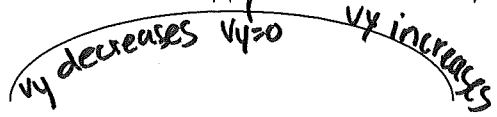
Name Key Hour _____

Projectile Motion Review

The test: on **Wed 10/28**

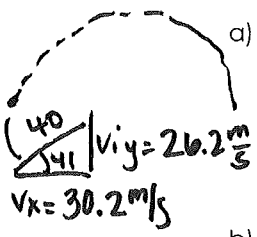
1. At what point of its flight is a projectile shot at an angle at its maximum height? $\frac{1}{2}$ way
2. Is Δy the same as Viy? NO!
3. Show what happens to the Vx and Vy during the flight of an angled projectile.



Vx is constant

H or A?

4. Tiger Woods is on the 16th hole at Pebble Beach Golf Course and hits a golf ball with a velocity of 40 m/s at an angle of 41° N of E.



a) How far will the golf ball travel horizontally? (161 m)

① need Δt
$a_y = \frac{v_{fy} - v_{iy}}{\Delta t}$
$-9.8 = \frac{-26.2}{\Delta t}$
$\Delta t = 2.67 \times 2 = 5.35$ ($\frac{1}{2}$ way)

② $V_x = \frac{\Delta x}{\Delta t}$ $30.2 \frac{m}{s} = \frac{\Delta x}{5.35 sec}$ $\Delta x = 161 m$

Δx = 161 m

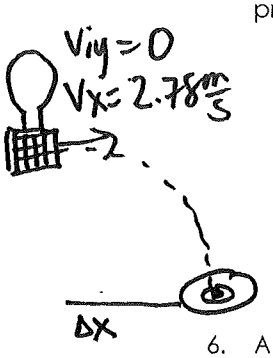
b) Calculate the maximum height of the golf ball during his shot. (35 m)

Δt = 2.67sec at $\frac{1}{2}$ way point
$\Delta y = v_{iy}\Delta t + \frac{1}{2} a_y \Delta t^2$
$(26.2)(2.67) + \frac{1}{2}(-9.8)(2.67)^2$ $\Delta y = 35 m$

Δy = 35m

H or A?

5. You are part of the Amazing Race and are attempting to land a projectile from a hot air balloon onto a bullseye. If you are in the hot air balloon 25 m above the bullseye and the balloon is traveling horizontally at 2.78 m/sec, how far (Δx) before the bullseye should you release the projectile? (6.3 m)



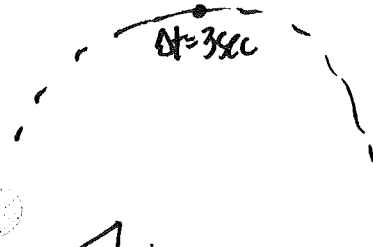
① Solve Δt
$\Delta y = v_{iy}\Delta t + \frac{1}{2} a_y \Delta t^2$ ($v_{iy} = 0$)
$-25 = \frac{1}{2}(-9.8)\Delta t^2$
$\Delta t = 2.26 sec$

② $V_x = \frac{\Delta x}{\Delta t}$
$2.78 = \frac{\Delta x}{2.26 sec}$
$\Delta x = 6.3 m$

Δx = 6.3m

H or A?

6. A baseball player hits a ball at an unknown angle N of E. If it is in the air for 6 sec total and travels 25 m horizontally, calculate the velocity in **miles per hour** and the angle it was hit at. (66.5 mph, 81.9° N of E)

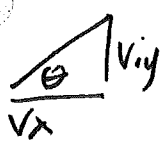


① $V_x = \frac{\Delta x}{\Delta t} = \frac{25m}{6sec} = 4.17 \frac{m}{s}$

② $a_y = \frac{v_{fy} - v_{iy}}{\Delta t}$
$-9.8 = \frac{-v_{iy}}{3sec}$
$v_{iy} = 29.4 \frac{m}{s}$

③ $V^2 = V_x^2 + v_{iy}^2$
$(4.17)^2 + (29.4)^2$
$V = 29.7 \frac{m}{s} \times \frac{1 mi}{1609 m} \times \frac{3600 s}{1 hr} = 66.5$

④ $\tan\theta = \frac{v_{iy}}{V_x} = \frac{29.4}{4.17}$

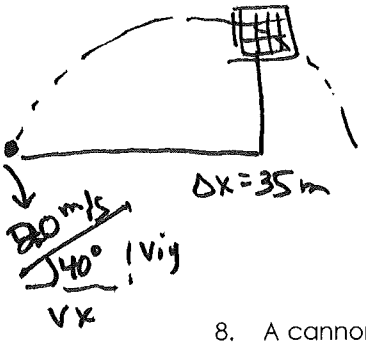


Vx = 4.17 m/s
Viy = 29.4 m/s
V = 66.5 mph
θ = 81.9°

Name_____ Hour _____

H or A?

7. A daredevil is shot out of a cannon at 40° N of E with a speed of 20 m/s. A net is placed at a horizontal distance of 35 meters. At what height above the cannon should the net be placed in order to catch the daredevil? (3.85 m)



① Solve Vx + Viy

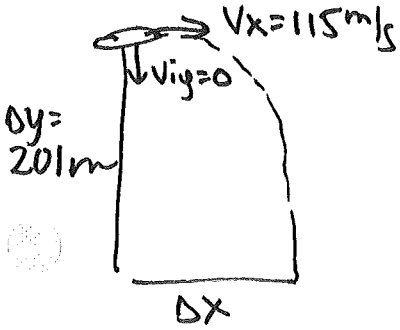
② use $V_x = \frac{\Delta x}{\Delta t}$ to find Δt (2.28sec)

③ Find Δy at 2.28 sec

Δy = 3.85m

H or A?

8. A cannon is fired horizontally with a V_x= 115 m/s from the top of a cliff at a height of 201 meters. How far from the base of the cliff will the ball land? (737 m)



① use Δy = to find Δt (6.4sec)

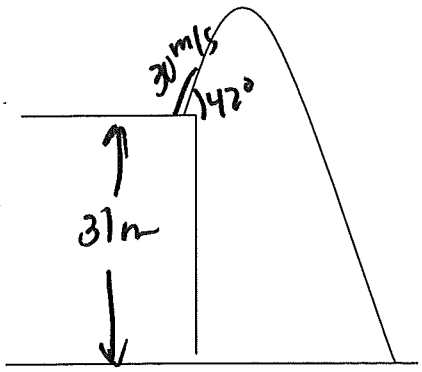
② solve Δx

$V_x = \frac{\Delta x}{\Delta t}$

Δx = 737m

H or A?

9. You shoot a potato gun at 30 m/s at 42° N of E off the edge of a cliff that is 31 meters high. With what speed will it hit the ground in **mph**? This is TRICKY! You will need to use projectile equations to find Δy at the top and then a 1-D equation to find the V_f at the bottom. (71.1 **mph**) (***If you want to try another problem like this...change the angle to 62 N of E and resolve it. The answer should be 81 mph)



① Solve Viy (20.07m/s)

② Find Δt using $a_y = \frac{V_f^0 - V_{iy}}{\Delta t}$ (2.04sec)

③ Find Δy above cliff (20.71m)

$\Delta y = V_{iy}\Delta t + \frac{1}{2}a_y\Delta t^2$

④ add to Δy of cliff (51.7m)

⑤ Find V_f (31.8m/s)

$V_f^2 = V_i^2 + 2a\Delta y$

⑥ convert to mph (71.2mph)

V = 31.8 m/s

V = 71.2 mph