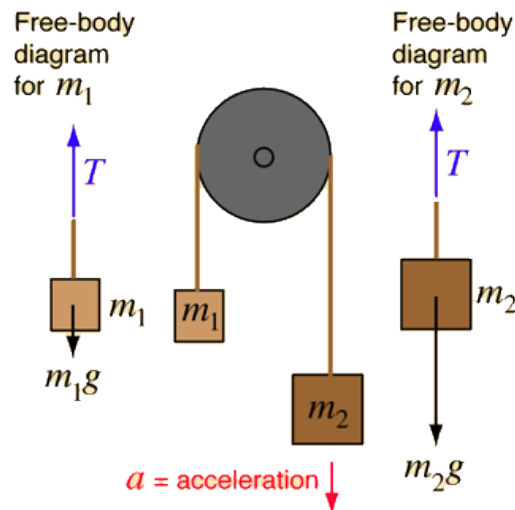# Answer on Question #55266, Physics / Mechanics | Kinematics | Dynamics

In a system of the Atwood machine with masses of 6kg and 10kg. (a) What is the tension in the chord connecting the masses? (b) What is the acceleration of the masses? Assume that the pulley is frictionless and rope massless. Take g = 9.8m/s²

Solution:

Given:
$$m_1 = 6 \text{ kg,}$$
$$m_2 = 10 \text{ kg,}$$
$$W_1 = m_1 g$$
$$W_1 = m_2 g$$

The equations of motion are:
$$m_1 a = T - m_1 g$$
$$m_2 a = m_2 g - T$$

The adding of two equations gives:
$$m_1 a + m_2 a = -m_1 g + T - T + m_2 g$$
$$m_1 a + m_2 a = m_2 g - m_1 g = g(m_2 - m_1)$$

The acceleration is
$$a = \frac{g(m_2 - m_1)}{m_1 + m_2}$$
$$a = \frac{9.8 \cdot (10 - 6)}{10 + 6} = 2.45 \text{ m/s}^2$$

(a) The tension from second equation is
$$T = m_2(g - a) = 10 \cdot (9.8 - 2.45) = 73.5 \text{ N}$$

(b) $a = 2.45 \text{ m/s}^2$

Answer. $T = 73.5 \text{ N}; a = 2.45 \text{ m/s}^2.$