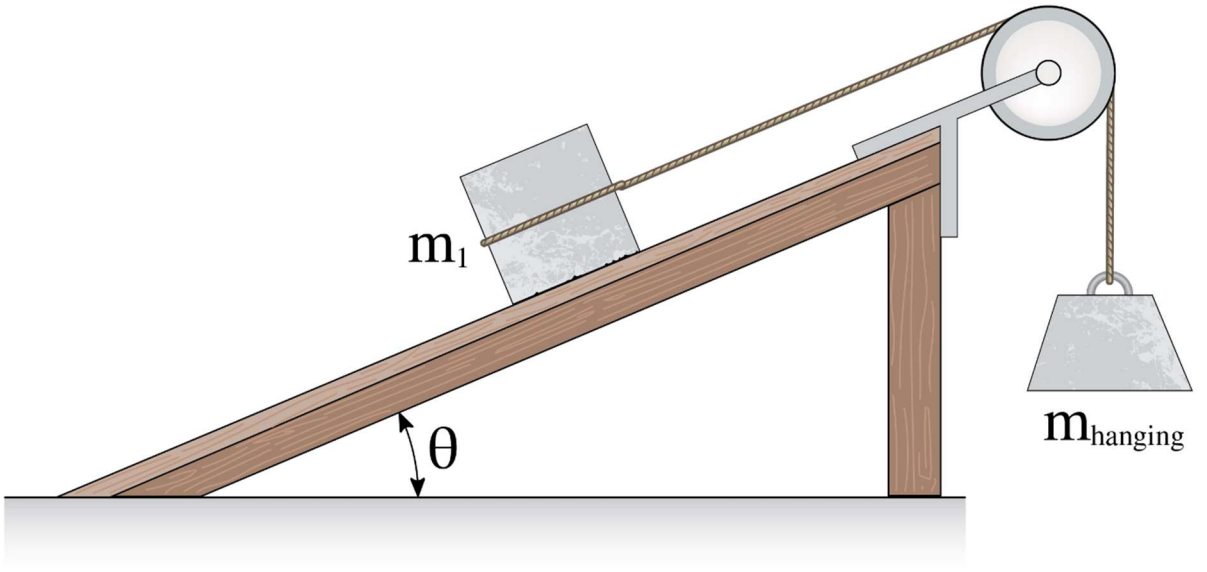
21-P-FA-AG-011



UBC Engineering

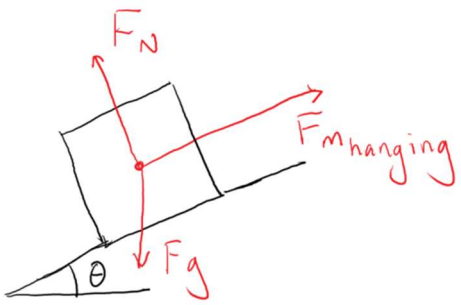
Using s1 as the position between m_1 and the pulley, s2 as the position between $m_{hanging}$ and the pulley, and L1 as the length of cord over the pulley, write an equation for the total cord length, l_t.

If $m_1 = M1$, $m_{hanging} = M2$, and $\theta = \theta\ degrees$, which way is m_1 moving? Left, right, or staying still?

Assume the ramp is frictionless and $g = 9.81\frac{m}{s^2}$.

ANSWER:

We know that $s_{from\ m_1\ to\ the\ pulley} + l_{over\ the\ pulley} + s_{from\ the\ pulley\ to\ m_{hanging}} = l_t$. By taking the first time derivative, we find $v_{from\ m_1\ to\ the\ pulley} + v_{from\ the\ pulley\ to\ m_{hanging}} = 0$. Therefore, the velocities must be equal and opposite. Additionally, because the velocities must always be equal, the accelerations must also always be equal.



$$\sum F_x = -F_{g,x} + F_{m_{hanging}} =$$

$$= -M1\sin(\theta)\cdot g + M2\cdot g$$

If $\sum F_x > 0$, then the block will move right.

If $\sum F_x < 0$, then the block will move left.

If $\sum F_x = 0$, then the block will not move.