First Pully Problem

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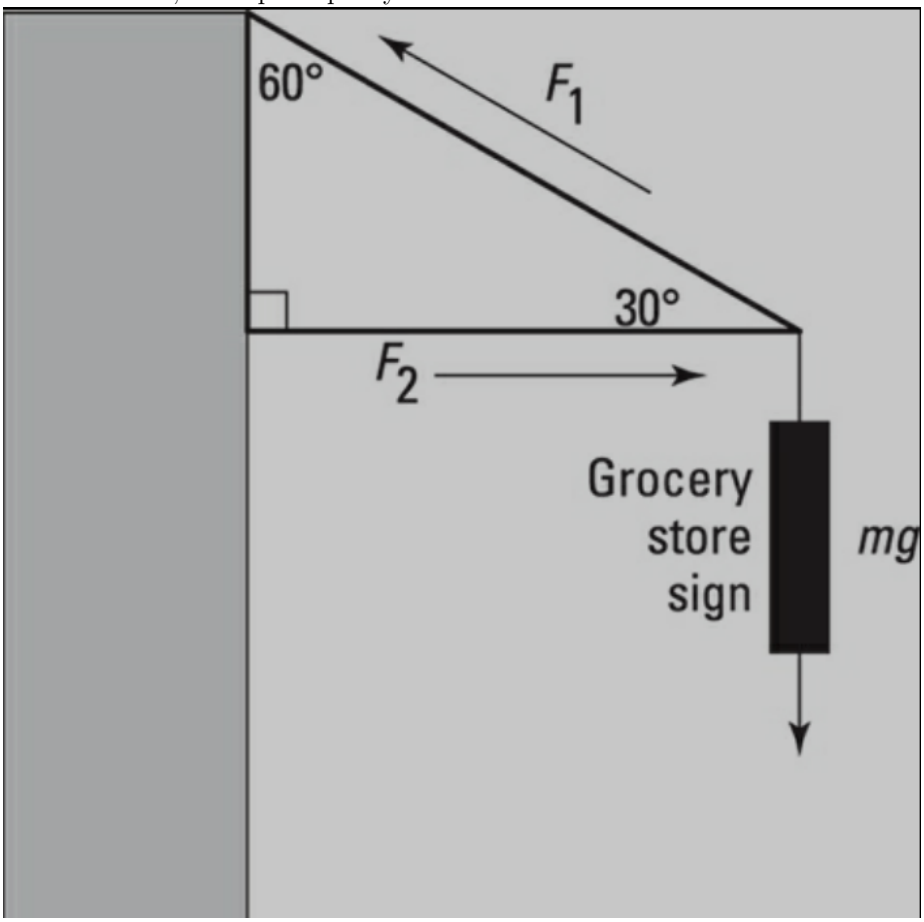
July 17, 2018

1 Problem

Here, the mass m isn't moving, and you're applying a force F to hold it stationary. Here's the question: What force is the pulley's support exerting, and in which direction, to keep the pulley where it is?



Holzner, Steven. Physics I For Dummies (For Dummies (Math & Science)) (p. 94). Wiley. Kindle Edition.

2 Solution

$$F_1 = 15N$$

$$F_s = 8N$$

$$a = 0$$

$$F_{sign-y} = 15\cos(60)$$

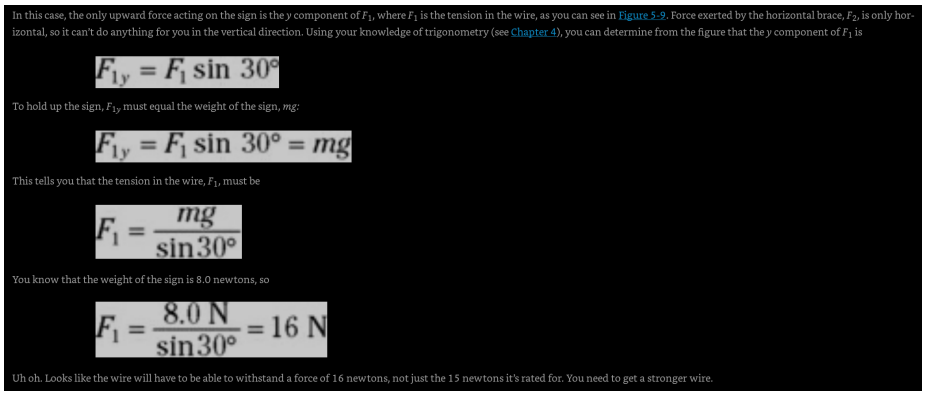
$$F_{sign-y} = 7.5$$

El letro require 8N de fuerza para sostenerse. El alambre solo puede apoyar 7.5N de fuerza en la eje y lo que es insuficiente.

The sign requires 8N of force to support itself. The wire can only support 7.5N in the y axis, which is insufficient for the 8N required by the wire.

3 Question

The book used the following explanation. Mine seems logical, but is it mathematically correct?


In this case, the only upward force acting on the sign is the *y* component of F_1, where F_1 is the tension in the wire, as you can see in Figure 5-9. Force exerted by the horizontal brace, F_2, is only horizontal, so it can't do anything for you in the vertical direction. Using your knowledge of trigonometry (see Chapter 4), you can determine from the figure that the *y* component of F_1 is

$$F_{1y} = F_1 \sin 30°$$

To hold up the sign, F_{1y} must equal the weight of the sign, *mg*:

$$F_{1y} = F_1 \sin 30° = mg$$

This tells you that the tension in the wire, F_1, must be

$$F_1 = \frac{mg}{\sin 30°}$$

You know that the weight of the sign is 8.0 newtons, so

$$F_1 = \frac{8.0\ \text{N}}{\sin 30°} = 16\ \text{N}$$

Uh oh. Looks like the wire will have to be able to withstand a force of 16 newtons, not just the 15 newtons it's rated for. You need to get a stronger wire.