1-5 Equations

Find the solution set of each equation if the replacement set is \{11, 12, 13, 14, 15\}.

1. \( n + 10 = 23 \)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( n )</th>
<th>( n + 10 = 23 )</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>11 + 10 = 23</td>
<td>False</td>
</tr>
<tr>
<td>12</td>
<td>12 + 10 = 23</td>
<td>False</td>
</tr>
<tr>
<td>13</td>
<td>13 + 10 = 23</td>
<td>True</td>
</tr>
<tr>
<td>14</td>
<td>14 + 10 = 23</td>
<td>False</td>
</tr>
<tr>
<td>15</td>
<td>15 + 10 = 23</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \{13\}.

2. \( 7 = \frac{c}{2} \)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( c )</th>
<th>( 7 = \frac{c}{2} )</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>7 = ( \frac{11}{2} )</td>
<td>False</td>
</tr>
<tr>
<td>12</td>
<td>7 = ( \frac{12}{2} )</td>
<td>False</td>
</tr>
<tr>
<td>13</td>
<td>7 = ( \frac{13}{2} )</td>
<td>False</td>
</tr>
<tr>
<td>14</td>
<td>7 = ( \frac{14}{2} )</td>
<td>True</td>
</tr>
<tr>
<td>15</td>
<td>7 = ( \frac{15}{2} )</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \{14\}.

3. \( 29 = 3x - 7 \)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( x )</th>
<th>( 29 = 3x - 7 )</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>29 = 3(11) - 7</td>
<td>False</td>
</tr>
<tr>
<td>12</td>
<td>29 = 3(12) - 7</td>
<td>True</td>
</tr>
<tr>
<td>13</td>
<td>29 = 3(13) - 7</td>
<td>False</td>
</tr>
<tr>
<td>14</td>
<td>29 = 3(14) - 7</td>
<td>False</td>
</tr>
<tr>
<td>15</td>
<td>29 = 3(15) - 7</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \{12\}.
1-5 Equations

4. \((k - 8)12 = 84\)

**SOLUTION:**

<table>
<thead>
<tr>
<th>(k)</th>
<th>((k - 8)12 = 84)</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>((11 - 8)12 = 84)</td>
<td>False</td>
</tr>
<tr>
<td>12</td>
<td>((12 - 8)12 = 84)</td>
<td>False</td>
</tr>
<tr>
<td>13</td>
<td>((13 - 8)12 = 84)</td>
<td>False</td>
</tr>
<tr>
<td>14</td>
<td>((14 - 8)12 = 84)</td>
<td>False</td>
</tr>
<tr>
<td>15</td>
<td>((15 - 8)12 = 84)</td>
<td>True</td>
</tr>
</tbody>
</table>

The solution set is \{15\}.

5. **MULTIPLE CHOICE** Solve \(\frac{d + 5}{10} = 2\).

A 10  
B 15  
C 20  
D 25

**SOLUTION:**

<table>
<thead>
<tr>
<th>(d)</th>
<th>(\frac{d + 5}{10} = 2)</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>(\frac{10 + 5}{10} = 2)</td>
<td>False</td>
</tr>
<tr>
<td>15</td>
<td>(\frac{15 + 5}{10} = 2)</td>
<td>True</td>
</tr>
<tr>
<td>20</td>
<td>(\frac{20 + 5}{10} = 2)</td>
<td>False</td>
</tr>
<tr>
<td>25</td>
<td>(\frac{25 + 5}{10} = 2)</td>
<td>False</td>
</tr>
</tbody>
</table>

The correct answer is B.

Solve each equation.

6. \(x = 4(6) + 3\)

**SOLUTION:**

\[
x = 4(6) + 3 \quad \text{Original Equation}
\]

\[
= 24 + 3 \quad \text{Multiply.}
\]

\[
= 27 \quad \text{Add 24 and 3.}
\]
1-5 Equations

7. \( 14 - 82 = w \)

**SOLUTION:**

\[
14 - 82 = w \quad \text{Original Equation} \\
-68 = w \quad \text{Subtract 82 from 14.}
\]

8. \( 5 + 22a = 2 + 10 \div 2 \)

**SOLUTION:**

\[
5 + 22a = 2 + 10 \div 2 \quad \text{Original Equation} \\
5 + 22a = 2 + 5 \quad \text{Divide 10 by 2.} \\
5 + 22a = 7 \quad \text{Add 2 and 5.}
\]

Test values for \( a \).

\[
5 + 22(1) = 27 \\
5 + 22(0) = 5
\]

7 is in between 5 and 27, and is very close to 5, so the solution should be close to 0. Try a few more.

\[
5 + 22\left(\frac{1}{2}\right) = 16 \\
5 + 22\left(\frac{1}{4}\right) = 10.25 \\
5 + 22\left(\frac{1}{8}\right) = 7.75 \\
5 + 22\left(\frac{1}{10}\right) = 7.2 \\
5 + 22\left(\frac{1}{11}\right) = 2
\]

Through a good amount of guessing, we have come to a solution of \( \frac{1}{11} \).
9. \((2 \cdot 5) + \frac{c^3}{3} = c^3 \div (1^5 + 2) + 10\)

**SOLUTION:**

\[
(2 \cdot 5) + \frac{c^3}{3} = c^3 \div (1^5 + 2) + 10 \quad \text{Original equation}
\]

\[
(2 \cdot 5) + \frac{c^3}{3} = c^3 \div (1 + 2) + 10 \quad \text{Evaluate powers}
\]

\[
10 + \frac{c^3}{3} = c^3 \div (1 + 2) + 10 \quad \text{Multiply 2 by 5.}
\]

\[
10 + \frac{c^3}{3} = c^3 + 3 + 10 \quad \text{Add 1 and 2.}
\]

\[
10 + \frac{c^3}{3} = \frac{c^3}{3} + 10 \quad \text{Divide } c^3 \text{ by 3.}
\]

\[
\frac{c^3}{3} + 10 = \frac{c^3}{3} + 10 \quad \text{Comm. Prop.}
\]

Notice that the left side of the equation is identical to the right side of the equation. No matter what value is substituted for \(c\), the left side of the equation will always be equal to the right side of the equation. So, the equation will always be true. The solution is all real numbers.

10. **RECYCLING** San Francisco has a recycling facility that accepts unused paint. Volunteers blend and mix the paint into different colors and give it away in 5-gallon buckets. Write and solve an equation to find the number of buckets of paint given away from the 30,000 gallons that are donated.

