

2024 – 2025

Final Examination

S.4 MATHEMATICS Compulsory Part

PAPER 1

Question-Answer Book

Time allowed: 2 hours 15 minutes

Full Marks: 100

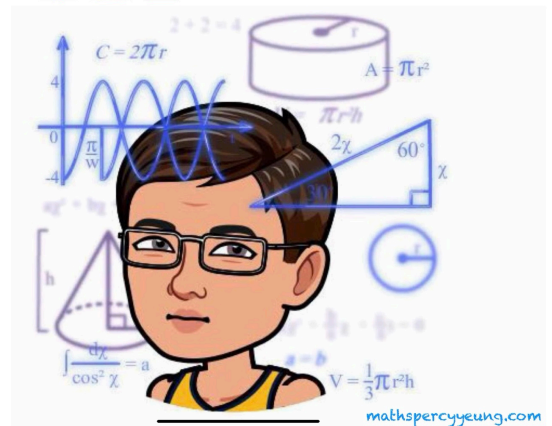
This paper must be answered in English

INSTRUCTIONS

- (1) Write your name, class and class number in the spaces provided.
- (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) Graph paper and supplementary answer sheets will be supplied on request. Write your name, class and class number in the spaces provided on each sheet and fasten them with string INSIDE this book.
- (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.
- (8) Only calculators with the “**H.K.E.A. APPROVED**” or “**H.K.E.A.A. APPROVED**” label are allowed in the examination.

Name	
Class	()

	Marker's Use Only
Question No.	Marks

[illegible]

SECTION A(1) (36 marks)

1. Simplify $\frac{(x^2y^{-4})^3}{x^7y^{-2}}$ and express your answer with positive indices. (3 marks)

.....

.....

.....

.....

.....

.....

2. Make n the subject of the formula $\frac{5}{m} - \frac{2}{n} = 6$. (3 marks)

.....

.....

.....

.....

.....

.....

.....

.....

3. Factorize
 (a) $a^3 - a^2b + 9a^2$,
 (b) $a^3 - a^2b + 9a^2 - a + b - 9$. (4 marks)

.....

.....

.....

.....

.....

.....

.....

.....

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2024 – 2025
Final Examination
S.4 Mathematics Compulsory Part Paper 1

Name: _____

S.4 _____ ()

4. Simplify $\frac{5}{k-5} + \frac{7}{4k+7}$.

(3 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

5. The cost of a table is \$990. If the table is sold at a discount of 40% on its marked price, then the percentage loss is 20%. Find the marked price of the table.

(4 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

6. In a farm, the ratio of the number of chickens to the number of ducks is $18 : 11$. If 30 chickens and 15 ducks are sold to a restaurant, then the ratio of the number of chickens to the number of ducks is $3 : 2$. Find the original number of ducks in the farm.

(4 marks)

[illegible]

7. The length and the breadth of a rectangle are $(30 + 2r)$ cm and $(10 - r)$ cm respectively. If the length of a diagonal of the rectangle is 25 cm, find r .

(3 marks)

[illegible]

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2024 – 2025
Final Examination
S.4 Mathematics Compulsory Part Paper 1

Name: _____

S.4 _____ ()

8. Solve $\sqrt{7} \cos \theta - 5 \sin \theta = 0$, where $0^\circ < \theta < 360^\circ$.

(3 marks)

.....

.....

.....

.....

.....

.....

.....

.....

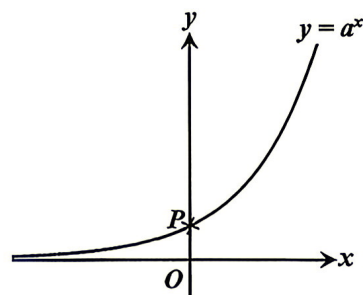
.....

.....

9. In the figure, the graph of the exponential function $y = a^x$ cuts the y-axis at the point P .

- (a) Write down the coordinates of P .
- (b) It is given that $a^2 - a - 6 = 0$. If the point $(2, k)$ lies on the graph of $y = a^x$, find the value of k .

