

## Section 4. Proportions

### Section 4. Practice Exercises

1. proportion

$$3. \frac{3 \text{ teachers}}{45 \text{ students}} = \frac{1 \text{ teacher}}{15 \text{ students}}$$

$$5. \frac{6 \text{ days}}{2 \text{ days}} = \frac{3}{1}$$

$$7. \frac{337.2 \text{ mi}}{12 \text{ gal}} = 28.1 \text{ mpg}$$

$$9. \frac{4}{16} = \frac{5}{20}$$

$$11. \frac{-25}{15} = \frac{-10}{6}$$

$$13. \frac{2}{3} = \frac{4}{6}$$

$$15. \frac{-30}{-25} = \frac{12}{10}$$

$$17. \frac{\$6.25}{1 \text{ hr}} = \frac{\$187.50}{30 \text{ hr}}$$

$$19. \frac{1 \text{ in.}}{7 \text{ mi}} = \frac{5 \text{ in.}}{35 \text{ mi}}$$

$$21. \frac{5}{18} = \frac{?}{16}$$
$$(5)(16) = (18)(?)$$
$$80 \neq 72$$

No

$$23. \frac{16}{24} = \frac{?}{3}$$
$$(16)(3) = (24)(?)$$
$$48 \neq 48$$

Yes

$$25. \frac{2\frac{1}{2}}{3\frac{2}{3}} = \frac{15}{22}$$
$$\left(2\frac{1}{2}\right)(22) = \left(3\frac{2}{3}\right)(15)$$
$$\frac{5}{\cancel{2}} \cdot \frac{2\cancel{2}}{1} = \frac{11}{\cancel{3}} \cdot \frac{5}{1}$$
$$55 = 55$$

Yes

$$27. \frac{2}{-3.2} = \frac{?}{-16}$$
$$(2)(-16) = (3.2)(?)$$
$$-32 = -32$$

Yes

$$29. \frac{48}{18} = \frac{?}{9}$$
$$(48)(9) = (18)(?)$$
$$432 = 432$$

Yes

$$31. \quad \frac{2\frac{3}{8}}{1\frac{1}{2}} \stackrel{?}{=} \frac{9\frac{1}{2}}{6}$$

$$\left(2\frac{3}{8}\right)(6) \stackrel{?}{=} \left(1\frac{1}{2}\right)\left(9\frac{1}{2}\right)$$

$$\frac{19}{8} \cdot \frac{3}{1} \stackrel{?}{=} \frac{3}{2} \cdot \frac{19}{2}$$

$$\frac{57}{4} = \frac{57}{4}$$

Yes

$$33. \quad \frac{-6.3}{9} \stackrel{?}{=} \frac{-12.6}{16}$$

$$(-6.3)(16) \stackrel{?}{=} (9)(-12.6)$$

$$-100.8 \neq -113.4$$

No

$$35. \quad \frac{x}{40} = \frac{1}{-8}; x = -5$$

$$\frac{-5}{40} \stackrel{?}{=} \frac{1}{-8}$$

$$(-5)(-8) \stackrel{?}{=} 40(1)$$

$$40 = 40$$

Yes

$$37. \quad \frac{12.4}{31} = \frac{8.2}{y}; y = 20$$

$$\frac{12.4}{31} \stackrel{?}{=} \frac{8.2}{20}$$

$$(12.4)(20) \stackrel{?}{=} (31)(8.2)$$

$$248 \neq 254.2$$

No

$$39. \quad \frac{12}{16} = \frac{3}{x}$$

$$12x = (16)(3)$$

$$12x = 48$$

$$\frac{12x}{12} = \frac{48}{12}$$

$$x = 4$$

Check:

$$\frac{12}{16} \stackrel{?}{=} \frac{3}{4}$$

$$(12)(4) \stackrel{?}{=} (16)(3)$$

$$48 = 48 \checkmark$$

$$41. \quad \frac{9}{21} = \frac{x}{7} \quad \text{Check:} \quad \frac{9}{21} \stackrel{?}{=} \frac{3}{7}$$

$$(9)(7) = 21x$$

$$63 = 21x$$

$$\frac{63}{21} = \frac{21x}{21}$$

$$3 = x$$

$$(9)(7) \stackrel{?}{=} (21)(3)$$

$$63 = 63 \checkmark$$

$$43. \quad \frac{p}{12} = \frac{-25}{4}$$

$$4p = (12)(-25)$$

$$4p = -300$$

$$\frac{4p}{4} = \frac{-300}{4}$$

$$p = -75$$

$$\text{Check:} \quad \frac{75}{12} \stackrel{?}{=} \frac{25}{4}$$

$$(-75)(4) \stackrel{?}{=} (12)(-25)$$

$$-300 = -300 \checkmark$$

$$45. \quad \frac{3}{40} = \frac{w}{10}$$

$$(3)(10) = 40(w)$$

$$30 = 40w$$

$$\frac{30}{40} = \frac{40w}{40}$$

$$\frac{3}{4} = w$$

$$\text{Check:} \quad \frac{-3}{40} \stackrel{?}{=} \frac{3}{10}$$

$$(3)(10) \stackrel{?}{=} (40)\left(\frac{3}{4}\right)$$

$$-30 = -30 \checkmark$$

$$47. \quad \frac{-16}{13} = \frac{20}{t}$$

$$16t = (-13)(20)$$

$$16t = -260$$

$$\frac{16t}{16} = \frac{-260}{16}$$

$$t = \frac{-65}{4} \text{ or } -16\frac{1}{4} \text{ or } -16.25$$

$$\text{Check:} \quad \frac{16}{-13} \stackrel{?}{=} \frac{20}{-16.25}$$

$$(16)(-16.25) \stackrel{?}{=} (-13)(20)$$

$$-260 = -260 \checkmark$$

$$49. \quad \frac{m}{12} = \frac{5}{8}$$

$$8m = (12)(5)$$

$$8m = 60$$

$$\frac{8m}{8} = \frac{60}{8}$$

$$m = \frac{15}{2} \text{ or } 7\frac{1}{2} \text{ or } 7.5$$

$$\text{Check: } \frac{7.5}{12} \stackrel{?}{=} \frac{5}{8}$$

$$(7.5)(8) \stackrel{?}{=} (12)(5)$$

$$-60 = -60 \checkmark$$

$$51. \quad \frac{17}{12} = \frac{4\frac{1}{4}}{x}$$

$$17x = \left(4\frac{1}{4}\right)(12)$$

$$17x = \frac{17}{\cancel{4}} \cdot \frac{\cancel{12}^3}{1}$$

$$17x = 51$$

$$\frac{17x}{17} = \frac{51}{17}$$

$$x = 3$$

$$\text{Check: } \frac{17}{12} \stackrel{?}{=} \frac{4\frac{1}{4}}{3}$$

$$(17)(3) \stackrel{?}{=} (12)\left(4\frac{1}{4}\right)$$

$$51 \stackrel{?}{=} \cancel{12} \cdot \frac{17}{\cancel{4}}$$

$$51 = 51 \checkmark$$

$$53. \quad \frac{0.5}{h} = \frac{1.8}{9}$$

$$(0.5)(9) = 1.8h$$

$$4.5 = 1.8h$$

$$\frac{4.5}{1.8} = \frac{1.8h}{1.8}$$

$$2.5 = h$$

$$\text{Check: } \frac{0.5}{2.5} \stackrel{?}{=} \frac{1.8}{9}$$

$$(0.5)(9) \stackrel{?}{=} (2.5)(1.8)$$

$$4.5 = 4.5 \checkmark$$

$$55. \quad \frac{\frac{3}{8}}{6.75} = \frac{x}{72}$$

$$6.75x = \left(\frac{3}{8}\right)(72)$$

$$6.75x = \frac{3}{\cancel{8}} \cdot \frac{\cancel{72}^9}{1}$$

$$6.75x = 27$$

$$\frac{6.75x}{6.75} = \frac{27}{6.75}$$

$$x = 4$$

Check:

