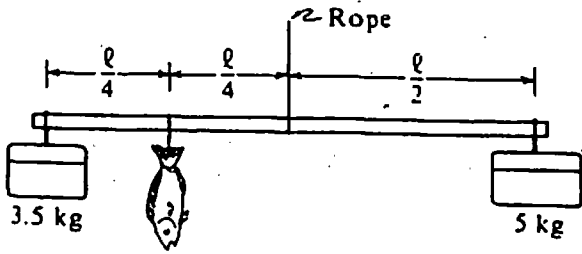
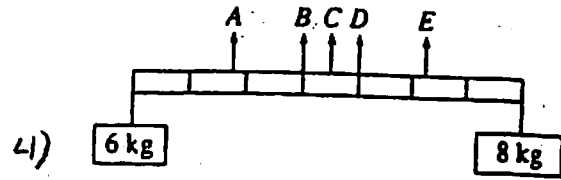


## Torque (ps.1)



To weigh a fish, a person hangs a tackle box of mass 3.5 kilograms and a cooler of mass 5 kilograms from the ends of a uniform rigid pole that is suspended by a rope attached to its center. The system balances when the fish hangs at a point  $\frac{1}{4}$  of the rod's length from the tackle box. What is the mass of the fish?

- (A) 1.5 kg
- (B) 2 kg
- (C) 3 kg
- (D) 6 kg
- (E) 6.5 kg



Two objects, of masses 6 and 8 kilograms, are hung from the ends of a stick that is 70 centimeters long and has marks every 10 centimeters, as shown above. If the mass of the stick is negligible, at which of the points indicated should a cord be attached if the stick is to remain horizontal when suspended from the cord?

- (A) A
- (B) B
- (C) C
- (D) D
- (E) E

### Questions

2 & 3

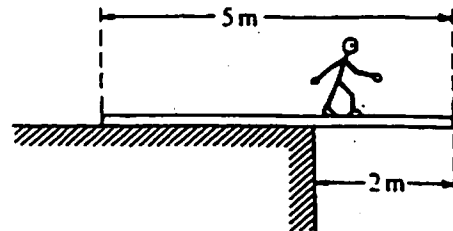
A horizontal, uniform board of weight 125 N and length 4 m is supported by vertical chains at each end. A person weighing 500 N is sitting on the board. The tension in the right chain is 250 N.

1) What is the tension in the left chain?

- 2)
- (A) 250 N
  - (B) 375 N
  - (C) 500 N
  - (D) 625 N
  - (E) 875 N

3) How far from the left end of the board is the person sitting?

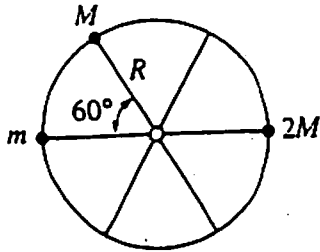
- (A) 0.4 m
- (B) 1.5 m
- (C) 2 m
- (D) 2.5 m
- (E) 3 m



A 5-meter uniform plank of mass 100 kilograms rests on the top of a building with 2 meters extended over the edge as shown above. How far can a 50-kilogram person venture past the edge of the building on the plank before the plank just begins to tip?

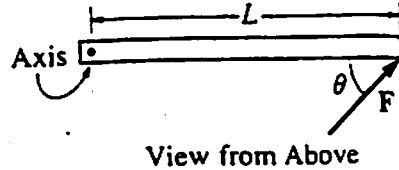
- (A)  $\frac{1}{2}$  m
- (B) 1 m
- (C)  $\frac{3}{2}$  m
- (D) 2 m
- (E) It is impossible to make the plank tip since the person would have to be more than 2 meters from the edge of the building.

## Torque (pg. 2)



A wheel of radius  $R$  and negligible mass is mounted on a horizontal frictionless axle so that the wheel is in a vertical plane. Three small objects having masses  $m$ ,  $M$ , and  $2M$ , respectively, are mounted on the rim of the wheel, as shown above. If the system is in static equilibrium, what is the value of  $m$  in terms of  $M$ ?

- (A)  $\frac{M}{2}$
- (B)  $M$
- (C)  $\frac{3M}{2}$
- (D)  $2M$
- (E)  $\frac{5M}{2}$



A rod on a horizontal tabletop is pivoted at one end and is free to rotate without friction about a vertical axis, as shown above. A force  $F$  is applied at the other end, at an angle  $\theta$  to the rod. If  $F$  were to be applied perpendicular to the rod, at what distance from the axis should it be applied in order to produce the same torque?

- (A)  $L \sin \theta$
- (B)  $L \cos \theta$
- (C)  $L$
- (D)  $L \tan \theta$
- (E)  $\sqrt{2} L$