Math Diversion 748

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> My grandparents's generation used to say, "It will NEVER
> happen!" My parents's generation said, "Not in MY
> lifetime, it won't." Our generation has to get used
> to saying,"Probably not before Tuesday."
> — Anonymous

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Source: The Ether of Great Mathematical Ideas
Title: A Nice Mixed-Rate Problem
 Presenter: Patrick
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1 The Problem

A and B together can do a job in 8 days. A and C together can do the job in 9 days. And B and C together can do the job in 10 days. What is B's individual rate?

2 The Solution

When two 'machines', A and B, say, work together over a common time they have a combined effective rate of $\frac{1}{T}$, which we get from the equation

$$(R_A + R_B)T = 1[\text{job}]\,, \tag{1}$$

from which we get

$$R_{A+B}^{\text{effective}} = R_A + R_B = \frac{1}{T}\,. \tag{2}$$

Now, on to the rate we need. So, from the given information, we get

$$R_A + R_B = 1/8\,, \tag{3a}$$
$$R_A + R_C = 1/9\,, \tag{3b}$$
$$R_B + R_C = 1/10\,. \tag{3c}$$

According to wolframalpha.com, $R_B = \frac{41}{720}$.