1-7 Functions

Determine whether each relation is a function. Explain.

1.

**SOLUTION:**
A function is a relation in which each element of the domain is paired with exactly one element of the range. So, this relation is a function.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>-4</td>
<td>-1</td>
</tr>
<tr>
<td>-2</td>
<td>1</td>
</tr>
<tr>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

2.

**SOLUTION:**
A function is a relation in which each element of the domain is paired with exactly one element of the range. In the domain, the value 6 is paired with both 9 and 10. So, this relation is not a function.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
</tr>
</tbody>
</table>

3. \{(2, 2), (−1, 5), (5, 2), (2, −4)\}

**SOLUTION:**
A function is a relation in which each element of the domain is paired with exactly one element of the range. In the domain, the value 2 is paired with 2 and −4. So, this relation is not a function.

4. \(y = \frac{1}{2}x - 6\)

**SOLUTION:**

This is a function because no vertical line can be drawn so that it intersects the graph more than once.
1-7 Functions

**SOLUTION:**
A function is a relation in which each element of the domain is paired with exactly one element of the range. When \( x = 0, y = 1 \) and \( y = 6 \). So, this relation is not a function.

**SOLUTION:**
This is a function because no vertical line can be drawn so that it intersects the graph more than once.

**SOLUTION:**
This is a function because no vertical line can be drawn so that it intersects the graph more than once.
8. **SOLUTION:**

This is not a function because a vertical line can be drawn so that it intersects the graph more than once.
1-7 Functions

9. SCHOOL ENROLLMENT The table shows the total enrollment in U.S. public schools.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Enrollment</td>
<td>48,560</td>
<td>48,710</td>
<td>48,948</td>
<td>49,091</td>
</tr>
</tbody>
</table>

Source: The World Almanac

a. Write a set of ordered pairs representing the data in the table if \( x \) is the number of school years since 2004-2005.

b. Draw a graph showing the relationship between the year and enrollment.

c. Describe the domain and range of the data.

SOLUTION:
a. The school year is the domain for this relation. The enrollment is the range. So, when creating ordered pairs, the school year is first and the enrollment is second. The ordered pairs for this data are \( \{(0, 48,560), (1, 48,710), (2, 48,948), (3, 49,091)\} \).

b. The domain is the school year and the range is the enrollment.
1-7 Functions

10. CCSS REASONING The cost of sending cell phone pictures is given by \( y = 0.25x \), where \( x \) is the number of pictures sent, and \( y \) is the cost in dollars.

   a. Write the equation in function notation. Interpret the function in terms of the context.

   b. Find \( f(5) \) and \( f(12) \). What do these values represent?

   c. Determine the domain and range of this function.

**SOLUTION:**
In function notation, \( f(x) \) represents the range. So, the function looks like \( f(x) = 0.25x \) written in function notation.

\[
\begin{align*}
  f(x) &= 0.25x \\
  f(5) &= 0.25(5) \\
  &= 1.25 \\
  f(12) &= 0.25(12) \\
  &= 3
\end{align*}
\]

So, it costs $1.25 to send 5 photos and $3.00 to send 12 photos. The domain is the number of pictures sent and the cost is the range.

If \( f(x) = 6x + 7 \) and \( g(x) = x^2 - 4 \), find each value.

11. \( f(-3) \)

   **SOLUTION:**
   \[
   \begin{align*}
   f(x) &= 6x + 7 & \text{Original equation} \\
   f(-3) &= 6(-3) + 7 & \text{Replace } x \text{ with } -3. \\
   &= -18 + 7 & \text{Multiply.} \\
   &= -11 & \text{Add.}
   \end{align*}
   \]

12. \( f(m) \)

   **SOLUTION:**
   \[
   \begin{align*}
   f(x) &= 6x + 7 & \text{Original equation} \\
   f(m) &= 6m + 7 & \text{Replace } x \text{ with } m. \\
   &= 6m + 7 & \text{Multiply.}
   \end{align*}
   \]

13. \( f(r - 2) \)

   **SOLUTION:**
   \[
   \begin{align*}
   f(x) &= 6x + 7 & \text{Original equation} \\
   f(r - 2) &= 6(r - 2) + 7 & \text{Replace } x \text{ with } r - 2 \\
   &= 6r - 12 + 7 & \text{Distributive Property} \\
   &= 6r - 5 & \text{Add.}
   \end{align*}
   \]
1-7 Functions