$$\frac{\frac{3}{8}}{6.75} \stackrel{?}{=} \frac{4}{72}$$

$$\left(\frac{3}{8}\right)(72) \stackrel{?}{=} (4)(6.75)$$

$$\frac{3}{\cancel{8}} \cdot \frac{\cancel{72}^9}{1} \stackrel{?}{=} 27$$

$$27 = 27 \checkmark$$

$$57. \quad \frac{4}{\frac{1}{10}} = \frac{-\frac{1}{2}}{z}$$

$$4z = \left(\frac{1}{10}\right)\left(-\frac{1}{2}\right)$$

$$4z = -\frac{1}{20}$$

$$\frac{1}{4} \cdot 4z = \frac{1}{4} \cdot \left(-\frac{1}{20}\right)$$

$$z = -\frac{1}{80}$$

Check:  $\frac{4}{\frac{1}{10}} \stackrel{?}{=} \frac{-\frac{1}{2}}{-\frac{1}{80}}$

$$(4)\left(-\frac{1}{80}\right) \stackrel{?}{=} \left(\frac{1}{10}\right)\left(-\frac{1}{2}\right)$$

$$-\frac{1}{20} = -\frac{1}{20} \checkmark$$

$$7(x+1) = 3.5$$

$$7x + 7 = 15$$

$$7x + 7 - 7 = 15 - 7$$

$$7x = 8$$

$$\frac{7x}{7} = \frac{8}{7}$$

$$x = \frac{8}{7}$$

59.  $\frac{25}{100} = \frac{9}{y}$

$$25y = 9(100)$$

$$25y = 900$$

$$\frac{25y}{25} = \frac{900}{25}$$

$$y = 36$$

67.  $\frac{x-3}{3x} = \frac{2}{3}$

$$3(x-3) = 2(3x)$$

$$3x - 9 = 6x$$

$$3x - 3x - 9 = 6x - 3x$$

$$-9 = 3x$$

$$\frac{-9}{3} = \frac{3x}{3}$$

$$-3 = x$$

61.  $\frac{15}{20} = \frac{t}{10}$

$$15(10) = 20t$$

$$150 = 20t$$

$$\frac{150}{20} = \frac{20t}{20}$$

$$7.5 = t$$

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

$$4(x+3) = 5x$$

$$4x + 12 = 5x$$

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

$$12 = x$$

63.  $\frac{-3.125}{5} = \frac{-18.75}{k}$

$$-3.125k = 5(-18.75)$$

$$-3.125k = -93.75$$

$$\frac{-3.125k}{-3.125} = \frac{-93.75}{-3.125}$$

$$k = 30$$

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

$$4x = 3(x-2)$$

$$4x = 3x - 6$$

$$4x - 3x = 3x - 3x - 6$$

$$x = -6$$

65.  $\frac{x+1}{3} = \frac{5}{7}$

### Problem Recognition Exercises:

#### Operations on Fractions versus Solving Proportions

1. (a) Proportion

$$\frac{x}{4} = \frac{15}{8}$$

$$8x = 4(15)$$

$$8x = 60$$

$$\frac{8x}{8} = \frac{60}{8}$$

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

(b) Product of fractions

$$\frac{1}{4} \cdot \frac{15}{8} = \frac{15}{32}$$

3. (a) Product of fractions

$$\frac{2}{7} \times \frac{3}{14} = \frac{6}{98} = \frac{3}{49}$$

(b) Proportion

$$\begin{aligned}\frac{2}{7} &= \frac{n}{14} \\ 2(14) &= 7n \\ 28 &= 7n \\ \frac{28}{7} &= \frac{7n}{7} \\ 4 &= n\end{aligned}$$

5. (a) Proportion

$$\begin{aligned}\frac{48}{p} &= \frac{16}{3} \\ 48(3) &= 16p \\ 144 &= 16p \\ \frac{144}{16} &= \frac{16p}{16} \\ 9 &= p\end{aligned}$$

(b) Product of fractions

$$\frac{48}{8} \cdot \frac{16}{3} = \frac{\cancel{2} \cdot 16}{\cancel{8}} \cdot \frac{2 \cdot \cancel{8}}{\cancel{3}} = \frac{32}{1} = 32$$

7. (a)  $\frac{3}{7} = \frac{6}{z}$   
 $3z = 6 \cdot 7$   
 $3z = 42$   
 $\frac{3z}{3} = \frac{42}{3}$   
 $z = 14$

(b)  $\frac{3}{7} \div \frac{6}{35} = \frac{3}{7} \cdot \frac{35}{6} = \frac{\cancel{3} \cdot 5 \cdot \cancel{7}}{\cancel{7} \cdot 2 \cdot \cancel{3}} = \frac{5}{2}$

(c)  $\frac{3}{7} + \frac{6}{35} = \frac{3 \cdot 5}{7 \cdot 5} + \frac{6}{35} = \frac{15}{35} + \frac{6}{35} = \frac{21}{35}$   
 $= \frac{3 \cdot \cancel{7}}{5 \cdot \cancel{7}} = \frac{3}{5}$

(d)  $\frac{3}{7} \cdot \frac{6}{35} = \frac{18}{245}$

9. (a)  $\frac{14}{5} \cdot \frac{10}{7} = \frac{2 \cdot \cancel{7}}{\cancel{5}} \cdot \frac{2 \cdot \cancel{5}}{\cancel{7}} = \frac{4}{1} = 4$

(b)  $\frac{14}{5} = \frac{x}{7}$   
 $14 \cdot 7 = 5x$   
 $98 = 5x$   
 $\frac{98}{5} = \frac{5x}{5}$   
 $\frac{98}{5} = x$

(c)  $\frac{14}{5} - \frac{10}{7} = \frac{14 \cdot 7}{5 \cdot 7} - \frac{10 \cdot 5}{7 \cdot 5} = \frac{98}{35} - \frac{50}{35} = \frac{48}{35}$

(d)  $\frac{14}{5} \div \frac{10}{7} = \frac{14}{5} \cdot \frac{7}{10} = \frac{\cancel{2} \cdot 7}{5} \cdot \frac{7}{\cancel{2} \cdot 5} = \frac{49}{25}$

## Section 4. Percents fractions and decimals

### Section 4. Practice Exercises

1. percent

$$3. \frac{84}{100} = 84\%$$

$$5. \frac{10}{100} = 10\%$$

$$7. \frac{\$2}{\$100} = 2\%$$

$$9. \frac{70}{100} = 70\%$$

11. Replace the symbol % by  $\times \frac{1}{100}$  (or  $\div 100$ ).

Then simplify the fraction to lowest terms.

$$13. 3\% = 3 \times \frac{1}{100} = \frac{3}{100}$$

$$15. 84\% = 84 \times \frac{1}{100} = \frac{84}{100} = \frac{21}{25}$$

$$17. 3.4\% = 3.4 \times \frac{1}{100} = \frac{3.4}{100} = \frac{34}{1000} = \frac{17}{500}$$

$$19. 115\% = 115 \times \frac{1}{100} = \frac{115}{100} = \frac{23}{20} \text{ or } 1\frac{3}{20}$$

$$21. 0.5\% = 0.5 \times \frac{1}{100} = \frac{0.5}{100} = \frac{5}{1000} = \frac{1}{200}$$

$$23. 0.25\% = 0.25 \times \frac{1}{100} = \frac{0.25}{100} = \frac{25}{10,000} \\ = \frac{1}{400}$$

$$25. 5\frac{1}{6}\% = \frac{31}{6} \times \frac{1}{100} = \frac{31}{600}$$

$$27. 124\frac{1}{2}\% = \frac{249}{2} \times \frac{1}{100} = \frac{249}{200}$$

29. Replace the % symbol by  $\times 0.01$  (or  $\div 100$ ).

$$31. 58\% = 58 \times 0.01 = 0.58$$

$$33. 8.5\% = 8.5 \times 0.01 = 0.085$$

$$35. 142\% = 142 \times 0.01 = 1.42$$

$$37. 0.55\% = 0.55 \times 0.01 = 0.0055$$

$$39. 26\frac{2}{5}\% = 26\frac{4}{10} \times 0.01 = 26.4 \times 0.01 = 0.264$$

$$41. 55\frac{1}{20}\% = 55\frac{5}{100} \times 0.01 = 55.05 \times 0.01 \\ = 0.5505$$

