Solution manual for Basic College Mathematics through Applications 5th Edition by Akst and Bragg 0321733398 9780321733399

Chapter 2

FRACTIONS

2.1 Factors and Prime Numbers

Exercises

2. A <u>composite</u> number is a whole number that has more than two factors.

4. The <u>least common multiple</u> of two or more numbers is the smallest nonzero number that is a multiple of each number.

6. The <u>divisibility</u> test for 10 is to check if the ones digit is 0.

8. $\dfrac{10}{1} = 10\,R0$ $\dfrac{10}{2} = 5\,R0$

The factors of 10 are 1, 2, 5, and 10.

10. $\dfrac{9}{1} = 9\,R0$ $\dfrac{9}{3} = 3\,R0$

The factors of 9 are 1, 3, and 9.

12. $\dfrac{15}{1} = 15\,R0$ $\dfrac{15}{3} = 5\,R0$

The factors of 15 are 1, 3, 5, and 15.

14. $\dfrac{47}{} = 47\,R0$

22. $\dfrac{48}{} = 48$ $\dfrac{48}{} = 24$ $\dfrac{48}{} = 16\,R0$

$\dfrac{R0}{1}$ $\dfrac{R0}{2}$ 3

$\dfrac{48}{4} = 12\,R0$ $\dfrac{48}{6} = 8\,R0$

The factors of 48 are 1, 2, 3, 4, 6, 8, 12, 16, 24, and 48.

24. 7 is prime.

26. 24 is composite; 2, 3, 4, 6, 8, and 12 are factors.

28. 75 is composite; 3, 5, 15, and 25 are factors.

30. 31 is prime.
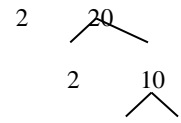
32. 45 is composite; 3, 5, 9 and 15 are factors.

34. 10 = 2 × 5

36. 14 = 2 × 7

38. $18 = 2 \times 3 \times 3 = 2 \times 3^2$

40. 40

1

The factors of 47 are 1 and 47.

16. $\dfrac{35}{} = 35\,R0$ $\dfrac{35}{} = 7\,R0$

2   20

2   10

1   5

The factors of 35 are 1, 5, 7, and 35.

2   5

18. $\dfrac{73}{} = $ 73 R0

The factors of 73 are 1 and 73.

$$40 = 2 \times 2 \times 2 \times 5 = 2^3 \times 5$$

42.

```
     63
    /  \
   3    21
        / \
       3   7
```

$$63 = 3 \times 3 \times 7 = 3^2 \times 7$$

20. $\dfrac{98}{1} = 98\ R0$ $\dfrac{98}{2} = 49\ R0$ $\dfrac{98}{7} = 14\ R0$

The factors of 98 are 1, 2, 7, 14, 49, and 98.

44.
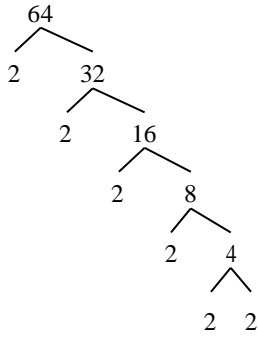
```
     57
    /  \
   3    19
```

$$57 = 3 \times 19$$

46.

```
     49
    /  \
   7    7
```

$$49 = 7 \times 7 = 7^2$$

.

13

48.

```
        64
       /  \
      2    32
          /  \
         2    16
             /  \
            2    8
                / \
               2   4
                  / \
                 2   2
```

$64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^6$

50.

```
      22
     /  \
    2    11
```

$22 = 2 \times 11$

52.

```
     105
    /   \
   3     35
        /  \
       5    7
```

$105 = 3 \times 5 \times 7$

54.

```
      169
     /   \
    13    13
```
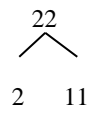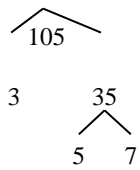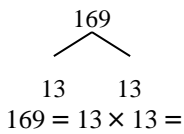
$169 = 13 \times 13 =$

56. 13^2

```
      62
     /  \
    2    31
```

$62 = 2 \times 31$

58.

```
     200
    /   \
   2    100
        /  \
       2    50
           /  \
          2    25
              /  \
             5    5
```

$200 = 2 \times 2 \times 2 \times 5 \times 5 = 2^3 \times 5^2$

60.

```
      90
     /  \
    2    45
        /  \
```

62.

```
      400
     /   \
    2    200
        /   \
       2    100
           /   \
          2     50
              /   \
             2     25
                  /  \
                 5    5
```
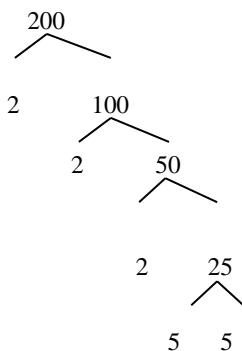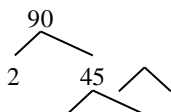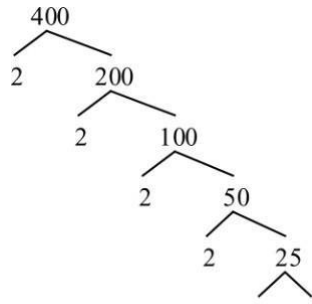
$400 = 2 \times 2 \times 2 \times 2 \times 5 \times 5 = 2^4 \times 5^2$

64. $9 = 3^2$ $12 = 2^2 \times 3$

LCM $= 2^2 \times 3^2 = 4 \times 9 = 36$

66. $4 = 2^2$ $6 = 2 \times 3$

LCM $= 2^2 \times 3 = 4 \times 3 = 12$

68. $20 = 2^2 \times 5$ $21 = 3 \times 7$

LCM $= 2^2 \times 3 \times 5 \times 7 = 4 \times 3 \times 5 \times 7 = 420$

70. $15 = 3 \times 5$ $60 = 2^2 \times 3 \times 5$

LCM $= 2^2 \times 3 \times 5 = 4 \times 3 \times 5 = 60$

72. $30 = 2 \times 3 \times 5$ $150 = 2 \times 3 \times 5^2$

LCM $= 2 \times 3 \times 5^2 = 2 \times 3 \times 25 = 150$

74. $100 = 2^2 \times 5^2$ $90 = 2 \times 3^2 \times 5$

LCM $= 2^2 \times 3^2 \times 5^2 = 4 \times 9 \times 25 = 900$

76. $2 = 2$ $8 = 2^3$ $10 = 2 \times 5$

LCM $= 2^3 \times 5 = 8 \times 5 = 40$

78. $2 = 2$ $3 = 3$ $5 = 5$

LCM $= 2 \times 3 \times 5 = 6 \times 5 = 30$

80. $6 = 2 \times 3$ $8 = 2^3$ $12 = 2^2 \times 3$

LCM $= 2^3 \times 3 = 8 \times 3 = 24$

82. $8 = 2^3$ $24 = 2^3 \times 3$ $56 = 2^3 \times 7$

```
    3       15
```

LCM = $2^3 \times 3 \times 7 = 8 \times 3 \times 7 = 168$

84. 63 is composite; 3, 7, 9, and 21 are factors.

3
5 **86.**

$5 = 5$ $10 = 2 \times 5$ $12 = 2^2 \times 3$

$90 = 2 \times 3 \times 3 \times 5 = 2 \times 3^2 \times 5$

LCM $= 2^2 \times 3 \times 5 = 4 \times 15 = 60$

88. a.

$$4 \overline{)196} \quad 49 \text{ R0}$$

Yes, because 196 is a multiple of 4.

b. $4 \overline{)198}$ $\underline{49}$ R2

     No, because 198 is not a multiple of 4.

90. Yes, an oil change would be recommended at 21,000 miles, because 21,000 is divisible by 3,000.

92. LCM(4, 3) = 12 . Both prizes will be given in 2006 + 12 = 2018.

94. $6 = 2 \times 3; 3 = 3; 4 = 2 \times 2$

     LCM(6,3,4) = $2^2 \times 3 = 12$, so the bills will all fall due again in 12 months.