**SOLUTION:**

Let \(b\) represent the number of buckets of paint and let \(g\) represent the gallons of paint donated.

\[b = \frac{g}{5}\]

\[b = \frac{30,000}{5} \quad \text{Replace } g \text{ with 30,000.}
\]

\[b = 6,000 \quad \text{Divide 30,000 by 5.}
\]

So, 6000 buckets of paint are given away.
1-5 Equations

Find the solution set of each equation if the replacement sets are y: \{1, 3, 5, 7, 9\} and z: \{10, 12, 14, 16, 18\}.

11. \( z + 10 = 22 \)

**SOLUTION:**

| \( z \) | \( z + 10 = 22 \) | True or False?
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10 + 10 = 22</td>
<td>False</td>
</tr>
<tr>
<td>12</td>
<td>12 + 10 = 22</td>
<td>True</td>
</tr>
<tr>
<td>14</td>
<td>14 + 10 = 22</td>
<td>False</td>
</tr>
<tr>
<td>16</td>
<td>16 + 10 = 22</td>
<td>False</td>
</tr>
<tr>
<td>18</td>
<td>18 + 10 = 22</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \{12\}.

12. \( 52 = 4z \)

**SOLUTION:**

| \( z \) | \( 52 = 4z \) | True or False?
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>52 = 4 \cdot 10</td>
<td>False</td>
</tr>
<tr>
<td>12</td>
<td>52 = 4 \cdot 12</td>
<td>False</td>
</tr>
<tr>
<td>14</td>
<td>52 = 4 \cdot 14</td>
<td>False</td>
</tr>
<tr>
<td>16</td>
<td>52 = 4 \cdot 16</td>
<td>False</td>
</tr>
<tr>
<td>18</td>
<td>52 = 4 \cdot 18</td>
<td>False</td>
</tr>
</tbody>
</table>

There is no solution.

13. \( \frac{15}{y} = 3 \)

**SOLUTION:**

| \( y \) | \( \frac{15}{y} = 3 \) | True or False?
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( \frac{15}{1} = 3 )</td>
<td>False</td>
</tr>
<tr>
<td>3</td>
<td>( \frac{15}{3} = 3 )</td>
<td>False</td>
</tr>
<tr>
<td>5</td>
<td>( \frac{15}{5} = 3 )</td>
<td>True</td>
</tr>
<tr>
<td>7</td>
<td>( \frac{15}{7} = 3 )</td>
<td>False</td>
</tr>
<tr>
<td>9</td>
<td>( \frac{15}{9} = 3 )</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \{5\}.
1-5 Equations

14. \( 17 = 24 - y \)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( y )</th>
<th>( 17 = 24 - y )</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>17 = 24 - 1</td>
<td>False</td>
</tr>
<tr>
<td>3</td>
<td>17 = 24 - 3</td>
<td>False</td>
</tr>
<tr>
<td>5</td>
<td>17 = 24 - 5</td>
<td>False</td>
</tr>
<tr>
<td>7</td>
<td>17 = 24 - 7</td>
<td>True</td>
</tr>
<tr>
<td>9</td>
<td>17 = 24 - 9</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \( \{7\} \).

15. \( 2z - 5 = 27 \)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( z )</th>
<th>( 2z - 5 = 27 )</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>2(10) - 5 = 27</td>
<td>False</td>
</tr>
<tr>
<td>12</td>
<td>2(12) - 5 = 27</td>
<td>False</td>
</tr>
<tr>
<td>14</td>
<td>2(14) - 5 = 27</td>
<td>False</td>
</tr>
<tr>
<td>16</td>
<td>2(16) - 5 = 27</td>
<td>True</td>
</tr>
<tr>
<td>18</td>
<td>2(18) - 5 = 27</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \( \{16\} \).

16. \( 4(y + 1) = 40 \)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( y )</th>
<th>( 4(y + 1) = 40 )</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4(1 + 1) = 40</td>
<td>False</td>
</tr>
<tr>
<td>3</td>
<td>4(3 + 1) = 40</td>
<td>False</td>
</tr>
<tr>
<td>5</td>
<td>4(5 + 1) = 40</td>
<td>False</td>
</tr>
<tr>
<td>7</td>
<td>4(7 + 1) = 40</td>
<td>False</td>
</tr>
<tr>
<td>9</td>
<td>4(9 + 1) = 40</td>
<td>True</td>
</tr>
</tbody>
</table>

The solution set is \( \{9\} \).
17. \(22 = \frac{60}{y} + 2\)

**SOLUTION:**

<table>
<thead>
<tr>
<th>(y)</th>
<th>(22 = \frac{60}{y} + 2)</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(22 = \frac{60}{1} + 2)</td>
<td>False</td>
</tr>
<tr>
<td>3</td>
<td>(22 = \frac{60}{3} + 2)</td>
<td>True</td>
</tr>
<tr>
<td>5</td>
<td>(22 = \frac{60}{5} + 2)</td>
<td>False</td>
</tr>
<tr>
<td>7</td>
<td>(22 = \frac{60}{7} + 2)</td>
<td>False</td>
</tr>
<tr>
<td>9</td>
<td>(22 = \frac{60}{9} + 2)</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \(\{3\}\).

18. \(111 = z^2 + 11\)

**SOLUTION:**

<table>
<thead>
<tr>
<th>(z)</th>
<th>(111 = z^2 + 11)</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>(111 = (10)^2 + 11)</td>
<td>True</td>
</tr>
<tr>
<td>12</td>
<td>(111 = (12)^2 + 11)</td>
<td>False</td>
</tr>
<tr>
<td>14</td>
<td>(111 = (14)^2 + 11)</td>
<td>False</td>
</tr>
<tr>
<td>16</td>
<td>(111 = (16)^2 + 11)</td>
<td>False</td>
</tr>
<tr>
<td>18</td>
<td>(111 = (18)^2 + 11)</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \(\{10\}\).

