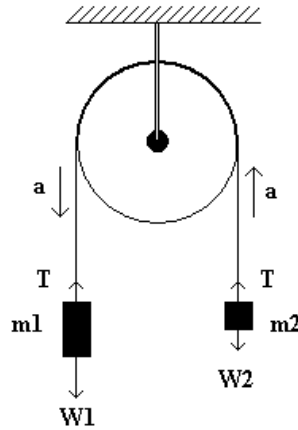


Answer on Question #40810, Physics, Mechanics

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

Solution:



Given:

$$m_1 = 4 \text{ kg,}$$

$$m_2 = 2 \text{ kg,}$$

$$W_1 = m_1 g$$

$$W_2 = m_2 g$$

The equations of motion are:

$$m_1 a = m_1 g - T$$

$$m_2 a = T - m_2 g$$

The adding of two equations gives:

$$\begin{aligned} m_1 a + m_2 a &= m_1 g - T + T - m_2 g \\ m_1 a + m_2 a &= m_1 g - m_2 g = g(m_1 - m_2) \end{aligned}$$

Thus, the acceleration is

$$\begin{aligned} a &= \frac{g(m_1 - m_2)}{m_1 + m_2} \\ a &= \frac{9.81 \cdot (4 - 2)}{4 + 2} = 3.27 \text{ m/s}^2 \end{aligned}$$

Answer. $a = 3.27 \text{ m/s}^2$.