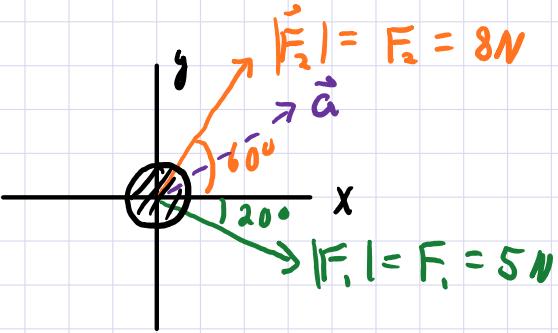
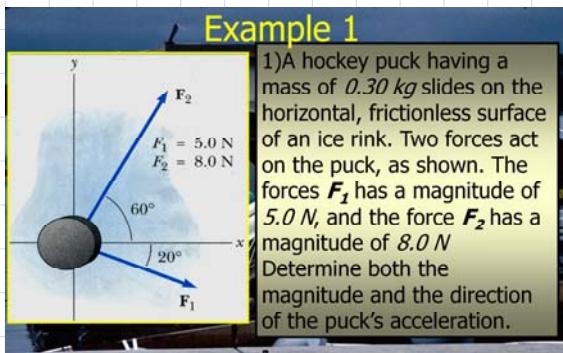


Example 1

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$$\sum F_x = m a_x$$

$$F_1 \cos(20^\circ) + F_2 \cos(60^\circ) = m a_x$$

$$a_x = \frac{F_1 \cos(20^\circ) + F_2 \cos(60^\circ)}{m} = \frac{(5\text{N}) \cos(20^\circ) + (8\text{N}) \cos(60^\circ)}{0.30\text{kg}}$$

$$a_x = 28.99 \text{ m/s}^2 \approx 29 \text{ m/s}^2$$

$$\sum F_y = m a_y$$

$$-F_1 \sin(20^\circ) + F_2 \sin(60^\circ) = m a_y$$

$$a_y = \frac{-F_1 \sin(20^\circ) + F_2 \sin(60^\circ)}{m} = \frac{-(5\text{N}) \sin(20^\circ) + (8\text{N}) \sin(60^\circ)}{0.30\text{kg}}$$

$$a_y = 17.4 \text{ m/s}^2$$

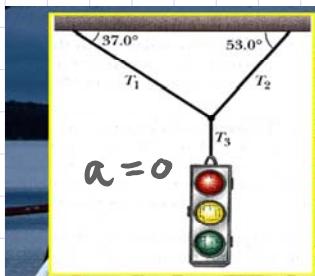
$$|\vec{a}| = \sqrt{a_x^2 + a_y^2} = \sqrt{(29 \text{ m/s}^2)^2 + (17.4 \text{ m/s}^2)^2}$$

$$|\vec{a}| = 33.8 \text{ m/s}^2$$

$$\theta = \tan^{-1} \left(\frac{a_y}{a_x} \right) = \tan^{-1} \left(\frac{17.4 \text{ m/s}^2}{29 \text{ m/s}^2} \right) = 30.9^\circ \approx 31^\circ$$

Example 2

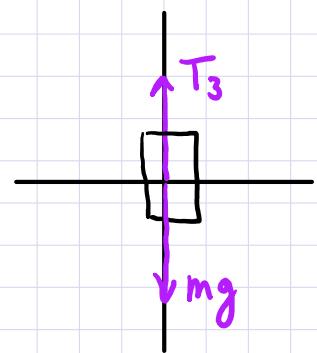
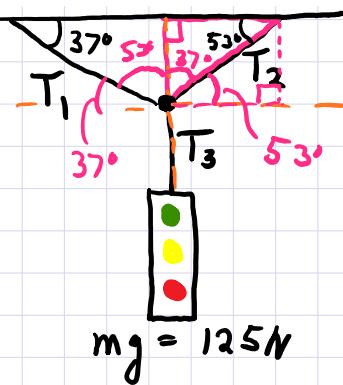
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Example 2



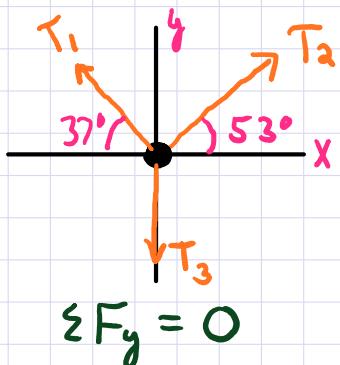
- 2) A traffic light weighing 125 N hangs from a cable tied to two other cables fastened to a support. The upper cables make angles of 37.0° and 53.0° with the horizontal. Find the tension in the three cables



$$\sum F_y = 0$$

$$T_3 - mg = 0$$

$$T_3 = mg = 125 \text{ N}$$



$$\sum F_x = 0$$

$$-T_1 \cos(37^\circ) + T_2 \cos(53^\circ) = 0$$

$$T_2 \cos(53^\circ) = T_1 \cos(37^\circ)$$

$$T_2 = T_1 \frac{\cos(37^\circ)}{\cos(53^\circ)} = (75.3 \text{ N}) \frac{\cos(37^\circ)}{\cos(53^\circ)} = 99.9 \text{ N}$$

$$\sum F_y = 0$$

$$T_1 \sin(37^\circ) + T_2 \sin(53^\circ) - T_3 = 0$$

$$T_1 \sin(37^\circ) + \left[T_1 \frac{\cos(37^\circ)}{\cos(53^\circ)} \right] \sin(53^\circ) = T_3$$

$$T_1 \left[\sin(37^\circ) + \frac{\cos(37^\circ)}{\cos(53^\circ)} \sin(53^\circ) \right] = T_3$$

$$T_1 = \frac{T_3}{\sin(37^\circ) + \frac{\cos(37^\circ)}{\cos(53^\circ)} \sin(53^\circ)}$$

$$T_1 = \frac{125 \text{ N}}{\sin(37^\circ) + \frac{\cos(37^\circ)}{\cos(53^\circ)} \sin(53^\circ)}$$

$$T_1 = 75.3 \text{ N}$$