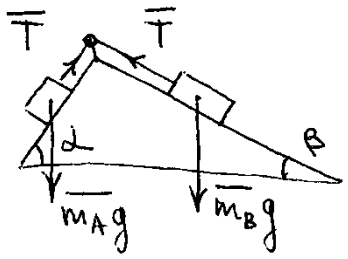
Answer on Question #85208, Physics / Mechanics | Relativity

Question:

Two masses mA = 1.0 kg and mB = 7.0 kg are on inclines and are connected together by a string as shown in (Figure 1). The coefficient of kinetic friction between each mass and its incline is μk = 0.30.

If mA moves up, and mB moves down, determine their acceleration. Ignore masses of the (frictionless) pulley and the cord.

Solution:



Equations of mass motion are: $m_B a = m_B g \sin\beta - \mu_k m_B g \cos\beta - T$ and $m_A a = T - m_A g \sin\alpha - \mu_k m_A g \cos\alpha$, respectively the acceleration $a = g\dfrac{(m_B \sin\beta - m_A \sin\alpha) - \mu_k (m_A \cos\alpha + m_B \cos\beta)}{m_A + m_B}$. Using known parameters we get: $a = 10\dfrac{(7\sin\beta - \sin\alpha) - 0.3(\cos\alpha + 7\cos\beta)}{8}$.

The answer:

The acceleration is: $a = 10\dfrac{(7\sin\beta - \sin\alpha) - 0.3(\cos\alpha + 7\cos\beta)}{8}$.