**Problem Solving Part 1: Mixture Problems**

**REVIEW:** A *percent* is parts per hundred.

**Example 1:**

A 50% alcohol solution has 50% alcohol and 50% water.

A 60% alcohol solution has 60% alcohol and 40% water.

**Example 2:**

A chemist has 200 gallons of a 30% acid solution. How many gallons of pure acid is in the solution?

We can use the following formula to solve this problem.

\[
\text{amount of solution} \times \text{percent of acid} = \text{amount of acid}
\]

\[
(200 \text{ gallons}) \times (0.30) = \underline{\text{gallons}}
\]

This means that there are _______ gallons of pure acid and _______ gallons of water.
A MIXTURE PROBLEM:

Example 3:

How many gallons of 50% alcohol must be mixed with 80 gallons of 20% alcohol to get a mixture that is 40% alcohol?

Since there are \( x \) gallons in the first solution and 80 gallons in the second solution, and we are mixing the two solutions to make one big mixture, there must be \((x + 80)\) gallons in the mixture.

We must organize all of this information into a table in order to solve the problem.

<table>
<thead>
<tr>
<th>Amount of Solution</th>
<th>Percent Alcohol</th>
<th>Amount of Alcohol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution 1:</td>
<td>50% alcohol</td>
<td></td>
</tr>
<tr>
<td>Solution 2:</td>
<td>20% alcohol</td>
<td></td>
</tr>
<tr>
<td>Final Mixture:</td>
<td>40% alcohol</td>
<td></td>
</tr>
</tbody>
</table>

Now that the table is filled out. We can write an equation to solve for \( x \).

**RECALL:**

\[
\left( \text{alcohol amount of solution 1} \right) \times \left( \text{alcohol amount of solution 2} \right) = \text{(Final Mixture)}
\]

So our equation becomes:

\[
0.50x + 0.20(80) = 0.40(x + 80)
\]

Solve for \( x \).
How many liters of a 20% acid solution must be mixed with 12 liters of a 12% acid solution to get a mixture that is 14% acid?

<table>
<thead>
<tr>
<th>Amount of Solution</th>
<th>Percent Acid</th>
<th>Amount of Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution 1: 20% acid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solution 2: 12% acid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Mixture: 14% acid</td>
<td></td>
<td></td>
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</tbody>
</table>