

This is a 1-D problem involving average velocity and average speed.

A delivery truck drives 6.5 km along a straight road. The driver then exits the truck, walks 1.5 km to deliver a package at one house, and then continues walking another 2 km to deliver a package to another house. The driver then walks back to the truck. The driving speed of the truck is 70 km/h, and the walking speed of the driver is 5 km/h.

(a) What is the average velocity and average speed of the driver from the start of the drive until the time that the package is delivered to the second house?

(b) What is the average velocity and average speed of the driver from the start of the drive until the time that the driver returns to the truck?

Solution:

(a) The displacement is:  $6.5 \text{ km} + 1.5 \text{ km} + 2 \text{ km} = 10 \text{ km}$   
The travel distance is:  $10 \text{ km}$

Time interval,  $\Delta t = \frac{6.5 \text{ km}}{70 \text{ km/h}} + \frac{1.5 \text{ km}}{5 \text{ km/h}} + \frac{2 \text{ km}}{5 \text{ km/h}} = 0.79 \text{ h}$

Average velocity:  $\bar{v} = \frac{\text{displacement}}{\Delta t} = \frac{10 \text{ km}}{0.79 \text{ h}} = 12.6 \text{ km/h}$  (ans.)

Average speed:  $\bar{s} = \frac{\text{travel distance}}{\Delta t} = \frac{10 \text{ km}}{0.79 \text{ h}} = 12.6 \text{ km/h}$  (ans.)

(b) The travel distance is:  $6.5 \text{ km} + 1.5 \text{ km} + 2 \text{ km} + 2 \text{ km} + 1.5 \text{ km} = 13.5 \text{ km}$

The displacement is:  $6.5 \text{ km}$

$$\text{Average velocity: } \bar{v} = \frac{\text{displacement}}{\Delta t} = \frac{6.5 \text{ km}}{\Delta t}$$

$$\text{Average speed: } \bar{s} = \frac{\text{travel distance}}{\Delta t} = \frac{13.5 \text{ km}}{\Delta t}$$

Time interval,

$$\Delta t = \frac{6.5 \text{ km}}{70 \text{ km/h}} + \frac{1.5 \text{ km}}{5 \text{ km/h}} + \frac{2 \text{ km}}{5 \text{ km/h}} + \frac{2 \text{ km}}{5 \text{ km/h}} + \frac{1.5 \text{ km}}{5 \text{ km/h}}$$

$$\Delta t = 1.49 \text{ h}$$

$$\text{Therefore, } \bar{v} = \frac{6.5 \text{ km}}{1.49 \text{ h}} = 4.4 \text{ km/h (answer)}$$

$$\bar{s} = \frac{13.5 \text{ km}}{1.49 \text{ h}} = 9.1 \text{ km/h (answer)}$$