Practice 1-1 Variables and Expressions

Write an expression for each quantity.

1. the value in cents of 5 quarters
2. the value in cents of q quarters
3. the number of months in 7 years
4. the number of months in y years
5. the number of gallons in 21 quarts
6. the number of gallons in q quarts

Write a variable expression for each word phrase.

7. 9 less than k
8. m divided by 6
9. twice x
10. 4 more than twice x
11. the sum of eighteen and b
12. three times the quantity 2 plus a

Tell whether each expression is a numerical expression or a variable expression. For a variable expression, name the variable.

13. 4d
14. 74 + 8
15. \(\frac{4(9)}{6}\)
16. 14 - p
17. 5k - 9
18. 3 + 3 + 3 + 3
19. 19 + 3(12)
20. 25 - 9 + x

The room temperature is c degrees centigrade. Write a word phrase for each expression.

21. c + 15
22. c - 7
Practice 1-2  The Order of Operations

Simplify each expression.
1. $3 + 15 - 5 \cdot 2$  
2. $5 \cdot 6 + 2 \cdot 4$  
3. $48 \div 8 - 1$  
4. $68 - 12 \div 2 \div 3$  
5. $6(2 + 7)$  
6. $25 - (6 \cdot 4)$  
7. $3[9 - (6 - 3)] - 10$  
8. $60 \div (3 + 12)$  
9. $4 - 2 + 6 \cdot 2$  
10. $18 \div (5 - 2)$  
11. $\frac{16 + 24}{30 - 22}$  
12. $2[4(9 - 7) + 1]$  
13. $(8 \div 8 + 2 + 11) \div 2$  
14. $9 + 3 \cdot 4$  
15. $18 \div 3 \cdot 5 - 4$  
16. $10 + 28 \div 14 - 5$  

Insert grouping symbols to make each number sentence true.
17. $3 + 5 \cdot 8 = 64$  
18. $4 \cdot 6 - 2 + 7 = 23$  
19. $10 \div 3 + 2 \cdot 4 = 8$  
20. $3 + 6 \cdot 2 = 18$

A city park has two walkways with a grassy area in the center, as shown in the diagram.

21. Write an expression for the area of the sidewalks, using subtraction.
   
   
22. Write an expression for the area of the sidewalks, using addition.
   
   

Compare. Use $>$, $<$, or $=$ to complete statement.
23. $(24 - 8) \div 4$  
24. $3 \cdot (4 - 2) \cdot 5$  
25. $(22 + 8) \div 2$  
26. $20 \div 2 + 8 \cdot 2$  
27. $11 \cdot 4 - 2$  
28. $(7 \cdot 3) - (4 \cdot 2)$  

Pre-Algebra Chapter 1
Evaluate each expression.

1. \( xy \), for \( x = 3 \) and \( y = 5 \) ________
2. \( 24 - p \cdot 5 \), for \( p = 4 \) ________
3. \( 5a + b \), for \( a = 6 \) and \( b = 3 \) ________
4. \( 6x \), for \( x = 3 \) ________
5. \( 9 - k \), for \( k = 2 \) ________
6. \( 63 \div p \), for \( p = 7 \) ________
7. \( 2 + n \), for \( n = 3 \) ________
8. \( 3m \), for \( m = 11 \) ________
9. \( 10 - r + 5 \), for \( r = 9 \) ________
10. \( m + n \div 6 \), for \( m = 12 \) and \( n = 18 \) ________
11. \( 1,221 \div x \), for \( x = 37 \) ________
12. \( 10 - x \), for \( x = 3 \) ________
13. \( 4m + 3 \), for \( m = 5 \) ________
14. \( 35 - 3x \), for \( x = 10 \) ________
15. \( 851 - p \), for \( p = 215 \) ________
16. \( 18a - 9b \), for \( a = 12 \) and \( b = 15 \) ________
17. \( 3ab - c \), for \( a = 4 \), \( b = 2 \), and \( c = 5 \) ________
18. \( \frac{ab}{2} + 4c \), for \( a = 6 \), \( b = 5 \), and \( c = 3 \) ________
19. \( \frac{rst}{3} \), for \( r = 9 \), \( s = 2 \), and \( t = 4 \) ________
20. \( x(y + 5) - z \), for \( x = 3 \), \( y = 2 \), and \( z = 7 \) ________
21. Elliot is 58 years old.
   a. Write an expression for the number of years by which Elliot’s age exceeds that of his daughter, who is \( y \) years old. ________
   b. If his daughter is 25, how much older is Elliot? ________
22. A tree grows 5 in. each year.
   a. Write an expression for the tree’s height after \( x \) years. ________
   b. When the tree is 36 years old, how tall will it be? ________
Graph each set of numbers on a number line. Then order the numbers from least to greatest.

1. \(-4, -8, 5\)
2. \(3, -3, -2\)
3. \(0, -9, -5\)
4. \(-7, -1, -6\)

Write an integer to represent each quantity.

5. 5 degrees below zero  
6. 2,000 ft above sea level
7. a loss of 12 yd  
8. 7 strokes under par

Simplify each expression.

9. the opposite of \(-15\)  
10. \(|-9|\)
11. \(-|-25|\)  
12. the opposite of \(|-8|\)
13. \(-|-31|\)  
14. \(847\)

Write the integer represented by each point on the number line.

15. \(A\)  
16. \(B\)  
17. \(C\)
18. \(D\)  
19. \(E\)

Compare. Use >, <, or = to complete each statement.

20. \(-3\) \(4\)  
21. \(5\) \(1\)  
22. \(-2\) \(-6\)  
23. \(7\) \(|8|\)
24. \(-2\) \(|2|\)  
25. \(-1\) \(-6\)  
26. \(|4|\) \(|-5|\)  
27. \(0\) \(|-7|\)
Practice 1-5  Adding Integers

Write a numerical expression for each of the following. Then find the sum.
1. climb up 26 steps, then climb down 9 steps

2. earn $100, spend $62, earn $35, spend $72

Find each sum.
3. \(-8 + (-3)\)  
4. \(6 + (-6)\)  
5. \(-12 + (-17)\)  
6. \(9 + (-11)\)  
7. \(-4 + (-6)\)  
8. \(18 + (-17)\)  
9. \(-8 + 8 + (-11)\)  
10. \(12 + (-7) + 3 + (-8)\)  
11. \(-15 + 7 + 15\)  
12. \(0 + (-11)\)  
13. \(6 + (-5) + (-4)\)  
14. \(-5 + (-16) + 5 + 8 + 16\)

Without adding, tell whether each sum is positive, negative, or zero.
15. \(192 + (-129)\)  
16. \(-417 + (-296)\)  
17. \(-175 + 87\)

Evaluate each expression for \(n = -12\).
18. \(n + 8\)  
19. \(n + (-5)\)  
20. \(12 + n\)

Compare. Write >, <, or = to complete each statement.
21. \(-7 + 5 \quad 3 + (-6)\)  
22. \(4 + (-9) \quad 6 + (-7) + (-4)\)
23. An elevator went up 15 floors, down 9 floors, up 11 floors, and down 19 floors. Find the net change. ______________
24. The price of a share of stock started the day at $37. During the day it went down $3, up $1, down $7, and up $4. What was the price of a share at the end of the day? ______________
Use rules to find each difference.

1. \(8 - 12\)
2. \(13 - 6\)
3. \(9 - (-12)\)
4. \(57 - 39\)
5. \(-173 - 162\)
6. \(71 - (123)\)
7. \(51 - 89\)
8. \(-222 - (-117)\)
9. \(843 - 677\)
10. \(-98 - 183\)
11. \(366 - (-429)\)
12. \(-83 - (-48) - 65\)

Find each difference.

13. \(6 - 9\)
14. \(14 - 8\)
15. \(-15 - 3\)
16. \(-25 - 25\)
17. \(-16 - (-16)\)
18. \(32 - (-17) - 32\)

Round each number. Then estimate each sum or difference.

19. \(-57 + (-98)\)
20. \(448 - 52\)
21. \(-191 + (-511)\)
22. \(-361 - (-58)\)
23. \(888 + 1,177\)
24. \(-484 - 1,695\)

Write a numerical expression for each phrase. Then simplify.

25. A balloon goes up 2,300 ft, then goes down 600 ft.

26. You lose $50, then spend $35.

27. The Glasers had $317 in their checking account. They wrote checks for $74, $132, and $48. What is their checking account balance?
Write a rule for each pattern. Find the next three numbers in each pattern.

1. 3, 6, 9, 12, 15, _____, _____, _____
   Rule: ____________________________

2. 1, 2, 4, 8, 16, _____, _____, _____
   Rule: ____________________________

3. 6, 7, 14, 15, 30, 31, _____, _____, _____
   Rule: ____________________________

4. 34, 27, 20, 13, 6, _____, _____, _____
   Rule: ____________________________

Is each statement correct or incorrect? If it is incorrect, give a counterexample.

5. All roses are red

6. A number is divisible by 4 if its last two digits are divisible by 4.

7. The difference of two numbers is always less than at least one of the numbers.

Describe the next figure in each pattern. Then draw the figure.

8. 

9. 

10. 

11. 

Name ________________________________  Class __________________ Date ____________
**Practice 1-8  Look for a Pattern**

Solve using any strategy.

1. Each row in a window display of floppy disk cartons contains two more boxes than the row above. The first row has one box.
   a. Complete the table.

<table>
<thead>
<tr>
<th>Row Number</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boxes in the row</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total boxes in the display</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   b. Describe the pattern in the numbers you wrote.

   c. Find the number of rows in a display containing the given number of boxes.

   81    144    400

   d. Describe how you can use the number of boxes in the display to calculate the number of rows.

2. A computer multiplied nine 100 times.
   You can use patterns to find the ones’ digit of the product.  

   a. Find the ones’ digit when nine is multiplied:

      1 time   _____  2 times   _____  3 times   _____  4 times   _____

   b. Describe the pattern.

   c. What is the ones’ digit of the computer product?  _____

3. Use the method of Exercise 2 to find the ones’ digit of the product when
   4 is multiplied by itself 100 times.  _____
Practice 1-9  Multiplying and Dividing Integers

Use repeated addition, patterns, or rules to find each product or quotient.

1. 23 \cdot 16 \\
2. 8 \cdot 7(-6) \\
3. -17 \cdot 3 \\
4. -24 \div 4 \\
5. -65 \div 5 \\
6. 117 \div (-1) \\
7. -30 \div (-6) \\
8. -21 \div (-3) \\
9. 63 \div (-21) \\
10. 5(-1)(-9) \\
11. -6(-3) \cdot 2 \\
12. -3 \cdot 7(-2) \\
13. \frac{1.512}{-42} \\
14. \frac{-4.875}{-65} \\
15. \frac{-15(-3)}{-9} \\

Compare. Use >, <, or = to complete each statement.

16. -7(5) \underline{\square} -6 \cdot (-6) \\
17. -20 \cdot (-5) \underline{\square} 10 \cdot |10| \\
18. 3(-6) \underline{\square} -3(6) \\
19. 121 \div (-11) \underline{\square} -45 \div (-6) \\
20. -40 \div 8 \underline{\square} 40 \div (-8) \\
21. -54 \div 9 \underline{\square} 21 \div (-3) \\

For each group, find the average.

22. temperatures: 6°, -15°, -24°, 3°, -25° \\
23. bank balances: $52, -$7, $20, -$63, -$82 \\
24. stock price changes: $6, -$6, -$9, $1, $3 \\
25. golf scores: -2, 0, 3, -2, -3, 1, -4 \\
26. elevations (ft): -120, 168, -60, -42, -36 \\

Write a multiplication or division sentence to answer the question.

27. The temperature dropped 4° each hour for 3 hours. What was the total change in temperature?
Graph each point.

1. \( A(-2, 2) \)
2. \( B(0, 3) \)
3. \( C(-3, 0) \)
4. \( D(2, 3) \)
5. \( E(-1, -2) \)
6. \( F(4, -2) \)

Write the coordinates of each point.

7. \( A \) ________ 8. \( B \) ________
9. \( C \) ________ 10. \( D \) ________

In which quadrant or on what axis does each point fall?

11. \( A \) ________ 12. \( B \) ________
13. \( C \) ________ 14. \( D \) ________

Name the point with the given coordinates.

15. \( (1, 4) \) ________ 16. \( (-3, 0) \) ________
17. \( (5, -1) \) ________ 18. \( (-2, -4) \) ________

Complete using **positive**, or **negative**, or **zero**.

19. In Quadrant II, \( x \) is ________ and \( y \) is ________.
20. In Quadrant III, \( x \) is ________ and \( y \) is ________.
21. On the y-axis \( x \) is ________.
22. On the x-axis \( y \) is ________.
**Practice 2-1 Properties of Numbers**

*Mental Math* Simplify each expression.

1. \(4 \cdot 13 \cdot 25\)
2. \(700 + 127 + 300\)
3. \(68 + 85 + 32\)
4. \(2 \cdot 3 \cdot 4 \cdot 5\)
5. \(-14 + 71 + 29 + (-86)\)
6. \(125 \cdot 9 \cdot 8\)
7. \(20 \cdot 7 \cdot 5\)
8. \(217 + 545 - 17\)
9. \(39 + 27 + 11\)
10. \(4 \cdot 12 \cdot 250\)
11. \(19 + 0 + (-9)\)
12. \(-6 \cdot 1 \cdot 30\)

Write the letter of the property shown.

13. \(14(mn) = (14m)n\)
14. \(19 + 11 = 11 + 19\)
15. \(k \cdot 1 = k\)
16. \((x + y) + z = x + (y + z)\)
17. \(65t = t(65)\)
18. \(p = 0 + p\)
19. \(n = 1 \cdot n\)
20. \((x + p) + (r + t) = (r + t) + (x + p)\)
21. \((h + 0) + 4 = h + 4\)
22. \(x + yz = x + zy\)

*Mental Math* Evaluate each expression.

23. \(x(yz), \text{ for } x = 8, y = -9, z = 5\)
24. \(q + r + s, \text{ for } q = 46, r = 19, s = 54\)
25. \(a(b)(-c), \text{ for } a = 7, b = -2, c = 15\)
Practice 2-2  The Distributive Property

Write an expression using parentheses for each model. Then multiply.

1. 

2. 

Multiply each expression.

3. \(6(h - 4)\)  

4. \((p + 3)5\)

5. \(-3(x + 8)\)  

6. \((4 - y)(-9)\)

7. \(2(7n - 11)\)  

8. \(-10(-a + 5)\)

Use the distributive property to simplify.

9. \(98 \cdot 7\)

10. \(9 \cdot 28\)

11. \(78 \cdot 8\)

12. \(7(2,009)\)

13. \(899 \cdot 5\)

14. \(30 \cdot 105\)

15. \(8 \cdot 5 - 12 \cdot 5\)

16. \(7 \cdot 10 + 7(-3)\)

17. \(-4(3) + (-4)(6)\)

18. \(6(8) + 6(-2)\)

Solve using mental math.

19. A shipping container holds 144 boxes. How many boxes can be shipped in 4 containers?  

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Pre-Algebra Chapter 2
Simplify each expression.

1. $16 + 7y - 8$
2. $18m - 7 + 12m$
3. $5(3t) - 7(2t)$
4. $2x - 9y + 7x + 20y$
5. $3(9k - 4) - 4(5n - 3)$
6. $6(g - h) - 6(g - h)$
7. $-21(a + 2b) + 14a - 9b$
8. $-7a + 3(a - c) + 5c$
9. $-2(-5q) + (-72)(-q)$

Name the coefficients, any like terms, and any constants.

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Like Terms</th>
<th>Constants</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. $3x + 7$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. $4m + (-3n) + n$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. $6kp + 9k + kp - 14$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. $-8y + 6ab + 7 - 3ba$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. $c + 2c + c - 5c + 1$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Write an expression for each model. Simplify the expression.

15. [Expression]
16. [Expression]

Justify each step.

17. $5(n + 4) + 9n = (5n + 20) + 9n$
   $= 5n + (20 + 9n)$
   $= 5n + (9n + 20)$
   $= (5n + 9n) + 20$
   $= (5 + 9)n + 20$
   $= 14n + 20$
**Practice 2-4  Variables and Equations**

**Is the given number a solution of the equation?**

1. \(9k = 10 - k; -1 \) \(_______\)  
2. \(-7r - 15 = -2r; -3 \) \(_______\)

3. \(3g \div (-6) = 5 - g; -10 \) \(_______\)  
4. \(-3p = 4p + 35; -5 \) \(_______\)

5. \(8 - e = 2e - 16; 8 \) \(_______\)  
6. \(5 - 15s = 8 - 16s; 3 \) \(_______\)

7. \(2(x - 2) - 5x = 5(2 - x); 7 \) \(_______\)  
8. \(6a + 3 = 3(3a - 2); 4 \) \(_______\)

**Is each equation true, false, or an open sentence?**

9. \(14 = x - 9\) \(_______\)  
10. \(8 + 7 = 10\) \(_______\)

11. \(4 - 15 = 22 - 33\) \(_______\)  
12. \(5 + x = 90 \div 9 + 4\) \(_______\)

13. \(-7(5 - 9) = 19 - 3(-3)\) \(_______\)  
14. \(6(5 - 8) = 2(10 - 1)\) \(_______\)

**Write an equation for each sentence. Is each equation true, false, or an open sentence.**

15. One fifth of a number \(n\) is equal to \(-7\).

16. The product of 13 and \(-7\) is \(-91\).

17. Fifty-four divided by six equals negative nine.

18. Seven less than the product of a number \(z\) and 3 is equal to 4.

**Write an equation. Is the given value a solution?**

19. A truck driver drove 468 miles on Tuesday. That was 132 miles farther than she drove on Monday. Let \(d\) represent the distance she drove on Monday. Did she drive 600 miles on Monday?
Practice 2-5  Solving Equations by Adding or Subtracting

Use mental math to solve each equation.

1. \(-52 = -52 + k\) __________
2. \(837 = p + 37\) __________
3. \(x - 155 = 15\) __________
4. \(180 = 80 + n\) __________
5. \(2,000 + y = 9,500\) __________
6. \(81 = x - 19\) __________
7. \(111 + f = 100\) __________
8. \(w - 6 = -16\) __________

Solve each equation.

