Initially, equations are solved either by applying math facts (for example, \(4x = 12\), since \(4 \cdot 3 = 12, x = 3\)) or by matching equal quantities, simplifying the equation, and using math facts as shown in the examples below. Equations are often written in the context of a geometric situation.

Write an equation that represents each situation and find the value of the variable.

**Example 1**

\[
\begin{align*}
32 &= x + 10 \\
x &= 22
\end{align*}
\]

**Example 2**

\[
\begin{align*}
44 &= x + 2x + 8 \\
x &= 12
\end{align*}
\]

**Example 3**

\[
\begin{align*}
25 &= 3y + y \\
y &= 12.5
\end{align*}
\]

**Example 4**

\[
\begin{align*}
180 &= 2x + 3x + 40 \\
x &= 18
\end{align*}
\]
Problems

Write an equation that represents each situation and then find the value of the variable.

1. \[ x + x + 3 = 25 \]
2. \[ x + x + 4 = 16 \]
3. \[ 2x + x + 7 = 25 \]
4. \[ n + n + n + n = 12 \]
5. \[ 122^\circ \]

Solve each equation.

7. \[ x + 7 = -9 \]
8. \[ y - 2 = -3 \]
9. \[ -3y = 24 \]
10. \[ \frac{m}{2} = -6 \]
11. \[ 3x + 2 = 11 \]
12. \[ 4x + x + 5 = 25 \]
13. \[ m + 2m + 7 = m + 11 \]
14. \[ x + 9 + x + x = 30 \]
15. \[ 3 - y = 9 \]
16. \[ 4k + 1 = -7 \]
17. \[ x + 3x + x + 7 = 52 \]
18. \[ 3m + 7 = m + 11 \]
19. \[ 2(y + 3) = -12 \]
20. \[ 3(c + 2) + c + 1 = 57 \]
Answers

1. $2x + 3 = 25; x = 11$
2. $2x + 4 = x + 16; x = 12$
3. $3x + 7 = 25; x = 6$
4. $4n + 12 = 2n + 28; n = 8$
5. $122 + x = 180; x = 58^\circ$
6. $2x + 40 = 180; x = 70^\circ$
7. $x = -16$
8. $y = -1$
9. $y = -8$
10. $m = -12$
11. $x = 3$
12. $x = 4$
13. $m = 2$
14. $x = 7$
15. $y = -6$
16. $k = -2$
17. $x = 9$
18. $m = 2$
19. $y = -9$
20. $c = 12.5$