

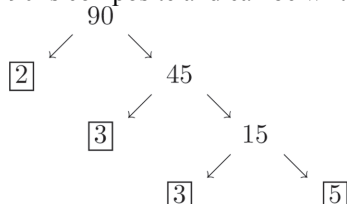
Chapter R

Prealgebra Review

R.1 Fractions

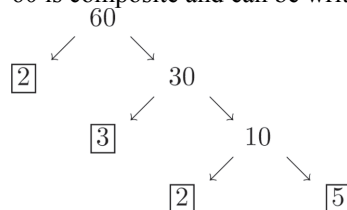
Classroom Examples, Now Try Exercises

1. 90 is composite and can be written as



Writing 90 as the product of primes gives us
 $90 = 2 \cdot 3 \cdot 3 \cdot 5$.

- N1. 60 is composite and can be written as



Writing 60 as the product of primes gives us
 $60 = 2 \cdot 2 \cdot 3 \cdot 5$.

2. (a) $\frac{12}{20} = \frac{3 \cdot 4}{5 \cdot 4} = \frac{3}{5} \cdot \frac{4}{4} = \frac{3}{5} \cdot 1 = \frac{3}{5}$

(b) $\frac{8}{48} = \frac{8}{6 \cdot 8} = \frac{1}{6 \cdot 1} = \frac{1}{6}$

(c) $\frac{90}{162} = \frac{5 \cdot 18}{9 \cdot 18} = \frac{5}{9} \cdot 1 = \frac{5}{9}$

N2. (a) $\frac{30}{42} = \frac{5 \cdot 6}{7 \cdot 6} = \frac{5}{7} \cdot \frac{6}{6} = \frac{5}{7} \cdot 1 = \frac{5}{7}$

(b) $\frac{10}{70} = \frac{10}{7 \cdot 10} = \frac{1}{7 \cdot 1} = \frac{1}{7}$

(c) $\frac{72}{120} = \frac{3 \cdot 24}{5 \cdot 24} = \frac{3}{5} \cdot 1 = \frac{3}{5}$

3. The fraction bar represents division. Divide the numerator of the improper fraction by the denominator.

$$\begin{array}{r} 3 \\ 10 \overline{)37} \\ \underline{30} \\ 7 \end{array}$$

Thus, $\frac{37}{10} = 3 \frac{7}{10}$.

- N3. The fraction bar represents division. Divide the numerator of the improper fraction by the denominator.

$$\begin{array}{r} 18 \\ 5 \overline{)92} \\ \underline{5} \\ 42 \\ \underline{40} \\ 2 \end{array}$$

Thus, $\frac{92}{5} = 18 \frac{2}{5}$.

4. Multiply the denominator of the fraction by the natural number and then add the numerator to obtain the numerator of the improper fraction.
 $5 \cdot 3 = 15$ and $15 + 4 = 19$

The denominator of the improper fraction is the same as the denominator in the mixed number.

Thus, $3 \frac{4}{5} = \frac{19}{5}$.

- N4. Multiply the denominator of the fraction by the natural number and then add the numerator to obtain the numerator of the improper fraction.
 $3 \cdot 11 = 33$ and $33 + 2 = 35$

The denominator of the improper fraction is the same as the denominator in the mixed number.

Thus, $11 \frac{2}{3} = \frac{35}{3}$.

5. (a) To multiply two fractions, multiply their numerators and then multiply their denominators. Then simplify and write the answer in lowest terms.

$$\begin{aligned} \frac{5}{9} \cdot \frac{18}{25} &= \frac{5 \cdot 18}{9 \cdot 25} \\ &= \frac{90}{225} \\ &= \frac{2 \cdot 45}{5 \cdot 45} \\ &= \frac{2}{5} \end{aligned}$$

- (b) To multiply two mixed numbers, first write them as improper fractions. Multiply their numerators and then multiply their denominators. Then simplify and write the answer as a mixed number in lowest terms.

$$\begin{aligned} 3\frac{1}{3} \cdot 1\frac{3}{4} &= \frac{10}{3} \cdot \frac{7}{4} \\ &= \frac{10 \cdot 7}{3 \cdot 4} \\ &= \frac{2 \cdot 5 \cdot 7}{3 \cdot 2 \cdot 2} \\ &= \frac{35}{6}, \text{ or } 5\frac{5}{6} \end{aligned}$$

- N5. (a) To multiply two fractions, multiply their numerators and then multiply their denominators. Then simplify and write the answer in lowest terms.

$$\begin{aligned} \frac{4}{7} \cdot \frac{5}{8} &= \frac{4 \cdot 5}{7 \cdot 8} \\ &= \frac{20}{56} \\ &= \frac{5 \cdot 4}{14 \cdot 4} \\ &= \frac{5}{14} \end{aligned}$$

- (b) To multiply two mixed numbers, first write them as improper fractions. Multiply their numerators and then multiply their denominators. Then simplify and write the answer as a mixed number in lowest terms.

$$\begin{aligned} 3\frac{2}{5} \cdot 6\frac{2}{3} &= \frac{17}{5} \cdot \frac{20}{3} \\ &= \frac{17 \cdot 20}{5 \cdot 3} \\ &= \frac{17 \cdot 5 \cdot 4}{5 \cdot 3} \\ &= \frac{68}{3}, \text{ or } 22\frac{2}{3} \end{aligned}$$

6. (a) To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned} \frac{9}{10} \div \frac{3}{5} &= \frac{9}{10} \cdot \frac{5}{3} \\ &= \frac{3 \cdot 3 \cdot 5}{2 \cdot 5 \cdot 3} \\ &= \frac{3}{2}, \text{ or } 1\frac{1}{2} \end{aligned}$$

- (b) Change both mixed numbers to improper fractions. Then multiply by the reciprocal of the second fraction.

$$\begin{aligned} 2\frac{3}{4} \div 3\frac{1}{3} &= \frac{11}{4} \div \frac{10}{3} \\ &= \frac{11}{4} \cdot \frac{3}{10} \\ &= \frac{33}{40} \end{aligned}$$

- N6. (a) To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned} \frac{2}{7} \div \frac{8}{9} &= \frac{2}{7} \cdot \frac{9}{8} \\ &= \frac{2 \cdot 3 \cdot 3}{7 \cdot 2 \cdot 4} \\ &= \frac{9}{28} \end{aligned}$$

- (b) To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned} 3\frac{3}{4} \div 4\frac{2}{7} &= \frac{15}{4} \div \frac{30}{7} \\ &= \frac{15}{4} \cdot \frac{7}{30} \\ &= \frac{15 \cdot 7}{4 \cdot 2 \cdot 15} \\ &= \frac{7}{8} \end{aligned}$$

7. To find the sum of two fractions having the same denominator, add the numerators and keep the same denominator.

$$\begin{aligned} \frac{1}{9} + \frac{5}{9} &= \frac{1+5}{9} \\ &= \frac{6}{9} \\ &= \frac{2 \cdot 3}{3 \cdot 3} \\ &= \frac{2}{3} \end{aligned}$$

- N7.** To find the sum of two fractions having the same denominator, add the numerators and keep the same denominator.

$$\begin{aligned}\frac{1}{8} + \frac{3}{8} &= \frac{1+3}{8} \\ &= \frac{4}{8} \\ &= \frac{1 \cdot 4}{2 \cdot 4} \\ &= \frac{1}{2}\end{aligned}$$

- 8. (a)** Since $30 = 2 \cdot 3 \cdot 5$ and $45 = 3 \cdot 3 \cdot 5$, the least common denominator must have one factor of 2 (from 30), two factors of 3 (from 45), and one factor of 5 (from either 30 or 45), so it is $2 \cdot 3 \cdot 3 \cdot 5 = 90$.

Write each fraction with a denominator of 90.

$$\frac{7}{30} = \frac{7 \cdot 3}{30 \cdot 3} = \frac{21}{90} \quad \text{and} \quad \frac{2}{45} = \frac{2 \cdot 2}{45 \cdot 2} = \frac{4}{90}$$

Now add.

$$\frac{7}{30} + \frac{2}{45} = \frac{21}{90} + \frac{4}{90} = \frac{21+4}{90} = \frac{25}{90}$$

Write $\frac{25}{90}$ in lowest terms.

$$\frac{25}{90} = \frac{5 \cdot 5}{18 \cdot 5} = \frac{5}{18}$$

- (b)** Write each mixed number as an improper fraction.

$$4\frac{5}{6} + 2\frac{1}{3} = \frac{29}{6} + \frac{7}{6}$$

The least common denominator is 6, so write each fraction with a denominator of 6.

$$\frac{29}{6} \quad \text{and} \quad \frac{7}{3} = \frac{7 \cdot 2}{3 \cdot 2} = \frac{14}{6}$$

Now add.

$$\begin{aligned}\frac{29}{6} + \frac{7}{3} &= \frac{29}{6} + \frac{14}{6} = \frac{29+14}{6} \\ &= \frac{43}{6}, \text{ or } 7\frac{1}{6}\end{aligned}$$

- N8. (a)** Since $12 = 2 \cdot 2 \cdot 3$ and $8 = 2 \cdot 2 \cdot 2$, the least common denominator must have three factors of 2 (from 8) and one factor of 3 (from 12), so it is $2 \cdot 2 \cdot 2 \cdot 3 = 24$.

Write each fraction with a denominator of 24.

$$\frac{5}{12} = \frac{5 \cdot 2}{12 \cdot 2} = \frac{10}{24} \quad \text{and} \quad \frac{3}{8} = \frac{3 \cdot 3}{8 \cdot 3} = \frac{9}{24}$$

Now add.

$$\frac{5}{12} + \frac{3}{8} = \frac{10}{24} + \frac{9}{24} = \frac{10+9}{24} = \frac{19}{24}$$

- (b)** Write each mixed number as an improper fraction.

$$3\frac{1}{4} + 5\frac{5}{8} = \frac{13}{4} + \frac{45}{8}$$

The least common denominator is 8, so write each fraction with a denominator of 8.

$$\frac{45}{8} \quad \text{and} \quad \frac{13}{4} = \frac{13 \cdot 2}{4 \cdot 2} = \frac{26}{8}$$

Now add.

$$\begin{aligned}\frac{13}{4} + \frac{45}{8} &= \frac{26}{8} + \frac{45}{8} = \frac{26+45}{8} \\ &= \frac{71}{8}, \text{ or } 8\frac{7}{8}\end{aligned}$$

- 9. (a)** Since $10 = 2 \cdot 5$ and $4 = 2 \cdot 2$, the least common denominator is $2 \cdot 2 \cdot 5 = 20$. Write each fraction with a denominator of 20.

$$\frac{3}{10} = \frac{3 \cdot 2}{10 \cdot 2} = \frac{6}{20} \quad \text{and} \quad \frac{1}{4} = \frac{1 \cdot 5}{4 \cdot 5} = \frac{5}{20}$$

Now subtract.

