2024-2025 S3
2nd TERM UT1
MATH

2024 – 2025
S3 Second Term Uniform Test 1

MATHEMATICS

Question–Answer Book

24th March, 2025
8:15 am – 9:15 am (1 hour)

This paper must be answered in English

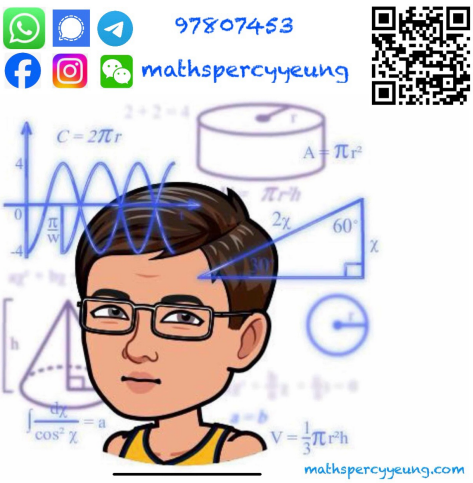
INSTRUCTIONS

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 – 2)	
A (3 – 10)	
A Total	**/50**
B Total	**/20**
TOTAL	**/70**

Section A (50 marks)

1. Solve the simultaneous equations $\begin{cases} 3x-5y=27 \\ 3x+2y=6 \end{cases}$. (3 marks)

2. In Figure 1, ΔABD and ΔBCD are right-angled triangles. $AB = 5$, $AD = 3$ and $BC = 1$. Find CD. (3 marks)

   (Express your answer in surd form if necessary.)

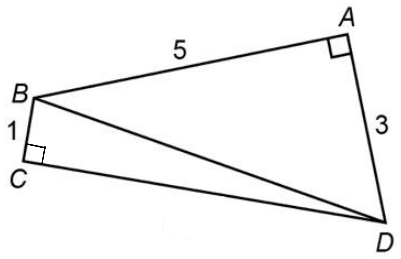


Figure 1

3. (a) Factorize

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

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

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

(5 marks)

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

(b) If n is a positive integer, simplify $\dfrac{3^{n+3} \times 9^{n+1}}{9^{3n+4}}$.

(6 marks)

5. Figure 2 shows a right frustum.

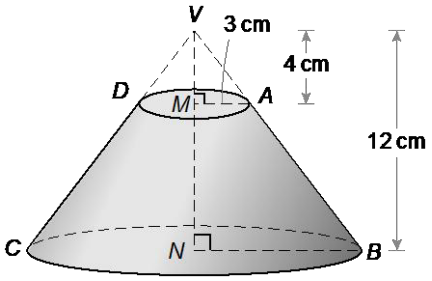


Figure 2

(a) Find the base radius *NB*.

(b) Find the volume of the frustum.

(c) Find the total surface area of the frustum.

(Express your answers in terms of π if necessary.) (7 marks)

6. In Figure 3, a sector is rolled up to form a right circular cone of height 30 cm and volume 2560π cm^3.

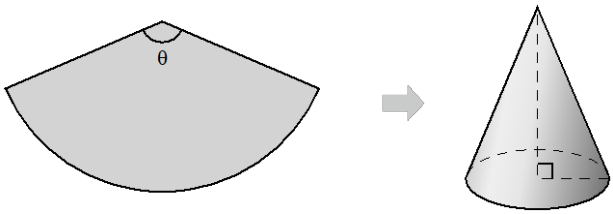


Figure 3

(a) Find the base radius of the circular cone.

(b) Find the curved surface area of the circular cone in terms of π.

(c) Aiden claims that θ is greater than 170°. Do you agree? Explain your answer.

(7 marks)

7. In Figure 4, D is a point lying on AB and CD is the height of ΔABC. Find the value of k.

(3 marks)

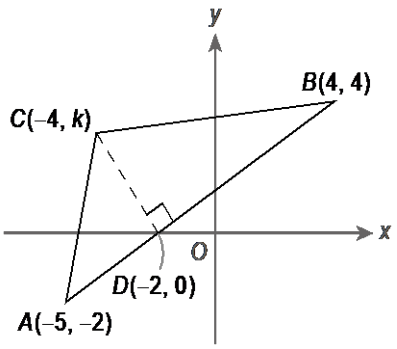


Figure 4

8. Three points $A(-12, 5)$, $B(k-1, k)$ and $C(4, -11)$ are collinear.

(a) Find the value of k.

(b) Romeo claims that $AB : AC = 1 : 3$. Do you agree? Explain your answer.

(6 marks)

9. In Figure 5, ABC and AED are straight lines. $\angle BAC = 30^\circ$, $DE = 3$ cm and $CD = 3\sqrt{3}$ cm.

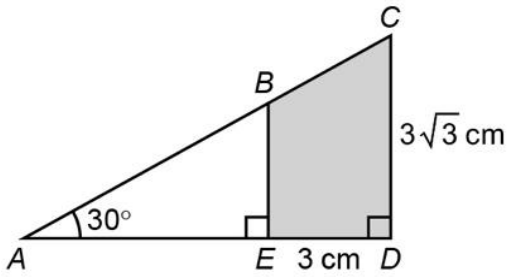


Figure 5

(a) Find AE.

(b) Find the area of quadrilateral $BCDE$.

(Express your answer in surd form if necessary.)

(5 marks)

10. (a) Simplify $\cos\theta\,(1+\tan^2\theta)$.

(b) Hence, prove that $\left[\cos\theta\,(1+\tan^2\theta)\sin\theta\right]^2 \equiv \dfrac{\cos^2(90^\circ-\theta)}{\sin^2(90^\circ-\theta)}$.

(5 marks)

Section B (20 marks)

11. Figure 6 shows solid A formed by a hemisphere and a right cylinder with a common base of base radius 3 m. The height of solid A is 5 m. It is given that solid B is similar to solid A, and the ratio of the base area of solid A to that of solid B is 9 : 25.

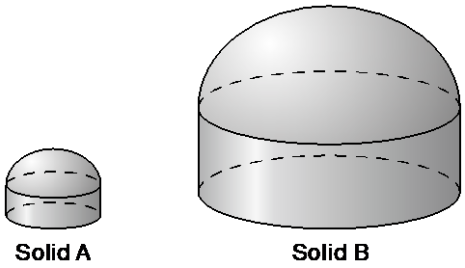


Figure 6

(a) Find the volume of solid A. (2 marks)

(b) Find the volume of solid B. (3 marks)

(c) Find the total surface area of solid B. (3 marks)

(d) Solid C is formed by removing a cylinder of volume $8\pi\,m^3$ from the bottom of solid A while solid D is formed by removing a cylinder of volume $40\pi\,m^3$ from the bottom of solid B. Are solid C and solid D similar? Explain your answer. (3 marks)

(Express your answers in terms of π if necessary.)

12. In Figure 7, M is the mid-point of AB. P is a point lying on BC such that $BP : PC = 1 : r$ and $MP \perp BC$.

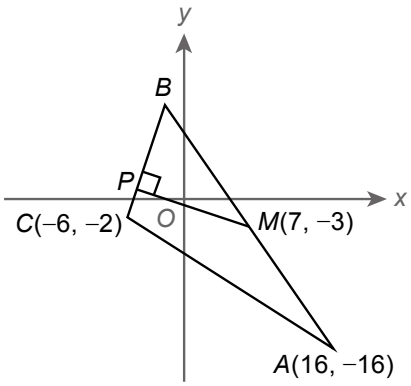


Figure 7

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

(b) Find the coordinates of P in terms of r. (3 marks)

(c) Find the value of r. (4 marks)

END OF PAPER