2024-2025 S5
2nd TERM EXAM
MATH CP
PAPER 1

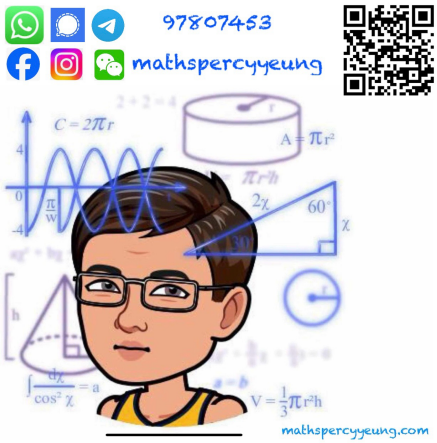
2024 – 2025
S5 Second Term Examination

MATHEMATICS Compulsory Part

PAPER 1

Question–Answer Book

11th June, 2025
8:15 am – 10:30 am (2 hours 15 minutes)
This paper must be answered in English



Sections	Marks
A (1 – 9)	
A (10 – 14)	
A Total	**/70**
B Total	**/35**
TOTAL	**/105**

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) (35 marks)

1. Simplify $\frac{4}{x-y}-\frac{2}{x}$. (3 marks)

2. Make y the subject of the formula $\frac{r-y}{s+y}=\frac{p}{q}$. (3 marks)

Answers written in the margins will not be marked

3. Factorize
   (a) $p^3 - p^2q - 9p^2$,
   (b) $p^3 - p^2q - 9p^2 - 4p + 4q + 36$.

(4 marks)

4. Let p and q be non-zero numbers. If $p : q = 2 : 3$ and the difference of subtracting $4q$ from 234 is $7p$, find the value of p. (3 marks)

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5. Consider the compound inequality

$$-3(2x+3) > 16 - x \text{ and } 3 - 7x > -5 \quad \ldots\ldots \text{ (*)}$$

(a) Solve (*).

(b) Write down the greatest integer satisfying (*).

(4 marks)

6. A pair of shoes is sold at a discount of 20% on its marked price. The selling price of the pair of shoes is \$540.

(a) Find the marked price of the pair of shoes.

(b) If the cost of the pair of shoes is \$600, find the percentage loss.

(4 marks)

Answers written in the margins will not be marked

7. The weight of a pen is measured as 10g, correct to 2 significant figures. Clara claims that the total weight of 300 pens can be measured as 3200g, correct to the nearest 100g. Is her claim correct? Explain your answer. (4 marks)

8. In Figure 1, $BECF$ is a straight line and $\Delta ABC \cong \Delta DEF$. Given that $BE = 3$ cm and $EC = 2$ cm.

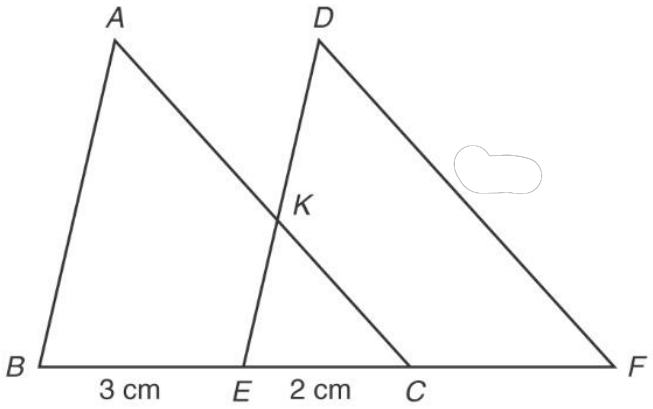

Figure 1

(a) Prove that $\Delta KEC \sim \Delta DEF$.

(b) Given that the area of ΔKEC is 4 cm^2. Find the area of $DKCF$.

(5 marks)

Answers written in the margins will not be marked

9. The table below shows the distribution of the numbers of children in a group of families, where a is a positive integer.

Number of children	0	1	2	3	4
Number of families	5	3	4	a	3

It is given that the mean number of children in the families is 1.9.

