2.

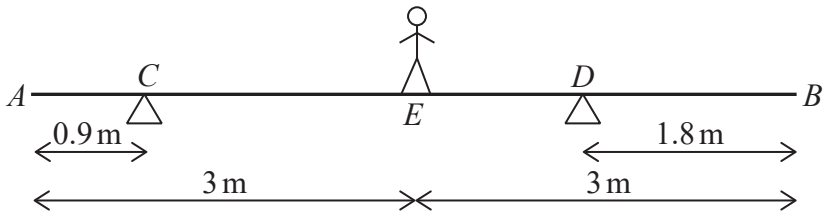


Figure 1

A non-uniform beam AB has length 6 m and mass 50 kg. The beam rests horizontally on two supports at C and D, where $AC = 0.9$ m and $DB = 1.8$ m.

A child of mass 25 kg stands on the beam at E, where $AE = EB = 3$ m, as shown in Figure 1.

The beam is in equilibrium.

The magnitude of the normal reaction between the beam and the support at C is R_C newtons.

The magnitude of the normal reaction between the beam and the support at D is R_D newtons.

The beam is modelled as a rod and the child is modelled as a particle.

The centre of mass of the beam is between C and D and is a distance x metres from D.

Given that $2R_D = 3R_C$

(a) show that $x = 1.38$

(6)

The child remains at E and a block of mass M kg is placed on the beam at B.

The block is modelled as a particle.

Given that the beam is on the point of tilting,

(b) find the value of M.

(3)

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Question 2 continued

(Total for Question 2 is 9 marks)