

# MATHEMATICS PAPER 1 Question-Answer Book

8.30 am - 10.30 am (2 hours)
This paper must be answered in English

- 1. Write your Candidate Number, Centre Number and Seat Number in the spaces provided on this cover.
- 2. This paper consists of THREE sections, A(1), A(2) and B. Each section carries 33 marks.
- 3. Attempt ALL questions in Sections A(1) and A(2), and any THREE questions in Section B. Write your answers in the spaces provided in this Question-Answer Book. Supplementary answer sheets will be supplied on request. Write your Candidate Number on each sheet and fasten them with string inside this book.
- 4. Write the question numbers of the questions you have attempted in Section B in the spaces provided on this cover.
- 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.

Candidate Number					
Centre Number					
Seat Number					

	Marker's Use Only	Examiner's Use Only
	Marker No.	Examiner No.
Section A Question No.	Marks	Marks
1–3		
4–5		
6–7		
8		
9		
10		
11		
12		
13		
Section A Total		

Checker's	Section A Total	
Use Only	Section A Total	AI

Section B Question No.*	Marks	Marks
Section B Total		

<sup>\*</sup>To be filled in by the candidate.

Checker's Use Only	Section B	Total	
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Checker No.	
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SPHERE Surface area =  $4\pi r^2$ 

Volume =  $\frac{4}{3}\pi r^3$ 

CYLINDER Area of curved surface =  $2\pi rh$ 

Volume =  $\pi r^2 h$ 

CONE Area of curved surface =  $\pi rl$ 

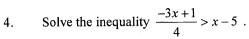
Volume =  $\frac{1}{3}\pi r^2 h$ 

PRISM Volume = base area × height

PYRAMID Volume =  $\frac{1}{3} \times \text{base area} \times \text{height}$ 

SECTION A(1) (33 marks)
Answer ALL questions in this section and write your answers in the spaces provided.

Make a the subject of the formula $P = ab + 2bc + 3ac$ .	(3 m
Simplify $\frac{(x^3y)^2}{y^5}$ and express your answer with positive indices.	(2
Simplify $\frac{5}{y^5}$ and express your answer with positive indices.	(3 m
	·
Factorize  (a) $4x^2 - 4xx + x^2$	
(a) $4x^2 - 4xy + y^2$ , (b) $4x^2 - 4xy + y^2 - 2x + y$ .	
(0) + x - +xy + y - 2x + y	(3 ma



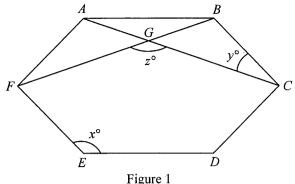
Also write down all integers which satisfy both the inequalities	$\frac{-3x+1}{4} > x-5$ and $2x+1$	≥0.
	4	(3 marks)
The ratio of the number of marbles owned by Susan to the num Susan has $n$ marbles. If Susan gives 18 of her own marbles to number of marbles. Find $n$ .	aber of marbles owned by Te to Teresa, both of them will	eresa is 5:2. have the same (3 marks)
		·····

5.

(a)	Find the marked price of the calculator.
(b)	If the calculator is sold at a 10 % discount on the marked price, find the percentage prof percentage loss.
	(4 ma
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	1st term and the 2nd term of an arithmetic sequence are 5 and 8 respectively. If the sum of
	1st term and the 2nd term of an arithmetic sequence are 5 and 8 respectively. If the sum of $n$ terms of the sequence is 3 925, find $n$ . (4 mag)
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8. In Figure 1, ABCDEF is a regular six-sided polygon. AC and BF intersect at G. Find x, y and z.



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9. In Figure 2, OABC is a sector with  $\widehat{ABC} = 10\pi$  cm.

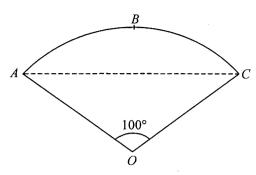


Figure 2

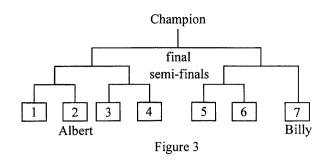
(a) Find OA.

b)	Find the area of segment $ABC$ .	(5 marks)



Section A(2) (33 marks)
Answer ALL questions in this section and write your answers in the spaces provided.

Let $g(x) = f(x) - 6$ .	
(i) Prove that $x-3$ is a factor of $g(x)$ .	
(ii) Factorize $g(x)$ .	(4
	(4 ma
_	Let $g(x) = f(x) - 6$ . (i) Prove that $x - 3$ is a factor of $g(x)$ .



Seven players take part in a men's singles tennis knock-out tournament. They are randomly assigned to the positions 1, 2, 3, 4, 5, 6 and 7. It is known that Albert and Billy are in positions 2 and 7 respectively. The winner of each game proceeds to the next round as shown in Figure 3 and the loser is knocked out. Billy goes straight to the semi-finals. In each game, each player has an equal chance of beating his opponent.

Write down the probability that Albert will reach the semi-finals.	(1 mark
Find the probability that Albert will be the champion.	(2 marks)
Find the probability that Albert will fail to reach the final.	(3 marks)
Find the probability that Albert will play against Billy in the final.	(2 marks)

12. Figure 4 shows a solid consisting of a right circular cone and a hemisphere with a common base. The height and the base radius of the cone are h cm and (h-4) cm respectively. It is known that the volume of the cone is equal to the volume of the hemisphere.

