

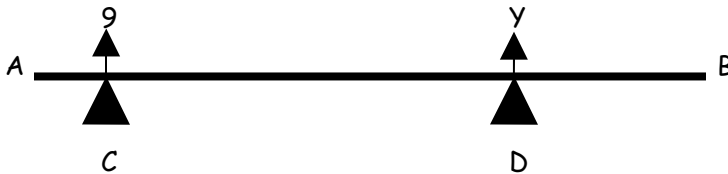
Moments

Questions

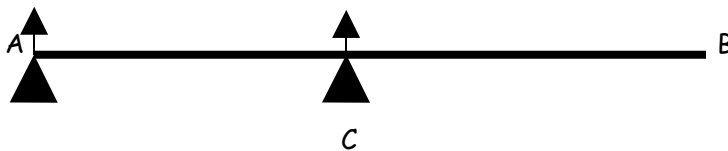
(some diagrams have forces missing, you need to figure out which ones!)

1 A uniform rod AB of weight 70N and length 5m . It rests in a horizontal position supported at point C and D , where $AC = 0.4\text{m}$. the reaction on the rod at C has magnitude 9N . Find

- the magnitude of the reaction on the rod at D
- the distance AD .



2 A uniform rod AB of length 6m and mass 40Kg . It is supported by two smooth pivots in a horizontal position at A and C where $AC = 3\text{m}$. A woman of mass 75Kg stands on the rod which remains in equilibrium. The magnitudes of the reactions at the two pivots are equal to R Newtons.



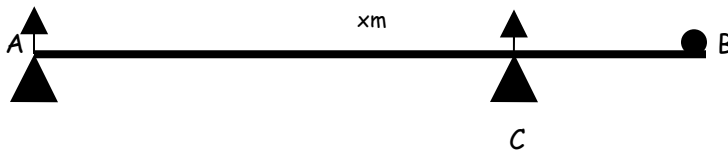
Find

- the value of R .
- the distance of the woman from A .

- 3 A non uniform plank of wood AB of length 10m and mass 100Kg is smoothly supported in a horizontal position at A and B. An object of mass 90Kg is put on the plank at C, where $AC = 6\text{m}$. The plank is in equilibrium and the magnitudes of the reactions at A and B are equal. Find:
- the magnitude of the reaction R, on the plank at B.
 - the distance, x , of the centre of mass of the plank from A.



- 4 A uniform plank AB has weight 80N and length $x\text{m}$. The plank rests in equilibrium on two supports at A and C, where $AC = 3\text{m}$. A rock of weight 20N is placed at B and the plank remains in equilibrium. The reaction on the plank at C has magnitude 70N.
- find the value of x



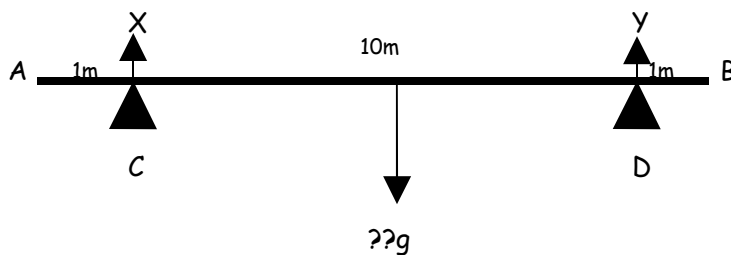
- The support at A is now moved to a point D on the plank and the plank remains in equilibrium with the rock at B. The reaction on the plank at C is now two times the reaction at D.
- find the distance AD.

- 5 A non uniform rod, AB, of length 7m and mass 10Kg is suspended in equilibrium in a horizontal position by ropes attached to the points E and F of the rod, where $AE = 2\text{m}$ and $AF = 6\text{m}$. The tensions in the ropes are equal. Find the distance of the centre of mass from A.

Extension

1 A large log AB is 10m long. It rests in a horizontal on two supports C and D, where $AC = 1\text{m}$ and $BD = 1\text{m}$. An estimate of the weight of the log is required, but the log is too heavy to lift off the supports. When a force of magnitude 1100N is applied vertically to the log at A, the log is about to tilt about D.

- state the value of the reaction on the log at C for this case.
- by modeling the log as a uniform rod, estimate the weight of the log.



The force at A is removed and a force vertically upwards is applied at B. The log is about to tilt about C when the force has a magnitude of 1600N. By modeling the log as a non uniform rod, with the distance of the centre of mass of the log being x metres from A, find:

- a new estimate for the weight of the log.
- the value of x .