of corresponding sides are proportional

$\frac{10}{5} = \frac{14}{7} = \frac{12}{6} = \frac{8}{4} = \frac{2}{1}$

4. $\angle A \cong \angle T$, $\angle B \cong \angle U$, $\angle C \cong \angle V$, $\angle D \cong \angle W$;

$\frac{AB}{TU} = \frac{BC}{UV} = \frac{CD}{VW} = \frac{AD}{TW}$

5. $\frac{15}{9} = \frac{5}{3}$

6. $\frac{5}{3} = \frac{x}{6}$

$3x = 30$

$x = 10$

7. $m\angle TUV = m\angle ABC = 180° - 70° = 110°$

8.3 Practice and Applications (pp. 476–478)

8. $\angle D \cong \angle P$, $\angle E \cong \angle Q$, $\angle F \cong \angle R$;

$\frac{DE}{PQ} = \frac{EF}{QR} = \frac{DF}{PR}$

9. $\angle J \cong \angle W$, $\angle K \cong \angle X$, $\angle L \cong \angle Y$, $\angle M \cong \angle Z$;

$\frac{JK}{WX} = \frac{KL}{XY} = \frac{LM}{YZ} = \frac{JM}{WZ}$

10. $\angle Q \cong \angle A, \angle R \cong \angle B, \angle S \cong \angle C, \angle T \cong \angle D, \angle U \cong \angle E$;

$$\frac{QR}{AB} = \frac{RS}{BC} = \frac{ST}{CD} = \frac{TU}{DE} = \frac{QU}{AE}$$

11. Yes; both figures are rectangles, so all 4 $\measuredangle$ are $\cong$ and $\frac{AB}{FG} = \frac{BC}{GH} = \frac{CD}{HE} = \frac{AD}{FE} = \frac{7}{4}$.

12. No; lengths of corresponding sides are not proportional; $\frac{7}{5} \neq \frac{3.5}{5}$.

13. No; $m\angle B = 90°$ and $m\angle Q = 88°$, so corresponding $\measuredangle$ are not $\cong$.

14. No; $m\angle K = 90°$ and $m\angle Q = 88°$, so corresponding $\measuredangle$ are not $\cong$ and $\frac{6}{5} \neq \frac{3}{3}$, so lengths of corresponding sides are not proportional.

15. Yes; *Sample answers:*

ABCD~*EFGH*,

ABCD~*FEHG*

16. No; $\frac{6}{3} \neq \frac{4}{4}$

17. Yes; $\angle A \cong \angle Y$, $\angle C \cong \angle X$, $\angle B \cong \angle Z$ and $\frac{12}{8} = \frac{9}{6} = \frac{6.75}{4.5} = \frac{3}{2}$; $\triangle XYZ \sim \triangle CAB$

18. No; $m\angle R = 65°$ and $m\angle L = 180° - 118° = 62°$, so corresponding $\measuredangle$ are not $\cong$ and $\frac{30}{14} \neq \frac{20}{10}$, so corresponding sides are not proportional.

19. $\frac{12}{15} = \frac{4}{5}$

20. $\frac{15}{12} = \frac{5}{4}$

21.

$\frac{w}{25} = \frac{4}{5}$	$\frac{x}{10} = \frac{5}{4}$	$\frac{y}{16} = \frac{5}{4}$
$5w = 100$	$4x = 50$	$4y = 80$
$w = 20$	$x = 12.5$	$y = 20$

22. *JKLM*: $25 + 15 + 12.5 + 20 = 72.5$

PQRS: $16 + 10 + 12 + 20 = 58$

23. $\frac{58}{72.5} = \frac{4}{5}$

24. $\frac{6}{3} = \frac{2}{1}$

25. $\frac{x}{4} = \frac{1}{2}$

$2x = 4$

$x = 2$

26. $m\angle G = m\angle C = 180° - 30° = 150°$

27. $3 + 3 + 2 + 2 = 10$

28. $\frac{10}{20} = \frac{1}{2}$

29. No; $\frac{18}{14} \neq \frac{18}{8} \neq \frac{30}{18}$

30. Yes; because *A* and *B* are parallelograms, the marked angles are $\cong$ to their opposite angles and the angles consecutive to the marked angles are supplements of the marked angles. So corresponding $\measuredangle$ are $\cong$. Also, because all 4 sides of *A* and all 4 sides of *B* are $\cong$, the lengths of corresponding sides are proportional.

$\frac{6}{4} = \frac{3}{2}$

31. sometimes **32.** sometimes **33.** sometimes

34. sometimes **35.** always **36.** never

37. always **38.** sometimes

39.

$\frac{x-2}{6} = \frac{15}{10}$	$\frac{y+3}{8} = \frac{15}{10}$
$10(x-2) = 90$	$10(y+3) = 120$
$10x - 20 = 90$	$10y + 30 = 120$
$10x = 110$	$10y = 90$
$x = 11$	$y = 9$

40.

$\frac{x+4}{22} = \frac{12}{18}$

Because $y°$ is the supplement of $60°$; $y = 180 - 60 = 120$.

$18(x+4) = 264$

$18x + 72 = 264$

$18x = 192$

$x = \frac{192}{18} = \frac{32}{3} = 10\frac{2}{3}$

41.

$\frac{x-6}{39} = \frac{18}{21}$	$\frac{y}{27} = \frac{18}{21}$
$21(x-6) = 702$	$21y = 486$
$21x - 126 = 702$	$y = \frac{486}{21} = \frac{162}{7} = 23\frac{1}{7}$
$21x = 828$	
$x = \frac{828}{21} = \frac{276}{7} = 39\frac{3}{7}$	

42.

$\frac{x}{5} = \frac{6}{4}$	$(y-73)° = 360° - 116° - 61° - 90°$
$4x = 30$	$= 93°$
$x = \frac{30}{4}$	$y - 73 = 93$
$= \frac{15}{2} = 7\frac{1}{2}$	$y = 166$

43.

Analog:	Digital:
$(4x)^2 + (3x)^2 = 27^2$	$(16x)^2 + (9x)^2 = 27^2$
$16x^2 + 9x^2 = 729$	$256x^2 + 81x^2 = 729$
$25x^2 = 729$	$337x^2 = 729$
$x^2 = 29.16$	$x^2 \approx 2.1632$
$x = 5.4$	$x \approx 1.47$
$4x = 4(5.4) = 21.6$ in.	$16x = 16(1.47) \approx 23.5$ in.
$3x = 3(5.4) = 16.2$ in.	$9x = 9(1.47) \approx 13.2$ in.

44. No; the ratio of length to width $= \frac{4}{3}$ for a standard screen and $\frac{16}{9}$ for a digital screen. Then $\frac{\text{length}}{\text{length}} = \frac{4}{16}$ and $\frac{\text{width}}{\text{width}} = \frac{3}{9}$, and $\frac{4}{16} \neq \frac{3}{9}$.

45. $ABCD \sim EFGH$ with a scale factor of $\frac{AB}{EF} = \frac{l}{kl} = \frac{1}{k}$. The perimeter of $EFGH$ is $2(kl) + 2(kw) = k(2l + 2w)$. The ratio $\frac{\text{perimeter of } ABCD}{\text{perimeter of } EFGH} = \frac{2l + 2w}{k(2l + 2w)} = \frac{1}{k}$. So, $\frac{\text{perimeter of } ABCD}{\text{perimeter of } EFGH} = \frac{AB}{EF}$.

46. 2:7.5

4:15

47. $\frac{2}{5} = \frac{x}{28}$

$5x = 56$

$x = 11.2$ in.

48. $\frac{94}{18.8} = \frac{5}{1}$ so

$\frac{5}{1} = \frac{15}{x}$ $\qquad$ $\frac{5}{1} = \frac{32}{y}$

$5x = 15$ $\qquad$ $5y = 32$

$x = 3$ cm $\qquad$ $y = 6.4$ cm

49. a. Figure 1:

$\frac{AB}{6} = \frac{7}{10}$ $\qquad$ $\frac{BC}{3} = \frac{7}{10}$

$10(AB) = 42$ $\qquad$ $10(BC) = 21$

$AB = 4.2$ $\qquad$ $BC = 2.1$

$\frac{CD}{5} = \frac{7}{10}$ $\qquad$ $\frac{DE}{2} = \frac{7}{10}$

$10(CD) = 35$ $\qquad$ $10(DE) = 14$

$CD = 3.5$ $\qquad$ $DE = 1.4$

$\frac{EA}{4} = \frac{7}{10}$

$10(EA) = 28$

$EA = 2.8$

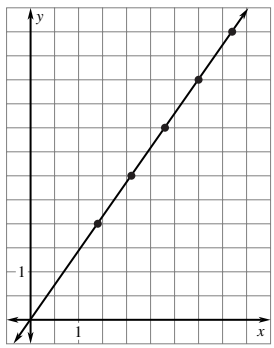
b. $y = mx + b$

$6 = \left(\frac{10}{7}\right)(4.2) + b$

$6 = 6 + b$

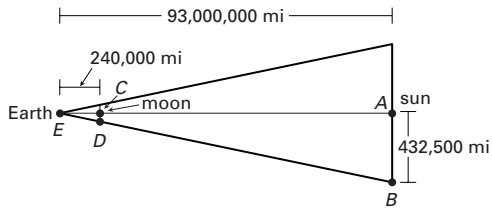
$0 = b$

$y = \frac{10}{7}x$



c. $m = \frac{10}{7}$; it is the reciprocal of the scale factor.

50. *Sample sketch:*



51. Since $\triangle CDE \sim \triangle ABE$, if you are standing at a point on Earth at the vertex of the triangles (E), it would appear that the moon is completely blocking the sun's light.

