

Math Diversion 959

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With me, everything turns into mathematics.

— Rene Descartes

(P.S. I calculate; therefore I am.)

Source: The Ether of Great Mathematical Ideas

Title: A Mixture Problem

Presenter: Patrick

1 Problem

A jar containing a mixture (Mix 1) of two liquids, A and B , in ratio $A : B :: 4 : 1$. If 10 liters is removed and replaced by 10 liters of B , the ratio of A to B becomes $2 : 3$. How much of A was in Mix 1?

2 Solution

The initial volume of Mix 1 (call it x) is the same as the final volume of Mix 2. And accompanying figure is, please:

A to B ratio:	4 : 1	0 : 1	2 : 3		
Fractional amount of A:	4 / 5	0 / 5	2 / 5		
Substance:	Mix 1	+	B	→	Mix 2
Quantities (Liters):	$x - 10$		10		x

Figure 1. Only one unknown means we need only one equation. To get it, we can choose to balance on A or on B . Which should we pick? (Perhaps you were expecting to see $0/1$ over as the 'Fractional amount of A ' in B , and that would be correct, but $0/5$ is also correct but also has the same denominator as the other two fractions.)

We need only one equation to derive x from. Let's use the conservation of A equation.

$$\frac{4}{5}(x - 10) + 0(10) = \frac{2}{5}(x), \quad (1)$$

which has solution $x = 20$. Thus, the fractional amount of A is Mix 1 is $4/5$ th that, being 16 liters.