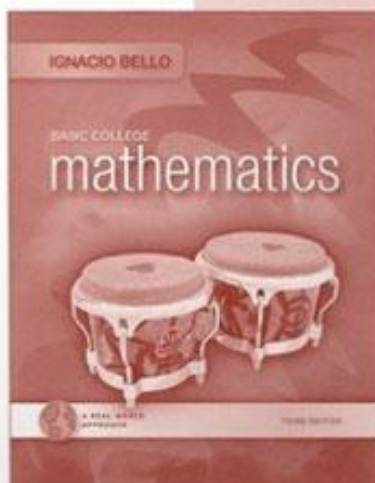


SOLUTIONS MANUAL



Student's Solutions Manual to accompany



Prepared by
Mark Stevenson

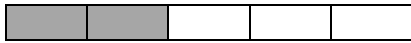
Chapter 2

Fractions and Mixed Numbers

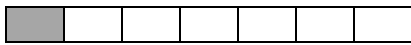
Section 2.1 – Fractions and Mixed Numbers

Problems

1. $\frac{2}{5} = \frac{2 \text{ shaded parts}}{5 \text{ total parts}}$



$\frac{1}{7} = \frac{1 \text{ shaded part}}{7 \text{ total parts}}$



2. a. $\frac{6}{6} = 1$; thus $\frac{6}{6}$ is an improper fraction.

b. $\frac{3}{19}$ is less than 1; thus $\frac{3}{19}$ is a proper fraction.

c. $\frac{19}{3}$ is greater than 1; thus $\frac{19}{3}$ is an improper fraction.

d. $\frac{0}{3} = 0$, which is less than 1; thus $\frac{0}{19}$ is a proper fraction.

c. $\frac{7}{1}$ is greater than 1; thus $\frac{7}{1}$ is an improper fraction.

3. a. $\frac{26}{5} = 5$ with a remainder of 1. Thus

$$\frac{26}{5} = 5\frac{1}{5}.$$

b. $\frac{47}{6} = 7$ with a remainder of 5. Thus

$$\frac{47}{6} = 7\frac{5}{6}.$$

4. a. $5\frac{3}{4} = \frac{4 \times 5 + 3}{4} = \frac{23}{4}$

b. $8\frac{2}{7} = \frac{7 \times 8 + 2}{7} = \frac{58}{7}$

5. a. 1 week = $\frac{7}{30}$ month

b. 30 days = $\frac{30}{30} = 1$ month

c. 60 days = $\frac{60}{30} = 2$ months

6. a. Safflower oil

b. $\frac{8}{10}$

7. $\frac{28}{4} = 7$

Exercises 2.1

1. $\frac{1 \text{ part shaded}}{2 \text{ equal parts}} = \frac{1}{2}$

2. $\frac{2 \text{ parts shaded}}{4 \text{ equal parts}} = \frac{2}{4}$

3. $\frac{1 \text{ part shaded}}{3 \text{ equal parts}} = \frac{1}{3}$

4. $\frac{4 \text{ parts shaded}}{5 \text{ equal parts}} = \frac{4}{5}$

5. $\frac{5 \text{ parts shaded}}{12 \text{ equal parts}} = \frac{5}{12}$

6. $\frac{2 \text{ parts shaded}}{8 \text{ equal parts}} = \frac{2}{8}$

7. $\frac{1 \text{ part shaded}}{4 \text{ equal parts}} = \frac{1}{4}$

8. $\frac{2 \text{ parts shaded}}{4 \text{ equal parts}} = \frac{2}{4}$
9. $\frac{3 \text{ parts shaded}}{4 \text{ equal parts}} = \frac{3}{4}$
10. $\frac{4 \text{ parts shaded}}{8 \text{ equal parts}} = \frac{4}{8}$
11. $\frac{2}{4}$
12. $\frac{1}{4}$
13. $\frac{3}{4}$
14. $\frac{0}{4}$ or 0
15. $\frac{4}{4}$ or 1
16. $\frac{1}{3}$
17. $\frac{2}{3}$
18. $\frac{3}{3}$ or 1
19. 1
20. $\frac{1}{2}$
21. $\frac{9}{61}$ is less than 1 and is therefore a proper fraction.
22. $\frac{61}{9}$ is greater than 1 and is therefore an improper fraction.
23. $\frac{4}{17}$ is less than 1 and is therefore a proper fraction.
24. $\frac{17}{4}$ is greater than 1 and is therefore an improper fraction.
25. $\frac{8}{41}$ is less than 1 and is therefore a proper fraction.
26. $\frac{9}{47}$ is less than 1 and is therefore a proper fraction.
27. $\frac{8}{16}$ is less than 1 and is therefore a proper fraction.
28. $\frac{14}{1}$ is greater than 1 and is therefore an improper fraction.
29. $\frac{3}{100}$ is less than 1 and is therefore a proper fraction.
30. $\frac{100}{10}$ is greater than 1 and is therefore an improper fraction.
31. $\frac{31}{10} = 3$ with remainder 1; thus $\frac{31}{10} = 3\frac{1}{10}$.
32. $\frac{46}{5} = 9$ with remainder 1; thus $\frac{46}{5} = 9\frac{1}{5}$.
33. $\frac{8}{7} = 1$ with remainder 1; thus $\frac{8}{7} = 1\frac{1}{7}$.
34. $\frac{59}{8} = 7$ with remainder 3; thus $\frac{59}{8} = 7\frac{3}{8}$.
35. $\frac{29}{8} = 3$ with remainder 5; thus $\frac{29}{8} = 3\frac{5}{8}$.
36. $\frac{19}{2} = 9$ with remainder 1; thus $\frac{19}{2} = 9\frac{1}{2}$.
37. $\frac{69}{9} = 7$ with remainder 6; thus $\frac{69}{9} = 7\frac{6}{9} = 7\frac{2}{3}$.

38. $\frac{83}{3} = 27$ with remainder 2; thus
 $\frac{83}{3} = 27\frac{2}{3}$.
39. $\frac{101}{10} = 10$ with remainder 1; thus
 $\frac{101}{10} = 10\frac{1}{10}$.
40. $\frac{97}{3} = 32$ with remainder 1; thus
 $\frac{97}{3} = 32\frac{1}{3}$.
41. $5\frac{1}{7} = \frac{7 \times 5 + 1}{7} = \frac{35 + 1}{7} = \frac{36}{7}$
42. $6\frac{1}{9} = \frac{9 \times 6 + 1}{9} = \frac{54 + 1}{9} = \frac{55}{9}$
43. $4\frac{1}{10} = \frac{10 \times 4 + 1}{10} = \frac{40 + 1}{10} = \frac{41}{10}$
44. $5\frac{3}{11} = \frac{11 \times 5 + 3}{11} = \frac{55 + 3}{11} = \frac{58}{11}$
45. $1\frac{2}{11} = \frac{11 \times 1 + 2}{11} = \frac{11 + 2}{11} = \frac{13}{11}$
46. $3\frac{2}{13} = \frac{13 \times 3 + 2}{13} = \frac{39 + 2}{13} = \frac{41}{13}$
47. $8\frac{3}{10} = \frac{10 \times 8 + 3}{10} = \frac{80 + 3}{10} = \frac{83}{10}$
48. $7\frac{2}{11} = \frac{11 \times 7 + 2}{11} = \frac{77 + 2}{11} = \frac{79}{11}$
49. $2\frac{1}{6} = \frac{6 \times 2 + 1}{6} = \frac{12 + 1}{6} = \frac{13}{6}$
50. $9\frac{7}{8} = \frac{8 \times 9 + 7}{8} = \frac{72 + 7}{8} = \frac{79}{8}$
51. 7 hours = $\frac{7}{24}$ day
52. 45 minutes = $\frac{45}{60} = \frac{3}{4}$ hour
53. 7 ounces = $\frac{7}{16}$ pound
54. a. 5 pieces = $\frac{5}{8}$
 b. 3 pieces left = $\frac{3}{8}$
55. $\frac{5}{8}$
56. $\frac{31}{41}$
57. $\frac{51}{100}$
58. $\frac{7}{100}$
59. a. Dog food: $\frac{60}{60} = 1$ minute
 b. Toothpaste: $\frac{90}{60} = 1\frac{1}{2}$ minutes
 c. Soap: $\frac{45}{60} = \frac{3}{4}$ minute
 d. Cereal: $\frac{15}{60} = \frac{1}{4}$ minute
60. $\frac{3}{31}$
61. Single person: $\frac{25}{98}$
62. Three persons: $\frac{16}{98} = \frac{8}{49}$
63. Five persons: $\frac{6}{98} = \frac{3}{49}$
64. Five persons or more: $\frac{6 + 2 + 1}{98} = \frac{9}{98}$
65. Six persons or more: $\frac{2 + 1}{98} = \frac{3}{98}$
66. Germany: $\frac{5}{99}$

67. Mexico: $\frac{37}{99}$
68. Italy: $\frac{5}{99}$
69. Spain: $\frac{2}{99}$
70. Switzerland: $\frac{2}{99}$
71. $\frac{35}{100} = \frac{7}{20}$
72. $\frac{3}{10}$
73. $\frac{15}{100} = \frac{3}{20}$
74. $\frac{1}{10}$
75. $\frac{10}{100} = \frac{1}{10}$
76. Payment history, since it contributes most to the FICO score.
77. $\frac{0}{4} = 0$ was used; $\frac{4}{4} = 1$ remains
78. $\frac{1}{4}$ was used; $\frac{3}{4}$ remains
79. $\frac{2}{4} = \frac{1}{2}$ was used; $\frac{2}{4} = \frac{1}{2}$ remains
80. $\frac{3}{4}$ was used; $\frac{1}{4}$ remains
81. $\frac{180}{10} = 18$ miles per gallon
82. $\frac{260}{13} = 20$ miles per gallon
83. $\frac{210}{10} = 21$ miles per gallon
84. $\frac{23}{1} = 23$ miles per gallon
85. $\frac{25 \text{ miles}}{1 \text{ gallon}} \cdot 14 \text{ gallons} = 350$ miles
86. $220 \text{ miles} \cdot \frac{1 \text{ gallon}}{20 \text{ miles}} = \frac{220}{20} = 11$ gal.
87. $340 \text{ miles} \cdot \frac{1 \text{ gallon}}{20 \text{ miles}} = \frac{340}{20} = 17$ gallons needed. Thus, no you can't make it since you need 17 gallons and you only have 14 gallons.
88. $\frac{260}{20} = 13$ gallons
89. $240 \text{ miles} \cdot \frac{1 \text{ gallon}}{20 \text{ miles}} = \frac{240}{20} = 12$ gal.
90. $\frac{322}{14} = 23$ mpg
91. Answers may vary.
92. Answers may vary. Sample answer: $\frac{0}{n} = 0$ since $0 = 0 \cdot n$. No, n can't be 0.
93. Answers may vary.
94. numerator
95. denominator
96. less
97. greater
98. 0
99. undefined
100. sum
101. $\frac{a}{b}$

102. P/E ratio = $\frac{48}{12} = 4$

103. 5 months = $\frac{5}{12}$ year

104. $7\frac{2}{3} = \frac{3 \times 7 + 2}{3} = \frac{21 + 2}{3} = \frac{23}{3}$

105. $\frac{25}{3} = 8$ with remainder 1; thus $\frac{25}{3} = 8\frac{1}{3}$.

106. $\frac{17}{18}$ is less than 1 and is therefore a proper fraction.

107. $\frac{17}{17} = 1$ and is therefore an improper fraction.

108. $\frac{2 \text{ parts shaded}}{5 \text{ equal parts}} = \frac{2}{5}$

109. $23 < 27$

110. $38 > 31$

111.
$$\begin{array}{r} 2 \overline{)28} \\ \underline{2} \\ 0 \end{array}$$
 Thus, $28 = 2^2 \cdot 7$

112.
$$\begin{array}{r} 2 \overline{)72} \\ \underline{2} \\ 0 \\ 2 \overline{)36} \\ \underline{2} \\ 0 \\ 2 \overline{)18} \\ \underline{2} \\ 0 \\ 3 \overline{)9} \\ \underline{3} \\ 0 \end{array}$$
 Thus, $72 = 2^3 \cdot 3^2$

113.
$$\begin{array}{r} 2 \overline{)180} \\ \underline{2} \\ 0 \\ 2 \overline{)90} \\ \underline{2} \\ 0 \\ 3 \overline{)45} \\ \underline{3} \\ 0 \\ 3 \overline{)15} \\ \underline{3} \\ 0 \end{array}$$
 Thus, $180 = 2^2 \cdot 3^2 \cdot 5$

114.
$$\begin{array}{r} 2 \overline{)200} \\ \underline{2} \\ 0 \\ 2 \overline{)100} \\ \underline{2} \\ 0 \\ 2 \overline{)50} \\ \underline{2} \\ 0 \\ 5 \overline{)25} \\ \underline{5} \\ 0 \end{array}$$
 Thus, $200 = 2^3 \cdot 5^2$

Section 2.2 – Equivalent Fractions

Problems

1. a. $\frac{2}{7} = \frac{?}{28}$. The denominator 7 has to be multiplied by 4 to get the denominator 28 so the numerator 2 has to be multiplied by 4. Thus $\frac{2}{7} = \frac{2 \times 4}{7 \times 4} = \frac{8}{28}$.

b. $\frac{5}{6} = \frac{20}{?}$. The numerator 5 has to be multiplied by 4 to get the numerator 20 so the denominator 6 has to be multiplied by 4. Thus $\frac{5}{6} = \frac{5 \times 4}{6 \times 4} = \frac{20}{24}$.

2. a. $\frac{42}{54} = \frac{?}{18}$. The denominator 54 has to be divided by 3 to get the denominator 18 so the numerator 42 has to be divided by 3. Thus $\frac{42}{54} = \frac{42 \div 3}{54 \div 3} = \frac{14}{18}$.

b. $\frac{6}{20} = \frac{3}{?}$. The numerator 6 has to be divided by 2 to get the numerator 3 so the denominator 20 has to be divided by 2. Thus $\frac{6}{20} = \frac{6 \div 2}{20 \div 2} = \frac{3}{10}$.

$$3. \text{ a. } \frac{16}{80} = \frac{\cancel{2} \times \cancel{2} \times \cancel{2} \times \cancel{2}}{\cancel{2} \times \cancel{2} \times \cancel{2} \times \cancel{2} \times 5} = \frac{1}{5}$$

$$\text{ b. } \frac{70}{155} = \frac{2 \times \cancel{5} \times 7}{\cancel{5} \times 31} = \frac{14}{31}$$

$$4. \frac{28\cancel{0}}{12\cancel{0}} = \frac{28}{12} = \frac{\cancel{4} \times 7}{\cancel{4} \times 3} = \frac{7}{3}$$

$$10. 5\frac{1}{10} = \frac{?}{90}; \frac{51}{10} = \frac{51 \times 9}{10 \times 9} = \frac{459}{90}. \text{ The missing number is 459.}$$

$$11. \frac{12}{15} = \frac{?}{5}; \frac{12}{15} = \frac{12 \div 3}{15 \div 3} = \frac{4}{5}. \text{ The missing number is 4.}$$

$$12. \frac{14}{42} = \frac{?}{6}; \frac{14}{42} = \frac{14 \div 7}{42 \div 7} = \frac{2}{6}. \text{ The missing number is 2.}$$

$$13. \frac{8}{24} = \frac{4}{?}; \frac{8}{24} = \frac{8 \div 2}{24 \div 2} = \frac{4}{12}. \text{ The missing number is 12.}$$

$$14. \frac{12}{18} = \frac{4}{?}; \frac{12}{18} = \frac{12 \div 3}{18 \div 3} = \frac{4}{6}. \text{ The missing number is 6.}$$

$$15. \frac{21}{56} = \frac{?}{8}; \frac{21}{56} = \frac{21 \div 7}{56 \div 7} = \frac{3}{8}. \text{ The missing number is 3.}$$

$$16. \frac{36}{180} = \frac{?}{5}; \frac{36}{180} = \frac{36 \div 36}{180 \div 36} = \frac{1}{5}. \text{ The missing number is 1.}$$

$$17. \frac{28}{30} = \frac{\cancel{2} \times 14}{\cancel{2} \times 15} = \frac{14}{15}$$

$$18. \frac{15}{12} = \frac{\cancel{3} \times 5}{\cancel{3} \times 4} = \frac{5}{4}$$

$$19. \frac{13}{52} = \frac{13}{2 \times 26} = \frac{\cancel{13}}{2 \times 2 \times \cancel{13}} = \frac{1}{4}$$

$$20. \frac{27}{54} = \frac{\cancel{27}}{2 \times \cancel{27}} = \frac{1}{2}$$

$$21. \frac{56}{24} = \frac{2 \times 28}{2 \times 12} = \frac{2 \times 2 \times 14}{2 \times 2 \times 6} = \frac{\cancel{2} \times \cancel{2} \times \cancel{2} \times 7}{\cancel{2} \times \cancel{2} \times \cancel{2} \times 3} = \frac{7}{3}$$

Exercises 2.2

$$1. \frac{3}{5} = \frac{?}{50}; \frac{3}{5} = \frac{3 \times 10}{5 \times 10} = \frac{30}{50}. \text{ The missing number is 30.}$$

$$2. \frac{1}{8} = \frac{4}{?}; \frac{1}{8} = \frac{1 \times 4}{8 \times 4} = \frac{4}{32}. \text{ The missing number is 32.}$$

$$3. \frac{1}{6} = \frac{5}{?}; \frac{1}{6} = \frac{1 \times 5}{6 \times 5} = \frac{5}{30}. \text{ The missing number is 30.}$$

$$4. \frac{7}{9} = \frac{?}{27}; \frac{7}{9} = \frac{7 \times 3}{9 \times 3} = \frac{21}{27}. \text{ The missing number is 21.}$$

$$5. \frac{3}{5} = \frac{27}{?}; \frac{3}{5} = \frac{3 \times 9}{5 \times 9} = \frac{27}{45}. \text{ The missing number is 45.}$$

$$6. \frac{7}{12} = \frac{?}{60}; \frac{7}{12} = \frac{7 \times 5}{12 \times 5} = \frac{35}{60}. \text{ The missing number is 35.}$$

$$7. 1\frac{2}{3} = \frac{?}{9}; \frac{5}{3} = \frac{5 \times 3}{3 \times 3} = \frac{15}{9}. \text{ The missing number is 15.}$$

$$8. 2\frac{1}{5} = \frac{?}{15}; \frac{11}{5} = \frac{11 \times 3}{5 \times 3} = \frac{33}{15}. \text{ The missing number is 33.}$$

$$9. 4\frac{1}{2} = \frac{?}{16}; \frac{9}{2} = \frac{9 \times 8}{2 \times 8} = \frac{72}{16}. \text{ The missing number is 72.}$$

22. $\frac{56}{21} = \frac{8 \times \cancel{7}}{3 \times \cancel{7}} = \frac{8}{3}$
23. $\frac{21}{28} = \frac{3 \times \cancel{7}}{4 \times \cancel{7}} = \frac{3}{4}$
24. $\frac{18}{24} = \frac{3 \times \cancel{6}}{4 \times \cancel{6}} = \frac{3}{4}$
25. $\frac{22}{33} = \frac{2 \times \cancel{11}}{3 \times \cancel{11}} = \frac{2}{3}$
26. $\frac{100}{25} = \frac{4 \times \cancel{25}}{\cancel{25}} = \frac{4}{1} = 4$
27. $\frac{45}{210} = \frac{5 \times 9}{5 \times 42} = \frac{\cancel{5} \times \cancel{3} \times 3}{\cancel{5} \times \cancel{3} \times 14} = \frac{3}{14}$
28. $\frac{18\cancel{0}}{16\cancel{0}} = \frac{18}{16} = \frac{\cancel{2} \times 9}{\cancel{2} \times 8} = \frac{9}{8}$
29. $\frac{231}{1001} = \frac{3 \times 77}{7 \times 143} = \frac{3 \times \cancel{7} \times \cancel{11}}{\cancel{7} \times \cancel{11} \times 13} = \frac{3}{13}$
30. $\frac{91}{455} = \frac{7 \times 13}{5 \times 91} = \frac{\cancel{7} \times \cancel{13}}{5 \times \cancel{7} \times \cancel{13}} = \frac{1}{5}$
31. $\frac{46}{100} = \frac{2 \times 23}{2 \times 50} = \frac{23}{50}$. This is $\frac{23}{50}$ of the personal income tax revenues.
32. $\frac{8}{100} = \frac{2}{25}$. This is $\frac{2}{25}$ of the corporate income tax revenues.
33. $\frac{46\cancel{0}}{276\cancel{0}} = \frac{2 \times 23}{2 \times 6 \times 23} = \frac{1}{6}$. The fraction of the budget to be spent on defense is $\frac{1}{6}$.
34. $\frac{20}{365} = \frac{5 \times 4}{5 \times 73} = \frac{4}{73}$. This is $\frac{4}{73}$ of the days.
35. $\frac{100}{365} = \frac{5 \times 20}{5 \times 73} = \frac{20}{73}$. This is $\frac{20}{73}$ of the days.
36. $\frac{36}{80} = \frac{4 \times 9}{4 \times 20} = \frac{9}{20}$. This is $\frac{9}{20}$ of the water used per day.
37. a. $\frac{26}{52} = \frac{1 \times 26}{2 \times 26} = \frac{1}{2}$ of the deck is red.
 b. $\frac{13}{52} = \frac{1 \times 13}{2 \times 2 \times 13} = \frac{1}{4}$ of the deck is hearts.
 c. $\frac{4}{52} = \frac{1 \times 4}{2 \times 2 \times 13} = \frac{1}{13}$ of the deck is Kings.
38. $\frac{21\cancel{0}}{63\cancel{0}} = \frac{21}{63} = \frac{3 \times 7}{3 \times 21} = \frac{1}{3}$. He got a hit $\frac{1}{3}$ of the time.
39. $\frac{3}{5}$ and $\frac{1}{2}$; $3 \times 2 = 6 > 5 \times 1 = 5$ so $\frac{3}{5} > \frac{1}{2}$. The recipe calling for $\frac{3}{5}$ cup takes more sugar.
40. a. $\frac{45\cancel{00}}{10,0\cancel{00}} = \frac{45}{100} = \frac{5 \times 9}{5 \times 20} = \frac{9}{20}$
 b. $\frac{9}{20}$ and $\frac{1}{5}$; $9 \times 5 = 45 > 20 \times 1 = 20$ so $\frac{9}{20} > \frac{1}{5}$. The dumping of sewage was greater in the first year.
41. $\frac{24}{96} = \frac{\cancel{2} \times \cancel{2} \times \cancel{2} \times \cancel{2}}{\cancel{2} \times \cancel{2} \times \cancel{2} \times \cancel{2} \times 4} = \frac{1}{4}$. He uses $\frac{1}{4}$ of his time in shopping and paperwork.

42. $\frac{36}{96} = \frac{\cancel{2} \times \cancel{2} \times \cancel{3} \times 3}{\cancel{2} \times \cancel{2} \times 2 \times \cancel{3} \times 4} = \frac{3}{8}$. He uses $\frac{3}{8}$ of his time doing housework.

43. $\frac{12}{96} = \frac{\cancel{2} \times \cancel{2} \times \cancel{3}}{\cancel{2} \times \cancel{2} \times 2 \times \cancel{3} \times 4} = \frac{1}{8}$. He uses $\frac{1}{8}$ of his time doing kitchen work.

44. $\frac{24}{96} = \frac{\cancel{2} \times \cancel{2} \times \cancel{2} \times \cancel{3}}{\cancel{2} \times \cancel{2} \times \cancel{2} \times \cancel{3} \times 4} = \frac{1}{4}$. He uses $\frac{1}{4}$ of his time caring for the family.

45. $\frac{25}{200} = \frac{\cancel{5} \times \cancel{5}}{\cancel{5} \times \cancel{5} \times 8} = \frac{1}{8}$. The fraction of a Big Mac that is protein is $\frac{1}{8}$.

46. $\frac{4\cancel{0}}{20\cancel{0}} = \frac{\cancel{2} \times \cancel{2}}{\cancel{2} \times \cancel{2} \times 5} = \frac{1}{5}$. The fraction of a Big Mac that is carbohydrates is $\frac{1}{5}$.

47. $\frac{35}{200} = \frac{\cancel{5} \times 7}{\cancel{5} \times 40} = \frac{7}{40}$. The fraction of a Big Mac that is fat is $\frac{7}{40}$.

48. $\frac{18}{140} = \frac{\cancel{2} \times 9}{\cancel{2} \times 70} = \frac{9}{70}$. The fraction of the 2 slices that is protein is $\frac{9}{70}$.

49. $\frac{52}{140} = \frac{\cancel{2} \times \cancel{2} \times 13}{\cancel{2} \times \cancel{2} \times 35} = \frac{13}{35}$. The fraction of the 2 slices that is carbohydrates is $\frac{13}{35}$.

50. $\frac{6}{140} = \frac{\cancel{2} \times 3}{\cancel{2} \times 70} = \frac{3}{70}$. The fraction of 2 slices that is fat is $\frac{3}{70}$.

51. a. $\frac{5}{258}$

b. $\frac{10}{258} = \frac{5}{129}$

52. a. $\frac{0}{258} = 0$

b. $\frac{0}{258} = 0$

53. a. $\frac{54}{258} = \frac{9}{43}$

b. $\frac{53}{258}$

54. a. $\frac{4}{258} = \frac{2}{129}$

b. $\frac{4}{258} = \frac{2}{129}$

55. a. $\frac{16}{258} = \frac{8}{129}$

b. $\frac{9}{258} = \frac{3}{86}$

56. a. $\frac{25}{258}$

b. $\frac{37}{258}$

57. $\frac{25}{30} = \frac{5}{6}$ or “5 to 6”

58. P/E ratio = $\frac{20}{5} = 4$ or “4 to 1”

59. a. $\frac{2\cancel{00}}{56\cancel{00}} = \frac{\cancel{2}}{\cancel{2} \times 2 \times 14} = \frac{1}{28}$ or “1 to 28”

b. $\frac{1}{20} = \frac{?}{8000}$. The denominator 20 has to be multiplied by 400 to get the denominator 8000 so the numerator 1 has to be multiplied by 400. Thus $\frac{1}{20} = \frac{1 \times 400}{20 \times 400} = \frac{400}{8000}$ and so 400 teachers are needed.

60. Answers may vary.

61. Answers may vary. Sample answer: $\frac{1}{2}$ and $\frac{4}{8}$.

62. Answers may vary.

63. Answers may vary.

64. Answers may vary.

$$65. \frac{6x^3}{8x^2} = \frac{\cancel{2} \cdot 3 \cdot \cancel{x} \cdot \cancel{x} \cdot x}{\cancel{2} \cdot 2 \cdot 2 \cdot \cancel{x} \cdot \cancel{x}} = \frac{3x}{4}$$

$$66. \frac{8x^3}{6x^2} = \frac{\cancel{2} \cdot 2 \cdot 2 \cdot \cancel{x} \cdot \cancel{x} \cdot x}{\cancel{2} \cdot 3 \cdot \cancel{x} \cdot \cancel{x}} = \frac{4x}{3}$$

$$67. \frac{12x^4}{18x^3} = \frac{\cancel{2} \cdot 2 \cdot \cancel{3} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot x}{\cancel{2} \cdot \cancel{3} \cdot 3 \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x}} = \frac{2x}{3}$$

$$68. \frac{16x^5}{32x^7} = \frac{\cancel{16} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x}}{2 \cdot \cancel{16} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot x \cdot x} = \frac{1}{2x^2}$$

69. equivalent

$$70. \frac{a \cdot c}{b \cdot c}$$

71. reduced

72. product

73. $\frac{3}{5} = \frac{?}{25}$. The denominator 5 has to be multiplied by 5 to get the denominator 25 so the numerator 3 has to be multiplied by 5. Thus $\frac{3}{5} = \frac{3 \times 5}{5 \times 5} = \frac{15}{25}$.

74. $\frac{4}{9} = \frac{24}{?}$. The numerator 4 has to be multiplied by 6 to get the numerator 24 so the denominator 9 has to be multiplied by 6. Thus $\frac{4}{9} = \frac{4 \times 6}{9 \times 6} = \frac{24}{54}$.

75. $\frac{9}{75} = \frac{?}{25}$. The denominator 75 has to be divided by 3 to get the denominator 25 so the numerator 9 has to be divided by 3.

$$\text{Thus } \frac{9}{75} = \frac{9 \div 3}{75 \div 3} = \frac{3}{25}.$$

76. $\frac{54}{90} = \frac{6}{?}$. The numerator 54 has to be divided by 9 to get the numerator 6 so the denominator 90 has to be divided by 10.

$$\text{Thus } \frac{54}{90} = \frac{54 \div 9}{90 \div 9} = \frac{6}{10}.$$

$$77. \frac{20}{115} = \frac{\cancel{5} \times 4}{\cancel{5} \times 23} = \frac{4}{23}$$

$$78. \frac{54}{90} = \frac{\cancel{2} \times \cancel{3} \times \cancel{3} \times 3}{\cancel{2} \times \cancel{3} \times \cancel{3} \times 5} = \frac{3}{5}$$

$$79. 3\frac{3}{8} = \frac{8 \times 3 + 3}{8} = \frac{24 + 3}{8} = \frac{27}{8}$$

$$80. 6\frac{5}{7} = \frac{47}{7}$$

$$81. 7\frac{9}{10} = \frac{10 \times 7 + 9}{10} = \frac{70 + 9}{10} = \frac{79}{10}$$

$$82. 9\frac{2}{11} = \frac{101}{11}$$

$$83. 10\frac{2}{13} = \frac{10 \times 13 + 2}{13} = \frac{130 + 2}{13} = \frac{132}{13}$$

$$84. 11\frac{1}{5} = \frac{56}{5}$$

Section 2.3 – Multiplication and Division of Fractions and Mixed Numbers

Problems

1. a. $\frac{2}{5} \cdot \frac{4}{7} = \frac{2 \cdot 4}{5 \cdot 7} = \frac{8}{35}$

b. $\frac{3}{4} \cdot \frac{2}{3} = \frac{3 \cdot 2}{4 \cdot 3} = \frac{6}{12} = \frac{1}{2}$.

