

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
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6	
7	
8	
TOTAL	



General Certificate of Education
Advanced Subsidiary Examination
January 2013

Mathematics

MM1B

Unit Mechanics 1B

Wednesday 23 January 2013 9.00 am to 10.30 am

For this paper you must have:

- the blue AQA booklet of formulae and statistical tables.

You may use a graphics calculator.

Time allowed

- 1 hour 30 minutes

Instructions

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Write the question part reference (eg (a), (b)(i) etc) in the left-hand margin.
- You must answer each question in the space provided for that question. If you require extra space, use an AQA supplementary answer book; do **not** use the space provided for a different question.
- Do not write outside the box around each page.
- Show all necessary working; otherwise marks for method may be lost.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- The **final** answer to questions requiring the use of calculators should be given to three significant figures, unless stated otherwise.
- Take $g = 9.8 \text{ m s}^{-2}$, unless stated otherwise.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 75.

Advice

- Unless stated otherwise, you may quote formulae, without proof, from the booklet.
- You do not necessarily need to use all the space provided.



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Answer space for question 2

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Answer space for question 3

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Answer space for question 4

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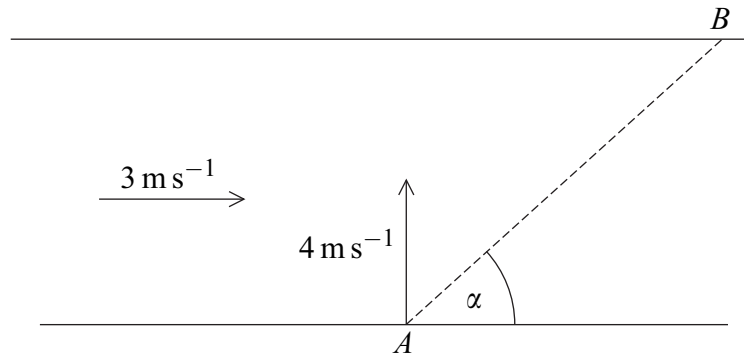
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6

A river has straight parallel banks. The water in the river is flowing at a constant velocity of 3 m s^{-1} parallel to the banks. A boat crosses the river, from the point A to the point B , so that its path is at an angle α to the bank. The velocity of the boat relative to the water is 4 m s^{-1} perpendicular to the bank. The diagram shows these velocities and the path of the boat.



- (a) Show that $\alpha = 53.1^\circ$, correct to three significant figures. (2 marks)
- (b) The boat returns along the same straight path from B to A . Given that the speed of the boat relative to the water is still 4 m s^{-1} , find the magnitude of the resultant velocity of the boat on the return journey. (6 marks)

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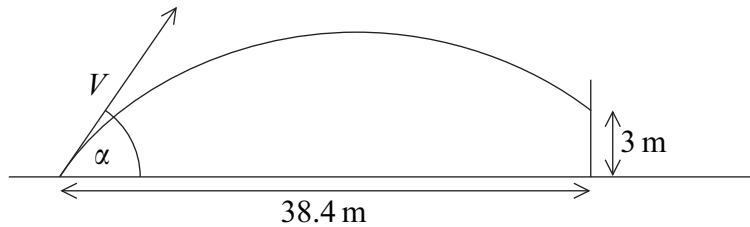
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8

A golf ball is hit from a point on a horizontal surface, so that it has an initial velocity $V \text{ m s}^{-1}$ at an angle α above the horizontal. The ball travels through the air and after 2.4 seconds hits a vertical wall at a height of 3 metres. The wall is at a horizontal distance of 38.4 metres from the point where the ball was hit. The path of the ball is shown in the diagram.



Assume that the weight of the ball is the only force that acts on it as it travels through the air.

- (a) Find the horizontal component of the velocity of the ball. (2 marks)
- (b) Find V . (5 marks)
- (c) Find α . (3 marks)

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Answer space for question 8



QUESTION
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Answer space for question 8

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