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

- (b)** Write each mixed number as an improper fraction.

$$3\frac{3}{8} - 1\frac{1}{2} = \frac{27}{8} - \frac{3}{2}$$

The least common denominator is 8. Write each fraction with a denominator of 8. $\frac{27}{8}$

remains unchanged, and $\frac{3}{2} = \frac{3 \cdot 4}{2 \cdot 4} = \frac{12}{8}$.

Now subtract.

$$\frac{27}{8} - \frac{3}{2} = \frac{27}{8} - \frac{12}{8} = \frac{27-12}{8} = \frac{15}{8}, \text{ or } 1\frac{7}{8}$$

- N9. (a)** Since $11 = 11$ and $9 = 3 \cdot 3$, the least common denominator is $3 \cdot 3 \cdot 11 = 99$. Write each fraction with a denominator of 99.

$$\frac{5}{11} = \frac{5 \cdot 9}{11 \cdot 9} = \frac{45}{99} \quad \text{and} \quad \frac{2}{9} = \frac{2 \cdot 11}{9 \cdot 11} = \frac{22}{99}$$

Now subtract.

$$\frac{5}{11} - \frac{2}{9} = \frac{45}{99} - \frac{22}{99} = \frac{23}{99}$$

- (b) Write each mixed number as an improper fraction.

$$4\frac{1}{3} - 2\frac{5}{6} = \frac{13}{3} - \frac{17}{6}$$

The least common denominator is 6. Write

each fraction with a denominator of 6. $\frac{17}{6}$

remains unchanged, and $\frac{13}{3} = \frac{13}{3} \cdot \frac{2}{2} = \frac{26}{6}$.

Now subtract.

$$\frac{13}{3} - \frac{17}{6} = \frac{26}{6} - \frac{17}{6} = \frac{26-17}{6} = \frac{9}{6}$$

Now reduce.

$$\frac{9}{6} = \frac{3 \cdot 3}{2 \cdot 3} = \frac{3}{2}, \text{ or } 1\frac{1}{2}$$

10. To find out how many yards of fabric Jen should buy, add the lengths needed for each piece to obtain the total length. The common denominator is 12.

$$1\frac{1}{4} + 1\frac{2}{3} + 2\frac{1}{2} = 1\frac{3}{12} + 1\frac{8}{12} + 2\frac{6}{12} = 4\frac{17}{12}$$

Because $\frac{17}{12} = 1\frac{5}{12}$, we have

$4\frac{17}{12} = 4 + 1\frac{5}{12} = 5\frac{5}{12}$. Jen should buy $5\frac{5}{12}$ yd of fabric.

- N10. To find out how long each piece must be, divide the total length by the number of pieces.

$$10\frac{1}{2} \div 4 = \frac{21}{2} \div \frac{4}{1} = \frac{21}{2} \cdot \frac{1}{4} = \frac{21}{8}, \text{ or } 2\frac{5}{8}$$

Each piece should be $2\frac{5}{8}$ feet long.

11. (a) In the circle graph, the sector for Other is the second largest, so Other had the second largest share of Internet users, $\frac{23}{100}$.

- (b) The total number of Internet users, 3900 million, can be rounded to 4000 million (or 4 billion). Multiply $\frac{1}{10}$ by 4000.

$$\frac{1}{10} \cdot 4000 = 400 \text{ million}$$

- (c) Multiply the fraction from the graph for Africa by the actual number of users.

$$\frac{1}{10} \cdot 3900 = 390 \text{ million}$$

- N11. (a) In the circle graph, the sector for Africa is the smallest, so Africa had the least number of Internet users.

- (b) The total number of Internet users, 3900 million, can be rounded to 4000 million (or 4 billion). Multiply $\frac{1}{2}$ by 4000.

$$\frac{1}{2} \cdot 4000 = 2000 \text{ million, or 2 billion}$$

- (c) Multiply the fraction from the graph for Asia by the actual number of users.

$$\frac{1}{2} \cdot 3900 = 1950 \text{ million, or 1.95 billion}$$

Exercises

- True; the number above the fraction bar is called the numerator and the number below the fraction bar is called the denominator.
- True; 5 divides the 31 six times with a remainder of one, so $\frac{31}{5} = 6\frac{1}{5}$.
- False; this is an improper fraction. Its value is 1.
- False; the number 1 is neither prime nor composite.
- False; the fraction $\frac{13}{39}$ can be written in lowest terms as $\frac{1}{3}$ since $\frac{13}{39} = \frac{13 \cdot 1}{13 \cdot 3} = \frac{1}{3}$.
- False; the reciprocal of $\frac{6}{2} = 3$ is $\frac{2}{6} = \frac{1}{3}$.
- False; *product* refers to multiplication, so the product of 10 and 2 is 20. The *sum* of 10 and 2 is 12.
- False; *difference* refers to subtraction, so the difference between 10 and 2 is 8. The *quotient* of 10 and 2 is 5.
- $\frac{16}{24} = \frac{2 \cdot 8}{3 \cdot 8} = \frac{2}{3}$
Therefore, C is correct.

10. Simplify each fraction to find which are equal to $\frac{5}{9}$.

$$\frac{15}{27} = \frac{3 \cdot 5}{3 \cdot 9} = \frac{5}{9}$$

$$\frac{30}{54} = \frac{6 \cdot 5}{6 \cdot 9} = \frac{5}{9}$$

$$\frac{40}{74} = \frac{2 \cdot 20}{2 \cdot 37} = \frac{20}{37}$$

$$\frac{55}{99} = \frac{11 \cdot 5}{11 \cdot 9} = \frac{5}{9}$$

Therefore, C is correct.

11. A common denominator for $\frac{p}{q}$ and $\frac{r}{s}$ must be a multiple of both denominators, q and s . Such a number is $q \cdot s$. Therefore, A is correct.

12. We need to multiply 8 by 3 to get 24 in the denominator, so we must multiply 5 by 3 as well.

$$\frac{5}{8} = \frac{5 \cdot 3}{8 \cdot 3} = \frac{15}{24}$$

Therefore, B is correct.

13. Since 19 has only itself and 1 as factors, it is a prime number.
14. Since 31 has only itself and 1 as factors, it is a prime number.
15. $30 = 2 \cdot 15$
 $= 2 \cdot 3 \cdot 5$
 Since 30 has factors other than itself and 1, it is a composite number.
16. $50 = 2 \cdot 25$
 $= 2 \cdot 5 \cdot 5$,
 so 50 is a composite number.
17. $64 = 2 \cdot 32$
 $= 2 \cdot 2 \cdot 16$
 $= 2 \cdot 2 \cdot 2 \cdot 8$
 $= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 4$
 $= 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
 Since 64 has factors other than itself and 1, it is a composite number.
18. $81 = 3 \cdot 27$
 $= 3 \cdot 3 \cdot 9$
 $= 3 \cdot 3 \cdot 3 \cdot 3$
 Since 81 has factors other than itself and 1, it is a composite number.

19. As stated in the text, the number 1 is neither prime nor composite, by agreement.
20. The number 0 is not a natural number, so it is neither prime nor composite.
21. $57 = 3 \cdot 19$, so 57 is a composite number.
22. $51 = 3 \cdot 17$, so 51 is a composite number.
23. Since 79 has only itself and 1 as factors, it is a prime number.
24. Since 83 has only itself and 1 as factors, it is a prime number.
25. $124 = 2 \cdot 62$
 $= 2 \cdot 2 \cdot 31$,
 so 124 is a composite number.
26. $138 = 2 \cdot 69$
 $= 2 \cdot 3 \cdot 23$,
 so 138 is a composite number.
27. $500 = 2 \cdot 250$
 $= 2 \cdot 2 \cdot 125$
 $= 2 \cdot 2 \cdot 5 \cdot 25$
 $= 2 \cdot 2 \cdot 5 \cdot 5 \cdot 5$,
 so 500 is a composite number.
28. $700 = 2 \cdot 350$
 $= 2 \cdot 2 \cdot 175$
 $= 2 \cdot 2 \cdot 5 \cdot 35$
 $= 2 \cdot 2 \cdot 5 \cdot 5 \cdot 7$,
 so 700 is a composite number.
29. $3458 = 2 \cdot 1729$
 $= 2 \cdot 7 \cdot 247$
 $= 2 \cdot 7 \cdot 13 \cdot 19$
 Since 3458 has factors other than itself and 1, it is a composite number.
30. $1025 = 5 \cdot 205$
 $= 5 \cdot 5 \cdot 41$
 Since 1025 has factors other than itself and 1, it is a composite number.
31. $\frac{8}{16} = \frac{1 \cdot 8}{2 \cdot 8} = \frac{1}{2} \cdot \frac{8}{8} = \frac{1}{2} \cdot 1 = \frac{1}{2}$
32. $\frac{4}{12} = \frac{1 \cdot 4}{3 \cdot 4} = \frac{1}{3} \cdot \frac{4}{4} = \frac{1}{3} \cdot 1 = \frac{1}{3}$
33. $\frac{15}{18} = \frac{3 \cdot 5}{3 \cdot 6} = \frac{3}{3} \cdot \frac{5}{6} = 1 \cdot \frac{5}{6} = \frac{5}{6}$

$$34. \frac{16}{20} = \frac{4 \cdot 4}{5 \cdot 4} = \frac{4}{5} \cdot \frac{4}{4} = \frac{4}{5} \cdot 1 = \frac{4}{5}$$

$$35. \frac{90}{150} = \frac{3 \cdot 30}{5 \cdot 30} = \frac{3}{5} \cdot \frac{30}{30} = \frac{3}{5} \cdot 1 = \frac{3}{5}$$

$$36. \frac{100}{140} = \frac{5 \cdot 20}{7 \cdot 20} = \frac{5}{7} \cdot \frac{20}{20} = \frac{5}{7} \cdot 1 = \frac{5}{7}$$

$$37. \frac{18}{90} = \frac{1 \cdot 18}{5 \cdot 18} = \frac{1}{5} \cdot \frac{18}{18} = \frac{1}{5} \cdot 1 = \frac{1}{5}$$

$$38. \frac{16}{64} = \frac{1 \cdot 16}{4 \cdot 16} = \frac{1}{4} \cdot \frac{16}{16} = \frac{1}{4} \cdot 1 = \frac{1}{4}$$

$$39. \frac{144}{120} = \frac{6 \cdot 24}{5 \cdot 24} = \frac{6}{5} \cdot \frac{24}{24} = \frac{6}{5} \cdot 1 = \frac{6}{5}$$

$$40. \frac{132}{77} = \frac{12 \cdot 11}{7 \cdot 11} = \frac{12}{7} \cdot \frac{11}{11} = \frac{12}{7} \cdot 1 = \frac{12}{7}$$

$$41. \begin{array}{r} 1 \\ 7 \overline{)12} \\ \underline{7} \\ 5 \end{array}$$

$$\text{Therefore, } \frac{12}{7} = 1\frac{5}{7}.$$

$$42. \begin{array}{r} 1 \\ 9 \overline{)16} \\ \underline{9} \\ 7 \end{array}$$

$$\text{Therefore, } \frac{16}{9} = 1\frac{7}{9}.$$

$$43. \begin{array}{r} 6 \\ 12 \overline{)77} \\ \underline{72} \\ 5 \end{array}$$

$$\text{Therefore, } \frac{77}{12} = 6\frac{5}{12}.$$

$$44. \begin{array}{r} 6 \\ 15 \overline{)101} \\ \underline{90} \\ 11 \end{array}$$

$$\text{Therefore, } \frac{101}{15} = 6\frac{11}{15}.$$

$$45. \begin{array}{r} 7 \\ 11 \overline{)83} \\ \underline{77} \\ 6 \end{array}$$

$$\text{Therefore, } \frac{83}{11} = 7\frac{6}{11}.$$

$$46. \begin{array}{r} 5 \\ 13 \overline{)67} \\ \underline{65} \\ 2 \end{array}$$

$$\text{Therefore, } \frac{67}{13} = 5\frac{2}{13}.$$

47. Multiply the denominator of the fraction by the natural number and then add the numerator to obtain the numerator of the improper fraction.