Mindstretchers

1. a. 57 = 7 + 19 + 31 or 57 = 3 + 17 + 37

     b. 81 = 11 + 23 + 47 or 81 = 7 + 37 + 37

2. $1 = 1 \; 2 = 2 \; 3 = 3 \; 4 = 2^2 \; 5 = 5$

     $6 = 2 \times 3 \; 7 = 7 \; 8 = 2^3 \; 9 = 3^2 \; 10 = 2 \times 5$

     LCM = $1 \times 2^3 \times 3^2 \times 5 \times 7 = 2{,}520$

3. $715 \times 7 \times 11 \times 13 = 715{,}715$

2.2   Introduction to Fractions

Exercises

2. The improper fraction $\dfrac{5}{2}$ can be expressed as a <u>mixed</u> number.

4. Divide the numerator and denominator of a fraction by the same whole number in order to <u>simplify</u> it.

6. The <u>least common denominator</u> of two or more fractions is the least common multiple of their denominators.

8. There are 4 equal parts of which 1 part is shaded. The fraction is $\dfrac{1}{4}$.

10. There are 5 equal parts of which 4 parts are shaded. The fraction is $\dfrac{4}{5}$.

12. There are 2 wholes and $\dfrac{2}{5}$ of a whole shaded.

14. There is 1 whole shaded and $\dfrac{6}{8}$ of a whole shaded. The mixed number is $1\dfrac{6}{8}$.

16. $\dfrac{6}{11}$

18. $\dfrac{4}{10}$

20. $\dfrac{11}{11}$

22. $\dfrac{8}{3}$

24. $4\dfrac{1}{5}$
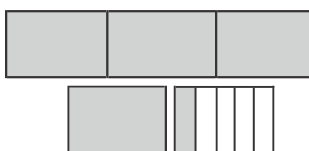
26. $3\dfrac{4}{9}$

28. $\dfrac{7}{12}$, proper

30. $\dfrac{11}{10}$, improper

32. $12\dfrac{1}{2}$, mixed number

34. $\dfrac{4}{4}$, improper

36. $\dfrac{5}{6}$, proper

38. $10\dfrac{3}{4}$, mixed number

40. $1\dfrac{1}{3} = \dfrac{(3 \times 1) + 1}{3} = \dfrac{4}{3}$

The mixed number is $2\frac{3}{5}$.

3   3   3

42. $10\dfrac{2}{3} = \dfrac{(3 \times 10) + 2}{3} = \dfrac{32}{3}$

44. $12\dfrac{3}{4} = \dfrac{(4 \times 12) + 3}{4} = \dfrac{51}{4}$

46. $8 = \dfrac{8}{1}$

48. $6\dfrac{5}{6} = \dfrac{(6 \times 6) + 5}{6} = \dfrac{41}{6}$

50. $10\dfrac{1}{2} = \dfrac{(2 \times 10) + 1}{2} = \dfrac{21}{2}$

52. $20\dfrac{1}{8} = \dfrac{(8 \times 20) + 1}{8} = \dfrac{161}{8}$

54. $11\dfrac{5}{7} = \dfrac{(7 \times 11) + 5}{7} = \dfrac{82}{7}$

56. $10 = \dfrac{10}{1}$

58. $2\dfrac{7}{+7} = \dfrac{(13 \times 2)}{13} = \dfrac{33}{13}$

60. $4\dfrac{1}{6} = \dfrac{(6 \times 4) + 1}{6} = \dfrac{25}{6}$

62. $14\dfrac{1}{10} = \dfrac{(10 \times 14) + 1}{10} = \dfrac{141}{10}$

64. $\dfrac{6}{1} = 5\overline{\smash{)}6}^{\,1\,R1} \quad \dfrac{6}{5} = \dfrac{1}{5}$

66. $\dfrac{12}{5} = 5\overline{\smash{)}12}^{\,2\,R2} \quad \dfrac{12}{5} = 2\dfrac{2}{5}$

78. $\dfrac{41}{8} = 8\overline{\smash{)}41}^{\,5\,R1} \quad \dfrac{41}{8} = 5\dfrac{1}{8}$

80. $\dfrac{58}{11} = 11\overline{\smash{)}58}^{\,5\,R3} \quad \dfrac{58}{11} = 5\dfrac{3}{11}$

82. $\dfrac{38}{3} = 3\overline{\smash{)}38}^{\,12\,R2} \quad \dfrac{38}{3} = 12\dfrac{2}{3}$

84. $\dfrac{72}{9} = 9\overline{\smash{)}72}^{\,8\,R0} \quad \dfrac{72}{9} = 8$

86. $\dfrac{19}{1} = 1\overline{\smash{)}19}^{\,19\,R0} \quad \dfrac{19}{1} = 19$

88. Possible answers:
$$\dfrac{3}{10} = \dfrac{3 \cdot 2}{10 \cdot 2} = \dfrac{6}{20}$$
$$\dfrac{3}{10} = \dfrac{3 \cdot 3}{10 \cdot 3} = \dfrac{9}{30}$$

90. Possible answers:
$$\dfrac{1}{10} = \dfrac{1 \cdot 2}{10 \cdot 2} = \dfrac{2}{20}$$
$$\dfrac{1}{10} = \dfrac{1 \cdot 3}{10 \cdot 3} = \dfrac{3}{30}$$

92. Possible answers:
$$\dfrac{5}{6} = \dfrac{5 \cdot 2}{6 \cdot 2} = \dfrac{10}{12}$$
$$\dfrac{5}{6} = \dfrac{5 \cdot 3}{6 \cdot 3} = \dfrac{15}{18}$$

94. Possible answers:
$$\dfrac{3}{5} = \dfrac{3 \cdot 2}{5 \cdot 2} = \dfrac{6}{10}$$
$$\dfrac{3}{5} = \dfrac{3 \cdot 3}{5 \cdot 3} = \dfrac{9}{15}$$

96. $\dfrac{2}{9} = \dfrac{2 \cdot 2}{9 \cdot 2} = \dfrac{4}{18}$

98. $\dfrac{7}{10} = \dfrac{7 \cdot 2}{10 \cdot 2} = \dfrac{14}{20}$

100. $5 = \dfrac{5}{1} = \dfrac{5 \cdot 15}{1 \cdot 15} = \dfrac{75}{15}$

102. $\dfrac{4}{9} = \dfrac{4 \cdot 7}{9 \cdot 7} = \dfrac{28}{63}$

104. $\dfrac{3}{10} = \dfrac{3 \cdot 4}{10 \cdot 4} = \dfrac{12}{40}$

68. $\dfrac{5}{12} = 12\overline{\smash{)}12}^{\,1\ R0}$ $\dfrac{5}{12} = 1$

106. $2\quad = \dfrac{2}{1} = \dfrac{2\cdot 21}{1\cdot 21} = \dfrac{42}{21}$

12) 12

108. $\dfrac{7}{} = \dfrac{7 \cdot 3}{} = \dfrac{21}{}$ **110.** $\dfrac{5}{} = \dfrac{5 \cdot 8}{} = \dfrac{40}{}$

70. $\dfrac{100}{100} = 100$ $\quad$ 1 R0 $\quad$ $\dfrac{100}{100} = 1$

$\qquad 100 \overline{)100}$

72. $\dfrac{31}{2} =$ $\quad$ 2 $\overline{)31}$ $\begin{array}{l}15\text{ R1}\end{array}$ $\quad$ $\dfrac{31}{2} = 15\dfrac{1}{2}$

74. $\dfrac{62}{3} = 3\overline{)62}$ $\begin{array}{l}20\text{ R2}\end{array}$ $\quad$ $\dfrac{62}{3} = 20\dfrac{2}{3}$

76. $\dfrac{40}{3} = 3\overline{)40}$ $\begin{array}{l}13\text{ R1}\end{array}$ $\quad$ $\dfrac{40}{3} = 13\dfrac{1}{3}$

112. $\dfrac{1}{3} = \dfrac{1\cdot30}{3\cdot30} = \dfrac{30}{90}$ $\qquad$ **114.** $\dfrac{1}{4} = \dfrac{1\cdot25}{4\cdot25} = \dfrac{25}{100}$

116. $\dfrac{7}{8} = \dfrac{7\cdot7}{8\cdot7} = \dfrac{49}{56}$ $\qquad$ **118.** $\dfrac{5}{6} = \dfrac{5\cdot24}{6\cdot24} = \dfrac{120}{144}$

120. $\dfrac{9}{12} = \dfrac{3\cdot3}{3\cdot4} = \dfrac{3}{4}$ $\qquad$ **122.** $\dfrac{21}{21} = \dfrac{3\cdot7}{3\cdot7} = 1$

