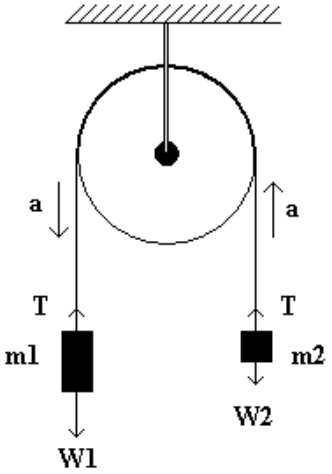
Answer on Question #45256, Physics, Mechanics | Kinematics | Dynamics

A light string passing over a smooth light pulley connects two blocks of masses m1 and m2 .if the acceleration of the system is g/8, then find the ratio of their masses.

Solution:



$W_1 = m_1 g$
$W_1 = m_2 g$

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:

$$m_1 a + m_2 a = m_1 g - T + T - m_2 g$$

$$m_1 a + m_2 a = m_1 g - m_2 g = g(m_1 - m_2)$$

Thus, the acceleration is

$$a = \frac{g(m_1 - m_2)}{m_1 + m_2}$$

Let

$$\frac{m_1}{m_2} = x$$

Thus,

$$a = \frac{g(m_2 x - m_2)}{m_2 x + m_2} = \frac{g(x-1)}{(x+1)}$$

From given

$$a = \frac{g}{8}$$
$$\frac{g}{8} = \frac{g(x-1)}{(x+1)}$$

or

$$- = \frac{x -}{x +}$$

or

$$x + \quad = \quad x -$$

or

$$9 = 7x$$

Thus,

$$x = \frac{9}{7}$$

Answer: $\frac{m_1}{m_2} = \frac{9}{7}$.