H.W 3 Due today

Read 4.1 - 4.6 for wednesday

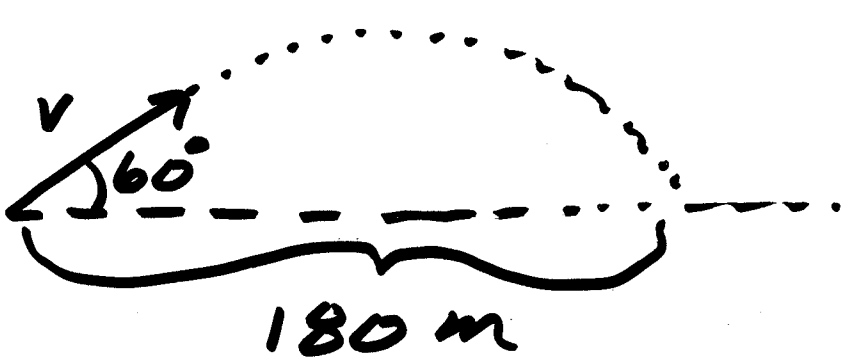
Exam 1 Monday 7:30 A.M - 7:20 A.M
HERE

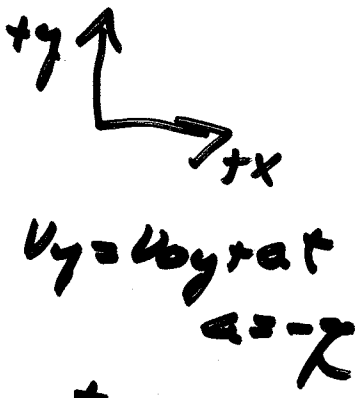
Please wait outside room

chp 1-3 mostly 2,3

16 multiple choice questions
1 "free"

ex) A Golfer hits a ball 180 m on level ground at an angle of 60° above the horizontal. What is the initial speed of the ball?





$\theta = 60°$

$v_{ox} = V\cos 60°$

$v_{oy} = V\sin 60°$

$v_y = v_{oy} - gt$

at top $v_y = 0$

$0 = v_{oy} - gt$

$t = \frac{v_{oy}}{g} \times 2$

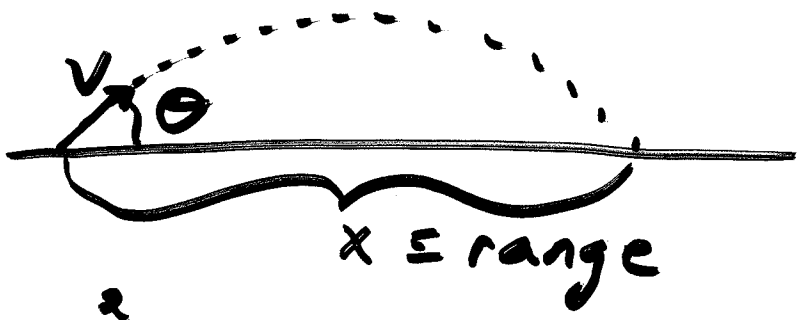
$x = v_{ox} t$

$x = \frac{v_{ox} v_{oy} 2}{g}$

$x = \frac{V\cos 60\, V\sin 60 \cdot 2}{g} = \frac{2V^2 \sin\theta\cos\theta}{g}$

$180\text{m} = \frac{2V^2 \sin 60° \cos 60°}{g}$

$V = 45\ \text{m/s}$



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

trig identity: $2\sin\theta\cos\theta = \sin 2\theta$

$$\boxed{x = \frac{V^2 \sin 2\theta}{g}}$$ handy formula

Note where is range maximum $\theta = ?$

where is $\sin 2\theta = 1$ $\quad \theta = 45^\circ$

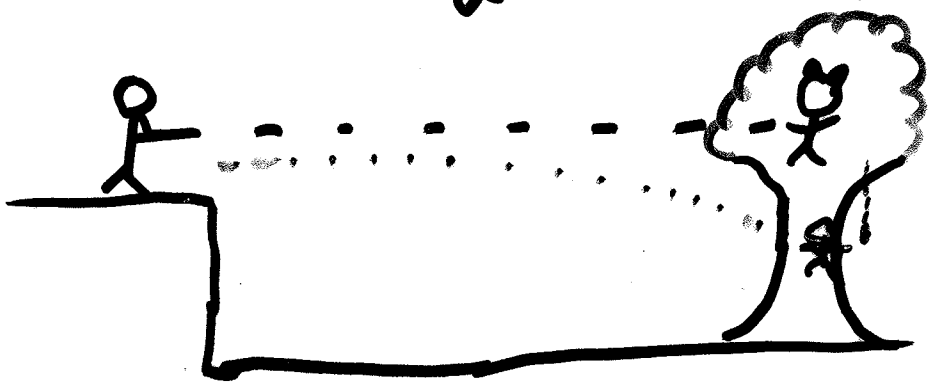
If double velocity how much further will object go?

$$x_{new} = \frac{(V_{new})^2 \sin 2\theta}{g} \qquad x = \frac{V^2 \sin 2\theta}{g}$$

$$\frac{x_{new}}{x} = \frac{(V_{new})^2 \sin 2\theta / g}{V^2 \sin 2\theta / g} = \left(\frac{V_{new}}{V}\right)^2 = \left(\frac{2V}{V}\right)^2 = \underline{4}$$

A hunter shoots at a monkey straight across. Just as hunter shoots, monkey lets go. Did monkey take physics?

