Selected Answers

Section 1.1 Whole Number Operations (pages 7–9)

1. addition 3. division 5. addition
7. a. dividend b. quotient c. divisor
9. $4785 - 3391; 1394$ people 11. $4785 \times 2; 9570$ people 13. $7081$
15. $2462$ 17. $433$ 19. $6944$
21. $31$ 23. $60$ 25. $\frac{47110}{173}$

27. The partial product $39$ should be moved to the left so that the $3$ is under the $2$ and the $9$ is under the $7$. The answer should be $663$.

29. multiplication 31. division 33. addition

51. A

Section 1.2 Powers and Exponents (pages 14 and 15)

1. An exponent indicates the number of times the base is used as a factor. A power is the entire expression (base and exponent). A power is a product of repeated factors.

3. $3 + 3 + 3 + 3 = 3(4)$ does not belong because it shows a product as a sum of repeated addends, whereas the other three show powers as products of repeated factors.

5. $13^2$ 7. $2^5$ 9. $8^4$ 11. $7^6$

13. The base is written as the exponent and the exponent is written as the base.

15. $64$ 17. $196$ 19. $65,536$

21. $1,419,857$ 23. $8,000,000$ people 25. not a perfect square

27. perfect square 29. perfect square 31. not a perfect square
1. Using the order of operations for \(12 - 8 \div 2\), you divide 8 by 2 and then subtract the result from 12. Using the order of operations for \((12 - 8) \div 2\), you subtract 8 from 12 and then divide by 2.

3. 57

5. 2

7. 5

9. 24

11. 88

13. 2

15. Addition was performed before multiplication. \(9 + 2 \times 3 = 9 + 6 = 15\)

17. 8 pages

19. 25

21. 47

23. 8

25. 22 people

27. 1

29. $34

31. $23; Add the prices of the items you buy. Then subtract the amount of the gift card from the total.

33. a. \(27 \div 3 + 5 \times 2 = 19\)

b. Sample answer: \(9^2 + 11 - 8 \times 4 \div 1 = 60\)

c. \(5 \times 6 - 15 + 9 = 24\)

d. \(14 \times 2 + 7 - 3 + 9 = 10\)

35. 6.1

37. 0.9

### Section 1.4

**Prime Factorization**

(pages 28 and 29)

1. The prime factorization of a composite number is the number written as a product of its prime factors.

3. 6, 9 does not belong because it is a factor pair of 54 and the others are factor pairs of 56.

5. 3, 5, 9

7. None, 1709 is a prime number.

9. 1, 22; 2, 11

11. 1, 39; 3, 13

13. 1, 54; 2, 27; 3, 18; 6, 9

15. 1, 61

17. 5 \(\times\) 5 or 5²

19. 2 \(\times\) 13

21. \(2 \times 3 \times 3\) or \(2 \times 3^3\)

23. 7 \(\times\) 11

33. 40,000 cm²

35. 8 squares

37. | Power | 4⁴ | 4³ | 4² | 4¹ |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>4096</td>
<td>1024</td>
<td>256</td>
<td>64</td>
</tr>
</tbody>
</table>

As the exponent decreases, the value of the power is divided by 4. \(4^0 = 1\)

39. 13 blocks; add \(7^2 - 6^2\) blocks; 19 blocks; add \(10^2 - 9^2\) blocks; 39 blocks; add \(20^2 - 19^2\) blocks

41. 165

43. 7
Section 1.4
Prime Factorization (continued)
(pages 28 and 29)

25.  
   ![Factorization Diagram]

27. 1575

29. 4

31. 36

33. yes; 2 is a prime number because it only has 1 and itself as factors. The rest of the even whole numbers have 2 as a factor.

35. Use 36 objects to help you determine the possible group sizes.

37. cupcake table; Because 60 has more factors than 75, there are more rectangular arrangements.

39. 6 prisms; There are 6 unique arrangements of length, width, and height using the factors of 40. (Note that 1 × 1 × 40 names the same prism as 40 × 1 × 1);
   1 × 1 × 40, 1 × 2 × 20, 1 × 4 × 10, 1 × 5 × 8, 2 × 2 × 10, 2 × 4 × 5

41. 357

43. 1248

Section 1.5
Greatest Common Factor
(pages 34 and 35)

1. The GCF is the greatest factor that is shared by the two numbers.

3. What is the greatest prime factor of 24 and 32?; 2; 8

5. 2

7. 3

9. 1

11. 17

13. 15

15. 9

17. 1

19. 7 is the greatest common prime factor. The GCF is 2 × 7 = 14.

21. 23 packets

23. 7

25. 14

27. Sample answer: Prime factorization because it is tedious to find all the factors of large numbers.

29. always

31. 12; 6 red, 5 pink, and 4 yellow

33. a. Because 73 is a prime number and the GCF of the three numbers is 1.
   b. 18; The GCF of 54 and 36 is 18. 18 divides evenly into 72 leaving one banana left over.

35. Commutative Property of Addition

37. Commutative Property of Multiplication

39. B
1. The LCM of two numbers is the least of the multiples shared by the two numbers.

3. 21  
5. 60  
7. 12

9. 40  
11. 36  
13. 108

15. 66  
17. 350  
19. 15 days

21. D; This model represents multiples of 4 and 6 which have an LCM of 12. The other models represent multiples of 3 and 8, 8 and 12, and 6 and 8, which have an LCM of 24.

23. 165  
25. 120  
27. 1260

29. always  
31. never  
33. 300th caller

35. a. Prime factors of 16
Prime factors of 24
Prime factors of 40

b. 240  
37. 3^2  
39. 17^5

37. Sample answer: The LCD method uses numbers that are easier to work with, but there is extra work in finding the LCD. Using the other method, there are no preliminary steps for finding the LCD, but there may be more simplifying in the solution.
Section 2.1

Multiplying Fractions
(pages 59–61)

1. Multiply numerators and multiply denominators, then simplify the fraction.

3. Sample answer: \( \frac{3}{2} \times \frac{3}{7} = 11 \)

5. \( \frac{5}{16} \)  

7. \( \frac{3}{28} \)  

9. \( \frac{5}{8} \)  

11. \( \frac{1}{3} \)  

13. \( \frac{5}{4} \)

15.  

17.  

19. \( \frac{19}{30} \)  

21. \( \frac{3}{10} \)

23. \( \frac{4}{7} > \left( \frac{9}{10} \times \frac{4}{7} \right) \); Because \( \frac{9}{10} < 1 \), the product will be less than \( \frac{4}{7} \).

25. \( \frac{5}{6} = \left( \frac{5}{6} \times \frac{7}{7} \right) \); Because \( \frac{7}{7} = 1 \), by the Multiplication Property of One, the two expressions are equal.

27.  

29.  

31.  

33. \( \frac{1}{2} \)

35. \( \frac{13}{14} \)

37. \( \frac{362}{3} \)

39. \( \frac{64}{9} \)

41. \( \frac{113}{8} \)

43. You must first rewrite the mixed number as improper fractions and then multiply.

\[
\frac{2 \frac{1}{2}}{\frac{4}{5}} \times \frac{\frac{39}{5}}{\frac{2}{5}} = \frac{1}{2} \times \frac{39}{2} \\
= \frac{39}{2} \times \frac{1}{2} \\
= \frac{39}{2} \times \frac{1}{2} = 19 \frac{1}{2}
\]

45. a. 7 ft\(^2\)  

b. 10 ft\(^2\)

47. \( \frac{2}{15} \)

49. \( \frac{262}{5} \)

51. \( \frac{9}{25} \)

53. 462 in.\(^2\)

55. 4 mi

57. Which units of measure would make the calculations easier?

59. a. \( \frac{3}{50} \)  

b. 45 people

61. \( 3^2 \cdot 5 \)

63. \( 2^2 \cdot 3 \cdot 5 \)

Section 2.2

Dividing Fractions
(pages 67–69)

1. Sample answer: \( \frac{2}{5} \div \frac{5}{2} \)

3. B

5. A

7. \( \frac{1}{8} \)

9. \( \frac{5}{2} \)

11. \( \frac{1}{2} \)

13. 16

15. \( \frac{1}{14} \)

17. \( \frac{1}{3} \)

19. 3

21. \( \frac{2}{27} \)

23. \( \frac{27}{28} \)

25. \( \frac{20}{4} \)
27. You need to invert the second fraction before you multiply.

\[ \frac{4}{7} \div \frac{13}{28} = \frac{4}{7} \times \frac{28}{13} = \frac{4 \times 28}{7 \times 13} = \frac{16}{13} \text{ or } 1 \frac{3}{13} \]

29. Round \( \frac{2}{5} \) to \( \frac{1}{2} \) and \( \frac{8}{9} \) to \( \frac{1}{2} \div \frac{1}{2} = \frac{1}{2} \), which is not close to the incorrect answer of \( \frac{20}{9} \).

31. \( 5 \frac{5}{8} \) times

33. yes

35. yes

37. \( \frac{1}{3} \)

39. >; When you divide a number by a fraction less than 1, the quotient is greater than the number.

41. >; When you divide a number by a fraction less than 1, the quotient is greater than the number.

