Chapter 2: Ratios and Percents

Review Set 2-1 (page 50)

1. $3:150 = \frac{3}{150} = \mathbf{\frac{1}{50}}$

2. $6:10 = \frac{6}{10} = \mathbf{\frac{3}{5}}$

3. $0.05:0.15 = \frac{0.05}{0.15} = \mathbf{\frac{1}{3}}$

4. $20:40 = \frac{20}{40} = \frac{1}{2} = \mathbf{0.5}$

5. $\frac{1}{1000}:\frac{1}{150} = \frac{\frac{1}{1000}}{\frac{1}{150}} = \frac{1}{1000} \div \frac{1}{150} = \frac{1}{\cancel{1000}_{20}} \times \frac{\cancel{150}^{3}}{1} = \frac{3}{20} = \mathbf{0.15}$

$$
\begin{array}{r}
0.15 \\
20\overline{)3.00} \\
\underline{20} \\
100 \\
\underline{100} \\
0
\end{array}
$$

6. $0.3:4.5 = \frac{0.3}{4.5} = \mathbf{0.07}$

$$
\begin{array}{r}
0.066 \\
4.5\overline{)0.3000} \\
\underline{270} \\
300 \\
\underline{270} \\
30
\end{array}
$$

7. $1\frac{1}{2}:6\frac{2}{9} = \frac{1\frac{1}{2}}{6\frac{2}{9}} = 1\frac{1}{2} \div 6\frac{2}{9} = \frac{3}{2} \div \frac{56}{9} = \frac{3}{2} \times \frac{9}{56} = \frac{27}{112} = \mathbf{0.24}$

$$
\begin{array}{r}
0.241 \\
112\overline{)27.000} \\
\underline{224} \\
460 \\
\underline{448} \\
120 \\
\underline{112} \\
8
\end{array}
$$

8. $12:48 = \frac{12}{48} = \frac{1}{4} = 0.25 = \mathbf{25}\%$

9. $0.08 : 0.64 = \frac{0.08}{0.64} = 0.125 = \mathbf{12.5\%}$

$$
\begin{array}{r}
0.125 \\
0.64\overline{)\,0.08.000} \\
\underline{64} \\
160 \\
\underline{128} \\
320 \\
\underline{320} \\
0
\end{array}
$$

10. $7 : 10 = \frac{7}{10} = 0.7 = \mathbf{70}\%$

11. $50 : 100 = \frac{50}{100} = \mathbf{50}\%$

12. $45\% = \frac{45}{100} = \mathbf{\frac{9}{20}}$

13. $0.5\% = 0.005 = \frac{5}{1000} = \mathbf{\frac{1}{200}}$

14. $1\% = 0.01 = \mathbf{\frac{1}{100}}$

15. $66\frac{2}{3}\% = \frac{200}{3}\% = \frac{200}{3} \div 100 = \frac{\overset{2}{\cancel{200}}}{3} \times \frac{1}{\underset{1}{\cancel{100}}} = \mathbf{\frac{2}{3}}$

16. $2.94\% = 2.94 \div 100 = 0.0294 = \mathbf{0.03}$

17. $33\% = 33 \div 100 = \mathbf{0.33}$

18. $0.9\% = 0.9 \div 100 = 0.009 = \mathbf{0.01}$

19. $16\% = \frac{16}{100} = \frac{4}{25} = \mathbf{4:25}$

20. $25\% = \frac{25}{100} = \frac{1}{4} = \mathbf{1:4}$

21. $50\% = \frac{50}{100} = \frac{1}{2} = \mathbf{1:2}$

22. $0.9\% = 0.9 \div 100 =$ 0.009
    $0.9 =$ **0.900 is largest**
    $1:9 = \frac{1}{9} = 1 \div 9 =$ 0.110
    $\frac{1}{90} = 1 \div 90 =$ 0.011

23. $0.05 =$ 0.050
    $\frac{200}{400} = 200 \div 400 = 0.5 =$ **0.500 is largest**
    $0.025 =$ 0.025
    $1:25 = \frac{1}{25} = 0.04 = 0.040 =$ 0.040

$$
\begin{array}{r}
0.5 \\
400\overline{)\,200} \\
\underline{200} \\
0
\end{array}
\qquad
\begin{array}{r}
0.04 \\
25\overline{)\,1.00} \\
\underline{100} \\
0
\end{array}
$$

