

Applying Rational Numbers

Solutions Key

ARE YOU READY?

1. decimal
2. improper fraction
3. fraction
4. $\frac{24}{40} = \frac{\cancel{8}^1 \cdot 3}{\cancel{8}_1 \cdot 5} = \frac{3}{5}$
5. $\frac{64}{84} = \frac{\cancel{4}^1 \cdot 16}{\cancel{4}_1 \cdot 21} = \frac{16}{21}$
6. $\frac{66}{78} = \frac{\cancel{6}^1 \cdot 11}{\cancel{6}_1 \cdot 13} = \frac{11}{13}$
7. $\frac{64}{192} = \frac{\cancel{64}^1}{\cancel{64}_1 \cdot 3} = \frac{1}{3}$
8. $\frac{21}{35} = \frac{\cancel{7}^1 \cdot 3}{\cancel{7}_1 \cdot 5} = \frac{3}{5}$
9. $\frac{11}{99} = \frac{\cancel{11}^1}{\cancel{11}_1 \cdot 9} = \frac{1}{9}$
10. $\frac{16}{36} = \frac{\cancel{4}^1 \cdot 4}{\cancel{4}_1 \cdot 9} = \frac{4}{9}$
11. $\frac{20}{30} = \frac{\cancel{10}^1 \cdot 2}{\cancel{10}_1 \cdot 3} = \frac{2}{3}$
12. $7\frac{1}{2} = \frac{2 \cdot 7 + 1}{2} = \frac{15}{2}$
13. $2\frac{5}{6} = \frac{6 \cdot 2 + 5}{6} = \frac{17}{6}$
14. $1\frac{14}{15} = \frac{15 \cdot 1 + 14}{15} = \frac{29}{15}$
15. $3\frac{2}{11} = \frac{11 \cdot 3 + 2}{11} = \frac{35}{11}$
16. $3\frac{7}{8} = \frac{8 \cdot 3 + 7}{8} = \frac{31}{8}$
17. $8\frac{4}{9} = \frac{9 \cdot 8 + 4}{9} = \frac{76}{9}$
18. $4\frac{1}{7} = \frac{7 \cdot 4 + 1}{7} = \frac{29}{7}$
19. $5\frac{9}{10} = \frac{10 \cdot 5 + 9}{10} = \frac{59}{10}$
20. $\frac{23}{6} = 3\frac{5}{6}$
21. $\frac{17}{3} = 5\frac{2}{3}$
22. $\frac{29}{7} = 4\frac{1}{7}$
23. $\frac{39}{4} = 9\frac{3}{4}$
24. $\frac{48}{5} = 9\frac{3}{5}$
25. $\frac{82}{9} = 9\frac{1}{9}$
26. $\frac{69}{4} = 17\frac{1}{4}$
27. $\frac{35}{8} = 4\frac{3}{8}$
28. $-11 + (-24) = -35$
29. $-11 + (-7) = -18$
30. $-4 \times (-10) = 40$
31. $-22 \div (-11) = 2$
32. $23 + (-30) = -7$
33. $-33 + (-74) = -107$
34.
$$\begin{array}{r} -62 \\ \times -34 \\ \hline 248 \\ 1860 \\ \hline 2,108 \end{array}$$
35. $84 \div (-12) = -7$
36. $-26 + (-18) = -44$

LESSON 1

Think and Discuss

1. Possible answer: The answer is not correct because the decimal points are not lined up. The solution should be as follows:

$$\begin{array}{r} 12.30 \\ +4.68 \\ \hline 16.98 \end{array}$$

2. Possible answer: Check the reasonableness by estimating. Add to check subtraction. Add again to check addition, or subtract to check addition.

Exercises

1. $5.37 + 16.45$
Line up the decimal points. Add.

$$\begin{array}{r} 5.37 \\ +16.45 \\ \hline 21.82 \end{array}$$

Estimate: $5 + 16 = 21$
21.82 is a reasonable answer.
2. $2.46 + 11.99$
Line up the decimal points. Add.

$$\begin{array}{r} 2.46 \\ +11.99 \\ \hline 14.45 \end{array}$$

Estimate: $2 + 12 = 14$
14.45 is a reasonable answer.
3. $7 + 5.826$
Use zeros as placeholders. Line up the decimal points. Add.

$$\begin{array}{r} 7.000 \\ +5.826 \\ \hline 12.826 \end{array}$$

Estimate: $7 + 6 = 13$
12.826 is a reasonable answer.
4. $-5.62 + (-12.9)$
Line up the decimal points. Use zero as a placeholder. Add. Use the sign of the two numbers.

$$\begin{array}{r} 5.62 \\ +12.90 \\ \hline 18.52 \end{array}$$

 $-5.62 + (-12.9) = -18.52$
Estimate: $-6 + (-13) = -19$
 -18.52 is a reasonable answer.
5. $7.89 - 5.91$
Line up the decimal points. Subtract.

$$\begin{array}{r} 7.89 \\ -5.91 \\ \hline 1.98 \end{array}$$
6. $17 - 4.12$
Use zeros as placeholders. Line up the decimal points. Subtract.

$$\begin{array}{r} 17.00 \\ -4.12 \\ \hline 12.88 \end{array}$$
7. $4.97 - 3.2$
Use zero as a placeholder. Line up the decimal points. Subtract.

$$\begin{array}{r} 4.97 \\ -3.20 \\ \hline 1.77 \end{array}$$

8. $9 - 1.03$

Use zeros as placeholders. Line up the decimal points. Subtract

$$\begin{array}{r} 9.00 \\ -1.03 \\ \hline 7.97 \end{array}$$

9. Line up the decimal points. Subtract.

$$\begin{array}{r} 95.5 \\ -58.3 \\ \hline 37.2 \end{array}$$

Spending by international visitors increased by \$37.2 billion.

10. $7.82 + 31.23 = 39.05$

Estimate: $8 + 31 = 39$

11. $5.98 + 12.99 = 18.97$

Estimate: $6 + 13 = 19$

12. $4.917 + 12 = 16.917$

Estimate: $5 + 12 = 17$

13. $-9.82 + (-15.7) = -25.52$

Estimate: $-10 + (-16) = -26$

14. $6 + 9.33 = 15.33$

Estimate: $6 + 9 = 15$

15. $10.022 + 0.11 = 10.132$

Estimate: $10 + 0 = 10$

16. $8 + 1.071 = 9.071$

Estimate: $8 + 1 = 9$

17. $-3.29 + (-12.6) = -15.89$

Estimate: $-3 + -13 = -16$

18. $5.45 - 3.21 = 2.24$

19. $12.87 - 3.86 = 9.01$

20. $15.39 - 2.6 = 12.79$

21. $21.04 - 4.99 = 16.05$

22. $5 - 0.53 = 4.47$

23. $14 - 8.9 = 5.1$

24. $41 - 9.85 = 31.15$

25. $33 - 10.23 = 22.77$

26. $4.35 + 3.9 = 8.25$

Angela's total time for the two laps is 8.25 min.

27. $122.83 - 45.7 = 77.13$

The jeweler has 77.13 g left.

28. $-7.238 + 6.9 = -0.338$

Estimate: $-7 + 7 = 0$

29. $4.16 - 9.043 = -4.883$

Estimate: $4 - 9 = -5$

30. $-2.09 - 15.271 = -17.361$

Estimate: $-2 - 15 = -17$

31. $5.23 - (-9.1) = 14.33$

Estimate: $5 - (-9) = 14$

32. $-123 - 2.55 = -125.55$

Estimate: $-123 - 3 = -126$

33. $5.29 - 3.37 = 1.92$

Estimate: $5 - 3 = 2$

34. $32.6 - (-15.86) = 48.46$

Estimate: $33 - (-16) = 49$

35. $-32.7 + 62.82 = 30.12$

Estimate: $-33 + 63 = 30$

36. $-51 + 81.623 = 30.623$

Estimate: $-51 + 82 = 31$

37. $5.9 - 10 + 2.84 = -1.26$

Estimate: $6 - 10 + 3 = -1$

38. $-4.2 + 2.3 - 0.7 = -2.6$

Estimate: $-4 + 2 - 1 = -3$

39. $-8.3 + 5.38 - 0.537 = -3.457$

Estimate: $-8 + 5 - 1 = -4$

40. First, find the total distance already run.

$$273.5 + 275.8 + 270.2 = 819.5$$

Then find the distance left to run.

$$2,462 - 819.5 = 1,642.5$$

The students need to run 1,642.5 more miles to reach their goal.

41. You must keep the place value units together. For instance, you will get the wrong answer if you mix up ones and tenths.

42. $68.0 - 66.4 = 1.6$

1.6°F

43. $70.8 - 4.4 = 66.4$

The year with an average summertime temperature of 66.4°F is 1915.

44. $\frac{1.2\text{ g}}{\text{ml}} - \frac{0.3\text{ g}}{\text{ml}} = \frac{0.9\text{ g}}{\text{ml}}$

If the egg floats in water, it is spoiled.

45. $71.1 - 0.051 = 71.049$

D; 71.049 thousand acres

46. Possible answer: Line up the decimal points.

If needed, use zeros as placeholders. Add or subtract.

47. Let x represent the missing number.

$$5.11 + 6.9 - 15.3 + x = 20$$

$$(5.11 + 6.9 - 15.3) + x = 20$$

$$-3.29 + x = 20.00$$

$$\begin{array}{r} +3.29 \\ \hline \end{array} \quad \begin{array}{r} +3.29 \\ \hline \end{array}$$

$$x = 23.29$$

48. B; $22.20 - 20.09 = 2.11$

2.11 seconds

49. G; $\$2.38 + \$0.25 - \$0.89 = \1.74

LESSON 2

Think and Discuss

1. It cannot be correct. Possible answer: There is only one decimal place in the product and there are two decimal places in the factors. Also, an estimate of $2.1 \cdot 3.3$ is $2 \cdot 3 = 6$. 69.3 is too great.

2. Possible answer: Multiplying integers and multiplying decimals are the same in the way the numbers are multiplied. When multiplying decimals, there is the additional step of placing the decimal point in the product.

Exercises

$$\begin{array}{r} 1. \quad -9 \quad 0 \text{ decimal places} \\ \times 0.4 \quad 1 \text{ decimal place} \\ \hline -3.6 \quad 0 + 1 = 1 \text{ decimal place} \end{array}$$

$$\begin{array}{r} 2. \quad 3 \quad 0 \text{ decimal places} \\ \times 0.2 \quad 1 \text{ decimal place} \\ \hline 0.6 \quad 0 + 1 = 1 \text{ decimal place} \end{array}$$

$$\begin{array}{r} 3. \quad 0.06 \quad 2 \text{ decimal places} \\ \times 3 \quad 0 \text{ decimal place} \\ \hline 0.18 \quad 2 + 0 = 2 \text{ decimal places} \end{array}$$

$$\begin{array}{r} 4. \quad -0.5 \quad 1 \text{ decimal place} \\ \times 2 \quad 0 \text{ decimal place} \\ \hline -1.0 \quad 1 + 0 = 1 \text{ decimal place} \end{array}$$

$$\begin{array}{r} 5. \quad 1.7 \quad 1 \text{ decimal place} \\ \times 1.2 \quad 1 \text{ decimal place} \\ \hline 34 \\ 170 \\ \hline 2.04 \quad 1 + 1 = 2 \text{ decimal places} \\ \text{Estimate: } 2 \cdot 1 = 2 \\ 2.04 \text{ is a reasonable answer.} \end{array}$$

$$\begin{array}{r} 6. \quad 2.6 \quad 1 \text{ decimal place} \\ \times 0.4 \quad 1 \text{ decimal place} \\ \hline 1.04 \quad 1 + 1 = 2 \text{ decimal places} \\ \text{Estimate: } 3 \cdot 0.5 = 1.5 \\ 1.04 \text{ is a reasonable answer.} \end{array}$$

$$\begin{array}{r} 7. \quad 1.5 \quad 1 \text{ decimal place} \\ \times -0.21 \quad 2 \text{ decimal places} \\ \hline 15 \\ 300 \\ \hline -0.315 \quad 1 + 2 = 3 \text{ decimal places} \\ \text{Estimate: } 2 \cdot 0 = 0 \\ -0.315 \text{ is a reasonable answer.} \end{array}$$

$$\begin{array}{r} 8. \quad -0.4 \quad 1 \text{ decimal place} \\ \times 1.17 \quad 2 \text{ decimal places} \\ \hline 28 \\ 40 \\ 400 \\ \hline -0.468 \quad 1 + 2 = 3 \text{ decimal places} \\ \text{Estimate: } -0.5 \cdot 1 = -0.5 \\ -0.468 \text{ is a reasonable answer.} \end{array}$$

$$\begin{array}{r} 9. \quad 24.03 \quad 2 \text{ decimal places} \\ \times 13.93 \quad 2 \text{ decimal places} \\ \hline 7209 \\ 216270 \\ 720900 \\ 2403000 \\ \hline 334.7379 \quad 2 + 2 = 4 \text{ decimal places} \\ \text{Estimate: } 25 \cdot 14 = 350 \\ 334.7379 \text{ is a reasonable answer.} \\ \text{Carla could drive 334.7379 miles.} \end{array}$$

$$10. 8 \cdot 0.6 = 4.8$$

$$11. 5 \cdot 0.07 = 0.35$$

$$12. -3 \cdot 2.7 = -8.1$$

$$13. 0.8 \cdot 4 = 3.2$$

$$14. 6 \cdot 4.9 = 29.4$$

$$15. 1.7 \cdot (-12) = -20.4$$

$$16. 43 \cdot 2.11 = 90.73$$

$$17. -7 \cdot (-1.3) = 9.1$$

$$18. 2.4 \cdot 3.2 = 7.68$$

$$19. 2.8 \cdot 1.6 = 4.48$$

$$\text{Estimate: } 2 \cdot 3 = 6$$

$$\text{Estimate: } 3 \cdot 1.5 = 5$$

$$20. 5.3 \cdot 4.6 = 24.38$$

$$\text{Estimate: } 5 \cdot 5 = 25$$

$$21. 4.02 \cdot 0.7 = 2.814$$

$$\text{Estimate: } 4 \cdot 1 = 4$$

$$22. -5.14 \cdot 0.03 = -0.1542$$

$$\text{Estimate: } -5 \cdot 0 = 0$$

$$23. 1.04 \cdot (-8.9) = -9.256$$

$$\text{Estimate: } 1 \cdot (-9) = -9$$

$$24. 4.31 \cdot (-9.5) = -40.945$$

$$\text{Estimate: } 4 \cdot (-10) = -40$$

$$25. -6.1 \cdot (-1.01) = 6.161$$

$$\text{Estimate: } -6 \cdot (-1) = 6$$

$$26. 15.8 \cdot 18 = 284.4$$

$$\text{Estimate: } 16 \cdot 18 = 288$$

Nicholas bicycled 284.4 kilometers last month.