3   3   3

124. $\dfrac{4}{24} = \dfrac{\cancel{2}\cdot\cancel{2}}{2\cdot2\cdot2\cdot3} = \dfrac{1}{6}$ **126.** $\dfrac{25}{49} = \dfrac{5}{7\cdot7} = \dfrac{25}{49}$

$\dfrac{5}{49} \qquad \dfrac{25}{49}$

128. $\dfrac{75}{100} = \dfrac{3\cdot\cancel{25}}{4\cdot\cancel{25}} = \dfrac{3}{4}$

130. $\dfrac{875}{1{,}000} = \dfrac{\cancel{5}\cdot\cancel{5}\cdot5\cdot7}{\cancel{5}\cdot\cancel{5}\cdot5\cdot8} = \dfrac{7}{8}$

132. $\dfrac{15}{9} = \dfrac{3\cdot5}{3\cdot3} = \dfrac{5}{3} = 1\dfrac{2}{3}$

134. $\dfrac{30}{18} = \dfrac{5\cdot\cancel{6}}{3\cdot\cancel{6}} = \dfrac{5}{3} = 1\dfrac{2}{3}$

136. $\dfrac{36}{45} = \dfrac{9\cdot4}{9\cdot5} = \dfrac{4}{5}$ **138.** $\dfrac{19}{51} = \dfrac{19}{51}$

140. $\dfrac{36}{144} = \dfrac{9\cdot4}{9\cdot4\cdot4} = \dfrac{1}{4}$

142. $\dfrac{21}{36} = \dfrac{3\cdot7}{3\cdot12} = \dfrac{7}{12}$

144. $11\dfrac{51}{11} = \dfrac{1\cdot51}{11} = 11\dfrac{1}{11}$

$\dfrac{102}{144} = \dfrac{2\cdot51}{1} = 2$

$\underline{144}$

156. $2 = 2 \quad 3 = 3 \quad 4 = 2^2$

LCM $= 2^2\cdot3 = 4\cdot3 = 12$

$\dfrac{3}{2} = \dfrac{3\cdot6}{2\cdot6} = \dfrac{18}{12}$

$\dfrac{3}{3} = \dfrac{3\cdot4}{3\cdot4} = \dfrac{12}{12}$

$\dfrac{3}{4} = \dfrac{3\cdot3}{4\cdot3} = \dfrac{9}{12}$

In increasing order, the fractions are $\dfrac{3}{4}, \dfrac{3}{3}, \dfrac{3}{2}$.

158. $4 = 2^2 \quad 6 = 2\cdot3 \quad 8 = 2^3$

LCM $= 2^3\cdot3 = 8\cdot3 = 24$

$\dfrac{3}{4} = \dfrac{3\cdot6}{4\cdot6} = \dfrac{18}{24}$

$\dfrac{5}{6} = \dfrac{5\cdot4}{6\cdot4} = \dfrac{20}{24}$

$\dfrac{7}{8} = \dfrac{7\cdot3}{8\cdot3} = \dfrac{21}{24}$

In increasing order, the fractions are $\dfrac{3}{4}, \dfrac{5}{6}, \dfrac{7}{8}$.

160. $8 = 2^3 \quad 2 = 2 \quad 11 = 11$

LCM $= 2^3\cdot11 = 8\cdot11 = 88$

$\dfrac{5}{8} = \dfrac{5\cdot11}{8\cdot11} = \dfrac{55}{88}$

$\dfrac{1}{2} = \dfrac{1\cdot44}{2\cdot44} = \dfrac{44}{88}$

$\dfrac{4}{11} = \dfrac{4\cdot8}{11\cdot8} = \dfrac{32}{88}$

In increasing order, the fractions are $\dfrac{4}{11}, \dfrac{1}{2}, \dfrac{5}{8}$.

162. $6\overline{\smash)32}\;\;5\;R2 \quad \dfrac{32}{6} = 5\dfrac{2}{6} = 5\dfrac{1}{3}$

$\sqrt{}$

146. $\sqrt{144} = 1 + 1 = 2$

148. $\dfrac{5}{10} > \dfrac{3}{10}$ because $5 > 3$

164. $\dfrac{9}{10}$

$= \dfrac{2}{?}$ because $9 \cdot 4 = 12 \cdot 3,\ 36 = 36$

150. $\dfrac{5}{6} < \dfrac{7}{8}$ because $\dfrac{20}{24} < \dfrac{21}{24}$

152

$\dfrac{1}{6}$

166.

$$\frac{12}{4}$$

154. $2\frac{3}{7} > 1\frac{1}{2}$ because $\frac{17}{7} > \frac{3}{2}$ since $\frac{34}{14} > \frac{21}{14}$

$$2\frac{19}{8} = \frac{3}{8}$$

168. $\frac{1}{2}$ $\overline{4\ 6}$ $\frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$

There are $1\frac{1}{2}$ cloves per serving.

170. a. The total number of therapists is
$182,000 + 94,000 = 276,000$. The fraction of
therapists who are physical therapists is
$\dfrac{182,000}{276,000} = \dfrac{182}{276} = \dfrac{91}{138}$.

b. The fraction of therapists who are respiratory
therapists is $\dfrac{94,000}{276,000} = \dfrac{94}{276} = \dfrac{47}{138}$.

172. The Lakers did not win $82 - 65 = 17$ games.

This is $\dfrac{17}{82}$ of the games played.

174. $\dfrac{1}{9} = \dfrac{1 \cdot 4}{9 \cdot 4} = \dfrac{4}{36}$

$\dfrac{9}{5} = \dfrac{9 \cdot 4}{5} = \dfrac{36}{36}$

There is a greater probability of getting a 6

because $\dfrac{5}{36} > \dfrac{1}{9}$.

176. The LCM of 2, 8, and 16 is 16.

$\dfrac{1}{16} = \dfrac{1}{16}$ $\quad$ $\dfrac{1}{8} = \dfrac{1 \cdot 2}{8 \cdot 2} = \dfrac{2}{16}$ $\quad$ $\dfrac{1}{2} = \dfrac{1}{2} \cdot \dfrac{8}{8} = \dfrac{8}{16}$

a. Newark Airport had the best visibility at

$\dfrac{1}{2}$ mi.

b. Kennedy Airport had the worst visibility at
$\dfrac{1}{16}$ mi.

178. average age $= \dfrac{57 + 61 + 57 + 57 + 58 + 57}{6}$

$= \dfrac{347}{6}$ yr $= 57\dfrac{5}{6}$ yr

Mindstretchers

2.3 Adding and Subtracting Fractions

Exercises

2. To subtract unlike fractions, rewrite them as
<u>equivalent</u> fractions with the same denominator.

4. Fractions with equal numerators and
<u>denominators</u> are equivalent to 1.

6. $\dfrac{7}{10} + \dfrac{9}{10} = \dfrac{16}{10} = 1\dfrac{6}{10}$ or $1\dfrac{3}{5}$

8. $\dfrac{71}{100} + \dfrac{7}{5} = \dfrac{150}{100} =$ or $1\dfrac{1}{2}$

10. $\dfrac{1}{7} + \dfrac{3}{7} + \dfrac{2}{7} = \dfrac{6}{7}$

12. $\dfrac{1}{10} + \dfrac{3}{10} + \dfrac{1}{10} = \dfrac{5}{10} = \dfrac{1}{2}$

14. $\dfrac{1}{4} = \dfrac{5}{20}$

$+ \dfrac{2}{8} = + \dfrac{5}{20}$

$\overline{} \quad \dfrac{13}{20}$

16. $\dfrac{1}{6} = \dfrac{1}{6}$

$+ \dfrac{2}{3} = + \dfrac{4}{6}$

$\overline{} \quad \dfrac{5}{6}$

18. $\dfrac{5}{6} = \dfrac{10}{12}$

$+ \dfrac{1}{1} = + \dfrac{12}{12}$

$\overline{1\dfrac{12}{12}} \quad \dfrac{11}{12}$

20. $\dfrac{3}{4} = \dfrac{21}{28}$

$+ \dfrac{3}{3} = + \dfrac{12}{28}$

$\overline{\dfrac{7}{28}} \quad \dfrac{33}{28} = 1\dfrac{5}{28}$

22. $\dfrac{9}{10} = \dfrac{9}{10}$

$+ \dfrac{4}{10} = + \dfrac{8}{10}$

1. The shaded center triangle is equivalent
to 4 of the smaller shaded triangles, so

there are 7 shaded triangles. There are 9 unshaded triangles,

so there are 16 triangles in total. $\frac{7}{16}$ of the triangle is shaded.