(a) Find a. Hence, write down the median of the distribution.

(b) Find the standard deviation of the numbers of children in the families.

(c) If a family is randomly selected from the group, find the probability that the chosen family has more than 2 children.

(5 marks)

Answers written in the margins will not be marked

Section A(2) (35 marks)

10. $f(x)$ is partly constant and partly varies as $(x-1)^2$. It is given that $f(0)=6$ and $f(4)=-10$.

(a) Find $f(x)$. (3 marks)

(b) If V is the vertex of the graph of $y=f(x)$, and the graph cuts the x-axis at A and B, find the area of $\triangle VAB$. (4 marks)

Answers written in the margins will not be marked

11. An inverted right circular conical vessel of base radius 18 cm and height 24 cm contains water to a depth of 8 cm.

(a) (i) Find the radius of the water surface.

(ii) Find the volume of the water inside the vessel. (Leave your answer in terms of π)

(4 marks)

(b) Now the vessel is turned upside down. Find the new depth of water, correct to 1 decimal place. (2 marks)

Answers written in the margins will not be marked

12. Let $p(x)$ be a polynomial and r be a non-zero constant. When $p(x)$ is divided by $x+r$, the quotient is $x^2-rx+2r^2$ and the remainder is $-4r^3$.

(a) Prove that $p(x)$ is divisible by $x-r$. (3 marks)

(b) Ray claims that all the roots of the equation $p(x) = 0$ are real numbers. Do you agree? Explain your answer. (4 marks)

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13 The coordinates of points A and B are (2, 16) and $(-4, 18)$ respectively. The circle C passes through A and B and intersects the x-axis at the points P and Q. It is given that $\angle ABP = 90°$.

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

(b) Find the equation of C. (2 marks)

(c) Let R be a moving point in the rectangular coordinate plane such that R is equidistant from P and Q. Denote the locus of R by Γ.

(i) Describe the geometric relationship between Γ and PQ.

(ii) Suppose that Γ cuts the x-axis at point D. Someone claims that the area of ΔADQ is the same as the area of ΔABQ. Do you agree? Explain your answer.

(4 marks)

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14. The stem-and-leaf diagram below shows the distribution of weights (in kg) of 24 ladies before joining a keep fit programme:

Stem (tens)	Leaf (units)
6	*a* *a*
7	1 2 3 *b* 8 8 8 9
8	1 2 2 3 4 5 7 8 8 9
9	3 4 7 *c*

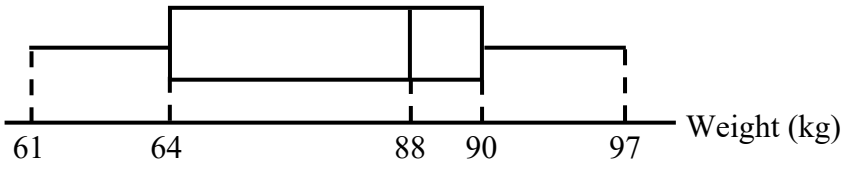
It is given that the inter-quartile range of the distribution is 12 kg.

(a) Find *b*. (2 marks)

(b) It is given that the range of the distribution is less than 33 kg.

(i) Find the minimum value of *a*.

(ii) The box-and-whisker diagram below shows the distribution of weights (in kg) of the same group of ladies after the programme.



The manager claims that at least 25% of the participants have lost weights in the programme. Do you agree? Explain your answer.

(5 marks)

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Section B (35 marks)

15. 11 gentlemen and 9 ladies joined a competition. At the beginning, 5 participants are randomly selected to form a team.

