Mechanics 2 – Moments 2

Please **complete** this homework by _____. Start it early. If you can't do a question you will then have time to ask your teacher for help or go to a drop in session.

Section 1 – Review of previous topics. Please complete all questions.

1. The value of correlation between daily mean pressure (hPa) and daily mean temperature (°C) was calculated from the large data set for Heathrow during May 2015. The value was found to be 0.4011

a) Explain what this value for r shows about the daily mean pressure and daily mean temperature during May 2015 in Heathrow.

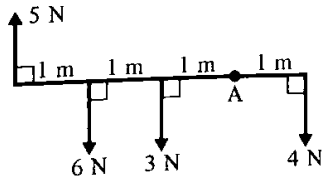
The correlation coefficient between daily mean pressure and daily mean temperature during October 2015 in Heathrow was calculated as -0.3375.

b) Compare and interpret the correlation values between the daily mean pressure and daily mean temperature in Heathrow during October and May 2015.

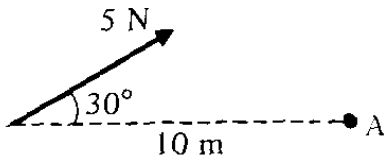
2. A and B are two points on a straight road. A car travelling along the road passes through A when t = 0 and maintains a constant speed until t = 30 secs and in this time covers 3/5 of the distance from A to B. The car then decelerates uniformly to rest at B. Sketch a velocity-time graph for the motion and find the total time taken for the car to travel from A to B.

3. a) Find the total moment, stating whether clockwise or anti-clockwise:

i)

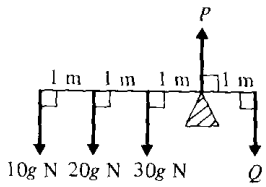


ii)

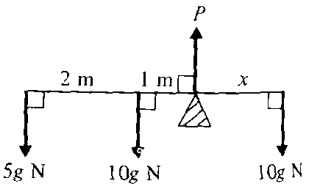


b) Find the values of P, Q and x :

i)



ii)

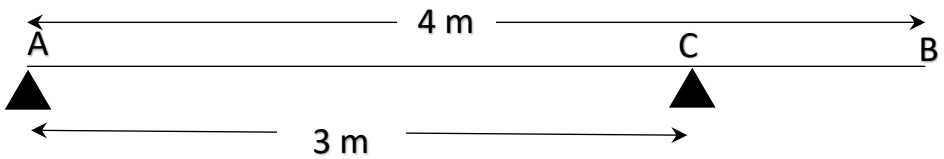


Section 2 – Consolidation of this week's topic. Please complete all questions.

1. A non-uniform rod AB of length 4m and weight 6N rests horizontally on two supports at A and B. Given that the centre of mass of the rod is 2.4 m from the end A, find the reactions at the two supports. **(4)**

2. A non-uniform plank AB of length 4m and weight 120N is pivoted at its mid-point. The plank is in equilibrium in a horizontal position with a child of weight 200N sitting at A and a child of weight 300 N sitting at B. By modelling the plank as a rod and the two children as particles find the distance of the centre of mass of the plank from A. **(5)**

3.



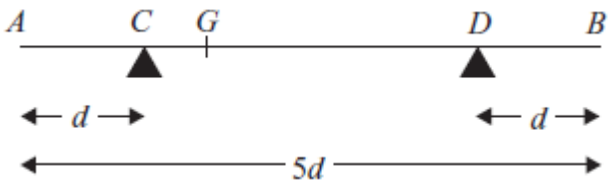
A uniform plank AB has mass 40 kg and length 4 m. It is supported in a horizontal position by two smooth pivots. One pivot is at the end A and the other is at the point C where AC = 3m, as shown in the diagram above. A man of mass 80 kg stands on the plank which remains in equilibrium. The magnitude of the reaction at A is twice the magnitude of the reaction at C. The magnitude of the reaction at C is R Newtons. The plank is modelled as a rod and the man is modelled as a particle.

a. Find the value of R. **(3)**

b. Find the distance of the man from A. **(5)**

c. State how you have used the modelling assumption that i) the plank is uniform, ii) the plank is a rod, iii) the man is a particle. **(3)**

4.



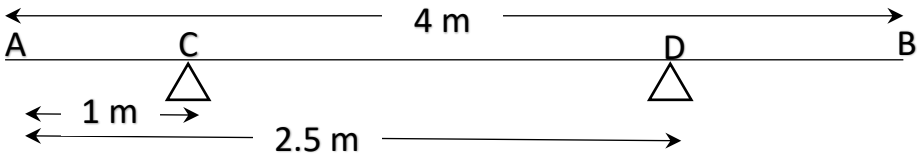
A non-uniform rod *AB*, of mass *m* and length 5*d*, rests horizontally in equilibrium on two supports at *C* and *D*, where *AC* = *DB* = *d*, as shown in above. The centre of mass of the rod is at the point *G*. A particle of mass ½*m* is placed on the rod at *B*. Given that the reaction at D is twice the reaction at C,

(*a*) Show that *GD* = 2*d*. **(4)**

The particle is moved from *B* to the mid-point of the rod and the rod remains in equilibrium.

(b) Find the magnitude of the normal reaction between the support at *D* and the rod. **(5)**

5.



A uniform rod AB has length 4 m and weight 150 N. The rod rests in equilibrium in a horizontal position, smoothly supported at points C and D, where AC = 1 m and AD = 2.5 m as shown in the diagram above. A particle of weight W N is attached to the rod at a point E where AE = x metres. The rod remains in equilibrium and the magnitude of the reaction at C is now equal to the magnitude of the reaction at D.

a) Show that W = $\frac{150}{7-4x}$ **(9)**

b) Hence deduce the range of possible values of x. **(2)**

Total 40 Marks