Answer on Question #68035-Physics-Mechanics | Relativity
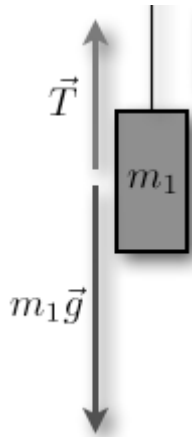
Two weights connected by a lightweight string running over a pully is known as an Atwoods Machine. Determine the acceleration of the two masses of a simple Atwood's machine, with one fixed pulley and two masses m1 and m2. (m1 > m2)
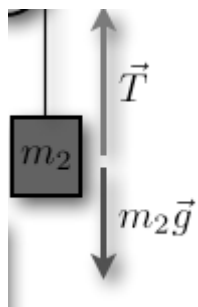
(Do free-body diagram first for each weight.)

Solution

A free-body diagram for first weight:

A free-body diagram for second weight:

$$\begin{cases} m_1 a = m_1 g - T \\ m_2 a = T - m_2 g \end{cases}$$

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

The acceleration of the two masses of a simple Atwood's machine is

$$a = \frac{(m_1 - m_2)}{(m_1 + m_2)}g = \frac{1 - \dfrac{m_2}{m_1}}{1 + \dfrac{m_2}{m_1}}g$$