9. \(m - 17 = -8\) __________
10. \(k - 55 = 67\) __________
11. \(-44 + n = 36\) __________
12. \(-36 = p - 91\) __________
13. \(x - 255 = 671\) __________
14. \(19 = c - (-12)\) __________
15. \(x + 14 = 21\) __________
16. \(31 = p + 17\) __________
17. \(-19 = k + 9\) __________
18. \(87 + y = 19\) __________
19. \(36 + n = 75\) __________
20. \(-176 = h + (-219)\) __________
21. \(41 + k = 7\) __________
22. \(1,523 + c = 2,766\) __________
23. \(-88 + z = 0\) __________
24. \(-33 + (-7) = 29 + m\) __________
25. \(t + (-2) = -66\) __________
26. \(-390 + x = 11 - 67\) __________

27. The combined enrollment in the three grades at Jefferson Middle School is 977. There are 356 students in the seventh grade and 365 in the eighth grade. Write and solve an equation to find how many students are in the ninth grade.

   Equation ________________________________

   Solution _______________________________
Practice 2-6  Solving Equations by Multiplying or Dividing

Solve each equation.

1. \( \frac{k}{3} = -5 \)  
2. \( -3 = \frac{y}{7} \)

3. \( \frac{x}{12} = 0 \)  
4. \( -6 = \frac{m}{2} \)

5. \( \frac{y}{4} = -12 \)  
6. \( \frac{s}{30} = 6 \)

7. \( \frac{1}{yz} = 0 \)  
8. \( \frac{m}{55} = 1 \)

9. \( -3x = 18 \)  
10. \( -56 = 8y \)

11. \( 8p = -8 \)  
12. \( -4s = -32 \)

13. \( 14h = 42 \)  
14. \( -175 = 25g \)

15. \( -42 = 6m \)  
16. \( -2x = 34 \)

17. \( \frac{x}{y} = -11 \)  
18. \( 216 = 9w \)

19. \( -17v = -17 \)  
20. \( -161 = 23t \)

21. \( 56h = 3,136 \)  
22. \( 20 = \frac{e}{25} \)

23. \( 4,200 = 30x \)  
24. \( \frac{y}{21} = -21 \)

25. \( \frac{m}{3} = 21 \)  
26. \( 4,000 = \frac{x}{40} \)

27. A bamboo tree grew 3 in. per day. Write and solve an equation to find how many days \( d \) it took the tree to grow 144 in.

   Equation:  
   Solution: 

28. Carl drove 561 miles. His car averages 33 miles per gallon of gas. Write and solve an equation to find how much gas \( g \) Carl’s car used.

   Equation:  
   Solution: 

For what values of \( y \) is each equation true?

29. \( -5|y| = -25 \)  
30. \( \frac{|y|}{2} = 28 \)

31. \( 9|y| = 27 \)

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Pre-Algebra Chapter 2 6
**Practice 2-7  Try, Test, Revise**

Use the Try, Test, Revise strategy to solve each problem.

1. The length of a rectangle is 9 in. greater than the width. The area is 36 in.$^2$ Find the dimensions.  

<table>
<thead>
<tr>
<th>Width</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Shari Williams, a basketball player, scored 30 points on 2-point and 3-point goals. She hit 5 more 2-pointers than 3-pointers. How many of each did she score?  

<table>
<thead>
<tr>
<th>3-pointers</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2-pointers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>points</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. The sums and products of pairs of integers are given. Find each pair of integers.

   a. sum $= -12$, product $= 36$  

   b. sum $= -12$, product $= 35$  

   c. sum $= -12$, product $= 32$  

   d. sum $= -12$, product $= 11$  

   e. sum $= -12$, product $= 0$  

4. Jess had 3 more nickels than dimes for a total of $1.50. How many of each coin did he have?  

5. A brush cost $2 more than a comb. The brush and a comb together cost $3.78. Find the cost of each.  

Write an inequality for each sentence.

1. The total \( t \) is less than sixteen.  
   \[ t < 16 \]

2. A number \( h \) is not less than 7.  
   \[ h \geq 7 \]

3. The price \( p \) is less than or equal to $25.  
   \[ p \leq 25 \]

4. A number \( n \) is negative.  
   \[ n < 0 \]

Write an inequality for each graph.

5. \[ -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 \]
   \[ -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 \]
   \[ t \geq -7 \]

6. \[ -16 -12 -8 -4 0 4 \]
   \[ -16 -12 -8 -4 0 4 \]
   \[ h \leq 3 \]

7. \[ -5 -4 -3 -2 -1 0 1 2 3 4 5 \]
   \[ -5 -4 -3 -2 -1 0 1 2 3 4 5 \]
   \[ p < -3 \]

8. \[ -5 -4 -3 -2 -1 0 1 2 3 4 5 \]
   \[ -5 -4 -3 -2 -1 0 1 2 3 4 5 \]
   \[ k \geq -2 \]

Graph the solutions of each inequality on a number line.

9. \( x < -2 \)
   \[ -5 -4 -3 -2 -1 0 1 2 3 4 5 \]

10. \( y \geq -1 \)
    \[ -5 -4 -3 -2 -1 0 1 2 3 4 5 \]

11. \( k > 1 \)
    \[ -5 -4 -3 -2 -1 0 1 2 3 4 5 \]

12. \( p \leq 4 \)
    \[ -5 -4 -3 -2 -1 0 1 2 3 4 5 \]

Write an inequality for each situation.

13. Everyone in the class is under 13 years old. Let \( x \) be the age of a person in the class.
    \[ x < 13 \]

14. The speed limit is 60 miles per hour. Let \( s \) be the speed of a car driving within the limit.
    \[ s \leq 60 \]

15. You have $4.50 to spend on lunch. Let \( c \) be the cost of your lunch.
    \[ c \leq 4.50 \]
Practice 2-9  **Solving One-Step Inequalities by Adding or Subtracting**

Write an inequality for each sentence. Then solve the inequality.

1. Six less than $n$ is less than $-4$.

2. The sum of a number $k$ and five is greater than or equal to two.

3. Nine more than a number $b$ is greater than negative three.

4. You must be at least 48 inches tall to ride an amusement park ride, and your little sister is 39 inches tall. How many inches $i$ must she grow before she may ride the ride?

5. You need no more than 3,000 calories in a day. You consumed 840 calories at breakfast and 1,150 calories at lunch. How many calories $c$ can you eat for dinner?

Solve each inequality. Graph the solutions.

6. $7 + x \geq 9$

7. $-5 \leq x - 6$

8. $0 \geq x + 12$

9. $x - 15 \leq -8$

10. $13 + x \geq 13$

11. $x - 8 > -5$

12. $4 + x < -2$

13. $x - 9 > -11$

14. $x - 6 \leq -1$

15. $-4 + x < -4$
Practice 2-10  Solving One-Step Inequalities by Multiplying or Dividing

Write an inequality for each sentence. Then solve the inequality.

1. The product of $k$ and $-5$ is no more than 30.

2. Half of $p$ is at least $-7$.

3. The product of $k$ and 9 is no more than 18.

4. One-third of $p$ is at least $-17$.

5. The opposite of $g$ is at least $-5$.

Solve each inequality.

6. $-5x < 10$

7. $\frac{x}{4} > 1$

8. $-8 < -8x$

9. $\frac{1}{3}x > -2$

10. $48 \geq -12x$

11. $\frac{1}{3}x < -6$

12. $\frac{x}{5} < -4$

13. $-x \leq 2$

Determine whether each number is a solution of $7 \geq -3k$.

14. 2

15. -2

16. 0

17. -3

Justify each step.

18. $-5n \geq 45$

\[
\frac{-5n}{-5} \leq \frac{45}{-5}
\]

\[
n \leq -9
\]
Estimate using front-end estimation.
1. 6.3 + 8.55  2. 345 + 682  3. 4.60 + 5.53
   _______  _______  _______
4. $6.14 + $9.38  5. $39.65 + $25.84  6. 9.71 + 3.94
   _______  _______  _______

Estimate by clustering.
7. $7.04 + $5.95 + $6.08 + $5.06 + $6.12  8. 9.3 + 8.7 + 8.91 + 9.052
   _______  _______
9. 37.6 + 44.91 + 41 + 39.1  10. 2.357 + 1.874 + 1.956
   _______  _______

Estimate by rounding each number to the same place value.
   _______  _______
13. 194.78 − 12.31  14. $289 − $67.20
   _______  _______
15. 800 − 301.47  16. 0.06 + 19.41
   _______  _______

Round to the underlined place value.
17. 6.739  18. 52.192
   _______  _______
19. 0.61  20. 348.598
   _______  _______

Estimate. State your method (rounding, front-end, or clustering).
21. 91.7 + 88.6 + 89.1 + 92.5 + 90.6
   ________________________________
22. 3.9 + 8.1 + 2.06
   ________________________________
23. $1.08 + $.95 + $.89 + $1.14
   ________________________________
24. 11.56 + 19.43 + 13.40 + 14.39
   ________________________________
25. 0.015 + 0.039 + 0.0266
   ________________________________
Practice 3-2 Estimating Decimal Products and Quotients

Determine whether each product or quotient is reasonable. If it is not reasonable, find a reasonable result.

1. \(62.77 \times 29.8 = 187.0546\)
2. \(16.132 \div 2.96 = 54.5\)
3. \((47.89) \times 6.193 = 296.5828\)
4. \(318.274 \div 4.07 = 78.2\)
5. \(2.65 \times -0.84 = -2.226\)
6. \(-38.6 \times -1.89 = 7.2954\)
7. \(6355 \div 775 = 8.2\)
8. \(1444.14 \div 67.8 = 213\)
9. \(1.839 \times 6.3 = 115.857\)
10. \(3.276 \div 0.63 = 5.2\)

Estimate each product or quotient.

11. \(8.73 \cdot 6.01\)
12. \(11.042 \times 4.56\)
13. \(197.4 \cdot 2.85\)
14. \(675.1 \cdot 0.051\)
15. \(479.2 \times 3.2\)
16. \(712.9 \cdot 0.41\)
17. \(11.57 \div 3.09\)
18. \(43.68 \div 8.7\)
19. \(29.5 \div 5.1\)
20. \($41.09 \div 6.88\)
21. \(148.8 \div 9.8\)
22. \($76.77 \div 24.19\)

23. Apples cost $0.89 per lb. Estimate the cost of three 5-lb bags.

24. You buy 3 dinners that are $6.85 each. Before tax and tip, the total is $25.42. Is this total correct? Explain.

25. You worked 18 hours last week and received $92.70 in your paycheck. Estimate your hourly pay.
**Practice 3-3 Mean, Median, and Mode**

1. There were 8 judges at a gymnastics competition. Kathleen received these scores for her performance on the uneven parallel bars: 
   8.9, 8.7, 8.9, 9.2, 8.8, 8.2, 8.9, 8.8

   **a.** Find these statistics: mean _______ median _______ mode _______

   **b.** Which measure of central tendency best describes the data? Explain.

   ____________________________________________________________

   **c.** Why do you think that the highest and lowest judge’s scores are disregarded in tallying the total score in a gymnastics competition?

   ____________________________________________________________

**Find the mean, median, and mode. Round to the nearest tenth where necessary. Identify any outliers.**

<table>
<thead>
<tr>
<th>Data</th>
<th>Mean</th>
<th>Median</th>
<th>Mode</th>
<th>Outliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. 8, 15, 9, 7, 4, 5, 9, 11</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. 70, 61, 28, 40, 60, 72, 25, 31, 64, 63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. 4.9, 5.7, 6.0, 5.3, 4.8, 4.9, 5.3, 4.7, 4.9, 5.6, 5.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. 271, 221, 234, 240, 271, 234, 213, 253, 155</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. 0, 2, 3, 3, 3, 4, 4, 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Use the data in the table. Round to the nearest tenth where necessary.**

<table>
<thead>
<tr>
<th>Peak</th>
<th>Height (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mont Blanc</td>
<td>15,771</td>
</tr>
<tr>
<td>Monte Rosa</td>
<td>15,203</td>
</tr>
<tr>
<td>Dom</td>
<td>14,911</td>
</tr>
<tr>
<td>Liskamm</td>
<td>14,852</td>
</tr>
<tr>
<td>Weissrom</td>
<td>14,780</td>
</tr>
</tbody>
</table>

7. What is the mean height of the five highest European mountains?  ________________

8. What is the median height?  __________________________

9. Is any of the heights an outlier? Explain.  __________________________
Practice 3-4 Using Formulas

Use the formula \( P = 2l + 2w \). Find the perimeter of each rectangle.

1. 2. 3.

\[
\begin{array}{c}
9 \text{ m} \\
4.5 \text{ m}
\end{array}
\quad
\begin{array}{c}
5.2 \text{ ft} \\
1.3 \text{ ft}
\end{array}
\quad
\begin{array}{c}
12.9 \text{ cm} \\
4.7 \text{ cm}
\end{array}
\]

Use the formula \( A = lw \). Find the area of each rectangle above.

4. 5. 6.

7. Use the formula \( d = rt \) to find how far each animal in the table can travel in 5 seconds.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Speed (ft/s)</th>
<th>Distance in 5 s (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pronghorn antelope</td>
<td>89.5</td>
<td></td>
</tr>
<tr>
<td>Wildebeest</td>
<td>73.3</td>
<td></td>
</tr>
<tr>
<td>Gray fox</td>
<td>61.6</td>
<td></td>
</tr>
<tr>
<td>Wart hog</td>
<td>44.0</td>
<td></td>
</tr>
<tr>
<td>Wild turkey</td>
<td>22.0</td>
<td></td>
</tr>
<tr>
<td>Chicken</td>
<td>13.2</td>
<td></td>
</tr>
</tbody>
</table>

8. While vacationing on the Mediterranean Sea, Angie recorded the temperature several times during a 24-hour period. She used a thermometer in the lobby of her hotel. It was a beautiful day. Use the formula \( F = 1.8C + 32 \) to change the temperatures Angie recorded from Celsius to Fahrenheit.

<table>
<thead>
<tr>
<th>Time</th>
<th>Temperature (°C)</th>
<th>Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:00 A.M.</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>8:00 A.M.</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>12:00 P.M.</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>4:00 P.M.</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>8:00 P.M.</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>12:00 A.M.</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>
Practice 3-5  Solving Equations by Adding or Subtracting Decimals

Solve each equation.

1. $3.8 = n - 3.62$

2. $x - 19.7 = -17.48$

3. $12.5 = t - 3.55$

4. $k - 263.48 = -381.09$

5. $9.36 + k = 14.8$

6. $-22 = p + 13.7$

7. $y + 3.85 = 2.46$

8. $-13.8 = h + 15.603$

9. $y - 48.763 = 0$

10. $6.21 = e + (-3.48)$

11. $x + (-0.0025) = 0.0024$

12. $-58.109 = v - 47.736$

13. $x + 82.7 = 63.5$

14. $-0.08 = f + 0.07$

15. $0 = a + 27.98$

16. $117.345 + m = 200$

17. $z - 81.6 = -81.6$

18. $5.4 = t + (-6.1)$

19. $-4.095 + b = 18.665$

20. $4.87 = n + 0.87$

Use mental math to solve each equation.

21. $k + 23.7 = 23.7$

22. $5.63 = n + 1.63$

23. $x - 3.2 = 4.1$

24. $p - 0.7 = 9.3$

25. $6.75 + c = 12.95$

26. $-1.09 = j - 4.99$
Use mental math to solve each equation.

1. \(0.7h = 4.2\)  
2. \(\frac{x}{2.5} = -3\)  
3. \(38.7 = -100k\)  
4. \(-45.6e = -4.56\)

Solve each equation.

5. \(\frac{p}{27} = 0.55\)  
6. \(9.1 = \frac{x}{-0.7}\)  
7. \(-6.4 = \frac{y}{8.5}\)  
8. \(-\frac{k}{12} = -0.07\)  
9. \(277.4 = \frac{n}{3.5}\)  
10. \(-\frac{e}{-0.76} = 2,809\)
11. \(\frac{a}{27} = -32.3\)  
12. \(-\frac{p}{1.52} = -3,600\)  
13. \(-9k = 2.34\)  
14. \(-12.42 = 0.03p\)
15. \(-7.2y = 61.2\)  
16. \(-0.1035 = 0.23n\)
17. \(1.5m = 3.03\)  
18. \(-0.007h = 0.2002\)
19. \(8.13t = -100.812\)  
20. \(0.546 = 0.42y\)

Write an equation for each sentence. Solve for the variable.

21. The opposite of seventy-five hundredths times some number \(n\) equals twenty-four thousandths. Find the value of \(n\).  

22. A number \(n\) divided by \(-3.88\) equals negative two thousand. Find the value of \(n\).  

23. Four hundredths times some number \(n\) equals thirty-three and four tenths. Find the value of \(n\).  

24. The product of some number \(n\) and \(-0.26\) equals 169.39. Find the value of \(n\).
Practice 3-7 Using the Metric System

Write the metric unit that makes each statement true.

1. $7.84 \text{ cm} = \_\_\_ \text{ mm}$
2. $423 \text{ m} = \_\_\_ \text{ km}$
3. $2.8 \text{ m} = \_\_\_ \text{ cm}$
4. $6.5 \text{ km} = \_\_\_ \text{ m}$

Complete each statement.

5. $3.4 \text{ cm} = \_\_\_ \text{ mm}$
6. $197.5 \text{ cm} = \_\_\_ \text{ m}$
7. $7 \text{ L} = \_\_\_ \text{ mL}$
8. $5,247 \text{ mg} = \_\_\_ \text{ g}$
9. $87 \text{ g} = \_\_\_ \text{ kg}$
10. $9,246 \text{ mL} = \_\_\_ \text{ L}$

Choose a reasonable estimate. Explain your choice.

11. The amount of water a cup would hold: $250 \text{ mL}$ $250 \text{ L}$

12. The mass of a bag of apples: $2 \text{ g}$ $2 \text{ kg}$

13. The height of your kitchen table: $68 \text{ cm}$ $68 \text{ m}$

Choose an appropriate metric unit. Explain your choice.

14. distance between two cities

15. the mass of a pencil

16. the capacity of an automobile’s gas tank

17. One Olympic event is the 1,500-meter run. How many kilometers is this?

18. A fish pond holds 2,500 liters of water. How many kiloliters is this?
Practice 3-8 Simplify a Problem

Solve using any strategy.