$$43. 0.27 = 0.27 \times 100\% = 27\%$$

$$45. 0.19 = 0.19 \times 100\% = 19\%$$

$$47. 1.75 = 1.75 \times 100\% = 175\%$$

$$49. 0.124 = 0.124 \times 100\% = 12.4\%$$

$$51. 0.006 = 0.006 \times 100\% = 0.6\%$$

$$53. 1.014 = 1.014 \times 100\% = 101.4\%$$

$$55. \frac{71}{100} = \frac{71}{100} \times 100\% = \frac{71}{\cancel{100}^1} \times \frac{\cancel{100}^1}{1}\% \\ = 71\%$$

$$57. \frac{7}{8} = \frac{7}{8} \times 100\% = \frac{7}{8} \times \frac{100}{1}\% = \frac{700}{8}\% \\ = 87.5\% \text{ or } 87\frac{1}{2}\%$$

$$59. \frac{5}{6} = \frac{5}{6} \times 100\% = \frac{5}{6} \times \frac{100}{1}\% = \frac{500}{6}\% \\ = 83.\bar{3}\% \text{ or } 83\frac{1}{3}\%$$

$$61. 1\frac{3}{4} = \frac{7}{4} \times 100\% = \frac{7}{4} \times \frac{\cancel{100}^{25}}{1}\% = 175\%$$

$$63. \frac{11}{9} = \frac{11}{9} \times 100\% = \frac{11}{9} \times \frac{100}{1}\% = \frac{1100}{9}\% \\ = 122.\bar{2}\% \text{ or } 122\frac{2}{9}\%$$

$$65. 1\frac{2}{3} = \frac{5}{3} \times 100\% = \frac{5}{3} \times \frac{100}{1}\% = \frac{500}{3}\% \\ = 166.\bar{6}\% \text{ or } 166\frac{2}{3}\%$$

$$\begin{aligned}
 67. \quad \frac{3}{7} &= \frac{3}{7} \times 100\% \\
 &= \frac{3}{7} \times \frac{100}{1} \% \\
 &= \frac{300}{7} \% \\
 &\approx 42.9\%
 \end{aligned}$$

$$\begin{array}{r}
 42.85 \\
 7 \overline{) 300.00} \\
 \underline{-28} \phantom{00} \\
 20 \phantom{00} \\
 \underline{-14} \phantom{00} \\
 60 \phantom{00} \\
 \underline{-56} \phantom{00} \\
 40 \phantom{00} \\
 \underline{-35} \phantom{00} \\
 5
 \end{array}$$

$$\begin{aligned}
 69. \quad \frac{1}{13} &= \frac{1}{13} \times 100\% \\
 &= \frac{1}{13} \times \frac{100}{1} \% \\
 &= \frac{100}{13} \% \\
 &\approx 7.7\%
 \end{aligned}$$

$$\begin{array}{r}
 7.69 \\
 13 \overline{) 100.00} \\
 \underline{-91} \phantom{00} \\
 90 \phantom{00} \\
 \underline{-78} \phantom{00} \\
 120 \phantom{00} \\
 \underline{-117} \phantom{00} \\
 3
 \end{array}$$

$$\begin{aligned}
 71. \quad \frac{5}{11} &= \frac{5}{11} \times 100\% \\
 &= \frac{5}{11} \times \frac{100}{1} \% \\
 &= \frac{500}{11} \% \\
 &\approx 45.5\%
 \end{aligned}$$

$$\begin{array}{r}
 45.45 \\
 11 \overline{) 500.00} \\
 \underline{-44} \phantom{00} \\
 60 \phantom{00} \\
 \underline{-55} \phantom{00} \\
 50 \phantom{00} \\
 \underline{-44} \phantom{00} \\
 60 \phantom{00} \\
 \underline{-55} \phantom{00} \\
 5
 \end{array}$$

$$\begin{aligned}
 73. \quad \frac{13}{15} &= \frac{13}{15} \times 100\% \\
 &= \frac{13}{15} \times \frac{100}{1} \% \\
 &= \frac{1300}{15} \% \\
 &\approx 86.7\%
 \end{aligned}$$

$$\begin{array}{r}
 86.66 \\
 15 \overline{) 1300.00} \\
 \underline{-120} \phantom{00} \\
 100 \phantom{00} \\
 \underline{-90} \phantom{00} \\
 100 \phantom{00} \\
 \underline{-90} \phantom{00} \\
 100 \phantom{00} \\
 \underline{-90} \phantom{00} \\
 10
 \end{array}$$

$$75. \quad 66\frac{2}{3}\% = \frac{200}{3} \times \frac{1}{100} = \frac{200}{300} = \frac{2}{3}$$

c

$$77. \quad 90\% = 90 \times \frac{1}{100} = \frac{90}{100} = \frac{9}{10}$$

e

$$79. \quad 25\% = 25 \times \frac{1}{100} = \frac{25}{100} = \frac{1}{4}$$

f

$$81. \quad 0.30 = 0.30 \times 100\% = 30\%$$

e

$$83. \quad 5 = 5 \times 100\% = 500\%$$

f

$$85. \quad 0.05 = 0.05 \times 100\% = 5\%$$

a

$$87.(a) \quad \frac{1}{4} = \frac{25}{100} = 0.25$$

$$\frac{1}{4} \times 100\% = \frac{100}{4} \% = 25\%$$

$$(b) \quad 0.92 = \frac{92}{100} = \frac{23}{25}$$

$$0.92 \times 100\% = 92\%$$

$$(c) \quad 15\% = 15 \times \frac{1}{100} = \frac{15}{100} = \frac{3}{20}$$

$$15\% = 15 \times 0.01 = 0.15$$

$$(d) \quad 1.6 = \frac{16}{10} = \frac{8}{5} \text{ or } 1\frac{3}{5}$$

$$1.6 \times 100\% = 160\%$$

$$(e) \quad \frac{1}{100} = 0.01$$

$$\frac{1}{100} = 1\%$$

$$(f) \quad 0.8\% = 0.8 \times \frac{1}{100} = \frac{8}{10} \times \frac{1}{100} = \frac{8}{1000} = \frac{1}{125}$$

$$0.8\% = 0.8 \times 0.01 = 0.008$$

$$89.(a) \quad 14\% = 14 \times \frac{1}{100} = \frac{14}{100} = \frac{7}{50}$$

$$14\% = 14 \times 0.01 = 0.14$$

$$(b) \quad 0.87 = \frac{87}{100}$$

$$0.87 = 0.87 \times 100\% = 87\%$$

$$(c) \quad 1 = \frac{1}{1} \text{ or } 1$$

$$1 = 1 \times 100\% = 100\%$$

$$(d) \quad \frac{1}{3} = 0.\bar{3}$$

$$\frac{1}{3} = \frac{1}{3} \times 100\% = \frac{100}{3} \%$$

$$= 33.\bar{3}\% \text{ or } 33\frac{1}{3}\%$$

$$(e) 0.2\% = 0.2 \times \frac{1}{100} = \frac{2}{10} \times \frac{1}{100} = \frac{2}{1000}$$

$$= \frac{1}{500}$$

$$0.2\% = 0.2 \times 0.01 = 0.002$$

$$(f) \frac{19}{20} = \frac{95}{100} = 0.95$$

$$\frac{19}{20} = \frac{19}{20} \times 100\% = \frac{19}{\cancel{20}^1} \times \frac{\cancel{100}^5}{1} \%$$

$$= 95\%$$

$$91. \frac{1}{4} = \frac{1}{4} \times 100\% = \frac{1}{4} \times \frac{100}{1} \% = \frac{100}{4} \% = 25\%$$

