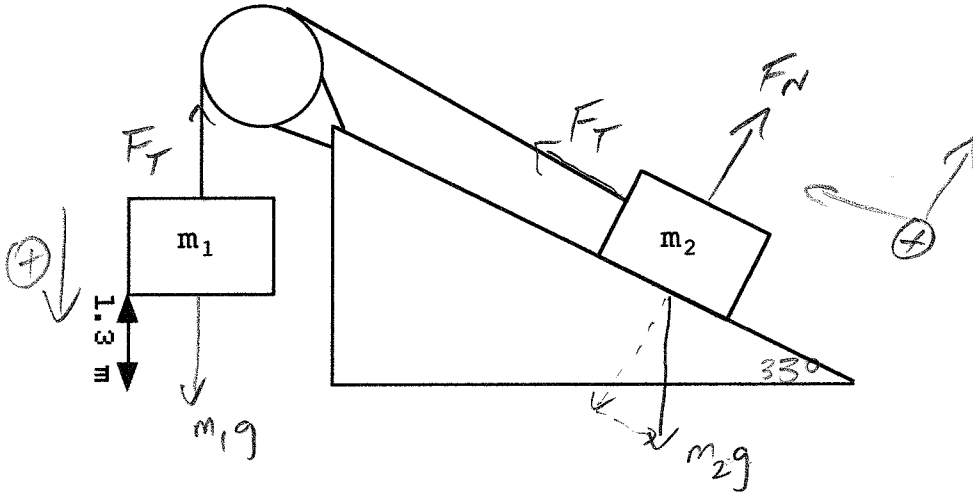


Quiz #4A

Clearly indicate (with a box) your answers to the following questions. SHOW ALL WORK.

1. Two blocks are connected by a thin rope over a frictionless pulley as shown below. The suspended mass $m_1 = 1.8 \text{ kg}$ and the mass on the 33° frictionless incline is $m_2 = 2.5 \text{ kg}$. How much time does it take for m_1 to hit the ground if the system starts from rest?



$$m_1: \Sigma F_y = -F_T + m_1g = m_1 a$$

$$m_2: \Sigma F_{\parallel} = F_T - m_2g \sin 33^\circ = m_2 a$$

$$\text{From } m_2: F_T = m_2 a + m_2g \sin 33^\circ$$

$$\text{Plug into } m_1: -m_2 a - m_2g \sin 33^\circ + m_1g = m_1 a$$

$$m_1g - m_2g \sin 33^\circ = (m_1 + m_2) a$$

$$a = \frac{m_1 - m_2 \sin 33^\circ}{m_1 + m_2} g = \frac{0.438}{4.3} g$$

$$\Delta y = 1.3 \text{ m}$$

$$v_{0y} = 0$$

$$v_y = ?$$

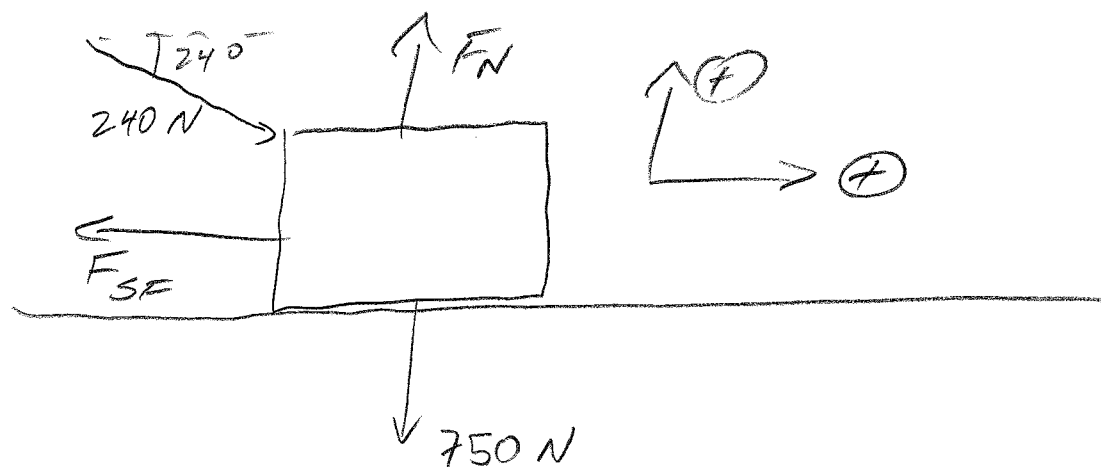
$$a_y = 0.998$$

$$t = ?$$

$$1.3 = 0 + \frac{1}{2} (0.998) t^2 = 0.998$$

$$\frac{1.3}{.499} = t^2 \quad \boxed{t = 1.6 \text{ s}}$$

2. Starting from rest, a worker tries to push a 750-N crate across a horizontal rough surface with an applied force of 240-N at 24° below the horizontal. The coefficient of static friction between the crate and the surface is 0.21. Does the crate move?



$$\Sigma F_x = 240 \cos 24^\circ - F_{SF} = 0$$

$$\Sigma F_y = F_N - 240 \sin 24^\circ - 750 = 0$$

$$\rightarrow F_{SF} = \underline{219 \text{ N}}$$

$$\rightarrow F_N = 240 \sin 24^\circ + 750$$

$$= 848$$

$$\text{so } \bar{F}_{SF, \text{MAX}} = (0.21)(848) = \underline{178 \text{ N}}$$

Since $F_{SF} > F_{SF, \text{MAX}}$, the crate moves.