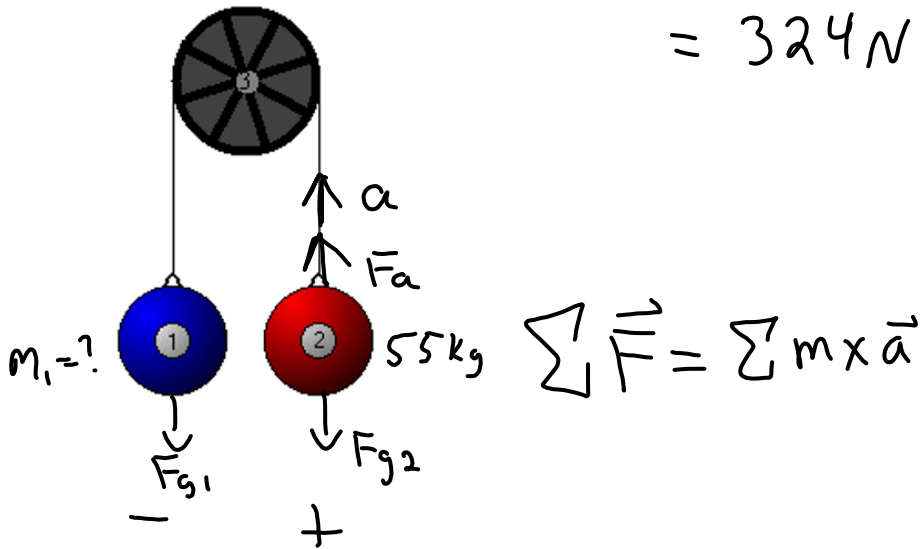


Suppose the maximum mass a person can lift is 33 kg. A counterbalance is set up to help that person lift other objects. Calculate the mass of the counter weight for the person to lift 55 kg with an acceleration magnitude of 1.5 m/s² (M = 36 kg)

$$F_a = 33 \times 9.81$$

$$= 324 \text{ N}$$



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

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

$$-9.81m_1 + 540 - 324 = -1.5m_1 - 82.5$$

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

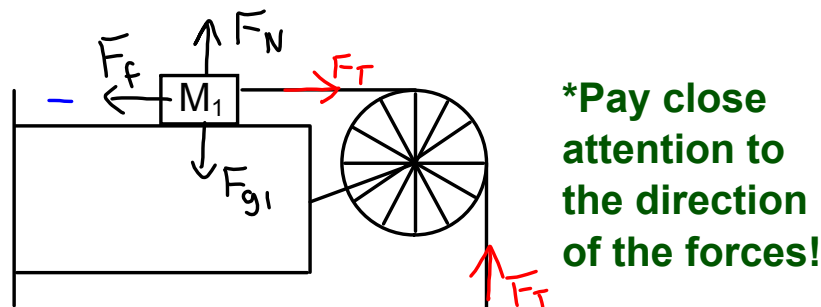
$$216 + 82.5 = -1.5m_1 + 9.81m_1$$

$$298.5 = 8.31m_1$$

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

Fletcher's Trolley

Calculate the acceleration of the masses if $M_1 = 5.2 \text{ kg}$, $M_2 = 4.5 \text{ kg}$, and $\mu_k = 0.22$.
Then calculate the tension in the wire.



***Pay close attention to the direction of the forces!**

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

$$F_f + F_{g2} = (m_1 + m_2) a$$

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

$$-(0.22)(5.2)(9.81) + (4.5)(9.81) = (5.2 + 4.5) a$$

$$-11.2 + 44.1 = 9.7 a$$

$$32.9 = 9.7 a$$

$$\boxed{3.4 \text{ m/s}^2 = a}$$

Find $F_T = ?$ ← forces only on m_2

$$\sum F = m_2 a$$

$$F_{g2} + F_T = m_2 a$$

$$(4.5)(9.81) + F_T = (4.5)(3.4)$$

$$\boxed{F_T = -29 \text{ N}}$$

Attachments

forces-and-motion-basics_all.jar

forces-1d_all.jar