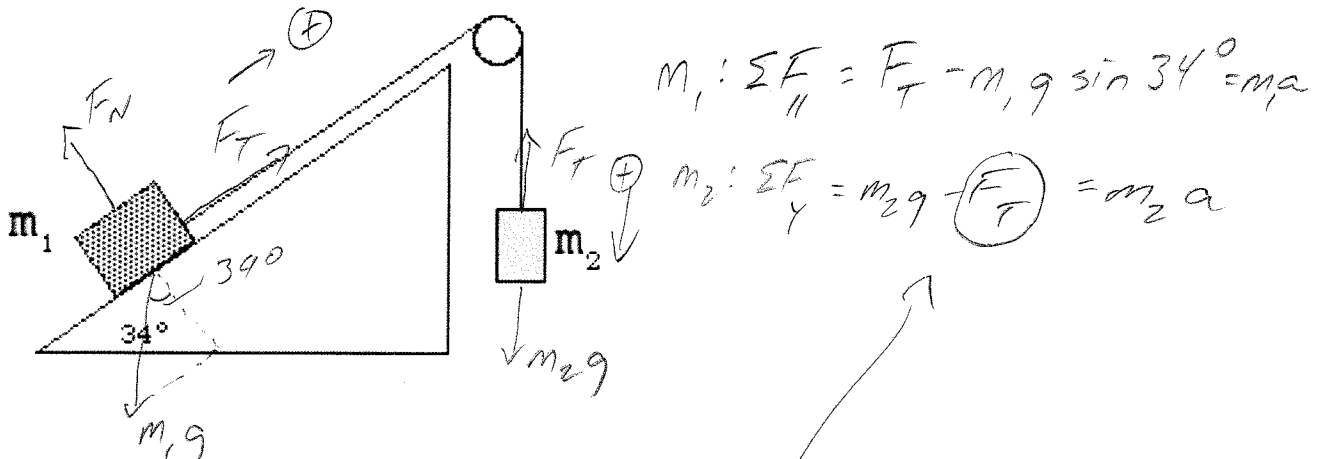


## Physics 10154 - Exam #4C

Answer the following two questions. Be sure to clearly indicate your answer with a circle or box. Show all work. If I cannot see how you arrived at an answer, I will deduct points!

1. Two masses ( $m_1 = 5.0 \text{ kg}$ ,  $m_2 = 2.0 \text{ kg}$ ) are connected by a massless string over a pulley as shown below. What is the tension in the string, and what is the acceleration of  $m_1$  (be sure to indicate direction clearly)?



$$F_T = m_1 a + m_1 g \sin 34^\circ$$

$$m_2 g - m_1 a - m_1 g \sin 34^\circ = m_2 a$$

$$m_2 g - m_1 g \sin 34^\circ = (m_1 + m_2) a$$

$$a = \frac{m_2 - m_1 \sin 34^\circ}{m_1 + m_2} g = \frac{-0.796}{7} g$$

$$= -1.1 \text{ m/s}^2$$

$$a = \boxed{1.1 \text{ m/s}^2, \text{ down ramp}}$$

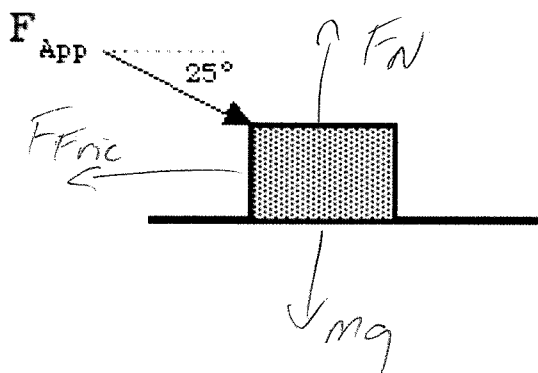
$$F_T = (5)(-1.1) + (5)(9.8) \sin 34^\circ = \boxed{22 \text{ N}}$$

2. An 18-kg mass is at rest on a rough surface. An applied force of 140 N acts as shown on the block. The coefficient of static friction between the block and surface is 0.65. The coefficient of kinetic friction is 0.33.

Does the block move? Justify your answer.

If the block moves, determine the magnitude and direction of the acceleration.

If the block does not move, find the magnitude and direction of the force of static friction acting on the block.



Block moves if  $F_{APP} \cos 25^\circ = F_{SF, MAX}$

$$F_{APP} \cos 25^\circ = 126.9 \text{ N}$$

$$\Sigma F_\perp = F_N - mg - F_{APP} \sin 25^\circ = 0$$

$$F_N = mg + F_{APP} \sin 25^\circ$$

$$= (18)(9.8) + 140 \sin 25^\circ = 235.6 \text{ N}$$

$$F_{SF, MAX} = \mu_s F_N = 153.1$$

Block doesn't move

Since block doesn't move

$$\Sigma F_x = F_{APP} \cos 25^\circ - F_{SF} = 0$$

$$F_{SF} = 130 \text{ N}$$