$$93. \frac{1}{10} = \frac{1}{10} \times 100\% = \frac{1}{10} \times \frac{100}{1} \% = \frac{100}{10} \%$$

$$= 10\%$$

$$95. 9.6\% = 9.6 \times 0.01 = 0.096$$

$$9.6\% = 9.6 \times \frac{1}{100} = \frac{24}{10} \times \frac{1}{\cancel{100}^{25}}$$

$$= \frac{24}{\cancel{10}^5} \times \frac{1}{25} = \frac{12}{125}$$

$$97. 8.4\% = 8.4 \times 0.01 = 0.084$$

$$8.4\% = 8.4 \times \frac{1}{100} = \frac{84}{10} \times \frac{1}{100} = \frac{84}{1000}$$

$$= \frac{21}{250}$$

$$18.2\% = 18.2 \times \frac{1}{100} = \frac{182}{10} \times \frac{1}{100}$$

$$= \frac{182}{1000} = \frac{91}{500}$$

$$99. \text{The fraction } \frac{1}{2} = 0.5 \text{ and}$$

$$\frac{1}{2}\% = 0.5\% = 0.005.$$

$$101. 25\% = 0.25 \text{ and } 0.25\% = 0.0025.$$

$$103. \text{ a, c}$$

$$105. \text{ a, c}$$

$$107. 1.4 = 1.4 \times 100\% = 140\%$$

$$1.4 > 100\%$$

$$109. 0.052 = 0.052 \times 100\% = 5.2\%$$

$$0.052 < 50\%$$

## Section 4. Percent Proportions and Applications

### Section 4. Practice Exercises

1. (a) percent

(b) cross

$$3. 1.30 = 1.30 \times 100\% = 130\%$$

$$5. \frac{3}{8} = \frac{3}{8} \times 100\% = \frac{3}{8} \times \frac{100}{1} \% = \frac{300}{8} \%$$

$$= 37.5\% \text{ or } 37\frac{1}{2}\%$$

$$7. \frac{1}{100} = \frac{1}{100} \times 100\% = \frac{1}{100} \times \frac{100}{1} \%$$

$$= \frac{100}{100} \% = 1\%$$

$$9. 2\% = 2 \times \frac{1}{100} = \frac{2}{100} = \frac{1}{50}$$

$$11. 82\% = 82 \times 0.01 = 0.82$$

$$13. 100\% = 100 \times 0.01 = 1$$

15. Amount: 12

base: 20

$p = 60$

17. Amount: 99

base: 200

$p = 49.5$

19. Amount: 50

base: 40

$p = 125$

base: 2

$$p = 175$$

**21.** Amount: 12

base: 120

$$p = 10$$

$$\frac{10}{100} = \frac{12}{120}$$

**23.** Amount: 72

base: 90

$$p = 80$$

$$\frac{80}{100} = \frac{72}{90}$$

**25.** Amount: 21,684

base: 20,850

$$p = 104$$

$$\frac{104}{100} = \frac{21,684}{20,850}$$

**27.** Amount:  $x$

base: 200

$$p = 54$$

$$\frac{54}{100} = \frac{x}{200}$$

$$100x = (54)(200)$$

$$100x = 10,800$$

$$\frac{100x}{100} = \frac{10,800}{100}$$

$$x = 108 \text{ employees}$$

**29.** Amount:  $x$

base: 40

$$p = \frac{1}{2}$$

$$\frac{\frac{1}{2}}{100} = \frac{x}{40}$$

$$100x = \left(\frac{1}{2}\right)(40)$$

$$100x = 20$$

$$\frac{100x}{100} = \frac{20}{100}$$

$$x = 0.2$$

**31.** Amount:  $x$

base: 500

$$p = 112$$

$$\frac{112}{100} = \frac{x}{500}$$

$$100x = (112)(500)$$

$$100x = 56,000$$

$$\frac{100x}{100} = \frac{56,000}{100}$$

$$x = 560$$

**33.** Let  $x$  represent the amount Pedro pays in taxes.

base: 72,000

$$p = 28$$

$$\frac{28}{100} = \frac{x}{72,000}$$

$$100x = (28)(72,000)$$

$$100x = 2,016,000$$

$$\frac{100x}{100} = \frac{2,016,000}{100}$$

$$x = 20,160$$

Pedro pays \$20,160 in taxes.

**35.** Let  $x$  represent the approximate number of teens not wearing seat belts.

base: 304

$$p = 72$$

$$\frac{72}{100} = \frac{x}{304}$$

$$100x = (72)(304)$$

$$100x = 21,888$$

$$\frac{100x}{100} = \frac{21,888}{100}$$

$$x \approx 219$$

Approximately 219 of the 304 teens were not wearing seat belts.

**37.** Amount: 18

base:  $x$

$$p = 50$$

$$\frac{50}{100} = \frac{18}{x}$$

$$50x = (100)(18)$$

$$50x = 1800$$

$$\frac{50x}{50} = \frac{1800}{50}$$

$$x = 36$$

**39.** Amount: 69

base:  $x$

$$p = 30$$

$$\frac{30}{100} = \frac{69}{x}$$

$$30x = (100)(69)$$

$$30x = 6900$$

$$\frac{30x}{30} = \frac{6900}{30}$$

$$x = 230 \text{ lb}$$

**41.** Amount: 9

base:  $x$

$$p = \frac{2}{3}$$

$$\frac{\frac{2}{3}}{100} = \frac{9}{x}$$

$$\frac{2}{3}x = (100)(9)$$

$$\frac{2}{3}x = 900$$

$$\frac{3}{2} \cdot \frac{2}{3}x = \frac{3}{2} \cdot \frac{900}{1}$$

$$x = \frac{2700}{2}$$

$$x = 1350$$

**43.** Let  $x$  represent Albert's monthly income.

amount: 120

$$p = 7.5$$

$$\frac{7.5}{100} = \frac{120}{x}$$

$$7.5x = (100)(120)$$

$$7.5x = 12,000$$

$$\frac{7.5x}{7.5} = \frac{12,000}{7.5}$$

$$x = 1600$$

Albert makes \$1600 per month.

The total distance is 70 mi.

**45.** Let  $x$  represent the total number of e-mails.

amount: 14

$$p = 40$$

$$\frac{40}{100} = \frac{14}{x}$$

$$40x = (100)(14)$$

$$40x = 1400$$

$$\frac{40x}{40} = \frac{1400}{40}$$

$$x = 35$$

Amiee has a total of 35 e-mails.

**47.** Amount: 42

base: 120

$p$  unknown

$$\frac{p}{100} = \frac{42}{120}$$

$$120p = (100)(42)$$

$$120p = 4200$$

$$\frac{120p}{120} = \frac{4200}{120}$$

$$p = 35$$

35% of \$120 is \$42.

**49.** Amount: 84

base: 70

$p$  unknown

$$\frac{p}{100} = \frac{84}{70}$$

$$70p = (100)(84)$$

$$70p = 8400$$

$$\frac{70p}{70} = \frac{8400}{70}$$

$$p = 120$$

120% of 70 is 84.

**51.** Amount: 280

base: 320

$p$  unknown

$$\frac{p}{100} = \frac{280}{320}$$

$$320p = (100)(280)$$

$$320p = 28,000$$

$$\frac{320p}{320} = \frac{28,000}{320}$$

$$p = 87.5$$

87.5% of 320 mi is 280 mi.

**53.** Let  $p$  represent the percent of the questions answered correctly.

amount: 29

base: 40

$$\frac{p}{100} = \frac{29}{40}$$

$$40p = (100)(29)$$

$$40p = 2900$$

$$\frac{40p}{40} = \frac{2900}{40}$$

$$p = 72.5$$

She answered 72.5% correctly.

**55.** Amount: 120

base: 600

$p$  unknown

$$\frac{p}{100} = \frac{120}{600}$$

$$600p = (100)(120)$$

$$600p = 12,000$$

$$\frac{600p}{600} = \frac{12,000}{600}$$

$$p = 20$$

20% of the officers are female.

