Physics 111 - Class 05

CQ 5.1 - Weight on the moon

$W_E = 294N \rightarrow W_M = ?$

Remember that $g_{moon} \sim g_{Earth}/6$

$W_E = m g_E$

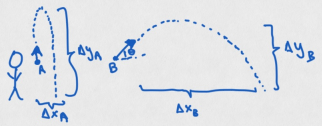
$m = \frac{W_E}{g_E} \rightarrow W_M = m g_m$

$= \left(\frac{W_E}{g_E}\right) g_m$

$= \left(\frac{W_E}{g_E}\right) \cdot \frac{g_E}{6}$

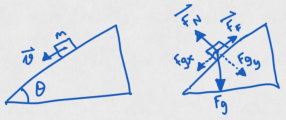
$\boxed{W_M = W_E/6}$ 50.1N

CQ 5.2 - Balls thrown in air



Balls thrown in the air with the same force will travel different distances depending on the angle.

CQ 5.3 - Block on a ramp.



5 Statements:

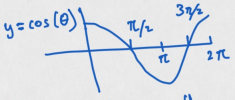
TRUE I. Frictional force is up the inclined plane

TRUE II. F_F depends on the mass of the object: $F_F = \mu F_N$

$= \mu(F_{gy})$

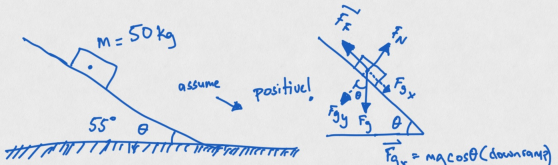
$= \mu m g \cos\theta$

TRUE III. If θ increases, F_F decreases



FALSE IV. F_F depends on the speed of the object.

CQ 5.4 - Block on Ramp (Calculation)



$\vec{F}_{gx} = mg\cos\theta$ (down ramp)

$\vec{F}_F = -80N$ (up ramp)

By Newton's second Law:

$\vec{F}_{NET} = \sum_i \vec{F}_i = m \cdot \vec{a}_T$

X: $m \cdot \vec{a}_T = (\vec{F}_{gx} - \vec{F}_F)$

$= (mg\sin\theta - F_F)$

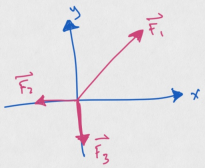
$\vec{a}_T = \left(\frac{mg\sin\theta - 80N}{m}\right)$

if ans is negative up/down the ramp

if ans is positive

$\boxed{\vec{a}_T = 6.43 \text{ m/s}}$ down ramp.

WP 5.1 - Telephone Pole



a) Find the net force on the pole in comp. form

$\vec{F}_1 = (300\hat{i} + 500\hat{j})$ N

$\vec{F}_2 = (-200\hat{i} + 0\hat{j})$ N

$\vec{F}_3 = (0\hat{i} - 800\hat{j})$ N

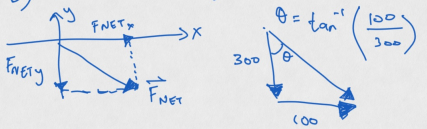
$\vec{F}_{NET} = \sum_i \vec{F}_i = F_1 + F_2 + \vec{F}_3$

$= (300 + (-200) + 0)\hat{i}$

$+ (500 + 0 + (-800))\hat{j}$

$\boxed{\vec{F}_{NET} = (100\hat{i} - 300\hat{j})N}$

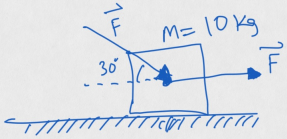
b) Find the magnitude + direction:



$|F_{NET}| = \sqrt{100^2 + 300^2}$

$\boxed{|F_{NET}| = 316 \text{ N}, -71.6^\circ \text{ from the pos x (5th E)}}$

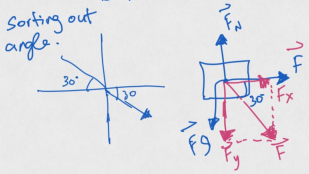
WP 5.2 - Pushed Block



What is the magnitude of the resulting acceleration?

Draw a Free Body Diagram:

Sorting out angles:



X: $\vec{F}_{NET} = |\vec{F}| + F_x$

$m \cdot a = 30N + 30N\cos(30)$

$m \cdot a = 55.98$ N

$\boxed{a = 5.6 \text{ m/s}^2}$