1. A house-number manufacturer sold numbers to retail stores for $.09 per digit. A hardware store bought enough digits for two of every house number from 1 to 999. How many digits did the store purchase for house numbers:
   a. 1–9 ________  b. 10–99 ________  c. 100–999 ________
   d. Find the total cost of the house numbers. _______________

2. A tic-tac-toe diagram uses 2 vertical lines and 2 horizontal lines to create 9 spaces. How many spaces can you create using:
   a. 1 vertical line and 1 horizontal line ________
   b. 2 vertical lines and 1 horizontal line ________
   c. 3 vertical lines and 3 horizontal line ________
   d. 4 vertical lines and 5 horizontal lines ________
   e. 17 vertical lines and 29 horizontal lines ________

3. Each side of each triangle in the figure has length 1 cm. The perimeter (the distance around) of the first triangle is 3 cm. Find the perimeter of the figure formed by connecting:
   a. 2 triangles ________  b. 3 triangles ________
   c. 4 triangles ________  d. 50 triangles ________

4. At the inauguration, the President was honored with a 21-gun salute. The report from each gunshot lasted 1 s. Four seconds elapsed between shots. How long did the salute last?
   _______________

5. Bernie began building a model airplane on day 7 of his summer vacation and finished building it on day 65. He worked on the plane each day. How many days did it take?
   _______________
**Practice 4-1 Divisibility and Factors**

List all the factors of each number.

1. 12
2. 45
3. 41
4. 54
5. 48
6. 100
7. 117

Test whether each number is divisible by 2, 3, 5, 9, and 10.

8. 215
9. 432
10. 770
11. 1,011
12. 975
13. 2,070
14. 3,707
15. 5,715

Write the missing digit to make each number divisible by 9.

16. 7□1
17. 2,2□2
18. 88,□12

19. There are four different digits which, when inserted in the blank space in the number 4□5, make the number divisible by 3. Write them.

20. There are two different digits which, when inserted in the blank space in the number 7,16□, make the number divisible by 5. Write them.

21. There are five different digits which, when inserted in the blank space in the number 99,99□, make the number divisible by 2. Write them.
Evaluate each expression.

1. \(m^4\), for \(m = 5\)  
2. \((5a)^3\), for \(a = -1\) 
3. \(- (2p)^2\), for \(p = 7\)  
4. \(-n^6\), for \(n = 2\) 
5. \(b^6\) for, \(b = -1\)  
6. \((e - 2)^3\), for \(e = 11\) 
7. \((6 + h^2)^2\), for \(h = 3\)  
8. \(x^2 + 3x - 7\), for \(x = -4\) 
9. \(y^3 - 2y^2 + 3y - 4\), for \(y = 5\) 

Write using exponents.

10. \(3 \cdot 3 \cdot 3 \cdot 3\)  
11. \(k \cdot k \cdot k \cdot k \cdot k\)  
12. \((-9)(-9)(-9)m \cdot m \cdot m\)  
13. \(g \cdot g \cdot g \cdot g \cdot h\)  
14. \(7 \cdot a \cdot a \cdot b \cdot b \cdot b\)  
15. \(-8 \cdot m \cdot n \cdot n \cdot 2 \cdot m \cdot m\)  
16. \(d \cdot (-3) \cdot e \cdot e \cdot d \cdot (-3) \cdot e\) 

Simplify each expression.

17. \((-2)^3\) and \(-2^3\)  
18. \(0^{12}\)  
19. \(2^8\) and \(4^4\)  
20. \(-5^2 + 4 \cdot 2^3\)  
21. \(3(8 - 6)^2\)  
22. \(-6^2 + 2 \cdot 3^2\)  
23. \((-2)(-5)^2(3)\)  
24. \(24 + (11 - 3)^2 \div 4\)  
25. \((17 - 3)^2 \div (4^2 - 3^2)\)  
26. \((5 + 10)^2 \div 5^2\)  
27. \(4^3 \div (2^5 - 4^2)\)  
28. \((-1)^5 \cdot (2^4 - 13)^2\)
**Practice 4-3 Prime Factorization and Greatest Common Factor**

Find each GCF.

1. 8, 12
2. 36, 54
3. 63, 81
4. 69, 92
5. 15, 28
6. 21, 35
7. 30m, 36n
8. 75x^3y^2, 100xy
9. 15, 24, 30
10. 48, 80, 128
11. 36hk^3, 60k^2m, 84k^4n
12. 2mn, 4m^2n^2

Is each number prime, composite, or neither? For each composite, write the prime factorization.

13. 75
14. 152
15. 432
16. 588
17. 160
18. 108
19. 19
20. 143
21. 531
22. 369
23. 83
24. 137
25. The numbers 3, 5, and 7 are factors of n. Find four other factors of n besides 1.

26. For which expressions is the GCF 8x?
   A. 2xy and 4x^2
   B. 16x^2 and 24xy
   C. 8x^3 and 4x
   D. 24x^2 and 48x^3
### Practice 4-4 Simplifying Fractions

Write in simplest form.

1. \(\frac{10}{15}\)  
2. \(\frac{18}{36}\)  
3. \(\frac{27}{36}\)  
4. \(\frac{12}{15}\)  
5. \(\frac{26}{39}\)  
6. \(\frac{7b}{9b}\)  
7. \(\frac{16y^3}{20y^5}\)  
8. \(\frac{8x}{10y}\)  
9. \(\frac{6xy}{16y}\)  
10. \(\frac{24n^2}{28n}\)  
11. \(\frac{abc}{10abc}\)  
12. \(\frac{30hxy}{54kxy}\)  
13. \(\frac{mn^2}{pm^2n}\)  
14. \(\frac{5jh}{15jh^3}\)  
15. \(\frac{12h^3k}{16h^5k^2}\)  
16. \(\frac{20s^2t^3}{16sr^5}\)

Find two fractions equivalent to each fraction.

17. \(\frac{1}{4}\)  
18. \(\frac{2}{3}\)  
19. \(\frac{3}{5}\)  
20. \(\frac{3}{18}\)  
21. \(\frac{8k}{16k}\)  
22. \(\frac{3m}{8n}\)  
23. \(\frac{5pq}{10p^2q^3}\)  
24. \(\frac{3s^2t^2}{7r}\)

25. Monty completed 18 passes in 30 attempts. What fraction of his passes did Monty complete? Write in simplest form.

26. Five new state quarters will be issued by the United States mint this year. What fraction of the states will have quarters issued this year?
Practice 4-5 Account for All Possibilities

Solve each problem by accounting for all possibilities.

1. A baseball team has 4 pitchers and 3 catchers. How many different pitcher-catcher combinations are possible? One way to solve this problem is to make a list like the one started below. Finish the list.

   P1-C1  P2-C1
   P1-C2  P2-C2
   ______  ______
   ______  ______
   ______  ______
   ______  ______

2. The baseball team has 2 first basemen, 3 second basemen, and 2 third basemen. How many combinations of the three positions are possible?

   ______

3. A quarter is tossed 3 times. In how many different orders can heads and tails be tossed?

   ______

4. A quarter is tossed 4 times. In how many different orders can heads and tails be tossed?

   ______

5. Curtains are manufactured in 3 different styles and 5 different colors.
   a. How many different style-color combinations are possible?

   ______

   b. The curtains are produced in 2 different fabrics. How many different style-color-fabric combinations are possible?

   ______
Graph the rational numbers below on the same number line.

1. \(\frac{3}{4}\)  
2. \(-\frac{1}{4}\)  
3. \(-0.5\)  
4. 0.3

Evaluate. Write in simplest form.

5. \(\frac{x}{y}\), for \(x = 12, y = 21\)  
6. \(\frac{n}{n + p}\), for \(n = 9, p = 6\)

7. \(\frac{k}{k^2 + 4}\), for \(k = 6\)  
8. \(\frac{x - y}{21}\), for \(x = -2, y = 5\)

9. \(\frac{m}{n}\), for \(m = 6, n = 7\)  
10. \(\frac{x(y - 8)}{60}\), for \(x = 3, y = 9\)

Write three fractions equivalent to each fraction.

11. \(\frac{5}{7}\)  
12. \(\frac{22}{33}\)

13. \(\frac{24}{30}\)  
14. \(\frac{6}{10}\)

15. Which of the following rational numbers are equal to \(\frac{17}{10}\)?
   \(-17, -1.7, -\frac{34}{20}, 0.17\)

16. Which of the following rational numbers are equal to \(\frac{3}{5}\)?
   \(\frac{12}{20}, \frac{-3}{5}, 0.3, \frac{6}{10}\)

17. Which of the following rational numbers are equal to \(\frac{12}{15}\)?
   \(\frac{4}{5}, \frac{40}{50}, \frac{-8}{10}, \frac{8}{10}\)

18. The weight \(w\) of an object in pounds is related to its distance \(d\) from the center of Earth by the equation \(w = \frac{320}{d^2}\), where \(d\) is in thousands of miles. How much does the object weigh at sea level which is about 4,000 miles from the center of Earth?
Practice 4-7 Exponents and Multiplication

Complete each equation.
1. \(9^3 \cdot 9 = 9^7\)
2. \(6^8 \cdot 6 = 6^{17}\)
3. \(n \cdot n^5 = n^{15}\)
4. \((a^{12})^8 = a^{24}\)
5. \((c^4)^2 = c^{12}\)
6. \(r^2 \cdot r^{12} = r^{20}\)

Simplify each expression.
7. \((z^3)^5 = \) 
8. \(- (m^4)^3 = \) 
9. \((-3^2)^3 = \) 
10. \((x^3)(x^4) = \) 
11. \(y^4 \cdot y^5 = \) 
12. \((-y^5)(y^2) = \) 
13. \((3y^3)(2y^3) = \) 
14. \(3x^{12} \cdot 2x^3 = \) 
15. \(m^{30} \cdot m^{12} = \) 
16. \((x^4)(y^2)(x^2) = \) 
17. \((-6x^7)(-9x^{12}) = \) 
18. \((h^4)^4 = \) 

Find the area of each rectangle.
19. \[
\begin{array}{c}
p^2 \\
3p^4
\end{array}
\]
20. \[
\begin{array}{c}
7z^5 \\
6z^3
\end{array}
\]

Compare. Use >, <, or = to complete each statement.
21. \((4^3)^2 \) \(\square\) \((4^2)^3\) 
22. \(5^3 \cdot 5^4 \) \(\square\) \(5^{10}\) 
23. \((3^5)^4 \) \(\square\) \(3^{10}\) 
24. \(3^4 \) \(\square\) \(9^2\) 
25. \((9^7)^9 \) \(\square\) \((9^8)^8\) 
26. \(4^2 \cdot 4^3 \) \(\square\) \(4^5\) 
27. \((6^2)^2 \) \(\square\) \(3^4 \cdot 2^4\) 
28. \(5^2 \cdot 5^6 \) \(\square\) \(5^7\) 
29. \((8^2)^2 \) \(\square\) \((8^2)^3\)
Practice 4-8 Exponents and Division

Complete each equation.

1. \( \frac{8^n}{8^7} = 8^2 \), \( n = \) ________
2. \( \frac{12x^5}{4x^3} = 3x^n \), \( n = \) ________
3. \( \frac{1}{h^5} = h^n \), \( n = \) ________
4. \( \frac{p^n}{p^8} = p^{-6} \), \( n = \) ________
5. \( \frac{1}{81} = 3^n \), \( n = \) ________
6. \( \frac{124}{12^n} = 1 \), \( n = \) ________

Simplify each expression.

7. \( \frac{a^3}{a^7} \) \( \) \( \) \( \)
8. \( \frac{f^5}{f^6} \) \( \) \( \) \( \)
9. \( \frac{x^7}{x^7} \) \( \) \( \) \( \)
10. \( \frac{k^5}{k^3} \) \( \) \( \) \( \)
11. \( \frac{9x^8}{12x^5} \) \( \) \( \) \( \)
12. \( \frac{2f^{10}}{f^5} \) \( \) \( \) \( \)
13. \( \frac{3y^4}{6y^4} \) \( \) \( \) \( \)
14. \( n^{-5} \) \( \) \( \) \( \)
15. \( \frac{3xy^4}{9xy} \) \( \) \( \) \( \)
16. \( (-15)^0 \) \( \) \( \) \( \)
17. \( \frac{15hk^3}{5hk^2} \) \( \) \( \) \( \)
18. \( 4b^{-6} \) \( \) \( \) \( \)

Write each expression without a fraction bar.

19. \( \frac{a^7}{a^{10}} \) \( \) \( \) \( \)
20. \( \frac{4x^2y}{2x^3} \) \( \) \( \) \( \)
21. \( \frac{x^3y^4}{x^5y^2} \) \( \) \( \) \( \)
22. \( \frac{12mn}{12m'^n} \) \( \) \( \) \( \)
23. \( \frac{16s^2t^4}{8s^3t^5} \) \( \) \( \) \( \)
24. \( \frac{21e^4f^2}{7e^2} \) \( \) \( \) \( \)
25. Write three different quotients that equal \( 4^{-5} \).

\[
\frac{1}{4^5}, \frac{1}{4^5}, \frac{1}{4^5}
\]
**Practice 4-9 Scientific Notation**

Write each number in standard notation.

1. \(3.77 \times 10^4\)  
2. \(8.5 \times 10^3\)  
3. \(9.002 \times 10^{-5}\)  
4. \(1.91 \times 10^{-3}\)

Write each number in scientific notation.

5. Pluto is about 3,653,000,000 mi from the sun.  
6. There are 63,360 in. in a mile.  
7. At its closest, Mercury is about 46,000,000 km from the sun.  
8. 77,250,000  
9. 526,000  
10. 8 billion  
11. 8,100,000  
12. 0.00000073  
13. 0.00903

Multiply. Express each result in scientific notation.

14. \((2 \times 10^5)(3 \times 10^2)\)  
15. \((1.5 \times 10^5)(4 \times 10^9)\)  
16. \((6 \times 10^{-4})(1.2 \times 10^{-3})\)  
17. \((5 \times 10^3)(1.7 \times 10^{-5})\)

Order from least to greatest.

18. \(72 \times 10^5, 6.9 \times 10^6, 23 \times 10^5\)  
19. \(19 \times 10^{-3}, 2.5 \times 10^{-4}, 1.89 \times 10^{-4}\)

20. An ounce is 0.00003125 tons. Write this number in scientific notation.

21. A century is 3,153,600,000 seconds. Write this number in scientific notation.
**Practice 5-1 Comparing and Ordering Fractions**

**Compare. Use >, <, or = to complete each statement.**

1. \( \frac{2}{3} \) \( \square \) \( \frac{7}{9} \)
2. \( \frac{3}{5} \) \( \square \) \( \frac{7}{10} \)
3. \( -\frac{3}{4} \) \( \square \) \( -\frac{13}{16} \)
4. \( \frac{9}{21} \) \( \square \) \( \frac{6}{14} \)
5. \( -\frac{2}{3} \) \( \square \) \( -\frac{7}{12} \)
6. \( \frac{7}{9} \) \( \square \) \( -\frac{8}{9} \)
7. \( \frac{5}{8} \) \( \square \) \( \frac{7}{12} \)
8. \( -\frac{4}{5} \) \( \square \) \( -\frac{7}{8} \)
9. \( -\frac{4}{18} \) \( \square \) \( -\frac{6}{27} \)
10. \( \frac{8}{17} \) \( \square \) \( -\frac{3}{8} \)
11. \( \frac{4}{7} \) \( \square \) \( 2\frac{4}{7} \)
12. \( -\frac{9}{11} \) \( \square \) \( \frac{9}{11} \)
13. \( \frac{1}{3} \) \( \square \) \( -\frac{3}{9} \)
14. \( -\frac{12}{6} \) \( \square \) \( -\frac{9}{3} \)
15. \( -\frac{5}{10} \) \( \square \) \( -\frac{3}{4} \)

**Find the LCM of each group of numbers or expressions.**

16. 7, 21 ________________
17. 24, 32 ________________
18. 15, 50 ________________
19. \( 9a^3b, 18abc \) ________________
20. \( 28xy^2, 42x^2y \) ________________
21. 9, 12, 16 ________________
22. A quality control inspector in an egg factory checks every forty-eighth egg for cracks and every fifty-fourth egg for weight. What is the number of the first egg each day that the inspector checks for both qualities?

23. A stock sold for \( 3\frac{5}{8} \) one day and \( 3\frac{1}{2} \) the next. Did the value of the stock go up or down? Explain.

24. Marissa needs \( 2\frac{2}{3} \) yards of ribbon for a wall-hanging she wants to make. She has \( 2\frac{3}{4} \) yards. Does she have enough ribbon? Explain.

**Order from least to greatest.**

25. \( \frac{2}{3}, \frac{3}{4}, \frac{1}{2} \) ________________
26. \( \frac{2}{5}, \frac{1}{3}, \frac{3}{7}, \frac{4}{9} \) ________________
27. \( \frac{8}{11}, \frac{9}{10}, \frac{7}{8}, \frac{3}{4} \) ________________
**Practice 5-2 Fractions and Decimals**

Write as a fraction or mixed number in simplest form.

1. 0.4
2. 0.75
3. 0.16
4. 2.34
5. 0.09
6. 8.8

Write each fraction or mixed number as a decimal.

7. \( \frac{17}{20} \)
8. \( \frac{7}{8} \)
9. \( -\frac{9}{16} \)

10. \( 3\frac{1}{5} \)
11. \( 6\frac{9}{32} \)
12. \( 2\frac{87}{125} \)

13. \( 1\frac{13}{25} \)
14. \( 4\frac{31}{80} \)
15. \( -\frac{7}{12} \)

16. \( \frac{4}{9} \)
17. \( \frac{5}{18} \)
18. \( \frac{15}{11} \)

Order from least to greatest

19. 0.4, \( \frac{3}{5} \), \( \frac{1}{2} \), \( \frac{3}{10} \)

20. \( -\frac{3}{8} \), \( -\frac{3}{4} \), \( -0.38 \), \( -0.6 \)

21. \( \frac{1}{3} \), \( -\frac{1}{5} \), 0.2, \( \frac{2}{5} \)

22. Write an improper fraction with the greatest possible value using each of the digits 5, 7, and 9 once. Write this as a mixed number and as a decimal.