43. \( \frac{1}{216} \)

45. \( \frac{1}{6} \)

47. 2

49. \( \frac{3}{26} \)

51. \( \frac{2}{3} \)

53. \( 2 \frac{2}{5} \) hours, or 2 hours 24 minutes

55. a. \( 3 \frac{3}{4} \) times  
   b. \( 3 \frac{1}{3} \) times  
   c. \( \frac{1}{4} \)

57. a. \( 6 \frac{7}{15} \) gal  
   b. \( 8 \frac{2}{5} \) gal  
   c. \( 33 \frac{3}{5} \) gal

59. 6

61. 5

## Section 2.3

### Dividing Mixed Numbers  
(pages 74 and 75)

1. \( \frac{3}{22} \)

3. sometimes; The reciprocal of \( \frac{2}{2} \) is \( \frac{2}{2} \), which is improper.

5. 3

7. \( 9 \frac{3}{4} \)

9. \( 3 \frac{18}{19} \)

11. \( \frac{9}{10} \)

13. \( 12 \frac{1}{2} \)

15. \( 1 \frac{1}{5} \)

17. \( 2 \frac{2}{7} \)

19. \( 1 \frac{5}{18} \)

21. The mixed number \( 1 \frac{2}{3} \) was not written as an improper fraction before inverting.

\[ 3 \frac{1}{2} \div 1 \frac{2}{3} = \frac{7}{2} \div \frac{5}{3} = \frac{7 \times 3}{2 \times 5} = \frac{21}{10} \text{ or } 2 \frac{1}{10} \]

23. 14 hamburgers

25. no; The model shows \( 2 \frac{1}{2} \div 1 \frac{1}{6} = 2 \frac{1}{7} \)

There are 2 full groups of \( 1 \frac{1}{6} \) plus one piece remaining, which represents \( \frac{1}{7} \) of \( 1 \frac{1}{6} \).

27. \( \frac{4}{3} \)

29. \( \frac{1 \frac{1}{3}}{3} \)

31. \( \frac{5 \frac{1}{6}}{3} \)

33. \( \frac{7}{54} \)

35. \( 12 \frac{1}{2} \)

37. \( \frac{22}{35} \)

39. a. 6 ramps; Sample answer: The estimate is reasonable because \( 12 \frac{1}{2} \) was rounded down.

   b. 6 ramps; \( 1 \frac{1}{4} \) feet left over

41. 0.43

43. 3.8

45. C
Section 2.4
Adding and Subtracting Decimals
(pages 82 and 83)

1. Estimating allows you to check that your answer is reasonable.

3. \(1.15 + 0.43 = 1.58\)

5. \(11.029\)

7. \(22.899\)

9. \(29.937\)

11. \(1.46\)

13. \(4.366\)

15. \(2.644\)

17. Line up the decimal points before adding. Insert a 0 at the end of the second number so that both numbers have the same number of decimal places. \(6.058 + 3.95 = 10.008\).

19. \$8.30

21. 19.58

23. 10

25. 15.606

27. the decimal parts in the sum total 1; the decimal parts in the difference are exactly the same

29. \(34.995 \text{ m}\)

31. \(4.816 \text{ AU}\)

33. \(20.189 \text{ AU}\)

35. \(6.85 \text{ units}\)

37. \(\frac{1}{4}\)

39. \(\frac{1}{20}\)

Section 2.5
Multiplying Decimals
(pages 89–91)

1. Place the decimal point so that there are two decimal places. \(1.2 \times 2.4 = 2.88\)

3. \(8.722\)

5. \(19.5750\)

7. 4

9. 3.15

11. 0.21

13. 33.6

15. 115.04

17. 21.45

19. 13.888

21. 2.4

23. 0.0342

25. The decimal is in the wrong place. \(0.0045 \times 9 = 0.0405\)

27. 30.06 lb

29. 3 mm; 9 mm

31. 0.024

33. 0.000072

35. 0.03

37. 0.000012

39. 109.74

41. 3.886

43. 13.7104

45. 51.3156

47. \$3.24

49. \$1284.78

51. \(7.12 \times 8.22 \times 100 = 7.12 \times 822 = 5852.64\)

53. 137

55. 23.112

57. 71.984

59. 36.225

61. 2; 3; 4

63. Each number is 0.1 times the previous number; 0.0015, 0.00015, 0.000015

65. Each number is 1.5 times the previous number; 25.3125, 37.96875, 56.953125

67. a. 190.06 mi

b. 91.29 mi

69. Which framing is thicker?

71. 5

73. 7

A16 Selected Answers
Section 2.6
Dividing Decimals
(pages 97−99)

1. 0.61
4
2. 2.44

3. 6.38 ÷ 11 = 0.58

4. 13

5. 47 \div 136

6. 9

7. 216 \div 1850

8. 9.4

9. 3.2

10. 0.086
6 \div 0.516
48
36
36
0

29. 1.62

30. 10.12

31. 8.046

32. $80.96

33. 400

34. 460

35. $26.96

36. about 12.21

37. about 1.33

38. about 0.08

39. about 15 tickets

40. 51. 850 songs

41. 1.3

42. about 12.21

43. about 5357 bees

44. When dividing, make sure your units cancel.

45. $120

46. $8

47. 25

48. about 12.21

49. 113 tickets

50. 850 songs

51. B

Section 3.1
Algebraic Expressions
(pages 115−117)

1. 3(4) + 5 does not belong because it is a numerical expression and the other three are algebraic expressions.

2. decrease; When you subtract greater and greater values from 20, you will have less and less left.

5. $120

6. $8

9. Terms: g, 12, 9g
Coefficients: 1, 9
Constant: 12

10. Terms: 2m^2, 15, 2p^2
Coefficients: 2, 2
Constant: 15

11. Terms: 8x^2, \frac{x^2}{3}
Coefficients: 8, \frac{1}{3}
Constant: none

12. a. Terms: 2l, 2w
Coefficients: 2, 2: Constant: none

b. The coefficient 2 of l represents that there are 2 lengths on the rectangle.

The coefficient 2 of w represents that there are 2 widths on the rectangle.

13. a. Terms: 2l, 2w
Coefficients: 2, 2: Constant: none

b. The coefficient 2 of l represents that there are 2 lengths on the rectangle.

The coefficient 2 of w represents that there are 2 widths on the rectangle.

15. 27. g^5
19. 5.2y^3
21. 2.1xz^4
23. 25d^2
25. 9

28. 11
29. 10
31. 6
33. 5
35. 4

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Section 3.1 Algebraic Expressions (continued) (pages 115–117)

37. Multiplication should be done first, then addition.
   
   \[ 5m + 3 = 5 \cdot 8 + 3 \]
   
   \[ = 40 + 3 \]
   
   \[ = 43 \]

39. 34 mm; 118 mm

41. \[
\begin{array}{ccc}
\text{ } & 2 & 4 & 8 \\
64 \div x & 32 & 16 & 8 \\
\end{array}
\]

43. 23

45. \(2\frac{5}{6}\)

47. 22

49. 46

51. 24

53. Start by drawing a visual image of moving 2000 feet in exactly 10 minutes.

55. 64 in.³

57. 512

59. 256

Section 3.2 Writing Expressions (pages 122 and 123)

1. \( x \) take away 12; \( x - 12 \); \( x + 12 \)

3. \( 8 - 5 \)

5. \( 28 \div 7 \)

7. \( 18 - 3 \)

9. \( x - 13 \)

11. \( 18 \div a \)

13. \( 7 + w \) or \( w + 7 \)

15. \( y + 4 \) or \( 4 + y \)

17. \( 2 \cdot z \) or \( z \cdot 2 \)

19. The expression is not written in the correct order; \( \frac{8}{y} \)

21. a. \( x \div 5 \)

b. Sample answer: If the total cost is $30, then the cost per person is \( x \div 5 = 30 \div 5 = $6 \). The result is reasonable.

23. Sample answer: The sum of \( n \) and 6; 6 more than a number \( n \)

25. Sample answer: A number \( b \) less than 15; 15 take away a number \( b \)

27. \( \frac{y}{4} - 3; 2 \)

29. \( 8x + 6; 46 \)

31. a. 

\[
\begin{array}{c|ccccc}
\text{Game} & 1 & 2 & 3 & 4 & 5 \\
\hline
\text{Cost} & $5 & $8 & $11 & $14 & $17 \\
\end{array}
\]

b. \( 2 + 3g \)

c. \$26

33. It might help to see the pattern if you make a table of the data in the bar graph.

35. \( \frac{x}{4} \)

37. 59

39. 140

A18 Selected Answers
Section 3.3

Properties of Addition and Multiplication (pages 130 and 131)

1. Sample answer: \( \frac{1}{5} + \frac{3}{5} = \frac{3}{5} + \frac{1}{5} \)  
   \[ 4 \div 5 = \frac{4}{5} \]

3. Sample answer: \((5 \cdot x) \cdot 1 = 5 \cdot (x \cdot 1)\)  
   \[ = 5x \]

7. Assoc. Prop. of Mult.  
9. Add. Prop. of Zero

11. The grouping of the numbers did not change. The statement illustrates the Commutative Property of Addition because the order of the addends changed.

13. \((14 + y) + 3 = (y + 14) + 3\)  
   Comm. Prop. of Add.  
   \[ = y + (14 + 3)\]  
   Assoc. Prop. of Add.  
   \[ = y + 17\]  
   Add 14 and 3.