**57.** Amount: 160

base: 600

$p$  unknown

$$\frac{p}{100} = \frac{160}{600}$$

$$600p = (100)(160)$$

$$600p = 16,000$$

$$\frac{600p}{600} = \frac{16,000}{600}$$

$$p = 26.\bar{6}$$

Approximately 26.7% of the officers were promoted.

**59.** Amount:  $x$

base: 50

$p = 15$

$$\frac{15}{100} = \frac{x}{50}$$

$$100x = (15)(50)$$

$$100x = 750$$

$$\frac{100x}{100} = \frac{750}{100}$$

$$x = 7.5$$

**61.** Amount: 96

base: 240

$p = ?$

$$\frac{p}{100} = \frac{96}{240}$$

$$240p = 96(100)$$

$$240p = 9600$$

$$\frac{240p}{240} = \frac{9600}{240}$$

$$p = 40$$

40% of 240 is 96.

**63.** Amount: 78.2

base:  $x$

$p = 85$

$$\frac{85}{100} = \frac{78.2}{x}$$

$$85x = 78.2(100)$$

$$85x = 7820$$

$$\frac{85x}{85} = \frac{7820}{85}$$

$$x = 92$$

**65.** Amount:  $x$

base: 2200

$p = 3.5$

$$\frac{3.5}{100} = \frac{x}{2200}$$

$$100x = (3.5)(2200)$$

$$100x = 7700$$

$$\frac{100x}{100} = \frac{7700}{100}$$

$$x = 77$$

**67.** Amount: 44

base:  $x$

$p = 0.5$

$$\frac{0.5}{100} = \frac{44}{x}$$

$$0.5x = 44(100)$$

$$0.5x = 4400$$

$$\frac{0.5x}{0.5} = \frac{4400}{0.5}$$

$$x = 8800$$

**69.** Amount: 80

base: 50

$p = ?$

$$\frac{p}{100} = \frac{80}{50}$$

$$50p = 80(100)$$

$$50p = 8000$$

$$\frac{50p}{50} = \frac{8000}{50}$$

$$p = 160$$

80 is 160% of 50.

- 71.** Let  $x$  represent the amount of rain that fell in August.

base: 56

$$p = 125$$

$$\frac{125}{100} = \frac{x}{56}$$

$$100x = (125)(56)$$

$$100x = 7000$$

$$\frac{100x}{100} = \frac{7000}{100}$$

$$x = 70$$

70 mm of rain fell in August.

- 73.** Let  $x$  represent the number students that applied.

amount: 6400

$$p = 23$$

$$\frac{23}{100} = \frac{6400}{x}$$

$$23x = (100)(6400)$$

$$23x = 640,000$$

$$\frac{23x}{23} = \frac{640,000}{23}$$

$$x \approx 27,826$$

Approximately 27,826 students applied.

- 75.** Let  $p$  represent the percent of occupied beds.

amount: 546

base: 650

$$\frac{p}{100} = \frac{546}{650}$$

$$650p = (100)(546)$$

$$650p = 54,600$$

$$\frac{650p}{650} = \frac{54,600}{650}$$

$$p = 84$$

The hospital is filled to 84% occupancy.

- 77.(a)** Let  $x$  represent the number of women diagnosed with Stage II breast cancer expected to relapse after 10 years.

base: 200

$$p = 11$$

$$\frac{11}{100} = \frac{x}{200}$$

$$100x = (11)(200)$$

$$100x = 2200$$

$$\frac{100x}{100} = \frac{2200}{100}$$

$$x = 22$$

22 women would be expected to relapse.

- (b)** Let  $x$  represent the number of women diagnosed with Stage I breast cancer not expected to relapse after 10 years.

base: 500

$$p = 93$$

$$\frac{93}{100} = \frac{x}{500}$$

$$100x = (93)(500)$$

$$100x = 46,500$$

$$\frac{100x}{100} = \frac{46,500}{100}$$

$$x = 465$$

465 women would not be expected to relapse.

- 79.** Let  $x$  represent the number of Chevys.

base: 215

$$p = 34$$

$$\frac{34}{100} = \frac{x}{215}$$

$$100x = (34)(215)$$

$$100x = 7310$$

$$\frac{100x}{100} = \frac{7310}{100}$$

$$x = 73.10$$

73 were Chevys.

- 81.** Let  $x$  represent the total vehicles sold.

amount: 27

$$p = 15$$

$$\frac{15}{100} = \frac{27}{x}$$

$$15x = (100)(27)$$

$$15x = 2700$$

$$\frac{15x}{15} = \frac{2700}{15}$$

$$x = 180$$

There were 180 total vehicles.

- 83.** Let  $x$  represent the amount spent on clothes.

Let  $y$  represent the amount spent on dinner.

$$\frac{44}{100} = \frac{x}{600}$$

$$100x = (44)(600)$$

$$100x = 26,400$$

$$\frac{100x}{100} = \frac{26,400}{100}$$

$$x = 264$$

$$\begin{array}{r} 600 \\ - 264 \\ \hline 336 \end{array}$$

336 left after clothes

$$\frac{20}{100} = \frac{y}{336}$$

$$100y = (20)(336)$$

$$100y = 6720$$

$$\frac{100y}{100} = \frac{6720}{100}$$

$$y = 67.20$$

$$\begin{array}{r} 264 \\ + 67.20 \\ \hline 331.20 \end{array}$$

Carson spent \$331.20.

- 85.** Step 1:  $\$57.65 \approx \$58$

Step 2: 10% of 58 is 5.8.

Step 3:  $2 \times 5.8 = 11.6$

A 20% tip is \$11.60.

- 87.** Step 1: \$42 is already a whole dollar amount.

Step 2: 10% of 42 is 4.2

Step 4:  $\frac{1}{2}(4.2) = 2.1$

$$2.1 + 4.2 = 6.3$$

A 15% tip is \$6.30.

## Section 4.4 Percent Equations and Applications

### Section 4.4 Practice Exercises

**1.**  $0.059 = 0.059 \times 100\% = 5.9\%$

**3.**  $124\% = 124 \times 0.01 = 1.24$

$$124\% = \frac{124}{100} = \frac{31}{25}$$

**5.**  $3x = 27$

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

$$x = 9$$

**7.**  $\frac{62}{100} = \frac{x}{47}$

$$100x = 62(47)$$

$$100x = 2914$$

$$\frac{100x}{100} = \frac{2914}{100}$$

$$x = 29.14$$

**9.**  $\frac{43}{80} = \frac{x}{100}$

$$80x = 43(100)$$

$$80x = 4300$$

$$\frac{80x}{80} = \frac{4300}{80}$$

$$x = 53.75$$

- 11.** Let  $x$  represent the unknown amount.

$$x = (35\%)(700)$$

$$x = (0.35)(700)$$

$$x = 245$$

- 13.** Let  $x$  represent the unknown amount.

$$x = (0.55\%)(900)$$

$$x = (0.0055)(900)$$

$$x = 4.95$$

15. Let  $x$  represent the unknown amount.

$$x = (133\%)(600)$$

$$x = (1.33)(600)$$

$$x = 798$$

17. 50% equals one-half of the number. So multiply the number by  $\frac{1}{2}$ .

19.  $2 \cdot 14 = 28$

21.  $\frac{1}{2} \cdot 40 = 20$

23. Let  $x$  represent the amount of active ingredient.

$$x = (6\%)(64)$$

$$x = (0.06)(64)$$

$$x = 3.84$$

There are 3.84 oz of sodium hypochlorite in household bleach.

25. Let  $x$  represent the number of completed passes.

$$x = (60\%)(8358)$$

$$x = (0.6)(8358) \approx 5015$$

He completed approximately 5015 passes.

27. Let  $x$  represent the base.

$$18 = (0.40)x$$

$$\frac{18}{0.4} = \frac{0.4x}{0.4}$$
$$45 = x$$

29. Let  $x$  represent the base.

$$(0.92)x = 41.4$$

$$\frac{0.92x}{0.92} = \frac{41.4}{0.92}$$
$$x = 45$$

31. Let  $x$  represent the base.

$$3.09 = (1.03)x$$

$$\frac{3.09}{1.03} = \frac{1.03x}{1.03}$$
$$3 = x$$

33. Let  $x$  represent the number tested.

$$47 = (0.04)x$$

$$\frac{47}{0.04} = \frac{0.04x}{0.04}$$
$$1175 = x$$

There were 1175 subjects tested.

