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

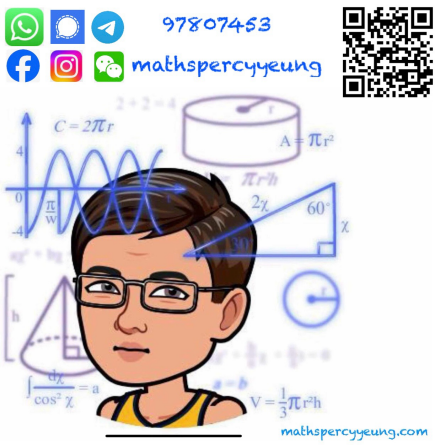
2024 – 2025
S5 First Term Uniform Test

MATHEMATICS Compulsory Part

PAPER 1

Question–Answer Book

29th October, 2024
9:45 am – 10:45 am (1 hour)
This paper must be answered in English



Sections	Marks
A (1 – 2)	
A (3 – 6)	
A Total	**/26**
B Total	**/24**
TOTAL	**/50**

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 A(1) (11 marks)

1. Simplify $\dfrac{(-3mn^2)^{-2}}{6^{-1}m^{-3}n}$ and express your answer with positive indices. (3 marks)

2. (a) Factorize $6x^2 - 5xy - 6y^2$.

   (b) Hence, or otherwise, factorize $6x^2 - 5xy - 6y^2 - 2mx + 3my$.

(4 marks)

3. (a) Find the range of values of x which satisfy both $\dfrac{3-5x}{4} \geq 2 - x$ and $3x + 24 > 0$.

   (b) How many integers satisfy the compound inequalities in (a)?

(4 marks)

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Section A(2) (15 marks)

4. In Figure 1, $ABCD$ is a cyclic quadrilateral where $\angle BCD = 96°$ and $\overset{\frown}{AB} : \overset{\frown}{BC} : \overset{\frown}{CD} = 2:1:3$.

   Find $\angle ADC$. (4 marks)

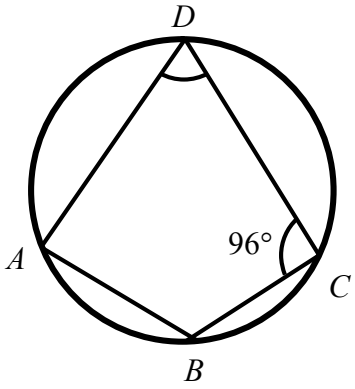

Figure 1

Answers written in the margins will not be marked

5. When the polynomial $f(x) = ax^3 + 3x^2 - 11x + b$ is divided by $(x-1)$, the remainder is -12. $f(x)$ is divisible by $(x+3)$.

(a) Find the values of *a* and *b.*

(b) Someone claims that all the roots of $f(x) = 0$ are integers. Do you agree? Explain briefly.

(5 marks)

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6. In Figure 2a, a circle C_1 of radius 8 cm is inscribed in a square. A smaller circle C_2 of radius r cm touches the larger circle C_1 and two sides of the square.

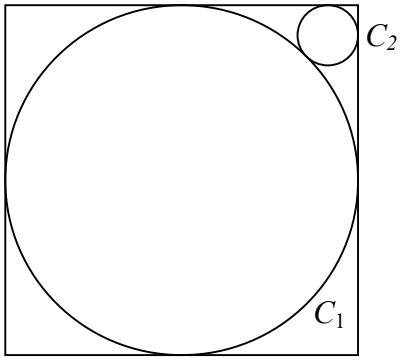

Figure 2a

(a) Prove that $r^2 - 48r + 64 = 0$. (3 marks)

(b) In Figure 2b, the solid cylinders X and Y are formed with bases C_1 and C_2 respectively. If X and Y are similar solids and the volume of Y is 10 cm^3. Find the volume of X, correct to the nearest cm^3. (3 marks)

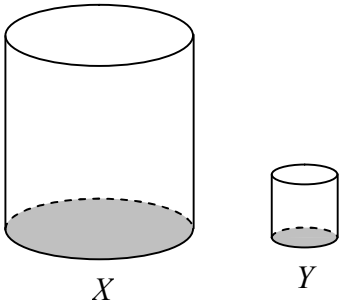

Figure 2b

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Section B (24 marks)

7. In Figure 3, AB is a diameter of the circle ADB and ABC is an isosceles triangle with $AB = AC$. BDC is a straight line.

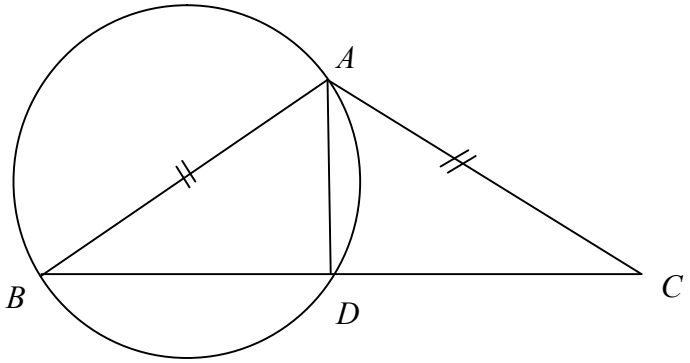

Figure 3

(a) Prove that ΔABD and ΔACD are congruent. (2 marks)

The tangent to the circle at D cuts AC at the point E.

(b) Prove that ΔABD and ΔADE are similar. (2 marks)

(c) Given $AB = 5$ and $BD = 4$.

(i) Find DE.

(ii) CA is produced to meet the circle at the point F. Find AF.

(5 marks)

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8. Given two curves $C_1 : y = -\frac{1}{4}x^2 + 2x + m$ and $C_2 : y = -\frac{1}{5}x^2 - (\frac{h-20}{10})x + h$, where m and h are real numbers. C_1 passes through the point (10, 0).

(a) (i) Find the value of m.

(ii) Hence, find the vertex of C_1. (3 marks)

(b) (i) Show that C_2 also passes through the point (10, 0).

(ii) If C_1 and C_2 meet at two points, find, in terms of h, the x-coordinate of the point other than (10, 0).

(6 marks)

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9. The x-intercepts of the graph of $y = x^2 - (k-2)x + k + 1$ are α and β, where k is a real number and $\alpha \neq \beta$.

(a) Find the range of possible values of k. (3 marks)

(b) Hence, if $-5 < \alpha\beta < 5$, find the range of possible values of k. (3 marks)

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END OF PAPER