2024-2025 S5
1st TERM EXAM
MATH CP
PAPER 1

2024 – 2025
S5 First Term Examination

MATHEMATICS Compulsory Part

PAPER 1

Question–Answer Book

6th January, 2025
8:15 am – 10:00 am (1 hour 45 minutes)
This paper must be answered in English

INSTRUCTIONS

1. Write your name, class and class number in the spaces provided on this cover.

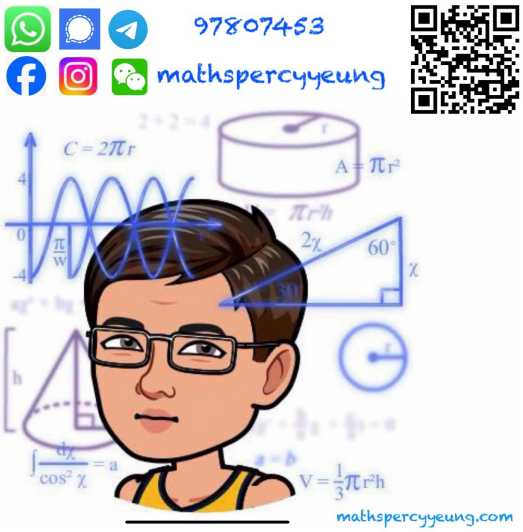
2. This paper consists of THREE sections, A(1), A(2) and B.

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. Unless otherwise specified, all working must be clearly shown.

5. Unless otherwise specified, numerical answers should be either exact or correct to 3 significant figures.

6. The diagrams in this paper are not necessarily drawn to scale.



Section	Marks
A (1 – 3)	/ 11
A (4 – 12)	/ 44
A Total	**/ 55**
B Total	**/ 27**
TOTAL	**/ 82**

Section A(1) (27 marks)

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

2. Factorize

   (a) $6m^2 - 13mn + 6n^2$,

   (b) $6m^2 - 13mn + 6n^2 - 9m + 6n$.

   (3 marks)

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3. The sum of the volumes of two spheres is 2592π cm^3. The radius of the larger sphere is equal to the diameter of the smaller sphere. Express, in terms of π,

(a) the volume of the larger sphere;

(b) the sum of the surface areas of the two spheres.

(5 marks)

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4. (a) Find the range of values of x which satisfy both $\frac{x-1}{3} > \frac{x}{4}$ and $3(2x-1) \geq 15$.

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

(4 marks)

5. The length and the breadth of a rectangle are 12 cm and $(20+r)\text{ cm}$ respectively. If the length of a diagonal of the rectangle is $(8-3r)\text{ cm}$, find r . (3 marks)

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6. Let $g(x)=4x^2+12x+c$, where c is a constant. The equation $g(x)=0$ has equal roots. Find

(a) c ;

(b) the x-intercept(s) of the graph of $y=g(x)-169$.

(5 marks)

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7. In Figure 1, PR is a diameter of the circle $PQRS$. Denote the point of intersection of PR and QS by T.

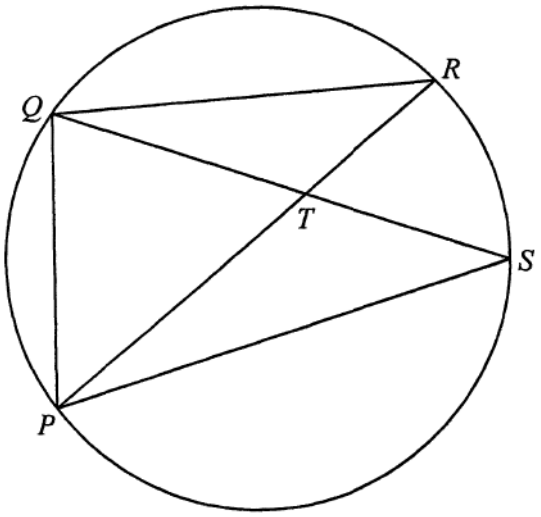

Figure 1

If $\angle PSQ = 41°$ and $\angle PTQ = 68°$, find $\angle RQS$ and $\angle PQS$. (4 marks)

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Section A(2) (28 marks)

8. Let $\$C$ be the cost of manufacturing a cubical flower pot of side s cm. It is given that C is partly constant and partly varies as the square of s. When $s=12$, $C=100$ and when $s=20$, $C=228$.

   (a) Find the cost of manufacturing a cubical flower pot of side 15 cm. (4 marks)

   (b) If the cost of manufacturing a cubical flower pot is $\$60$, find the length of a side of the flower pot. (2 marks)

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9. Let $f(x)=2x(x+1)^2+hx+k$, where h and k are constants. It is given that $x+4$ is a factor of $f(x)$. When $f(x)$ is divided by $x-1$, the remainder is $2h+47$.

(a) Find h and k . (3 marks)

(b) Andy claims that the equation $f(x)=0$ has only one real root. Do you agree? Explain your answer. (4 marks)

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10. Two identical solid metal right circular cylinders of base radius R cm and height 18 cm are melted and recast into 75 smaller identical solid right circular cylinders of base radius r cm. It is given that the base area of a larger circular cylinder is 25 times that of a smaller one.

(a) Find

(i) $r : R$,

(ii) the height of a smaller circular cylinder.

(5 marks)

(b) Someone claims that a smaller circular cylinder and a larger circular cylinder are similar. Do you agree? Explain your answer. (2 marks)

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11. In Figure 2, O is the centre of circle $ABCDE$. AC is a diameter of the circle. BD and OC intersect at the point F. It is given that $\angle AED = 115°$.

