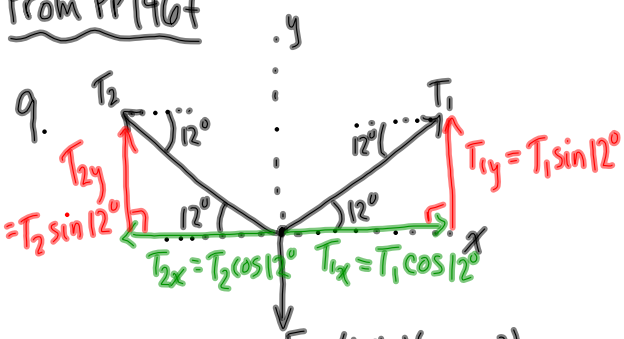
From PP 467

9.



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

$F_g = 637.65N$

Horizontally:

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

$T_1 \cos 12^\circ = T_2 \cos 12^\circ$

$T_1 = T_2$

* $T_1 = T_2$ ONLY because of the symmetry

Vertically:

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

$T_1 \sin 12^\circ + T_2 \sin 12^\circ = 637.65N$

$T_1 \sin 12^\circ + T_1 \sin 12^\circ = 637.65N$

$2T_1 \sin 12^\circ = 637.65N$

$T_1 = \frac{637.65N}{2(\sin 12^\circ)}$

$T_1 = 1.5 \times 10^3 N = T_2$

Shortcut: Because of the symmetry, we can say that F_g is equally distributed between the y-components of the tensions.

$y = \frac{637.65}{2} = 318.825N$

$\sin\theta = \frac{opp}{hyp}$

$\sin 12^\circ = \frac{318.825N}{T}$

$T = \frac{318.825N}{\sin 12}$

$T = 1.5 \times 10^3 N$

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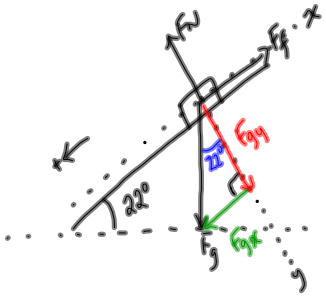
$m = 84\,kg$

$\theta = 22^\circ$

$\mu_s = 0.47$

$\mu_k = 0.25$



a) Will it slide down?

If $F_{gx} \geq F_f$, the crate will slide down the hill

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

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

$F_{gx} = (84\,kg)(9.81\,m/s^2)\sin 22^\circ$

$F_{gx} = 308.69\,N$

$F_f = \mu F_N$

$F_f = \mu F_{gy}$

$F_f = \mu F_g \cos\theta$

$F_f = \mu mg\cos\theta$

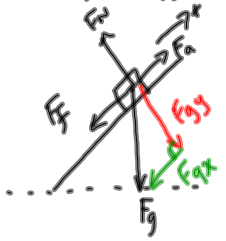
$F_f = (0.47)(84\,kg)(9.81\,m/s^2)\cos 22^\circ$

$F_f = 359.097\,N$

Since $F_{gx} < F_f$, the crate will not slide

b) If it slides, what is acc? N/A

c) What force is needed to just start pushing uphill?



At the instant the crate begins to move: ← static

$F_a = F_f + F_{gx}$

667.787 $F_a = 359.097\,N + 308.69\,N$

$F_a = 6.7 \times 10^2\,N$

d) acc = ??

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

$F_a - (F_f + F_{gx}) = ma$

$F_a - F_f - F_{gx} = ma$ (kinetic)

$F_a - \mu_k F_N - F_{gx} = ma$

$F_a - \mu_k F_{gy} - F_{gx} = ma$

$F_a - \mu_k mg\cos\theta - F_{gx} = ma$

$667.787\,N - (0.25)(84\,kg)(9.81\,m/s^2)\cos 22^\circ - 308.69\,N = (84\,kg)a$

$667.787\,N - 191.01\,N - 308.69\,N = (84\,kg)a$

$168.09 = (84\,kg)a$

$a = 2.0\,m/s^2$

$\vec{a} = 2.0\,m/s^2$ [uphill]

TO DO

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