

# Word Problems - Mixture

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One method of solving mixture problems is to do the problem in terms of what is being added.

**That means if you have a problem involving a mixture of antifreeze and you are going to add water to it to dilute it, then do the problem in terms of water.**

An iodine problem that has you adding alcohol to dilute it should be done in terms of alcohol.

Water is water, salt is salt, if you don't get these right, it will be my fault. Just remember, when solving mixture problems, we **DON'T** start off with water and add salt to get salt water.

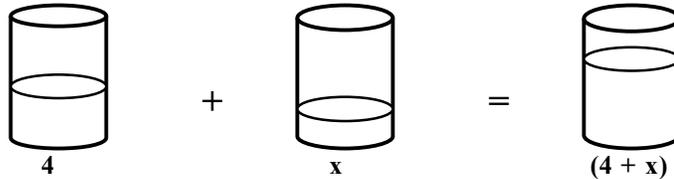
## EXAMPLE

A pharmacist has 4 quarts of a 15% solution of iodine. How much alcohol must be added to reduce it to a 10% solution of iodine?

What's being added? Hopefully, you said alcohol. Therefore our equation will look like this:

$$\begin{array}{rclcl} \text{ALCOHOL} & + & \text{ALCOHOL} & = & \text{ALCOHOL} \\ 4 \text{ qts} + & & x \text{ qts} & = & (4 + x) \text{ qts} \end{array}$$

We start off with 4 quarts, add x quarts, then end up with (4 + x) quarts.



Notice that you started with 4 quarts and added x quarts on the left side of the equation and you ended up with (4 + x) on the other side. The parentheses indicate that it's one container, Neato!

Of the original 4 quarts, 15% is iodine. Since we are doing the problem in terms of what we are adding – alcohol, we must change 15% iodine solution to an 85% solution of alcohol. Let's write the equation.

$$.85(4) + x = .90(4 + x)$$

Where'd the .90 come from? Well, since I wanted to end up with a 10% solution of iodine, that meant it must be a 90% solution of alcohol.

Multiplying both sides of the equation by the common denominator – 100, we have

$$\begin{array}{rclcl} 85(4) & + & 100x & = & 90(4 + x) \\ 340 & + & 100x & = & 360 + 90x \\ & & 10x & = & 20 \\ & & x & = & 2 \end{array}$$

You would have to add 2 quarts of alcohol to reduce the mixture to 10% iodine.

## EXAMPLE

How much water must be added to a 30 quarts of a 75% acid solution to reduce it to a 15% solution of acid?

I'm adding water, so we have

$$\mathbf{WATER} + \mathbf{WATER} = \mathbf{WATER}$$

Starting off with 30 quarts and adding x quarts, we should end up with (30 + x) quarts

$$\mathbf{30} + \mathbf{x} = \mathbf{(30 + x)}$$

The problem describes the solution in terms of acid, we have set it up in terms of water. So, we have to change the percentages and put them in the problem.

$$\mathbf{.25(30)} + \mathbf{x} = \mathbf{.85(30 + x)}$$

Again, we multiply both sides of the equation by 100 to get rid of the decimal point.

$$\begin{array}{rclcl} \mathbf{25(30)} & + & \mathbf{100x} & = & \mathbf{85(30 + x)} \\ \mathbf{750} & + & \mathbf{100x} & = & \mathbf{2550 + 85x} \\ & & \mathbf{15x} & = & \mathbf{1800} \\ & & \mathbf{x} & = & \mathbf{120\ qts} \end{array}$$

Remember to do the problem in terms of what's being added, then make sure your percents describe the solution in your equation.