

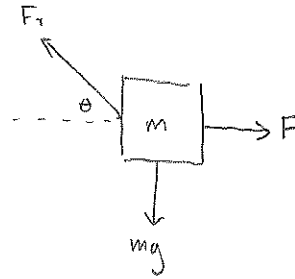
The Force of Tension:

1.



$$\begin{aligned} \ddot{a} &= 0 \text{ m/s}^2 \\ \sum \vec{F} &= 0 \\ \boxed{F_T = mg} \end{aligned}$$

2. $\ddot{a} = 0 \text{ m/s}^2$

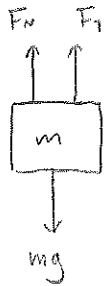


$$\begin{aligned} \hat{x}: \sum \vec{F}_x &= 0 \\ F_T \cos \theta &= F \\ \boxed{F_T = \frac{F}{\cos \theta}} \end{aligned}$$

OR

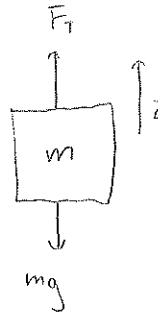
$$\begin{aligned} \hat{y}: \sum \vec{F}_y &= 0 \\ F_T \sin \theta &= mg \\ \boxed{F_T = \frac{mg}{\sin \theta}} \end{aligned}$$

3.



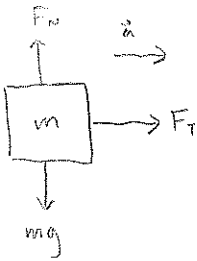
$$\begin{aligned} \ddot{a} &= 0 \\ \sum \vec{F} &= 0 \\ F_T + F_N &= mg \\ \boxed{F_T = mg - F_N} \end{aligned}$$

4.



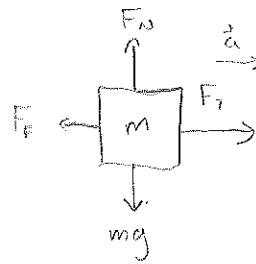
$$\begin{aligned} \sum \vec{F} &= m\vec{a} \\ F_T - mg &= ma \\ \boxed{F_T = mg + ma} \end{aligned}$$

5.



$$\begin{aligned} \sum \vec{F}_x &= m\vec{a}_x \\ \boxed{F_T = ma} \end{aligned}$$

6.



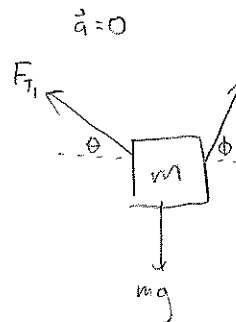
$$\begin{aligned} \sum \vec{F}_y &= 0 \\ F_N &= mg \\ \sum \vec{F}_x &= m\vec{a}_x \\ F_T - F_f &= ma \\ F_T - \mu F_N &= ma \\ F_T - \mu mg &= ma \\ \boxed{F_T = ma + \mu mg} \end{aligned}$$

7.



$$\begin{aligned} \sum \vec{F} &= m\vec{a} \\ mg - F_T &= ma \\ \boxed{F_T = mg - ma} \end{aligned}$$

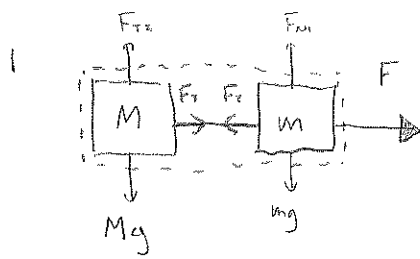
8.



$$\begin{aligned} \sum F_x &= 0 \\ \boxed{F_{T1} \cos \theta = F_{T2} \cos \phi} & \text{ (1)} \\ \sum F_y &= 0 \\ \boxed{F_{T1} \sin \theta + F_{T2} \sin \phi = mg} & \text{ (2)} \end{aligned}$$

2 equations, 2 unknowns \rightarrow SOLVE

Systems



System:

$$\sum \vec{F} = m\vec{a}$$

$$F = (M+m)a$$

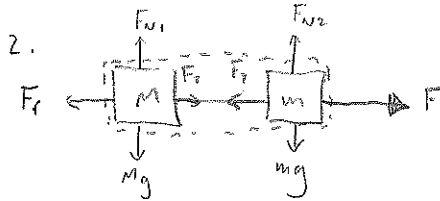
$$a = \frac{F}{(M+m)}$$

M:

$$\sum \vec{F} = m\vec{a}$$

$$F_T = Ma$$

$$F_T = M \left(\frac{F}{M+m} \right)$$



System:

