S3 First Term Uniform Test (2025-2026)
Mathematics
(1 hour)

Date: 24th October 2025 Name: _____

Time: 9:45 a.m. – 10:45 a.m. Class: _____ No.:_____

Instructions to students:

1. This paper consists of TWO parts, Conventional Questions and Bonus Question. There are Section A and Section B in Conventional Questions. Section A carries 53 marks, Section B carries 11 marks and Bonus Question carries 4 marks.

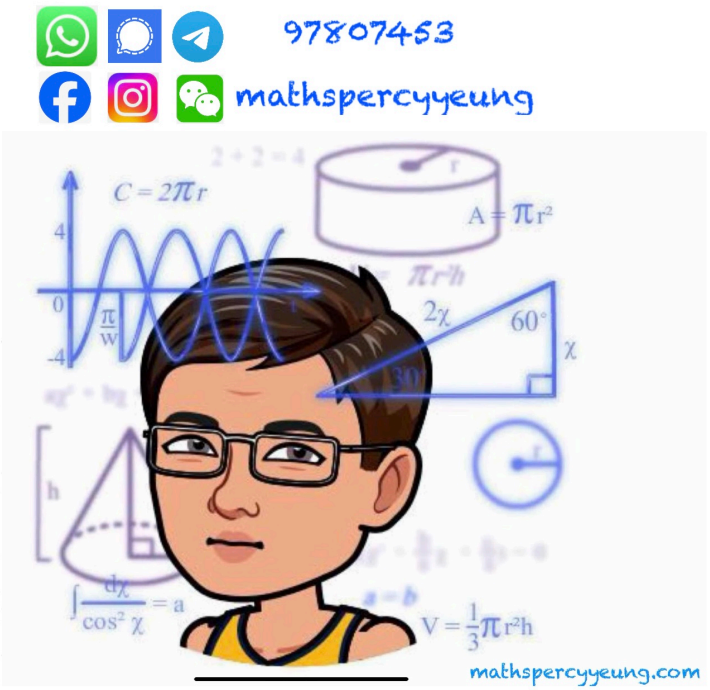
2. The maximum score of this paper is 64.

3. Attempt ALL questions in Conventional Questions. Write your answers in the spaces provided in this Question / Answer Book.

4. Unless otherwise specified, show your workings clearly.

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.



Conventional Questions

Section A (53 marks)

1. Make y the subject of the formula $4x = \dfrac{5x-y}{2y-5}$. (3 marks)

2. Simplify the following expressions and express the answers with positive indices.

(a) $\dfrac{4(b^3)^{-2}}{8b^5}$ (b) $\dfrac{(5x^{-3})^2(125x^5)^{-2}}{(25x^9)^{-3}}$ (c) $\left(\dfrac{6m^2n^{-4}}{m^{-3}n^2}\right)^2 \div \left(\dfrac{12m^5n^{-2}}{n^3}\right)$ (8 marks)

3. Factorize

(a) $6x^2 - 13xy + 6y^2$,

(b) $6x^2 - 13xy + 6y^2 - 6x + 9y$. (3 marks)

4. (a) Solve the inequality $\frac{1}{2} - \frac{x+2}{3} \leq \frac{3-x}{4}$ and represent the solutions graphically.

(b) Write down all negative even integers satisfying the inequality in part (a).

(4 marks)

5. Without using a calculator, evaluate the following expressions and express the answers in scientific notation.

(a) $(3 \times 10^{-7}) \div (4 \times 10^{-3})$ (b) $\dfrac{0.000\,000\,048 - 0.000\,000\,12}{900\,000 \times 2\,000\,000}$ (4 marks)

6. (a) Without using a calculator, convert 2355_{10} into a binary number.

(b) Without using a calculator, express $3 \times 2^9 + 5 \times 2^6 - 2^5 + 2^0$ as a binary number.

(5 marks)

7. In bottle A, 20% of the liquid is alcohol. In bottle B, 60% of the liquid is alcohol. 750 mL of the liquid in bottle A is mixed with the liquid in bottle B. If the mixture contains at least 50% of alcohol, find the minimum possible volume of the liquid in bottle B.

(4 marks)

8. A residential flat was worth \$4 500 000 in 2023. The value of the flat increased by 10% per year in the following two years and then increased by 8% in each subsequent year.
   (a) Find the value of the flat in 2025.
   (b) Find the value of the flat in 2027.

(4 marks)

9. Felix deposited \$32 000 in bank P at a simple interest rate of 3.5% p.a. Gary deposited \$32 000 in bank Q at an interest rate of 3% p.a., compounded quarterly. Gary claims that he will receive a larger amount than Felix after 12 years. Do you agree? Explain your answer.

(4 marks)

10. Sally borrows a sum of money from a bank at an interest rate of 3% p.a., compounded half-yearly and then invests the sum of money in a bond. The value of her investment increases by 3.5% per year. After 2 years, she repays the loan that she owes the bank and she earns \$2367. How much does Sally borrow?

(4 marks)

11. The table below shows the salaries tax rates of a city.

Net chargeable income	Rate
On the first $50 000	2%
On the next $50 000	6%
On the next $50 000	10%
On the next $50 000	14%
Remainder	17%

Janice is a citizen of the city. Her net chargeable income is $160 000 and she is entitled to a total allowance of $140 000.

(a) Find her salaries tax payable.

(b) Find the percentage of her salaries tax payable to her annual income.

(5 marks)

12. The base radius and the height of a circular cylinder are in the ratio 2 : 3. If the base radius increases by 20% and its height decreases by 30%, find the percentage change in the total surface area of the circular cylinder. (5 marks)

Section B (11 marks)

13. Simplify $\dfrac{36^n \times 6^{n+2} - 90 \times 6^{3n-1}}{7 \times 4^n \times 3^{2n} \times 6^n}$ where n is an integer. (4 marks)

14. It is given that $(a-b)^2 \geq 0$ for any real numbers a and b.

(a) Prove that $\frac{a^2+b^2}{2} \geq ab$.

(b) Let c, d and e be any non-negative real numbers.

(i) By using the result of (a), prove that $cd \leq \frac{c^2}{2e} + \frac{d^2e}{2}$, where $e \neq 0$.

(ii) By using the result of (a), prove that $(1+c)^2(1+d)^2(1+e)^2 \geq 64cde$.

(7 marks)

Bonus Question (4 marks)

15. Let N be a 10-digit binary number. Use N to create another binary number M by changing each digit '0' in N to '1' and each '1' in N to '0' and ignore the leading '0's, e.g. if $N = 1101011100_2$ then $M = 10100011_2$. Find the number N such that the difference between N and M has the fewest number of digits '1' in its binary representation.