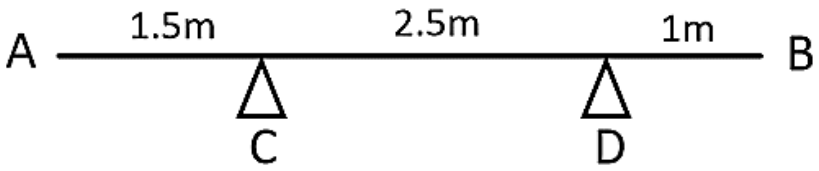
Equilibrium

If a rigid body is in equilibrium:

1.
2.

Example

AB is a uniform rod of length 5m and weight 20N. AB is resting in a horizontal position on supports at C and D. Find the magnitude of the reactions at C and D.



Example

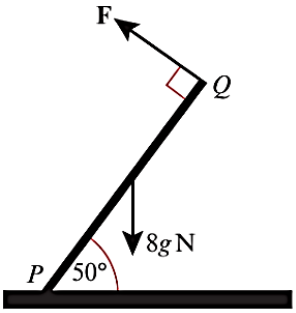
A uniform beam AB, of length 2m and mass 4kg, has a mass of 3kg attached to one end and a mass of 1kg attached at the other end. Find the position of the support C, if the beam rests in a horizontal position.

Remember to include all forces on your force diagram.
There are two ways to solve this problem:

1) Take moments about C
2) Resolve forces to find the reaction at C, then take moments about one end

Test Your Understanding *(Textbook)*

A uniform rod PQ is hinged at the point P, and is held in equilibrium at an angle of $50°$ to the horizontal by a force of magnitude $\mathbf{F}$ acting perpendicular to the rod at Q. Given that the rod has a length of 3 m and a mass of 8 kg, find the value of $\mathbf{F}$.



Test Your Understanding *(EdExcel M1 May 2013 (R) Q8)*

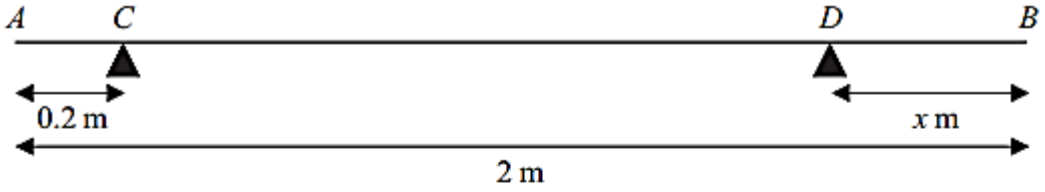


Figure 5

A uniform rod AB has length 2 m and mass 50 kg. The rod is in equilibrium in a horizontal position, resting on two smooth supports at C and D, where $AC = 0.2$ metres and $DB = x$ metres, as shown in Figure 5. Given that the magnitude of the reaction on the rod at D is twice the magnitude of the reaction on the rod at C,

(a) find the value of x.

(6)

The support at D is now moved to the point E on the rod, where $EB = 0.4$ metres. A particle of mass m kg is placed on the rod at B, and the rod remains in equilibrium in a horizontal position. Given that the magnitude of the reaction on the rod at E is four times the magnitude of the reaction on the rod at C,

(b) find the value of m.

(7)

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