Math Diversion 1029

P. Reany

January 30, 2026

Self-education is, I firmly believe, the only
kind of education there is.
— Isaac Asimov

```
Source: https://gmatclub.com/forum/the-ratio-by-
        volume-of-soap-to-alcohol-to-water-in-a-68933.
Title: A ratios Problem
Presenter: Patrick
```

1 Problem

The ratio by volume of soap to alcohol to water in a certain solution is $2 : 50 : 100$. After the solution is altered so that the ratio of soap to alcohol is doubled, and the ratio of soap to water is halved, there is 100cc of alcohol. How many cc's of water does this new solution contain?

2 Solution 25.3.1: Conceptualizing the Problem

What does it mean to double or half a ratio? To double the ratio $a : b$ is to yield $2a : b$. To half the ratio $d : e$ is to get $d : 2e$. So, we deal with these changes in steps.

Step 1) Soap to alcohol is doubled means we get the ratios $4 : 50 : 100$.

Step 2) As we left things in the last step, we also doubled ratio of soap to water. To half the ratio of soap to water means $2 : 50 : 100 \to 2 : 50 : 200$. To combine these two effects, we can either half the fifty in $2 : 50 : 200$ to get $2 : 25 : 200$ or quadruple the 100 in $4 : 50 : 100$ to get $4 : 50 : 400$. Either way, both alterations are in effect.

The question of how much water is obtained is given by the proportion

$$\frac{400}{50} = \frac{x}{100}\,, \tag{1}$$

with answer $x = 800$cc.