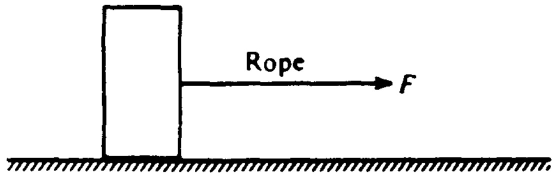
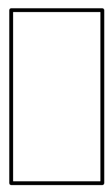
AP Physics Problem of the Day – Torque 1 Mr. McMullen

Name ____ Date ______________ Period _______



1. A box of uniform density weighing 100 newtons moves in a straight line with constant speed along a horizontal surface. The coefficient of sliding friction is 0.4 and a rope exerts a force F in the direction of motion as shown above.

a. On the diagram below, draw and identify all the forces on the box.

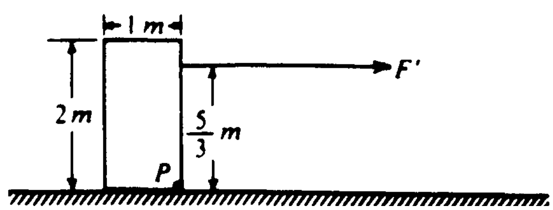


FBD. F_n pointing up, F_g pointing down, f_k applied to base of box pointing left

b. Calculate the force F exerted by the rope that keeps the box moving with constant speed.

Constant speed → a=0.

Fnet = 0 F – fk = 0 F – uFn = 0 F – (0.4)(100)=0 F = 40 N



c. A horizontal force F', applied at a height 5/3 meters above the surface as shown in the diagram above, is just sufficient to cause the box to begin to tip forward about an axis through point P. The box is 1 meter wide and 2 meters high. Calculate the force F'.

The force F' occurs at the limit point of tipping which is when the torque trying to tip it (caused by F') is equal to the torque trying to stop it from tipping (from the weight) using the tipping pivot point of the bottom right corner of the box.

(F')(5/3 m) = Fg (0.5m)

(F') (5/3) = (100)(0.5)

F' = 30 N