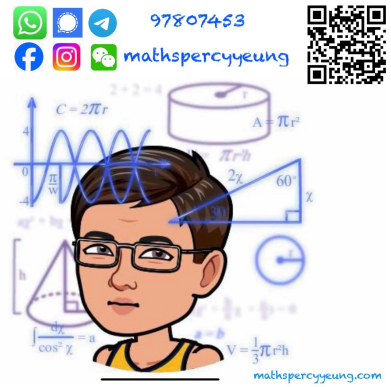
2023-2024 Second Term Form Test

F. 3 Mathematics



Time allowed : 45 minutes

Full mark : 45

This question-answer book consists of 11 printed pages.

Instructions to candidates:

1. This paper must be answered in English with a blue / black ball pen, unless otherwise specified.

2. Write your name, class and class number in the space provided on this cover.

3. This paper consists of TWO sections, A and B.
   Section A carries 20 marks and Section B carries 25 marks.

4. Answer 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.

5. Mark the answers for Section A on page 4 with an HB pencil as follows:

CORRECT:	INCORRECT:
23. ▭ ▬ ▭ ▭	23. ▭ ▭ ▭ ▭
	23. ▭ ▭ ▭ ▬

   Wrong marks should be completely erased with a clean rubber.
   Choose the best answer for each question. All questions carry equal marks in Section A.

6. All diagrams / graphs / charts as part of the answers must be clearly drawn with an HB pencil.

7. Graph paper and supplementary answer sheets will be supplied on request. Write your name, class and class number on each sheet, and fasten them INSIDE this book.

8. Unless otherwise specified, all working must be clearly shown in Section B.

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

10. Unless otherwise specified, numerical answers must be exact or correct to 3 significant figures.

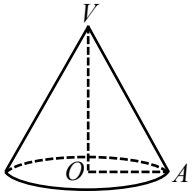
11. Calculator pad printed with the “HKEA Approved” / “HKEAA Approved” label is allowed.
    Remove the calculator cover / jacket.

Section A (20 marks)

1. If the volume of a sphere is $\frac{\pi}{6}$ cm^3, find the surface area of the sphere.

   A. π cm^2
   B. 2π cm^2
   C. 3π cm^2
   D. 4π cm^2

2. The figure shows a right circular cone of slant height 8 cm, where O is the centre of the base. If $\angle VAO = 60°$, find the curved surface area of the cone.



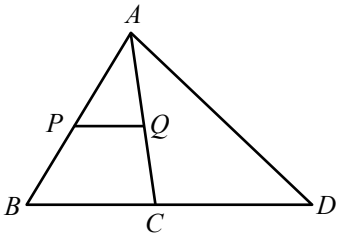
   A. 32π cm^2
   B. $32\sqrt{2}\pi$ cm^2
   C. $32\sqrt{3}\pi$ cm^2
   D. $64\sqrt{3}\pi$ cm^2

3. A pyramid is cut along a plane parallel to its base to obtain a smaller pyramid S and a frustum F such that the ratio of the height of S to the height of F is $2:3$. If the total area of all lateral faces of S is 40 cm^2, find the total area of all lateral faces of F.

   A. 50 cm^2
   B. 90 cm^2
   C. 210 cm^2
   D. 250 cm^2

4. In the figure, C, P and Q are points lying on BD, AB and AC respectively where $PQ//BC$. It is given that the area of ΔAPQ is 9 cm^2 and $PQ:BC:CD = 1:2:3$. Find the area of ΔACD.

   A. 27 cm^2
   B. 40.5 cm^2
   C. 54 cm^2
   D. 81 cm^2



5. If $M(7, 10)$ is the mid-point of the line segment joining $A(k, 2)$ and $B(-4, k)$, then $k =$

   A. 4.
   B. 6.
   C. 10.
   D. 18.

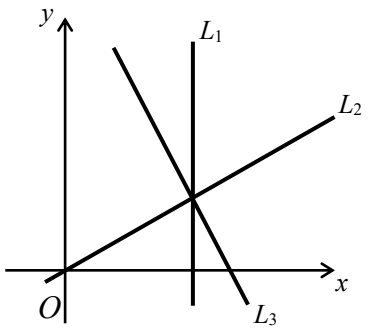
Answers written in the margins will not be marked.