$$5 \cdot 2 = 10 \text{ and } 10 + 3 = 13$$

The denominator of the improper fraction is the same as the denominator in the mixed number.

$$\text{Thus, } 2\frac{3}{5} = \frac{13}{5}.$$

48. Multiply the denominator of the fraction by the natural number and then add the numerator to obtain the numerator of the improper fraction.

$$7 \cdot 5 = 35 \text{ and } 35 + 6 = 41$$

The denominator of the improper fraction is the same as the denominator in the mixed number.

$$\text{Thus, } 5\frac{6}{7} = \frac{41}{7}.$$

49. Multiply the denominator of the fraction by the natural number and then add the numerator to obtain the numerator of the improper fraction.

$$8 \cdot 10 = 80 \text{ and } 80 + 3 = 83$$

The denominator of the improper fraction is the same as the denominator in the mixed number.

$$\text{Thus, } 10\frac{3}{8} = \frac{83}{8}.$$

50. Multiply the denominator of the fraction by the natural number and then add the numerator to obtain the numerator of the improper fraction.

$$3 \cdot 12 = 36 \text{ and } 36 + 2 = 38$$

The denominator of the improper fraction is the same as the denominator in the mixed number.

$$\text{Thus, } 12\frac{2}{3} = \frac{38}{3}.$$

51. Multiply the denominator of the fraction by the natural number and then add the numerator to obtain the numerator of the improper fraction.

$$5 \cdot 10 = 50 \text{ and } 50 + 1 = 51$$

The denominator of the improper fraction is the same as the denominator in the mixed number.

$$\text{Thus, } 10\frac{1}{5} = \frac{51}{5}.$$

52. Multiply the denominator of the fraction by the natural number and then add the numerator to obtain the numerator of the improper fraction.

$$6 \cdot 18 = 108 \text{ and } 108 + 1 = 109$$

The denominator of the improper fraction is the same as the denominator in the mixed number.

$$\text{Thus, } 18\frac{1}{6} = \frac{109}{6}.$$

$$53. \frac{4}{5} \cdot \frac{6}{7} = \frac{4 \cdot 6}{5 \cdot 7} = \frac{24}{35}$$

$$54. \frac{5}{9} \cdot \frac{2}{7} = \frac{5 \cdot 2}{9 \cdot 7} = \frac{10}{63}$$

$$55. \frac{2}{15} \cdot \frac{3}{8} = \frac{2 \cdot 3}{15 \cdot 8} = \frac{6}{120} = \frac{1 \cdot 6}{20 \cdot 6} = \frac{1}{20}$$

$$56. \frac{3}{20} \cdot \frac{5}{21} = \frac{3 \cdot 5}{20 \cdot 21} = \frac{15}{420} = \frac{1 \cdot 15}{28 \cdot 15} = \frac{1}{28}$$

$$57. \frac{1}{10} \cdot \frac{12}{5} = \frac{1 \cdot 12}{10 \cdot 5} = \frac{1 \cdot 2 \cdot 6}{2 \cdot 5 \cdot 5} = \frac{6}{25}$$

$$58. \frac{1}{8} \cdot \frac{10}{7} = \frac{1 \cdot 10}{8 \cdot 7} = \frac{1 \cdot 2 \cdot 5}{2 \cdot 4 \cdot 7} = \frac{5}{28}$$

$$\begin{aligned} 59. \frac{15}{4} \cdot \frac{8}{25} &= \frac{15 \cdot 8}{4 \cdot 25} \\ &= \frac{3 \cdot 5 \cdot 4 \cdot 2}{4 \cdot 5 \cdot 5} \\ &= \frac{3 \cdot 2}{5} \\ &= \frac{6}{5}, \text{ or } 1\frac{1}{5} \end{aligned}$$

$$\begin{aligned} 60. \frac{21}{8} \cdot \frac{4}{7} &= \frac{21 \cdot 4}{8 \cdot 7} \\ &= \frac{3 \cdot 7 \cdot 4}{4 \cdot 2 \cdot 7} \\ &= \frac{3}{2}, \text{ or } 1\frac{1}{2} \end{aligned}$$

$$\begin{aligned} 61. 21 \cdot \frac{3}{7} &= \frac{21}{1} \cdot \frac{3}{7} \\ &= \frac{21 \cdot 3}{1 \cdot 7} \\ &= \frac{3 \cdot 7 \cdot 3}{1 \cdot 7} \\ &= \frac{3 \cdot 3}{1} = 9 \end{aligned}$$

$$\begin{aligned} 62. 36 \cdot \frac{4}{9} &= \frac{36}{1} \cdot \frac{4}{9} \\ &= \frac{36 \cdot 4}{1 \cdot 9} \\ &= \frac{4 \cdot 9 \cdot 4}{1 \cdot 9} \\ &= \frac{4 \cdot 4}{1} = 16 \end{aligned}$$

63. Change both mixed numbers to improper fractions.

$$\begin{aligned} 3\frac{1}{4} \cdot 1\frac{2}{3} &= \frac{13}{4} \cdot \frac{5}{3} \\ &= \frac{13 \cdot 5}{4 \cdot 3} \\ &= \frac{65}{12}, \text{ or } 5\frac{5}{12} \end{aligned}$$

64. Change both mixed numbers to improper fractions.

$$\begin{aligned} 2\frac{2}{3} \cdot 1\frac{3}{5} &= \frac{8}{3} \cdot \frac{8}{5} \\ &= \frac{8 \cdot 8}{3 \cdot 5} \\ &= \frac{64}{15}, \text{ or } 4\frac{4}{15} \end{aligned}$$

65. Change both mixed numbers to improper fractions.

$$\begin{aligned} 2\frac{3}{8} \cdot 3\frac{1}{5} &= \frac{19}{8} \cdot \frac{16}{5} \\ &= \frac{19 \cdot 16}{8 \cdot 5} \\ &= \frac{19 \cdot 2 \cdot 8}{8 \cdot 5} \\ &= \frac{38}{5}, \text{ or } 7\frac{3}{5} \end{aligned}$$

66. Change both mixed numbers to improper fractions.

$$\begin{aligned} 3\frac{3}{5} \cdot 7\frac{1}{6} &= \frac{18}{5} \cdot \frac{43}{6} \\ &= \frac{18 \cdot 43}{5 \cdot 6} \\ &= \frac{3 \cdot 6 \cdot 43}{5 \cdot 6} \\ &= \frac{3 \cdot 43}{5} \\ &= \frac{129}{5}, \text{ or } 25\frac{4}{5} \end{aligned}$$

67. Change both numbers to improper fractions.

$$\begin{aligned} 5 \cdot 2\frac{1}{10} &= \frac{5}{1} \cdot \frac{21}{10} \\ &= \frac{5 \cdot 21}{1 \cdot 10} \\ &= \frac{5 \cdot 21}{1 \cdot 2 \cdot 5} \\ &= \frac{21}{1 \cdot 2} \\ &= \frac{21}{2}, \text{ or } 10\frac{1}{2} \end{aligned}$$

68. Change both numbers to improper fractions.

$$\begin{aligned} 3 \cdot 4\frac{2}{9} &= \frac{3}{1} \cdot \frac{38}{9} \\ &= \frac{3 \cdot 38}{1 \cdot 9} \\ &= \frac{3 \cdot 38}{1 \cdot 3 \cdot 3} \\ &= \frac{38}{1 \cdot 3} \\ &= \frac{38}{3}, \text{ or } 12\frac{2}{3} \end{aligned}$$

69. To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned} \frac{7}{9} \div \frac{3}{2} &= \frac{7}{9} \cdot \frac{2}{3} \\ &= \frac{7 \cdot 2}{9 \cdot 3} \\ &= \frac{14}{27} \end{aligned}$$

70. To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned} \frac{6}{11} \div \frac{5}{4} &= \frac{6}{11} \cdot \frac{4}{5} \\ &= \frac{6 \cdot 4}{11 \cdot 5} \\ &= \frac{24}{55} \end{aligned}$$

71. To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned} \frac{5}{4} \div \frac{3}{8} &= \frac{5}{4} \cdot \frac{8}{3} \\ &= \frac{5 \cdot 8}{4 \cdot 3} \\ &= \frac{5 \cdot 4 \cdot 2}{4 \cdot 3} \\ &= \frac{5 \cdot 2}{3} \\ &= \frac{10}{3}, \text{ or } 3\frac{1}{3} \end{aligned}$$

72. To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned} \frac{7}{5} \div \frac{3}{10} &= \frac{7}{5} \cdot \frac{10}{3} \\ &= \frac{7 \cdot 10}{5 \cdot 3} \\ &= \frac{7 \cdot 2 \cdot 5}{5 \cdot 3} \\ &= \frac{14}{3}, \text{ or } 4\frac{2}{3} \end{aligned}$$

73. To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned} \frac{32}{5} \div \frac{8}{15} &= \frac{32}{5} \cdot \frac{15}{8} \\ &= \frac{32 \cdot 15}{5 \cdot 8} \\ &= \frac{8 \cdot 4 \cdot 3 \cdot 5}{1 \cdot 5 \cdot 8} \\ &= \frac{4 \cdot 3}{1} = 12 \end{aligned}$$

74. To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned}\frac{24}{7} \div \frac{6}{21} &= \frac{24}{7} \cdot \frac{21}{6} \\ &= \frac{24 \cdot 21}{7 \cdot 6} \\ &= \frac{4 \cdot 6 \cdot 3 \cdot 7}{1 \cdot 7 \cdot 6} \\ &= \frac{4 \cdot 3}{1} = 12\end{aligned}$$

75. To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned}\frac{3}{4} \div 12 &= \frac{3}{4} \cdot \frac{1}{12} \\ &= \frac{3 \cdot 1}{4 \cdot 12} \\ &= \frac{3 \cdot 1}{4 \cdot 3 \cdot 4} \\ &= \frac{1}{4 \cdot 4} = \frac{1}{16}\end{aligned}$$