14. \( g(5) \)

**SOLUTION:**

\[ g(x) = (x)^2 - 4 \]  \hspace{0.5cm} \text{Original equation}

\[ g(5) = (5)^2 - 4 \]  \hspace{0.5cm} \text{Replace } x \text{ with } 5

\[ = 25 - 4 \]  \hspace{0.5cm} \text{Evaluate powers.}

\[ = 21 \]  \hspace{0.5cm} \text{Subtract.}

15. \( g(a) + 9 \)

**SOLUTION:**

\[ g(x) + 9 = (x)^2 - 4 \]  \hspace{0.5cm} \text{Original equation}

\[ g(a) + 9 = (a)^2 - 4 \]  \hspace{0.5cm} \text{Replace } x \text{ with } a

\[ = a^2 - 4 + 9 \]  \hspace{0.5cm} \text{Evaluate powers.}

\[ = a^2 + 5 \]  \hspace{0.5cm} \text{Add.}

16. \( g(-4t) \)

**SOLUTION:**

\[ g(x) = (x)^2 - 4 \]  \hspace{0.5cm} \text{Original equation}

\[ g(-4t) = (-4t)^2 - 4 \]  \hspace{0.5cm} \text{Replace } x \text{ with } -4t.

\[ = 16t^2 - 4 \]  \hspace{0.5cm} \text{Evaluate powers.}

17. \( f(q + 1) \)

**SOLUTION:**

\[ f(x) = 6(x) + 7 \]  \hspace{0.5cm} \text{Original equation}

\[ f(q + 1) = 6(q + 1) + 7 \]  \hspace{0.5cm} \text{Replace } x \text{ with } q + 1.

\[ = 6q + 6 + 7 \]  \hspace{0.5cm} \text{Distributive property}

\[ = 6q + 13 \]  \hspace{0.5cm} \text{Add.}
1-7 Functions

18. \( f(2) + g(2) \)

**SOLUTION:**

\[
f(x) + g(x) = [\ell(x) + 7] + [(x)^2 - 4] \\
f(2) + g(2) = [\ell(2) + 7] + [(2)^2 - 4] \quad x = 2 \\
= [\ell(2) + 7] + [4 - 4] \\
= [12 + 7] + [4 - 4] \quad \text{Multiply.} \\
= [19] + [4 - 4] \quad \text{Add.} \\
= [19] + [0] \quad \text{Subtract.} \\
= 19 \quad \text{Multiply.}
\]

19. \( g(-b) \)

**SOLUTION:**

\[
g(x) = (x)^2 - 4 \quad \text{Original equation} \\
g(-b) = (-b)^2 - 4 \quad \text{Replace } x \text{ with } -b \\
= b^2 - 4 \quad \text{Evaluate powers.}
\]

**Determine whether each relation is a function. Explain.**

20.

**SOLUTION:**

A function is a relation in which each element of the domain is paired with exactly one element of the range. So, this relation is a function.

21.

**SOLUTION:**

A function is a relation in which each element of the domain is paired with exactly one element of the range. In the domain, the value 4 is paired with both 5 and 6. So, this relation is not a function.
22. **SOLUTION:**
A function is a relation in which each element of the domain is paired with exactly one element of the range. In the domain, the value \(-5\) is paired with both 3 and 5. So, this relation is not a function.

23. **SOLUTION:**
A function is a relation in which each element of the domain is paired with exactly one element of the range. So, this relation is a function.

24. **SOLUTION:**
A function is a relation in which each element of the domain is paired with exactly one element of the range. When \(x = 4\), \(y = 4\) and \(y = 6\). So, this relation is not a function.

25. **SOLUTION:**
This is a function because no vertical line can be drawn so that it intersects the graph more than once.
1-7 Functions

26. CCSS SENSE-MAKING The table shows the median home prices in the United States, from 2007 to 2009.

<table>
<thead>
<tr>
<th>Year</th>
<th>Median Home Price ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>234,300</td>
</tr>
<tr>
<td>2008</td>
<td>213,200</td>
</tr>
<tr>
<td>2009</td>
<td>212,200</td>
</tr>
</tbody>
</table>

a. Write a set of ordered pairs representing the data in the table.

b. Draw a graph showing the relationship between the year and price.

c. What is the domain and range for this data?