35. Let  $x$  represent the total population.

$$80 = (0.26)x$$

$$\frac{80}{0.26} = \frac{0.26x}{0.26}$$
$$308 \approx x$$

At that time, the population was about 308 million.

37. Let  $x$  represent the percent.

$$x \cdot 480 = 120$$

$$\frac{480x}{480} = \frac{120}{480}$$

$$x = 0.25$$

$$x = 0.25 \times 100\%$$

$$x = 25\%$$

39. Let  $x$  represent the percent.

$$666 = x \cdot 740$$

$$\frac{666}{740} = \frac{740x}{740}$$

$$0.9 = x$$

$$x = 0.9 \times 100\%$$

$$x = 90\%$$

41. Let  $x$  represent the percent.

$$x \cdot 300 = 400$$

$$\frac{300x}{300} = \frac{400}{300}$$

$$x = 1.333$$

$$x = 1.333 \times 100\%$$

$$x = 133.3\%$$

43. Let  $x$  represent the percent.

$$x \cdot 8079 = 406$$

$$\frac{8079x}{8079} = \frac{406}{8079}$$

$$x \approx 0.0502$$

$$x = 0.0502 \times 100\%$$

$$x = 5\%$$

5% of American Peace Corps volunteers were over 50 years old.

$$45.(a) 4 + 2 + 14 + 10 + 16 + 18 + 10 + 6 = 80$$

There are 80 total employees.

(b) Let  $x$  represent the percent.

$$x \cdot 80 = 10$$

$$\frac{80x}{80} = \frac{10}{80}$$

$$x = 0.125$$

$$x = 0.125 \times 100\%$$

$$x = 12.5\%$$

12.5% missed 3 days of work.

$$(c) 2 + 14 + 10 + 16 + 18 = 60$$

Let  $x$  represent the percent.

$$x \cdot 80 = 60$$

$$\frac{80x}{80} = \frac{60}{80}$$

$$x = 0.75$$

$$x = 0.75 \times 100\%$$

$$x = 75\%$$

75% missed 1 to 5 days of work.

$$47. x = (45\%)(62)$$

$$x = 0.45(62)$$

$$x = 27.9$$

$$49. x(140) = 28$$

$$140x = 28$$

$$\frac{140x}{140} = \frac{28}{140}$$

$$x = 0.20$$

$$x = 0.20(100\%) = 20\%$$

$$51. 23\%(x) = 34.5$$

$$0.23x = 34.5$$

$$\frac{0.23x}{0.23} = \frac{34.5}{0.23}$$

$$x = 150$$

$$53. x = (18.5\%)(3000)$$

$$x = 0.185(3000)$$

$$x = 555$$

$$55. 350\%(x) = 2100$$

$$3.50x = 2100$$

$$\frac{3.5x}{3.5} = \frac{2100}{3.5}$$

$$x = 600$$

$$57. x(600) = 1.2$$

$$600x = 1.2$$

$$\frac{600x}{600} = \frac{1.2}{600}$$

$$x = 0.002$$

$$x = 0.002(100\%) = 0.2\%$$

59. Let  $x$  represent the total number of hospital stays.

$$6.3 = (0.18)x$$

$$\frac{6.3}{0.18} = \frac{0.18x}{0.18}$$

$$35 = x$$

There were 35 million total hospital stays that year.

61. Let  $x$  represent the percent.

$$x \cdot 87 = 11$$

$$\frac{87x}{87} = \frac{11}{87}$$

$$x \approx 0.126$$

$$0.126 \times 100\% = 12.6\%$$

Approximately 12.6% of Florida's panthers live in Everglades National Park.

63. Let  $x$  represent the number saving for their children's education.

$$x = (0.52)(800)$$

$$x = 416$$

416 parents would be expected to have started saving for their children's education.

65. Let  $x$  represent the total cost of the TV.

$$1440 = (0.60)x$$

$$\frac{1440}{0.60} = \frac{0.60x}{0.60}$$

$$2400 = x$$

The total cost of the TV is \$2400.

$$67. (a) \$49,000 - \$8800 = \$40,200$$

(b) Let  $n$  represent the 2011 salary.

$$n = 49,000 + 49,000(0.04)$$

$$n = 49,000 + 1960$$

$$n = \$50,960$$

Let  $f$  represent the 2011 cost of food.

$$f = 8800 + 8800(0.62)$$

$$f = 8800 + 545.60$$

$$f = 9345.60$$

$$50,960 - 9346 = \$41,614$$

The amount remaining from his salary after subtracting the cost of food is \$41,614.

**69.** Let  $x$  represent the number in 35–44 age group.

$$x = 0.204(60,000)$$

$$x = 12,240$$

12,240 accidents involved drivers 35–44 years old.

**71.** Let  $x$  represent the total traffic fatalities.

$$9040 = 0.226x$$

$$\frac{9040}{0.226} = \frac{0.226x}{0.226}$$

$$40,000 = x$$

There were 40,000 traffic fatalities.

**73.(a)**  $220 - 20 = 200$  beats per minute

$$\text{(b)}(0.60)(200) = 120$$

$$(0.85)(200) = 170$$

Between 120 and 170 beats per minute

### Problem Recognition Exercises: Percents

**1.**  $0.10(82) = 8.2$

**3.**  $0.20(82) = 16.4$

**5.**  $2.00(82) = 164$

**7.** Greater than, since  $104\% > 100\%$ .

**9.** Greater than, since  $11\% > 10\%$  and  $10\%$  of 90 is 9.

**11.** Let  $x$  represent the base.

$$6 = (0.002)x$$

$$\frac{6}{0.002} = \frac{0.002x}{0.002}$$

$$3000 = x$$

**13.** Let  $x$  represent the number.

$$x = (0.12)(40)$$

$$x = 4.8$$

**15.** Let  $x$  represent the base.

$$\frac{150}{100} = \frac{105}{x}$$

$$150x = (100)(105)$$

$$150x = 10,500$$

$$\frac{150x}{150} = \frac{10,500}{150}$$

$$x = 70$$

**17.** Let  $x$  represent the amount.

$$x = (0.07)(90)$$

$$x = 6.3$$

**19.** Let  $x$  represent the percent.

$$x \cdot 60 = 180$$

$$\frac{60x}{60} = \frac{180}{60}$$

$$x = 3$$

$$x = 3 \times 100\%$$

$$x = 300\%$$

**21.** Let  $x$  represent the base.

$$75 = (0.001)x$$

$$\frac{75}{0.001} = \frac{0.001x}{0.001}$$

$$75,000 = x$$

**23.** Let  $x$  represent the amount.

$$x = (0.50)(50)$$

$$x = 25$$

**25.** Let  $x$  represent the base.

$$50 = (0.50)x$$

$$\frac{50}{0.50} = \frac{0.50x}{0.50}$$

$$100 = x$$

27. Let  $x$  represent the percent.

$$\begin{aligned}x \cdot 250 &= 2 \\ \frac{250x}{250} &= \frac{2}{250} \\ x &= 0.008 \\ x &= 0.008 \times 100\% \\ x &= 0.8\%\end{aligned}$$

29. Let  $x$  represent the amount.

$$\begin{aligned}x &= (0.10)(26) \\ x &= 2.6\end{aligned}$$

31. Let  $x$  represent the percent.

$$\begin{aligned}x \cdot 248 &= 186 \\ \frac{248x}{248} &= \frac{186}{248} \\ x &= 0.75 \\ x &= 0.75 \times 100\% \\ x &= 75\%\end{aligned}$$