15. \(7(9w) = (7 \cdot 9)w\)  
   Assoc. Prop. of Mult.  
   \[ = 63w\]  
   Multiply 7 and 9.

17. \((0 + a) + 8 = a + 8\)  
   Add. Prop. of Zero  
   \[ = 63\]  
   Multiply 7 and 9.

19. \((18.6 \cdot d) \cdot 1 = 18.6 \cdot (d \cdot 1)\)  
   Assoc. Prop. of Mult.  
   \[ = 18.6d\]  
   Mult. Prop. of One

21. \((2.4 + 4n) + 9 = (4n + 2.4) + 9\)  
   Comm. Prop. of Add.  
   \[ = 4n + (2.4 + 9)\]  
   Assoc. Prop. of Add.  
   \[ = 4n + 11.4\]  
   Add 2.4 and 9.

23. \(z \cdot 0 \cdot 12 = (z \cdot 0) \cdot 12\)  
   Assoc. Prop. of Mult.  
   \[ = 0 \cdot 12\]  
   Mult. Prop. of Zero  
   \[ = 0\]  
   Mult. Prop. of Zero

25. a. \(x\) represents the cost of a box of cookies.  
   b. \(120x\)

27. \(7 + (x + 5) = x + 12\)

29. \((7 \cdot 2) \cdot y\)

31. \((17 + 6) + 2x\)

33. \(w \cdot 16\)

35. \(98\)

37. \(90\)

39. \(37\) is already prime.

41. \(3 \times 7^2\)

43. B

Section 3.4

The Distributive Property (pages 137 – 139)

1. Sample answer: You must distribute or give the number outside the parentheses to the numbers inside the parentheses.

3. \(4 + (x \cdot 4)\) does not belong because it does not represent the Distributive Property.

5. \(63\)

7. \(516\)

9. \(936\)

11. \(504\)

13. \(\frac{4}{7}\)

15. \(2 \frac{1}{2}\)

17. \(3x + 12\)

19. \(6s - 54\)

21. \(96 + 8a\)

23. \(72 - 12k\)

25. \(63 + 9c\)

27. \(40g + 24\)

29. \(4x + 4y\)

31. \(7p + 7q + 63\)

33. The 6 was not distributed to the 8 inside the parentheses; \(6(y + 8) = 6y + 48\)

35. \(5(r + 15)\) and \(5r + 5 \cdot 15\), because they are equivalent expressions.
**Section 3.4**

**The Distributive Property (continued)**

37. \(16(10 + x) = 160 + 16x\)
39. \(6x + 25\)
41. \(68 + 28k\)
43. \(19y + 5\)
45. \(3d + 1\)
47. \(5v\)
49. Area: \(8x + 64\)
   Perimeter: \(2x + 32\)
51. \(\frac{11}{4}z + \frac{3}{10}\)
53. \(7x + 12y\)
55. \(x = 8\)
57. \(x = 3\)
59. Area: \(9x + 108\)
   Perimeter: \(2x + 42\)
61. Area: \(9x + 108\)
   Perimeter: \(2x + 42\)
63. a. 6.2  
   b. 14
   
**Sample answer:** The preferred method is not the same for both expressions.
   For part (a), evaluating inside the parentheses first requires easier and less calculations.
   For part (b), using the Distributive Property will eliminate the fractions.
65. \(7(x + 3) + 8 \cdot x + 3 \cdot x + 8 - 9 = 2(9x + 10)\)
67. 34.006
69. 0.387

**Extension 3.4**

**Factoring Expressions**

1. \(7(1 + 2)\)
3. \(6(3 - 2)\)
5. \(12(5 - 3)\)
7. \(28(3 + 1)\)
9. \(2(x + 5)\)
11. \(13(2x - 1)\)
13. \(9(4x + 1)\)
15. \(5(2x - 5y)\)
17. yes; yes; Because \(a\) and \(b\) are divisible by \(c\), you can factor \(c\) out of each expression.
   Because \(c\) is a factor of the sum and the difference, each expression is divisible by \(c\).
19. \((x + 4)\) feet

**Section 4.1**

**Areas of Parallelograms**

1. The area of a polygon is the amount of surface it covers. The perimeter of a polygon is the distance around the polygon.
3. \(18\text{ ft}^2\)
5. \(187\text{ km}^2\)
7. \(243\text{ in.}^2\)
9. 15 m was used for the height instead of 13 m.
   \(A = 8(13) = 104\text{ m}^2\)
11. \(12\text{ units}^2\)
13. \(24\text{ units}^2\)
15. \(72\text{ m}^2\)
17. What shape could have an area of 128 square feet?
   What shape could have an area of \(s^2\) square feet?
19. \(287\text{ in.}^2\)
21. \(n^2bh\) where \(b\) represents the base and \(h\) represents the height of the original parallelogram, or \(n^2A\) where \(A\) represents the area of the original parallelogram.
23. \(1640\)
25. \(118\)

A20  Selected Answers
Section 4.2

Areas of Triangles
(pages 162 and 163)

1. yes; To find the area of the triangle, you must also know the height of the triangle. That is, the perpendicular distance from the base to the opposite vertex.

3. 6 cm²

5. 1620 in.²

7. 1125 cm²

9. The side length of 13 meters was used instead of the height.
   \[ A = \frac{1}{2}(10)(12) = 60 \text{ m}² \]

11. 324 cm²

13. 90 mi²

15. Sample answer:

17. \( x^2 \) times greater

19. 4 times greater

21. Mult. Prop. of One


Section 4.3

Areas of Trapezoids
(pages 170 and 171)

1. bases: 4 ft and 7 ft; height: 15 ft

3. \( 2L + 2w \); This is an expression for the perimeter of a rectangle. The other three are expressions for area (triangle, rectangle, and trapezoid).

5. 24 units²

7. 28 in.²

9. 105 ft²

11. 8 units²

13. 12 units²

15. 60 in.²

17. 78 m²

19. 18 ft

21. Use the strategy Solve a Simpler Problem by assigning values to the variables.

23 and 25.

27. C

Extension 4.3

Areas of Composite Figures
(page 173)

1. 36 units²

3. 20 units²

5. \( 126 \frac{1}{2} \) cm²

7. 3400 yd²
   Sample answer: Separate the figure into a trapezoid and a square.
1. Plot the points that represent the vertices of the polygon and connect the points in order.

3. Length of CD is 8 units.

5. Length of QR is 5 units.

7. 24 units; 36 units²

9. 28 units; 45 units²

11. a. square
b. 28 ft; 49 ft²

13. 27 miles; There are only two ways to go from station P to station L. Traveling from station P to N to M to L is 27 miles. Traveling from station P to J to K to L is 33 miles.

15. 2.5 times larger

23. consonants; For every 5 vowels there are 7 consonants, so consonants outnumber the vowels.

25. 2 out of every 5; this ratio is 2 : 3, all other ratios are 2 : 5.

27. 6 to 4, or 6 : 4; For every 6 basketballs, there are 4 soccer balls.
9. 3 to 7, or 3 : 7; For every 3 shirts, there are 7 pants

11. 8 to 15, or 8 : 15; 8 out of 15 movies are comedies.

13. 15 to 3, or 15 : 3; Out of 15 movies, 3 are dramas.

15. 9 h

17. 12 : 16

19. 6 black pieces; The ratio of black to red is 3 : 5, so each part is \(16 \div 8 = 2\). So, there are \(3 \times 2 = 6\) black pieces and \(5 \times 2 = 10\) red pieces.

21. It may be helpful to organize your results in a table.

23. 4 pints of soda water, 8 pints of fruit punch concentrate, 20 pints of ginger ale; Yes; Sample answer: There is twice as much fruit punch as soda water (as in the original ratio). There is 5 times as much ginger ale as soda water (as in the original ratio).

25. 4.6

27. 2.53

29. B

---

Section 5.2

Ratio Tables (pages 201–203)

1. Two ratios are equivalent if they can be written as the same ratio.

3. 12 : 15 does not belong because all other ratios are equivalent.

5. The ratio of ladybugs to bees can be described by 12 : 4, 6 : 2, or 3 : 1.

7. 

<table>
<thead>
<tr>
<th>Violins</th>
<th>8</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellos</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

8 : 3 and 24 : 9

9. 

<table>
<thead>
<tr>
<th>Burgers</th>
<th>3</th>
<th>6</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Dogs</td>
<td>5</td>
<td>10</td>
<td>15</td>
</tr>
</tbody>
</table>

3 : 5, 6 : 10, and 9 : 15

11. 

<table>
<thead>
<tr>
<th>Forks</th>
<th>16</th>
<th>8</th>
<th>48</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spoons</td>
<td>10</td>
<td>5</td>
<td>30</td>
</tr>
</tbody>
</table>

16 : 10, 8 : 5, and 48 : 30

13. 

<table>
<thead>
<tr>
<th>You</th>
<th>3</th>
<th>6</th>
<th>9</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Friend</td>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
</tr>
</tbody>
</table>

16 tickets

15. 

