



Moments

Questions

Suitable for:
Pearson Edexcel International A-Level (iAL) — Mechanics 1



Question 1

A rod is fixed at point A. Two forces act perpendicular to the rod, both in the same rotational direction.

(a) A force of 25 N acts at a distance of 3 m from A. Calculate the moment of this force about A, stating its units.

(1 marks)

(b) A second force of 10 N acts at a distance of 1.5 m from A in the same direction. Find the total resultant moment about A.

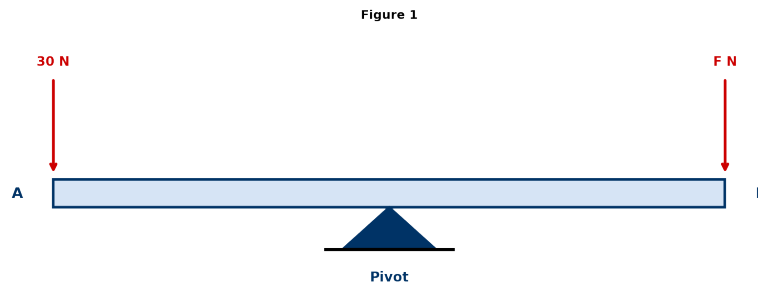
(2 marks)

Total for question = 3 marks



Question 2

A uniform rod AB has length 4 m and mass 6 kg. The rod is pivoted at its midpoint. A load of 30 N is attached at A. A force F N acts vertically downward at B. Take $g = 9.8 \text{ m s}^{-2}$.



Find the value of F for the rod to rest in equilibrium in a horizontal position.

(4 marks)

Total for question = 4 marks



Question 3

A uniform beam AB has mass 20 kg and length 6 m. The beam rests horizontally in equilibrium on two supports, one at A and one at C, where $AC = 4$ m. Take $g = 9.8 \text{ m s}^{-2}$.

Figure 2



Find the magnitudes of the reactions at A and C.

(5 marks)

Total for question = 5 marks



Question 4

A uniform beam AB has mass 15 kg and length 8 m. The beam rests horizontally in equilibrium on supports at A and B. A load of 60 N is placed on the beam at a point 2 m from A. Take $g = 9.8 \text{ m s}^{-2}$.

Figure 3



Find the magnitudes of the reactions at A and B.

(5 marks)

Total for question = 5 marks



Question 5

A non-uniform rod AB has length 4 m and weight 50 N. The rod rests horizontally in equilibrium on supports at A and B. The reaction at A is 30 N.

Figure 4



Find the distance of the centre of mass of the rod from A.

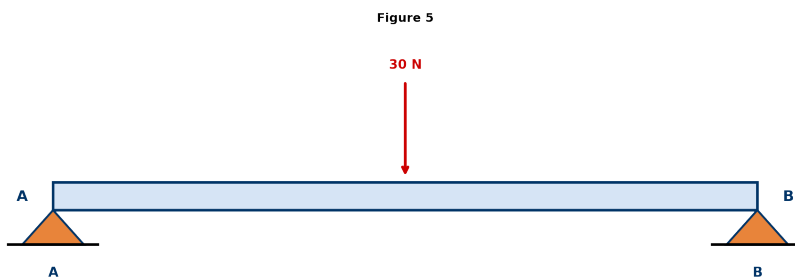
(4 marks)

Total for question = 4 marks



Question 6

A non-uniform beam AB has mass 12 kg and length 5 m. Its centre of mass is 2 m from A. The beam rests horizontally in equilibrium on supports at A and B. A load of 30 N is placed at the midpoint of the beam. Take $g = 9.8 \text{ m s}^{-2}$.



Find the magnitudes of the reactions at A and B.

(5 marks)

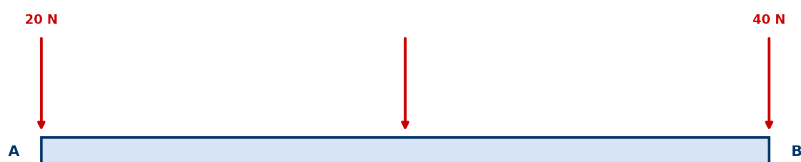
Total for question = 5 marks



Question 7

A uniform beam AB has length 6 m and weight 80 N. A load of 20 N is attached at A and a load of 40 N is attached at B. The beam is supported by a single pivot.

Figure 6



Find the distance from A at which the pivot must be placed to keep the beam in horizontal equilibrium.

(4 marks)

Total for question = 4 marks



Question 8

A uniform beam AB has mass 10 kg and length 4 m. The beam rests horizontally on supports at C and D, where $AC = 0.5$ m and $DB = 0.5$ m. A load of W N is placed at B. Take $g = 9.8 \text{ m s}^{-2}$.

Figure 7



Find the maximum value of W for which the beam does not tilt, justifying your answer.

(5 marks)

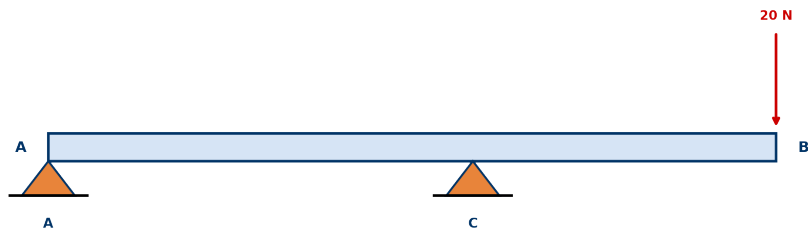
Total for question = 5 marks



Question 9

A uniform rod AB has length 6 m and weight 60 N. The rod rests horizontally in equilibrium on a support at A and a support at C. A load of 20 N hangs from B. The reaction at A is half the reaction at C.

Figure 8



Find the distance AC.

(5 marks)

Total for question = 5 marks



Question 10

A non-uniform beam AB has length 8 m and weight 200 N. The beam rests horizontally in equilibrium on supports at C and D, where $AC = 1$ m and $DB = 2$ m. The centre of mass of the beam is 3 m from A.

Figure 9



Find the magnitudes of the reactions at C and D.

(5 marks)

Total for question = 5 marks



Question 11

Using the beam from Question 10, a load of W N is now placed at A.

Figure 10



- (a) State which support would lift off first as W is increased, giving a reason.

(1 marks)

- (b) Find the maximum value of W for which the beam remains in equilibrium.

(4 marks)

Total for question = 5 marks



Question 12

A uniform plank AB has mass 30 kg and length 10 m. The plank rests horizontally in equilibrium on two supports, one at C and one at D, where $AC = 2$ m and $BD = 1$ m. A person of mass 70 kg stands at D. Take $g = 9.8 \text{ m s}^{-2}$.

Figure 11



- (a) Find the magnitudes of the reactions at C and D.

(5 marks)

The person now walks slowly from D toward A.

- (b) Find the distance from A at which the plank is on the point of tilting, stating which support the plank tilts about.

(4 marks)

Total for question = 9 marks