76. To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned}\frac{2}{5} \div 30 &= \frac{2}{5} \cdot \frac{1}{30} \\ &= \frac{2 \cdot 1}{5 \cdot 30} \\ &= \frac{2 \cdot 1}{5 \cdot 2 \cdot 15} \\ &= \frac{1}{5 \cdot 15} = \frac{1}{75}\end{aligned}$$

77. To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned}6 \div \frac{3}{5} &= \frac{6}{1} \cdot \frac{5}{3} \\ &= \frac{6 \cdot 5}{1 \cdot 3} \\ &= \frac{2 \cdot 3 \cdot 5}{1 \cdot 3} \\ &= \frac{2 \cdot 5}{1} = 10\end{aligned}$$

78. To divide fractions, multiply by the reciprocal of the divisor.

$$\begin{aligned}8 \div \frac{4}{9} &= \frac{8}{1} \cdot \frac{9}{4} \\ &= \frac{8 \cdot 9}{1 \cdot 4} \\ &= \frac{2 \cdot 4 \cdot 9}{1 \cdot 4} \\ &= \frac{2 \cdot 9}{1} = 18\end{aligned}$$

79. Change the first number to an improper fraction, and then multiply by the reciprocal of the divisor.

$$\begin{aligned}6\frac{3}{4} \div \frac{3}{8} &= \frac{27}{4} \div \frac{3}{8} \\ &= \frac{27}{4} \cdot \frac{8}{3} \\ &= \frac{27 \cdot 8}{4 \cdot 3} \\ &= \frac{3 \cdot 9 \cdot 2 \cdot 4}{4 \cdot 3} \\ &= \frac{9 \cdot 2}{1} = 18\end{aligned}$$

80. Change the first number to an improper fraction, and then multiply by the reciprocal of the divisor.

$$\begin{aligned}5\frac{3}{5} \div \frac{7}{10} &= \frac{28}{5} \div \frac{7}{10} \\ &= \frac{28}{5} \cdot \frac{10}{7} \\ &= \frac{28 \cdot 10}{5 \cdot 7} \\ &= \frac{4 \cdot 7 \cdot 2 \cdot 5}{5 \cdot 7} \\ &= \frac{4 \cdot 2}{1} = 8\end{aligned}$$

81. Change both mixed numbers to improper fractions, and then multiply by the reciprocal of the divisor.

$$\begin{aligned}2\frac{1}{2} \div 1\frac{5}{7} &= \frac{5}{2} \div \frac{12}{7} \\ &= \frac{5}{2} \cdot \frac{7}{12} \\ &= \frac{5 \cdot 7}{2 \cdot 12} \\ &= \frac{35}{24}, \text{ or } 1\frac{11}{24}\end{aligned}$$

- 82.** Change both mixed numbers to improper fractions, and then multiply by the reciprocal of the divisor.

$$\begin{aligned} 2\frac{2}{9} \div 1\frac{2}{5} &= \frac{20}{9} \div \frac{7}{5} \\ &= \frac{20}{9} \cdot \frac{5}{7} \\ &= \frac{20 \cdot 5}{9 \cdot 7} \\ &= \frac{100}{63}, \text{ or } 1\frac{37}{63} \end{aligned}$$

- 83.** Change both mixed numbers to improper fractions, and then multiply by the reciprocal of the divisor.

$$\begin{aligned} 2\frac{5}{8} \div 1\frac{15}{32} &= \frac{21}{8} \div \frac{47}{32} \\ &= \frac{21}{8} \cdot \frac{32}{47} \\ &= \frac{21 \cdot 32}{8 \cdot 47} \\ &= \frac{21 \cdot 8 \cdot 4}{8 \cdot 47} \\ &= \frac{21 \cdot 4}{47} \\ &= \frac{84}{47}, \text{ or } 1\frac{37}{47} \end{aligned}$$

- 84.** Change both mixed numbers to improper fractions, and then multiply by the reciprocal of the divisor.

$$\begin{aligned} 2\frac{3}{10} \div 1\frac{4}{5} &= \frac{23}{10} \div \frac{9}{5} \\ &= \frac{23}{10} \cdot \frac{5}{9} \\ &= \frac{23 \cdot 5}{2 \cdot 5 \cdot 9} \\ &= \frac{23}{18}, \text{ or } 1\frac{5}{18} \end{aligned}$$

85. $\frac{7}{15} + \frac{4}{15} = \frac{7+4}{15} = \frac{11}{15}$

86. $\frac{2}{9} + \frac{5}{9} = \frac{2+5}{9} = \frac{7}{9}$

87. $\frac{7}{12} + \frac{1}{12} = \frac{7+1}{12}$
 $= \frac{8}{12}$
 $= \frac{2 \cdot 4}{3 \cdot 4}$
 $= \frac{2}{3}$

88. $\frac{3}{16} + \frac{5}{16} = \frac{3+5}{16} = \frac{8}{16} = \frac{1}{2}$

- 89.** Since $9 = 3 \cdot 3$, and 3 is prime, the LCD (least common denominator) is $3 \cdot 3 = 9$.

$$\frac{1}{3} = \frac{1}{3} \cdot \frac{3}{3} = \frac{3}{9}$$

Now add the two fractions with the same denominator.

$$\frac{5}{9} + \frac{1}{3} = \frac{5}{9} + \frac{3}{9} = \frac{8}{9}$$

- 90.** To add $\frac{4}{15}$ and $\frac{1}{5}$, first find the LCD. Since

$15 = 3 \cdot 5$ and 5 is prime, the LCD is 15.

$$\begin{aligned} \frac{4}{15} + \frac{1}{5} &= \frac{4}{15} + \frac{1}{5} \cdot \frac{3}{3} \\ &= \frac{4}{15} + \frac{3}{15} \\ &= \frac{4+3}{15} \\ &= \frac{7}{15} \end{aligned}$$

- 91.** Since $8 = 2 \cdot 2 \cdot 2$ and $6 = 2 \cdot 3$, the LCD is $2 \cdot 2 \cdot 2 \cdot 3 = 24$.

$$\frac{3}{8} = \frac{3}{8} \cdot \frac{3}{3} = \frac{9}{24} \text{ and } \frac{5}{6} = \frac{5}{6} \cdot \frac{4}{4} = \frac{20}{24}$$

Now add fractions with the same denominator.

$$\frac{3}{8} + \frac{5}{6} = \frac{9}{24} + \frac{20}{24} = \frac{29}{24}, \text{ or } 1\frac{5}{24}$$

- 92.** Since $6 = 2 \cdot 3$ and $9 = 3 \cdot 3$, the LCD is $2 \cdot 3 \cdot 3 = 18$.

$$\frac{5}{6} = \frac{5}{6} \cdot \frac{3}{3} = \frac{15}{18} \text{ and } \frac{2}{9} = \frac{2}{9} \cdot \frac{2}{2} = \frac{4}{18}$$

Now add fractions with the same denominator.

$$\frac{5}{6} + \frac{2}{9} = \frac{15}{18} + \frac{4}{18} = \frac{19}{18}, \text{ or } 1\frac{1}{18}$$

93. Since $9 = 3 \cdot 3$ and $16 = 4 \cdot 4$, the LCD is $3 \cdot 3 \cdot 4 \cdot 4 = 144$.

$$\frac{5}{9} = \frac{5}{9} \cdot \frac{16}{16} = \frac{80}{144} \text{ and } \frac{3}{16} = \frac{3}{16} \cdot \frac{9}{9} = \frac{27}{144}$$

Now add fractions with the same denominator.

$$\frac{5}{9} + \frac{3}{16} = \frac{80}{144} + \frac{27}{144} = \frac{107}{144}$$

94. Since $4 = 2 \cdot 2$ and $25 = 5 \cdot 5$, the LCD is $2 \cdot 2 \cdot 5 \cdot 5 = 100$.

$$\frac{3}{4} = \frac{3}{4} \cdot \frac{25}{25} = \frac{75}{100} \text{ and } \frac{6}{25} = \frac{6}{25} \cdot \frac{4}{4} = \frac{24}{100}$$

Now add fractions with the same denominator.

$$\frac{3}{4} + \frac{6}{25} = \frac{75}{100} + \frac{24}{100} = \frac{99}{100}$$

95. $3\frac{1}{8} = 3 + \frac{1}{8} = \frac{24}{8} + \frac{1}{8} = \frac{25}{8}$

$$2\frac{1}{4} = 2 + \frac{1}{4} = \frac{8}{4} + \frac{1}{4} = \frac{9}{4}$$

$$3\frac{1}{8} + 2\frac{1}{4} = \frac{25}{8} + \frac{9}{4}$$

Since $8 = 2 \cdot 2 \cdot 2$ and $4 = 2 \cdot 2$, the LCD is $2 \cdot 2 \cdot 2$ or 8.

$$\begin{aligned} 3\frac{1}{8} + 2\frac{1}{4} &= \frac{25}{8} + \frac{9}{4} \cdot \frac{2}{2} \\ &= \frac{25}{8} + \frac{18}{8} \\ &= \frac{43}{8}, \text{ or } 5\frac{3}{8} \end{aligned}$$

96. $4\frac{2}{3} = 4 + \frac{2}{3} = \frac{12}{3} + \frac{2}{3} = \frac{14}{3}$

$$2\frac{1}{6} = 2 + \frac{1}{6} = \frac{12}{6} + \frac{1}{6} = \frac{13}{6}$$

Since $6 = 2 \cdot 3$, the LCD is 6.

$$\begin{aligned} 4\frac{2}{3} + 2\frac{1}{6} &= \frac{14}{3} \cdot \frac{2}{2} + \frac{13}{6} \\ &= \frac{28}{6} + \frac{13}{6} \\ &= \frac{41}{6}, \text{ or } 6\frac{5}{6} \end{aligned}$$

97. $3\frac{1}{4} = 3 + \frac{1}{4} = \frac{12}{4} + \frac{1}{4} = \frac{13}{4}$

$$1\frac{4}{5} = 1 + \frac{4}{5} = \frac{5}{5} + \frac{4}{5} = \frac{9}{5}$$

Since $4 = 2 \cdot 2$, and 5 is prime, the LCD is $2 \cdot 2 \cdot 5 = 20$.

$$\begin{aligned} 3\frac{1}{4} + 1\frac{4}{5} &= \frac{13}{4} \cdot \frac{5}{5} + \frac{9}{5} \cdot \frac{4}{4} \\ &= \frac{65}{20} + \frac{36}{20} \\ &= \frac{101}{20}, \text{ or } 5\frac{1}{20} \end{aligned}$$

98. To add $5\frac{3}{4}$ and $1\frac{1}{3}$, first change to improper fractions then find the LCD, which is 12.

$$\begin{aligned} 5\frac{3}{4} + 1\frac{1}{3} &= \frac{23}{4} + \frac{4}{3} \\ &= \frac{23}{4} \cdot \frac{3}{3} + \frac{4}{3} \cdot \frac{4}{4} \\ &= \frac{69}{12} + \frac{16}{12} \\ &= \frac{85}{12}, \text{ or } 7\frac{1}{12} \end{aligned}$$

99. $\frac{7}{9} - \frac{2}{9} = \frac{7-2}{9} = \frac{5}{9}$

100. $\frac{8}{11} - \frac{3}{11} = \frac{8-3}{11} = \frac{5}{11}$

101. $\frac{13}{15} - \frac{3}{15} = \frac{13-3}{15}$
 $= \frac{10}{15}$
 $= \frac{2 \cdot 5}{3 \cdot 5} = \frac{2}{3}$

102. $\frac{11}{12} - \frac{3}{12} = \frac{11-3}{12}$
 $= \frac{8}{12}$
 $= \frac{2 \cdot 4}{3 \cdot 4} = \frac{2}{3}$

103. Since $12 = 4 \cdot 3$ (12 is a multiple of 3), the LCD is 12.

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

Now subtract fractions with the same denominator.

$$\frac{7}{12} - \frac{1}{3} = \frac{7}{12} - \frac{4}{12} = \frac{3}{12} = \frac{1 \cdot 3}{4 \cdot 3} = \frac{1}{4}$$

- 104.** Since $6 = 3 \cdot 2$ (6 is a multiple of 2), the LCD is 6.