(4 marks)



.....

.....

.....

.....

.....

.....

.....

.....

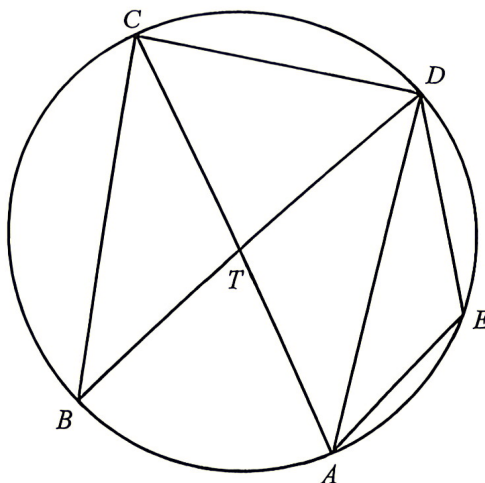
.....

.....

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.



6

2024 – 2025
Final Examination
S.4 Mathematics Compulsory Part Paper 1

Name: _____

S.4 _____ ()

SECTION A(2) (35 marks)

11. Let $g(x) = x^3 - ax^2 + bx + 2$, where a and b are positive integers, and $a > b$. It is given that $g(-1) = -3$.

(a) (i) Prove that $a + b = 4$.

(ii) Write down the values of a and b .

(3 marks)

(b) Let $R(x) = g(x) - f(x)$, where $f(x) = x^3 - 4x^2 - 5x - 7$. Find the number of points of intersection between the graph $y = R(x)$ and the x -axis.

(3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

12. It is given that $\sin \theta < 0$ and $\cos \theta = \frac{1}{k}$, where $k > 1$.
- (a) Write down the quadrant in which θ lies. (1 mark)
- (b) Express the values of $\sin \theta$ and $\tan \theta$ in terms of k . (3 marks)
- (c) Express the value of $\sin^2(360^\circ - \theta) + \frac{1}{\tan^2(270^\circ + \theta)}$ in terms of k . (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

S.4_____ ()

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

13. Let $f(x) = 6x^3 + 41x^2 + 52x - 53$. When $f(x)$ is divided by $3x^2 + ax - 6$, the quotient and the remainder are $2x + 9$ and $bx + c$ respectively, where a , b and c are constants.
- (a) Find a . (3 marks)
- (b) Let $g(x)$ be a quadratic polynomial such that when $g(x)$ is divided by $3x^2 + ax - 6$, the remainder is $bx + c$.
- (i) Prove that $f(x) - g(x)$ is divisible by $3x^2 + ax - 6$.
- (ii) Someone claims that all the roots of the equation $f(x) - g(x) = 0$ are integers. Do you agree? Explain your answer.

(5 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2024 – 2025
Final Examination
S.4 Mathematics Compulsory Part Paper 1

Name: _____

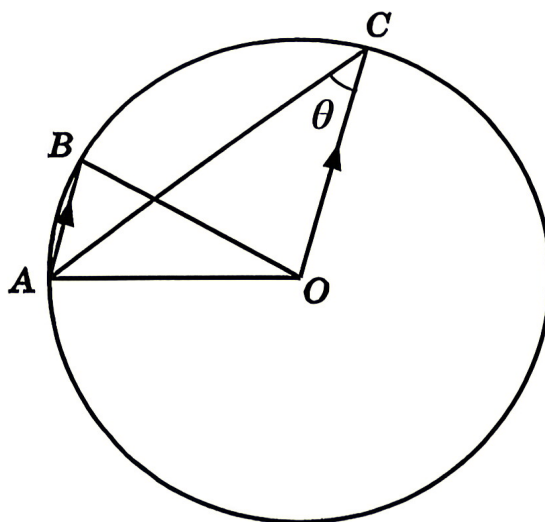
S.4 _____ ()

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.



- (a) Express $\angle BOC$ and $\angle AOB$ in terms of θ . (4 marks)
- (b) Is it possible that $\theta > 45^\circ$? Explain your answer. (2 marks)

[illegible]

Answers written in the margins will not be marked.

