

An object uniformly accelerates from rest and reaches a velocity of 122.0 km/h north in 10.5 s. what was the average velocity of the object?

The formula for average velocity:

$$v_a = \frac{S_{total}}{t_{total}}$$

Total distance:

$$S_{total} = \frac{at_{total}^2}{2}$$

By definition, acceleration is (initial velocity = 0):

$$a = \frac{v_{final}}{t_{total}}$$

Thus:

$$S_{total} = \frac{\frac{v_{final}}{t_{total}} t_{total}^2}{2} = \frac{t_{total} v_{final}}{2}$$

And finally:

$$v_a = \frac{t_{total} v_{final}}{2 t_{total}} = \frac{v_{final}}{2}$$

$$v_a = \frac{122 \text{ km/h}}{2} = 61 \text{ km/h}$$

Answer: $v_a = 61 \text{ km/h}$