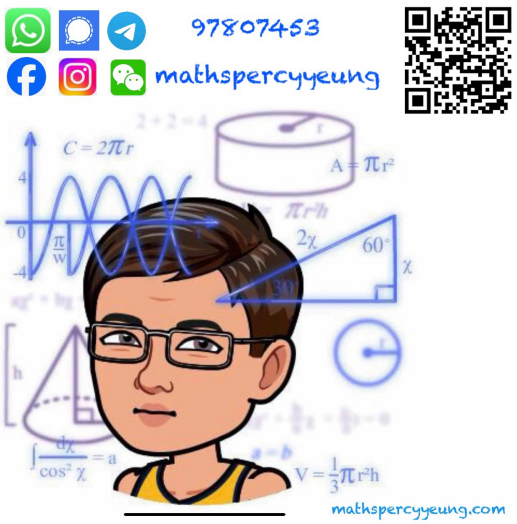
2023-2024 S4
2nd TERM EXAM
MATH CP
PAPER 1



2023 – 2024
S4 Second Term Examination

MATHEMATICS Compulsory Part

PAPER 1

Question–Answer Book

11th June, 2024
8:15 am – 9:45 am (1 hour 30 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.

Sections	Marks
A (1 – 4)	
A (5 – 10)	
A Total	**/46**
B Total	**/24**
TOTAL	**/70**

Section A(1) (22 marks)

1. Simplify $\dfrac{(-5x^2)^3}{-25x^4}$ and express your answer with positive indices. (3 marks)

2. (a) Factorize $9-24y+16y^2$.
   (b) Hence, factorize $9-24y+16y^2+4y-3$. (4 marks)

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3. Make w the subject of the formula $\frac{2(w-1)}{7} = k^2 w$. (3 marks)

4. The total weight of 5 lemons and 3 oranges is 710 g whereas the total weight of 4 lemons and 5 oranges is 880 g. Find the total weight of 2 lemons and 4 oranges. (4 marks)

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5. It is given that $g(x) = x^2 + (k+1)x - k$ and $g(1) = g(-10)$, where k is a constant.

(a) Find the value of k.

(b) Find the negative integer n such that $2g(n) = g(n+2) + 6$.

(4 marks)

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6. In Figure 1, O is the centre of the circle $PSQR$. POR is a straight line. $PS = SQ$ and $\angle ROQ = 84°$. Find $\angle QPS$. (4 marks)

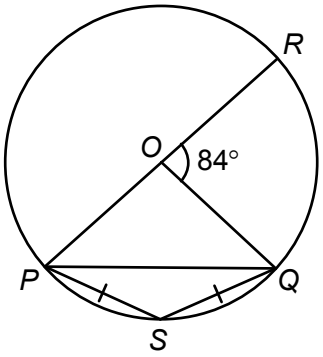

Figure 1

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Section A(2) (24 marks)

7. Let $f(x) = 8x^3 - kx^2 + 33x - 9$, where k is a constant. It is given that $x - 3$ is the factor of $f(x)$.

   (a) Find the value of k. (2 marks)

   (b) Someone claims that all roots of the equation $f(x) = 0$ are positive. Do you agree? Explain your answer. (4 marks)

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8. In Figure 2, O is the centre of the semi-circle. $ABCD$ is a trapezium with upper base of 6 cm and height of 4 cm. Let M be the mid-point of BC.

(a) Find the length of OB. (2 marks)

(b) Find the perimeter of the trapezium. (Give your answer correct to 3 significant figures.) (3 marks)

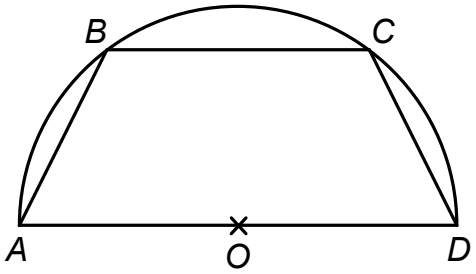

Figure 2

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9. A factory makes different kinds of chocolate. It is known that the cost ($\$C$) of making each pack of chocolate is the sum of two parts. One part varies directly as the square of the weight (m g) of cocoa beans used in each pack of chocolate. The other part varies inversely as the number of packs of chocolate made (r packs) and directly as the total number of machines (n) operated in making chocolate. When $m = 10$, $n = 40$ and $r = 20\ 000$, $C = 25$. When $m = 20$, $n = 3$ and $r = 2500$, $C = 32$.

