Math Diversion 1059

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Mental toughness is essential to success.
— Vince Lombardi

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Source:  https://www.youtube.com/watch?v=rfArXK422FM
Title: Russian Math Olympiad Questions
 Presenter: Math Beast
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1 Word Problem

Question 6293: In printing an article of 48,000 words, a printer decides to use two sizes of type. Using the larger type, a printed page contains 1,800 words. Using smaller type, a page contains 2,400 words. The article is allotted 21 full pages in a magazine. How many pages must be in smaller type?

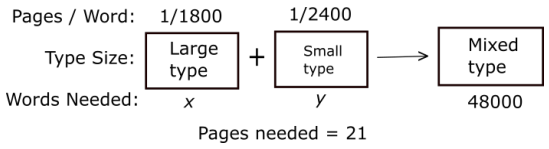

Figure 2. Pages per word? Really? Sure, because that's what works.

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2 Solution

In principle, this problem is no different than two machines working together to complete a job. The job here is for these two abstract 'machines' together to consume 21 pages of output. The faster machine gobbles up pages at the rate of 1/1800 [pages/word], and the slower machine at the rate of 1/2400 [pages/word].

Balancing on total words needed, we get

$$x + y = 48000\,. \tag{1a}$$

Balancing on total pages, we get

$$1800^{-1}x + 2400^{-1}y = 21\,. \tag{1b}$$

The solutions are $x = 7200$ and $y = 40800$.

Thus, the number of pages at the smaller type is (40800 words)$(\frac{1\,\text{page}}{2400\,\text{words}})$ = 17 pages.