24. $0.0125\% \div 100 = \quad 0.000125$

    $0.25\% = 0.25 \div 100 =$ **0.002500 is largest**

    $0.1\% = 0.1 \div 100 = \quad 0.001000$

    $0.02\% = 0.02 \div 100 = 0.002000$

25. $\frac{1}{150} = 0.007$

    $\frac{1}{300} = 0.003$

    $0.5 =$ **0.500 is largest**

    $\frac{2}{3}\% = 0.067$

$$\begin{array}{r} 0.0066 \\ 150\overline{)\,1.0000} \\ \underline{900} \\ 1000 \\ \underline{900} \\ 100 \end{array} \qquad \begin{array}{r} 0.0033 \\ 300\overline{)\,1.0000} \\ \underline{900} \\ 1000 \\ \underline{900} \\ 100 \end{array}$$

$\frac{2}{3}\% = \frac{2}{3} \div 100 = \frac{2}{3} \times \frac{1}{100} = \frac{2}{300}$

$$\begin{array}{r} 0.0066 \\ 300\overline{)\,2.0000} \\ \underline{1800} \\ 2000 \\ \underline{1800} \\ 200 \end{array}$$

Review Set 2-2 (page 52)

1. X = 0.25% × 520
   X = 0.0025 × 520
   X **= 1.3**

2. X = 5% × 95
   X = 0.05 × 95
   X **= 4.75**

3. X = 40% × 140
   X = 0.4 × 140
   X **= 56**

4. X = 0.7% × 62
   X = 0.007 × 62
   X **=** 0.434 = **0.43**

5. X = 3% × 889
   X = 0.03 × 889
   X **= 26.67**

6. X = 20% × 75
   X = 0.2 × 75
   X **= 15**

7. X = 4% × 20
   X = 0.04 × 20
   X **= 0.8**

8. X = 7% × 34
   X = 0.07 × 34
   X **= 2.38**

9. X = 15% × 250
   X = 0.15 × 250
   X **= 37.5**

10. X = 75% × 150
    X = 0.75 × 150
    X **= 112.5**

11. X = 40% × 20
    X = 0.4 × 20
    X **= 8 tablets**

12. X = 60% × 1200
    X = 0.60 × 1200
    X **= 720 mL**

13. X = 80% of $17 651.07
    X = 0.8 × $17 651.07
    X = $14 120.86

$ 17 651.07	total bill
- 14 120.86	paid by insurance company
$ **3530.21**	paid by patient

14. X = 40% × 750
    X = 0.4 × 750
    X **= 300 g**

15. X = 20% × 3500
    X = 0.2 × 3500
    X **= 700 calories**

Practice Problems—Chapter 2 (pages 52–54)

1. $\mathbf{0.4}$ **,** $\mathbf{40\%}$**,** $\mathbf{2:5}$ $\frac{2}{5} = \frac{0.4}{5\overline{)2.0}}$ $\frac{20}{0}$ $0.4 \quad 0.40 = 40\%$

2. $\mathbf{\frac{1}{20}}$**,** $\mathbf{5\%}$**,** $\mathbf{1:20}$ $0.5 = \frac{5}{100} = \frac{1}{20}$ $0.05 \quad 0.05 = 5\%$

3. $\mathbf{0.17}$**,** $\mathbf{\frac{17}{100}}$**,** $\mathbf{17:100}$ $17\% = \frac{17}{100} = 0.17$

4. $\mathbf{0.25}$**,** $\mathbf{\frac{1}{4}}$**,** $\mathbf{25\%}$ $1{:}4 = \frac{1}{4} = \frac{0.25}{4\overline{)1.00}}$ $0.25 \quad 0.25 = 25\%$

5. **0.06, $\frac{3}{50}$, 3:50** $\quad$ $6\% = \frac{6}{100} = \frac{3}{50}$ $\quad$ 6% $\quad$ 06% = 0.06

6. **0.17, 17%, 1:6** $\quad$ $\frac{1}{6}$ =

$$\begin{array}{r} 0.166 \\ 6\overline{)1.000} \\ \underline{6} \\ 40 \\ \underline{36} \\ 40 \\ \underline{36} \\ 4 \end{array}$$

0.166 = 0.17 $\quad$ 0.17 = 17%

7. **0.5, $\frac{1}{2}$, 1:2** $\quad$ 50% = $\frac{50}{100}$ = $\frac{1}{2}$ = 1 : 2

