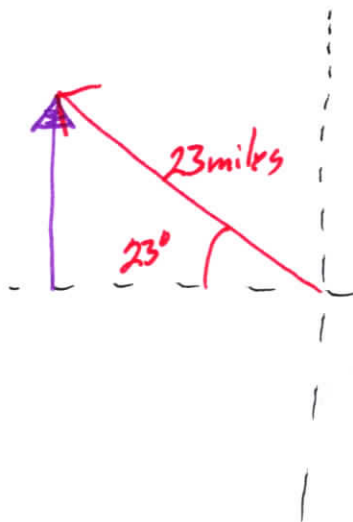


# VECTORS

## FT VECTORS (2)

Directions: Solve the following problems. Your work will be graded, not just the answer.

- 1) While driving on an interstate highway, you notice that you just drove 23 miles at 23 degrees north of west. How far north did you go?



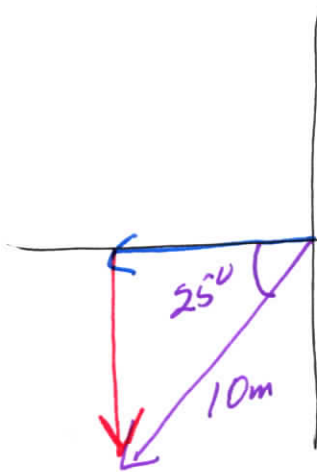
$$\sin \theta = \frac{\text{opp}}{\text{hyp}}$$

$$\text{hyp} \sin \theta = \text{opp}$$

$$23 \text{ mi} \sin(23^\circ) = 8.98 \text{ mi}$$

## key Level II Physics Pd 2

2) Resolve the following vector: 10 m at 25 degrees south of west.



$$\cos \theta = \frac{\text{Adj}}{\text{hyp}}$$

$$\text{hyp} \cos \theta = \text{Adj}$$

$$10 \text{ m} \cos \theta = \text{Adj}$$

$$10 \text{ m} \cos 25^\circ = \text{9m West}$$

$$\sin \theta = \frac{\text{Opp}}{\text{hyp}}$$

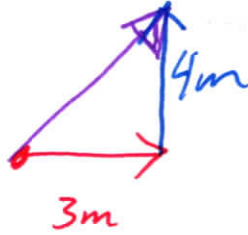
$$\text{hyp} \sin \theta = \text{Opp}$$

$$10 \text{ m} \sin 25^\circ = \text{Opp}$$

$$\text{4.2m South} = \text{Opp}$$

## key Level II Physics Pd 2

- 3) Make a sketch to show that you understand how to solve this by drawing: How far will you be from your starting point if you walk 3 m east, then walk 4 m north?



## key Level II Physics Pd 2

- 4) You are taking a road trip, driving on I-81. You find out that some of your friends are in a car 2 miles ahead of you driving at the posted 65 mi/hr. How far will you have to drive to catch them if you are driving at 72 mi/hr?

Your Speed WRT them

$$v = 7 \text{ mi/hr}$$

$$x = 2 \text{ mi}$$

$$t = ?$$

$$a = \text{zero}$$

$$x = v_0 t + \frac{1}{2} a t^2$$

$$x = v_0 t$$

$$\frac{x}{v_0} = t$$

$$\frac{2 \text{ mi}}{7 \text{ mi/hr}} = \underline{.286 \text{ hr}}$$

Distance WRT Ground

$$x = v_0 t + \frac{1}{2} a t^2$$

$$x = v_0 t$$

$$x = \left( \frac{72 \text{ mi}}{\text{hr}} \right) (.286 \text{ hr})$$

$$x = 20.6 \text{ mi}$$

$$x = ?$$

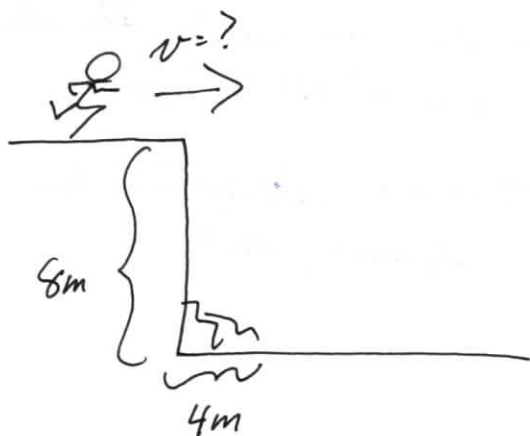
$$t = .286 \text{ hr}$$

$$v = 72 \text{ mi/hr}$$

$$a = \text{zero}$$

## key Level II Physics Pd 2

- 5) During a hike on a hot summer day, you find a "cliff" over a water hole that is 8 m above the water. Before jumping in, you find that there are rocks that reach out 4 m from just below the cliff, under the water. How fast must you run across the level ground on the top of the cliff to clear the rocks?



