

NAME:

Quiz 02: Chapter 03

Determine the tensions in cables AB and AC if the 20-kg ball at D is in equilibrium. The applied force $F = 300\text{N}$ and $d = 1\text{m}$.

$$\tan\theta_1 = \left(\frac{2.5}{2}\right) \Rightarrow \theta_1 = 51.3^\circ$$

$$T_{1x} = -T_1 \cos\theta_1 = -T_1 \cos(51.3^\circ) = -0.625T_1$$

$$T_{1y} = T_1 \sin\theta_1 = T_1 \sin(51.3^\circ) = 0.781T_1$$

$$\tan\theta_2 = \left(\frac{1}{2}\right) \Rightarrow \theta_2 = 26.6^\circ$$

$$T_{2x} = -T_2 \cos\theta_2 = -T_2 \cos(26.6^\circ) = -0.894T_2$$

$$T_{2y} = T_2 \sin\theta_2 = T_2 \sin(26.6^\circ) = 0.447T_2$$

$$\sum F_x = F - 0.625T_1 - 0.894T_2 = 0$$

$$\sum F_y = 0.781T_1 + 0.447T_2 - mg = 0$$

$$T_1 + 1.431T_2 = \frac{300\text{N}}{0.625} = 480\text{N}$$

$$T_1 + 0.573T_2 = \frac{(20\text{kg})(9.8\text{m/s}^2)}{0.781} = 251\text{N}$$

$$(1.431 - 0.573)T_2 = (480 - 251)\text{N} \Rightarrow T_2 = 267\text{N}$$

$$T_1 = 480\text{N} - 1.431(267\text{N}) \Rightarrow T_1 = 98.2\text{N}$$