<table>
<thead>
<tr>
<th>First</th>
<th>100</th>
<th>10</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td>60</td>
<td>6</td>
<td>36</td>
</tr>
</tbody>
</table>

$60

17. Adding the same number, 5 in this case, to each part of the ratio does not create equivalent ratios. You can add corresponding parts of equivalent ratios to create new equivalent ratios.

Sample answer:

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>7</td>
<td>14</td>
<td>21</td>
</tr>
</tbody>
</table>

19. 28 basketballs

21. Add the corresponding quantities of Recipes B and D to create Recipe E.

23. Subtract the corresponding quantities of Recipe B from Recipe C to create Recipe A.

25. Sample answer: Add the corresponding quantities of Recipes B and F to create a batch with 11 servings.

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Section 5.2  Ratio Tables (continued)  (pages 201–203)

27.  \( A = 16, B = 28 \)  
33.  36 bugs

29.  \( A = 65, B = 40 \)  
35.  \( 27(2 + 1) \)  

31.  32

37.  \( 14(3x + 2y) \)

Section 5.3  Rates  (pages 208 and 209)

1.  Sample answer: You walk at a rate of 2 blocks per minute, so you walk 12 blocks in 6 minutes.

3.  Sample answer: 45 words for every 30 minutes  
5.  Sample answer: 4 inches for every 12 years

7.  \$7 per week

9.  45 miles per hour

11.  140 kilobytes per second

13.  72 miles per gallon

15.  100 times per second

17.  \$20  

19.  equivalent

21.  not equivalent

23.  \( a. \)  6 min

\( b. \) Photos

\[ \begin{array}{|c|c|c|c|c|c|} \hline 
& 0 & 7 & 14 & 21 & 28 & 35 \\ \hline 
Minutes & 0 & 2 & 4 & 6 & 8 & 10 \\ \hline 
\end{array} \]

25.  It may be helpful to organize your results in a table.

27.  1.2 h

29.  Sample answer: \( \frac{10}{12} \)  

31.  Sample answer: \( \frac{8}{18} \)

Section 5.4  Comparing and Graphing Ratios  (pages 214 and 215)

1.  Use ratio tables to write equivalent ratios where one part from each ratio has the same numerical value. Compare the other part.

3.  A

5.  B

7.  A

9.  B

11.  the first recipe

13.  

<table>
<thead>
<tr>
<th>Zoo</th>
<th>People</th>
<th>Cost (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>240</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Museum</th>
<th>People</th>
<th>Cost (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
<td>95</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>190</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>285</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>380</td>
</tr>
</tbody>
</table>

Both graphs begin at (0, 0). The graph for the museum is steeper, so the cost to attend the museum is greater than the cost to attend the zoo.
15. Begin by using double number lines to represent the situations.

17. a. Sample answer:

<table>
<thead>
<tr>
<th></th>
<th>Peanuts</th>
<th>Almonds</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Old Mixture</strong></td>
<td>7</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>21</td>
<td>12</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>16</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>35</td>
<td>20</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>24</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>49</td>
<td>28</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>56</td>
<td>32</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>63</td>
<td>36</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>40</td>
<td>110</td>
</tr>
<tr>
<td></td>
<td>77</td>
<td>44</td>
<td>121</td>
</tr>
<tr>
<td></td>
<td>84</td>
<td>48</td>
<td>132</td>
</tr>
<tr>
<td></td>
<td>91</td>
<td>52</td>
<td><strong>143</strong></td>
</tr>
</tbody>
</table>

| **New Mixture**  | 8       | 5       | 13    |
|                  | 16      | 10      | 26    |
|                  | 24      | 20      | 39    |
|                  | 32      | 25      | 52    |
|                  | 40      | 30      | 65    |
|                  | 48      | 35      | 78    |
|                  | 56      | 40      | 91    |
|                  | 64      | 45      | 104   |
|                  | 72      | 45      | 117   |
|                  | 80      | 45      | 130   |
|                  | 88      | 50      | **143**|

143 nuts

<table>
<thead>
<tr>
<th>Nut Mixture</th>
<th>Peanuts</th>
<th>Almonds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old Mixture</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>New Mixture</td>
<td>9</td>
<td>12</td>
</tr>
</tbody>
</table>

Both graphs begin at (0, 0). The graph for the new mixture is slightly steeper, so it has a greater concentration of almonds.

b. more; Almonds cost more and there are more of them in the new mixture than in the old mixture.

19. 16

21. 34 R109

---

**Section 5.5**

**Percents**

*(pages 222 and 223)*

1. You can shade 42 out of 100 squares to model 42%.

3. Sample answer: \(\frac{3}{20}, \frac{23}{100}, \frac{1}{8}\)

5. 

7. 

9. \(\frac{9}{10}\)

11. \(\frac{7}{100}\)

13. \(\frac{79}{100}\)

15. \(\frac{122}{25}\)

17. \(\frac{6}{25}\)

19. \(\frac{1}{250}\)

21. 10%

23. 55%

25. 54%

27. 185%

29. The decimal point should not have been added to the percent expression.

\[
\frac{14}{25} = \frac{14 \times 4}{25 \times 4} = \frac{56}{100} = 56\%
\]

31. \(\frac{5}{4}\); No, you have more than you need.

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Section 5.5

Percents (continued)
(pages 222 and 223)

33. 81.25%
35. 82.5%
37. Organize the percents and fractions in a table. What operation should you use to compare Illinois to Hawaii?
39. You can shade half of one of the squares.
41. \( \frac{1}{2} \)
43. 16
45. D

Section 5.6

Solving Percent Problems
(pages 229–231)

1. Twenty percent of what number is 30?; 6; 150
3–21. Explanations will vary.
3. 12
5. 35
7. 9
9. 12.5
11. 21
13. 20.25
15. 24
17. 14
19. 84
21. 94.5
23. The percent was not written as a fraction before multiplying; \( 40\% \times 75 = \frac{2}{5} \times 75 = 30 \)
25. 35.2 in.
27–35. Explanations will vary.
27. 140
29. 84
31. 80
33. 25
35. 20
37. The percent should be written as a fraction before dividing; \( 5 \div 20\% = 5 \div \frac{1}{5} = 25 \)
39. a. 50 students  b. 18 students
41. 21 cars
43. =
45. >
47. 48 min
49. a. 432 in.\(^2\)
   b. 37.5%; Because the length is doubled, the width of the rectangle is now half of 75% of its length, or 37.5%.
51. Sample answer: Because 30% of \( n \) is equal to 2 times 15% of \( n \) and 45% of \( n \) is equal to 3 times 15% of \( n \), you can write 30% of \( n = 2 \times 12 = 24 \) and 45% of \( n = 3 \times 12 = 36 \).
53. 97.2%
55. 16.5
57. 26.28

Section 5.7

Converting Measures
(pages 236 and 237)

1. yes; Because 1 centimeter is equal to 10 millimeters, the conversion factor equals 1.
3. Find the number of inches in 5 cm; 5 cm \( \approx \) 1.97 in.; 5 in. = 12.7 cm
5. person weighing 75 kg; 75 kg \( \approx \) 166.67 lb and 166.67 lb > 110 lb
7. 1.5
9. 12.63
11. 1.22
13. 0.19
15. 37.78
17. 14.49

A26 Selected Answers
19. a. about 60.67    b. about 8.04 km

21. <  23. >  25. >  27. 1320  29. 111.8  31. 0.001

33. When using conversion factors, make sure your units cancel.

37. 30  39. 18

Section 6.1
Integers (pages 252 and 253)

1. 8, −9, 22

3. Sample answer: below, under, lose

5. 

7. 

9. 37,500

11. −56

13. 5

15. −318

17. 

19. 

21. 

23. 

25. 

27. −8

29. 18

31. a. Sample answer: Choosing 8, the opposite is −8.

b. Sample answer: 8

c. The opposite of the opposite of an integer is the integer.; Yes;
Sample answer:

Case 1:

Case 2:

Case 3: Choose 0. The opposite of 0 is 0, so the opposite of the opposite of 0 is 0.

d. −(−(−6)) is the opposite of the opposite of −6; −(−(−6)) = −6

33. \[
\frac{3}{8} \quad \frac{1}{2} \quad \frac{3}{4} \quad \frac{7}{8}
\]

35. B

Section 6.2
Comparing and Ordering Integers (pages 258 and 259)

1. On a number line, numbers to the left are less than numbers to the right. Numbers to the right are greater than numbers to the left.

3. The value of \(a\) is less than the value of \(b\) because \(a\) is to the left of \(b\).

5. <  7. >  9. >  11. >
Section 6.2
Comparing and Ordering Integers (continued)
(pages 258 and 259)

13. The explanation about where the integers are located on a number line is incorrect; 
   \(-7 < -3\); So, \(-7\) is to the left of \(-3\) on a number line.

15. \(-4, -3, -2, 1, 2\)  17. \(-7, -4, 2, 3, 6\)

23. always; The opposite of a positive integer is a negative integer. Positive integers are 
greater than negative integers.

25. a. Florida, Louisiana, Arkansas, Tennessee, California
    b. California, Louisiana, Florida, Arkansas, Tennessee
    c. An elevation of 0 feet represents sea level.

27. no; In order for the median to be below \(0^\circ\)F, at least 6 of the temperatures must be below \(0^\circ\)F.

