

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



* A 0 3 0 E 0 0 1 *

SECTION A(1) (35 marks)

1. Make b the subject of the formula $\frac{a+4}{3} = \frac{b+1}{2}$. (3 marks)

2. Simplify $\frac{xy^7}{(x^{-2}y^3)^4}$ and express your answer with positive indices. (3 marks)

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3. (a) Round up 265.473 to the nearest integer.
(b) Round down 265.473 to 1 decimal place.
(c) Round off 265.473 to 2 significant figures.

(3 marks)

4. A box contains n white balls, 5 black balls and 8 red balls. If a ball is randomly drawn from the box, then the probability of drawing a red ball is $\frac{2}{5}$. Find the value of n . (3 marks)

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5. Factorize

(a) $9r^3 - 18r^2s$,

(b) $9r^3 - 18r^2s - rs^2 + 2s^3$.

(4 marks)

6. (a) Find the range of values of x which satisfy both $\frac{3-x}{2} > 2x+7$ and $x+8 \geq 0$.

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

(4 marks)

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7. The marked price of a vase is 30% above its cost. A loss of \$88 is made by selling the vase at a discount of 40% on its marked price. Find the marked price of the vase. (5 marks)

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8. In Figure 1, $ABCDE$ is a circle. It is given that $AB \parallel ED$. AD and BE intersect at the point F .

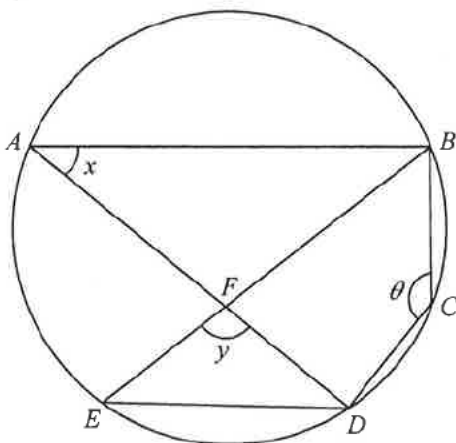


Figure 1

Express x and y in terms of θ .

(5 marks)

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9. A car travels from city P to city Q at an average speed of 72 km/h and then the car travels from city Q to city R at an average speed of 90 km/h . It is given that the car travels 210 km in 161 minutes for the whole journey. How long does the car take to travel from city P to city Q ? (5 marks)

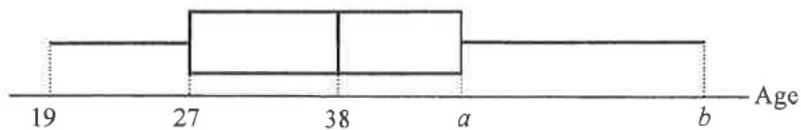
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SECTION A(2) (35 marks)

10. The box-and-whisker diagram below shows the distribution of the ages of the clerks in team X of a company. It is given that the range and the inter-quartile range of this distribution are 43 and 21 respectively.



- (a) Find a and b . (3 marks)
- (b) There are five clerks in team Y of the company and three of them are of age 38. It is given that the range of the ages of the clerks in team Y is 20. Team X and team Y are now combined to form a section. The manager of the company claims that the range of the ages of the clerks in the section and the range of the ages of the clerks in team X must be the same. Do you agree? Explain your answer. (2 marks)

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11. The following table shows the distribution of the numbers of children of some families:

Number of children	0	1	2	3	4
Number of families	k	2	9	6	7

It is given that k is a positive integer.

- (a) If the mode of the distribution is 2, write down
- (i) the least possible value of k ;
 - (ii) the greatest possible value of k .
- (2 marks)
- (b) If the median of the distribution is 2, write down
- (i) the least possible value of k ;
 - (ii) the greatest possible value of k .
- (2 marks)
- (c) If the mean of the distribution is 2, find the value of k .
- (2 marks)

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12. Let $f(x) = 4x(x+1)^2 + ax + b$, where a and b are constants. It is given that $x - 3$ is a factor of $f(x)$. When $f(x)$ is divided by $x + 2$, the remainder is $2b + 165$.