2. There are an infinite number of fractions, such as

$$\frac{3}{2} = \frac{1}{1}, \frac{4}{2} = 1\frac{1}{3}, \frac{5}{3} = 1\frac{1}{4}, \text{ and so on.}$$

$$\frac{5}{10} \quad \frac{10}{10}$$
$$\frac{17}{10} = 1\frac{7}{10}$$

24. $\frac{7}{20} = \frac{7}{20}$

$\frac{3}{15}$

3. a. $42 = 42$; $174 = 174$; $406 = 406$

b. $\frac{2}{4} = \frac{3}{6} = \frac{79}{158}$

$$\frac{+}{4} = \frac{+}{20}$$

$$\frac{22}{20} = 1\frac{2}{20} = 1\frac{1}{10}$$

26. $\dfrac{1}{5} + \dfrac{1}{6} + \dfrac{1}{3} = \dfrac{6}{30} + \dfrac{5}{30} + \dfrac{10}{30} = \dfrac{21}{30} = \dfrac{7}{10}$

28. $\dfrac{3}{10} + \dfrac{1}{3} + \dfrac{1}{9} = \dfrac{27}{90} + \dfrac{30}{90} + \dfrac{10}{90} =$

$\dfrac{67}{90}$

30. $\dfrac{1}{2} = \dfrac{6}{12}$

$\dfrac{1}{3} = \dfrac{4}{12}$

$+\dfrac{1}{4} = +\dfrac{3}{12}$

$\dfrac{13}{12} = 1\dfrac{1}{12}$

32. $\dfrac{1}{10} = \dfrac{3}{30}$

$\dfrac{7}{}$

$\dfrac{2}{5} = \dfrac{12}{30}$

$+\dfrac{5}{6} = +\dfrac{25}{30}$

$\dfrac{40}{30} = 1\dfrac{10}{30} = 1\dfrac{1}{3}$

34. $4\dfrac{1}{5}$

$+2\phantom{\dfrac{1}{1}}$

$6\dfrac{5}{}$

Check: $4\dfrac{1}{5} + 2$

$\downarrow \quad \downarrow$

$4 + 2 = 6$

36. $6\dfrac{1}{12}$

$+4\dfrac{1}{12}$

$10\dfrac{2}{12} = 10\dfrac{1}{6}$

Check: $6\dfrac{1}{12} + 4\dfrac{1}{12}$

$\downarrow \quad \downarrow$

$6 + 4 = 10$

38. $8\dfrac{2}{3}$

40. $2\dfrac{3}{10}$

44. $4\dfrac{7}{10} = 4\dfrac{14}{20}$

$+\dfrac{7}{20} = +\dfrac{7}{20}$

$4\dfrac{21}{20} = 5\dfrac{1}{}$

Check: $4\dfrac{7}{10} + 7\dfrac{20}{20}$

$\downarrow \quad \downarrow$

$5 + 0 = 5$

46. $4\dfrac{1}{9} = 4\dfrac{10}{90}$

$+20 = +20\dfrac{63}{90}$

$24\dfrac{73}{90}$

Check: $4\dfrac{1}{9} + 20\dfrac{7}{10}$

$\downarrow \quad \downarrow$

$4 + 21 = 25$

48. $\dfrac{1}{5} =$

$+3\dfrac{6}{2} = \dfrac{30}{}$

$+3\dfrac{12}{}$

$\dfrac{5}{} \quad \dfrac{30}{}$

$\dfrac{17}{}$

$3\dfrac{30}{}$

Check: $\dfrac{1}{2} + 3$

$\downarrow \quad \downarrow$

$6 \quad 5$

$0 + 3 = 3$

50. $20\dfrac{3}{5} = 20\dfrac{6}{10}$

$+4\dfrac{1}{2} = +4\dfrac{5}{10}$

$24\dfrac{11}{10} = 25\dfrac{1}{}$

Check: $20\dfrac{3}{5} + 4\dfrac{1}{2}$

$\downarrow \quad \downarrow$

$21 + 5 = 26$

52. $4\dfrac{8}{} = 4\dfrac{8}{}$

$+6\dfrac{2}{}$

$$\underline{3}$$

$$+7\frac{9}{10}$$

$$\overset{9}{\underset{3}{+5}}\frac{1}{} = \overset{9}{+5}$$

$$14\frac{4}{3} = 15\frac{1}{3} \qquad\qquad 9\frac{12}{10} = 10\frac{2}{10} = 10\frac{1}{5} \qquad\qquad \frac{3}{} \qquad \frac{9}{}$$

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

Check: $8\frac{2}{3} + 6\frac{2}{3}$ Check: $2\frac{3}{10} + 7\frac{9}{10}$

$\quad\quad\quad \downarrow \quad \downarrow \quad\quad\quad\quad\quad\quad \downarrow \quad \downarrow$

Check: $4\frac{8}{9} + 5\frac{1}{3}$

$$9 + 7 = 16 \qquad\qquad 2 + 8 = 10 \qquad\qquad \downarrow \quad \downarrow$$

$$5 + 5 = 10$$

42.
$$17\frac{3}{8} = 17\frac{15}{40}$$

$$+20\frac{1}{8} = +20\frac{5}{40}$$

$$\underline{\phantom{+20\frac{1}{8}}} = \underline{\phantom{+20\frac{5}{40}}}$$

$$37\frac{23}{40}$$

Check: $17\frac{3}{8} + 20\frac{1}{5}$

$$\downarrow \quad \downarrow$$
$$17 + 20 = 37$$

54.
$$10\frac{5}{6} = 10\frac{10}{12}$$

$$+\,8\frac{1}{4} = +\,8\frac{3}{12}$$

$$\underline{\phantom{+8\frac{1}{4}}} \quad \underline{\phantom{+8\frac{3}{12}}}$$

$$18\frac{13}{12} \text{ or } 19\frac{1}{12}$$

Check: $10\frac{5}{6} + 8\frac{1}{4}$

$$\downarrow \quad \downarrow$$
$$11 + 8 = 19$$

56.
$$8\frac{3}{10} = 8\frac{300}{1,000}$$
$$+2\frac{321}{1,000} = +2\frac{321}{1,000}$$
$$10\frac{621}{1,000}$$

Check: $8\frac{3}{10} + 2\frac{321}{1,000}$
$$\downarrow \qquad \downarrow$$
$$8 \;+\; 2 = 10$$

58.
$$\frac{1}{3} = \frac{8}{24}$$
$$25\frac{7}{24} = 25\frac{7}{24}$$
$$+100\frac{1}{2} = +100\frac{12}{24}$$
$$125\frac{27}{24} = 126\frac{3}{24} \text{ or } 126\frac{1}{8}$$

Check: $\frac{1}{3} + 25\frac{7}{24} + 100\frac{1}{2}$
$$\downarrow \qquad \downarrow \qquad \downarrow$$
$$0 + 25 + 101 = 126$$

60.
$$4\frac{1}{16} = 4\frac{2}{16}$$
$$4\frac{8}{16} = 4\frac{3}{16}$$
$$+\frac{5}{4} = +\frac{20}{16}$$
$$8\frac{25}{16} = 9\frac{9}{16}$$

64.
$$4\frac{2}{3} = 4\frac{24}{36}$$
$$2\frac{11}{36} = 2\frac{11}{36}$$
$$+1\frac{1}{2} = +1\frac{18}{36}$$
$$7\frac{53}{36} = 8\frac{17}{36}$$

Check: $4\frac{2}{3} + 2\frac{11}{36} + 1\frac{1}{2}$
$$\downarrow \qquad \downarrow \qquad \downarrow$$
$$5 + 2 + 2 = 9$$

66. $\dfrac{7}{9} - \dfrac{5}{9} = \dfrac{2}{9}$

68. $\dfrac{11}{12} - \dfrac{5}{12} = \dfrac{6}{12} = \dfrac{1}{2}$

70. $\dfrac{3}{2} - \dfrac{1}{2} = \dfrac{2}{2} = 1$

72. $\dfrac{7}{9} - \dfrac{4}{9} = \dfrac{3}{9} = \dfrac{1}{3}$

74. $\dfrac{1}{8} - \dfrac{1}{8} = 0$

76.
$$\frac{2}{5} = \frac{12}{30}$$
$$-\frac{1}{6} = -\frac{5}{30}$$
$$\frac{7}{30}$$