50% = 0.5

8. **0.01, $\frac{1}{100}$, 1%** $\quad$ 1:100 = $\frac{1}{100}$

1% = 01% = 0.01

9. **$\frac{9}{100}$, 9%, 9:100** $\quad$ 0.09 = $\frac{9}{100}$

0.09 $\quad$ 0. 09= 9%

10. **0.38, 38%, 3:8** $\quad$ $\frac{3}{8}$ =

$$\begin{array}{r} 0.375 \\ 8\overline{)3.000} \\ \underline{24} \\ 60 \\ \underline{56} \\ 40 \\ \underline{36} \\ 4 \end{array}$$

0.375 = 0.38 $\quad$ 0.38 = 38%

11. **0.67, $\frac{2}{3}$, 67%** $\quad$ 2:3 = $\frac{2}{3}$ =

$$\begin{array}{r} 0.666 \\ 3\overline{)2.000} \\ \underline{18} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

0.666 = 0.67 $\quad$ 0.67 = 67%

12. **0.33, 33%, 1:3** $\quad$ $\frac{1}{3}$ =

$$\begin{array}{r} 0.333 \\ 3\overline{)1.000} \\ \underline{9} \\ 10 \\ \underline{9} \\ 10 \\ \underline{9} \\ 1 \end{array}$$

0.333 = 0.33 $\quad$ 0.33 = 33%

13. $\mathbf{\frac{13}{25}}$**, 52%, 13:25** $0.52 = \frac{52}{100} = \frac{13}{25}$

0.52 $0.52 = 52\%$

14. **0.45,** $\mathbf{\frac{9}{20}}$**, 45%** $9:20 = \frac{9}{20} =$ 0.45 / $20\overline{)9.00}$, 80, 100, 100, 0 0.45 $0.45 = 45\%$

15. **0.86, 86%, 6:7** $\frac{6}{7} =$ 0.857 / $7\overline{)6.000}$, 56, 40, 35, 50, 49, 1 0.86 $0.86 = 86\%$

16. **0.3,** $\mathbf{\frac{3}{10}}$**, 30%** $3:10 = \frac{3}{10} =$ 0.3 / $10\overline{)3.0}$ 0.3 $0.3 = 3\%$

17. **0.02, 2%, 1:50** $\frac{1}{50} =$ 0.02 / $50\overline{)1.00}$, 100, 0 0.02 $0.02 = 2\%$

18. $\mathbf{\frac{3}{50}}$**, 6%, 3:50** $0.06 = 6\%$ $0.06 = \frac{6}{100} = \frac{3}{50}$

19. $\mathbf{\frac{1}{25}}$**, 4%, 1:25** $0.04 = 4\%$ $4\% = \frac{4}{100} = \frac{1}{25}$

20. **0.1,** $\mathbf{\frac{1}{10}}$**, 1: 10** $10\% = \frac{10}{100} = \frac{1}{10}$ 0.1 / $10\overline{)1.0}$, 10, 0

21. $1:25 = \frac{1}{25} =$ **0.04** 0.04 / $25\overline{)1.00}$, 100, 0

22. $\frac{10}{400} = \frac{1}{40} =$ **1:40**

23. 0.075 $0.075 =$ **7.5%**

24. $17:34 = \frac{17}{34} = \mathbf{\frac{1}{2}}$

25. $75\% = \frac{75}{100} = \frac{3}{4} = \mathbf{3:4}$

26. $X = 35\% \times 750$
    $X = 0.35 \times 750$
    $X = \mathbf{262.5}$

```
  750
× 0.35
 3750
2250
262.5
```

27. $X = 7\% \times 52$
    $X = 0.07 \times 52$
    $X = \mathbf{3.64}$

28. $X = 8.3\% \times 24$
    $X = 0.083 \times 24$
    $X = \mathbf{1.99}$

29. $1:40 = \frac{1}{40} = 0.025$

```
  0.025
40|1.000
  80
  200
  200
    0
```

$1:400 = \frac{1}{400} = 0.0025$

```
   0.0025
400|1.0000
  800
  2000
  2000
     0
```

$1:4 = \frac{1}{4} = 0.25$

```
  0.25
4|1.00
  8
  20
  20
   0
```

1:4 is the strongest solution.