Write each decimal as a fraction or mixed number in simplest form.

23. 10.0\( \overline{7} \)
24. 3.44
25. -4.2\( \overline{7} \)

26. 0.09
27. 0.375
28. 0.2\( \overline{43} \)

Compare. Use <, >, or = to complete each statement.

29. \( \frac{5}{6} \) \[ \square \] 0.8
30. \( \frac{7}{11} \) \[ \square \] 0.65
31. \( 4\frac{2}{3} \) \[ \square \] \( \frac{42}{9} \)

32. \( -\frac{3}{11} \) \[ \square \] -0.25
33. 0.8\( \overline{0} \) \[ \square \] \( \frac{80}{99} \)
34. -0.43 \[ \square \] -\( \frac{7}{16} \)
Find each sum or difference.

1. \( \frac{2}{3} + \frac{1}{6} \)  
2. \( \frac{5}{8} - \frac{1}{4} \)  
3. \( 2 - \frac{5}{7} \)  
4. \( 1\frac{1}{2} - 2\frac{3}{4} \)  
5. \( \frac{1}{4} - \frac{1}{3} \)  
6. \( 5\frac{7}{8} + 3\frac{5}{12} \)  
7. \( \frac{2}{5} + \frac{3}{5} \)  
8. \( \frac{24}{5} + \left(-\frac{4}{6}\right) \)  
9. \( \frac{7}{12} - \frac{3}{12} \)  
10. \( \frac{31}{5} + 2\frac{3}{5} \)  
11. \( 1\frac{5}{8} - 1\frac{1}{8} \)  
12. \( \frac{3}{5y} + \frac{1}{5y} \)  
13. \( \frac{9}{10} + \frac{3}{4} \)  
14. \( 2\frac{7}{10} - 3\frac{7}{20} \)  
15. \( 3\frac{5}{6} + 2\frac{3}{4} \)  
16. \( -1\frac{2}{3} + \left(-2\frac{1}{4}\right) \)

Find each sum using mental math.

17. \( \frac{3}{8} + \frac{1}{4} + \frac{1}{6} \)  
18. \( 6\frac{7}{12} + 4\frac{5}{12} \)  
19. \( 8\frac{3}{16} + 2\frac{5}{16} + 4\frac{7}{16} \)  
20. \( 7\frac{9}{16} + 3\frac{3}{16} \)  

Estimate each sum or difference.

21. \( 13\frac{4}{5} - 2\frac{9}{10} \)  
22. \( 18\frac{3}{8} + 11\frac{6}{7} \)  
23. \( 23\frac{6}{13} + 32\frac{7}{8} \)  
24. \( 26\frac{9}{10} + 72\frac{5}{6} \)  

Use prime factors to simplify each expression.

25. \( \frac{7}{30} - \frac{29}{75} \)  
26. \( \frac{3}{14} + \frac{17}{63} \)  
27. \( \frac{5}{42} + \frac{5}{12} \)  
28. \( 2\frac{5}{6} - 2\frac{5}{22} \)  
29. \( 4\frac{4}{15} + 2\frac{4}{39} \)  
30. \( 3\frac{5}{9} - 2\frac{11}{12} \)
Find each quotient.

1. \( \frac{1}{2} \div \frac{5}{8} \) ____________________
2. \( \frac{-5}{24} \div \frac{7}{12} \) ____________________
3. \( \frac{3}{8} \div \frac{6}{7} \) ____________________
4. \( \frac{15}{19} \div \frac{15}{19} \) ____________________
5. \( 8 \div \frac{4}{5} \) ____________________
6. \( 6\frac{1}{4} \div 2\frac{1}{2} \) ____________________
7. \( 5\frac{5}{8} \div 1\frac{1}{4} \) ____________________
8. \( 2\frac{1}{3} \div \frac{7}{10} \) ____________________
9. \( \frac{6}{35} \div \frac{3}{7} \) ____________________
10. \( 1\frac{3}{7} \div \left(-2\frac{1}{7}\right) \) ____________________

Find each product.

11. \( \frac{2}{3} \cdot \frac{3}{7} \) ____________________
12. \( \frac{5}{6} \cdot \frac{3}{5} \) ____________________
13. \( \frac{7}{9} \cdot \frac{6}{13} \) ____________________
14. \( \frac{5}{6} \cdot \left(-1\frac{3}{10}\right) \) ____________________
15. \( -4\frac{2}{5} (-5\frac{1}{5}) \) ____________________
16. \( 2\frac{5}{6} (-\frac{2}{5}) \) ____________________
17. \( 4\frac{7}{8} \cdot 6 \) ____________________
18. \( \frac{5}{7} \cdot \frac{3}{10} \) ____________________
19. \( \frac{9a}{10} \cdot \frac{5}{12a} \) ____________________
20. \( \frac{9t}{16} \cdot \frac{12}{17} \) ____________________

21. You are making cookies for a bake sale. The recipe calls for \( 2\frac{3}{4} \) cups of flour. How much flour will you need if you triple the recipe?

22. It took you 1 hour to read \( 1\frac{3}{8} \) chapters of a novel. At this rate, how many chapters can you read in three hours?

23. A teacher wants to tape sheets of paper together to make a science banner. He wants the banner to be \( 127\frac{1}{2} \) inches long, and each sheet of paper is \( 8\frac{1}{2} \) inches wide. How many sheets of paper will he need?
### Practice 5-5 Using Customary Units of Measurement

Use estimation, mental math, or paper and pencil to convert from one unit to the other.

1. $2 \text{ gal } 2 \text{ qt} = \underline{\phantom{0}} \text{ qt}$
2. $3 \text{ yd} = \underline{\phantom{0}} \text{ ft}$
3. $1 \text{ ft } 8 \text{ in.} = \underline{\phantom{0}} \text{ in.}$
4. $\frac{3}{5} \text{ t} = \underline{\phantom{0}} \text{ lb}$
5. $30 \text{ in.} = \underline{\phantom{0}} \text{ ft}$
6. $20 \text{ fl oz} = \underline{\phantom{0}} \text{ c}$
7. $20 \text{ oz} = \underline{\phantom{0}} \text{ lb}$
8. $\frac{11}{2} \text{ pt} = \underline{\phantom{0}} \text{ c}$
9. $1\frac{1}{8} \text{ lb} = \underline{\phantom{0}} \text{ oz}$
10. $7920 \text{ ft} = \underline{\phantom{0}} \text{ mi}$

Is each measurement reasonable? If not, give a reasonable measurement.

11. A glass of milk holds about 8 pt.
   
   

12. A newborn baby weighs about $7\frac{1}{2} \text{ oz}$.
   
   

13. A phonebook is $\frac{3}{4} \text{ ft}$ wide.
   
   

Choose an appropriate unit of measure. Explain your choice.

14. weight of a whale
   
   

15. sugar in a cookie recipe
   
   

16. length of a mouse
   

Should each item be measured by length, weight, or capacity?

17. amount of soup in a can
   

18. height of a can
   

19. heaviness of a can
   

20. diameter of a can
   

Work backward to solve each problem.

1. Manuel’s term paper is due on March 31. He began doing research on March 1. He intends to continue doing research for 3 times as long as he has done already. Then he will spend a week writing the paper and the remaining 3 days typing. What day is it? (Assume he will finish typing on March 30.)

2. A disc jockey must allow time for 24 minutes of commercials every hour, along with 4 minutes for news, 3 minutes for weather, and 2 minutes for public-service announcements. If each record lasts an average of 3 minutes, how many records per hour can the DJ play?

3. Margaret is reading the 713-page novel War and Peace. When she has read twice as many pages as she has read already, she will be 119 pages from the end. What page is she on now?

4. On Monday the low temperature at the South Pole dropped 9°F from Sunday’s low. On Tuesday it fell another 7°F, then rose 13°F on Wednesday and 17°F more on Thursday. Friday it dropped 8°F to −50°F. What was Sunday’s low temperature?

5. Each problem lists the operations performed on \( n \) to produce the given result. Find \( n \).
   a. Multiply by 3, add 4, divide by 5, subtract 6; result, −1.
      \[ n = \underline{\phantom{00000}} \]
   b. Add 2, divide by 3, subtract 4, multiply by 5; result, 35.
      \[ n = \underline{\phantom{00000}} \]
   c. Multiply by 2, add 7, divide by 17; result, 1.
      \[ n = \underline{\phantom{00000}} \]
   d. Divide by 3, add 9, multiply by 2, subtract 12; result, 4.
      \[ n = \underline{\phantom{00000}} \]
   e. Subtract 2, divide by 5, add 7, multiply by 3; result, 30.
      \[ n = \underline{\phantom{00000}} \]
Practice 5-7 Solving Equations by Adding or Subtracting Fractions

Solve each equation.

1. \( m - \left( -\frac{7}{10} \right) = -1\frac{1}{5} \) __________
2. \( k - \frac{3}{4} = \frac{2}{3} \) __________
3. \( x - \frac{5}{6} = \frac{1}{10} \) __________
4. \( t - \left( -\frac{3}{6} \right) = 7\frac{2}{3} \) __________
5. \( x + \frac{5}{8} = \frac{7}{8} \) __________
6. \( k + \frac{4}{3} = 1\frac{3}{3} \) __________
7. \( 4 = \frac{4}{9} + y \) __________
8. \( h + \left( -\frac{5}{8} \right) = -\frac{5}{12} \) __________
9. \( n + \frac{2}{3} = \frac{1}{9} \) __________
10. \( e - \frac{11}{10} = -\frac{7}{8} \) __________
11. \( w - 14\frac{1}{12} = -2\frac{3}{4} \) __________
12. \( v + \left( -\frac{5}{6} \right) = 2\frac{1}{3} \) __________
13. \( a - \frac{9}{6} = -3\frac{19}{24} \) __________
14. \( f + \left| -3\frac{11}{12} \right| = 18 \) __________
15. \( z + \left( -3\frac{2}{5} \right) = -4\frac{1}{10} \) __________
16. \( x - \frac{7}{15} = \frac{7}{60} \) __________
17. \( h - \left( -6\frac{1}{2} \right) = 14\frac{1}{4} \) __________
18. \( p - 5\frac{3}{8} = -\frac{11}{24} \) __________

Solve each equation using mental math.

19. \( x + \frac{3}{7} = \frac{5}{7} \) __________
20. \( k - \frac{8}{9} = -\frac{1}{9} \) __________
21. \( a + \frac{1}{9} = \frac{3}{9} \) __________
22. \( g - \frac{4}{5} = -\frac{2}{5} \) __________

Write an equation to solve each problem.

23. Pete’s papaya tree grew \( 3\frac{7}{12} \) ft during the year. If its height at the end of the year was \( 21\frac{1}{6} \) ft, what was its height at the beginning of the year?

24. Lee is \( 1\frac{3}{4} \) ft taller than Jay. If Lee is \( 6\frac{1}{4} \) ft tall, how tall is Jay?
Solve each equation.

1. \( \frac{3}{4}x = \frac{9}{16} \)  
2. \( -\frac{1}{3}p = \frac{1}{4} \)
3. \( \frac{-3}{8}k = \frac{1}{2} \)  
4. \( \frac{1}{8}h = \frac{1}{10} \)
5. \( 2\frac{2}{3}e = \frac{1}{18} \)  
6. \( -1\frac{2}{3}m = 6 \)
7. \( -\frac{1}{4}p = \frac{1}{18} \)  
8. \( \frac{11}{12}w = -1 \)
9. \( -3\frac{4}{5}x = 0 \)  
10. \( \frac{2}{5}m = 2\frac{2}{5} \)
11. \( 5c = \frac{2}{5} \)  
12. \( -8k = \frac{4}{5} \)
13. \( \frac{4}{7}y = 4 \)  
14. \( 2\frac{1}{4}f = \frac{6}{5} \)
15. \( \frac{10}{11}n = \frac{2}{11} \)  
16. \( \frac{7}{8}c = \frac{7}{6} \)

Solve each equation using mental math.

17. \( 7d = 42 \)  
18. \( \frac{1}{3}y = 5 \)
19. \( -3h = \frac{3}{8} \)  
20. \( \frac{1}{2}k = -\frac{1}{3} \)

Write an equation to solve each problem.

21. It takes Nancy 1\( \frac{2}{3} \) min to read 1 page in her social studies book. It took her 22\( \frac{1}{2} \) min to complete her reading assignment. How long was the assignment? Let \( m \) represent the number of pages she read.

22. It takes Gary three hours to drive to Boston. If the trip is 156 miles, what is Gary’s average number of miles per hour? Let \( x \) represent the miles per hour.
Practice 5-9 Powers of Products and Quotients

Simplify each expression.

1. \( \left( \frac{5}{x} \right)^2 \) 
2. \( \left( -\frac{4}{y} \right)^2 \) 
3. \( \left( \frac{x^2}{y} \right)^3 \) 
4. \( (2x)^3 \) 
5. \( (-3y^2)^2 \) 
6. \( (5ab^2)^3 \) 
7. \( (12mn)^2 \) 
8. \( (-10xy^3)^3 \) 
9. \( (9qrs^4)^3 \) 
10. \( \left( \frac{2x^3}{y^2} \right)^2 \) 
11. \( -(a^2b^2)^3 \) 
12. \( (2a^3b^2)^4 \) 
13. \( \left( \frac{2y}{x} \right)^2 \) 
14. \( \left( \frac{3x}{8y} \right)^2 \) 
15. \( \left( \frac{3y^2}{x} \right)^3 \) 
16. \( \left( \frac{2x^2y^5}{xy^3} \right)^5 \) 

Evaluate for \( a = 2 \), \( b = -1 \), and \( c = \frac{1}{3} \).

17. \( (a^2)^3 \) 
18. \( 2b^3 \) 
19. \( (-9c^2)^3 \) 
20. \( (a^2b)^2 \) 
21. \( (ac)^2 \) 
22. \( (b^3)^7 \) 

Complete each equation.

23. \( (3b) \quad \) \(^2 = 9b^{10} \)
24. \( (m^2n) \quad \) \(^2 = m^8n^4 \)
25. \( (xy) \quad \) \(^2 = x^2y^6 \)
26. \( \left( \frac{3s^2t}{r} \right) \quad \) \(^2 = \frac{9s^4t^2}{r^2} \)

27. Write an expression for the area of a square with a side of length \( 4a^2 \). Simplify your expression.

28. Write an expression for the volume of a cube with a side of length \( 3z^5 \). Simplify your expression.
**Practice 6-1  Ratios and Unit Rates**

Find each unit rate.
1. 78 mi on 3 gal
2. $52.50 in 7 h
3. 416 mi in 8 h
4. 9 bull’s eyes in 117 throws

Write each ratio as a fraction in simplest form.
5. 7th-grade boys to 8th-grade boys
6. 7th-grade girls to 7th-grade boys
7. 7th graders to 8th graders
8. boys to girls
9. girls to all students

Write three different ratios for each model.
10. □□□ □□□ □□□□□
11. ●●●●
12. ☐☐☐☐☐☐☐☐

Write each ratio as a fraction in simplest form.
13. 7 : 12
14. 3 is to 6
15. 10 : 45
16. 32 out of 40
17. 36 is to 60
18. 13 out of 14
19. 9 out of 21
20. 45 : 63
21. 24 is to 18
22. 15 out of 60
Practice 6-2 Proportions

Write a proportion for each phrase. Then solve. When necessary, round to the nearest hundredth.

1. 420 ft^2 painted in 36 min; \( f \) ft^2 painted in 30 min

2. 75 points scored in 6 games; \( p \) points scored in 4 games

3. 6 apples for $1.00; 15 apples for \( d \) dollars

Tell whether each pair of ratios forms a proportion.

4. \( \frac{3}{4} \) and \( \frac{9}{12} \) \( \stackrel{?}{=} \) \( \frac{25}{40} \) and \( \frac{5}{8} \) \( \stackrel{?}{=} \)

5. \( \frac{8}{12} \) and \( \frac{14}{21} \) \( \stackrel{?}{=} \) \( \frac{13}{15} \) and \( \frac{4}{5} \) \( \stackrel{?}{=} \)

6. \( \frac{4}{5} \) and \( \frac{5}{6} \) \( \stackrel{?}{=} \) \( \frac{49}{21} \) and \( \frac{28}{12} \) \( \stackrel{?}{=} \)

Solve each proportion. Where necessary, round to the nearest tenth.

10. \( \frac{3}{5} = \frac{15}{x} \) \( \stackrel{?}{=} \) \( \frac{15}{30} = \frac{r}{34} \) \( \stackrel{?}{=} \)

11. \( \frac{h}{36} = \frac{21}{27} \) \( \stackrel{?}{=} \) \( \frac{11}{6} = \frac{f}{60} \) \( \stackrel{?}{=} \)

12. \( \frac{26}{15} = \frac{130}{m} \) \( \stackrel{?}{=} \) \( \frac{36}{7} = \frac{7}{20} \) \( \stackrel{?}{=} \)

13. \( \frac{r}{23} = \frac{17}{34} \) \( \stackrel{?}{=} \) \( \frac{77}{93} = \frac{x}{24} \) \( \stackrel{?}{=} \)

18. At Discount Copy, 12 copies cost $0.66. Melissa needs 56 copies. How much should they cost?

19. You estimate that you can do 12 math problems in 45 min. How long should it take you to do 20 math problems?
Practice 6-3 Similar Figures and Scale Drawings

The scale of a map is \( \frac{1}{2} \) in. : 8 mi. Find the actual distance for each map distance.

1. 2 in. 2. 5 in. 3. \( 3\frac{1}{2} \) in.

4. 10 in. 5. 8 in. 6. \( 7\frac{1}{4} \) in.

Each pair of figures is similar. Find the missing length. Round to the nearest tenth where necessary.

7. \[ \frac{20}{8} = \frac{x}{32} \]
   \[ x = \underline{______} \]

8. \[ \frac{30}{12} = \frac{p}{17} \]
   \[ p = \underline{______} \]

9. \[ \frac{28}{63} = \frac{n}{81} \]
   \[ n = \underline{______} \]

10. \[ \frac{8}{21} = \frac{e}{16} \]
    \[ e \approx \underline{______} \]
    \[ f = \underline{______} \]

11. A meter stick casts a shadow 1.4 m long at the same time a flagpole casts a shadow 7.7 m long. The triangle formed by the meterstick and its shadow is similar to the triangle formed by the flagpole and its shadow. How tall is the flagpole?

   \[ \underline{______} \]

A scale drawing has a scale of \( \frac{1}{4} \) in. : 6 ft. Find the length on the drawing for each actual length.

