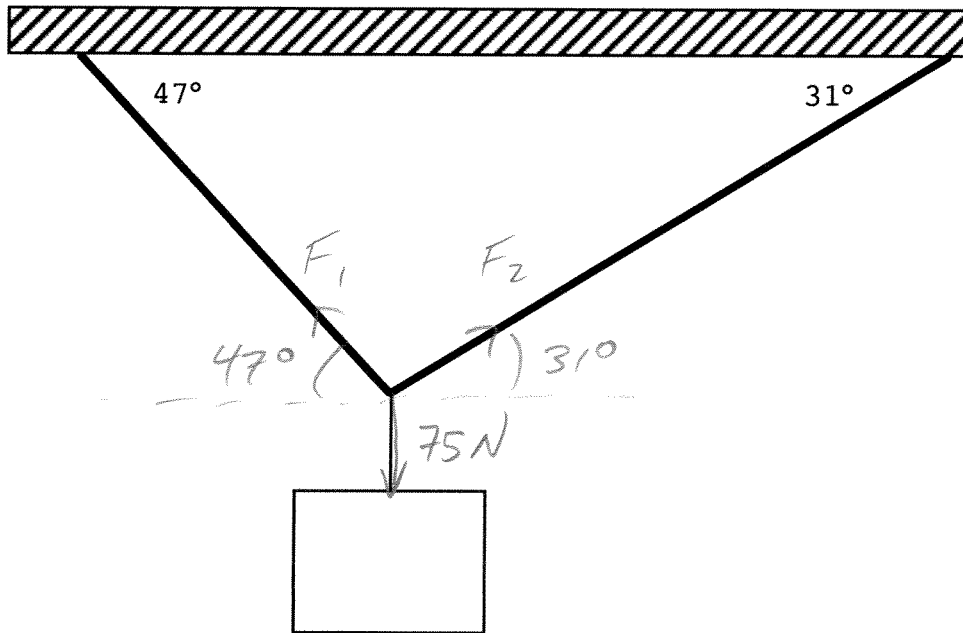


Physics 10154 - Exam #2b

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work (or if some parts are incorrect) even if you get the right answer. Clearly indicate your answer with a circle or box and remember to include correct units and significant figures.

1. (30 pts) A 75 Newton crate hangs from two strings at rest as shown below. Determine the tension in each rope.



$$\Sigma F_x = -F_1 \cos 47^\circ + F_2 \cos 31^\circ = 0$$

$$\Sigma F_y = F_1 \sin 47^\circ + F_2 \sin 31^\circ - 75 = 0$$

$$F_1 = \frac{F_2 \cos 31^\circ}{\cos 47^\circ} = 1.26 F_2$$

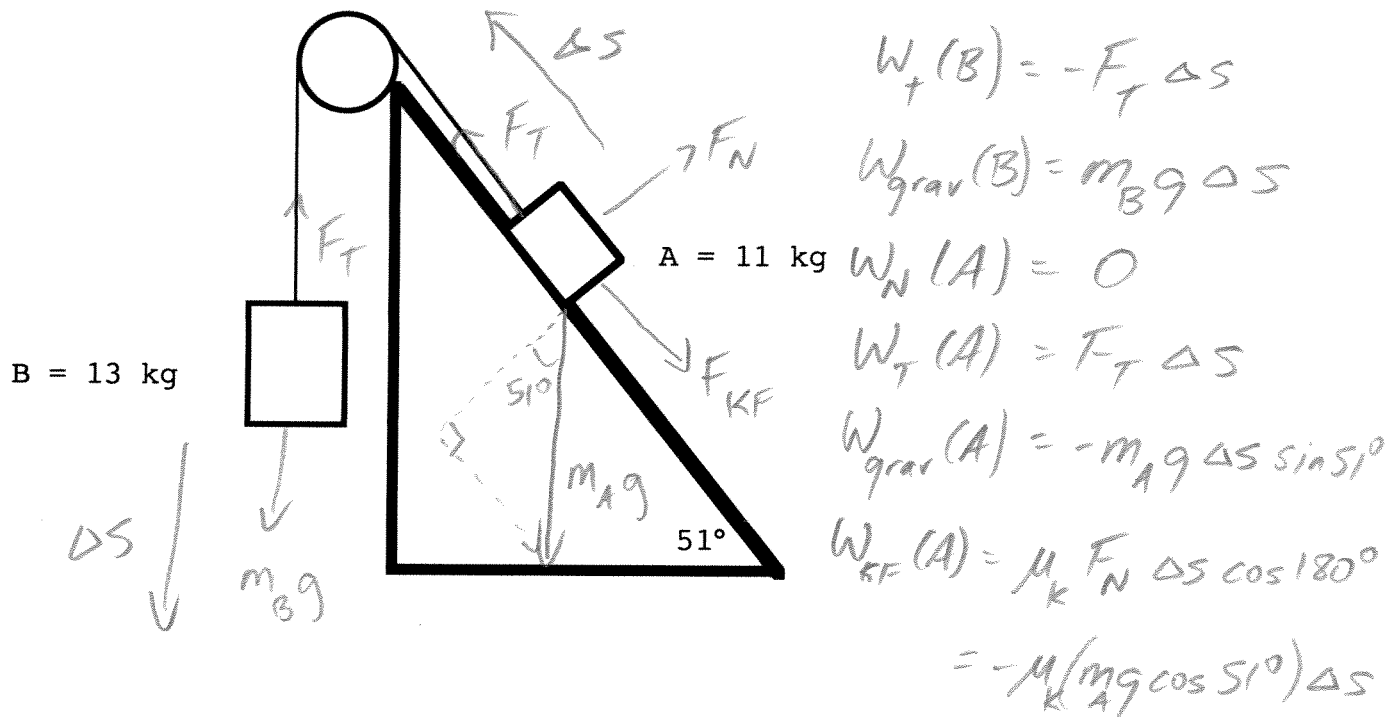
$$1.26 F_2 \sin 47^\circ + F_2 \sin 31^\circ - 75 = 0$$

