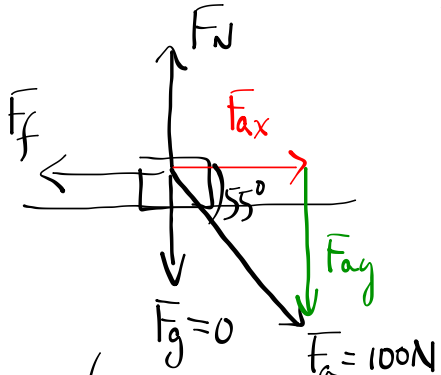
Forces at Angles

1.



(Snow shovel is very light!)

$\rightarrow$

Horizontally

$F_{ax} = F_f$

$F_a \cos\theta = \mu F_N$

$F_a \cos\theta = \mu F_{ay}$

$F_a \cos\theta = \mu F_a \sin\theta$

$\mu = \dfrac{\cos\theta}{\sin\theta}$

$\mu = \dfrac{\cos 55^\circ}{\sin 55^\circ}$

$\mu = 0.70$

$F_f = F_{ax}$

$F_f = 100 \cos 55^\circ$

$F_f = 57N$

Incline Problems

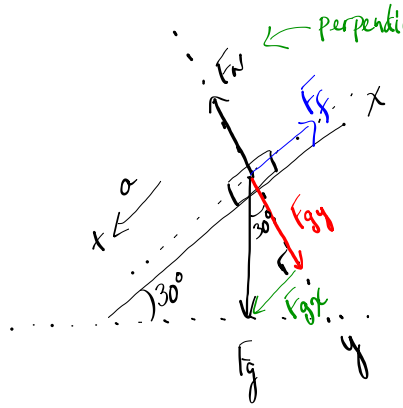
SP

$m = 50kg$

$\theta = 30^\circ$

a) $a = ?$ (no friction)

b) $a = ?$ ($\mu = 0.15$)



$\sin\theta = \frac{F_{gx}}{F_g}$

$F_{gx} = F_g \sin\theta$

$\vec{F}_{net} = m\vec{a}$

$F_{gx} = ma$

$F_g \sin\theta = ma$

$mg \sin\theta = ma$ ← mass of object does not matter

$a = g \sin\theta$

$a = (9.81 m/s^2) \sin 30^\circ$

$a = 4.9\ m/s^2$

b) Now with friction:

$\vec{F}_{net} = m\vec{a}$

$F_{gx} - F_f = ma$

$F_g \sin\theta - \mu F_N = ma$

$mg \sin\theta - \mu F_{gy} = ma$

$mg \sin\theta - \mu F_g \cos\theta = ma$

$mg \sin\theta - \mu mg \cos\theta = ma$ ← mass does not matter

$g \sin\theta - \mu g \cos\theta = a$

$(9.81 m/s^2) \sin 30^\circ - 0.15(9.81 m/s^2) \cos 30^\circ = a$

$(4.90 m/s^2)$

$a = 3.6\ m/s^2$