$$27. 3.63 \cdot 1.5 = 5.445$$

$$\text{Estimate: } 4 \cdot 1.5 = 6$$

Lara walked 5.445 miles.

$$28. -9.6 \cdot 2.05 = -19.68$$

$$\text{Estimate: } -10 \cdot 2 = -20$$

$$29. 0.07 \cdot 0.03 = 0.0021$$

$$\text{Estimate: } 0 \cdot 0 = 0$$

$$30. 4 \cdot 4.15 = 16.6$$

$$\text{Estimate: } 4 \cdot 4 = 16$$

$$31. -1.08 \cdot (-0.4) = 0.432$$

$$\text{Estimate: } -1 \cdot 0 = 0$$

$$32. 1.46 \cdot (-0.06) = -0.0876$$

$$\text{Estimate: } 1.5 \cdot 0 = 0$$

$$33. -3.2 \cdot 0.9 = -2.88$$

$$\text{Estimate: } -3 \cdot 1 = -3$$

$$34. -325.9 \cdot 1.5 = -488.85$$

$$\text{Estimate: } -300 \cdot 1.5 = -450$$

$$35. 14.7 \cdot 0.13 = 1.911$$

$$\text{Estimate: } 15 \cdot 0 = 0$$

$$36. -28.5 \cdot (-1.07) = 30.495$$

$$\text{Estimate: } -30 \cdot -1 = 30$$

$$37. -7.02 \cdot (-0.05) = 0.351$$

$$\text{Estimate: } -7 \cdot 0 = 0$$

$$38. 1.104 \cdot (-0.7) = -0.7728$$

$$\text{Estimate: } 1 \cdot -1 = -1$$

$$39. 0.072 \cdot 0.12 = 0.00864$$

$$\text{Estimate: } 0 \cdot 0 = 0$$

$$40. (8.95 \cdot 32.5) + 28.75$$

$$290.875 + 28.75$$

$$319.625 \approx 319.63$$

Bo earned \$319.63 last week.

$$41. 27.16 \cdot 1.066 = 28.96256 \approx 28.95$$

The air pressure within the eye of a Category 1 hurricane is about 28.95 inches of mercury.

$$42. \text{ a. } 1994 - 1995: 7 \text{ million people enjoyed canoeing} \\ 7 \cdot 3 = 21$$

$$1999 - 2000: 19.7 \text{ million people enjoyed canoeing.}$$

$$19.7 \text{ is about 3 times 7.}$$

yes, this is a reasonable claim.

- b. 2016–2017: 6.6 million people enjoyed kayaking.
6.6 rounds to 7.
 $7 \cdot 6 = 42$
about 42 million people
43. $0.3 \cdot 2.8 \cdot (-10.6) = -8.904$
Estimate: $0.5 \cdot 3 \cdot -10 = -15$
44. $1.3 \cdot (-4.2) \cdot (-3.94) = 21.5124$
Estimate: $1 \cdot (-4) \cdot (-4) = 16$
45. $0.6 \cdot (-0.9) \cdot 0.05 = -0.027$
Estimate: $0.5 \cdot (-1) \cdot 0 = 0$
46. $-6.5 \cdot (-1.02) \cdot (-12.6) = -83.538$
Estimate: $-7 \cdot (-1) \cdot (-13) = -91$
47. $-22.08 \cdot (-5.6) \cdot 9.9 = 1,224.1152$
Estimate: $-22 \cdot (-6) \cdot 10 = 1,320$
48. $-63.75 \cdot 13.46 \cdot 7.8 = -6,692.985$
Estimate: $-64 \cdot 13 \cdot 8 = 6,656$
49. Possible answer: What is the total mass of the rocks in the collection?
50. They are the same: 2.048. Possible answer: The factors differ only in the placement of the decimal points. However, the product has the same number of digits after the decimal point.
51. $(0.2)^5$
 $0.2 \cdot 0.2 \cdot 0.2 \cdot 0.2 \cdot 0.2$
 $0.04 \cdot 0.2 \cdot 0.2 \cdot 0.2$
 $0.008 \cdot 0.2 \cdot 0.2$
 $0.0016 \cdot 0.2$
 0.00032
52. Check each expression to see which is equal to -4.3 .
A. $0.8 \cdot (-5.375) = -4.3 \checkmark$
53. $1.8 \cdot 5 + 2.3$
 $9 + 2.3$
 11.3
Julia walked 11.3 miles.

LESSON 3

Think and Discuss

- Possible answer: They are not the same. To change 4.27 to a whole number, you must multiply by 100. You must also multiply 0.7 by 100, resulting in 70, not 7.
- Possible answer: First multiply the divisor by the power of ten to make it a whole number, and multiply the integer by the same power of ten. Then divide as you would with whole numbers.

Exercises

- $3.78 \div 4.2$
Multiply both numbers by 10.
 $37.8 \div 42$
$$\begin{array}{r} 0.9 \\ 42 \overline{)37.8} \\ \underline{-37.8} \\ 0 \end{array}$$

- $13.3 \div (-0.38)$
Multiply both numbers by 100.
 $1,330 \div (-38)$
$$\begin{array}{r} 35 \\ 38 \overline{)1330} \\ \underline{-114} \\ 190 \\ \underline{-190} \\ 0 \end{array}$$

The signs are different.
 $13.3 \div (-0.38) = -35$

- $14.49 \div 3.15$
Multiply both numbers by 100.
 $1,449 \div 315$
$$\begin{array}{r} 4.6 \\ 315 \overline{)1449.0} \\ \underline{-1260} \\ 1890 \\ \underline{-1890} \\ 0 \end{array}$$

- $1.06 \div 0.2$
Multiply both numbers by 10.
 $10.6 \div 2$
$$\begin{array}{r} 5.3 \\ 2 \overline{)10.6} \\ \underline{-10} \\ 06 \\ \underline{-6} \\ 0 \end{array}$$

- $-9.76 \div 3.05$
Multiply both numbers by 100.
 $-976 \div 305$
$$\begin{array}{r} 3.2 \\ 305 \overline{)976.0} \\ \underline{-915} \\ 610 \\ \underline{-610} \\ 0 \end{array}$$

The signs are different.
 $-9.76 \div 3.06 = -3.2$

- $263.16 \div (-21.5)$
Multiply both numbers by 10.
 $2,631.6 \div (-215)$
$$\begin{array}{r} 12.24 \\ 215 \overline{)2631.60} \\ \underline{-215} \\ 481 \\ \underline{-430} \\ 516 \\ \underline{-430} \\ 860 \\ \underline{-860} \\ 0 \end{array}$$

The signs are different.
 $263.16 \div (-21.5) = -12.24$

7. $3 \div 1.2$

Multiply both numbers by 10.

$30 \div 12$

$$\begin{array}{r} 2.5 \\ 12 \overline{)30.0} \\ \underline{-24} \\ 60 \\ \underline{-60} \\ 0 \end{array}$$

Estimate: $3 \div 1 = 3$

2.5 is a reasonable answer.

8. $84 \div 2.4$

Multiply both numbers by 10.

$840 \div 24$

$$\begin{array}{r} 35 \\ 24 \overline{)840} \\ \underline{-72} \\ 120 \\ \underline{-120} \\ 0 \end{array}$$

Estimate: $80 \div 2 = 40$

35 is a reasonable answer.

9. $36 \div (-2.25)$

Multiply both numbers by 100.

$3,600 \div (-225)$

$$\begin{array}{r} 16 \\ 225 \overline{)3600} \\ \underline{-225} \\ 1350 \\ \underline{-1350} \\ 0 \end{array}$$

The signs are different.

$36 \div (-2.25) = -16$

Estimate: $36 \div (-2) = -18$

-16 is a reasonable answer.

10. $24 \div (-1.2)$

Multiply both numbers by 10.

$240 \div (-12)$

$$\begin{array}{r} 20 \\ 12 \overline{)240} \\ \underline{-24} \\ 00 \\ \underline{-00} \\ 0 \end{array}$$

The signs are different.

$24 \div (-1.2) = -20$

Estimate: $24 \div (-1) = -24$

-20 is a reasonable answer.

11. $-18 \div 3.75$

Multiply both numbers by 100.

$-1,800 \div 375$

$$\begin{array}{r} 4.8 \\ 375 \overline{)1800.0} \\ \underline{-1500} \\ 3000 \\ \underline{-3000} \\ 0 \end{array}$$

The signs are different.

$-18 \div 3.75 = -4.8$

Estimate: $-20 \div 4 = -5$

-4.8 is a reasonable answer.

12. $189 \div 8.4$

Multiply both numbers by 10.

$1,890 \div 84$

$$\begin{array}{r} 22.5 \\ 84 \overline{)1890.0} \\ \underline{-168} \\ 210 \\ \underline{-168} \\ 420 \\ \underline{-420} \\ 0 \end{array}$$

Estimate: $200 \div 10 = 20$

22.5 is a reasonable answer.

13. Divide the number of miles by the amount of gasoline that Samuel used.

$401.8 \div 14.35$

Multiply both numbers by 100.

$40,180 \div 1,435$

$$\begin{array}{r} 28 \\ 1435 \overline{)40180} \\ \underline{-2870} \\ 11480 \\ \underline{-11480} \\ 0 \end{array}$$

Samuel's car's gas mileage was 28 miles per gallon.

14. $81.27 \div 0.03$

Multiply both numbers by 100.

$8,127 \div 3 = 2,709$

$81.27 \div 0.03 = 2,709$

15. $-0.408 \div 3.4$

Multiply both numbers by 10.

$-4.08 \div 34 = -0.12$

$-0.408 \div 3.4 = -0.12$

16. $38.5 \div (-5.5)$

Multiply both numbers by 10.

$385 \div (-55) = -7$

$38.5 \div (-5.5) = -7$

17. $-1.12 \div 0.08$

Multiply both numbers by 100.

$-112 \div 8 = -14$

$-1.12 \div 0.08 = -14$

18. $27.82 \div 2.6$

Multiply both numbers by 10.

$278.2 \div 26 = 10.7$

$27.82 \div 2.6 = 10.7$

19. $14.7 \div 3.5$

Multiply both numbers by 10.

$147 \div 35 = 4.2$

$14.7 \div 3.5 = 4.2$

20. $35 \div (-2.5) = -14$

Estimate: $36 \div (-3) = -12$

21. $361 \div 7.6 = 47.5$

Estimate: $350 \div 7 = 50$

22. $63 \div (-4.2) = -15$

Estimate: $60 \div (-4) = -15$

23. $5 \div 1.25 = 4$

Estimate: $5 \div 1 = 5$

24. $14 \div 2.5 = 5.6$
Estimate: $15 \div 3 = 5$
25. $-78 \div 1.6 = -48.75$
Estimate: $-80 \div 2 = -40$
26. Divide the total miles by the number of gallons used.
 $508.25 \div 26.75 = 19$
Lonnie's truck's gas mileage was 19 miles per gallon.
27. Divide the amount of time by the number of laps.
 $20.4 \div 8.5 = 2.4$
It took Mitchell 2.4 minutes to walk one full lap.
28. $-24 \div 0.32 = -75$
Estimate: $-25 \div 0.3 = -75$
29. $153 \div 6.8 = 22.5$
Estimate: $154 \div 7 = 22$
30. $-2.58 \div (-4.3) = 0.6$
Estimate: $-3 \div (-4) = 0.75$
31. $4.12 \div (-10.3) = -0.4$
Estimate: $4 \div -10 = -0.4$
32. $-17.85 \div 17 = -1.05$
Estimate: $-17 \div 17 = -1$
33. $64 \div 2.56 = 25$
Estimate: $60 \div 3 = 20$
34. $2^2 \cdot (6.8 \div 3.4) \cdot 5$
 $4 \cdot 2 \cdot 5$
40
35. $11.7 \div (0.7 + 0.6) \cdot 2$
 $11.7 \div 1.3 \cdot 2$
18
36. $4 \cdot 5(0.6 + 0.2) \cdot 0.25$
 $4 \cdot 5 \cdot 0.8 \cdot 0.25$
4
37. $(1.6 \div 3.2) \cdot (4.2 + 8.6)$
 $0.5 \cdot 12.8$
6.4
38. Divide the car loan by the number of payments to find the monthly payment.
 $\$13,456.44 \div 36 = \373.79
No, each monthly payment is \$373.79, which is more than the \$350 that Lin Yao can afford.
39. Divide the thickness that the ice needs to be by the rate that it accumulates per year.
 $18 \div 0.0072 = 2,500$
It would take 2,500 years.
40. Possible answer: Decimals represent parts of a whole. Rounding a decimal to a whole number does not change the whole number by a significant amount. If you round 56.21457 to 56, you can quickly see that the answer is about 8.

