Math Diversion Problem 947

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December 4, 2025

> In life, work hard, don't complain, emphasize the positive, earn your accomplishments.
> — The Author

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  https://www.algebra.com/algebra/homework/word/mixtures
          /Mixture_Word_Problems.faq.question.954102.html
Title: A Mixed-Rate Problem
  Presenter: Patrick
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1 Problem (paraphrased):

Starting with 100 lbs alloy of 20% copper and 5% tin, how many pounds of copper and pounds of tin must be melted into it to produce a new alloy that's 30% copper and 10% tin?

2 Solution

The essence of a before-and-after process is that, while some things are clearly changing, other things presumably are not. In this problem, the things that are not changing are the total amounts of tin and copper, from which we derive two coupled conservation equations.

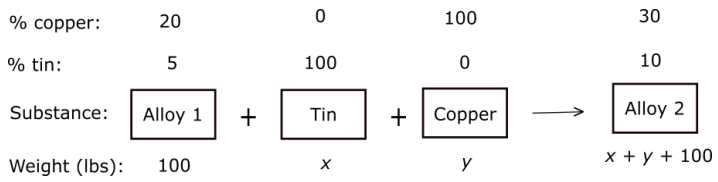

Figure D1. This graphic represents adding three things together, instead of the usual two things. Reasonably, pure tin has no copper in it, and pure copper has no tin in it. Conservation of weight is already accounted for.

We will represent the amount of tin to be added as x and the amount of copper to be added as y. In Figure D1, we can see that our requirement that the weights of the constituent parts is preserved.

We have two unknowns to solve for, so we need two coupled equations to solve for them.

$$\text{Conservation of Copper:} \quad .2(100) + 0(x) + 1.0(y) = .3(x + y + 100)\,, \quad \text{(1a)}$$

$$\text{Conservation of Tin:} \quad .05(100) + 1.0(x) + 0(y) = .1(x + y + 100)\,. \quad \text{(1b)}$$

My solutions are $x \approx 7.5$ and $y \approx 17.5$.