## Question #79125, Physics / Other

A painter has a weight of 510N. He is stationary and supported by a rope . Calculate the tension in the rope when he is supported.

a) Both ends of the rope are attached to the painter and assume the two ropes are essentially parallel (ex. purely vertical)

b) one end of the rope is attached to the painter, and one to the flagpole. HINT: Draw a free body diagram for the painter.

Solution

a) Free body digram
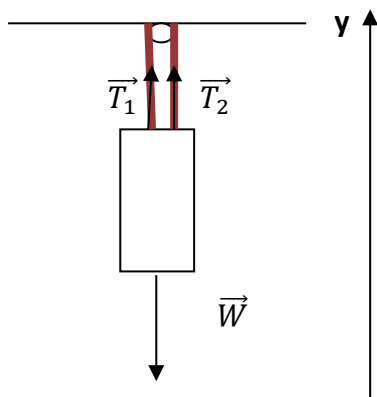
Newton's Second Law of motion:

$$\overrightarrow{F_{net}} = m\vec{a}$$

$$\vec{W} + \vec{T} = m\vec{a}$$

$$\vec{W} + \vec{T_1} + \vec{T_2} = m\vec{a}$$

$$y: -W_y + T_{1y} + T_{2y} = ma_y$$

As painter is stationary then a=0.

$$-W_y + T_{1y} + T_{2y} = 0$$

As both ends of the rope are attached to the painter and the two ropes are essentially parallel (ex. purely vertical) then $T_1 = T_2$
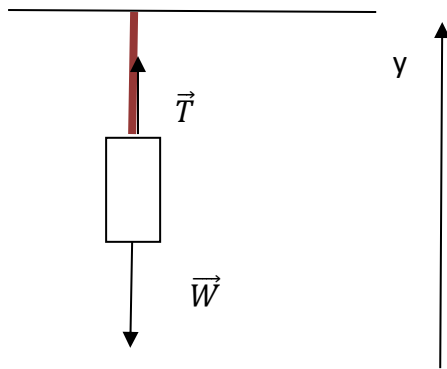
$$2T_{1y} = W_y$$

$$T_{1y} = W_y/2$$

$$T_{1y} = \frac{510\ N}{2}$$

$$T_{1y} = 255\ N$$

b) Free body diagram

Newton's Second Law of motion: $\overrightarrow{F_{net}} = m\vec{a}$

$$\vec{W} + \vec{T} = m\vec{a}$$

$$\text{y: } -W_y + T_y = ma_y$$

As painter is stationary then a=0.

$$-W_y + T_y = 0$$

$$T_y = W_y$$

$$T_y = 510\ N$$

Answer: a) 255N,   b) 510 N

Answer provided by https://www.AssignmentExpert.com