33. B

Section 6.3
Fractions and Decimals on the Number Line
(pages 264 and 265)

1. a
3. \(-2.6\)

7. \(-2\frac{1}{2}, 2\frac{1}{2}\)

11. <
13. <

19. the larger sand dollar

23. \(-5, -4.9, -4.35, -4.3, -4\)

27. 1, 2, and any integer less than \(-3\)

31.

Section 6.4
Absolute Value
(pages 272 and 273)

1. Find the distance between the number and 0 on a number line.

3. What integer is 3 units to the left of 0?; \(-3; 3\)

7. 2
9. 8.35

11. \(\frac{3}{5}; 13. 14.06\)

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Selected Answers

15. $-10, 10$
17. $<$
19. $>$
21. $<$

23. Scientist B

25. A; You owe more than $25, so debt $> 25$.

27. $-2, 0, | -1 |, | 4 |, 5$

29. $-11, 0, | 3 |, | -6 |, 9, 10$

31. 0

33. $-1$

35. sometimes; If the number is negative then its absolute value is greater, but if the number is positive or zero then it is equal to its absolute value.

37. never; The absolute value of a positive number is the number itself.

39. Sample answer: $x = -2, y = -3$

41. $y = x$

43. $y = x$

Section 6.5
The Coordinate Plane
(pages 279–281)

1. 4
3. (2, $-3$); (2, $-3$) is in Quadrant IV. The other three points are in Quadrant II.
5. (3, 1)
7. $(-2, 4)$
9. (2, $-2$)
11. ($-4, 2$)
13. (4, 0)

15–21. See graph below.

15. Quadrant I
17. $y$-axis
19. Quadrant IV
21. $x$-axis

23. The numbers are reversed. To plot (4, 5), start at (0, 0) and move 4 units right and 5 units up.

25.

27.

29.

31. ($-2, 1$)

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33. \( y = x - 3 \)

35. a. about 142,000
   b. 2011 and 2012
   c. about 10,000

22 units; 28 units

37. a. 

<table>
<thead>
<tr>
<th>Profit (millions of dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(10, 1.2)</td>
</tr>
<tr>
<td>(11, 0.8)</td>
</tr>
<tr>
<td>(12, 1)</td>
</tr>
<tr>
<td>(7, 0.6)</td>
</tr>
<tr>
<td>(8, -0.2)</td>
</tr>
<tr>
<td>(13, -0.6)</td>
</tr>
<tr>
<td>(9, -1.2)</td>
</tr>
</tbody>
</table>

   b. Sample answer: There are four years where the profit is positive and three years where the profit is negative. The profit decreased from 2007 to 2009. The profit increased the most from 2009 to 2010.

   c. $1.6 million

   d. Because the \( x \)-axis represents the number of years since 2000, then 0 represents 2000. So, you could graph the profits for 1990 to 2006 by using \( x \)-values from -10 to 6.

39. Quadrant III

41. Quadrant I or Quadrant IV

43. origin

45. never; All points in Quadrant III have negative \( y \)-coordinates.

47. Reptiles

49. no; Quadrants III or IV

51. Because the rainforest is in Quadrant IV, the \( x \)-coordinate of the point will be positive and the \( y \)-coordinate of the point will be negative.

53. Sample answer: \((-6, 3), (-2, 3), (-2, -9), (2, -9) \)

55. \( y - 4 \)

57. \( x + 9 \)

59. C

Extension 6.5

Reflecting Points in the Coordinate Plane

1. a. \((3, -2)\)
   b. \((-3, 2)\)

3. a. \((-5, 6)\)
   b. \((5, -6)\)

5. a. \((0, 1)\)
   b. \((0, -1)\)

7. a. \((2.5, -4.5)\)
   b. \((-2.5, 4.5)\)

9. \((-4, -5)\)

11. \((2, 2)\)

13. \((3, 9)\); 18 units

15. a. \((-4, -5), (1, -7), (2, 2), (-6.5, 10.5)\); yes; Sample answer: The order of the reflections does not matter. You are still reflecting the points in both axes.

   b. Sample answer: Use the opposite of each coordinate.

A30 Selected Answers
Section 7.1
Writing Equations in One Variable (pages 298 and 299)

1. An equation has an equal sign and an expression does not.
3. Sample answer: A number $n$ subtracted from 28 is 5.
5. What was the high temperature if it was 4° less than 62° F? 58° F
7. $y - 9 = 8$  
9. $w + 5 = 6$  
11. $5 = \frac{1}{4} c$  
13. $n - 9 = 27$
15. $6042 = 1780 + a$  
17. $16 = 3x$  
19. $326 = 12(14) + 6(5) + 16x$
21. It might be helpful to organize the given information visually.
23. 13  25. 28  27. B

Section 7.2
Solving Equations Using Addition or Subtraction (pages 305 – 307)

1. Substitute your solution back into the original equation and see if you obtain a true statement.
3. subtraction  
5. so that $x$ is by itself; so that the two sides remain equal
7. yes  9. no  11. yes  13. $t = 1$
15. What number plus 5 equals 12?; $a = 7$  
17. 20 is what number minus 6?; $d = 26$
19. $z = 16$  21. $p = 3$  23. $h = 34$  25. $q = 11$  27. $x = \frac{7}{30}$  29. $a = 11.8$
31. They must apply the same operations to both sides.

$$34 = y - 12$$
$$+ 12 + 12$$
$$46 = y$$
33. $x - 8 = 16$; 24th floor
35. Subtract 3 from each side. (Subtraction Property of Equality); Subtract 3 from 3. (Subtract.); Add $x$ and 0. (Addition Property of Zero)
37. $k + 7 = 34$; $k = 27$  
39. $93 = g + 58$; $g = 35$
41. $y = 15$  43. $v = 28$  45. $d = 54$
47. $x + 34 + 34 + 16 = 132$; 48 in.  
49. Addition is commutative.
51. Begin by writing the characteristics of each problem.
53. $x + 15.50 + 8.75 = 66.55$; $42.30$
55. a. $5.25$  
   b. no; You have $5.25 left and it costs $9.75 to ride each ride once.
57. 96  59. 5  61. C
### Section 7.3

**Solving Equations Using Multiplication or Division (pages 312 and 313)**

1. 12

3. \[ \frac{4x}{4} = \frac{24}{4} \]

5. \[ 8 \cdot 3 = (n \div 3) \cdot 3 \]

7. \( s = 70 \)

9. \( x = 24 \)

11. \( a = 4 \)

13. \( y = 10 \)

15. \( x = 15 \)

17. \( d = 78 \)

19. \( c = 66 \)

21. \( n = 2.56 \)

23. They should have multiplied by 4.

\[ x \div 4 = 28 \]

\[ (x \div 4) \cdot 4 = 28 \cdot 4 \]

\[ x = 112 \]

25. \( 3x = 45; 15 \) items

27. 9 units

29. 8 units

31. 20 cards

33. \( x = 6; \) Because \( 5x \) is on both sides of the equation, \( 3x \) must be equal to 18 so that the equation is true.

35. length: 20 in.; width: 5 in.

37. \[ \frac{t}{3} = 7 \]

### Section 7.4

**Writing Equations in Two Variables (pages 319–321)**

1. **Sample answer:** An independent variable can change freely. A dependent variable depends on the independent variable.

3. \( n = 4n - 6; \) This one is not an equation in two variables.

5. \( A = 9h, \) where \( A \) is the area in square feet and \( h \) is the height in feet; \( A \) depends on \( h. \)

7. yes

9. no

11. yes

13. \( w \) is independent and \( A \) is dependent.

15. \( p \) is independent and \( t \) is dependent.

17. $270

19 and 21. Sample answers are given.

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Dependent Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. The speed you are pedaling a bike</td>
<td>Time it takes to stop your bike</td>
</tr>
<tr>
<td>21. The number of years of education</td>
<td>The amount of money you earn</td>
</tr>
</tbody>
</table>

23. **Sample answer:** \( c = 25m + 35 \) where \( m \) is the number of months and \( c \) is the total cost of the gym membership.

25. Methods to create the graph will vary.

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27. \[ d = \frac{5}{6} - 6t \]

29. \[ d = 240t \]

31. 1

33. no; By definition, the independent variable can change freely.

35. 50 city blocks

37. Methods to create the graph will vary.

39. a. no; It does not make sense to draw a line between the points to show the solutions because you cannot sell part of a ticket.

b. \( c = 10n \)

41. 80%

43. 68%

### Section 7.5

Writing and Graphing Inequalities

(\textit{pages 329–331})

1. Both phrases refer to numbers that are greater than a given number. The difference is that “greater than or equal to” includes the number itself, whereas “greater than” does not.

3. The graph of \( x \leq 6 \) has a closed circle at 6. The graph of \( x < 6 \) has an open circle at 6.

5. \( k < 10 \)

7. \( z < \frac{3}{4} \)

9. \( 1 + y \leq -13 \)

11. yes

13. yes

15. no

17. B

19. D

21. \( x < 1 \); A number \( x \) is less than 1.

23. \( x \geq -4 \); A number \( x \) is at least \(-4\).

25. \( y < -2 \)

27. \( y < -3 \)

29. \( y < -1.2 \)

31. \( y < -6 \)

33. \( y < -3 \)

35. \( y < -1.8 \)

37. \( x \geq 1 \) means that 1 is also a solution, so a closed circle should be used.

