

Math Diversion 999

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You will never plough a field if you only turn
it over in your mind.

— Irish Proverb

Source: <http://gmatclub.com/forum/two-kinds-of-vodka-are-mixed-in-the-ratio-1-2-and-2-1-and-113897.html>

Title: A Mixed-Rate Problem

Presenter: Patrick

1 Problem

Two kinds of Vodka are mixed in the ratio 1:2 and 2:1 and they are sold fetching the profit 10% and 20% respectively. If the vodkas are mixed in equal ratio and the individual profit percent on them are increased by $\frac{4}{3}$ and $\frac{5}{3}$ times respectively, then the mixture will fetch the profit of

- A. 18%
- B. 20%
- C. 21%
- D. 23%
- E. Cannot be determined

2 Solution 24.1.1: Conceptualizing the Problem

The first thing to note in this problem is the irrelevant information. That is the specific ratios by which the component vodkas are mixed to form Mix 1 at 10% profit and Mix 2 at 20% profit. The reason we do not need to know these ratios is simply because the question asks us nothing about the costs or profits of the component vodkas. What we are asked to find is the percentage profit on the third mix, Mix 3, made by adding Mix 1 and Mix 2 together.

Before we consider the 'profit factors', where do we stand at the moment? Let's make a figure.

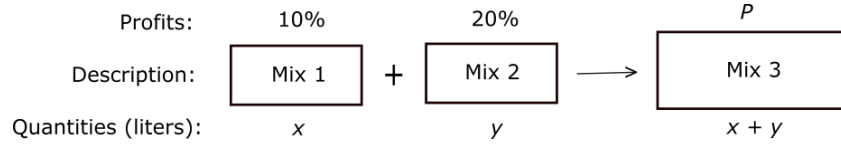


Figure 1. We have chosen the quantities to be in liters, but any volume unit would do as well.

From our long experience with these kinds of percentage problems, we know that the profit percentage of Mix 3 must be something between 10% and 20%. In fact, it will be in the exact middle between them (their average of 15%) if we combine the mixes in equal amounts. But now we're asked to consider the effect of applying arbitrary multiplication factors to these mixtures on the profit percentage of Mix 3. Next figure, please!

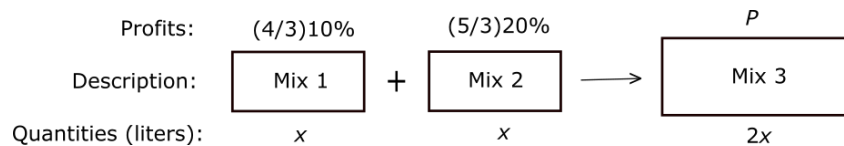


Figure 2. The whole problem boils down to dealing with this simple figure.

We need only balance on the conserved values of profits (not their percentages).

$$(4/3)10x + (5/3)20x = P \cdot 2x. \tag{1}$$

This has solution $P = 23.3\%$. So, the answer is D.