12. 18 ft 13. 66 ft 14. 204 ft

   \[ \underline{______} \]

   \[ \underline{______} \]

   \[ \underline{______} \]
Practice 6-4 Probability

Find each probability for choosing a letter at random from the word PROBABILITY.

1. \( P(B) \) 
2. \( P(P) \) 
3. \( P(A \text{ or } I) \) 
4. \( P(\text{not } P) \) 

A child is chosen at random from the Erb and Smith families. Find the odds in favor of each of the following being chosen.

5. a girl 
6. an Erb 
7. an Erb girl 
8. a Smith girl 
9. not a Smith boy 
10. a Smith 

A box contains 7 red, 14 yellow, 21 green, 42 blue, and 84 purple marbles. A marble is drawn at random from the box. Find each probability.

11. \( P(\text{red}) \) 
12. \( P(\text{yellow}) \) 
13. \( P(\text{green or blue}) \) 
14. \( P(\text{purple, yellow, or red}) \) 
15. \( P(\text{not green}) \) 
16. \( P(\text{not purple, yellow, or red}) \) 

Find the odds in favor of each selection when a marble is chosen at random from the box described above.

17. blue 
18. purple 
19. not red 
20. not green or blue 
21. yellow 
22. not purple or yellow
Write each decimal or fraction as a percent. Round to the nearest tenth of a percent where necessary.

1. 0.16
2. 0.72
3. \( \frac{24}{25} \)
4. \( \frac{31}{40} \)
5. \( \frac{111}{200} \)
6. \( \frac{403}{1,000} \)
7. 3.04
8. 5.009
9. 0.0004
10. \( \frac{40}{13} \)
11. \( \frac{4}{7} \)
12. \( \frac{57}{99} \)

Write each percent as a decimal.

13. 8%
14. 12.4%
15. 145%
16. 0.07%
17. \( 7\frac{1}{2}\% \)
18. \( 15\frac{1}{4}\% \)

Write each percent as a fraction or mixed number in simplest form.

19. 60%
20. 5%
21. 35%
22. 32%
23. 140%
24. 0.8%

Use >, <, or = to complete each statement.

25. 0.7 \( \boxed{<} \) 7%
26. 80% \( \boxed{=} \) \( \frac{4}{5} \)
27. \( \frac{1}{3} \) \( \boxed{<} \) 33%

28. In the United States in 1990, about one person in twenty was 75 years old or older. Write this fraction as a percent.
Write a proportion. Then solve. Where necessary, round to the nearest tenth or tenth of a percent.

1. \(62\frac{1}{2}\% \) of \(t\) is 35. What is \(t\)? 

2. 38\% of \(n\) is 33.44. What is \(n\)?

3. 120\% of \(y\) is 42. What is \(y\)?

4. 300\% of \(m\) is 600. What is \(m\)?

5. 1.5\% of \(h\) is 12. What is \(h\)?

6. What percent of 40 is 12?

7. What percent of 48 is 18?

8. What percent is 54 of 60?

9. What percent is 39 of 50?

10. Find 80\% of 25.

11. Find 150\% of 74.

12. Find 44\% of 375.


14. The Eagles won 70\% of the 40 games that they played. How many games did they win?

15. Thirty-five of 40 students surveyed said that they favored recycling. What percent of those surveyed favored recycling?

16. Candidate Carson received 2,310 votes, 55\% of the total. How many total votes were cast?
**Practice 6-7 Percents and Equations**

Write and solve an equation. Where necessary, round to the nearest tenth or tenth of a percent.

1. What percent of 25 is 17? 
2. What percent is 10 of 8? 
3. What percent is 63 of 84? 
4. What percent is 3 of 600? 
5. Find 45% of 60. 
6. Find 325% of 52. 
7. Find 66\(\frac{2}{3}\)% of 87. 
8. Find 1% of 3,620. 
9. 62\(\frac{1}{2}\)% of \(x\) is 5. What is \(x\)?
10. 300% of \(k\) is 42. What is \(k\)?
11. 33\(\frac{1}{3}\)% of \(p\) is 19. What is \(p\)?
12. 70% of \(c\) is 49. What is \(c\)?
13. 15% of \(n\) is 1,050. What is \(n\)?
14. 38% of \(y\) is 494. What is \(y\)?
15. A camera regularly priced at $295 was placed on sale at $236. What percent of the regular price was the sale price?
16. Nine hundred thirty-six students, 65% of the entire student body, attended the football game. Find the size of the student body.
Find each percent of change. Round to the nearest tenth of a percent. Tell whether the change is an increase or a decrease.

1. 24 to 21
2. 64 to 80
3. 100 to 113
4. 50 to 41
5. 63 to 105
6. 42 to 168
7. 80 to 24
8. 200 to 158
9. 56 to 71
10. 127 to 84
11. 20 to 24
12. 44 to 22
13. 16 to 12
14. 10 to 100
15. 20 to 40
16. 10 to 50
17. 12 to 16
18. 80 to 100
19. 69 to 117
20. 19 to 9
21. 95 to 145
22. 88 to 26

23. Mark weighed 110 pounds last year. He weighs 119 pounds this year. What is the percent of increase in his weight, to the nearest tenth of a percent?

24. Susan had $140 in her savings account last month. She added $20 this month and earned $.50 interest. What is the percent of increase in the amount in her savings account to the nearest tenth of a percent?

25. The population density of California was 151.4 people per square mile in 1980. By 1990 it had increased to 190.8 people per square mile. Find the percent increase to the nearest percent.
Practice 6-9  Markup and Discount

Find each sale price. Round to the nearest cent where necessary.

<table>
<thead>
<tr>
<th>Regular price</th>
<th>Percent of discount</th>
<th>Sale price</th>
</tr>
</thead>
<tbody>
<tr>
<td>$46</td>
<td>25%</td>
<td></td>
</tr>
<tr>
<td>$35.45</td>
<td>15%</td>
<td></td>
</tr>
<tr>
<td>$174</td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>$1.40</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>$87</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>$675</td>
<td>20%</td>
<td></td>
</tr>
</tbody>
</table>

Find each selling price. Round to the nearest cent where necessary.

<table>
<thead>
<tr>
<th>Cost</th>
<th>Percent markup</th>
<th>Selling price</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5.50</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>$25</td>
<td>50%</td>
<td></td>
</tr>
<tr>
<td>$170</td>
<td>85%</td>
<td></td>
</tr>
<tr>
<td>$159.99</td>
<td>70%</td>
<td></td>
</tr>
<tr>
<td>$12.65</td>
<td>90%</td>
<td></td>
</tr>
<tr>
<td>$739</td>
<td>20%</td>
<td></td>
</tr>
</tbody>
</table>

13. A company buys a sweater for $14 and marks it up 90%. It later discounts the sweater 25%.
   a. Find the original selling price of the sweater.
   ________________________________

   b. How much was the discount?
   ________________________________

   c. Find the sale price after the discount.
   ________________________________

   d. The company’s profit on the sweater can be found by subtracting the final selling price minus the cost. What was the company’s profit on the sweater?
   ________________________________

   e. The profit was what percent of the cost?
   ________________________________
Make a table to solve each problem.

1. A car was worth $12,500 in 1998. It’s value depreciates, or decreases, 15% per year. Find its value in 2002.

<table>
<thead>
<tr>
<th>Year</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car’s value</td>
<td>$12,500</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Marcus spent $105 on 6 items at a sale. Videotapes were on sale for $15 each and music CD’s were on sale for $20 each. How many of each item did Marcus buy?

<table>
<thead>
<tr>
<th>Number of videotapes</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of CD’s</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Total cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Karina likes to mix either apple, orange, or grape juice with either lemon lime soft drink or sparkling water to make a fizz. How many different fizzes can she make?

4. How many ways can you have 25 cents in change?

5. The deer population of a state park has increased 8% a year for the last 4 years. If there are 308 deer in the park this year, find how large the population was 4 years ago by completing the table.

<table>
<thead>
<tr>
<th>Year</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deer population</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>308</td>
</tr>
</tbody>
</table>

6. How many different sandwiches can you make from 3 types of bread, 2 types of cheese, and 2 types of meat? Assume that only one type of each item is used per sandwich.

7. A bus leaves a station at 8:00 A.M. and averages 30 mi/h. Another bus leaves the same station following the same route two hours after the first and averages 50 mi/h. When will the second bus catch up with the first bus?
**Practice 7-1 Solving Two-step Equations**

Solve each equation.

1. \(4x - 17 = 31\)  
2. \(15 = 2m + 3\)

3. \(\frac{k}{3} + 3 = 8\)  
4. \(7 = 3 + \frac{h}{6}\)

5. \(9n + 18 = 81\)  
6. \(5 = \frac{y}{3} - 9\)

7. \(14 = 5k - 31\)  
8. \(\frac{f}{9} - 7 = -5\)

9. \(\frac{v}{8} - 9 = -13\)  
10. \(25 - 13f = -14\)

Solve each equation using mental math.

11. \(3p + 5 = 14\)  
12. \(\frac{k}{2} - 5 = 1\)

13. \(\frac{m}{7} - 3 = 0\)  
14. \(10v - 6 = 24\)

15. \(8 + \frac{x}{2} = -7\)  
16. \(7 = 6r - 17\)

Choose the correct equation. Solve.

17. Tehira has read 110 pages of a 290-page book. She reads 20 pages each day. How many days will it take to finish?  
   - **A.** \(20 + 110p = 290\)  
   - **B.** \(20p + 290 = 110\)  
   - **C.** \(110 + 20p = 290\)  
   - **D.** \(290 = 110 - 20p\)

Write an equation to describe the situation. Solve.

18. A waitress earned $73 for 6 hours of work. The total included $46 in tips. What was her hourly wage?

19. You used \(6\frac{3}{4}\) c of sugar while baking muffins and nutbread for a class party. You used a total of \(1\frac{1}{2}\) c of sugar for the muffins. Your nutbread recipe calls for \(1\frac{3}{4}\) c of sugar per loaf. How many loaves of nutbread did you make?
Practice 7-2  Solving Multi-step Equations

Solve and check each equation.

1. \( \frac{p}{3} - 7 = -2 \)

2. \( 2(n - 7) + 3 = 9 \)

3. \( 0 = 5(k + 9) \)

4. \( 4h + 7h - 16 = 6 \)

5. \( 3(2n - 7) = 9 \)

6. \( -27 = 8x - 5x \)

7. \( 4p + 5 - 7p = -1 \)

8. \( 7 - y + 5y = 9 \)

9. \( 8e + 3(5 - e) = 10 \)

10. \( -37 = 3x + 11 - 7x \)

11. \( 9 - 3(n - 5) = 30 \)

12. \( \frac{1}{6}(y + 42) - 15 = -3 \)

Write and solve an equation for each situation.

13. Find three consecutive integers whose sum is 51.

14. Find three consecutive integers whose sum is -15.

15. Find four consecutive integers whose sum is 30.

16. Jack’s overtime wage is $3 per hour more than his regular hourly wage. He worked for 5 hours at his regular wage and 4 hours at the overtime wage. He earned $66. Find his regular wage.
Solve and check each equation.

1. \(0.7n - 1.5 + 7.3n = 14.5\)

2. \(18p - 45 = 0\)

3. \(16.3k + 19.2 + 7.5k = -64.1\)

4. \(h + 3h + 4h = 100\)

5. \(40 - 5n = -2\)

6. \(14 = \frac{2}{3}(9y - 15)\)

7. \(\frac{2}{3}y - 6 = 2\)

8. \(1.2m + 7.5m + 2.1 = 63\)

9. \(\frac{7}{8}h - \frac{5}{8} = 2\)

10. \(93.96 = 4.7p + 8.7p - 2.6p\)

11. \(9w - 16.3 = 5.3\)

12. \(88.1 - 2.3f = 72.46\)

13. \(-15.3 = -7.5k + 55.2\)

14. \(26e + 891 = -71\)

15. \(2.3(x + 1.4) = -9.66\)

16. \((x - 17.7) + 19.6 = 27.8\)

Write an equation to describe each situation. Solve.

17. Jolene bought three blouses at one price and 2 blouses priced $3 below the others. The total cost was $91.50. Find the prices of the blouses.

18. A car rented for $29 per day plus $.08 per mile. Julia paid $46.12 for a one-day rental. How far did she drive?

By what number would you multiply each equation to clear denominators or decimals? Do not solve.

19. \(\frac{1}{3}x + \frac{1}{6} = \frac{51}{6}\)

20. \(3.7 + 2.75k = 27.35\)
Write an equation. Then solve.

1. Bill purchased 4 pens for $3.32, including $.16 sales tax. Find the cost of 1 pen.

2. Arnold had $1.70 in dimes and quarters. He had 3 more dimes than quarters. How many of each coin did he have?

3. A baby weighed 3.2 kg at birth. She gained 0.17 kg per week. How old was she when she weighed 5.75 kg?

4. In the parking lot at a truck stop there were 6 more cars than 18-wheel trucks. There were 134 wheels in the parking lot. How many cars and trucks were there?

5. The product of 6 and 3 more than $k$ is 48.

6. A bottle and a cap together cost $1.10. The bottle costs $1 more than the cap. How much does each cost?

7. The perimeter of a rectangular garden is 40 ft. The width is 2 ft more than one half the length. Find the length and width.
Practice 7-5  Solving Equations with Variables on Both Sides

Solve each equation.

1. \[ 3k + 16 = 5k \]
2. \[ 5e = 3e + 36 \]
3. \[ n + 4n - 22 = 7n \]
4. \[ 2(x - 7) = 3x \]
5. \[ 8h - 10h = 3h + 25 \]
6. \[ 7n + 6n - 5 = 4n + 4 \]
7. \[ 11(p - 3) = 5(p + 3) \]
8. \[ 9(m + 2) = -6(m + 7) \]
9. \[ y + 2(y - 5) = 2y + 2 \]
10. \[ -9x + 7 = 3x + 19 \]
11. \[ k + 9 = 6(k - 11) \]
12. \[ -6(4 - t) = 12t \]
13. \[ 2(x + 7) = 5(x - 7) \]
14. \[ 5m + 9 = 3(m - 5) + 7 \]
15. \[ 5x + 7 = 6x \]
16. \[ k + 12 = 3k \]
17. \[ 8m = 5m + 12 \]
18. \[ 3p - 9 = 4p \]

Write an equation for each situation. Solve.

19. The difference when 7 less than a number is subtracted from twice the number is 12. What is the number?

20. Four less than three times a number is three more than two times the number. What is the number?
Practice 7-6 Solving Two-step Inequalities

Solve each inequality. Graph the solutions on a number line.

1. $5x + 2 \leq 17$  
   
   2. $7x + 2x \geq 21 - 3$  
   
   3. $9 - x > 10$  
   
   4. $19 + 8 \leq 6 + 7x$  
   
   5. $-6x < 12$  
   
   6. $\frac{x}{4} > 0$  

Solve each inequality.

7. $2x - 5 > 1$  
   
   8. $9x - 7 \leq 38$  
   
   9. $3 < \frac{1}{2}x + 1$  
   
   10. $-12 < -12x$  
   
   11. $-8x + 18 > -22$  
   
   12. $50 < 8 - 6x$  
   
   13. $\frac{1}{3}x + 6 > -3$  
   
   14. $30 \geq -6(5 - x)$  

Write an inequality for each situation. Then solve the inequality.

15. Nine more than half the number $n$ is no more than $-8$. Find $n$.  

16. Judith drove $h$ hours at a rate of 55 mi/hr. She did not reach her goal of driving 385 miles for the day. How long did she drive?
Use this information to answer 1-4: Shopping City has a 6% sales tax.

1. Solve the formula \( c = 1.06p \) for \( p \), where \( c \) is the cost of an item at Shopping City, including tax, and \( p \) is the selling price.

2. Clara spent $37.10 on a pair of pants at Shopping City. What was the selling price of the pants?

3. Manuel spent $10.59 on a basketball at Shopping City. What was the selling price of the ball?

4. Clara and Manuel's parents spent $165.84 on groceries at Shopping City. How much of that amount was sales tax?

Transform the formulas.

5. The area of a triangle \( A \) can be found with the formula \( A = \frac{1}{2}bh \) where \( b \) is the length of the base of the triangle and \( h \) is the height of the triangle. Solve the formula for \( h \).

6. Solve the formula \( A = \frac{1}{2}bh \) for \( b \).

Find the missing part of each triangle.

7. \( A = 27 \text{ cm}^2 \)

8. \( A = 18 \text{ ft}^2 \)

Solve for the variable indicated.

9. \( V = \frac{1}{2}lwh \), for \( w \)

10. \( \frac{1}{a} + \frac{1}{b} = \frac{1}{c} \), for \( c \)
Find each balance.

<table>
<thead>
<tr>
<th>Principal</th>
<th>Interest rate</th>
<th>Compounded</th>
<th>Time (years)</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>$400</td>
<td>7%</td>
<td>annually</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>$8,000</td>
<td>5%</td>
<td>annually</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>$1,200</td>
<td>4%</td>
<td>semi-annually</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>$50,000</td>
<td>6%</td>
<td>semi-annually</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Find the simple interest.

5. $900 deposited at an interest rate of 3% for 5 years

6. $1,348 deposited at an interest rate of 2.5% for 18 months

Complete each table. Compound the interest annually.

7. $5,000 at 6% for 4 years.

<table>
<thead>
<tr>
<th>Principal at beginning of year</th>
<th>Interest</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1: $5,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 2:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. $7,200 at 3% for 4 years

<table>
<thead>
<tr>
<th>Principal at beginning of year</th>
<th>Interest</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1: $7,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 2:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 4:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Practice 8-1 Relations and Functions

Graph each relation. Is the relation a function? Explain.

1. 

\[
\begin{array}{c|c}
 x & y \\
-1 & 4 \\
2 & 3 \\
4 & -1 \\
-1 & -2 \\
\end{array}
\]

Domain: ___________________________ Range: ___________________________

For each relation, list the members of the domain. List the members of the range. Is the relation a function? Explain.