**Solve each equation.**

19. \(a = 32 - 9(2)\)

**SOLUTION:**

\(a = 32 - 9(2)\) **Original equation**

\(a = 32 - 18\) **Multiply 9 by 2.**

\(a = 14\) **Subtract 18 from 32.**
1-5 Equations

20. \( w = 56 ÷ (2^2 + 3) \)

\[ w = 56 ÷ (2^2 + 3) \quad \text{Original equation} \]
\[ w = 56 ÷ (4 + 3) \quad \text{Evaluate power.} \]
\[ w = 56 ÷ 7 \quad \text{Add 4 and 3.} \]
\[ w = 8 \quad \text{Divide 56 by 7.} \]

21. \( \frac{27+5}{16} = g \)

\[ \frac{27+5}{16} = g \quad \text{Original equation} \]
\[ \frac{32}{16} = g \quad \text{Add 27 and 5.} \]
\[ 2 = g \quad \text{Divide 32 by 16.} \]

22. \( \frac{12·5}{15−3} = y \)

\[ \frac{12·5}{15−3} = y \quad \text{Original equation} \]
\[ \frac{60}{15−3} = y \quad \text{Multiply 12 by 5.} \]
\[ \frac{60}{12} = y \quad \text{Subtract 3 from 15.} \]
\[ 5 = y \quad \text{Divide 60 by 12.} \]

23. \( r = \frac{9(6)}{(8+1)3} \)

\[ r = \frac{9(6)}{(8+1)3} \quad \text{Original equation} \]
\[ r = \frac{54}{(9)3} \quad \text{Multiply 9 by 6.} \]
\[ r = \frac{54}{27} \quad \text{Multiply 54 by 27.} \]
\[ r = 2 \quad \text{Divide 54 by 27.} \]
1-5 Equations

24. \( a = \frac{4(14 - 1)}{3(6) - 5} + 7 \)

**SOLUTION:**

\[ a = \frac{4(14 - 1)}{3(6) - 5} + 7 \quad \text{Original equation} \]

\[ a = \frac{4(13)}{18 - 5} + 7 \quad \text{Subtract 1 from 14.} \]

\[ a = \frac{52}{13} + 7 \quad \text{Multiply 4 by 13.} \]

\[ a = \frac{52}{13} + 7 \quad \text{Subtract 5 from 18.} \]

\[ a = 4 + 7 \quad \text{Divide 52 by 13.} \]

\[ a = 11 \quad \text{Add 4 and 7.} \]

25. \((4 - 2^2 + 5)w = 25\)

**SOLUTION:**

\((4 - 2^2 + 5)w = 25 \quad \text{Original equation} \)

\((4 - 4 + 5)w = 25 \quad \text{Evaluate power.} \)

\((0 + 5)w = 25 \quad \text{Subtract 4 from 4.} \)

\[ 5w = 25 \quad \text{Simplify.} \]

\[ w = 5 \quad \text{Divide each side by 5.} \]

26. \(7 + x - (3 + 32 + 8) = 3\)

**SOLUTION:**

\(7 + x - (3 + 32 + 8) = 3 \quad \text{Original equation} \)

\(7 + x - (3 + 4) = 3 \quad \text{Divide 32 by 8.} \)

\(7 + x - 7 = 3 \quad \text{Add 3 and 4.} \)

\(7 + (-7) + x = 3 \quad \text{Commutative Property} \)

\[ 0 + x = 3 \quad \text{Subtract 7 from 7.} \]

\[ x = 3 \quad \text{Simplify.} \]
27. \(3^2 - 2 \cdot 3 + u = (3^3 - 3 \cdot 8)(2) + u\)

**SOLUTION:**

\[
3^2 - 2 \cdot 3 + u = (3^3 - 3 \cdot 8)(2) + u
\]

9 - 2 \cdot 3 + u = (27 - 3 \cdot 8)(2) + u \quad \text{Evaluate power.}

9 - 6 + u = (27 - 3 \cdot 8)(2) + u \quad \text{Multiply.}

9 - 6 + u = (27 - 24)(2) + u \quad \text{Multiply.}

9 - 6 + u = 3(2) + u \quad \text{Subtract.}

3 + u = 3(2) + u \quad \text{Subtract.}

3 + u = 6 + u \quad \text{Multiply.}

No matter what real value is substituted for \(u\), the left side of the equation will always be three less than the right side of the equation. So, the equation will never be true, and there is no solution.

28. \((3 \cdot 6 + 2)\nu + 10 = 3^2 \nu + 9\)

**SOLUTION:**

\[
(3 \cdot 6 + 2)\nu + 10 = 3^2 \nu + 9 \quad \text{Original equation}
\]

\[
(18 + 2)\nu + 10 = 3^2 \nu + 9 \quad \text{Multiply 3 by 6.}
\]

\[
(18 + 2)\nu + 10 = 9\nu + 9 \quad \text{Evaluate power.}
\]

\[
9\nu + 10 = 9\nu + 9 \quad \text{Divide 18 by 2.}
\]

No matter what real value is substituted for \(\nu\), the left side of the equation will always be one more than the right side of the equation. So, the equation will never be true, and there is no solution.

29. \(6k + (3 \cdot 10 - 8) = (2 \cdot 3)k + 22\)

**SOLUTION:**

\[
6k + (3 \cdot 10 - 8) = (2 \cdot 3)k + 22 \quad \text{Original equation}
\]

\[
6k + (30 - 8) = 6k + 22 \quad \text{Multiply 2 by 3.}
\]

\[
6k + (30 - 8) = 6k + 22 \quad \text{Multiply 2 by 3.}
\]

\[
6k + 22 = 6k + 22 \quad \text{Subtract 24 from 27}
\]

No matter what value is substituted for \(k\), the left side of the equation will always be equal to the right side of the equation. So, the equation will always be true. The solution is all real numbers.
30. \((3 \cdot 5)t + (21-12) = 15t + 3^2\)

**SOLUTION:**

\[
(3 \cdot 5)t + (21-12) = 15t + 3^2 \\
15t + 9 = 15t + 9 \\
15t + 9 = 15t + 9 \\
15t + 9 = 15t + 9
\]

Evaluate power. Multiply 2 by 3. Subtract 24 from 27.

No matter what value is substituted for \(h\), the left side of the equation will always be equal to the right side of the equation. So, the equation will always be true. The solution is all real numbers.

