Math Diversion Problem 935

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We must use time as a tool, not as a couch.
— John F. Kennedy

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Source: https://www.algebra.com/algebra/homework/word/mixtures/
              Mixture-problems.lesson
Title: Changing a Concentration Problem
  Presenter: Patrick
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1 Problem

How much water should be added to 200 milliliters of a 10% acid solution to get a 2% acid solution? (Concentrations here are volume-to-volume concentrations, measured in [mL/mL] units, or milliliters of the acid per 1 milliliter of the solution).

2 Solution

Let's make a diagram to help out.

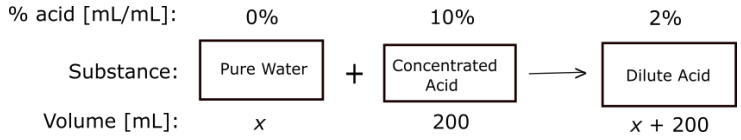

Figure 1. Here, the notion of 'concentrated' vs 'dilute' acid is not following any technical definition. To illustrate what I mean, sulfuric acid is said to be 'concentrated' only when at or above 98.3% by mass.

1) Conservation of volume is accounted for.
2) Next, we write down the conservation of 'pure' acid equation:

$$(0.00)(x) + (0.10)(200) = (0.02)(x + 200). \tag{1}$$

The solution for x is 800 mL.