Nestor Plata – 101282246 Kian Badieikhorsand 101282433 Assignment 1 Game Physics Game 2005

a)

$M = 2.2\ Kg$

$V_i = 95_{m/s}$

$\alpha = ?$

$\Delta x = 485_m$

$$\Delta x = \frac{V_i^2\ sin2\alpha}{g}$$

$$485 = \frac{95^2 sin2\alpha}{9.8}$$

$2\alpha = 31.6$

$\alpha = 15.8^\circ$

b)

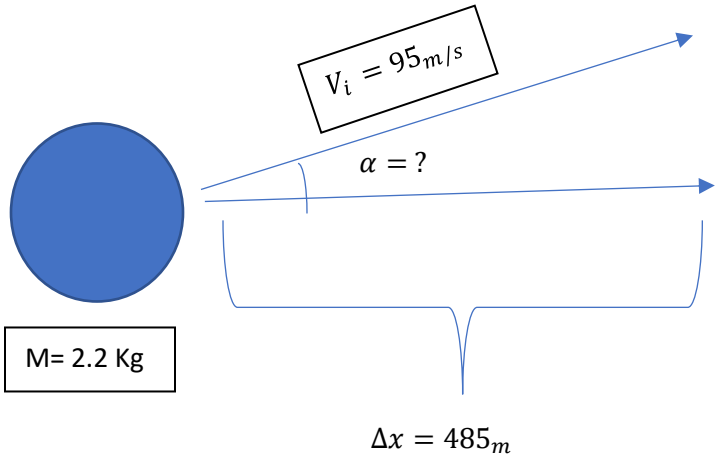
$\alpha = 45^\circ$

$$\Delta x = \frac{95^2\ sin90^\circ}{9.8}$$

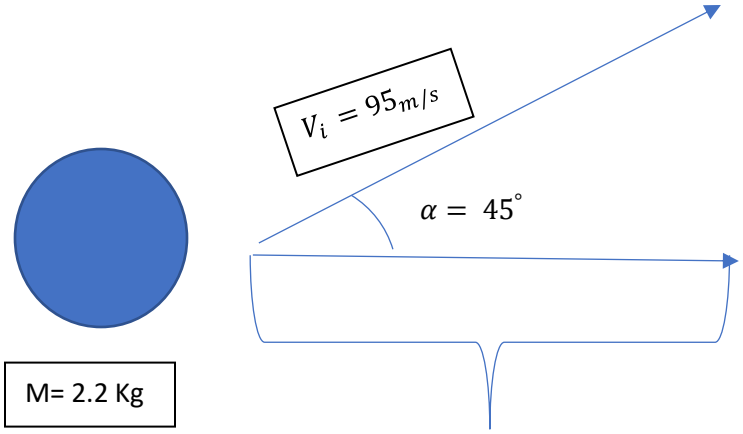
$\Delta x = 920.9_m$

c)

a)



b)



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GAME2005 – Game Physics –Assignment 1

Over a completely flat surface a thermal detonator (Star Wars) is thrown by a wookiee (a member of the rebel alliance) towards a group of imperial stormtroopers. The thermal detonator always leaves the wookiee's hand with a speed of 95m/s and the thermal detonator has a mass of 2.2Kg

a) Suppose that the Stormtroopers are 485m away. What is the correct angle for the wookiee to throw the thermal detonator so that it reaches the Stormtroopers. (10 Marks)
b) What is the maximum distance the thermal detonator could travel? (10 Marks)
c) Include a short document (report) that includes a diagram that illustrates the problem and your solution. Ensure you include appropriate labels and show your work (10 Marks)