31. \((2^4 - 3 \cdot 5)q + 13 = (2 \cdot 9 - 4^2)q + \left(\frac{34}{12} - 1\right)\)

**SOLUTION:**

\[
(2^4 - 3 \cdot 5)q + 13 = (2 \cdot 9 - 4^2)q + \left(\frac{34}{12} - 1\right) \\
(16 - 3 \cdot 5)q + 13 = (2 \cdot 9 - 4^2)q + \left(\frac{34}{12} - 1\right) \\
(16 - 15)q + 13 = (2 \cdot 9 - 16)q + \left(\frac{34}{12} - 1\right) \\
(16 - 15)q + 13 = (18 - 16)q + \left(\frac{34}{12} - 1\right) \\
(16 - 15)q + 13 = (18 - 16)q + \left(\frac{12}{12} - 1\right) \\
q + 13 = (18 - 16)q + (1 - 1) \\
q + 13 = 2q + (1 - 1) \\
q + 13 = 2q + 0 \\
q + 13 = 2q
\]

Test values of \(q\) for which the statement is true.

\[
\begin{align*}
10 + 13 & \neq 2(10) \\
23 & \neq 20 \\
12 + 13 & \neq 2(12) \\
25 & \neq 24 \\
13 + 13 & \neq 2(13) \\
26 & = 26
\end{align*}
\]

The only value for \(q\) that makes the equation true is 13. So, \(q = 13\).
32. \( \frac{3 \cdot 22}{18 + 4} - \left( \frac{4^2}{9 + 7} - 1 \right) = r + \left( \frac{8 \cdot 9}{3} + 3 \right) \)

**SOLUTION:**

\[
\frac{3 \cdot 22}{18 + 4} - \left( \frac{4^2}{9 + 7} - 1 \right) = r + \left( \frac{8 \cdot 9}{3} + 3 \right)
\]

Multiply.

\[
\frac{66}{18 + 4} - \left( \frac{16}{9 + 7} - 1 \right) = r + \left( \frac{8 \cdot 9}{3} + 3 \right)
\]

Add.

\[
\frac{66}{18 + 4} - \left( \frac{16}{16} - 1 \right) = r + \left( \frac{72}{3} + 3 \right)
\]

Multiply.

\[
\frac{66}{22} - \left( \frac{16}{16} - 1 \right) = r + \left( \frac{72}{3} + 3 \right)
\]

Add.

\[
3r - (1 - 1) = r + \left( \frac{72}{3} + 3 \right)
\]

Divide.

\[
3r - 0 = r + (24 + 3)
\]

Divide.

\[
3r - 0 = r + 8
\]

Subtract.

\[
3r = r + 8
\]

Simplify.

Test values of \( r \) for which the statement is true.

\[
\begin{align*}
3(0) & \neq 0 + 8 \\
0 & \neq 8 \\
3(2) & \neq 2 + 8 \\
6 & \neq 10 \\
3(4) & \neq 4 + 8 \\
12 & = 12
\end{align*}
\]

The only value for \( r \) that makes the equation true is 4. So, \( r = 4 \).
33. **SCHOOL** A conference room can seat a maximum of 85 people. The principal and two counselors need to meet with the school’s juniors to discuss college admissions. If each student must bring a parent with them, how many students can attend each meeting? Assume that each student has a unique set of parents.

**SOLUTION:**
Let \( j \) represent the number of juniors. Then \( 2j \) represents every student-parent pair. Write an equation to represent how many students can attend each meeting.

\[ 3 + 2j = 85 \]

Test values of \( j \) for which the statement is true.

\[
\begin{align*}
3 + 2(20) & \neq 85 \\
3 + 40 & \neq 85 \\
43 & \neq 85 \\
3 + 2(40) & \neq 85 \\
3 + 80 & \neq 85 \\
83 & \neq 85 \\
3 + 2(41) & \neq 85 \\
3 + 82 & \neq 85 \\
85 & = 85
\end{align*}
\]

The only value for \( j \) that makes the equation true is 41. So, 41 students can attend each meeting.

34. **CCSS MODELING** The perimeter of a regular octagon is 128 inches. Find the length of each side.

**SOLUTION:**
A regular octagon has 8 congruent sides. Let \( P \) represent the perimeter of the regular octagon and \( x \) represent the side length. Write an equation.

\[ P = x + x + x + x + x + x + x + x \]
\[ 128 = 8x \]

The only value for \( x \) that makes the equation true is 16. So, \( x = 16 \). So, the length of each side is 16 inches.

35. **SPORTS** A 200-pound athlete who trains for four hours per day requires 2836 Calories for basic energy requirements. During training, the same athlete requires an additional 3091 Calories for extra energy requirements. Write an equation to find \( C \), the total daily Calorie requirement for this athlete. Then solve the equation.

**SOLUTION:**
Let \( C \) represent the total daily Calorie requirement for the athlete.

\[ C = 2836 + 3091 \]
\[ C = 5927 \]

So, an athlete needs 5927 Calories per day.
36. **ENERGY** An electric generator can power 3550 watts of electricity. Write and solve an equation to find how many 75-watt light bulbs a generator could power.

**SOLUTION:**
Let \( x \) represent the number of light bulbs the generator could power.

\[
3550 = 75x
\]

\[
\frac{3550}{75} \approx 47.3
\]

The only value for \( x \) that makes the equation true is between 47 and 48.
So, the generator can power about 47 light bulbs.

Make a table of values for each equation if the replacement set is \( \{-2, -1, 0, 1, 2\} \).

37. \( y = 3x - 2 \)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( x )</th>
<th>( 3x - 2 )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>3(-2) - 2</td>
<td>-8</td>
</tr>
<tr>
<td>-1</td>
<td>3(-1) - 2</td>
<td>-5</td>
</tr>
<tr>
<td>0</td>
<td>3(0) - 2</td>
<td>-2</td>
</tr>
<tr>
<td>1</td>
<td>3(1) - 2</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>3(2) - 2</td>
<td>4</td>
</tr>
</tbody>
</table>

38. \( 3.25x + 0.75 = y \)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( x )</th>
<th>( 3.25x + 0.75 )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>3.25(-2) + 0.75</td>
<td>-5.75</td>
</tr>
<tr>
<td>-1</td>
<td>3.25(-1) + 0.75</td>
<td>-2.5</td>
</tr>
<tr>
<td>0</td>
<td>3.25(0) + 0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>1</td>
<td>3.25(1) + 0.75</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>3.25(2) + 0.75</td>
<td>7.25</td>
</tr>
</tbody>
</table>

Solve each equation using the given replacement set.

39. \( t - 13 = 7 \); \{10, 13, 17, 20\}

**SOLUTION:**

<table>
<thead>
<tr>
<th>( t )</th>
<th>( t - 13 = 7 )</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10 - 13 = 7</td>
<td>False</td>
</tr>
<tr>
<td>13</td>
<td>13 - 13 = 7</td>
<td>False</td>
</tr>
<tr>
<td>17</td>
<td>17 - 13 = 7</td>
<td>False</td>
</tr>
<tr>
<td>20</td>
<td>20 - 13 = 7</td>
<td>True</td>
</tr>
</tbody>
</table>

The solution set is \{20\}. 
1-5 Equations

40. \(14(x + 5) = 126; \{3, 4, 5, 6, 7\}\)

**SOLUTION:**

<table>
<thead>
<tr>
<th>(x)</th>
<th>(14(x + 5) = 126)</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>(14(3 + 5) = 126)</td>
<td>False</td>
</tr>
<tr>
<td>4</td>
<td>(14(4 + 5) = 126)</td>
<td>True</td>
</tr>
<tr>
<td>5</td>
<td>(14(5 + 5) = 126)</td>
<td>False</td>
</tr>
<tr>
<td>6</td>
<td>(14(6 + 5) = 126)</td>
<td>False</td>
</tr>
<tr>
<td>7</td>
<td>(14(7 + 5) = 126)</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \{4\}.