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

Now subtract fractions with the same denominator.

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

- 105.** Since $12 = 2 \cdot 2 \cdot 3$ and $9 = 3 \cdot 3$, the LCD is $2 \cdot 2 \cdot 3 \cdot 3 = 36$.

$$\frac{7}{12} = \frac{7}{12} \cdot \frac{3}{3} = \frac{21}{36} \quad \text{and} \quad \frac{1}{9} \cdot \frac{4}{4} = \frac{4}{36}$$

Now subtract fractions with the same denominator.

$$\frac{7}{12} - \frac{1}{9} = \frac{21}{36} - \frac{4}{36} = \frac{17}{36}$$

- 106.** $\frac{11}{16} - \frac{1}{12} = \frac{11}{16} \cdot \frac{3}{3} - \frac{1}{12} \cdot \frac{4}{4}$ The LCD of 12 and 16 is 48.

$$= \frac{33}{48} - \frac{4}{48} \\ = \frac{29}{48}$$

- 107.** $4\frac{3}{4} = 4 + \frac{3}{4} = \frac{16}{4} + \frac{3}{4} = \frac{19}{4}$

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

Since $4 = 2 \cdot 2$, and 5 is prime, the LCD is $2 \cdot 2 \cdot 5 = 20$.

$$4\frac{3}{4} - 1\frac{2}{5} = \frac{19}{4} - \frac{7}{5} = \frac{19}{4} \cdot \frac{5}{5} - \frac{7}{5} \cdot \frac{4}{4} \\ = \frac{95}{20} - \frac{28}{20} \\ = \frac{67}{20}, \text{ or } 3\frac{7}{20}$$

- 108.** Change both numbers to improper fractions then add, using 45 as the common denominator.

$$3\frac{4}{5} - 1\frac{4}{9} = \frac{19}{5} - \frac{13}{9} \\ = \frac{19}{5} \cdot \frac{9}{9} - \frac{13}{9} \cdot \frac{5}{5} \\ = \frac{171}{45} - \frac{65}{45} \\ = \frac{106}{45}, \text{ or } 2\frac{16}{45}$$

- 109.** $6\frac{1}{4} = 6 + \frac{1}{4} = \frac{24}{4} + \frac{1}{4} = \frac{25}{4}$

$$5\frac{1}{3} = 5 + \frac{1}{3} = \frac{15}{3} + \frac{1}{3} = \frac{16}{3}$$

Since $4 = 2 \cdot 2$, and 3 is prime, the LCD is $2 \cdot 2 \cdot 3 = 12$.

$$6\frac{1}{4} - 5\frac{1}{3} = \frac{25}{4} - \frac{16}{3} \\ = \frac{25}{4} \cdot \frac{3}{3} - \frac{16}{3} \cdot \frac{4}{4} \\ = \frac{75}{12} - \frac{64}{12} \\ = \frac{11}{12}$$

- 110.** $5\frac{1}{3} = 5 + \frac{1}{3} = \frac{15}{3} + \frac{1}{3} = \frac{16}{3}$

$$4\frac{1}{2} = 4 + \frac{1}{2} = \frac{8}{2} + \frac{1}{2} = \frac{9}{2}$$

2 and 3 are prime, so the LCD is $2 \cdot 3 = 6$.

$$5\frac{1}{3} - 4\frac{1}{2} = \frac{16}{3} - \frac{9}{2} = \frac{16}{3} \cdot \frac{2}{2} - \frac{9}{2} \cdot \frac{3}{3} \\ = \frac{32}{6} - \frac{27}{6} \\ = \frac{5}{6}$$

- 111.** $8\frac{2}{9} = 8 + \frac{2}{9} = \frac{72}{9} + \frac{2}{9} = \frac{74}{9}$

$$4\frac{2}{3} = 4 + \frac{2}{3} = \frac{12}{3} + \frac{2}{3} = \frac{14}{3}$$

Since $9 = 3 \cdot 3$, and 3 is prime, the LCD is $3 \cdot 3 = 9$.

$$8\frac{2}{9} - 4\frac{2}{3} = \frac{74}{9} - \frac{14}{3} = \frac{74}{9} - \frac{14}{3} \cdot \frac{3}{3} \\ = \frac{74}{9} - \frac{42}{9} \\ = \frac{32}{9}, \text{ or } 3\frac{5}{9}$$

$$112. \quad 7\frac{5}{12} = 7 + \frac{5}{12} = \frac{84}{12} + \frac{5}{12} = \frac{89}{12}$$

$$4\frac{5}{6} = 4 + \frac{5}{6} = \frac{24}{6} + \frac{5}{6} = \frac{29}{6}$$

Since $12 = 2 \cdot 2 \cdot 3$ and $6 = 2 \cdot 3$, the LCD is $2 \cdot 2 \cdot 3 = 12$.

$$\begin{aligned} 7\frac{5}{12} - 4\frac{5}{6} &= \frac{89}{12} - \frac{29}{6} \cdot \frac{2}{2} \\ &= \frac{89}{12} - \frac{58}{12} \\ &= \frac{31}{12}, \text{ or } 2\frac{7}{12} \end{aligned}$$

113. Observe that there are 24 dots in the entire figure, 6 dots in the triangle, 12 dots in the rectangle, and 2 dots in the overlapping region.

(a) $\frac{12}{24} = \frac{1}{2}$ of all the dots are in the rectangle.

(b) $\frac{6}{24} = \frac{1}{4}$ of all the dots are in the triangle.

(c) $\frac{2}{6} = \frac{1}{3}$ of the dots in the triangle are in the overlapping region.

(d) $\frac{2}{12} = \frac{1}{6}$ of the dots in the rectangle are in the overlapping region.

114. (a) 12 is $\frac{1}{3}$ of 36, so Maureen got a hit in exactly $\frac{1}{3}$ of her at-bats.

(b) 5 is a little less than $\frac{1}{2}$ of 11, so Chase got a hit in just less than $\frac{1}{2}$ of his at-bats.

(c) 1 is a little less than $\frac{1}{10}$ of 11, so Chase got a home run in just less than $\frac{1}{10}$ of his at-bats.

(d) 9 is a little less than $\frac{1}{4}$ of 40, so Christine got a hit in just less than $\frac{1}{4}$ of her at-bats.

(e) 8 is $\frac{1}{2}$ of 16, and 10 is $\frac{1}{2}$ of 20, so Joe and

Greg each got hits $\frac{1}{2}$ of the time they were at bat.

115. Multiply the number of cups of water per serving by the number of servings.

$$\frac{3}{4} \cdot 8 = \frac{3}{4} \cdot \frac{8}{1}$$

$$= \frac{3 \cdot 8}{4 \cdot 1}$$

$$= \frac{24}{4}$$

$$= 6 \text{ cups}$$

For 8 microwave servings, 6 cups of water will be needed.

116. Four stove-top servings require $\frac{1}{4}$ tsp, or $\frac{2}{8}$

tsp, of salt. Six stove-top servings require $\frac{1}{2}$

tsp, or $\frac{4}{8}$ tsp, of salt. Five is halfway between 4

and 6, and $\frac{3}{8}$ is halfway between $\frac{2}{8}$ and $\frac{4}{8}$.

Therefore, 5 stove-top servings would require $\frac{3}{8}$ tsp of salt.

117. The difference in length is found by subtracting.

$$3\frac{1}{4} - 2\frac{1}{8} = \frac{13}{4} - \frac{17}{8}$$

$$= \frac{13}{4} \cdot \frac{2}{2} - \frac{17}{8} \quad \text{LCD} = 8$$

$$= \frac{26}{8} - \frac{17}{8}$$

$$= \frac{9}{8}, \text{ or } 1\frac{1}{8}$$

The difference is $1\frac{1}{8}$ inches.

- 118.** The difference in length is found by subtracting.

$$\begin{aligned} 4 - 2\frac{1}{8} &= \frac{4}{1} - \frac{17}{8} \\ &= \frac{4}{1} \cdot \frac{8}{8} - \frac{17}{8} \quad \text{LCD} = 8 \\ &= \frac{32}{8} - \frac{17}{8} \\ &= \frac{15}{8}, \text{ or } 1\frac{7}{8} \end{aligned}$$

The difference is $1\frac{7}{8}$ inches.

- 119.** The difference between the two measures is found by subtracting, using 16 as the LCD.

$$\begin{aligned} \frac{3}{4} - \frac{3}{16} &= \frac{3}{4} \cdot \frac{4}{4} - \frac{3}{16} \\ &= \frac{12}{16} - \frac{3}{16} \\ &= \frac{12-3}{16} \\ &= \frac{9}{16} \end{aligned}$$

The difference is $\frac{9}{16}$ inch.

- 120.** The difference between the two measures is found by subtracting, using 16 as a common denominator.

$$\begin{aligned} \frac{9}{16} - \frac{3}{8} &= \frac{9}{16} - \frac{3}{8} \cdot \frac{2}{2} \\ &= \frac{9}{16} - \frac{6}{16} \\ &= \frac{9-6}{16} \\ &= \frac{3}{16} \end{aligned}$$

The difference is $\frac{3}{16}$ inch.

- 121.** The perimeter is the sum of the measures of the 5 sides.

$$\begin{aligned} 196 + 98\frac{3}{4} + 146\frac{1}{2} + 100\frac{7}{8} + 76\frac{5}{8} \\ &= 196 + 98\frac{6}{8} + 146\frac{4}{8} + 100\frac{7}{8} + 76\frac{5}{8} \\ &= 196 + 98 + 146 + 100 + 76 + \frac{6+4+7+5}{8} \\ &= 616 + \frac{22}{8} \quad \left(\frac{22}{8} = 2\frac{6}{8} = 2\frac{3}{4} \right) \\ &= 618\frac{3}{4} \text{ feet} \end{aligned}$$

The perimeter is $618\frac{3}{4}$ feet.

