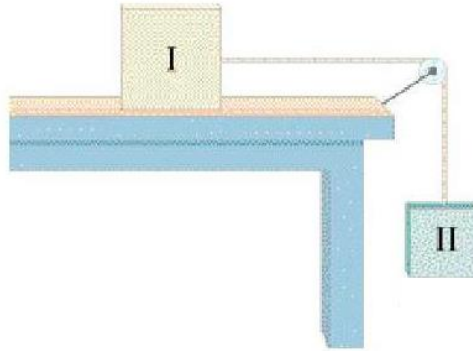


Answer on Question #57059, Physics / Other

A weight of 442N sits on a table connected by a massless string to a 185N block that is dangling above the ground with the string draped over a pulley. Ignoring all frictional effects and assuming the pulley to be massless, find the acceleration and the tension in the rope.

Solution:



Given:

$$W_1 = 442 \text{ N}$$

$$W_2 = 185 \text{ N}$$

$$a = ?$$

$$T = ?$$

The masses of blocks are

$$m_1 = \frac{W_1}{g} = \frac{442}{9.81} = 45.06 \text{ kg}$$

$$m_2 = \frac{W_2}{g} = \frac{185}{9.81} = 18.86$$

The equations of motion are:

$$m_1 a = T$$

$$m_2 a = W_2 - T$$

The adding of two equations gives:

$$m_1 a + m_2 a = W_2$$

Thus, the acceleration is

$$a = \frac{W_2}{m_1 + m_2} = \frac{185}{45.06 + 18.86} = 2.89 \text{ m/s}^2$$

The tension from first equation is

$$T = m_1 a = 45.06 \cdot 2.89 = 130.2 \text{ N}$$

Answer: $a = 2.89 \text{ m/s}^2$; $T = 130.2 \text{ N}$