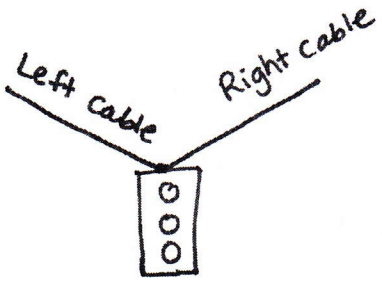
BFPM: Graphical Method: Find unknown force(s): B

A 6.8 kg (15 lb on earth) traffic light is suspended from two cables that are attached to the top of the traffic light and is at rest. The right cable is at an angle of 14° above the horizontal at the point where it attaches to the traffic light, and the tension in this cable is 167 N. (Picture is not to scale.)

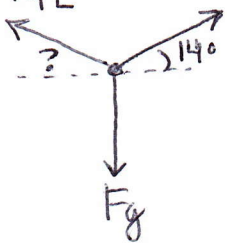


a) What force and motion models describe the situation?
b) Draw a labeled FBD for the traffic light
c) Calculate the force of gravity on the traffic light
d) Use graphical methods to find all unknown forces on the traffic light. (State magnitude and direction for each)

Reminder:
In your work, be sure to write down your scale and list of all forces (include magnitude in Newtons, the direction, and the scaled length for each.)

a) constant velocity
balanced forces

b) F_{TL} F_{TR} (Force of tension: Right)



c) $F_g = mg$
$= (6.8\ kg)(9.8\ \frac{N}{kg})$
$= \boxed{66.6\ N}$

Scale: 1cm = 10 N

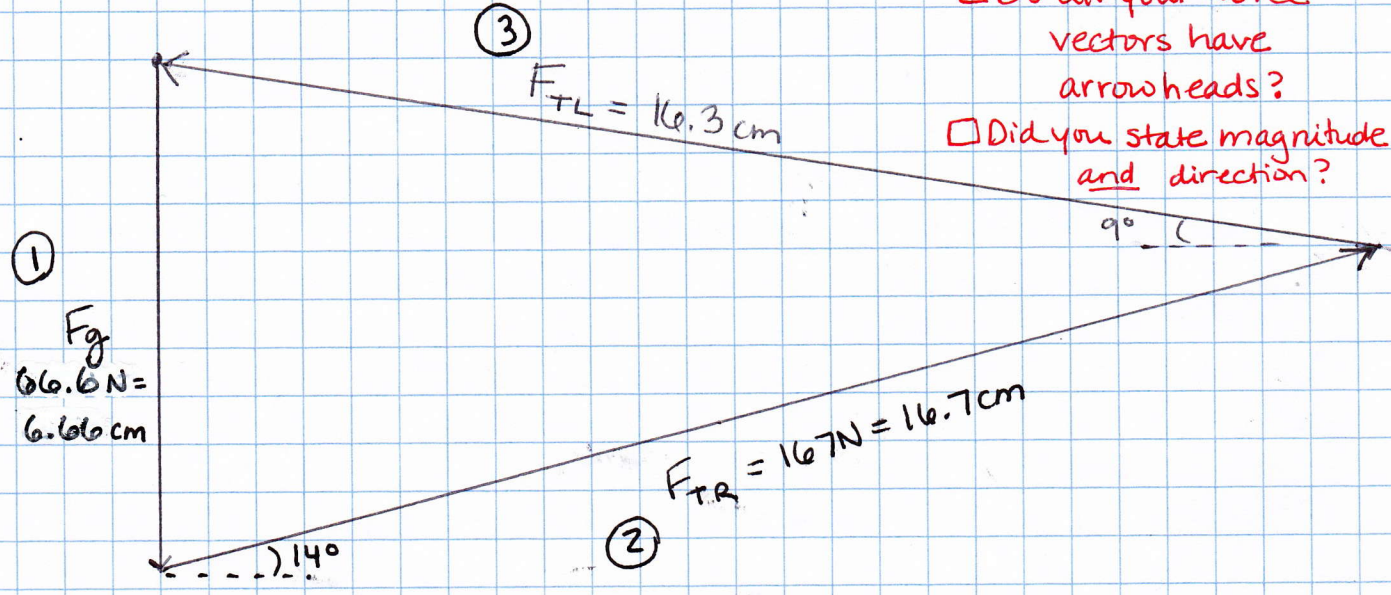
F_g = 66.6 N, down ⇒ 6.66 cm

F_{TR} = 167 N, 14° ⇒ 16.7 cm

(F_{TL} = 163 N, 9° ⇐ 16.3 cm)

↳171° from +x-axis

Answer: F_{TL} = 163 N at 171° from +x-axis



☐ Do all your force vectors have arrowheads?

☐ Did you state magnitude and direction?

Description of Process:

① Draw F_g to scale because this force is known. You could also start with F_{TR}.

② Then I added the F_{TR} vector.

③ I know the vector addition diagram of the three forces has to be a closed figure because $\Sigma F = 0$ since the forces are balanced. Therefore, F_{TL} is the force vector that closes the shape. Measure its length and convert to Newtons using the scale. Measure its angle.