$$\sum \vec{F} = m\vec{a}$$

$$F - F_f = (m+M)a$$

$$F - \mu F_{N1} = (m+M)a$$

$$F - \mu Mg = (m+M)a$$

$$a = \frac{F - \mu Mg}{m+M}$$

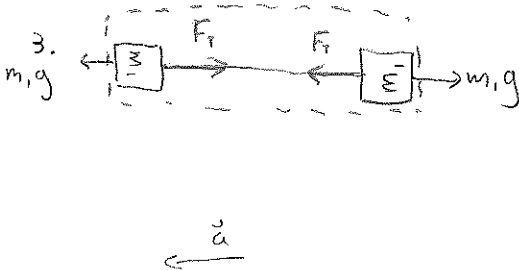
m:

$$\sum \vec{F} = m\vec{a}$$

$$F - F_T = ma$$

$$F_T = F - ma$$

$$F_T = F - m \left(\frac{F - \mu Mg}{m+M} \right)$$



System:

$$\sum \vec{F} = m\vec{a}$$

$$m_1g - m_2g = (m_1+m_2)a$$

$$a = 0 \text{ m/s}^2$$

m1:

$$\sum \vec{F} = 0$$

$$F_T = m_1g$$



System

$$\sum \vec{F} = m\vec{a}$$

$$m_1g - m_2g = (m_1+m_2)a$$

$$a = \frac{m_1g - m_2g}{(m_1+m_2)}$$

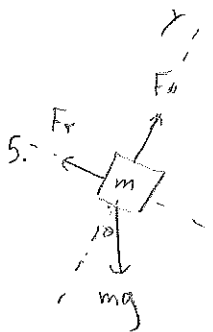
m2:

$$\sum \vec{F} = m\vec{a}$$

$$F_T - m_2g = m_2a$$

$$F_T = m_2a + m_2g$$

$$F_T = m_2 \left(\frac{m_1g - m_2g}{(m_1+m_2)} \right) + m_2g$$

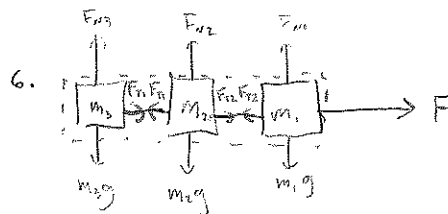


$$\vec{a} = 0$$

$$\sum \vec{F}_x = 0$$

$$mgsin\theta = F_T$$

$$F_T = mgsin\theta$$



System:

$$\sum \vec{F} = m\vec{a}$$

$$F = (m_1+m_2+m_3)a$$

$$a = \frac{F}{(m_1+m_2+m_3)}$$

m3:

$$\sum \vec{F} = m\vec{a}$$

$$F_{T1} = m_3a$$

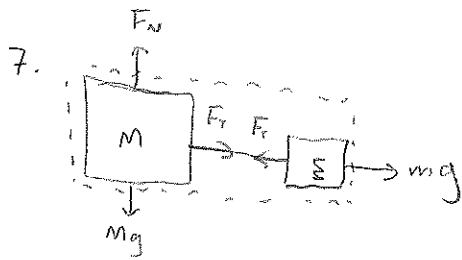
$$F_{T1} = m_3 \left(\frac{F}{m_1+m_2+m_3} \right)$$

m2+m3:

$$\sum \vec{F} = m\vec{a}$$

$$F_{T2} = (m_2+m_3)a$$

$$F_{T2} = (m_2+m_3) \left(\frac{F}{m_1+m_2+m_3} \right)$$



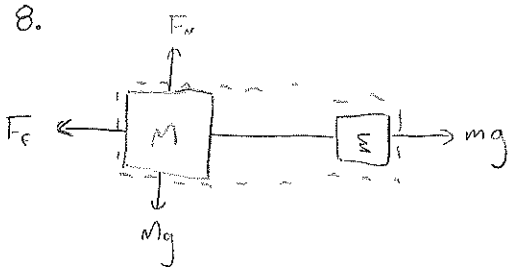
System:

$$\begin{aligned} \sum \vec{F} &= m\vec{a} \\ mg &= (m+M)a \\ a &= \frac{mg}{m+M} \end{aligned}$$

M:

$$\begin{aligned} \sum \vec{F} &= m\vec{a} \\ F_T &= Ma \end{aligned}$$

$$F_T = M \left(\frac{mg}{m+M} \right)$$



System:

$$\begin{aligned} \sum \vec{F}_y &= 0 \\ F_N &= Mg \\ \sum \vec{F}_x &= m\vec{a}_x \\ mg - F_T &= (M+m)a \\ mg - \mu F_N &= (M+m)a \end{aligned}$$

$$a = \frac{mg - \mu Mg}{M+m}$$

m:



$$\begin{aligned} \sum \vec{F} &= m\vec{a} \\ mg - F_T &= ma \\ F_T &= mg - ma \end{aligned}$$

$$F_T = mg - m \left(\frac{mg - \mu Mg}{m+M} \right)$$