    (a) How many different teams can be formed? (1 mark)

    (b) Find the probability that there are more gentlemen than ladies in the team. (2 marks)

16. (a) Given that $2\log_2 x - \log_2(xy) = 1$, where $x, y > 0$. Express x in terms of y. (3 marks)

    (b) Hence, solve $\begin{cases} \log_2(xy) = 2\log_2 x - 1 \\ \log_3(2x - y) = 2 \end{cases}$. (3 marks)

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17. In Figure 2, the region $OPQR$ is a quadrilateral bounded by the lines L_1, L_2 and the two coordinate axes. The coordinates of P and R are (0, 9) and (6, 0) respectively. The equations of L_1 and L_2 are $hx - y = 18$ and $3x + ky = 72$ respectively, where h and k are constants.

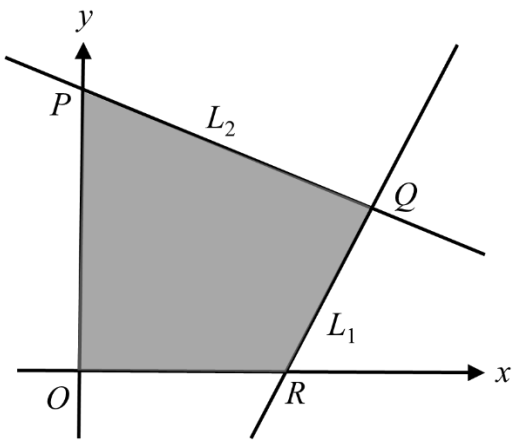

Figure 2

(a) Find the values of h and k. (2 marks)

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

(c) Write down the system of inequalities whose solutions are represented by the quadrilateral $OPQR$. (2 marks)

(d) If (x, y) is a point lying in quadrilateral $OPQR$, show that $3x + 2y \leq 36$. (3 marks)

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18. In Figure 3, $ABCD$ is a paper card. It is given that ACD is an equilateral triangle of side 24 cm, $BC = 23$ cm and $\angle ABC = 70°$.

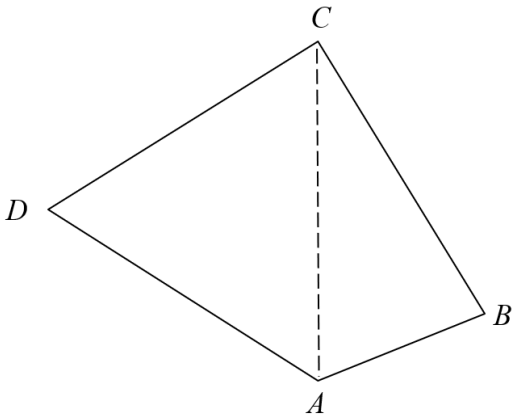

Figure 3

(a) Find

(i) $\angle BAC$,

(ii) the shortest distance from B to AC.

(3 marks)

(b) The paper card is folded along AC such that AB and AD lie on the horizontal ground as shown in Figure 4. It is given that $\angle BAD = 45°$.

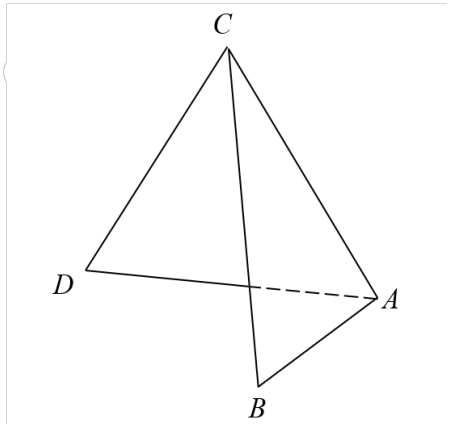

Figure 4

Find the angle between the plane ABC and the plane ACD. (5 marks)

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19. There are 8 seats in a row in a conference room. 5 people go in the conference room, where one of them is the manager and one of them is the assistant manager. If these 5 people sit randomly, find the probabilities of the following events.

(a) Both the manager and the assistant manager sit at the two ends of the row of seats. (2 marks)

(b) Both the manager and the assistant manager do not sit at the two ends of the row of seats. (2 marks)

(c) The manager and the assistant manager sit next to each other. (2 marks)

(d) The manager and the assistant manager sit next to each other given that both of them do not sit at the two ends of the row of seats. (3 marks)

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