41. \(22 = \frac{n}{3}; \{62, 64, 66, 68, 70\}\)

**SOLUTION:**

<table>
<thead>
<tr>
<th>(n)</th>
<th>(22 = \frac{n}{3})</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>62</td>
<td>(22 = \frac{62}{3})</td>
<td>False</td>
</tr>
<tr>
<td>64</td>
<td>(22 = \frac{64}{3})</td>
<td>False</td>
</tr>
<tr>
<td>66</td>
<td>(22 = \frac{66}{3})</td>
<td>True</td>
</tr>
<tr>
<td>68</td>
<td>(22 = \frac{68}{3})</td>
<td>False</td>
</tr>
<tr>
<td>70</td>
<td>(22 = \frac{70}{3})</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \{66\}.

42. \(35 = \frac{g - 8}{2}; \{78, 79, 80, 81\}\)

**SOLUTION:**

<table>
<thead>
<tr>
<th>(g)</th>
<th>(35 = \frac{g - 8}{2})</th>
<th>True or False?</th>
</tr>
</thead>
<tbody>
<tr>
<td>78</td>
<td>(35 = \frac{78 - 8}{2})</td>
<td>True</td>
</tr>
<tr>
<td>79</td>
<td>(35 = \frac{79 - 8}{2})</td>
<td>False</td>
</tr>
<tr>
<td>80</td>
<td>(35 = \frac{80 - 8}{2})</td>
<td>False</td>
</tr>
<tr>
<td>81</td>
<td>(35 = \frac{81 - 8}{2})</td>
<td>False</td>
</tr>
</tbody>
</table>

The solution set is \{78\}. 
1-5 Equations

Solve each equation.

43. \( \frac{3(9) - 2}{1+4} = d \)

**SOLUTION:**

\[
\frac{3(9) - 2}{1+4} = d \quad \text{Original equation}
\]

\[
\frac{27 - 2}{1+4} = d \quad \text{Multiply 3 and 9.}
\]

\[
\frac{27 - 2}{5} = d \quad \text{Add 1 and 4.}
\]

\[
\frac{25}{5} = d \quad \text{Subtract 2 from 27.}
\]

\[
5 = d \quad \text{Divide 25 by 5.}
\]

44. \( j = 15 + 3 \cdot 5 - 4^2 \)

**SOLUTION:**

\[
j = 15 + 3 \cdot 5 - 4^2 \quad \text{Original equation}
\]

\[
j = 15 + 3 \cdot 5 - 16 \quad \text{Evaluate power.}
\]

\[
j = 5 \cdot 5 - 16 \quad \text{Divide 15 by 3.}
\]

\[
j = 25 - 16 \quad \text{Multiply 5 by 5.}
\]

\[
j = 9 \quad \text{Subtract 16 from 25.}
\]

45. \( c + (3^2 - 3) = 21 \)

**SOLUTION:**

\[
c + (3^2 - 3) = 21 \quad \text{Original equation}
\]

\[
c + (9 - 3) = 21 \quad \text{Evaluate power.}
\]

\[
c + 6 = 21 \quad \text{Subtract 3 from 9.}
\]

\[
c = 15 \quad \text{Subtract 6 from each side.}
\]

46. \( (3^3 - 3 \cdot 9) + (7 - 2^2) b = 24 b \)

**SOLUTION:**

\[
(3^3 - 3 \cdot 9) + (7 - 2^2) b = 24 b \quad \text{Original equation}
\]

\[
(27 - 3 \cdot 9) + (7 - 2^2) b = 24 b \quad \text{Evaluate power.}
\]

\[
(27 - 3 \cdot 9) + (7 - 4) b = 24 b \quad \text{Evaluate power.}
\]

\[
(27 - 27) + (7 - 4) b = 24 b \quad \text{Multiply 3 by 9.}
\]

\[
0 + (7 - 4) b = 24 b \quad \text{Subtract 27 from 27.}
\]

\[
0 + 3 b = 24 b \quad \text{Subtract 4 from 7.}
\]

\[
3 b = 24 b \quad \text{Simplify.}
\]

The only value for \( b \) that makes the equation true is 0. So, the equation has a unique solution of \( b = 0 \).
1-5 Equations

47. CCSS SENSE-MAKING Blood flow rate can be expressed as $F = \frac{p_1 - p_2}{r}$, where $F$ is the flow rate, $p_1$ and $p_2$ are the initial and final pressure exerted against the blood vessel’s walls, respectively, and $r$ is the resistance created by the size of the vessel.

a. Write and solve an equation to determine the resistance of the blood vessel for an initial pressure of 100 millimeters of mercury Hg, a final pressure of 0 millimeters of mercury Hg, and a flow rate of 5 liters per minute.

b. Use the equation to complete the table.

<table>
<thead>
<tr>
<th>Initial Pressure $p_1$ (mm Hg)</th>
<th>Final Pressure $p_2$ (mm Hg)</th>
<th>Resistance $r$ (mm Hg/L/min)</th>
<th>Blood Flow Rate $F$ (L/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0</td>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>100</td>
<td>0</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>90</td>
<td>10</td>
<td>40</td>
<td>6</td>
</tr>
</tbody>
</table>

SOLUTION:

a. 

$$F = \frac{p_1 - p_2}{r}$$

$$5 = \frac{100 - 0}{r}$$

$$5 = \frac{100}{r}$$

Test values of $r$ for which the statement is true.

$$\frac{100}{5} = 20$$

$$\frac{100}{10} = 10$$

$$\frac{100}{20} = 5$$

The only value for $r$ that makes the equation true is 20. So, the resistance is 20 mm Hg/L/min.

b. Row 1: The resistance is 20 mm Hg/L/min as determined in part a.

