

Investigating: Solving Equations – A Balance!

The golden rule of algebra!

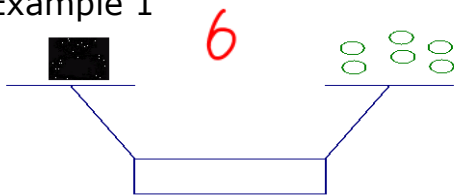
Do unto one side of the equation, what you do to the other!

An equation is like a balance scale. If we put something on, or take something off of one side, the scale (or equation) is unbalanced. When solving math equations, we must always keep the 'scale' (or equation) balanced so that both sides are ALWAYS equal.

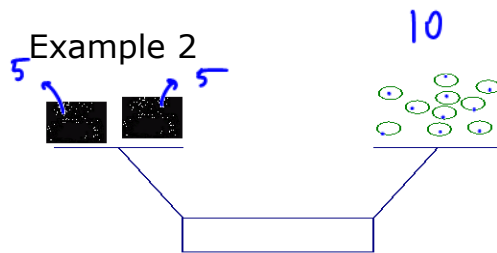
Some pictorial examples →

How many marbles are in each pouch?

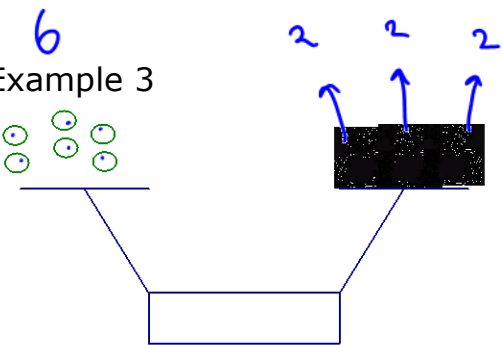
Example 1



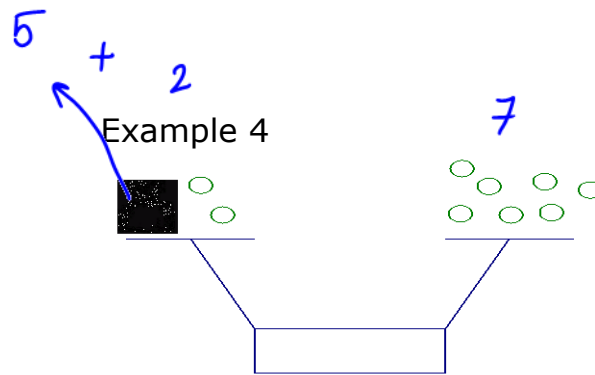
Example 2



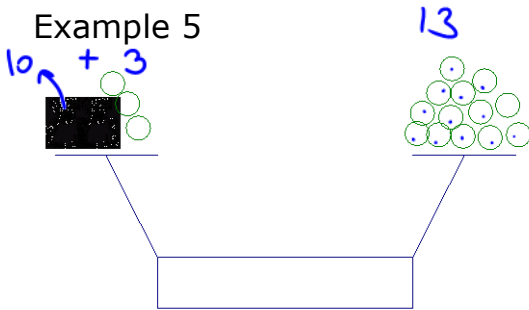
Example 3



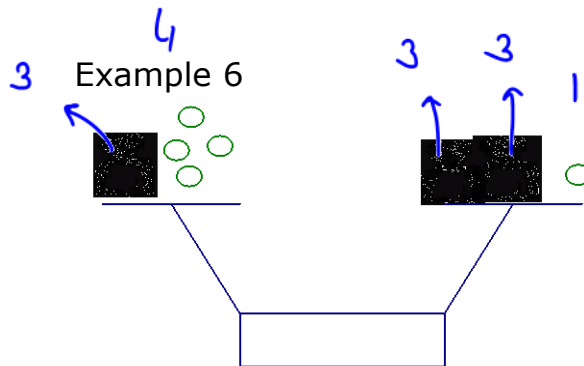
Example 4



Example 5



Example 6



Lesson: Solving Equations

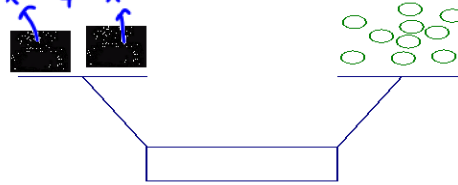
We can solve these same problems algebraically, if we let 'x' represent each pouch and each marble will have a value of 1.

