

Key Pd 2

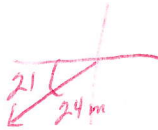
Vector Test

AT vector (07)

work @ #4 #3: by Taddles
comment on neatness

Solve the following problems. Each is worth 6 points. Be sure to show all work, and circle your answer.

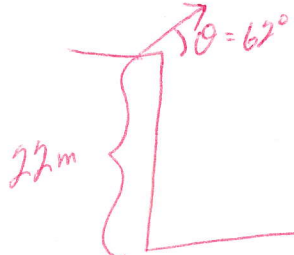
- 1) Resolve the following vector: 24 m at 21 degrees south of west.



8.6 m South
22.4 m West

- 2) A cannon is placed at the top of a cliff that is 22 m high. The cannon is fired over the edge of the cliff at an angle of 62 degrees above the horizontal at a speed of 33 m/s. Determine how far the cannon ball will land from the base of the cliff. Assume the cannon is placed on the edge of the cliff, and the cliff is sheer (straight down).

$\theta = 62^\circ$
 $v_0 = 33 \text{ m/s}$



$$y = -22 \text{ m}$$

$$v_{0y} = v_0 \sin \theta$$

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

$$t = ?$$

$$v_{0x} = v_0 \cos \theta$$

$$t = 6.62 \text{ s}$$

$$x = ?$$

$$a = 2 \text{ ev}$$

$$x = v_{0x} t + \frac{1}{2} a t^2$$

$$y = v_{0y} t + \frac{1}{2} a t^2$$

$$(-22 \text{ m}) = [33 \text{ m/s} (\sin 62^\circ)] t + \frac{1}{2} (-9.8 \text{ m/s}^2) t^2$$

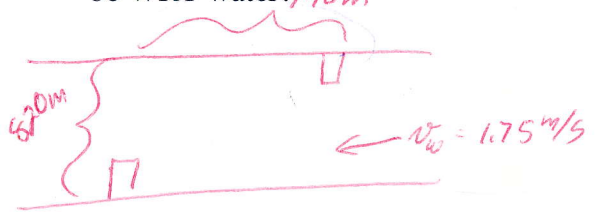
$$x = (33 \text{ m/s} \cos 62^\circ) (6.62 \text{ s})$$

$$x = 102.6 \text{ m}$$

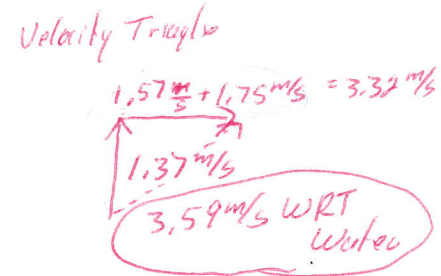
$$0 = (-4.9) t^2 + (29.1) t + 22$$

$$t = -0.679 \text{ s} \text{ or } 6.62 \text{ s}$$

- 3) A river is flowing at 1.75 m/s. The river is 820 m wide. You are on a boat that is doing to "land" at a dock on the other side of the river, and 940 m upstream. If you need to get to the other dock in 10 minutes, what must the speed of the boat be WRT water? 940 m



10 m = 600 s



- 4) Determine how high a projectile will be 2.3 seconds after it is fired if the projectile is fired at 74 degrees above the horizontal at a speed of 37 m/s.

$$y = ?$$

$$t = 2.3s$$

$$v_{0y} = v_0 \sin \theta$$

$$y = v_{0y}t + \frac{1}{2}at^2$$

$$y = (37 \text{ m/s}) \sin(74^\circ)(2.3s) + \frac{1}{2}(-9.8 \text{ m/s}^2)(2.3s)^2$$

$$y = 55.9 \text{ m}$$

- 5) While driving on interstate 83, you notice a friend 0.5 miles in front of you. Assuming your friend is driving at the legal 65 miles per hour, determine how fast you would have to travel (WRT land) to catch them in 5 minutes.

$$v = \frac{x}{t} = \frac{0.5 \text{ mi}}{1/12 \text{ hr}} = 6 \text{ mi/hr}$$

$$5 \text{ min} = 0.0833 \text{ hr} = \frac{1}{12} \text{ hr}$$

$$71 \text{ mi/hr WRT land}$$

- 6) A "cannon" can fire at 38 m/s. Determine the angle needed to hit a target 28 m away.

$$x = \frac{v_0^2 \sin 2\theta}{g}$$

$$\sin^{-1} \left(\frac{xg}{v_0^2} \right) = 5.5^\circ \text{ - or - } 84.5^\circ$$