Homework: Questions?

$F_{Eq} = 5.0 \pm 0.2\,N$ 2cm : 1N

$10.00 \pm 0.05\,cm$

$\text{Scale} = \frac{10.00 \pm 0.05\,cm}{5.0 \pm 0.2\,N}$

$2.00 \pm 0.08\,\frac{cm}{N}$

length $F_{1x} = 8.05 \pm 0.05\,cm$

$F_{1x} = \frac{8.05 \pm 0.05\,cm}{2.00 \pm 0.08\,cm/N}$

$= 4.0 \pm 0.2\,N$

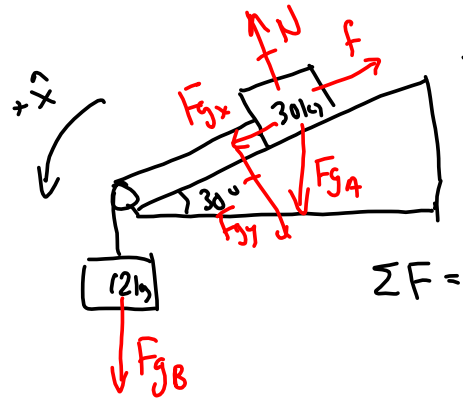
$\frac{\delta Q}{|Q|} = \sqrt{\left(\frac{\delta a}{a}\right)^2 + \left(\frac{\delta b}{b}\right)^2}$

$= \sqrt{(0.005)^2 + (0.04)^2}$ ← 2

$\delta Q = 0.0405 \times |Q|$

$= 0.08$

5.



$\mu = 0.20$

$$\Sigma F = (F_{gB} + F_{gx}) - f = (m_A + m_B)a$$

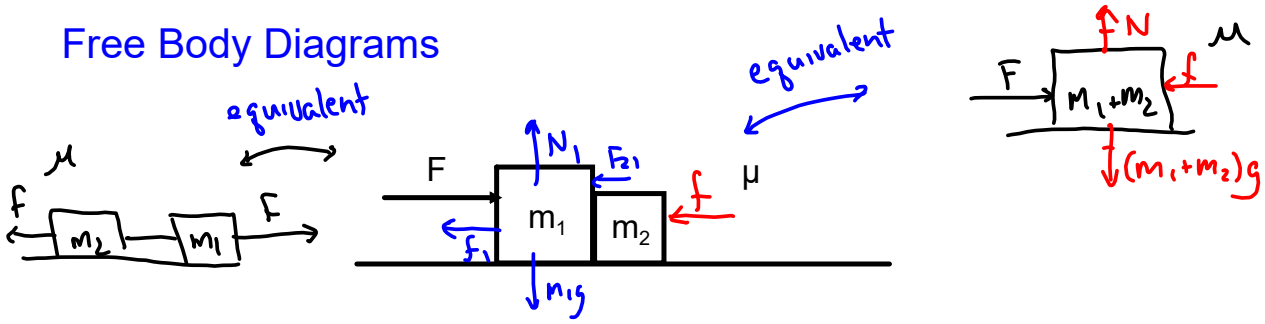
$$12 \cdot g + 30 \cdot g \cdot \sin 30^\circ - 0.20 \cdot 30 \cdot g \cdot \cos 30^\circ = 42a$$

$$27g - 3\sqrt{3}g = 42a$$

$$214 = 42a$$

$$a = 5.1\ m/s^2$$

Free Body Diagrams



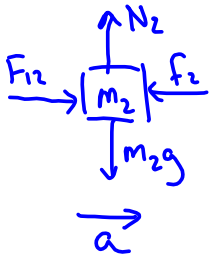
In the situation above find:
The acceleration, and
the force m_1 puts on m_2.
interaction force

$$\Sigma F = F - f = (m_1+m_2)a$$

$$F - \mu(m_1+m_2)g = (m_1+m_2)a$$

$$a = \frac{F}{m_1+m_2} - \mu g$$

FBD - choose m_2 since it has fewer forces.

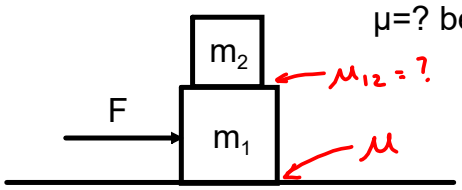


$$\Sigma F = F_{12} - f_2 = m_2 a$$

$$F_{12} - \mu m_2 g = m_2\left(\frac{F}{m_1+m_2} - \mu g\right)$$

$$F_{12} - \mu m_2 g = \frac{m_2}{m_1+m_2}F - \mu m_2 g$$

$$F_{12} = \frac{m_2}{m_1+m_2}F$$



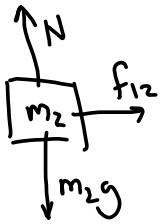
If the coefficient of friction between m_1 and the ground is μ, what is the minimum coefficient of friction between the two boxes in order for the two boxes to move with the same acceleration without slipping?

As a system this question is identical to the last. Only the interaction force has changed

So

$$a = \frac{F}{m_1+m_2} - \mu g$$

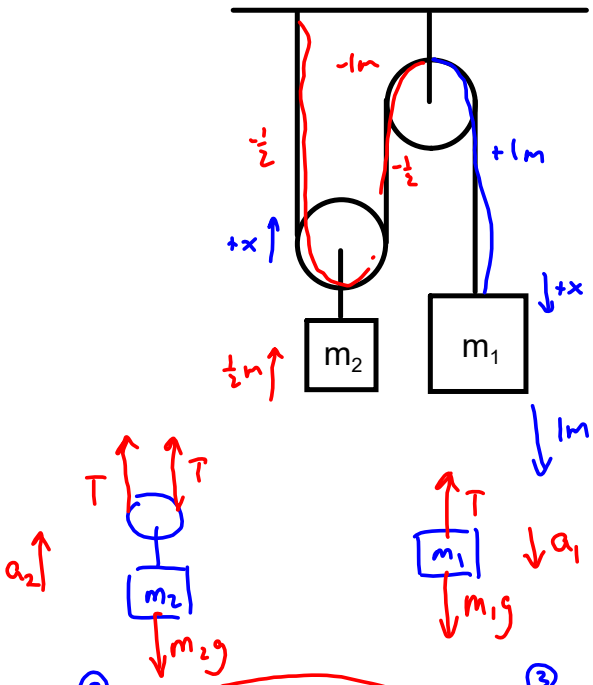
FBD - m_2



$$\Sigma F = f_{12} = m_2 a$$

$$\mu_{12} m_2 g = m_2 \left(\frac{F}{m_1+m_2} - \mu g\right)$$

$$\mu_{12_{min}} = \frac{F}{(m_1+m_2)g} - \mu$$



Find the acceleration of both masses.

We can't look at the system as a whole $a_1 \neq a_2$

$a_1 = 2a_2$ ①

② $\Sigma F = 2T - m_2 g = m_2 a_2$

$2(m_1 g - 2m_1 a_1) - m_2 g = m_2 a_2$

$2m_1 g - m_2 g = (4m_1 + m_2) a_2$

$\frac{2m_1 - m_2}{4m_1 + m_2} g = a_2$

③ $\Sigma F = m_1 g - T = m_1 a_1$

$T = m_1 g - m_1 a_1$

$= m_1 g - 2m_1 a_2$

$a_1 = \frac{4m_1 - 2m_2}{4m_1 + m_2} g$

Homework: p.478 #14-16