

3-3 Adding Integers (pp. 140-143)

EXAMPLE

■ Add.

$$\begin{aligned} -7 + (-11) \\ -7 + (-11) \\ -18 \end{aligned}$$

The signs are the same.

EXERCISES

■ Add.

$$\begin{aligned} 11. -8 + 5 \\ 13. -16 + (-40) \\ 15. -2 + 16 \end{aligned}$$

$$12. 7 + (-6)$$

$$14. -9 + 18$$

$$16. 12 + (-18)$$

3-4 Subtracting Integers (pp. 146-149)

EXAMPLE

■ Subtract.

$$\begin{aligned} -5 - (-3) \\ -5 + 3 \\ -2 \end{aligned}$$

Add the opposite of -3.

EXERCISES

■ Subtract.

$$\begin{aligned} 17. 8 - 2 \\ 19. -6 - (-5) \end{aligned}$$

$$18. 10 - 19$$

$$20. -5 - 4$$

3-5 Multiplying and Dividing Integers (pp. 150-153)

EXAMPLE

■ Find each product or quotient.

$$12 \cdot (-3)$$

The signs are different, so the product is negative.

$$21. 5 \cdot (-10)$$

$$22. -27 \div (-9)$$

$$23. -2 \cdot (-8)$$

$$24. -40 \div 20$$

$$25. -3 \cdot 4$$

$$26. 45 \div (-15)$$

-16 \div (-4) = 4
The signs are the same, so the quotient is positive.

EXERCISES

■ Find each product or quotient.

$$21. 5 \cdot (-10)$$

$$22. -27 \div (-9)$$

$$23. -2 \cdot (-8)$$

$$24. -40 \div 20$$

$$25. -3 \cdot 4$$

$$26. 45 \div (-15)$$

3-6 Solving Equations Containing Integers (pp. 156-159)

EXAMPLE

■ Solve.

$$\begin{aligned} x - 12 &= 4 \\ \pm 12 & \\ x &= 16 \end{aligned}$$

Add 12 to each side.

$$27. 7y = 70$$

$$28. d - 8 = 6$$

$$29. f + 23 = -3$$

$$30. \frac{n}{36} = 2$$

$$31. -26 = -2c$$

$$32. 28 = -7m$$

$$\begin{aligned} -10 &= -2f \\ \frac{-10}{-2} &= \frac{-2f}{-2} \\ 5 &= f \end{aligned}$$

Divide each side by -2.

EXERCISES

■ Solve.

$$27. 7y = 70$$

$$28. d - 8 = 6$$

$$29. f + 23 = -3$$

$$30. \frac{n}{36} = 2$$

$$31. -26 = -2c$$

$$32. 28 = -7m$$

4-4 Dividing Decimals by Integers (pp. 206-209)

EXAMPLE

■ Divide.

$$\begin{array}{r} 2.8 \div 7 \\ 0.4 \\ \underline{7 \overline{)2.8}} \\ -2.8 \\ \hline 0 \end{array}$$

Divide.

$$\begin{aligned} 19. 16.1 \div 7 \\ 21. 0.48 \div 6 \\ 23. 8.25 \div (-5) \end{aligned}$$

$$20. 102.9 \div (-21)$$

$$22. 17.4 \div (-9)$$

$$24. 81.6 \div 24$$

4-5 Dividing Decimals and Integers by Decimals (pp. 210-213)

EXAMPLE

■ Divide.

$$\begin{array}{r} 0.96 \div 1.6 \\ 0.6 \\ \underline{16 \overline{)9.6}} \\ -9.6 \\ \hline 0 \end{array}$$

Divide.

$$\begin{aligned} 25. 7.65 \div 1.7 \\ 27. 126.28 \div (-8.2) \\ 29. 9 \div 4.5 \end{aligned}$$

$$26. 9.483 \div (-8.7)$$

$$28. 2.5 \div (-0.005)$$

$$30. 13 \div 3.25$$

4-6 Solving Equations Containing Decimals (pp. 214-217)

EXAMPLE

■ Solve.

$$\begin{aligned} n - 4.77 &= 8.60 \\ + 4.77 & \\ n &= 13.37 \end{aligned}$$

Solve.

$$\begin{aligned} 31. x + 40.44 &= 30 \\ 33. 0.8x &= 0.0056 \end{aligned}$$

$$32. \frac{5}{1.07} = 100$$

$$34. k - 8 = 0.64$$

4-7 Multiplying Fractions and Mixed Numbers (pp. 222-225)

EXAMPLE

■ Multiply. Write the answer in simplest form.

$$\begin{aligned} 4\frac{1}{2} \cdot 5\frac{3}{4} &= \frac{9 \cdot 23}{2 \cdot 4} \\ &= \frac{207}{8} \text{ or } 25\frac{7}{8} \end{aligned}$$