78.
$$\frac{9}{10} = \frac{90}{100}$$
$$-3\frac{3}{100} = -3\frac{3}{100}$$
$$\frac{87}{100}$$

80.
$$\frac{5}{6} = \frac{20}{24}$$
$$-\frac{1}{8} = -\frac{3}{24}$$
$$\frac{17}{24}$$

82.
$$\frac{2}{5} = \frac{18}{45}$$
$$-\frac{2}{9} = -\frac{10}{45}$$
$$\frac{8}{45}$$

Check: $4\frac{1}{8} + 4\frac{3}{16} + \frac{5}{4}$

$\downarrow \quad \downarrow \quad \downarrow$

$4 + 4 + 1 = 9$

62. $\quad 1\frac{2}{} \;=\; 1\frac{8}{}$

$$24 \qquad\qquad 45$$

84. $\dfrac{11}{12} = \dfrac{11}{12}$ **86.** $\dfrac{5}{6} = \dfrac{5}{6}$

$-\dfrac{1}{} = -\dfrac{4}{}$ $-\dfrac{2}{} = -\dfrac{4}{}$

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

$$+\ 3\frac{1}{4} = +3\frac{3}{12}$$

$$9\frac{13}{12} = 10\frac{9}{12} = 10$$

Check: $1\frac{2}{3} + 5\frac{5}{6} + 3\frac{1}{4}$

$\downarrow \quad \downarrow \quad \downarrow$

$2 + 6 + 3 = 11$

88. $6\frac{2}{3}$ Check: $5\frac{1}{3}$ **90.** $10\frac{5}{6}$ Check: $8\frac{5}{6}$

$-1\frac{1}{3}$ $+1\frac{2}{3}$ $-2\frac{6}{8}$ $+2\frac{5}{6}$

$5\frac{1}{3}$ $6\frac{2}{3}$ $10\frac{5}{6}$

92. $7\frac{3}{4}$ Check: $7\frac{1}{2} = 7\frac{2}{4}$

$\begin{array}{r} 7\frac{3}{4} \\ -1\frac{1}{4} \\ \hline 7\frac{2}{4} = 7\frac{1}{2} \end{array}$ $\begin{array}{r} 2\frac{2}{4} \\ +1\frac{1}{4} = +1\frac{1}{4} \\ \hline 7\frac{3}{4} \end{array}$

Check: $2\frac{4}{5} = 2\frac{8}{10}$

$+ 2\frac{3}{5} = + 2\frac{3}{10}$

$4\frac{11}{10} = 5\frac{1}{10}$

94. $2\frac{1}{3}$ Check: $\frac{1}{3}$

$\begin{array}{r} 2\frac{1}{3} \\ -2 \\ \hline \frac{1}{3} \end{array}$ $\begin{array}{r} \frac{1}{3} \\ +2 \\ \hline 2\frac{1}{3} \end{array}$

106. $3\frac{1}{5} = 2\frac{6}{5}$ Ch eck: $1\frac{2}{5}$

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

$1\frac{2}{5}$ $2\frac{6}{5} = 3\frac{1}{5}$

96. $4 = 3\frac{5}{5}$ Check: $2\frac{4}{5}$

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

$2\frac{4}{5}$ $3\frac{5}{5} = 4$

108. $\frac{7}{3} = \frac{17}{2}$

$-\frac{9}{10} = -\frac{9}{10}$

$2\frac{8}{10} = 2\frac{4}{5}$

98. $2 = 1\frac{2}{2}$ Check: $\frac{1}{2}$

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

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

Check: $2\frac{4}{5} = 2\frac{8}{10}$

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

$2\frac{17}{10} = 3\frac{7}{10}$

100. $5 = 4\frac{10}{10}$ Check: $\frac{1}{10}$

$-4\frac{9}{10} = -4\frac{9}{10}$ $\frac{9}{10}$

$\frac{1}{10}$ $+ 4\frac{10}{10}$

$4\frac{10}{10} = 5$

110. $2\frac{1}{5} = 1\frac{6}{5}$ Check: $1\frac{2}{5}$

$-\frac{4}{5} = -\frac{4}{5}$ $+\frac{4}{5}$

$1\frac{2}{5}$ $1\frac{6}{5} = 2\frac{1}{5}$

$9 = 8\frac{4}{4}$ Check: $8\frac{1}{4}$

$\frac{1}{7} \frac{7}{77}$

7

102.

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

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

$$8\frac{1}{8}$$ $$8\frac{4}{9} =$$

4   4

112. $7\frac{1}{10} = 7\frac{7}{70} = 6\frac{67}{70}$ Check:

$$-2\frac{1}{7} = -2\frac{10}{70} = -2\frac{10}{70}$$ $$7\frac{1}{10} - 2\frac{1}{7}$$

$$4\frac{67}{70}$$ ↓   ↓

$$4\frac{4}{70}$$ $-2 = 5$

104.　$5\dfrac{1}{} = 4\dfrac{11}{}$　　　　　　　　　　　　$\underline{1}$　　　$\underline{10}$　　　$\underline{110}$

$$\frac{10}{} \qquad \frac{10}{}$$

$$-2\frac{3}{10} = -2\frac{3}{10}$$
$$\underline{\quad\frac{10}{} \quad \frac{10}{}}$$
$$2\frac{8}{10} = 2\frac{4}{5}$$

114. $2\frac{}{10} = 2\frac{}{100}\qquad \frac{1}{100}$ Check:
$$=$$

$$-1\frac{27}{100}\quad -1\frac{27}{100} = -1\frac{27}{100}\qquad 2\frac{1}{10} \quad 1\frac{27}{1000}$$
$$\frac{83}{100}\qquad \downarrow \qquad \downarrow$$
$$2 - 1 = 1$$

116. $9\dfrac{13}{100} = 9\dfrac{13}{100} = 8\dfrac{113}{100}$ Check:

$-6\dfrac{7}{10} = -6\dfrac{70}{100} = -6\dfrac{70}{100}$ $9\dfrac{13}{100} - 6\dfrac{7}{10}$

$\dfrac{}{} \dfrac{}{} 2\dfrac{43}{100}$ $\downarrow \quad \downarrow$

$\phantom{2\dfrac{43}{100}}$ $9 - 7 = 2$

Check: $5\dfrac{3}{5} = 5\dfrac{6}{10}$

$+3\dfrac{1}{2} = +3\dfrac{5}{10}$

$8\dfrac{11}{10} = 9\dfrac{1}{10}$

118. $1\dfrac{2}{8} = 1\dfrac{3}{12} = \dfrac{15}{12}$

$-\dfrac{2}{6} = -\dfrac{4}{12} = -\dfrac{4}{12}$

$\phantom{-\dfrac{2}{6}} \dfrac{11}{12}$

Check: $\dfrac{11}{12} = \dfrac{11}{12}$

$+\dfrac{2}{6} = +\dfrac{4}{12}$

$\dfrac{15}{12} = 1\dfrac{3}{12} = 1\dfrac{1}{4} = 1\dfrac{2}{8}$

126. $3\dfrac{1}{4} = 3\dfrac{4}{16} = 2\dfrac{20}{16}$

$-2\dfrac{5}{16} = -2\dfrac{5}{16} = -2\dfrac{15}{16}$

Check: $\dfrac{15}{16}$

$+2\dfrac{5}{16}$

$2\dfrac{20}{16} = 3\dfrac{4}{16} = 3\dfrac{1}{4}$

120. $2\dfrac{1}{2} = 2\dfrac{2}{4} = 1\dfrac{6}{4}$ Check: $\dfrac{3}{4}$

$-1\dfrac{3}{4} = -1\dfrac{3}{4} = -1\dfrac{3}{4}$ $+1\dfrac{3}{4}$

$ \dfrac{3}{4} 1\dfrac{6}{4} = 2\dfrac{2}{4} = 2\dfrac{1}{2}$

128. $\dfrac{2}{3} - \dfrac{1}{5} + \dfrac{1}{2} = \dfrac{20}{30} - \dfrac{6}{30} + \dfrac{15}{30} = \dfrac{29}{30}$

122. $7\dfrac{1}{4} = 7\dfrac{4}{16} = 6\dfrac{20}{16}$

$-1\dfrac{5}{16} = -1\dfrac{5}{16} = -1\dfrac{5}{16}$

$\phantom{-1\dfrac{5}{16}} 5\dfrac{15}{16}$

130. $7\dfrac{1}{3} = 7\dfrac{5}{15} = 6\dfrac{20}{15}$ $4\dfrac{8}{15} = \dfrac{8}{4}$