41. To find the average, add up the number of visits and divide by the number of parks.
 $(20.9 \text{ million} + 13.5 \text{ million} + 21 \text{ million}) \div 3$
 $55.4 \text{ million} \div 3$
Round to the nearest hundredth.
18.47 million
The average number of visits was about 18.47 million.
42. Possible answer: If costs \$12.95 for 5 pounds of mixed nuts. What is the cost of 1 pound of mixed nuts?
43. Possible answer: No, you cannot use the commutative property when dividing decimals. For example, $0.2 \div 0.4 \neq 0.4 \div 0.2$; $0.5 \neq 2$.
44. $(2^3 \cdot 7.5 + 3.69) \div 48.25 \div [1.04 - (0.08 \cdot 2)] = 1.5$
45. C; Check each expression to see which is NOT equal to -1.34 .
A $-6.7 \div 5 = -1.34$ ✓
B $16.08 \div (-12) = -1.34$ ✓
C $-12.06 \div (-9) = 1.34$ ✗
C is NOT equal to -1.34 .
46. H; Divide the total amount spent by the price of 5 sandwiches to find out how many sets of 5 sandwiches were purchased.
 $\$83.25 \div \$5.55 = 15$
Multiply the number of sets of sandwiches by 5 to find out how many sandwiches were purchased.
 $15 \cdot 5 = 75$
Divide the number of sandwiches by the number of players to find out how many sandwiches each player got.
 $75 \div 25 = 3$
Each player got 3 sandwiches.
47. Divide the total cost by the number of CDs.
 $\$49.65 \div 5 = \9.93
9.93

LESSON 4

Think and Discuss

- Possible answer: Isolate x by adding 1.25 to each side.
 $x = 2.5$
- Possible answer: Because the product of 10s is a negative number, s must be negative because 10 is positive. Therefore, s cannot equal 1.01.
 $10 \cdot 1.01 = 10.1$, not -10.1

Exercises

- $w - 5.8 = 1.2$
 $\frac{w}{w} = \frac{+5.8 + 5.8}{7}$
- $x + 9.15 = 17$
 $\frac{-9.15 - 9.15}{x} = \frac{-9.15}{7.85}$
- $k + 3.91 = 28$
 $\frac{-3.91 - 3.91}{k} = \frac{24.09}{24.09}$
- $n - 1.35 = 19.9$
 $\frac{+1.35 + 1.35}{n} = \frac{21.25}{21.25}$

$$5. \quad \frac{b}{1.4} = 3.6$$

$$\frac{b}{1.4} \cdot 1.4 = 3.6 \cdot 1.4$$

$$b = 5.04$$

$$7. \quad 3.1t = 27.9$$

$$\frac{3.1t}{3.1} = \frac{27.9}{3.1}$$

$$t = 9$$

9. Write an equation with s being the cost of the sandwich.

$$\begin{array}{r} \$2.85 + s = \$7.10 \\ -\$2.85 \quad -\$2.85 \\ \hline s = \$4.25 \end{array}$$

The cost of the sandwich was \$4.25.

$$10. \quad v + 0.84 = 6$$

$$\begin{array}{r} -0.84 \quad -0.84 \\ \hline v = 5.16 \end{array}$$

$$12. \quad d - 14.25 = -23.9$$

$$\begin{array}{r} +14.25 \quad +14.25 \\ \hline d = -9.65 \end{array}$$

$$14. \quad w - 9.01 = 12.6$$

$$\begin{array}{r} +9.01 \quad +9.01 \\ \hline w = 21.61 \end{array}$$

$$16. \quad 3.2c = 8$$

$$\begin{array}{r} \frac{3.2c}{3.2} = \frac{8}{3.2} \\ \hline c = 2.5 \end{array}$$

$$18. \quad 21.8x = -124.26$$

$$\begin{array}{r} \frac{21.8x}{21.8} = \frac{-124.26}{21.8} \\ \hline x = -5.7 \end{array}$$

$$20. \quad \frac{m}{0.19} = 12$$

$$\frac{m}{0.19} \cdot 0.19 = 12 \cdot 0.19$$

$$m = 2.28$$

$$21. \quad \frac{a}{21.23} = -3.5$$

$$\frac{a}{21.23} \cdot 21.23 = -3.5 \cdot 21.23$$

$$a = -74.305$$

22. Write an equation with t being the cost of the ticket.

$$25t = \$31.25$$

$$\frac{25t}{25} = \frac{\$31.25}{25}$$

$$t = \$1.25$$

The cost of each ticket is \$1.25.

23. Write an equation with c being the cost to climb the rock wall.

$$\frac{c}{5} = \$1.50$$

$$\frac{c}{5} \cdot 5 = \$1.50 \cdot 5$$

$$c = \$7.50$$

The cost to climb the rock wall is \$7.50.

$$24. \quad 1.2y = -1.44$$

$$\frac{1.2y}{1.2} = \frac{-1.44}{1.2}$$

$$y = -1.2$$

$$6. \quad \frac{x}{0.8} = 7.2$$

$$\frac{x}{0.8} \cdot 0.8 = 7.2 \cdot 0.8$$

$$x = 5.76$$

$$8. \quad 7.5 = 5y$$

$$\frac{7.5}{5} = \frac{5y}{5}$$

$$1.5 = y$$

$$11. \quad c - 32.56 = 12$$

$$\begin{array}{r} +32.56 \quad +32.56 \\ \hline c = 44.56 \end{array}$$

$$13. \quad 3.52 + a = 8.6$$

$$\begin{array}{r} -3.52 \quad -3.52 \\ \hline a = 5.08 \end{array}$$

$$15. \quad p + 30.34 = -22.87$$

$$\begin{array}{r} -30.34 \quad -30.34 \\ \hline p = -53.21 \end{array}$$

$$17. \quad 72 = 4.5z$$

$$\begin{array}{r} \frac{72}{4.5} = \frac{4.5z}{4.5} \\ \hline 16 = z \end{array}$$

$$19. \quad \frac{w}{2.8} = 4.2$$

$$\frac{w}{2.8} \cdot 2.8 = 4.2 \cdot 2.8$$

$$w = 11.76$$

$$25. \quad \frac{n}{8.2} = -0.6$$

$$\frac{n}{8.2} \cdot 8.2 = -0.6 \cdot 8.2$$

$$n = -4.92$$

$$26. \quad w - 4.1 = -5$$

$$\begin{array}{r} +4.1 \quad +4.1 \\ \hline w = -0.9 \end{array}$$

$$28. \quad x - 5.2 = -7.3$$

$$\begin{array}{r} +5.2 \quad +5.2 \\ \hline x = -2.1 \end{array}$$

$$30. \quad a + 0.81 = -6.3$$

$$\begin{array}{r} -0.81 \quad -0.81 \\ \hline a = -7.11 \end{array}$$

$$32. \quad \frac{h}{-7.1} = 0.62$$

$$\frac{h}{-7.1} \cdot (-7.1) = 0.62 \cdot (-7.1)$$

$$h = -4.402$$

$$33. \quad \frac{t}{-0.18} = -5.2$$

$$\frac{t}{-0.18} \cdot (-0.18) = -5.2 \cdot (-0.18)$$

$$t = 0.936$$

$$34. \quad 7.9 = d + 12.7$$

$$\begin{array}{r} -12.7 \quad -12.7 \\ \hline -4.8 = d \end{array}$$

$$36. \quad -k = 287.658$$

$$\begin{array}{r} \frac{-k}{-1} = \frac{287.658}{-1} \\ \hline k = -287.658 \end{array}$$

$$38. \quad 0.64f = 12.8$$

$$\begin{array}{r} \frac{0.64f}{0.64} = \frac{12.8}{0.64} \\ \hline f = 20 \end{array}$$

$$39. \quad 15.217 - j = 4.11$$

$$\begin{array}{r} -15.217 \quad -15.217 \\ \hline -j = -11.107 \\ \hline -j = -11.107 \\ -1 \quad -1 \\ \hline j = 11.107 \end{array}$$

$$40. \quad -2.1 = p + (-9.3)$$

$$\begin{array}{r} +9.3 \quad +9.3 \\ \hline 7.2 = p \end{array}$$

$$41. \quad \frac{27.3}{g} = 54.6$$

$$\frac{27.3}{g} \cdot g = 54.6 \cdot g$$

$$27.3 = 54.6g$$

$$\frac{27.3}{54.6} = \frac{54.6g}{54.6}$$

$$0.5 = g$$

42. Write an equation using x for the number of tubs the members must sell.

$$\$570.00 = \$4.75x$$

$$\frac{\$570.00}{\$4.75} = \frac{\$4.75x}{\$4.75}$$

$$120 = x$$

The members need to sell 120 tubs of cookie dough.

$$27. \quad r + 0.48 = 1.2$$

$$\begin{array}{r} -0.48 \quad -0.48 \\ \hline r = 0.72 \end{array}$$

$$29. \quad 1.05 = -7m$$

$$\frac{1.05}{-7} = \frac{-7m}{-7}$$

$$-0.15 = m$$

$$31. \quad 60k = 54$$

$$\frac{60k}{60} = \frac{54}{60}$$

$$k = 0.9$$

43. Let x represent the regular price of the desk.

$$\frac{x}{4.5} = 38$$

$$\frac{x}{4.5} \cdot 4.5 = 38 \cdot 4.5$$

$$x = 171$$

The regular price of the desk is \$171.

44. Let d represent the density of pennies minted today.

$$d + 1.71 = 8.85$$

$$\frac{-1.71}{d} = \frac{-1.71}{7.14}$$

The density of pennies minted today is 7.14 g/cm^3 .

45. a. $28.3 + 9.8 + 46.5 + 33.1 + 15.9 + 9.1 + 5.4 = 148.1$

148.1 million people claimed ancestry from the countries listed.

- b. The first number greater than 19.6 million is 28.3, which is English, and the first number less than 19.6 million is 15.9, which is Italian. "American" would be placed between Italian and English.

46. Possible answer: The students subtracted 0.63 on the side of the equation with the variable but added 0.63 on the side with 5 instead of subtracting.

$$m + 0.63 = 5$$

$$\frac{-0.63}{m} = \frac{-0.63}{4.37}$$

47. You must keep track of the decimal points when solving equations containing decimals.

48. $-2.8 + (b - 1.7) = -0.6 \cdot 9.4$

$$-2.8 + b + -1.7 = -5.64$$

$$-4.5 + b = -5.64$$

$$\frac{+4.5}{b} = \frac{+4.5}{-1.14}$$

49. C; $-4.55 + x = 6.32$

$$\frac{+4.55}{x} = \frac{+4.55}{10.87}$$

50. H; Let x represent the cost of one ticket.

$$5x = 1.00$$

51. Possible answer: José works for \$6.25 per hour. How many hours will he have to work in order to earn \$125?

Let x represent the number of hours José works.

$$6.25x = 125$$

$$\frac{6.25x}{6.25} = \frac{125}{6.25}$$

$$x = 20$$

José will have to work 20 hours to make \$125.

READY TO GO ON?

- $4.73 + 29.68 = 34.41$
- $-6.89 - (-29.4) = 22.51$
- $23.58 - 8.36 = 15.22$
- $-15 + (-9.44) = -24.44$
- $3.4 \cdot 9.6 = 32.64$
- $-2.66 \cdot 0.9 = -2.394$
- $-7 \cdot (-0.06) = 0.42$

8. $6.94 \cdot (-24) = -166.56$

9. Multiply the number of miles she can run in one hour by the number of hours she will run.

$$7.02 \cdot 1.75 = 12.285$$

Round to the nearest hundredth.

$$12.29$$

Cami can run 12.29 miles in 1.75 hours.

10. $55 \div 12.5 = 4.4$

11. $-126.45 \div (-4.5) = 28.1$

12. $-3.3 \div 0.11 = -30$ 18. $-36 \div (-0.9) = 40$

13. $10.4 \div (-0.8) = -13$ 20. $18 \div 2.4 = 7.5$

14. $-45.6 \div 12 = -3.8$

15. $-99.36 \div (-4) = 24.84$

16. Take the total time divided by the number of laps she ran.

$$38.5 \div 17.5 = 2.2$$

Cynthia ran 1 full lap in 2.2 minutes.

17. $162.18 \div 7.4 = 21.92$

The necklace is worth \$21.92 per gram.

18. $3.4 + n = 8$

$$\frac{-3.4}{n} = \frac{-3.4}{4.6}$$

19. $x - 1.75 = -19$

$$\frac{+1.75}{x} = \frac{+1.75}{-17.25}$$

20. $-3.5 = -5x$

$$\frac{-3.5}{-5} = \frac{-5x}{-5}$$

$$0.7 = x$$

21. $10.1 = \frac{8}{8}$

$$10.1 \cdot 8 = \frac{8}{8} \cdot 8$$

$$80.8 = 8$$

22. Let x represent how much Raymond earns per hour.

$$\frac{x}{1.2} = 5.50$$

$$\frac{x}{1.2} \cdot 1.2 = 5.50 \cdot 1.2$$

$$x = 6.60$$

Raymond earns \$6.60 per hour.

LESSON 5

Think and Discuss

- Possible answer: find a common denominator and write fractions in that form. Numerators are subtracted, but the denominator stays the same.
- Possible answer: $\frac{3}{4} + \frac{2}{3} = \frac{5}{7}$ is not correct. Adding numerators and denominators is not the correct way to add fractions. The correct way to add fractions is to write the fractions with common denominators and add the numerators: $\frac{9}{12} + \frac{8}{12} = \frac{17}{12}$.

Exercises

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

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

$$3. \frac{16}{21} - \frac{7}{21} = \frac{16-7}{21} = \frac{9}{21} = \frac{3}{7}$$

$$4. \frac{4}{17} + 1\frac{1}{17} = \frac{4+11}{17} = \frac{15}{17}$$

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

$$\begin{aligned} 6. \frac{9}{10} - \frac{3}{4} &= \frac{9 \cdot 2}{10 \cdot 2} - \frac{3 \cdot 5}{4 \cdot 5} \\ &= \frac{18}{20} - \frac{15}{20} \\ &= \frac{3}{20} \end{aligned}$$

$$\begin{aligned} 7. \frac{2}{3} + \frac{1}{8} &= \frac{2 \cdot 8}{3 \cdot 8} + \frac{1 \cdot 3}{8 \cdot 3} \\ &= \frac{16}{24} + \frac{3}{24} \\ &= \frac{19}{24} \end{aligned}$$

$$\begin{aligned} 8. \frac{5}{8} - \frac{3}{10} &= \frac{5 \cdot 5}{8 \cdot 5} - \frac{3 \cdot 4}{10 \cdot 4} \\ &= \frac{25}{40} - \frac{12}{40} \\ &= \frac{13}{40} \end{aligned}$$

$$\begin{aligned} 9. \frac{1}{4} - \frac{1}{6} &= \frac{1 \cdot 3}{4 \cdot 3} - \frac{1 \cdot 2}{6 \cdot 2} \\ &= \frac{3}{12} - \frac{2}{12} \\ &= \frac{1}{12} \end{aligned}$$

Parker spent $\frac{1}{12}$ more on rent.