EXERCISES

■ Multiply. Write each answer in simplest form.

$$\begin{aligned} 35. 1\frac{2}{3} \cdot 4\frac{1}{2} \\ 37. 4\frac{7}{9} \cdot 3\frac{5}{9} \end{aligned}$$

$$36. \frac{4}{5} \cdot 2\frac{3}{10}$$

$$38. 3\frac{7}{8} \cdot 1\frac{1}{4}$$

4-8 Dividing Fractions and Mixed Numbers (pp. 226-229)

EXAMPLE

■ Divide.

$$\begin{aligned} 3 \div \frac{2}{5} &= \frac{3}{1} \cdot \frac{5}{2} \\ &= \frac{15}{2} \text{ or } 7\frac{1}{2} \end{aligned}$$

EXERCISES

Divide. Write each answer in simplest form.

$$\begin{aligned} 39. \frac{1}{3} \div 6\frac{1}{4} \\ 41. \frac{11}{13} \div \frac{11}{13} \end{aligned}$$

$$40. \frac{1}{2} \div 3\frac{3}{4}$$

$$42. 2\frac{7}{8} \div 1\frac{1}{2}$$

Estimate with Fractions (pp. 230-233)

EXAMPLE

Estimate the difference.

$$\begin{array}{r} 7\frac{3}{4} - 4\frac{1}{3} \\ \hline 8 - 4\frac{1}{2} \end{array} \rightarrow 8, 4\frac{1}{3} \rightarrow 4\frac{1}{2}$$

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

Estimate each sum or difference.

43. $11\frac{1}{7} + 12\frac{2}{4}$ 44. $5\frac{2}{3} - 3\frac{1}{5}$

45. $5\frac{7}{9} - 13\frac{10}{17}$ 46. $6\frac{1}{6} + 14\frac{6}{11}$

47. $9\frac{7}{8} + (-7\frac{1}{13})$ 48. $11\frac{8}{9} - 11\frac{1}{20}$

Adding and Subtracting Fractions (pp. 236-239)

EXAMPLE

Add.

$$\frac{1}{3} + \frac{2}{5} = \frac{5}{15} + \frac{6}{15} = \frac{11}{15}$$

Add or subtract. Write each answer in simplest form.

49. $\frac{3}{4} - \frac{1}{3}$ 50. $\frac{1}{4} + \frac{3}{5}$

51. $\frac{4}{11} + \frac{4}{44}$ 52. $\frac{4}{9} - \frac{1}{3}$

Adding and Subtracting Mixed Numbers (pp. 240-243)

EXAMPLE

Add.

$$\begin{array}{r} 1\frac{1}{3} + 2\frac{1}{2} = 1\frac{2}{6} + 2\frac{2}{6} \\ = 3 + \frac{3}{6} \\ = 3\frac{1}{2} \end{array}$$

Add or subtract. Write each answer in simplest form.

53. $3\frac{7}{8} + 2\frac{1}{3}$ 54. $2\frac{1}{4} + 1\frac{1}{12}$

55. $8\frac{1}{2} - 2\frac{1}{4}$ 56. $11\frac{3}{4} - 10\frac{1}{3}$

Solving Equations Containing Fractions (pp. 244-247)

EXAMPLE

Solve. Write the answer in simplest form.

$$\begin{array}{r} \frac{1}{2}x = \frac{1}{6} \\ 4 \cdot \frac{1}{2}x = \frac{1}{6} \cdot 4 \\ \frac{1}{1} \cdot \frac{1}{4}x = \frac{1}{6} \cdot 4 \\ x = \frac{4}{6} = \frac{2}{3} \end{array}$$

Solve. Write each answer in simplest form.

57. $\frac{1}{5}x = \frac{1}{3}$ 58. $\frac{1}{3} + y = \frac{2}{5}$

59. $\frac{1}{6}x = \frac{2}{7}$ 60. $\frac{2}{7} + x = \frac{3}{4}$

254 Chapter 4 Operations with Rational Numbers

5.2 Identifying and Writing Proportions (pp. 264-267)

EXAMPLE

Determine if the ratios are proportional.

$\frac{5}{12} = \frac{3}{9}$ $\frac{5}{12}$ is already in simplest form.

$\frac{3}{8} = \frac{1}{5}$ Simplify $\frac{3}{8}$.

Since $\frac{5}{12} \neq \frac{1}{5}$, the ratios are not proportional.

EXERCISES

Determine if the ratios are proportional.

9. $\frac{15}{20} = \frac{20}{21}$ 10. $\frac{2}{3} = \frac{64}{90}$ 11. $\frac{16}{4} = \frac{8}{8}$

12. $\frac{9}{27} = \frac{6}{20}$ 13. $\frac{15}{25} = \frac{20}{30}$ 14. $\frac{21}{14} = \frac{18}{12}$

Find a ratio equivalent to each ratio. Then use the ratios to write a proportion.