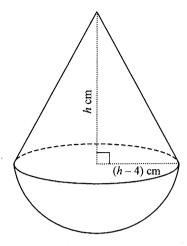


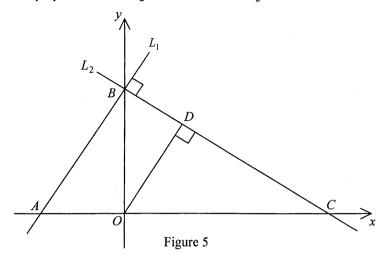
Figure 4

Find $h$ .			(3 n
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13. In Figure 5, the straight line  $L_1: 2x-y+4=0$  cuts the x-axis and the y-axis at A and B respectively. The straight line  $L_2$ , passing through B and perpendicular to  $L_1$ , cuts the x-axis at C. From the origin O, a straight line perpendicular to  $L_2$  is drawn to meet  $L_2$  at D.



Write down the coordinates of A and B.

(2 marks)

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Find the equation of  $L_2$  . (3 marks)

(a)

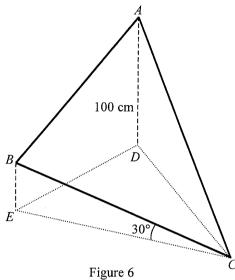
(b)

Find the ratio of the area of $\Delta ODC$ to the area of quadrilateral $OABD$ .	(4 marks)
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### **SECTION B (33 marks)**

Answer any THREE questions in this section and write your answers in the spaces provided. Each question carries 11 marks.

14.



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In Figure 6, a thin triangular board ABC is held with the vertex C on the horizontal ground. D and E are points on the ground vertically below A and B respectively. BC is inclined at an angle of  $30^{\circ}$  with the horizontal. It is known that  $AD = 100 \,\mathrm{cm}$ ,  $BC = 120 \,\mathrm{cm}$ ,  $\angle CAB = 60^{\circ}$  and  $\angle ABC = 80^{\circ}$ .

(a)	Find	BE	and	CE .
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(2 marks)

(b) Find AB and AC.

(3 marks)

(c	) Find ∠	∠CDE and the s	shortest distance	from $C$ to $D$	E	(6 marks)
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15.	The scores (in marks) obtained by a class of 20 students in a music test are shown below:								
			84 103 122 144	86 120 134 146	90 120 134 146	93 120 136 146	100 121 137 158		
	(a)	Find t	the mean, the	mean deviati	ion and the	standard de	eviation of the abo	ove scores.	(4 marks)
	(b)						dard score in the test? Explain yo		1 . Is Mary (3 marks)
	(c)	(i)					he probability th nusic test is 122		f the scores
		(ii)					he probability the nusic test is 122		
									(4 marks)
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16.	mont	hly. Fo a month	as a loan of \$200 000 from a bank at an interest rate of 6% per annum, compounded are each successive month after the day when the loan is taken, loan interest is calculated and ally instalment of $x$ is immediately paid to the bank until the loan is fully repaid (the last ay be less than $x$ ), where $x$ < 200 000.
	(a)	(i)	Find the loan interest for the 1st month.
		(ii)	Express, in terms of $x$ , the amount that Peter still owes the bank after paying the 1st instalment.
		(iii)	Prove that if Peter has not yet fully repaid the loan after paying the <i>n</i> th instalment, he still owes the bank $\{200\ 000(1.005)^n - 200x[(1.005)^n - 1]\}$ .
			(6 marks)
	(b)	Suppo \$ 1 80	ose that Peter's monthly instalment is $$1800$ ( the last instalment may be less than $0$ ).
		(i)	Find the number of months for Peter to fully repay the loan.
		(ii)	Peter wants to fully repay the loan with a smaller monthly instalment. He requests to pay a monthly instalment of \$900. However, the bank refuses his request. Why?
			(5 marks)
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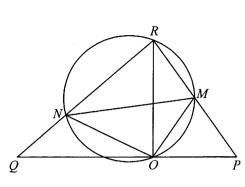


Figure 7(a)

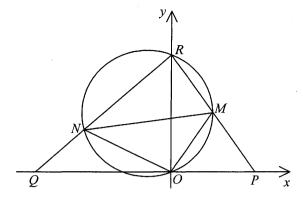


Figure 7(b)

- (a) In Figure 7(a), MN is a diameter of the circle MONR. The chord RO is perpendicular to the straight line POQ. RNQ and RMP are straight lines.
  - (i) By considering triangles OQR and ORP, prove that  $OR^2 = OP \cdot OQ$ .
  - (ii) Prove that  $\triangle MON \sim \triangle POR$ .

(5 marks)

- (b) A rectangular coordinate system, with O as the origin, is introduced to Figure 7(a) so that R lies on the positive y-axis and the coordinates of P and Q are (4, 0) and (-9, 0) respectively (see Figure 7(b)).
  - (i) Find the coordinates of R.
  - (ii) If the centre of the circle *MONR* lies in the second quadrant and  $ON = \frac{3\sqrt{13}}{2}$ , find the radius and the coordinates of the centre of the circle *MONR*.

(6 marks)

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