3 A uniform beam AB is attached by a hinge to a wall at end A, as shown in Fig. 3.1.
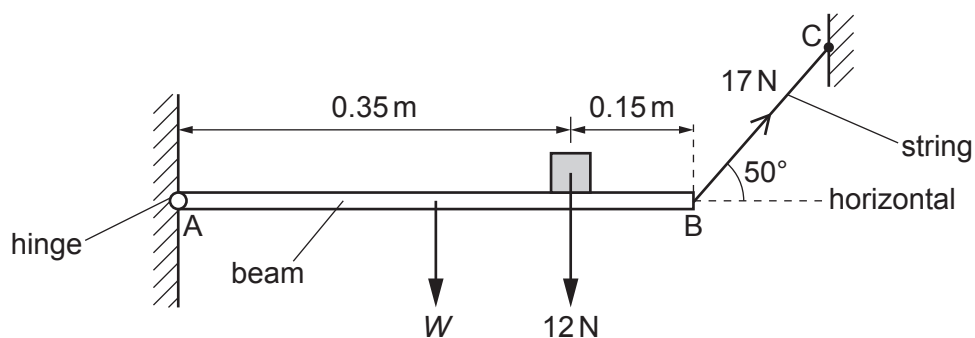

Fig. 3.1 (not to scale)

The beam has length 0.50 m and weight W. A block of weight 12 N rests on the beam at a distance of 0.15 m from end B.

The beam is held horizontal and in equilibrium by a string attached between end B and a fixed point C. The string has a tension of 17 N and is at an angle of 50° to the horizontal.

(a) State **two** conditions for an object to be in equilibrium.

1 ....

....

2 ....

....
[2]

(b) Show that the vertical component of the tension in the string is 13 N.

[1]

(c) By taking moments about end A, calculate the weight W of the beam.

$W =$ .... N [2]

(d) Calculate the magnitude of the vertical component of the force exerted on the beam by the hinge.

force = ... N [1]

(e) The block is now moved closer to end A of the beam. Assume that the beam remains horizontal.

State whether this change will increase, decrease or have no effect on the horizontal component of the force exerted on the beam by the hinge.

.... [1]

[Total: 7]