2. a. Ground beef:
 $\frac{1}{3} \cdot 1\frac{1}{2} = \frac{1}{3} \cdot \frac{3}{2} = \frac{1 \cdot 3}{3 \cdot 2} = \frac{3}{6} = \frac{1}{2}$ lb
- b. Veal: $\frac{1}{3} \cdot 1 = \frac{1}{3}$ lb
- c. Onion: $\frac{1}{3} \cdot \frac{1}{4} = \frac{1 \cdot 1}{3 \cdot 4} = \frac{1}{12}$ cup
- d. Salt: $\frac{1}{3} \cdot 2 = \frac{1}{3} \cdot \frac{2}{1} = \frac{2}{3}$ tsp
- e. Garlic salt: $\frac{1}{3} \cdot \frac{1}{2} = \frac{1}{6}$ tsp
- f. Pepper: $\frac{1}{3} \cdot \frac{1}{3} = \frac{1}{9}$ tsp

3. $3\frac{1}{4} \cdot \frac{4}{3} \cdot \frac{3}{13} = \frac{\cancel{13}^1}{\cancel{4}_1} \cdot \frac{\cancel{4}_1}{\cancel{13}_1} \cdot \frac{\cancel{3}_1}{\cancel{13}_1} = 1$
4. a. $\left(\frac{2}{5}\right)^3 = \frac{2}{5} \cdot \frac{2}{5} \cdot \frac{2}{5} = \frac{8}{125}$ lb
- b. $\left(1\frac{1}{4}\right)^2 = \left(\frac{5}{4}\right)^2 = \frac{5}{4} \cdot \frac{5}{4} = \frac{25}{16}$
- c. $\left(\frac{2}{3}\right)^2 \cdot \left(2\frac{1}{4}\right) = \frac{\cancel{2}_1}{\cancel{3}_1} \cdot \frac{\cancel{2}_1}{\cancel{3}_1} \cdot \frac{\cancel{4}_1}{\cancel{4}_1} = 1$

5. a. $\frac{5}{7} \div \frac{3}{8} = \frac{5}{7} \cdot \frac{8}{3} = \frac{40}{21}$
- b. $\frac{3}{4} \div 7 = \frac{3}{4} \cdot \frac{1}{7} = \frac{3}{28}$
6. a. $5\frac{1}{2} \div \frac{3}{4} = \frac{11}{2} \div \frac{3}{4} = \frac{11}{\cancel{2}_1} \cdot \frac{\cancel{4}_2}{3} = \frac{22}{3}$
- b. $\frac{6}{7} \div 3\frac{1}{7} = \frac{6}{7} \div \frac{22}{7} = \frac{\cancel{6}_3}{\cancel{7}_1} \cdot \frac{\cancel{7}_7}{\cancel{22}_{11}} = \frac{3}{11}$

7. $2\frac{1}{2} \cdot 41,000 = \frac{5}{\cancel{2}_1} \cdot \frac{\cancel{41,000}^{20,500}}{1} = 102,500$

They can afford \$102,500 home.

8. $130 \div 1\frac{2}{5} = 130 \div \frac{7}{5} = 130 \cdot \frac{5}{7} = \frac{650}{7} = 92\frac{6}{7}$
 About 93 brushings are possible.

9. Area = $4\frac{1}{3} \cdot 5\frac{2}{3} = \frac{13}{3} \cdot \frac{17}{3} = \frac{221}{9} = 24\frac{5}{9}$ yd²

Exercises 2.3

1. $\frac{3}{4} \cdot \frac{7}{8} = \frac{3 \cdot 7}{4 \cdot 8} = \frac{21}{32}$

2. $\frac{2}{3} \cdot \frac{7}{3} = \frac{14}{9}$

3. $\frac{1}{\cancel{6}} \cdot \frac{\cancel{6}}{7} = \frac{1}{7}$

4. $\frac{\cancel{4}}{9} \cdot \frac{4}{\cancel{4}} = \frac{4}{9}$

5. $\frac{2}{\cancel{3}} \cdot \frac{\cancel{3}}{3} = \frac{2}{3}$

6. $\frac{\cancel{6}}{5} \cdot \frac{7}{\cancel{6}} = \frac{7}{5}$

7. $3 \cdot \frac{2}{5} = \frac{3}{1} \cdot \frac{2}{5} = \frac{6}{5}$ or $1\frac{1}{5}$

8. $\frac{3}{4} \cdot 7 = \frac{21}{4}$ or $5\frac{1}{4}$

9. $\frac{\cancel{1}}{\cancel{2}\cancel{6}} \cdot \frac{\cancel{1}}{\cancel{6}_1} = \frac{1}{2}$

10. $\frac{\cancel{7}}{\cancel{7}} \cdot \frac{\cancel{6}^2}{\cancel{7}} = 2$

11. $\frac{\cancel{7}}{\cancel{7}_1} \cdot \frac{\cancel{15}^3}{\cancel{14}_2} = \frac{3}{2}$ or $1\frac{1}{2}$

$$12. \frac{\cancel{2}}{\cancel{1}} \cdot \frac{\cancel{21}}{\cancel{8}} = \frac{3}{4}$$

$$13. \frac{\cancel{6}}{\cancel{1}} \cdot \frac{\cancel{14}}{\cancel{1}} = \frac{4}{1} = 4$$

$$14. \frac{\cancel{21}}{\cancel{2}} \cdot \frac{\cancel{8}}{\cancel{7}} = 12$$

$$15. 1\frac{2}{3} \cdot \frac{6}{5} = \frac{\cancel{2}}{\cancel{3}} \cdot \frac{\cancel{6}}{\cancel{5}} = \frac{2}{1} = 2$$

$$16. 2\frac{1}{4} \cdot \frac{4}{7} = \frac{9}{\cancel{4}} \cdot \frac{\cancel{4}}{7} = \frac{9}{7} \text{ or } 1\frac{2}{7}$$

$$17. \frac{9}{4} \cdot 3\frac{1}{9} = \frac{\cancel{9}}{\cancel{4}} \cdot \frac{\cancel{28}}{\cancel{9}} = \frac{7}{1} = 7$$

$$18. \frac{2}{15} \cdot 2\frac{1}{2} = \frac{\cancel{2}}{\cancel{15}} \cdot \frac{\cancel{3}}{\cancel{2}} = \frac{1}{3}$$

$$19. 2\frac{1}{3} \cdot 4\frac{1}{2} = \frac{7}{\cancel{3}} \cdot \frac{\cancel{9}}{\cancel{2}} = \frac{21}{2} \text{ or } 10\frac{1}{2}$$

$$20. 2\frac{3}{5} \cdot 2\frac{1}{7} = \frac{13}{\cancel{5}} \cdot \frac{\cancel{15}}{\cancel{7}} = \frac{39}{7} \text{ or } 5\frac{4}{7}$$

$$21. 3 \cdot 4\frac{1}{3} = \frac{\cancel{3}}{\cancel{1}} \cdot \frac{13}{\cancel{3}} = \frac{13}{1} = 13$$

$$22. 5 \cdot 1\frac{2}{5} = \frac{\cancel{5}}{\cancel{1}} \cdot \frac{7}{\cancel{5}} = 7$$

$$23. 5\frac{1}{6} \cdot 12 = \frac{31}{\cancel{6}} \cdot \frac{\cancel{12}}{\cancel{1}} = \frac{62}{1} = 62$$

$$24. 3\frac{1}{3} \cdot 6 = \frac{10}{\cancel{3}} \cdot \frac{\cancel{6}}{\cancel{1}} = 20$$

$$25. \left(\frac{1}{3}\right)^2 = \frac{1}{3} \cdot \frac{1}{3} = \frac{1}{9}$$

$$26. \left(\frac{4}{5}\right)^2 = \frac{4}{5} \cdot \frac{4}{5} = \frac{16}{25}$$

$$27. \left(2\frac{1}{2}\right)^2 = \left(\frac{5}{2}\right)^2 = \frac{5}{2} \cdot \frac{5}{2} = \frac{25}{4} \text{ or } 6\frac{1}{4}$$

$$28. \left(1\frac{1}{4}\right)^2 = \left(\frac{5}{4}\right)^2 = \frac{5}{4} \cdot \frac{5}{4} = \frac{25}{16} \text{ or } 1\frac{9}{16}$$

$$29. \text{ a. } \frac{\cancel{1}}{\cancel{4}} \times \frac{\cancel{2}}{\cancel{8}} \times \frac{1}{5} = \frac{2}{15}$$

$$\text{ b. } \frac{\cancel{3}}{\cancel{12}} \times \frac{\cancel{6}}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{3}} = \frac{1}{2}$$

$$30. \text{ a. } \frac{4}{5} \times 2\frac{1}{2} \times 3 = \frac{\cancel{4}}{\cancel{5}} \times \frac{\cancel{3}}{\cancel{2}} \times \frac{3}{1} = 6$$

$$\text{ b. } \frac{3}{8} \times 2\frac{1}{3} \times 4 = \frac{\cancel{3}}{\cancel{8}} \times \frac{7}{\cancel{3}} \times \frac{\cancel{4}}{\cancel{1}} = \frac{7}{2} \text{ or } 3\frac{1}{2}$$

$$31. \left(\frac{2}{3}\right)^2 \cdot \frac{3}{4} = \frac{\cancel{2}}{\cancel{3}} \cdot \frac{\cancel{2}}{\cancel{3}} \cdot \frac{\cancel{3}}{\cancel{4}} = \frac{1}{3}$$

$$32. \left(\frac{4}{5}\right)^2 \cdot \frac{7}{8} = \frac{\cancel{4}}{\cancel{5}} \cdot \frac{\cancel{4}}{\cancel{5}} \cdot \frac{7}{\cancel{8}} = \frac{14}{25}$$

$$33. \frac{14}{27} \cdot \left(\frac{3}{7}\right)^2 = \frac{\cancel{14}^2}{\cancel{27}_3} \cdot \frac{\cancel{3}}{7} \cdot \frac{\cancel{3}}{7} = \frac{2}{21}$$

$$34. \frac{5}{12} \cdot \left(\frac{6}{5}\right)^2 = \frac{\cancel{5}}{\cancel{12}_2} \cdot \frac{\cancel{6}^3}{\cancel{5}} \cdot \frac{\cancel{6}^3}{5} = \frac{3}{5}$$

$$35. \left(\frac{2}{3}\right)^3 = \frac{2}{3} \cdot \frac{2}{3} \cdot \frac{2}{3} = \frac{8}{27}$$

$$36. \left(\frac{3}{5}\right)^3 = \frac{3}{5} \cdot \frac{3}{5} \cdot \frac{3}{5} = \frac{27}{125}$$

$$37. 5 \div \frac{2}{3} = \frac{5}{1} \cdot \frac{3}{2} = \frac{15}{2} \text{ or } 7\frac{1}{2}$$

$$38. 7 \div \frac{3}{5} = \frac{7}{1} \cdot \frac{5}{3} = \frac{35}{3} \text{ or } 11\frac{2}{3}$$

$$39. \frac{4}{5} \div 6 = \frac{\cancel{4}^2}{5} \cdot \frac{1}{\cancel{6}_3} = \frac{2}{15}$$

$$40. \frac{3}{4} \div 9 = \frac{\cancel{3}}{4} \cdot \frac{1}{\cancel{9}_3} = \frac{1}{12}$$

$$41. \frac{2}{3} \div \frac{6}{7} = \frac{\cancel{2}}{3} \cdot \frac{7}{\cancel{6}_3} = \frac{7}{9}$$

$$42. \frac{3}{5} \div \frac{9}{10} = \frac{\cancel{3}}{5} \cdot \frac{\cancel{10}^2}{\cancel{9}_3} = \frac{2}{3}$$

$$43. \frac{4}{5} \div \frac{8}{15} = \frac{\cancel{4}^3}{5} \cdot \frac{\cancel{15}}{\cancel{8}_2} = \frac{3}{2} \text{ or } 1\frac{1}{2}$$

$$44. \frac{3}{7} \div \frac{9}{14} = \frac{\cancel{3}}{7} \cdot \frac{\cancel{14}^2}{\cancel{9}_3} = \frac{2}{3}$$

$$45. \frac{2}{3} \div \frac{5}{12} = \frac{2}{\cancel{3}} \cdot \frac{\cancel{12}^4}{5} = \frac{8}{5} \text{ or } 1\frac{3}{5}$$

$$46. \frac{1}{2} \div \frac{3}{4} = \frac{1}{\cancel{2}} \cdot \frac{\cancel{4}^2}{3} = \frac{2}{3}$$

$$47. \frac{3}{4} \div \frac{3}{4} = \frac{\cancel{3}}{\cancel{4}} \cdot \frac{\cancel{4}}{\cancel{3}} = 1$$

$$48. \frac{9}{10} \div \frac{3}{5} = \frac{\cancel{9}^3}{\cancel{10}_2} \cdot \frac{\cancel{5}}{\cancel{3}} = \frac{3}{2} \text{ or } 1\frac{1}{2}$$

$$49. \frac{3}{5} \div 1\frac{1}{2} = \frac{3}{5} \div \frac{3}{2} = \frac{\cancel{3}}{5} \cdot \frac{2}{\cancel{3}} = \frac{2}{5}$$

$$50. \frac{5}{8} \div 3\frac{1}{3} = \frac{5}{8} \div \frac{10}{3} = \frac{\cancel{5}}{8} \cdot \frac{3}{\cancel{10}_2} = \frac{3}{16}$$

$$51. 3\frac{3}{4} \div \frac{3}{8} = \frac{15}{4} \div \frac{3}{8} = \frac{\cancel{15}^5}{4} \cdot \frac{\cancel{8}^2}{\cancel{3}_1} = 10$$

$$52. 1\frac{1}{5} \div \frac{3}{5} = \frac{6}{5} \div \frac{3}{5} = \frac{\cancel{6}^2}{\cancel{5}} \cdot \frac{\cancel{5}}{\cancel{3}_1} = 2$$

$$53. 6\frac{1}{2} \div 2\frac{1}{2} = \frac{13}{2} \div \frac{5}{2} = \frac{13}{\cancel{2}} \cdot \frac{\cancel{2}}{5} = \frac{13}{5} \text{ or } 2\frac{3}{5}$$

$$54. 1\frac{5}{8} \div 2\frac{7}{8} = \frac{13}{8} \div \frac{23}{8} = \frac{13}{\cancel{8}} \cdot \frac{\cancel{8}}{\cancel{23}} = \frac{13}{23}$$

$$55. 3\frac{1}{8} \div 1\frac{1}{3} = \frac{25}{8} \div \frac{4}{3} = \frac{25}{8} \cdot \frac{3}{4} = \frac{75}{32} \text{ or } 2\frac{11}{32}$$

$$56. 2\frac{1}{2} \div 6\frac{1}{4} = \frac{5}{2} \div \frac{25}{4} = \frac{\cancel{5}}{2} \cdot \frac{\cancel{4}^2}{\cancel{25}_5} = \frac{2}{5}$$

57. $3\frac{1}{8} \div 3\frac{1}{8} = \frac{25}{8} \div \frac{25}{8} = \frac{\cancel{25}}{8} \cdot \frac{8}{\cancel{25}} = 1$
58. $10\frac{1}{2} \div 2\frac{1}{3} = \frac{21}{2} \div \frac{7}{3} = \frac{\cancel{21}^3}{2} \cdot \frac{3}{\cancel{7}_1} = \frac{9}{2}$ or $4\frac{1}{2}$
59. $1\frac{2}{3} \div 13\frac{3}{4} = \frac{5}{3} \div \frac{55}{4} = \frac{\cancel{5}^1}{3} \cdot \frac{4}{\cancel{55}_{11}} = \frac{4}{33}$
60. $4\frac{7}{10} \div 4\frac{7}{10} = 1$
61. $\frac{\cancel{8}}{7} \cdot \frac{2}{\cancel{8}} = \frac{2}{7}$ square miles
62. a. $\frac{2}{3} \cdot 75 = \frac{2}{\cancel{3}} \times \frac{\cancel{75}^{25}}{\cancel{1}} = 50$ lb
 b. $\frac{2}{3} \cdot 100 = \frac{2}{\cancel{3}} \times \frac{100}{\cancel{1}} = \frac{200}{3}$ or $66\frac{2}{3}$
 It will serve about 67 people.
63. $\frac{4}{5} \cdot 90 = \frac{4}{\cancel{5}} \cdot \frac{\cancel{90}^{18}}{\cancel{1}} = \frac{72}{1} = 72$ people
64. $\frac{3}{5} \cdot 20 = \frac{3}{\cancel{5}} \cdot \frac{\cancel{20}^4}{\cancel{1}} = \frac{12}{1} = 12$ minutes
65. $\frac{8}{15} \cdot 30 = \frac{8}{\cancel{15}} \cdot \frac{\cancel{30}^2}{\cancel{1}} = \frac{16}{1} = 16$ days
66. $\frac{1}{6} \cdot 450 = \frac{1}{\cancel{6}} \cdot \frac{\cancel{450}^{75}}{\cancel{1}} = 75$ lb
67. $1\frac{1}{2} \div \frac{3}{16} = \frac{3}{2} \div \frac{3}{16} = \frac{\cancel{3}}{2} \cdot \frac{\cancel{16}^8}{\cancel{3}} = 8$ turns
68. $24\frac{3}{4} \div 4\frac{1}{2} = \frac{99}{4} \div \frac{9}{2} = \frac{\cancel{99}^{11}}{\cancel{4}_2} \cdot \frac{\cancel{2}}{\cancel{9}} = \frac{11}{2}$ or $5\frac{1}{2}$ sheets
69. $10\frac{1}{2} \div \frac{5}{8} = \frac{21}{2} \div \frac{5}{8} = \frac{\cancel{21}}{\cancel{2}} \cdot \frac{\cancel{8}^4}{5} = \frac{84}{5} = 16\frac{4}{5}$ or 16 vests
70. $98 \div 3\frac{1}{2} = 98 \div \frac{7}{2} = \frac{\cancel{98}^{14}}{\cancel{1}} \cdot \frac{2}{\cancel{7}} = 28$ bonds
71. $40 \cdot 16\frac{1}{2} = \frac{\cancel{40}^{20}}{\cancel{1}} \cdot \frac{\cancel{33}}{\cancel{1}} = 660$ feet
72. a. $7 \times 40 = 280$ rods in 7 furlongs
 b. $40 \cdot 16\frac{1}{2} = \frac{\cancel{40}^{20}}{\cancel{1}} \cdot \frac{\cancel{33}}{\cancel{1}} = 660$ ft in a furlong
 c. $660 \times 7 = 4620$ feet
73. $5 \cdot 2\frac{1}{5} = \frac{\cancel{5}}{\cancel{1}} \cdot \frac{\cancel{11}}{\cancel{5}} = 11$ liters
74. $10 \cdot 11\frac{2}{5} = \frac{\cancel{10}^2}{\cancel{1}} \cdot \frac{\cancel{57}}{\cancel{1}} = \frac{114}{1} = 114$ grams
75. $80\frac{3}{5} \div 6\frac{1}{5} = \frac{403}{5} \div \frac{31}{5} = \frac{\cancel{403}^{13}}{\cancel{5}} \cdot \frac{\cancel{5}}{\cancel{31}} = 13$ gal
76. $\frac{12\cancel{0}}{9\cancel{0}} = \frac{4}{3} = 1\frac{1}{3}$ grams

$$77. \frac{18\cancel{0}}{16\cancel{0}} = \frac{9}{8} = 1\frac{1}{8} \text{ grams}$$

$$78. \frac{40}{37} = 1\frac{3}{37} \text{ grams}$$

$$79. \frac{13\cancel{0}}{12\cancel{0}} = \frac{13}{12} = 1\frac{1}{12} \text{ grams}$$

$$80. \frac{23\cancel{0}}{22\cancel{0}} = \frac{23}{22} = 1\frac{1}{22} \text{ grams}$$

$$81. 36 \times 2\frac{2}{3} = 36 \times \frac{8}{3} = 96 \text{ miles}$$

$$82. 36 \times 2\frac{1}{4} = 36 \times \frac{9}{4} = 81 \text{ miles}$$

$$83. 36 \times 4\frac{2}{3} = 36 \times \frac{14}{3} = 168 \text{ miles}$$

$$84. \frac{108}{36} = 3 \text{ inches}$$

$$85. \frac{240}{36} = \frac{\cancel{240}^{60}}{\cancel{36}_9} = 6\frac{6}{9} = 6\frac{2}{3} \text{ inches}$$

$$86. \frac{279}{36} = \frac{\cancel{279}^{31}}{\cancel{36}_4} = \frac{31}{4} = 7\frac{3}{4} \text{ miles}$$

$$87. 4\frac{3}{8} \cdot 5\frac{3}{4} = \frac{35}{8} \cdot \frac{23}{4} = \frac{805}{32} = 25\frac{5}{32} \text{ sq. in.}$$

$$88. 5\frac{1}{4} \cdot 7\frac{1}{4} = \frac{21}{4} \cdot \frac{29}{4} = \frac{609}{16} = 38\frac{1}{16} \text{ sq. in.}$$

$$89. 4\frac{1}{8} \cdot 9\frac{1}{2} = \frac{33}{8} \cdot \frac{19}{2} = \frac{627}{16} = 39\frac{3}{16} \text{ sq. in.}$$

$$90. 5 \cdot 3\frac{1}{2} = \frac{5}{1} \cdot \frac{7}{2} = \frac{35}{2} = 17\frac{1}{2} \text{ sq. in.}$$

$$91. 9\frac{1}{4} \cdot 4\frac{2}{3} = \frac{37}{4} \cdot \frac{14}{3} = \frac{518}{12} = 43\frac{1}{6} \text{ sq. in.}$$

$$92. 13\frac{2}{5} \cdot 9\frac{1}{2} = \frac{67}{5} \cdot \frac{19}{2} = \frac{1273}{10} = 127\frac{3}{10} \text{ sq. in.}$$

$$93. 10\frac{1}{2} \cdot 12\frac{4}{5} = \frac{21}{2} \cdot \frac{64}{5} = \frac{1344}{10} = 134\frac{2}{5} \text{ sq. in.}$$

$$94. 3\frac{1}{10} \cdot 4\frac{1}{2} = \frac{31}{10} \cdot \frac{9}{2} = \frac{279}{20} = 13\frac{19}{20} \text{ sq. in.}$$

$$95. 15\frac{3}{4} \div 3\frac{1}{2} = \frac{63}{4} \div \frac{7}{2} = \frac{\cancel{63}^9}{\cancel{4}_2} \cdot \frac{\cancel{2}}{\cancel{7}} = \frac{9}{2} = 4\frac{1}{2} \text{ yd}$$

$$96. 655 \div 65\frac{1}{2} = 655 \div \frac{131}{2} = \frac{\cancel{655}^5}{1} \cdot \frac{2}{\cancel{131}_1} = 10$$

You can do 10 jobs.

$$97. 36 \times 3\frac{1}{2} = \frac{\cancel{36}^{18}}{1} \cdot \frac{7}{\cancel{2}_1} = 126 \text{ miles}$$

$$98. 36 \times 1\frac{3}{4} = \frac{\cancel{36}^9}{1} \cdot \frac{7}{\cancel{4}_1} = 63 \text{ miles}$$

$$99. 36 \times 2\frac{1}{2} = \frac{\cancel{36}^{18}}{1} \cdot \frac{5}{\cancel{2}_1} = 90 \text{ miles}$$

$$100. 4\frac{1}{2} \times 1\frac{1}{2} = \frac{9}{2} \cdot \frac{3}{2} = \frac{27}{4} = 6\frac{3}{4} \text{ inches}$$

$$101. 2\frac{1}{2} \times 1\frac{1}{4} = \frac{5}{2} \cdot \frac{5}{4} = \frac{25}{8} = 3\frac{1}{8} \text{ inches}$$

102. Answers may vary.

103. Answers may vary.

104. Answers may vary.

105. Answers may vary.

106. Answers may vary.

107. $\frac{a \cdot c}{b \cdot d}$

108. $\frac{a \cdot d}{b \cdot c}$

109. $2 \cdot \frac{1}{4} = \frac{2}{1} \cdot \frac{1}{4} = \frac{1}{2}$ cup

110. $\frac{\cancel{8}}{5} \cdot \frac{2}{\cancel{8}} = \frac{2}{5}$

111. $5 \cdot \frac{3}{4} = \frac{5}{1} \cdot \frac{3}{4} = \frac{15}{4}$ or $3\frac{3}{4}$

112. $\left(\frac{3}{4}\right)^3 = \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{4} = \frac{27}{64}$

113. $\left(\frac{3}{4}\right)^2 \cdot \left(1\frac{1}{2}\right) = \frac{3}{4} \cdot \frac{3}{4} \cdot \frac{3}{2} = \frac{27}{32}$

114. $\frac{3}{5} \div \frac{2}{3} = \frac{3}{5} \cdot \frac{3}{2} = \frac{9}{10}$

115. $1\frac{3}{5} \div \frac{2}{5} = \frac{8}{5} \div \frac{2}{5} = \frac{8}{\cancel{5}} \cdot \frac{\cancel{5}}{2} = \frac{8}{2} = 4$

116. $\frac{8}{5} \div 2\frac{2}{3} = \frac{8}{5} \div \frac{8}{3} = \frac{\cancel{8}}{5} \cdot \frac{3}{\cancel{8}} = \frac{3}{5}$

117. $3\frac{1}{3} \times 4\frac{2}{3} = \frac{10}{3} \times \frac{14}{3} = \frac{140}{9} = 15\frac{5}{9}$ sq. yd.

118. $84 = 2 \times 42$
 $= 2 \times 2 \times 21$
 $= 2 \times 2 \times 3 \times 7$
 $= 2^2 \times 3 \times 7$

119. $128 = 2^7$

120. $72 = 9 \times 8$
 $= (3 \times 3) \times (2 \times 2 \times 2)$
 $= 2^3 \times 3^2$

121. $180 = 10 \times 18$
 $= (2 \times 5) \times (2 \times 3 \times 3)$
 $= 2^2 \times 3^2 \times 5$

122. $105 = 5 \times 21 = 5 \times 3 \times 7 = 3 \times 5 \times 7$

123. $900 = 9 \times 100$
 $= (3 \times 3) \times (4 \times 25)$
 $= 3 \times 3 \times 2 \times 2 \times 5 \times 5$
 $= 2^2 \times 3^2 \times 5^2$

Section 2.4 – The Least Common Multiple**Problems**

1. 6 12 18 $\boxed{24}$ 36

8 16 $\boxed{24}$ 32 40

The LCM of 6 and 8 is 24.

2. 10 20 30 40 50 $\boxed{60}$ 70

12 24 36 48 $\boxed{60}$ 72 84

The LCM of 10 and 12 is 60.

3. Multiples of 18: 18, 36,

The LCM is 36.

4. Since 39 is a multiple of 13, the LCM is 39.

5. a. Multiples of 10: 10, 20, 30,

Since 30 is a multiple of 6, LCD = 30.

b. $\frac{3}{10} = \frac{3 \times 3}{10 \times 3} = \frac{9}{30}$ and $\frac{1}{6} = \frac{1 \times 5}{6 \times 5} = \frac{5}{30}$

6. a. Multiples of 7: 7, 14, 21, 28, 35,

Since 35 is a multiple of 5, LCD = 35.

b. $\frac{3}{7} = \frac{3 \times 5}{7 \times 5} = \frac{15}{35}$ and $\frac{4}{5} = \frac{4 \times 7}{5 \times 7} = \frac{28}{35}$

7. $40 = 2^3 \cdot 5$

$12 = 2^2 \cdot 3$

$LCD = 2^3 \cdot 3 \cdot 5 = 120$

- OR -

$$\begin{array}{r} 2 \overline{)40 \ 12} \\ 2 \overline{)20 \ 6} \\ \underline{10 \ 3} \end{array}$$

$$\begin{array}{r} 2 \overline{)40 \ 12} \\ 2 \overline{)20 \ 6} \\ \underline{10 \ 3} \end{array}$$

$$\begin{array}{r} 2 \overline{)40 \ 12} \\ 2 \overline{)20 \ 6} \\ \underline{10 \ 3} \end{array}$$

$LCD = 2 \cdot 2 \cdot 10 \cdot 3 = 120$

8. $2 \overline{)8 \ 12 \ 14}$

$$\begin{array}{r} 2 \overline{)4 \ 6 \ 7} \\ \underline{2 \ 3 \ 7} \end{array}$$

$$\begin{array}{r} 2 \overline{)4 \ 6 \ 7} \\ \underline{2 \ 3 \ 7} \end{array}$$

$LCD = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 7 = 168$

9. a. The denominators are the same and 3

is greater than 2 so $\frac{3}{17} > \frac{2}{17}$.

b. The LCD of 5 and 9 is 45.

$$\frac{1}{5} = \frac{1 \times 9}{5 \times 9} = \frac{9}{45} \text{ and } \frac{2}{9} = \frac{2 \times 5}{9 \times 5} = \frac{10}{45}$$

Since $\frac{9}{45} < \frac{10}{45}$, we have $\frac{1}{5} < \frac{2}{9}$.

5. $9 \ \boxed{18} \ 27 \ 36$

$\boxed{18} \ 36$

The LCM of 9 and 18 is 18.

6. $30 \ \boxed{60} \ 90 \ 120 \ 150$

$\boxed{60} \ 120$

The LCM of 30 and 60 is 60.

7. $14 \ 28 \ \boxed{42} \ 56 \ 70$

$21 \ \boxed{42}$

The LCM of 14 and 21 is 42.

8. $80 \ 160 \ \boxed{240} \ 320$

$120 \ \boxed{240}$

The LCM of 80 and 120 is 240.

9. $30 \ \boxed{60} \ 90 \ 120 \ 150 \ 180$

$15 \ 30 \ 45 \ \boxed{60} \ 75 \ 90$

$\boxed{60}$

The LCM of 30, 15, and 60 is 60.

10. $15 \ 30 \ 45 \ \boxed{60} \ 75 \ 90$

$20 \ 40 \ \boxed{60} \ 90 \ 120 \ 150 \ 180$

$30 \ \boxed{60}$

The LCM of 15, 20, and 30 is 60.

11. Since 6 is a multiple of 3, the LCD of 3 and 6 is 6.

$\frac{1}{3} = \frac{1 \times 2}{3 \times 2} = \frac{2}{6}$; $\frac{1}{6}$ is already written with the LCD.

12. $LCD = 15$; $\frac{2}{5} = \frac{6}{15}$ and $\frac{1}{15}$

13. Since 21 is a multiple of 7, the LCD of 21 and 7 is 21.

$\frac{1}{21}$ is already written with the LCD;

$$\frac{1}{7} = \frac{1 \times 3}{7 \times 3} = \frac{3}{21}$$

Exercises 2.4

1. $8 \ 16 \ 24 \ 32 \ \boxed{40} \ 48$

$10 \ 20 \ 30 \ \boxed{40}$

The LCM of 8 and 10 is 40.

2. $6 \ 12 \ 18 \ 24 \ \boxed{30} \ 36$

$10 \ 20 \ \boxed{30}$

The LCM of 6 and 10 is 30.

3. $16 \ 32 \ \boxed{48} \ 64 \ 80$

$24 \ \boxed{48}$

The LCM of 16 and 24 is 48.

4. $21 \ 42 \ 63 \ \boxed{84} \ 70$

$28 \ 56 \ \boxed{84}$

The LCM of 21 and 28 is 84.