**SOLUTION:**
a. The year is the domain for this relation. The median price is the range. So, when creating ordered pairs, the year is first and the median price is second. The ordered pairs for this data are {(2007, 234,300), (2008, 213,200), (2009, 212,200)}.

b. The domain is the year. The range is the median home price.

**Determine whether each relation is a function.**

27. {(5, −7), (6, −7), (−8, −1), (0, −1)}

**SOLUTION:**
A function is a relation in which each element of the domain is paired with exactly one element of the range. So, this relation is a function.

28. {(4, 5), (3, −2), (−2, 5), (4, 7)}

**SOLUTION:**
A function is a relation in which each element of the domain is paired with exactly one element of the range. The value 4 is paired with 5 and 7. So, this relation is not a function.
1-7 Functions

29. $y = -8$

**SOLUTION:**
This is a function because no vertical line can be drawn so that it intersects the graph more than once.

30. $x = 15$

**SOLUTION:**
This is not a function because a vertical line can be drawn so that it intersects the graph more than once.

31. $y = 3x - 2$

**SOLUTION:**
This is a function because no vertical line can be drawn so that it intersects the graph more than once.

32. $y = 3x + 2y$

**SOLUTION:**
This is a function because no vertical line can be drawn so that it intersects the graph more than once.

If $f(x) = -2x - 3$ and $g(x) = x^2 + 5x$, find each value.

33. $f(-1)$

**SOLUTION:**

\[
\begin{align*}
  f(x) &= -2(x) - 3 & \text{Original equation} \\
  f(-1) &= -2(-1) - 3 & \text{Replace } x \text{ with } -1. \\
        &= 2 - 3 & \text{Multiply.} \\
        &= -1 & \text{Subtract.}
\end{align*}
\]

34. $f(6)$

**SOLUTION:**

\[
\begin{align*}
  f(x) &= -2(x) - 3 & \text{Original equation} \\
  f(6) &= -2(6) - 3 & \text{Replace } x \text{ with } 6. \\
        &= -12 - 3 & \text{Multiply.} \\
        &= -15 & \text{Subtract.}
\end{align*}
\]

35. $g(2)$

**SOLUTION:**

\[
\begin{align*}
  g(x) &= (x)^2 + 5x & \text{Original equation} \\
  g(2) &= (2)^2 + 5(2) & \text{Replace } x \text{ with } 2. \\
       &= 4 + 5(2) & \text{Evaluate powers.} \\
       &= 4 + 10 & \text{Multiply.} \\
       &= 14 & \text{Add}
\end{align*}
\]
1-7 Functions

36. \( g(-3) \)

**SOLUTION:**
\[
g(x) = (x)^2 + 5x \quad \text{Original equation}
\]
\[
g(-3) = (-3)^2 + 5(-3) \quad \text{Replace } x \text{ with } -3
\]
\[
= 9 + 5(-3) \quad \text{Evaluate powers}
\]
\[
= 9 + (-15) \quad \text{Multiply}
\]
\[
= -15 \quad \text{Add}
\]

37. \( g(-2) + 2 \)

**SOLUTION:**
\[
g(x) + 2 = [(x)^2 + 5x] + 2
\]
\[
g(-2) + 2 = [(-2)^2 + 5(-2)] + 2 \quad x = -2
\]
\[
= [4 + 5(-2)] + 2 \quad (-2)^2 = 4
\]
\[
= [4 + (-10)] + 2 \quad \text{Multiply}
\]
\[
= [-6] + 2 \quad \text{Add}
\]
\[
= -4 \quad \text{Add}
\]

38. \( f(0) - 7 \)

**SOLUTION:**
\[
f(x) - 7 = [-2(x) - 3] - 7 \quad \text{Original equation}
\]
\[
f(0) - 7 = [-2(0) - 3] - 7 \quad \text{Replace } x \text{ with } 0.
\]
\[
= [0 - 3] - 7 \quad \text{Multiply}
\]
\[
= [-3] - 7 \quad \text{Simplify}
\]
\[
= -10 \quad \text{Subtract}
\]

39. \( f(4y) \)

**SOLUTION:**
\[
f(x) = -2(x) - 3 \quad \text{Original equation}
\]
\[
f(4y) = -2(4y) - 3 \quad \text{Replace } x \text{ with } 4y
\]
\[
= -8y - 3 \quad \text{Multiply}
\]

