

- 3 Fig. 3.1 shows a force diagram that represents a boat that is being lifted by two ropes so that the boat remains horizontal and travels vertically upwards at a constant speed after leaving the water.

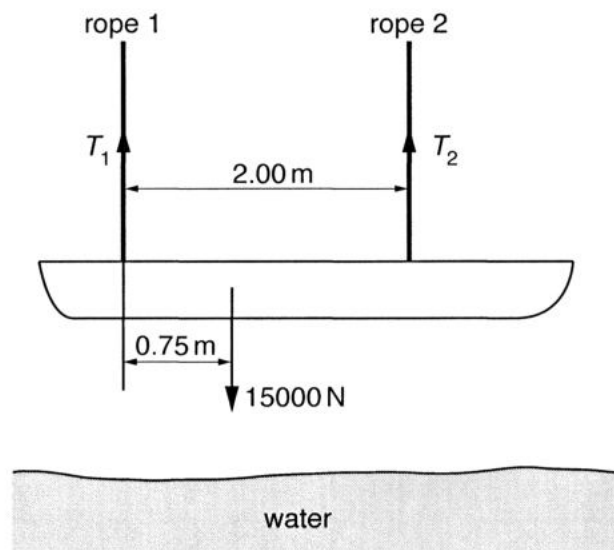


Fig. 3.1

The weight of the boat is 15000N and the tensions in the ropes 1 and 2 are  $T_1$  and  $T_2$  respectively.

- (a) The position of the centre of gravity of the boat is not at its midpoint. Suggest what this implies about the distribution of mass in the boat.

.....  
 .....[1]

- (b) Explain two conditions required for the boat to be in a state of equilibrium while it is moving upwards.

1. ....  
 2. ....  
 [2]

(c) Use the principle of moments to determine the tensions in the two ropes.

$$T_1 = \dots\dots\dots \text{ N}$$

$$T_2 = \dots\dots\dots \text{ N [4]}$$