$$\begin{aligned} & \underline{y} \\ y &= -8\text{m} \\ a &= -9.8\text{m/s}^2 \\ t &= ? \\ v_{0y} &= \text{Zero} \\ y &= v_0 t + \frac{1}{2} a t^2 \\ y &= \frac{1}{2} a t^2 \\ \sqrt{\frac{2y}{a}} = t &= \sqrt{\frac{(2)(-8\text{m})}{-9.8\text{m/s}^2}} = \underline{1.28\text{s}} \end{aligned}$$

$$\begin{aligned} & \underline{x} \\ x &= 4\text{m} \\ a &= \text{Zero} \\ t &= 1.28\text{s} \\ v_x &= ? \\ x &= v_0 t + \frac{1}{2} a t^2 \\ \frac{x}{t} &= v_0 \\ \frac{4\text{m}}{1.28\text{s}} &= \underline{3.13\text{m/s}} \end{aligned}$$

## key Level II Physics Pd 2

- 6) Using a giant sling shot, you hurl a water balloon at 32 m/s at an angle to 43 degrees. What is the speed of the balloon at its highest point?



- The x-Velocity Is Unchanged  
The Entire Flight

- The y-Velocity Is Zero At The  
highest point.

$$\cos \theta = \frac{A_{di}}{v_{yp}}$$

$$v_{yp} \cos \theta = A_{di}$$

$$32 \text{ m/s} \cos 43^\circ = A_{di}$$

$$23 \text{ m/s} = A_{di}$$

## key Level II Physics Pd 2

- 7) While driving on a level road in your pick-up at 45 mi/hr, someone riding in the back throws a ball straight up in the air at 12 m/s. How long after they throw it will it land in the bed of the truck? (neglect air resistance).

Need To Find The Time The Ball Is In The Air

$$v_0 = 12 \text{ m/s}$$

$$v = -12 \text{ m/s}$$

$$t = ?$$

$$a = -9.8 \text{ m/s}^2$$

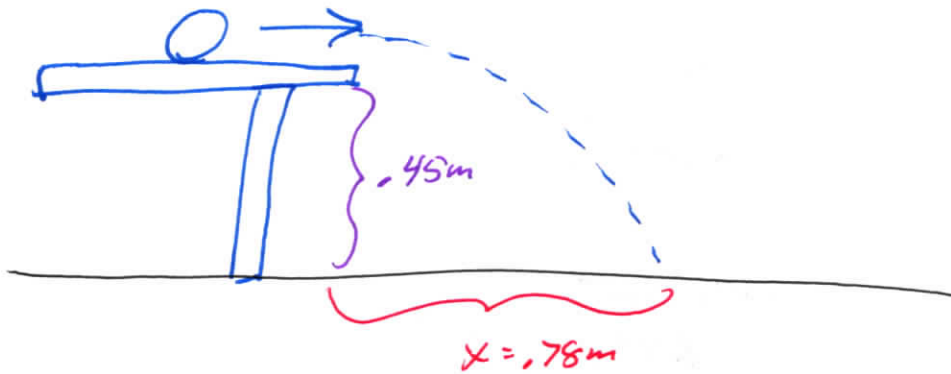
$$v = v_0 + at$$

$$\frac{v - v_0}{a} = t$$

$$\frac{-12 \text{ m/s} - 12 \text{ m/s}}{-9.8 \text{ m/s}^2} = 2.45 \text{ s}$$

## key Level II Physics Pd 2

- 8) A ball rolls across a level 0.45m high table and lands 0.78 m out from the edge of the table.  
What was the speed of the ball as it rolled across the table?



y

$$y = -0.45\text{m}$$

$$a = -9.8\text{m/s}^2$$

$$v_{0y} = \text{zero}$$

$$t = ?$$

$$y = v_0 t + \frac{1}{2} a t^2$$

$$y = \frac{1}{2} a t^2$$

$$\sqrt{\frac{2y}{a}} = t = \sqrt{\frac{(2)(-0.45\text{m})}{-9.8\text{m/s}^2}} = 0.3\text{s}$$

x

$$t = 0.3\text{s}$$

$$x = 0.78\text{m}$$

$$v_x = ?$$

$$a = \text{zero}$$

$$x = v_0 t + \frac{1}{2} a t^2$$

$$\frac{x}{t} = v_0$$

$$\frac{0.78\text{m}}{0.3\text{s}} = 2.6\text{m/s}$$