52. $\frac{AE}{CE} = \frac{AB}{CD}$

$\frac{93{,}000{,}000}{240{,}000} = \frac{432{,}500}{CD}$

$93{,}000{,}000(CD) = 103{,}800{,}000{,}000$

$CD \approx 1120$ miles

8.3 Mixed Review (p. 479)

53. $\frac{8 - 4}{3 - (-1)} = \frac{4}{4} = 1$

54. $\frac{-3 - (-7)}{-6 - 0} = \frac{4}{-6} = -\frac{2}{3}$

55. $\frac{5 - 4}{2 - 9} = -\frac{1}{7}$

56. $\frac{10 - (-3)}{1 - (-2)} = \frac{13}{3}$

57. $\frac{-2 - 5}{2 - (-4)} = -\frac{7}{6}$

58. $\frac{-5 - 6}{5 - (-1)} = -\frac{11}{6}$

59. $x° + 90° + 41° = 180°$

$x + 131 = 180$

$x = 49$

60. $83° + 5x° + (9x - 1)° = 180°$

$14x + 82 = 180$

$14x = 98$

$x = 7$

61. $3x° + 105° + (6x - 6)° = 180°$

$9x + 99 = 180$

$9x = 81$

$x = 9$

62. $\frac{x}{9} = \frac{6}{27}$

$27x = 54$

$x = 2$

63. $\frac{4}{y} = \frac{2}{19}$

$2y = 76$

$y = 38$

64. $\frac{5}{24} = \frac{25}{z}$

$5z = 600$

$z = 120$

65. $\frac{4}{13} = \frac{b}{8}$

$13b = 32$

$b = \frac{32}{13}$

66. $\frac{11}{x+2} = \frac{9}{x}$

$11x = 9(x+2)$

$11x = 9x + 18$

$2x = 18$

$x = 9$

67. $\frac{3x+7}{5} = \frac{4x}{6}$

$6(3x+7) = 20x$

$18x + 42 = 20x$

$42 = 2x$

$x = 21$

Quiz 1 (p. 479)

1. $\frac{p}{15} = \frac{2}{3}$

$3p = 30$

$p = 10$

2. $\frac{5}{7} = \frac{20}{d}$

$5d = 140$

$d = 28$

3. $\frac{4}{2x-6} = \frac{16}{x}$

$4x = 16(2x-6)$

$4x = 32x - 96$

$-28x = -96$

$x = \frac{96}{28} = \frac{24}{7}$

4. $\frac{7}{x} = \frac{x}{63}$

$x^2 = 441$

$x = 21$

5. $\frac{5}{x} = \frac{x}{11}$

$x^2 = 55$

$x = \sqrt{55} \approx 7.42$

6. $\frac{10}{x} = \frac{x}{7}$

$x^2 = 70$

$x = \sqrt{70} \approx 8.37$

7. $\frac{3}{6} = \frac{x+1}{8}$

$24 = 6(x+1)$

$24 = 6x + 6$

$18 = 6x$

$x = 3$

Scale factor $= 3{:}6 = 1{:}2$

Ratio of perimeters $= \frac{1}{2}$

8. $\frac{45}{x} = \frac{x}{20}$

$x^2 = 900$

$x = 30$

Scale factor $= 45{:}30 = 3{:}2$

Ratio of perimeters $= \frac{3}{2}$

9. $\frac{8}{5} \neq \frac{10}{7}$, $\frac{8}{2.25} \neq \frac{10}{3.25}$, $\frac{5}{2.25} \neq \frac{7}{3.25}$

None are exactly similiar, but the 5×7 and wallet sizes are nearly similar $\left(\frac{5}{2.25} \approx 2.22, \frac{7}{3.25} \approx 2.15\right)$.

10. $\frac{8}{10} = \frac{2.5}{x}$

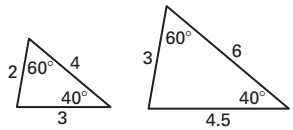
$8x = 25$

$x = 3\frac{1}{8}$ in.

Lesson 8.4

Activity (p. 480)

Sample answer:



The angles are both 80° by the Triangle Sum Thm.; $\frac{3}{2} = \frac{6}{4} = \frac{4.5}{3}$; yes, the triangles are similar.

8.4 Guided Practice (p. 483)

1. $\frac{AB}{XY} = \frac{6}{4} = \frac{3}{2}$

2. *Sample answer:* any two points; $\frac{6-3}{-1-2} = \frac{3}{-3} = -1$

or

$\frac{5-1}{0-4} = \frac{4}{-4} = -1$

3. No; corresponding sides of ~ △ are not ≅ unless the scale factor of the △ is 1:1. Corresponding ∡ are ≅.

4. No; corresponding ∡ are not ≅.

5. Yes; all ∡ are 60° so corresponding ∡ are ≅.

6. $m\angle J = m\angle M = 37°$;

$m\angle N = m\angle K = 90°$;

$m\angle P = m\angle L = 53°$

7. $\frac{8}{4} = \frac{MP}{5}$ $\qquad$ $\frac{8}{4} = \frac{PN}{3}$

$40 = 4(MP)$ $\qquad$ $24 = 4(PN)$

$MP = 10$ $\qquad$ $PN = 6$

8. $\angle C \cong \angle C$ by the Reflexive Prop. of Congruence, so $\triangle ABC \sim \triangle BDC$ by the AA Similarity Postulate.

8.4 Practice and Applications (pp. 483–487)

9. $\angle J$ and $\angle F$, $\angle K$ and $\angle G$, $\angle L$ and $\angle H$;

$\frac{JK}{FG} = \frac{KL}{GH} = \frac{JL}{FH}$

10. $\angle V$ and $\angle S$, $\angle T$ and $\angle T$, $\angle W$ and $\angle U$;

$\frac{VT}{ST} = \frac{TW}{TU} = \frac{VW}{SU}$

11. $\angle L$ and $\angle Q$, $\angle M$ and $\angle P$, $\angle LNM$ and $\angle QNP$;

$\frac{LM}{QP} = \frac{MN}{PN} = \frac{LN}{QN}$

12. $\triangle LMN$

13. LM; MN; NL

14. 15; y

15. 15; x

16. $\frac{y}{12} = \frac{20}{15}$

$15y = 240$

$y = 16$

17. $\frac{18}{x} = \frac{15}{20}$

$15x = 360$

$x = 24$

18. No; $m\angle C = 31°$ and $m\angle D = 47°$ so corresponding $\measuredangle$s are not $\cong$.

19. Yes; $\angle Q \cong \angle VPW$ and $\angle W \cong \angle RPQ$ so the $\triangle$s are $\sim$ by AA Similarity Postulate; $\triangle PQR \sim \triangle WPV$

20. No; $\frac{20}{26} \neq \frac{16}{20}$, so the lengths of corresponding sides are not proportional.

21. Yes; $m\angle Z + 48° + 77° = 180°$

$m\angle Z = 55°$

$\angle X \cong \angle G$ and $\angle Z \cong \angle H$ so the $\triangle$s are $\sim$ by AA Similarity Postulate; $\triangle XYZ \sim \triangle GFH$

22. No; $m\angle E = 94°$, $m\angle B = 94°$, $m\angle A = 54°$, so corresponding $\measuredangle$s are not $\cong$.

23. Yes; $\angle NJM \cong \angle LJK$ by Vertical $\measuredangle$ Thm., $m\angle N = m\angle K = 50°$ so the $\triangle$s are $\sim$ by AA Similarity Postulate; $\triangle JMN \sim \triangle JLK$.

24. Yes; $m\angle A = m\angle E = 50°$ and $m\angle B = m\angle D = 40°$ so the $\triangle$s are $\sim$ by AA Similarity Postulate; $\triangle ABC \sim \triangle EDC$.

25. Yes; $m\angle W = m\angle VYZ$ and $m\angle X = m\angle VZY$ so the $\triangle$s are $\sim$ by AA Similarity Postulate; $\triangle VWX \sim \triangle VYZ$.

26. Yes; $\angle PST \cong \angle TQR$ and $\angle P \cong \angle P$ by the Reflexive Prop. so the $\triangle$s are $\sim$ by AA Similarity Postulate; $\triangle PQR \sim \triangle PST$

27. *Sample answer:*

$\frac{1-3}{-3-(-8)} = -\frac{2}{5}$

$\frac{-3-(-1)}{7-2} = -\frac{2}{5}$

28. *Sample answer:*

$\frac{0-(-1)}{5-2} = \frac{1}{3}$

$\frac{-1-(-2)}{2-(-1)} = \frac{1}{3}$

29. Slope of $\overleftrightarrow{BC} = \frac{0-3}{6-0} = -\frac{1}{2}$

so $-\frac{1}{2} = \frac{5-0}{0-x}$

$-1(-x) = 10$

$x = 10$

$(10, 0)$

30. Slope of $\overleftrightarrow{BC} = \frac{0-4}{3-0} = \frac{-4}{3}$

so $-\frac{4}{3} = \frac{7-0}{0-x}$

$-4(-x) = 21$

$4x = 21$

$x = 5\frac{1}{4}$

$\left(5\frac{1}{4}, 0\right)$

31. Slope of $\overleftrightarrow{BC} = \frac{0-1}{5-0} = -\frac{1}{5}$

so $-\frac{1}{5} = \frac{6-0}{0-x}$

$-1(-x) = 30$

$x = 30$

$(30, 0)$

32. Slope of $\overleftrightarrow{BC} = \frac{0-8}{4-0} = -2$

so $-2 = \frac{9-0}{0-x}$

$-2(-x) = 9$

$2x = 9$

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

$\left(4\frac{1}{2}, 0\right)$

33. CDE

34. CD; CE; DE

35. $\frac{6}{15} = \frac{8}{x}$

36. $\frac{15}{6} = \frac{10}{y}$

37. $\frac{6}{15} = \frac{8}{x}$

$6x = 120$

$x = 20$

38. $\frac{15}{6} = \frac{10}{y}$

$15y = 60$

$y = 4$

39. $\frac{16}{8} = \frac{p}{7}$

$8p = 112$

$p = 14$

40. $\frac{11}{4} = \frac{7}{r}$

$11r = 28$

$r = 2\frac{6}{11}$

41. $\frac{y-3}{32} = \frac{18}{24}$

$24(y-3) = 576$

$24y - 72 = 576$

$24y = 648$

$y = 27$

42. $\frac{4}{5} = \frac{z}{45}$

$180 = 5z$

$z = 36$

43. $35° + 45° + x° = 180°$

$x = 100$

44. $\frac{4}{9} = \frac{6}{s}$

$4s = 54$

$s = 13\frac{1}{2}$

45. $\frac{12}{18} = \frac{8}{x}$

$12x = 144$

$x = 12$

46. $\frac{48}{y} = \frac{36}{y - 20}$

$48(y - 20) = 36y$

$48y - 960 = 36y$

$12y = 960$

$y = 80$

47. $\frac{14}{z - 4} = \frac{18}{27}$

$378 = 18(z - 4)$

$378 = 18z - 72$

$450 = 18z$

$z = 25$

48. Since $\overline{KM} \perp \overline{JL}$ and $\overline{JK} \perp \overline{KL}$, $\angle JMK$ and $\angle JKL$ are right $\triangleleft$. Since all right $\triangleleft$ are $\cong$, $\angle JMK \cong \angle JKL$. By the Reflexive Prop. of Cong. $\angle J \cong \angle J$, so $\triangle JKL \sim \triangle JMK$ by the AA Similarity Post.

