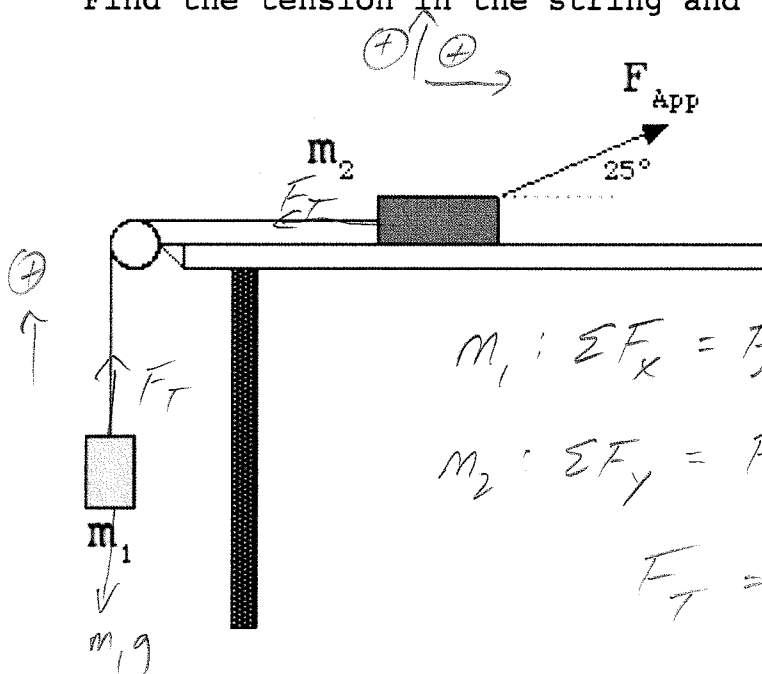


Physics 10154 - Exam #4B

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 ($m_1 = 1.0 \text{ kg}$, $m_2 = 2.0 \text{ kg}$) are connected by a massless string over a pulley as shown below. An applied force of 32 N acts on m_2 as shown.

Find the tension in the string and the acceleration of m_1 .



$$m_1: \Sigma F_x = F_{App} \cos 25^\circ - F_T = m_2 a$$

$$m_2: \Sigma F_y = F_T - m_1 g = m_1 a$$

$$F_T = m_1 a + m_1 g$$

$$F_{App} \cos 25^\circ - m_1 a - m_1 g = m_2 a$$

$$F_{App} \cos 25^\circ - m_1 g = (m_1 + m_2) a$$

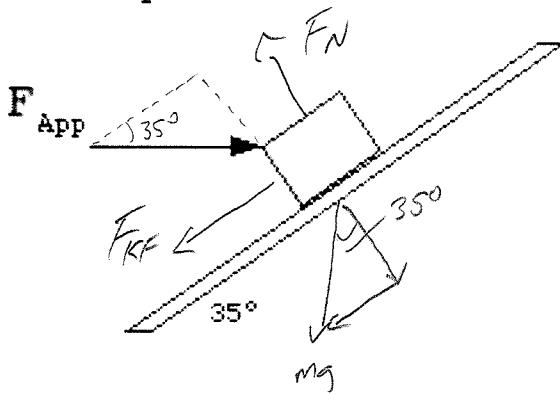
$$a = \frac{F_{App} \cos 25^\circ - m_1 g}{m_1 + m_2} = \frac{29 - 9.8}{3.0}$$

$$= \boxed{6.4 \text{ m/s}^2}$$

$$F_T = (1)(6.4) + (1)(9.8) = \boxed{16 \text{ N}}$$

2. A 7.0 kg mass is being pushed up a ramp with by an applied force of 74 Newtons directed horizontally. The mass is moving at a constant speed of 2.0 meters/sec.

What is the coefficient of kinetic friction between the mass and the ramp?



no acceleration due to constant velocity
↓

$$\Sigma F_{\parallel} = F_{App} \cos 35^{\circ} - mg \sin 35^{\circ} - \mu_k F_N = 0$$

$$\Sigma F_{\perp} = F_N - F_{App} \sin 35^{\circ} - mg \cos 35^{\circ} = 0$$

$$\Sigma F_{\parallel} = 74 \cos 35^{\circ} - (7)(9.8) \sin 35^{\circ} - \mu_k F_N = 0$$

$$F_N = 74 \sin 35 + (7)(9.8) \cos 35^{\circ}$$

$$= 42.4 + 56.2 = 98.6$$

$$60.6 - 39.3 = \mu_k (98.6)$$

$$\mu_k = 0.22$$