$-2\dfrac{4}{5} = -2\dfrac{12}{15} = -2\dfrac{12}{15}$ $-1\dfrac{11}{15} = -1\dfrac{5}{15}$

$\phantom{-2\dfrac{4}{5}} 4\dfrac{8}{15}$ $3\dfrac{3}{15} = 3\dfrac{1}{5}$

132. $4\dfrac{1}{10}$ $7 = 6\dfrac{\pm}{4}$

16

$+2\dfrac{9}{10}$

$-3\dfrac{3}{10} = -3\dfrac{3}{10}$

Check: $5\dfrac{15}{?}$

$-\dfrac{4}{4} \quad \dfrac{4}{1}$

$$\begin{array}{r} \frac{16}{} \\ + 1\frac{5}{16} \\ \hline \end{array}$$

$$6\frac{20}{16} = 7\frac{4}{16} = 7\frac{1}{4}$$

124.
$$\begin{array}{r} \frac{1}{10} \quad \frac{1}{10} \quad \frac{11}{10} \\ -3\frac{1}{10} = -3\frac{5}{10} = -3\frac{5}{10} \\ \underline{2} \quad \underline{10} \quad \underline{10} \end{array}$$

$$5\frac{6}{10} = 5\frac{3}{5}$$

$$6\frac{10}{10} = 7 \qquad 3\frac{4}{}$$

134.
$$8\frac{9}{10} = 8\frac{9}{10}$$
$$\begin{array}{r} -\frac{1}{5} = -\frac{2}{10} \\ \hline \frac{7}{} \end{array}$$

$$\begin{array}{r} 8\frac{10}{} \\ 19\frac{1}{6} = 19\frac{5}{30} = 19\frac{35}{30} \\ 18\frac{30}{21} \\ -8\frac{6}{7} = -8\frac{30}{21} = -8\frac{30}{21} \end{array}$$

$\frac{1}{6} = \frac{3}{6}$ **138.** $\frac{3}{3} = \frac{9}{9}$

150. The difference in foot length when comparing

$\frac{1}{0}$

$\frac{10}{14}$

$= \frac{107}{30}$

$\frac{3}{0}$

$\frac{3}{0}$

136.

10	30		8	24
7	14		1	12

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

15	30		2	24
	$9\frac{17}{30}$		$+3\frac{1}{3} = 2\frac{8}{24} +$	

$\frac{29}{24} = 1\frac{5}{24}$

sizes 4 and 7 is

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

The difference in foot length when comparing sizes 7 and 10 is

$7\frac{1}{4} - 6\frac{1}{2} = 7\frac{1}{4} - 6\frac{2}{4} = 6\frac{5}{4} - 6\frac{2}{4} = \frac{3}{4}$ in.

Both differences are the same.

140. $\frac{9}{10} = \frac{18}{20}$ **142.** $\frac{7}{8}$ acre $= \frac{7}{8}$ acre

$-\frac{1}{4} = -\frac{5}{20}$ $-\frac{1}{4}$ acre $= -\frac{8}{5}$ acre

$\frac{13}{20}$ $\frac{8}{5}$ acre

The area of the land not occupied by the

building is $\frac{5}{8}$ acre.

152. The total weight of the packages on the right side of the scale is:

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

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

4 lb $\frac{4}{}$

The total weight of the packages on the leftside

144. a. $\dfrac{1}{32} = \dfrac{1}{32}$ The combined amount of

$+\dfrac{1}{32} = +\dfrac{4}{32}$ $\dfrac{5}{32}$

of the scale must also equal $4\dfrac{3}{4}$ lb.

electricity generated by liquid fuels and nuclear power is $\dfrac{5}{32}$ of the total

world electricity.[32]

4
3

1

b
$\frac{4}{3}$

b. $\frac{7}{56} = \frac{14}{32}$ The amount of electricity
generated by coal is $\frac{9}{32}$

$-\frac{}{32} = -\frac{}{32}$ greater than the combined
amount generated by liquid
$\frac{9}{32}$ fuel and nuclear power.

146. The sum of the fractions of the votes would
equal 1 whole, or $\frac{8}{8}$.

$\frac{5}{8} + \frac{1}{4} = \frac{5}{8} + \frac{2}{8} = \frac{7}{8}$

$\frac{8}{8} - \frac{7}{8} = \frac{1}{8}$

The third candidate got $\frac{1}{8}$ of the votes.

148. $20\frac{5}{8} = 20\frac{5}{8}$

$+10\frac{1}{2} = +10\frac{4}{8}$

$30\frac{9}{8} = 31\frac{1}{8}$

The total weight of the boxes is $31\frac{1}{8}$ oz.

$-\ -2\frac{}{4}$ lb
2 lb
The small package on the left weighs 2 lb.

Mindstretchers

1.

$1\frac{1}{4}$	$\frac{2}{3}$	$1\frac{1}{12}$
$\frac{5}{6}$	1	$1\frac{1}{6}$
$\frac{11}{12}$	$1\frac{1}{3}$	$\frac{3}{4}$

2. $\frac{3}{7} = \frac{1}{28} + \frac{1}{7} + \frac{1}{4}$

3. a. In Method 1 we "borrow" from the whole
number in the minuend so that the fraction in
the minuend is big enough to subtract the
fraction in the subtrahend. In Method 2 we
add a fraction to the subtrahend, making it a
whole number. We add the same fraction to
the minuend and then subtract.

b. Answers may vary.

c. Answers may vary.

2.4 Multiplying and Dividing Fractions

Exercises

2. To multiply mixed numbers, change each mixed number to its equivalent <u>improper fraction</u>.

4. To <u>divide</u> fractions, change the divisor to its reciprocal, and multiply the resulting fractions.

6. When multiplying fractions, we can divide any numerator and any denominator by a common <u>factor</u>.

8. $\dfrac{7}{8} \times \dfrac{1}{2} = \dfrac{7}{16}$

10. $\dfrac{1}{10} \cdot \dfrac{1}{4} = \dfrac{1}{40}$

12. $\left(\dfrac{1}{8}\right) \cdot \left(\dfrac{1}{8}\right) \left(\dfrac{1}{8}\right) = \dfrac{1}{64}$

14. $\dfrac{1}{2} \times \dfrac{3}{2} = \dfrac{3}{4}$

16. $\dfrac{20}{3} \times \dfrac{2}{7} = \dfrac{40}{21} = 1\dfrac{19}{21}$

18. $\dfrac{11}{10} \cdot \dfrac{9}{5} = \dfrac{99}{50} = 1\dfrac{49}{50}$

20. $\left(\dfrac{4}{5}\right)\left(\dfrac{1}{4}\right)\left(\dfrac{1}{5}\right) = \dfrac{1}{5} \cdot \dfrac{1}{4} \cdot \dfrac{1}{5} = \dfrac{1}{1}$

22. $\dfrac{4}{5} \times \dfrac{1}{2} = \dfrac{4}{5} \times \dfrac{1}{2} =$

34. $100 \cdot \dfrac{2}{5} = \dfrac{100}{1} \cdot \dfrac{2}{5} = 40$

36. $20 \cdot \dfrac{4}{5} = \dfrac{20}{1} \cdot \dfrac{4}{5} = 16$

38. $\dfrac{5}{8} \times 12 = \dfrac{5}{8} \times \dfrac{12}{1} = \dfrac{15}{2} = 7\dfrac{1}{2}$

40. $\left(\dfrac{8}{3}\right)\left(\dfrac{13}{4}\right)\left(\dfrac{1}{5}\right) = \dfrac{13}{15}$

42. $\dfrac{1}{3} \times 2\dfrac{1}{5} = \dfrac{1}{3} \times \dfrac{11}{5} = \dfrac{11}{15}$

44. $\left(\dfrac{9}{10}\right)\left(2\dfrac{1}{7}\right) = \dfrac{9}{10} \cdot \dfrac{15}{7} = \dfrac{27}{14} = 1\dfrac{13}{14}$

46. $4\dfrac{1}{2} \times \dfrac{2}{3} = \dfrac{9}{2} \times \dfrac{2}{3} = 3$

48. $\dfrac{3}{8} \cdot 5\dfrac{1}{3} = \dfrac{3}{8} \cdot \dfrac{16}{3} = 2$

24.