3. \{(7, -2), (8, -2), (-5, 7), (-9, 1)\}

Domain: ___________________________ Range: ___________________________

Function? ___________________________

4. \{(-8, 0), (10, 6), (10, -2), (-5, 7)\}

Domain: ___________________________ Range: ___________________________

Function? ___________________________

5. \{(9.2, 4.7), (-3.6, 4.8), (5.2, 4.7)\}

Domain: ___________________________ Range: ___________________________

Function? ___________________________

6. Is the time it takes you to run a 100-meter race a function of the speed you run? Explain.
### Practice 8-2 Equations with Two Variables

Write each equation as a function in “y = . . .” form.

1. \(3y = 15x - 12\)
2. \(5x + 10 = 10y\)
3. \(3y - 21 = 12x\)

\[ y = \quad \quad \quad \quad y = \quad \quad \quad \quad y = \quad \quad \quad \quad \]

4. \(5y + 3 = 2y - 3x + 5\)
5. \(-2(x + 3y) = 18\)
6. \(5(x + y) = 20 + 3x\)

\[ y = \quad \quad \quad \quad y = \quad \quad \quad \quad y = \quad \quad \quad \quad \]

Graph each equation.

7. \(y = -0.5x + 4\)

\[
\begin{array}{|c|c|c|c|}
\hline
x & -4 & -2 & 0 & 2 & 4 \\
\hline
y & \quad & \quad & \quad & \quad & \quad \\
\hline
\end{array}
\]

8. \(y = 4\)

\[
\begin{array}{|c|c|c|c|}
\hline
x & -4 & -2 & 0 & 2 & 4 \\
\hline
y & \quad & \quad & \quad & \quad & \quad \\
\hline
\end{array}
\]

9. \(2x - 3y = 6\)

\[
\begin{array}{|c|c|c|c|}
\hline
x & -4 & -2 & 0 & 2 & 4 \\
\hline
y & \quad & \quad & \quad & \quad & \quad \\
\hline
\end{array}
\]

10. \(-10x = 5y\)

\[
\begin{array}{|c|c|c|c|}
\hline
x & -4 & -2 & 0 & 2 & 4 \\
\hline
y & \quad & \quad & \quad & \quad & \quad \\
\hline
\end{array}
\]

Is each ordered pair a solution of \(3x - 2y = 12\)? Write yes or no.

11. \((0, 4)\) \quad 12. \((6, 3)\) \quad 13. \((4, 0)\)

Is each ordered pair a solution of \(-2x + 5y = 10\)? Write yes or no.

14. \((-3, 2)\) \quad 15. \((-10, -2)\) \quad 16. \((5, 4)\)
Find the slope of the line through each pair of points.

1. A(1, 1), B(6, 3)

2. J(−4, 6), K(−4, 2)

3. P(3, −7), Q(−1, −7)

4. M(7, 2), N(−1, 3)

Complete.

<table>
<thead>
<tr>
<th>Equation</th>
<th>Equation in slope-intercept form</th>
<th>Slope</th>
<th>y-Intercept</th>
</tr>
</thead>
<tbody>
<tr>
<td>5. 5x − y = 6</td>
<td>_________</td>
<td>______</td>
<td>______</td>
</tr>
<tr>
<td>6. 7x + 2y = 10</td>
<td>_________</td>
<td>______</td>
<td>______</td>
</tr>
</tbody>
</table>

Find the slope of each line.

7. _________

8. _________

Graph each equation.

9. y = −2x + 3

10. y = \( \frac{1}{3}x - 1 \)
Write a rule for each function.

1. ____________

2. ____________

3. 

\[
\begin{array}{|c|c|}
\hline
x & f(x) \\
\hline
-3 & 18 \\
-1 & 6 \\
1 & -6 \\
3 & -18 \\
\hline
\end{array}
\]

4. 

\[
\begin{array}{|c|c|}
\hline
x & f(x) \\
\hline
5 & -2 \\
7 & 0 \\
9 & 2 \\
11 & 4 \\
\hline
\end{array}
\]

5. ____________

6. ____________

\[
\begin{array}{|c|c|}
\hline
x & f(x) \\
\hline
-3 & -17 \\
-1 & -11 \\
1 & -5 \\
3 & 1 \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
x & f(x) \\
\hline
-4 & 4 \\
0 & 6 \\
2 & 7 \\
4 & 8 \\
\hline
\end{array}
\]

Write a function rule to describe each situation.

7. The number of pounds \( p(z) \) as a function of the number of ounces \( z \).

8. The selling price \( s(c) \) after a 45% markup of an item as a function of the stores’ cost \( c \).

9. The total number of miles \( m(r) \) covered when you walk 7 miles before lunch, and you walk for 2 hours at \( r \) mi/hr after lunch.
Practice 8-5 Scatter Plots

Use the data in the table.

1. Make a (year, units of CD’s) scatter plot.

2. Make a (year, units of cassettes) scatter plot.

3. Make a (year, units of LP’s) scatter plot.

Is there a positive correlation, a negative correlation, or no correlation between the data sets in each scatter plot?

4. (year, units of CD’s) scatterplot ______________________

5. (year, units of cassettes) scatterplot ______________________

6. (year, units of LP’s) scatterplot ______________________
A giraffe was 1 ft tall at birth. 7 ft tall at the age of 4, and 11\(\frac{1}{2}\) ft tall at the age of 7.

1. Use the data to make a (age, height) scatter plot.
2. Draw a trend line.
3. Write an equation for your trend line in slope-intercept form.

\[ y = \text{slope} \cdot x + \text{intercept} \]

4. Use your equation to find the following information.
   a. the giraffe’s height at the age of 5
   b. the age at which the giraffe was 16 ft tall

A hippopotamus weighed 700 lb at the age of 1 and 1,900 lb at the age of 3, and 2,500 lb at the age of 4.

5. Use the data to make a (age, weight) scatter plot.
6. Draw a trend line.
7. Write an equation for your trend line.

\[ y = \text{slope} \cdot x + \text{intercept} \]

8. Use the equation to predict the following information.
   a. the hippo’s weight at the age of 8
   b. the age at which the hippo weighed 7,900 lb

9. Can this equation be used to predict the hippo’s weight at any age? Explain.
**Practice 8-7 Solving Systems of Linear Equations**

Is each ordered pair a solution of the given system? Write yes or no.

1. \( y = 6x + 12 \)
   \( 2x - y = 4 \)
   \((-4, -12)\) ________

2. \( y = -3x \)
   \( x = 4y + \frac{1}{2} \)
   \( \left( \frac{3}{7}, \frac{2}{7} \right) \) ________

3. \( x + 2y = 2 \)
   \( 2x + 5y = 2 \)
   \( (6, -2) \) ________

Solve each system by graphing. Check your solution.

4. \( x + y = 3 \)
   \( x - y = -1 \)
   Solution:
   \[ \begin{array}{c|c|c}
   \hline
   x & y & \text{Graph} \\
   \hline
   0 & 3 & \text{Point} \\
   1 & 2 & \text{Point} \\
   -2 & -5 & \text{Point} \\
   \hline
   \end{array} \]

5. \( 2x + y = 1 \)
   \( x - 2y = 3 \)
   Solution:
   \[ \begin{array}{c|c|c}
   \hline
   x & y & \text{Graph} \\
   \hline
   0 & 1 & \text{Point} \\
   1 & -1 & \text{Point} \\
   -1 & -3 & \text{Point} \\
   \hline
   \end{array} \]

6. \( y + 2 = 0 \)
   \( 2x + y = 0 \)
   Solution:
   \[ \begin{array}{c|c|c}
   \hline
   x & y & \text{Graph} \\
   \hline
   0 & -2 & \text{Point} \\
   1 & -4 & \text{Point} \\
   -2 & 2 & \text{Point} \\
   \hline
   \end{array} \]

7. \( 3x + 2y = -6 \)
   \( x + 3y = -2 \)
   Solution:
   \[ \begin{array}{c|c|c}
   \hline
   x & y & \text{Graph} \\
   \hline
   0 & -3 & \text{Point} \\
   1 & -2 & \text{Point} \\
   -1 & 1 & \text{Point} \\
   \hline
   \end{array} \]

Write a system of linear equations. Solve by graphing.

8. The sum of two numbers is 3. Their difference is 1. Find the numbers.

   \[ \begin{array}{c|c|c}
   \hline
   x & y & \text{Graph} \\
   \hline
   0 & 1 & \text{Point} \\
   1 & 2 & \text{Point} \\
   -1 & 4 & \text{Point} \\
   \hline
   \end{array} \]
Graph each inequality.

1. \( y < x \)

2. \( x + y \leq 2 \)

3. \( x + 2y \geq 4 \)

4. \( x > -2 \)

Solve each system by graphing.

5. \( y \geq -x - 2 \)
   \( x - 2y < 4 \)

6. \( x + y < 3 \)
   \( y \geq 3x - 2 \)

7. Is the origin a solution to the system in Exercise 5? __________

8. Is \((4, 0)\) a solution to the system in Exercise 5? __________

9. Is \((1, 0)\) a solution to the system in Exercise 6? __________

10. Is \((-1, 0)\) a solution to the system in Exercise 6? __________
**Practice 9-1 Introduction to Geometry: Points, Lines, and Planes**

Use the figures at the right. Name each of the following.

1. Four segments that intersect $\overline{AB}$.

   ________________________________

2. Three segments parallel to $\overline{AB}$.

   ________________________________

3. Four segments skew to $\overline{AB}$.

   ________________________________

Use the figure at the right. Find each of the following.

4. all points shown

   ________________________________

5. all segments shown

   ________________________________

6. five different rays

   ________________________________

7. all lines shown

   ________________________________

8. all names for $\overrightarrow{NB}$

   ________________________________

Write an equation. Then find the length of each segment.

9. $\overline{AB}$� $\overline{AC}$

   equation: 

   $n = \quad$  

   $AB = \quad AC = \quad$

10. $\overline{KM}$� $\overline{KN}$

    equation: 

    $x = \quad$  

    $MN = \quad KN = \quad$
Find the measure of each angle in the figure at the right.
1. \( m \angle 1 \) \( = \) \_
2. \( m \angle 2 \) \( = \) \_
3. \( m \angle 3 \) \( = \) \_
4. \( m \angle VWR \) \( = \) \_

Use the figure at the right for Exercises 5-8.
5. Write an equation. \( \) \_
6. Find the value of \( x \). \( \) \_
7. Find \( m \angle ABD \). \( \) \_
8. Find \( m \angle DBC \). \( \) \_

Use the figure at the right for Exercises 9-12.
9. Write an equation. \( \) \_
10. Find the value of \( x \). \( \) \_
11. Find \( m \angle MNQ \). \( \) \_
12. Find \( m \angle MNR \). \( \) \_

In each figure, find the measures of \( \angle 1 \) and \( \angle 2 \).
13. Given \( p \parallel q \)

\[
m\angle 1 = \_
m\angle 2 = \\
\]

14. Given \( p \parallel q \)

\[
m\angle 1 = \_
m\angle 2 = \\
\]

15. Find a pair of complementary angles such that the difference of their measures is \( 12^\circ \).
Practice 9-3 Classifying Polygons

Name all quadrilaterals that have each of the named properties.

1. four 90° angles
   _________________________________

2. opposite sides congruent and parallel
   _________________________________

3. at least one pair of parallel sides
   _________________________________

Judging by appearances, classify each triangle by its sides and angles.

4. _______________________________

5. _______________________________

6. _______________________________

7. _______________________________

Write a formula to find the perimeter of each figure. Use the formula to find the perimeter.

8. a regular dodecagon (12-gon); one side is 9.25 cm
   \[ P = \text{___________} \] \[ P = \text{___________} \]

9. a rhombus; one side is \( \frac{3}{4} \) yd
   \[ P = \text{___________} \] \[ P = \text{___________} \]

10. a parallelogram; the sides are 10.4 m and 5.6 m
    \[ P = \text{___________} \] \[ P = \text{___________} \]
Solve by drawing a diagram.

1. How many diagonals does a quadrilateral have?

2. Which quadrilaterals always have congruent diagonals?

3. Find a formula for the number of diagonals \( d \) in a polygon with \( n \) sides. Complete the table to help you. Look for a pattern.

<table>
<thead>
<tr>
<th>Figure</th>
<th>Number of sides</th>
<th>Number of vertices</th>
<th>Number of diagonals from each vertex</th>
<th>Total number of diagonals</th>
</tr>
</thead>
<tbody>
<tr>
<td>triangle</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>quadrilateral</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pentagon</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>hexagon</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>octagon</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( n )-gon</td>
<td>( n )</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\( d = \) 

4. One day in the lunch line, Maurice was ahead of Aquia and behind Rochelle. Rochelle was ahead of Shequille and behind Whitney. Shequille was ahead of Maurice. Who was last?

5. A mail carrier leaves the post office at 10:00 A.M. and travels 4 miles south, then 7 miles east, then 5 miles south, then 10 miles west, and 9 miles north. At the end of her route, how far and in which direction is the mail carrier from the post office?
Given that $\triangle GHM \cong \triangle RSA$, complete the following.

1. $\overline{GH} \cong \underline{_______}$
2. $\overline{AS} \cong \underline{_______}$
3. $\angle S \cong \underline{_______}$
4. $\angle M \cong \underline{_______}$
5. $\overline{AR} \cong \underline{_______}$
6. $\angle R \cong \underline{_______}$
7. $m\angle A = \underline{_______}$
8. $m\angle G = \underline{_______}$

List the congruent corresponding parts of each pair of triangles. Write a congruence statement for the triangles.

9. 

$\underline{_______}$

$\underline{_______}$

$\underline{_______}$

$\underline{_______}$

$\underline{_______}$ by $\underline{_______}$

10. 

$\underline{_______}$

$\underline{_______}$

$\underline{_______}$

$\underline{_______}$

$\underline{_______}$ by $\underline{_______}$

Given that $\triangle HPKT \cong \triangle BEWL$; complete the following.

11. $\overline{PK} \cong \underline{_______}$
12. $\angle L \cong \underline{_______}$
13. $\angle KPH \cong \underline{_______}$
14. $\overline{LB} \cong \underline{_______}$
15. $\overline{EB} \cong \underline{_______}$
16. $\angle PHT \cong \underline{_______}$

17. Explain why the pair of triangles is congruent. Then, find the missing measures.

$\underline{_______}$
**Practice 9-6 Circles**

Find the measures of the central angles that you would draw to represent each percent in a circle graph. Round to the nearest degree.

<table>
<thead>
<tr>
<th>Voter Preference for Senator</th>
<th>Central Angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peterson</td>
<td>40%</td>
</tr>
<tr>
<td>Washington</td>
<td>30%</td>
</tr>
<tr>
<td>Gomez</td>
<td>15%</td>
</tr>
<tr>
<td>Thomson</td>
<td>10%</td>
</tr>
<tr>
<td>Miller</td>
<td>5%</td>
</tr>
</tbody>
</table>

6. Draw a circle graph for the data on voter preference.

Voter Preference for Senator

7. The total number of voters surveyed was 5,000. How many voters preferred Gomez?

Find the circumference of each circle with the given radius or diameter. Use 3.14 for \( \pi \).

8. \( d = 25.8 \text{ m} \)
   \[ C = \text{_______________} \]

9. \( r = 9.1 \text{ cm} \)
   \[ C = \text{_______________} \]

10. \( r = 0.28 \text{ km} \)
    \[ C = \text{_______________} \]

11. \( d = 14 \text{ ft} \)
    \[ C = \text{_______________} \]

12. \( d = 5 \text{ in.} \)
    \[ C = \text{_______________} \]

13. \( r = \frac{7}{8} \text{ in.} \)
    \[ C = \text{_______________} \]
**Practice 9-7 Constructions**

Construct each figure using the diagram at the right.

1. \( MP \) congruent to \( BC \)
   \[ M \rightarrow P \]

2. \( JK \) twice as long as \( BC \)
   \[ J \rightarrow K \]

3. \( \angle D \) congruent to \( \angle A \)
   \[ D \]

4. \( \triangle PQR \) half the measure of \( \angle A \)
   \[ Q \rightarrow R \]

5. \( \angle STU \) with measure 135°
   \[ S \rightarrow T \rightarrow U \]

6. \( EF \) half as long as \( BC \)
   \[ E \rightarrow F \]

7. Construct \( \triangle WXY \) so that:
   \( \angle W \) is congruent to \( \angle A \), \( \overline{WY} \) is congruent to \( \overline{BC} \), \( \angle Y \) is half the measure of \( \angle A \).

8. What seems to be true about \( \angle X \) in \( \triangle WXY \) you constructed?
Write a rule to describe each translation.

1. \((x, y) \rightarrow \) ________________

2. \((x, y) \rightarrow \) ________________

3. \((x, y) \rightarrow \) ________________

4. \((x, y) \rightarrow \) ________________

The vertices of a triangle and a translation are given. Graph each triangle and its image.

5. \(G(-4, 4), H(-2, 3), J(-3, 0); \) right 5 and down 2

6. \(K(0, -1), L(4, 2), M(3, -3); \) left 4 units and up 3 units

A point and its image after a translation are given. Write a rule to describe the translation.

7. \(A(9, -4), A'(2, -1) \) \((x, y) \rightarrow \) ________________

8. \(B(-3, 5), B'(-5, -3) \) \((x, y) \rightarrow \) ________________
Practice 9-9 Symmetry and Reflections

The vertices of a polygon are listed. Graph each polygon and its image after a reflection over the given line. Name the coordinates of the image.

1. \(A(1, 3), B(4, 1), C(3, -2), D(2, -4); x = 0\)
2. \(J(-2, 1), K(1, 3), L(4, 2); y = -1\)

\[
\begin{array}{c|c|c|c|c}
& & & & \\
& 4 & & 2 & \\
4 & & & & \\
2 & & & & \\
1 & & & & \\
0 & & & & \\
-1 & & & & \\
-2 & & & & \\
-3 & & & & \\
-4 & & & & \\
\end{array}
\quad
\begin{array}{c|c|c|c|c}
& & & & \\
& 4 & & 2 & \\
4 & & & & \\
2 & & & & \\
1 & & & & \\
0 & & & & \\
-1 & & & & \\
-2 & & & & \\
-3 & & & & \\
-4 & & & & \\
\end{array}
\]

\(A'\quad B'\quad J'\quad K'\)

\(C'\quad D'\quad L'\)

Draw all the lines of symmetry for each figure.

