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### Semester One Examination, 2019

### Question/Answer booklet

# MATHEMATICS

If required by your examination administrator, please place your student identification label in this box

**SPECIALIST**

**UNIT 1**

## Section One:

## Calculator-free

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student number: In figures |  |  |  |  |  |  |  |  |  |  |

In words

Your name

## Time allowed for this section

Reading time before commencing work: five minutes

Working time: fifty minutes

## Materials required/recommended for this section

***To be provided by the supervisor***

This Question/Answer booklet

Formula sheet

***To be provided by the candidate***

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,  
correction fluid/tape, eraser, ruler, highlighters

Special items: nil

## Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

## Structure of this paper

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Section | Number of questions available | Number of questions to be answered | Working  time (minutes) | Marks available | Percentage of examination |
| Section One:  Calculator-free | 8 | 8 | 50 | 52 | 35 |
| Section Two:  Calculator-assumed | 13 | 13 | 100 | 98 | 65 |
|  | | |  | **Total** | 100 |

|  |  |  |
| --- | --- | --- |
| Markers use only | | |
| Question | Maximum | Mark |
| 1 | 4 |  |
| 2 | 8 |  |
| 3 | 6 |  |
| 4 | 7 |  |
| 5 | 6 |  |
| 6 | 7 |  |
| 7 | 6 |  |
| 8 | 8 |  |
| S1 Total | 52 |  |
| S1 Wt (×0.6731) | 35% |  |
| S2 Wt | 65% |  |
| Total | 100% |  |

## Instructions to candidates

1. The rules for the conduct of examinations are detailed in the school handbook. Sitting this examination implies that you agree to abide by these rules.

2. Write your answers in this Question/Answer booklet preferably using a blue/black pen.  
Do not use erasable or gel pens.

3. You must be careful to confine your answer to the specific question asked and to follow any instructions that are specified to a particular question.

4. Show all your working clearly. Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat any question, ensure that you cancel the answer you do not wish to have marked.

5. It is recommended that you do not use pencil, except in diagrams.

6. Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

7. The Formula sheet is not to be handed in with your Question/Answer booklet.

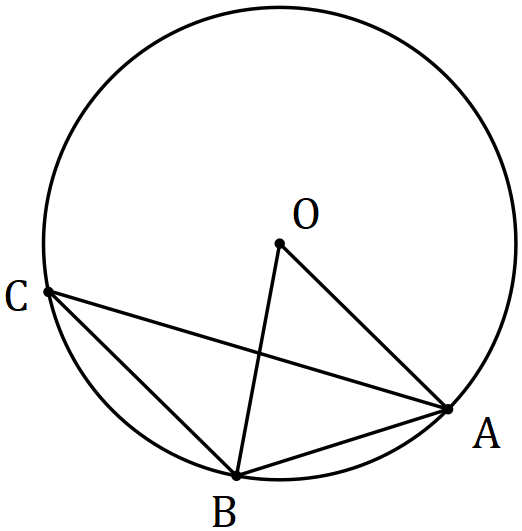
Section One: Calculator-free 35% (52 Marks)

This section has**eight (****8)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time: 50 minutes.

Question 1 (4 marks)

In the diagram below (not drawn to scale) and lie on the circle with centre and is parallel to .



Determine, with reasons, the size of and the size of when .

Question 2 (8 marks)

Let , and .

(a) Determine

(i) . (1 mark)

(ii) . (2 marks)

(iii) . (2 marks)

(b) Determine a unit vector that is parallel to but in the opposite direction. (3 marks)

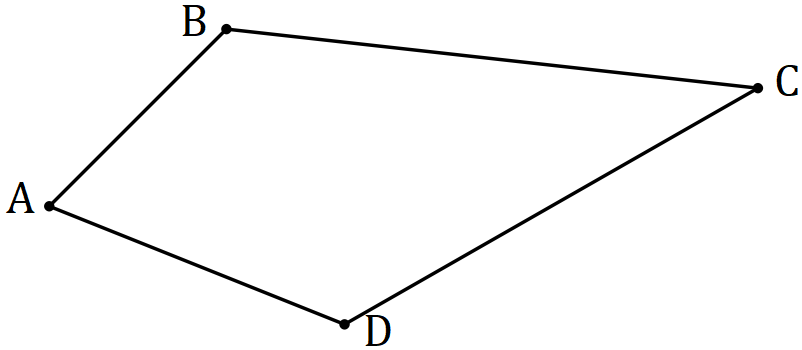
Question 3 (6 marks)

(a) Body moves m on a bearing of . Express this displacement in component form using unit vectors and . (3 marks)

(b) Body moves with a velocity of ms-1. Determine the speed of this body and the bearing it is travelling in. (3 marks)

Question 4 (7 marks)

Quadrilateral is shown below. The midpoints of sides and are and respectively. Let and .



(a) Sketch quadrilateral on the diagram above. (1 mark)

(b) Determine expressions for and in terms of and . (3 marks)

(c) Prove that and . (3 marks)

Question 5 (6 marks)

Consider the following statement that refers to two **isosceles** triangles.

If the triangles have the same area, then the triangles are congruent.

(a) Write the inverse statement and state whether it is true or false. (2 marks)

(b) Write the converse statement and state whether it is true or false. (2 marks)

(c) Write the contrapositive statement and use a counter-example to explain why it is false.

(2 marks)

Question 6 (7 marks)

(a) The work done, in joules, by a force of Newtons in changing the displacement of an object by metres, is given by the scalar product of and . Determine the work done by

(i) force N that moves a small body from m to m.

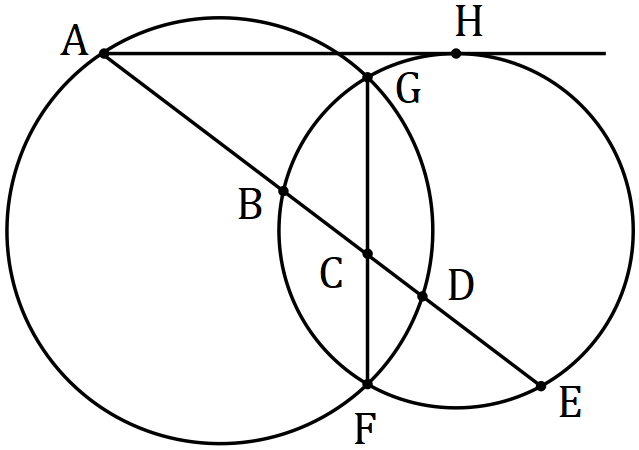
(2 marks)

(ii) a horizontal force of N that pushes a small body m up a slope inclined at to the horizontal. (2 marks)

(b) Determine the vector projection of on . (3 marks)

Question 7 (6 marks)

In the diagram below (not drawn to scale), two circles intersect at and . is a tangent to the circle at . is a straight line that cuts the circles at and and intersects chord at . , and .



(a) Deduce that . (2 marks)

(b) Determine and , justifying your answers. (4 marks)

Question 8 (8 marks)

(a) Evaluate . (3 marks)

(b) Given that , determine the constant in terms of and/or . (3 marks)

(c) Given that , determine . (2 marks)

Supplementary page

Question number: \_\_\_\_\_\_\_\_\_

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