Math Diversion 967

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> Physical concepts are free creations of the human mind,
> and are not, however it may seem, uniquely
> determined by the external world.
> — Albert Einstein

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Source: https://www.algebra.com/algebra
Title: Question 353765: A Mixed-Rate Problem
 Presenter: Patrick
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1 Problem

.....Lead....Zinc....Copper
Alloy A..40%...30%...30%
Alloy B..20%...30%...50%
Alloy C.....10%...90%
How many grams of each alloys A, B, and C must be mixed to get 325 gm of an alloy that is 25% lead, 13% zinc, and 62% copper? I've tried this using the Matrix, and the inverse Matrix, and keep coming up with negatives on some alloys. Thanks for your help.

2 Solution

First, I also got negative numbers with the original data set, so (after some trial and error) I changed the percentages in the final alloy to the values in the table below:

	Lead	Zinc	Copper
Alloy A	40%	30%	30%
Alloy B	20%	30%	50%
Alloy C	0%	10%	90%
Alloy D	22%	25%	53%

Time to put the data into a figure. Note that the percentage information was coded in the form of ratios.

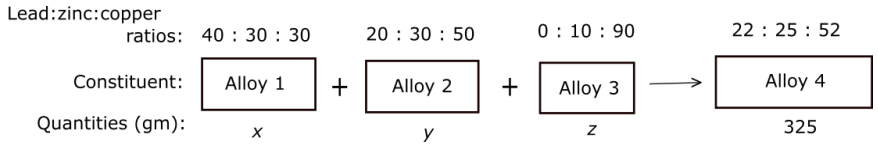

Figure 1. The percentage data is easier displayed as ratios.

Now, balancing on lead, zinc, and copper, in that order, we get

$$40x + 20y + 0z = 22(325)\,, \tag{1a}$$
$$30x + 30y + 10z = 25(325)\,, \tag{1b}$$
$$30x + 50y + 90z = 53(325)\,. \tag{1c}$$

Wolframalpha.com gives as solutions for this system

$$x = 113.75\,, \quad y = 130\,, \quad z = 81.25\,, \tag{2}$$

and these three values add to 325, as they should.