$$\begin{aligned} 10. \frac{2}{3} + \frac{1}{3} &= \frac{3}{3} \\ &= 1 \end{aligned}$$

$$\begin{aligned} 12. \frac{5}{8} + \frac{7}{8} &= \frac{12}{8} \\ &= \frac{3}{2} \text{ or } 1\frac{1}{2} \end{aligned}$$

$$\begin{aligned} 14. \frac{7}{12} - \frac{5}{12} &= \frac{2}{12} \\ &= \frac{1}{6} \end{aligned}$$

$$\begin{aligned} 16. \frac{8}{9} - \frac{5}{9} &= \frac{3}{9} \\ &= \frac{1}{3} \end{aligned}$$

$$\begin{aligned} 18. \frac{1}{5} + \frac{2}{3} &= \frac{3}{15} + \frac{10}{15} \\ &= \frac{13}{15} \end{aligned}$$

$$\begin{aligned} 20. \frac{5}{6} + \frac{3}{4} &= \frac{10}{12} + \frac{9}{12} \\ &= \frac{19}{12} \text{ or } 1\frac{7}{12} \end{aligned}$$

$$\begin{aligned} 22. \frac{21}{24} - \frac{1}{2} &= \frac{21}{24} - \frac{12}{24} \\ &= \frac{9}{24} = \frac{3}{8} \end{aligned}$$

$$\begin{aligned} 24. \frac{1}{2} - \frac{2}{7} &= \frac{7}{14} - \frac{4}{14} \\ &= \frac{3}{14} \end{aligned}$$

$$\begin{aligned} 11. \frac{3}{20} + \frac{7}{20} &= \frac{10}{20} \\ &= \frac{1}{2} \end{aligned}$$

$$\begin{aligned} 13. \frac{6}{15} + \frac{3}{15} &= \frac{9}{15} \\ &= \frac{3}{5} \end{aligned}$$

$$\begin{aligned} 15. \frac{5}{6} - \frac{1}{6} &= \frac{4}{6} \\ &= \frac{2}{3} \end{aligned}$$

$$\begin{aligned} 17. \frac{9}{25} - \frac{4}{25} &= \frac{5}{25} \\ &= \frac{1}{5} \end{aligned}$$

$$\begin{aligned} 19. \frac{1}{6} + \frac{1}{12} &= \frac{2}{12} + \frac{1}{12} \\ &= \frac{3}{12} = \frac{1}{4} \end{aligned}$$

$$\begin{aligned} 21. \frac{1}{2} + \frac{2}{8} &= \frac{4}{8} + \frac{2}{8} \\ &= \frac{6}{8} = \frac{3}{4} \end{aligned}$$

$$\begin{aligned} 23. \frac{3}{4} - \frac{11}{12} &= \frac{9}{12} - \frac{11}{12} \\ &= -\frac{2}{12} = -\frac{1}{6} \end{aligned}$$

$$\begin{aligned} 25. \frac{7}{10} - \frac{1}{6} &= \frac{21}{30} - \frac{5}{30} \\ &= \frac{16}{30} = \frac{8}{15} \end{aligned}$$

$$\begin{aligned} 26. \frac{3}{4} - \frac{1}{12} &= \frac{9}{12} - \frac{1}{12} \\ &= \frac{8}{12} = \frac{2}{3} \end{aligned}$$

Seana had $\frac{2}{3}$ quart of blackberries left.

$$\begin{aligned} 27. \frac{2}{3} - \frac{1}{2} &= \frac{4}{6} - \frac{3}{6} \\ &= \frac{1}{6} \end{aligned}$$

Armando must walk $\frac{1}{6}$ mile farther to get to his school.

$$\begin{aligned} 28. \frac{4}{5} + \frac{6}{7} &= \frac{28}{35} + \frac{30}{35} \\ &= \frac{58}{35} \text{ or } 1\frac{23}{35} \end{aligned}$$

$$\begin{aligned} 29. \frac{5}{6} - \frac{1}{9} &= \frac{15}{18} - \frac{2}{18} \\ &= \frac{13}{18} \end{aligned}$$

$$\begin{aligned} 30. \frac{1}{2} - \frac{3}{4} &= \frac{2}{4} - \frac{3}{4} \\ &= -\frac{1}{4} \end{aligned}$$

$$\begin{aligned} 31. \frac{2}{3} + \frac{2}{15} &= \frac{10}{15} + \frac{2}{15} \\ &= \frac{12}{15} = \frac{4}{5} \end{aligned}$$

$$\begin{aligned} 32. \frac{5}{7} + \frac{1}{3} &= \frac{15}{21} + \frac{7}{21} \\ &= \frac{22}{21} \text{ or } 1\frac{1}{21} \end{aligned}$$

$$\begin{aligned} 33. \frac{1}{2} - \frac{7}{12} &= \frac{6}{12} - \frac{7}{12} \\ &= -\frac{1}{12} \end{aligned}$$

$$\begin{aligned} 34. \frac{3}{4} + \frac{2}{5} &= \frac{15}{20} + \frac{8}{20} \\ &= \frac{23}{20} \text{ or } 1\frac{3}{20} \end{aligned}$$

$$\begin{aligned} 35. \frac{9}{14} - \frac{1}{7} &= \frac{9}{14} - \frac{2}{14} \\ &= \frac{7}{14} = \frac{1}{2} \end{aligned}$$

$$\begin{aligned} 36. \frac{7}{8} + \frac{2}{3} + \frac{5}{6} &= \frac{21}{24} + \frac{16}{24} + \frac{20}{24} \\ &= \frac{57}{24} = \frac{19}{8} \text{ or } 2\frac{3}{8} \end{aligned}$$

$$\begin{aligned} 37. \frac{3}{5} + \frac{1}{10} - \frac{3}{4} &= \frac{12}{20} + \frac{2}{20} - \frac{15}{20} \\ &= -\frac{1}{20} \end{aligned}$$

$$\begin{aligned} 38. \frac{3}{10} + \frac{5}{8} + \frac{1}{5} &= \frac{12}{40} + \frac{25}{40} + \frac{8}{40} \\ &= \frac{45}{40} = \frac{9}{8} \text{ or } 1\frac{1}{8} \end{aligned}$$

$$\begin{aligned} 39. \frac{2}{5} - \frac{1}{6} + \frac{7}{10} &= \frac{12}{30} - \frac{5}{30} + \frac{21}{30} \\ &= \frac{28}{30} = \frac{14}{15} \end{aligned}$$

$$\begin{aligned} 40. -\frac{1}{2} + \frac{3}{8} + \frac{2}{7} &= -\frac{28}{56} + \frac{21}{56} + \frac{16}{56} \\ &= \frac{9}{56} \end{aligned}$$

$$\begin{aligned} 41. \frac{1}{3} + \frac{3}{7} - \frac{1}{9} &= \frac{21}{63} + \frac{27}{63} - \frac{7}{63} \\ &= \frac{41}{63} \end{aligned}$$

$$\begin{aligned} 42. \frac{2}{9} - \frac{7}{18} + \frac{1}{6} &= \frac{4}{18} - \frac{7}{18} + \frac{3}{18} \\ &= \frac{0}{18} = 0 \end{aligned}$$

$$\begin{aligned} 43. \frac{2}{15} + \frac{4}{9} + \frac{1}{3} &= \frac{6}{45} + \frac{20}{45} + \frac{15}{45} \\ &= \frac{41}{45} \end{aligned}$$

$$\begin{aligned} 44. \frac{9}{35} - \frac{4}{7} - \frac{5}{14} &= \frac{18}{70} - \frac{40}{70} - \frac{25}{70} \\ &= -\frac{47}{70} \end{aligned}$$

$$45. \frac{1}{3} - \frac{5}{7} + \frac{8}{21} = \frac{7}{21} - \frac{15}{21} + \frac{8}{21}$$

$$= \frac{0}{21} = 0$$

$$46. -\frac{2}{9} - \frac{1}{12} - \frac{7}{18} = -\frac{8}{36} - \frac{3}{36} - \frac{14}{36}$$

$$= -\frac{25}{36}$$

$$47. -\frac{2}{3} + \frac{4}{5} + \frac{5}{8} = -\frac{80}{120} + \frac{96}{120} + \frac{75}{120}$$

$$= \frac{91}{120}$$

$$48. \frac{1}{2} - \frac{2}{16} = \frac{8}{16} - \frac{2}{16}$$

$$= \frac{6}{16} = \frac{3}{8}$$

The first recipe requires $\frac{3}{8}$ cup more sugar.

$$49. \frac{1}{2} + \frac{1}{3} = \frac{3}{6} + \frac{2}{6}$$

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

Earl worked on his homework for $\frac{5}{6}$ hour.

$$50. \frac{1}{2} - \frac{1}{8} = \frac{4}{8} - \frac{1}{8}$$

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

The difference is $\frac{3}{8}$ measure.

$$51. \frac{2}{3} - \frac{1}{8} = \frac{16}{24} - \frac{3}{24}$$

$$= \frac{13}{24}$$

Lauren walked $\frac{13}{24}$ mile farther than Rosalyn.

$$52. \frac{3}{4} + \frac{1}{8} = \frac{6}{8} + \frac{1}{8}$$

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

Cai and Rosalyn together walked $\frac{7}{8}$ mile.

$$53. \text{Janna walked } \frac{7}{10} = \frac{14}{20} \text{ mile.}$$

$$\text{Cai walked } \frac{3}{4} = \frac{15}{20} \text{ mile.}$$

Cai walked farther than Janna.

$$54. \text{ a. } \frac{1}{4} - \frac{3}{16} = \frac{4}{16} - \frac{3}{16}$$

$$= \frac{1}{16}$$

A hamster weighs $\frac{1}{16}$ pound more.

$$\text{ b. } \frac{1}{16} \cdot 16 = 1$$

A hamster weighs 1 ounce more.

55. To find the weight that still needs to be added, subtract the weight of the nuts already added from the final weight.

$$\frac{3}{4} - \frac{1}{8} - \frac{1}{4} = \frac{6}{8} - \frac{1}{8} - \frac{2}{8}$$

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

You would add $\frac{3}{8}$ pound of cashews.

56. Each number would be $\frac{1}{8}$ less than the number before it.

57. Possible answer: Of the people surveyed, $\frac{1}{3}$ prefer driving cars, $\frac{1}{4}$ prefer driving SUVs, and $\frac{1}{3}$ prefer driving trucks. If the rest of the people prefer riding the bus, what fraction of people prefer riding the bus?

58. Write the fractions with a common denominator, and then write the sum or the difference of the numerators over the common denominator.

59. Let x represent the unknown fraction.

$$x + \left(x + \frac{3}{8}\right) = 1$$

$$(x + x) + \frac{3}{8} = 1$$

$$2x + \frac{3}{8} = 1$$

$$\begin{array}{r} -\frac{3}{8} \\ 2x + \frac{3}{8} = 1 \\ \hline 2x = \frac{5}{8} \end{array}$$

$$2x = \frac{5}{8}$$

$$2x \div 2 = \frac{5}{8} \div 2$$

$$x = \frac{5}{8} \cdot \frac{1}{2}$$

$$x = \frac{5}{16}$$

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

$$= \frac{11}{16}$$

$$\frac{5}{16}, \frac{11}{16}$$

$$60. \text{ B; } \frac{3}{7} + \frac{1}{5} = \frac{15}{35} + \frac{7}{35}$$

$$= \frac{22}{35}$$

61. Subtract each of the amounts that Grace and Julie have from the amount that the recipe requires.

$$1 - \frac{1}{2} - \frac{2}{5} = \frac{10}{10} - \frac{5}{10} - \frac{4}{10}$$

$$= \frac{1}{10} \text{ or } 0.1$$

LESSON 6

Think and Discuss

1. Possible answer: Change the mixed number to an improper fraction, simplify completely, multiply numerators, and multiply denominators.

2. Possible answer: $\frac{1}{2} \cdot \frac{1}{3} \cdot \frac{1}{4} = \frac{1}{24}$ is correct since $1 \cdot 1 \cdot 1 = 1$ and $2 \cdot 3 \cdot 4 = 24$.

3. Possible answer: $\frac{2}{3} \cdot \frac{3}{4} = \frac{6}{12} = \frac{1}{2}$. If you simplify before multiplying, you will not have to simplify the answer.

Exercises

$$\begin{aligned} 1. -8 \cdot \frac{3}{4} &= \frac{-8 \cdot 3}{1 \cdot 4} \\ &= \frac{-8 \cdot 3}{1 \cdot 4} \\ &= \frac{-6}{1} = -6 \end{aligned}$$

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

$$\begin{aligned} 5. 4 \cdot 3\frac{1}{2} &= \frac{4 \cdot 7}{1 \cdot 2} \\ &= \frac{4 \cdot 7}{1 \cdot 2} \\ &= \frac{14}{1} = 14 \end{aligned}$$

$$\begin{aligned} 7. 1\frac{1}{2} \cdot 1\frac{5}{9} &= \frac{3 \cdot 14}{2 \cdot 9} \\ &= \frac{3 \cdot 14}{2 \cdot 9} \\ &= \frac{7}{3} = 2\frac{1}{3} \end{aligned}$$

$$\begin{aligned} 8. 2\frac{6}{7} \cdot (-7) &= \frac{20}{7} \cdot \left(-\frac{7}{1}\right) \\ &= \frac{-20 \cdot 7}{7 \cdot 1} \\ &= \frac{-20}{1} = -20 \end{aligned}$$

$$\begin{aligned} 9. 10 \cdot \frac{1}{4} &= \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} \\ &= \frac{10}{4} \\ &= \frac{5}{2} \\ &= 2\frac{1}{2} \end{aligned}$$

Last night, Maxwell spent $2\frac{1}{2}$ hours dreaming.