49. Since $\angle ECD$ and $\angle EAB$ are both right $\triangleleft$, they are $\cong$. $\angle CED \cong \angle AEB$ by the Reflexive Prop. of Cong, so $\triangle ABE \sim \triangle CDE$ by AA Similarity Postulate

50. True; all right $\triangleleft$ are $\cong$, so the $\triangle$ are $\sim$ by AA Similarity Postulate

51. False; all $\triangleleft$ of any 2 equilateral $\triangle$ are $\cong$, so the $\triangle$ are $\sim$ by AA Similarity Postulate

52. True; since the vertex $\angle$ of each isosceles $\triangle$ has measure 40°, the measure of each base $\angle$ is $\frac{1}{2}(180° - 40°) = 70°$. The $\triangle$ are $\sim$ by AA Similarity Postulate

53. $\frac{2.4}{6 - 2.4} = \frac{1}{d}$

$\frac{2.4}{3.6} = \frac{1}{d}$

$2.4d = 3.6$

$d = 1.5$ m

54. Answers will vary, but the slopes are always equal.

55. $\overline{PQ} \perp \overline{QT}$ and $\overline{SR} \perp \overline{QT}$ so $\angle Q$ and $\angle SRT$ are right angles and $\cong$. $\overline{PR} \parallel \overline{ST}$ so $\angle PRQ \cong \angle T$ by Corresp. $\triangleleft$ Thm. So $\triangle PQR \sim \triangle SRT$ by AA Similarity Post.; therefore $\frac{PQ}{SR} = \frac{QR}{RT}$ so $\frac{PQ}{4} = \frac{780}{6.5}$ and $PQ = 480$ feet.

56. *Sample answer:* Rod = 5 ft, rod shadow = 4 ft, and the building shadow = 25 ft

$\frac{x}{5} = \frac{25}{4}$

$4x = 125$

$x = 31.25$ ft

57. a. $\angle ABX$ and $\angle DCX$ are right $\triangleleft$ and $\angle AXB$ and $\angle DXC$ are $\cong$ by the Vertical Angles Thm., so $\triangle ABX \sim \triangle DCX$ by AA Similarity Postulate

b. $\frac{1}{3} = \frac{x}{3 - x}$

$3x = 3 - x$

$4x = 3$

$x = \frac{3}{4}$ mi

c. $1^2 + (0.75)^2 = (AX)^2$

$1.5625 = (AX)^2$

$AX = 1.25$ mi

$3^2 + (2.25)^2 = (DX)^2$

$14.0625 = (DX)^2$

$DX = 3.75$ mi

$AX + DX = AD$

$AD = 5$ mi

d. *Sample Answer*: If point E is added to the diagram so that $m\angle E = 90°$, $\overline{ED} \parallel \overline{BC}$ and $\overline{BE} \parallel \overline{CD}$, then $BCDE$ is a rectangle, $BE = CD = 3$, $AE = AB + BE = 4$, and $AD = \sqrt{(AE)^2 + (ED)^2} = \sqrt{4^2 + 3^2} = \sqrt{25} = 5$.

58. *Sample answer:* $\frac{d}{25} = \frac{h}{r}$

59. $\frac{10 \text{ m}}{25 \text{ mm}} = \frac{h}{1 \text{ mm}}$

$10 = 25h$

$h = 0.4$ m

60. $\frac{d}{25 \text{ mm}} = \frac{1 \text{ m}}{1 \text{ mm}}$

$d = 25$ m

8.4 Mixed Review (p. 487)

61. $\sqrt{(-21 - 12)^2 + (14 - (-17))^2}$

$\sqrt{1089 + 961} = \sqrt{2050} = 5\sqrt{82}$

62. $\overline{KJ}$

63. $KJ = 2(NP) = 2(23) = 46$

64. N is the midpoint of $\overline{KL}$ so $KL = 32$,

$MP = \frac{1}{2}(KL) = \frac{1}{2}(32) = 16$

65. $MN = \frac{1}{2}(JL) = \frac{1}{2}(24) = 12$

66. $\frac{x}{12} = \frac{3}{8}$

$8x = 36$

$x = \frac{9}{2}$

67. $\frac{3}{y} = \frac{12}{32}$

$12y = 96$

$y = 8$

68. $\frac{17}{x} = \frac{11}{33}$

$561 = 11x$

$x = 51$

69. $\frac{34}{11} = \frac{x + 6}{3}$

$102 = 11(x + 6)$

$102 = 11x + 66$

$36 = 11x$

$x = \frac{36}{11}$

70. $\frac{23}{24} = \frac{x}{72}$

$1656 = 24x$

$x = 69$

71. $\frac{8}{x} = \frac{x}{32}$

$x^2 = 256$

$x = \pm 16$

Lesson 8.5

8.5 Guided Practice (p. 492)

1. $\frac{FH}{RX} = \frac{HG}{XS} = \frac{FG}{RS}$

2. AA Similarity Post.; $\triangle ABC \sim \triangle DEF$

3. SAS Sim. Thm.; $\triangle ABC \sim \triangle DFE$

4. $\triangle JKL$ and $\triangle MNP$ are both $\sim$ to $\triangle ABC$, $\frac{AB}{JK} = \frac{BC}{KL} = \frac{AC}{JL} = \frac{8}{5}$ and $\frac{AB}{MN} = \frac{BC}{NP} = \frac{AC}{MP} = 2$; the $\triangle$s are $\sim$ by the SSS Similarity Thm.

5. $\frac{2}{12} = \frac{5}{30} = \frac{6}{36} = \frac{1}{6}$; all ratios are equal to $\frac{1}{6}$ so the $\triangle$s are $\sim$ by SSS Similarity Thm.

6. $\triangle MNP$ and $\triangle QRS$ are $\sim$ by the SSS Sim. Thm. $\frac{6}{4} = \frac{4.5}{3} = \frac{7.5}{5} = \frac{3}{2}$, so the scale factor is $\frac{3}{2}$.

7. $\triangle DEF$ and $\triangle GHJ$ are $\sim$ by the SSS Sim. Thm. $\frac{8}{20} = \frac{10}{25} = \frac{4}{10} = \frac{2}{5}$, so the scale factor is $\frac{2}{5}$.

8. $\triangle XYZ$ and $\triangle TSU$ are $\sim$ by the SSS Sim. Thm. $\frac{18}{24} = \frac{27}{36} = \frac{33}{44} = \frac{3}{4}$, so the scale factor is $\frac{3}{4}$.

9. Yes; $\frac{35}{10} = \frac{35}{10} = \frac{28}{8} = \frac{7}{2}$, so $\triangle JKL \sim \triangle XYZ$ (or $\triangle XZY$) by SSS Similarity Thm.

10. Yes; $\triangle PMS \sim \triangle RMN$; SAS Similarity Thm.

11. No; $\frac{32}{24} = \frac{20}{15} \neq \frac{18}{14}$

12. Yes; $\frac{6}{8} = \frac{8}{10\frac{2}{3}} = \frac{3}{4}$; $\triangle ABC \sim \triangle LKJ$; SAS Similarity Thm.

13. Yes; $\frac{18}{15} = \frac{30}{25} = \frac{24}{20} = \frac{6}{5}$; $\triangle PQR \sim \triangle DEF$; SSS or SAS Similarity Thm.

14. Yes; $\angle W \cong \angle W$ by reflexive prop, and $\angle XPW \cong \angle YZW$ by Corresp. $\angle$s Post.; $\triangle WXP \sim \triangle WYZ$; AA Similarity Post.

15. $\frac{8}{4} = \frac{16}{8} = \frac{18}{9} = \frac{2}{1}$; SSS Similarity Thm.

16. If $m\angle A = 28°$ and $m\angle B = 62°$ then $m\angle C = 90°$ by Triangle Sum. Thm. Also, $m\angle D = 28°$ and $m\angle F = 90°$ so $m\angle E = 62°$. So $\triangle$s are $\sim$ by the AA Similarity Post.

17. The ratios of the lengths of corresponding sides are the same, $\left(\frac{18}{6} = \frac{24}{8} = \frac{3}{1}\right)$, and the included $\angle$s are $\cong$ so the $\triangle$s are $\sim$ by SAS Similarity Thm.

18. The ratios of the lengths of the given sides are the same (6:1) and the included $\angle$s are $\cong$ so the $\triangle$s are $\sim$ by SAS Similarity Thm.

19. 53° by Alt. Int. $\angle$s Thm. **20.** 45° by Alt. Int. $\angle$s Thm.

21. 82° by Triangle Sum Thm.

22. $\frac{3}{9} = \frac{4}{x}$

$3x = 36$

$x = 12$

23. $\frac{3}{9} = \frac{5}{x}$

$3x = 45$

$x = 15$

24. $\frac{4}{12} = \frac{7}{x}$

$4x = 84$

$x = 21$

25. $\frac{4}{12} = \frac{x}{12\sqrt{2}}$

$48\sqrt{2} = 12x$

$x = 4\sqrt{2}$

26. $\triangle AGC$ and $\triangle EFC$, $\triangle BGC$ and $\triangle DFC$, $\triangle ABC$ and $\triangle EDC$

27. $\frac{10}{15} = \frac{8}{12}$ and included $\angle$s are $\cong$. So $\triangle ABC \sim \triangle BDC$ by SAS Similarity Thm.

$\frac{10}{15} = \frac{12}{p}$

$10p = 180$

$p = 18$

28. $\frac{6}{12} = \frac{4}{8}$ and $\angle E \cong \angle E$ so $\triangle EFG \sim \triangle EJH$ by SAS Similarity Thm.

$\frac{6}{12} = \frac{5}{r}$

$6r = 60$

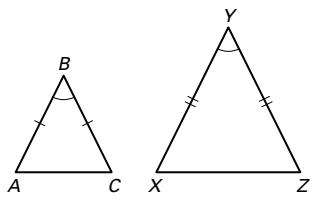
$r = 10$

29. $\frac{5.6}{h} = \frac{4}{100}$

$560 = 4h$

$h = 140$ ft

30. Since $\overline{BA} \cong \overline{BC}$ and $\overline{YX} \cong \overline{YZ}$, $BA = BC$ and $YX = YZ$. Then $\frac{BA}{YX} = \frac{BC}{YZ}$ and, since $\angle B \cong \angle Y$, $\triangle ABC \sim \triangle XYZ$ by SAS Similarity Thm.



