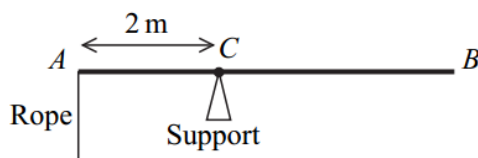# Mechanics 2 Moments

3 The diagram shows a uniform rod, AB, of mass $10\,\text{kg}$ and length 5 metres. The rod is held in equilibrium in a horizontal position, by a support at C and a light vertical rope attached to A, where AC is 2 metres.


(a) Draw and label a diagram to show the forces acting on the rod. *(1 mark)*

(b) Show that the tension in the rope is 24.5 N. *(3 marks)*

(c) A package of mass m kg is suspended from B. The tension in the rope has to be doubled to maintain equilibrium.

    (i) Find m. *(4 marks)*

    (ii) Find the magnitude of the force exerted on the rod by the support. *(3 marks)*

(d) Explain how you have used the fact that the rod is uniform in your solution. *(1 mark)*

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2 A hotel sign consists of a uniform rectangular lamina of weight W. The sign is suspended in equilibrium in a vertical plane by two vertical light chains attached to the sign at the points A and B, as shown in the diagram. The edge containing A and B is horizontal.
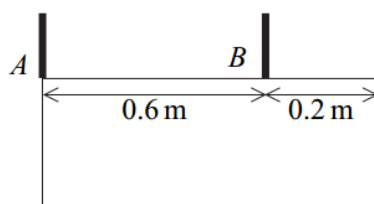
The tensions in the chains attached at A and B are T_A and T_B respectively.

(a) Draw a diagram to show the forces acting on the sign. *(1 mark)*

(b) Find T_A and T_B in terms of W. *(4 marks)*

(c) Explain how you have used the fact that the lamina is uniform in answering part (b). *(1 mark)*

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4 A uniform plank is 10 m long and has mass 15 kg. It is placed on horizontal ground at the edge of a vertical river bank, so that 2 m of the plank is projecting over the edge, as shown in the diagram below.
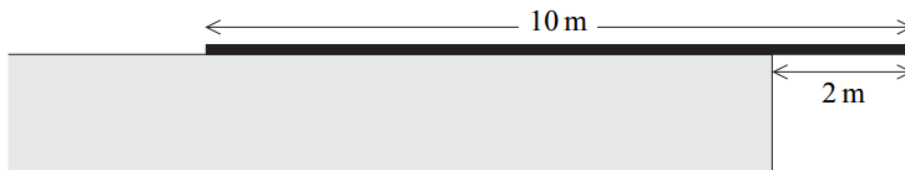
(a) A woman of mass 50 kg stands on the part of the plank which projects over the river.

Find the greatest distance from the river bank at which she can safely stand. *(3 marks)*

(b) The woman wishes to stand safely at the end of the plank which projects over the river.

Find the minimum mass which she should place on the other end of the plank so that she can do this. *(4 marks)*

(c) State how you have used the fact that the plank is uniform in your solution. *(1 mark)*

(d) State one other modelling assumption which you have made. *(1 mark)*