



MATHEMATICS Compulsory Part
PAPER 1
Question-Answer Book

9:00 am — 11:15 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 and 3.
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. 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

	Marker's Use Only	Examiner's Use Only
	Marker No.	Examiner No.
Question No.	Marks	Marks
1-2		
3-4		
5-6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
Total		

SECTION A (1) (35 marks)

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

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2. Simplify $\frac{x^2 y^{-3}}{(x^3 y^{-1})^6}$ and express your answer with positive indices . (3 marks)

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3. (a) Round down 38.26 to 1 decimal place .

(b) Find the percentage error of the approximation in (a) .

(3 marks)

4. Factorize

(a) $8m^3 - 4m^2n$,

(b) $8m^3 - 4m^2n - 18mn^2 + 9n^3$.

(4 marks)

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5. (a) Find the range of values of x which satisfy both $5(x+2) > \frac{8x-7}{3}$ and $6-x \geq 8$.
- (b) Write down all integers satisfying both inequalities in (a).

(4 marks)

6. The coordinates of the points A and B are $(-4, 6)$ and $(-3, 4)$ respectively. A is rotated anticlockwise about the origin through 270° to A' . B' is the reflection image of B with respect to the straight line $y = 1$.
- (a) Write down the coordinates of A' and B' .
- (b) Prove that $A'OB'$ is a straight line, where O is the origin.

(4 marks)

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7. The cumulative frequency distribution table below shows the time spent on using the Internet last week by a class of students in a school .

Time spent on using the Internet (t hours)	Cumulative frequency
$t \leq 4$	5
$t \leq 7$	9
$t \leq 10$	a
$t \leq 13$	17
$t \leq 16$	b

If a student is randomly selected from the class , the probability that the selected student spent less than or equal to 10 hours on using the Internet is $\frac{3}{5}$. It is given that the number of students spent between 7 to 10 hours on using the Internet is the same as that spent between 13 to 16 hours . Find a and b .

(4 marks)

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8. In Figure 1, O is the centre of the circle $ABCDE$. It is given that $\angle COD = 64^\circ$.

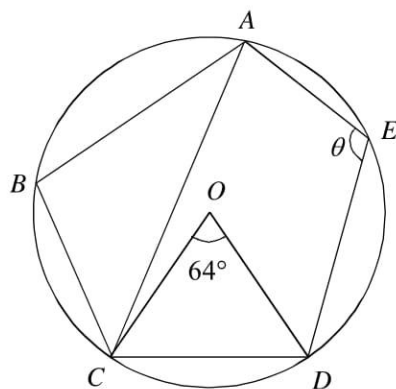


Figure 1

Express $\angle ACD$ and $\angle ABC$ in terms of θ . (5 marks)

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- (5 marks)

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SECTION A (2) (35 marks)

10. The stem-and-leaf diagram below shows the distribution of the ages of the players of a football team . It is given that the mean age of the players of the football team is 25 .

Stem (tens)	Leaf (units)									
1	7	8	8	9						
2	0	2	2	3	a	6	6	8	9	
3	0	1	1	3	3					

As the two oldest players retired , three new players join the football team . After the three players join the football team , the manager of the team finds that the mean age of the players of the football team is 1 year less than that of the original team .

- (a) Find a and the mean age of the three new players . (4 marks)
- (b) Suppose m is the new median of the ages of the players of the football team . Find the possible values of m . (2 marks)

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- (6 marks)

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14. It is given that the base radius and the height of an inverted right circular conical vessel are 10 cm and 24 cm respectively. The vessel is held vertically on a horizontal table and some water is poured into the vessel until the volume of water is equal to $\frac{64}{125}$ of the capacity of the vessel.

- (a) Find the area of the wet curved surface of the vessel in terms of π . (4 marks)
- (b) Some more water is now poured into the vessel and the top of the vessel is covered by a circular lid. Then the vessel is held upside down (i.e. the circular lid is placed on the table) without water leaking. Shirley now finds that the area of the wet curved surface of the vessel is the same as that in (a), she claims that the depth of the water in the vessel is greater than 14.8 cm. Do you agree? Explain your answer. (4 marks)

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15. A six-digit number is formed by a permutation of 0, 3, 4, 6, 7 and 8.

- (a) Find the number of six-digit number formed . (1 mark)
- (b) Find the number of six-digit even number formed . (2 marks)

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17. (a) In Figure 3, the equations of the straight lines L_1 and L_2 are $x = 20$ and $x + y = 5$ respectively. The straight line L_3 cuts L_1 at the point $(20, 10)$ and is parallel to L_2 .

