

Surname	Centre Number	Candidate Number
First name(s)		2



GCE A LEVEL

1305U60-1



S25-1305U60-1

FRIDAY, 13 JUNE 2025 – AFTERNOON

FURTHER MATHEMATICS – A2 unit 6
FURTHER MECHANICS B

1 hour 45 minutes

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1	16	
2	9	
3	11	
4	17	
5	12	
6	15	
Total	80	

ADDITIONAL MATERIALS

In addition to this examination paper, you will need:

- a Formula Booklet;
- a calculator.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Take g as 9.8 ms^{-2} .

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The maximum mark for this paper is 80.

The number of marks is given in brackets at the end of each question or part-question.

Sufficient working must be shown to demonstrate the **mathematical** method employed.

Answers without working may not gain full credit.

Unless the degree of accuracy is stated in the question, answers should be rounded appropriately.

You are reminded of the necessity for good English and orderly presentation in your answers.



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[7]

[illegible]

1305U601
03



(c) Find the speed of the car when it has travelled a distance of 250 m.

[2]

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(d) Explain why, according to this model, the car will not actually reach the maximum speed of 40 ms^{-1} .

[1]

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- (b) Find, in terms of m , the impulse exerted on sphere B by sphere A , stating your units clearly. [2]



- (b) When the sign is freely suspended from a point P on BC , it hangs in equilibrium with BC horizontal. Write down the length BP . [1]





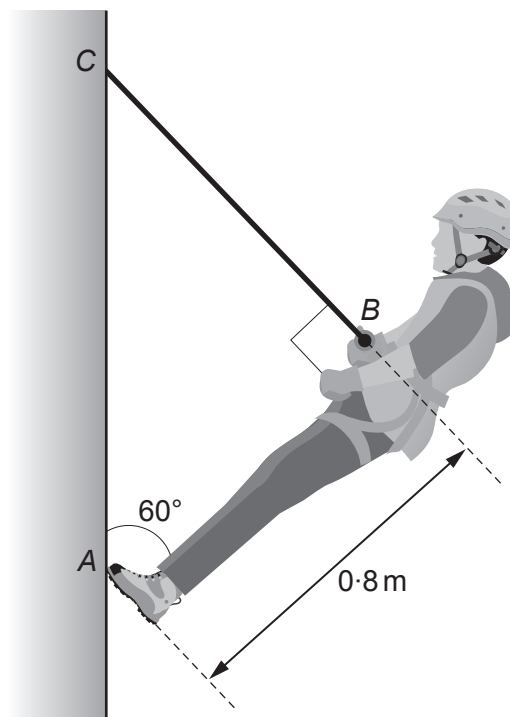
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Area with horizontal dotted lines for writing.

1305U601
11



5. A person of mass 72 kg is climbing down a cliff face using a rope that is fixed at a point C . As shown in the diagram below, the person's feet make contact with the cliff at A and the rope is attached to the person at B , where $AB = 0.8$ m. The person is being held at rest by means of the rope BC , with AB making an angle of 60° with the vertical and $\hat{ABC} = 90^\circ$.



You may use the following modelling assumptions.

- The person can be modelled as a rod with centre of mass at B .
- The rope is light and inextensible.
- The cliff face is vertical.
- The cliff face is rough and the coefficient of friction between the person's feet and the cliff is denoted by μ .



(a) Find the tension in the rope BC .

[3]

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(c) State one reason as to why your answer to part (b) may be unreliable in reality. [1]



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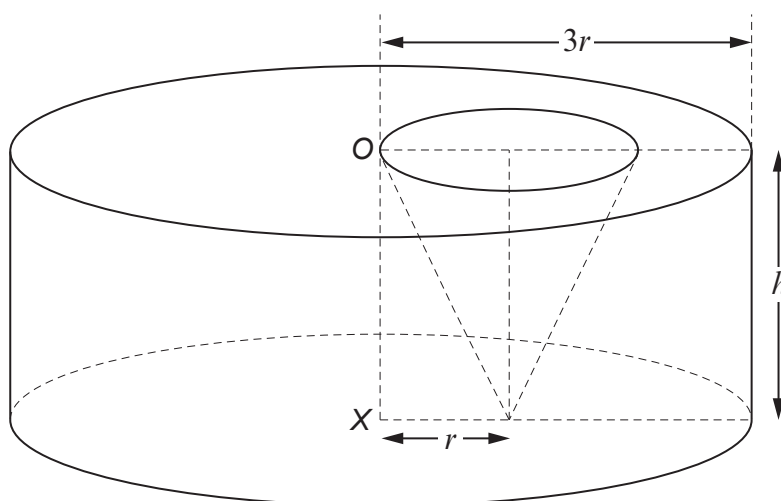
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- (b) The diagram below shows a solid body which consists of a uniform right circular cylinder with an inverted right circular cone removed.

The cylinder has height h , radius $3r$ and the centre of its top plane face is O . The centre of its bottom plane face is X .

The cone has height h , radius r and the point O lies on the circumference of the base of the cone. The vertex of the cone lies on the base of the cylinder.



- (i) Show that the vertical distance of the centre of mass of the solid from its top plane face is $\frac{53}{104}h$.
- (ii) Find the horizontal distance of the centre of mass of the solid from OX .
- (iii) The solid is suspended by a string which is attached to O . Given that OX is inclined at an angle of α to the vertical, find $\tan \alpha$ in terms of h and r . [11]

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