

## 2.3 Solving Two-Step Equations

Undo the operations in reverse order...  
in other words, work backwards.

- Combine like terms, if possible.
- Undo addition/subtraction.
- Undo multiplication/division.

Solve.

$$\begin{array}{l}
 1. \quad \frac{x}{4} + 9 = 6 \\
 \quad \quad \quad \underline{-9 \quad -9} \\
 \quad \quad \quad \frac{x}{4} = -3 \\
 \quad \quad \quad \underline{4 \cdot \frac{x}{4} \quad = \quad -3 \cdot 4} \\
 \quad \quad \quad \boxed{x = -12}
 \end{array}$$

$$\begin{array}{l}
 2. \quad -3y - 7 = -13 \\
 \quad \quad \quad \underline{+7 \quad +7} \\
 \quad \quad \quad \frac{-3y}{-3} = \frac{-6}{-3} \\
 \quad \quad \quad \underline{-3y \quad = \quad -6} \\
 \quad \quad \quad \underline{-3 \quad \quad \quad -3} \\
 \quad \quad \quad \boxed{y = 2}
 \end{array}$$

Solve.

$$3. \quad \frac{2}{3}a - 14 = 61$$

$$\begin{array}{r|l} +14 & +14 \\ \hline \frac{2}{3}a & = 75 \\ \frac{2}{3} \cdot a & \\ \hline \frac{2}{3} & \frac{2}{3} \end{array}$$

$$a = \frac{225}{2} \text{ or } 112.5$$

$$4. \quad -5 = 8 - 3d$$

$$\begin{array}{r|l} -8 & -8 \\ \hline -13 & = -3d \\ -3 & -3 \\ \hline \frac{13}{3} & = d \end{array}$$

Solve.

$$5. \quad 4(2 - 3f) = 12$$

$$\begin{array}{r|l} +2 & -3f = 48 \\ -2 & -2 \\ \hline -3f & = 46 \\ -3 & -3 \\ \hline f & = -\frac{46}{3} \end{array}$$

$$6. \quad 2 \cdot -25 = \frac{(3w + 1)}{2} \cdot 2$$

$$\begin{array}{r|l} -50 & = 3w + 1 \\ -1 & -1 \\ \hline -51 & = 3w \\ 3 & 3 \\ \hline -17 & = w \end{array}$$

Solve.

7.  $8y + 3y = 44$

like terms

$$\begin{array}{r} 11y = 44 \\ \hline y = 4 \end{array}$$

8.  $-34 = -5k + 2k - 2$

like terms

$$\begin{array}{r} -34 = -3k - 2 \\ +2 \quad \quad +2 \\ \hline -32 = -3k \\ \hline -3 \quad \quad -3 \\ \hline \frac{32}{3} = k \end{array}$$

9. The output of a function is 5 more than -2 times the input. Find the input when the output is 11.

$y = -2x + 5$

add 5

$$\begin{array}{r} 11 = -2x + 5 \\ -5 \quad \quad -5 \\ \hline 6 = -2x \\ \hline -2 \quad \quad -2 \\ \hline -3 = x \end{array}$$

10. The output of a function is 4 less than 4 times the input. Find the input when the output is 3.

$y = 4x - 4$

subtract 4

$$\begin{array}{r} 3 = 4x - 4 \\ +4 \quad \quad +4 \\ \hline 7 = 4x \\ \hline \frac{7}{4} = \frac{4x}{4} \\ \hline 1.75 \text{ or } \frac{7}{4} = x \end{array}$$

11. Define a variable, write an equation, & solve.

Karen has 6 <sup>add 6</sup> more than twice <sup>mult by 2</sup> as many newspaper customers as when she started selling newspapers. She now has 98 customers.

How many did she have when she started?

Let  $x = \#$  of customers she had

$$\begin{array}{r} 2x + 6 = 98 \\ \underline{-6} \quad \underline{-6} \\ 2x = 92 \\ \underline{\quad} \quad \underline{\quad} \\ x = 46 \end{array}$$

46 customers

12. Define a variable, write an equation, & solve.

A skate park charges \$7 per session to skate and \$4 per session to rent safety equipment. Jared rents safety equipment every time he skates. During the summer, he spends \$99 for skating charges and equipment rentals. How many times did he pay to skate at the park?

Let  $x = \#$  of visits to skate park

$$\begin{array}{r} 7x + 4x = 99 \\ \underline{11x} \quad \underline{11} \\ 11x = 99 \\ \underline{\quad} \quad \underline{\quad} \\ x = 9 \end{array}$$

9 visits