3. 
4. 
5.

Is the dashed line a line of symmetry? Write yes or no.

6. 
7. 
8.
Judging from appearances, does each figure have rotational symmetry? If yes, what is the angle of rotation?

1. ____________
2. ____________
3. ____________

The vertices of a triangle are given. Graph each triangle and its image after a rotation of (a) 90° and (b) 180° about the origin. Name the coordinates of the vertices of the images.

4. A(1, 4), B(1, 1), C(4, 2)

5. S(2, 3), T(−2, 4), U(−4, 2)

Look for a pattern in Exercises 4 and 5 to complete the following.

6. In a 90° rotation, (x, y) → ________________

7. In a 180° rotation, (x, y) → ________________
**Practice 10-1 Area: Parallelograms**

Find the area of each parallelogram.

1. 
   \[
   \begin{array}{c}
   \text{18 ft} \\
   \text{28 ft} \\
   \end{array}
   \quad
   \begin{array}{c}
   \text{19 ft} \\
   \end{array}
   \]

2. 
   \[
   \begin{array}{c}
   \text{9 m} \\
   \end{array}
   \quad
   \begin{array}{c}
   \text{13 m} \\
   \end{array}
   \]

3. 
   \[
   \begin{array}{c}
   \text{5 m} \\
   \text{50 cm} \\
   \end{array}
   \]

Find the area of each shaded region. Assume that all angles that appear to be right angles are right angles.

4. 
   \[
   \begin{array}{c}
   \text{80 ft} \\
   \text{70 ft} \\
   \text{50 ft} \\
   \text{35 ft} \\
   \text{25 ft} \\
   \text{20 ft} \\
   \end{array}
   \]

5. 
   \[
   \begin{array}{c}
   \text{65 m} \\
   \text{30 m} \\
   \text{15 m} \\
   \text{45 m} \\
   \text{15 m} \\
   \text{30 m} \\
   \text{10 m} \\
   \text{10 m} \\
   \end{array}
   \]

The vertices of a parallelogram are given. Draw each parallelogram. Find its area.

6. \( P(1, 1), Q(3, 1), R(2, 4), S(4, 4) \)

7. \( J(-3, 2), K(1, 2), M(-1, -3), L(3, -3) \)

8. The perimeter of a square is 72 in. What is its area?
Find the area of each trapezoid.

1. \[ \text{base}_1 = 13 \text{ in.} \]
   \[ \text{base}_2 = 8 \text{ in.} \]
   \[ \text{height} = 5 \text{ in.} \]

2. \[ \text{base}_1 = 24.6 \text{ cm} \]
   \[ \text{base}_2 = 9.4 \text{ cm} \]
   \[ \text{height} = 15 \text{ cm} \]

3. \[ \text{base}_1 = 2.25 \text{ ft} \]
   \[ \text{base}_2 = 4.75 \text{ ft} \]
   \[ \text{height} = 3.5 \text{ ft} \]

Find the area of each triangle.

7. \[ \text{base} = 24 \text{ in.} \]
   \[ \text{height} = 9 \text{ in.} \]

8. \[ \text{height} = 12 \text{ ft} \]
   \[ \text{base} = 9 \text{ ft} \]

9. \[ \text{height} = 8.25 \text{ ft} \]
   \[ \text{base} = 40 \text{ ft} \]

Find the area of each shaded region.

13. \[ \text{base} = 12 \text{ ft} \]
   \[ \text{height} = 12 \text{ ft} \]

14. \[ \text{base} = 12 \text{ m} \]
   \[ \text{height} = 12 \text{ m} \]

15. A triangle has an area of 36 \( \text{cm}^2 \) and a base of 6 cm. What is the height of the triangle?
**Practice 10-3 Area: Circle**

Find the area of each circle. Give an exact area and an approximate area to the nearest tenth.

1. \( r = 7 \text{ m} \)  
   \[ A = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ A \approx \ \ \ \ \ \ \ \ \ \ \ \ \ \ \]  

2. \( d = 18 \text{ cm} \)  
   \[ A = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ A \approx \ \ \ \ \ \ \ \ \ \ \ \ \ \ \]  

3. \( d = 42 \text{ m} \)  
   \[ A = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ A \approx \ \ \ \ \ \ \ \ \ \ \ \ \ \ \]  

4. \( r = 35 \text{ km} \)  
   \[ A = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ A \approx \ \ \ \ \ \ \ \ \ \ \ \ \ \ \]  

5. \( d = 22 \text{ cm} \)  
   \[ A = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ A \approx \ \ \ \ \ \ \ \ \ \ \ \ \ \ \]  

6. \( r = 25 \text{ ft} \)  
   \[ A = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ A \approx \ \ \ \ \ \ \ \ \ \ \ \ \ \ \]  

7. \( r = 3\frac{1}{2} \text{ mi} \)  
   \[ A = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ A \approx \ \ \ \ \ \ \ \ \ \ \ \ \ \ \]  

8. \( d = 5 \text{ in.} \)  
   \[ A = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ A \approx \ \ \ \ \ \ \ \ \ \ \ \ \ \ \]  

9. \( d = 9.8 \text{ mm} \)  
   \[ A = \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ A \approx \ \ \ \ \ \ \ \ \ \ \ \ \ \ \]  

Find the area of each shaded region to the nearest tenth.

10. 

11. 

12. 

13. 

14. A goat is tethered to a stake in the ground with a 5-m rope. The goat can graze to the full length of the rope a full 360° around the stake. How much area does the goat have in which to graze?
Name the space figure you can form from each net.

1. 2. 3.

For each figure, describe the base(s) and name the figure.

4. 5. 6. 7. 8. 9.
**Practice 10-5  Surface Area: Prisms and Cylinders**

Find the surface area of each space figure. If the answer is not a whole number, round to the nearest tenth.

1. 2. 3.

Find the surface area of the space figure represented by each net to the nearest square unit.

4. 5. 6.

7. A room is 18 ft long, 14 ft wide, and 8 ft high.
   a. Find the cost of painting the four walls with two coats of paint costing $9.50 per gallon. Each gallon covers 256 ft\(^2\) with one coat.
   b. Find the cost of carpeting the floor with carpet costing $5/ft\(^2\).
   c. Find the cost of covering the ceiling with acoustic tile costing $7.50/ft\(^2\).
   d. Find the total cost of renovating the walls, floor, and ceiling.
Practice 10-6 Surface Area: Pyramids, Cones, and Spheres

Find the surface area of each space figure to the nearest square unit.

1. 

2. 

3. 

4. 

5. 

6. 

7. 

8. 

9. 

10. A hemisphere with diameter 70 cm

11. A cone and a square-based pyramid have slant heights of 6 in. The diameter for the cone and the base edge of the pyramid are both 8 in.
   a. Which space figure has the greater surface area?
   b. By how much does the surface area of the greater space figure exceed that of the smaller? Use 3.14 for π.
Find the volume of each prism or cylinder to the nearest cubic unit.

1. prism
   rectangular base:
   8 in. by 6 in.
   height: 7 in.

2. cube
   sides: 13 m

3. cylinder
   radius: 14 in.
   height: 18 in.

4. prism
   square base:
   3.5 ft on a side
   height: 6 ft

5. cylinder
   diameter: 5 ft
   height: 9 ft

6. cylinder
   radius: 5 cm
   height: 11.2 cm

7. A water storage tank has a cylindrical shape. The base has a diameter of 18 m and the tank is 32 m high. How much water, to the nearest cubic unit, can the tank hold?

8. A tent in the shape of a triangular prism has a square base with a side of 8 feet and a height of 6 feet. What is the volume of the tent?
Solve by making a model.

1. A narrow strip of paper is twisted once, then joined at the ends with glue or tape. The strip is then cut lengthwise along the dotted line shown.
   a. Guess the results.
   b. Make and cut a model as directed. What are the results?

2. The midpoint of a segment is the point that divides the segment into two segments of equal length. A quadrilateral with unequal sides is drawn. The midpoints of the four sides are found and connected in order.
   a. Guess what kind of quadrilateral is formed.
   b. Draw four quadrilaterals with unequal sides and connect the midpoints of adjacent sides. What kind of quadrilaterals appear to have been formed?

3. A penny with Lincoln’s head upright is rolled along the edge of another penny as shown in the figure.
   a. At the end, do you think Lincoln will be right-side-up or upside-down?
   b. Conduct an experiment to find out. What are your results?

4. A net for an octahedron is shown. All the sides are congruent, equilateral triangles. Cut and fold on the dotted lines. Find the surface area of the octahedron.
Practice 10-9 Volume: Pyramids, Cones, and Spheres

Find the volume of each figure to the nearest cubic unit.

1. 

2. 

3. 

4. 

5. 

6. 

7. square-based pyramid
   \( s = 9 \text{ in.} \)
   \( h = 12 \text{ in.} \)

8. cone
   \( r = 8 \text{ cm} \)
   \( h = 15 \text{ cm} \)

9. sphere
   \( r = 6 \text{ in.} \)

10. You make a snow figure using three spheres with radii of 12 in., 10 in., and 8 in., with the biggest on the bottom and the smallest for the head. You get snow from a rectangular area that is 6 ft by 7 ft.

   a. Find the volume of snow in your snow figure to the nearest hundredth of a cubic inch.

   bottom: ____________________          middle: ____________________
   head: ____________________           total: ____________________

   b. Find the area in square inches from which you get snow.

   ____________________

   c. How deep does the snow need to be before you have enough snow to make a figure? State your answer to the nearest \( \frac{1}{4} \) in.

   ____________________

Name ______________________  Class __________________  Date ___________
Practice 11-1  Square Roots and Irrational Numbers

Estimate to the nearest integer.

1. \( \sqrt{18} \)  
2. \( \sqrt{24} \)  
3. \( \sqrt{50} \)  
4. \( \sqrt{8} \)  
5. \( \sqrt{62} \)  
6. \( \sqrt{78} \)  
7. \( \sqrt{98} \)  
8. \( \sqrt{46} \)  
9. \( \sqrt{38} \)  

Simplify each square root.

10. \( \sqrt{144} \)  
11. \( \sqrt{9 + 16} \)  
12. \( \sqrt{900} \)  
13. \( \sqrt{169} \)  
14. \( -\sqrt{100} \)  
15. \( \sqrt{0.16} \)  
16. \( \sqrt{\frac{16}{81}} \)  
17. \( \sqrt{\frac{3}{25}} \)  
18. \( \sqrt{\frac{121}{144}} \)  

Identify each number as rational or irrational.

19. \( \sqrt{289} \)  
20. \( 5.777\ldots \)  
21. \( \sqrt{41} \)  
22. \( 0.6266\ldots \)  
23. \( \sqrt{49} \)  
24. \( \sqrt{52} \)  

Find two integers that make each equation true.

25. \( x^2 = 16 \)  
26. \( 3m^2 = 147 \)  

Use the formula \( d = \sqrt{1.5h} \) to estimate the distance to the horizon \( d \) in miles for each viewer’s eye height \( h \), in feet.

27. \( h = 12 \text{ ft} \)  
28. \( h = 216 \text{ ft} \)  
29. \( h = 412 \text{ ft} \)  

30. The Moon has a surface area of approximately 14,650,000 mi\(^2\). Estimate its radius to the nearest mile.
Practice 11-2 The Pythagorean Theorem

Can you form a right triangle with the three lengths given?
Show your work.
1. 20, 21, 29
2. 7, 11, 12
3. 10, \(2\sqrt{11}\), 12

4. 28, 45, 53
5. 9, \(\sqrt{10}\), 10
6. 10, 15, 20

Find each missing length to the nearest tenth of a unit.
7. 

8. 

9. 

10. 

11. 

12. 

Use the triangle at the right. Find the missing length to the nearest tenth of a unit.
13. \(a = 6\) m, \(b = 9\) m
14. \(a = 19\) in., \(c = 35\) in.

15. \(b = 24\) cm, \(c = 32\) cm
16. \(a = 14\) ft, \(c = 41\) ft

17. A rectangular park measures 300 ft by 400 ft. A sidewalk runs diagonally from one corner to the opposite corner. Find the length of the sidewalk.
## Practice 11-3 Distance and Midpoint Formulas

The table has sets of endpoints of several segments. Find the distance between each pair of points and the midpoint of each segment. Round to the nearest tenth when necessary.

<table>
<thead>
<tr>
<th>Endpoints</th>
<th>Distance Between (Length of Segment)</th>
<th>Midpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A(2, 6) and B(4, 10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. C(5, -3) and D(7, 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. E(0, 12) and F(5, 0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. G(4, 7) and H(-2, -3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. J(-1, 5) and K(2, 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. L(-3, 8) and M(-7, -1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Find the perimeter of each figure. Round to the nearest tenth when necessary.

7. ![Polygon ABC](image1)

8. ![Polygon OPQR](image2)

9. ![Polygon WXYZ](image3)

10. ![Polygon JKLM](image4)
**Practice 11-4 Write a Proportion**

Write a proportion and find the value of each $x$.

1. $\triangle KLM \sim \triangle NQP$
   
   ![Diagram of $\triangle KLM \sim \triangle NQP$]
   
   Proportion: ________________
   
   $x = ________________$

2. $\triangle RST \sim \triangle RPQ$
   
   ![Diagram of $\triangle RST \sim \triangle RPQ$]
   
   Proportion: ________________
   
   $x = ________________$

3. $\triangle ABC \sim \triangle ADE$
   
   ![Diagram of $\triangle ABC \sim \triangle ADE$]
   
   Proportion: ________________
   
   $x = ________________$

4. $\triangle UVW \sim \triangle UYZ$
   
   ![Diagram of $\triangle UVW \sim \triangle UYZ$]
   
   Proportion: ________________
   
   $x = ________________$

**Solve. Show the proportion you use.**

5. A surveyor needs to find the distance across a canyon. She finds a tree on the edge of the canyon and a large rock on the other edge. The surveyor uses stakes to set up the similar right triangles shown. Find the distance across the canyon, $x$.

   ![Diagram of a surveyor setting up stakes]

6. Three cartons of juice cost $4.77. Find the cost of 8 cartons.

   $\quad$

7. If a pizza with a diameter of 12 inches costs $10.99, based on area, how much should a 15-inch pizza cost?

   $\quad$
The length of one side of the triangle is given in each row of the table. Find the missing lengths for that triangle.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>3</td>
<td>9\sqrt{3}</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>8.7</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>7\sqrt{2}</td>
</tr>
<tr>
<td>8</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

Tell whether a triangle with sides of the given lengths could be 45°-45°-90° or 30°-60°-90°. Explain.

9. 3\sqrt{2}, 3\sqrt{2}, 6

10. 10, 24, 26

In the figure, \( BD = 6\sqrt{2} \). Find each value.

11. \( AB \)  
12. \( AD \)  
13. \( BC \)  
14. \( CD \)  

15. One leg of a 45°-45°-90° right triangle measures 14 cm. Find the exact perimeter.
Find each value. Round to four decimal places.

1. \( \cos 20^\circ \) 
2. \( \tan 64^\circ \) 
3. \( \sin 41^\circ \) 
4. \( \tan 8^\circ \) 
5. \( \sin 88^\circ \) 
6. \( \cos 53^\circ \)

Use \( \triangle MNP \) for Exercises 7 to 12. Find each ratio.

7. sine of \( \angle P \) 
8. cosine of \( \angle P \) 
9. tangent of \( \angle P \) 
10. sine of \( \angle M \) 
11. cosine of \( \angle M \) 
12. tangent of \( \angle M \) 

Use \( \triangle RST \) for Exercises 13 to 18. Find each ratio in simplest form.

13. sine of \( \angle T \) 
14. cosine of \( \angle T \) 
15. tangent of \( \angle T \) 
16. sine of \( \angle R \) 
17. cosine of \( \angle R \) 
18. tangent of \( \angle R \) 

Write each ratio using square root signs. Use your knowledge of 45°-45°-90° and 30°-60°-90° right triangles.

19. \( \tan 30^\circ \) 
20. \( \cos 45^\circ \) 
21. \( \sin 60^\circ \) 
22. \( \cos 60^\circ \) 
23. \( \tan 45^\circ \) 
24. \( \sin 30^\circ \) 

25. A surveyor standing 2,277 ft from the base of the World Trade Center in New York City measured a 31° angle to the topmost point. To the nearest ft, how tall is the World Trade Center?
Find \( x \) to the nearest tenth.

1. \( \text{canyon} \)
\[
\begin{array}{c}
\text{ground} \\
\text{runway} \\
x
\end{array}
\]
\[
\text{0.75 mi} \quad \text{3°}
\]
\[x \approx \]

2. \( \text{60 m} \)
\[
\begin{array}{c}
\text{canyon} \\
x
\end{array}
\]
\[
\text{55°}
\]
\[x \approx \]

Solve each problem. Round to the nearest unit.

5. A helicopter is rescuing a would-be mountain climber. The helicopter is hovering, so there is an angle of depression of 35° from the helicopter to the climber. The bottom of the helicopter’s 12-meter ladder is hanging even with the climber. How far does the helicopter need to move horizontally to be directly above the climber?

6. Kara’s kite is flying at the end of 35 yards of string. Her end of the string is 1 yard off the ground. The angle of elevation of the kite is 50°. What is the height of the kite from the ground?

7. Karl is standing 80 ft from the base of a tree. He sees the top of the tree from an angle of elevation of 42°. His eye is 4.5 feet off the ground. How tall is the tree?
Draw a line plot for each frequency table. Find the range.

1. Number: 1 2 3 4 5 6  
   Frequency: 2 0 4 1 2 4  
   range: ________

2. Number: 1 2 3 4 5 6  
   Frequency: 4 4 0 0 3 2  
   range: ________

Display each set of data in a frequency table.

3. Number: 5 1 4 6 2 6 4 5 1 3 2 6 4 5 4 6  
   Frequency: 2 2 1 4 3 4

4. Number: 4 3 1 2 1 3 3 1 3 2 1  
   Frequency: 4 2 4 1

Construct a frequency table from the line plot.

5. State Average Pupils per Teacher

<table>
<thead>
<tr>
<th>Pupils per Teacher</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

6. What is the range in pupil-teacher ratios? _____________________________
Use the box-and-whisker plot to answer each question.