31. Locate G on $\overline{AB}$ so that $GB = DE$ and draw $\overline{GH}$ through $G \parallel$ to $\overline{AC}$. Corresp. $\measuredangle A$ and BGH are $\cong$, as are corresp. $\measuredangle C$ and BHG, so $\triangle ABC \sim \triangle GBH$. Then $\frac{AB}{GB} = \frac{AC}{GH}$. But $\frac{AB}{DE} = \frac{AC}{DF}$ and $GB = DE$, so $\frac{AC}{GH} = \frac{AC}{DF}$ and $GH = DF$. By the SAS Cong. Post., $\triangle BGH \cong \triangle EDF$. Corresp. $\measuredangle F$ and BHG are $\cong$, so $\angle F \cong \angle C$ by the Transitive Prop. of Cong. $\triangle ABC \sim \triangle DEF$ by AA Similarity Postulate.

32. $\frac{20}{x + 20} = \frac{25}{125}$

$2500 = 25(x + 20)$

$2500 = 25x + 500$

$2000 = 25x$

$x = 80$ m

33. $\frac{x}{48} = \frac{30}{80}$

$80x = 1440$

$x = 18$ ft

34. $\frac{7}{35} - \frac{5}{x}$

$7x = 175$

$x = 25$ ft

35. Julia and the flagpole are both perpendicular to the ground and the two $\measuredangle$s formed have a shared angle. Then the $\measuredangle$s are $\sim$ by the AA Similarity Postulate

36. $\frac{AC}{70} = \frac{2}{5}$

$5(AC) = 140$

$AC = 28$;

so perimeter of $\triangle ABC = 28 + 20 + 42 = 80$;

The length of $\overline{XY}$ is

$\frac{42}{XY} = \frac{2}{5}$

$2(XY) = 210$

$XY = 105$

B

37. $XY + BC = 105 + 20 = 125$;

$\frac{2}{5} = \frac{20}{YZ}$

$2(YZ) = 100$

$YZ = 50$

$XZ + YZ = 70 + 50 = 120$

A

38. Assume that the posts $\overline{AD}$ and $\overline{BC}$ are perpendicular to the ground, $\overline{DC}$. Then $\overline{AD}, \overline{BC}$, and $\overline{EF}$ are all $\perp$ to $\overline{DC}$ so they are all $\parallel$ to each other. Then $\angle ADC$, $\angle BCD$, $\angle EFD$, and $\angle EFC$ are all right $\measuredangle$s and so are all $\cong$. $\angle DAC \cong \angle FEC$ and $\angle DBC \cong \angle DEF$ by the Corr. $\measuredangle$ Post. So $\triangle ADC \sim \triangle EFC$ and $\triangle BCD \sim \triangle EFD$ by the AA Similarity Post. Then $\frac{EF}{40} = \frac{FC}{DC}$ and $\frac{EF}{30} = \frac{DF}{DC}$ by the definition of similar triangles. Then add equals to equals and solve for EF as follows:

$\frac{EF}{40} + \frac{EF}{30} = \frac{FC}{DC} + \frac{DF}{DC}$	Addition Prop. of Equality
$\frac{EF}{40} + \frac{EF}{30} = \frac{FC + DF}{DC}$	Combine fractions.
$\frac{EF}{40} + \frac{EF}{30} = \frac{DC}{DC}$	Simplify.
$\frac{EF}{40} + \frac{EF}{30} = 1$	Simplify.
$\frac{3 \cdot EF + 4 \cdot EF}{120} = 1$	Combine fractions.
$\frac{7 \cdot EF}{120} = 1$	Simplify.
$7 \cdot EF = 120$	Multiply.
$EF = \frac{120}{7} = 17\frac{1}{7}$	Divide and simplify.

The length of $\overline{EF}$ is $17\frac{1}{7}$ ft.

8.5 Mixed Review (p. 495)

39. $m\angle ABD = m\angle DBC = \frac{1}{2}(m\angle ABC) = \frac{1}{2}(77°) = 38.5°$

40. $m\angle ABD = m\angle DBC = \frac{1}{2}(m\angle ABC) = \frac{1}{2}(36°) = 18°$

41. $m\angle ABD = m\angle DBC = 64°$; $m\angle ABC = 128°$

42. $\angle 12$ **43.** $\angle 10$ **44.** $\angle 7$ **45.** $\angle 5$

46. A reflection in the x-axis changes the sign of the y-coordinate; $(0, -5)$

47. A reflection in the y-axis changes the sign of the x-coordinate; $(2, 7)$

48. A reflection in the y-axis changes the sign of the x-coordinate; $(3, -10)$

49. A reflection in the x-axis changes the sign of the y-coordinate; $(-5, 1)$

Quiz 2 (p. 496)

1. Yes; $m\angle E + 53° + 46° = 180°$

$m\angle E = 81°$;

$m\angle B = 81°$ by Alt. Int. $\measuredangle$ Thm.;

$m\angle ANB = 46°$ by Vert. $\measuredangle$ Thm.;

$m\angle A = 53°$ by Alt. Int $\measuredangle$ Thm.

2. Yes; $m\angle P + 101° + 32° = 180°$

$m\angle P = 47°$;

$m\angle U = 101°$ by Corresp. $\measuredangle$ Post.

$m\angle VSU = 47°$ by Corresp. $\measuredangle$ Post.

$m\angle V + 47° + 101° = 180°$

$m\angle V = 32°$

3. No; $180° - 96° = m\angle J + m\angle H = 84°$;

so $m\angle J = m\angle H = 42°$; $m\angle A = 43°$ and $m\angle P = 94°$ so corresp. $\measuredangle$ are not $\cong$.

4. No; $\frac{4}{3} \neq \frac{7}{6} \neq \frac{8}{7}$

5. Yes; $\frac{3}{6} = \frac{6}{12} = \frac{7}{14}$

6. Yes; $\frac{3}{1} = \frac{6}{2} = \frac{7}{\left(\frac{7}{3}\right)}$

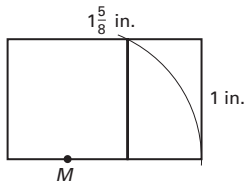
7. $\frac{5}{x} = \frac{7}{14}$

$7x = 70$

$x = 10$ mi

Math & History (p. 496)

Sample answer:



$1{:}1\frac{5}{8}$

1:1.625

or about

1:1.618

Technology Activity

Sample answers:

Investiagte

1. Measurements will vary, but $\frac{BD}{DA} = \frac{BE}{EC}$.

2. The ratios will remain the same.

3. The ratios will remain the same.

Make a Conjecture

4. When a line $\parallel$ to one side of a $\triangle$ intersects the other two sides, it divides them proportionally.

Investiagte

5. Measurements will vary, but $\frac{BR}{BQ} = \frac{RP}{QP}$.

Make a Conjecture

6. The ratios will remain the same.

7. The bisector of an $\angle$ of a $\triangle$ divides the opp. side into 2 segments whose lengths are in the same ratio as the lengths of the other 2 sides of the $\triangle$.

Extension

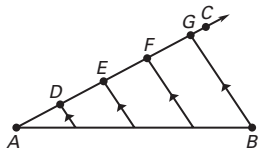
The $\measuredangle$ are $\sim$ if and only if the original $\triangle$ is isosceles. (If so, the resulting $\measuredangle$ are not only $\sim$, they are $\cong$.)

Lesson 8.6

Activity (p. 500)

Sample answer:

1–3.



4. The $\parallel$ lines divide the transversals proportionally.

Since $\frac{AD}{DE} = \frac{DE}{EF} = \frac{EF}{FG} = 1$, then $\frac{AJ}{JK} = \frac{JK}{KL} = \frac{KL}{LB} = 1$ and $AJ = JK = KL = LB$.

8.6 Guided Practice (p. 502)

1. parallel; $\triangle$ Proportionality Converse

2. $\frac{BR}{RC} = \frac{AB}{AC}$

3. True by $\triangle$ Proportionality Thm.

4. True by Corresp. $\measuredangle$ Post., AA Similarity Post., and def. of $\sim$ $\measuredangle$.

5. True by Corresp. $\measuredangle$ Post., AA Similarity Post., and def. of $\sim$ $\measuredangle$.

6. False; statement does not follow from similarity.

7. CE **8.** AD **9.** GE **10.** EA

8.6 Practice and Applications (pp. 502–505)

11. Yes; $\frac{16}{4} = \frac{8}{2}$

12. Yes; $\frac{12.5}{5} = \frac{10}{4}$

13. No; $\frac{34}{15} \neq \frac{35}{16}$

14. Yes; $\frac{12}{9} = \frac{20}{15}$

15. Yes; $\triangle$ Proportionality Converse

16. No; only one angle is given ($\angle N$ is $\cong$ to itself), which is not enough to prove that $\overline{LP} \parallel \overline{MO}$.

17. Yes; Corresp. $\measuredangle$ Converse

18. Yes; Corresp. $\measuredangle$ Converse

19. No; $\overline{MN}$ and $\overline{MQ}$ are sides of $\triangle MNQ$ and $\overline{LP}$ is a side of $\triangle LNP$, but $\overline{LM}$ is not a side of a $\triangle$, so this is not a proportion of lengths of corresponding sides. The proportion does not give enough information to prove $\sim$ $\measuredangle$ or conclude that $\overline{LP} \parallel \overline{MQ}$.

20. Yes; def. of $\sim$ $\measuredangle$ and Corresp. $\measuredangle$ Converse.

21.
$$\frac{9}{a} = \frac{15}{5}$$
$$15a = 45$$
$$a = 3$$

22.
$$\frac{24 - c}{c} = \frac{20}{12}$$
$$12(24 - c) = 20c$$
$$288 - 12c = 20c$$
$$288 = 32c$$
$$c = 9$$

23.
$$\frac{8}{20} = \frac{x}{15}$$
$$20x = 120$$
$$x = 6$$

24.
$$\frac{25 - z}{z} = \frac{8}{12}$$
$$12(25 - z) = 8z$$
$$300 - 12z = 8z$$
$$300 = 20z$$
$$z = 15$$

25.
$$\frac{7}{p} = \frac{12}{24}$$
$$12p = 168$$
$$p = 14$$

26.
$$\frac{21}{17.5} = \frac{33}{q}$$
$$21q = 577.5$$
$$q = 27.5$$

27.
$$\frac{f}{21} = \frac{21}{15}$$
$$15f = 441$$
$$f = 29.4$$

28.
$$\frac{17.5}{1.25q} = \frac{14}{12}$$
$$210 = 17.5q$$
$$q = 12$$

29.
$$\frac{38}{97} = \frac{\text{Lot } A}{122}$$
$$97(\text{Lot } A) = 4636$$
$$\text{Lot } A \approx 47.8 \text{ m};$$
$$\frac{32}{97} = \frac{\text{Lot } B}{122}$$
$$3904 = 97(\text{Lot } B)$$
$$\text{Lot } B \approx 40.2 \text{ m};$$
$$\frac{27}{97} = \frac{\text{Lot } C}{122}$$
$$97(\text{Lot } C) = 3294$$
$$\text{Lot } C \approx 34.0 \text{ m}$$

30. Lot A since it has the longest distance of ocean frontage.

31.