40. \( g(-6m) \)

**SOLUTION:**
\[
g(x) = (x)^2 + 5x \quad \text{Original equation}
\]
\[
g(-6m) = (-6m)^2 + 5(-6m) \quad \text{Replace } x \text{ with } -6m
\]
\[
= 36m^2 + 5(-6m) \quad \text{Evaluate powers}
\]
\[
= 36m - 30m \quad \text{Multiply}
\]
1-7 Functions

41. $f(c - 5)$

**SOLUTION:**
\[
\begin{align*}
  f(x) &= -2(x) - 3 & \text{Original equation} \\
  f(c - 5) &= -2(c - 5) - 3 & \text{Replace } x \text{ with } c - 5. \\
  &= -2c + 10 - 3 & \text{Distributive Property} \\
  &= -2c + 7 & \text{Subtract.}
\end{align*}
\]

42. $f(r + 2)$

**SOLUTION:**
\[
\begin{align*}
  f(x) &= -2(x) - 3 & \text{Original equation} \\
  f(r + 2) &= -2(r + 2) - 3 & \text{Replace } x \text{ with } r + 2. \\
  &= -2r - 4 - 3 & \text{Distributive Property} \\
  &= -2r - 7 & \text{Subtract.}
\end{align*}
\]

43. $5[f(d)]$

**SOLUTION:**
\[
\begin{align*}
  f(x) &= -2(x) - 3 & \text{Original equation} \\
  5[f(x)] &= 5[-2(x) - 3] & \text{Product of 5 and } f(x) \\
  5[f(d)] &= 5[-2(d) - 3] & \text{Replace } x \text{ with } d. \\
  &= 5[-2d - 3] & \text{Multiply.} \\
  &= -10d - 15 & \text{Distributive Property}
\end{align*}
\]

44. $3[g(n)]$

**SOLUTION:**
\[
\begin{align*}
  g(x) &= (x)^2 + 5x & \text{Original equation} \\
  3[g(x)] &= 3[(x)^2 + 5x] & \text{Product of 3 and } g(x) \\
  3[g(n)] &= 3[(n)^2 + 5(n)] & \text{Replace } x \text{ with } n \\
  &= (n^2 + 5n) & \text{Evaluate powers.} \\
  &= 3[n^2 + 5n] & \text{Multiply.} \\
  &= 3n^2 + 15n & \text{Distributive Property}
\end{align*}
\]
45. **EDUCATION** The average national math test scores \( f(t) \) for 17-year-olds can be represented as a function of the national science scores \( t \) by \( f(t) = 0.8t + 72 \).

a. Graph this function. Interpret the function in terms of the context.

b. What is the science score that corresponds to a math score of 308?

c. What is the domain and range of this function?

**SOLUTION:**

a. 

When the science score is 0, the math score is 72. For each point the science score increases, the math score increases by 0.8 point.

b. 

\[
308 = 0.8t + 72 \\
308 - 72 = 0.8t + 72 - 72 \quad \text{Subtract.} \\
236 = 0.8t \quad \text{Simplify.} \\
\frac{236}{0.8} = \frac{0.8t}{0.8} \quad \text{Divide.} \\
295 = t \quad \text{Simplify.}
\]

c. The domain is the independent variable or \( x \)-variable. Thus the domain is the set of science scores. The range is the dependent variable or the \( y \)-variable. Thus, the range is the set of math scores.
1-7 Functions

Determine whether each relation is a function.

46. 

SOLUTION:
This is a function because no vertical line can be drawn so that it intersects the graph more than once.

47. 

SOLUTION:
This is a function because no vertical line can be drawn so that it intersects the graph more than once.
48. **BABYSITTING** Christina earns $7.50 an hour babysitting.

   a. Write an algebraic expression to represent the money Christina will earn if she works \( h \) hours.

   b. Choose five values for the number of hours Christina can babysit. Create a table with \( h \) and the value for the amount of money she will make during that time.

   c. Use the values in your table to create a graph.

   d. Does it make sense to connect the points in your graph with a line? Why or why not?

