Math Diversion Problem 821

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> Unless you try to do something beyond what you have
> already mastered, you will never grow.
> — Ralph Waldo Emerson

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

A job takes 4 hours for two people (A and B) to perform. A, working alone, can do the job in 6 hours. How long would it take B to perform the job alone?

2 Solution

Now, total of 1 job is performed by both people:

$$1 \text{ job} = (\text{PJDB } A) + (\text{PJDB } B)\,, \tag{1}$$

where "PJDB" = "part of job done by." Expanding a bit, we get

$$1 = R_A T_A + R_B T_B = (R_A + R_B)T\,, \tag{2}$$

since $T_A = T_B = T$, the common time they work together, which is 4 hours. And $T_A = 6$ hours. Therefore,

$$1 = (\frac{1}{6} + R_B)4\,, \tag{3}$$

which has solution $R_B = \frac{1}{12}$ job/hour. And this implies that B will require 12 hours to complete one job.