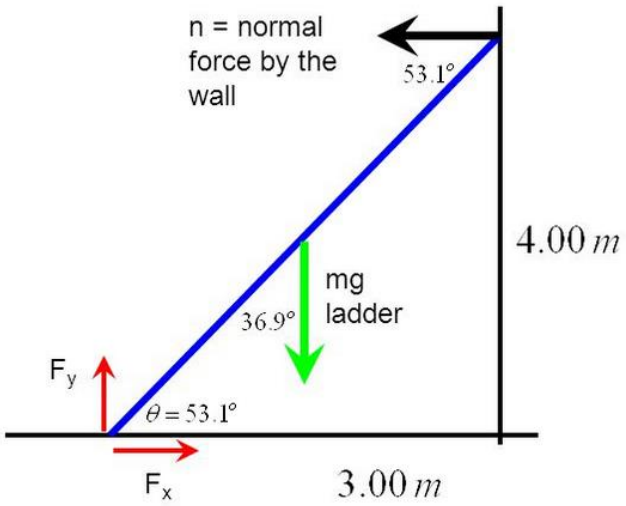
Answer on Question #62706, Physics / Other

A 5.00 m long ladder leans against a frictionless wall. The point of constant between the ladder and the wall is 4.00 m above the ground. The ladder is uniform with a mass of 15.00 kg. Determine the forces exerted by the ground and the wall on the ladder.

Solution:



$$\sin\theta = \frac{4\ m}{5\ m}$$
$$\cos\theta = \frac{3\ m}{5\ m}$$

Put pivot at bottom left end to get the normal force by the wall N from torque:

$$(N)(4\ m) = (mg)(2.5\ m)(\cos\theta)$$

$$N = \frac{(mg)(2.5\ m)(\cos\theta)}{4\ m} = \frac{(15.00\ kg)(9.80\ m/s^2)(2.5\ m)(\frac{3}{5})}{4\ m} = 55.125\ \text{N}$$

Use net force to get F_x and F_y:

$$F_{netx} = 0 \qquad F_x - N = 0$$

$$F_x = 55.125\ \text{N}$$

$$F_{nety} = 0 \qquad F_y - mg = 0$$

$$F_y = mg = (15.00\ kg)\left(9.80\frac{m}{s^2}\right) = 147\ \text{N}$$

Answer: $N = 55.125\ \text{N}$; $F_y = 147\ \text{N}$.