$$\begin{aligned} 10. 5 \cdot \frac{1}{8} &= \frac{5 \cdot 1}{1 \cdot 8} \\ &= \frac{5 \cdot 1}{1 \cdot 8} \\ &= \frac{5}{8} \end{aligned}$$

$$\begin{aligned} 12. 3 \cdot \frac{5}{8} &= \frac{3 \cdot 5}{1 \cdot 8} \\ &= \frac{3 \cdot 5}{1 \cdot 8} \\ &= \frac{15}{8} = 1\frac{7}{8} \end{aligned}$$

$$\begin{aligned} 14. \frac{2}{5} \cdot \frac{5}{7} &= \frac{2 \cdot 5}{5 \cdot 7} \\ &= \frac{2}{7} \end{aligned}$$

$$\begin{aligned} 16. \frac{1}{2} \cdot \left(-\frac{4}{9}\right) &= \frac{-1 \cdot 4}{2 \cdot 9} \\ &= \frac{-2}{9} \end{aligned}$$

$$\begin{aligned} 2. \frac{2}{3} \cdot \frac{3}{5} &= \frac{2 \cdot 3}{3 \cdot 5} \\ &= \frac{2}{5} \end{aligned}$$

$$\begin{aligned} 4. \frac{3}{5} \cdot (-15) &= \frac{3}{5} \cdot \left(-\frac{15}{1}\right) \\ &= \frac{-3 \cdot 15}{5 \cdot 1} \\ &= \frac{-9}{1} = -9 \end{aligned}$$

$$\begin{aligned} 6. \frac{4}{9} \cdot 5\frac{2}{5} &= \frac{4 \cdot 27}{9 \cdot 5} \\ &= \frac{4 \cdot 27}{9 \cdot 5} \\ &= \frac{12}{5} = 2\frac{2}{5} \end{aligned}$$

$$\begin{aligned} 11. 4 \cdot \frac{1}{8} &= \frac{4 \cdot 1}{1 \cdot 8} \\ &= \frac{4 \cdot 1}{1 \cdot 8} \\ &= \frac{1}{2} \end{aligned}$$

$$\begin{aligned} 13. 6 \cdot \frac{2}{3} &= \frac{6 \cdot 2}{1 \cdot 3} \\ &= \frac{6 \cdot 2}{1 \cdot 3} \\ &= \frac{4}{1} = 4 \end{aligned}$$

$$\begin{aligned} 15. \frac{3}{8} \cdot \frac{2}{3} &= \frac{3 \cdot 2}{8 \cdot 3} \\ &= \frac{1}{4} \end{aligned}$$

$$\begin{aligned} 17. -\frac{5}{6} \cdot \frac{2}{3} &= \frac{-5 \cdot 2}{6 \cdot 3} \\ &= \frac{-5}{9} \end{aligned}$$

$$\begin{aligned} 18. 7\frac{1}{2} \cdot 2\frac{2}{5} &= \frac{15}{2} \cdot \frac{12}{5} \\ &= \frac{3 \cdot 15 \cdot 12}{2 \cdot 5} \\ &= \frac{18}{1} = 18 \end{aligned}$$

$$\begin{aligned} 20. 2\frac{4}{7} \cdot \frac{1}{6} &= \frac{18}{7} \cdot \frac{1}{6} \\ &= \frac{3 \cdot 18 \cdot 1}{7 \cdot 6} \\ &= \frac{3}{7} \end{aligned}$$

$$\begin{aligned} 22. \frac{2}{3} \cdot 2\frac{1}{4} &= \frac{2 \cdot 9}{3 \cdot 4} \\ &= \frac{2 \cdot 9}{3 \cdot 4} \\ &= \frac{3}{2} = 1\frac{1}{2} \end{aligned}$$

$$\begin{aligned} 24. 7 \cdot 5\frac{1}{8} &= \frac{7 \cdot 41}{1 \cdot 8} \\ &= \frac{7 \cdot 41}{1 \cdot 8} \\ &= \frac{287}{8} = 35\frac{7}{8} \end{aligned}$$

$$\begin{aligned} 26. 4 \cdot \frac{5}{6} &= \frac{5}{6} + \frac{5}{6} + \frac{5}{6} + \frac{5}{6} \\ &= \frac{20}{6} \\ &= \frac{10}{3} \\ &= 3\frac{1}{3} \end{aligned}$$

Sherry spent $3\frac{1}{3}$ hours jogging.

$$\begin{aligned} 27. 5 \cdot \frac{1}{3} &= \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} \\ &= \frac{5}{3} \\ &= 1\frac{2}{3} \end{aligned}$$

Doreen needs $1\frac{2}{3}$ tsp of salt.

$$\begin{aligned} 28. \frac{5}{8} \cdot \frac{4}{5} &= \frac{5 \cdot 4}{8 \cdot 5} \\ &= \frac{1}{2} \end{aligned}$$

$$\begin{aligned} 30. -\frac{2}{3} \cdot 6 &= \frac{-2 \cdot 6}{3 \cdot 1} \\ &= \frac{-2 \cdot 6}{3 \cdot 1} \\ &= \frac{-4}{1} = -4 \end{aligned}$$

$$\begin{aligned} 32. \frac{1}{8} \cdot 5 &= \frac{1 \cdot 5}{8 \cdot 1} \\ &= \frac{1 \cdot 5}{8 \cdot 1} \\ &= \frac{5}{8} \end{aligned}$$

$$\begin{aligned} 34. 4\frac{2}{3} \cdot 2\frac{4}{7} &= \frac{14}{3} \cdot \frac{18}{7} \\ &= \frac{2 \cdot 14 \cdot 18}{3 \cdot 7} \\ &= \frac{12}{1} = 12 \end{aligned}$$

$$\begin{aligned} 19. 6 \cdot 7\frac{2}{5} &= \frac{6 \cdot 37}{1 \cdot 5} \\ &= \frac{6 \cdot 37}{1 \cdot 5} \\ &= \frac{222}{5} = 44\frac{2}{5} \end{aligned}$$

$$\begin{aligned} 21. 2\frac{5}{8} \cdot 6\frac{2}{3} &= \frac{21}{8} \cdot \frac{20}{3} \\ &= \frac{7 \cdot 21 \cdot 20}{8 \cdot 3} \\ &= \frac{35}{2} = 17\frac{1}{2} \end{aligned}$$

$$\begin{aligned} 23. 1\frac{1}{2} \cdot 1\frac{5}{9} &= \frac{3 \cdot 14}{2 \cdot 9} \\ &= \frac{3 \cdot 14}{2 \cdot 9} \\ &= \frac{7}{3} = 2\frac{1}{3} \end{aligned}$$

$$\begin{aligned} 25. 3\frac{3}{4} \cdot 2\frac{1}{5} &= \frac{15}{4} \cdot \frac{11}{5} \\ &= \frac{3 \cdot 15 \cdot 11}{4 \cdot 5} \\ &= \frac{33}{4} = 8\frac{1}{4} \end{aligned}$$

$$\begin{aligned} 29. 4\frac{3}{7} \cdot \frac{5}{6} &= \frac{31}{7} \cdot \frac{5}{6} \\ &= \frac{31 \cdot 5}{7 \cdot 6} \\ &= \frac{155}{42} = 3\frac{29}{42} \end{aligned}$$

$$\begin{aligned} 31. 2 \cdot \frac{1}{6} &= \frac{2 \cdot 1}{1 \cdot 6} \\ &= \frac{2 \cdot 1}{1 \cdot 6} \\ &= \frac{1}{3} \end{aligned}$$

$$\begin{aligned} 33. -\frac{3}{4} \cdot \frac{2}{9} &= \frac{-3 \cdot 2}{4 \cdot 9} \\ &= \frac{-1}{6} \end{aligned}$$

$$\begin{aligned} 35. -\frac{4}{9} \cdot \left(-\frac{3}{16}\right) &= \frac{4 \cdot 3}{9 \cdot 16} \\ &= \frac{1}{12} \end{aligned}$$

$$36. 3\frac{1}{2} \cdot 5 = \frac{7 \cdot 5}{2 \cdot 1}$$

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

$$= \frac{35}{2} = 17\frac{1}{2}$$

$$37. \frac{1}{2} \cdot \frac{2}{3} \cdot \frac{3}{5} = \frac{1 \cdot \cancel{2}^1 \cdot \cancel{3}^1}{\cancel{2}_1 \cdot \cancel{3}^1 \cdot 5}$$

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

$$38. \frac{6}{7} \cdot 5 = \frac{6 \cdot 5}{7 \cdot 1}$$

$$= \frac{6 \cdot 5}{7 \cdot 1}$$

$$= \frac{30}{7} = 4\frac{2}{7}$$

$$39. 1\frac{1}{2} \cdot \frac{3}{5} \cdot \frac{7}{9} = \frac{\cancel{2}^1 \cdot \cancel{3}^1 \cdot 7}{2 \cdot \cancel{5}^1 \cdot \cancel{9}^1}$$

$$= \frac{3 \cdot 3 \cdot 7}{2 \cdot 5 \cdot 9}$$

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

$$40. -\frac{2}{3} \cdot 1\frac{1}{2} \cdot \frac{2}{3} = -\frac{\cancel{2}^1 \cdot \cancel{2}^1 \cdot 2}{\cancel{3}^1 \cdot \cancel{2}^1 \cdot \cancel{3}^1}$$

$$= -\frac{2 \cdot 3 \cdot 2}{3 \cdot 2 \cdot 3}$$

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

$$41. \frac{8}{9} \cdot \frac{3}{11} \cdot \frac{33}{40} = \frac{\cancel{8}^1 \cdot \cancel{3}^1 \cdot \cancel{33}^1}{\cancel{9}^1 \cdot 11 \cdot \cancel{40}^1}$$

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

$$42. \frac{1}{6} \cdot 6 \cdot 8\frac{2}{3} = \frac{1 \cdot \cancel{6}^1 \cdot 26}{\cancel{6}^1 \cdot 1 \cdot 3}$$

$$= \frac{1 \cdot \cancel{6}^1 \cdot 26}{\cancel{6}^1 \cdot 1 \cdot 3}$$

$$= \frac{26}{3} = 8\frac{2}{3}$$

$$43. -\frac{8}{9} \cdot \left(-1\frac{1}{8}\right) = -\frac{8}{9} \cdot \left(-\frac{9}{8}\right)$$

$$= \frac{\cancel{8}^1 \cdot \cancel{9}^1}{\cancel{9}^1 \cdot \cancel{8}^1}$$

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

$$44. \frac{1 \cdot ?}{2 \cdot 8} = \frac{3}{16}$$

$$\frac{1 \cdot ?}{2 \cdot 8} = \frac{3}{16}$$

In the denominators, $2 \cdot 8 = 16$. So, $1 \cdot ? = 3$, and the missing number is 3.

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

$$45. \frac{2 \cdot ?}{3 \cdot 4} = \frac{1}{2}$$

$$\frac{2 \cdot ?}{3 \cdot 4} = \frac{1}{2}$$

In the denominator, $3 \cdot 4 = 12$. $\frac{1}{2} = \frac{6}{12}$, so

$$\frac{2 \cdot ?}{3 \cdot 4} = \frac{6}{12}$$

$2 \cdot 3 = 6$. Therefore, the missing number is 3.

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

3

$$46. \frac{? \cdot 5}{3 \cdot 8} = \frac{5}{12}$$

$$\frac{? \cdot 5}{3 \cdot 8} = \frac{5}{12}$$

In the denominator, $3 \cdot 8 = 24$. $\frac{5}{12} = \frac{10}{24}$, so

$$\frac{? \cdot 5}{3 \cdot 8} = \frac{10}{24}$$

$2 \cdot 5 = 10$. Therefore, the missing number is 2.

$$\frac{\cancel{2}^1 \cdot 5}{3 \cdot \cancel{8}^1} = \frac{5}{12}$$

2

$$47. \frac{3 \cdot ?}{5 \cdot 7} = \frac{3}{7}$$

$$\frac{3 \cdot ?}{5 \cdot 7} = \frac{3}{7}$$

In the denominator, $5 \cdot 7 = 35$. $\frac{3}{7} = \frac{15}{35}$, so

$$\frac{3 \cdot ?}{5 \cdot 7} = \frac{15}{35}$$

$3 \cdot 5 = 15$. Therefore, the missing number is 5.

$$\frac{3 \cdot \cancel{5}^1}{5 \cdot \cancel{7}^1} = \frac{3}{7}$$

5

$$48. \frac{5 \cdot 3}{6 \cdot ?} = \frac{1}{4}$$

$$\frac{5 \cdot 3}{6 \cdot ?} = \frac{1}{4}$$

In the numerator, $5 \cdot 3 = 15$. $\frac{1}{4} = \frac{15}{60}$, so

$$\frac{5 \cdot 3}{6 \cdot ?} = \frac{15}{60}$$

$6 \cdot 10 = 60$, so the missing number is 10.

$$\frac{\cancel{15}^1 \cdot \cancel{3}^1}{\cancel{6}^1 \cdot \cancel{10}^1} = \frac{1}{4}$$

10

$$49. \frac{4 \cdot 4}{? \cdot 5} = \frac{8}{15}$$

$$\frac{4 \cdot 4}{? \cdot 5} = \frac{8}{15}$$

In the numerator, $4 \cdot 4 = 16$. $\frac{8}{15} = \frac{16}{30}$, so

$$\frac{4 \cdot 4}{? \cdot 5} = \frac{16}{30}$$

$6 \cdot 5 = 30$, so 6 is the missing number.

$$\frac{4 \cdot \cancel{4}^2}{\cancel{6}^1 \cdot 5} = \frac{8}{15}$$

6

$$50. \frac{2 \cdot 9}{3 \cdot ?} = \frac{3}{11}$$

$$\frac{2 \cdot 9}{3 \cdot ?} = \frac{3}{11}$$

In the numerator, $2 \cdot 9 = 18$. $\frac{3}{11} = \frac{18}{66}$

$$\frac{2 \cdot 9}{3 \cdot ?} = \frac{18}{66}$$

$3 \cdot 22 = 66$, so the missing number is 22.

$$\frac{\cancel{2}^1 \cdot \cancel{9}^3}{\cancel{3}^1 \cdot \cancel{22}^1} = \frac{3}{11}$$

22

$$51. \frac{?}{15} \cdot \frac{3}{5} = \frac{1}{25}$$

$$\frac{? \cdot 3}{15 \cdot 5} = \frac{1}{25}$$

In the denominator, $15 \cdot 5 = 75$. $\frac{1}{25} = \frac{3}{75}$

$$\frac{? \cdot 3}{15 \cdot 5} = \frac{3}{75}$$

$1 \cdot 3 = 3$, so the missing number is 1.

$$\frac{1 \cdot \cancel{3}^1}{\cancel{3}^1 15 \cdot 5} = \frac{1}{25}$$

$$52. 75 \cdot 1\frac{1}{4} = \frac{75}{1} \cdot \frac{5}{4}$$

$$= \frac{75 \cdot 5}{1 \cdot 4}$$

$$= \frac{375}{4} = 93\frac{3}{4}$$

The paperclips would be $93\frac{3}{4}$ in. long.

$$53. 12\frac{1}{2} \cdot \frac{1}{6} = \frac{25}{2} \cdot \frac{1}{6}$$

$$= \frac{25 \cdot 1}{2 \cdot 6}$$

$$= \frac{25}{12} = 2\frac{1}{12}$$

The bowling ball would weigh $2\frac{1}{12}$ lb on the moon.

$$54. \text{ a. } 200 \cdot \frac{9}{20} = \frac{200}{1} \cdot \frac{9}{20}$$

$$= \frac{200 \cdot 9}{1 \cdot \cancel{20}_1}$$

$$= \frac{90}{1} = 90$$

90 students were influenced by the radio.

b. First, find the number of students influenced by a music video channel.

$$200 \cdot \frac{2}{25} = \frac{200}{1} \cdot \frac{2}{25}$$

$$= \frac{200 \cdot 2}{1 \cdot \cancel{25}_1}$$

$$= \frac{16}{1} = 16$$

Next, subtract the number influenced by a music video channel from the number influenced by radio.

$$90 - 16 = 74$$

74 more students were influenced by the radio than by a music video channel.

c. First, find the number of students influenced by a friend or relative.

$$200 \cdot \frac{3}{20} = \frac{200}{1} \cdot \frac{3}{20}$$

$$= \frac{200 \cdot 3}{1 \cdot \cancel{20}_1}$$

$$= \frac{30}{1} = 30$$

Next, find the number of students influenced by hearing a song in a store.

$$200 \cdot \frac{1}{10} = \frac{200}{1} \cdot \frac{1}{10}$$

$$= \frac{200 \cdot 1}{1 \cdot \cancel{10}_1}$$

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

Add the number of students in each case.

$$30 + 20 = 50$$

50 students said a friend or relative influenced them or they heard the song at the store.

$$55. 2 \cdot 5\frac{2}{3} = \frac{2}{1} \cdot \frac{17}{3}$$

$$= \frac{34}{3} = 11\frac{1}{3}$$

Eduardo will travel $11\frac{1}{3}$ miles.

$$56. \frac{1}{2} \cdot \frac{2}{3} \cdot \frac{3}{4} \cdot \frac{4}{5} = \frac{1}{5}$$

A

57. The product will be less than 1. The fractions $\frac{1}{2}$ and $\frac{1}{4}$ are both positive and proper fractions and $\frac{1}{2} \cdot \frac{1}{4} = \frac{1}{8} < 1$.

