

MATHEMATICS Compulsory Part
PAPER 1

Question-Answer Book

8:30 am – 10:45 am (2¼ hours)

This paper must be answered in English

INSTRUCTIONS

- (1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5, 7, 9 and 11.
- (2) This paper consists of THREE sections, A(1), A(2) and B.
- (3) Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
- (4) Graph paper and supplementary answer sheets will be supplied on request. Write your Candidate Number, mark the question number box and stick a barcode label on each sheet, and fasten them with string INSIDE this book.
- (5) Unless otherwise specified, all working must be clearly shown.
- (6) Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.
- (7) The diagrams in this paper are not necessarily drawn to scale.
- (8) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

Please stick the barcode label here.

Candidate Number



- (3 marks)

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- (3 marks)

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no text or other markings on the paper.

Answers written in the margins will not be marked.

2024-DSE-MATH-CP 1-2

3. Factorize

(a) $6r^2 - 13rs - 28s^2$,

(b) $4r - 14s + 6r^2 - 13rs - 28s^2$.

(3 marks)

4. (a) Find the range of values of x which satisfy both $\frac{5x+7}{4} - 1 < 2x$ and $3x+9 \geq 0$.

(b) Write down the least integer satisfying both inequalities in (a).

(4 marks)

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6. The marked price of a calculator is 40% higher than its cost. The calculator is sold at a discount of 25% on its marked price and the profit is \$13. Find the marked price of the calculator. (4 marks)

2024-DSE-MATH-CP 1–4

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7. In a polar coordinate system, O is the pole. The polar coordinates of the points P , Q and R are $(11, 59^\circ)$, $(60, 149^\circ)$ and $(144, 239^\circ)$ respectively.

- (a) Find $\angle POQ$.
- (b) Are P , O and R collinear? Explain your answer.
- (c) Find the perimeter of $\triangle PQR$.

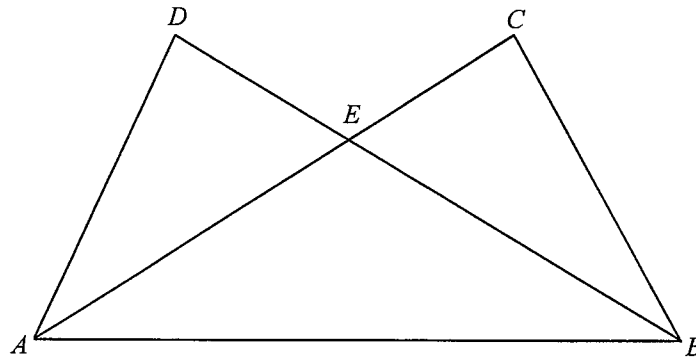
(4 marks)

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8. In Figure 1, E is the point of intersection of AC and BD . It is given that $\angle ACB = \angle ADB = 90^\circ$ and $AD = BC$.



- (a) Prove that $\triangle ABC \cong \triangle BAD$.
- (b) If $AD = 12$ cm and $DE = 9$ cm , find the area of the pentagon $ABCDE$.

(5 marks)

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9. The table below shows the distribution of the numbers of keys owned by a group of housewives.

Number of keys	3	4	5	6	7	8
Number of housewives	10	9	4	3	4	k

If a housewife is randomly selected from the group, then the probability that she owns more than 6 keys is $\frac{5}{18}$.

- (a) Find k .
- (b) Write down the mean, the mode and the median of the distribution.

(5 marks)

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11. The stem-and-leaf diagram below shows the distribution of the numbers of hours spent on reading journals in a month by a group of researchers.

Stem (tens)	Leaf (units)									
2	0	0	1	a	a	a	8	8	9	9
3	0	0	2	3	4	4	7	9		
4	0	b								

The mean of the distribution is 30 .

- (a) Find a and b . (3 marks)
- (b) Write down the least possible range of the distribution. (1 mark)
- (c) Find the greatest possible inter-quartile range of the distribution. (3 marks)

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- (b) The base of another solid right pyramid is a square. This pyramid is divided into a frustum Z and a pyramid by a plane which is parallel to its base. The height and the total surface area of Z are 3 cm and 960 cm^2 respectively. Are X and Z similar? Explain your answer. (4 marks)

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2024-DSE-MATH-CP 1–12

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- (a) Write down the value of p . (1 mark)
- (b) When $F(x)$ is divided by $x+1$, the remainder is -12 . It is given that $x-2$ is a factor of $F(x)$.
- (i) Find q and r .
- (ii) How many irrational roots does the equation $F(x)=0$ have? Explain your answer. (7 marks)

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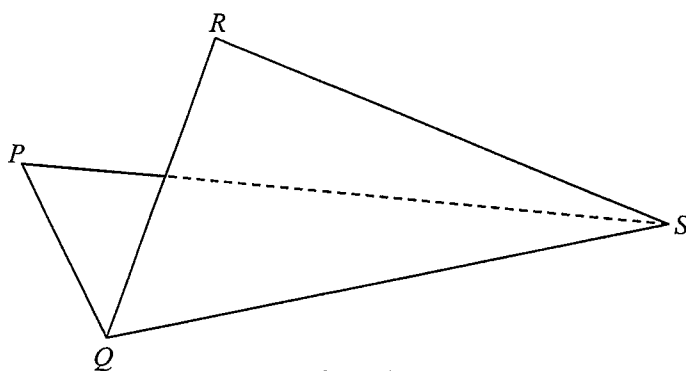
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19. Let $f(x) = 2x^2 + 4mx + 8x + 2m^2 + 8m + n$, where m and n are real constants such that $mn < 0$. Denote the vertex of the graph of $y = f(x)$ by P .

(a) Using the method of completing the square, express the coordinates of P in terms of m and n . (2 marks)

(b) Describe the geometric meaning represented by transforming $f(x)$ to $f\left(\frac{x}{5}\right) + 7$. (2 marks)

(c) Denote the vertex of the graph of $y = f\left(\frac{x}{5}\right) + 7$ by Q . Let (a_1, b_1) and (a_2, b_2) be the coordinates of P and Q respectively. It is given that $a_1, 1 + n, a_2$ is an arithmetic sequence and $b_1, 4 - m, b_2$ is a geometric sequence.

(i) Find the coordinates of P and Q .

(ii) The coordinates of the points R and S are $(3t + 27, t)$ and $(3t + 3, 2t - 3)$ respectively, where t is a real number. Is it possible that $PQRS$ is a rhombus? Explain your answer.

(8 marks)

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