

Math Diversion 716

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Beauty is the first test: there is no permanent place
in the world for ugly mathematics.

— G.H. Hardy

The problem is found at:

Source: <https://www.algebra.com/algebra>

Title: Question 22466

Presenter: Patrick

1 The Problem

An apprentice A takes three hours longer to do a certain job than his mentor M . Working together, they can do the job in two hours. What are their individual rates?

2 Solution

Let's begin without a figure this time.

We'll represent the rates at which the mentor and the assistant work the job as, respectively, R_M and R_A . These have units of job/hour, but some of the information given to us forces us to compare their hours/job, requiring the multiplicative inverses of R_M and R_A . So, let the time it takes M to do the job be T hours. Then, $R_M^{-1} = T$ hours/job and $R_A^{-1} = (T+3)$ hours/job. Therefore, $R_M = 1 \text{ job}/(T \text{ hours})$ and $R_A = 1 \text{ job}/[(T+3) \text{ hours}]$

For our second equation, we take the total of one job being done by the mentor and apprentice, working for same quantity of time, 2 hours:

$$1 = \frac{1}{T} 2 + \frac{1}{T+3} 2, \tag{1}$$

with units suppressed, as usual. This equation has solution $T = 3$ hours. Then for $T + 3$ we get 6 hours. We're almost done. $R_M = 1 \text{ job}/(3 \text{ hours})$ and $R_A = 1 \text{ job}/(6 \text{ hours})$.