

**ADVANCED SUBSIDIARY GCE  
MATHEMATICS**

Core Mathematics 1

**4721**

**QUESTION PAPER**

Candidates answer on the printed answer book.

**OCR supplied materials:**

- Printed answer book 4721
- List of Formulae (MF1)

**Other materials required:**

None

**Monday 10 January 2011  
Morning**

**Duration:** 1 hour 30 minutes

**INSTRUCTIONS TO CANDIDATES**

These instructions are the same on the printed answer book and the question paper.

- The question paper will be found in the centre of the printed answer book.
- Write your name, centre number and candidate number in the spaces provided on the printed answer book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the printed answer book.** Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are **not** permitted to use a calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.

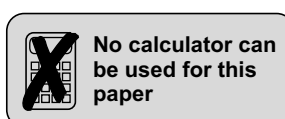
**INFORMATION FOR CANDIDATES**

This information is the same on the printed answer book and the question paper.

- The number of marks is given in brackets [ ] at the end of each question or part question on the question paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The printed answer book consists of **12** pages. The question paper consists of **4** pages. Any blank pages are indicated.

**INSTRUCTION TO EXAMS OFFICER / INVIGILATOR**

- Do not send this question paper for marking; it should be retained in the centre or destroyed.



1 The points  $A$  and  $B$  have coordinates  $(6, 1)$  and  $(-2, 7)$  respectively.

(i) Find the length of  $AB$ . [2]

(ii) Find the gradient of the line  $AB$ . [2]

(iii) Determine whether the line  $4x - 3y - 10 = 0$  is perpendicular to  $AB$ . [3]

2 Given that

$$(x - p)(2x^2 + 9x + 10) = (x^2 - 4)(2x + q)$$

for all values of  $x$ , find the constants  $p$  and  $q$ . [3]

3 Express each of the following in the form  $8^p$ :

(i)  $\sqrt{8}$ , [1]

(ii)  $\frac{1}{64}$ , [1]

(iii)  $2^6 \times 2^2$ . [3]

4 By using the substitution  $u = (3x - 2)^2$ , find the roots of the equation

$$(3x - 2)^4 - 5(3x - 2)^2 + 4 = 0. [6]$$

5 (i) Sketch the curve  $y = -x^3$ . [2]

(ii) The curve  $y = -x^3$  is translated by 3 units in the positive  $x$ -direction. Find the equation of the curve after it has been translated. [2]

(iii) Describe a transformation that transforms the curve  $y = -x^3$  to the curve  $y = -5x^3$ . [2]

6 Given that  $y = \frac{5}{x^2} - \frac{1}{4x} + x$ , find

(i)  $\frac{dy}{dx}$ , [4]

(ii)  $\frac{d^2y}{dx^2}$ . [2]

- 7 (i) Express  $4x^2 + 12x - 3$  in the form  $p(x + q)^2 + r$ . [4]
- (ii) Solve the equation  $4x^2 + 12x - 3 = 0$ , giving your answers in simplified surd form. [4]
- (iii) The quadratic equation  $4x^2 + 12x - k = 0$  has equal roots. Find the value of  $k$ . [3]
- 8 (i) Find the equation of the tangent to the curve  $y = 7 + 6x - x^2$  at the point  $P$  where  $x = 5$ , giving your answer in the form  $ax + by + c = 0$ . [6]
- (ii) This tangent meets the  $x$ -axis at  $Q$ . Find the coordinates of the mid-point of  $PQ$ . [3]
- (iii) Find the equation of the line of symmetry of the curve  $y = 7 + 6x - x^2$ . [2]
- (iv) State the set of values of  $x$  for which  $7 + 6x - x^2$  is an increasing function. [2]
- 9 A circle with centre  $C$  has equation  $x^2 + y^2 - 8x - 2y - 3 = 0$ .
- (i) Find the coordinates of  $C$  and the radius of the circle. [3]
- (ii) Find the values of  $k$  for which the line  $y = k$  is a tangent to the circle, giving your answers in simplified surd form. [3]
- (iii) The points  $S$  and  $T$  lie on the circumference of the circle.  $M$  is the mid-point of the chord  $ST$ . Given that the length of  $CM$  is 2, calculate the length of the chord  $ST$ . [3]
- (iv) Find the coordinates of the point where the circle meets the line  $x - 2y - 12 = 0$ . [6]

**There are no questions printed on this page.**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

**ADVANCED SUBSIDIARY GCE  
MATHEMATICS**

Core Mathematics 1

**4721**

**PRINTED ANSWER BOOK**

Candidates answer on this printed answer book.