52. $2\frac{1}{} \times 1 \quad | = 7 \quad \times 3 = 7$

$$= 3\frac{1}{5}$$

26. $\frac{12}{4} \times \frac{15}{5} = \frac{\overset{3}{12}}{4} \times \frac{\overset{3}{15}}{5} = 9$

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

28. $\dfrac{5}{6} \times 5 = \dfrac{5}{6} \times \dfrac{5}{1} = \dfrac{25}{6} = 4\dfrac{1}{6}$

30. $\dfrac{5}{3} \times 7 = \dfrac{5}{3} \times \dfrac{7}{1} = \dfrac{35}{3} = 11\dfrac{2}{3}$

32. $\dfrac{3}{9} \times 12 = \dfrac{3}{9} \times 12 =$

56. $5 \cdot 1\dfrac{1}{2} = \dfrac{5}{1} \times \dfrac{3}{2} = \dfrac{15}{2} = 7\dfrac{1}{2}$

58. $1\dfrac{1}{6} \times 20 = \dfrac{?}{6} \times \dfrac{20}{1} = = 36\dfrac{2}{3}$

60. $5\frac{1}{4} \times 1\frac{1}{9} = \frac{\overset{7}{21}}{\overset{4}{2}} \times \frac{\overset{5}{10}}{9} = \frac{35}{6} = 5\frac{5}{6}$

62. $\left(1\frac{1}{10}\right)\left(2\frac{2}{9}\right) = \frac{11}{10} \cdot \frac{\overset{}{20}}{9} = \frac{3}{45}$

64. $5\frac{1}{10} \cdot 1\frac{2}{3} = \frac{51}{10} \cdot \frac{\overset{1}{5}}{\overset{}{3}} = \frac{17}{2} = 8\frac{1}{2}$

66. $\frac{37}{1} \cdot 1\frac{3}{5} = \frac{\overset{15}{75}}{\overset{}{5}} \cdot \frac{\overset{4}{8}}{\overset{}{5}} = \frac{}{60}$

68. $\frac{1}{8} \times 2\frac{1}{4} \times 6 = \frac{1}{8} \times \frac{9}{4} \times \frac{6}{1} = \frac{27}{16} = 1\frac{11}{16}$

70.

88. $\frac{5}{6} \div \frac{1}{3} = \frac{5}{\overset{}{6}} \times \frac{\overset{1}{3}}{1} = \frac{5}{2} = 2\frac{1}{2}$

90. $\frac{3}{4} \div \frac{6}{5} = \frac{3}{4} \times \frac{5}{6} = \frac{5}{8}$

92. $\frac{7}{10} \div 10 = \frac{7}{10} \div \frac{10}{1} = \frac{7}{10} \times \frac{1}{10} = \frac{7}{100}$

94. $\frac{1}{20} \div 2 = \frac{1}{20} \div \frac{2}{1} = \frac{1}{20} \times \frac{1}{2} = \frac{1}{40}$

96. $8 \div \frac{9}{2} = \frac{8}{1} \div \frac{9}{2} = \frac{8}{1} \times \frac{2}{9} = \frac{16}{9}$

98. $10 \div \frac{2}{5} = \frac{10}{1} \div \frac{2}{5} = \frac{\overset{5}{10}}{1} \times \frac{5}{2} = 25$

100. $10 \div \frac{2}{3} = \frac{10}{1} \div \frac{2}{3} = \frac{10}{1} \times \frac{3}{2} = 15$

72. $8\frac{1}{3} \times \frac{3}{10} \times \frac{5}{6} = \frac{25}{3} \times \frac{3}{10} \times \frac{5}{6} = \frac{25}{12} = 2\frac{1}{12}$

$\frac{125}{} \qquad \frac{5}{}$

74. $| \quad 2 \quad | = | \quad | | \quad | | \quad | = = 15$

102. $3 \div \frac{1}{8} = \frac{3}{1} \div \frac{1}{8} = \frac{3}{1} \times \frac{8}{1} = 24$

104. $5\frac{1}{9} \div \frac{2}{3} = \frac{46}{9} \div \frac{2}{3} = \frac{46}{9} \times \frac{3}{2} = \frac{23}{3} = 7\frac{2}{3}$

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|

76. $\dfrac{2}{3} \div \dfrac{3}{5} = \dfrac{2}{3} \times \dfrac{5}{3} = \dfrac{10}{9} = 1\dfrac{1}{9}$

78. $\dfrac{7}{8} \div \dfrac{4}{5} = \dfrac{7}{8} \times \dfrac{5}{4} = \dfrac{35}{32} = 1\dfrac{3}{32}$

106. $7\dfrac{1}{10} \div \dfrac{1}{2} = \dfrac{71}{10} \div \dfrac{1}{2} = \dfrac{71}{10} \times \dfrac{2}{1} = \dfrac{71}{5} = 14\dfrac{1}{5}$

80. $\dfrac{1}{2} \div \dfrac{1}{7} = \dfrac{1}{7} \times \dfrac{2}{1} =$

       7   2   7   1   7

82. $\dfrac{1}{9} \div \dfrac{5}{8} = \dfrac{1}{8} \times \dfrac{9}{5} =$ –

       8   9   8   5   40

84. $\dfrac{3}{10} \div \dfrac{6}{5} = \dfrac{3}{10} \times \dfrac{5}{6} = \dfrac{1}{4}$
   (2)   (2)

86. $\dfrac{10}{3} \div \dfrac{5}{6} = \dfrac{10}{3} \times \dfrac{6}{5} = 4$
   (2) (2)   1   1

108. $6\dfrac{2}{1} \div \dfrac{2}{1} = \dfrac{2}{1} \div \dfrac{2}{2} = \times = 13$

110. $15\dfrac{2}{3} \div \dfrac{5}{6} = \dfrac{47}{3} \div \dfrac{5}{6} = \dfrac{47}{3} \times \dfrac{6}{5} = \dfrac{94}{5} = 18\dfrac{4}{5}$
   (1)

112. $\dfrac{2}{7} \div \dfrac{1}{3} = \dfrac{2}{7} \div \dfrac{4}{3} = \dfrac{2}{7} \times \dfrac{3}{4} = \dfrac{3}{14}$
   (2)

114. $\dfrac{3}{4} \div 3\dfrac{1}{9} = \dfrac{3}{4} \div \dfrac{28}{9} = \dfrac{3}{4} \times \dfrac{9}{28} = \dfrac{27}{112}$

116. $7 \div 1\frac{9}{10} = \frac{7}{1} \div \frac{19}{10} = \frac{7}{1} \times \frac{10}{19} = \frac{70}{19} = 3\frac{13}{19}$

118. $5\frac{6}{7} \div 14 = \frac{41}{7} \div \frac{14}{1} = \frac{41}{7} \times \frac{1}{14} = \frac{41}{98}$

120. $3\frac{1}{7} \div 2\frac{1}{2} = \frac{22}{7} \div \frac{5}{2} = \frac{22}{7} \times \frac{2}{5} = \frac{44}{35} = 1\frac{9}{35}$

122. $1\frac{7}{8} \div 5\frac{1}{10} = \frac{17}{8} \div \frac{41}{10} = \frac{17}{8} \times \frac{10}{41}^{5}_{4} = \frac{68}{205}$

124. $8\frac{1}{6} \div 2\frac{1}{2} = \frac{49}{6} \div \frac{5}{2} = \frac{49}{6} \times \frac{2}{5}^{1}_{3} = \frac{49}{15} = 3\frac{4}{15}$

126. $1\frac{2}{3} \div 1\frac{2}{5} = \frac{5}{3} \div \frac{7}{5} = \frac{5}{3} \times \frac{5}{7} = \frac{25}{21} = 1\frac{4}{21}$

128. $\frac{9}{10} + \frac{4}{5} \cdot 8 = \frac{9}{10} + \left(\frac{4}{5} \cdot \frac{1}{1}\right)$

$= \frac{9}{10} + \frac{32}{5}$

$= \frac{9}{10} + \frac{64}{10}$

$= \frac{73}{10} = 7\frac{3}{10}$

138. $\frac{1}{3} \div \frac{1}{6} \times \frac{2}{3} = \left(\frac{1}{3}\frac{1}{6}\right) \times \frac{2}{3}$