58. Possible answer:

$$\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}, \frac{2}{1} \cdot \frac{1}{2} = 1, \frac{5}{2} \cdot \frac{1}{2} = \frac{5}{4} = 1\frac{1}{4}$$

$$59. \text{ B; A } \quad \cancel{18} \cdot \frac{9}{18} = \frac{9}{2} = 4\frac{1}{2}$$

$$4\frac{1}{2} < 5\frac{5}{8}$$

$$\text{B } \quad -\frac{7}{9} \cdot \left(-8\frac{2}{7}\right) = -\frac{7}{9} \cdot \left(-\frac{58}{7}\right) = \frac{58}{9} = 6\frac{4}{9}$$

$$6\frac{4}{9} > 5\frac{5}{8}$$

$$60. \text{ G; } \frac{3}{8} \cdot 85 = \frac{255}{8} = 31\frac{7}{8}$$

$31\frac{7}{8}$ pounds

LESSON 7

Think and Discuss

- They are not the same. Possible answer: The wrong number has been replaced by its reciprocal. The reciprocal of the divisor, not the dividend, should be used.
- Possible answer: when multiplying and dividing, mixed numbers are changed to improper fractions first. Fractions are simplified and then multiplied. The major difference is the change from division by a divisor to multiplication by its reciprocal prior to simplification and multiplication.

Exercises

$$1. 6 \div \frac{1}{3} = \frac{6}{1} \cdot \frac{3}{1}$$

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

$$= \frac{18}{1} = 18$$

$$2. \frac{3}{5} \div \frac{3}{4} = \frac{3}{5} \cdot \frac{4}{3}$$

$$= \frac{\cancel{3} \cdot 4}{5 \cdot \cancel{3}_1}$$

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

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

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

$$= \frac{3}{32}$$

$$4. -\frac{5}{9} \div \frac{2}{5} = -\frac{5}{9} \cdot \frac{5}{2}$$

$$= -\frac{5 \cdot 5}{9 \cdot 2}$$

$$= -\frac{25}{18} = -1\frac{7}{18}$$

$$5. \frac{5}{6} \div 3\frac{1}{3} = \frac{5}{6} \div \frac{10}{3}$$

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

$$= \frac{\cancel{5} \cdot \cancel{3}^1}{\cancel{6}^2 \cdot 10_2}$$

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

$$7. 10\frac{4}{5} \div 5\frac{2}{5} = \frac{54}{5} \div \frac{27}{5}$$

$$= \frac{54}{5} \cdot \frac{5}{27}$$

$$= \frac{\cancel{54}^2 \cdot \cancel{5}^1}{\cancel{5}^1 \cdot \cancel{27}_3}$$

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

$$9. 12\frac{1}{2} \div 3\frac{5}{6} = \frac{25}{2} \div \frac{23}{6}$$

$$= \frac{25}{2} \cdot \frac{6}{23}$$

$$= \frac{25 \cdot \cancel{6}^3}{\cancel{2}^1 \cdot 23}$$

$$= \frac{75}{23} = 3\frac{6}{23}$$

Kareem can make
3 capes.

$$11. 10 \div \frac{5}{9} = 10 \cdot \frac{9}{5}$$

$$= 18$$

$$12. \frac{3}{4} \div \frac{6}{7} = \frac{3}{4} \cdot \frac{7}{6}$$

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

$$13. \frac{7}{8} \div \frac{1}{5} = \frac{7}{8} \cdot \frac{5}{1}$$

$$= \frac{35}{8} \text{ or } 4\frac{3}{8}$$

$$14. \frac{8}{9} \div \frac{1}{4} = \frac{8}{9} \cdot \frac{4}{1}$$

$$= \frac{32}{9} = 3\frac{5}{9}$$

$$16. \frac{9}{10} \div 6 = \frac{9}{10} \cdot \frac{1}{6}$$

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

$$17. -16 \div \frac{2}{5} = -16 \cdot \frac{5}{2}$$

$$= -40$$

$$18. \frac{7}{11} \div 4\frac{1}{5} = \frac{7}{11} \div \frac{21}{5}$$

$$= \frac{7}{11} \cdot \frac{5}{21}$$

$$= \frac{5}{33}$$

$$19. \frac{3}{4} \div 2\frac{1}{10} = \frac{3}{4} \div \frac{21}{10}$$

$$= \frac{3}{4} \cdot \frac{10}{21}$$

$$= \frac{5}{14}$$

$$20. 22\frac{1}{2} \div 4\frac{2}{7} = \frac{45}{2} \div \frac{30}{7}$$

$$= \frac{45}{2} \cdot \frac{7}{30}$$

$$= \frac{21}{4} = 5\frac{1}{4}$$

$$21. -10\frac{1}{2} \div \frac{3}{4} = -\frac{21}{2} \div \frac{3}{4}$$

$$= -\frac{21}{2} \cdot \frac{4}{3}$$

$$= -14$$

$$22. 3\frac{5}{7} \div 9\frac{1}{7} = \frac{26}{7} \div \frac{64}{7}$$

$$= \frac{26}{7} \cdot \frac{7}{64}$$

$$= \frac{13}{32}$$

$$23. 14\frac{2}{3} \div 1\frac{1}{6} = \frac{44}{3} \div \frac{7}{6}$$

$$= \frac{44}{3} \cdot \frac{6}{7}$$

$$= \frac{88}{7} = 12\frac{4}{7}$$

$$24. 7\frac{7}{10} \div 2\frac{2}{5} = \frac{77}{10} \div \frac{12}{5}$$

$$= \frac{77}{10} \cdot \frac{5}{12}$$

$$= \frac{77}{24} = 3\frac{5}{24}$$

$$25. 8\frac{2}{5} \div \frac{7}{8} = \frac{42}{5} \cdot \frac{8}{7}$$

$$= \frac{\cancel{42}^6 \cdot 8}{\cancel{5}^1 \cdot \cancel{7}_1}$$

$$= \frac{48}{5} = 9\frac{3}{5}$$

$$26. 43\frac{3}{4} \div 2\frac{1}{2} = \frac{175}{4} \div \frac{5}{2}$$

$$= \frac{175}{4} \cdot \frac{2}{5}$$

$$= \frac{35}{2} = 17\frac{1}{2}$$

$$27. 147 \div 24\frac{1}{2} = 147 \div \frac{49}{2}$$

$$= 147 \cdot \frac{2}{49}$$

$$= 6$$

17 bottles can be filled.

6 pieces of ribbon can be cut.

$$28. 6\frac{2}{3} \div \frac{7}{9} = \frac{20}{3} \cdot \frac{9}{7}$$

$$= \frac{60}{7} = 8\frac{4}{7}$$

$$29. -1\frac{7}{11} \div \frac{9}{11} = -\frac{18}{11} \cdot \frac{11}{9}$$

$$= -2$$

$$30. \frac{2}{3} \div \frac{8}{9} = \frac{2}{3} \cdot \frac{9}{8}$$

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

$$31. -1\frac{3}{5} \div 2\frac{1}{2} = -\frac{8}{5} \div \frac{5}{2}$$

$$= -\frac{8}{5} \cdot \frac{2}{5}$$

$$= -\frac{16}{25}$$

$$32. \frac{1}{2} \div 4\frac{3}{4} = \frac{1}{2} \div \frac{19}{4}$$

$$= \frac{1}{2} \cdot \frac{4}{19}$$

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

$$33. \left(2\frac{3}{4} + 3\frac{2}{3}\right) \div \frac{11}{18} = \left(2\frac{9}{12} + 3\frac{8}{12}\right) \div \frac{11}{18}$$

$$= 5\frac{17}{12} \div \frac{11}{18}$$

$$= \frac{77}{12} \cdot \frac{18}{11}$$

$$= \frac{21}{2} = 10\frac{1}{2}$$

$$34. \left(\frac{1}{2} + \frac{2}{3}\right) \div 1\frac{1}{2} = \left(\frac{3}{6} + \frac{4}{6}\right) \div \frac{3}{2}$$

$$= \frac{7}{6} \cdot \frac{2}{3}$$

$$= \frac{7}{9}$$

$$35. \frac{4}{5} \cdot \frac{3}{8} \div \frac{9}{10} = \frac{3}{10} \div \frac{9}{10}$$

$$= \frac{3}{10} \cdot \frac{10}{9}$$

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

$$\begin{aligned}
 36. \frac{1}{2} \left(\frac{3}{5} - \frac{2}{15} \right) + \frac{2}{9} \div \frac{1}{3} &= \frac{1}{2} \left(\frac{9}{15} - \frac{2}{15} \right) + \frac{2}{9} \cdot \frac{3}{1} \\
 &= \frac{1}{2} \left(\frac{7}{15} \right) + \frac{6}{9} \\
 &= \frac{7}{30} + \frac{2}{3} \\
 &= \frac{7}{30} + \frac{20}{30} \\
 &= \frac{27}{30} \\
 &= \frac{9}{10}
 \end{aligned}$$

$$\begin{aligned}
 37. \frac{3}{7} \div \frac{15}{28} \div \left(-\frac{4}{5} \right) &= \frac{3}{7} \cdot \frac{28}{15} \div \left(-\frac{4}{5} \right) \\
 &= \frac{4}{5} \div \left(-\frac{4}{5} \right) \\
 &= -1
 \end{aligned}$$

$$\begin{aligned}
 38. \frac{7}{8} \div 2\frac{1}{10} &= \frac{7}{8} \div \frac{21}{10} \\
 &= \frac{7}{8} \cdot \frac{10}{21} \\
 &= \frac{5}{12}
 \end{aligned}$$

$$\begin{aligned}
 39. \frac{2}{3} \div \left(\frac{5}{6} + \frac{1}{12} \right) - 2 \cdot \frac{1}{2} &= \frac{2}{3} \div \frac{11}{12} - 1 \\
 &= \frac{2}{3} \cdot \frac{12}{11} - 1 \\
 &= \frac{24}{33} - \frac{33}{33} \\
 &= -\frac{9}{33} \\
 &= -\frac{3}{11}
 \end{aligned}$$

$$\begin{aligned}
 40. \frac{3}{4} + \frac{3}{20} \div \frac{2}{5} \cdot \frac{7}{8} - 1 &= \frac{3}{4} + \frac{3}{20} \cdot \frac{5}{2} \cdot \frac{7}{8} - 1 \\
 &= \frac{3}{4} + \frac{105}{320} - 1 \\
 &= \frac{3}{4} + \frac{21}{64} - 1 \\
 &= \frac{48}{64} + \frac{21}{64} - \frac{64}{64} \\
 &= \frac{5}{64}
 \end{aligned}$$

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

$$\begin{aligned}
 42. 226\frac{4}{5} \div 3 &= \frac{1,134}{5} \div 3 \\
 &= \frac{1,134}{5} \cdot \frac{1}{3} \\
 &= \frac{378}{5} = 75\frac{3}{5}
 \end{aligned}$$

Each friend will drive $75\frac{3}{5}$ miles.

Possible answer: Dividing by 3 will equally split the total distance between the three friends.

43. First, find the total amount of meat.

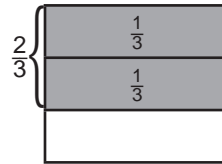
$$\begin{aligned}
 10\frac{1}{4} + 11\frac{1}{2} &= 10\frac{1}{4} + 11\frac{2}{4} \\
 &= 21\frac{3}{4}
 \end{aligned}$$

Next, divide the total amount of meat by $\frac{1}{4}$.

$$\begin{aligned}
 21\frac{3}{4} \div \frac{1}{4} &= \frac{87}{4} \cdot \frac{4}{1} \\
 &= 87
 \end{aligned}$$

87 hamburger patties can be made from the meat.

44. Possible answer: To divide $\frac{2}{3}$ by $\frac{1}{3}$ means to find how many $\frac{1}{3}$'s are in $\frac{2}{3}$. The model shows that there are two $\frac{1}{3}$'s in $\frac{2}{3}$, so $\frac{2}{3} \div \frac{1}{3} = 2$.



45. First, find how many pieces can be cut from each board.

$$\begin{aligned}
 50\frac{3}{4} \div 7\frac{1}{4} &= \frac{203}{4} \div \frac{29}{4} \\
 &= \frac{203}{4} \cdot \frac{4}{29} \\
 &= 7
 \end{aligned}$$

Each board will make 7 pieces.

Mr. Park has 6 boards, and each board will make 7 pieces.

$$6 \cdot 7 = 42$$

42 side pieces can be cut.

$$\begin{aligned}
 46. 8\frac{3}{4} \div 1\frac{1}{4} &= \frac{35}{4} \div \frac{5}{4} \\
 &= \frac{35}{4} \cdot \frac{4}{5} \\
 &= 7
 \end{aligned}$$

Brandy can get 7 circles.

$$\begin{aligned}
 47. 3\frac{2}{3} \div 4 &= \frac{11}{3} \cdot \frac{1}{4} \\
 &= \frac{11}{12}
 \end{aligned}$$

The bookcase in the drawing will be $\frac{11}{12}$ foot, or 11 inches.

$$\begin{aligned}
 48. 199\frac{3}{4} \div 17 &= \frac{799}{4} \cdot \frac{1}{17} \\
 &= \frac{47}{4} = 11\frac{3}{4}
 \end{aligned}$$

Each student worked an average of $11\frac{3}{4}$ hours.