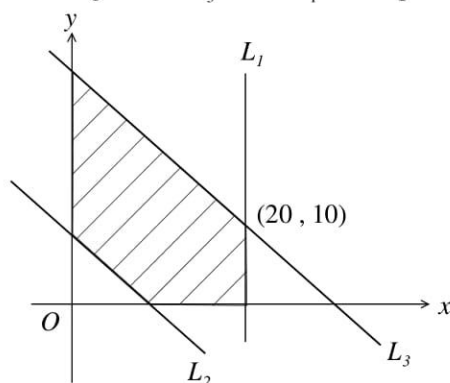


Figure 3

- (i) Write down the equation of L_3 .
- (ii) The shaded region (including the boundary) represents the solution of a system of inequalities. It is given that two of the inequalities are $0 \leq x \leq 20$ and $y \geq 0$. Write down the rest of the inequalities.
- (2 marks)
- (b) The three customers Amy, Betty and Cindy ordered 20, 45 and 25 cakes respectively from a bakery. The bakery has two workshops A and B. There are 30 cakes in the workshop A and 60 cakes in the workshop B. The table below shows the distances between the two workshops and the three customers.

	Amy	Betty	Cindy
Workshop A	8 km	4 km	1 km
Workshop B	2 km	1 km	1 km

- (i) If workshop A allocates x cakes to Amy and allocates y cakes to Betty, how many cakes should be allocated to Cindy from workshop B? Give the answer in terms of x and y .
- (ii) If the transportation charge of each cake is \$5 / km, find the least value of the total transportation charges.

(5 marks)

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18. Figure 4(a) shows a right pyramid $VABC$ with an equilateral triangle base ABC , where $\angle VAB = 78^\circ$ and $AB = 12$ cm. Let P and Q be the points lying on VB and VC respectively such that PQ is parallel to BC and $\angle PAB = 60^\circ$. A geometric model is made by cutting off the pyramid $VAPQ$ from $VABC$ as shown in Figure 4(b).

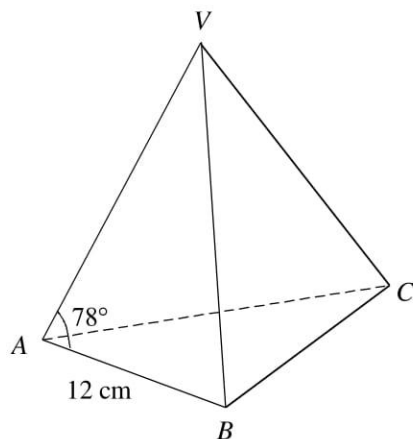


Figure 4(a)

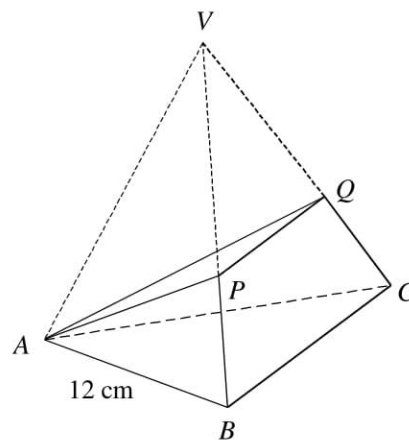


Figure 4(b)

- (a) Find the length of PB . (2 marks)
- (b) Let α be the angle between the plane APQ and the base ABC .
- (i) Find α .
- (ii) Let β be the angle between PA and the base ABC . Someone claims that $\beta > \alpha$. Do you agree? Explain your answer. (7 marks)

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19. Let the coordinates of point G be $(8, -3)$, the equation of the straight line L is $5x - 12y + 2 = 0$. And $P(h, k)$ be an arbitrary point lying on straight line L .

(a) Express GP^2 in terms of k . Hence, using the method of completing the square, find the minimum value of GP^2 . (4 marks)

(b) The centre of the circle C is G and the circle touches L . The straight line l cuts C at A and B with $AB = 8\sqrt{2}$.

(i) Find the equation of C .

(ii) It is given that G is the circumcentre of $\triangle ABK$, find $\angle AKB$. If $\triangle ABK$ is an acute-angled isosceles triangle with $KA = KB$, find the radius of the inscribed circle of $\triangle ABK$.

(7 marks)

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