14. LCD = 9; $\frac{2}{9}$ and $\frac{3}{9}$

15. Multiples of 10: 10, 20,

The LCD of 4 and 10 is 20.

$$\frac{3}{4} = \frac{3 \times 5}{4 \times 5} = \frac{15}{20}; \frac{1}{10} = \frac{1 \times 2}{10 \times 2} = \frac{2}{20}$$

16. Multiples of 15: 15, 30,

LCD = 30. $\frac{7}{10} = \frac{21}{30}; \frac{4}{15} = \frac{8}{30}$

17. Since 24 is a multiple of 12 and 6, The LCD of 6, 12, and 24 is 24.

$$\frac{1}{6} = \frac{1 \times 4}{6 \times 4} = \frac{4}{24}; \frac{1}{12} = \frac{1 \times 2}{12 \times 2} = \frac{2}{24}; \frac{1}{24}$$

18. Multiples of 15: 15, 30,

LCD = 30.

$$\frac{7}{15} = \frac{14}{30}; \frac{3}{10} = \frac{9}{30}; \frac{1}{6} = \frac{5}{30}$$

19. Multiples of 20: 20, 40,

The LCD of 5, 8, and 20 is 40.

$$\frac{3}{5} = \frac{3 \times 8}{5 \times 8} = \frac{24}{40}; \frac{5}{8} = \frac{5 \times 5}{8 \times 5} = \frac{25}{40};$$

$$\frac{7}{20} = \frac{7 \times 2}{20 \times 2} = \frac{14}{40}$$

20. Multiples of 24: 24, 48, 72,

LCD = 72.

$$\frac{2}{9} = \frac{16}{72}; \frac{7}{12} = \frac{42}{72}; \frac{11}{24} = \frac{33}{72}$$

21. $18 = 2 \cdot 3^2$

$$24 = 2^3 \cdot 3; \text{LCD} = 2^3 \cdot 3^2 = 72$$

$$\frac{1}{18} = \frac{1 \times 4}{18 \times 4} = \frac{4}{72}; \frac{1}{24} = \frac{1 \times 3}{24 \times 3} = \frac{3}{72}$$

22. $15 = 3 \cdot 5$

$$45 = 3^2 \cdot 5; \text{LCD} = 3^2 \cdot 5 = 45$$

$$\frac{3}{15} = \frac{9}{45}; \frac{2}{45}$$

23. $32 = 2^5$

$$80 = 2^4 \cdot 5; \text{LCD} = 2^5 \cdot 5 = 160$$

$$\frac{1}{32} = \frac{1 \times 5}{32 \times 5} = \frac{5}{160}; \frac{1}{80} = \frac{1 \times 2}{80 \times 2} = \frac{2}{160}$$

24. $9 = 3^2$

$$12 = 2^2 \cdot 3; \text{LCD} = 2^2 \cdot 3^2 = 36$$

$$\frac{2}{9} = \frac{8}{36}; \frac{1}{12} = \frac{3}{36}$$

25. $4 = 2^2$

$$10 = 2 \cdot 5; \text{LCD} = 2^2 \cdot 5 = 20$$

$$\frac{3}{4} = \frac{3 \times 5}{4 \times 5} = \frac{15}{20}; \frac{3}{10} = \frac{3 \times 2}{10 \times 2} = \frac{6}{20}$$

26. $20 = 2^2 \cdot 5$

$$15 = 3 \cdot 5; \text{LCD} = 2^2 \cdot 3 \cdot 5 = 60$$

$$\frac{7}{20} = \frac{21}{60}; \frac{4}{15} = \frac{16}{60}$$

27. $2 \overline{) 6 \ 12 \ 24}$

$$2 \overline{) \boxed{3} \ 6 \ 12}$$

$$3 \overline{) \ 3 \ 3 \ 6}$$

$$1 \ 1 \ 2$$

$$\text{LCD} = 2 \cdot 2 \cdot 3 \cdot 1 \cdot 1 \cdot 2 = 24$$

$$\frac{1}{6} = \frac{1 \times 4}{6 \times 4} = \frac{4}{24}; \frac{1}{12} = \frac{1 \times 2}{12 \times 2} = \frac{2}{24}; \frac{1}{24}$$

28. $2 \overline{) \boxed{15} \ 10 \ 6}$

$$3 \overline{) \ 15 \ \boxed{5} \ 3}$$

$$5 \overline{) \ 5 \ 5 \ \boxed{1}}$$

$$1 \ 1 \ 1$$

$$\text{LCD} = 2 \cdot 3 \cdot 5 \cdot 1 \cdot 1 \cdot 1 = 30$$

$$\frac{7}{15} = \frac{14}{30}; \frac{3}{10} = \frac{9}{30}; \frac{1}{6} = \frac{5}{30}$$

29. $2 \overline{) \boxed{5} \ 8 \ 20}$

$$2 \overline{) \boxed{5} \ 4 \ 10}$$

$$5 \overline{) \ 5 \ \boxed{2} \ 5}$$

$$1 \ 2 \ 1$$

$$\text{LCD} = 2 \cdot 2 \cdot 5 \cdot 1 \cdot 2 \cdot 1 = 40$$

$$\frac{3}{5} = \frac{3 \times 8}{5 \times 8} = \frac{24}{40}; \frac{5}{8} = \frac{5 \times 5}{8 \times 5} = \frac{25}{40};$$

$$\frac{7}{20} = \frac{7 \times 2}{20 \times 2} = \frac{14}{40}$$

$$30. \begin{array}{r} 2 \overline{) 9 \ 12 \ 24} \\ \underline{2 \ 9 \ 6 \ 12} \\ 3 \ 9 \ 3 \ 6 \\ \underline{3 \ 1 \ 2} \end{array}$$

$$\text{LCD} = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 1 \cdot 2 = 72$$

$$\frac{2}{9} = \frac{16}{72}; \frac{7}{12} = \frac{42}{72}; \frac{11}{24} = \frac{33}{72}$$

31. Since the denominators are the same and 7 is greater than 5, $\frac{7}{8}$ is the greater number.

32. $\frac{7}{9}$ is the greater number.

33. Since the denominators are the same and 57 is greater than 4, $\frac{5}{11}$ is the greater number.

34. $\frac{3}{7}$ is the greater number.

35. $\frac{2}{3} = \frac{2 \times 5}{3 \times 5} = \frac{10}{15}$ and $\frac{4}{5} = \frac{4 \times 3}{5 \times 3} = \frac{12}{15}$
 Since 12 is greater than 10, $\frac{2}{3} < \frac{4}{5}$.

36. $\frac{1}{2} = \frac{4}{8}$ and 5 is greater than 4 so $\frac{5}{8} > \frac{1}{2}$.

37. Since 5 is greater than 4, $1\frac{4}{7} > 1\frac{5}{7}$.

38. $\frac{3}{4} = \frac{6}{8}$ and 7 is greater than 6 so
 $8\frac{3}{4} < 8\frac{7}{8}$.

39. $\frac{2}{7} = \frac{2 \times 8}{7 \times 8} = \frac{16}{56}$ and $\frac{3}{8} = \frac{3 \times 7}{8 \times 7} = \frac{21}{56}$
 Since 21 is greater than 16, $11\frac{2}{7} < 11\frac{3}{8}$.

40. $\frac{1}{3} = \frac{5}{15}$ and $\frac{2}{5} = \frac{6}{15}$. Since 6 is greater than 5, $6\frac{1}{3} < 6\frac{2}{5}$.

41. $20 = 2^2 \cdot 5$ and $30 = 2 \cdot 3 \cdot 5$
 $\text{LCM} = 2^2 \cdot 3 \cdot 5 = 60$
 You have to wait 60 minutes.

42. $\begin{array}{r} 2 \overline{) 10 \ 20 \ 45} \\ \underline{5 \ 10 \ 45} \\ 1 \ 2 \ 9 \end{array}$
 $\text{LCM} = 2 \cdot 5 \cdot 1 \cdot 2 \cdot 9 = 180$
 You have to wait at least 180 minutes.

43. $17 = 1 \cdot 17$ and $13 = 1 \cdot 13$
 $\text{LCM} = 17 \cdot 13 = 221$
 It will be 221 years before they both emerge together again.

44. a. 15 is a multiple of 3 so $\text{LCM} = 15$.
 The cicada will face the predators in 15 years.

b. The LCM of 3 and 17 is $3 \cdot 17 = 51$.
 They will face the 3-year predators in 51 years.

45. $\begin{array}{r} 2 \overline{) 6 \ 2 \ 4} \\ \underline{3 \ 1 \ 2} \\ \text{LCM} = 2 \cdot 3 \cdot 1 \cdot 2 = 12 \end{array}$
 You will have to take all three medications again in 12 hours.

46. $\begin{array}{r} 2 \overline{) 6 \ 2 \ 4 \ 12} \\ \underline{3 \ 1 \ 2 \ 6} \\ 1 \ 1 \ 1 \ 2 \end{array}$
 $\text{LCM} = 2 \cdot 3 \cdot 2 = 12$
 You will have to take all four medications again in 12 hours.

47. The LCM of 5 and 4 is 20.
 They will be made fresh again in 20 days.

$$48. \begin{array}{r} 2 \overline{)542} \\ \underline{521} \\ 21 \end{array}$$

$$\text{LCM} = 2 \cdot 5 \cdot 2 \cdot 1 = 20$$

They will have fresh tamales and pastries made with fresh meat in 20 days.

$$49. 4 = 2^2 \text{ and } 3 = 1 \cdot 3 \text{ so } \text{LCM} = 2^2 \cdot 3 = 12.$$

They will be delivered in 12 days.

$$50. \begin{array}{r} 2 \overline{)30453} \\ \underline{315253} \\ 55251 \\ \underline{1211} \\ 43141 \\ \underline{43141} \\ 0 \end{array}$$

$$\text{LCM} = 2 \cdot 3 \cdot 5 \cdot 1 \cdot 2 \cdot 1 \cdot 1 = 60$$

All four products will be delivered again in 60 days.

$$51. \begin{array}{r} 2 \overline{)12302} \\ \underline{36151} \\ 251 \end{array}$$

$$\text{LCM} = 2 \cdot 3 \cdot 2 \cdot 5 \cdot 1 = 60$$

It will take 60 years, so in 2060 the alignment will happen again.

$$52. \begin{array}{r} 2 \overline{)12842} \\ \underline{26421} \\ 33211 \\ \underline{171} \\ 1651 \\ \underline{1651} \\ 0 \end{array}$$

$$\text{LCM} = 2 \cdot 2 \cdot 3 \cdot 1 \cdot 7 \cdot 1 = 84$$

It will take 84 years.

$$53. \begin{array}{r} 2 \overline{)3084} \\ \underline{31542} \\ 514 \end{array}$$

$$\text{LCM} = 2 \cdot 3 \cdot 5 \cdot 14 = 420$$

It will take 420 years.

54. Answers will vary.

55. Answers will vary.

56. a. Answers will vary.

b. Answers will vary.

57. They are the same.

58. LCM

59. LCM

60. numerator

61. LCD

62. Since the denominators are the same and 4 is less than 5, $\frac{4}{11} < \frac{5}{11}$.

63. $\frac{3}{11} = \frac{3 \times 4}{11 \times 4} = \frac{12}{44}$ and $\frac{1}{4} = \frac{1 \times 11}{4 \times 11} = \frac{11}{44}$
Since 12 is greater than 11, $\frac{3}{11} > \frac{1}{4}$.

64. $12 = 2^2 \cdot 3$ and $14 = 2 \cdot 7$
 $\text{LCM} = 2^2 \cdot 3 \cdot 7 = 84$

65. 45 is a multiple of 15 so $\text{LCM} = 45$

66. $\begin{array}{r} 2 \overline{)10314} \\ \underline{537} \\ 4974 \\ \underline{4974} \\ 0 \end{array}$
 $\text{LCM} = 2 \cdot 5 \cdot 3 \cdot 7 = 210$

67. $\text{LCD} = 7 \cdot 5 = 35$
 $\frac{3}{7} = \frac{3 \times 5}{7 \times 5} = \frac{15}{35}$; $\frac{4}{5} = \frac{4 \times 7}{5 \times 7} = \frac{28}{35}$

68. $40 = 2^3 \cdot 5$ and $18 = 2 \cdot 3^2$
 $\text{LCD} = 2^3 \cdot 3^2 \cdot 5 = 360$

69. $6 = 2 \cdot 3$, $20 = 2^2 \cdot 5$, and $9 = 3^2$
 $\text{LCD} = 2^2 \cdot 3^2 \cdot 5 = 180$

70. $\frac{1}{8} = \frac{3}{24}$; $\frac{1}{6} = \frac{4}{24}$

71. $\frac{5}{9} = \frac{5 \times 8}{9 \times 8} = \frac{40}{72}$; $\frac{3}{8} = \frac{3 \times 9}{8 \times 9} = \frac{27}{72}$

72. $\frac{1}{8} = \frac{15}{120}$; $\frac{1}{12} = \frac{10}{120}$; $\frac{1}{10} = \frac{12}{120}$

Section 2.5 – Addition and Subtraction of Fractions**Problems**

1. a. $\frac{2}{11} + \frac{3}{11} = \frac{2+3}{11} = \frac{5}{11}$

b. $\frac{1}{8} + \frac{3}{8} = \frac{1+3}{8} = \frac{4}{8} = \frac{1}{2}$

2. Multiples of 8: 8, 16, 24, 32, Since 6 goes into 24, the LCD is 24.

$$\frac{3}{8} = \frac{3 \times 3}{8 \times 3} = \frac{9}{24} \text{ and } \frac{1}{6} = \frac{1 \times 4}{6 \times 4} = \frac{4}{24};$$

$$\frac{3}{8} + \frac{1}{6} = \frac{9}{24} + \frac{4}{24} = \frac{13}{24}$$

3. Multiples of 9: 9, 18, 27, 36, 45, Since 4 goes into 36, the LCD is 36.

$$\frac{3}{4} = \frac{3 \times 9}{4 \times 9} = \frac{27}{36} \text{ and } \frac{5}{9} = \frac{5 \times 4}{9 \times 4} = \frac{20}{36};$$

$$\frac{3}{4} + \frac{5}{9} = \frac{27}{36} + \frac{20}{36} = \frac{47}{36} \text{ or } 1\frac{11}{36}$$

4. $40 = 2^3 \cdot 5$

$$12 = 2^2 \cdot 3$$

$$\text{LCD} = 2^3 \cdot 3 \cdot 5 = 120$$

$$\frac{1}{40} = \frac{1 \times 3}{40 \times 3} = \frac{3}{120}, \quad \frac{5}{12} = \frac{5 \times 10}{12 \times 10} = \frac{50}{120};$$

$$\frac{1}{40} + \frac{5}{12} = \frac{3}{120} + \frac{50}{120} = \frac{53}{120}$$

5. Multiples of 12: 12, 24, 36, 48, 60, 72, 84, Since 8 and 9 goes into 72, the LCD

is 72. $\frac{1}{8} = \frac{1 \times 9}{8 \times 9} = \frac{9}{72}$, $\frac{1}{12} = \frac{1 \times 6}{12 \times 6} = \frac{6}{72}$,

and $\frac{1}{9} = \frac{1 \times 8}{9 \times 8} = \frac{8}{72}$;

$$\frac{1}{8} + \frac{1}{12} + \frac{1}{9} = \frac{9}{72} + \frac{6}{72} + \frac{8}{72} = \frac{23}{72}$$

6. a. $2 \overline{)12 \ 10}$
6 5

$$\text{LCD} = 2 \cdot 6 \cdot 5 = 60$$

$$\frac{7}{12} = \frac{7 \times 5}{12 \times 5} = \frac{35}{60}, \quad \frac{1}{10} + \frac{1 \times 6}{10 \times 6} = \frac{6}{60};$$

$$\frac{7}{12} - \frac{1}{10} = \frac{35}{60} - \frac{6}{60} = \frac{35-6}{60} = \frac{29}{60}$$

b. $5 \overline{)15 \ 20}$
3 4

$$\text{LCD} = 5 \cdot 3 \cdot 4 = 60$$

$$\frac{11}{15} = \frac{11 \times 4}{15 \times 4} = \frac{44}{60}, \quad \frac{3}{20} + \frac{3 \times 3}{20 \times 3} = \frac{9}{60};$$

$$\frac{11}{15} - \frac{3}{20} = \frac{44}{60} - \frac{9}{60} = \frac{44-9}{60} = \frac{35}{60} = \frac{7}{12}$$

7. a. $2 \overline{)8 \ 6 \ 9}$
3 $\overline{)4 \ 3 \ 9}$
4 1 3

$$\text{LCD} = 2 \cdot 3 \cdot 4 \cdot 3 = 72$$

$$\frac{3}{8} = \frac{3 \times 9}{8 \times 9} = \frac{27}{72}, \quad \frac{1}{6} = \frac{1 \times 12}{6 \times 12} = \frac{12}{72},$$

and $\frac{2}{9} = \frac{2 \times 8}{9 \times 8} = \frac{16}{72}$;

$$\begin{aligned} \frac{3}{8} + \frac{1}{6} - \frac{2}{9} &= \frac{27}{72} + \frac{12}{72} - \frac{16}{72} \\ &= \frac{27+12-16}{72} = \frac{23}{72} \end{aligned}$$

b. $8 = 2^3$

$$3 = 1 \cdot 3$$

$$12 = 2^2 \cdot 3$$

$$\text{LCD} = 2^3 \cdot 3 = 24$$

$$\frac{7}{8} = \frac{7 \times 3}{8 \times 3} = \frac{21}{24}, \quad \frac{1}{3} = \frac{1 \times 8}{3 \times 8} = \frac{8}{24},$$

and $\frac{11}{12} = \frac{11 \times 2}{12 \times 2} = \frac{22}{24}$;

$$\begin{aligned} \frac{7}{8} - \frac{1}{3} + \frac{11}{12} &= \frac{21}{24} - \frac{8}{24} + \frac{22}{24} \\ &= \frac{27-8+16}{24} = \frac{35}{24} \text{ or } 1\frac{11}{24} \end{aligned}$$

8. a. $\frac{37}{100} + \frac{1}{10} = \frac{37}{100} + \frac{10}{100} = \frac{47}{100}$

The fraction of the students having brown or gray eyes is $\frac{47}{100}$.

b. $\frac{1}{5} + \frac{33}{100} = \frac{20}{100} + \frac{33}{100} = \frac{53}{100}$

The fraction of the students having green or blue eyes is $\frac{53}{100}$.

Exercises 2.5

1. $\frac{1}{3} + \frac{1}{3} = \frac{1+1}{3} = \frac{2}{3}$
2. $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$
3. $\frac{1}{7} + \frac{4}{7} = \frac{1+4}{7} = \frac{5}{7}$
4. $\frac{1}{9} + \frac{7}{9} = \frac{8}{9}$
5. $\frac{2}{9} + \frac{4}{9} = \frac{2+4}{9} = \frac{6}{9} = \frac{2}{3}$
6. $\frac{3}{8} + \frac{5}{8} = \frac{8}{8} = 1$
7. $\frac{1}{6} + \frac{5}{6} = \frac{1+5}{6} = \frac{6}{6} = 1$
8. $\frac{2}{9} + \frac{10}{9} = \frac{12}{9} = \frac{4}{3}$ or $1\frac{1}{3}$
9. $\frac{3}{4} + \frac{5}{4} = \frac{3+5}{4} = \frac{8}{4} = 2$
10. $\frac{6}{7} + \frac{8}{7} = \frac{14}{7} = 2$
11. The LCD of 3 and 5 is 15.
 $\frac{1}{3} = \frac{1 \times 5}{3 \times 5} = \frac{5}{15}$ and $\frac{1}{5} = \frac{1 \times 3}{5 \times 3} = \frac{3}{15}$;
 $\frac{1}{3} + \frac{1}{5} = \frac{5}{15} + \frac{3}{15} = \frac{8}{15}$
12. $\frac{1}{4} + \frac{1}{6} = \frac{3}{12} + \frac{2}{12} = \frac{5}{12}$
13. The LCD of 2 and 6 is 6. $\frac{1}{2} = \frac{1 \times 3}{2 \times 3} = \frac{3}{6}$;
 $\frac{1}{2} + \frac{1}{6} = \frac{3}{6} + \frac{1}{6} = \frac{4}{6} = \frac{2}{3}$
14. $\frac{7}{8} + \frac{3}{4} = \frac{7}{8} + \frac{6}{8} = \frac{13}{8}$ or $1\frac{5}{8}$
15. The LCD of 2 and 5 is 10.
 $\frac{1}{2} = \frac{1 \times 5}{2 \times 5} = \frac{5}{10}$ and $\frac{4}{5} = \frac{4 \times 2}{5 \times 2} = \frac{8}{10}$;
 $\frac{1}{2} + \frac{4}{5} = \frac{5}{10} + \frac{8}{10} = \frac{13}{10}$ or $1\frac{3}{10}$
16. $\frac{5}{6} + \frac{3}{10} = \frac{25}{30} + \frac{9}{30} = \frac{34}{30} = \frac{17}{15}$ or $1\frac{2}{15}$
17. The LCD of 7 and 14 is 14.
 $\frac{4}{7} = \frac{4 \times 2}{7 \times 2} = \frac{8}{14}$;
 $\frac{4}{7} + \frac{3}{14} = \frac{8}{14} + \frac{3}{14} = \frac{11}{14}$
18. $\frac{1}{6} + \frac{11}{12} = \frac{2}{12} + \frac{11}{12} = \frac{13}{12}$ or $1\frac{1}{12}$
19. The LCD of 2 and 8 is 8. $\frac{1}{2} = \frac{1 \times 4}{2 \times 4} = \frac{4}{8}$;
 $\frac{1}{2} + \frac{3}{8} = \frac{4}{8} + \frac{3}{8} = \frac{7}{8}$
20. $\frac{5}{12} + \frac{1}{6} = \frac{5}{12} + \frac{2}{12} = \frac{7}{12}$
21. $2 \overline{)40} \ 18$
 $20 \ 9$ LCD = $2 \cdot 20 \cdot 9 = 360$
 - OR -
 $40 = 2^3 \cdot 5$
 $18 = 2 \cdot 3^2$
 LCD = $2^3 \cdot 3^2 \cdot 5 = 360$
 $\frac{1}{40} = \frac{1 \times 9}{40 \times 9} = \frac{9}{360}$, $\frac{1}{18} = \frac{1 \times 20}{18 \times 20} = \frac{20}{360}$;
 $\frac{1}{40} + \frac{1}{18} = \frac{9}{360} + \frac{20}{360} = \frac{29}{360}$
22. $\frac{5}{24} + \frac{7}{30} = \frac{25}{120} + \frac{28}{120} = \frac{53}{120}$

23. $65 = 5 \cdot 13$
 $26 = 2 \cdot 13$; LCD = $2 \cdot 5 \cdot 13 = 130$
 - OR -

$$\begin{array}{r} 13 \overline{) 65 \ 26} \\ \underline{5 \ 2} \\ 130 \\ \underline{ 130} \\ 0 \end{array}$$

 LCD = $13 \cdot 5 \cdot 2 = 130$
 $\frac{2}{65} = \frac{2 \times 2}{65 \times 2} = \frac{4}{130}$, $\frac{3}{26} = \frac{3 \times 5}{26 \times 5} = \frac{15}{130}$;
 $\frac{2}{65} + \frac{3}{26} = \frac{4}{130} + \frac{15}{130} = \frac{19}{130}$

24. $120 = 2^3 \cdot 3 \cdot 5$
 $150 = 2 \cdot 3 \cdot 5^2$
 LCD = $2^3 \cdot 3 \cdot 5^2 = 600$
 $\frac{7}{120} + \frac{11}{150} = \frac{7 \cdot 5}{120 \cdot 5} + \frac{11 \cdot 4}{150 \cdot 4}$
 $= \frac{35}{600} + \frac{44}{600}$
 $= \frac{79}{600}$

25.
$$\begin{array}{r} 2 \overline{) 120 \ 180} \\ \underline{2 \ 60 \ 90} \\ 3 \overline{) 30 \ 45} \\ \underline{3 \ 10 \ 15} \\ 5 \end{array}$$

 2 3; The LCD is $2^3 \cdot 3^2 \cdot 5 = 360$.
 - OR -

$120 = 2^3 \cdot 3 \cdot 5$
 $180 = 2^2 \cdot 3^2 \cdot 5$
 LCD = $2^3 \cdot 3^2 \cdot 5 = 360$
 $\frac{7}{120} = \frac{7 \times 3}{120 \times 3} = \frac{21}{360}$, $\frac{1}{180} = \frac{1 \times 2}{180 \times 2} = \frac{2}{360}$;
 $\frac{7}{120} + \frac{1}{180} = \frac{21}{360} + \frac{2}{360} = \frac{23}{360}$

26. $90 = 2 \cdot 3^2 \cdot 5$
 $120 = 2^3 \cdot 3 \cdot 5$
 LCD = $2^3 \cdot 3^2 \cdot 5 = 360$
 $\frac{1}{90} + \frac{7}{120} = \frac{1 \cdot 4}{90 \cdot 4} + \frac{7 \cdot 3}{120 \cdot 3}$
 $= \frac{4}{360} + \frac{21}{360}$
 $= \frac{25}{360}$
 $= \frac{5}{72}$

27. Multiples of 60: 60, 120, Since 10 and 20 goes into 60, the LCD is 60.
 $\frac{3}{10} + \frac{7}{20} + \frac{11}{60} = \frac{3 \cdot 6}{10 \cdot 6} + \frac{7 \cdot 3}{20 \cdot 3} + \frac{11}{60}$
 $= \frac{18}{60} + \frac{21}{60} + \frac{11}{60}$
 $= \frac{50}{60}$
 $= \frac{5}{6}$

28. $\frac{5}{9} + \frac{7}{12} + \frac{5}{18} = \frac{20}{36} + \frac{21}{36} + \frac{10}{36}$
 $= \frac{51}{36}$
 $= \frac{17}{12}$ or $1\frac{5}{12}$

29.
$$\begin{array}{r} 2 \overline{) 14 \ 6 \ 9} \\ 3 \overline{) 7 \ 3 \ 9} \\ 7 \ 1 \ 3 \end{array}$$
 so the LCD is $2 \cdot 3 \cdot 7 \cdot 3 = 126$.

$\frac{11}{14} + \frac{5}{6} + \frac{8}{9} = \frac{11 \cdot 9}{14 \cdot 9} + \frac{5 \cdot 21}{6 \cdot 21} + \frac{8 \cdot 14}{9 \cdot 14}$
 $= \frac{99}{126} + \frac{105}{126} + \frac{112}{126}$
 $= \frac{316}{126}$
 $= \frac{158}{63}$ or $2\frac{32}{63}$

30. $\frac{5}{36} + \frac{1}{80} + \frac{7}{90} = \frac{5 \cdot 20}{36 \cdot 20} + \frac{1 \cdot 9}{80 \cdot 9} + \frac{7 \cdot 8}{90 \cdot 8}$
 $= \frac{100}{720} + \frac{9}{720} + \frac{56}{720}$
 $= \frac{165}{720}$
 $= \frac{11}{48}$

31. $\frac{3}{7} - \frac{1}{7} = \frac{3-1}{7} = \frac{2}{7}$

32. $\frac{5}{8} - \frac{2}{8} = \frac{3}{8}$

33. $\frac{5}{6} - \frac{1}{6} = \frac{5-1}{6} = \frac{4}{6} = \frac{2}{3}$

34. $\frac{3}{8} - \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$

35. The LCD of 12 and 4 is 12.

$$\frac{5}{12} - \frac{1}{4} = \frac{5}{12} - \frac{1 \cdot 3}{4 \cdot 3} = \frac{5}{12} - \frac{3}{12} = \frac{2}{12} = \frac{1}{6}$$

36. $\frac{1}{3} - \frac{1}{6} = \frac{1 \cdot 2}{3 \cdot 2} - \frac{1}{6} = \frac{2}{6} - \frac{1}{6} = \frac{1}{6}$

37. The LCD of 2 and 5 is 10.

$$\frac{1}{2} - \frac{1}{5} = \frac{1 \cdot 5}{2 \cdot 5} - \frac{1 \cdot 2}{5 \cdot 2} = \frac{5}{10} - \frac{2}{10} = \frac{3}{10}$$

38. $\frac{1}{4} - \frac{1}{6} = \frac{3}{12} - \frac{2}{12} = \frac{1}{12}$

39. The LCD of 20 and 40 is 40.

$$\frac{5}{20} - \frac{7}{40} = \frac{5 \cdot 2}{20 \cdot 2} - \frac{7}{40} = \frac{10}{40} - \frac{7}{40} = \frac{3}{40}$$

40. $\frac{7}{10} - \frac{3}{20} = \frac{7 \cdot 2}{10 \cdot 2} - \frac{3}{20} = \frac{14}{20} - \frac{3}{20} = \frac{11}{20}$

41. The LCD of 8 and 12 is 24.

$$\frac{7}{8} - \frac{5}{12} = \frac{7 \cdot 3}{8 \cdot 3} - \frac{5 \cdot 2}{12 \cdot 2} = \frac{21}{24} - \frac{10}{24} = \frac{11}{24}$$

42. $\frac{8}{15} - \frac{2}{25} = \frac{8 \cdot 5}{15 \cdot 5} - \frac{2 \cdot 3}{25 \cdot 3} = \frac{40}{75} - \frac{6}{75} = \frac{34}{75}$

43.
$$\begin{array}{r} 2 \overline{)60 \ 48} \\ 2 \overline{)30 \ 24} \\ 3 \overline{)15 \ 12} \end{array}$$

5 4 so the LCD is $2 \cdot 2 \cdot 3 \cdot 5 \cdot 4 = 120$.

$$\frac{13}{60} - \frac{1}{48} = \frac{13 \cdot 4}{60 \cdot 4} - \frac{1 \cdot 5}{48 \cdot 5}$$

$$= \frac{52}{240} - \frac{5}{240}$$

$$= \frac{47}{240}$$

44. $\frac{19}{24} - \frac{7}{60} = \frac{19 \cdot 5}{24 \cdot 5} - \frac{7 \cdot 2}{60 \cdot 2}$

$$= \frac{95}{120} - \frac{14}{120}$$

$$= \frac{81}{120}$$

$$= \frac{27}{40}$$

45. $\frac{8}{9} - \frac{2}{9} - \frac{1}{9} = \frac{8-2-1}{9} = \frac{5}{9}$

46. $\frac{7}{11} - \frac{3}{11} - \frac{2}{11} = \frac{7-3-2}{11} = \frac{2}{11}$

47. The LCD of 4, 12, and 6 is 12.

$$\frac{3}{4} + \frac{5}{12} - \frac{1}{6} = \frac{3 \cdot 3}{4 \cdot 3} + \frac{5}{12} - \frac{1 \cdot 2}{6 \cdot 2}$$

$$= \frac{9}{12} + \frac{5}{12} - \frac{2}{12}$$

$$= \frac{9+5-2}{12}$$

$$= \frac{12}{12}$$

$$= 1$$

48. $\frac{5}{6} + \frac{1}{9} - \frac{1}{3} = \frac{5 \cdot 6}{6 \cdot 6} + \frac{1 \cdot 4}{9 \cdot 4} - \frac{1 \cdot 12}{3 \cdot 12}$

$$= \frac{30}{36} + \frac{4}{36} - \frac{12}{36}$$

$$= \frac{22}{36}$$

$$= \frac{11}{18}$$

49. The LCD of 2 and 3 is 6.

$$\frac{9}{2} - \frac{7}{3} = \frac{9 \cdot 3}{2 \cdot 3} - \frac{7 \cdot 2}{3 \cdot 2} = \frac{27}{6} - \frac{14}{6} = \frac{13}{6} \text{ or } 2\frac{1}{6}$$

50. $\frac{11}{5} - \frac{7}{4} = \frac{11 \cdot 4}{5 \cdot 4} - \frac{7 \cdot 5}{4 \cdot 5} = \frac{44}{20} - \frac{35}{20} = \frac{9}{20}$

51. $\frac{3}{4} + \frac{3}{8} + \frac{1}{32} = \frac{3 \cdot 8}{4 \cdot 8} + \frac{3 \cdot 4}{8 \cdot 4} + \frac{1}{32}$

$$= \frac{24}{32} + \frac{12}{32} + \frac{1}{32}$$

$$= \frac{37}{32} \text{ or } 1\frac{5}{32}$$

The result is $\frac{37}{32}$ (or $1\frac{5}{32}$) in. thick.

52. $\frac{1}{4} + \frac{1}{2} = \frac{1}{4} + \frac{2}{4} = \frac{3}{4}$

This is $\frac{3}{4}$ lb of candy.

53. $\frac{1}{4} + \frac{1}{2} + \frac{1}{8} = \frac{2}{8} + \frac{4}{8} + \frac{1}{8} = \frac{7}{8}$ of his estate

was left to his daughter, wife, and son

together. Thus $1 - \frac{7}{8} = \frac{8}{8} - \frac{7}{8} = \frac{1}{8}$ of his

estate remains.

$$54. 1 - \frac{1}{5} - \frac{3}{10} = \frac{10}{10} - \frac{2}{10} - \frac{3}{10} = \frac{5}{10} = \frac{1}{2}$$

55. The LCD of 1, 4, and 20 is 20.

$$1 - \frac{1}{4} - \frac{3}{10} = \frac{20}{20} - \frac{5}{20} - \frac{6}{20} = \frac{9}{20}$$

56. The fraction of the time spent on eating is $\frac{1}{12}$.

57. $\frac{2}{12} = \frac{1}{6}$. The fraction of the time spent watching TV is $\frac{1}{6}$.