39. a. \( b \leq 3 \); b. \( \ell \geq 18 \);

41. The cost of the necklace and another item should be less than or equal to $33.

43. sometimes; The only time this is not true is if \( x = 5 \).

45. \( p \leq 375 \)

47. \( x = 9 \)

49. \( x = 28 \)

51. D

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Section 7.6

Solving Inequalities Using Addition or Subtraction (pages 336 and 337)

1. Sample answer: \( x + 7 \geq 143 \)

3. By solving the inequality to obtain \( x \leq 1 \), the graph has a closed circle at 1 and an arrow pointing in the negative direction.

5. \( x < 9; \)

7. \( 5 \geq y; \)

9. \( 6 > x; \)

11. \( y < 106; \)

13. \( 3 < x; \)

15. \( \frac{1}{4} \leq n; \)

17. To solve the inequality, 9 should be added to both sides, not subtracted.

19. \( x + 18.99 \leq 24; x \leq 5.01 \)

Section 7.7

Solving Inequalities Using Multiplication or Division (pages 342 and 343)

1. The solution of \( 2x \geq 10 \) includes the solution of \( 2x = 10, x = 5, \) and all other \( x \) values that are greater than 5.


5. Sample answer: \( \frac{x}{2} \geq 4, 2x \geq 16 \)

7. \( n > 12; \)

9. \( c \geq 99; \)

11. \( x \geq 5; \)

13. \( p \leq 6; \)

15. \( x < 15; \)

17. \( v \leq 81; \)

19. \( w \leq 32; \)

21. \( x \geq 48; \)

23. \( 8x < 168; x < 21 \text{ ft} \)

25. \( 8n < 72; n < 9 \)

27. \( 225 \geq 12w; 18.75 \geq w \)

29. \( 11 \)

31. \( 80x > 2 \cdot 272; x > 6.8 \text{ yards per play} \)

33. Sample answer: the number of gallons of milk you can buy with $20; the length of a park that has an area of at least 500 square feet.
35. yes; $a > b$ and $x > y$
39. rectangle

37. yes; $a > b$ and $x > y$
41. parallelogram

### Section 8.1

**Three-Dimensional Figures**

*(pages 358 and 359)*

1. false; It has two triangular faces.
3. true
5. false; Some are perpendicular and some are neither (skew).

7. front: 10 cubes
   side: 
   top: 

9. front: 9 cubes
   side: 
   top: 

11. 10 faces, 24 edges, and 16 vertices

13. 

15. 

17. front: 
   side: 
   top: 

19. front: 
   side: 
   top: 

21. front: 
    side: 
    top: 

23. 

25. 

27. Answer should include, but is not limited to: an original drawing of a house; a description of any solids that make up any part of the house

29. Sample answer:
   a. Triangular prism
      6 vertices
      9 edges
   b. More than one solid can have the same number of faces, so knowing the number of edges and vertices can help you draw the intended solid.

31. 12 cm²

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Section 8.2
Surface Areas of Prisms
(pages 364 and 365)

1. Find the sum of the areas of the faces.

3. 94 units²

5. 162 units²

7. 198 cm²

9. 17.6 ft²

11. 57.1 mm²

13. 136 ft²

15. Draw diagrams of the given information.

17. 364 ft²

19. 165 ft²

21. C

Section 8.3
Surface Areas of Pyramids
(pages 372 and 373)

1. Find the sum of the areas of the faces.

3. 160 units²

5. 27 units²

7. 172.8 yd²

9. 224.4 ft²

11. 55 m²

13. 21,274.4 ft²

15. 4

17. no; You can place the four triangles on top of the square and it covers the entire square. But when you lift up the triangles, they do not touch. So, they do not form a pyramid.

19. | Apples | 10 | 5 | 30 |
    | Oranges | 4 | 2 | 12 |

A36 Selected Answers
Section 8.4 Volumes of Rectangular Prisms
(pages 378 and 379)

1. The volume of an object is the amount of space it occupies. The surface area of an object is the sum of the areas of all of its faces.

3. How much does it take to cover the rectangular prism?; 310 cm²; 350 cm³

5. \( \frac{5}{16} \text{ cm}^3 \)

7. \( \frac{15}{16} \text{ m}^3 \)

9. \( 12\frac{1}{2} \text{ m}^3 \)

11. \( 220.5 = 7 \cdot w \cdot 7 \); 4.5 cm

13. Use unit cubes to visualize filling the fish tank.

15. 1728 1-inch cubes; There are 1728 1-inch cubes in a cube with a side length of 1 foot. The area of the cube with a side length of 1 foot is 1 cubic foot, or 1728 cubic inches. So, 1 cubic foot is equal to 1728 cubic inches. You can use the conversion factors \( \frac{1728 \text{ in}^3}{1 \text{ ft}^3} \) and \( \frac{1 \text{ ft}^3}{1728 \text{ in}^3} \) to convert between cubic inches and cubic feet.

17. 1152 cm³

19. yes

21. no

Section 9.1 Introduction to Statistics
(pages 394 and 395)

1. A statistical question is one for which you do not expect to get a single answer. Instead, you expect a variety of answers, and you are interested in the distribution and tendency of those answers. Sample answer: How old are the teachers in middle school?

3. yes; There are many different answers.

5. Sample answer: 2 pets; no

7. 100 senators; yes

9. not statistical; There is only one answer.

11. statistical; There are many different answers.

13. The test scores are spread out pretty evenly with no clusters or gaps. The peak is 83.

15. Most of the registrations are in a cluster from 21 to 26. The peak is 25. There is a gap between 16 and 21.

17. a. 21 earthworms
   b. Sample answer: Use a centimeter ruler. The units are centimeters.
   c. Sample answer: “What is the length of an earthworm?”; The lengths are spread out pretty evenly from 15 centimeters to 28 centimeters.

19. Sample answer: Anemometer; miles per hour

21. Sample answer: Richter scale; magnitude

23. Sample answer: 65 mi/h; Most of the data cluster around 65, and 65 miles per hour is a common speed limit.

25. Does changing the order of the bars in the bar graph affect the distribution?

27. no

29. D
**Section 9.2**

**Mean**
*(pages 400 and 401)*

1. Add the data values then divide by the number of data values.

3. yes; Because of the variability of the answers to a statistical question, the mean gives an average of the answers. That way, you can use only one value, the mean, to answer the statistical question.

5. 1 movie seen this week; Find the total number of movies and divide by the number of people.

7. 3 brothers and sisters

9. 16 visits

11. a. yes; There will be variability in the lengths of the commercial breaks.

b. 3.45 minutes


15. 3.9 inches; No, neither team has a height that is much shorter or taller than the other heights. So, you can say that the Tigers are taller than the Dolphins on average.

17. There are 5 different allowance amounts and 24 students. Each amount is used more than once.

19. 9

21. 18.5

23. B

**Section 9.3**

**Measures of Center**
*(pages 407–409)*

1. *Sample answer:* 1, 2, 3, 4, 5, 6

3. outlier; The other three are measures of center.

5. 5.5

7. median: 7; mode: 3

9. median: 92.5; mode: 3

11. median: 17; mode: 12

13. The data were not ordered from least to greatest; The median is 55.

49, 50, 51, 55, 58, 59, 63

15. singing

17. mean: 35.875; median: 44; mode: 48

*Sample answer:* The median is probably best, because it is close to most of the data. The mean is less than most of the data and the mode is the greatest value.

19. mean: 12; median: 8; mode: 2

*Sample answer:* The median is the best measure, because the mean is greater than most of the data and the mode is the least value.

21. *With Outlier*  

   - mean: 48.5
   - median: 53
   - mode: none

   *Without Outlier*  

   - mean: 53
   - median: 54
   - mode: none

   The outlier reduces the median slightly, but reduces the mean more. There is no mode with or without the outlier.

23. mean: 7.61; median: 7.42; no mode

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25.  
   a. mean: 94°F; median: 91°F; mode: 91°F
   Sample answer: Both the median and mode are the best measures for the data, because both are very close to most of the values.
   
   b. mean: 77°F; median: 77°F; modes: 77°F and 78°F
   Sample answer: Both the mean and median are the best measures for the data, because there are two modes.

27.  
   10 hours; Using the mean as the average, you would need to work 12 hours. Using the median as the average, you would need to work 10 or more hours. Using the mode as the average, you would need to work 10 hours. So, the minimum number of hours is 10 and you can use the median or mode to justify your answer.

29.  
   Ordering the data makes it easier to find the median and the mode.

31.  
   a. mean: $1794; median: $1790; mode: $1940
   
   b. mean: $1883.70; median: $1879.50; mode: $2037
   The mean, median, and mode all increased by 5%.
   
   c. annual salaries: $23,280, $19,920, $22,320, $25,200, $20,640, $18,480, $21,240, $23,280, $21,840, $19,200; mean: $21,528; median: $21,480; mode: $23,280; They are 12 times the mean, median, and mode of the monthly salary.

33.  
   13

35.  
   119

37.  
   D

---

Section 9.4

Measures of Variation
(pages 416 and 417)

1. A measure of center represents the center of a data set, but a measure of variation describes the distribution of a data set.

