"Given Sum, Find Parts" Word Problems

One type of word problems look like this:

[**Example 1**] Two numbers' sum is 999. The first number is twice as big as the second number. Find both numbers.

[**Solution**] We could let the first number be *x*, or the second number be *x*. The **rule of thumb** is to let the smaller number be *x*. Let me show you why.

If we let the bigger number be *x*, then the smaller number would be $\dfrac{x}{2}$, half as big.

If we let the smaller number be *x*, then the bigger number would be 2*x*, twice as big.

It's obvious the second way is better, as we avoided dealing with a fraction.

If the smaller number is *x*, and the bigger number is 2*x*, and their sum is *x*+2*x*.

It's given that the sum is 999. Now we can write an equation and then solve for it:

$$(\text{smaller number}) + (\text{bigger number}) = \text{sum}$$
$$x + 2x = 999$$
$$3x = 999$$
$$\frac{3x}{3} = \frac{999}{3}$$
$$x = 333$$

Solution: The smaller number is 333, so the bigger number is $2 \cdot 333 = 666$.

For this type of word problems, the sum of two numbers is given, in addition to the relationship between those two numbers. The general method is to let the smaller number be *x*, and write an expression for the bigger number in terms of *x* (like 2*x* in Example 1). Then, the equation looks like:

$$(\text{smaller number}) + (\text{bigger number}) = \text{sum}$$

Scroll down for Example 2.

[**Example 2**] A team played a total of 120 games last year. This team lost 3 less than twice of the games they won. How many games did the team win and lose last year?

[**Solution**] Since this team lost more games than they won, assume they won *x* games. This implies they lost 2*x*-3 games. Now we can write an equation and then solve it:

$$\text{(smaller number)} + \text{(bigger number)} = \text{sum}$$
$$x + (2x - 3) = 120$$
$$x + 2x - 3 = 120$$
$$3x - 3 = 120$$
$$3x - 3 + 3 = 120 + 3$$
$$3x = 123$$
$$\frac{3x}{3} = \frac{123}{3}$$
$$x = 41$$

Solution: The team won 41 games, and lost $2 \cdot 41 - 3 = 79$ games.