

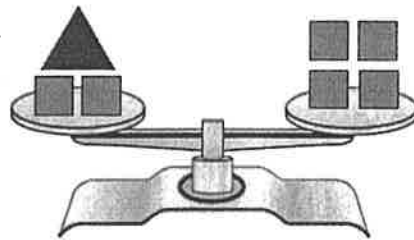
One-Step Equations with Addition/Subtraction

Warm up:

Each of the following problems shows a scale that is balanced.

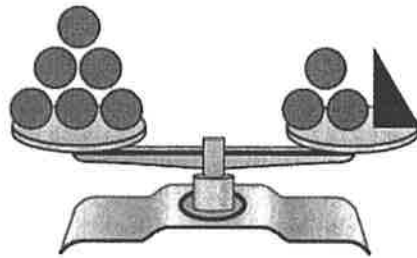
1. How many \blacksquare are equal to one \blacktriangle ?

$$\begin{array}{r} x + 2 = 4 \\ - 2 \quad - 2 \\ \hline x = 2 \end{array}$$



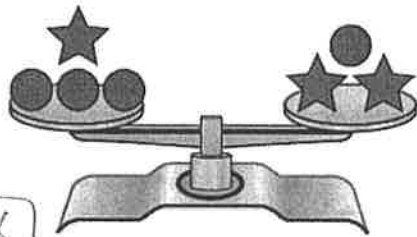
2. How many \bullet are equal to one \blacktriangle ?

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



3. How many \bullet are equal to one \star ?

$$\begin{array}{r} x + 3 = 2x + 1 \\ - x \quad - x \\ \hline 3 = x + 1 \end{array}$$



2 = x

THINK AND DISCUSS

4. Describe how you solved each problem.

let a variable represent
the unknown

Equation: mathematical statement that sets two expressions equal to each other

Solution: value of a variable that makes an equation true

The goal of solving an equation is: isolate x using inverse operations

Inverse Operations	
Operation	Inverse Operation
addition	subtraction
subtraction	addition

Examples:

$$\begin{array}{r}
 1.) \quad x - 3 = 3 \\
 \quad \quad 13 \quad +3 \\
 \hline
 \quad \quad x = 6
 \end{array}$$

$$\begin{array}{r}
 2.) \quad x + 6 = 10 \\
 \quad \quad -6 \quad -6 \\
 \hline
 \quad \quad x = 4
 \end{array}$$

$$\begin{array}{r}
 3.) \quad x - 15 = -13 \\
 \quad \quad +15 \quad +15 \\
 \hline
 \quad \quad x = -8
 \end{array}$$

$$\begin{array}{r}
 4.) \quad -8 = n - (-4) \\
 \quad \quad -4 \quad -4 \\
 \hline
 \quad \quad -12 = n
 \end{array}$$

$$\begin{array}{r}
 5.) \quad -9 = 15 + x \\
 \quad \quad -15 \quad -15 \\
 \hline
 \quad \quad -24 = x
 \end{array}$$

$$\begin{array}{r}
 6.) \quad 9.4 = 27.8 + x \\
 \quad \quad -27.8 \quad -27.8 \\
 \hline
 \quad \quad -18.4 = x
 \end{array}$$

$$\begin{array}{r}
 7.) \quad \frac{3}{4} + x = \frac{7}{4} \\
 \quad \quad -\frac{3}{4} \quad -\frac{3}{4} \\
 \hline
 \quad \quad x = \frac{4}{4}
 \end{array}$$

$$\boxed{x = 1}$$

$$\begin{array}{r}
 8.) \quad -\frac{5}{11} + p = -\frac{2}{11} \\
 \quad \quad +\frac{5}{11} \quad +\frac{5}{11} \\
 \hline
 \quad \quad p = \frac{3}{11}
 \end{array}$$

Translate the following into an algebraic equation. Then, solve the equation.

9.) Ten more than a number is fourteen.

$$\begin{array}{r} 10 + n = 14 \\ -10 \quad -10 \\ \hline n = 4 \end{array}$$

10.) 12 less than a number is -7.

$$\begin{array}{r} n - 12 = -7 \\ +12 \quad +12 \\ \hline n = 5 \end{array}$$

11.) 8 increased by a number equals 15.

$$\begin{array}{r} 8 + n = 15 \\ -8 \quad -8 \\ \hline n = 7 \end{array}$$

12.) The difference a number and 5 is 9.

$$\begin{array}{r} n - 5 = 9 \\ +5 \quad +5 \\ \hline n = 14 \end{array}$$

13.) A person's maximum heart rate is the highest rate, in beats per minutes that the person's heart should reach. One method to estimate maximum heart rates states that your age added to your maximum heart rate is 220.

$x = \text{max. heart rate}$

a.) Using this method, write and solve an equation to find the maximum heart rate of a 14 year old.

$$\begin{array}{r} x + 14 = 220 \\ -14 \quad -14 \\ \hline x = 206 \end{array}$$

b.) What if the person's heart rate was 185 beats per minute, how old was the person?

$x = \text{age}$

$$\begin{array}{r} x + 185 = 220 \\ -185 \quad -185 \\ \hline x = 35 \end{array}$$

14.) When you turn 16 you are going to receive a loan to buy a car. The terms of the loan are that you have to make a down payment in cash. The amount of the loan you are going to receive is the purchase price of the car minus the down payment. You make a down payment of \$1500 on a used car. You received a loan of \$2600. Write and solve an equation to find the cost of the car.

$x = \text{cost of car}$

$$\begin{array}{r} x - 1500 = 2600 \\ +1500 \quad +1500 \\ \hline x = 4100 \end{array}$$