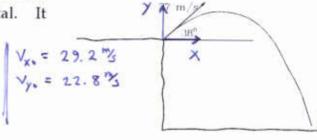# PHYSICS 121, SECTION 1 ....QUIZ #2

1. A projectile is shot from the edge of a cliff with an initial speed of $37\frac{m}{s}$ at an angle of 38° up from the horizontal. It strikes the lower ground level 6.2 s after firing.

a) How high is the cliff?

What is y at $t = 6.2$ s ?

$V_{x_0} = 29.2 \frac{m}{s}$
$V_{y_0} = 22.8 \frac{m}{s}$

$y = 0 + (22.8 \frac{m}{s}) t - \frac{1}{2} g t^2$

$\quad = (22.8 \frac{m}{s})(6.2 s) - \frac{1}{2}(9.8 \frac{m}{s^2})(6.2 s)^2$

$\quad = -47.1 m \qquad \longrightarrow \quad$ Cliff is $\boxed{47.1 m \quad \text{high}}$

b) How far from the base of the cliff did the projectile land?

What is x at $t = 6.2$ s ?

$x = (29.2 \frac{m}{s}) t = (29.2 \frac{m}{s})(6.2 s) = \boxed{181 m}$

c) Find the velocity components of the projectile at impact.

$V_x = V_{x_0} = \boxed{29.2 \frac{m}{s}}$

$V_y = V_{y_0} - gt = 22.8 \frac{m}{s} - (9.8 \frac{m}{s^2})(6.2 s) = \boxed{-38.0 \frac{m}{s}}$

d) Find the *speed* of the projectile at impact.

$V = \sqrt{(29.2 \frac{m}{s})^2 + (-38.0 \frac{m}{s})^2} = \boxed{47.9 \frac{m}{s}}$

2. An object has a *mass* of 1.5 kg . What is its *weight*?

Weight $= mg = (1.5 \, kg)(9.8 \frac{m}{s^2}) = \boxed{14.7 \, N}$
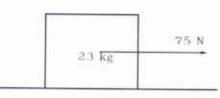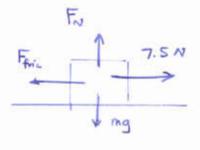
3. A 2.3kg - mass is dragged horizontally over a *rough* surface by a force of 7.5N. We observe that the mass undergoes an acceleration of $2.1 \frac{m}{s^2}$.

a) What is the *net* force which acts on the mass?

$$F_{net,x} = ma_x = (2.3 \, kg)(2.1 \frac{m}{s^2})$$

$$= \boxed{4.8 \, N}$$

b) What is the (magnitude of) the friction force?

Since

$$7.5 \, N - F_{fric} = 4.8 \, N,$$

$$F_{fric} = 7.5 \, N - 4.8 \, N = \boxed{2.7 \, N}$$

c) What is the normal force between the surface and the block?

y-forces must cancel:

$$F_N = mg = (2.3 \, kg)(9.8 \frac{m}{s^2}) = \boxed{22.5 \, N}$$

d) What is the coefficient of kinetic friction for the block and the surface?

Since $\qquad F_{fric} = \mu_k F_N,$

$$\mu_k = \frac{F_{fric}}{F_N} = \frac{2.7 \, N}{22.5 \, N} = \boxed{0.12}$$

$x = x_0 + v_{x0} + \frac{1}{2}a_x t^2 \qquad v_x = v_{x0} + a_x t \qquad v_x^2 = v_{x0}^2 + 2a_x(x - x_0)$

$y = y_0 + v_{y0} + \frac{1}{2}a_y t^2 \qquad v_y = v_{y0} + a_y t \qquad v_y^2 = v_{y0}^2 + 2a_y(y - y_0)$

$F = ma \qquad F_{fric,s} \leq \mu_s F_N \qquad F_{fric,k} = \mu_k F_N \qquad g = 9.8 \frac{m}{s^2}$

REMEMBER TO <u>SHOW YOUR WORK</u>!