Velocity

mp142

Given

$\vec{d}_1 = 0.0\,m$ $t_1 = 0.0\,s$

$\vec{d}_2 = 200.0\,m\,[E]$ $t_2 = 4.3\,s$

$\vec{d}_3 = 400.0\,m\,[E]$ $t_3 = 11.0\,s$

Required

a) $\vec{V}_{ave}(1\to2)$

b) $\vec{V}_{ave}(2\to3)$

c) $\vec{V}_{ave}(1\to3)$

Analysis

$$\vec{V}_{ave} = \frac{\Delta \vec{d}}{\Delta t}$$

Solution

a) $$\vec{V}_{ave} = \frac{\vec{d}_2 - \vec{d}_1}{t_2 - t_1}$$

$$\vec{V}_{ave} = \frac{200.0\,m\,[E] - 0.0\,m}{4.3\,s - 0.0\,s}$$

$$\vec{V}_{ave} = \frac{200.0\,m\,[E]}{4.3\,s}$$

$$\boxed{\vec{V}_{ave} = 47\,m/s\,[E]}$$

b) $$\vec{V}_{ave} = \frac{\vec{d}_3 - \vec{d}_2}{t_3 - t_2}$$

$$\vec{V}_{ave} = \frac{400.0\,m\,[E] - 200.0\,m\,[E]}{11.0\,s - 4.3\,s}$$

$$\vec{V}_{ave} = \frac{200.0\,m\,[E]}{6.7\,s}$$

$$\vec{V}_{ave} = 3.0 \times 10^{1}\,m/s\,[E] \quad (29.8507\ldots)$$

c) $$\vec{V}_{ave} = \frac{\vec{d}_3 - \vec{d}_1}{t_3 - t_1}$$

$$\vec{V}_{ave} = \frac{400.0\,m\,[E] - 0.0\,m}{11.0\,s - 0.0\,s}$$

$$\vec{V}_{ave} = \frac{400.0\,m\,[E]}{11.0\,s}$$

$$\boxed{\vec{V}_{ave} = 36.4\,m/s\,[E]}$$

NOTE: This is not the average of 30 m/s and 47 m/s

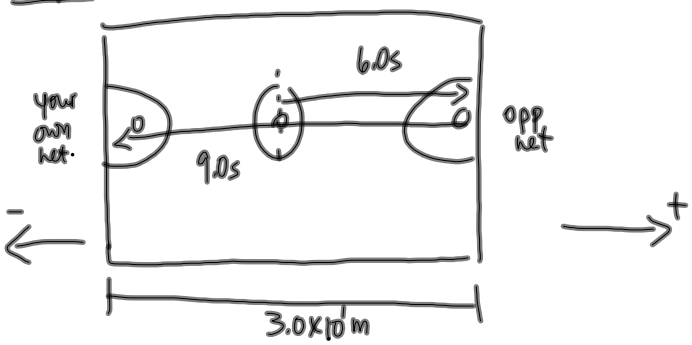
Paraphrase

The average velocity for the first 200 m was 47 m/s

" " second 200 m was 30 m/s

" " whole trip was 36.4 m/s

MP 4.4



Given

$\vec{d}_1 = 0.0\,m$, $\vec{d}_2 = +15\,m$ $\Rightarrow \Delta t = 6.0\,s$

$\vec{d}_2 = +15\,m$, $\vec{d}_3 = -15\,m$ $\Rightarrow \Delta t = 9.0\,s$

Required

a) $\vec{v}_{ave\,(1\to2)}$

b) $\vec{v}_{ave\,(2\to3)}$

Analysis

$$\vec{v}_{ave} = \frac{\Delta \vec{d}}{\Delta t}$$

Solution

a) $$\vec{v}_{ave} = \frac{\vec{d}_2 - \vec{d}_1}{\Delta t}$$

$$\vec{v}_{ave} = \frac{+15\,m - 0\,m}{6\,s}$$

$$\vec{v}_{ave} = +2.5\,\frac{m}{s}$$

$$\vec{v}_{ave} = 2.5\,\frac{m}{s}\ [\text{toward the opp net}]$$

b) $$\vec{v}_{ave} = \frac{\vec{d}_3 - \vec{d}_2}{\Delta t}$$

$$\vec{v}_{ave} = \frac{-15\,m - (+15\,m)}{\Delta t}$$

$$\vec{v}_{ave} = -\frac{30\,m}{9.0\,s}$$

$$\vec{v}_{ave} = -3.3\,m/s$$

$$\vec{v}_{ave} = 3.3\,m/s\ [\text{toward your own net}]$$

Paraphrase

The average velocity for the first 6.0s was 2.5 m/s [toward the opp net]

last 9.0s was 3.3 m/s [toward your own net]