

Math Diversion Problem 601

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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.]

The YouTube video is found at:

Source: <https://www.youtube.com/shorts/nJtj8XCGT5I>

Title: Math Word Problems

Presenter: GuinnessAndMathGuy (shorts)

1 The Problem

The average age of a class of 40 students is 12 years. If the teacher’s age is also included (in the average), the average age increases by 1. The teacher’s age is

(a) 41 years (b) 52 years (c) 53 years (d) 54 years?

2 The Preparation

A simple average is the sum of the parts divided by the number of those parts:

$$\text{ave.} = \frac{\sum_{i=1}^N p_i}{N}, \quad (1)$$

where N is the number of values being added.

3 The Solution

The average age of students alone is

$$\text{ave. age of students} = \frac{\sum_{i=1}^{40} p_i}{40} = 12, \quad (2)$$

where p_i is the age of the i th student. The average age of students and teacher is

$$\text{ave. age of students and teacher} = \frac{\left(\sum_{i=1}^{40} p_i\right) + p_{\text{teacher}}}{41} = 13. \quad (3)$$

Let's create two simpler equations by clearing of fractions.

$$\sum_{i=1}^{40} p_i = 12 \times 40, \quad (4a)$$

$$\sum_{i=1}^{40} p_i + p_{\text{teacher}} = 13 \times 41. \quad (4b)$$

So, we can get the age of the teacher (p_{teacher}) by subtracting (4a) from (4b), to get

$$p_{\text{teacher}} = 13 \times 41 - 12 \times 40 = 533 - 480 = 53. \quad (5)$$