

Math Diversion 709

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The most powerful teaching moments are
the ones where you screw up
— Brené Brown

The problem is found at:

Source: <https://www.youtube.com/watch?v=D6HwZgoT6kc>
Title: Only 3% Solved this Germany Olympiad Problem
Presenter: MathMinds

1 The Problem

We start with a square subdivided into three rectangles as shown in Fig. 1. The side length of the square is L , and the numbers inside the rectangles are their respective areas of the rectangles. [**Note:** This is **not** the original problem given in the video, which treated the numbers as representing the perimeters of the rectangles.]

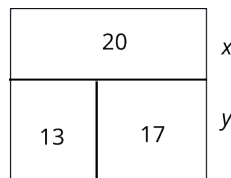


Figure 1. $L = x + y$.

Our problem is to solve for the the side length, L , of the square, and x and y , given the information of the altered problem—if a solution even exists. Well, we'll see.

2 The Solution

What are the obvious relations? We already have that

$$L = x + y. \tag{1}$$

We also have a ‘total as the sum of its parts’, concerning the areas:

$$L^2 = 20 + 13 + 17 = 50, \tag{2}$$

from which we get

$$L = \sqrt{50} = x + y. \tag{3}$$

That leaves just x and y to solve for. I leave it to the reader to prove the not-too-difficult fact that the ratio of the horizontal area sums (going top-down) is proportional to the ratio of x to y :

$$\frac{x}{y} = \frac{20}{30}. \tag{4}$$

Eliminating y between (3) and (4), gives us

$$x = \frac{2}{5}\sqrt{50}. \tag{5}$$

And using this value in (3), we have that

$$y = \frac{3}{5}\sqrt{50}. \tag{6}$$

So it looks like the problem does have a solution.

3 Afterwords

Obviously, I didn’t ‘read the problem carefully enough’ in the beginning, and if this were a test, I would have failed the problem. However, I wanted the numbers in the rectangles to represent areas because I immediately saw the **instructive relation** embodied in Eq. (4). So, I co-opted the original problem for the sake of setting up a not-so-spontaneous ‘**teaching moment**’.