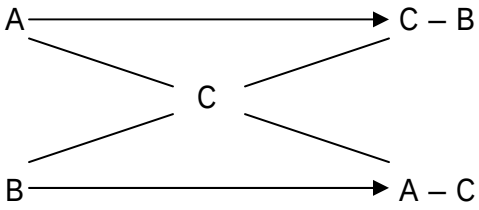
DILUTION RECTANGLE CALCULATIONS

One of the advanced processes found on water treatment operator certification exams deals with combining solutions of different volumes and concentrations to form a new concentration, or diluting a known concentration to a target dosage. Two-normal and three-normal equations can be used in many of these computations, but they are not always enough. Consider the following:

An operator needs to feed 50 gallons of 6% sodium hypochlorite for disinfection purposes. He has 100 gallons of 12.5% NaOCl, and 100 gallons of 0.8% NaOCl. How many gallons would be used from each of these to make the desired concentration?

A) 27 gallons of 0.8% and 23 gallons of 12.5%
B) 28 gallons of 0.8% and 22 gallons of 12.5%
C) 29 gallons of 0.8% and 21 gallons of 12.5%
D) 30 gallons of 0.8% and 20 gallons of 12.5%

The question looks like a three-normal calculation, but there is not enough information to use that process because there are two unknown quantities. That is where a dilution rectangle can help. This is how it looks:



Where:
A = the stronger starting solution %
B = the weaker starting solution %
C = the target concentration %

This is how it is used: A = 12.5% B = 0.8% C = 6.0%
The number of parts needed from the stronger solution is determined by: C – B = 5.2
The number of parts needed from the weaker solution is determined by: A – C = 6.5
The total number of parts is found by adding these two numbers: 5.2 + 6.5 = 11.7
A ratio for each solution is calculated by dividing each subtraction result by the total.
5.2 ÷ 11.7 = 0.44 6.5 ÷ 11.7 = 0.56
Since 50 gallons of 6% NaOCl are needed, multiply each ratio by 50. $0.56 \times 50 = 28$ and $0.44 \times 50 = 22$, so the answer is... ***B) 28 gallons of 0.8% and 22 gallons of 12.5%***.

Determining ratios correctly is the key to doing dilution rectangle calculations. For more help with this or other water math processes, please contact Water Opcert School.

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