Example 1



$$x = 6$$

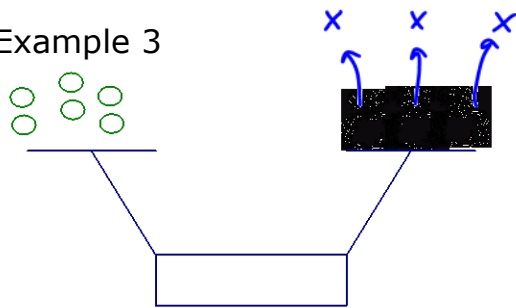
Example 2



$$\frac{2x}{2} = \frac{10}{2}$$

$$x = 5$$

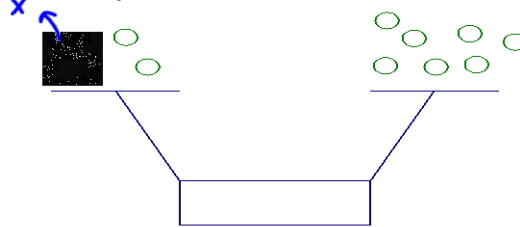
Example 3



$$\frac{6}{3} = \frac{3x}{3}$$

$$2 = x$$

Example 4

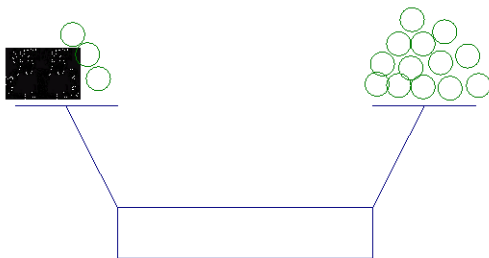


$$x + 2 = 7$$

$$x = 7 - 2$$

$$x = 5$$

Example 5



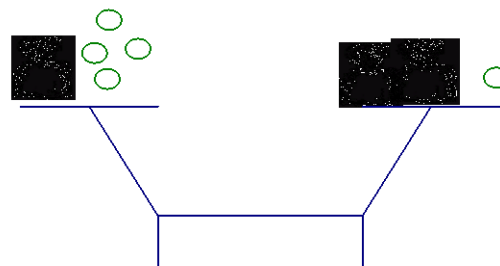
$$2x + 3 = 13$$

$$2x = 13 - 3$$

$$\frac{2x}{2} = \frac{10}{2}$$

$$x = 5$$

Example 6



$$x + 4 = 2x + 1$$

(we will explore these trickier problems later in the unit)

$$4 - 1 = 2x - x$$

$$3 = x$$

*With the exception of EXAMPLE 6 these are all one or two-step problems.
*Pictorial examples are more difficult to demonstrate when we have negative values, so we can use the patterns from the positive examples to solve other problems.

Practice: Solving Equations - One and Two-Step

a. $w - 4 = 9$
 $w = 9 + 4$
 $w = 13$

b. $y + 2 = 8$
 $y = 8 - 2$
 $y = 6$

c. $\frac{4m}{4} = \frac{-48}{4}$
 $m = -12$

d. $\frac{x}{7} = \frac{-3}{1}$ cross multiply
 $x = -21$

e. $k - 6 = -11$
 $k = -11 + 6$
 $k = -5$

f. $3p + 5 = 2$
 $3p = 2 - 5$
 $\frac{3p}{3} = \frac{-3}{3}$
 $p = -1$

g. $3a + 7 = 13$
 $3a = 13 - 7$
 $\frac{3a}{3} = \frac{6}{3}$
 $a = 2$

h. $-b + 7 = 5$
 $-b = 5 - 7$
 $\frac{-b}{-1} = \frac{-2}{-1}$
 $b = 2$

i. $8 - c = -2$
 $-c = -2 - 8$
 $\frac{-c}{-1} = \frac{-10}{-1}$
 $c = 10$

j. $-3 = 5x + 2$
 $-3 - 2 = 5x$
 $\frac{-5}{5} = \frac{5x}{5}$
 $-1 = x$

k. $17 + 2d = 1$
 $2d = 1 - 17$
 $\frac{2d}{2} = \frac{-16}{2}$
 $d = -8$

l. $24 = 19 - 10h$
 $24 - 19 = -10h$
 $\frac{5}{-10} = \frac{-10h}{-10}$
 $-0.5 = h$

m. Mike is currently 8 years older than his sister Janet. The sum of their ages is 30. The following equation represents this scenario, $2m - 8 = 30$, where m is Mike's age. How old is Mike? How old is Janet?

$2m - 8 = 30$
 $2m = 30 + 8$
 $\frac{2m}{2} = \frac{38}{2}$
 $m = 19$

	<u>Mike</u>	+	<u>Janet</u>	=	30
	m	+	n	=	30
	19	+	n	=	30
			n	=	30 - 19

$n = 11$
∴ Mike is 19
Janet is 11

n. A triangle has a perimeter of 250cm. The three side lengths are x , $2x + 40$, and $x + 60$. The equation $4x + 100 = 250$ represents this scenario. What are the side lengths of this triangle?



Perimeter = 250
 $x + 2x + 40 + x + 60 = 250$
 $4x + 100 = 250$
 $4x = 250 - 100$
 $\frac{4x}{4} = \frac{150}{4}$
 $x = 37.5 \text{ cm}$

Sides
 $\overline{AC} \quad x = 37.5$
 $\overline{AB} \quad 2x + 40 = 2(37.5) + 40 = 115 \text{ cm}$
 $\overline{BC} \quad x + 60 = 37.5 + 60 = 97.5 \text{ cm}$

ANSWERS: a) $w=13$, b) $y=6$, c) $m=-12$, d) $x=-21$, e) ~~$k=-1$~~ , f) $p=-1$, g) $a=2$, h) $b=2$, i) $c=10$, j) $x=-1$, k) $d=-8$, l) $h=-0.5$, m) 19 & 11, n) 37.5cm, ~~77.5cm, 117.5cm~~
97.5cm 115cm
 $k = -5$