$M = 2.2\ Kg$

$V_i = 95_{m/s}$

$\alpha = 0$

$\Delta xi = 0_m$

$\Delta yi = 0_m$

$\Delta xf = 485_m$

$\Delta yf = 0_m$

a)

$$\Delta x = V_i * t * \cos(\theta)$$

$$485m = 95\frac{m}{s} * t * \cos(\theta)$$

$$t = \frac{485m}{95\frac{m}{s} * \cos(\theta)}$$

$$t = \frac{5.1053s}{\cos(\theta)}$$

$$\Delta y = V_i * t * \sin(\theta) - \frac{gt^2}{2}$$

$$0m = 95\frac{m}{s} * t * \sin(\theta) - \frac{9.8\frac{m}{s^2}}{2}t^2$$

$$0m = 95\frac{m}{s} * \frac{5.1053s}{\cos(\theta)} * \sin(\theta) - 4.9\frac{m}{s^2} * \left(\frac{5.1053s}{\cos(\theta)}\right)^2$$

$$0m = 485m * \frac{\sin(\theta)}{\cos(\theta)} - 4.9\frac{m}{s^2} * \frac{26.0641s^2}{\cos(\theta)^2}$$

$$0m = 485m * \tan(\theta) - 127.714m * \frac{1}{\cos(\theta)^2}$$

$$\left(0m = 485m * \tan(\theta) - 127.714m * \frac{1}{\cos(\theta)^2}\right) * \cos(\theta)^2$$

$$0m = 485m * \sin(\theta) * \cos(\theta) - 127.714m$$

$$\sin(2\theta) = 2 * \sin(\theta)\cos(\theta)$$

$$\frac{\sin(2\theta)}{2} = \sin(\theta)\cos(\theta)$$

$$0m = 485m * \frac{\sin(2\theta)}{2} - 127.714m$$

$$0m = 242.5m * \sin(2\theta) - 127.714m$$

$$\frac{127.714m}{242.5m} = \sin(2\theta)$$

$$0.5267 = \sin(2\theta)$$

$$\csc(0.5267) = 2\theta$$

$$31.7798 = 2\theta$$

$$\theta = 15.8899°$$

b)

$$\alpha = 45^{\circ}$$

$$\Delta x = V_i * t * \cos(\theta)$$

$$\Delta x = 95\frac{m}{s} * t * \cos(45^{\circ})$$

$$t = \frac{\Delta x}{95\frac{m}{s} * \cos(45^{\circ})}$$

$$\Delta y = V_i * t * \sin(\theta) - \frac{gt^2}{2}$$

$$0m = 95\frac{m}{s} * t * \sin(45^{\circ}) - \frac{9.8\frac{m}{s^2} * t^2}{2}$$

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$$0m = 95\frac{m}{s} * \frac{\Delta x}{95\frac{m}{s} * \cos(45^\circ)} * \sin(45^\circ) - 4.9\frac{m}{s^2} * \left(\frac{\Delta x}{95\frac{m}{s} * \cos(45^\circ)}\right)^2$$

$$\left(0m = \Delta x * \frac{\sin(45^\circ)}{\cos(45^\circ)} - \frac{4.9\frac{m}{s^2} * \Delta x^2}{9025\frac{m^2}{s^2} * \cos(45^\circ)^2}\right) * \cos(45^\circ)^2$$

$$\frac{4.9\frac{m}{s^2} * \Delta x^2}{9025\frac{m^2}{s^2}} = \Delta x * \sin(45^\circ) * \cos(45^\circ)$$

$$\Delta x^2 = \frac{9025\frac{m^2}{s^2}}{4.9\frac{m}{s^2}} * \Delta x * 0.5$$

$$\Delta x^2 = 920.9184m * \Delta x$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-920.9184 \pm \sqrt{(920.9184)^2 - 4 * 1 * 0}}{2 * 1}$$

$$x = \frac{-920.9184 \pm 920.9184}{2}$$

$x = 0$ or

$x = -920.9184m$

a) The correct angle for the wookiee to throw the thermal detonator so that it reaches the Stormtroopers is $15.8899°$ or simplified $16°$
b) the maximum distance the thermal detonator could travel is $920.9184m$
c)

OTHER CALCULATIONS

$$t = \frac{5.1053s}{\cos(\theta)}$$

$$t = \frac{5.1053s}{\cos(15.8899°)}$$

$$t = 5.3081$$

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