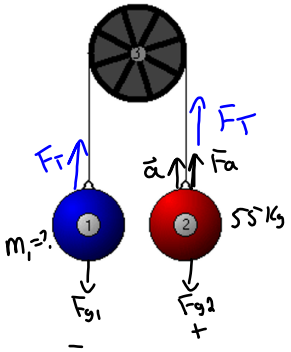
Suppose the maximum force a person can apply upwards is 324 N. A counterbalance is set up to help that person lift other objects. Calculate the mass of the counter weight for the person to lift 55 kg with an acceleration magnitude of 1.5 m/s^2 (M = 36 kg)



$$\sum \vec{F} = \sum \text{masses} \times \vec{a}$$

$$F_{g1} + F_{g2} + F_a = (m_1 + m_2)\vec{a}$$

$$F_{g1} = m_1 g$$
$$= -9.81 m_1$$

$$F_{g2} = m_2 g = (55)(9.81)$$
$$= 540 N$$

$$F_a = -324 N$$

$$a = -1.5 \text{ m/s}^2$$

$$-9.81m_1 + 540 - 324 = (m_1 + 55)(-1.5)$$

$$-9.81m_1 + 216 = -1.5m_1 - 82.5$$

$$216 + 82.5 = -1.5m_1 + 9.81m$$

$$298.5 = 8.31 m_1$$

$$\frac{298.5}{8.31} = m_1$$

$$\boxed{36 \text{ kg} = m_1}$$

b) F_T in wire = ?

$$\sum_{\text{on } m_1} \vec{F} = m_1 \vec{a}$$

$$F_{g1} + F_T = m_1 a$$

$$-(36)(9.81) + F_T = (36)(-1.5)$$

$$-353 + F_T = -54$$

$$F_T = -54 + 353$$

$$\boxed{F_T = 299 N}$$

Attachments

forces-and-motion-basics_all.jar

forces-1d_all.jar