2022-2023-S4 2nd TERM EXAM-MATH-CP 1

2022-2023 S4 2nd TERM EXAM MATH CP PAPER 1

> 2022 – 2023 S4 Second Term Examination

MATHEMATICS Compulsory Part

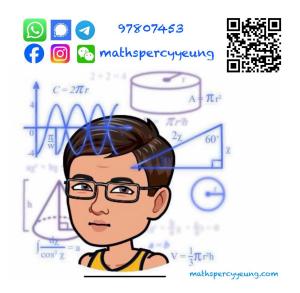
PAPER 1

Question–Answer Book

12th June, 2023 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.
- This paper consists of THREE sections, A(1), A(2) and B.
- 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 | /48 |
| B Total | /22 |
| TOTAL | /70 |

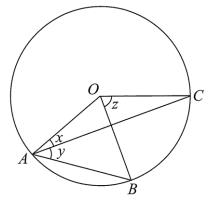
Section A(1) (23 marks) Simplify $\frac{(3a^3b^{-4}c^0)^2}{a^2b^{-2}}$ and express your answer with positive indices. 1. (3 marks) 2. Factorize (a) 2ab+4b, (b) $6a^2 + 8a - 8$, $2ab+4b-6a^2-8a+8$. (c) (4 marks)

| Make <i>y</i> the subject of the formula $py = -q(3+ry)$. | | (3 mar |
|--|--------------|---------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| The marked price of a painting is \$1200. In the discount of 70% on its marked price. | | |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 mar |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 marl |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 marl |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 marl |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 mar |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 mar) |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 mar) |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 mar] |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 mar) |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 marl |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 mar) |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 mar] |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | | (4 mar] |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 mar] |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | he painting. | (4 mar] |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | | (4 mar] |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | | (4 mar] |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | | (4 marl |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | | (4 mar] |
| discount of 70% on its marked price.(a) Find the selling price of the painting. | | (4 mar) |

| (a) | nsider the equation $3x^2 + 9x + k = 2$ which has two distinct real roots. Find the largest integral value of k. | |
|-----|---|----------|
| (b) | | |
| (0) | esting the value of <i>k</i> obtained in (<i>a</i>), solve the equation. | (4 marks |
| | | (+ marks |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

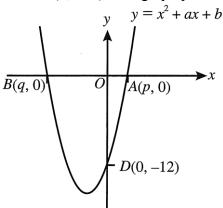
5.

6. In the figure, *O* is the centre of the circle. It is given that $\angle OBA = 50^{\circ}$ and $\angle OCA = 20^{\circ}$. Find *x*, *y* and *z*. (5 marks)



Section A(2) (25 marks)

7. The figure shows the graph of $y = f(x) = x^2 + ax + b$. It cuts the *x*-axis at A(p, 0) and B(q, 0) where p > q and cuts the *y*-axis at D(0, -12). The graph passes through the point (-5, -7).

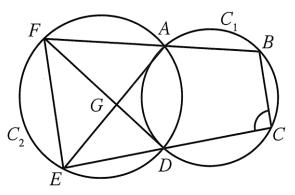


(a) Find the values of *a* and *b*.
(b) If a horizontal line passes through the *y*-intercept and cuts the graph of y = f(x) at another point *C*, find the area of the trapezium *ABCD*.
(5 marks)

| |
|------|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

8. In the figure, circles C_1 and C_2 intersect at A and D. *FAB* and *EDC* are straight lines. *AE* and *FD* intersect at G such that $\angle AGD = 94^\circ$. If $\angle ABC = 102^\circ$ and $\angle AED = 40^\circ$, find $\angle BCD$.

(4 marks)

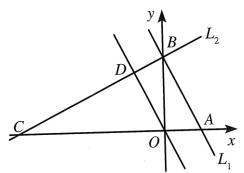


| | | |
|------|------|--|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| · / | Find the values of <i>a</i> and <i>b</i> . Simon claims that the equation $f(x) = 4x-2$ has 3 distinct real roots. D | (4 ma o you ag |
|-----|---|-------------------|
| | Explain your answer. | (3 ma |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| |
|------|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

10. The straight line L_1 : 2x + y - 10 = 0 cuts the *x*-axis and the *y*-axis at *A* and *B* respectively. The straight line L_2 cuts the *x*-axis at *C*. L_2 passes through *B* and is perpendicular to L_1 . A straight line perpendicular to L_2 from the origin *O* is drawn to meet L_2 at *D*.



(a) Write down the coordinates of A and B.(2 marks)(b) Find the equation of L_2 .(2 marks)(c) Find the ratio of the area of $\triangle ODC$ to the area of quadrilateral OABD.(3 marks)

| |
|------|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

| |
|------|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

| | Solve the logarithmic equation $\log_2(x+1) + \log_2(3x-2) = 3$. | (3 mark |
|---|---|---------|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| • | Solve the equation $3^{2x} + 2(3^x) = 3$. | (3 mark |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Answers written in the margins will not be marked

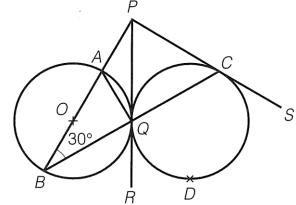
13. The graph below shows the linear relation between $\log_9 x$ and $\log_3 y$. The slope and the intercept on the horizontal axis of the graph are $\frac{4}{9}$ and 9 respectively. Express y in terms of x. (3 marks) $\log_3 y$ $\longrightarrow \log_9 x$ 0 9

Answers written in the margins will not be marked

Answers written in the margins will not be marked

2022-2023-S4 2nd TERM EXAM-MATH-CP 1-13

14. In the figure, the circles *ABQ* and *CDQ* touch externally at *Q* and *PQR* is a common tangent to the two circles. The straight line *PCS* is the tangent to circle *CDQ* at *C*. *O* is the centre of circle *ABQ*. *PAOB* and *BQC* are straight lines and $\angle ABQ = 30^{\circ}$.



(a) Find $\angle BPQ$.(3 marks)(b) Prove the $\triangle PQC$ is an equilateral triangle.(3 marks)(c) Prove that A, Q, C and P are concyclic.(2 marks)

| |
|------|
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |
| |

| 15. | (a) | Simplify $\frac{1-2i}{3+i}$ and express the answer in the form of $a+bi$. | (2 marks) |
|-----|-----|--|-----------|
| | (b) | Hence solve the equation $2i + (3+i)z = 5 - 8i$. | (3 marks) |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | END OF PAPER | |