A) yes
B) NO



where is monkey at time t

$$y - y_0 = v_{y_0}^{0} t - \frac{1}{2} g t^2$$

$$\Delta y = -\frac{1}{2} g t^2$$

Bullet at time t

$$y - y_0 = v_{y_0}^{0} t - \frac{1}{2} g t^2$$

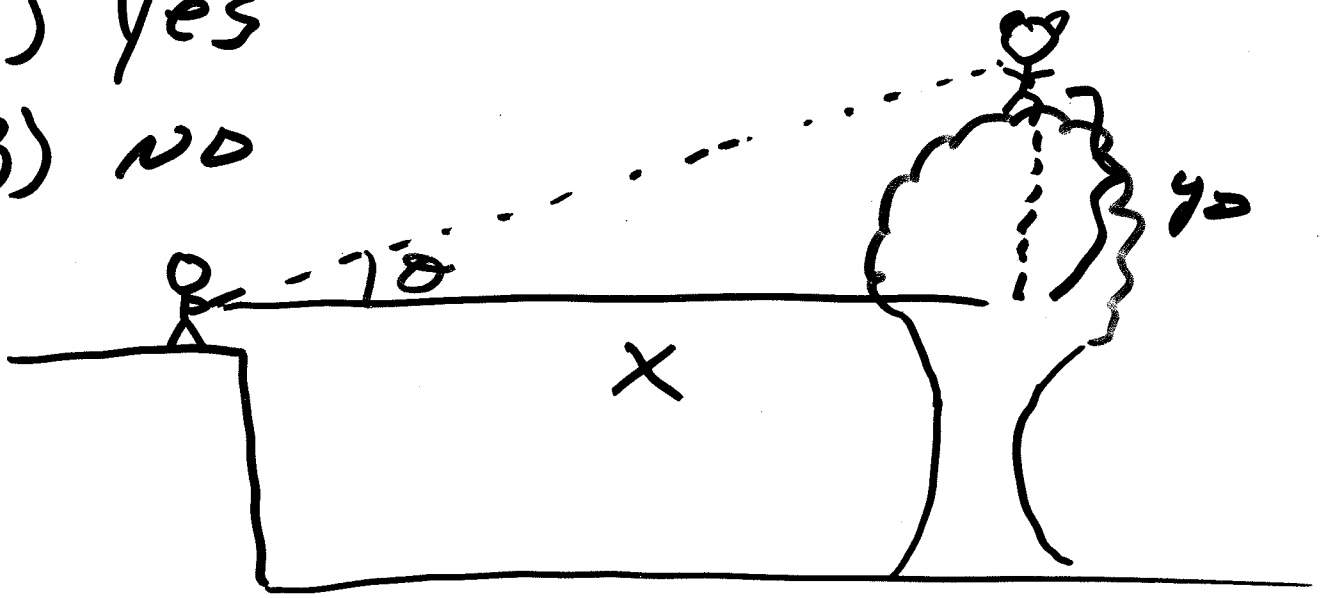
$$\underline{\Delta y = -\frac{1}{2} g t^2}$$

monkey's uncle is higher up in tree. When hunter shoots, monkey lets go.

Did uncle take physics?

