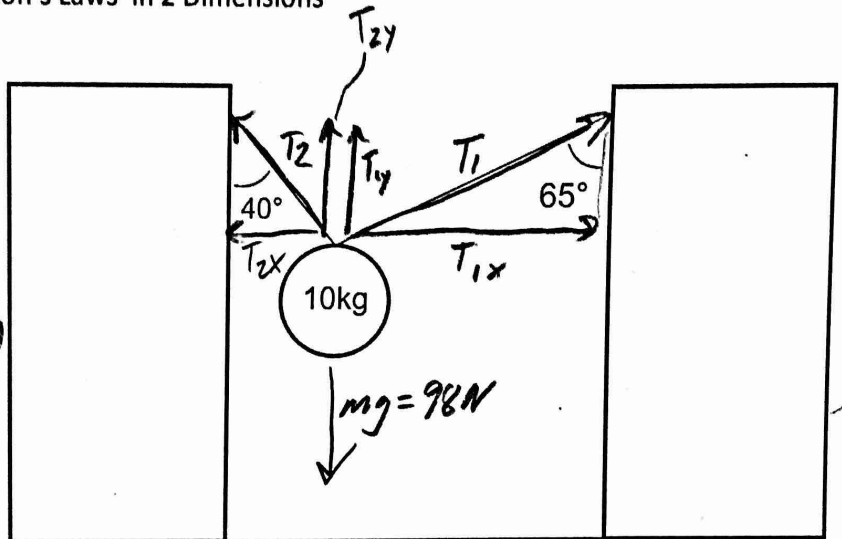Physics 200

Name: Key

Masses Hanging and Dragged at Angles – Newton's Laws in 2 Dimensions

1. The 10kg mass is in static equilibrium. Find the tensions in the two segments of rope.

$$\Sigma F_y = 0 = T_{1y} + T_{2y} - 98N$$

$$\Sigma F_x = 0 = T_{1x} - T_{2x} \Rightarrow T_{1x} = T_{2x}$$

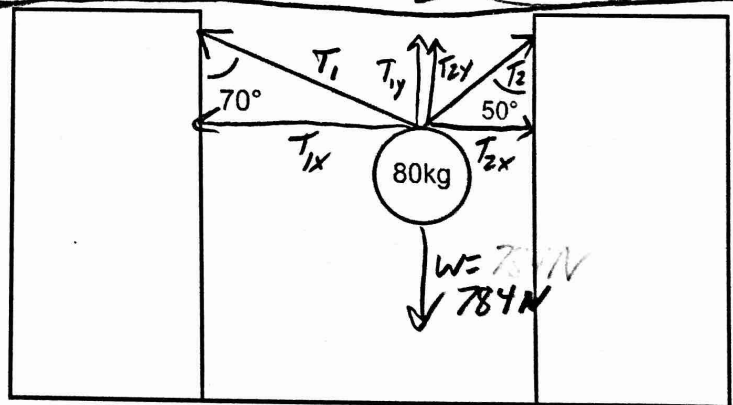$$\sin 65°(T_1) = \sin 40°(T_2)$$

$$0.906 T_1 = 0.643 T_2$$

$$T_1 = 0.71 T_2$$

$$0 = \cos 65° T_1 + \cos 40° T_2 - 98N$$

$$0 = 0.423 T_1 + 0.766 T_2 - 98N = 0.423(0.71 T_2) + 0.766 T_2 - 98N$$

$$0 = 0.766 T_2 + 0.3 T_2 - 98N$$

$$T_2 = 91.5N \Rightarrow T_1 = 0.71 T_2 = 65N$$

2. The 80kg mass is in static equilibrium. Find the tensions in the two segments of rope.

$$\Sigma F_x = 0 = T_{2x} - T_{1x} \Rightarrow T_{1x} = T_{2x}$$

$$\Sigma F_y = 0 = T_{1y} + T_{2y} - 784N$$

$$T_{1x} = \sin 70°(T_1) \qquad T_{2x} = \sin 50°(T_2)$$

$$0.94 \qquad\qquad 0.766$$

$$0.94 T_1 = 0.766 T_2$$

$$T_1 = 0.815 T_2$$

$$\cos 70°(T_1) + \cos 50°(T_2) - 784N = 0$$

$$0.342(0.815 T_2) + 0.643(T_2) - 784N = 0$$

$$0.29 T_2 + 0.643 T_2 = 784N$$

$$T_2 = 839N \qquad T_1 = 684N$$

234
539

642
642