Statements	Reasons
1. $\overline{DE} \parallel \overline{AC}$	**1.** Given
2. $\angle EDB \cong \angle CAB$; $\angle DEB \cong \angle ACB$	**2.** Corresp $\measuredangle$ Post.
3. $\triangle DBE \sim \triangle ABC$	**3.** AA Similarity Post.
4. $\frac{BA}{BD} = \frac{BC}{BE}$	**4.** Def. of $\sim$ $\measuredangle$
5. $\frac{BD + DA}{BD} = \frac{BE + EC}{BE}$	**5.** Segment Addition Post.
6. $\frac{BD}{BD} + \frac{DA}{BD} = \frac{BE}{BE} + \frac{EC}{BE}$	**6.** Addition of fractions
7. $1 + \frac{DA}{BD} = 1 + \frac{EC}{BE}$	**7.** Substit. Prop. of Equality
8. $\frac{DA}{BD} = \frac{EC}{BE}$	**8.** Subtraction Prop. of Equality

32. Draw $\overline{AD}$ intersecting $\overline{BE}$ at X. (Through any 2 points there is exactly 1 line.) By the $\triangle$ Proportionality Thm., since $k_1 \parallel k_2$ and $k_2 \parallel k_3$, $\frac{CB}{BA} = \frac{DX}{XA}$ and $\frac{DX}{XA} = \frac{DE}{EF}$. Then $\frac{CB}{BA} = \frac{DE}{EF}$ by the Transitive property of equality.

33. Draw a line $\parallel$ to $\overline{XW}$ through Z ($\parallel$ Post.) and extend $\overline{XY}$ to intersect the $\parallel$ line at A. ($\overline{XY}$ is not $\parallel$ to $\overline{AZ}$ because it would also have to be $\parallel$ to $\overline{XW}$.) Then $\frac{YW}{WZ} = \frac{XY}{XA}$. Also, corresp. $\measuredangle$ YXW and A are $\cong$, as are alt. int. $\measuredangle$ WXZ and AZX. Since $\angle YXW \cong \angle WXZ$, $\angle A \cong \angle AZX$ by the Transitive prop. of cong. By the Converse of the Base Angles Thm., $\overline{XA} \cong \overline{XZ}$ or $XA = XZ$. Then by the Substit. prop. of equality, $\frac{YW}{WZ} = \frac{XY}{XZ}$.

34. $\frac{AB}{11.9} = \frac{8}{13.6}$ $\qquad$ $\frac{DF}{11.9} = \frac{6}{13.6}$

$13.6(AB) = 95.2$ $\qquad$ $13.6(AB) = 71.4$

$AB = 7$ $\qquad$ $DF = 5.25$

$\frac{GJ}{13.6} = \frac{3.5}{11.9}$ $\qquad$ $\frac{BC}{10.8} = \frac{8}{21.6}$

$11.9(GJ) = 47.6$ $\qquad$ $21.6(BC) = 86.4$

$GJ = 4$ $\qquad$ $BC = 4$

$\frac{FG}{27.6} = \frac{10.8}{21.6}$ $\qquad$ $\frac{HJ}{31.6} = \frac{10.8}{21.6}$

$21.6(FG) = 298.08$ $\qquad$ $21.6(HJ) = 341.28$

$FG = 13.8$ $\qquad$ $HJ = 15.8$

35. $\frac{MT}{5.6} = \frac{27}{18}$ $\qquad$ $\frac{LN}{18} = \frac{12}{27}$

$18(MT) = 151.2$ $\qquad$ $27(LN) = 216$

$MT = 8.4$ $\qquad$ $LN = 8$

$\frac{SN}{12} = \frac{26}{39}$ $\qquad$ $\frac{PR}{18} = \frac{27}{18}$

$39(SN) = 312$ $\qquad$ $18(PR) = 486$

$SN = 8$ $\qquad$ $PR = 27$

$\frac{UR}{14} = \frac{66}{44}$

$44(UR) = 924$

$UR = 21$

36. $\frac{x}{1300} \approx \frac{2800}{2600}$

$2600x \approx 3{,}640{,}000$

$x \approx 1400$ ft

37. $\frac{1120}{x} \approx \frac{2800}{2600}$

$2800x \approx 2{,}912{,}000$

$x \approx 1040$ ft

38. In the diagram for Ex. 31 on page 504, suppose that $\frac{DA}{BD} = \frac{EC}{BE}$. Then $\frac{DA + BD}{BD} = \frac{EC + BE}{BE}$. $\left(\text{If } \frac{a}{b} = \frac{c}{d}, \text{ then } \frac{a+b}{b} = \frac{c+d}{d}\right)$. So, $\frac{BA}{BD} = \frac{BC}{BE}$ by the Segment Addition Post. and the substitution prop. of equality. Since $\angle B \cong \angle B$ by the Reflexive Prop of Cong., $\triangle ABC \sim \triangle DBE$ by the SAS Similarity Thm. Then corresp. $\measuredangle BDE$ and A are $\cong$ and $\overline{DE} \parallel \overline{AC}$ by the Corresponding Angles Converse.

39. a. $\frac{6}{8} = \frac{BE}{20}$

$8(BE) = 120$

$BE = 15$

b. *Sample answers:*

$\frac{BD}{BA} = \frac{BE}{BC}, \frac{BD}{DA} = \frac{BE}{EC}, \frac{BA}{BD} = \frac{AC}{DE}$

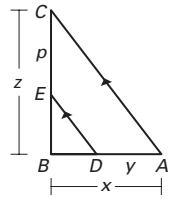
c. $\frac{6}{10} = \frac{CE}{20}$

$10(CE) = 120$

$CE = 12$

d. *Sample answer:* If $2 \parallel$ lines are cut by a transversal, corresp. $\measuredangle$ are $\cong$, so $\angle BDE \cong \angle A$ and $\angle BED \cong \angle C$, then $\triangle ABC \sim \triangle DBE$ by AA Similarity Post.

40. *Sample construction:*



so $\frac{x}{y} = \frac{z}{p}$

8.6 Mixed Review (p. 505)

41. $\sqrt{(5-(-4))^2 + (10-(-6))^2} = \sqrt{9^2 + 16^2} = \sqrt{337}$

42. $\sqrt{(4-(-3))^2 + (-9-7)^2} = \sqrt{7^2 + (-16)^2} = \sqrt{305}$

43. $\sqrt{(-2-(-9))^2 + (6-(-1))^2} = \sqrt{7^2 + 7^2} = \sqrt{98} = 7\sqrt{2}$

44. $\sqrt{(2-11)^2 + (-5-0)^2} = \sqrt{(-9)^2 + (-5)^2} = \sqrt{106}$

45. $\sqrt{(7-(-10))^2 + (4-0)^2} = \sqrt{17^2 + 4^2} = \sqrt{305}$

46. $\sqrt{(4-(-5))^2 + (0-8)^2} = \sqrt{9^2 + (-8)^2} = \sqrt{145}$

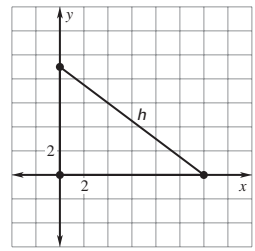
47. *Sample answer:*

$12^2 + 9^2 = h^2$

$225 = h^2$

$h = \sqrt{225}$

$h = 15$

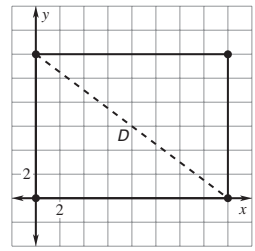


48. *Sample answer:*

$16^2 + 12^2 = D^2$

$400 = D^2$

$D = 20$

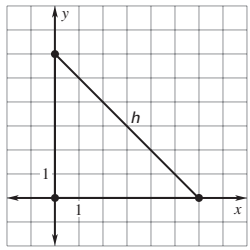


49. *Sample answer:*

$6^2 + 6^2 = h^2$

$72 = h^2$

$h = 6\sqrt{2}$

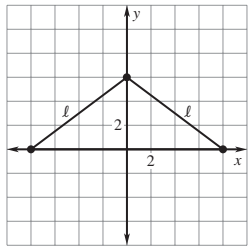


50. *Sample answer:*

$8^2 + 6^2 = \ell^2$

$100 = \ell^2$

$\ell = 10$



51. reflection **52.** glide reflection **53.** rotation

Lesson 8.7

8.7 Guided Practice (p. 509)

1. similar

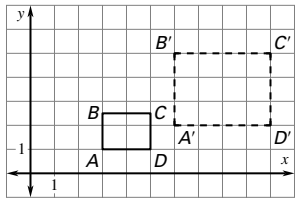
2. She found $\frac{CP}{CP'}$, rather than $\frac{CP'}{CP}$.

3. Enlargement; the scale factor is $\frac{4}{2} = \frac{2}{1} = 2$ which is > 1.

4. similar

5. larger; enlargement (since $k > 1$)

6.



7. yes; *Sample answer:* A preimage and its image after a dilation are ~.