58. The fraction of the time spent doing homework is $\frac{1}{12}$.

$$59. \frac{3}{10} + \frac{9}{20} = \frac{6}{20} + \frac{9}{20} = \frac{15}{20} = \frac{3}{4}$$

The fraction of the expenses for benefits or salary is $\frac{3}{4}$.

$$60. \frac{3}{10} + \frac{1}{4} = \frac{6}{20} + \frac{5}{20} = \frac{11}{20}$$

The fraction of the expenses for benefits or facilities is $\frac{11}{20}$.

$$61. \frac{1}{10} + \frac{1}{10} = \frac{2}{10} = \frac{1}{5}$$

The fraction of the days rainy or snowy is $\frac{1}{5}$.

$$62. \frac{1}{10} + \frac{1}{5} = \frac{1}{10} + \frac{2}{10} = \frac{3}{10}$$

The fraction of the days rainy or cloudy is $\frac{3}{10}$.

$$63. \frac{3}{10} + \frac{1}{5} = \frac{3}{10} + \frac{2}{10} = \frac{5}{10} = \frac{1}{2}$$

The fraction of the people who walk or use a car is $\frac{1}{2}$.

$$64. \frac{1}{20} + \frac{1}{5} = \frac{1}{20} + \frac{4}{20} = \frac{5}{20} = \frac{1}{4}$$

The fraction of the people who bike or use a car is $\frac{1}{4}$.

$$65. 1 - \frac{3}{10} = \frac{10}{10} - \frac{3}{10} = \frac{7}{10}$$

The fraction of the people who do not walk is $\frac{7}{10}$.

$$66. \text{ a. } \frac{3}{10} + \frac{1}{4} = \frac{6}{20} + \frac{5}{20} = \frac{11}{20}$$

The fraction of the expenses that goes toward food and tuition is $\frac{11}{20}$.

$$\text{ b. } \frac{11}{20}(3000) = 1650$$

The amount for food and tuition is \$1650.

$$67. \text{ a. } \frac{3}{10} + \frac{1}{5} = \frac{3}{10} + \frac{1 \times 2}{5 \times 2} = \frac{3}{10} + \frac{2}{10} = \frac{5}{10} = \frac{1}{2}$$

The fraction of the expenses that goes toward food and room is $\frac{1}{2}$.

$$\text{ b. } \frac{1}{2}(3000) = 1500$$

The amount for food and room is \$1500.

$$68. \text{ a. } \frac{1}{4} + \frac{1}{10} = \frac{5}{20} + \frac{2}{20} = \frac{7}{20}$$

The fraction of the expenses that goes toward books and tuition is $\frac{7}{20}$.

$$\text{ b. } \frac{7}{20}(3000) = 1050$$

The amount for books and tuition is \$1050.

$$\begin{aligned}
 69. \text{ a. } \frac{1}{10} + \frac{3}{20} + \frac{1}{5} &= \frac{1 \times 2}{10 \times 2} + \frac{3}{20} + \frac{1 \times 4}{5 \times 4} \\
 &= \frac{2}{20} + \frac{3}{20} + \frac{4}{20} \\
 &= \frac{9}{20}
 \end{aligned}$$

The fraction of the expenses that goes toward books, personal, and room is

$$\frac{9}{20}.$$

$$\text{b. } \frac{9}{20}(3000) = 1350$$

The amount for books, personal, and room is \$1350.

$$70. \text{ a. } 1 - \frac{1}{10} = \frac{10}{10} - \frac{1}{10} = \frac{9}{10}$$

The fraction of the expenses going toward paying for everything except books is $\frac{9}{10}$.

$$\text{b. } \frac{9}{10}(3000) = 2700$$

The amount for everything except books is \$2700.

71. Multiples of 10 (hot dogs):

10, 20, 30, 40, 50,

Since 8 goes into 40, the LCD is 40.

10×4 packs = 40 hot dogs and

8×5 packs = 40 buns. Thus, you must

buy at least 4 packages of hot dogs and 5 packages of buns.

72. Multiples of 12 (buns):

12, 24, 36, 48, 60, 72,

Since 10 goes into 60, The LCD is 60.

10×6 packs = 60 hot dogs and

12×5 packs = 60 buns. Thus, you must buy at least 6 packages of hot dogs and 5 packages of buns.

73. Yes; answers may vary.

74. Answers may vary.

75. Answers may vary.

76. Answers may vary.

$$77. \frac{a+b}{c}$$

$$78. \frac{a-b}{c}$$

$$79. \frac{1}{30} \text{ and } \frac{1}{18}.$$

$$30 = 2 \cdot 3 \cdot 5$$

$$18 = 2 \cdot 3^2 \text{ so the LCD} = 2 \cdot 3^2 \cdot 5 = 90.$$

$$80. \frac{1}{10} + \frac{7}{10} = \frac{1+7}{10} = \frac{8}{10} = \frac{4}{5}.$$

$$81. \frac{1}{8} + \frac{1}{6} = \frac{3}{24} + \frac{4}{24} = \frac{7}{24}$$

$$82. \frac{1}{10} + \frac{7}{4} = \frac{2}{20} + \frac{35}{20} = \frac{37}{20} \text{ or } 1\frac{17}{20}$$

$$\begin{aligned}
 83. \frac{1}{10} + \frac{1}{12} + \frac{3}{8} &= \frac{12}{120} + \frac{10}{120} + \frac{45}{120} \\
 &= \frac{12+10+45}{120} \\
 &= \frac{67}{120}
 \end{aligned}$$

$$84. \frac{5}{12} - \frac{1}{18} = \frac{15}{36} - \frac{2}{36} = \frac{13}{36}$$

$$\begin{aligned}
 85. \frac{3}{10} + \frac{1}{12} - \frac{1}{8} &= \frac{36}{120} + \frac{10}{120} - \frac{15}{120} \\
 &= \frac{36+10-15}{120} \\
 &= \frac{31}{120}
 \end{aligned}$$

$$86. \text{ a. } \frac{3}{10} + \frac{1}{10} = \frac{4}{10} = \frac{2}{5}$$

The chinchilla is eating too much or too little $\frac{2}{5}$ of the time.

$$\text{b. } \frac{1}{10} + \frac{2}{5} = \frac{1}{10} + \frac{4}{10} = \frac{5}{10} = \frac{1}{2}$$

The chinchilla is eating either have no problem or act weird $\frac{1}{2}$ of the time.

$$87. 3\frac{1}{5} = \frac{5 \cdot 3 + 1}{11} = \frac{16}{11}$$

$$88. 5\frac{3}{11} = \frac{11 \cdot 5 + 3}{11} = \frac{58}{11}$$

$$91. \frac{10}{6} = 1\frac{4}{6} = 1\frac{2}{3}$$

$$89. 6\frac{7}{8} = \frac{8 \cdot 6 + 7}{8} = \frac{48 + 7}{8} = \frac{55}{8}$$

$$92. \frac{45}{6} = 7\frac{3}{6} = 7\frac{1}{2}$$

$$90. 7\frac{10}{11} = \frac{11 \cdot 7 + 10}{11} = \frac{77 + 10}{11} = \frac{87}{11}$$

Section 2.6 – Addition and Subtraction of Mixed Numbers

Problems

1. Method 1:

$$3\frac{1}{9} + 2\frac{4}{9} = \frac{28}{9} + \frac{22}{9} = \frac{50}{9} = 5\frac{5}{9}$$

Method 2:

$$\begin{array}{r} 3\frac{1}{9} \\ +2\frac{4}{9} \\ \hline 5\frac{5}{9} \end{array}$$

2. Multiples of 6: 6, 12, 18, Since 4 goes into 12, the LCD of 4 and 6 is 12.

$$1\frac{3}{4} = \frac{7}{4} = \frac{7 \cdot 3}{4 \cdot 3} = \frac{21}{12} \text{ and } \frac{1}{6} = \frac{1 \cdot 2}{6 \cdot 2} = \frac{2}{12} \text{ so}$$

$$1\frac{3}{4} + \frac{1}{6} = \frac{21}{12} + \frac{2}{12} = \frac{23}{12} = 1\frac{11}{12}$$

3. The LCD of 4 and 6 is 12.

$$5\frac{1}{4} = \frac{21}{4} = \frac{21 \cdot 3}{4 \cdot 3} = \frac{63}{12} \text{ and}$$

$$1\frac{5}{6} = \frac{11}{6} = \frac{11 \cdot 2}{6 \cdot 2} = \frac{22}{12} \text{ so}$$

$$5\frac{1}{4} + 1\frac{5}{6} = \frac{63}{12} + \frac{22}{12} = \frac{85}{12} = 7\frac{1}{12}$$

4. The LCD of 6 and 9 is 18.

$$\begin{aligned} 4\frac{1}{6} - 3\frac{2}{9} &= \frac{25}{6} - \frac{29}{9} \\ &= \frac{25 \cdot 3}{6 \cdot 3} - \frac{29 \cdot 2}{9 \cdot 2} \\ &= \frac{75}{18} - \frac{58}{18} \\ &= \frac{17}{18} \end{aligned}$$

$$5. \begin{array}{r} 2\frac{8}{5} - 2\frac{10}{6} \\ \hline \end{array}$$

2 5 3 so the LCD is $2^3 \cdot 5 \cdot 3 = 120$.

$$\begin{aligned} 1\frac{3}{8} + 2\frac{3}{10} - 2\frac{1}{12} &= \frac{11}{8} + \frac{23}{10} - \frac{25}{12} \\ &= \frac{11 \cdot 15}{8 \cdot 15} + \frac{23 \cdot 12}{10 \cdot 12} - \frac{25 \cdot 10}{12 \cdot 10} \\ &= \frac{165}{120} + \frac{276}{120} - \frac{250}{120} \\ &= \frac{165 + 276 - 250}{120} \\ &= \frac{191}{120} \\ &= 1\frac{71}{120} \end{aligned}$$

$$6. 20\frac{8}{12} \text{ ft} + 15 \text{ ft} + 20\frac{8}{12} \text{ ft} + 15 \text{ ft}$$

$$= 20\frac{2}{3} \text{ ft} + 20\frac{2}{3} \text{ ft} + 15 \text{ ft} + 15 \text{ ft}$$

$$= 40\frac{4}{3} \text{ ft} + 30 \text{ ft}$$

$$= \left(40 + 1\frac{1}{3}\right) \text{ ft} + 30 \text{ ft}$$

$$= 41\frac{1}{3} \text{ ft} + 30 \text{ ft}$$

$$= 71\frac{1}{3} \text{ ft}$$

You need $71\frac{1}{3}$ feet of molding.

Exercises 2.6

1. $3\frac{1}{7} + 1\frac{3}{7} = 4\frac{4}{7}$
2. $3\frac{1}{9} + 4\frac{3}{9} = 7\frac{4}{9}$
3. $2\frac{1}{7} + \frac{3}{7} = 2\frac{4}{7}$
4. $5\frac{1}{9} + \frac{7}{9} = 5\frac{8}{9}$
5. $\frac{3}{8} + 5\frac{1}{8} = 5\frac{4}{8} = 5\frac{1}{2}$
6. $\frac{3}{8} + 2\frac{1}{8} = 2\frac{4}{8} = 2\frac{1}{2}$
7. $1\frac{3}{5} + 2\frac{4}{5} = 3\frac{7}{5} = 3 + 1\frac{2}{5} = 4\frac{2}{5}$
8. $2\frac{4}{7} + 5\frac{5}{7} = 7\frac{9}{7} = 7 + 1\frac{2}{7} = 8\frac{2}{7}$
9. $2 + 3\frac{1}{7} = 5\frac{1}{7}$
10. $3 + 4\frac{1}{8} = 7\frac{1}{8}$
11. The LCD of 4 and 15 is 60.
 $\frac{3}{4} = \frac{3 \cdot 15}{4 \cdot 15} = \frac{45}{60}$ and $\frac{2}{15} = \frac{2 \cdot 4}{15 \cdot 4} = \frac{8}{60}$;
 $2\frac{3}{4} + \frac{2}{15} = 2\frac{45}{60} + \frac{8}{60} = 2\frac{53}{60}$
12. $2\frac{3}{5} + \frac{3}{8} = 2\frac{24}{40} + \frac{15}{40} = 2\frac{39}{40}$
13. The LCD of 10 and 12 is 60.
 $\frac{3}{10} = \frac{3 \cdot 6}{10 \cdot 6} = \frac{18}{60}$ and $\frac{11}{12} = \frac{11 \cdot 5}{12 \cdot 5} = \frac{55}{60}$;
 $1\frac{3}{10} + 2\frac{11}{12} = 1\frac{18}{60} + 2\frac{55}{60}$
 $= 3\frac{73}{60} = 3 + 1\frac{13}{60} = 4\frac{13}{60}$
14. $1\frac{4}{5} + 3\frac{7}{9} = 1\frac{36}{45} + 3\frac{35}{45}$
 $= 4\frac{71}{45}$
 $= 4 + 1\frac{26}{45}$
 $= 5\frac{26}{45}$
15. The LCD of 4 and 6 is 12.
 $1\frac{3}{4} + 2\frac{5}{6} = 1\frac{3 \cdot 3}{4 \cdot 3} + 2\frac{5 \cdot 2}{6 \cdot 2}$
 $= 1\frac{9}{12} + 2\frac{10}{12}$
 $= 3\frac{19}{12}$
 $= 3 + 1\frac{7}{12}$
 $= 4\frac{7}{12}$
16. $2\frac{4}{5} + 3\frac{5}{6} = 2\frac{24}{30} + 3\frac{25}{30}$
 $= 5\frac{49}{30}$
 $= 5 + 1\frac{19}{30}$
 $= 6\frac{19}{30}$
17. The LCD of 7 and 9 is 63.
 $8\frac{1}{7} + 3\frac{1}{9} = 8\frac{1 \cdot 9}{7 \cdot 9} + 3\frac{1 \cdot 7}{9 \cdot 7}$
 $= 8\frac{9}{63} + 3\frac{7}{63}$
 $= 11\frac{16}{63}$
18. $6\frac{1}{8} + 5\frac{3}{7} = 6\frac{1 \cdot 7}{8 \cdot 7} + 5\frac{3 \cdot 8}{7 \cdot 8}$
 $= 6\frac{7}{56} + 5\frac{24}{56}$
 $= 11\frac{31}{56}$

19. The LCD of 7 and 9 is 63.

$$\begin{aligned} 9\frac{1}{11} + 3\frac{1}{10} &= 9\frac{1 \cdot 10}{11 \cdot 10} + 3\frac{1 \cdot 11}{10 \cdot 11} \\ &= 9\frac{10}{110} + 3\frac{11}{110} \\ &= 12\frac{21}{110} \end{aligned}$$

20. $7\frac{3}{8} + 1\frac{1}{9} = 7\frac{27}{72} + 1\frac{8}{9} = 8\frac{35}{72}$

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

22. $7\frac{5}{8} - 3\frac{3}{8} = 4\frac{2}{8} = 4\frac{1}{4}$

23. $4\frac{5}{6} - 3\frac{1}{6} = 1\frac{4}{6} = 1\frac{2}{3}$

24. $5\frac{3}{8} - 2\frac{1}{8} = 3\frac{2}{8} = 3\frac{1}{4}$

25. The LCD of 12 and 4 is 12.

$$\begin{aligned} 3\frac{1}{12} - 1\frac{1}{4} &= \frac{37}{12} - \frac{5 \cdot 3}{4 \cdot 3} \\ &= \frac{37}{12} - \frac{15}{12} \\ &= \frac{22}{12} \\ &= \frac{11}{6} \\ &= 1\frac{5}{6} \end{aligned}$$

26. $3\frac{1}{3} - 1\frac{5}{6} = \frac{10 \cdot 2}{3 \cdot 2} - \frac{11}{6} = \frac{20}{6} - \frac{11}{6} = \frac{9}{6} = 1\frac{1}{2}$

27. The LCD of 2 and 5 is 10.

$$3\frac{1}{2} - 2\frac{4}{5} = \frac{7 \cdot 5}{2 \cdot 5} - \frac{14 \cdot 2}{5 \cdot 2} = \frac{35}{10} - \frac{28}{10} = \frac{7}{10}$$

28. $4\frac{1}{4} - 3\frac{5}{6} = \frac{17 \cdot 3}{4 \cdot 3} - \frac{23 \cdot 2}{6 \cdot 2} = \frac{51}{12} - \frac{46}{12} = \frac{5}{12}$

29. The LCD of 20 and 40 is 40.

$$4\frac{1}{20} - 3\frac{3}{40} = \frac{81 \cdot 2}{20 \cdot 2} - \frac{123}{40} = \frac{162}{40} - \frac{123}{40} = \frac{39}{40}$$

30. $8\frac{3}{10} - 7\frac{9}{20} = \frac{83 \cdot 2}{10 \cdot 2} - \frac{149}{20} = \frac{166}{20} - \frac{149}{20} = \frac{17}{20}$

31. The LCD of 8 and 12 is 24.

$$\begin{aligned} 3\frac{7}{8} - 1\frac{5}{12} &= \frac{31 \cdot 3}{8 \cdot 3} - \frac{17 \cdot 2}{12 \cdot 2} \\ &= \frac{93}{24} - \frac{34}{24} = \frac{59}{24} = 2\frac{11}{24} \end{aligned}$$

32. $5\frac{8}{15} - 1\frac{2}{25} = 5\frac{8 \cdot 5}{15 \cdot 5} - 1\frac{2 \cdot 3}{25 \cdot 3}$

$$\begin{aligned} &= 5\frac{40}{75} - 1\frac{6}{75} \\ &= 4\frac{34}{75} \end{aligned}$$

33. $2\frac{60}{48}$

$$2\frac{30}{24}$$

$$3\frac{15}{12}$$

5 4 so the LCD is $2 \cdot 2 \cdot 3 \cdot 5 \cdot 4 = 240$.

$3\frac{13}{60} - 3\frac{1}{48} = 3\frac{13 \cdot 4}{60 \cdot 4} - 3\frac{1 \cdot 5}{48 \cdot 5}$

$$\begin{aligned} &= 3\frac{52}{240} - 3\frac{5}{240} \\ &= \frac{47}{240} \end{aligned}$$

34. $4\frac{19}{24} - 4\frac{7}{60} = 4\frac{19 \cdot 5}{24 \cdot 5} - 4\frac{7 \cdot 2}{60 \cdot 2}$

$$= 4\frac{95}{120} - 4\frac{14}{120} = \frac{81}{120} = \frac{27}{40}$$

35. Since the denominators are the same, we

have $3\frac{8}{9} + 1\frac{2}{9} - 1\frac{1}{9} = 3 + 1 - 1 + \frac{8}{9} + \frac{2}{9} - \frac{1}{9}$

$$= 3 + \frac{9}{9}$$

$$= 3 + 1$$

$$= 4$$

36. $4\frac{7}{11} + 2\frac{3}{11} - 3\frac{2}{11} = 4 + 2 - 3 + \frac{7}{11} + \frac{3}{11} - \frac{2}{11}$

$$= 3 + \frac{8}{11}$$

$$= 3\frac{8}{11}$$

37. The LCD of 4, 12, and 6 is 12.

$$\begin{aligned} 3\frac{3}{4} + 1\frac{1}{12} - 1\frac{1}{6} &= \frac{15 \cdot 3}{4 \cdot 3} + \frac{13}{12} - \frac{7 \cdot 2}{6 \cdot 2} \\ &= \frac{45}{12} + \frac{13}{12} - \frac{14}{12} \\ &= \frac{45 + 13 - 14}{12} \\ &= \frac{44}{12} \\ &= \frac{11}{3} \\ &= 3\frac{2}{3} \end{aligned}$$

38. $2\frac{5}{6} + 3\frac{1}{9} - 2\frac{1}{3} = \frac{17 \cdot 3}{6 \cdot 3} + \frac{28 \cdot 2}{9 \cdot 2} - \frac{7 \cdot 6}{3 \cdot 6}$
 $= \frac{51}{18} + \frac{56}{18} - \frac{42}{18} = \frac{65}{18} = 3\frac{11}{18}$

39. The LCD of 2, 3, and 4 is 12.

$$\begin{aligned} 4\frac{1}{2} - 2\frac{1}{3} + 3\frac{1}{4} &= \frac{9 \cdot 6}{2 \cdot 6} - \frac{7 \cdot 4}{3 \cdot 4} + \frac{13 \cdot 3}{4 \cdot 3} \\ &= \frac{54}{12} - \frac{28}{12} + \frac{39}{12} \\ &= \frac{54 - 28 + 39}{12} \\ &= \frac{65}{12} \\ &= 5\frac{5}{12} \end{aligned}$$

40. $2\frac{1}{5} - 1\frac{3}{4} + 5\frac{1}{2} = \frac{11}{5} - \frac{7}{4} + \frac{11}{2}$
 $= \frac{11 \cdot 4}{5 \cdot 4} - \frac{7 \cdot 5}{4 \cdot 5} + \frac{11 \cdot 10}{2 \cdot 10}$
 $= \frac{44}{20} - \frac{35}{20} + \frac{110}{20} = \frac{119}{20} = 5\frac{19}{20}$

41. The LCD of 65 and 26 is 130.

$$\begin{aligned} 3\frac{1}{65} + 10\frac{1}{26} - 1\frac{2}{65} &= 3\frac{1 \cdot 2}{65 \cdot 2} + 10\frac{1 \cdot 5}{26 \cdot 5} - 1\frac{2 \cdot 2}{65 \cdot 2} \\ &= 3\frac{2}{130} + 10\frac{5}{130} - 1\frac{4}{130} \\ &= 3 + 10 - 1 + \frac{2}{130} + \frac{5}{130} - \frac{4}{130} \\ &= 12 + \frac{3}{130} \\ &= 12\frac{3}{130} \end{aligned}$$

42. $1\frac{7}{62} + 3\frac{1}{155} - 1\frac{3}{62}$
 $= 1\frac{7 \cdot 5}{62 \cdot 5} + 3\frac{1 \cdot 2}{155 \cdot 2} - 1\frac{3 \cdot 5}{62 \cdot 5}$
 $= 1\frac{35}{310} + 3\frac{2}{310} - 1\frac{15}{310}$
 $= 1 + 3 - 1 + \frac{35}{130} + \frac{2}{130} - \frac{15}{130}$
 $= 3 + \frac{22}{310}$
 $= 3\frac{11}{155}$

43. The LCD of 45 and 60 is 180.

$$\begin{aligned} 14\frac{11}{45} - 14\frac{11 \cdot 4}{45 \cdot 4} + 14\frac{44}{180} &+ 7\frac{7}{60} = + 7\frac{7 \cdot 3}{60 \cdot 3} = + 7\frac{21}{180} \\ - 3\frac{8}{45} - 3\frac{8 \cdot 4}{45 \cdot 4} - 3\frac{32}{180} &= 18\frac{33}{180} = 18\frac{11}{60} \end{aligned}$$

44. The LCD of 26 and 91 is 182.

$$\begin{aligned} 10\frac{3}{26} - 10\frac{3 \cdot 7}{26 \cdot 7} + 10\frac{21}{182} &+ 5\frac{1}{91} = + 5\frac{1 \cdot 2}{91 \cdot 2} = + 5\frac{2}{182} \\ - 3\frac{1}{26} - 3\frac{1 \cdot 7}{26 \cdot 7} - 3\frac{7}{182} &= 12\frac{16}{182} = 12\frac{8}{91} \end{aligned}$$

45. $101\frac{6}{10} - 98\frac{6}{10} = 3$

That is 3 degrees above normal.

46. $3\frac{1}{8} - 2\frac{1}{4} = \frac{25}{8} - \frac{9 \cdot 2}{4 \cdot 2} = \frac{25}{8} - \frac{18}{8} = \frac{7}{8}$

That was $\frac{7}{8}$ lb under the average.

47. $4\frac{7}{16} - 3\frac{1}{8} = 4\frac{7}{8} - 3\frac{1 \cdot 2}{8 \cdot 2} = 4\frac{7}{8} - 3\frac{2}{16} = 1\frac{5}{16}$

This weight is $1\frac{5}{16}$ lb above the average.

48. $\frac{3}{4} + 1\frac{2}{3} = \frac{3 \cdot 3}{4 \cdot 3} + \frac{5 \cdot 4}{3 \cdot 4} = \frac{9}{12} + \frac{20}{12} = \frac{29}{12} = 2\frac{5}{12}$

She rode $2\frac{5}{12}$ miles.

$$49. 2\frac{1}{2} + \frac{3}{4} = \frac{5 \cdot 2}{2 \cdot 2} + \frac{3}{4} = \frac{10}{4} + \frac{3}{4} = \frac{13}{4} = 3\frac{1}{4}$$

These ingredients total $3\frac{1}{4}$ cups.

$$50. 1\frac{3}{4} + \frac{5}{8} + \frac{1}{32} = \frac{7 \cdot 8}{4 \cdot 8} + \frac{5 \cdot 4}{8 \cdot 4} + \frac{1}{32}$$

$$= \frac{56}{32} + \frac{20}{32} + \frac{1}{32} = \frac{77}{32} = 2\frac{13}{32}$$

The result is $2\frac{13}{32}$ inches thick.

$$51. \frac{1}{4} + 2\frac{1}{2} + 3 = \frac{1}{4} + 2\frac{1 \cdot 2}{2 \cdot 2} + 3$$

$$= \frac{1}{4} + 2\frac{2}{4} + 3$$

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

$$= 5\frac{3}{4}$$

The total weight was $5\frac{3}{4}$ lb.

$$52. 1 - \frac{1}{5} - \frac{3}{10} = \frac{10}{10} - \frac{2}{10} - \frac{3}{10} = \frac{5}{10} = \frac{1}{2}$$

The fraction is $\frac{1}{2}$.

$$53. 1 - \frac{1}{4} - \frac{9}{20} = \frac{20}{20} - \frac{5}{20} - \frac{9}{20} = \frac{6}{20} = \frac{3}{10}$$

This fraction is $\frac{3}{10}$.

$$54. 6\frac{1}{2} + 3\frac{1}{10} = 6\frac{5}{10} + 3\frac{1}{10} = 9\frac{6}{10} = 9\frac{3}{5}$$

Americans spend $\$9\frac{3}{5}$ billion on newspapers.

$$55. 46\frac{3}{5} - 38\frac{9}{10} = 46\frac{3 \cdot 2}{5 \cdot 2} - 38\frac{9}{10}$$

$$= 46\frac{6}{10} - 38\frac{9}{10}$$

$$= \frac{466}{10} - \frac{389}{10} = \frac{77}{10} = 7\frac{7}{10}$$

Americans work $7\frac{7}{10}$ more hours per week than Canadians.

$$56. 7\frac{1}{2} + 2\frac{3}{5} + 2 = 7\frac{5}{10} + 2\frac{6}{10} + 2$$

$$= 9\frac{11}{10} + 2$$

$$= 9 + 1\frac{1}{10} + 2$$

$$= 12\frac{1}{10} \text{ hours}$$

$$57. 15\frac{1}{4} + 9\frac{2}{5} = 15\frac{5}{20} + 9\frac{8}{20} = 24\frac{13}{20}$$

Pedro worked a total of $24\frac{13}{20}$ hours.

$$58. 1\frac{1}{2} + 2\frac{1}{4} = 1\frac{2}{4} + 2\frac{1}{4} = 3\frac{3}{4}$$

$$59. 11\frac{4}{12} + 14\frac{8}{12} + 11\frac{4}{12} + 14\frac{8}{12} = 50\frac{24}{12}$$

$$= 50 + 2$$

$$= 52$$

You need 52 feet of baseboard molding.

$$60. 21\frac{4}{12} + 28\frac{4}{12} + 21\frac{4}{12} + 28\frac{4}{12} = 98\frac{16}{12}$$

$$= 98 + 1\frac{4}{12}$$

$$= 99\frac{1}{3} \text{ feet}$$

$$61. 3\frac{3}{8} + \frac{1}{4} = \frac{27}{8} + \frac{1}{4}$$

$$= \frac{27}{8} + \frac{1 \times 2}{4 \times 2}$$

$$= \frac{27}{8} + \frac{2}{8} = \frac{29}{8} = 3\frac{5}{8}$$

$$62. 2\frac{2}{3} + 1\frac{5}{8} = \frac{8}{3} + \frac{13}{8}$$

$$= \frac{64}{24} + \frac{39}{24} = \frac{103}{24} = 4\frac{7}{24}$$

$$63. 2\frac{2}{3} - 1\frac{5}{8} = \frac{8}{3} - \frac{13}{8}$$

$$= \frac{8 \times 8}{3 \times 8} - \frac{13 \times 3}{8 \times 3}$$

$$= \frac{64}{24} - \frac{39}{24} = \frac{25}{24} = 1\frac{1}{24}$$

$$64. 1\frac{2}{3} + 2\frac{1}{4} - 3\frac{5}{8} = \frac{5}{3} + \frac{9}{4} - \frac{29}{8}$$

$$= \frac{40}{24} + \frac{54}{24} - \frac{87}{24} = \frac{7}{24}$$

$$65. \$3\frac{1}{4} - \$\frac{1}{8} = \$3\frac{2}{8} - \$\frac{1}{8} = \$3\frac{1}{8} \text{ per share}$$

$$66. \$2\frac{1}{4} - \$\frac{1}{8} = \$2\frac{2}{8} - \$\frac{1}{8} = \$2\frac{1}{8} \text{ per share}$$

$$67. \$62\frac{3}{8} + \$\frac{1}{4} = \$62\frac{3}{8} + \$\frac{2}{8} = \$62\frac{5}{8} \text{ per share}$$

$$68. \$57\frac{5}{8} + \$\frac{1}{4} = \$57\frac{5}{8} + \$\frac{2}{8} = \$57\frac{7}{8} \text{ per share}$$

69. No; answers may vary. For example,

$$\frac{1}{2} + \frac{3}{4} = \frac{5}{4}.$$

70. No; answers may vary. For example,

$$1\frac{1}{3} + 2\frac{2}{3} = 3\frac{3}{3} = 3 + 1 = 4.$$

71. Answers may vary.

72. Answers may vary.

73. LCD

74. perimeter

$$75. 2\frac{3}{4} + \frac{1}{15} = 2\frac{45}{60} + \frac{4}{60} = 2\frac{49}{60}$$

$$76. 3\frac{3}{7} + 2\frac{1}{7} = 5\frac{4}{7}$$

$$77. 2\frac{3}{4} + 3\frac{5}{6} = 2\frac{9}{12} + 3\frac{10}{12} = 5\frac{19}{12} = 6\frac{7}{12}$$

$$78. 3\frac{3}{4} - 1\frac{1}{15} = 3\frac{45}{60} - 1\frac{4}{60} = 2\frac{41}{60}$$

$$79. 2\frac{5}{9} + 3\frac{7}{10} - 4\frac{1}{12}$$

$$= 2\frac{5 \cdot 20}{9 \cdot 20} + 3\frac{7 \cdot 18}{10 \cdot 18} - 4\frac{1 \cdot 15}{12 \cdot 15}$$

$$= 2\frac{100}{180} + 3\frac{126}{180} - 4\frac{15}{180}$$

$$= 1\frac{211}{180} = 1 + 1\frac{31}{180} = 2\frac{31}{180}$$

$$80. 30\frac{1}{4} + 15\frac{1}{2} + 30\frac{1}{4} + 15\frac{1}{2} = 60\frac{2}{4} + 30\frac{2}{2}$$

$$= 60\frac{1}{2} + 31$$

$$= 91\frac{1}{2} \text{ feet}$$

$$81. \frac{\cancel{18}}{2} \cdot \frac{\cancel{10}}{2} = \frac{1}{4}$$

$$82. \frac{3}{10} \cdot \frac{\cancel{28}^3}{14} = \frac{9}{140}$$

$$83. \frac{4}{5} \div \frac{15}{32} = \frac{4}{5} \cdot \frac{32}{15} = \frac{128}{75}$$

$$84. \frac{10}{33} \div \frac{25}{11} = \frac{\cancel{10}^2}{\cancel{33}_3} \cdot \frac{\cancel{11}}{\cancel{25}_5} = \frac{2}{15}$$

