

Velocity fake test

Do the following math problems... 2 marks for the drawing, 1 for stating the formula and 2 for the solution.

- 1) An archer not located at the reference point fires an arrow in the negative direction at $t=0$. It passes a marker 4 m away from the origin 2 s later and continues on to strike a target at $t=7$ s. If the arrow travels at a constant velocity of 60 m/s in the negative direction, what is the position of the target?

let negative be negative

$$\begin{array}{c} \text{---} \leftarrow \\ \boxed{} \\ t = 7s \\ d = ? \end{array}$$

$$\begin{array}{c} \text{---} \leftarrow \\ \boxed{} \\ d = -4m \\ t = 2s \end{array}$$

$$\begin{array}{c} \text{---} \leftarrow \\ \boxed{} \\ t = 0 \end{array}$$

$$\begin{aligned} \Delta d &= v_{av} \Delta t \\ \vec{d}_f - \vec{d}_i &= v_{av} (t_f - t_i) \\ \vec{d}_f - (-4m) &= -60 \frac{m}{s} (7s - 2s) \\ d_f + 4m &= -300m \end{aligned}$$

$$d_f = -304m$$

- 2) A runner starts 5 m north of a reference point 9 s after a stopwatch is started. If the runner is running south at a constant velocity of 6 m/s, how far away from the origin will they be 14 seconds after the stopwatch was started?

let south be "+"

$$\begin{array}{c} d_i = -5m \\ t_i = 9s \end{array}$$

$$\downarrow v_{av} = 6 \frac{m}{s}$$

$$\begin{array}{c} t_f = 14s \\ d_f = ? \end{array}$$

$$\begin{aligned} \Delta d &= v_{av} \Delta t \\ \vec{d}_f - d_i &= v_{av} (t_f - t_i) \\ \vec{d}_f - (-5m) &= 6 \frac{m}{s} \times (14s - 9s) \end{aligned}$$

$$d_f = 25m$$

- 3) 5 seconds after a stopwatch is started, a dog standing 14 m north of a reference point starts running south at a constant velocity of 30 m/s. At what time does the dog get 20 meters south of the reference point?

let north be "+"

$$t_f = ? \quad \leftarrow \quad t_i = 5s$$

$$d_f = -20m \quad d_i = 14m$$

$$v = -30 \frac{m}{s}$$

$$\Delta t = \frac{\Delta d}{v_{av}}$$

$$t_f - t_i = \frac{d_f - d_i}{v_{av}}$$

$$d_f - 5s = \frac{-20m - 14m}{-30 \frac{m}{s}}$$

$$d_f - 5s = 6.13s$$

- 4) A relay runner starts 20 m west of a timing station running at 10 m/s [E]. If the runner crosses the finish line 20 m east of the timing station with a time of 6 s, at what time did he start running?

let east be "+"

$$d_i = -20m$$

$$v = 10 \frac{m}{s}$$

$$d_f = 20m$$

$$t_f = 6s$$

$$\Delta t = \frac{\Delta d}{v_{av}}$$

$$t_f - t_i = \frac{d_f - d_i}{v_{av}}$$

$$6s - t_i = \frac{20m - (-20m)}{10 \frac{m}{s}}$$

$$6s - t_i = \frac{40m}{10 \frac{m}{s}}$$

$$t_i = 2s$$

- 5) Three seconds before a stopwatch is started, a runner starts running from 6 m west of a reference point. If the runner gets to 13 m east of the starting line when the stopwatch reads 4 s, what was the runner's velocity?

let east = pos

$$t_i = -3s \quad v_{av} = \frac{d_f - d_i}{t_f - t_i} \quad t_f = 4$$

$$d_i = -6m \quad d_f = 13m$$

$$v_{av} = \frac{13 + 6m}{4 + 3} =$$

$$2.71 \frac{m}{s}$$