Question #43179, Physics, Other

On a 60 km straight road, a bus travels the first 30 km with a uniform speed of 30 kmh-1. How fast must the
bus travel the next 30 km so as to have average speed of 40 kmh-1 for the entire trip?

Solution:

We know formula for average speed when we have two parts of hole trip:

$$v_{avr} = \frac{S_1 + S_2}{t_1 + t_2} \quad (1)$$

where S_1 – first part of trip ($S_1 = 30$ kmh^{-1}) , S_2 - second part of trip (S_2 = 30 kmh^{-1}), t_1 and t_2 – time on this two parts respectively.

We also know that:

$$t_1 = \frac{S_1}{v_1}$$

$$t_2 = \frac{S_2}{v_2}$$

Let`s place this two formulas in (1):

$$v_{avr} = \frac{S_1 + S_2}{\frac{S_1}{v_1} + \frac{S_2}{v_2}}$$

Also we know that $S_1 = S_2 = S$, where S is hole road. Let`s change our formula and reduce (where possible on S):

$$v_{avr} = \frac{2}{\frac{1}{v_1} + \frac{1}{v_2}} = \frac{2v_1 v_2}{v_1 + v_2}$$

We know $v_{avr} = 40.$ $v_1 = 30.$ Let`s $v_{2.} = x$

Let`s solve our expression and get : v_2 = 60 kmh^{-1}.