15. $\frac{10}{12}$ 16. $\frac{45}{50}$ 17. $\frac{9}{15}$

5.3 Solving Proportions (pp. 268-271)

EXAMPLE

Use cross products to solve $\frac{p}{8} = \frac{10}{12}$.

$$\begin{array}{l} p = 10 \\ \frac{p}{8} = \frac{10}{12} \\ p \cdot 12 = 8 \cdot 10 \\ 12p = 80 \\ \frac{12p}{12} = \frac{80}{12} \\ p = \frac{20}{3}, \text{ or } 6\frac{2}{3} \end{array}$$

EXERCISES

Use cross products to solve each proportion.

18. $\frac{4}{6} = \frac{7}{5}$ 19. $\frac{2}{a} = \frac{5}{15}$

20. $\frac{b}{15} = \frac{8}{3}$ 21. $\frac{16}{11} = \frac{96}{x}$

22. $\frac{2}{y} = \frac{1}{11}$ 23. $\frac{7}{10} = \frac{70}{x}$

5.4 Dimensional Analysis (pp. 272-275)

EXAMPLE

Use a unit conversion factor to convert 14 gallons to quarts.

$$14 \text{ gal} = 4 \text{ qt, so use } \frac{1 \text{ gal}}{4 \text{ qt}} \text{ or } \frac{4 \text{ qt}}{1 \text{ gal}}$$

Choose the second conversion factor so that the gallon units cancel.

$$14 \text{ gal} \cdot \frac{4 \text{ qt}}{1 \text{ gal}} = 56 \text{ qt}$$

EXERCISES

Use a unit conversion factor to convert the units.

24. 10 gallons to quarts
25. 6 quarts to gallons
26. 11,616 feet to miles
27. How many feet are there in 15 yards?

5.5 Similar Figures and Proportions (pp. 280–283)

EXAMPLE

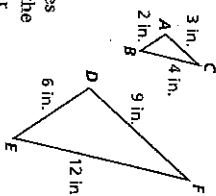
Determine if the triangles are similar.

$$\frac{AB}{DE} = \frac{BC}{DF} = \frac{AC}{EF}$$

$$\frac{2}{6} = \frac{4}{12} = \frac{3}{9}$$

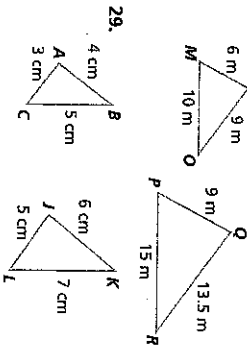
$$\frac{1}{3} = \frac{1}{3} = \frac{1}{3}$$

The ratios of the corresponding sides are equivalent, so the triangles are similar.



EXERCISES

Determine if the triangles are similar.



5.6 Using Similar Figures (pp. 284–287)

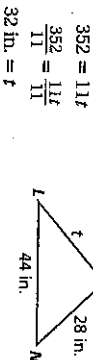
EXAMPLE

Find the unknown length in the similar triangle.

$$\frac{AB}{LM} = \frac{AC}{LN}$$

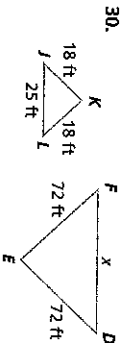
$$\frac{8}{11} = \frac{7}{f}$$

$$8 \cdot f = 7 \cdot 11$$



EXERCISES

Find the unknown length in the similar triangle.



5.7 Scale Drawings and Scale Models (pp. 288–291)

EXAMPLE

A model sailboat is 4 inches long. The scale factor is $\frac{1}{24}$. How long is the actual sailboat?

$$\frac{\text{model}}{\text{actual}} = \frac{1}{24}$$

$$\frac{4}{n} = \frac{1}{24}$$

$$4 \cdot 24 = n \cdot 1$$

$$96 = n$$

The sailboat is 96 inches long.

EXERCISES

Solve.

- The Wright brothers' *Flyer* had a 484-inch wingspan. Carla bought a model of the plane with a scale factor of $\frac{1}{40}$. What is the model's wingspan?
- Eduardo measured the distance from Asheville to Winston-Salem on a map to be 3.7 inches. The map scale is 1 inch = 40 miles. What is the actual distance?

6.2 Estimate with Percents (pp. 308–311)

EXAMPLE

Estimate 26% of 77.

$$26\% \text{ of } 77 \approx \frac{1}{4} \cdot 77$$

$$\approx \frac{1}{4} \cdot 80$$

$$\approx 20$$

26% of 77 is about 20.

EXERCISES

Estimate.