- 122.** To find the perimeter of a triangle, add the lengths of the three sides.

$$\begin{aligned} 5\frac{1}{4} + 7\frac{1}{2} + 10\frac{1}{8} &= 5\frac{2}{8} + 7\frac{4}{8} + 10\frac{1}{8} \\ &= 22\frac{7}{8} \end{aligned}$$

The perimeter of the triangle is $22\frac{7}{8}$ feet.

- 123.** Divide the total board length by 3.

$$\begin{aligned} 15\frac{5}{8} \div 3 &= \frac{125}{8} \div \frac{3}{1} \\ &= \frac{125}{8} \cdot \frac{1}{3} \\ &= \frac{125 \cdot 1}{8 \cdot 3} \\ &= \frac{125}{24}, \text{ or } 5\frac{5}{24} \end{aligned}$$

The length of each of the three pieces must be $5\frac{5}{24}$ inches.

- 124.** Divide the total amount of tomato sauce by the number of servings.

$$2\frac{1}{3} \div 7 = \frac{7}{3} \div \frac{7}{1} = \frac{7}{3} \cdot \frac{1}{7} = \frac{7 \cdot 1}{3 \cdot 7} = \frac{1}{3}$$

For 1 serving of barbecue sauce, $\frac{1}{3}$ cup of tomato sauce is needed.

125. To find the number of cakes the caterer can make, divide $15\frac{1}{2}$ by $1\frac{3}{4}$.

$$\begin{aligned} 15\frac{1}{2} \div 1\frac{3}{4} &= \frac{31}{2} \div \frac{7}{4} \\ &= \frac{31}{2} \cdot \frac{4}{7} \\ &= \frac{31 \cdot 2 \cdot 2}{2 \cdot 7} \\ &= \frac{62}{7}, \text{ or } 8\frac{6}{7} \end{aligned}$$

There is not quite enough sugar for 9 cakes. The caterer can make 8 cakes with some sugar left over.

126. Divide the total amount of fabric by the amount of fabric needed to cover one chair.

$$\begin{aligned} 23\frac{2}{3} \div 2\frac{1}{4} &= \frac{71}{3} \div \frac{9}{4} \\ &= \frac{71}{3} \cdot \frac{4}{9} \\ &= \frac{71 \cdot 4}{3 \cdot 9} \\ &= \frac{284}{27}, \text{ or } 10\frac{14}{27} \end{aligned}$$

Kyla can cover 10 chairs. There will be some fabric left over.

127. Multiply the amount of fabric it takes to make one costume by the number of costumes.

$$\begin{aligned} 2\frac{3}{8} \cdot 7 &= \frac{19}{8} \cdot \frac{7}{1} \\ &= \frac{19 \cdot 7}{8 \cdot 1} \\ &= \frac{133}{8}, \text{ or } 16\frac{5}{8} \text{ yd} \end{aligned}$$

For 7 costumes, $16\frac{5}{8}$ yards of fabric would be needed.

128. Multiply the amount of sugar for one batch times the number of batches.

$$\begin{aligned} 2\frac{2}{3} \cdot 4 &= \frac{8}{3} \cdot \frac{4}{1} \\ &= \frac{8 \cdot 4}{3 \cdot 1} \\ &= \frac{32}{3}, \text{ or } 10\frac{2}{3} \end{aligned}$$

$10\frac{2}{3}$ cups of sugar are required to make four batches of cookies.

129. Subtract the heights to find the difference.

$$\begin{aligned} 10\frac{1}{2} - 7\frac{1}{8} &= \frac{21}{2} - \frac{57}{8} \\ &= \frac{21}{2} \cdot \frac{4}{4} - \frac{57}{8} \quad \text{LCD} = 8 \\ &= \frac{84}{8} - \frac{57}{8} \\ &= \frac{27}{8}, \text{ or } 3\frac{3}{8} \end{aligned}$$

The difference in heights is $3\frac{3}{8}$ inches.

130. Subtract $\frac{3}{8}$ from $\frac{11}{16}$ using 16 as the LCD.

$$\begin{aligned} \frac{11}{16} - \frac{3}{8} &= \frac{11}{16} - \frac{3}{8} \cdot \frac{2}{2} \\ &= \frac{11}{16} - \frac{6}{16} \\ &= \frac{5}{16} \end{aligned}$$

Thus, $\frac{3}{8}$ inch is $\frac{5}{16}$ inch smaller than $\frac{11}{16}$ inch.

131. A share of $\frac{11}{100}$ can be rounded to $\frac{10}{100} = \frac{1}{10}$.

Multiply by the total number of foreign-born people in the U.S., approximately 40 million.

$$\frac{1}{10} \cdot 40 = \frac{1}{10} \cdot \frac{40}{1} = \frac{4 \cdot 10}{1 \cdot 10} = \frac{4}{1} = 4,$$

There were approximately 4 million (or 4,000,000) foreign-born people in the U.S. who were born in Europe.

For the actual number:

$$\frac{11}{100} \cdot 40 = \frac{11}{100} \cdot \frac{40}{1} = \frac{11 \cdot 2 \cdot 20}{5 \cdot 20 \cdot 1} = \frac{22}{5}, \text{ or } 4\frac{2}{5}$$

The actual number who were born in Europe

was $4\frac{2}{5}$ million (or 4,400,000) people.

132. Multiply the fraction representing the U.S. foreign-born population from Latin America, $\frac{13}{25}$, by the total number of foreign-born people in the U.S., approximately 40 million.

$$\frac{13}{25} \cdot 40 = \frac{13}{25} \cdot \frac{40}{1} = \frac{13 \cdot 5 \cdot 8}{5 \cdot 5 \cdot 1} = \frac{104}{5}, \text{ or } 20\frac{4}{5}$$

There were approximately $20\frac{4}{5}$ million (or 20,800,000) foreign-born people in the U.S. who were born in Latin America.

133. The sum of the fractions representing the U.S. foreign-born population from Latin America, Asia, or Europe is

$$\begin{aligned}\frac{13}{25} + \frac{29}{100} + \frac{11}{100} &= \frac{13}{25} \cdot \frac{4}{4} + \frac{29}{100} + \frac{11}{100} \\ &= \frac{52 + 29 + 11}{100} \\ &= \frac{92}{100} \\ &= \frac{23 \cdot 4}{25 \cdot 4} \\ &= \frac{23}{25}.\end{aligned}$$

So the fraction representing the U.S. foreign-born population from other regions is

$$\begin{aligned}1 - \frac{23}{25} &= \frac{25}{25} - \frac{23}{25} \\ &= \frac{2}{25}.\end{aligned}$$

134. The sum of the fractions representing the U.S. foreign-born population from Latin America or Asia is

$$\begin{aligned}\frac{13}{25} + \frac{29}{100} &= \frac{13}{25} \cdot \frac{4}{4} + \frac{29}{100} \\ &= \frac{52 + 29}{100} \\ &= \frac{81}{100}.\end{aligned}$$

135. Estimate each fraction. $\frac{14}{26}$ is about $\frac{1}{2}$, $\frac{98}{99}$ is

about 1, $\frac{100}{51}$ is about 2, $\frac{90}{31}$ is about 3, and

$$\frac{13}{27} \text{ is about } \frac{1}{2}.$$

Therefore, the sum is approximately

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

The correct choice is C.

136. Estimate each fraction. $\frac{202}{50}$ is about 4, $\frac{99}{100}$ is

about 1, $\frac{21}{40}$ is about $\frac{1}{2}$, and $\frac{75}{36}$ is about 2.

Therefore, the product is approximately

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

The correct choice is B.

R.2 Decimals and Percents

Classroom Examples, Now Try Exercises

1. (a) $0.15 = \frac{15}{100}$

(b) $0.009 = \frac{9}{1000}$

(c) $2.5 = 2\frac{5}{10} = \frac{25}{10}$

N1. (a) $0.8 = \frac{8}{10}$

(b) $0.431 = \frac{431}{1000}$

(c) $2.58 = 2\frac{58}{100} = \frac{258}{100}$

2. (a)
$$\begin{array}{r} 42.830 \\ 71.000 \\ + 3.074 \\ \hline 116.904 \end{array}$$

(b)
$$\begin{array}{r} 32.50 \\ - 21.72 \\ \hline 10.78 \end{array}$$

N2. (a)
$$\begin{array}{r} 68.900 \\ 42.720 \\ + 8.973 \\ \hline 120.593 \end{array}$$

(b)
$$\begin{array}{r} 351.800 \\ - 2.706 \\ \hline 349.094 \end{array}$$

3. (a)
$$\begin{array}{r} 30.2 \quad 1 \text{ decimal place} \\ \times 0.052 \quad 3 \text{ decimal places} \\ \hline 604 \quad \downarrow \\ 1510 \quad 1 + 3 = 4 \\ \hline 1.5704 \quad 4 \text{ decimal places} \end{array}$$

(b)
$$\begin{array}{r} 0.06 \quad 2 \text{ decimal places} \\ \times 0.12 \quad 2 \text{ decimal places} \\ \hline 12 \quad \downarrow \\ 6 \quad 2 + 2 = 4 \\ \hline 0.0072 \quad 4 \text{ decimal places} \end{array}$$

N3. (a) 9.32 2 decimal places
 $\times 1.4$ 1 decimal place
 $\hline 3728$ $\downarrow$
 932 $2 + 1 = 3$
 $\hline 13.048$ 3 decimal places

(b) 0.6 1 decimal place
 $\times 0.004$ 3 decimal places
 $\hline 24$ $1 + 3 = 4$
 $\hline 0.0024$ 4 decimal places

- 4. (a)** To change the divisor 0.37 into a whole number, move each decimal point two places to the right. Move the decimal point straight up and divide as with whole numbers.

$$\begin{array}{r} 14.8 \\ 37 \overline{)547.6} \\ \underline{37} \\ 177 \\ \underline{148} \\ 296 \\ \underline{296} \\ 0 \end{array}$$

Therefore, $5.476 \div 0.37 = 14.8$.

- (b)** To change the divisor 3.1 into a whole number, move each decimal point one place to the right. Move the decimal point straight up and divide as with whole numbers.

$$\begin{array}{r} 1.21 \\ 31 \overline{)37.60} \\ \underline{31} \\ 66 \\ \underline{62} \\ 40 \\ \underline{31} \\ 9 \end{array}$$

We carried out the division to 2 decimal places so that we could round to 1 decimal place. Therefore, $3.76 \div 3.1 \approx 1.2$.

- N4. (a)** To change the divisor 14.9 into a whole number, move each decimal point one place to the right. Move the decimal point straight up and divide as with whole numbers.

$$\begin{array}{r} 30.3 \\ 149 \overline{)4514.7} \\ \underline{447} \\ 447 \\ \underline{447} \\ 0 \end{array}$$

Therefore, $451.47 \div 14.9 = 30.3$.