**OCR supplied materials:**

- Question paper 4721 (inserted)
- List of Formulae (MF1)

**Other materials required:**

None

**Monday 10 January 2011  
Morning**

**Duration:** 1 hour 30 minutes



Candidate forename		Candidate surname	
--------------------	--	-------------------	--

Centre number						Candidate number				
---------------	--	--	--	--	--	------------------	--	--	--	--

**INSTRUCTIONS TO CANDIDATES**

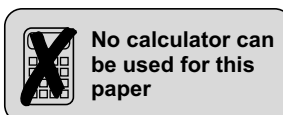
These instructions are the same on the printed answer book and the question paper.

- The question paper will be found in the centre of the printed answer book.
- Write your name, centre number and candidate number in the spaces provided on the printed answer book. Please write clearly and in capital letters.
- **Write your answer to each question in the space provided in the printed answer book.** Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- You are **not** permitted to use a calculator in this paper.
- Give non-exact numerical answers correct to 3 significant figures unless a different degree of accuracy is specified in the question or is clearly appropriate.

**INFORMATION FOR CANDIDATES**

This information is the same on the printed answer book and the question paper.

- The number of marks is given in brackets [ ] at the end of each question or part question on the question paper.
- **You are reminded of the need for clear presentation in your answers.**
- The total number of marks for this paper is **72**.
- The printed answer book consists of **12** pages. The question paper consists of **4** pages. Any blank pages are indicated.



<b>1 (i)</b>	
<b>1 (ii)</b>	
<b>1 (iii)</b>	

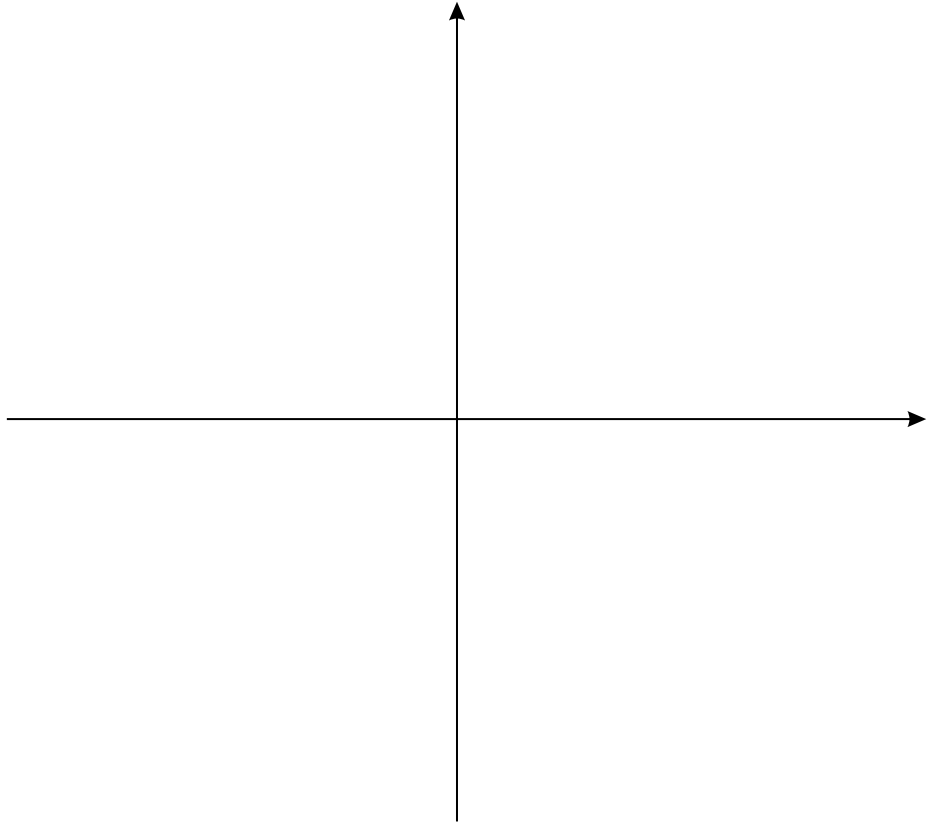


<b>3 (i)</b>	
<b>3 (ii)</b>	
<b>3 (iii)</b>	





5 (i)



5 (ii)


5 (iii)


<b>6 (i)</b>	

<b>6 (ii)</b>	

<b>7 (i)</b>	
<b>7 (ii)</b>	
<b>7 (iii)</b>	

**8 (i)**


**8 (ii)**


<b>8 (iii)</b>	
<b>8 (iv)</b>	
<b>9 (i)</b>	

<b>9 (ii)</b>	
<b>9 (iii)</b>	

<b>9 (iv)</b>	



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series. If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.