Section 2.7 – Order of Operations and Grouping Symbols

Problems

$$1. \text{ a. } \frac{1}{3} \cdot \left(\frac{3}{2}\right)^2 - \frac{1}{12} = \frac{1}{3} \cdot \frac{9}{4} - \frac{1}{12}$$

$$= \frac{9}{12} - \frac{1}{12} = \frac{8}{12} = \frac{2}{3}$$

$$\text{ b. } \left(\frac{1}{3}\right)^3 + \frac{2}{3} \cdot \frac{1}{9} = \frac{1}{27} + \frac{2}{3} \cdot \frac{1}{9}$$

$$= \frac{1}{27} + \frac{2}{27} = \frac{3}{27} = \frac{1}{9}$$

$$\begin{aligned}
 2. \text{ a. } \frac{3}{4} \div \frac{5}{6} - \left(\frac{1}{3} + \frac{1}{5}\right) &= \frac{3}{4} \div \frac{5}{6} - \left(\frac{8}{15}\right) \\
 &= \frac{3}{4} \cdot \frac{6}{5} - \left(\frac{8}{15}\right) \\
 &= \frac{9}{10} - \left(\frac{8}{15}\right) \\
 &= \frac{27}{30} - \frac{16}{30} = \frac{11}{30}
 \end{aligned}$$

$$\begin{aligned}
 \text{b. } 27 \div \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} - 1 &= 27 \cdot \frac{3}{1} \cdot \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} - 1 \\
 &= 81 \cdot \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} - 1 \\
 &= 27 \cdot \frac{1}{3} + \frac{1}{2} - 1 \\
 &= 9 + \frac{1}{2} - 1 \\
 &= 9\frac{1}{2} - 1 = 8\frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 3. \left(\frac{1}{2}\right)^3 \div \frac{1}{8} \cdot \frac{1}{2} + \frac{1}{3} \left(\frac{3}{2} - \frac{1}{2}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 &= \left(\frac{1}{2}\right)^3 \div \frac{1}{8} \cdot \frac{1}{2} + \frac{1}{3}(1) - \frac{1}{3} \cdot \frac{1}{2} \\
 &= \frac{1}{8} \div \frac{1}{8} \cdot \frac{1}{2} + \frac{1}{3}(1) - \frac{1}{3} \cdot \frac{1}{2} \\
 &= 1 \cdot \frac{1}{2} + \frac{1}{3}(1) - \frac{1}{3} \cdot \frac{1}{2} \\
 &= \frac{1}{2} + \frac{1}{3} - \frac{1}{6} = \frac{5}{6} - \frac{1}{6} = \frac{4}{6} = \frac{2}{3}
 \end{aligned}$$

$$\begin{aligned}
 4. \frac{1}{6} \div 1\frac{1}{6} + \left\{ 27 \cdot \left(\frac{1}{3}\right)^2 - \left[\frac{1}{3} + \left(2\frac{1}{3} - \frac{1}{3}\right)\right] \right\} \\
 &= \frac{1}{6} \div 1\frac{1}{6} + \left\{ 27 \cdot \left(\frac{1}{3}\right)^2 - \left[\frac{1}{3} + (2)\right] \right\} \\
 &= \frac{1}{6} \div 1\frac{1}{6} + \left\{ 27 \cdot \left(\frac{1}{3}\right)^2 - 2\frac{1}{3} \right\} \\
 &= \frac{1}{6} \div 1\frac{1}{6} + \left\{ 27 \cdot \frac{1}{9} - 2\frac{1}{3} \right\} \\
 &= \frac{1}{6} \div 1\frac{1}{6} + \left\{ 3 - 2\frac{1}{3} \right\} \\
 &= \frac{1}{6} \div 1\frac{1}{6} + \frac{2}{3} \\
 &= \frac{1}{6} \cdot \frac{6}{7} + \frac{2}{3} = \frac{1}{7} + \frac{2}{3} = \frac{17}{21}
 \end{aligned}$$

$$\begin{aligned}
 5. \frac{5\frac{1}{4} + 6\frac{1}{2} + 4\frac{1}{4} + 3\frac{1}{2}}{4} &= \frac{18 + 1\frac{1}{2}}{4} \\
 &= \frac{19\frac{1}{2}}{4} \\
 &= \frac{39}{8} \\
 &= \frac{2}{4} \\
 &= \frac{39}{2} \cdot \frac{1}{4} \\
 &= \frac{39}{8} = 4\frac{7}{8} \text{ lb}
 \end{aligned}$$

Exercises 2.7

$$\begin{aligned}
 1. \left(\frac{1}{2}\right)^2 \cdot \frac{1}{5} + \frac{1}{6} &= \frac{1}{4} \cdot \frac{1}{5} + \frac{1}{6} \\
 &= \frac{1}{20} + \frac{1}{6} \\
 &= \frac{3}{60} + \frac{10}{60} = \frac{13}{60}
 \end{aligned}$$

$$2. \frac{1}{3} \cdot \left(\frac{1}{2}\right)^2 + \frac{1}{6} = \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{6} = \frac{1}{12} + \frac{1}{6} = \frac{3}{12} = \frac{1}{4}$$

$$\begin{aligned}
 3. \frac{1}{7} + \frac{1}{3} \cdot \left(\frac{1}{2}\right)^2 &= \frac{1}{7} + \frac{1}{3} \cdot \frac{1}{4} \\
 &= \frac{1}{7} + \frac{1}{12} \\
 &= \frac{12}{84} + \frac{7}{84} = \frac{19}{84}
 \end{aligned}$$

$$4. \frac{1}{6} + \left(\frac{1}{3}\right)^2 \cdot \frac{1}{2} = \frac{1}{6} + \frac{1}{9} \cdot \frac{1}{2} = \frac{1}{6} + \frac{1}{18} = \frac{4}{18} = \frac{2}{9}$$

$$5. \frac{1}{7} \cdot \left(\frac{1}{2}\right)^3 - \frac{1}{56} = \frac{1}{7} \cdot \frac{1}{8} - \frac{1}{56} = \frac{1}{56} - \frac{1}{56} = 0$$

$$6. \frac{4}{9} \cdot \left(\frac{1}{2}\right)^2 - \left(\frac{1}{3}\right)^2 = \frac{4}{9} \cdot \frac{1}{4} - \frac{1}{9} = \frac{1}{9} - \frac{1}{9} = 0$$

$$7. \frac{1}{2} - \frac{1}{3} \cdot \frac{1}{5} = \frac{1}{2} - \frac{1}{15} = \frac{15}{30} - \frac{2}{30} = \frac{13}{30}$$

$$8. \frac{1}{3} - \frac{1}{6} \cdot \frac{1}{5} = \frac{1}{3} - \frac{1}{30} = \frac{10}{30} - \frac{1}{30} = \frac{9}{30} = \frac{3}{10}$$

9. $12 \div 6 - \left(\frac{1}{3} + \frac{1}{2}\right) = 12 \div 6 - \left(\frac{5}{6}\right)$
 $= 2 - \frac{5}{6}$
 $= \frac{12}{6} - \frac{5}{6} = \frac{7}{6}$
10. $18 \div 9 - \left(\frac{1}{4} + \frac{1}{6}\right) = 18 \div 9 - \left(\frac{5}{12}\right) = 2 - \frac{5}{12} = \frac{19}{12}$
11. $\frac{1}{3} \cdot \frac{1}{4} \div \frac{1}{2} + \left(\frac{5}{6} - \frac{1}{2}\right) = \frac{1}{3} \cdot \frac{1}{4} \div \frac{1}{2} + \left(\frac{1}{3}\right)$
 $= \frac{1}{12} \div \frac{1}{2} + \left(\frac{1}{3}\right)$
 $= \frac{1}{12} \cdot \frac{2}{1} + \left(\frac{1}{3}\right)$
 $= \frac{1}{6} + \frac{1}{3}$
 $= \frac{1}{6} + \frac{2}{6} = \frac{3}{6} = \frac{1}{2}$
12. $\frac{1}{3} \cdot \frac{1}{6} \div \frac{1}{2} + \left(\frac{4}{5} - \frac{1}{2}\right) = \frac{1}{3} \cdot \frac{1}{6} \div \frac{1}{2} + \left(\frac{3}{10}\right)$
 $= \frac{1}{18} \div \frac{1}{2} + \left(\frac{3}{10}\right)$
 $= \frac{1}{9} + \frac{3}{10} = \frac{37}{90}$
13. $\frac{1}{6} \div \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} + \left(\frac{1}{4} - \frac{1}{9}\right) = \frac{1}{6} \div \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} + \left(\frac{5}{36}\right)$
 $= \frac{1}{6} \cdot \frac{3}{1} \cdot \frac{1}{3} \cdot \frac{1}{3} + \left(\frac{5}{36}\right)$
 $= \frac{1}{2} \cdot \frac{1}{3} \cdot \frac{1}{3} + \left(\frac{5}{36}\right)$
 $= \frac{1}{6} \cdot \frac{1}{3} + \left(\frac{5}{36}\right)$
 $= \frac{1}{18} + \frac{5}{36}$
 $= \frac{2}{36} + \frac{5}{36} = \frac{7}{36}$
14. $\frac{1}{10} \div \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} + \left(\frac{2}{3} - \frac{1}{2}\right) = \frac{1}{10} \div \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} + \left(\frac{1}{6}\right)$
 $= \frac{1}{5} \cdot \frac{1}{2} \cdot \frac{1}{2} + \left(\frac{1}{6}\right)$
 $= \frac{1}{10} \cdot \frac{1}{2} + \left(\frac{1}{6}\right)$
 $= \frac{1}{20} + \frac{1}{6} = \frac{13}{60}$
15. $8 \div \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} - \left(\frac{1}{3} + \frac{1}{5}\right) = 8 \div \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} - \left(\frac{8}{15}\right)$
 $= 8 \cdot \frac{2}{1} \cdot \frac{1}{2} \cdot \frac{1}{2} - \left(\frac{8}{15}\right)$
 $= 16 \cdot \frac{1}{2} \cdot \frac{1}{2} - \left(\frac{8}{15}\right)$
 $= 8 \cdot \frac{1}{2} - \left(\frac{8}{15}\right)$
 $= 4 - \frac{8}{15}$
 $= \frac{60}{15} - \frac{8}{15} = \frac{52}{15} = 3\frac{7}{15}$
16. $6 \div \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} - \left(\frac{1}{3} + \frac{1}{5}\right) = 6 \div \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} - \left(\frac{8}{15}\right)$
 $= 18 \cdot \frac{1}{3} \cdot \frac{1}{3} - \left(\frac{8}{15}\right)$
 $= 6 \cdot \frac{1}{3} - \left(\frac{8}{15}\right)$
 $= 2 - \frac{8}{15} = \frac{22}{15} = 1\frac{7}{15}$
17. $\frac{1}{10} \div \frac{1}{5} \cdot \frac{1}{2} + \frac{1}{8} \left(\frac{4}{5} - \frac{1}{2}\right) + \left(\frac{1}{8} \div \frac{1}{4}\right)$
 $= \frac{1}{10} \div \frac{1}{5} \cdot \frac{1}{2} + \frac{1}{8} \left(\frac{3}{10}\right) + \left(\frac{1}{8} \cdot \frac{4}{1}\right)$
 $= \frac{1}{10} \div \frac{1}{5} \cdot \frac{1}{2} + \frac{1}{8} \left(\frac{3}{10}\right) + \left(\frac{1}{2}\right)$
 $= \frac{1}{10} \cdot \frac{5}{1} \cdot \frac{1}{2} + \frac{1}{8} \left(\frac{3}{10}\right) + \left(\frac{1}{2}\right)$
 $= \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{8} \left(\frac{3}{10}\right) + \left(\frac{1}{2}\right)$
 $= \frac{1}{4} + \frac{3}{80} + \left(\frac{1}{2}\right)$
 $= \frac{20}{80} + \frac{3}{80} + \frac{40}{80} = \frac{23}{80} + \frac{40}{80} = \frac{63}{80}$
18. $\frac{1}{15} \div \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} \left(\frac{4}{5} - \frac{1}{2}\right) + \left(\frac{1}{8} \div \frac{1}{4}\right)$
 $= \frac{1}{15} \div \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} \left(\frac{3}{10}\right) + \left(\frac{1}{2}\right)$
 $= \frac{1}{5} \cdot \frac{1}{3} + \frac{1}{2} \left(\frac{3}{10}\right) + \left(\frac{1}{2}\right)$
 $= \frac{1}{15} + \frac{3}{20} + \frac{1}{2}$
 $= \frac{13}{60} + \frac{1}{2} = \frac{43}{60}$

$$\begin{aligned}
 19. \quad & \frac{1}{5} \div \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} \left(\frac{1}{2} - \frac{1}{5} \right) + \left(\frac{1}{8} \div \frac{1}{4} \right) \\
 &= \frac{1}{5} \div \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} \left(\frac{3}{10} \right) + \left(\frac{1}{8} \cdot \frac{4}{1} \right) \\
 &= \frac{1}{5} \div \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} \left(\frac{3}{10} \right) + \left(\frac{1}{2} \right) \\
 &= \frac{1}{5} \cdot \frac{3}{1} \cdot \frac{1}{3} + \frac{1}{2} \left(\frac{3}{10} \right) + \left(\frac{1}{2} \right) \\
 &= \frac{3}{5} \cdot \frac{1}{3} + \frac{1}{2} \left(\frac{3}{10} \right) + \left(\frac{1}{2} \right) \\
 &= \frac{1}{5} + \frac{1}{2} \left(\frac{3}{10} \right) + \left(\frac{1}{2} \right) \\
 &= \frac{1}{5} + \frac{3}{20} + \left(\frac{1}{2} \right) \\
 &= \frac{7}{20} + \frac{1}{2} \\
 &= \frac{17}{20}
 \end{aligned}$$

$$\begin{aligned}
 20. \quad & \frac{1}{5} \div \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{2} \left(\frac{1}{2} - \frac{1}{5} \right) + \left(\frac{1}{8} \div \frac{1}{4} \right) \\
 &= \frac{1}{5} \div \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{2} \left(\frac{3}{10} \right) + \left(\frac{1}{2} \right) \\
 &= \frac{2}{5} \cdot \frac{1}{2} + \frac{1}{2} \left(\frac{3}{10} \right) + \left(\frac{1}{2} \right) \\
 &= \frac{1}{5} + \frac{3}{20} + \frac{1}{2} = \frac{7}{20} + \frac{1}{2} = \frac{17}{20}
 \end{aligned}$$

$$\begin{aligned}
 21. \quad & \frac{1}{20} \div \frac{1}{5} + \left\{ \frac{1}{3} \div \frac{1}{4} - \left[\frac{1}{4} + \left(\frac{1}{3} - \frac{1}{5} \right) \right] \right\} \\
 &= \frac{1}{20} \div \frac{1}{5} + \left\{ \frac{1}{3} \div \frac{1}{4} - \left[\frac{1}{4} + \left(\frac{2}{15} \right) \right] \right\} \\
 &= \frac{1}{20} \div \frac{1}{5} + \left\{ \frac{1}{3} \div \frac{1}{4} - \left[\frac{23}{60} \right] \right\} \\
 &= \frac{1}{20} \div \frac{1}{5} + \left\{ \frac{1}{3} \cdot \frac{4}{1} - \left[\frac{23}{60} \right] \right\} \\
 &= \frac{1}{20} \div \frac{1}{5} + \left\{ \frac{4}{3} - \left[\frac{23}{60} \right] \right\} \\
 &= \frac{1}{20} \div \frac{1}{5} + \left\{ \frac{19}{20} \right\} \\
 &= \frac{1}{4} + \frac{19}{20} = \frac{6}{5} = 1\frac{1}{5}
 \end{aligned}$$

$$\begin{aligned}
 22. \quad & \left\{ \frac{1}{4} \div \frac{1}{2} - \left[\frac{1}{3} + \left(\frac{3}{5} - \frac{1}{4} \right) \right] \right\} + \frac{1}{30} \div \frac{1}{6} \\
 &= \left\{ \frac{1}{4} \div \frac{1}{2} - \left[\frac{1}{3} + \left(\frac{7}{20} \right) \right] \right\} + \frac{1}{30} \div \frac{1}{6} \\
 &= \left\{ \frac{1}{4} \div \frac{1}{2} - \left[\frac{41}{60} \right] \right\} + \frac{1}{30} \div \frac{1}{6} \\
 &= \left\{ \frac{1}{2} - \frac{41}{60} \right\} + \frac{1}{30} \div \frac{1}{6} \\
 &= \left\{ -\frac{11}{60} \right\} + \frac{1}{30} \div \frac{1}{6} = -\frac{11}{60} + \frac{1}{5} = \frac{1}{60}
 \end{aligned}$$

$$\begin{aligned}
 23. \quad & \frac{7}{30} \div \frac{1}{15} \cdot \left\{ \frac{1}{10} \div \frac{1}{20} - \left[\frac{1}{2} \cdot \frac{1}{2} + \frac{1}{2} \right] \right\} \\
 &= \frac{7}{30} \div \frac{1}{15} \cdot \left\{ \frac{1}{10} \div \frac{1}{20} - \left[\frac{1}{4} + \frac{1}{2} \right] \right\} \\
 &= \frac{7}{30} \div \frac{1}{15} \cdot \left\{ \frac{1}{10} \div \frac{1}{20} - \left[\frac{3}{4} \right] \right\} \\
 &= \frac{7}{30} \div \frac{1}{15} \cdot \left\{ 2 - \left[\frac{3}{4} \right] \right\} \\
 &= \frac{7}{30} \div \frac{1}{15} \cdot \left\{ \frac{5}{4} \right\} = \frac{7}{2} \cdot \frac{5}{4} = \frac{35}{8} = 4\frac{3}{8}
 \end{aligned}$$

$$\begin{aligned}
 24. \quad & \frac{1}{30} \div \frac{1}{10} \cdot \left\{ \frac{1}{2} \div \frac{1}{4} - \left[\frac{1}{3} \cdot \frac{1}{3} + \frac{1}{3} \right] \right\} \\
 &= \frac{1}{30} \div \frac{1}{10} \cdot \left\{ \frac{1}{2} \div \frac{1}{4} - \left[\frac{1}{9} + \frac{1}{3} \right] \right\} \\
 &= \frac{1}{30} \div \frac{1}{10} \cdot \left\{ \frac{1}{2} \div \frac{1}{4} - \left[\frac{4}{9} \right] \right\} \\
 &= \frac{1}{3} \cdot \left\{ 2 - \left[\frac{4}{9} \right] \right\} \\
 &= \frac{1}{3} \cdot \left\{ \frac{14}{9} \right\} = \frac{14}{27}
 \end{aligned}$$

$$\begin{aligned}
 25. \quad & \left\{ \frac{1}{4} \div \frac{1}{12} \cdot \frac{1}{6} + \left[\frac{1}{5} \left(\frac{1}{3} + \frac{1}{2} \right) - \frac{1}{6} \right] - \left(\frac{1}{3} + \frac{1}{2} \cdot \frac{1}{3} \right) \right\} \\
 &= \left\{ \frac{1}{4} \div \frac{1}{12} \cdot \frac{1}{6} + \left[\frac{1}{5} \left(\frac{5}{6} \right) - \frac{1}{6} \right] - \left(\frac{1}{3} + \frac{1}{6} \right) \right\} \\
 &= \left\{ \frac{1}{4} \div \frac{1}{12} \cdot \frac{1}{6} + \left[\frac{1}{6} - \frac{1}{6} \right] - \left(\frac{1}{2} \right) \right\} \\
 &= \left\{ \frac{1}{4} \div \frac{1}{12} \cdot \frac{1}{6} + [0] - \left(\frac{1}{2} \right) \right\} \\
 &= \left\{ \frac{1}{4} \cdot \frac{12}{1} \cdot \frac{1}{6} - \left(\frac{1}{2} \right) \right\} \\
 &= \left\{ 3 \cdot \frac{1}{6} - \left(\frac{1}{2} \right) \right\} = \left\{ \frac{1}{2} - \frac{1}{2} \right\} = 0
 \end{aligned}$$

$$26. \frac{\frac{1}{10} + 2\frac{1}{2}}{2} = \frac{\frac{1}{10} + \frac{5}{2}}{2}$$

$$= \frac{\frac{26}{20}}{2} = \frac{26}{20} = \frac{13}{10} = 1\frac{3}{10} \text{ in.}$$

$$27. \frac{2\frac{9}{10} + 2\frac{4}{5}}{2} = \frac{\frac{29}{10} + \frac{14}{5}}{2}$$

$$= \frac{\frac{29}{10} + \frac{28}{10}}{2}$$

$$= \frac{\frac{57}{10}}{2} = \frac{57}{10} \cdot \frac{1}{2} = \frac{57}{20} = 2\frac{17}{20} \text{ in.}$$

$$28. \frac{40 + 41\frac{1}{2} + 43}{3} = \frac{124\frac{1}{2}}{3}$$

$$= \frac{\frac{249}{2}}{3}$$

$$= \frac{249}{2} \cdot \frac{1}{3} = \frac{83}{2} = 41\frac{1}{2} \text{ lb}$$

$$29. \frac{29 + 32\frac{1}{2} + 32\frac{3}{5}}{3} = \frac{29 + \frac{65}{2} + \frac{163}{5}}{3}$$

$$= \frac{\frac{290}{10} + \frac{325}{10} + \frac{326}{10}}{3}$$

$$= \frac{\frac{941}{10}}{3}$$

$$= \frac{941}{10} \cdot \frac{1}{3} = \frac{931}{30} = 31\frac{11}{30} \text{ lb}$$

$$30. \frac{600\frac{4}{5} + 460 + 434\frac{9}{10}}{3}$$

$$= \frac{600\frac{8}{10} + 460 + 434\frac{9}{10}}{3}$$

$$= \frac{1494\frac{17}{10}}{3}$$

$$= \frac{14,957}{10}$$

$$= \frac{14,957}{10} \cdot \frac{1}{3} = \frac{14,957}{30} = \$498\frac{17}{30} \text{ million}$$

$$31. \text{ a. } \frac{150\frac{2}{5} + 148\frac{1}{2} + 148\frac{1}{5}}{3}$$

$$= \frac{150\frac{4}{10} + 148\frac{5}{10} + 148\frac{2}{10}}{3}$$

$$= \frac{446\frac{11}{10}}{3}$$

$$= \frac{4471}{10}$$

$$= \frac{4471}{10} \cdot \frac{1}{3} = \frac{4471}{30} = \$149\frac{1}{30} \text{ million}$$

$$\text{ b. } \$498\frac{17}{30} - \$149\frac{1}{30} = \$349\frac{16}{30}$$

$$= \$349\frac{8}{15} \text{ million}$$

$$32. \frac{4\frac{3}{5} + 8\frac{1}{2} + 7\frac{1}{2}}{3} = \frac{4\frac{3}{5} + 16}{3}$$

$$= \frac{20\frac{3}{5}}{3}$$

$$= \frac{103}{5}$$

$$= \frac{103}{5} \cdot \frac{1}{3} = 6\frac{13}{15} \text{ hr}$$

$$33. \frac{6\frac{4}{5} + 8\frac{1}{10} + 7\frac{7}{10}}{3} = \frac{6\frac{4}{5} + 15\frac{8}{10}}{3}$$

$$= \frac{6\frac{4}{5} + 15\frac{4}{5}}{3}$$

$$= \frac{21\frac{8}{5}}{3}$$

$$= \frac{113}{5}$$

$$= \frac{113}{5} \cdot \frac{1}{3} = 8\frac{8}{15} \text{ nights}$$

$$\begin{aligned}
 34. \quad & \frac{20\frac{1}{10} + 20\frac{9}{10} + 20\frac{1}{2}}{3} \\
 &= \frac{40\frac{10}{10} + 20\frac{1}{2}}{3} \\
 &= \frac{41 + 20\frac{1}{2}}{3} \\
 &= \frac{61\frac{1}{2}}{3} = \frac{123}{2} \cdot \frac{1}{3} = 20\frac{1}{2} \text{ hr per week}
 \end{aligned}$$

$$\begin{aligned}
 35. \quad & \frac{13\frac{4}{5} + 14\frac{2}{5} + 14\frac{3}{10}}{3} \\
 &= \frac{27\frac{6}{5} + 14\frac{3}{10}}{3} \\
 &= \frac{27\frac{12}{10} + 14\frac{3}{10}}{3} \\
 &= \frac{41\frac{15}{10}}{3} = \frac{41\frac{3}{2}}{3} \\
 &= \frac{85}{5} \cdot \frac{1}{3} = 20\frac{1}{2} \text{ hr per week}
 \end{aligned}$$

$$\begin{aligned}
 36. \quad & \frac{12\frac{4}{5} + 12\frac{4}{5} + 12\frac{1}{2}}{3} = \frac{24\frac{8}{5} + 12\frac{1}{2}}{3} \\
 &= \frac{25\frac{3}{5} + 12\frac{1}{2}}{3} \\
 &= \frac{25\frac{6}{10} + 12\frac{5}{10}}{3} \\
 &= \frac{37\frac{11}{10}}{3} \\
 &= \frac{38\frac{1}{10}}{3} \\
 &= \frac{381}{10} \\
 &= \frac{381}{10} \cdot \frac{1}{3} \\
 &= 12\frac{7}{10} \text{ hr per week}
 \end{aligned}$$

$$\begin{aligned}
 37. \quad & \frac{19\frac{4}{5} + 21\frac{1}{10} + 20\frac{1}{5}}{3} = \frac{39\frac{5}{5} + 21\frac{1}{10}}{3} \\
 &= \frac{40 + 21\frac{1}{10}}{3} \\
 &= \frac{61\frac{1}{10}}{3} \\
 &= \frac{611}{10} \\
 &= \frac{611}{10} \cdot \frac{1}{3} \\
 &= 20\frac{11}{30} \text{ hr per week}
 \end{aligned}$$

$$\begin{aligned}
 38. \quad & \frac{23\frac{9}{10} + 24\frac{9}{10} + 25\frac{1}{10}}{3} = \frac{72\frac{19}{10}}{3} \\
 &= \frac{73\frac{9}{10}}{3} \\
 &= \frac{739}{10} \\
 &= \frac{739}{10} \cdot \frac{1}{3} \\
 &= 24\frac{19}{30} \text{ hr per week}
 \end{aligned}$$

39. Women 18 and over

40. Adolescents 12-17

$$\begin{aligned}
 41. \quad & \frac{L^2 \cdot G}{1200} = \frac{(20)^2 \cdot (15\frac{1}{2})}{1200} \\
 &= \frac{400 \cdot \frac{31}{2}}{1200} \\
 &= \frac{6200}{1200} = \frac{62}{12} = \frac{31}{6} = 5\frac{1}{6}
 \end{aligned}$$

The bass weighs about $5\frac{1}{6}$ lb.

$$\begin{aligned}
 42. \quad & \frac{L^3}{3500} = \frac{(20)^3}{3500} \\
 &= \frac{8000}{3500} = \frac{80}{35} = \frac{16}{7} = 2\frac{2}{7}
 \end{aligned}$$

The pike weighs about $2\frac{2}{7}$ lb.

$$43. \frac{L \cdot G^2}{800} = \frac{30 \cdot (25)^2}{800}$$

$$= \frac{30(625)}{800}$$

$$= \frac{18,750}{800} = \frac{375}{16} = 23\frac{7}{16}$$

The trout weighs about $23\frac{7}{16}$ lb.

$$44. \frac{L^3}{2700} = \frac{(24)^3}{2700}$$

$$= \frac{13,824}{2700} = \frac{128}{25} = 5\frac{3}{25}$$

The wallyeye weighs about $2\frac{2}{7}$ lb.

45. a. Divisors of 8: 8, 4, 2, 1

$$b. A_8 = \frac{8+4+2+1}{4} = \frac{15}{4} = 3\frac{3}{4}$$

$$c. H_8 = \frac{4}{\frac{1}{8} + \frac{1}{4} + \frac{1}{2} + 1}$$

$$= \frac{4}{\frac{1}{8} + \frac{2}{8} + \frac{4}{8} + \frac{8}{8}}$$

$$= \frac{4}{\frac{15}{8}} = \frac{4}{1} \cdot \frac{8}{15} = \frac{32}{15} = 2\frac{2}{15}$$

$$d. A_8 \cdot H_8 = 3\frac{3}{4} \cdot 2\frac{2}{15} = \frac{15}{4} \cdot \frac{32}{15} = 8; \text{ yes}$$

46. a. Divisors of 16: 16, 8, 4, 2, 1

$$b. A_{16} = \frac{16+8+4+2+1}{5} = \frac{31}{5} = 6\frac{1}{5}$$

$$c. H_{16} = \frac{5}{\frac{1}{16} + \frac{1}{8} + \frac{1}{4} + \frac{1}{2} + 1}$$

$$= \frac{5}{\frac{1}{16} + \frac{2}{16} + \frac{4}{16} + \frac{8}{16} + \frac{16}{16}}$$

$$= \frac{5}{\frac{31}{16}} = \frac{5}{1} \cdot \frac{16}{31} = \frac{80}{31} = 2\frac{18}{31}$$

$$d. A_{16} \cdot H_{16} = \frac{31}{5} \cdot \frac{80}{31} = 16; \text{ yes}$$

47. Answers may vary.

48. a. Both are right; answers may vary.

b. Answers may vary.

