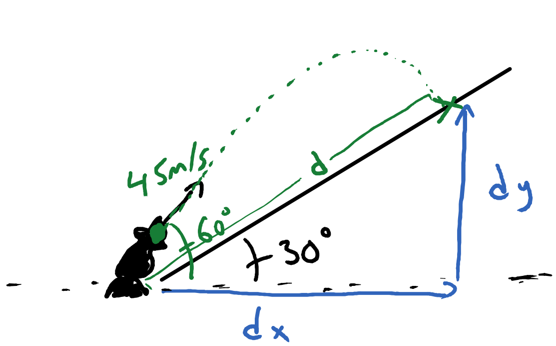
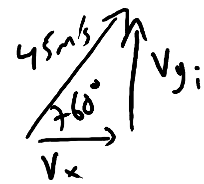
Incline Plane

February 15, 2017 8:42 AM

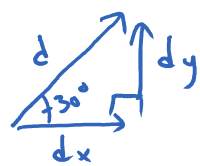
A projectile is fired at the base of a hill. The hill slopes up at an angle of 30 degrees. If the projectile is fired with a velocity of 45m/s and at an angle of 60 degrees, then how far up the slope will the projectile hit?





$V_{y_i} = 45\sin 60$

$V_x = 45\cos 60$



$dy = d\sin 30$

$dx = d\cos 30$

Vertical

$V_{y_i} = 45\sin 60$

$V_{yf} =$

$dy = d\sin 30$

$a = -9.8\,m/s^2$

$t =$

Horizontal $(a=0)$

$V_x = 45\cos 60$

$dx = d\cos 30$

$t =$

$dx = V_x \cdot t$

$t = \dfrac{dx}{V_x}$

$$\boxed{t = \frac{d\cos 30}{45\cos 60}} \quad Eq\ 1$$

$dy = V_{y_i} t + \frac{1}{2} a t^2$

$$\boxed{d\sin 30 = 45\sin 60\, t - 4.9 t^2} \quad Eq\ 2$$

$$d\sin 30 = 45\sin 60\left(\frac{d\cos 30}{45\cos 60}\right) - 4.9\left(\frac{d\cos 30}{45\cos 60}\right)^2$$

$$0.5d = 1.5d - 0.007259259 d^2$$

$$-1.5d \qquad -1.5d$$

$$+\cancel{d} = +0.007259259 d^{\cancel{2}}$$

$$\frac{1}{0.007259259} = \frac{0.007259259 d}{0.007259259}$$

$\underline{\underline{138m = d}}$