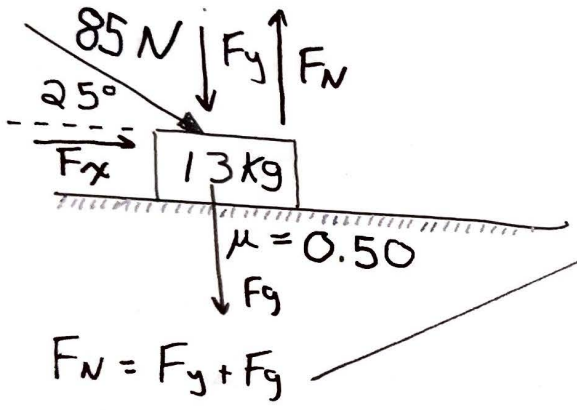
Dynamics Assignment

Physics 12

Name: ANSWERS

1) Will the 13 kg block begin to slide due to the applied force, if it is initially at rest? Prove it.



$F_N = F_y + F_g$

$F_x = 85 \cos 25 = 77.0\ N$

$F_y = 85 \sin 25 = 35.9\ N$

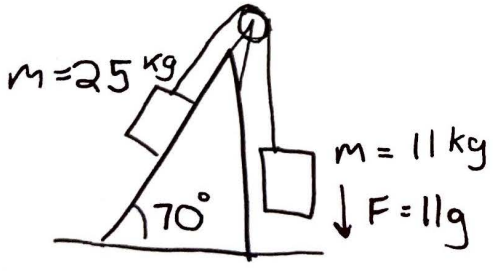
$F_f = \mu F_N = 0.50(35.9\ N + 13g)$

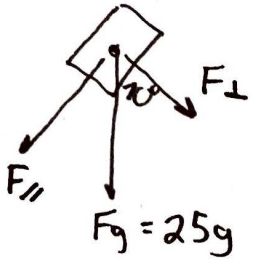
$= 24.5\ N$ 81.7 oops!

$F_g > F_f \therefore F_{net} \neq 0$

$F_f > F_x$ so ~~it will accelerate~~! It won't accelerate.

2) Determine the acceleration of the following system. Assume no friction.





$F_\perp = 25g \cos 70$

$F_{//} = 25g \sin 70$

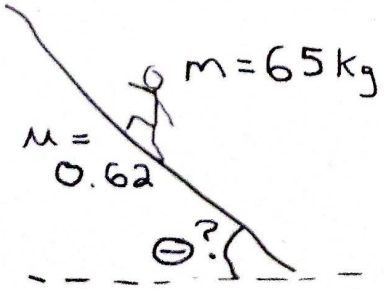
$= 230.5\ N$

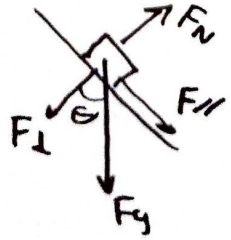
$F_{net} = 11g - 230.5\ N$

$= 122.5\ N$

$a = \frac{F_{net}}{m} = \frac{122.5\ N}{(11 + 25\ kg)} =$ [3.40 m/s to the ~~right~~ left"]

3) At what angle will this poor hiker begin to slide downhill?
(hint: do some algebra and remember sin/cos = tan)





$F_N = F_\perp = F_g \cos\theta$

$F_f = \mu F_N = \mu F_g \cos\theta$

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

When they *just* begin to slide, $F_{net} = 0$

$\therefore F_f = F_{//}$

$\mu F_g \cos\theta = F_g \sin\theta$

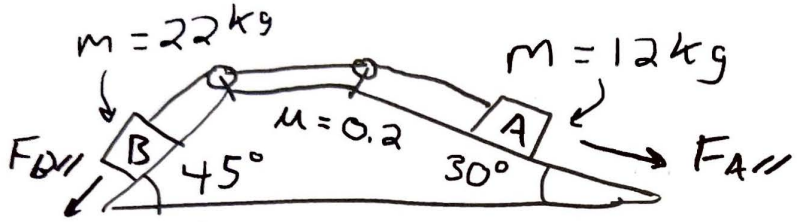
$\mu = \frac{\sin\theta}{\cos\theta}$

$\mu = \tan\theta$

$\theta = \tan^{-1}(\mu)$!

$\theta = 32^\circ$

4) Determine the tension in the rope.



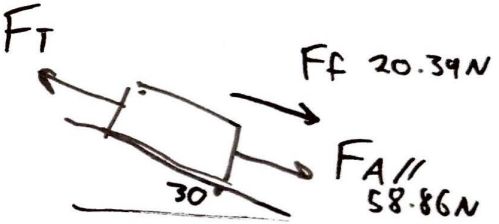
① System

- $F_{A//} = +(12g \sin 30) = 58.86\,N$
- $F_{B//} = -(22g \sin 45) = -152.61\,N$

* $F_{B//}$ is stronger so friction opposes it (is positive)

- $F_{fA} = \mu F_{N_A} = \mu F_{AL} = \mu\, 12g \cos 30 = 20.39\,N$
- $F_{fB} = \mu F_{N_B} = \mu F_{BL} = \mu\, 22g \cos 45 = 30.52\,N$

② Body A



$Ma = F_{net} = \Sigma F$

$(12kg)(-1.26 m/s^2) = 58.8 + 20.39N - F_T$

$$F_T = 94.3\,N$$

$Ma = F_{net} = 58.86 + 20.39 + 30.52 - 152.61$ (Right = positive)

$$a = \frac{-42.84\,N}{(22+12\,kg)} = -1.26\,m/s^2 \text{ (to left)}$$

Partly Meeting Expectations	Fully Meeting Expectations	Exceeding Expectations