49. There are 9 letters in Alexandra.

$7\frac{1}{2} \div 3\frac{1}{2} = 2\frac{1}{7}$ and $18 \div 3\frac{1}{2} = 5\frac{1}{7}$, so she can make 2 rows with 5 letters each.

Yes, Alexandra can make all of the letters in her name.

$$\begin{aligned}
 50. D; 2\frac{2}{3} \div 1\frac{5}{8} &= 2\frac{2}{3} \div \frac{13}{8} = \frac{8}{3} \div \frac{13}{8} \\
 &= \frac{8}{3} \cdot \frac{8}{13}
 \end{aligned}$$

Choices A, B, and C are represented above.

$$\begin{aligned}
 51. G; \frac{3}{5} \cdot \frac{1}{6} \div \frac{2}{5} &= \frac{3}{30} \cdot \frac{5}{2} \\
 &= \frac{1}{4} \\
 52. 16\frac{1}{2} \div \frac{3}{4} &= \frac{33}{2} \cdot \frac{4}{3} \\
 &= 22
 \end{aligned}$$

Alysse can feed 22 cats.

LESSON 8

Think and Discuss

- Possible answer: Use the inverse operation, subtraction, and subtract $3\frac{5}{8}$ from both sides.
- Possible answer: Substitute $\frac{2}{3}$ for y and multiply, which will show that $\frac{7}{8} \cdot \frac{2}{3} \neq \frac{3}{5}$.
- Possible answer: Dividing by a fraction is the same as multiplying by its reciprocal. Since $\frac{5}{2}$ is the reciprocal of $\frac{2}{5}$, the results will be the same.

Exercises

$$1. \quad a - \frac{1}{2} = \frac{1}{4} \qquad 2. \quad m + \frac{1}{6} = \frac{5}{6}$$

$$a - \frac{1}{2} + \frac{1}{2} = \frac{1}{4} + \frac{1}{2} \qquad m + \frac{1}{6} - \frac{1}{6} = \frac{5}{6} - \frac{1}{6}$$

$$a = \frac{1}{4} + \frac{2}{4} \qquad m = \frac{4}{6} = \frac{2}{3}$$

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

$$3. \quad p - \frac{2}{3} = \frac{5}{6}$$

$$p - \frac{2}{3} + \frac{2}{3} = \frac{5}{6} + \frac{2}{3}$$

$$p = \frac{5}{6} + \frac{4}{6}$$

$$p = \frac{9}{6} = 1\frac{3}{6} = 1\frac{1}{2}$$

$$4. \quad \frac{1}{5}x = 8 \qquad 5. \quad \frac{2}{3}r = \frac{3}{5}$$

$$\frac{1}{5}x \cdot 5 = 8 \cdot 5 \qquad \frac{2}{3}r \cdot \frac{3}{2} = \frac{3}{5} \cdot \frac{3}{2}$$

$$x = 40 \qquad r = \frac{9}{10}$$

$$6. \quad 3w = \frac{3}{7}$$

$$3w \cdot \frac{1}{3} = \frac{3}{7} \cdot \frac{1}{3}$$

$$w = \frac{1}{7}$$

7. Let n represent the amount of oatmeal needed.

$$n - \frac{3}{8} = \frac{3}{4}$$

$$n - \frac{3}{8} + \frac{3}{8} = \frac{3}{4} + \frac{3}{8}$$

$$n = \frac{6}{8} + \frac{3}{8}$$

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

The amount of oatmeal Kara needs is $\frac{9}{8}$ cup or $1\frac{1}{8}$ cup.

$$8. \quad n - \frac{1}{5} = \frac{3}{5} \qquad 9. \quad t - \frac{3}{8} = \frac{1}{4}$$

$$n - \frac{1}{5} + \frac{1}{5} = \frac{3}{5} + \frac{1}{5} \qquad t - \frac{3}{8} + \frac{3}{8} = \frac{1}{4} + \frac{3}{8}$$

$$n = \frac{4}{5} \qquad t = \frac{2}{8} + \frac{3}{8}$$

$$t = \frac{5}{8}$$

$$10. \quad s - \frac{7}{24} = \frac{1}{3}$$

$$s - \frac{7}{24} + \frac{7}{24} = \frac{1}{3} + \frac{7}{24}$$

$$s = \frac{8}{24} + \frac{7}{24}$$

$$s = \frac{15}{24} = \frac{5}{8}$$

$$11. \quad x + \frac{2}{3} = 2\frac{7}{8}$$

$$x + \frac{2}{3} - \frac{2}{3} = 2\frac{7}{8} - \frac{2}{3}$$

$$x = 2\frac{21}{24} - \frac{16}{24}$$

$$x = 2\frac{5}{24}$$

$$12. \quad h + \frac{7}{10} = \frac{7}{10}$$

$$h + \frac{7}{10} - \frac{7}{10} = \frac{7}{10} - \frac{7}{10}$$

$$h = 0$$

$$13. \quad y + \frac{5}{6} = \frac{19}{20} \qquad 14. \quad \frac{1}{5}x = 4$$

$$y + \frac{5}{6} - \frac{5}{6} = \frac{19}{20} - \frac{5}{6} \qquad \frac{1}{5}x \cdot 5 = 4 \cdot 5$$

$$y = \frac{57}{60} - \frac{50}{60} \qquad x = 20$$

$$y = \frac{7}{60}$$

$$15. \quad \frac{1}{4}w = \frac{1}{8} \qquad 16. \quad 5y = \frac{3}{10}$$

$$\frac{1}{4}w \cdot 4 = \frac{1}{8} \cdot 4 \qquad 5y \cdot \frac{1}{5} = \frac{3}{10} \cdot \frac{1}{5}$$

$$w = \frac{1}{2} \qquad y = \frac{3}{50}$$

$$17. \quad 6z = \frac{1}{2} \qquad 18. \quad \frac{5}{8}x = \frac{2}{5}$$

$$6z \cdot \frac{1}{6} = \frac{1}{2} \cdot \frac{1}{6} \qquad \frac{5}{8}x \cdot \frac{8}{5} = \frac{2}{5} \cdot \frac{8}{5}$$

$$z = \frac{1}{12} \qquad x = \frac{16}{25}$$

$$19. \quad \frac{5}{8}n = 1\frac{1}{5}$$

$$\frac{5}{8}n \cdot \frac{8}{5} = \frac{6}{5} \cdot \frac{8}{5}$$

$$n = \frac{48}{25} = 1\frac{23}{25}$$

20. Let s represent how much was in the original sample.

$$\frac{1}{8}s = 5$$

$$\frac{1}{8}s \cdot 8 = 5 \cdot 8$$

$$s = 40$$

40 grams of carbon-14 were in the original sample.

$$21. \quad \frac{4}{5}t = \frac{1}{5} \qquad 22. \quad m - \frac{1}{2} = \frac{2}{3}$$

$$\frac{4}{5}t \cdot \frac{5}{4} = \frac{1}{5} \cdot \frac{5}{4} \qquad m - \frac{1}{2} + \frac{1}{2} = \frac{2}{3} + \frac{1}{2}$$

$$t = \frac{1}{4} \qquad m = \frac{4}{6} + \frac{3}{6}$$

$$m = \frac{7}{6} = 1\frac{1}{6}$$

$$23. \quad \frac{1}{8}w = \frac{3}{4}$$

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

$$w = 6$$

$$25. \quad \frac{5}{3}x = 1$$

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

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

$$27. \quad \frac{4}{3}n = 3\frac{1}{5}$$

$$\frac{4}{3}n \cdot \frac{3}{4} = \frac{16}{5} \cdot \frac{3}{4}$$

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

$$29. \quad \frac{3}{4}y = \frac{3}{8}$$

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

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

$$30. \quad -\frac{5}{26} + m = -\frac{7}{13}$$

$$-\frac{5}{26} + m + \frac{5}{26} = -\frac{7}{13} + \frac{5}{26}$$

$$m = -\frac{14}{26} + \frac{5}{26}$$

$$m = -\frac{9}{26}$$

$$31. \quad -\frac{8}{77} + r = -\frac{1}{11}$$

$$-\frac{8}{77} + r + \frac{8}{77} = -\frac{1}{11} + \frac{8}{77}$$

$$r = -\frac{7}{77} + \frac{8}{77}$$

$$r = \frac{1}{77}$$

$$32. \quad y - \frac{3}{4} = -\frac{9}{20}$$

$$y - \frac{3}{4} + \frac{3}{4} = -\frac{9}{20} + \frac{3}{4}$$

$$y = -\frac{9}{20} + \frac{15}{20}$$

$$y = \frac{6}{20}$$

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

$$33. \quad h - \frac{3}{8} = -\frac{11}{24}$$

$$h - \frac{3}{8} + \frac{3}{8} = -\frac{11}{24} + \frac{3}{8}$$

$$h = -\frac{11}{24} + \frac{9}{24}$$

$$h = -\frac{2}{24}$$

$$h = -\frac{1}{12}$$

$$24. \quad \frac{8}{9} + t = \frac{17}{18}$$

$$\frac{8}{9} + t - \frac{8}{9} = \frac{17}{18} - \frac{8}{9}$$

$$t = \frac{17}{18} - \frac{16}{18}$$

$$t = \frac{1}{18}$$

$$26. \quad j + \frac{5}{8} = \frac{11}{16}$$

$$j + \frac{5}{8} - \frac{5}{8} = \frac{11}{16} - \frac{5}{8}$$

$$j = \frac{11}{16} - \frac{10}{16}$$

$$j = \frac{1}{16}$$

$$28. \quad z + \frac{1}{6} = 3\frac{9}{15}$$

$$z + \frac{1}{6} - \frac{1}{6} = 3\frac{9}{15} - \frac{1}{6}$$

$$z = 3\frac{18}{30} - \frac{5}{30}$$

$$z = 3\frac{13}{30}$$

$$34. \quad -\frac{5}{36}t = -\frac{5}{16}$$

$$-\frac{5}{36}t \cdot \left(-\frac{36}{5}\right) = -\frac{5}{16} \cdot \left(-\frac{36}{5}\right)$$

$$t = \frac{9}{4} = 2\frac{1}{4}$$

$$35. \quad -\frac{8}{13}v = -\frac{6}{13}$$

$$-\frac{8}{13}v \left(-\frac{13}{8}\right) = -\frac{6}{13} \left(-\frac{13}{8}\right)$$

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

$$36. \quad 4\frac{6}{7} + p = 5\frac{1}{4}$$

$$4\frac{6}{7} + p - 4\frac{6}{7} = 5\frac{1}{4} - 4\frac{6}{7}$$

$$p = 5\frac{7}{28} - 4\frac{24}{28}$$

$$p = 4\frac{35}{28} - 4\frac{24}{28}$$

$$p = \frac{11}{28}$$

$$37. \quad d - 5\frac{1}{8} = 9\frac{3}{10}$$

$$d - 5\frac{1}{8} + 5\frac{1}{8} = 9\frac{3}{10} + 5\frac{1}{8}$$

$$d = 9\frac{12}{40} + 5\frac{5}{40}$$

$$d = 14\frac{17}{40}$$

$$38. \quad 6\frac{8}{21}k = 13\frac{1}{3}$$

$$\frac{134}{21}k = \frac{40}{3}$$

$$\frac{134}{21}k \cdot \frac{21}{134} = \frac{40}{3} \cdot \frac{21}{134}$$

$$k = \frac{140}{67} = 2\frac{6}{67}$$

39. Let i represent the average amount of coffee and Italian drinks per year.

$$i + 13\frac{1}{16} = 24\frac{1}{4}$$

$$i + 13\frac{1}{16} - 13\frac{1}{16} = 24\frac{1}{4} - 13\frac{1}{16}$$

$$i = 24\frac{4}{16} - 13\frac{1}{16}$$

$$i = 11\frac{3}{16}$$

An Italian drinks an average of $11\frac{3}{16}$ pounds of coffee each year.

40. Let y represent the amount of rain Yuma receives in one year.

$$y + 102\frac{1}{100} = 105\frac{9}{50}$$

$$y + 102\frac{1}{100} - 102\frac{1}{100} = 105\frac{9}{50} - 102\frac{1}{100}$$

$$y = 105\frac{18}{100} - 102\frac{1}{100}$$

$$y = 3\frac{17}{100}$$

Yuma gets $3\frac{17}{100}$ inches of rain in one year.

41. Let s represent the number of species scientists think to exist.

$$\frac{1}{10}s = 1,500,000$$

$$\frac{1}{10}s \cdot 10 = 1,500,000 \cdot 10$$

$$s = 15,000,000$$

Scientists think there are 15 million species of animals.

42. a. Let t represent the total number of presidents represented in the graph.

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

$$\frac{3}{5}t \cdot \frac{5}{3} = 6 \cdot \frac{5}{3}$$

$$t = 10$$

10 presidents are represented in the graph.

b. $10 \cdot \frac{1}{5} = 2$

2 presidents were born in Massachusetts.

43. Let b represent the number of stories in the Chase Tower.

$$\frac{2}{3}b = 32$$

$$\frac{2}{3}b \cdot \frac{3}{2} = 32 \cdot \frac{3}{2}$$

$$b = 48$$

The Chase Tower has 48 stories.

44. If Jennifer saves $\frac{1}{5}$ of her allowance, then she spends $\frac{4}{5}$ of it.

Let l represent the amount she spends on lunch.

$$\frac{2}{15} + l = \frac{4}{5}$$

$$\frac{2}{15} + l - \frac{2}{15} = \frac{4}{5} - \frac{2}{15}$$

$$l = \frac{12}{15} - \frac{2}{15}$$

$$l = \frac{10}{15}$$

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

Jennifer spends $\frac{2}{3}$ of her allowance on lunches.

45. Possible answer: $\frac{2}{3}$ was multiplied by the fraction $\frac{3}{5}$ instead of by its reciprocal, $\frac{5}{3}$.

46. $3\frac{1}{3}z = 1\frac{1}{2}$

$$\frac{10}{3}z = \frac{3}{2}$$

$$\left(\frac{3}{10}\right)\frac{10}{3}z = \frac{3}{2}\left(\frac{3}{10}\right)$$

$$z = \frac{9}{20}$$

It is easier to identify and multiply by the reciprocal of a mixed number when the mixed number is in the form of an improper fraction.

