AS/A Level Mathematics

Moments

Candidates may use any calculator allowed by the regulations of the Joint Council for Qualifications. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.

Instructions

• Use **black** ink or ball-point pen.
• If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
• **Fill in the boxes** at the top of this page with your name.
• Answer **all** questions and ensure that your answers to parts of questions are clearly labelled..
• Answer the questions in the spaces provided
– there may be more space than you need.
• You should show sufficient working to make your methods clear.
Answers without working may not gain full credit.
• Answers should be given to three significant figures unless otherwise stated.

Information

• The marks for **each** question are shown in brackets
– use this as a guide as to how much time to spend on each question.

Advice

• Read each question carefully before you start to answer it.
• Try to answer every question.
• Check your answers if you have time at the end.

1 A seesaw AB of length 4 m is supported by a pivot at it's centre. Child C of mass 30 kg sits on the end at A. Child D of mass 45 kg sits x m from the centre of the seesaw and the seesaw rests horizontally in equilibrium. The seesaw is modelled as a uniform rod.
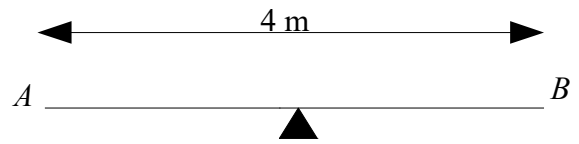
Find the value of x.

(Total for question 1 is 3 marks)

2 A uniform rod AB has length 3 m and mass 4 kg. The rod rests horizontally on two supports C and D, where $AC = 0.5$ m and $AD = 2$ m.
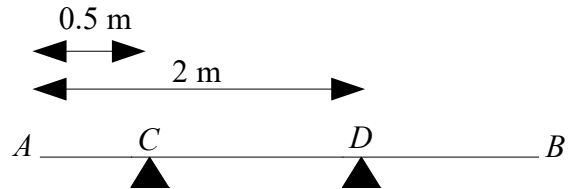
(a) Find the magnitude of the reactions of the support at C and D.
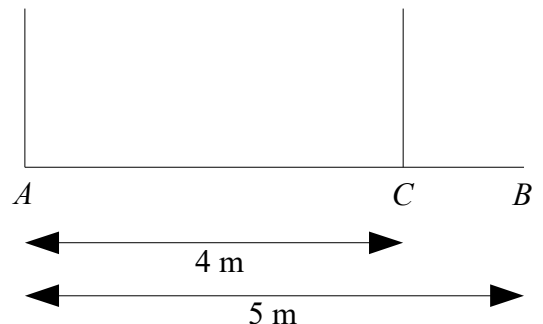
(3)

A block is now placed at B and the rod is on the point of tilting about D

(b) Find the weight of the block

(3)

(c) Find the magnitude of the reaction at D

(2)

(Total for question 2 is 8 marks)

3 A non uniform rod AB has length 5 m and mass 12 kg. The rod is supported by two light inextensible strings attached at A and C, where $AC = 4$ m.
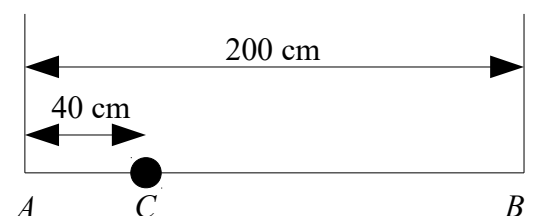
Given that the tension in the string at A is twice the tension in the string at C.

(a) Find the tension in the string at C. **(2)**

(b) Find the distance of the rod's centre of mass from A.

(4)

(Total for question 3 is 6 marks)

4 A non uniform rod AB has length 200 cm and mass 15 kg. A mass of weight 10 kg is placed on the road at C, where $AC = 40$cm. The rod is held in horizontal equilibrium by two light inextensible strings attached at A and B.

Given that the tension in the string at A is 10 N greater than the tension in the string at B.

Find the distance, to the nearest cm, of the rod's centre of mass from A.

(Total for question 4 is 6 marks)