Row 2:

$$F = \frac{p_1 - p_2}{r}$$

$$F = \frac{100 - 0}{30}$$

$$F = \frac{100}{30}$$

$$F \approx 3.33$$
1-5 Equations

Row 3:
\[ F = \frac{p_1 - p_2}{r} \]
\[ 4 = \frac{p_1 - 5}{40} \]

Test values of \( p_1 \) for which the statement is true.

\[ \frac{5 - 5}{40} = 0 \]
\[ \frac{45 - 5}{40} = 1 \]
\[ \frac{245 - 5}{40} = 6 \]
\[ \frac{205 - 5}{40} = 5 \]
\[ \frac{165 - 5}{40} = 4 \]

The only value for \( p_1 \) that makes the equation true is 165. So the initial pressure is 165 mm Hg.

Row 4:
\[ F = \frac{p_1 - p_2}{r} \]
\[ 6 = \frac{90 - p_2}{10} \]

<table>
<thead>
<tr>
<th>Initial Pressure ( p_1 ) (mm Hg)</th>
<th>Final Pressure ( p_2 ) (mm Hg)</th>
<th>Resistance ( r ) (mm Hg/L/min)</th>
<th>Blood Flow Rate ( F ) (L/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>100</td>
<td>0</td>
<td>30</td>
<td>( \approx 3.33 )</td>
</tr>
<tr>
<td>165</td>
<td>5</td>
<td>40</td>
<td>4</td>
</tr>
<tr>
<td>90</td>
<td>30</td>
<td>10</td>
<td>6</td>
</tr>
</tbody>
</table>

The only value for \( p_2 \) that makes the equation true is 30. So, the final pressure is 30 mm Hg.

**Determine whether the given number is a solution of the equation.**

48. \( x + 6 = 15; 9 \)

**SOLUTION:**

\( x + 6 = 15 \)

\( 9 + 6 \neq 15 \)

\( 15 = 15 \)

9 is a solution.
1-5 Equations

49. 12 + y = 26; 14

\[ \text{SOLUTION:} \]
\[ 12 + y = 26 \]
\[ 12 + 14 = 26 \]
\[ 26 = 26 \]

14 is a solution.

50. 2t – 10 = 4; 3

\[ \text{SOLUTION:} \]
\[ 2t - 10 = 4 \]
\[ 2(3) - 10 = 4 \]
\[ 6 - 10 = 4 \]
\[ -4 \neq 4 \]

3 is not a solution.

51. 3r + 7 = -5; 2

\[ \text{SOLUTION:} \]
\[ 3r + 7 = -5 \]
\[ 3(2) + 7 = -5 \]
\[ 6 + 7 = -5 \]
\[ 13 \neq -5 \]

2 is not a solution.

52. 6 + 4m = 18; 3

\[ \text{SOLUTION:} \]
\[ 6 + 4m = 18 \]
\[ 6 + 4(3) = 18 \]
\[ 6 + 12 = 18 \]
\[ 18 = 18 \]

3 is a solution.
53. \(-5 + 2p = -11\); \(-3\)

**SOLUTION:**
\[-5 + 2p = -11\]
\[-5 + 2(-3) = -11\]
\[-5 - 6 = -11\]
\[-11 = -11\]

\(-3\) is a solution.

54. \(\frac{q}{2} = 20; 10\)

**SOLUTION:**
\[\frac{q}{2} = 20\]
\[\frac{10}{2} = 20\]
\[5 \neq 20\]

\(10\) is not a solution.

55. \(\frac{w - 4}{5} = -3; -11\)

**SOLUTION:**
\[\frac{w - 4}{5} = -3\]
\[\frac{-11 - 4}{5} = -3\]
\[\frac{-15}{5} = -3\]
\[\frac{-3}{5} = -3\]

\(-11\) is a solution.

56. \(\frac{g}{3} - 4 = 12; 48\)

**SOLUTION:**
\[\frac{g}{3} - 4 = 12\]
\[\frac{48}{3} - 4 = 12\]
\[16 - 4 = 12\]
\[12 = 12\]

\(48\) is a solution.
### 1-5 Equations

Make a table of values for each equation if the replacement set is \{-2, -1, 0, 1, 2\}.

57. \( y = 3x + 5 \)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( x )</th>
<th>( 3x + 5 )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>3(-2) + 5</td>
<td>-1</td>
</tr>
<tr>
<td>-1</td>
<td>3(-1) + 5</td>
<td>2</td>
</tr>
<tr>
<td>0</td>
<td>3(0) + 5</td>
<td>5</td>
</tr>
<tr>
<td>1</td>
<td>3(1) + 5</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>3(2) + 5</td>
<td>11</td>
</tr>
</tbody>
</table>

58. \(-2x - 3 = y\)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( x )</th>
<th>(-2x - 3)</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>-2(-2) - 3</td>
<td>1</td>
</tr>
<tr>
<td>-1</td>
<td>-2(-1) - 3</td>
<td>-1</td>
</tr>
<tr>
<td>0</td>
<td>-2(0) - 3</td>
<td>-3</td>
</tr>
<tr>
<td>1</td>
<td>-2(1) - 3</td>
<td>-5</td>
</tr>
<tr>
<td>2</td>
<td>-2(2) - 3</td>
<td>-7</td>
</tr>
</tbody>
</table>

59. \( y = \frac{1}{2}x + 2 \)

**SOLUTION:**

<table>
<thead>
<tr>
<th>( x )</th>
<th>( \frac{1}{2}x + 2 )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>( \frac{1}{2}(-2) + 2 )</td>
<td>1</td>
</tr>
<tr>
<td>-1</td>
<td>( \frac{1}{2}(-1) + 2 )</td>
<td>1.5</td>
</tr>
<tr>
<td>0</td>
<td>( \frac{1}{2}(0) + 2 )</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>( \frac{1}{2}(1) + 2 )</td>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
<td>( \frac{1}{2}(2) + 2 )</td>
<td>3</td>
</tr>
</tbody>
</table>
1-5 Equations

60. \(4.2x - 1.6 = y\)

\textbf{SOLUTION:}

\begin{center}
\begin{tabular}{|c|c|c|}
\hline
\(x\) & \(4.2x - 1.6\) & \(y\) \\
\hline
-2 & 4.2(-2) - 1.6 & -10 \\
-1 & 4.2(-1) - 1.6 & -5.8 \\
0 & 4.2(0) - 1.6 & -1.6 \\
1 & 4.2(1) - 1.6 & 2.6 \\
2 & 4.2(2) - 1.6 & 6.8 \\
\hline
\end{tabular}
\end{center}

61. \textbf{GEOMETRY} The length of a rectangle is 2 inches greater than the width. The length of the base of an isosceles triangle is 12 inches, and the lengths of the other two sides are 1 inch greater than the width of the rectangle.