3. What is the range of the data?; 20; 12

5. median = 81.5; median of lower half = 67; median of upper half = 92; The data is spread out.

7. 23

9. 7.3

11. median = 37; $Q_1 = 33.5$; $Q_3 = 40.5$; IQR = 7

13. median = 133.5; $Q_1 = 128$; $Q_3 = 139$; IQR = 11

15. range = $21\frac{3}{4}$ ft; The distances traveled by the paper airplane vary by no more than $21\frac{3}{4}$ feet; IQR = 11 ft; The middle half of the distances traveled by the paper airplane vary by no more than 11 feet.

17. Exercise 11: 54
   Exercise 12: none
   Exercise 13: 106 and 158
   Exercise 14: 38

19.  
   a. range = 172 points; IQR = 42 points
   
   b. The outlier is 193 points; range = 101; IQR = 34; range
Measures of Variation (continued)
(pages 416 and 417)

21. a. Show A: mean = 20, median = 19.5, range = 13, IQR = 5
Show B: mean = 21, median = 20.5, range = 23, IQR = 6
The mean ages for the shows, 20 and 21, and the median ages for the shows, 19.5 and 20.5, are about the same. The interquartile ranges of the ages for the shows, 5 and 6, are about the same. The range of the ages for Show A is 13 years and the range for Show B is 23 years. So, the ages for Show B are more spread out.

b. Show A: The mean of the ages decreases a small amount, from 20 to 19 8/9. The median of the ages decreases from 19.5 to 18. The range of the ages stays at 13. The interquartile ranges of the ages increase from 5 to 6.5. Some of these values do not change by a large amount because 21 is towards the middle of the data set.

Show B: The mean of the ages decreases from 21 to 19 1/3. The median of the ages decreases a small amount, from 20.5 to 20. The range of the ages decreases a large amount, from 23 to 12. The interquartile ranges of the ages increase a small amount, from 6 to 6.5. Some of these values change by a large amount because 36 is an outlier of the data set.

23. 11

Mean Absolute Deviation
(pages 422 and 423)

1. All the values in the data set are the same.

3. 2.8 years

5. 4.4; The prices differ from the mean price by an average of $4.40.

7. 4.9; The capacities differ from the mean capacity by an average of 4.9 thousand, or 4900 people.

9. When calculating the mean absolute deviation, you need to divide by 6, not 5. Even though the distance from the mean of one of the values (38) is 0, it is still included in the calculation.

\[
\text{mean absolute deviation} = \frac{3 + 2 + 0 + 6 + 4 + 3}{6} = 3
\]

So, the values differ from the mean by an average of 3.0.

11. The MAD of the five most-expensive dishes is 3.6. The MAD of the five least-expensive dishes is 1.76. The MAD of the five least-expensive dishes is much less than the MAD of the five most-expensive dishes. So, the data for the five least-expensive dishes is closer together compared to the five most-expensive dishes.

13. a. mean: 8.25; median: 8.5; mode: 5
range: 13; IQR: 5.5; MAD: 3

b. no; Using the interquartile range, 21 is inside the outlier boundaries.
mean: 9; median: 9; mode: 5
range: 19; IQR: 6.5; MAD: 3.5
The range is most affected by including this value. The mode stays the same. The mean, median, IQR, and MAD all increased slightly.
15. monthly amounts of water used in a home; Sample answer: The amount of rainfall that falls in a city during a month usually ranges from 0 to 5–6 inches. The monthly amounts of water used in a home are much greater numbers that will have more variation from month to month.

17. a. 50%; 87.5%; 2 and 15  
   b. Sample answer: A good portion of a data set is within one MAD of the mean and most of the data set is within 2 MADs of the mean. As you get more and more MADs away from the mean, the percent increases because more and more data are included in the interval.

19. mean: 1.6; median: 1.7; modes: 1.2, 1.7

### Section 10.1: Stem-and-Leaf Plots (pages 438 and 439)

1. 3 is the stem; 4 is the leaf

3. From the leaves, you can see where most of the data lies and whether there are many values that are low or high.

5. **Hours Online**

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0268</td>
</tr>
<tr>
<td>1</td>
<td>224578</td>
</tr>
<tr>
<td>2</td>
<td>14</td>
</tr>
</tbody>
</table>

**Key:** 2|1 = 21 hours

7. **Points Scored**

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>222335</td>
</tr>
<tr>
<td>5</td>
<td>01688</td>
</tr>
<tr>
<td>6</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0115</td>
</tr>
</tbody>
</table>

**Key:** 3|8 = 38 points

9. **Minutes in Line**

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>69</td>
</tr>
<tr>
<td>2</td>
<td>02679</td>
</tr>
<tr>
<td>3</td>
<td>1168</td>
</tr>
<tr>
<td>4</td>
<td>00</td>
</tr>
</tbody>
</table>

**Key:** 4|0 = 4.0 minutes

11. **Weights**

<table>
<thead>
<tr>
<th>Stem</th>
<th>Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>8</td>
</tr>
<tr>
<td>1</td>
<td>2578</td>
</tr>
<tr>
<td>2</td>
<td>44</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

**Key:** 2|4 = 24 pounds

Most of the weights are in the middle.

17. a. 6.4; The daily high temperatures differ from the mean daily high temperature by an average of 6.4 degrees.

   b. Because the mean absolute deviation increases, most of the data values for the rest of the month must be further from the mean than 6.4 degrees. So, most of the data values for the rest of the month are either less than 71.6 degrees or greater than 84.4 degrees.

19. 

21. B

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Section 10.2

Histograms
(pages 445–447)

1. The Test Scores graph is a histogram because the number of students (frequency) achieving the test scores are shown in intervals of the same size (20).

3. No bar is shown on that interval.

5. Sample answer:

<table>
<thead>
<tr>
<th>Interval</th>
<th>Tally</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>20–29</td>
<td>I</td>
<td>1</td>
</tr>
<tr>
<td>30–39</td>
<td>III</td>
<td>3</td>
</tr>
<tr>
<td>40–49</td>
<td>IIII</td>
<td>7</td>
</tr>
<tr>
<td>50–59</td>
<td>IIII</td>
<td>4</td>
</tr>
</tbody>
</table>

7. Chess Team

<table>
<thead>
<tr>
<th>Points Scored</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>20–29</td>
<td>3</td>
</tr>
<tr>
<td>30–39</td>
<td>3</td>
</tr>
<tr>
<td>40–49</td>
<td>7</td>
</tr>
<tr>
<td>50–59</td>
<td>4</td>
</tr>
</tbody>
</table>

9. There should not be space between the bars of the histogram.

11. The frequency is the number of songs not the percent of songs. The statement should be “12 of the songs took 5–8 seconds to download.”

13. Pennsylvania; You can see from the intervals and frequencies that Pennsylvania counties are greater in area, which makes up for it having fewer counties.

15. a. yes; The stem-and-leaf plot shows that 10 pounds is a data value.
   b. no; Both displays show that 11 residents produced between 20 and 29 pounds of garbage.

17. Begin by ordering the data.

19. 45

21. 22.4

23. D

Section 10.3

Shapes of Distributions
(pages 454 and 455)

1. The shape of a skewed distribution will have a tail on one side. The shape of a symmetric distribution is when the data on the left are a mirror image of the data on the right.

3. Miles Run per Day

5. skewed left

7. skewed right

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9. Police Officers of Jones County

<table>
<thead>
<tr>
<th>Years of service</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–3</td>
<td>10</td>
</tr>
<tr>
<td>4–7</td>
<td>15</td>
</tr>
<tr>
<td>8–11</td>
<td>18</td>
</tr>
<tr>
<td>12–15</td>
<td>11</td>
</tr>
<tr>
<td>16–19</td>
<td>6</td>
</tr>
<tr>
<td>20–23</td>
<td>3</td>
</tr>
</tbody>
</table>

Skewed right

Police Officers of Pine County

<table>
<thead>
<tr>
<th>Years of service</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–3</td>
<td>10</td>
</tr>
<tr>
<td>4–7</td>
<td>15</td>
</tr>
<tr>
<td>8–11</td>
<td>18</td>
</tr>
<tr>
<td>12–15</td>
<td>11</td>
</tr>
<tr>
<td>16–19</td>
<td>6</td>
</tr>
<tr>
<td>20–23</td>
<td>3</td>
</tr>
</tbody>
</table>

Symmetric

Jones County: The distribution of Jones County is skewed right, so most of the data values are on the left.

11. no; Distributions can have any shape.

13. a. skewed right

15. median = 70; $Q_1 = 65.5; Q_3 = 75; IQR = 9.5$

17. A

Extension 10.3 Choosing Appropriate Measures (page 457)

1. median and interquartile range; median: $32; IQR: $6$

3. no; You do not know the actual values in the data set. You can approximate the mean and MAD but your answers will not be exact.

5. Sample answer:

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1. Order the data. The first number is the least value and the last number is the greatest value. The middle value is the median. The middle value of the lower half of the data is the first quartile. The middle value of the upper half of the data is the third quartile.

3. Is the distribution skewed right? yes; no

5. [Graph showing age distribution with values 22, 29, 35, 47, 62 on a scale from 20 to 70.]

7. [Graph showing donation distribution with values 5, 10, 20, 30, 50 on a scale from 0 to 55.]

