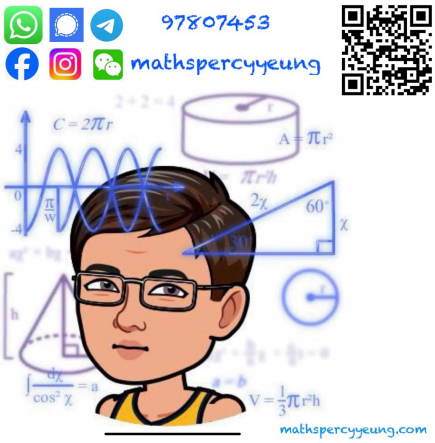
2023-2024 S3
1st TERM UT1
MATH



2023 – 2024
S3 First Term Uniform Test 1

MATHEMATICS

Question–Answer Book

9th November, 2023
8:15 am – 9:15 am (1 hour)

This paper must be answered in English

INSTRUCTIONS

1. Write your name, class and class number in the spaces provided on this cover.

2. Attempt ALL questions in this paper. Write your answers in the spaces provided in this Question – Answer Book.

3. Unless otherwise specified, all working must be clearly shown and numerical answers should be either exact or correct to 3 significant figures.

4. The diagrams in this paper are not necessarily drawn to scale.

Sections	Marks
A (1 – 3)	
A (4 –11)	
A Total	**/50**
B Total	**/20**
TOTAL	**/70**

Section A (50 marks)

1. Benny's weight is measured as 40 kg, correct to the nearest kg. Find the percentage error of the weight. (3 marks)

2. Factorize the following expressions.

   (a) $9a^2 - 16b^2$

   (b) $9a^2 - 16b^2 + 6a - 8b$

   (3 marks)

3. Make n the subject of the formula $8 - 3m = 2(5m - n)$. (3 marks)

4. Simplify the following expressions and express your answer with positive indices.

(a) $(3a^{-3}b^{-4})(2a^{-5}b^{-2})$

(b) $\left(-2x^{4}y^{-3}\right)^{4}$

(c) $\left(\frac{m}{n^{2}}\right)^{-4} \times m^{0}n^{-5}$

(8 marks)

5. Factorize the following expressions.

(a) $m^{2}+11m+18$

(b) $-36x^{2}+15xy+6y^{2}$

(3 marks)

6. If n is an integer, simplify $\dfrac{4^{n+1}\cdot 2^{n-1}}{2^{3n+1}}$. (4 marks)

7. (a) Express the following numbers in scientific notation.

(i) 37 800 000 000

(ii) 0.000 002 1

(b) Hence, or otherwise, evaluate $\dfrac{37\ 800\ 000\ 000 \div 0.000\ 002\ 1}{3\times 10^{-9}}$ and express the answer in scientific notation.

(4 marks)

8. (a) Express $1\times 2^0 + 1\times 2^2 + 1\times 2^5$ as a binary number.

(b) Convert 47_{10} into a binary number.

(3 marks)

9. Solve the following inequalities and represent the solutions graphically.

(a) $3+2x \geq 4x-19$

(b) $3(6+x)+2 \leq 20$

(7 marks)

10. (a) Find the range of values of x that satisfy the inequality $x+15 > \frac{2(x-1)}{13}+5$.

(b) Write down the smallest possible integer that satisfy the inequality in (a).

(4 marks)

11. The following table shows the expenditure of a toy factory this month.

Expenditure	Amount ($)
Salary	750 000
Rent	100 000
Cost of raw materials	200 000
Miscellaneous expenses	150 000

(a) In the past 5 months, the total expenditure increased by 5% per month. Find the total expenditure of the toy factory 5 months ago.

(b) Compared with this month, it is expected that the salary and rent will increase by 30%, the cost of raw materials will decrease by 5% and the miscellaneous expenses will remain unchanged next month. Find the new total expenditure next month.

(c) Daisy claims that the percentage change in the total expenditure from this month to next month is +55%. Do you agree? Explain your answer.

(8 marks)

Section B (20 marks)

12. (a) Factorize the following expressions. (2 marks)

(i) $6a^2 - 5ab - 6b^2$

(ii) $12a^2 + 11ab + 2b^2$

(b) Hence, factorize $(6a^3 - 5a^2b - 6ab^2) + (24a^2b + 22ab^2 + 4b^3)$. (3 marks)

(c) Hence, simplify $\dfrac{(6a^3 - 5a^2b - 6ab^2) + (24a^2b + 22ab^2 + 4b^3)}{3a^2 - 7ab - 6b^2} - \dfrac{b(5a + 4b)}{a - 3b}$. (4 marks)

13. Calvin plans to deposit $200 000 in a bank. Bank H offers the following three plans:

Plan	**Simple interest rate per annum**
A	5.5%
B	4.5% for the first 2 years, then 5.8% every subsequent year
C	2% for the first year, then an increase of 1% every subsequent year

(a) For Plan A, B and C, calculate the interest obtained in the first 6 years respectively.

(6 marks)

(b) Bank K offers Plan D which provides deposit interest at an interest rate of 3% p.a. compounded quarterly in the first five years, then 5% p.a. compounded quarterly starting from the sixth year.

(i) Calculate the amount he can obtain in the first five years. (Give your answer correct to the nearest dollar.)

(ii) Among the four plans, which plan should he choose in order to earn more interest after 6 years? Explain your answer.

(5 marks)

END OF PAPER