Homework: Questions?

Scale 2 cm : 1 N

$F_{eq} = 5.0 \pm 0.2 N$

$\ell_{Feq} = 10.00 \pm 0.05\ cm$

$\ell_{Fix} = 6.24 \pm 0.05 cm$

$F_{ix} = \frac{\ell_{Fix}}{Scale} = \frac{6.24 \pm 0.05\ cm}{2.00 \pm 0.08\ cm/N}$

$= 3.12 \pm 0.1\ N$

$= 3.1 \pm 0.1\ N$

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

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

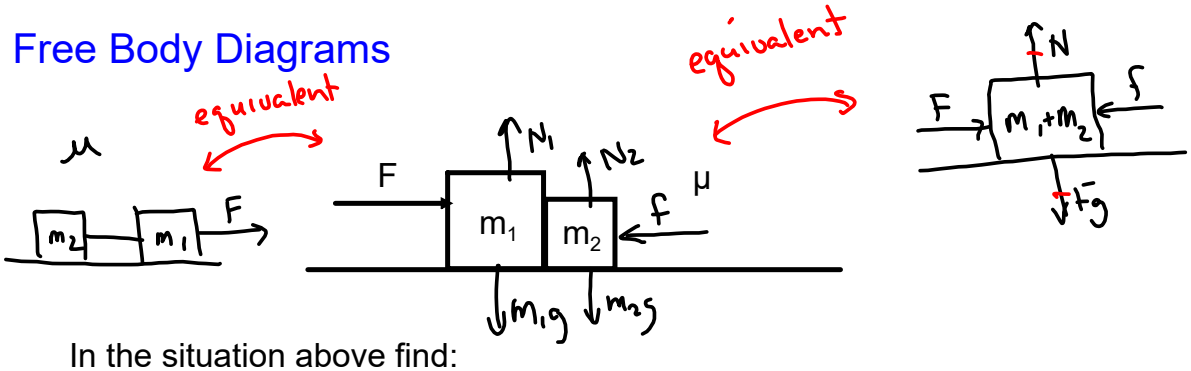
$\frac{\delta Q}{|Q|} = \sqrt{\left(\frac{\delta a}{a}\right)^2 + \left(\frac{\delta b}{b}\right)^2}$

$= \sqrt{\left(\frac{0.05}{10}\right)^2 + \left(\frac{0.2}{5.0}\right)^2}$

$\frac{\delta Q}{2.0 \frac{cm}{N}} = 0.0405$

$\delta Q = 0.08\ cm/N$

Free Body Diagrams



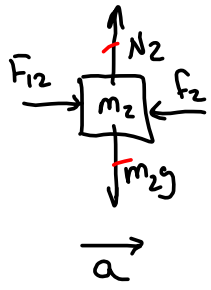
In the situation above find:
The acceleration, and
the force m_1 puts on m_2.

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

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

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

FBD - chose m_2 because it has fewer forces



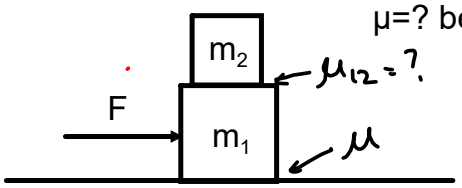
$$\Sigma F = F_{12} - f_2 = m_2 a$$

$$F_{12} - \mu m_2 g = m_2 a$$

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

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

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



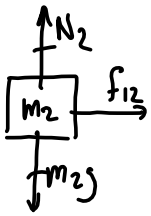
If the coefficient of friction between m_1 and the ground is μ, what is the minimum coefficient of friction between the two boxes in order for the two boxes to move with the same acceleration without slipping?

synonomous

This problem has the same mass and ΣF as the last, so

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

Choose m_2 for FBD

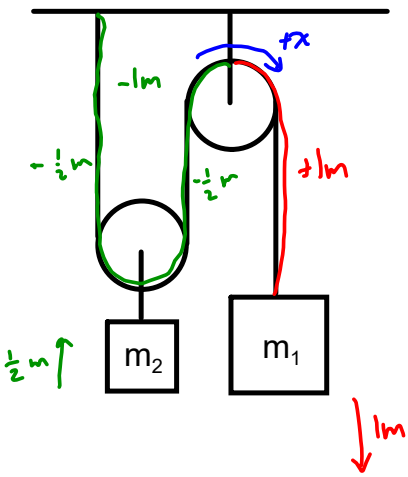


$$\Sigma F = f_{12} = m_2 a$$

$$\mu_{12} m_2 g = m_2 (\text{mass})$$

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

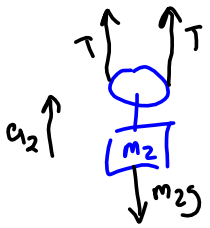
↑ min μ required



Find the acceleration of both masses.

$a_1 \neq a_2$

① $a_1 = 2a_2$

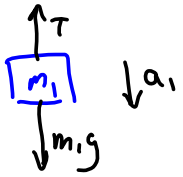


② $\Sigma F = 2T - m_2 g = m_2 a_2$

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

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

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



③ $\Sigma F = m_1 g - T = m_1 a_1$

$m_1 g - T = 2m_1 a_2$

$T = m_1 g - 2m_1 a_2$

$a_1 = 2a_2$

$a_1 = 2a_2 = \frac{4m_1 - 2m_2}{4m_1 + m_2} g$

Homework: p.478 #14-16