

Pearson Edexcel AS Further Mathematics 8FM0

Further Mechanics 2 – 2 Centre of Mass 2D

Time allowed: 45 minutes

School: www.CasperYC.club

Name:

Teacher:

How I can achieve better:

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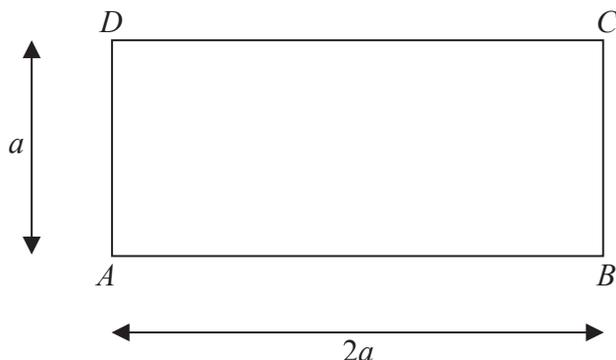
Question	Points	Score
1	15	
2	7	
3	15	
4	11	
5	9	
6	10	
Total:	67	

Last updated: February 3, 2026



8FM0 Unit Test – Further Mechanics 2 – 2 Centre of Mass 2D

1. Figure below shows a uniform rectangular lamina $ABCD$ with $AB = 2a$ and $AD = a$. The mass of the lamina is $6m$.



A particle of mass $2m$ is attached to the lamina at A , a particle of mass m is attached to the lamina at B and a particle of mass $3m$ is attached to the lamina at D , to form a loaded lamina L of total mass $12m$.

- (a) Write down the distance of the centre of mass of L from AB . You must give a reason for your answer. [2]
- (b) Show that the distance of the centre of mass of L from AD is $\frac{2a}{3}$. [3]

A particle of mass km is now also attached to L at D to form a new loaded lamina N .

- (c) Show that the distance of the centre of mass of N from AB is $\frac{(k+6)a}{(k+12)}$. [4]

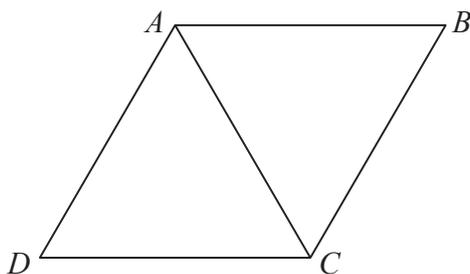
When N is freely suspended from A and is hanging in equilibrium, the side AB makes an angle α with the vertical, where $\tan \alpha = \frac{3}{2}$.

- (d) Find the value of k . [6]

Total: 15



5. Five identical uniform rods are joined together to form the rigid framework $ABCD$ shown below.



Each rod has weight W and length $4a$. The points A, B, C and D all lie in the same plane.

The centre of mass of the framework is at the point G .

(a) Explain why G is the midpoint of AC . [1]

The framework is suspended from the ceiling by two vertical light inextensible strings. One string is attached to the framework at A and the other string is attached to the framework at B . The framework hangs freely in equilibrium with AB horizontal.

(b) Find [4]

- i. the tension in the string attached at A ,
- ii. the tension in the string attached at B .

A particle of weight kW is now attached to the framework at D and a particle of weight $2kW$ is now attached to the framework at C . The framework remains in equilibrium with AB horizontal and the strings vertical.

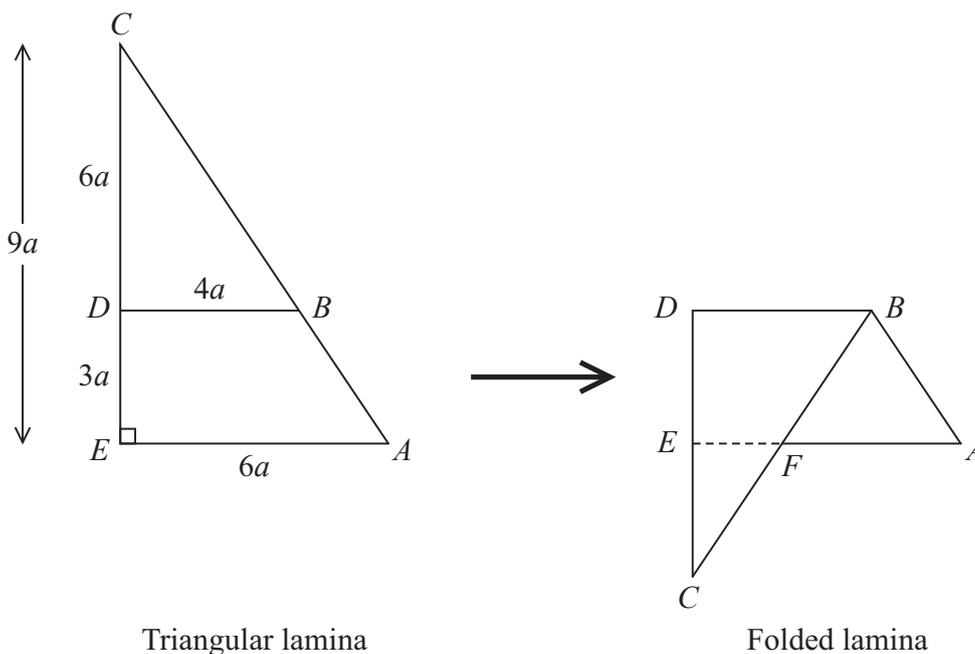
Either string will break if the tension in it exceeds $6W$.

(c) Find the greatest possible value of k . [4]

Total: 9



6. The uniform triangular lamina $ABCDE$ is such that angle $CEA = 90^\circ$, $CE = 9a$ and $EA = 6a$.



Triangular lamina

Folded lamina

The point D lies on CE , with $DE = 3a$.

The point B on CA is such that DB is parallel to EA and $DB = 4a$.

The triangular lamina is folded along the line DB to form the folded lamina $ABDECF$, as shown.

The distance of the centre of mass of the triangular lamina from DC is d_1 .

The distance of the centre of mass of the folded lamina from DC is d_2 .

(a) Explain why $d_1 = d_2$. [1]

The folded lamina is freely suspended from B and hangs in equilibrium with BA inclined at an angle α to the downward vertical through B .

(b) Find, to the nearest degree, the size of angle α . [9]

Total: 10