2024 – 2025
Final Examination
S.4 Mathematics Compulsory Part Paper 1

Name: _____

S.4 _____ ()

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

- (4 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2024 – 2025
Final Examination
S.4 Mathematics Compulsory Part Paper 1

Name: _____

S.4 _____ ()

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

SECTION B (29 marks)

16. (a) Let $f(x) = x^2 - 36x + 648$. Using the method of completing the square, find the coordinates of the vertex of the graph of $y = f(x)$. (2 marks)
- (b) A metal wire of length 36 cm is cut into two pieces. Each piece is bent into a square. The sum of the areas of the two squares is $A \text{ cm}^2$. Let $x \text{ cm}$ be the length of one of the two pieces.
- (i) Express A in terms of x .
- (ii) The cost of each cm^2 of a cloth is \$8. Sally puts the two square metal wires onto the cloth and then cuts two pieces of cloth away along the edges of the squares. Sally claims that the total cost of the two pieces of cloth is not less than \$324. Do you agree? Explain your answer.

(5 marks)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2024 – 2025
Final Examination
S.4 Mathematics Compulsory Part Paper 1

Name: _____

S.4 _____ ()

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

17. (a) Express $\frac{1}{2-3i}$ in the form of $p + qi$, where p and q are real numbers. (2 marks)
- (b) The roots of the quadratic equation $x^2 + ax + b = 0$ are $\frac{26}{2-3i}$ and $\frac{26}{2+3i}$. Find
- (i) a and b ,
- (ii) the range of values of c such that the quadratic equation $x^2 + ax + b = c$ has 2 distinct real roots.

(5 marks)

[illegible]

Answers written in the margins will not be marked.

2024 – 2025
Final Examination
S.4 Mathematics Compulsory Part Paper 1

Name: _____

S.4 _____ ()

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

18. For any positive integer n , let $p(n) = \frac{1}{n} - \frac{1}{n+1}$ and $q(n) = 7^{\frac{1}{n} - \frac{1}{n+1}}$.

- (a) Prove that $p(1) + p(2) + p(3) + \cdots + p(n) = \frac{n}{n+1}$. (2 marks)

- (b) Find the least value of n such that $\log_7 [q(1)q(2)q(3)\cdots q(n)] > 0.95$. (3 marks)

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

2024 – 2025
Final Examination
S.4 Mathematics Compulsory Part Paper 1

Name: _____

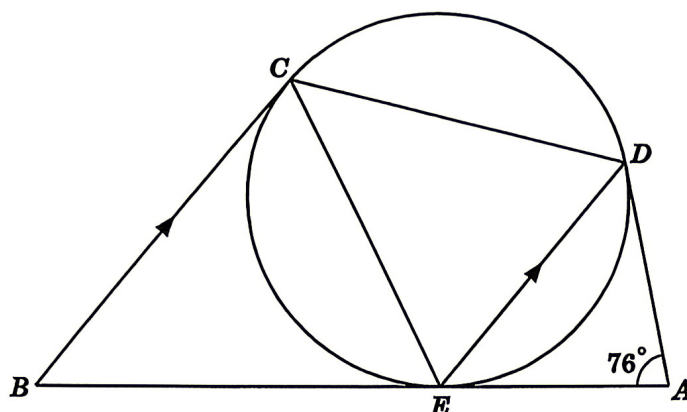
S.4 _____ ()

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.



- (a) Find $\angle BCE$. (4 marks)
- (b) Is $ABCD$ a cyclic quadrilateral? Explain your answer. (2 marks)
- (c) Let P be the mid-point of ED . Someone claims that C , P and A are collinear. Do you agree? Explain your answer. (4 marks)

Answers written in the margins will not be marked.

2024 – 2025
Final Examination
S.4 Mathematics Compulsory Part Paper 1

Name: _____

S.4 _____ ()

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

Answers written in the margins will not be marked.

End of Paper

Answers written in the margins will not be marked.