

Math Diversion Problem 436

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I feel that a visual representation of the Dirac algebra is of great benefit, because it can provide an additional insight that is not easily expressed with words or equations.

— David M. Goodmanson

[‘A graphical representation of the Dirac algebra’,
American J. Phys., Vol. 64, No. 7,
July 1996, p. 870.]

Problem Statement

Note: This is Problem #28.4 from my Word Problem page.

I found this little gem in Blitzer [1]. At the north campus of a small liberal arts college, 10% of the students are women. At the south campus, 50% of the students are women. The campuses are merged into one east campus, of which 40% of the 1200 students are women. How many students were in the north and south campuses before the merger?

Visualizing the Problem

Our figure needs to represent all three campuses in the boxes.

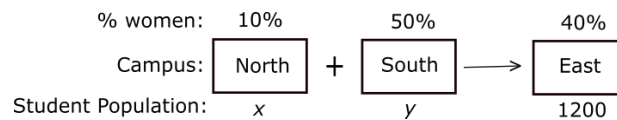


Figure 1. A standard setup, containing all the relevant data.

Scheme & Solution

Are there any totals in the problem? (Almost always there are.)

Balancing on the total numbers of students before and after the merger (a conserved quantity in a 'before-and-after' process), we get

$$x + y = 1200. \tag{1}$$

Balancing on the number of women before and after the merger, we get

$$.1x + .5y = .4(1200), \tag{2}$$

where the percentages have been converted to decimals. The solutions to these last two equations are $x = 300$, and $y = 900$.

References

- [1] R. Blitzer. *Intermediate Algebra for College Students*, 3rd Ed. Prentice-Hall (2002), p. 181 #21.