

1. Michael walks 5 miles and then runs back the same distance. He runs at a speed that is 1.5 times as much as his walking speed. Totally it took him 2 hours. Find his walking and running speeds.

NOTE: Many of you assumed that the time for running is 2 hours. In fact, the TOTAL TIME is 2 hours. If running time is 2 hours, the problem would be too easy! Then running speed is $5/2 = 2.5$ and walking speed is 1.5 times that, equals to 3.75 mph. I didn't take off any points if you did this, because the way I wrote it on the blackboard was ambiguous.

Also, note that running speed + walking speed does not equal average speed (= 10 miles/ 2 hours = 5 mph). In general, you cannot add speeds in separate sections to get average speed for whole trip. Also, there is no such thing as total speed.

Solution

Start with the unknown. You can pick either speed as the unknown. For calculation, it is easier to pick the walking speed as x .

Next write everything using x .

It helps to make a table with distance, speed and time.:

	<i>speed</i>	<i>time</i>	<i>distance</i>
<i>walk</i>	x	$\frac{5}{x}$	5
<i>run</i>	$1.5x$	$\frac{5}{1.5x}$	5
<i>total</i>		$\frac{5}{x} + \frac{5}{1.5x} = 2$	

Now we solve the equation by multiplying all by $1.5x$ which is the LCM:

$$\begin{aligned} & \frac{5}{x} + \frac{5}{1.5x} = 2 \\ \implies & (1.5x) \left(\frac{5}{x} + \frac{5}{1.5x} \right) = (1.5x) \times 2 \\ \implies & 5(1.5) + 5 = 3x \\ \implies & 12.5 = 3x \\ \implies & x = 12.5/3 \end{aligned}$$

Check that this is the answer by plugging into original.