$\div \left(\frac{\frac{2}{1}}{1} \times \frac{6}{1}\right) \times 2$

$\left(\frac{3}{1}\frac{1}{1}\right) \cdot 3$

$= \frac{2}{1} \times \frac{2}{3}$

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

140. $3\frac{1}{1} \div 5 + 4 \div 2 = \left(\frac{25}{5} \div 5\right) + \left(\frac{4}{1} \div 5\right)$

$= \left(\frac{25}{8} \cdot \frac{1}{5}\right) + \left(\frac{4}{1} \cdot \frac{2}{5}\right)$

$= \frac{5}{8} + \frac{8}{5} = \frac{25}{40} + \frac{64}{40}$

$= \frac{89}{40} = 2\frac{9}{40}$

142. $\frac{6}{11} \div \frac{18}{55} - \frac{7}{26} \times \frac{13}{14} = \left(\frac{6}{11} \div \frac{18}{55}\right) - \left(\frac{7}{26} \times \frac{13}{14}\right)$

$= \left(\frac{6}{11} \times \frac{55}{18}\right) \div - \left(\frac{7}{26} \times \frac{13}{14}\right) \div$

130. $3 \div \dfrac{2}{5} - 2\dfrac{1}{3} = \left(3 \div \dfrac{2}{5}\right) - 2\dfrac{1}{3}$

$= \left(3 \times \dfrac{5}{2}\right) - 2$

$= \dfrac{15}{2} - 2\dfrac{1}{3} = 7\dfrac{1}{2} - 2\dfrac{1}{3}$

$= \dfrac{5}{3} - \dfrac{1}{4} = \dfrac{20}{12} - \dfrac{3}{12}$

$= \dfrac{17}{12} = 1\dfrac{5}{12}$

144. $\left(1 - \dfrac{2}{\ }\right) \div \ , \left(1\dfrac{1}{\ }\right) \div = \left(\dfrac{5}{\ } - \dfrac{2}{\ }\right) \div \ , \left(\dfrac{3}{\ }\right) \div$

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

è 5ø   è 2ø   è5 5ø   è2ø

$$6 \qquad 6 \qquad 6$$

$$- \quad - \quad \underline{} \qquad - \quad - \quad \underline{1}$$

$$= \frac{æ3}{ç}ö^2 \div \quad \frac{æ3}{ç}ö^2 \div \quad = \frac{9}{25} \quad \frac{9}{4}$$

$$\frac{è5}{}ø \quad \frac{è2}{}ø \quad 25 \quad 4$$

$$\frac{8}{2} \quad \frac{2}{10} \quad \frac{8}{2} \quad \frac{2}{10}$$

$$= \frac{3}{10} - \frac{1}{10} = \frac{15}{80} - \frac{8}{80} = \frac{7}{80} \quad \frac{16}{80}$$

134. $6 \div 5 \times \frac{1}{4} = \frac{6}{5} \times \frac{1}{4} = \frac{3}{5} \times \frac{1}{2} = \frac{3}{10}$

136. $4 \cdot \frac{2}{3} - 1\frac{1}{8} = \left(\frac{4}{1} \cdot \frac{2}{3}\right) - 1\frac{1}{8}$

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

$$= 2\frac{16}{24} - 1\frac{3}{24} = 1\frac{13}{24}$$

$$= \frac{9}{25} \times \frac{4}{9} = \frac{4}{25}$$

146. $\left(\left(\frac{1}{3}\right)^2 + 2\left(\begin{matrix}1 & 1\\ 2 & 3\end{matrix}\right)\right)\left(\frac{7}{2}\right)^2 + 2\left(\begin{matrix}3 & 2\\ 6 & 6\end{matrix}\right)$

$$= \frac{49}{4} + 2\left(\frac{1}{6}\right)$$

$$= \frac{49}{4} + \left(2 \cdot \frac{1}{6}\right) = \frac{49}{4}$$

$$= \frac{147}{12} + \frac{4}{12} \quad \frac{151}{12} = 12\frac{7}{12}$$

$$=$$

148. $14 - 3 \div \left(\dfrac{4}{16}\right)^2 = 14 - 3 \div$

$$= 14 - \left(\dfrac{3}{1} \cdot \dfrac{25}{16}\right) = 14 - \dfrac{75}{16}$$

$$= 14 - 4\dfrac{11}{16} = 13\dfrac{16}{16} - 4\dfrac{11}{16} = 9\dfrac{5}{16}$$

150. $\dfrac{9}{10} \div \dfrac{2}{5} = \dfrac{9}{10} \cdot \dfrac{5}{2} = \dfrac{9}{4} = 2\dfrac{1}{4}$

152. $\left(4\dfrac{1}{2}\right)\left(6\dfrac{2}{3}\right) = \dfrac{9}{2} \cdot \dfrac{20}{3} = 30$

154. $\dfrac{1}{8} \cdot \dfrac{2}{5} = \dfrac{1}{20}$

$\dfrac{1}{20}$ of the emergency room visits were due to motor vehicle accidents.

156. $\$24,000 \div 12 = \$2,000$
Their monthly income is \$2,000.

$\dfrac{1}{4} \times 2,000 = \dfrac{1}{4} \times \dfrac{2,000}{1} = 500$

They should spend no more than \$500 per month on rent.

158.

162. $6 \text{ min} \div 2 \text{ min} = 3$

The temperature drops by $\dfrac{1}{10}°$ F three times.

$70 - \left(3 \times \dfrac{1}{10}\right) = 70 - \dfrac{3}{10} = 69\dfrac{10}{10} - \dfrac{3}{10} = 69\dfrac{7}{10}$

The temperature after 6 min is $69\dfrac{7}{10}°$F.

164. $9 \div \dfrac{3}{4} = \dfrac{9}{1} \times \dfrac{4}{3} = 12$

He can administer 12 doses.

166. a. $3 \div 1\dfrac{1}{2} = \dfrac{3}{1} \div \dfrac{3}{2} = \dfrac{3}{1} \times \dfrac{2}{3} = 2$

The average amount collected per year is \$2 million.

b. If an additional \$1 million were collected, then the total collected is \$4 million.

$4 \div 1\dfrac{2}{3} = \dfrac{4}{1} \div \dfrac{3}{2} = \dfrac{4}{1} \times \dfrac{2}{3} = \dfrac{8}{3} = 2\dfrac{2}{3}$

$2\dfrac{2}{3} - 2 = \dfrac{2}{3}$

The average would increase by $\$\dfrac{2}{3}$ million.

Mindstretchers

since its area is 186 sq ft and the area of the 16 ft × 11$\dfrac{1}{2}$ ft room is 184 sq ft.

$16 \times 11\frac{1}{2} = \frac{16}{1} \times \frac{23}{2} = \frac{368}{2} = 184$

$15\frac{1}{2} \times 12 = \frac{\overset{2}{\overset{1}{31}}}{\overset{2}{2}} \times \frac{\overset{2}{12}}{\overset{2}{1}} = \frac{372}{2} = 186$

The area of the $15\frac{1}{2}$ ft × 12 ft room is larger

1.
The
reci
pro

cal of 0 would have to be 1, which is impossible because the product of any number and its reciprocal is 1, but 0 times any number is 0.

160. $\dfrac{9}{10} \times 10\dfrac{1}{2} = \dfrac{9}{10} \times \dfrac{21}{2} = \dfrac{189}{20} = 9\dfrac{9}{20}$

2.

0

3	$\dfrac{1}{6}$	2
$\dfrac{2}{3}$	1	$1\dfrac{1}{2}$
$\dfrac{1}{2}$	6	$\dfrac{1}{3}$

There are $9\frac{9}{20}$ gallons of gasoline in $10\frac{1}{2}$ gallons of gasohol. So there are

$$10\frac{1}{2} - 9\frac{9}{20} = 10\frac{10}{20} - 9\frac{9}{20} = 1\frac{1}{20}$$ gallons of

$$9\frac{9}{20} - 1\frac{1}{20} = 8\frac{8}{20} = 8\frac{2}{5}$$ more gallons of

gasoline than ethyl alcohol in gasohol.

3. $1\frac{1}{2} \cdot 1\frac{1}{3} \cdot 1\frac{1}{4} \cdot \,\cdots\, \cdot 1\frac{1}{99} \cdot 1\frac{1}{100}$

$$= \frac{3}{2} \cdot \frac{4}{3} \cdot \frac{5}{4} \cdot \,\cdots\, \cdot \frac{100}{99} \cdot \frac{101}{100}$$

$$= \frac{101}{2} = 50\frac{1}{2}$$

ethyl alcohol in gasohol. There are