(a) Find a and b . (3 marks)

(b) Someone claims that the equation $f(x) = 0$ has at least one irrational root. Do you agree? Explain your answer. (4 marks)

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13. In Figure 2, $ABCD$ is a trapezium with $\angle ABC = 90^\circ$ and $AB \parallel DC$. E is a point lying on BC such that $\angle AED = 90^\circ$.

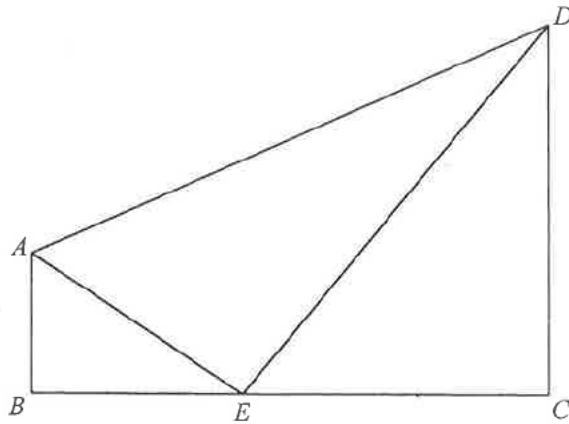


Figure 2

- (a) Prove that $\triangle ABE \sim \triangle ECD$. (2 marks)
- (b) It is given that $AB = 15$ cm, $AE = 25$ cm and $CE = 36$ cm.
- (i) Find the length of CD .
- (ii) Find the area of $\triangle ADE$.
- (iii) Is there a point F lying on AD such that the distance between E and F is less than 23 cm? Explain your answer. (6 marks)

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SECTION B (35 marks)

15. An eight-digit phone number is formed by a permutation of 2, 3, 4, 5, 6, 7, 8 and 9.

(a) How many different eight-digit phone numbers can be formed? (1 mark)

(b) If the first digit and the last digit of an eight-digit phone number are odd numbers, how many different eight-digit phone numbers can be formed? (2 marks)

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17. (a) In Figure 3(a), $ABCD$ is a paper card in the shape of a parallelogram. It is given that $AB = 60$ cm, $\angle ABD = 20^\circ$ and $\angle BAD = 120^\circ$.

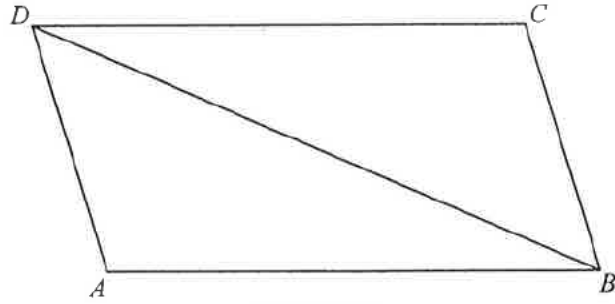


Figure 3(a)

Find the length of AD .

(2 marks)

- (b) The paper card in Figure 3(a) is folded along BD such that the distance between A and C is 40 cm (see Figure 3(b)).

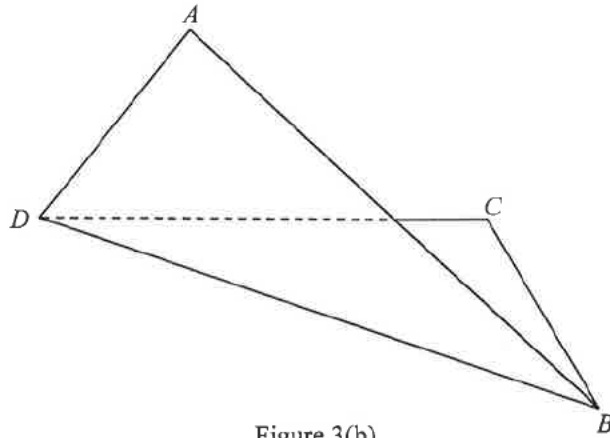


Figure 3(b)

- (i) Find $\angle ABC$.
- (ii) Find the angle between the plane ABD and the plane BCD .

(5 marks)

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19. The coordinates of the centre of the circle C are $(8, 2)$. Denote the radius of C by r . Let L be the straight line $kx - 5y - 21 = 0$, where k is a constant. It is given that L is a tangent to C .

(a) Find the equation of C in terms of r . Hence, express r^2 in terms of k . (4 marks)

(b) L passes through the point $D(18, 39)$.

