2024-2025 S6
1st TERM UT
MATH CP
PAPER 1

2024 – 2025
S6 First Term Uniform Test

MATHEMATICS Compulsory Part

PAPER 1

Question–Answer Book

29th October, 2024
10:00 am – 11:30 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.

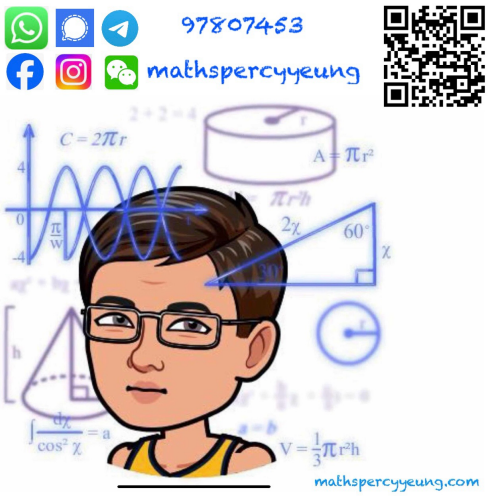
2. This paper consists of THREE sections, A(1), A(2) and B.

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 – 5)	
A (6 – 10)	
A Total	**/47**
B Total	**/25**
TOTAL	**/72**

Section A(1) (21 marks)

1. Simplify $(\alpha^5\beta)(\alpha^{-3}\beta^3)^{-7}$ and express your answer with positive indices. (3 marks)

2. Factorize the following.

(a) $32a^3 - 16a^2b$

(b) $32a^3 - 16a^2b - 18ab^2 + 9b^3$

(4 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

3. A bottle of green tea is termed *standard* if the volume of the green tea in the bottle is measured as 500 mL correct to the nearest 10 mL.

(a) Find the upper limit of the volume of the green tea in a *standard* bottle.

(b) Is it possible that the total volume of the green tea in 16 *standard* bottles is measured as 8.2L correct to the nearest 0.1L? Explain your answer.

(3 marks)

4. In a box, the ratio of the number of silver coins to the number of gold coins is $7:5$. If 6 more silver coins and 5 more gold coins are put into the box, the ratio of the number of silver coins to the number of gold coins is $4:3$. Find the original number of gold coins in the box.

(3 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

5. The radius and the area of a sector are 18 cm and 36π cm^2 respectively.

(a) Find the angle of the sector.

(b) If the sector is folded into a conical vessel, find the radius of the vessel.

(4 marks)

6. Consider the compound inequality

$$-4(2x+3) < x+6 \quad \text{or} \quad x+6 \geq 9 \quad \text{…….(*)}$$

(a) Solve (*).

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

(4 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

Section A(2) (26 marks)

7. It is given that $f(x)$ is the sum of two parts, one part varies as x^2 and the other part varies as x. Suppose that $f(1) = -12$ and $f(-2) = 96$.

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

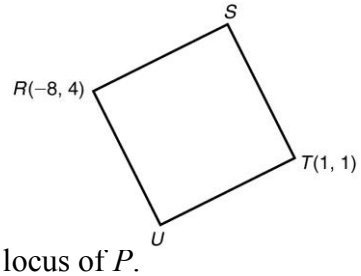
(b) Find the x-intercept(s) of the graph of $y = \frac{1}{2}f(x)$. (2 marks)

(c) Let k be a real constant. Find the range of values of k such that the equation $f(x) = k$ has no real roots. (2 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

8. In the figure, $RUTS$ is a square, where the coordinates of R and T are $(-8, 4)$ and $(1, 1)$ respectively. If P and Q are moving points such that $PR = PT$ and $QR \perp QT$.



(a) Find the equation of the locus of P. (2 marks)

(b) Find the equation of the locus of Q. (2 marks)

(c) Hence, or otherwise, find the coordinates of S and U. (3 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

9. It is given that $S(k)$ is the sum of the first k terms of the arithmetic sequence 83, 72, 61, 50, ...

(a) How many positive terms are there in the sequence? (2 marks)

(b) Find the maximum value of $S(k)$. (2 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

10. A circle $C : x^2 + y^2 + 6x + 2y + 5 = 0$ with centre G and a line $L : x + 3y + 1 = 0$ intersect at A and B, where A is on the right of B.

(a) Find the coordinates of A and B. (3 marks)

(b) Show that $\angle AGB = 90°$. (3 marks)

(c) Find the equation of the circle C_1 with AB as diameter. (2 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

Section B (25 marks)

11. A bag contains 6 yellow marbles and 10 green marbles. If 5 marbles are randomly selected from the bag at the same time, find the probabilities that

(a) at least 3 yellow marbles are selected, (2 marks)

(b) at least 3 green marbles are selected. (2 marks)

12. The following table shows the means and the standard deviations of the marks of David's class in two quizzes. David gets 60 marks in both quizzes and it is given that the standard score of David in both quizzes are the same.

	Quiz 1	**Quiz 2**
Mean	a	76
Standard deviation	4	b

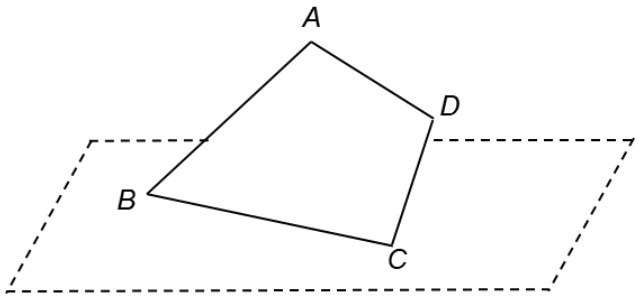
(a) If $a = 4b$, find the values of a and b. (3 marks)

(b) If Alex, a classmate of David, gets 76 marks in quiz 1 and a marks in quiz 2, find his standard scores in both quizzes. Hence, determine which quiz Alex performs better in. (2 marks)

Answers written in the margins will not be marked

Answers written in the margins will not be marked

13. $ABCD$ is a quadrilateral paper card, where $AB = BC = 14$ cm, $AD = 10$ cm, $\angle BAD = 80°$ and $\angle BCD = 90°$. The paper card is held with BC lying on the horizontal ground as shown in the figure.



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

(b) Find the area of the paper card. (2 marks)

(c) It is given that the angle between the paper card and the horizontal ground is $30°$.

(i) Find $\angle ABD$ and $\angle CBD$. Hence, find the shortest distance from A to BC.

(ii) It is given that the shortest distance from A to the horizontal ground is 6.39 cm. Someone claims that the angle between AB and the horizontal ground is greater than 25°. Do you agree? Explain your answer.

(6 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

14. The value of a car is \$270 000 in 2011 and its value decreases at a constant rate of 9% each year. Let $\$V_n$ be the value of the car after n years.

(a) **(i)** Express V_n in terms of n.

(ii) Find the value of the car in 2023. (Give your answer correct to the nearest dollar.)

(3 marks)

(b) In which year will the value of the car drop below half its value in 2011? (3 marks)

END OF PAPER

Answers written in the margins will not be marked

Answers written in the margins will not be marked