(a) Express C in terms of m, n, and r. (4 marks)

(b) Given that $C = 40$, $r = 10\ 000$ and $n = 20$, find the value of m. (2 marks)

(c) Suggest ONE possible value for n and r respectively if $C = 100$ and $m = 40$. (1 mark)

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10. In Figure 3, the graph of $y = 2(x-h)^2 - 8$ with vertex V cuts the x-axis at A and $B(5, 0)$, where A lies on the left of B. Given that $y = 2(x-h)^2 - 8$ intersects the y-axis at C.

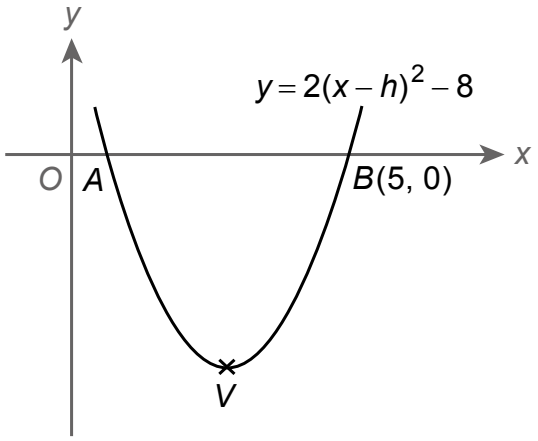

Figure 3

(a) Find the value(s) of h. (2 marks)

(b) Write down the coordinates of A. (1 mark)

(c) Find the area of quadrilateral $AVBC$. (3 marks)

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Section B (24 marks)

11. Solve the equation $(2^x)^2 - 7(2^x) + 6 = 0$. (4 marks)

12. Simplify $1 + \cos(270° + \theta)\sin(90° + \theta)\tan(180° - \theta)$. (3 marks)

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13. Figure 4 shows a linear relation between $\log_5 y$ and $\log_5 x$. If $y = ax^k$, find the values of k and a.

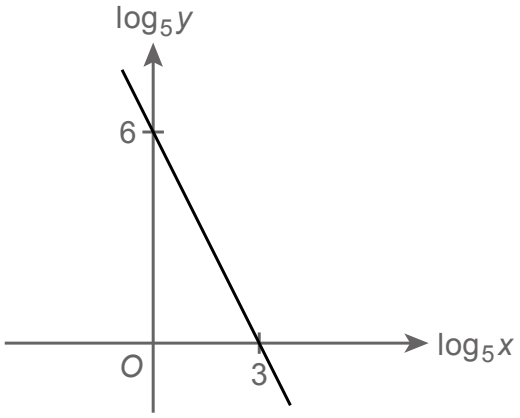

Figure 4

(4 marks)

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14. Solve $4\sin^2 x = \sin x$ for $0° \le x < 360°$.
(Give your answers correct to 1 decimal place if necessary.) (4 marks)

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15. In Figure 5, the straight lines L_1 and L_2: $3x + y - 6 = 0$ are perpendicular to each other and intersect at point P. The y-intercept of L_1 is 1 and L_1 cuts the x-axis at A.

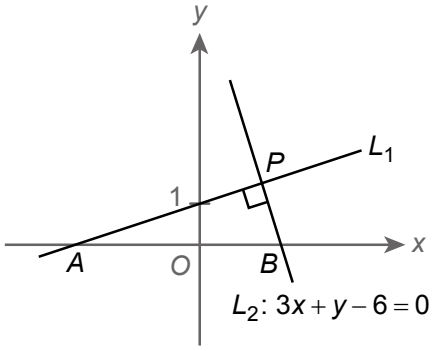

Figure 5

(a) Find the equation of L_1. (3 marks)

(b) Find the coordinates of P. (2 marks)

(c) Zoe claims that if L_2 cuts the x-axis at B, the area of ΔOAP is twice the area of ΔOBP. Do you agree? Explain your answer. (4 marks)

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