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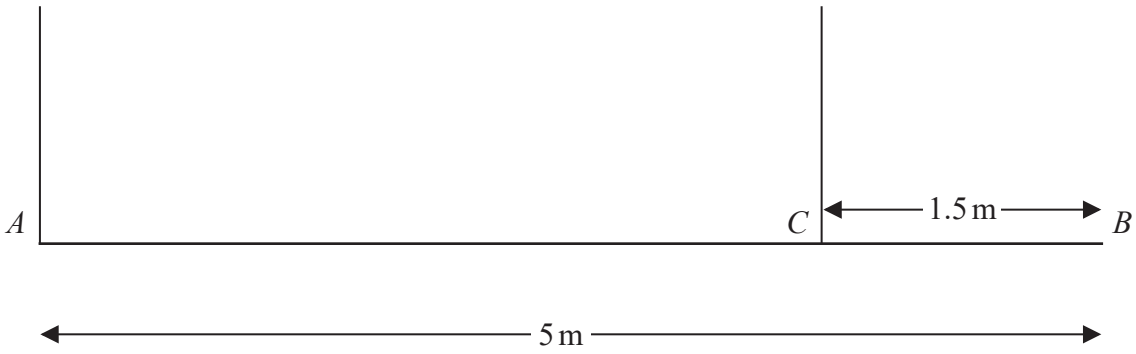


Figure 2

A non-uniform beam, AB, has length 5 m and mass 12 kg. The beam is suspended in a horizontal position by two vertical ropes. One rope is attached to the beam at A. The other rope is attached to the beam at C, where $CB = 1.5$ m, as shown in Figure 2. The distance of the centre of mass of the beam from A is 1.75 m. The beam is modelled as a non-uniform rod and the ropes are modelled as light inextensible strings.

A particle of mass M kg is now placed on the beam at B and the beam remains in equilibrium in a horizontal position.

(a) Find the largest possible value of M.

(3)

The particle at B is now removed and a particle of mass 15 kg is now placed on the beam at the point D, where $AD = x$ metres. The beam remains in equilibrium in a horizontal position.

Given that the tension in the rope attached to the beam at C is now twice the tension in the rope attached to the beam at A,

(b) find the value of x.

(5)

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