



Oxford Cambridge and RSA

Wednesday 13 May 2015 – Morning

AS GCE MATHEMATICS (MEI)

4751/01 Introduction to Advanced Mathematics (C1)

QUESTION PAPER



Candidates answer on the Printed Answer Book.

OCR supplied materials:

- Printed Answer Book 4751/01
- MEI Examination Formulae and Tables (MF2)

Other materials required:

None

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 inside 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. HB 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.
- Final answers should be given to a degree of accuracy appropriate to the context.

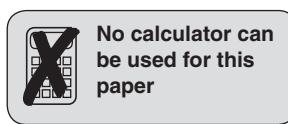
INFORMATION FOR CANDIDATES

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 advised that an answer may receive **no marks** unless you show sufficient detail of the working to indicate that a correct method is being used.
- 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 recycled. Please contact OCR Copyright should you wish to re-use this document.



Section A (36 marks)

1 Make r the subject of the formula $A = \pi r^2(x+y)$, where $r > 0$. [2]

2 A line L is parallel to $y = 4x + 5$ and passes through the point $(-1, 6)$. Find the equation of the line L in the form $y = ax + b$. Find also the coordinates of its intersections with the axes. [5]

3 Evaluate the following.

(i) 200^0 [1]

(ii) $\left(\frac{25}{9}\right)^{-\frac{1}{2}}$ [3]

4 Solve the inequality $\frac{4x-5}{7} > 2x+1$. [3]

5 Find the coordinates of the point of intersection of the lines $y = 5x - 2$ and $x + 3y = 8$. [4]

6 (i) Expand and simplify $(3 + 4\sqrt{5})(3 - 2\sqrt{5})$. [3]

(ii) Express $\sqrt{72} + \frac{32}{\sqrt{2}}$ in the form $a\sqrt{b}$, where a and b are integers and b is as small as possible. [2]

7 Find and simplify the binomial expansion of $(3x - 2)^4$. [4]

8 Fig. 8 shows a right-angled triangle with base $2x + 1$, height h and hypotenuse $3x$.

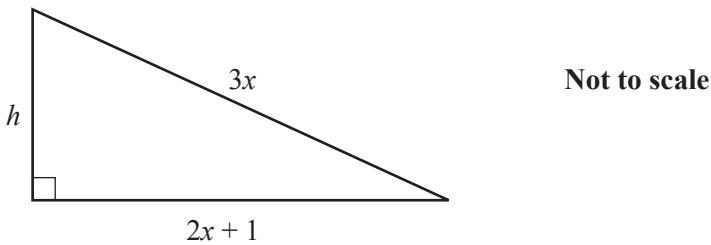


Fig. 8

(i) Show that $h^2 = 5x^2 - 4x - 1$. [2]

(ii) Given that $h = \sqrt{7}$, find the value of x , giving your answer in surd form. [3]

9 Explain why each of the following statements is false. State in each case which of the symbols \Rightarrow , \Leftarrow or \Leftrightarrow would make the statement true.

(i) ABCD is a square \Leftrightarrow the diagonals of quadrilateral ABCD intersect at 90° [2]

(ii) x^2 is an integer \Rightarrow x is an integer [2]

Section B (36 marks)

10 You are given that $f(x) = (x+3)(x-2)(x-5)$.

(i) Sketch the curve $y = f(x)$. [3]

(ii) Show that $f(x)$ may be written as $x^3 - 4x^2 - 11x + 30$. [2]

(iii) Describe fully the transformation that maps the graph of $y = f(x)$ onto the graph of $y = g(x)$, where $g(x) = x^3 - 4x^2 - 11x - 6$. [2]

(iv) Show that $g(-1) = 0$. Hence factorise $g(x)$ completely. [5]

11

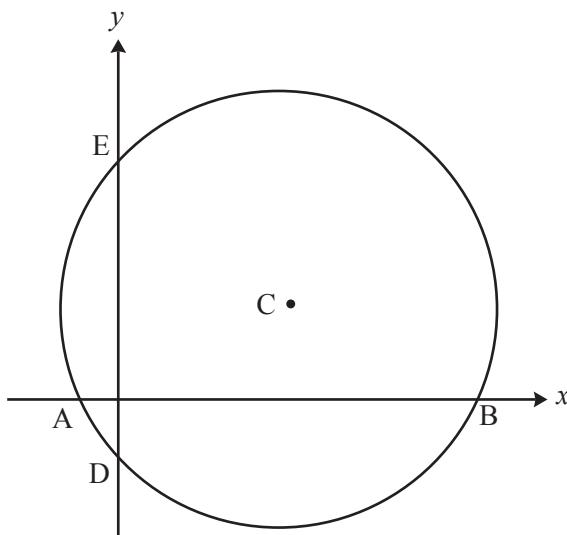


Fig. 11

Fig. 11 shows a sketch of the circle with equation $(x-10)^2 + (y-2)^2 = 125$ and centre C. The points A, B, D and E are the intersections of the circle with the axes.

(i) Write down the radius of the circle and the coordinates of C. [2]

(ii) Verify that B is the point (21, 0) and find the coordinates of A, D and E. [4]

(iii) Find the equation of the perpendicular bisector of BE and verify that this line passes through C. [6]

12 (i) Find the set of values of k for which the line $y = 2x + k$ intersects the curve $y = 3x^2 + 12x + 13$ at two distinct points. [5]

(ii) Express $3x^2 + 12x + 13$ in the form $a(x+b)^2 + c$. Hence show that the curve $y = 3x^2 + 12x + 13$ lies completely above the x-axis. [5]

(iii) Find the value of k for which the line $y = 2x + k$ passes through the minimum point of the curve $y = 3x^2 + 12x + 13$. [2]

END OF QUESTION PAPER



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) 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.