33. Let  $x$  represent the percent.

$$\begin{aligned}x \cdot 186 &= 248 \\ \frac{186x}{186} &= \frac{248}{186} \\ x &= 1.33\bar{3} \\ x &= 1.33\bar{3} \times 100\% \\ x &= 133.\bar{3}\% \text{ or } 133\frac{1}{3}\%\end{aligned}$$

## Section 4.5 Applications of Sales Tax, Commission, Discount, Markup, and Percent Increase and Decrease

### Section 4.5 Practice Exercises

1.(a)  $\left(\frac{\text{Sales tax}}{\text{tax rate}}\right) = \left(\frac{\text{Sales}}{\text{tax rate}}\right) \left(\frac{\text{Cost of merchandise}}{\text{merchandise}}\right)$

(b)  $\left(\frac{\text{Commission}}{\text{rate}}\right) = \left(\frac{\text{Commission}}{\text{rate}}\right) \left(\frac{\text{Total sales}}{\text{sales}}\right)$

(c)  $\left(\frac{\text{Discount}}{\text{rate}}\right) = \left(\frac{\text{Discount}}{\text{rate}}\right) \left(\frac{\text{Original price}}{\text{price}}\right)$

(d)  $\left(\frac{\text{Markup}}{\text{rate}}\right) = \left(\frac{\text{Markup}}{\text{rate}}\right) \left(\frac{\text{Original price}}{\text{price}}\right)$

(e)  $\left(\frac{\text{Percent Increase}}{\text{Increase}}\right) = \left(\frac{\text{Amount of increase}}{\text{Original amount}}\right) \times 100\%$

(f)  $\left(\frac{\text{Percent Decrease}}{\text{Decrease}}\right) = \left(\frac{\text{Amount of decrease}}{\text{Original amount}}\right) \times 100\%$

3. 12

5. 40

7. Let  $x$  represent the number.

$$\begin{aligned}52 &= (0.002)x \\ \frac{52}{0.002} &= \frac{0.002x}{0.002} \\ 26,000 &= x\end{aligned}$$

9. Let  $x$  represent the percent.

$$\begin{aligned}\frac{x}{100} &= \frac{6}{25} \\ 25x &= (100)(6) \\ 25x &= 600 \\ \frac{25x}{25} &= \frac{600}{25} \\ x &= 24 \\ 24\%\end{aligned}$$

11. Let  $x$  represent the amount.

$$\begin{aligned}x &= (0.016)(550) \\ x &= 8.8\end{aligned}$$

13.(a)  $(0.05)(\$20.00) = \$1.00$

$$\$20.00 + \$1.00 = \$21.00$$

(b)  $\frac{\$0.50}{\$12.50} = 0.04 \text{ or } 4\%$

$$\$12.50 + \$0.50 = \$13.00$$

(c) Let  $x$  represent the cost.

$$\begin{aligned} \$2.75 &= (0.025)x \\ \frac{\$2.75}{0.025} &= \frac{0.025x}{0.025} \\ \$110.00 &= x \\ \$110.00 + \$2.75 &= \$112.75 \end{aligned}$$

(d)  $\$58.30 - \$55.00 = \$3.30$

$$\frac{\$3.30}{\$55.00} = 0.06 = 6\%$$

15. Let  $x$  represent the amount of tax.

$$\begin{aligned} x &= (0.05)(68.25) \\ x &= 3.41 \\ 68.25 + 3.41 &= 71.66 \\ \text{The total bill is } &\$71.66. \end{aligned}$$

17. Let  $x$  represent the tax rate.

$$\begin{aligned} 16.80 &= x \cdot \$240.00 \\ \frac{16.80}{240.00} &= \frac{240.00x}{240.00} \\ 0.07 &= x \\ \text{The tax rate is } &7\%. \end{aligned}$$

19. Let  $x$  represent the price of the fruit basket.

$$\begin{aligned} 2.67 &= (0.06)x \\ \frac{2.67}{0.06} &= \frac{0.06x}{0.06} \\ 44.5 &= x \\ \text{The price is } &\$44.50. \end{aligned}$$

21.(a)  $(0.05)(\$20,000.00) = \$1000.00$

(b)  $\frac{\$10,000.00}{\$125,000.00} = 0.08$  or 8%

(c) Let  $x$  represent the total sales.

$$\begin{aligned} \$540.00 &= (0.10)x \\ \frac{\$540.00}{0.10} &= \frac{0.10x}{0.10} \\ \$5400.00 &= x \end{aligned}$$

23. Let  $x$  represent the amount of commission.

$$\begin{aligned} x &= (0.07)(\$48,000) \\ x &= \$3360 \\ \text{Zach made } &\$3360 \text{ in commission.} \end{aligned}$$

25. Let  $x$  represent the commission rate.

$$\begin{aligned} 300 &= x \cdot 2000 \\ \frac{300}{2000} &= \frac{2000x}{2000} \\ 0.15 &= x \end{aligned}$$

Rodney's commission rate is 15%.

27. Amount of commission

$$\begin{aligned} &= \$67,000 - \$25,000 \\ &= \$42,000 \end{aligned}$$

Let  $x$  represent total sales.

$$\begin{aligned} 42,000 &= 0.03x \\ \frac{42,000}{0.03} &= \frac{0.03x}{0.03} \\ 1,400,000 &= x \end{aligned}$$

Her sales were \$1,400,000.

29.(a) Discount =  $(0.20)(\$56.00) = \$11.20$

$$\text{Sale price} = \$56.00 - \$11.20 = \$44.80$$

(b) Discount =  $\$900 - \$600 = \$300$

$$\begin{aligned} (\text{rate})(\$900.00) &= \$300.00 \\ \text{rate} &= \frac{\$300.00}{\$900.00} \end{aligned}$$

$$= \frac{1}{3} \text{ or } 33\frac{1}{3}\%$$

(c) Original price =  $\$76.50 + \$8.50 = \$85$

$$(\text{rate})(\$85.00) = \$8.50$$

$$\begin{aligned} \text{rate} &= \frac{\$8.50}{\$85.00} \\ &= 0.10 \text{ or } 10\% \end{aligned}$$

(d)  $(0.50)(\text{original price}) = \$38.00$

$$\begin{aligned} \text{original price} &= \frac{\$38.00}{0.50} \\ &= \$76.00 \end{aligned}$$

$$\text{Sale price} = \$76.00 - \$38.00 = \$38.00$$

31.(a) Markup =  $(0.05)(\$92.00) = \$4.60$

$$\text{Retail price} = \$92 + \$4.60 = \$96.60$$

(b) Markup =  $\$118.80 - \$110.00 = \$8.80$

$$(\text{rate})(\$110.00) = \$8.80$$

$$\begin{aligned} \text{rate} &= \frac{\$8.80}{\$110.00} \\ &= 0.08 \text{ or } 8\% \end{aligned}$$

(c) Orig price = \$422.50 - \$97.50 = \$325

(rate)(\$325.00) = \$97.50

$$\text{rate} = \frac{\$97.50}{\$325.00}$$

= 0.30 or 30%

(d) (0.20)(original price) = \$9.00

$$\text{original price} = \frac{\$9.00}{0.20}$$

= \$45.00

Retail price = \$45 + \$9 = \$54

**33.** Let  $x$  represent the amount of discount.

$x = (0.15)(\$5.60) = \$0.84$

Sale price = \$5.60 - \$0.84 = \$4.76

The discounted lunch bill is \$4.76.

**34.(a)** Let  $x$  represent the amount of discount.

$x = (0.10)(\$550) = \$55$

The discount is \$55.

(b) Sale price = \$550 - \$55 = \$495

The discounted yearly membership will cost \$495.

**35.** Discount = \$60 - \$45 = \$15

Let  $x$  represent the discount rate.

$(x)(\$60) = \$15$

$$x = \frac{\$15}{\$60} = 0.25$$

The discount rate is 25%.

**37.(a)** Let  $x$  represent the amount of markup.

$x = (0.18)(\$150.00) = \$27.00$

The markup is \$27.00.

(b) Retail price = \$150.00 + \$27.00  
= \$177.00

The retail price is \$177.00.

