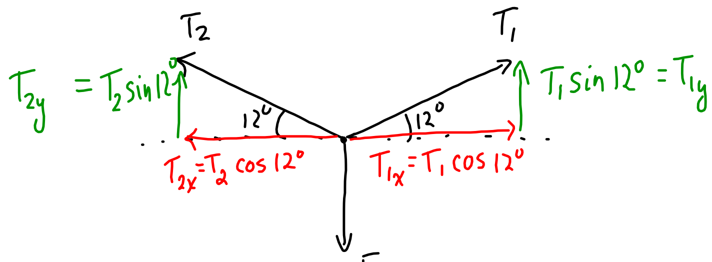
PP|467

9.



$F_g = mg$

$F_g = (65kg)(9.81 m/s^2)$

$F_g = 637.65N$

Horizontally ($\vec{F}_{net} = 0$)

$T_{1x} = T_{2x}$

$T_1 \cos 12° = T_2 \cos 12°$

$T_1 = T_2$

Vertically ($\vec{F}_{net} = 0$)

$T_{1y} + T_{2y} = F_g$

$T_1 \sin 12° + T_2 \sin 12° = 637.65N$

2 equations
2 unknowns

$T_1 \sin 12° + T_1 \sin 12° = 637.65N$

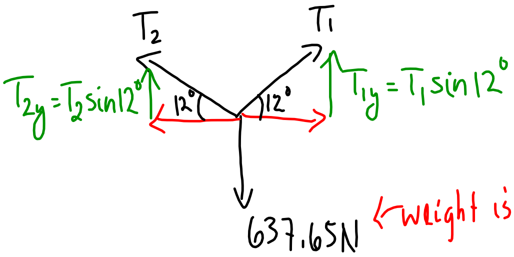
$2T_1 \sin 12° = 637.65N$

$T_1 = \frac{637.65N}{2(\sin 12°)}$

$T_1 = 1.5 \times 10^3 N$

$\therefore T_2 = 1.5 \times 10^3 N$

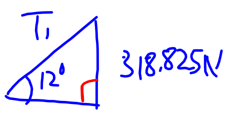
Shortcut (because of the symmetry)



← weight is equally distributed.

so $T_{1y} = \frac{637.65N}{2}$

$T_{1y} = 318.825N$



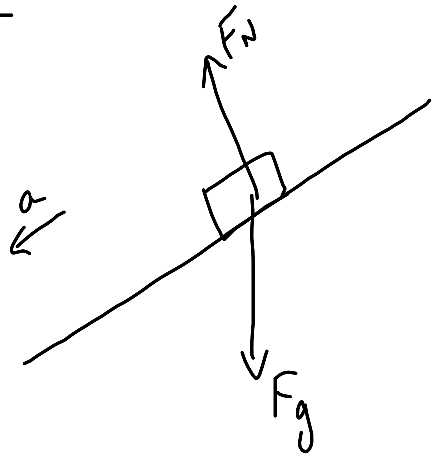
$\sin 12° = \frac{318.825N}{T_1}$

$T_1 = \frac{318.825N}{\sin 12°}$

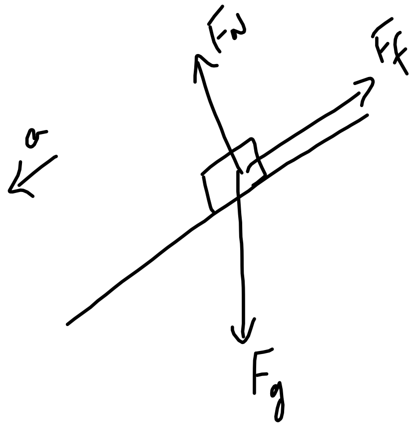
$T_1 = 1.5 \times 10^3 N = T_2$ ← because of the symmetry

Incline Problems

Consider a block sliding down a frictionless incline.



Consider a block sliding down an incline ($\mu_k = 0.25$)



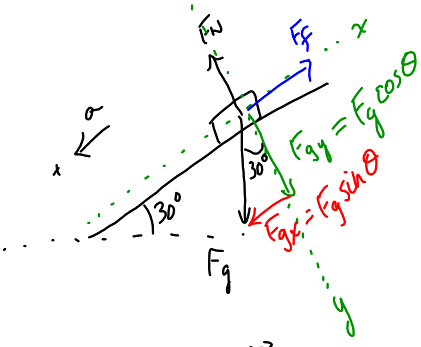
SP

m = 50kg

θ = 30°

a) a = ? (no friction)

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



Along the y-axis ($\vec{F}_{net} = 0$) (perpendicular to incline)

$$F_N = F_{gy}$$

$$F_N = F_g \cos\theta$$

$$F_N = mg\cos\theta$$

a) Along the x-axis ($\vec{F}_{net} = m\vec{a}$) (parallel to incline)

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

$$F_{gx} = ma$$

$$F_g \sin\theta = ma$$

$$\not{m}g\sin\theta = \not{m}a$$

$$a = g\sin\theta$$

$$a = (9.81\,m/s^2)\sin 30°$$

$$a = 4.9\,m/s^2$$

b) Along the x-axis ($\vec{F}_{net} = m\vec{a}$)

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

$$F_{gx} - F_f = ma$$

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

$$\not{m}g\sin\theta - \mu \not{m}g\cos\theta = \not{m}a$$

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

$$a = 4.9\,m/s^2 - 0.15(9.81\,m/s^2)(\cos 30°)$$

$$a = 4.9\,m/s^2 - 1.27\,m/s^2$$

$$a = 3.6\,m/s^2$$