8.7 Practice and Applications (pp. 509–512)

8. Reduction; the dilation has center C and a scale factor of $\frac{6}{14} = \frac{3}{7}$.

9. Enlargement; the dilation has center C and scale factor of $\frac{24}{9} = \frac{8}{3}$.

10. Enlargement; the dilation has center C and scale factor of $\frac{28}{14} = \frac{2}{1}$.

$\frac{2}{1} = \frac{16}{x}$ $\qquad$ $\frac{2}{1} = \frac{32}{y}$

$2x = 16$ $\qquad$ $2y = 32$

$x = 8$ $\qquad$ $y = 16$

11. Reduction; the dilation has center C and a scale factor of $\frac{10}{25} = \frac{2}{5}$.

$\frac{2}{5} = \frac{8}{x}$

$2x = 40$

$x = 20;\ y = 20;\ z = 25$

12. $J(-5, 3) \rightarrow J' = \frac{1}{2}(-5, 3) = \left(-2\frac{1}{2}, 1\frac{1}{2}\right)$

$K(2, 3) \rightarrow K' = \frac{1}{2}(2, 3) = \left(1, 1\frac{1}{2}\right)$

$L(2, -3) \rightarrow L' = \frac{1}{2}(2, -3) = \left(1, -1\frac{1}{2}\right)$

$M(-5, -3) \rightarrow M' = \frac{1}{2}(-5, -3) = \left(-2\frac{1}{2}, -1\frac{1}{2}\right)$

13. $P(3, 5) \rightarrow P' = 2(3, 5) = (6, 10)$

$Q(4, 0) \rightarrow Q' = 2(4, 0) = (8, 0)$

$R(1, 1) \rightarrow R' = 2(1, 1) = (2, 2)$

14. $D(-5, 4) \rightarrow D' = \frac{1}{3}(-5, 4) = \left(-\frac{5}{3}, \frac{4}{3}\right)$

$E(3, 2) \rightarrow E' = \frac{1}{3}(3, 2) = \left(1, \frac{2}{3}\right)$

$F(5, -3) \rightarrow F' = \frac{1}{3}(5, -3) = \left(\frac{5}{3}, -1\right)$

$G(-3, -4) \rightarrow G' = \frac{1}{3}(-3, -4) = \left(-1, -\frac{4}{3}\right)$

15. $S(-5, 2) \rightarrow S' = 4(-5, 2) = (-20, 8)$

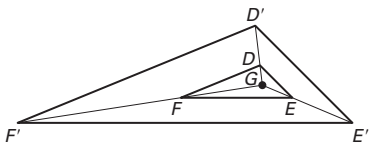
$T(-3, 4) \rightarrow T' = 4(-3, 4) = (-12, 16)$

$U(-1, 1) \rightarrow U' = 4(-1, 1) = (-4, 4)$

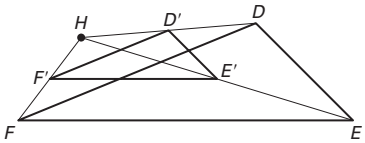
$V(-3, -1) \rightarrow V' = 4(-3, -1) = (-12, -4)$

16. 2; G; 2:1; same as the scale factor

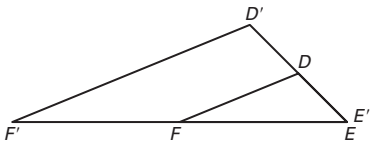
17.



18.



19.



20. $\frac{15}{9} = \frac{r}{12}$; $\frac{15}{9} = \frac{30}{t}$; 65:39

$180 = 9r$ $\qquad$ $15t = 270$ $\qquad$ 5:3

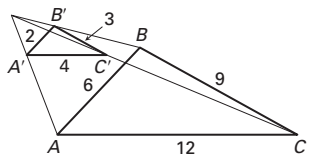
$20 = r$ $\qquad$ $t = 18$

21. $\frac{x}{9.6} = \frac{9}{12}$; $\frac{y}{8.4} = \frac{9}{12}$ $\qquad$ 30:22.5

$12x = 86.4$ $\qquad$ $12y = 75.6$ $\qquad$ 4:3

$x = 7.2$ $\qquad$ $y = 6.3$

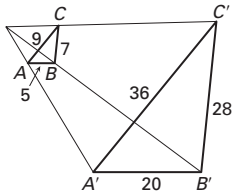
22. *Sample answer:*



reduction; $k = \frac{2}{6} = \frac{1}{3}$; $\frac{1}{3} = \frac{B'C'}{9}$; $\frac{1}{3} = \frac{A'C'}{12}$

$B'C' = 3$ $A'C' = 4$

23.



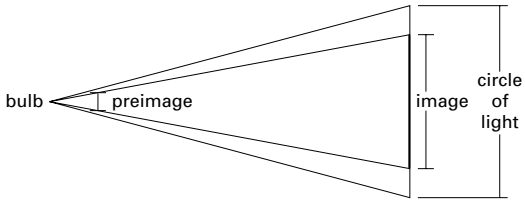
enlargement; $k = \frac{20}{5} = \frac{4}{1}$;

$\frac{4}{1} = \frac{36}{AC}$; $\frac{4}{1} = \frac{B'C'}{7}$

$4(AC) = 36$ $B'C' = 28$

$AC = 9$

24.



25. $\frac{2.7}{8.3} = \frac{3}{D}$

$2.7D = 24.9$

$D \approx 9.2$ cm

26. $\frac{2.7}{8.3} = \frac{2}{I}$

$2.7I = 16.6$

$I \approx 6.1$ cm

27. 7:1

28. $\frac{1.25}{x} = \frac{1}{7}$

$x = 8.75$ in.

29. $\frac{1.2}{7.2} = \frac{0.8}{x}$

$1.2x = 5.76$

$x = 4.8$ in.

30. $\frac{x}{14} = \frac{2}{12}$

$12x = 28$

$x \approx 2.33$ cm

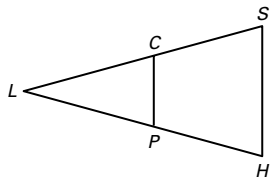
31. $\frac{2}{10} = \frac{x}{8.5}$

$10x = 17$

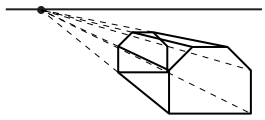
$x = 1.7$ in.

32. The $\triangle$ are $\cong$. All 3 $\triangle$ are $\sim$ to $\triangle PQR$, so all the corresp. $\angle$ are $\cong$. The scale factor of each dilation is 2, so each side of every image $\triangle$ is twice as long as the corresp. side of $\triangle PQR$. Then the corresp. sides of the 3 $\triangle$ are $\cong$ and the 3 $\triangle$ are $\cong$ by the def. of $\cong$ $\triangle$.

33. *Sample answer:*



I would show the student this figure and explain that L represents the light source, CP the height of the puppet, and SH the height of the image. I would tell the student that a dilation transforms a figure in such a way that the original figure (or *preimage*) and the figure after the dilation (the *image*) are similar. In the figure, the center of the dilation is L and the scale factor is the ratio of LS to LC.

34. *Sample answer:* 

35. $k = \frac{2}{6} = \frac{1}{3}$; since $k < 1$ this is a reduction. C

36. $\frac{2}{6} = 0.33\frac{1}{3}$ or $33\frac{1}{3}\%$ D

37. *Sample answer:* Let $\triangle ABC$ have sides 4, 6, 8 and let $k = 2$. Then $\triangle A'B'C'$ would have sides of 2, 3, 4. The second dilation would make $\triangle A'B'C'$ twice as large so $\triangle A''B''C''$ would have sides 4, 6, and 8. Therefore the new image is the original figure.

8.7 Mixed Review (p. 513)

38.
$5^2 + 12^2 = c^2$
$25 + 144 = c^2$
$169 = c^2$
$c = 13$

39.
$8^2 + b^2 = \left(2\sqrt{65}\right)^2$
$64 + b^2 = 260$
$b^2 = 196$
$b = 14$

40.
$a^2 + 2^2 = \left(5\sqrt{5}\right)^2$
$a^2 + 4 = 125$
$a^2 = 121$
$a = 11$

41.
$a^2 + 1^2 = \left(\sqrt{50}\right)^2$
$a^2 + 1 = 50$
$a^2 = 49$
$a = 7$

42.
$\frac{11}{x} = \frac{x}{44}$
$x^2 = 484$
$x = 22$

43. Yes; *Sample answer:* $\angle C \cong \angle L$ and $\frac{CA}{LJ} = \frac{CB}{LK}$ so the $\triangle$ are $\sim$ by the SAS Similarity Thm.

44. Yes; *Sample answer:* $\angle P \cong \angle T$ and $\angle R \cong \angle S$ by the Alt. Int $\measuredangle$ Thm; so the $\triangle$ are $\sim$ by AA Similarity Post.

Quiz 3 (p. 513)

1. BD **2.** CE **3.** AF **4.** FA

5. Enlargement; the dilation has center C and scale factor
$k = \frac{5 + 5}{5} = \frac{10}{5} = 2.$

6. Reduction; the dilation has center C and scale factor
$k = \frac{21}{21 + 42} = \frac{21}{63} = \frac{1}{3}.$

7. reduction; larger

8. $k = \frac{18}{8} = \frac{9}{4}$

Technology Activity (p. 514)

Investigate

1. $\frac{2}{1}$; the ratio is the reciprocal of the scale factor of the dilation.

2. $\frac{2}{1}$; the ratio is the reciprocal of the scale factor of the dilation.

3. no **4.** $A'B'C'D'E'$ is inside $ABCDE$. **5.** $\frac{4}{1}$

Conjecture

6. If the scale factor of a dilation is a:b, then the ratio of the area of a polygon to the area of its image after a dilation is a^2:b^2.

Extension

7. xy or yx. *Sample answer:* Let $\overline{AB}$ be a side of a polygon, $\overline{A'B'}$ its image after the first dilation, and $\overline{A''B''}$ its image after the second. Since the first image is $\sim$ to the pre-image and the second is $\sim$ to the first, the transitive properties of $\cong$ and equality can be used to show the second image is $\sim$ to the pre-image. Then $\frac{AB}{A'B'} = \frac{1}{x}$ so $A'B' = x \cdot AB$. Also $A''B'' = y \cdot A'B' = y \cdot x \cdot AB$. Therefore, the scale factor of the dilation that maps the original polygon to the final one is yx.

Chapter 8 Review *(pp. 516–518)*

1.
$\frac{3}{x} = \frac{2}{7}$
$21 = 2x$
$x = \frac{21}{2}$

2.
$\frac{a + 1}{5} = \frac{2a}{9}$
$9(a + 1) = 10a$
$9a + 9 = 10a$
$a = 9$

3.
$\frac{2}{x + 1} = \frac{4}{x + 6}$
$2(x + 6) = 4(x + 1)$
$2x + 12 = 4x + 4$
$-2x = -8$
$x = 4$

4.
$\frac{d - 4}{d} = \frac{3}{7}$
$7(d - 4) = 3d$
$7d - 28 = 3d$
$4d = 28$
$d = 7$

5.
$\frac{1}{3} = \frac{13}{x}$
$x = 39$ in.