- (b)** To change the divisor 1.3 into a whole number, move each decimal point one place to the right. Move the decimal point straight up and divide as with whole numbers.

$$\begin{array}{r} 5.641 \\ 13 \overline{)73.340} \\ \underline{65} \\ 83 \\ \underline{78} \\ 54 \\ \underline{52} \\ 20 \\ \underline{13} \\ 7 \end{array}$$

We carried out the division to 3 decimal places so that we could round to 2 decimal places. Therefore, $7.334 \div 1.3 \approx 5.64$.

- 5. (a)** Move the decimal point three places to the right.

$$19.5 \times 1000 = 19,500$$

- (b)** Move the decimal point one place to the left.

$$960.1 \div 10 = 96.01$$

- N5. (a)** Move the decimal point one place to the right.

$$294.72 \times 10 = 2947.2$$

- (b)** Move the decimal point two places to the left. Insert a 0 in front of the 4 to do this.

$$4.793 \div 100 = 0.04793$$

6. (a) Divide 3 by 50. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.06 \\ 50 \overline{) 3.00} \\ \underline{3 \ 00} \\ 0 \end{array}$$

Therefore, $\frac{3}{50} = 0.06$.

- (b) Divide 11 by 1. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.090909... \\ 11 \overline{) 1.000000...} \\ \underline{99} \\ 100 \\ \underline{99} \\ 100 \\ \underline{99} \\ 1 \end{array}$$

Note that the pattern repeats. Therefore,

$$\frac{1}{11} = 0.\overline{09}, \text{ or about } 0.091.$$

- N6. (a) Divide 20 by 17. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.85 \\ 20 \overline{) 17.00} \\ \underline{160} \\ 100 \\ \underline{100} \\ 0 \end{array}$$

Therefore, $\frac{17}{20} = 0.85$.

- (b) Divide 2 by 9. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.222... \\ 9 \overline{) 2.000...} \\ \underline{18} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

Note that the pattern repeats. Therefore,

$$\frac{2}{9} = 0.\overline{2}, \text{ or } 0.222.$$

7. (a) $5\frac{1}{4}\% = 5.25\%$

$$= \frac{5.25}{100} = 0.0525$$

(b) $200\% = \frac{200}{100} = 2.00$, or 2

N7. (a) $23\% = \frac{23}{100} = 0.23$

(b) $350\% = \frac{350}{100} = 3.50$, or 3.5

8. (a) $0.06 = 0.06 \cdot 100\% = 6\%$

(b) $1.75 = 1.75 \cdot 100\% = 175\%$

N8. (a) $0.31 = 0.31 \cdot 100\% = 31\%$

(b) $1.32 = 1.32 \cdot 100\% = 132\%$

9. (a) $85\% = 0.85$

(b) $110\% = 1.10$, or 1.1

(c) $0.30 = 30\%$

(d) $0.165 = 16.5\%$

N9. (a) $52\% = 0.52$

(b) $2\% = 0.02$

(c) $0.45 = 45\%$

(d) $3.5 = 3.50 = 350\%$

10. (a) $65\% = \frac{65}{100}$

In lowest terms,

$$\frac{65}{100} = \frac{13 \cdot 5}{20 \cdot 5} = \frac{13}{20}$$

(b) $1.5\% = \frac{1.5}{100} = \frac{1.5}{100} \cdot \frac{10}{10} = \frac{15}{1000} = \frac{3}{200}$

N10. (a) $20\% = \frac{20}{100}$

In lowest terms,

$$\frac{20}{100} = \frac{1 \cdot 20}{5 \cdot 20} = \frac{1}{5}$$

(b) $160\% = \frac{160}{100}$

In lowest terms,

$$\frac{160}{100} = \frac{8 \cdot 20}{5 \cdot 20} = \frac{8}{5}, \text{ or } 1\frac{3}{5}$$

$$\begin{aligned}
 11. \quad (a) \quad \frac{3}{50} &= \frac{3}{50} \cdot 100\% \\
 &= \frac{3}{50} \cdot \frac{100}{1} \% \\
 &= \frac{3 \cdot 50 \cdot 2}{50} \% \\
 &= 6\%
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad \frac{1}{3} &= \frac{1}{3} \cdot 100\% \\
 &= \frac{1}{3} \cdot \frac{100}{1} \% \\
 &= \frac{100}{3} \% \\
 &= 33\frac{1}{3}\%, \text{ or } 33.\bar{3}\%
 \end{aligned}$$

$$\begin{aligned}
 N11. \quad (a) \quad \frac{6}{25} &= \frac{6}{25} \cdot 100\% \\
 &= \frac{6}{25} \cdot \frac{100}{1} \% \\
 &= \frac{6 \cdot 25 \cdot 4}{25} \% \\
 &= 24\%
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad \frac{7}{9} &= \frac{7}{9} \cdot 100\% \\
 &= \frac{7}{9} \cdot \frac{100}{1} \% \\
 &= \frac{700}{9} \% \\
 &= 77\frac{7}{9}\%, \text{ or } 77.\bar{7}\%
 \end{aligned}$$

12. The discount is 30% of \$69. The word *of* here means multiply.

$$\begin{array}{ccc}
 30\% & \text{of} & 69 \\
 \downarrow & \downarrow & \downarrow
 \end{array}$$

$$0.30 \cdot 69 = 20.7$$

The discount is \$20.70. The sale price is found by subtracting.

$$\$69.00 - \$20.70 = \$48.30$$

- N12. The discount is 60% of \$120. The word *of* here means multiply.

$$\begin{array}{ccc}
 60\% & \text{of} & 120 \\
 \downarrow & \downarrow & \downarrow
 \end{array}$$

$$0.60 \cdot 120 = 72$$

The discount is \$72. The sale price is found by subtracting.

$$\$120.00 - \$72 = \$48$$

Exercises

1. 367.9412

(a) Tens: 6

(b) Tenths: 9

(c) Thousandths: 1

(d) Ones: 7

(e) Hundredths: 4

2. Answers will vary. One example is 5243.0164.

3. 46.249

(a) 46.25

(b) 46.2

(c) 46

(d) 50

4. (a) 0.889

(b) 0.444

(c) 0.976

(d) 0.865

5. $0.4 = \frac{4}{10}$

6. $0.6 = \frac{6}{10}$

7. $0.64 = \frac{64}{100}$

8. $0.82 = \frac{82}{100}$

9. $0.138 = \frac{138}{1000}$

10. $0.104 = \frac{104}{1000}$

11. $0.043 = \frac{43}{1000}$

12. $0.087 = \frac{87}{1000}$

13. $3.805 = 3\frac{805}{1000} = \frac{3805}{1000}$

14. $5.166 = 5\frac{166}{1000} = \frac{5166}{1000}$

$$\begin{array}{r}
 15. \quad 25.320 \\
 109.200 \\
 + 8.574 \\
 \hline
 143.094
 \end{array}$$

$$\begin{array}{r}
 16. \quad 90.527 \\
 32.430 \\
 + 589.800 \\
 \hline
 712.757
 \end{array}$$

$$\begin{array}{r}
 17. \quad 28.73 \\
 - 3.12 \\
 \hline
 25.61
 \end{array}$$

$$\begin{array}{r}
 18. \quad 46.88 \\
 - 13.45 \\
 \hline
 33.43
 \end{array}$$

$$\begin{array}{r}
 19. \quad 43.50 \\
 - 28.17 \\
 \hline
 15.33
 \end{array}$$

$$\begin{array}{r}
 20. \quad 345.10 \\
 - 56.31 \\
 \hline
 288.79
 \end{array}$$

$$\begin{array}{r}
 21. \quad 3.87 \\
 15.00 \\
 + 2.90 \\
 \hline
 21.77
 \end{array}$$

$$\begin{array}{r}
 22. \quad 8.20 \\
 1.09 \\
 + 12.00 \\
 \hline
 21.29
 \end{array}$$

$$\begin{array}{r}
 23. \quad 32.560 \\
 47.356 \\
 + 1.800 \\
 \hline
 81.716
 \end{array}$$

$$\begin{array}{r}
 24. \quad 75.200 \\
 123.960 \\
 + 3.897 \\
 \hline
 203.057
 \end{array}$$

$$\begin{array}{r}
 25. \quad 18.000 \\
 - 2.789 \\
 \hline
 15.211
 \end{array}$$

$$\begin{array}{r}
 26. \quad 29.000 \\
 - 8.582 \\
 \hline
 20.418
 \end{array}$$

$$\begin{array}{r}
 27. \quad 12.8 \quad 1 \text{ decimal place} \\
 \times 9.1 \quad 1 \text{ decimal place} \\
 \hline
 128 \quad \downarrow \\
 1152 \quad 1 + 1 = 2 \\
 \hline
 116.48 \quad 2 \text{ decimal places}
 \end{array}$$

$$\begin{array}{r}
 28. \quad 34.04 \quad 2 \text{ decimal places} \\
 \times 0.56 \quad 2 \text{ decimal places} \\
 \hline
 20424 \quad \downarrow \\
 17020 \quad 2 + 2 = 4 \\
 \hline
 19.0624 \quad 4 \text{ decimal places}
 \end{array}$$

$$\begin{array}{r}
 29. \quad 22.41 \quad 2 \text{ decimal places} \\
 \times 33 \quad 0 \text{ decimal places} \\
 \hline
 6723 \quad \downarrow \\
 6723 \quad 2 + 0 = 2 \\
 \hline
 739.53 \quad 2 \text{ decimal places}
 \end{array}$$

$$\begin{array}{r}
 30. \quad 55.76 \quad 2 \text{ decimal places} \\
 \times 72 \quad 0 \text{ decimal places} \\
 \hline
 11152 \quad \downarrow \\
 39032 \quad 2 + 0 = 2 \\
 \hline
 4014.72 \quad 2 \text{ decimal places}
 \end{array}$$

$$\begin{array}{r}
 31. \quad 0.2 \quad 1 \text{ decimal place} \\
 \times 0.03 \quad 2 \text{ decimal places} \\
 \hline
 6 \quad 1 + 2 = 3 \\
 \hline
 0.006 \quad 3 \text{ decimal places}
 \end{array}$$

$$\begin{array}{r}
 32. \quad 0.07 \quad 2 \text{ decimal places} \\
 \times 0.004 \quad 3 \text{ decimal places} \\
 \hline
 28 \quad 2 + 3 = 5 \\
 \hline
 0.00028 \quad 5 \text{ decimal places}
 \end{array}$$

$$\begin{array}{r}
 33. \quad \begin{array}{r} 7.15 \\ 11 \overline{)78.65} \\ \underline{77} \\ 16 \\ \underline{11} \\ 55 \\ \underline{55} \\ 0 \end{array}
 \end{array}$$

$$\begin{array}{r}
 5.24 \\
 14 \overline{)73.36} \\
 \underline{70} \\
 33 \\
 \underline{28} \\
 56 \\
 \underline{56} \\
 0
 \end{array}$$

35. To change the divisor 11.6 into a whole number, move each decimal point one place to the right. Move the decimal point straight up and divide as with whole numbers.

$$\begin{array}{r}
 2.8 \\
 116 \overline{)324.8} \\
 \underline{232} \\
 928 \\
 \underline{928} \\
 0
 \end{array}$$

Therefore, $32.48 \div 11.6 = 2.8$.