\begin{enumerate}
\item \textbf{a.} Draw a picture of each figure and label the dimensions.
\item \textbf{b.} Write two expressions to find the perimeters of the rectangle and triangle.
\item \textbf{c.} Find the width of the rectangle if the perimeters of the figures are equal.
\end{enumerate}

\textbf{SOLUTION:}

\begin{enumerate}
\item \textbf{a.}
\end{enumerate}

\begin{center}
\begin{tikzpicture}
\draw (0,0) rectangle (2,4);
\draw (2,0) -- (0,2) -- (2,4) -- (4,2) -- cycle;
\draw (2,0) -- (4,2);
\draw (2,4) -- (4,2);
\draw (4,2) -- (2,0);
\end{tikzpicture}
\end{center}

\begin{enumerate}
\item \textbf{b.} The formula for the perimeter of a rectangle is \(P = 2l + 2w\).
\end{enumerate}

\begin{align*}
P &= 2(2 + w) + 2w \\
   &= 4 + 2w + 2w \\
   &= 4 + 4w \\
\end{align*}

The formula for the perimeter of a triangle is \(P = a + b + c\).

\begin{align*}
P &= (w + 1) + (w + 1) + 12 \\
   &= w + w + 1 + 1 + 12 \\
   &= 2w + 14 \\
\end{align*}

\begin{enumerate}
\item \textbf{c.} Because the perimeters are equal, set the expression from parts \textbf{a} and \textbf{b} equal to each other and solve for \(w\).
1-5 Equations

$$4w + 4 = 2(w + 1) + 12$$
$$4w + 4 = 2w + 2 + 12$$
$$4w + 4 = 2w + 14$$

Test values for $w$.

$$4(1) + 4 = 2(1) + 14$$
$$8 \neq 16$$

$$4(2) + 4 = 2(2) + 14$$
$$12 \neq 18$$

$$4(4) + 4 = 2(4) + 14$$
$$20 \neq 22$$

$$4(5) + 4 = 2(5) + 14$$
$$24 = 24$$

The only value of $w$ that makes the equation true is 5. So, $w = 5$ inches.

62. **CONSTRUCTION** The construction of a building requires 10 tons of steel per story.

a. Define a variable and write an equation for the number of tons of steel required if the building has 15 stories.

b. How many tons of steel are needed?

**SOLUTION:**

a. Let $t$ represent tons of steel. There are 10 tons of steel required for every story and there are 15 stories, so the total number of tons of steel required can be found by multiplying 10 by 15. $t = 10(15)$

b. $t = 10(15)$

= 150

So, 150 tons of steel are needed.
1-5 Equations

63. **MULTIPLE REPRESENTATIONS** In this problem, you will further explore writing equations.

   a. **CONCRETE** Use centimeter cubes to build a tower similar to the one shown below.

   ![Concrete Representation](image)

   b. **TABULAR** Copy and complete the table shown below. Record the number of layers in the tower and the number of cubes used in the table.

<table>
<thead>
<tr>
<th>Layers</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
</table>

   c. **ANALYTICAL** As the number of layers in the tower increases, how does the number of cubes in the tower change?

   d. **ALGEBRAIC** Write a rule that gives the number of cubes in terms of the number of layers in the tower.

   **SOLUTION:**
   a. For example, towers built with two layers should have 8 cubes, towers built with 4 layers should have 16 cubes, and towers built with 6 layers should have 24 cubes.

   ![Tabular Representation](image)

   c. Each layer adds 4 more cubes to the tower.

   d. The number of cubes = 4L, where L is the number of layers in the tower.

64. **REASONING** Compare and contrast an expression and an equation.

   **SOLUTION:**
   Sample answer: An equation contains an equal sign and an expression does not. An equation is made up of 2 expressions and an equal sign. For example, 2x + 5 and 4x are expressions and 2x + 5 = 4x is an equation.

65. **OPEN ENDED** Write an equation that is an identity.

   **SOLUTION:**
   Sample answer: An identity is an equation that is true for every value of the variable. Thus, 3x + 12 = 3(x + 4) is an identity since 2x + 12 = 3x + 12.
66. **REASONING** Explain why an open sentence always has at least one variable.

**SOLUTION:**
An open sentence is a mathematical statement with one or more variables. Therefore if a sentence does not contain a variable, it cannot be an open sentence.

67. **CCSS CRITIQUE** Tom and Li-Cheng are solving the equation \( x = 4(3 - 2) + 6 \div 8 \). Is either of them correct? Explain your reasoning.

**SOLUTION:**
Tom: Tom evaluated inside the parenthesis first. Then he preformed multiplication and then division. Finally Tom added. Li-Cheng did evaluate inside the parenthesis first. However, next, she added \( 6 + 4 \) instead of dividing \( 6 \) by \( 8 \). She did not follow the order of operations.

68. **CHALLENGE** Find all of the solutions of \( x^2 + 5 = 30 \)

**SOLUTION:**
For the equation \( x^2 + 5 = 30 \) to be true, the value of \( x^2 \) must be 25. Both \( 5^2 \) and \((-5)^2 \) result in 25. So, the equation has two solutions, 5 and \(-5\).
1-5 Equations

69. OPEN ENDED Write an equation that involves two or more operations with a solution of −7.

**SOLUTION:**

\[ 3x - 2 = -23 \]

\[ 3(-7) - 2 \neq -23 \]

\[ -21 - 2 \neq -23 \]

\[ -23 = -23 \]

70. WRITING IN MATH Explain how you can determine that an equation has no real numbers as a solution. How can you determine that an equation has all real numbers as solutions?

**SOLUTION:**

Sample answer: Equations with no real numbers for solutions may have the same variables on each side of the equation, but are different by some number or operation. For example, the equation \( 3x + 1 = 3x + 2 \) will have no solution since 1 can never equal 2.

Equations that have all of the real numbers as solutions are equations with the same variables and same numbers and operations on both sides of the equation. For example, the equations \( 3x + 6 = 3x + 6 \) or \( 3x + 6 = 3(x + 2) \) have all real numbers as their solutions since the left side of the equation will always equal the right for any value of \( x \).

71. Which of the following is not an equation?

A \( y = 6x - 4 \)

B \( \frac{a + 4}{2} = \frac{1}{4} \)

C \( (4 \cdot 3b) + (8 \div 2c) \)

D \( 55 = 6 + d^2 \)

**SOLUTION:**

Equations have an equality symbol, so choice C is not an equation. It is an expression.

72. SHORT RESPONSE The expected attendance for the Drama Club production is 65% of the student body. If the student body consists of 300 students, how many students are expected to attend?