$$F_2 = \frac{75}{(1.26 \sin 47^\circ + \sin 31^\circ)} = 52.3\text{ N}$$

$$F_1 = 66\text{ N}, F_2 = 52\text{ N}$$

2. (40 pts) Two blocks are connected by a massless string and released from rest in the apparatus shown below (assume the pulley has no mass). The coefficient of kinetic friction is 0.44.

Assuming the system moves, how many seconds does it take for block B to drop a distance of 35 cm?



$$\Sigma W_F = m_B g \Delta s - m_A g \Delta s \sin 51^\circ - \mu_k m_A g \cos 51^\circ \Delta s$$

$$= \frac{1}{2} (m_A + m_B) v^2$$

$$44.59 - 29.32 - 10.45 = \frac{1}{2} (24) v^2$$

$$4.82 = 12 v^2$$

$$v = 0.634 \text{ m/s}$$

$$\Delta s = 0.35$$

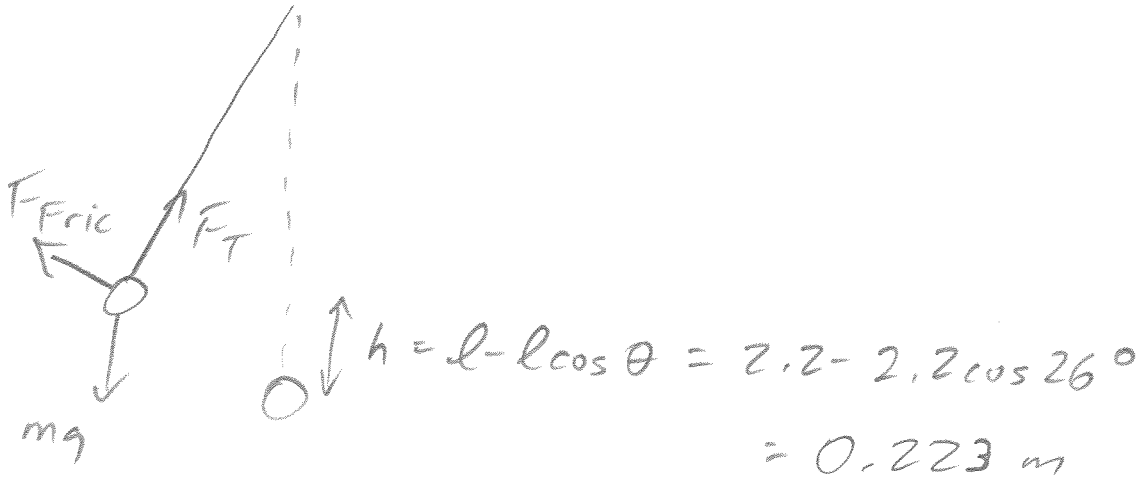
$$v_0 = 0$$

$$v = 0.634$$

$$0.35 = \frac{1}{2} (0 + 0.634) t$$

$$t = 1.1 \text{ s}$$

3. (30 pts) A 23.5 kg child on a 2.20 meter long swing is released from rest when the ropes of the swing make an angle of 26.0° with respect to the vertical. The speed of the child at his lowest point is 1.85 m/s. How much energy is lost due to friction?



$$W_{grav} + W_T + W_{Fric} = \Delta K$$

$$mgh + 0 + W_{Fric} = \frac{1}{2}mv^2 - 0$$

$$(23.5)(9.8)(0.223) + W_{Fric} = \frac{1}{2}(23.5)(1.85)^2$$

$$51.36 + W_{Fric} = 40.21$$

$$W_{Fric} = -11.1 \text{ J}$$