9. The data should be ordered before finding the five-number summary.

11. a. about \( \frac{1}{2} \)
   b. The right whisker is longer than the left whisker. So the data are more spread out above the third quartile than below the first quartile.
   c. 150; The middle half of the data varies by no more than 150 gallons.

13. skewed left; The left whisker is longer than the right whisker, and most of the data are on the right.

15. symmetric; The whiskers are about the same length, and the median is in the middle of the box.

17. a. School 1 is skewed left and School 2 is skewed right.
   b. School 2; The range for School 2 is a half hour greater than the range for School 1. Also, the IQR of School 2 is greater than the IQR of School 1.
   c. School 1; School 1 has more data on the left than School 2. So, School 1 is more likely to have recess before lunch.

19. [Graph showing account balance distribution with values -20, 35, 60, 100 on a scale from -20 to 100.]

21. Use the median to describe the center and the interquartile range to describe the variation.

23. When the least value and the first quartile are equal, there is no whisker on the left. When the greatest value and the third quartile are equal, there is no whisker on the right.

25. a. Team 1; There is less variability in the data.
   b. 24 games
   c. Team 1; In 75% of the games, Team 1 scored 6 runs or more. However, Team 2 scored 6 runs or less in 75% of the games.
   d. Team 1; Sample answer: By looking at the shapes of the distributions, you can see that the majority of the data for Team 1 is greater than the majority of the data for Team 2.

27. >

29. >
Key Vocabulary Index

Mathematical terms are best understood when you see them used and defined in context. This index lists where you will find key vocabulary. A full glossary is available in your Record and Practice Journal and at BigIdeasMath.com.

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Common Core State Standards

Kindergarten

Counting and Cardinality – Count to 100 by Ones and Tens; Compare Numbers
Operations and Algebraic Thinking – Understand and Model Addition and Subtraction
Number and Operations in Base Ten – Work with Numbers 11–19 to Gain Foundations for Place Value
Measurement and Data – Describe and Compare Measurable Attributes; Classify Objects into Categories
Geometry – Identify and Describe Shapes

Grade 1

Operations and Algebraic Thinking – Represent and Solve Addition and Subtraction Problems
Number and Operations in Base Ten – Understand Place Value for Two-Digit Numbers; Use Place Value and Properties to Add and Subtract
Measurement and Data – Measure Lengths Indirectly; Write and Tell Time; Represent and Interpret Data
Geometry – Draw Shapes; Partition Circles and Rectangles into Two and Four Equal Shares

Grade 2

Operations and Algebraic Thinking – Solve One- and Two-Step Problems Involving Addition and Subtraction; Build a Foundation for Multiplication
Number and Operations in Base Ten – Understand Place Value for Three-Digit Numbers; Use Place Value and Properties to Add and Subtract
Measurement and Data – Measure and Estimate Lengths in Standard Units; Work with Time and Money
Geometry – Draw and Identify Shapes; Partition Circles and Rectangles into Two, Three, and Four Equal Shares

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# Grade 3

**Operations and Algebraic Thinking**
- Represent and Solve Problems Involving Multiplication and Division; Solve Two-Step Problems Involving Four Operations

**Number and Operations in Base Ten**
- Round Whole Numbers; Add, Subtract, and Multiply Multi-Digit Whole Numbers

**Number and Operations—Fractions**
- Understand Fractions as Numbers

**Measurement and Data**
- Solve Time, Liquid Volume, and Mass Problems; Understand Perimeter and Area

**Geometry**
- Reason with Shapes and Their Attributes

# Grade 4

**Operations and Algebraic Thinking**
- Use the Four Operations with Whole Numbers to Solve Problems; Understand Factors and Multiples

**Number and Operations in Base Ten**
- Generalize Place Value Understanding; Perform Multi-Digit Arithmetic

**Number and Operations—Fractions**
- Build Fractions from Unit Fractions; Understand Decimal Notation for Fractions

**Measurement and Data**
- Convert Measurements; Understand and Measure Angles

**Geometry**
- Draw and Identify Lines and Angles; Classify Shapes

# Grade 5

**Operations and Algebraic Thinking**
- Write and Interpret Numerical Expressions

**Number and Operations in Base Ten**
- Perform Operations with Multi-Digit Numbers and Decimals to Hundredths

**Number and Operations—Fractions**
- Add, Subtract, Multiply, and Divide Fractions

**Measurement and Data**
- Convert Measurements within a Measurement System; Understand Volume

**Geometry**
- Graph Points in the First Quadrant of the Coordinate Plane; Classify Two-Dimensional Figures
# Mathematics Reference Sheet

## Conversions

### U.S. Customary
- 1 foot = 12 inches
- 1 yard = 3 feet
- 1 mile = 5280 feet
- 1 acre ≈ 43,560 square feet
- 1 cup = 8 fluid ounces
- 1 pint = 2 cups
- 1 quart = 2 pints
- 1 gallon = 4 quarts
- 1 pound = 16 ounces
- 1 ton = 2000 pounds
- 1 cubic foot ≈ 7.5 gallons

### U.S. Customary to Metric
- 1 inch = 2.54 centimeters
- 1 foot ≈ 0.3 meter
- 1 mile ≈ 1.61 kilometers
- 1 quart ≈ 0.95 liter
- 1 pound ≈ 0.45 kilogram
- 1 gallon ≈ 3.79 liters

### Metric
- 1 centimeter = 10 millimeters
- 1 meter = 100 centimeters
- 1 kilometer = 1000 meters
- 1 liter = 1000 milliliters
- 1 kiloliter = 1000 liters
- 1 milliliter = 1 cubic centimeter
- 1 liter = 1000 cubic centimeters
- 1 cubic millimeter = 0.001 milliliter
- 1 gram = 1000 milligrams
- 1 kilogram = 1000 grams

### Metric to U.S. Customary
- 1 centimeter ≈ 0.39 inch
- 1 meter ≈ 3.28 feet
- 1 kilometer ≈ 0.62 mile
- 1 liter ≈ 1.06 quarts
- 1 kilogram ≈ 2.2 pounds
- 1 gram ≈ 0.035 ounce
- 1 cubic meter ≈ 264 gallons

## Time
- 1 minute = 60 seconds
- 1 hour = 60 minutes
- 1 hour = 3600 seconds
- 1 year = 52 weeks

### Temperature
- \( C = \frac{5}{9} (F - 32) \)
- \( F = \frac{9}{5} C + 32 \)

## Number Properties

### Commutative Properties of Addition and Multiplication
- \( a + b = b + a \)
- \( a \cdot b = b \cdot a \)

### Associative Properties of Addition and Multiplication
- \( (a + b) + c = a + (b + c) \)
- \( (a \cdot b) \cdot c = a \cdot (b \cdot c) \)

### Addition Property of Zero
- \( a + 0 = a \)

### Multiplication Properties of Zero and One
- \( a \cdot 0 = 0 \)
- \( a \cdot 1 = a \)

### Distributive Property:
- \( a(b + c) = ab + ac \)
- \( a(b - c) = ab - ac \)

## Properties of Equality

### Addition Property of Equality
- If \( a = b \), then \( a + c = b + c \).

### Subtraction Property of Equality
- If \( a = b \), then \( a - c = b - c \).

### Multiplication Property of Equality
- If \( a = b \), then \( a \cdot c = b \cdot c \).

### Multiplicative Inverse Property
- \( n \cdot \frac{1}{n} = \frac{1}{n} \cdot n = 1, n \neq 0 \)

### Division Property of Equality
- If \( a = b \), then \( a \div c = b \div c, c \neq 0 \).
Properties of Inequality

Addition Property of Inequality
If $a > b$, then $a + c > b + c$.

Subtraction Property of Inequality
If $a > b$, then $a - c > b - c$.

Multiplication Property of Inequality
If $a > b$ and $c$ is positive, then $a \cdot c > b \cdot c$.

Division Property of Inequality
If $a > b$ and $c$ is positive, then $a \div c > b \div c$.

Perimeter and Area

<table>
<thead>
<tr>
<th>Square</th>
<th>Rectangle</th>
<th>Parallelogram</th>
<th>Triangle</th>
<th>Trapezoid</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="square.png" alt="Square Diagram" /></td>
<td><img src="rectangle.png" alt="Rectangle Diagram" /></td>
<td><img src="parallelogram.png" alt="Parallelogram Diagram" /></td>
<td><img src="triangle.png" alt="Triangle Diagram" /></td>
<td><img src="trapezoid.png" alt="Trapezoid Diagram" /></td>
</tr>
<tr>
<td>$P = 4s$</td>
<td>$P = 2\ell + 2w$</td>
<td>$A = bh$</td>
<td>$A = \frac{1}{2}bh$</td>
<td>$A = \frac{1}{2}h(b_1 + b_2)$</td>
</tr>
<tr>
<td>$A = s^2$</td>
<td>$A = \ell w$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Surface Area

Prism

![Prism Diagram](prism.png)

$S = \text{areas of bases} + \text{areas of lateral faces}$

Pyramid

![Pyramid Diagram](pyramid.png)

$S = \text{area of base} + \text{areas of lateral faces}$

Volume of a Rectangular Prism

![Rectangular Prism Diagram](rectangular_prism.png)

$V = Bh = \ell wh$