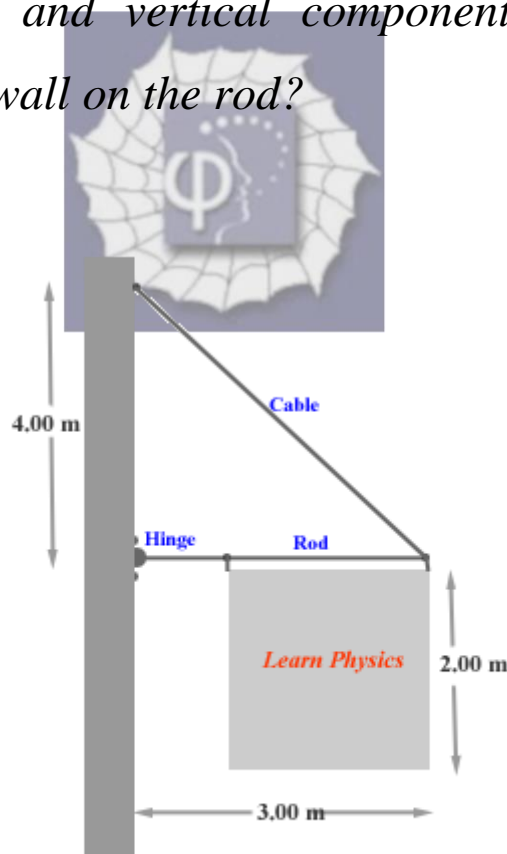


45.

Problem 13.26P (HRW)

A 50.0 kg uniform square sign, 2.00 m on a side, is hung from a 3.00 m rod of negligible mass. A cable is attached to the end of the rod and to a point on the wall 4.00 m above the point where the rod is fixed to the wall.

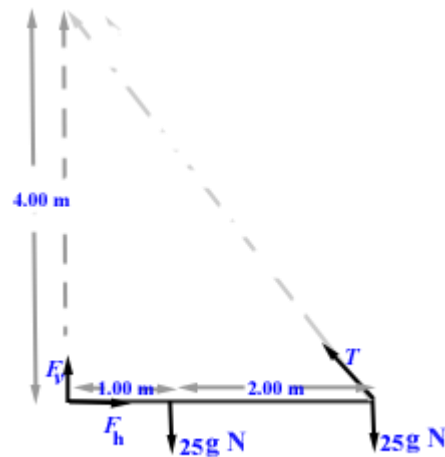
(a) What is the tension in the cable? (b) and (c) What are the horizontal and vertical components of the force exerted by the wall on the rod?



Solution:

We will draw a line diagram indicating forces acting on

the rod.



From the data we note that the length of the cable is 5 m. As the rod is in static equilibrium, balancing the horizontal and vertical component of forces acting on the rod, we get the following two algebraic equations:

$$F_h = \frac{3}{5}T,$$

$$F_v + \frac{4}{5}T = 50g.$$

Condition of zero torque about the hinge provides the third algebraic equation from which we can solve for F_h ,

F_v , T . Equation is

$$\frac{4}{5}T \times 3 \text{ m} = 25 \text{ g N m} + 25 \times 3 \text{ g N m},$$

or,

$$T = \frac{125}{3} \text{ g N}.$$

$$= 408 \text{ N}.$$

And,

$$F_h = 245 \text{ N},$$

$$F_v = 163 \text{ N}.$$

