

Answer on Question #51063, Physics, Mechanics | Kinematics | Dynamics

A 2 kg and a 4 kg hang freely at opposite ends of a light inextensible string which passes over a small and light pulley fixed to a rigid support. Calculate the acceleration of the system.

Solution

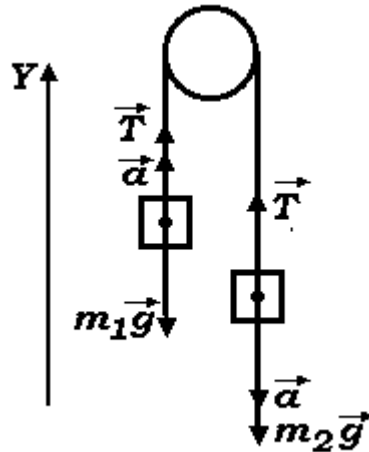


Fig.1

According to Newton's second law

$$\begin{cases} \vec{a}m_2 = m_2\vec{g} + \vec{T} \\ \vec{a}m_1 = \vec{T} + m_1\vec{g} \end{cases} \quad (1)$$

than

$$\begin{cases} am_2 = m_2g - T \\ am_1 = T - m_1g \end{cases} \quad (2)$$

From Eq.(2)

$$a = g \frac{m_2 - m_1}{m_2 + m_1} = 9.8m/s^2 \cdot \frac{4kg - 2kg}{4kg + 2kg} \approx 3.27m/s^2$$

Answer: $a = g \frac{m_2 - m_1}{m_2 + m_1} \approx 3.27m/s^2$