   **SOLUTION:**

   a. To find the money Christina will make babysitting, multiply the number of hours she worked by her pay or $7.50. So, an algebraic expression to represent the money she earns is $7.50h.

   b. Sample answer:

   ![Sample Answer Table]

   c. ![Graph of Amount Earned Babysitting]

   d. By connecting the points, all values between the numbers are included. So, the points should be connected because they could pay Christina for partial hours that she worked.
1-7 Functions

49. **OPEN ENDED** Write a set of three ordered pairs that represent a function. Choose another display that represents this function.

**SOLUTION:**
\{(−2, 3), (0, 3), (2, 5)\} is a set of ordered pairs.
A mapping is another display that represents the function. Place the x-coordinates in the domain and the y-coordinates in the range. Link each value in the domain with the corresponding value in the range.

```
<table>
<thead>
<tr>
<th>Domain</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>−2</td>
<td>3</td>
</tr>
<tr>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>
```

50. **REASONING** The set of ordered pairs \{(0, 1), (3, 2), (3, −5), (5, 4)\} represents a relation between \(x\) and \(y\). Graph the set of ordered pairs. Determine whether the relation is a function. Explain.

**SOLUTION:**

A function is a relation in which each element of the domain is paired with exactly one element of the range. The value 3 is paired with −5 and 2. So, this relation is not a function.

51. **CHALLENGE** Consider \(f(x) = −4.3x − 2\). Write \(f(g + 3.5)\) and simplify by combining like terms.

**SOLUTION:**
\[
f(g + 3.5) = −4.3(g + 3.5) − 2
= −4.3g − 15.05 − 2
= −4.3g − 17.05
\]

52. **WRITE A QUESTION** A classmate graphed a set of ordered pairs and used the vertical line test to determine whether it was a function. Write a question to help her decide if the same strategy can be applied to a mapping.

**SOLUTION:**
If the classmate could see the ordered pair in another way, it could help her see the relation. So, "Isn’t a mapping another representation of a set of ordered pairs?" is a good question to ask.
53. **CCSS PERSEVERENCE** If \( f(3b - 1) = 9b - 1 \), find one possible expression for \( f(x) \).

**SOLUTION:**
Our input is \( 3b - 1 \) and our output is \( 9b - 1 \). We need to find a function that convert the input to the output.
Let’s look at the variable first. What can we do to \( 3b \) to change it to \( 9b \)? \( 3 \times 3 = 9 \), so let’s multiply by 3. Let \( f(x) = 3x \). Test the function.

\[
\begin{align*}
f(x) &= 3x \\
f(3b - 1) &= 3(3b - 1) \\
&= 9b - 3
\end{align*}
\]

We did not get \( 9b - 1 \), but we were close. How can we change the “-3” to a “-1”? Add 2. Now, let’s try \( f(x) = 3x + 2 \).

\[
\begin{align*}
f(x) &= 3x + 2 \\
f(3b - 1) &= 3(3b - 1) + 2 \\
&= 9b - 3 + 2 \\
&= 9b - 1
\end{align*}
\]
We have found a function that works.
54. **ERROR ANALYSIS** Corazon thinks \( f(x) \) and \( g(x) \) are representations of the same function. Maggie disagrees. Who is correct? Explain your reasoning.

**SOLUTION:**

The graph has a \( y \)-intercept of 1. It also contains the point \((1, -1)\), which we can use to determine the slope:

\[
m = \frac{y_2 - y_1}{x_2 - x_1}
\]

\[
= \frac{-1 - 1}{1 - 0}
\]

\[
= \frac{-2}{1}
\]

\[
= -2
\]

The equation for \( f(x) \) is: \( f(x) = -2x + 1 \).

For the table, we can see that as \( x \) increases by 1, \( g(x) \) decreases by 2, which means the slope of \( g(x) \) is \(-2\). But the \( y \)-intercept for \( g(x) \) is \((0, -1)\), giving \( g(x) = -2x - 1 \).

The graph and table are representative of different functions.
55. **WRITING IN MATH** How can you determine whether a relation represents a function?

**SOLUTION:**
A relation is a function if each element of the domain is paired with exactly one element of the range. If given a graph, this means that it must pass the vertical line test.

<table>
<thead>
<tr>
<th>Function</th>
<th>Not a function</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="function_graph.png" alt="Graph" /></td>
<td><img src="not_function_graph.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

If given a table, or a set of ordered pairs, you can look to see if any value of the domain has more than one corresponding value in the range.