(c) Tax = (0.07)(\$177.00) = \$12.39

The total price is

\$177.00 + \$12.39 = \$189.39.

**39.** Markup amount = \$375 - \$300 = \$75

Let  $x$  represent the markup rate.

\$75 =  $(x)(\$300)$

$$\frac{\$75}{\$300} = x$$

0.25 =  $x$

The markup rate is 25%.

**41.** Let  $x$  represent the discount amount.

$x = (0.30)(\$269) = \$80.70$

sale price = \$269 - \$80.70 = \$188.30

The discount is \$80.70 and the sale price is \$188.30.

**43.** Original price = \$123.20 - \$43.20 = \$80.00

Let  $x$  represent the markup rate.

\$43.20 =  $(x)(\$80.00)$

$$\frac{\$43.20}{\$80.00} = x$$

0.54 =  $x$

The markup rate is 54%.

**45.** Let  $x$  represent the discount amount.

$x = (0.10)(\$109.99) = \$11.00$

Sale price = \$109.99 - \$11 = \$98.99

The discount is \$11.00, and the sale price is \$98.99.

**47.** \$60 - \$30

$$\frac{\$30}{\$30} \times 100\% = 1 \times 100\% = 100\%$$

c

**49.** Increase = 42,000 - 21,000 = 21,000

$$\begin{aligned} \text{Percent increase} &= \frac{21,000}{21,000} \times 100\% \\ &= 1 \times 100\% \\ &= 100\% \end{aligned}$$

**51.** Increase = 5500 - 5000 = 500

$$\begin{aligned} \text{Percent increase} &= \frac{500}{5000} \times 100\% \\ &= 0.10 \times 100\% \\ &= 10\% \end{aligned}$$

**53.** Increase = 45,000 - 42,000 = 3000

$$\begin{aligned} \text{Percent increase} &= \frac{3000}{42,000} \times 100\% \\ &\approx 0.07 \times 100\% \\ &\approx 7\% \end{aligned}$$

**55.** Decrease = 360,000 - 253,800 = 106,200

$$\begin{aligned}\text{Percent decrease} &= \frac{106,200}{360,000} \times 100\% \\ &\approx 0.295 \times 100\% \\ &= 29.5\%\end{aligned}$$

$$57. \text{ Decrease} = \$12.60 - \$11.97 = \$0.63$$

$$\begin{aligned}\text{Percent decrease} &= \frac{\$0.63}{\$12.60} \times 100\% \\ &= 0.05 \times 100\% \\ &= 5\%\end{aligned}$$

$$59. \text{ Decrease} = 5 - 1.6 = 3.4$$

$$\begin{aligned}\text{Percent decrease} &= \frac{3.4}{5} \times 100\% \\ &= 0.68 \times 100\% \\ &= 68\%\end{aligned}$$

$$61. \text{ Decrease} = 12 - 10.2 = 1.8$$

$$\begin{aligned}\text{Percent decrease} &= \frac{1.8}{12} \times 100\% \\ &= 0.15 \times 100\% \\ &= 15\%\end{aligned}$$

$$63.(\text{a}) \text{ Retail price per ticket} = \frac{\$648}{4} = \$162$$

$$\text{Markup per ticket} = \$162 - \$113 = \$49$$

$$\begin{aligned}(\text{b}) \text{ Markup rate} &= \frac{49}{113} \times 100\% \\ &= 0.4335 \times 100\% \\ &\approx 43.4\%\end{aligned}$$

$$65. \text{ Change} = 23.05 - 6.06 = \$16.99$$

$$\begin{aligned}\text{Percent increase} &= \frac{16.99}{6.06} \times 100\% \\ &\approx 2.804 \times 100\% \\ &\approx 280.4\%\end{aligned}$$

$$67. \text{ Change} = 132.45 - 118.37 = \$14.08$$

$$\begin{aligned}\text{Percent increase} &= \frac{14.08}{118.37} \times 100\% \\ &\approx 0.119 \times 100\% \\ &\approx 11.9\%\end{aligned}$$

## Section 4.6 Simple and Compound Interest

### Section 4.6 Practice Exercises

1.(a) simple; principal

$$(\text{b}) I = Prt$$

(c) compound

$$(\text{d}) A = P \left( 1 + \frac{r}{n} \right)^{n \cdot t}$$

$$3. 2.25\% = 2.25 \times 0.01 = 0.0225$$

$$5. \text{ Decrease in price} = 79 - 59 = \$20$$

$$\begin{aligned}\text{Percent decrease in price} &= \frac{20}{79} \times 100\% \\ &= 0.253 \times 100\% \\ &= 25.3\%\end{aligned}$$

$$7. I = Prt = (\$6000)(0.05)(3) = \$300(3) = \$900$$

$$\$6000 + \$900 = \$6900$$

$$9. I = Prt = (\$5050)(0.06)(4) = \$303(4) = \$1212$$

$$\$5050 + \$1212 = \$6262$$

$$11. I = Prt = (\$12,000)(0.04) \left( 4 \frac{1}{2} \right)$$

$$= \$480(4.5) = \$2160$$

$$\$12,000 + \$2160 = \$14,160$$

$$13. I = Prt = (\$10,500)(0.045)(4)$$

$$= \$472.50(4) = \$1890$$

$$\$10,500 + \$1890 = \$12,390$$

$$15.(\text{a}) I = Prt = (\$2500)(0.035)(4)$$

$$= \$87.50(4) = \$350$$

$$(\text{b}) \$2500 + \$350 = \$2850$$

$$17.(\text{a}) I = Prt = (\$400)(0.08)(1.5) = \$32(1.5)$$

$$= \$48$$

$$(\text{b}) \$400 + \$48 = \$448$$

$$19. I = Prt = (\$10,300)(0.04)(5) = \$412(5)$$

$$= \$2060$$

$$\$10,300 + \$2060 = \$12,360$$

21.  $I = Prt = (\$4500)(0.10)(2.5) = \$450(2.5)$   
 $= \$1125$   
 $\$4500 + \$1125 = \$5625$

25. There are  $12(2) = 24$  total compounding periods.

23. There are  $2(3) = 6$  total compounding periods.

27.(a)  $I = Prt = \$500(0.04)(3) = \$20(3) = \$60$   
 $\$500 + \$60 = \$560$

(b)

Year	Interest	Total
1	$(\$500)(0.04) = \$20$	$\$500 + \$20 = \$520$
2	$(\$520)(0.04) = \$20.80$	$\$520 + \$20.80 = \$540.80$
3	$(\$540.80)(0.04) = \$21.63$	$\$540.80 + \$21.63 = \$562.43$

29.(a)  $I = Prt = \$24,000(0.05)(2) = \$1200(2) = \$2400$   
 $\$24,000 + \$2400 = \$26,400$

(b)

Period	Interest	Total
1st	$(\$24,000)(0.05)(0.5) = \$600$	$\$24,000 + \$600 = \$24,600$
2nd	$(\$24,600)(0.05)(0.5) = \$615$	$\$24,600 + \$615 = \$25,215$
3rd	$(\$25,215)(0.05)(0.5) = \$630.38$	$\$25,215 + \$630.38 = \$25,845.38$
4th	$(\$25,845.38)(0.05)(0.5) =$ $\$646.13$	$\$25,845.38 + \$646.13 = \$26,491.51$

31.  $A$  = total amount in the account;  
 $P$  = principal;  
 $r$  = annual interest rate;  
 $n$  = number of compounding periods per year;  
 $t$  = time in years

35.  $A = \$6000 \left(1 + \frac{0.05}{2}\right)^{2 \cdot 2} \approx \$6622.88$

37.  $A = \$10,000 \left(1 + \frac{0.06}{4}\right)^{4 \cdot 1.5} \approx \$10,934.43$

39.  $A = \$14,000 \left(1 + \frac{0.045}{12}\right)^{12 \cdot 3} \approx \$16,019.47$

33.  $A = \$5000 \left(1 + \frac{0.045}{1}\right)^{1 \cdot 5} \approx \$6230.91$