QUIZ#11- CHAPTER12
DATE: 26/11/18

Name: Key Id#: Sect.#:

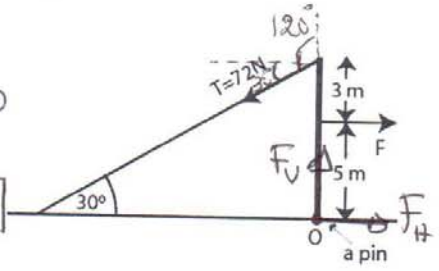
A uniform beam is held in a vertical position by a pin at its lower end and a cable at its upper end as shown in the figure. The tension in the cable is 72 N.

(a) Find the magnitude of the horizontal force F acting on the beam.

$\tau = r_\perp F$ (assume the beam massless)

$\tau_O = -5 \times F + T \times 8 \times \sin 120^\circ = 0$

$F = \dfrac{72 \times 8 \times \sin 120^\circ}{5} = \boxed{99.8\,N}$



(b) Calculate the horizontal and vertical components of the pin on the beam.

x-axis: $F + F_H - T\cos 30^\circ = 0$

$F_H = T\cos 30^\circ - F = 72\cos 30^\circ - 99.8$

$= \boxed{-37.6\,N}$

↑ means the force is to the left

Y-axis: $F_V - T\sin 30^\circ = 0$

$F_V = T\sin 30^\circ = 72\sin 30^\circ$

$\boxed{F_V = 36\,N}$

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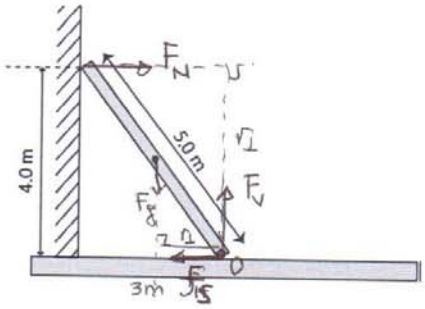
A 5.0 m long uniform ladder (with mass m = 12.0 kg) leans against a wall at a point 4.0 m above a horizontal floor as shown in the figure. Assume the wall is frictionless (but the floor is not).

(a) Determine the magnitude of the normal force exerted on the ladder by the wall.

$$\tau_0 = mg(1.5) + F_N(4) = 0$$

$$F_N = \frac{mg(1.5)}{4} = \boxed{44.1\ N}$$



(b) Determine the magnitude of the friction force on the ladder by the floor.

$$x\text{-axis:} \quad -f_s + F_N = 0 \Rightarrow f_s = F_N = \boxed{44.1N}$$

(c) Determine the magnitude of the normal force exerted on the ladder by the floor.

$$Y\text{-axis:} \quad F_V - mg = 0 \qquad F_V = mg = \boxed{117.6\ N}$$

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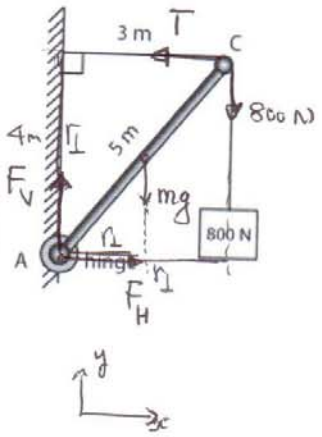
A 5.0-m rod (AC) of mass 10 kg, hinged to a wall at point A, is used to support an 800 N block as shown in the figure.

(a) Calculate the tension in the 3-m long cable. $\tau = F \cdot r_\perp$



$$\tau_A = -mg(1.5) - 800(3) + T(4) = 0$$

$$T = \frac{10 \times 9.8 \times 1.5 + 800 \times 3}{4} = \boxed{638.8\ N}$$

(b) Calculate the horizontal and vertical components of the force (F_H, F_V) of the hinge on the rod.

X-axis: $F_H - T = 0 \quad F_H = T = \boxed{638.8\ N}$

Y-axis: $F_V - mg - 800 = 0 \quad F_V = \boxed{898\ N}$