36. To change the divisor 17.4 into a whole number, move each decimal point one place to the right. Move the decimal point straight up and divide as with whole numbers.

$$\begin{array}{r}
 4.9 \\
 174 \overline{)852.6} \\
 \underline{696} \\
 1566 \\
 \underline{1566} \\
 0
 \end{array}$$

Therefore, $85.26 \div 17.4 = 4.9$.

37. To change the divisor 9.74 into a whole number, move each decimal point two places to the right. Move the decimal point straight up and divide as with whole numbers.

$$\begin{array}{r}
 2.05 \\
 974 \overline{)1996.70} \\
 \underline{1948} \\
 4870 \\
 \underline{4870} \\
 0
 \end{array}$$

Therefore, $19.967 \div 9.74 = 2.05$.

38. To change the divisor 5.27 into a whole number, move each decimal point two places to the right. Move the decimal point straight up and divide as with whole numbers.

$$\begin{array}{r}
 8.44 \\
 527 \overline{)4447.88} \\
 \underline{4216} \\
 2318 \\
 \underline{2108} \\
 2108 \\
 \underline{2108} \\
 0
 \end{array}$$

Therefore, $44.4788 \div 5.27 = 8.44$.

39. Move the decimal point one place to the right.
 $123.26 \times 10 = 1232.6$
40. Move the decimal point one place to the right.
 $785.91 \times 10 = 7859.1$
41. Move the decimal point two places to the right.
 $57.116 \times 100 = 5711.6$
42. Move the decimal point two places to the right.
 $82.053 \times 100 = 8205.3$
43. Move the decimal point three places to the right.
 $0.094 \times 1000 = 94$
44. Move the decimal point three places to the right.
 $0.025 \times 1000 = 25$
45. Move the decimal point one place to the left.
 $1.62 \div 10 = 0.162$
46. Move the decimal point one place to the left.
 $8.04 \div 10 = 0.804$
47. Move the decimal point two places to the left.
 $124.03 \div 100 = 1.2403$
48. Move the decimal point two places to the left.
 $490.35 \div 100 = 4.9035$
49. Move the decimal point three places to the left.
 $23.29 \div 1000 = 0.02329$
50. Move the decimal point three places to the left.
 $59.8 \div 1000 = 0.0598$
51. Convert from a decimal to a percent.
 $0.01 = 0.01 \cdot 100\% = 1\%$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{1}{100}$	0.01	1%

52. Convert from a percent to a decimal.

$$2\% = \frac{2}{100} = 0.02$$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{1}{50}$	0.02	2%

53. Convert from a percent to a fraction.

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

In lowest terms,

$$\frac{5}{100} = \frac{1 \cdot 5}{20 \cdot 5} = \frac{1}{20}$$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{1}{20}$	0.05	5%

54. Convert to a decimal first. Divide 1 by 10.
Move the decimal point one place to the left.
 $1 \div 10 = 0.1$
Convert the decimal to a percent.
 $0.1 = 0.1 \cdot 100\% = 10\%$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{1}{10}$	0.1	10%

55. Convert the decimal to a percent.
 $0.125 = 0.125 \cdot 100\% = 12.5\%$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{1}{8}$	0.125	12.5%

56. Convert the percent to a decimal first.

$$20\% = 0.20, \text{ or } 0.2$$

Convert from a percent to a fraction.

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

In lowest terms,

$$\frac{20}{100} = \frac{1 \cdot 20}{5 \cdot 20} = \frac{1}{5}$$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{1}{5}$	0.2	20%

57. Convert to a decimal first. Divide 1 by 4. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.25 \\ 4 \overline{)1.00} \\ \underline{8} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

Convert the decimal to a percent.

$$0.25 = 0.25 \cdot 100\% = 25\%$$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{1}{4}$	0.25	25%

58. Convert to a decimal first. Divide 1 by 3. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.33\ldots \\ 3 \overline{)1.00\ldots} \\ \underline{9} \\ 10 \\ \underline{9} \\ 1 \end{array}$$

Note that the pattern repeats. Therefore,

$$\frac{1}{3} = 0.\bar{3}$$

Convert the decimal to a percent.

$$0.33\bar{3} = 0.33\bar{3} \cdot 100\% = 33.\bar{3}\%, \text{ or } 33\frac{1}{3}\%$$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{1}{3}$	$0.\bar{3}$	$33.\bar{3}\%$ or $33\frac{1}{3}\%$

- 59.** Convert the percent to a decimal first.

$$50\% = 0.50, \text{ or } 0.5$$

Convert from a percent to a fraction.

$$50\% = \frac{50}{100}$$

In lowest terms,

$$\frac{50}{100} = \frac{1 \cdot 50}{2 \cdot 50} = \frac{1}{2}$$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{1}{2}$	0.5	50%

- 60.** Divide 2 by 3. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.66\ldots \\ 3 \overline{)2.00\ldots} \\ \underline{18} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

Note that the pattern repeats. Therefore,

$$\frac{2}{3} = 0.\bar{6}$$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{2}{3}$	$0.\bar{6}$	$66.\bar{6}\%$ or $66\frac{2}{3}\%$

- 61.** Convert the decimal to a percent first.

$$0.75 = 0.75 \cdot 100\% = 75\%$$

Convert from a percent to a fraction.

$$75\% = \frac{75}{100}$$

In lowest terms,

$$\frac{75}{100} = \frac{3 \cdot 25}{4 \cdot 25} = \frac{3}{4}$$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
$\frac{3}{4}$	0.75	75%

- 62.** Convert the decimal to a percent.

$$1.0 = 1.0 \cdot 100\% = 100\%$$

Fraction in Lowest Terms (or Whole Number)	Decimal	Percent
1	1.0	100%

- 63.** Divide 21 by 5. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 4.2 \\ 5 \overline{)21.0} \\ \underline{20} \\ 10 \\ \underline{10} \\ 0 \end{array}$$

- 64.** Divide 9 by 5. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 1.8 \\ 5 \overline{)9.0} \\ \underline{5} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

65. Divide 9 by 4. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 2.25 \\ 4 \overline{)9.00} \\ \underline{8} \\ 10 \\ \underline{8} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

66. Divide 15 by 4. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 3.75 \\ 4 \overline{)15.00} \\ \underline{12} \\ 30 \\ \underline{28} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

67. Divide 3 by 8. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.375 \\ 8 \overline{)3.000} \\ \underline{24} \\ 60 \\ \underline{56} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

68. Divide 7 by 8. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.875 \\ 8 \overline{)7.000} \\ \underline{64} \\ 60 \\ \underline{56} \\ 40 \\ \underline{40} \\ 0 \end{array}$$

69. Divide 5 by 9. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.555... \\ 9 \overline{)5.000...} \\ \underline{45} \\ 50 \\ \underline{45} \\ 50 \\ \underline{45} \\ 5 \end{array}$$

Note that the pattern repeats. Therefore,

$$\frac{5}{9} = 0.\overline{5}, \text{ or about } 0.556.$$

70. Divide 8 by 9. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.888... \\ 9 \overline{)8.000...} \\ \underline{72} \\ 80 \\ \underline{72} \\ 80 \\ \underline{72} \\ 8 \end{array}$$

Note that the pattern repeats. Therefore,

$$\frac{8}{9} = 0.\overline{8}, \text{ or about } 0.889.$$

71. Divide 1 by 6. Add a decimal point and as many 0s as necessary.

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

Note that the pattern repeats. Therefore,

$$\frac{1}{6} = 0.\overline{16}, \text{ or about } 0.167.$$

72. Divide 5 by 6. Add a decimal point and as many 0s as necessary.

$$\begin{array}{r} 0.833\ldots \\ 6 \overline{)5.000\ldots} \\ \underline{48} \\ 20 \\ \underline{18} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

Note that the pattern repeats. Therefore,

$$\frac{5}{6} = 0.8\overline{3}, \text{ or about } 0.833.$$

73. $54\% = 0.54$

74. $39\% = 0.39$

75. $7\% = 07\% = 0.07$

76. $4\% = 04\% = 0.04$

77. $117\% = 1.17$

78. $189\% = 1.89$

79. $2.4\% = 02.4\% = 0.024$

80. $3.1\% = 03.1\% = 0.031$

81. $6\frac{1}{4}\% = 6.25\% = 06.25\% = 0.0625$

82. $5\frac{1}{2}\% = 5.5\% = 05.5\% = 0.055$

83. $0.8\% = 00.8\% = 0.008$

84. $0.9\% = 00.9\% = 0.009$

85. $0.79 = 79\%$

86. $0.83 = 83\%$

87. $0.02 = 2\%$

88. $0.08 = 8\%$

89. $0.004 = 0.4\%$

90. $0.005 = 0.5\%$

91. $1.28 = 128\%$

92. $2.35 = 235\%$

93. $0.40 = 40\%$

94. $0.6 = 0.60 = 60\%$

95. $6 = 6.00 = 600\%$

96. $10 = 10.00 = 1000\%$

97. $51\% = \frac{51}{100}$

98. $47\% = \frac{47}{100}$

99. $15\% = \frac{15}{100}$

In lowest terms,

$$\frac{15}{100} = \frac{3 \cdot 5}{20 \cdot 5} = \frac{3}{20}$$

100. $35\% = \frac{35}{100}$

In lowest terms,

$$\frac{35}{100} = \frac{7 \cdot 5}{20 \cdot 5} = \frac{7}{20}$$

101. $2\% = \frac{2}{100}$

In lowest terms,

$$\frac{2}{100} = \frac{1 \cdot 2}{50 \cdot 2} = \frac{1}{50}$$

102. $8\% = \frac{8}{100}$

In lowest terms,

$$\frac{8}{100} = \frac{2 \cdot 4}{25 \cdot 4} = \frac{2}{25}$$

103. $140\% = \frac{140}{100}$

In lowest terms,

$$\frac{140}{100} = \frac{7 \cdot 20}{5 \cdot 20} = \frac{7}{5}, \text{ or } 1\frac{2}{5}$$

104. $180\% = \frac{180}{100}$

In lowest terms,

$$\frac{180}{100} = \frac{9 \cdot 20}{5 \cdot 20} = \frac{9}{5}, \text{ or } 1\frac{4}{5}$$

105. $7.5\% = \frac{7.5}{100} = \frac{7.5}{100} \cdot \frac{10}{10} = \frac{75}{1000}$

In lowest terms,

$$\frac{75}{1000} = \frac{3 \cdot 25}{40 \cdot 25} = \frac{3}{40}$$