Velocity Problems

Rearranging the velocity equation:

$$V = \frac{\Delta d}{\Delta t}$$

Rearrange for Δd: $\Delta d = V\Delta t$

Rearrange for Δt:

$$V = \frac{\Delta d}{\Delta t}$$

$$\frac{V\Delta t}{V} = \frac{\Delta d}{V}$$

$$\Delta t = \frac{\Delta d}{V}$$

Using the GRASP method to solve Velocity Problems:

Given - list what was given in the problem

Required - what do you want to find out?

Analysis - choose suitable equation + rearrange if necessary

Solution - substitute in your given information.

Paraphrase - sentence answer.

Velocity Problems

mp142

Given: $\vec{d}_0 = 0\ m$, $t_0 = 0.0\ s$
$\vec{d}_1 = 200.0\ m\ [E]$ (200.0 m [E]), $t_1 = 4.3\ s$ (4.3 s)
$\vec{d}_2 = 400.0\ m\ [E]$ (200.0 m [E]), $t_2 = 11.0\ s$ (6.7 s)

Required: a) $\vec{V}_{ave(0\to1)} = ?$

b) $\vec{V}_{ave(1\to2)} = ?$

c) $\vec{V}_{ave(0\to2)} = ?$

Analysis: a) $\vec{V}_{ave(0\to1)} = \dfrac{\Delta\vec{d}_{(0\to1)}}{\Delta t_{(0\to1)}}$

b) $\vec{V}_{ave(1\to2)} = \dfrac{\Delta\vec{d}_{(1\to2)}}{\Delta t_{(1\to2)}}$

c) $\vec{V}_{ave(0\to2)} = \dfrac{\Delta\vec{d}_{(0\to2)}}{\Delta t_{(0\to2)}}$

Solution: a) $\vec{V}_{ave(0\to1)} = \dfrac{200.0\ m\ [E]}{4.3\ s}$

$\vec{V}_{ave(0\to1)} \doteq 47\ m/s\ [E]$

b) $\vec{V}_{ave(1\to2)} = \dfrac{200.0\ m\ [E]}{6.7\ s}$

$\vec{V}_{ave(1\to2)} \doteq 3.0 \times 10^1\ m/s\ [E]$

c) $\vec{V}_{ave(0\to2)} = \dfrac{400.0\ m\ [E]}{11.0\ s}$

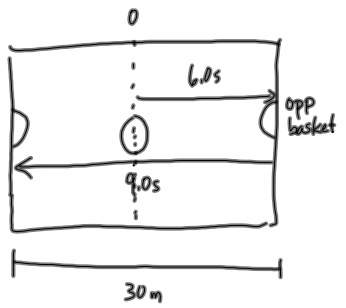
$\vec{V}_{ave(0\to2)} \doteq 36.4\ m/s\ [E]$

NOTE: Average Velocity $\neq \dfrac{V_1 + V_2 + V_3 + \ldots V_n}{n}$

Average Velocity = $\dfrac{\text{overall displacement}}{\text{overall time}}$.

Paraphrase: The average velocity for the first 200.0 m was 47 m/s [E]. The average velocity for the last 200.0 m was 3.0×10^1 m/s [E] and the average velocity for the whole trip was 36.4 m/s [E]

MP|44



Given: $\vec{d}_0 = 0\text{m}$ $\quad \Delta t_{(0\to1)} = 6.0\text{s}$

$\vec{d}_1 = 15\text{m [R]}$

$\vec{d}_2 = 15\text{m [L]}$ $\quad \Delta t_{(1\to2)} = 9.0\text{s}$

Required: a) $\vec{V}_{ave(0\to1)} = ??$

b) $\vec{V}_{ave(1\to2)} = ??$

Analysis|Solution: a) $V_{ave(0\to1)} = \dfrac{\Delta\vec{d}_{(0\to1)}}{\Delta t_{(0\to1)}}$

$= \dfrac{15\text{m [R]} - 0\text{m}}{6.0\text{s}}$

$= 2.5\ \frac{\text{m}}{\text{s}}\text{ [R]}$

b) $\vec{V}_{ave(1\to2)} = \dfrac{\Delta\vec{d}_{(1\to2)}}{\Delta t_{(1\to2)}}$

$= \dfrac{15\text{m [L]} - 15\text{m [R]}}{9.0\text{s}}$

$= \dfrac{-15\text{m [R]} - 15\text{m [R]}}{9.0\text{s}}$

$= \dfrac{-30\text{m [R]}}{9.0\text{s}}$

$= \dfrac{30\text{m [L]}}{9.0\text{s}}$

$\doteq 3.3\ \frac{\text{m}}{\text{s}}\text{ [L]}$

Paraphrase: The average velocity for the first 6.0s was 2.5m/s [R] and the average velocity for the last 9.0s was $3.3\ \frac{\text{m}}{\text{s}}$ [L]

TO DO

① PP|45-46

② Velocity Review: 14, 17, 19-21 (sketch a graph.)

③ Velocity Problems (Assignment) (Car-Chase) due Fri.