Answer on Question#82229 - Physics – Mechanics | Relativity

The speed of a car increases uniformly from 25 meter per second to 70 meter in 15 seconds. calculate the average speed. Options

A 40.5

B 37.5

C 47.5

D 50.5

Solution:

Since the speed of the car increases uniformly, its acceleration a is constant and can be calculated by the following formula

$$a = \frac{v_f - v_i}{\Delta t},$$

where v_f – is the final speed of the car, v_i – its initial speed and Δt – is the time of acceleration.

It is given that $v_f = 70\,\frac{\text{m}}{\text{s}}$, $v_i = 25\,\frac{\text{m}}{\text{s}}$ and $\Delta t = 15\ \text{s}$, thus we obtain

$$a = \frac{70\,\frac{\text{m}}{\text{s}} - 25\,\frac{\text{m}}{\text{s}}}{15\ \text{s}} = 3\,\frac{\text{m}}{\text{s}^2}$$

Then the displacement of the car $x(t)$ is given by

$$x(t) = v_i t + \frac{at^2}{2}$$

The average speed v_{avg} is defined as the ratio of traveled path to the time of travel. Therefore we get

$$v_{avg} = \frac{x(15\ \text{s}) - x(0\ \text{s})}{\Delta t} = \frac{25\,\frac{\text{m}}{\text{s}} \cdot 15\ \text{s} + \frac{3\,\frac{\text{m}}{\text{s}^2} \cdot (15\ \text{s})^2}{2}}{15\ \text{s}} = 47.5\,\frac{\text{m}}{\text{s}}$$

Answer: $47.5\,\frac{\text{m}}{\text{s}}$.