<table>
<thead>
<tr>
<th>Function</th>
<th>Not a function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><img src="function_table.png" alt="Table" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Not a function</th>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="not_function_table.png" alt="Table" /></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1-7 Functions

56. Which point on the number line represents a number whose square is less than itself?

![Number Line Diagram]

A A

B B

C C

D D

SOLUTION:
Consider the squares of all the numbers.

<table>
<thead>
<tr>
<th>Point</th>
<th>Value</th>
<th>Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>−1.75</td>
<td>3.0625</td>
</tr>
<tr>
<td>B</td>
<td>0.5</td>
<td>0.25</td>
</tr>
<tr>
<td>C</td>
<td>1.33</td>
<td>1.7689</td>
</tr>
<tr>
<td>D</td>
<td>2.85</td>
<td>8.1225</td>
</tr>
</tbody>
</table>

From the table, point B represents a number whose square is less than itself. Choice B is the correct answer.

57. Determine which of the following relations is a function.

F {(−3, 2), (4, 1), (−3, 5)}

G {(2, −1), (4, −1), (2, 6)}

H {(−3, −4), (−3, 6), (8, −2)}

J {(5, −1), (3, −2), (−2, −2)}

SOLUTION:
Consider the domain and range for each choice.

<table>
<thead>
<tr>
<th>Choice</th>
<th>Domain</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>−3, 4</td>
<td>2, 1, 5</td>
</tr>
<tr>
<td>G</td>
<td>2, 4</td>
<td>−1, 6</td>
</tr>
<tr>
<td>H</td>
<td>−3, 8</td>
<td>−4, 6, −2</td>
</tr>
<tr>
<td>J</td>
<td>5, 3, −2</td>
<td>−1, −2</td>
</tr>
</tbody>
</table>

From the table, choice J is the only one with three numbers in the domain row. The other rows have less, because one of the domain members is repeated. Thus, {(5, −1), (3, −2), (−2, −2)} is the only relation where each element of the domain is paired with exactly one element of the range. So, choice J is the correct answer.
58. GEOMETRY What is the value of \( x \)?

A 3 in  
B 4 in.  
C 5 in.  
D 6 in.

**SOLUTION:**
Properties of similar triangles can be used to find \( x \). The triangle with a hypotenuse of 4 is similar to the triangle with a leg of 9. Set up a proportion to find \( x \). Let the hypotenuse of each triangle be the numerator and let the corresponding leg of each triangle be the denominator of each ratio.

\[
\frac{4}{x} = \frac{12}{9}
\]

\[
12x = 36 \quad \text{Cross multiply.}
\]

\[
\frac{12x}{12} = \frac{36}{12} \quad \text{Divide by 12.}
\]

\[
x = 3 \quad \text{Simplify.}
\]

So, \( x \) is 3 inches. Choices C and D are not possible since the leg of the triangle cannot be longer than the hypotenuse. Choice B would make the \( x \) the same length as the hypotenuse. That would only work if the hypotenuse of the larger triangle equals the height of 9, which is not the case. Thus choice A is the correct answer.

59. SHORT RESPONSE Camille made 16 out of 19 of her serves during her first volleyball game. She made 13 out of 16 of her serves during her second game. During which game did she make a greater percent of her serves?

**SOLUTION:**
First, each number of serves needs to be made into a percentage. Then, compare the percentages to see which is greater.

\[
\frac{16}{19} \approx .84 = 84\%
\]

\[
\frac{13}{16} \approx .81 = 81\%
\]

In her first game, she made 84% of her serves, which is more than her second game of 81%.
1-7 Functions

Solve each equation.

60. \( x = \frac{27 + 3}{10} \)

**SOLUTION:**

\[
x = \frac{27 + 3}{10} = \frac{30}{10} = 3
\]

61. \( m = \frac{3^2 + 4}{7 - 5} \)

**SOLUTION:**

\[
m = \frac{3^2 + 4}{7 - 5} = \frac{9 + 4}{2} = \frac{13}{2}
\]

62. \( z = 32 + 4(-3) \)

**SOLUTION:**

\[
z = 32 + 4(-3) = 32 + (-12) = 20
\]
1-7 Functions

63. **SCHOOL SUPPLIES** The table shows the prices of some items Tom needs. If he needs 4 glue sticks, 10 pencils, and 4 notebooks, write and evaluate an expression to determine Tom’s cost.

