

**ADVANCED SUBSIDIARY GCE
MATHEMATICS (MEI)**

4751

Introduction to Advanced Mathematics (C1)

QUESTION PAPER

Candidates answer on the printed answer book.

OCR supplied materials:

- Printed answer book 4751
- MEI Examination Formulae and Tables (MF2)

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

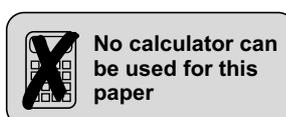
INFORMATION FOR CANDIDATES

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 destroyed.



Section A (36 marks)

- 1 Find the equation of the line which is parallel to $y = 5x - 4$ and which passes through the point $(2, 13)$. Give your answer in the form $y = ax + b$. [3]
- 2 (i) Write down the value of each of the following.
- (A) 4^{-2} [1]
- (B) 9^0 [1]
- (ii) Find the value of $\left(\frac{64}{125}\right)^{\frac{4}{3}}$. [2]
- 3 Simplify $\frac{(3xy^4)^3}{6x^5y^2}$. [3]
- 4 Solve the inequality $5 - 2x < 0$. [2]
- 5 The volume V of a cone with base radius r and slant height l is given by the formula
- $$V = \frac{1}{3}\pi r^2 \sqrt{l^2 - r^2}.$$
- Rearrange this formula to make l the subject. [4]
- 6 Find the first 3 terms, in ascending powers of x , of the binomial expansion of $(2 - 3x)^5$, simplifying each term. [4]
- 7 (i) Express $\frac{81}{\sqrt{3}}$ in the form 3^k . [2]
- (ii) Express $\frac{5 + \sqrt{3}}{5 - \sqrt{3}}$ in the form $\frac{a + b\sqrt{3}}{c}$, where a , b and c are integers. [3]
- 8 Find the coordinates of the point of intersection of the lines $x + 2y = 5$ and $y = 5x - 1$. [3]

- 9 Fig. 9 shows a trapezium ABCD, with the lengths in centimetres of three of its sides.

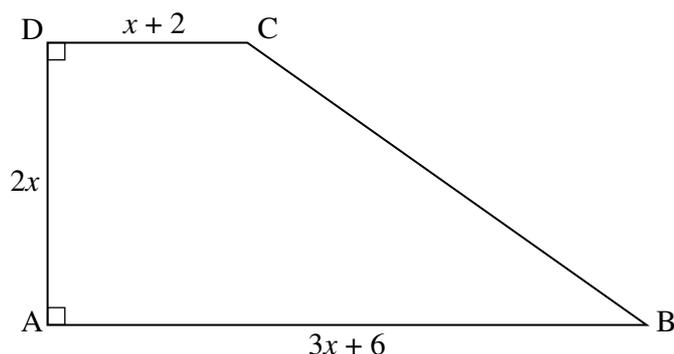


Fig. 9

This trapezium has area 140 cm^2 .

(i) Show that $x^2 + 2x - 35 = 0$. [2]

(ii) Hence find the length of side AB of the trapezium. [3]

- 10 Select the best statement from

$P \Rightarrow Q$

$P \Leftarrow Q$

$P \Leftrightarrow Q$

none of the above

to describe the relationship between P and Q in each of the following cases.

(i) P: WXYZ is a quadrilateral with 4 equal sides

Q: WXYZ is a square

(ii) P: n is an odd integer

Q: $(n + 1)^2$ is an odd integer

(iii) P: n is greater than 1 and n is a prime number

Q: \sqrt{n} is not an integer

[3]

Section B (36 marks)

- 11 The points A $(-1, 6)$, B $(1, 0)$ and C $(13, 4)$ are joined by straight lines.

(i) Prove that the lines AB and BC are perpendicular. [3]

(ii) Find the area of triangle ABC. [3]

(iii) A circle passes through the points A, B and C. Justify the statement that AC is a diameter of this circle. Find the equation of this circle. [6]

(iv) Find the coordinates of the point on this circle that is furthest from B. [1]

- 12** (i) You are given that $f(x) = (2x - 5)(x - 1)(x - 4)$.
- (A) Sketch the graph of $y = f(x)$. [3]
- (B) Show that $f(x) = 2x^3 - 15x^2 + 33x - 20$. [2]
- (ii) You are given that $g(x) = 2x^3 - 15x^2 + 33x - 40$.
- (A) Show that $g(5) = 0$. [1]
- (B) Express $g(x)$ as the product of a linear and quadratic factor. [3]
- (C) Hence show that the equation $g(x) = 0$ has only one real root. [2]
- (iii) Describe fully the transformation that maps $y = f(x)$ onto $y = g(x)$. [2]

13

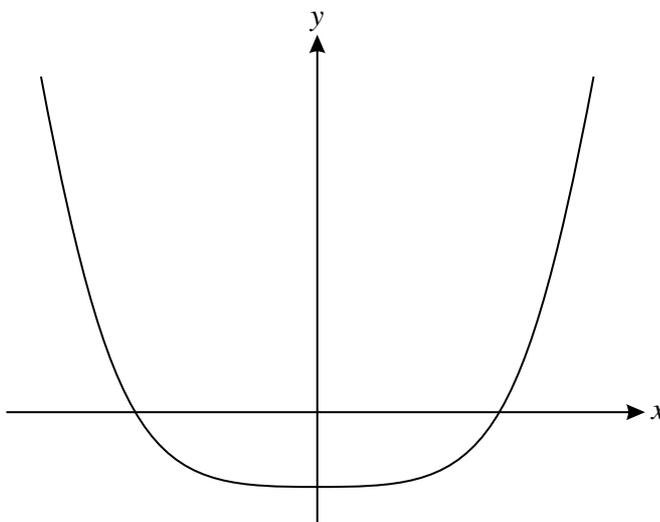


Fig. 13

Fig. 13 shows the curve $y = x^4 - 2$.

- (i) Find the exact coordinates of the points of intersection of this curve with the axes. [3]
- (ii) Find the exact coordinates of the points of intersection of the curve $y = x^4 - 2$ with the curve $y = x^2$. [5]
- (iii) Show that the curves $y = x^4 - 2$ and $y = kx^2$ intersect for all values of k . [2]

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