6.
$\frac{3}{1000} = \frac{12}{x}$
$3x = 12{,}000$
$x = 4000$ oz
$4000 \text{ oz} \left(\frac{1 \text{ lb}}{16 \text{ oz}}\right) = 250 \text{ lb}$

7.
$\frac{30}{18} = \frac{5}{3}$

8.
$\frac{5}{3} = \frac{x}{27}$
$3x = 135$
$x = 45$

$m\angle F + 67° = 180°$
$m\angle F = 113°$

9. $\frac{HJKL}{DEFG} = \frac{2(18) + 2(27)}{2(45) + 2(30)} = \frac{90}{150} = \frac{3}{5}$

10. Yes; $m\angle S = 180° - (104° + 48°) = 28°$, so $\angle S \cong \angle V$ and the $\triangle$ are $\sim$ by the AA Similarity Post; $\triangle STU \sim \triangle VWX$

11. No; $m\angle G = 180° - (38° + 75°) = 67°$ and $m\angle J = 180° - (64° + 75°) = 41°$; therefore corresp. $\measuredangle$ are not $\cong$.

12. Yes; vertical $\measuredangle$ PQN and SRQ are $\cong$ and so are $\measuredangle$ N and R. The $\triangle$ are $\sim$ by the AA Similarity Post.; $\triangle PQN \sim \triangle SRQ$.

13. No; $\frac{21}{14} = \frac{39}{26} \neq \frac{42}{27}$

14. Yes; $\frac{25}{20} = \frac{37.5}{30}$ and vertical $\measuredangle$ are $\cong$, so the $\triangle$ are $\sim$ by the SAS Similarity Thm.

15. $\frac{12}{24} = \frac{11}{x}$

$12x = 264$

$x = 22$

16. $\frac{15}{y} = \frac{10}{7}$

$10y = 105$

$y = 10.5$

17. $\frac{35}{24} = \frac{40 - h}{h}$

$35h = 24(40 - h)$

$35h = 960 - 24h$

$59h = 960$

$h = 16\frac{16}{59}$

18. Reduction; $k = \frac{24}{42} = \frac{4}{7}$;

$\frac{4}{7} = \frac{10}{b}$

$4b = 70$

$b = 17.5$

Chapter 8 Test *(p. 519)*

1. $\frac{x}{3} = \frac{12}{9}$

$9x = 36$

$x = 4$

2. $\frac{18}{y} = \frac{15}{20}$

$15y = 360$

$y = 24$

3. $\frac{11}{110} = \frac{z}{10}$

$110z = 110$

$z = 1$

4. 2

5. $3 + y$

36. $\frac{2.8}{3.2} = \frac{1.4}{EF}$

$2.8(EF) = 4.48$

$EF = 1.6$

7. $\frac{2.8}{3.2} = \frac{4.2}{FG}$

$2.8(FG) = 13.44$

$FG = 4.8$

8. No; $\frac{1.5}{2.25} \neq \frac{1.4}{4.2}$

9. $\angle RSQ \cong \angle RQT$ since all right $\measuredangle$ are $\cong$. Since $\angle R \cong \angle R$ by the Reflexive prop. of cong., $\triangle RSQ \sim \triangle RQT$ by the AA Similarity Post.

10. $\frac{15}{25} = \frac{3}{5}$

11. Yes; *Sample answer:* Since $\angle RSQ$ is a right $\angle$, $\angle QST$ is also a right $\angle$. Also, since $\triangle RSQ \sim \triangle RQT$, corresp. $\measuredangle$ RQS and T are $\cong$. Then $\triangle RSQ \sim \triangle QST$ by the AA Similarity Post.

12. $\frac{3}{5} = \frac{x}{20}$

$5x = 60$

$x = 12$

13. Yes; $\triangle$ Proportionality Converse

14. Yes; Corresponding $\measuredangle$ Converse

15. Yes; *Sample answer:* $\triangle LHM \sim \triangle JHK$ by SAS Similarity Thm., def. of $\sim$ $\triangle$, and Corres. $\measuredangle$ Converse.

16. $k = \frac{6}{24} = \frac{1}{4}$ $\quad \frac{1}{4} = \frac{S'T'}{12}$ $\quad \frac{1}{4} = \frac{R'T'}{20}$

$4(S'T') = 12$ $\quad 4(R'T') = 20$

$S'T' = 3$ $\quad R'T' = 5$

17. No; $\frac{7}{8} \neq \frac{14}{18}$

18. $k = \frac{9 \text{ in.}}{3 \text{ ft}} = \frac{9 \text{ in.}}{36 \text{ in.}} = \frac{1}{4}$

Chapter 8 Standardized Test *(pp. 520–521)*

1. B **2.** $\frac{20 \text{ ft}}{5 \text{ yd}} = \frac{20 \text{ ft}}{15 \text{ ft}} = \frac{4}{3}$ D

3. $2(2x + 7x) = 54$

$2(9x) = 54$

$18x = 54$

$x = 3$

$2x = 2(3) = 6$

$7x = 7(3) = 21$

C

4. $\frac{16}{x} = \frac{x}{256}$

$x^2 = 4096$

$x = 64$

B

5. $x° + 74° = 180°$; $\frac{12}{18} = \frac{7}{y + 3}$

$x = 106$ $\quad 12(y + 3) = 126$

$12y + 36 = 126$

$12y = 90$

$y = \frac{15}{2}$

E

6. B; $\overline{PR}$ and $\overline{TU}$ are not corresponding sides.

7. 12 to 4

3 to 1

A

8. $\frac{7}{8} = \frac{35}{AC}$

$7(AC) = 280$

$AC = 40$; so $AB = 35$, $BC = 30$ and perimeter $= 105$

E

9. $\frac{16}{3} = \frac{18}{x}$

$16x = 54$

$x = \frac{54}{16} = \frac{27}{8}$

B

10. $\frac{25}{15} = \frac{CD}{12}$

$15(CD) = 300$

$CD = 20$

C

11. $AB = 3$; $A'B' = 1$; the dilation is a reduction, so the perimeter of the pre-image is greater.

A

12. $k = \frac{A'B'}{AB} = \frac{1}{3}$

C

13. $\frac{8}{20} = \frac{2}{5}$ **14.** $\frac{3}{9} = \frac{1}{3}$ **15.** $12{,}560 \times 0.05 = 628$ cars

16. $800 \times 0.13 = 104$ cars

17. The colors are given in percents, which stay the same regardless of the number of cars manufactured.

18. **a.** 7.5

b. $\frac{7.5}{18} = \frac{14}{BC}$

$7.5(BC) = 252$

$BC = 33.6$

c. $\frac{EF}{30} = \frac{7.5}{18}$

$18(EF) = 225$

$EF = 12.5$

d. $m\angle DGF = m\angle DCB = 84°$

19. $\frac{18}{7.5} = \frac{36}{15} = \frac{12}{5}$

20. $\frac{7}{DC} = \frac{7.5}{18}$

$7.5(DC) = 126$

$DC = 16.8$

perimeter of $ABCD = 30 + 33.6 + 16.8 + 18$

$= 98.4$

perimeter of $EFGD = 14 + 7 + 7.5 + 12.5$

$= 41$

21. $\frac{98.4}{41} = \frac{12}{5}$

Algebra Review *(pp. 522–523)*

1. $\sqrt{121} = 11$

2. $\sqrt{52} = \sqrt{4} \cdot \sqrt{13} = 2\sqrt{13}$

3. $\sqrt{45} = \sqrt{9} \cdot \sqrt{5} = 3\sqrt{5}$

4. $\sqrt{72} = \sqrt{36} \cdot \sqrt{2} = 6\sqrt{2}$

5. $\sqrt{40} = \sqrt{4} \cdot \sqrt{10} = 2\sqrt{10}$

6. $\sqrt{27} = \sqrt{9} \cdot \sqrt{3} = 3\sqrt{3}$

7. $\sqrt{80} = \sqrt{16} \cdot \sqrt{5} = 4\sqrt{5}$

8. $\sqrt{50} = \sqrt{25} \cdot \sqrt{2} = 5\sqrt{2}$

9. $\sqrt{243} = \sqrt{81} \cdot \sqrt{3} = 9\sqrt{3}$

10. $\sqrt{288} = \sqrt{144} \cdot \sqrt{2} = 12\sqrt{2}$

11. $\sqrt{320} = \sqrt{64} \cdot \sqrt{5} = 8\sqrt{5}$

12. $\sqrt{225} = 15$

13. $\sqrt{75} + \sqrt{3} = \sqrt{25} \cdot \sqrt{3} + \sqrt{3} = 5\sqrt{3} + \sqrt{3} = 6\sqrt{3}$

14. $\sqrt{50} - \sqrt{18} = \sqrt{25} \cdot \sqrt{2} - \sqrt{9} \cdot \sqrt{2}$
$= 5\sqrt{2} - 3\sqrt{2}$
$= 2\sqrt{2}$

15. $\sqrt{64} - \sqrt{28} = 8 - \sqrt{7} \cdot \sqrt{4} = 8 - 2\sqrt{7}$

16. $\sqrt{44} + 2\sqrt{11} = \sqrt{4} \cdot \sqrt{11} + 2\sqrt{11}$
$= 2\sqrt{11} + 2\sqrt{11}$
$= 4\sqrt{11}$

17. $\sqrt{125} - \sqrt{80} = \sqrt{25} \cdot \sqrt{5} - \sqrt{16} \cdot \sqrt{5}$
$= 5\sqrt{5} - 4\sqrt{5}$
$= \sqrt{5}$

18. $\sqrt{242} + \sqrt{200} = \sqrt{121} \cdot \sqrt{2} + \sqrt{100} \cdot \sqrt{2}$
$= 11\sqrt{2} + 10\sqrt{2}$
$= 21\sqrt{2}$

19. $-\sqrt{147} - \sqrt{243} = -\sqrt{49} \cdot \sqrt{3} - \sqrt{81} \cdot \sqrt{3}$
$= -7\sqrt{3} - 9\sqrt{3}$
$= -16\sqrt{3}$

20. $\sqrt{28} + \sqrt{63} = \sqrt{4} \cdot \sqrt{7} + \sqrt{9} \cdot \sqrt{7}$
$= 2\sqrt{7} + 3\sqrt{7}$
$= 5\sqrt{7}$