49. parenthesis

50. exponential

51. multiplications

52. divisions

53. additions

54. subtractions

$$55. \frac{3}{8} \div \frac{1}{12} - \left(\frac{1}{4} + \frac{1}{10} \right) = \frac{3}{8} \div \frac{1}{12} - \left(\frac{5}{20} + \frac{2}{20} \right)$$

$$= \frac{3}{8} \div \frac{1}{12} - \left(\frac{7}{20} \right)$$

$$= \frac{3}{8} \cdot \frac{12}{1} - \left(\frac{7}{20} \right)$$

$$= \frac{9}{2} - \frac{7}{20}$$

$$= \frac{83}{20} = 4\frac{3}{20}$$

$$56. 9 \div \frac{1}{3} \cdot \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} - 1 = \frac{9}{1} \cdot \frac{3}{1} \cdot \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} - 1$$

$$= \frac{27}{1} \cdot \frac{1}{3} \cdot \frac{1}{3} + \frac{1}{2} - 1$$

$$= \frac{9}{1} \cdot \frac{1}{3} + \frac{1}{2} - 1$$

$$= 3 + \frac{1}{2} - 1$$

$$= \frac{7}{2} - 1 = \frac{5}{2} = 2\frac{1}{2}$$

$$57. \frac{1}{3} \cdot \left(\frac{3}{2} \right)^2 - \frac{1}{18} = \frac{1}{3} \cdot \frac{9}{4} - \frac{1}{18}$$

$$= \frac{3}{4} - \frac{1}{18} = \frac{27}{36} - \frac{2}{36} = \frac{25}{36}$$

$$58. \left(\frac{1}{3} \right)^3 + \frac{2}{3} \cdot \frac{1}{9} = \frac{1}{27} + \frac{2}{3} \cdot \frac{1}{9}$$

$$= \frac{1}{27} + \frac{2}{27} = \frac{3}{27} = \frac{1}{9}$$

$$\begin{aligned}
 59. \quad & \left(\frac{1}{3}\right)^3 \div \frac{1}{3} \cdot \frac{1}{9} + \frac{1}{2} \left(\frac{5}{3} - \frac{1}{3}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \left(\frac{1}{3}\right)^3 \div \frac{1}{3} \cdot \frac{1}{9} + \frac{1}{2} \left(\frac{4}{3}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{27} \div \frac{1}{3} \cdot \frac{1}{9} + \frac{1}{2} \left(\frac{4}{3}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{27} \cdot \frac{3}{1} \cdot \frac{1}{9} + \frac{1}{2} \left(\frac{4}{3}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{9} \cdot \frac{1}{9} + \frac{1}{2} \left(\frac{4}{3}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{81} + \frac{2}{3} - \frac{1}{6} \\
 & = \frac{1}{81} + \frac{54}{81} - \frac{1}{6} \\
 & = \frac{55}{81} - \frac{1}{6} = \frac{110}{162} - \frac{27}{162} = \frac{83}{162}
 \end{aligned}$$

$$\begin{aligned}
 60. \quad & \frac{1}{7} \div 1\frac{1}{7} + \left\{ 12 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{4} + \left(2\frac{1}{2} - \frac{1}{2}\right)\right] \right\} \\
 & = \frac{1}{7} \div 1\frac{1}{7} + \left\{ 12 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{4} + (2)\right] \right\} \\
 & = \frac{1}{7} \div 1\frac{1}{7} + \left\{ 12 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{9}{4}\right] \right\} \\
 & = \frac{1}{7} \div 1\frac{1}{7} + \left\{ 12 \cdot \frac{1}{4} - \left[\frac{9}{4}\right] \right\} \\
 & = \frac{1}{7} \div 1\frac{1}{7} + \left\{ 3 - \frac{9}{4} \right\} \\
 & = \frac{1}{7} \div \frac{8}{7} + \left\{ \frac{3}{4} \right\} \\
 & = \frac{1}{7} \cdot \frac{7}{8} + \left\{ \frac{3}{4} \right\} = \frac{1}{8} + \frac{3}{4} = \frac{7}{8}
 \end{aligned}$$

$$\begin{aligned}
 61. \quad & \frac{2\frac{1}{2} + 5\frac{1}{4} + 3\frac{1}{2} + 4\frac{1}{4}}{4} = \frac{6 + 9\frac{1}{2}}{4} \\
 & = \frac{15\frac{1}{2}}{4} \\
 & = \frac{31}{4} \\
 & = \frac{31}{2} \cdot \frac{1}{4} = 3\frac{7}{8}
 \end{aligned}$$

$$\begin{aligned}
 62. \quad & x + 5 = 17 \\
 & x + 5 - 5 = 17 - 5 \\
 & x = 12
 \end{aligned}$$

$$\begin{aligned}
 63. \quad & x + 7 = 13 \\
 & x + 7 - 7 = 13 - 7 \\
 & x = 6
 \end{aligned}$$

$$\begin{aligned}
 64. \quad & 10 - x = 3 \\
 & -x = -7 \\
 & x = 7
 \end{aligned}$$

$$\begin{aligned}
 65. \quad & 15 = 5x \\
 & 15 \div 5 = 5x \div 5 \\
 & 3 = x
 \end{aligned}$$

$$\begin{aligned}
 66. \quad & 24 \div x = 6 \\
 & \frac{24}{x} = 6 \\
 & 24 = 6x \\
 & 4 = x
 \end{aligned}$$

Section 2.8 – Equations and Problem Solving

Problems

1. a. $n + 5 = 6$
- b. $n - 8 = 2$
- c. $3 \cdot n = 12$

$$\begin{aligned}
 2. \quad & \text{a.} \quad n + \frac{1}{4} = \frac{3}{5} \\
 & n + \frac{1}{4} - \frac{1}{4} = \frac{3}{5} - \frac{1}{4} \\
 & n = \frac{12}{20} - \frac{5}{20} = \frac{7}{20}
 \end{aligned}$$

$$\begin{aligned} \text{b. } m - \frac{1}{3} &= \frac{3}{5} \\ m - \frac{1}{3} + \frac{1}{3} &= \frac{3}{5} + \frac{1}{3} \\ m &= \frac{9}{15} + \frac{5}{15} \\ m &= \frac{14}{15} \end{aligned}$$

$$\begin{aligned} \text{c. } \frac{q}{7} &= \frac{3}{5} \\ \cancel{7} \cdot \frac{q}{\cancel{7}} &= \frac{3}{5} \cdot 7 \\ q &= \frac{21}{5} = 4\frac{1}{5} \end{aligned}$$

$$\begin{aligned} \text{3. } \frac{5}{6} \cdot n &= 15 \\ \frac{\cancel{5}}{\cancel{6}} \cdot n &= 15 \\ \frac{\cancel{5}}{\cancel{6}} \cdot \frac{6}{6} &= \frac{15}{6} \\ n &= \cancel{15} \cdot \frac{6}{\cancel{6}} \\ n &= 18 \end{aligned}$$

$$\begin{aligned} \text{4. } n \cdot 2\frac{1}{2} &= 3\frac{1}{4} \\ n \cdot \frac{5}{2} &= \frac{13}{4} \\ n \cdot \frac{\cancel{5}}{\cancel{2}} &= \frac{13}{4} \\ \frac{\cancel{5}}{\cancel{2}} \cdot \frac{2}{2} &= \frac{5}{2} \\ n &= \frac{13}{\cancel{2}} \cdot \frac{\cancel{2}^1}{5} = \frac{13}{2} \cdot \frac{1}{5} = \frac{13}{10} \end{aligned}$$

$$\begin{aligned} \text{5. } \frac{2}{7} \cdot n &= 1\frac{1}{2} \\ \frac{2}{7} \cdot n &= \frac{3}{2} \\ \frac{\cancel{2}}{\cancel{7}} \cdot n &= \frac{3}{2} \\ \frac{\cancel{2}}{\cancel{7}} \cdot \frac{7}{7} &= \frac{2}{7} \\ n &= \frac{3}{2} \cdot \frac{7}{2} = \frac{21}{4} \end{aligned}$$

$$\begin{aligned} \text{6. } 2\frac{1}{4} \cdot 1\frac{1}{3} &= n \\ \frac{\cancel{3}^1 \cancel{4}}{\cancel{4}} \cdot \frac{\cancel{3}_1}{\cancel{3}} &= n \\ 3 &= n \end{aligned}$$

$$\begin{aligned} \text{7. } 1\frac{1}{4} &= \frac{5}{4} \text{ pints cost } 60¢ \\ 1 \text{ pint cost } 60 \div \frac{5}{4} &= \cancel{60} \cdot \frac{4}{\cancel{5}_1} = 48¢ \\ \text{Thus, 2 pints will cost } &48 \cdot 2 = 96¢. \end{aligned}$$

$$\begin{aligned} \text{8. } 6\frac{1}{3} &= \frac{19}{3} \text{ minutes to go } 1\frac{1}{2} = \frac{3}{2} \text{ miles} \\ \text{In 1 minute, the runner goes} & \\ \frac{3}{2} \div \frac{19}{3} &= \frac{3}{2} \cdot \frac{3}{19} = \frac{9}{38} \text{ mile} \\ \text{In } 12\frac{2}{3} = \frac{38}{3} \text{ minutes, the runner goes} & \\ \frac{\cancel{3}^1 \cancel{38}}{\cancel{38}} \cdot \frac{\cancel{3}_1}{\cancel{3}} &= 3 \text{ miles.} \end{aligned}$$

$$\begin{aligned} \text{9. } \frac{3}{25} + \frac{9}{100} + \frac{1}{25} + c &= 1 \\ \frac{4}{25} + \frac{9}{100} + c &= 1 \\ \frac{16}{100} + \frac{9}{100} + c &= 1 \\ \frac{25}{100} + c &= \frac{100}{100} \\ c &= \frac{100}{100} - \frac{25}{100} = \frac{75}{100} = \frac{3}{4} \\ \text{The fraction of coin that would be copper} & \\ \text{is } \frac{3}{4}. & \end{aligned}$$

Exercises 2.8

1. =

2. +

3. ×

4. =

5. +

6. ×

7. -
8. $\frac{1}{2} \cdot n$
9. $2 \cdot n$
10. -
11. $5 + n$
12. $n - 7$
13. $n - 7$
14. $1\frac{3}{4} \cdot n$
15. $\frac{3}{4} \div n = 5$
16. $n \div \frac{3}{4} = 5$
17. $\frac{1}{2} \cdot 3 \cdot n = 2$
18. $2 \cdot n + 2 = \frac{8}{3}$
19. $\frac{1}{2} \cdot n - 4 = \frac{3}{2}$
20. $8 - n = n$
21. $m + \frac{1}{8} = \frac{3}{7}$
 $m + \frac{1}{8} - \frac{1}{8} = \frac{3}{7} - \frac{1}{8}$
 $m = \frac{24}{56} - \frac{7}{56} = \frac{17}{56}$
22. $\frac{1}{5} + n = \frac{3}{8}$
 $n = \frac{3}{8} - \frac{1}{5} = \frac{7}{40}$
23. $p + \frac{2}{5} = 1\frac{3}{4}$
 $p + \frac{2}{5} = \frac{7}{4}$
 $p + \frac{2}{5} - \frac{2}{5} = \frac{7}{4} - \frac{2}{5}$
 $p = \frac{35}{20} - \frac{8}{20} = \frac{27}{20}$
24. $x - \frac{1}{5} = \frac{4}{7}$
 $x = \frac{4}{7} + \frac{1}{5} = \frac{27}{35}$
25. $y - \frac{3}{4} = \frac{4}{5}$
 $y - \frac{3}{4} + \frac{3}{4} = \frac{4}{5} + \frac{3}{4}$
 $y = \frac{16}{20} + \frac{15}{20} = \frac{31}{20} = 1\frac{11}{20}$
26. $z - \frac{3}{5} = 1\frac{7}{8}$
 $z - \frac{3}{5} = \frac{15}{8}$
 $z = \frac{15}{8} + \frac{3}{5} = \frac{99}{40} = 2\frac{19}{40}$
27. $\frac{u}{6} = 3\frac{1}{2}$
 $\frac{u}{6} = \frac{7}{2}$
 $\cancel{6} \cdot \frac{u}{\cancel{6}} = \frac{7}{\cancel{2}} \cdot \cancel{6}^3$
 $u = 7 \cdot 3 = 21$
28. $\frac{r}{7} = \frac{3}{5}$
 $r = \frac{3}{5} \cdot 7 = \frac{21}{5} = 4\frac{1}{5}$
29. $3 \cdot t = 2\frac{1}{5}$
 $3 \cdot t = \frac{11}{5}$
 $\cancel{3} \cdot t = \frac{11}{\cancel{3}}$
 $t = \frac{11}{5} \cdot \frac{1}{3} = \frac{11}{15}$

$$30. \frac{1}{2} \cdot n = 1\frac{2}{3}$$

$$\frac{1}{2} \cdot n = \frac{5}{3}$$

$$\frac{\cancel{1}}{2} \cdot n = \frac{5}{3}$$

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

$$n = \frac{5}{3} \cdot \frac{2}{1} = \frac{10}{3} = 3\frac{1}{3}$$

$$31. 1\frac{1}{2} \cdot n = 7\frac{1}{2}$$

$$\frac{3}{2} \cdot n = \frac{15}{2}$$

$$\frac{\cancel{3}}{2} \cdot n = \frac{15}{2}$$

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

$$n = \frac{5 \cancel{15}}{\cancel{2}} \cdot \frac{\cancel{2}}{\cancel{3}_1} = 5$$

$$32. 1\frac{5}{8} \cdot n = 2\frac{7}{8}$$

$$\frac{13}{8} \cdot n = \frac{23}{8}$$

$$\frac{\cancel{13}}{8} \cdot n = \frac{23}{8}$$

$$\frac{\cancel{13}}{8} = \frac{13}{8}$$

$$n = \frac{23}{\cancel{8}} \cdot \frac{\cancel{8}}{13} = \frac{23}{13} = 1\frac{10}{13}$$

$$33. n \cdot 1\frac{2}{3} = 4$$

$$n \cdot \frac{5}{3} = 4$$

$$n \cdot \frac{\cancel{5}}{3} = 4$$

$$\frac{\cancel{5}}{3} = \frac{5}{3}$$

$$n = 4 \cdot \frac{3}{5} = \frac{12}{5}$$

$$34. n \cdot 2\frac{1}{2} = 6$$

$$n \cdot \frac{5}{2} = 6$$

$$n = 6 \cdot \frac{2}{5} = \frac{12}{5}$$

$$35. n \cdot 2\frac{1}{2} = 6\frac{1}{4}$$

$$n \cdot \frac{5}{2} = \frac{25}{4}$$

$$\frac{n \cdot \cancel{5}}{\cancel{2}} = \frac{25}{4}$$

$$\frac{\cancel{5}}{2} = \frac{5}{2}$$

$$n = \frac{5 \cancel{25}}{2 \cancel{4}} \cdot \frac{\cancel{2}^1}{\cancel{2}_1} = \frac{5}{2} = 2\frac{1}{2}$$

$$36. n \cdot 1\frac{1}{3} = 3\frac{1}{8}$$

$$n \cdot \frac{4}{3} = \frac{25}{8}$$

$$n = \frac{25}{8} \cdot \frac{3}{4} = \frac{75}{32} = 2\frac{11}{32}$$

$$37. 1\frac{1}{3} \cdot n = 4\frac{2}{3}$$

$$\frac{4}{3} \cdot n = \frac{14}{3}$$

$$\frac{\cancel{4}}{3} \cdot n = \frac{14}{3}$$

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

$$n = \frac{7 \cancel{14}}{\cancel{3}} \cdot \frac{\cancel{3}}{\cancel{4}_2} = \frac{7}{2} = 3\frac{1}{2}$$

$$38. 3\frac{2}{5} \cdot n = 4\frac{1}{4}$$

$$\frac{17}{5} \cdot n = \frac{17}{4}$$

$$n = \frac{\cancel{17}}{5} \cdot \frac{5}{\cancel{17}} = \frac{5}{4} = 1\frac{1}{4}$$

39. $1\frac{1}{8} \cdot 2\frac{1}{2} = n$

$$\frac{9}{8} \cdot \frac{5}{2} = n$$

$$\frac{45}{16} = n$$

$$n = \frac{45}{16} = 2\frac{13}{16}$$

40. $1\frac{1}{8} \cdot 2\frac{2}{3} = n$

$$\frac{\cancel{3}^3}{\cancel{8}_1} \cdot \frac{\cancel{2}^2}{\cancel{3}_1} = n$$

$$3 = n$$

41. Let ℓ = length of the loaf

$$\ell \div 16 = 22\frac{1}{2} \div 12$$

$$\frac{\ell}{16} = \frac{15}{2} \cdot \frac{1}{\cancel{12}_4}$$

$$\cancel{16} \cdot \frac{\ell}{\cancel{16}} = \frac{15}{\cancel{1}_8} \cdot \cancel{16}^2$$

$$\ell = 30$$

The loaf would be 30 inches long.

42. $2\frac{1}{2} = \frac{5}{2}$ dozen pancakes calls for $3\frac{1}{2} = \frac{7}{2}$ cups of milk. Therefore 1 dozen pancakes calls for $\frac{7}{2} \div \frac{5}{2} = \frac{7}{2} \cdot \frac{2}{5} = \frac{7}{5} = 1\frac{2}{5}$ cups of

milk. Thus $1\frac{1}{4} = \frac{5}{4}$ dozen pancakes calls

for $\frac{\cancel{5}}{4} \cdot \frac{7}{\cancel{5}} = \frac{7}{4} = 1\frac{3}{4}$ cups of milk.

43. $2\frac{1}{2} = \frac{5}{2}$ dozen cookies calls for $1\frac{7}{8} = \frac{15}{8}$ cups of flour. Therefore 1 dozen cookies

calls for $\frac{15}{8} \div \frac{5}{2} = \frac{3}{\cancel{4}_8} \cdot \frac{\cancel{2}^1}{\cancel{5}_1} = \frac{3}{4}$ cup of

flour. Thus $1\frac{1}{3} = \frac{4}{3}$ dozen cookies calls

for $\frac{4}{3} \cdot \frac{3}{4} = 1$ cup of milk.

44. 2 popcorn balls calls for $2\frac{2}{3} = \frac{8}{3}$ cups of popped popcorn. Therefore 1 popcorn ball calls for $\frac{8}{3} \div 2 = \frac{8}{3} \cdot \frac{1}{2} = \frac{4}{3}$ cups of popped popcorn. Thus 5 popcorn balls calls for $5 \cdot \frac{4}{3} = \frac{20}{3} = 6\frac{2}{3}$ cup of popped popcorn.

45. 20 people ate 15 lb of ham so one person would have eaten $\frac{15}{20} = \frac{3}{4}$ lb of ham.

Thus, 32 people would have needed

$$\cancel{32}^8 \cdot \frac{3}{\cancel{4}_1} = 24 \text{ pounds of ham.}$$

46. 27 rose bushes used 9 lb of peat moss so 1 rose bush used $\frac{9}{27} = \frac{1}{3}$ lb of peat moss.

Thus 30 bushes would need $30 \cdot \frac{1}{3} = 10$ lb of peat moss.

47. $4\frac{1}{2} = \frac{9}{2}$ minutes to go $1\frac{1}{2} = \frac{3}{2}$ km; in 1 minute the runner goes

$$\frac{3}{2} \div \frac{9}{2} = \frac{\cancel{3}^1}{\cancel{2}} \cdot \frac{\cancel{2}}{\cancel{9}_3} = \frac{1}{3} \text{ km. Thus in}$$

$7\frac{1}{2} = \frac{15}{2}$ minutes the runner can go

$$\frac{5}{\cancel{2}} \cdot \frac{1}{\cancel{3}_1} = \frac{5}{2} = 2\frac{1}{2} \text{ km.}$$

48. $6\frac{1}{2} = \frac{13}{2}$ oz costs 26¢ so 1 oz cost

$$26 \div \frac{13}{2} = 26 \cdot \frac{2}{13} = 4 \text{ ¢. Thus } 3\frac{1}{2} = \frac{7}{2} \text{ oz}$$

would cost $\frac{7}{2} \cdot 4 = 14 \text{ ¢.}$

49. $3\frac{1}{4} = \frac{13}{4}$ lb costs 91¢ so 1 lb cost

$$91 \div \frac{13}{4} = \cancel{91}^7 \cdot \frac{4}{\cancel{13}_1} = 28 \text{ ¢. Thus } 2\frac{1}{2} = \frac{5}{2}$$

lb would cost $\frac{5}{2} \cdot \cancel{28}^{14} = 70 \text{ ¢.}$

50. \$225 is earned for $37\frac{1}{2} = \frac{75}{2}$ hr of work
 so $225 \div \frac{75}{2} = 225 \cdot \frac{2}{75} = \6 is earned in 1
 hr. Thus in $46\frac{1}{2} = \frac{93}{2}$ hr you would earn
 $46\frac{1}{2} \cdot 6 = \frac{93}{2} \cdot 6 = \279 .

51. $1 - \frac{12}{25} = \frac{25}{25} - \frac{12}{25} = \frac{13}{25}$
 The fraction of the patents that were
 foreign is $\frac{13}{25}$.

52. $1 - \frac{3}{100} - \frac{7}{100} - \frac{1}{5} - \frac{12}{25}$
 $= \frac{100}{100} - \frac{3}{100} - \frac{7}{100} - \frac{20}{100} - \frac{48}{100} = \frac{22}{100} = \frac{11}{50}$
 The fraction of the patents granted to
 other countries is $\frac{11}{50}$.

53. $F = 1\frac{4}{5}C + 32$
 $= \frac{9}{5}(25)^5 + 32 = 45 + 32 = 77$
 The temperature is 77 degrees Fahrenheit.

54. $C = \frac{5F - 160}{9}$
 $= \frac{5(68) - 160}{9} = \frac{340 - 160}{9} = \frac{180}{9} = 20$
 The temperature is 20 degrees Celsius.

55. $F = \frac{c}{4} + 39$
 $= \frac{120}{4} + 39 = 30 + 39 = 69$
 The temperature is 69 degrees Fahrenheit.

56. a. $F = \frac{c - 40}{4} + 50$
 $= \frac{120 - 40}{4} + 50$
 $= \frac{80}{4} + 50 = 20 + 50 = 70$
 The temperature is 70 degrees
 Fahrenheit.
 b. Yes; by 1°F.

57. a. $\frac{1}{6}$

b. $\frac{1}{3}$

c. $1 - \frac{1}{6} - \frac{1}{3} = \frac{6}{6} - \frac{1}{6} - \frac{2}{6} = \frac{3}{6} = \frac{1}{2}$

d. $50 \cdot \frac{1}{2} = 25$ lb

58. a. $1\frac{3}{4} + 8 + 1\frac{1}{2} = \frac{7}{4} + 8 + \frac{3}{2}$
 $= \frac{7}{4} + \frac{32}{4} + \frac{6}{4}$
 $= \frac{45}{4}$
 $= 11\frac{1}{4}$ cups

b. $11\frac{1}{4} \cdot 8 = \frac{45}{14} \cdot 8^2 = 90$ oz

c. $90 \div 20 = \frac{90}{20} = \frac{9}{2} = 4\frac{1}{2}$ oz per serving

59. a. $6 + \frac{1}{4} + \frac{1}{2} + \frac{1}{3} = 6 + \frac{3}{12} + \frac{6}{12} + \frac{4}{12}$
 $= 6 + \frac{13}{12}$
 $= 6 + 1\frac{1}{12}$
 $= 7\frac{1}{12}$ cups

b. $7\frac{1}{12} \cdot 8 = \frac{85}{12} \cdot 8^2 = \frac{170}{3} = 56\frac{2}{3}$ oz

c. $56\frac{2}{3} \div 10 = \frac{170}{3} \cdot \frac{1}{10} = \frac{17}{3} = 5\frac{2}{3}$ oz per
 serving

60. $250 \div 62\frac{1}{2} = 250 \div \frac{125}{2}$
 $= 250 \cdot \frac{2}{125}$
 $= 4$ ft³

61. $138\frac{1}{8} \div 42\frac{1}{2} = \frac{1105}{8} \div \frac{85}{2}$
 $= \frac{1105}{8} \cdot \frac{2}{85}$
 $= \frac{13}{4} = 3\frac{1}{4}$ ft³

62. $222 \div 49\frac{1}{3} = 222 \div \frac{148}{3}$
 $=^3 \cancel{222} \cdot \frac{3}{148} = \frac{9}{2} = 4\frac{1}{2} \text{ ft}^3$

63. $18 \cdot 6\frac{3}{5} = 18 \cdot \frac{33}{5} = \frac{594}{5} = 118\frac{4}{5} \text{ lb}$

64. From exercise #63, the weight of the gasoline in a full tank is $118\frac{4}{5} \text{ lb}$.

$$118\frac{4}{5} \cdot \frac{3}{4} = \frac{297 \cancel{594}}{5} \cdot \frac{3}{\cancel{4}_2} = \frac{891}{10} = 89\frac{1}{10} \text{ lb}$$

65. $45 \div 4\frac{1}{2} = 45 \div \frac{9}{2} =^5 \cancel{45} \cdot \frac{2}{9} = 10 \text{ ¢/oz};$

$$66 \div 5\frac{1}{2} = 66 \div \frac{11}{2} =^6 \cancel{66} \cdot \frac{2}{11} = 12 \text{ ¢/oz.}$$

The $4\frac{1}{2}$ oz item is the better buy.

66. $28 \div 3\frac{1}{2} = 28 \div \frac{7}{2} =^4 \cancel{28} \cdot \frac{2}{7} = 8 \text{ ¢ per oz};$

$$33 \div 5\frac{1}{2} = 33 \div \frac{11}{2} =^3 \cancel{33} \cdot \frac{2}{11} = 6 \text{ ¢ per}$$

oz. The $5\frac{1}{2}$ oz item is the better buy.

67. $70 \div 3\frac{1}{2} = 70 \div \frac{7}{2} =^{10} \cancel{70} \cdot \frac{2}{7} = 20 \text{ ¢/oz};$

$$98 \div 4 =^49 \cancel{98} \cdot \frac{1}{4} = \frac{49}{2} = 24.5 \text{ ¢/oz. The}$$

$3\frac{1}{2}$ oz item is the better buy.

68. $36 \div 4\frac{1}{2} = 36 \div \frac{9}{2} =^4 \cancel{36} \cdot \frac{2}{9} = 8 \text{ ¢ per oz}$

$$39 \div 5 = 39 \cdot \frac{1}{5} = \frac{39}{5} = 7\frac{4}{5} = 7.8 \text{ ¢ per oz.}$$

The 5 oz item is the better buy.

69. $33 \div 5\frac{1}{2} = 33 \div \frac{11}{2} =^3 \cancel{33} \cdot \frac{2}{11} = 6 \text{ ¢/oz};$

$$29 \div 5 = 29 \cdot \frac{1}{5} = \frac{29}{5} = 5\frac{4}{5} = 5.8 \text{ ¢/oz. The}$$

5 oz item is the better buy.

70. Answers may vary.

71. Answers may vary.

72. Answers may vary.

73. Answers may vary.

74. $a + c = b + c$

75. $a - c = b - c$

76. $a \cdot c = b \cdot c$

77. $a \div c = b \div c$

78. $\frac{3}{5} \cdot n = 3\frac{1}{4}$

$$\frac{\cancel{3}/5 \cdot n}{\cancel{3}/5} = \frac{13}{4}$$

$$n = \frac{13}{4} \cdot \frac{5}{3} = \frac{65}{12} = 5\frac{5}{12}$$

79. $n \cdot 1\frac{1}{2} = 3\frac{3}{4}$

$$\frac{n \cdot \cancel{3}/2}{\cancel{3}/2} = \frac{15}{4}$$

$$n = \frac{5 \cancel{15}}{2 \cancel{4}} \cdot \frac{2^1}{\cancel{2}_1} = \frac{5}{2} = 2\frac{1}{2}$$

80. $\frac{2}{3} \cdot n = 6$

$$\frac{\cancel{2}/3 \cdot n}{\cancel{2}/3} = \frac{6}{3}$$

$$n = \cancel{3} \cdot \frac{3}{\cancel{2}_1} = 9$$

81. a. $3 \cdot n = 9$

b. $n - 5 = 2$

c. $n + 8 = 7$

$$82. \text{ a. } x + \frac{1}{8} = \frac{1}{2}$$

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

$$\text{ b. } y - \frac{1}{4} = \frac{2}{5}$$

$$y = \frac{2}{5} + \frac{1}{4} = \frac{13}{20}$$

$$\text{ c. } \frac{z}{4} = \frac{3}{5}$$

$$z = \frac{3}{5} \cdot 4$$

$$z = \frac{12}{5} = 2\frac{2}{5}$$

$$83. \quad 2\frac{1}{2} \cdot 3\frac{5}{7} = n$$

$$\frac{5}{1} \cdot \frac{26}{7} = n$$

$$\frac{65}{7} = n$$

$$9\frac{2}{7} = n$$

$$84. \quad 1\frac{1}{2} = \frac{3}{2} \text{ pints cost } 78¢ \text{ so } 1 \text{ pint would}$$

$$\text{cost } 78 \div \frac{3}{2} = \cancel{26} \cdot \frac{2}{\cancel{3}} = 52¢. \text{ Thus } 2$$

pints would cost $2 \cdot 52 = 104¢$ or \$1.04.

$$85. \quad 1\frac{1}{2} = \frac{3}{2} \text{ miles in } 8\frac{1}{2} = \frac{17}{2} \text{ minutes means}$$

$$\text{she ran } \frac{3}{2} \div \frac{17}{2} = \frac{3}{\cancel{2}} \cdot \frac{\cancel{2}}{17} = \frac{3}{17} \text{ mile in } 1$$

minute. Thus in 17 minutes she can run

$$\cancel{17} \cdot \frac{3}{\cancel{17}} = 3 \text{ miles.}$$

$$86. \quad \underline{1}85 \rightarrow 200$$

$$87. \quad \underline{1}85 \rightarrow 190$$

$$88. \quad \underline{3}285 \rightarrow 3000$$

$$89. \quad 8 \div 4 \cdot \frac{11}{2} - \left[3 \left(\frac{5}{3} - \frac{1}{3} \right) + 1 \right]$$

$$= 8 \div 4 \cdot \frac{11}{2} - \left[3 \left(\frac{4}{3} \right) + 1 \right]$$

$$= 8 \div 4 \cdot \frac{11}{2} - [4 + 1]$$

$$= 8 \div 4 \cdot \frac{11}{2} - [5]$$

$$= 2 \cdot \frac{11}{2} - [5] = 11 - 5 = 6$$

$$90. \quad 4 \cdot \frac{3}{4} \div \frac{1}{3} + \left[\left(\frac{5}{8} - \frac{2}{7} \right) - \frac{1}{4} \right]$$

$$= 4 \cdot \frac{3}{4} \div \frac{1}{3} + \left[\left(\frac{19}{56} \right) - \frac{1}{4} \right]$$

$$= 4 \cdot \frac{3}{4} \div \frac{1}{3} + \left[\frac{5}{56} \right]$$

$$= 3 \div \frac{1}{3} + \left[\frac{5}{56} \right] = 9 + \frac{5}{56} = 9\frac{5}{56}$$

Collaborative Learning – Chapter 2

- Answers may vary.
- Answers will vary.
- Answers will vary.

