

Section 6.2: Solving Equations using Balance Strategies

To solve an equation we need to isolate the variable,

» which means get x by itself.

Last section we used inverse operations.

That method only works, however, when the variable occurs only once in the equation.

Another way to isolate the variable is to use a **balance strategy**.

To keep the scale "balanced",

» **whatever we do to one side of the "scale"/equation we must do to the other side.**

To solve, we need to get the variable on one side of the equal sign and the constant term on the other.

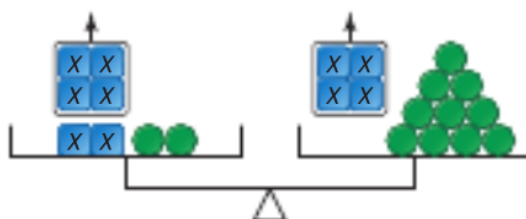
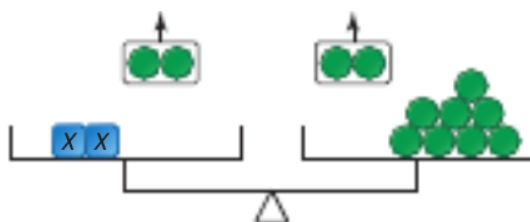
Example 1: Modelling Equations with Variable on Both Sides

Solve: $6x + 2 = 10 + 4x$

Pictorial Solution

Algebraic Solution

1. Model Equation:

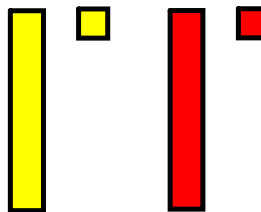
2. Remove $4x$ from both pans to get x on one side3. Remove 2 from both pans, to isolate x 

4. Divide into two equal groups



We cannot use a balance scale model when any term in the equation is **negative**.

Another strategy to use is algebra tiles!



Example 2:

Solve using Algebra tiles:

$$-2x + 4 = x - 2$$

Note: We must isolate x and then identify zero pairs!

Algebra Tiles

Algebraically



Algebra Tiles, however, is not an efficient method to use when equations involve large numbers.

Let's think algebraically!

Example 3:

Solve algebraically: $-3x + 7 = 2x - 8$

Remember the goal is to get the variable on one side of the equation and the numbers on the other side of the equation!

Example 4:

Solve algebraically: $4x + 7 = 21 - 3x$

Example 5:

Solve using algebra: $4(x - 5) = -2(x - 2)$

Your Turn:

Solve algebraically:

a. $2x + 10 = 20 - 3x$

b. $7y + 53 = 14 - 6y$

c. $4x + 2 = -2x + 8$

d. $2x + 3x = 8x - 3$

e. $3(x + 1) = 5(x - 1)$

f. $-4(x + 3) = 3(x - 2)$

Example 6: Two different taxi companies charge the following:

Company A: \$3.00 plus \$0.20 per km

Company B: \$2.50 plus \$0.25 per km

At what distance will the cost be the same?

a) Model the problem with an equation

b) Solve the problem

c) Verify the solution

Example 7: A cell phone company offers two plans.

Plan A: 120 free minutes, \$0.75 per additional minute

Plan B: 30 free minutes, \$0.25 per additional minutes

Which time for calls will result in the same cost for both plans?

a) Model the problem with an equation

b) Solve the problem

c) Verify the solution

Solving Equations with Fractions:

We can solve equations which contain fractions by **eliminating the denominator**.

We do this by multiplying each term by the whole number you choose. This whole number **must be a common denominator** for all the fractions in the equations.

Example 8: Solve using algebra:

a. $\frac{x}{9} = 3$

b. $\frac{2x}{3} = \frac{4x}{5} + 7$

c. $\frac{x}{4} + \frac{1}{5} = \frac{1}{2}$

d. $\frac{1}{2}(x-1) = \frac{2}{3}(1-x)$

e. $\frac{(2x-3)}{2} = \frac{(-x-1)}{4}$