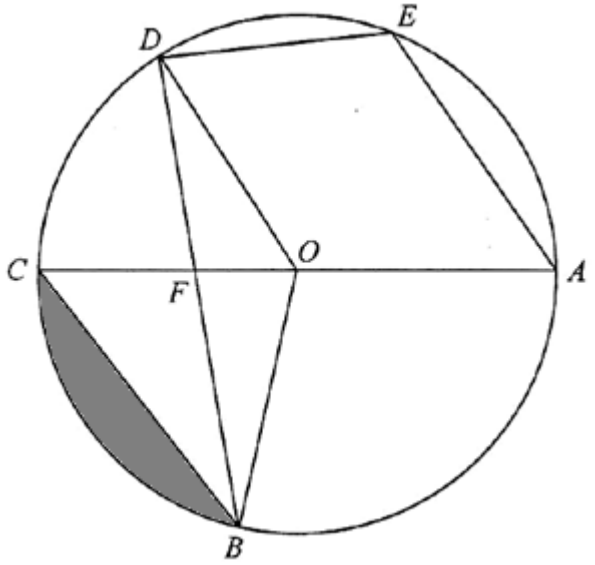

Figure 2

(a) Find $\angle CBF$. (2 marks)

(b) Suppose that $BC // OD$ and $OB = 18\text{ cm}$. Is the perimeter of the sector OBC less than 60 cm? Explain your answer. (4 marks)

(c) Find the area of the shaded region. (2 marks)

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Section B (27 marks)

12. (a) Find the greatest integral value of n such that $n^2 - 3n - 54 < 0$. (2 marks)

(b) Using (a), find the greatest integral value of k such that $(\log_2 k)^2 - \log_2 k^3 - 54 < 0$. (3 marks)

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13. In Figure 3, the equations of the straight lines L_1 and L_2 are $x=16$ and $y=6$ respectively. The straight lines L_3 and L_4 are perpendicular to each other. L_2 and L_3 intersect at $(9,6)$. L_3 and L_4 intersect at $(6,-4)$.

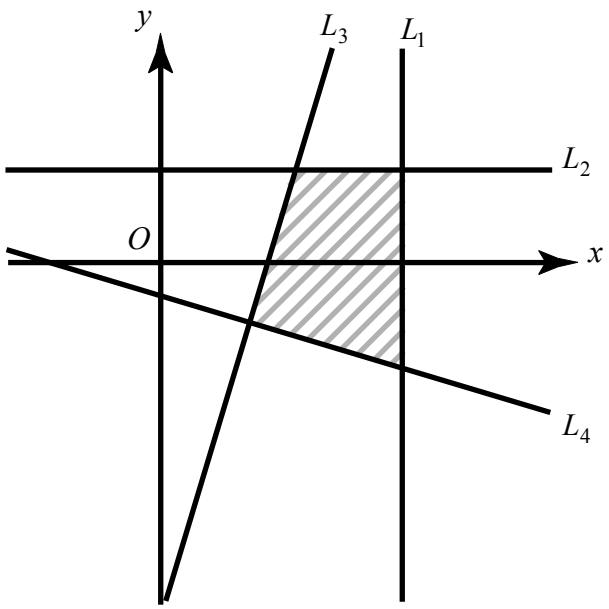

Figure 3

(a) Find the equations of L_3 and L_4. (4 marks)

(b) The shaded region (including the boundary) in the figure represents the solution of a system of inequalities. Write down the system of inequalities. (2 marks)

(c) Find the maximum and the minimum values of $P=10y-3x-8$, where (x, y) is a point lying in the shaded region. (5 marks)

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14. (a) Figure 4(a) shows a metal sheet ABC where $AB = 12$ cm, $AC = 18$ cm and $\angle ABC = 50°$. D is a point lying on BC such that $AD \perp BC$.

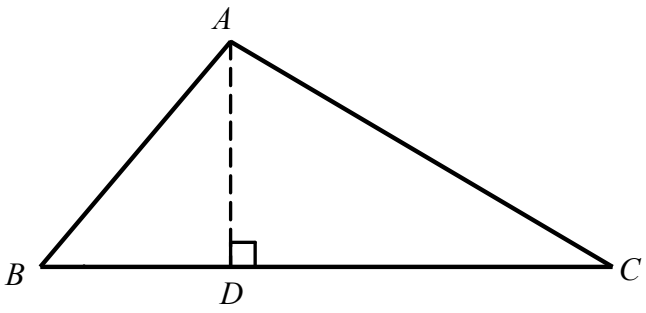

Figure 4(a)

(i) Find BD.

(ii) Find $\angle ACB$.

(iii) Find DC.

(4 marks)

(b) In Figure 4(b), the metal sheet in (a) is folded along AD such that $\angle BAC = 45°$, and then is put on the table. A, B and C lie on the tabletop.

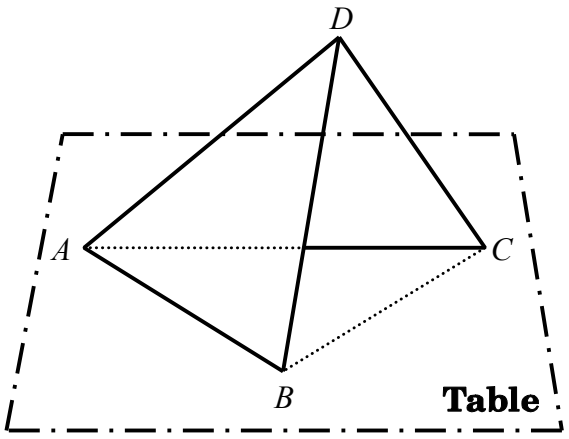

Figure 4(b)

(i) Find the distance between B and C on the table.

(ii) Find the angle between the planes ABD and ACD.

(iii) Find the shortest distance from D to the line BC.

(7 marks)

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