47. $\frac{3}{5}w = 0.9$

$$\frac{3}{5}w \cdot \frac{5}{3} = 0.9 \cdot \frac{5}{3}$$

$$w = \frac{9}{10} \cdot \frac{5}{3}$$

$$w = \frac{3}{2} = 1\frac{1}{2} = 1.5$$

48. C; $y - \frac{7}{8} = \frac{3}{5}$

$$y - \frac{7}{8} + \frac{7}{8} = \frac{3}{5} + \frac{7}{8}$$

$$y = \frac{24}{40} + \frac{35}{40}$$

$$y = \frac{59}{40} = 1\frac{19}{40}$$

49. G; $-\frac{3}{4}x = \frac{6}{20}$

$$-\frac{3}{4}x \cdot \left(-\frac{4}{3}\right) = \frac{6}{20} \cdot \left(-\frac{4}{3}\right)$$

$$x = -\frac{2}{5} \checkmark$$

READY TO GO ON?

1. $\frac{5}{8} + \frac{1}{8} = \frac{6}{8} = \frac{3}{4}$

2. $\frac{14}{15} - \frac{11}{15} = \frac{3}{15} = \frac{1}{5}$

3. $-\frac{1}{3} + \frac{6}{9} = -\frac{3}{9} + \frac{6}{9}$

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

4. $\frac{5}{8} - \frac{2}{3} = \frac{15}{24} - \frac{16}{24}$

$$= -\frac{1}{24}$$

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

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

Compare $\frac{8}{15}$ and $\frac{1}{2}$.

$\frac{8}{15} > \frac{1}{2}$, therefore at least half of the room was painted.

6. $-12 \cdot \frac{5}{6} = -10$

7. $\frac{5}{14} \cdot \frac{7}{10} = \frac{1}{4}$

8. $8\frac{4}{5} \cdot \frac{10}{11} = \frac{44}{5} \cdot \frac{10}{11}$

$$= 8$$

9. $10\frac{5}{12} \cdot 1\frac{3}{5} = \frac{125}{12} \cdot \frac{8}{5}$

$$= \frac{50}{3} = 16\frac{2}{3}$$

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

$$= \frac{10}{3} = 3\frac{1}{3}$$

Tom needs $3\frac{1}{3}$ cups of flour.

11. $\frac{1}{6} \div \frac{5}{6} = \frac{1}{6} \cdot \frac{6}{5}$

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

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

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

13. $5\frac{3}{5} \div \frac{4}{5} = \frac{28}{5} \cdot \frac{5}{4}$

$$= 7$$

14. $4\frac{2}{7} \div 1\frac{1}{5} = \frac{30}{7} \div \frac{6}{5}$

$$= \frac{30}{7} \cdot \frac{5}{6}$$

$$= \frac{25}{7} = 3\frac{4}{7}$$

15. $9\frac{3}{7} \div 1\frac{4}{7} = \frac{66}{7} \div \frac{11}{7}$

$$= \frac{66}{7} \cdot \frac{7}{11}$$

$$= 6$$

Nina can make 6 pillow cases.

$$16. \quad x - \frac{2}{3} = \frac{2}{15}$$

$$x - \frac{2}{3} + \frac{2}{3} = \frac{2}{15} + \frac{2}{3}$$

$$x = \frac{2}{15} + \frac{10}{15}$$

$$x = \frac{12}{15} = \frac{4}{5}$$

$$17. \quad \frac{4}{9} = -2q$$

$$\frac{4}{9} \cdot \left(-\frac{1}{2}\right) = -2q \cdot \left(-\frac{1}{2}\right)$$

$$-\frac{2}{9} = q$$

$$18. \quad \frac{1}{6}m = \frac{1}{9}$$

$$\frac{1}{6}m \cdot 6 = \frac{1}{96} \cdot 6$$

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

$$19. \quad \frac{3}{8} + p = -\frac{1}{6}$$

$$\frac{3}{8} + p - \frac{3}{8} = -\frac{1}{6} - \frac{3}{8}$$

$$p = -\frac{4}{24} - \frac{9}{24}$$

$$p = -\frac{13}{24}$$

20. Let s represent the amount of salt needed.

$$\frac{1}{6}s = \frac{1}{8}$$

$$\frac{1}{6}s \cdot 6 = \frac{1}{8} \cdot 6$$

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

Uncle Frank's recipe calls for $\frac{3}{4}$ tsp of salt.

STUDY GUIDE: REVIEW

- reciprocals
- $4.99 + 22.89 = 27.88$
- $-6.7 + (-44.5) = -51.2$
- $18.09 - 11.87 = 6.22$
- $47 + 5.902 = 52.902$
- $23 - 8.905 = 14.095$
- $4.68 + 31.2 = 35.88$
- $24.4 + 4.8 = 29.2$ cm
- $7 \cdot 0.5 = 3.5$
- $-4.3 \cdot 9 = -38.7$
- $4.55 \cdot 8.9 = 40.495$
- $7.88 \cdot 7.65 = 60.282$
- $63.4 \cdot 1.22 = 77.348$
- $-9.9 \cdot 1.9 = -18.81$
- $4 \cdot 9.52 = 38.08$
Fred spent \$38.08 on 4 shirts.
- $16 \div 3.2 = 5$
- $50 \div (-1.25) = -40$
- $48 \div 0.06 = 800$
- $31 \div (-6.2) = -5$
- $78 \div (-12.5) = -6.24$
- $816 \div 2.4 = 340$
- $7.65 \div 1.7 = 4.5$
- $9.483 \div (-8.7) = -1.09$
- $126.28 \div (-8.2) = -15.4$
- $2.5 \div (-0.005) = -500$
- $9 \div 4.5 = 2$
- $13 \div 3.25 = 4$
- $(195.3 + 190.456 + 193.557 + 192.757) \div 4 = 772.07 \div 4 = 193.0$
The average speed of the drivers was 193.0 mi/h.

$$29. \quad x + 40.44 = 30$$

$$\frac{-40.44}{x} = \frac{-40.44}{-10.44}$$

$$30. \quad \frac{s}{1.07} = 100$$

$$\frac{s}{1.07} \cdot 1.07 = 100 \cdot 1.07$$

$$s = 107$$

$$31. \quad 0.8n = 0.0056$$

$$\frac{0.8n}{0.8} = \frac{0.0056}{0.8}$$

$$n = 0.007$$

$$32. \quad k - 8 = 0.64$$

$$\frac{+8}{k} = \frac{+8}{8.64}$$

$$33. \quad 3.65 + e = -1.4$$

$$\frac{-3.65}{e} = \frac{-3.65}{-5.05}$$

$$34. \quad \frac{w}{-0.2} = 15.4$$

$$\frac{w}{-0.2} \cdot (-0.2) = 15.4 \cdot (-0.2)$$

$$w = -3.08$$

35. $434 \div 7.75 = 56$
Sam will need to work 56 hours to make enough money for the wakeboard.

$$36. \quad \frac{3}{4} - \frac{1}{3} = \frac{9}{12} - \frac{4}{12} = \frac{5}{12}$$

$$37. \quad \frac{1}{4} + \frac{3}{5} = \frac{5}{20} + \frac{12}{20} = \frac{17}{20}$$

$$38. \quad \frac{4}{11} + \frac{4}{44} = \frac{16}{44} + \frac{4}{44} = \frac{20}{44} = \frac{5}{11}$$

$$39. \quad \frac{4}{9} - \frac{1}{3} = \frac{4}{9} - \frac{3}{9} = \frac{1}{9}$$

$$40. \quad 1\frac{2}{3} \cdot 4\frac{1}{2} = \frac{5}{3} \cdot \frac{9}{2} = \frac{15}{2} = 7\frac{1}{2}$$

$$41. \quad \frac{4}{5} \cdot 2\frac{3}{10} = \frac{4}{5} \cdot \frac{23}{10} = \frac{46}{25} = 1\frac{21}{25}$$

$$42. \quad 4\frac{6}{7} \cdot 3\frac{5}{9} = \frac{34}{7} \cdot \frac{32}{9} = \frac{1,088}{63} = 17\frac{17}{63}$$

$$43. \quad 3\frac{4}{7} \cdot 1\frac{3}{4} = \frac{25}{7} \cdot \frac{7}{4} = \frac{25}{4} = 6\frac{1}{4}$$

$$44. \quad \frac{1}{3} \div 6\frac{1}{4} = \frac{1}{3} \div \frac{25}{4} = \frac{1}{3} \cdot \frac{4}{25} = \frac{4}{75}$$

$$45. \quad \frac{1}{2} \div 3\frac{3}{4} = \frac{1}{2} \div \frac{15}{4} = \frac{1}{2} \cdot \frac{4}{15} = \frac{2}{15}$$

$$46. \quad \frac{11}{13} \div \frac{11}{13} = \frac{11}{13} \cdot \frac{13}{11} = 1$$

$$47. \quad 2\frac{7}{8} \div 1\frac{1}{2} = 2\frac{3}{8} \div \frac{3}{2} = \frac{23}{8} \cdot \frac{2}{3} = \frac{23}{12} = 1\frac{11}{12}$$

$$48. \quad 21 \div \frac{3}{4} = 21 \cdot \frac{4}{3} = 28$$

There will be 28 slices.

$$49. \frac{1}{5}x = \frac{1}{3}$$

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

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

$$50. \frac{1}{3} + y = \frac{2}{5}$$

$$\frac{1}{3} + y - \frac{1}{3} = \frac{2}{5} - \frac{1}{3}$$

$$y = \frac{6}{15} - \frac{5}{15}$$

$$y = \frac{1}{15}$$

$$51. \frac{1}{6}x = \frac{2}{7}$$

$$\frac{1}{6}x \cdot 6 = \frac{2}{7} \cdot 6$$

$$x = \frac{12}{7} = 1\frac{5}{7}$$

$$52. \frac{2}{7} + x = \frac{3}{4}$$

$$\frac{2}{7} + x - \frac{2}{7} = \frac{3}{4} - \frac{2}{7}$$

$$x = \frac{21}{28} - \frac{8}{28}$$

$$x = \frac{13}{28}$$

$$53. 2\frac{1}{2} - \frac{3}{4} = \frac{5}{2} - \frac{3}{4}$$

$$= \frac{10}{4} - \frac{3}{4}$$

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

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

Ty has $1\frac{3}{4}$ cups of oil left.

CHAPTER TEST

1. $3.086 + 6.152 = 9.238$ 2. $5.91 + 12.8 = 18.71$

3. $3.1 - 2.076 = 1.024$ 4. $14.75 - 6.926 = 7.824$

5. $3.25 \cdot 24 = 78$ 6. $-3.79 \cdot 0.9 = -3.411$

7. $32 \div 1.6 = 20$ 8. $3.57 \div (-0.7) = -5.1$

9. $w - 5.3 = 7.6$ 10. $4.9 = c + 3.7$

$$\begin{array}{r} +5.3 \\ w - 5.3 = 7.6 \\ \hline w = 12.9 \end{array}$$

$$\begin{array}{r} -3.7 \\ -3.7 \\ \hline 1.2 = c \end{array}$$

11. $b \div 1.8 = 2.1$

$$b \div 1.8 \cdot 1.8 = 2.1 \cdot 1.8$$

$$b = 3.78$$

12. $4.3h = 81.7$ 13. $\frac{3}{10} + \frac{2}{5} = \frac{3}{10} + \frac{4}{10}$

$$\frac{4.3h}{4.3} = \frac{81.7}{4.3}$$

$$h = 19$$

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

14. $\frac{11}{16} - \frac{7}{8} = \frac{11}{16} - \frac{14}{16}$

$$= -\frac{3}{16}$$

15. $\frac{5}{12} + \frac{1}{12} = \frac{6}{12}$

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

16. $-\frac{3}{5} + \frac{1}{2} = -\frac{6}{10} + \frac{5}{10}$

$$= -\frac{1}{10}$$

17. $5 \cdot 4\frac{1}{3} = 5 \cdot \frac{13}{3}$

$$= \frac{65}{3} = 21\frac{2}{3}$$

18. $2\frac{7}{10} \cdot 2\frac{2}{3} = \frac{27}{10} \cdot \frac{8}{3}$ 19. $\frac{3}{10} \div \frac{4}{5} = \frac{3}{10} \cdot \frac{5}{4}$

$$= \frac{36}{5} = 7\frac{1}{5}$$

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

20. $2\frac{1}{5} \div 1\frac{5}{6} = \frac{11}{5} \div \frac{11}{6}$ 21. $4\frac{4}{5} \cdot 3\frac{1}{3} = \frac{24}{5} \cdot \frac{10}{3}$

$$= \frac{11}{5} \cdot \frac{6}{11}$$

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

$$= 16$$

Nasim needs 16 tbsp of butter.

22. $11\frac{2}{3} \div 1\frac{1}{6} = \frac{35}{3} \div \frac{7}{6}$

$$= \frac{35}{3} \cdot \frac{6}{7}$$

$$= 10$$

Brianna can make 10 pots of hot cocoa.

23. $\frac{1}{5}a = \frac{1}{8}$ 24. $\frac{1}{4}c = 980$

$$\frac{1}{5}a \cdot 5 = \frac{1}{85}$$

$$a = \frac{5}{8}$$

$$\frac{1}{4}c \cdot 4 = 9,804$$

$$c = 3,920$$

25. $-\frac{7}{9} + w = \frac{2}{3}$

$$-\frac{7}{9} + w + \frac{7}{9} = \frac{2}{3} + \frac{7}{9}$$

$$w = \frac{6}{9} + \frac{7}{9}$$

$$w = \frac{13}{9} = 1\frac{4}{9}$$

26. $z - \frac{5}{13} = \frac{6}{7}$

$$z - \frac{5}{13} + \frac{5}{13} = \frac{6}{7} + \frac{5}{13}$$

$$z = \frac{78}{91} + \frac{35}{91}$$

$$z = \frac{113}{91} = 1\frac{22}{91}$$

27. Let j represent the number of hours it took Jimmy to finish his homework.

$$j - 1\frac{1}{2} = \frac{3}{4}$$

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

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

$$j = \frac{3}{4} + \frac{6}{4}$$

$$j = \frac{9}{4} = 2\frac{1}{4}$$

It took Jimmy $2\frac{1}{4}$ hours to finish his homework.

28. $42 \cdot 1\frac{2}{3} = 42 \cdot \frac{5}{3}$

$$= 70$$

The second game lasted 70 minutes.