**SOLUTION:**

Use the percent equation to find 65% of 300 students. The base is 300 and the percent is 65. Let \( a \) represent the part.

\[ \frac{a}{b} = \frac{p}{100} \quad \text{Percent Proportion} \]

\[ \frac{a}{300} = \frac{65}{100} \quad b = 300, \ p = 65 \]

19,500 = 100\( a \) \quad \text{Find the cross products.}

195 = \( a \) \quad \text{Simplify.}

195 students are expected to attend.
1-5 Equations

73. GEOMETRY A speedboat and a sailboat take off from the same port. The diagram shows their travel. What is the distance between the boats?

**SOLUTION:**
The distance between the speedboat and the port can be calculated by:

\[ 8^2 + 6^2 = c^2 \]
\[ 64 + 36 = c^2 \]
\[ 100 = c^2 \]
\[ 10 = c \]

The distance between the port and the sailboat can be calculated by:

\[ 3^2 + 4^2 = x^2 \]
\[ 9 + 16 = x^2 \]
\[ 25 = x^2 \]
\[ 5 = x \]

Therefore, the distance between the sailboat and the speedboat is \( 10 + 5 = 15 \) miles, so the correct answer is G.
1-5 Equations

74. Michelle can read 1.5 pages per minute. How many pages can she read in two hours?

   A 90 pages
   B 150 pages
   C 120 pages
   D 180 pages

**SOLUTION:**
Let \( t \) represent time in minutes. Two hours is equal to 120 minutes.

\[
1.5t = 1.5(120)
\]
\[
= 180
\]

The answer is 180 pages. So, the correct answer is D.

75. **ZOO** A zoo has about 500 children and 750 adults visit each day. Write an expression to represent about how many visitors the zoo will have over a month.

**SOLUTION:**
Each day, there are 500 + 750 people. Therefore, we need to multiply this sum by the total number of days in a month to find the total number of visitors per month. If a month has 30 days, the expression can be written as 30(500 + 750).

**Find the value of** \( p \) **in each equation. Then name the property that is used.**

76. \( 7.3 + p = 7.3 \)

**SOLUTION:**
Because \( 7.3 + 0 = 7.3, p = 0; \)
Additive Identity

77. \( 12p = 1 \)

**SOLUTION:**

\[
p = \frac{1}{12}
\]
Since \( 12 \cdot \frac{1}{12} = 1 \), Multiplicative Inverse is used.

78. \( 1p = 4 \)

**SOLUTION:**
Because \( 1(4) = 4, p = 4. \)
Multiplicative Identity
1-5 Equations

79. MOVING BOXES The figure shows the dimensions of the boxes Steve uses to pack. How many cubic inches can each box hold?

![Box Diagram]

**SOLUTION:**

\[ V = lwh \]
\[ = (13)(8)(10) \]
\[ = 1040 \]

So, the box can hold 1040 cubic inches.

**Express each percent as a fraction.**

80. 35%

**SOLUTION:**

\[ 35\% = \frac{35}{100} = \frac{7}{20} \]

81. 15%

**SOLUTION:**

\[ 15\% = \frac{15}{100} = \frac{3}{20} \]

82. 28%

**SOLUTION:**

\[ 28\% = \frac{28}{100} = \frac{7}{25} \]
1-5 Equations

For each problem, determine whether you need an estimate or an exact answer. Then solve.

83. TRAVEL The distance from Raleigh, North Carolina, to Philadelphia, Pennsylvania, is approximately 428 miles. The average gas mileage of José’s car is 45 miles per gallon. About how many gallons of gas will be needed to make the trip?

**SOLUTION:**
You are asked to find about how many gallons, which means an estimate. Let \( g \) represent gallons of gas. Write an equation. Use 450 as an estimate of 428 for an easy division.

\[
g = \frac{450}{45}
\]

\[
g = 10
\]

Jose will need about 10 gallons of gas to make the trip.

84. PART-TIME JOB An employer pays $8.50 per hour. If 20% of pay is withheld for taxes, what are the take-home earnings from 28 hours of work?

**SOLUTION:**
You are asked to find the take-home earnings, so you need to find an exact value. Before taxes, 28 hours of work earns \( 28 \times 8.50 \), or $238. Withholding 20% is the same as finding 80%. Use the percent equation to find 80% of $238.

The base is 239 and the percent is 80. Let \( a \) represent the part.

\[
a \times \frac{p}{100} = \frac{b}{100}
\]

\[
\frac{a}{238} = \frac{80}{100}
\]

\[
19.040 = 100a
\]

\[
190.4 = a
\]

So, the take-home earnings are $190.40.

Find each sum or difference.

85. \(1.14 + 5.6\)

**SOLUTION:**

\(1.14 + 5.6 = 6.74\)

86. \(4.28 - 2.4\)

**SOLUTION:**

\(4.28 - 2.4 = 1.88\)

87. \(8 - 6.35\)

**SOLUTION:**

\(8 - 6.35 = 1.65\)
1-5 Equations

88. \( \frac{4}{5} + \frac{1}{6} \)

**SOLUTION:**
The LCS for 5 and 6 is 30. Rename \( \frac{4}{5} \) as \( \frac{24}{30} \) and \( \frac{1}{6} \) as \( \frac{5}{30} \).

\[
\frac{4}{5} + \frac{1}{6} = \frac{24}{30} + \frac{5}{30} \\
= \frac{24+5}{30} \quad \text{Add the numerators} \\
= \frac{29}{30} \quad \text{Simplify.}
\]

89. \( \frac{2}{7} + \frac{3}{4} \)

**SOLUTION:**
The LCD for 4 and 7 is 28. Rename \( \frac{2}{7} \) as \( \frac{8}{28} \) and \( \frac{3}{4} \) as \( \frac{21}{28} \).

\[
\frac{2}{7} + \frac{3}{4} = \frac{8}{28} + \frac{21}{28} \\
= \frac{8+21}{28} \quad \text{Add the numerators} \\
= \frac{29}{28} \quad \text{Simplify.}
\]

90. \( \frac{6}{8} - \frac{1}{2} \)

**SOLUTION:**
The LCD for 8 and 2 is 8. Rename \( \frac{1}{2} \) as \( \frac{4}{8} \).

\[
\frac{6}{8} - \frac{1}{2} = \frac{6}{8} - \frac{4}{8} \\
= \frac{6-4}{8} \quad \text{Subtract the numerators} \\
= \frac{2}{8} \quad \text{Simplify} \\
= \frac{1}{4} \quad \text{Rename the fraction.}
\]