Math Diversion Problem 900

P. Reany

November 14, 2025

> Young men should prove theorems, old
> men should write books.
> — G. H. Hardy

```
Source: http://www2.math.umd.edu/~jnd/Algebraic
     \_word\_problems.pdf
Title: Ratio of gold to silver in a crown
 Presenter: Patrick
```

1 The Problem

Question: Ratio of gold to silver in a crown:

A royal crown is an alloy of gold and solver. The crown weighs 3000 grams and has a volume of 200cc. If the density of gold is 20 grams/cc and of silver is 10 grams/cc, what is the ratio of gold to silver by volume in the crown?

2 Solution

Another easy problem once we identify the totals and their parts. When forming an alloy of two metals, both volumes and weights of the parts are preserved.

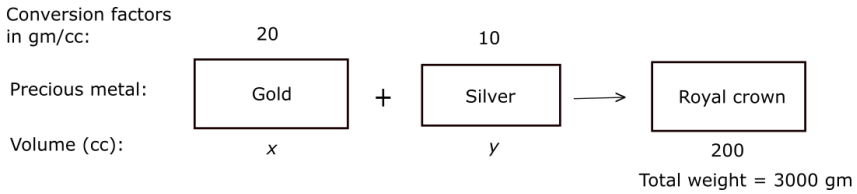

Figure 2. You can't fool this algebraist. Both weights and volumes must be conserved in forming this royal alloy.

Total volume is conserved in forming this alloy:

$$x + y = 200\,. \tag{1a}$$

And total weight is conserved:

$$20x + 10y = 3000\,. \tag{1b}$$

This system has solution $x = 100$ and $y = 100$. Therefore, the constituent metals are in ratio $1 : 1$, gold to silver by volume. Lastly, since gold is twice as dense as silver, the ratio of gold to silver by weight is $2 : 1$.