1. What is the highest weekly total? ___________ the lowest? ___________
2. What is the median weekly total? ___________
3. What percent of runners run less than 40 miles a week? ___________
4. How many runners run less than 20 miles a week? _________________

Make a box-and-whisker plot for each set of data.
5. 16 20 30 15 23 11 15 21 30 29 13 16
6. 9 12 10 3 2 3 9 11 5 1 10 4 7 12 3 10
7. 70 77 67 65 79 82 70 68 75 73 69 66
   70 73 89 72

Use box-and-whisker plots to compare data sets. Use a single number line for each comparison.
8. 1st set: 7 12 25 3 1 29 30 7 15 2 5
   10 29 1 10 30 18 8 7 29
   2nd set: 37 17 14 43 27 19 32 1 8 48
            26 16 28 6 25 18
   1st Set
   2nd Set
9. Area in 1,000 mi²
   midwestern states: 45 36 58 97 56 65 87 82 77
   southern states: 52 59 48 52 42 32 54 43 70 53 66
   Midwestern States
   Southern States
Use the graph at the right for Exercises 1–5.

1. Which group of animals appears to have more than twice as many endangered species as mammals?

2. Does one group actually have twice as many endangered species as mammals?

3. What gives the impression that one group has twice as many endangered species as mammals?

4. Redraw the graph without a break.

5. Describe the effect the change in scale has on what the graph suggests.

Use the data in the table for Exercises 6–10.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Union members (millions)</td>
<td>3</td>
<td>9</td>
<td>14</td>
<td>17</td>
<td>19</td>
<td>20</td>
<td>17</td>
</tr>
</tbody>
</table>

6. Draw a line graph of the data using the grid below.

7. Draw a line graph of the data using the grid below.

8. What gives the different impressions in the two graphs?
Practice 12-4 Counting Outcomes and Theoretical Probability

A computer store sells 4 models of computer. (m1, m2, m3, and m4) Each model can be fitted with 3 sizes of hard drive (A, B, and C).

1. Find the sample space.

2. What is the probability of choosing a computer with a size C hard drive at random?

3. What is the probability of choosing a model 2 computer with a size A hard drive at random?

Solve each problem by drawing a tree diagram.

4. A ballot offered 3 choices for president (A, B, C) and 2 choices for vice president (M, N). How many choices for a combination of the two offices did it offer? List them.

5. The Cougar baseball team has 4 pitchers (P1, P2, P3, P4) and 2 catchers (C1, C2). How many pitcher-catcher combinations are possible? List them.

Solve each problem by using the counting principle.

6. There are 5 roads from Allen to Baker, 7 roads from Baker to Carlson, and 4 roads from Carlson to Dodge. How many different routes from Allen to Dodge by way of Baker and Carlson are possible?

7. Drapery is sold in 4 different fabrics. Each fabric comes in 13 different patterns. Each pattern is offered in 9 different colors. How many fabric-pattern-color combinations are there?
**Practice 12-5 Independent and Dependent Events**

A shelf holds 3 novels, 2 biographies and 1 history book. Two students in turn choose a book at random. What is the probability that the students choose each of the following?

1. both novels
2. both biographies
3. a history, then a novel
4. both history books

Meg flipped a penny the given number of times. What is the probability the results were as follows?

5. 2; two heads
6. 3; three tails
7. 2; a tail, then a head
8. 5; five tails

Two puppies are chosen at random from a box at the mall. What is the probability of these outcomes?

9. both black
10. both brown
11. a setter, then a hound
12. a retriever, then a setter
13. both setters

Are the events independent or dependent? Explain.

14. A guest at a party takes a sandwich from a tray. A second guest then takes a sandwich.

15. Sam flips a coin and gets heads. He flips again and gets tails.

You can select only two cards from the right. Find the probability of selecting a T and an N for each condition.

16. You replace the first card before drawing the second.

17. You do not replace the first card before drawing the second.
Simplify each expression.

1. \(7P_2\) 
2. \(7C_2\) 
3. \(8P_3\) 
4. \(9P_4\) 
5. \(3C_2\) 
6. \(10C_4\)

7. Art, Becky, Carl, and Denise are lined up to buy tickets.
   a. How many different permutations of the four are possible?
   b. Suppose Ed was also in line. How many permutations would there be?
   c. In how many of the permutations of the five is Becky first?
   d. What is the probability that a permutation of this five chosen at random will have Becky first?

8. Art, Becky, Carl, Denise, and Ed all want to go to the concert. However, there are only 3 tickets. How many ways can they choose the 3 who get to go to the concert?

9. A combination lock has 36 numbers on it. How many different 3-number combinations are possible if no number may be repeated?

Numbers are to be formed using the digits 1, 2, 3, 4, 5, and 6. No digit may be repeated.

10. How many two-digit numbers can be formed? 
11. How many three-digit numbers can be formed? 
12. How many four-digit numbers can be formed? 
13. How many five-digit numbers can be formed? 
14. How many six-digit numbers can be formed?
**Practice 12-7  Experimental Probability**

The table shows the colors of Rahmi's soccer shirts. For each color, find the experimental probability that a random shirt from Rahmi's collection is that color. Write the probability as a percent, to the nearest tenth of a percent.

<table>
<thead>
<tr>
<th>Color</th>
<th>Number of shirts</th>
</tr>
</thead>
<tbody>
<tr>
<td>red</td>
<td>6</td>
</tr>
<tr>
<td>white</td>
<td>4</td>
</tr>
<tr>
<td>orange</td>
<td>3</td>
</tr>
<tr>
<td>blue</td>
<td>2</td>
</tr>
</tbody>
</table>

1. red ________  2. white ________
3. orange ________  4. blue ________
5. red or blue ________  6. not white ________
7. not orange or red ________  8. green ________

Your school's basketball team has an equal chance of winning or losing the first three games of the season. You simulate the probability by tossing a coin 60 times, letting heads stand for a win and tails stand for a loss. Use the data below. Find each experimental probability as a percent.

HHH T HH T HT THT THH
HTH T HH T HH HTH HHH
THH T TH T HH HTT TTT
HTT HHT T TH HTH THH

9. \( P(\text{win all 3}) \) ________
10. \( P(\text{win exactly 2}) \) ________
11. \( P(\text{win exactly 1}) \) ________
12. \( P(\text{win none}) \) ________
13. \( P(\text{win at least 2}) \) ________
14. \( P(\text{win at least 1}) \) ________
15. \( P(\text{win less than 2}) \) ________

Students were surveyed about the number of children living in their household. The table shows the results. Write each experimental probability as a fraction in simplest form.

<table>
<thead>
<tr>
<th>Number of children</th>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4 or more</td>
<td>4</td>
</tr>
</tbody>
</table>

16. \( P(\text{one child}) \) ________
17. \( P(\text{2 or more children}) \) ________
18. \( P(\text{at least 3 children}) \) ________

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Practice 12-8 Random Samples and Surveys

A school has 800 students. Two random surveys are conducted to determine students’ favorite sport. Use the data in the table to estimate the total number of students who prefer each sport.

<table>
<thead>
<tr>
<th>Sample</th>
<th>Number Sampled</th>
<th>Basketball</th>
<th>Football</th>
<th>Baseball</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>40</td>
<td>16</td>
<td>14</td>
<td>10</td>
</tr>
<tr>
<td>B</td>
<td>50</td>
<td>22</td>
<td>16</td>
<td>12</td>
</tr>
</tbody>
</table>

1. basketball based on Sample A _________________
2. basketball based on Sample B _________________
3. baseball based on Sample A _________________
4. baseball based on Sample B _________________

You want to find out if a school bond issue for a new computer center is likely to pass in the next election. State whether each survey plan describes a good sample. Explain your reasoning.

5. You interview people coming out of a computer store in your town.

___________________________________________
___________________________________________

6. You choose people to interview at random from the city telephone book.

___________________________________________
___________________________________________
___________________________________________

7. You interview every tenth person leaving each voting place in your school district.

___________________________________________

Pre-Algebra Chapter 12
Practice 12-9 Simulate a Problem

Solve by simulating the problem.

1. Twenty people seated in a circle counted to seven, beginning with the number one. The seventh person dropped out and those remaining counted to seven again. If every seventh person dropped out, what was the number of the last person remaining in the circle? Use the number circle to simulate the problem.

2. The Rockets played their first volleyball game on Friday, October 18, and played a game every Friday thereafter.
   a. What was the date of their ninth game?
   b. What was the number of the game they played on February 7?

3. Five coins are placed side by side as shown. A move consists of sliding two adjacent coins to an open spot without changing the order of the two coins. (The move “2-3 right” is illustrated.) Find three successive moves that will leave the coins in this order: 3-1-5-2-4

4. An irresponsible TV weatherperson forecasts the weather by throwing a number cube and consulting the weather key shown here. The weather during one 5-day stretch is given in the table. What is the probability that the forecaster was right at least 3 days out of 5? Use a number cube to simulate the forecaster’s predictions. A successful trial occurs when you roll the correct weather three or more times out of five.

<table>
<thead>
<tr>
<th>Mon</th>
<th>Tue</th>
<th>Wed</th>
<th>Thu</th>
<th>Fri</th>
</tr>
</thead>
<tbody>
<tr>
<td>continual</td>
<td>continual</td>
<td>clear and</td>
<td>cloudy and</td>
<td>snow</td>
</tr>
<tr>
<td>rain</td>
<td>rain</td>
<td>cool</td>
<td>cool</td>
<td></td>
</tr>
</tbody>
</table>

   Weather Key
   1–clear and warm
   2–clear and cool
   3–cloudy and cool
   4–intermittent showers
   5–continual rain
   6–snow

Work with a partner. Carry out 50 trials. Write the probability after the given number of trials.

a. 10 ________  b. 30 ________  c. 50 ________
Tell whether each sequence is arithmetic, geometric, or neither. Find the next three terms of each sequence. If the sequence is arithmetic or geometric, write a rule to describe the sequence.

1. 7, 14, 28, 56, ________ , ________ , ________  type: ________________
   rule: ____________________________
2. 5, 11, 17, 23, ________ , ________ , ________  type: ________________
   rule: ____________________________
3. 32, 16, 8, 4, ________ , ________ , ________  type: ________________
   rule: ____________________________
4. 25, 21, 17, 13, ________ , ________ , ________  type: ________________
   rule: ____________________________
5. 9, 3, −3, −9, ________ , ________ , ________  type: ________________
   rule: ____________________________
6. 8, 3, −3, −10, ________ , ________ , ________  type: ________________
   rule: ____________________________
7. 2, −6, 18, −54, ________ , ________ , ________  type: ________________
   rule: ____________________________
8. 1, 4, 9, 16, ________ , ________ , ________  type: ________________
   rule: ____________________________

What is the common difference of each arithmetic sequence?
9. 16, 19, 22, 25, . . . ________  10. 3, 5.8, 8.6, 11.4, . . . ________

What is the common ratio of each geometric sequence?
11. 6, 24, 96, 384, . . . ________  12. 12, 3, 3/4, 3/16, . . . ________
### Practice 13-2  Graphing Nonlinear Functions

For each function, complete the table for integer values of \( x \) from \(-2\) to \(2\). Then graph each function.

1. \( y = |x| - 2 \)

| \( x \) | \( y = |x| - 2 \) | (\( x, y \)) |
|------|--------------------|----------|
| 2    |                    |          |
| 1    |                    |          |
| 0    |                    |          |
| -1   |                    |          |
| -2   |                    |          |


2. \( y = -x^2 + 3 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y = -x^2 + 3 )</th>
<th>(( x, y ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


3. \( y = 2x^2 - 4 \)

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y = 2x^2 - 4 )</th>
<th>(( x, y ))</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


4. \( y = 2|x| + 3 \)

| \( x \) | \( y = -2|x| + 3 \) | (\( x, y \)) |
|------|--------------------|----------|
| 2    |                    |          |
| 1    |                    |          |
| 0    |                    |          |
| -1   |                    |          |
| -2   |                    |          |
Complete the table for integer values of \(x\) from 0 to 4. Then graph each function.

1. \(y = \frac{1}{3} \cdot 3^x\)

<table>
<thead>
<tr>
<th>(x)</th>
<th>(y)</th>
<th>((x, y))</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. \(y = \frac{5}{2} \cdot 2^x\)

<table>
<thead>
<tr>
<th>(x)</th>
<th>(y)</th>
<th>((x, y))</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. \(y = 50(0.2)^x\)

<table>
<thead>
<tr>
<th>(x)</th>
<th>(y)</th>
<th>((x, y))</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Is the point (3, 9) on the graph of each function?

4. \(y = x^2\)  
5. \(y = 3^x\)  
6. \(y = \frac{1}{3} \cdot 3^x\)

7. \(y = 3 \cdot \left(\frac{1}{3}\right)^x\)  
8. \(y = 3x\)  
9. \(y = x^3\)
Evaluate each polynomial for \( x = -1, y = 3, \) and \( z = 2. \)

1. \( x^2 + z \)  
2. \( 3y + x \)  
3. \( 2z + y \)  
4. \( x + y + z \)  
5. \( x^2 + y^2 \)  
6. \( z - x - y \)

Evaluate each polynomial for \( m = 21, n = -9, \) and \( p = 28. \)

7. \( 3m - 2p \)  
8. \( 2n^2 - 5m \)  
9. \( m^2 - n^2 \)  
10. \( n^2 + 5n - 6 \)  
11. \( 5p^2 - 5p \)  
12. \( 7m + 6p \)

Solve using the given polynomials.

13. Find the number of diagonals that can be drawn in a polygon with 24 sides.
   \[ N = \frac{1}{2}n^2 - \frac{3}{2}n \]
   \( N \) = number of diagonals  
   \( n \) = number of sides

14. A rock thrown from the top of a cliff at an initial velocity of 3 m/s takes 6.2 s to reach the bottom. To the nearest meter, how tall is the cliff?
   \[ d = 4.9t^2 - vt \]
   \( d \) = distance fallen  
   \( t \) = time falling  
   \( v \) = initial velocity

Tell whether each polynomial is a monomial, a binomial, or a trinomial.

15. \( 36abc \)  
16. \( 10 - h^3 \)
17. \( 95xy + y \)  
18. \( a^2 + b^2 + cd \)
19. \( 3k \)  
20. \( -12e + 12f^2 \)
Simplify each sum or difference.

1. \((10m - 4) - (3m - 5)\)

2. \((k^2 - 2k + 5) - (k^2 + 5k + 3)\)

3. \((2x^2 + 7x - 4) - (x^2 - 4)\)

4. \(2x^2 + 4 + (3x^2 - 4x - 5)\)

5. \((-2x^2 + 4x - 5) + (8x + 5x^2 + 6)\)

6. \((3x^2y^2 + 2xy + 5y) - (2x^2y^2 - 4x + 5y)\)

7. \((7x^3 - 5x^2 - 3x + 8) - (10x^3 - 4x^2 + 5x + 9)\)

8. \(
\frac{2x^3 - 5x^2}{3x^3 + 7x^2 + 9x} - 5
\)

9. \(-4x^2y^2 + 3xy + x^2 - 4y^2
\frac{+ x^2y^2 - 6xy - x^2 - 5y^2}{+ 9y}
\)

10. \((x^2 + 2y + 5) - (4x + 4y)\)

11. \((-4a^2b + 7ab^2 - 9a - 6b + 13) - (-6a^2b + 8a + 10b - 18)\)

Write the perimeter of each figure as a polynomial. Simplify.

12. \(2m^2 - 2\)

13. \(3n - 4\)
**Practice 13-6 Multiplying a Polynomial by a Monomial**

Simplify each product.

1. \(4x(3x - 5)\)
2. \(-8x(x - 7)\)
3. \(7xy^2(y - 2x + x^2)\)
4. \(3xy(2xy + 5)\)
5. \(-9xyz(-2xy + 3yz - 4xz)\)
6. \(12ab\left(\frac{-1}{2}b + \frac{1}{3}a^3\right)\)
7. \(-15a^2(a - b + 3c)\)
8. \(-3x^2a^2(2a^3 + ab - x)\)

Write an expression for the area of each shaded region. Simplify.

9. \(12x - 6y\)
10. \(2ab\)
11. \(3x\)

Use the GCF of the terms to write each expression as the product of two factors.

12. \(8x + 8y\)
13. \(13a - 13b\)
14. \(2x^3 + 2x^2\)
15. \(11a + 11b + 11c\)
16. \(x^3y^2 + x^2y^3 + x^4y\)
17. \(-12ab^2c + 18a^2bc^2 - 30ab^3c^3\)
18. \(90w^3x + 144w^2\)
Practice 13-7  Multiplying Binomials

Simplify each product.

1. \((x + 2)(x + 3)\)

2. \((x + 5)(x + 1)\)

3. \((x + 4)(x + 5)\)

4. \((x + 7)(x + 2)\)

5. \((x + 1)(x - 6)\)

6. \((x + 8)(x - 3)\)

7. \((2x + 5)(x + 3)\)

8. \((x - 4)(x - 6)\)

9. \((2x - 7)(2x + 7)\)

10. \((m - 15)(m - 20)\)

11. \((3k + 4)^2\)

12. \((x - 20)(x + 20)\)

13. \((5n + 4)(4n - 5)\)

14. \((10x - 1)^2\)

15. \((y - 7)(y - 6)\)

16. \((x - 9)(x - 5)\)

17. \((x - 10)(x + 3)\)

18. \((2x + 3)(3x + 2)\)

Find the area of each rectangle.

19. \(x + 5\)

20. \(4n + 7\)

21. \(3h + 4\)
Use multiple strategies to solve each problem.

1. A rectangle has length \((x - 3)^2\) and width 4. The perimeter of the rectangle is 40. Find the length.

2. A rectangular prism has length \(x + 2\), width \(x + 1\), height 4, and volume 24. Find the length and the width.

3. A piece of cardboard measures 12 ft by 12 ft. Corners are to be cut from it as shown by the broken lines, and the sides folded up to make a box with an open top. What size corners should be cut from the cardboard to make a box with the greatest possible volume?

4. What size corners should be cut from a piece of cardboard that measures 30 in. by 30 in. to make an open-top box with the greatest possible volume?

5. What is the maximum number of small boxes that can fit inside the large box?

6. The perimeter of a right triangle is 24 in. Find the dimensions of the triangle if the sides are all whole-number lengths.