

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



1. Simplify $\frac{2}{4h-7} - \frac{3}{6h-5}$.

[illegible]

(3 marks)

[illegible]

Answers written in the margins will not be marked.

2024-DSE-MATH-CP 1–2

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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)

Answers written in the margins will not be marked.

- [illegible]

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- 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 are no margins, text, or other markings on the paper.

Answers written in the margins will not be marked.

2024-DSE-MATH-CP 1–4

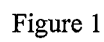
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- (4 marks)

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- (5 marks)

[illegible]

Answers written in the margins will not be marked.

2024-DSE-MATH-CP 1-6

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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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Answers written in the margins will not be marked.

10. It is given that $g(x)$ is partly constant and partly varies as x . Suppose that $g(-3) = -21$ and $g(7) = 9$.

- [illegible]

Answers written in the margins will not be marked.

2024-DSE-MATH-CP 1-8

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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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12. Denote the origin by O .

- (a) A and B are points lying on the positive x -axis such that the x -coordinate of A is greater than the x -coordinate of B . A vertical line which passes through B cuts the straight line $y = mx$ at the point C such that $AB = BC$, where m is a positive constant. Let D be a point such that $ABCD$ is a square. Express the slope of OD in terms of m . (3 marks)
- (b) The coordinates of the points M and N are $(6, 5)$ and $(10, 0)$ respectively. Let P and Q be points lying on OM and MN respectively while R and S be points lying on the x -axis. If the quadrilateral $PQRS$ is a square, find the x -coordinate of P . (4 marks)

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14. Let $F(x) = (6x^2 + x + p)(qx^2 + rx - 10)$, where p , q and r are constants. The constant term of $F(x)$ is 40.

(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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15. It is given that $\log_9 y$ is a linear function of $\log_3 x$. Denote the graph of the linear function by L . The slope of L is 4 and L passes through the point $(5, 22)$. Express y in terms of x . (3 marks)

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2024-DSE-MATH-CP 1-16

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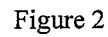
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- (b) The metal sheet $PQRS$ described in (a) is now folded along QS (see Figure 2). It is given that the angle between the plane PQS and the plane QRS is 80° .



- (4 marks)

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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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