21. $\sqrt{20} + \sqrt{45} - \sqrt{5} = \sqrt{4} \cdot \sqrt{5} + \sqrt{9} \cdot \sqrt{5} - \sqrt{5}$
$= 2\sqrt{5} + 3\sqrt{5} - \sqrt{5}$
$= 4\sqrt{5}$

22. $\left(\sqrt{13}\right)\left(\sqrt{26}\right) = \sqrt{338} = \sqrt{169} \cdot \sqrt{2} = 13\sqrt{2}$

23. $\left(3\sqrt{14}\right)\left(\sqrt{35}\right) = 3\sqrt{490}$
$= 3 \cdot \sqrt{49} \cdot \sqrt{10}$
$= 3 \cdot 7 \cdot \sqrt{10}$
$= 21\sqrt{10}$

24. $\left(\sqrt{363}\right)\left(\sqrt{300}\right) = \left(\sqrt{121} \cdot \sqrt{3}\right)\left(\sqrt{100} \cdot \sqrt{3}\right)$
$= \left(11\sqrt{3}\right)\left(10\sqrt{3}\right)$
$= 110 \cdot 3$
$= 330$

25. $\left(6\sqrt{2}\right)\left(2\sqrt{2}\right) = 12 \cdot 2 = 24$

26. $\left(\sqrt{18}\right)\left(\sqrt{72}\right) = \left(\sqrt{9} \cdot \sqrt{2}\right)\left(\sqrt{36} \cdot \sqrt{2}\right)$
$= \left(3\sqrt{2}\right)\left(6\sqrt{2}\right)$
$= 18 \cdot 2 = 36$

27. $\left(\sqrt{21}\right)\left(\sqrt{24}\right) = \sqrt{504} = \sqrt{36} \cdot \sqrt{14} = 6\sqrt{14}$

28. $\left(\sqrt{32}\right)\left(\sqrt{2}\right) = \sqrt{64} = 8$

29. $\left(\sqrt{98}\right)\left(\sqrt{128}\right) = \left(\sqrt{49} \cdot \sqrt{2}\right)\left(\sqrt{64} \cdot \sqrt{2}\right)$
$= \left(7\sqrt{2}\right)\left(8\sqrt{2}\right)$
$= 56 \cdot 2$
$= 112$

30. $\left(5\sqrt{4}\right)\left(2\sqrt{4}\right) = 10 \cdot 4 = 40$

31. $\left(6\sqrt{5}\right)^2 = 6^2\sqrt{5^2} = 36 \cdot 5 = 180$

32. $\left(4\sqrt{2}\right)^2 = 4^2\sqrt{2^2} = 16 \cdot 2 = 32$

33. $\left(8\sqrt{3}\right)^2 = 8^2\sqrt{3^2} = 64 \cdot 3 = 192$

34. $\left(2\sqrt{3}\right)^2 = 2^2\sqrt{3^2} = 4 \cdot 3 = 12$

35. $\left(5\sqrt{5}\right)^2 = 5^2\sqrt{5^2} = 25 \cdot 5 = 125$

36. $\left(10\sqrt{11}\right)^2 = 10^2\sqrt{11^2} = 100 \cdot 11 = 1100$

37. $\dfrac{4}{\sqrt{3}} = \dfrac{4\sqrt{3}}{\sqrt{3} \cdot \sqrt{3}} = \dfrac{4\sqrt{3}}{3}$

38. $\dfrac{5}{\sqrt{7}} = \dfrac{5\sqrt{7}}{\sqrt{7} \cdot \sqrt{7}} = \dfrac{5\sqrt{7}}{7}$

39. $\dfrac{2\sqrt{3}}{\sqrt{6}} = \dfrac{2\sqrt{3} \cdot \sqrt{6}}{\sqrt{6} \cdot \sqrt{6}} = \dfrac{2\sqrt{18}}{6} = \dfrac{\sqrt{9} \cdot \sqrt{2}}{3} = \dfrac{3\sqrt{2}}{3} = \sqrt{2}$

40. $\frac{2\sqrt{3}}{\sqrt{5}} = \frac{2\sqrt{3} \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}} = \frac{2\sqrt{15}}{5}$

41. $\frac{\sqrt{18}}{3\sqrt{2}} = \frac{\sqrt{18} \cdot \sqrt{2}}{3\sqrt{2} \cdot \sqrt{2}} = \frac{\sqrt{36}}{3 \cdot 2} = \frac{6}{6} = 1$

42. $\frac{4}{\sqrt{8}} = \frac{4\sqrt{8}}{\sqrt{8} \cdot \sqrt{8}} = \frac{4\sqrt{8}}{8} = \frac{\sqrt{8}}{2} = \frac{\sqrt{4} \cdot \sqrt{2}}{2} = \frac{2\sqrt{2}}{2} = \sqrt{2}$

43. $\frac{16}{\sqrt{24}} = \frac{16\sqrt{24}}{\sqrt{24} \cdot \sqrt{24}} = \frac{16\sqrt{24}}{24} = \frac{2\sqrt{4} \cdot \sqrt{6}}{3} = \frac{2 \cdot 2 \cdot \sqrt{6}}{3} = \frac{4\sqrt{6}}{3}$

44. $\frac{\sqrt{5}}{\sqrt{10}} = \frac{\sqrt{5} \cdot \sqrt{10}}{\sqrt{10} \cdot \sqrt{10}} = \frac{\sqrt{50}}{10} = \frac{\sqrt{25} \cdot \sqrt{2}}{10} = \frac{5\sqrt{2}}{10} = \frac{\sqrt{2}}{2}$

45. $\frac{4}{\sqrt{12}} = \frac{4\sqrt{12}}{\sqrt{12} \cdot \sqrt{12}} = \frac{4\sqrt{12}}{12} = \frac{\sqrt{4} \cdot \sqrt{3}}{3} = \frac{2\sqrt{3}}{3}$

46. $\frac{3\sqrt{5}}{\sqrt{20}} = \frac{3\sqrt{5} \cdot \sqrt{20}}{\sqrt{20} \cdot \sqrt{20}} = \frac{3\sqrt{100}}{20} = \frac{30}{20} = \frac{3}{2}$

47. $\frac{9}{\sqrt{52}} = \frac{9\sqrt{52}}{\sqrt{52} \cdot \sqrt{52}} = \frac{9\sqrt{4} \cdot \sqrt{13}}{52} = \frac{18\sqrt{13}}{52} = \frac{9\sqrt{13}}{26}$

48. $\frac{\sqrt{12}}{\sqrt{24}} = \frac{\sqrt{12} \cdot \sqrt{24}}{\sqrt{24} \cdot \sqrt{24}} = \frac{\sqrt{12} \cdot \sqrt{12} \cdot \sqrt{2}}{24} = \frac{12\sqrt{2}}{24} = \frac{\sqrt{2}}{2}$

49. $\frac{\sqrt{18}}{\sqrt{10}} = \frac{\sqrt{18} \cdot \sqrt{10}}{\sqrt{10} \cdot \sqrt{10}} = \frac{\sqrt{180}}{10} = \frac{\sqrt{36} \cdot \sqrt{5}}{10} = \frac{6\sqrt{5}}{10} = \frac{3\sqrt{5}}{5}$

50. $\frac{\sqrt{32}}{\sqrt{5}} = \frac{\sqrt{32} \cdot \sqrt{5}}{\sqrt{5} \cdot \sqrt{5}} = \frac{\sqrt{160}}{5} = \frac{\sqrt{16} \cdot \sqrt{10}}{5} = \frac{4\sqrt{10}}{5}$

51. $\frac{\sqrt{27}}{\sqrt{45}} = \frac{\sqrt{27} \cdot \sqrt{45}}{\sqrt{45} \cdot \sqrt{45}} = \frac{\sqrt{1215}}{45} = \frac{\sqrt{81} \cdot \sqrt{15}}{45} = \frac{9\sqrt{15}}{45} = \frac{\sqrt{15}}{5}$

52. $\frac{\sqrt{50}}{\sqrt{75}} = \frac{\sqrt{50} \cdot \sqrt{75}}{\sqrt{75} \cdot \sqrt{75}} = \frac{\sqrt{3750}}{75} = \frac{\sqrt{625} \cdot \sqrt{6}}{75} = \frac{25\sqrt{6}}{75} = \frac{\sqrt{6}}{3}$

53. $x^2 = 9$

$x = \pm 3$

54. $x^2 = 625$

$x = \pm 25$

55. $x^2 = 289$

$x = \pm 17$

56. $x^2 + 3 = 13$

$x^2 = 10$

$x = \pm\sqrt{10}$

57. $x^2 - 4 = 12$

$x^2 = 16$

$x = \pm 4$

58. $x^2 - 7 = 6$

$x^2 = 13$

$x = \pm\sqrt{13}$

59. $7x^2 = 252$

$x^2 = 36$

$x = \pm 6$

60. $3x^2 = 192$

$x^2 = 64$

$x = \pm 8$

61. $6x^2 = 294$

$x^2 = 49$

$x = \pm 7$

62. $4x^2 + 5 = 45$

$4x^2 = 40$

$x^2 = 10$

$x = \pm\sqrt{10}$

63. $2x^2 + 5 = 23$

$2x^2 = 18$

$x^2 = 9$

$x = \pm 3$

64. $9x^2 + 7 = 52$

$9x^2 = 45$

$x^2 = 5$

$x = \pm\sqrt{5}$

65. $11x^2 + 4 = 48$

$11x^2 = 44$

$x^2 = 4$

$x = \pm 2$

66. $6x^2 - 3 = 9$

$6x^2 = 12$

$x^2 = 2$

$x = \pm\sqrt{2}$

67. $10x^2 - 16 = -6$

$10x^2 = 10$

$x^2 = 1$

$x = \pm 1$

68. $5x^2 - 6 = 29$

$5x^2 = 35$

$x^2 = 7$

$x = \pm\sqrt{7}$

69. $8x^2 - 12 = 36$

$8x^2 = 48$

$x^2 = 6$

$x = \pm\sqrt{6}$

70. $5x^2 - 61 = 64$

$5x^2 = 125$

$x^2 = 25$

$x = \pm 5$

71. $x^2 + 3^2 = 5^2$

$x^2 + 9 = 25$

$x^2 = 16$

$x = \pm 4$

72. $7^2 + x^2 = 25^2$

$49 + x^2 = 625$

$x^2 = 576$

$x = \pm 24$

73. $5^2 + 12^2 = x^2$

$25 + 144 = x^2$

$169 = x^2$

$x = \pm 13$