OXFORD CAMBRIDGE AND RSA EXAMINATIONS

AS GCE

4751/01

MATHEMATICS (MEI)

Introduction to Advanced Mathematics (C1)

QUESTION PAPER

WEDNESDAY 13 MAY 2015: Morning

DURATION: 1 hour 30 minutes
plus your additional time allowance

MODIFIED ENLARGED

Candidates answer on the Printed Answer Book or any suitable paper provided by the centre. The Printed Answer Book may be enlarged by the centre.

OCR SUPPLIED MATERIALS:

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

OTHER MATERIALS REQUIRED:

None

NO CALCULATOR CAN BE USED FOR THIS PAPER

READ INSTRUCTIONS OVERLEAF

DC (ST/SW) 5320809544 109123/1

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces provided on the Printed Answer Book or on the paper provided by the centre. Please write clearly and in capital letters.

IF YOU USE THE PRINTED ANSWER BOOK, WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. 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.

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

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.

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]

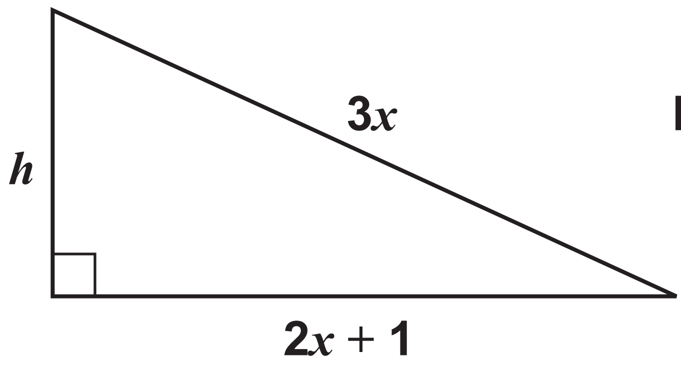
6 (i) Expand and simplify $(3 + 4\sqrt{5})(3 - 2\sqrt{5})$. [3]

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

FIG. 8



NOT TO SCALE

(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]

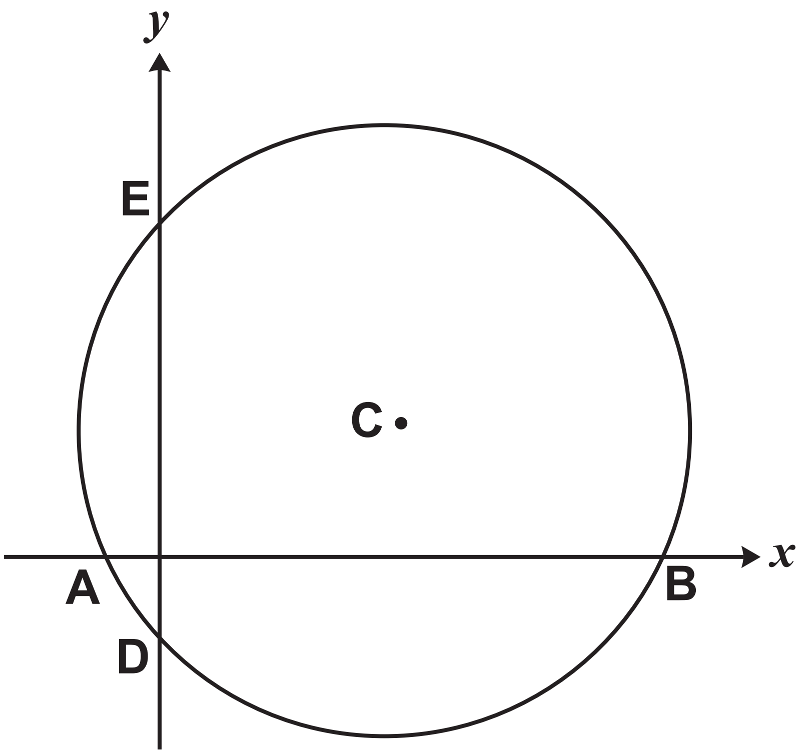
(ii) Show that $f(x)$ may be written as $x^3 - 4x^2 - 11x + 30$. [2]

(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 below 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.**

FIG. 11



(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