- 22% of 44
- 43% of 64
- 49% of 82
- 74% of 120
- 31% of 97
- 6% of 33

6.3 Percent of a Number (pp. 312–315)

EXAMPLE

Find the percent of the number.

$$125\% \text{ of } 610$$

$$125 = \frac{n}{100}$$

$$125 \cdot 610 = 100 \cdot n$$

$$76,250 = 100n$$

$$\frac{76,250}{100} = \frac{100n}{100}$$

$$762.5 = n$$

125% of 610 is 762.5.

EXERCISES

Find the percent of each number.

- 16% of 425
- 48% of 50
- 7% of 63
- 96% of 125
- 130% of 21
- 72% of 75

6.4 Solving Equations Containing Percents (pp. 316–319)

EXAMPLE

Solve.

$$80 \text{ is } 32\% \text{ of what number?}$$

$$80 = 32\% \cdot n$$

$$80 = 0.32 \cdot n$$

$$\frac{80}{0.32} = \frac{0.32 \cdot n}{0.32}$$

$$250 = n$$

80 is 32% of 250.

EXERCISES

Solve.

- 20% of what number is 25?
- 4 is what percent of 50?
- 30 is 250% of what number?
- What percent of 96 is 36?
- 6 is 75% of what number?
- 200 is what percent of 720?

Vocabulary

algebraic inequality	574	inequality	574
compound inequality	575	solution set	574

Complete the sentences below with vocabulary words from the list above.

1. $A(n)$ _____ states that two quantities either are not equal or may not be equal.
2. $A(n)$ _____ is a combination of more than one inequality.
3. Together, the solutions of an inequality are called the _____.

11.3 Solving Two-Step Equations (pp. 560–563)

EXAMPLE

▮ Solve $6a - 3 = 15$.

$$6a - 3 = 15$$

$$6a - 3 + 3 = 15 + 3$$

$$6a = 18$$

$$\frac{6a}{6} = \frac{18}{6}$$

$$a = 3$$

EXERCISES

- Solve.
4. $-5r + 6 = -34$
 5. $9 + \frac{2}{6} = 14$
 6. $\frac{w}{7} + 13 = -8$

11.2 Solving Multistep Equations (pp. 564–567)

EXAMPLE

▮ Solve $\frac{4x-3}{7} = 3$.

$$\frac{4x-3}{7} = 3$$

$$(7)\frac{4x-3}{7} = (7)3$$

$$4x - 3 = 21$$

$$4x - 3 + 3 = 21 + 3$$

$$4x = 24$$

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

$$x = 6$$

EXERCISES

- Solve.
7. $7a + 4 - 13a = 46$
 8. $\frac{8b-5}{3} = 9$
 9. $\frac{6j-18}{4} = 9$
 10. $-9 + 16y - 19 = 52$
 11. $\frac{12x+15}{3} = 53$

11.3 Solving Equations with Variables on Both Sides (pp. 568–571)

EXAMPLE

▮ Solve $8a = 3a + 25$.

$$8a = 3a + 25$$

$$8a - 3a = 3a - 3a + 25$$

$$5a = 25$$

$$\frac{5a}{5} = \frac{25}{5}$$

$$a = 5$$

EXERCISES

- Solve.
12. $-6b + 9 = 12b$
 13. $5 - 7c = -3c - 19$
 14. $18m - 14 = 12m + 2$
 15. $4 - \frac{2}{5}x = \frac{1}{5}x - 8$

11.4 Inequalities (pp. 574–577)

EXAMPLE

Write an inequality for each situation.

▮ You have to be at least 17 years old to drive a car in New Jersey.
age of driver ≥ 17

▮ There can be at most 60 people on the bus.
number of people ≤ 60

EXERCISES

- Write an inequality for each situation.
16. You must have an average of at least 65 to pass math class.
 17. A bridge's load limit is at most 9 tons.
 18. The large tree in the park is more than 200 years old.
 19. It is less than 2 miles from home to the grocery store.

11.5 Solving Inequalities by Adding or Subtracting (pp. 578–581)

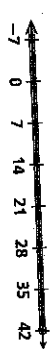
EXAMPLE

Solve. Graph each solution set.

▮ $b + 6 > -10$
 $b + 6 > -10$
 $b + 6 - 6 > -10 - 6$
 $b > -16$



▮ $p - 17 \leq 25$
 $p - 17 \leq 25$
 $p - 17 + 17 \leq 25 + 17$
 $p \leq 42$



EXERCISES

- Solve. Graph each solution set.
20. $r - 16 > 9$
 21. $s + 7 \geq 21$
 22. $12 + x \leq -14$
 23. $\frac{3}{4} + g < 8\frac{3}{4}$
 24. $\frac{2}{3} + t \leq 5$
 25. $7.46 > r - 1.54$
 26. $z + 17 < -13$
 27. $u - 57.7 \geq -123.7$