A) yes

B) no



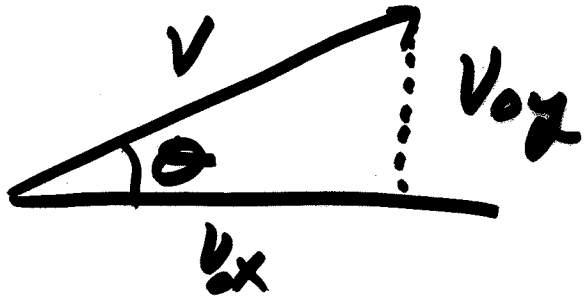
where will monkey be at time t

$$y_m = y_0 - \frac{1}{2}gt^2$$

where is bullet at time t

$$y_b = v_{0y}t - \frac{1}{2}gt^2$$

$$y_b = v\sin\theta\, t - \frac{1}{2}gt^2$$



$V_{oy} = V\sin\theta$

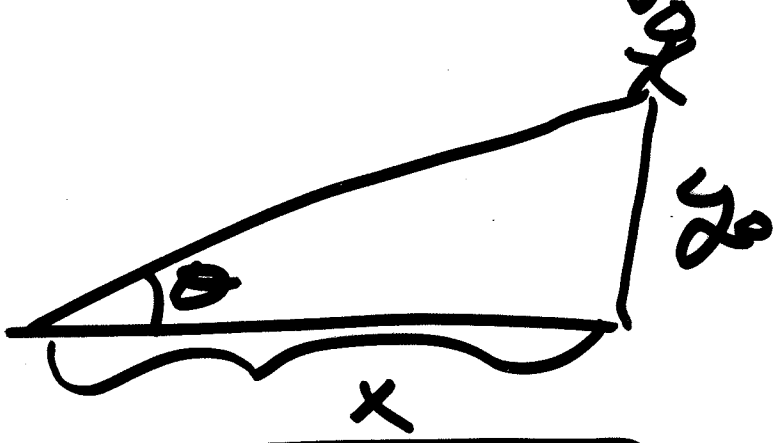
$V_{ox} = V\cos\theta$

$x = V_x t \Rightarrow t = \frac{x}{V_x} = \frac{x}{V\cos\theta}$

$$y_b = V\sin\theta\, t - \frac{1}{2}gt^2$$

$$y_b = \frac{V\sin\theta \cdot x}{V\cos\theta} - \frac{1}{2}gt^2$$

$$y_b = x\tan\theta - \frac{1}{2}gt^2$$



$\tan\theta = \frac{y_o}{x}$

$y_o = x\tan\theta$

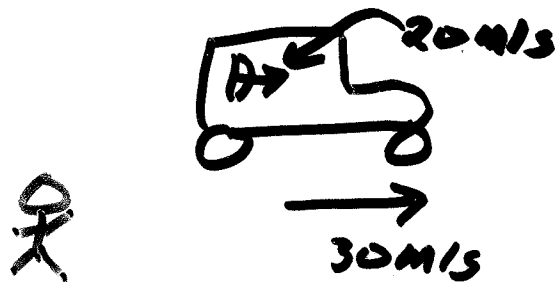
$$y_b = y_o - \frac{1}{2}gt^2$$

$$y_m = y_o - \frac{1}{2}gt^2$$

Relative Velocity

Velocity of arrow from bow = 20 m/s

If I shoot arrow from a car traveling at 30 m/s, what is velocity of arrow relative to ground?



$\vec{v}_{ag}$ = velocity of arrow relative to ground

$\vec{v}_{ac}$ = " " " car

$\vec{v}_{cg}$ = " " car " " ground

$\vec{v}_{ag} = \vec{v}_{ac} + \vec{v}_{cg}$

$= 20\,m/s + 30\,m/s = \underline{50\,m/s}$

Suppose you are traveling east riding a bike. You can pedal at 5mph with no wind. There is a wind from south at 3mph. How fast are you traveling?

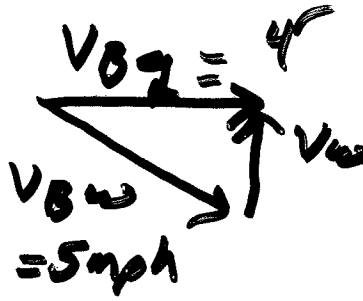
East →

$\vec{V}_{Bw} = 5$ mph Bike wrt wind

$\vec{V}_{wg} = 3$ mph wind wrt ground

$\vec{V}_{Bg} = ?$ Bike wrt ground

$\vec{V}_{Bg} = \vec{V}_{Bw} + \vec{V}_{wg}$



$V_{Bg} = 4$ mph

$3^2 + 4^2 = 5^2$

A plane can fly at 100 miles/hour in still air. If there is a wind blowing, what is the speed of the plane relative to the ground

- A) Less than 100 mi/hour
- B) More than 100 mi/hour
- C) 100 mi/hour
- D) Cannot determine with given information

A plane can fly east at 100 miles/hour in still air. If there is a strong wind blowing west, what is the speed of the plane relative to the ground

- A) Less than 100 mi/hour
- B) More than 100 mi/hour
- C) 100 mi/hour
- D) Cannot determine with given information

Interactive Question

A boat that can travel at 4 km/hr in still water crosses a river with a current of 2 km/hr. At what angle relative to the shore must the boat be pointed to go straight across the river?

$\tan^{-1}\frac{2}{4} = 27^\circ$

$\tan^{-1}\frac{4}{2} = 63^\circ$

$\sin^{-1}\frac{2}{4} = 30^\circ$

A) 27°

B) 30°

C) 60°

D) 63°

E) 90°

Interactive Question

A boat that can travel at 4 km/hr in still water crosses a river with a current of 2 km/hr. At what angle relative to the shore must the boat be pointed to get across the river quickest?

A) 27°

B) 30°

C) 60°

D) 63°

E) 90°