Translate the following verbal expressions into algebraic expressions then solve.

1. Seven less than a number is 5.
   \[ x - 7 = 5 \]
   \[ x = 12 \]

2. Five less than the quotient of a number and 3 is -7.
   \[ \frac{x}{3} - 5 = -7 \]
   \[ \frac{x}{3} = -2 \]
   \[ x = -6 \]

3. Twice a number plus 4 is 8.
   \[ 2x + 4 = 8 \]
   \[ 2x = 4 \]
   \[ x = 2 \]

4. Solve for \( p \):
   \[ 11 - (2 + p) = -17 \]
   \[ p = -9 \]
   \[ p = -20 \]

5. Solve for \( k \):
   \[ k^2 + 3 = 28 \]
   \[ k^2 = 25 \]
   \[ k = 5 \]
### Variables on Both Sides

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1. $5y - 8 = 3y + 12$

\[
\begin{align*}
-3y & -3y \\
2y - 8 & = 12 \\
0 + 8 & + 8 \\
2y & = 20 \\
\frac{2y}{2} & = 10 \\
\end{align*}
\]

\[y = 10\]

2. $-6x + 14 = 12 - 8x$

\[
\begin{align*}
+8x & +8x \\
2x + 14 & = 12 \\
-14 & -14 \\
2x & = -2 \\
\frac{2x}{2} & = -1 \\
\end{align*}
\]

\[x = -1\]
5. \[ 12 - 2u = 9u + 45 \]
\[
\begin{align*}
\frac{-12u + 12u}{12} &= 11u + 45 \\
-45 &= -45 \\
\hline
-33 &= 11u \\
\frac{-33}{11} &= 11 \\
-3 &= u
\end{align*}
\]

6. \[ 4(2w - 1) = -10(w - 5) \]
\[
\begin{align*}
8w - 4 &= -10w + 50 \\
+10w &= +10w \\
18w - 4 &= 50 \\
+4 &= +4 \\
18w &= 54 \\
\frac{18w}{18} &= \frac{54}{18} \\
w &= 3
\end{align*}
\]

11. \[ 5x - (x - 18) = 6 - 2(x + 15) \]
\[
\begin{align*}
5x - x + 18 &= 6 - 2x - 30 \\
4x + 18 &= -2x - 24 \\
+2x &= +2x \\
6x + 18 &= -24 \\
-18 &= -18 \\
\hline
6x &= -42 \\
x &= -7
\end{align*}
\]

12. \[ 8(y + 4) - 2(y - 1) = 70 - 3y \]
\[
\begin{align*}
8y + 32 - 2y + 2 &= 70 - 3y \\
+3y &= +3y \\
6y + 34 &= 70 - 3y \\
+3y &= +3y \\
9y + 34 &= 70 \\
-34 &= -34 \\
\hline
9y &= 36 \\
y &= 4
Variables on Both Sides...With Fractions!

When an equation contains fractions on both sides, it is helpful to multiply both sides by a common denominator.

\[
\frac{x}{2} + 5 = \frac{x}{3} + 8
\]

What is the common denominator?
1) \[
\frac{5x}{4} + 2 = \frac{x}{4} + 7
\]
\[
\begin{aligned}
4(\frac{5x}{4} + 2) &= 4\left(\frac{x}{4} + 7\right) \\
10x + 8 &= 4x + 28 \\
5x + 8 &= x + 28 \\
-x &= -x \\
4x + 8 &= 28 \\
8 &= 8 \\
4x &= 20 \\
x &= 5
\end{aligned}
\]

2) \[
\frac{x}{2} - 3 = \frac{x}{7} + 2
\]
\[
\begin{aligned}
\frac{14x}{2} - 42 &= \frac{14x}{7} + 28 \\
7x - 42 &= 2x + 28 \\
-2x &= -2x \\
5x &= 70 \\
x &= 14
\end{aligned}
\]

\[
\begin{aligned}
\frac{x}{5} + 7 &= \frac{x}{10} + 8 \\
\frac{10}{1}(\frac{x}{5} + 7) &= \frac{10}{1}(\frac{x}{10} + 8) \\
2x + 70 &= x + 80 \\
-x &= -x \\
x + 70 &= 80 \\
-70 &= -70 \\
(x &= 10)
\end{aligned}
\]