Math Diversion Problem 838

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> The shortest path between two truths in the real domain
> passes through the complex domain.
> — Jacques Hadamard

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Source: The Ether of Great Mathematical Ideas
Title: A Word Problem
  Presenter:  Patrick
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1 Problem

A widow received $\frac{1}{3}$rd of her husband's estate, and each of her three sons received $\frac{1}{3}$rd of the balance. If the sum the widow received is added to that of one of her sons, the total is \$60,000. What was the value of the estate?

2 Solution

We'll begin by writing that the value of the estate is equal to the sum of all of its distributed parts. Let the value of the estate be E.

$$\begin{aligned} E &= (\text{widow's amount}) + (\text{Son 1}) + (\text{Son 2}) + (\text{Son 3}) \\ &= W + S_1 + S_2 + S_3 \\ &= [\, W + S_1 \,] + \frac{1}{3}\big(\frac{2}{3}E\big) + \frac{1}{3}\big(\frac{2}{3}E\big) \\ &= 60,000 + \frac{1}{3}\big(\frac{2}{3}E\big) + \frac{1}{3}\big(\frac{2}{3}E\big)\,, \end{aligned} \tag{1}$$

which gives the answer $E =$ \$108,000.