Review Exercises – Chapter 2

- Proper
 - Proper
 - Improper
 - Proper
 - Improper
- $\frac{22}{7} = 3$ with remainder 1 so $\frac{22}{7} = 3\frac{1}{7}$
 - $\frac{18}{7} = 2$ with remainder 4 so $\frac{18}{7} = 2\frac{4}{7}$
 - $\frac{29}{3} = 9$ with remainder 2 so $\frac{29}{3} = 9\frac{2}{3}$
 - $\frac{14}{4} = 3$ with remainder 2; $\frac{14}{4} = 3\frac{2}{4} = 3\frac{1}{2}$
 - $\frac{19}{11} = 1$ with remainder 8 so $\frac{19}{11} = 1\frac{8}{11}$

3. a. $4\frac{1}{2} = \frac{2 \times 4 + 1}{2} = \frac{9}{2}$
 b. $3\frac{1}{9} = \frac{3 \times 9 + 1}{9} = \frac{28}{9}$
 c. $4\frac{2}{5} = \frac{5 \times 4 + 2}{5} = \frac{22}{5}$
 d. $8\frac{3}{14} = \frac{14 \times 8 + 3}{14} = \frac{115}{14}$
 e. $7\frac{7}{8} = \frac{8 \times 7 + 7}{8} = \frac{63}{8}$
4. a. P/E ratio = $\frac{80}{10} = 8$
 b. P/E ratio = $\frac{80}{8} = 10$
 c. P/E ratio = $\frac{80}{20} = 4$
 d. P/E ratio = $\frac{80}{40} = 2$
 e. P/E ratio = $\frac{80}{16} = 5$
5. a. $\frac{4}{3} = \frac{?}{6}$; $\frac{4}{3} = \frac{4 \cdot 2}{3 \cdot 2} = \frac{8}{6}$. The missing number is 8.
 b. $\frac{3}{5} = \frac{?}{25}$; $\frac{3}{5} = \frac{3 \cdot 5}{5 \cdot 5} = \frac{15}{25}$. The missing number is 15.
 c. $\frac{8}{9} = \frac{?}{27}$; $\frac{8}{9} = \frac{8 \cdot 3}{9 \cdot 3} = \frac{24}{27}$. The missing number is 24.
 d. $\frac{14}{21} = \frac{?}{42}$; $\frac{14}{21} = \frac{14 \cdot 2}{21 \cdot 2} = \frac{28}{42}$. The missing number is 28.
 e. $\frac{3}{9} = \frac{?}{54}$; $\frac{3}{9} = \frac{3 \cdot 6}{9 \cdot 6} = \frac{18}{54}$. The missing number is 18.
6. a. $\frac{6}{21} = \frac{2}{?}$; $\frac{6}{21} = \frac{6 \div 3}{21 \div 3} = \frac{2}{7}$. The missing number is 7.
 b. $\frac{8}{10} = \frac{4}{?}$; $\frac{8}{10} = \frac{8 \div 2}{10 \div 2} = \frac{4}{5}$. The missing number is 5.
 c. $\frac{18}{24} = \frac{6}{?}$; $\frac{18}{24} = \frac{18 \div 3}{24 \div 3} = \frac{6}{8}$. The missing number is 8.
 d. $\frac{24}{48} = \frac{4}{?}$; $\frac{24}{48} = \frac{24 \div 6}{48 \div 6} = \frac{4}{8}$. The missing number is 8.
- e. $\frac{18}{30} = \frac{6}{?}$; $\frac{18}{30} = \frac{18 \div 3}{30 \div 3} = \frac{6}{10}$. The missing number is 10.
7. a. $\frac{4}{8} = \frac{\cancel{1}^1 \cdot \cancel{2}^1}{\cancel{1}^1 \cdot \cancel{2}^1 \cdot 2} = \frac{1}{2}$
 b. $\frac{6}{9} = \frac{2 \cdot \cancel{3}}{3 \cdot \cancel{3}} = \frac{2}{3}$
 c. $\frac{14}{35} = \frac{2 \cdot \cancel{7}}{5 \cdot \cancel{7}} = \frac{2}{5}$
 d. $\frac{8}{28} = \frac{\cancel{2} \cdot \cancel{2} \cdot 2}{\cancel{2} \cdot \cancel{2} \cdot 7} = \frac{2}{7}$
 e. $\frac{10}{95} = \frac{2 \cdot \cancel{5}}{\cancel{5} \cdot 19} = \frac{2}{19}$
8. a. $12 = 2^2 \cdot 3$ and $36 = 2^2 \cdot 3^2$
 GCF = $2^2 \cdot 3 = 12$; $\frac{12}{36} = \frac{12 \div 12}{36 \div 12} = \frac{1}{3}$
 b. $10 = 2 \cdot 5$ and $50 = 2 \cdot 5^2$
 GCF = $2 \cdot 5 = 10$; $\frac{10}{50} = \frac{1}{5}$
 c. $18 = 2 \cdot 3^2$ and $45 = 3^2 \cdot 5$
 GCF = GCF = $3^2 = 9$;
 $\frac{18}{45} = \frac{18 \div 9}{45 \div 9} = \frac{2}{5}$
 d. $28 = 2^2 \cdot 7$ and $42 = 2 \cdot 3 \cdot 7$
 GCF = $2 \cdot 7 = 14$; $\frac{28}{42} = \frac{28 \div 14}{42 \div 14} = \frac{2}{3}$
 e. $51 = 3 \cdot 17$ and $34 = 2 \cdot 17$
 GCF = 17; $\frac{51}{34} = \frac{51 \div 17}{34 \div 17} = \frac{3}{2}$
9. a. $\frac{1}{3} \cdot \frac{2}{7} = \frac{2}{21}$
 b. $\frac{2}{\cancel{3}} \cdot \frac{\cancel{3}}{9} = \frac{2}{9}$
 c. $\frac{\cancel{1}^1}{\cancel{7}} \cdot \frac{\cancel{7}}{\cancel{3}_3} = \frac{1}{3}$
 d. $\frac{\cancel{1}^1}{\cancel{1}_1} \cdot \frac{\cancel{15}^3}{\cancel{5}_2} = \frac{3}{2} = 1\frac{1}{2}$
 e. $\frac{\cancel{7}}{\cancel{8}} \cdot \frac{\cancel{8}}{\cancel{7}} = 1$

10. a. $\frac{4}{7} \cdot 3\frac{1}{6} = \frac{4}{7} \cdot \frac{19}{3} = \frac{38}{21} = 1\frac{17}{21}$
- b. $\frac{3}{5} \cdot 3\frac{1}{3} = \frac{\cancel{3}}{5} \cdot \frac{10^2}{\cancel{3}} = \frac{2}{1} = 2$
- c. $\frac{6}{7} \cdot 1\frac{3}{4} = \frac{\cancel{6}^3}{7} \cdot \frac{\cancel{7}}{\cancel{4}_2} = \frac{3}{2} = 1\frac{1}{2}$
- d. $\frac{9}{10} \cdot 2\frac{1}{4} = \frac{9}{10} \cdot \frac{9}{4} = \frac{81}{40} = 2\frac{1}{40}$
- e. $\frac{6}{7} \cdot 4\frac{2}{3} = \frac{\cancel{6}^2}{7} \cdot \frac{\cancel{14}^2}{\cancel{3}_1} = \frac{4}{1} = 4$
11. a. $\left(\frac{2}{5}\right)^2 \cdot \frac{5}{6} = \frac{\cancel{2}^2}{5 \cdot \cancel{25}} \cdot \frac{\cancel{5}^1}{6_3} = \frac{2}{15}$
- b. $\left(\frac{3}{2}\right)^2 \cdot \frac{4}{9} = \frac{\cancel{3}^2}{\cancel{4}} \cdot \frac{\cancel{4}}{\cancel{9}} = 1$
- c. $\left(\frac{3}{2}\right)^2 \cdot \frac{8}{27} = \frac{\cancel{3}^2}{\cancel{4}} \cdot \frac{\cancel{8}^2}{\cancel{27}_3} = \frac{2}{3}$
- d. $\left(\frac{3}{2}\right)^2 \cdot \frac{14}{27} = \frac{\cancel{3}^2}{\cancel{4}} \cdot \frac{\cancel{14}^7}{\cancel{27}_3} = \frac{7}{6} = 1\frac{1}{6}$
- e. $\left(\frac{3}{2}\right)^2 \cdot \frac{8}{9} = \frac{\cancel{3}^2}{\cancel{4}} \cdot \frac{\cancel{8}^2}{\cancel{9}} = \frac{2}{1} = 2$
12. a. $\frac{3}{4} \div \frac{6}{7} = \frac{\cancel{3}}{4} \cdot \frac{7}{\cancel{6}_2} = \frac{7}{8}$
- b. $\frac{3}{8} \div \frac{6}{7} = \frac{\cancel{3}}{8} \cdot \frac{7}{\cancel{6}_2} = \frac{7}{16}$
- c. $\frac{4}{5} \div \frac{5}{9} = \frac{4}{5} \cdot \frac{9}{5} = \frac{36}{25} = 1\frac{11}{25}$
- d. $\frac{5}{3} \div \frac{7}{9} = \frac{5}{\cancel{3}} \cdot \frac{\cancel{9}^3}{7} = \frac{15}{7} = 2\frac{1}{7}$
- e. $\frac{6}{7} \div \frac{12}{7} = \frac{\cancel{6}}{7} \cdot \frac{\cancel{7}}{\cancel{12}_2} = \frac{1}{2}$
13. a. $2\frac{1}{4} \div \frac{4}{5} = \frac{9}{4} \div \frac{4}{5} = \frac{9}{4} \cdot \frac{5}{4} = \frac{45}{16} = 2\frac{13}{16}$
- b. $3\frac{1}{7} \div \frac{7}{8} = \frac{22}{7} \div \frac{7}{8} = \frac{22}{7} \cdot \frac{8}{7} = \frac{176}{49} = 3\frac{29}{49}$
- c. $6\frac{1}{2} \div \frac{4}{13} = \frac{13}{2} \div \frac{4}{13} = \frac{13}{2} \cdot \frac{13}{4} = \frac{169}{8} = 21\frac{1}{8}$
- d. $1\frac{1}{9} \div \frac{20}{27} = \frac{\cancel{10}}{9} \cdot \frac{\cancel{27}^3}{\cancel{20}_2} = \frac{3}{3} = 1\frac{1}{2}$
- e. $4\frac{1}{7} \div \frac{14}{15} = \frac{29}{7} \cdot \frac{15}{14} = \frac{435}{98} = 4\frac{43}{98}$
14. a. $\frac{3}{5} \div 1\frac{1}{5} = \frac{3}{5} \div \frac{6}{5} = \frac{\cancel{3}}{\cancel{5}} \cdot \frac{\cancel{5}}{\cancel{6}_2} = \frac{1}{2}$
- b. $\frac{4}{7} \div 2\frac{3}{7} = \frac{4}{7} \div \frac{17}{7} = \frac{4}{7} \cdot \frac{\cancel{7}}{17} = \frac{4}{17}$
- c. $\frac{3}{5} \div 3\frac{1}{5} = \frac{3}{5} \div \frac{16}{5} = \frac{3}{5} \cdot \frac{\cancel{5}}{16} = \frac{3}{16}$
- d. $\frac{1}{7} \div 2\frac{1}{2} = \frac{1}{7} \div \frac{5}{2} = \frac{1}{7} \cdot \frac{2}{5} = \frac{2}{35}$
- e. $\frac{2}{9} \div 3\frac{1}{8} = \frac{2}{9} \div \frac{25}{8} = \frac{2}{9} \cdot \frac{8}{25} = \frac{16}{225}$
15. a. $3\frac{1}{3} \cdot 4\frac{2}{3} = \frac{10}{3} \cdot \frac{14}{3} = \frac{140}{9} = 15\frac{5}{9}$ sq. yd.
- b. $3\frac{1}{2} \cdot 4\frac{1}{2} = \frac{7}{2} \cdot \frac{9}{2} = \frac{63}{4} = 15\frac{3}{4}$ sq. yd.
- c. $3\frac{1}{3} \cdot 4\frac{1}{2} = \frac{\cancel{10}}{3} \cdot \frac{\cancel{9}^3}{\cancel{2}_1} = 15$ sq. yd.
- d. $3\frac{1}{2} \cdot 4\frac{1}{3} = \frac{7}{2} \cdot \frac{13}{3} = \frac{91}{6} = 15\frac{1}{6}$ sq. yd.
- e. $4\frac{1}{2} \cdot 5\frac{1}{2} = \frac{9}{2} \cdot \frac{11}{2} = \frac{99}{4} = 24\frac{3}{4}$ sq. yd.
16. a. $8 = 2^3$ and $12 = 2^2 \cdot 3$
LCM = $2^3 \cdot 3 = 24$
- b. $15 = 3 \cdot 5$ and $6 = 2 \cdot 3$
LCM = $2 \cdot 3 \cdot 5 = 30$
- c. $18 = 2 \cdot 3^2$ and $12 = 2^2 \cdot 3$
LCM = $2^2 \cdot 3^2 = 36$
- d. $\begin{array}{r} 2 \overline{)20 \ 24} \\ \underline{10 \ 12} \\ 5 \ 6 \end{array}$ LCM = $2 \cdot 2 \cdot 5 \cdot 6 = 120$
- e. $\begin{array}{r} 2 \overline{)54 \ 180} \\ \underline{37 \ 90} \\ 3 \overline{)9 \ 30} \\ \underline{3 \ 10} \end{array}$ LCM = $2 \cdot 3 \cdot 3 \cdot 3 \cdot 10 = 540$
17. a. Since 33 is a multiple of 11, LCM = 33.
b. Since 34 is a multiple of 17, LCM = 34.
c. Since 57 is a multiple of 19, LCM = 57.
d. Since 40 is a multiple of 10, LCM = 40.
e. Since 92 is a multiple of 23, LCM = 92.

18. a. $12 = 2^2 \cdot 3$ and $16 = 2^4$
 $LCD = 2^4 \cdot 3 = 48$
 $\frac{7}{12} = \frac{7 \times 4}{12 \times 4} = \frac{28}{48}$; $\frac{3}{16} = \frac{3 \times 3}{16 \times 3} = \frac{9}{48}$

b. $15 = 3 \cdot 5$ and $9 = 3^2$
 $LCD = 3^2 \cdot 5 = 45$
 $\frac{2}{15} = \frac{2 \times 3}{15 \times 3} = \frac{6}{45}$; $\frac{5}{9} = \frac{5 \times 5}{9 \times 5} = \frac{25}{45}$

c. $16 = 2^4$ and $18 = 2 \cdot 3^2$
 $LCD = 2^4 \cdot 3^2 = 144$
 $\frac{5}{16} = \frac{5 \times 9}{16 \times 9} = \frac{45}{144}$; $\frac{5}{18} = \frac{5 \times 8}{18 \times 8} = \frac{40}{144}$

d. $LCD = 7 \cdot 5 = 35$
 $\frac{3}{7} = \frac{3 \times 5}{7 \times 5} = \frac{15}{35}$; $\frac{4}{5} = \frac{4 \times 7}{5 \times 7} = \frac{28}{35}$

e. $9 = 3^2$ and $15 = 3 \cdot 5$
 $LCD = 3^2 \cdot 5 = 45$
 $\frac{5}{9} = \frac{5 \times 5}{9 \times 5} = \frac{25}{45}$; $\frac{4}{15} = \frac{4 \times 3}{15 \times 3} = \frac{12}{45}$

19. a. Multiples of 6: 6, 12, 18, Since 12 is a multiple of both 4 and 2, $LCD = 12$.

$\frac{3}{4} = \frac{3 \times 3}{4 \times 3} = \frac{9}{12}$; $\frac{1}{2} = \frac{1 \times 6}{2 \times 6} = \frac{6}{12}$;
 $\frac{5}{6} = \frac{5 \times 2}{6 \times 2} = \frac{10}{12}$

b.
$$\begin{array}{r} 2 \overline{)12 \ 9 \ 8} \\ \underline{2 \ 6 \ 9 \ 4} \\ 3 \ 3 \ 9 \ 2 \\ \underline{1 \ 3 \ 2} \end{array}$$
 $LCD = 2 \cdot 2 \cdot 3 \cdot 3 \cdot 2 = 72$

$\frac{5}{12} = \frac{5 \times 6}{12 \times 6} = \frac{30}{72}$; $\frac{1}{9} = \frac{1 \times 8}{9 \times 8} = \frac{8}{72}$;

$\frac{3}{8} = \frac{3 \times 9}{8 \times 9} = \frac{27}{72}$

c.
$$\begin{array}{r} 2 \overline{)16 \ 18 \ 12} \\ \underline{2 \ 8 \ 9 \ 6} \\ 3 \ 4 \ 9 \ 3 \\ \underline{4 \ 3 \ 1} \end{array}$$
 $LCD = 2 \cdot 2 \cdot 3 \cdot 4 \cdot 3 = 144$

$\frac{13}{16} = \frac{13 \times 9}{16 \times 9} = \frac{117}{144}$; $\frac{1}{18} = \frac{1 \times 8}{18 \times 8} = \frac{8}{144}$;

$\frac{11}{12} = \frac{11 \times 12}{12 \times 12} = \frac{132}{144}$

d.
$$\begin{array}{r} 2 \overline{)10 \ 8 \ 12} \\ \underline{2 \ 5 \ 4 \ 6} \\ 5 \ 2 \ 3 \end{array}$$
 $LCD = 2 \cdot 2 \cdot 5 \cdot 2 \cdot 3 = 120$

$\frac{1}{10} = \frac{1 \times 12}{10 \times 12} = \frac{12}{120}$; $\frac{3}{8} = \frac{3 \times 15}{8 \times 15} = \frac{45}{120}$;

$\frac{1}{12} = \frac{1 \times 10}{12 \times 10} = \frac{10}{120}$

e. $LCD = 5 \cdot 9 \cdot 8 = 360$

$\frac{1}{5} = \frac{1 \times 72}{5 \times 72} = \frac{72}{360}$; $\frac{4}{9} = \frac{4 \times 40}{9 \times 40} = \frac{160}{360}$;

$\frac{1}{8} = \frac{1 \times 45}{8 \times 45} = \frac{45}{360}$

20. a. $\frac{1}{3}$ and $\frac{3}{10}$; $1 \times 10 = 10 > 3 \times 3 = 9$ so

$\frac{1}{3} > \frac{3}{10}$

b. $\frac{2}{3}$ and $\frac{3}{7}$; $2 \times 7 = 14 > 3 \times 3 = 9$ so

$\frac{2}{3} > \frac{3}{7}$

c. $\frac{4}{5}$ and $\frac{5}{7}$; $4 \times 7 = 28 > 5 \times 5 = 25$ so

$\frac{4}{5} > \frac{5}{7}$

d. $\frac{2}{9}$ and $\frac{3}{7}$; $2 \times 7 = 14 < 9 \times 3 = 27$ so

$\frac{2}{9} < \frac{3}{7}$

e. $\frac{3}{8}$ and $\frac{5}{32}$; $3 \times 32 = 96 > 8 \times 5 = 40$ so

$\frac{3}{8} > \frac{5}{32}$

21. a. $\frac{1}{5} + \frac{2}{5} = \frac{3}{5}$

b. $\frac{2}{3} + \frac{1}{3} = \frac{3}{3} = 1$

c. $\frac{3}{7} + \frac{1}{7} = \frac{4}{7}$

d. $\frac{2}{9} + \frac{1}{9} = \frac{3}{9} = \frac{1}{3}$

e. $\frac{7}{2} + \frac{9}{2} = \frac{16}{2} = 8$

$$22. \text{ a. } \frac{1}{3} + \frac{5}{6} = \frac{1 \cdot 2}{3 \cdot 2} + \frac{5}{6} = \frac{2}{6} + \frac{5}{6} = \frac{7}{6} = 1\frac{1}{6}$$

$$\text{ b. } \frac{1}{5} + \frac{1}{9} = \frac{1 \cdot 9}{5 \cdot 9} + \frac{1 \cdot 5}{9 \cdot 5} = \frac{9}{45} + \frac{5}{45} = \frac{14}{45}$$

$$\text{ c. } \frac{3}{7} + \frac{5}{6} = \frac{3 \cdot 6}{7 \cdot 6} + \frac{5 \cdot 7}{6 \cdot 7} \\ = \frac{18}{42} + \frac{35}{42} = \frac{53}{42} = 1\frac{11}{42}$$

$$\text{ d. } \frac{1}{6} + \frac{9}{20} = \frac{1 \cdot 10}{6 \cdot 10} + \frac{9 \cdot 3}{20 \cdot 3} = \frac{10}{60} + \frac{27}{60} = \frac{37}{60}$$

$$\text{ e. } \frac{2}{7} + \frac{3}{15} = \frac{2 \cdot 15}{7 \cdot 15} + \frac{3 \cdot 7}{15 \cdot 7} \\ = \frac{30}{105} + \frac{21}{105} = \frac{51}{105} = \frac{17}{35}$$

$$23. \text{ a. } \frac{15}{4} + \frac{16}{3} = \frac{15 \cdot 3}{4 \cdot 3} + \frac{16 \cdot 4}{3 \cdot 4} \\ = \frac{45}{12} + \frac{64}{12} = \frac{109}{12} = 9\frac{1}{12}$$

$$\text{ b. } \frac{7}{2} + \frac{5}{3} = \frac{7 \cdot 3}{2 \cdot 3} + \frac{5 \cdot 2}{3 \cdot 2} \\ = \frac{21}{6} + \frac{10}{6} = \frac{31}{6} = 5\frac{1}{6}$$

$$\text{ c. } \frac{17}{4} + \frac{33}{16} = \frac{17 \cdot 4}{4 \cdot 4} + \frac{33}{16} \\ = \frac{68}{16} + \frac{33}{16} = \frac{101}{16} = 6\frac{5}{16}$$

$$\text{ d. } \frac{19}{9} + \frac{13}{3} = \frac{19}{9} + \frac{13 \cdot 3}{3 \cdot 3} \\ = \frac{19}{9} + \frac{39}{9} = \frac{58}{9} = 6\frac{4}{9}$$

$$\text{ e. } \frac{9}{8} + \frac{19}{9} = \frac{9 \cdot 9}{8 \cdot 9} + \frac{19 \cdot 8}{9 \cdot 8} \\ = \frac{81}{72} + \frac{152}{72} = \frac{233}{72} = 3\frac{17}{72}$$

$$24. \text{ a. } \begin{array}{r} 2\overline{)7612} \\ 3\overline{)736} \end{array}$$

$$7 \ 1 \ 2 \quad \text{LCD} = 2 \cdot 3 \cdot 7 \cdot 2 = 84;$$

$$\frac{5}{7} + \frac{1}{6} + \frac{1}{12} = \frac{60}{84} + \frac{14}{84} + \frac{7}{84} = \frac{81}{84} = \frac{27}{28}$$

b. Multiples of 12: 12, 24, 36, Since 4 and 8 go into 24, LCD = 24.

$$\frac{3}{4} + \frac{1}{8} + \frac{1}{12} = \frac{18}{24} + \frac{3}{24} + \frac{2}{24} = \frac{23}{24}$$

c. Since 8 and 4 go into 16, LCD = 16.

$$\frac{5}{8} + \frac{3}{4} + \frac{1}{16} = \frac{10}{16} + \frac{12}{16} + \frac{1}{16} = \frac{23}{16} = 1\frac{7}{16}$$

d. Multiples of 15: 15, 30, 45, Since 5 and 6 go into 30, LCD = 30.

$$\frac{3}{5} + \frac{2}{6} + \frac{1}{15} = \frac{18}{30} + \frac{10}{30} + \frac{2}{30} = \frac{30}{30} = 1$$

e. Multiples of 12: 12, 24, 36, 48, Since 9 and 4 go into 36, LCD = 36.

$$\frac{6}{9} + \frac{2}{4} + \frac{1}{12} = \frac{24}{36} + \frac{18}{36} + \frac{3}{36} \\ = \frac{45}{36} = 1\frac{9}{36} = 1\frac{1}{4}$$

25. a. Since 8 is a multiple of 4, LCD = 8.

$$\frac{7}{8} - \frac{3}{4} = \frac{7}{8} - \frac{3 \times 2}{4 \times 2} = \frac{7}{8} - \frac{6}{8} = \frac{1}{8}$$

b. Multiples of 18: 18, 36, 54, Since 36 is a multiple of 12, LCD = 36.

$$\frac{11}{12} - \frac{7}{18} = \frac{11 \times 3}{12 \times 3} - \frac{7 \times 2}{18 \times 2} = \frac{33}{36} - \frac{14}{36} = \frac{19}{36}$$

c. Multiples of 16: 16, 32, 48, 64,

Since 48 is a multiple of 12, LCD = 48.

$$\frac{7}{12} - \frac{5}{16} = \frac{7 \times 4}{12 \times 4} - \frac{5 \times 3}{16 \times 3} = \frac{28}{48} - \frac{15}{48} = \frac{13}{48}$$

d. LCD = $7 \cdot 5 = 35$

$$\frac{5}{7} - \frac{3}{5} = \frac{5 \times 5}{7 \times 5} - \frac{3 \times 7}{5 \times 7} = \frac{25}{35} - \frac{21}{35} = \frac{4}{35}$$

$$\text{ e. } \begin{array}{r} 3\overline{)2724} \\ 9 \ 8 \end{array}$$

$$\text{LCD} = 3 \cdot 9 \cdot 8 = 216$$

$$\frac{16}{27} - \frac{5}{24} = \frac{16 \times 8}{27 \times 8} - \frac{5 \times 9}{24 \times 9} \\ = \frac{128}{216} - \frac{45}{216} \\ = \frac{83}{216}$$

$$26. \text{ a. } \frac{1}{2} + \frac{1}{4} = \frac{2}{4} + \frac{1}{4} = \frac{3}{4}$$

$$\text{ b. } \frac{13}{100} + \frac{1}{4} = \frac{13}{100} + \frac{25}{100} = \frac{38}{100} = \frac{19}{50}$$

$$\text{ c. } \frac{1}{10} + \frac{13}{100} = \frac{10}{100} + \frac{13}{100} = \frac{23}{100}$$

$$\text{ d. } \frac{1}{50} + \frac{1}{2} = \frac{1}{50} + \frac{25}{50} = \frac{26}{50} = \frac{13}{25}$$

$$\text{ e. } \frac{1}{10} + \frac{1}{50} = \frac{5}{50} + \frac{1}{50} = \frac{6}{50} = \frac{3}{25}$$

$$27. \text{ a. } 4\frac{1}{5} + 3\frac{1}{6} = \frac{21}{5} + \frac{19}{6}$$

$$= \frac{126}{30} + \frac{95}{30} = \frac{221}{30} = 7\frac{11}{30}$$

$$\text{b. } 2\frac{1}{3} + 3\frac{1}{12} = \frac{7}{3} + \frac{37}{12}$$

$$= \frac{28}{12} + \frac{37}{12} = \frac{65}{12} = 5\frac{5}{12}$$

$$\text{c. } 4\frac{4}{7} + 3\frac{2}{8} = 4\frac{4}{7} + 3\frac{1}{4}$$

$$= \frac{32}{7} + \frac{13}{4}$$

$$= \frac{128}{28} + \frac{91}{28} = \frac{219}{28} = 7\frac{23}{28}$$

$$\text{d. } 5\frac{1}{3} + 2\frac{1}{9} = \frac{16}{3} + \frac{19}{9} = \frac{48}{9} + \frac{19}{9} = \frac{67}{9} = 7\frac{4}{9}$$

$$\text{e. } 3\frac{5}{8} + 5\frac{3}{12} = \frac{29}{8} + \frac{63}{12}$$

$$= \frac{87}{24} + \frac{126}{24} = \frac{213}{24} = 8\frac{7}{8}$$

28a.

$$\text{a. } 2\frac{7}{8} - 2\frac{2}{3} = \frac{23}{8} - \frac{8}{3} = \frac{69}{24} - \frac{64}{24} = \frac{5}{24}$$

$$\text{b. } 3\frac{1}{3} - 1\frac{3}{5} = \frac{10}{3} - \frac{8}{5} = \frac{50}{15} - \frac{24}{15} = \frac{26}{15} = 1\frac{11}{15}$$

$$\text{c. } 3\frac{1}{5} - 2\frac{1}{3} = \frac{16}{5} - \frac{7}{3} = \frac{48}{15} - \frac{35}{15} = \frac{13}{15}$$

$$\text{d. } 4\frac{3}{5} - 3\frac{5}{8} = \frac{23}{5} - \frac{29}{8} = \frac{184}{40} - \frac{145}{40} = \frac{39}{40}$$

$$\text{e. } 1\frac{7}{8} - 1\frac{5}{9} = \frac{15}{8} - \frac{14}{9} = \frac{135}{72} - \frac{112}{72} = \frac{23}{72}$$

28b.