(i) Find r .

(ii) It is given that L cuts the y -axis at the point E . Let F be a point such that C is the inscribed circle of $\triangle DEF$. Is $\triangle DEF$ an obtuse-angled triangle? Explain your answer. (8 marks)

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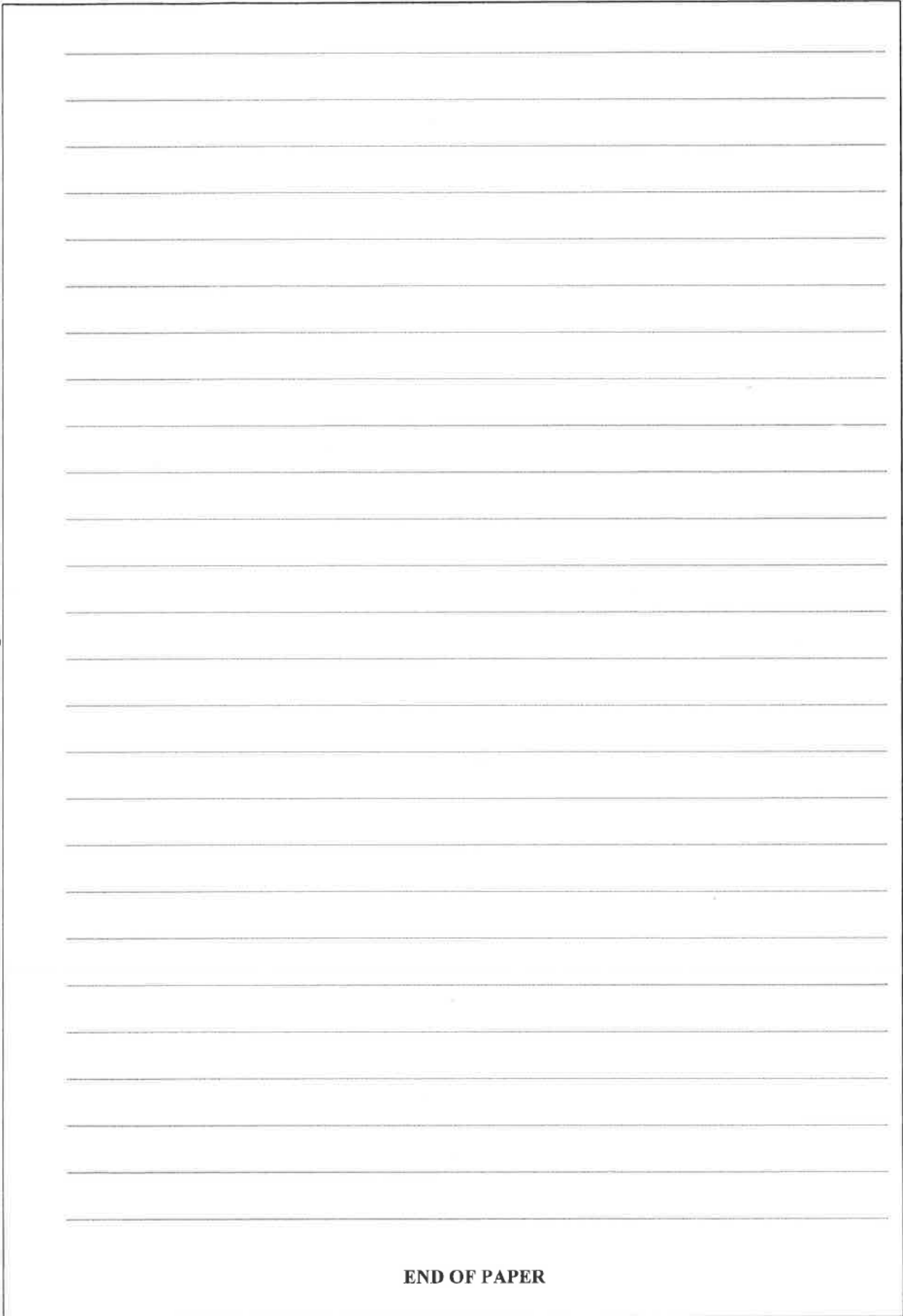
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END OF PAPER

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