30. $\frac{1}{10} = 0.1$

```
  0.1
10|1.0
  10
   0
```

$\frac{1}{200} = 0.005$

```
  0.005
200|1.000
  1000
     0
```

$\frac{1}{50} = 0.02$

```
  0.02
50|1.00
  100
   0
```

$\frac{1}{10}$ is the strongest solution.

31. $1680 \times \frac{20}{400} = 1680 \times \frac{1}{20} = \frac{1680}{20} = \frac{168}{2} = \mathbf{84}$

32. $\frac{4}{75} \div \frac{1}{300} = \frac{4}{75} \times \frac{300}{1} = \frac{1200}{75} = \mathbf{16}$

$$
\begin{array}{r}
16 \\
75\overline{)1200} \\
\underline{75} \\
450 \\
\underline{450} \\
0
\end{array}
$$

33. $\frac{3}{15} \times 5 = \frac{15}{15} = \mathbf{1}$

34. $2.2 \times 250 \div 500 = 550 \div 500 = \frac{550}{500} = \mathbf{1.1}$

$$
\begin{array}{r}
1.1 \\
500\overline{)550.0} \\
\underline{500} \\
500 \\
\underline{500} \\
0
\end{array}
$$

35. $0.6 \times \frac{200}{1.2} = \frac{120}{1.2} = \mathbf{100}$

$$
\begin{array}{r}
100 \\
1.2\overline{)120.0} \\
\underline{12} \\
000
\end{array}
$$

36. $11\frac{7}{9} \times 3 = \frac{106}{9} \times 3 = \frac{318}{9} = \mathbf{35.33}$

$$
\begin{array}{r}
35.33 \\
9\overline{)318.00} \\
\underline{27} \\
48 \\
\underline{45} \\
30 \\
\underline{27} \\
30 \\
\underline{27} \\
3
\end{array}
$$

37. $\frac{1}{8} \div \frac{1}{3} \times 2 = \frac{1}{8} \times \frac{3}{1} \times 2 = \frac{3}{8} \times 2 = \frac{6}{8} = \mathbf{0.75}$

$$
\begin{array}{r}
0.75 \\
8\overline{)6.00} \\
\underline{56} \\
40 \\
\underline{40} \\
0
\end{array}
$$

38. $\frac{7}{4} \times 12 = \mathbf{21}$

39. $\frac{9}{0.6} \times 8 = \frac{72}{0.6} = \mathbf{120}$

$$
\begin{array}{r}
120 \\
0.6\overline{)72.0} \\
\underline{6} \\
12 \\
\underline{12} \\
00
\end{array}
$$

40. $\frac{0.4}{0.1} \times 22.5 = 4 \times 22.5 =$ **90**

41. $\frac{3}{8} \times 368 =$ **138 nurses**

    $\frac{1}{8} \times 368 =$ **46 maintenance/cleaners**

    $\frac{1}{4} \times 368 =$ **92 technicians and 92 others**

42. $125 \times 0.2 =$ **25 g protein**

    $125 \times 0.05 =$ **6.25 g fat**

```
  125
× 0.2
 25.0  = 25

  125
× 0.05
 6.25  = 6.25
```

43. $308 \times 0.75 =$ **231 points needed to pass**

```
  308
× 0.75
 2156
1540
231.00
```

44. $\frac{27 \text{ minutes}}{90 \text{ ~~calories~~}} \times 200 \text{ ~~calories~~} = \frac{20 \times 27 \text{ minutes}}{9} = \frac{540 \text{ minutes}}{9} =$ **60 minutes**

45. $0.25 \times 200 =$ **50 mL**

```
  200
× 0.25
 1000
 400
50.00
```

46. $60 \times 0.45 =$ **27 mg**

```
  60
× 0.45
 300
 240
27.00
```

47. $\frac{6.75 \text{ mg}}{1 \text{ ~~minute~~}} \times 42 \text{ ~~minutes~~} = 6.75 \text{ mg} \times 42 =$ **283.5 mg of medication**

```
 6.75
×  42
1350
2700
283.50
```

48. $60 \text{ kg} \times 0.05 =$ **3 kg**

49. $0.17 \times \$12.56 = 2.14$

```
$12.56
-  2.14
$10.42
```

50. 10% of 150 = 0.10 × 150 = 15

150 mg first dose
− 15
135 mg second dose
− 15
120 mg third dose
− 15
105 mg fourth dose
− 15
90 mg fifth dose
− 15
75 mg sixth dose

6 total doses