$$\text{a. } 2\frac{5}{9} + 3\frac{1}{8} - 2\frac{1}{10} = \frac{23}{9} + \frac{25}{8} - \frac{21}{10}$$

$$= \frac{920}{360} + \frac{1125}{360} - \frac{756}{360}$$

$$= \frac{1289}{360} = 3\frac{209}{360}$$

$$\text{b. } 3\frac{5}{9} + 3\frac{1}{6} - 2\frac{1}{10} = \frac{32}{9} + \frac{19}{6} - \frac{21}{10}$$

$$= \frac{320}{90} + \frac{285}{90} - \frac{189}{90}$$

$$= \frac{416}{90}$$

$$= \frac{208}{45} = 4\frac{28}{45}$$

$$\text{c. } 4\frac{5}{9} + 3\frac{1}{12} - 2\frac{1}{8} = \frac{41}{9} + \frac{37}{12} - \frac{17}{8}$$

$$= \frac{328}{72} + \frac{222}{72} - \frac{153}{72}$$

$$= \frac{397}{72} = 5\frac{37}{72}$$

$$\text{d. } 5\frac{5}{9} + 3\frac{1}{12} - 2\frac{1}{6} = \frac{50}{9} + \frac{37}{12} - \frac{13}{6}$$

$$= \frac{200}{36} + \frac{111}{36} - \frac{78}{36}$$

$$= \frac{233}{36} = 6\frac{17}{36}$$

$$\text{e. } 6\frac{5}{9} + 3\frac{1}{8} - 2\frac{1}{6} = \frac{59}{9} + \frac{25}{8} - \frac{13}{6}$$

$$= \frac{472}{72} + \frac{225}{72} - \frac{156}{72}$$

$$= \frac{541}{72} = 7\frac{37}{72}$$

$$29. \text{ a. } 4\frac{1}{4} + 5\frac{1}{2} + 4\frac{1}{4} + 5\frac{1}{2} = 8\frac{2}{4} + 10\frac{2}{2}$$

$$= 8\frac{1}{2} + 10 + 1$$

$$= 8\frac{1}{2} + 11 = 19\frac{1}{2} \text{ yd}$$

$$\text{b. } 3\frac{1}{2} + 4\frac{1}{3} + 3\frac{1}{2} + 4\frac{1}{3} = 6\frac{2}{2} + 8\frac{2}{3}$$

$$= 6 + 1 + 8\frac{2}{3}$$

$$= 7 + 8\frac{2}{3} = 15\frac{2}{3} \text{ yd}$$

$$\text{c. } 4\frac{1}{3} + 5\frac{1}{2} + 4\frac{1}{3} + 5\frac{1}{2} = 8\frac{2}{3} + 10\frac{2}{2}$$

$$= 8\frac{2}{3} + 10 + 1$$

$$= 8\frac{2}{3} + 11 = 19\frac{2}{3} \text{ yd}$$

$$\text{d. } 3\frac{1}{2} + 5\frac{1}{3} + 3\frac{1}{2} + 5\frac{1}{3} = 6\frac{2}{2} + 10\frac{2}{3}$$

$$= 6 + 1 + 10\frac{2}{3}$$

$$= 7 + 10\frac{2}{3} = 17\frac{2}{3} \text{ yd}$$

$$\text{e. } 3\frac{1}{6} + 2\frac{5}{6} + 3\frac{1}{6} + 2\frac{5}{6} = 10\frac{12}{6}$$

$$= 10 + 2 = 12 \text{ yd}$$

$$30. \text{ a. } \frac{1}{2} \cdot \left(\frac{2}{3}\right)^2 - \frac{1}{9} = \frac{1}{\cancel{2}} \cdot \frac{\cancel{4}^2}{9} - \frac{1}{9} = \frac{2}{9} - \frac{1}{9} = \frac{1}{9}$$

$$\text{ b. } \frac{1}{3} \cdot \left(\frac{3}{4}\right)^2 - \frac{1}{16} = \frac{1}{\cancel{3}} \cdot \frac{\cancel{9}^3}{16} - \frac{1}{16} \\ = \frac{3}{16} - \frac{1}{16} = \frac{2}{16} = \frac{1}{8}$$

$$\text{ c. } \frac{1}{5} \cdot \left(\frac{5}{6}\right)^2 - \frac{1}{36} = \frac{1}{\cancel{5}} \cdot \frac{\cancel{25}^5}{36} - \frac{1}{36} \\ = \frac{5}{36} - \frac{1}{36} = \frac{4}{36} = \frac{1}{9}$$

$$\text{ d. } \frac{1}{6} \cdot \left(\frac{6}{7}\right)^2 - \frac{1}{49} = \frac{1}{\cancel{6}} \cdot \frac{\cancel{36}^6}{49} - \frac{1}{49} \\ = \frac{6}{49} - \frac{1}{49} = \frac{5}{49}$$

$$\text{ e. } \frac{1}{7} \cdot \left(\frac{7}{8}\right)^2 - \frac{1}{64} = \frac{1}{\cancel{7}} \cdot \frac{\cancel{49}^7}{64} - \frac{1}{64} \\ = \frac{7}{64} - \frac{1}{64} = \frac{6}{64} = \frac{3}{32}$$

$$31. \text{ a. } 4 \div \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 2 = 4 \cdot \frac{2}{1} \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 2 \\ = 8 \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 2 \\ = 4 \cdot \frac{1}{2} + \frac{1}{3} - 2 \\ = 2 + \frac{1}{3} - 2 \\ = 2\frac{1}{3} - 2 = \frac{1}{3}$$

$$\text{ b. } 6 \div \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 3 = 6 \cdot \frac{2}{1} \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 3 \\ = 12 \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 3 \\ = 6 \cdot \frac{1}{2} + \frac{1}{3} - 3 \\ = 3 + \frac{1}{3} - 3 \\ = 3\frac{1}{3} - 3 = \frac{1}{3}$$

$$\text{ c. } 8 \div \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 4 = 8 \cdot \frac{2}{1} \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 4 \\ = 16 \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 4 \\ = 8 \cdot \frac{1}{2} + \frac{1}{3} - 4 \\ = 4 + \frac{1}{3} - 4 \\ = 4\frac{1}{3} - 4 = \frac{1}{3}$$

$$\text{ d. } 10 \div \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 5 = 10 \cdot \frac{2}{1} \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 5 \\ = 20 \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 5 \\ = 10 \cdot \frac{1}{2} + \frac{1}{3} - 5 \\ = 5 + \frac{1}{3} - 5 \\ = 5\frac{1}{3} - 5 = \frac{1}{3}$$

$$\text{ e. } 12 \div \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 6 = 12 \cdot \frac{2}{1} \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 6 \\ = 24 \cdot \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3} - 6 \\ = 12 \cdot \frac{1}{2} + \frac{1}{3} - 6 \\ = 6 + \frac{1}{3} - 6 \\ = 6\frac{1}{3} - 6 = \frac{1}{3}$$

$$32. \text{ a. } \left(\frac{1}{2}\right)^3 \div \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{3} \left(\frac{7}{2} - \frac{1}{2}\right) - \frac{1}{3} \cdot \frac{1}{2} \\ = \left(\frac{1}{2}\right)^3 \div \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{3} \left(\frac{6}{2}\right) - \frac{1}{3} \cdot \frac{1}{2} \\ = \frac{1}{8} \div \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{3} (3) - \frac{1}{3} \cdot \frac{1}{2} \\ = \frac{1}{8} \cdot \frac{3}{1} \cdot \frac{1}{4} + \frac{1}{3} (3) - \frac{1}{3} \cdot \frac{1}{2} \\ = \frac{3}{8} \cdot \frac{1}{4} + \frac{1}{3} (3) - \frac{1}{3} \cdot \frac{1}{2} \\ = \frac{3}{32} + 1 - \frac{1}{6} = \frac{35}{32} - \frac{1}{6} = \frac{89}{96}$$

$$\begin{aligned}
 \text{b. } & \left(\frac{1}{2}\right)^3 \div \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{3} \left(\frac{9}{2} - \frac{1}{2}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \left(\frac{1}{2}\right)^3 \div \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{3} \left(\frac{8}{2}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{8} \div \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{3}(4) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{8} \cdot \frac{3}{1} \cdot \frac{1}{4} + \frac{1}{3}(4) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{3}{8} \cdot \frac{1}{4} + \frac{1}{3}(4) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{3}{32} + \frac{4}{3} - \frac{1}{6} = \frac{137}{96} - \frac{1}{6} = \frac{121}{96} = 1\frac{25}{96}
 \end{aligned}$$

$$\begin{aligned}
 \text{c. } & \left(\frac{1}{2}\right)^3 \div \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{3} \left(\frac{5}{2} - \frac{1}{2}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \left(\frac{1}{2}\right)^3 \div \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{3} \left(\frac{4}{2}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{8} \div \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{3}(2) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{8} \cdot \frac{3}{1} \cdot \frac{1}{4} + \frac{1}{3}(2) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{3}{8} \cdot \frac{1}{4} + \frac{1}{3}(2) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{3}{32} + \frac{2}{3} - \frac{1}{6} = \frac{73}{96} - \frac{1}{6} = \frac{19}{32}
 \end{aligned}$$

$$\begin{aligned}
 \text{d. } & \left(\frac{1}{2}\right)^3 \div \frac{1}{8} \cdot \frac{1}{2} + \frac{1}{3} \left(\frac{3}{2} - \frac{1}{2}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \left(\frac{1}{2}\right)^3 \div \frac{1}{8} \cdot \frac{1}{2} + \frac{1}{3}(1) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{8} \div \frac{1}{8} \cdot \frac{1}{2} + \frac{1}{3}(1) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{8} \cdot \frac{8}{1} \cdot \frac{1}{2} + \frac{1}{3}(1) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = 1 \cdot \frac{1}{2} + \frac{1}{3}(1) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{2} + \frac{1}{3} - \frac{1}{6} = \frac{5}{6} - \frac{1}{6} = \frac{4}{6} = \frac{2}{3}
 \end{aligned}$$

$$\begin{aligned}
 \text{e. } & \left(\frac{1}{2}\right)^3 \div \frac{1}{4} \cdot \frac{1}{2} + \frac{1}{3} \left(\frac{11}{2} - \frac{1}{2}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \left(\frac{1}{2}\right)^3 \div \frac{1}{4} \cdot \frac{1}{2} + \frac{1}{3} \left(\frac{10}{2}\right) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{8} \div \frac{1}{4} \cdot \frac{1}{2} + \frac{1}{3}(5) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{8} \cdot \frac{4}{1} \cdot \frac{1}{2} + \frac{1}{3}(5) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{2} \cdot \frac{1}{2} + \frac{1}{3}(5) - \frac{1}{3} \cdot \frac{1}{2} \\
 & = \frac{1}{4} + \frac{5}{3} - \frac{1}{6} = \frac{23}{12} - \frac{1}{6} = \frac{7}{4} = 1\frac{3}{4}
 \end{aligned}$$

$$\begin{aligned}
 \text{33. a. } & \frac{1}{6} \div 1\frac{1}{6} + \left\{ 16 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{3} + \left(3\frac{1}{2} - \frac{1}{2}\right) \right] \right\} \\
 & = \frac{1}{6} \div 1\frac{1}{6} + \left\{ 16 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{3} + (3) \right] \right\} \\
 & = \frac{1}{6} \div 1\frac{1}{6} + \left\{ 16 \cdot \left(\frac{1}{2}\right)^2 - \left[3\frac{1}{3} \right] \right\} \\
 & = \frac{1}{6} \div 1\frac{1}{6} + \left\{ 16 \cdot \frac{1}{4} - \left[3\frac{1}{3} \right] \right\} \\
 & = \frac{1}{6} \div \frac{7}{6} + \left\{ 4 - \left[\frac{10}{3} \right] \right\} \\
 & = \frac{1}{6} \div \frac{7}{6} + \left\{ \frac{2}{3} \right\} \\
 & = \frac{1}{\cancel{6}} \cdot \frac{\cancel{6}}{7} + \frac{2}{3} = \frac{1}{7} + \frac{2}{3} = \frac{17}{21}
 \end{aligned}$$

$$\begin{aligned}
 \text{b. } & \frac{1}{5} \div 1\frac{1}{5} + \left\{ 20 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{3} + \left(4\frac{1}{2} - \frac{1}{2}\right) \right] \right\} \\
 & = \frac{1}{5} \div 1\frac{1}{5} + \left\{ 20 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{3} + (4) \right] \right\} \\
 & = \frac{1}{5} \div 1\frac{1}{5} + \left\{ 20 \cdot \left(\frac{1}{2}\right)^2 - \left[4\frac{1}{3} \right] \right\} \\
 & = \frac{1}{5} \div 1\frac{1}{5} + \left\{ 20 \cdot \frac{1}{4} - \left[\frac{13}{3} \right] \right\} \\
 & = \frac{1}{5} \div \frac{6}{5} + \left\{ 5 - \left[\frac{13}{3} \right] \right\} \\
 & = \frac{1}{5} \div \frac{6}{5} + \left\{ \frac{2}{3} \right\} \\
 & = \frac{1}{\cancel{5}} \cdot \frac{\cancel{5}}{6} + \frac{2}{3} = \frac{1}{6} + \frac{2}{3} = \frac{5}{6}
 \end{aligned}$$

$$\begin{aligned}
 \text{c. } & \frac{1}{4} \div 1\frac{1}{4} + \left\{ 24 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{3} + \left(5\frac{1}{2} - \frac{1}{2}\right)\right] \right\} \\
 & = \frac{1}{4} \div 1\frac{1}{4} + \left\{ 24 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{3} + (5)\right] \right\} \\
 & = \frac{1}{4} \div 1\frac{1}{4} + \left\{ 24 \cdot \left(\frac{1}{2}\right)^2 - \left[5\frac{1}{3}\right] \right\} \\
 & = \frac{1}{4} \div 1\frac{1}{4} + \left\{ 24 \cdot \frac{1}{4} - \left[\frac{16}{3}\right] \right\} \\
 & = \frac{1}{4} \div \frac{5}{4} + \left\{ 6 - \left[\frac{16}{3}\right] \right\} \\
 & = \frac{1}{4} \div \frac{5}{4} + \left\{ \frac{2}{3} \right\} \\
 & = \frac{1}{\cancel{4}} \cdot \frac{\cancel{4}}{5} + \frac{2}{3} = \frac{1}{5} + \frac{2}{3} = \frac{13}{15}
 \end{aligned}$$

$$\begin{aligned}
 \text{d. } & \frac{1}{3} \div 1\frac{1}{3} + \left\{ 28 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{3} + \left(6\frac{1}{2} - \frac{1}{2}\right)\right] \right\} \\
 & = \frac{1}{3} \div 1\frac{1}{3} + \left\{ 28 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{3} + (6)\right] \right\} \\
 & = \frac{1}{3} \div 1\frac{1}{3} + \left\{ 28 \cdot \left(\frac{1}{2}\right)^2 - \left[6\frac{1}{3}\right] \right\} \\
 & = \frac{1}{3} \div 1\frac{1}{3} + \left\{ 28 \cdot \frac{1}{4} - \left[\frac{19}{3}\right] \right\} \\
 & = \frac{1}{3} \div \frac{4}{3} + \left\{ 7 - \left[\frac{19}{3}\right] \right\} \\
 & = \frac{1}{3} \div \frac{4}{3} + \left\{ \frac{2}{3} \right\} \\
 & = \frac{1}{\cancel{3}} \cdot \frac{\cancel{3}}{4} + \frac{2}{3} = \frac{1}{4} + \frac{2}{3} = \frac{11}{12}
 \end{aligned}$$

$$\begin{aligned}
 \text{e. } & \frac{1}{2} \div 1\frac{1}{2} + \left\{ 32 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{3} + \left(7\frac{1}{2} - \frac{1}{2}\right)\right] \right\} \\
 & = \frac{1}{2} \div 1\frac{1}{2} + \left\{ 32 \cdot \left(\frac{1}{2}\right)^2 - \left[\frac{1}{3} + (7)\right] \right\} \\
 & = \frac{1}{2} \div 1\frac{1}{2} + \left\{ 32 \cdot \left(\frac{1}{2}\right)^2 - \left[7\frac{1}{3}\right] \right\} \\
 & = \frac{1}{2} \div 1\frac{1}{2} + \left\{ 32 \cdot \frac{1}{4} - \left[\frac{22}{3}\right] \right\} \\
 & = \frac{1}{2} \div \frac{3}{2} + \left\{ 8 - \left[\frac{22}{3}\right] \right\} \\
 & = \frac{1}{2} \div \frac{3}{2} + \left\{ \frac{2}{3} \right\} \\
 & = \frac{1}{\cancel{2}} \cdot \frac{\cancel{2}}{3} + \frac{2}{3} = \frac{1}{3} + \frac{2}{3} = 1
 \end{aligned}$$

$$\begin{aligned}
 \text{34. a. } & \frac{3\frac{1}{2} + 4\frac{1}{4} + 2\frac{1}{2} + 7\frac{1}{4}}{4} \\
 & = \frac{5\frac{2}{2} + 11\frac{2}{4}}{4} \\
 & = \frac{5 + 1 + 11\frac{1}{2}}{4} \\
 & = \frac{17\frac{1}{2}}{4} = \frac{35}{4} = \frac{35}{2} \cdot \frac{1}{4} = \frac{35}{8} = 4\frac{3}{8} \text{ lb}
 \end{aligned}$$

$$\begin{aligned}
 \text{b. } & \frac{4\frac{1}{2} + 5\frac{1}{4} + 3\frac{1}{2} + 8\frac{1}{4}}{4} \\
 & = \frac{7\frac{2}{2} + 13\frac{2}{4}}{4} \\
 & = \frac{7 + 1 + 13\frac{1}{2}}{4} \\
 & = \frac{21\frac{1}{2}}{4} = \frac{43}{4} = \frac{43}{2} \cdot \frac{1}{4} = \frac{43}{8} = 5\frac{3}{8} \text{ lb}
 \end{aligned}$$

$$\begin{aligned}
 \text{c. } & \frac{5\frac{1}{2} + 6\frac{1}{4} + 4\frac{1}{2} + 9\frac{1}{4}}{4} \\
 & = \frac{9\frac{2}{2} + 15\frac{2}{4}}{4} \\
 & = \frac{9 + 1 + 15\frac{1}{2}}{4} \\
 & = \frac{25\frac{1}{2}}{4} = \frac{51}{4} = \frac{51}{2} \cdot \frac{1}{4} = \frac{51}{8} = 6\frac{3}{8} \text{ lb}
 \end{aligned}$$

$$\begin{aligned}
 \text{d. } & \frac{6\frac{1}{2} + 7\frac{1}{4} + 5\frac{1}{2} + 10\frac{1}{4}}{4} \\
 & = \frac{11\frac{2}{2} + 17\frac{2}{4}}{4} \\
 & = \frac{11 + 1 + 17\frac{1}{2}}{4} \\
 & = \frac{29\frac{1}{2}}{4} = \frac{59}{4} = \frac{59}{2} \cdot \frac{1}{4} = \frac{59}{8} = 7\frac{3}{8} \text{ lb}
 \end{aligned}$$

$$\begin{aligned} \text{e. } & \frac{7\frac{1}{2} + 8\frac{1}{4} + 6\frac{1}{2} + 11\frac{1}{4}}{4} \\ & = \frac{13\frac{2}{2} + 19\frac{2}{4}}{4} \\ & = \frac{13 + 1 + 19\frac{1}{2}}{4} \\ & = \frac{33\frac{1}{2}}{4} = \frac{67}{8} = \frac{67}{2} \cdot \frac{1}{4} = \frac{67}{8} = 8\frac{3}{8} \text{ lb} \end{aligned}$$

35. a. $n + 8 = 10$

b. $n - 5 = 1$

c. $2n = 12$

d. $\frac{n}{2} = 8$

e. $\frac{n}{7} = 3$

$$\begin{aligned} \text{36. a. } & p + \frac{1}{6} = \frac{1}{3} \\ & p + \frac{1}{6} - \frac{1}{6} = \frac{1}{3} - \frac{1}{6} \\ & p = \frac{1}{6} \end{aligned}$$

$$\begin{aligned} \text{b. } & q + \frac{1}{5} = \frac{1}{4} \\ & q + \frac{1}{5} - \frac{1}{5} = \frac{1}{4} - \frac{1}{5} \\ & q = \frac{1}{20} \end{aligned}$$

$$\begin{aligned} \text{c. } & r + \frac{1}{4} = \frac{2}{5} \\ & r + \frac{1}{4} - \frac{1}{4} = \frac{2}{5} - \frac{1}{4} \\ & r = \frac{3}{20} \end{aligned}$$

$$\begin{aligned} \text{d. } & s + \frac{1}{3} = \frac{5}{6} \\ & s + \frac{1}{3} - \frac{1}{3} = \frac{5}{6} - \frac{1}{3} \\ & s = \frac{1}{2} \end{aligned}$$

$$\begin{aligned} \text{e. } & t + \frac{1}{2} = \frac{6}{7} \\ & t + \frac{1}{2} - \frac{1}{2} = \frac{6}{7} - \frac{1}{2} \\ & t = \frac{5}{14} \end{aligned}$$

$$\begin{aligned} \text{37. a. } & r - \frac{1}{6} = \frac{2}{7} \\ & r - \frac{1}{6} + \frac{1}{6} = \frac{2}{7} + \frac{1}{6} \\ & r = \frac{19}{42} \end{aligned}$$

$$\begin{aligned} \text{b. } & s - \frac{1}{5} = \frac{3}{7} \\ & s - \frac{1}{5} + \frac{1}{5} = \frac{3}{7} + \frac{1}{5} \\ & s = \frac{22}{35} \end{aligned}$$

$$\begin{aligned} \text{c. } & t - \frac{1}{4} = \frac{4}{7} \\ & t - \frac{1}{4} + \frac{1}{4} = \frac{4}{7} + \frac{1}{4} \\ & t = \frac{23}{28} \end{aligned}$$

$$\begin{aligned} \text{d. } & u - \frac{1}{3} = \frac{5}{7} \\ & u - \frac{1}{3} + \frac{1}{3} = \frac{5}{7} + \frac{1}{3} \\ & u = \frac{22}{21} = 1\frac{1}{21} \end{aligned}$$

$$\begin{aligned} \text{e. } & v - \frac{1}{2} = \frac{6}{7} \\ & v - \frac{1}{2} + \frac{1}{2} = \frac{6}{7} + \frac{1}{2} \\ & v = \frac{19}{14} = 1\frac{5}{14} \end{aligned}$$

$$\begin{aligned} \text{38. a. } & \frac{v}{3} = \frac{2}{7} \\ & \cancel{3} \cdot \frac{v}{\cancel{3}} = \frac{2}{7} \cdot 3 \\ & v = \frac{6}{7} \end{aligned}$$

$$\begin{aligned} \text{b. } & \frac{v}{4} = \frac{3}{7} \\ & \cancel{4} \cdot \frac{v}{\cancel{4}} = \frac{3}{7} \cdot 4 \\ & v = \frac{12}{7} \text{ or } 1\frac{5}{7} \end{aligned}$$

$$\begin{aligned} \text{c. } & \frac{v}{5} = \frac{4}{7} \\ & \cancel{5} \cdot \frac{v}{\cancel{5}} = \frac{4}{7} \cdot 5 \\ & v = \frac{20}{7} \text{ or } 2\frac{6}{7} \end{aligned}$$

$$\begin{aligned} \text{d. } \frac{v}{6} &= \frac{5}{7} \\ \cancel{6} \cdot \frac{v}{\cancel{6}} &= \frac{5}{7} \cdot 6 \\ v &= \frac{30}{7} \text{ or } 4\frac{2}{7} \end{aligned}$$

$$\begin{aligned} \text{e. } \frac{v}{7} &= \frac{6}{7} \\ \cancel{7} \cdot \frac{v}{\cancel{7}} &= \frac{6}{\cancel{7}} \cdot \cancel{7} \\ v &= 6 \end{aligned}$$

$$\begin{aligned} \text{39. a. } \frac{1}{2} \cdot n &= 8 \\ \cancel{2} \cdot \frac{1}{\cancel{2}} \cdot n &= 8 \cdot 2 \\ n &= 16 \end{aligned}$$

$$\begin{aligned} \text{b. } \frac{2}{3} \cdot n &= 4 \\ \frac{\cancel{2}}{\cancel{3}} \cdot n &= \frac{4}{3} \\ \frac{\cancel{2}}{\cancel{3}} \cdot n &= \frac{2}{3} \\ n &= \cancel{2}^2 \cdot \frac{3}{\cancel{1}} = 6 \end{aligned}$$

$$\begin{aligned} \text{c. } \frac{3}{5} \cdot n &= 27 \\ \frac{\cancel{3}}{\cancel{5}} \cdot n &= \frac{27}{5} \\ \frac{\cancel{3}}{\cancel{5}} \cdot n &= \frac{3}{5} \\ n &= \cancel{3}^9 \cdot \frac{5}{\cancel{1}} = 45 \end{aligned}$$

$$\begin{aligned} \text{d. } \frac{2}{7} \cdot n &= 14 \\ \frac{\cancel{2}}{\cancel{7}} \cdot n &= \frac{14}{7} \\ \frac{\cancel{2}}{\cancel{7}} \cdot n &= \frac{2}{7} \\ n &= \cancel{2}^7 \cdot \frac{7}{\cancel{1}} = 49 \end{aligned}$$

$$\begin{aligned} \text{e. } \frac{6}{5} \cdot n &= 12 \\ \frac{\cancel{6}}{\cancel{5}} \cdot n &= \frac{12}{5} \\ \frac{\cancel{6}}{\cancel{5}} \cdot n &= \frac{6}{5} \\ n &= \cancel{2}^2 \cdot \frac{5}{\cancel{1}} = 10 \end{aligned}$$

$$\begin{aligned} \text{40. a. } 1 - \frac{3}{25} - \frac{7}{100} - \frac{1}{25} &= 1 - \frac{12}{100} - \frac{7}{100} - \frac{4}{100} \\ &= 1 - \frac{23}{100} \\ &= \frac{100}{100} - \frac{23}{100} \\ &= \frac{77}{100} \end{aligned}$$

$$\begin{aligned} \text{b. } 1 - \frac{6}{25} - \frac{7}{100} - \frac{2}{25} &= 1 - \frac{24}{100} - \frac{7}{100} - \frac{8}{100} \\ &= 1 - \frac{39}{100} \\ &= \frac{100}{100} - \frac{39}{100} \\ &= \frac{61}{100} \end{aligned}$$

$$\begin{aligned} \text{c. } 1 - \frac{7}{25} - \frac{7}{100} - \frac{3}{25} &= 1 - \frac{28}{100} - \frac{7}{100} - \frac{12}{100} \\ &= 1 - \frac{47}{100} \\ &= \frac{100}{100} - \frac{47}{100} \\ &= \frac{53}{100} \end{aligned}$$

$$\begin{aligned} \text{d. } 1 - \frac{8}{25} - \frac{7}{100} - \frac{4}{25} &= 1 - \frac{32}{100} - \frac{7}{100} - \frac{16}{100} \\ &= 1 - \frac{55}{100} \\ &= \frac{100}{100} - \frac{55}{100} \\ &= \frac{45}{100} \\ &= \frac{9}{20} \end{aligned}$$

$$\begin{aligned} \text{e. } 1 - \frac{9}{25} - \frac{7}{100} - \frac{6}{25} &= 1 - \frac{36}{100} - \frac{7}{100} - \frac{24}{100} \\ &= 1 - \frac{67}{100} \\ &= \frac{100}{100} - \frac{67}{100} \\ &= \frac{33}{100} \end{aligned}$$

Cumulative Review Chapters 1–2

1. $438 = 400 + 30 + 8$

2. $900 + 80 + 4 = 984$

3. 74,008: Seventy-four thousand, eight

4. 6710

5. $8\overline{6}49 \rightarrow 8600$

$$\begin{array}{r} 1 \\ 2776 \\ + 903 \\ \hline 3679 \end{array}$$

$$7. \begin{array}{r} 4 \ 12 \\ 6\cancel{2} \\ - 498 \\ \hline 4 \end{array} \rightarrow \begin{array}{r} 5 \ 14 \\ \cancel{6}\cancel{2} \\ - 4 \ 98 \\ \hline \boxed{1 \ 5 \ 4} \end{array}$$

$$8. \begin{array}{r} 12 \\ 36 \\ 137 \\ \times 319 \\ \hline 1233 \\ 137 \\ 411 \\ \hline 43,703 \end{array}$$

$$9. \begin{array}{r} 310 \\ \times 12 \\ \hline 620 \\ 310 \\ \hline 3720 \end{array}$$

The total amount of money paid is \$3720.

10. $26 \overline{)889}$ Answer: 34 r 5

$$\begin{array}{r} 34 \\ 26 \overline{)889} \\ \underline{78} \\ 109 \\ \underline{104} \\ 5 \end{array}$$

$$11. \begin{array}{r} 2 \overline{)24} \\ \underline{2} \\ 12 \\ \underline{12} \\ 0 \end{array}$$

Thus, the prime factors of 24 are 2 and 3.

$$12. \begin{aligned} 180 &= 18 \times 10 \\ &= 2 \times 9 \times 2 \times 5 \\ &= 2 \times 3 \times 3 \times 2 \times 5 \\ &= 2^2 \times 3^2 \times 5 \end{aligned}$$

$$13. 2^3 \times 4 \times 7^0 = 8 \times 4 \times 1 = 32 \times 1 = 32$$

$$14. \begin{aligned} 36 \div 6 \cdot 6 + 8 - 4 &= 6 \cdot 6 + 8 - 4 \\ &= 36 + 8 - 4 \\ &= 44 - 4 \\ &= 40 \end{aligned}$$

$$15. \begin{aligned} 26 &= m + 3 \\ 26 - 3 &= m + 3 - 3 \\ 23 &= m \end{aligned}$$

$$16. \begin{aligned} 21 &= 7x \\ \frac{21}{7} &= \frac{\cancel{7}x}{\cancel{7}} \\ 3 &= x \end{aligned}$$

17. $\frac{2}{3}$ is proper, since the numerator is less than the denominator.

$$18. \frac{11}{2} = 5\frac{1}{2}$$

$$19. 2\frac{1}{4} = \frac{4 \times 2 + 1}{4} = \frac{8 + 1}{4} = \frac{9}{4}$$

21. $\frac{2}{3} = \frac{18}{?}$, $\frac{2}{3} = \frac{2 \cdot 9}{3 \cdot 9} = \frac{18}{27}$. The missing number is 27.

$$22. \frac{10}{12} = \frac{\cancel{2} \times 5}{\cancel{2} \times 6} = \frac{5}{6}$$

23. $\frac{3}{4}$ and $\frac{5}{6}$; $3 \times 6 = 18 < 4 \times 5 = 20$ so $\frac{3}{4} < \frac{5}{6}$

$$24. \frac{1}{2} \cdot 6\frac{1}{3} = \frac{1}{2} \cdot \frac{19}{3} = \frac{19}{6} = 3\frac{1}{6}$$

$$25. \left(\frac{7}{6}\right)^2 \cdot \frac{1}{49} = \left(\frac{7}{6} \cdot \frac{7}{6}\right) \cdot \frac{1}{49} = \frac{\cancel{49}}{36} \cdot \frac{1}{\cancel{49}} = \frac{1}{36}$$

$$26. \frac{6}{7} \div 1\frac{1}{3} = \frac{6}{7} \div \frac{4}{3} = \frac{6}{7} \cdot \frac{3}{4} = \frac{9}{14}$$

$$27. \text{LCD} = 3 \cdot 10 = 30$$

$$\begin{aligned} 7\frac{1}{3} + 9\frac{3}{10} &= \frac{22}{3} + \frac{93}{10} \\ &= \frac{22 \cdot 10}{3 \cdot 10} + \frac{93 \cdot 3}{10 \cdot 3} \\ &= \frac{220}{30} + \frac{279}{30} \\ &= \frac{220 + 279}{30} = \frac{499}{30} = 16\frac{19}{30} \end{aligned}$$

$$\begin{aligned} 28. \quad 8\frac{1}{7} - 1\frac{8}{9} &= \frac{57}{7} - \frac{17}{9} \\ &= \frac{57 \cdot 9}{7 \cdot 9} - \frac{17 \cdot 7}{9 \cdot 7} \\ &= \frac{513}{63} - \frac{119}{63} \\ &= \frac{513 - 119}{63} = \frac{394}{63} = 6\frac{16}{63} \end{aligned}$$

$$\begin{aligned} 29. \quad z - \frac{6}{7} &= \frac{4}{9} \\ z - \frac{6}{7} + \frac{6}{7} &= \frac{4}{9} + \frac{6}{7} \\ z &= \frac{28}{63} + \frac{54}{63} \\ z &= \frac{28 + 54}{63} = \frac{82}{63} \end{aligned}$$

$$30. \text{ Let } n = \text{the number.}$$

$$\begin{aligned} \frac{9}{10}n &= 5\frac{1}{5} \\ \frac{9}{10}n &= \frac{26}{5} \\ \frac{\cancel{9}}{\cancel{10}}n &= \frac{26}{5} \\ \frac{9}{10} &= \frac{9}{10} \\ n &= \frac{26}{\cancel{9}} \cdot \frac{\cancel{10}^2}{9} = \frac{52}{9} = 5\frac{7}{9} \end{aligned}$$

The number is $5\frac{7}{9}$.

$$\begin{aligned} 31. \quad 3\frac{1}{2} &= \frac{7}{2} \text{ lb cost } 49\text{¢ so } 1 \text{ lb would cost} \\ 49 \div \frac{7}{2} &= \cancel{49} \cdot \frac{2}{\cancel{7}_1} = 14 \text{ ¢. Thus } 8 \text{ lb} \\ &\text{ would cost } 8 \cdot 14 = 112 \text{ ¢ or } \$1.12. \end{aligned}$$

$$\begin{aligned} 32. \text{ Perimeter} &= 4\frac{1}{3} + 6\frac{2}{3} + 4\frac{1}{3} + 6\frac{2}{3} \\ &= 20\frac{1+2+1+2}{3} \\ &= 20\frac{6}{3} = 20 + 2 = 22 \text{ yards} \end{aligned}$$

$$\begin{aligned} 33. \text{ Area} &= \left(4\frac{1}{3}\right) \cdot \left(6\frac{2}{3}\right) \\ &= \frac{13}{3} \cdot \frac{20}{3} = \frac{260}{9} = 28\frac{8}{9} \text{ sq. yd.} \end{aligned}$$

$$\begin{aligned} 34. \quad 16 &= 2^4 \text{ and } 20 = 2^2 \cdot 5 \\ \text{LCM} &= 2^4 \cdot 5 = 80 \end{aligned}$$

$$35. \text{ Since } 76 \text{ is a multiple of } 19, \text{ LCM} = 76.$$

$$\begin{aligned} 36. \quad 9 &= 3^2 \text{ and } 12 = 2^2 \cdot 3 \\ \text{LCD} &= 3^2 \cdot 2^2 = 36 \\ \frac{7}{9} &= \frac{7 \times 4}{9 \times 4} = \frac{28}{36}, \quad \frac{5}{12} = \frac{5 \times 3}{12 \times 3} = \frac{15}{36} \end{aligned}$$

$$\begin{aligned} 37. \quad & \begin{array}{r} 2 \overline{)10 \ 6 \ 5} \\ 5 \overline{) \ 5 \ 3 \ 5} \\ \hline 1 \ 3 \ 1 \end{array} \quad \text{LCD} = 2 \cdot 5 \cdot 1 \cdot 3 \cdot 1 = 30 \\ \frac{7}{10} &= \frac{7 \times 3}{10 \times 3} = \frac{21}{30}, \quad \frac{5}{6} = \frac{5 \times 5}{6 \times 5} = \frac{25}{30}, \\ \frac{3}{5} &= \frac{3 \times 6}{5 \times 6} = \frac{18}{30} \end{aligned}$$