<table>
<thead>
<tr>
<th>School Supplies Prices</th>
</tr>
</thead>
<tbody>
<tr>
<td>glue stick</td>
</tr>
<tr>
<td>pencil</td>
</tr>
<tr>
<td>notebook</td>
</tr>
</tbody>
</table>

**SOLUTION:**
To find the amount Tom will spend, multiply the price by the number of each item purchased. The sum of these will give the total cost. Let \( g \) be the number of glue sticks, \( p \) the number of pencils, and \( n \) the number of notebooks. Substitute 4 for \( g \), 10 for \( p \), and 4 for \( n \).

\[
C = 1.99g + 0.25p + 1.85n
\]

\[
= 1.99(4) + 0.25(10) + 1.85(4) \quad \text{Substitute}
\]

\[
= 7.96 + 2.5 + 7.4 \quad \text{Multiply}
\]

\[
= 17.86 \quad \text{Add}
\]

The total cost of the school supplies Tom needs is $17.86.

**Write a verbal expression for each algebraic expression.**
64. \( 4y + 2 \)

**SOLUTION:**
The expression shows the sum of two terms, \( 4y \) and 2. Because the 4 and \( y \) are written next to each other, they are being multiplied. So, the verbal expression *four times \( y \) plus two* can be used to describe the algebraic expression \( 4y + 2 \).

65. \( \frac{2}{3}x \)

**SOLUTION:**

\( \frac{2}{3} \) and \( x \) are next to each other, they are being multiplied. So, the verbal expression *two-thirds times \( x \)* can be used to describe the algebraic expression \( \frac{2}{3}x \).

66. \( a^2b + 5 \)

**SOLUTION:**
The expression shows the sum of two terms, \( a^2b \) and 5. Because \( a^2 \) and \( b \) are next to each other, they are being multiplied. The factor \( a^2 \) represents a number raised to the second power. So, the verbal expression *a squared times \( b \) plus 5* can be used to describe the algebraic expression \( a^2b + 5 \).
1-7 Functions

Find the volume of each rectangular prism.

67.

**SOLUTION:**
Replace \( \ell \) with 3.2, \( w \) with 2.2, and \( h \) with 5.4.

\[
V = \ell wh \\
= (3.2)(2.2)(5.4) \quad \text{Substitute.} \\
= 38.016 \quad \text{Multiply.}
\]

So, the volume of the rectangular prism is 38.016 cubic centimeters.

68.

**SOLUTION:**
The length, width, and height of the solid are each \( 1\frac{1}{2} \) in.

\[
V = \ell wh \\
= \frac{3}{2} \cdot \frac{3}{2} \cdot \frac{3}{2} \quad \text{Rewrite} \, \frac{1}{2} \, \text{as} \, \frac{3}{2} \\
= \frac{27}{8} \quad \text{Multiply.} \\
= 3\frac{3}{8} \quad \text{Simplify}
\]

So, the volume of the rectangular prism is \( 3\frac{3}{8} \) cubic inches.
1-7 Functions

69.

**SOLUTION:**
Let \( l = 180, w = 40, \) and \( h = 40. \)

\[
V = \ell \cdot w \cdot h \\
= 180 \cdot 40 \cdot 40 \quad \text{Substitute} \\
= 288,000 \quad \text{Multiply.}
\]

So, the volume of the rectangular prism is 288,000 cubic millimeters.

**Evaluate each expression.**
70. If \( x = 3, \) then \( 6x - 5 = ? \).

**SOLUTION:**
\[
6(3) - 5 = 18 - 5 \\
= 13
\]

71. If \( n = -1, \) then \( 2n + 1 = ? \).

**SOLUTION:**
\[
2(-1) + 1 = -2 + 1 \\
= -1
\]

72. If \( p = 4, \) then \( 3p + 4 = ? \).

**SOLUTION:**
\[
3(4) + 4 = 12 + 4 \\
= 16
\]

73. If \( q = 7, \) then \( 7q - 9 = ? \).

**SOLUTION:**
\[
7(7) - 9 = 49 - 9 \\
= 40
\]

74. If \( y = 10, \) then \( 8y - 15 = ? \).

**SOLUTION:**
\[
8(10) - 15 = 80 - 15 \\
= 65
\]
1-7 Functions

75. If \( k = -11 \), then \( 4k + 6 = \underline{?} \).

**SOLUTION:**

\[
4(-11) + 6 = -44 + 6 = -38
\]