6. The figure shows three straight lines L_1, L_2 and L_3 with slopes m_1, m_2 and m_3 respectively. L_1 is parallel to the y-axis and $L_2 \perp L_3$. Which of the following are correct?

I. $m_2 > m_3$

II. $m_1 = 0$

III. $m_2 = -m_3$



A. I only

B. I and III only

C. II and III only

D. I, II and III

7. A straight line L passes through $A(a, 15)$. It is given that the x-intercept and y-intercept of L are 6 and 2 respectively. Find the value of a.

A. -51

B. -39

C. -11

D. -1

8. $A(2, 3)$, $B(b, 9)$, $C(8, 15)$ and $D(17, d)$ are collinear. Find $AB : BD$.

A. $1:2$

B. $1:3$

C. $1:4$

D. $2:3$

9. It is given that $\tan\theta = \frac{k}{3}$, where $k > 0$. Find $\sin\theta$.

A. $\frac{3}{k^2+9}$

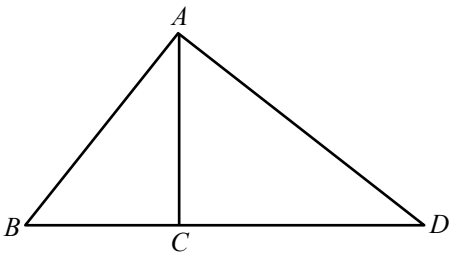
B. $\frac{k}{k^2+9}$

C. $\frac{3}{\sqrt{k^2+9}}$

D. $\frac{k}{\sqrt{k^2+9}}$

Answers written in the margins will not be marked.

10. In the figure, C is a point lying on BD such that $AC \perp BD$. It is given that $\angle ABC = 45°$ and $\angle CAD = 60°$. If $AD = k$, then $AB =$



A. $\frac{\sqrt{3}}{3}k$.

B. $\frac{\sqrt{2}}{2}k$.

C. $\frac{\sqrt{3}}{2}k$.

D. $\frac{\sqrt{6}}{2}k$.

Answers written in the margins will not be marked.

Use a pencil to mark your answer as follows: ▭ **A** ■ **B** ▭ **C** ▭ **D**

	A	B	C	D		A	B	C	D
1.	▭	▭	▭	▭	6.	▭	▭	▭	▭
2.	▭	▭	▭	▭	7.	▭	▭	▭	▭
3.	▭	▭	▭	▭	8.	▭	▭	▭	▭
4.	▭	▭	▭	▭	9.	▭	▭	▭	▭
5.	▭	▭	▭	▭	10.	▭	▭	▭	▭

Section B (25 marks)

1. It is given that $3\tan\theta\cos 60° - \sin 60° = 0$.

   (a) Find θ without using a calculator. (2 marks)

   (b) If $\cos^2 x = \sin\theta$, find x without using a calculator. (2 marks)

Answers written in the margins will not be marked.

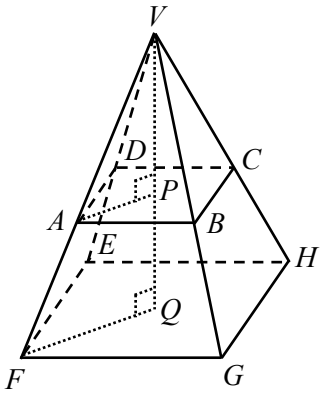
2. In the figure, *VABCD* and *VEFGH* are similar regular pyramids of heights *VP* and *VQ* respectively. It is given that $VQ = 15$ cm and $AP : FQ = 3 : 5$.

(a) Find the length of *VP*. (2 marks)

(b) Suppose $AB = 6$ cm.

(i) Find the volume of pyramid *VABCD*.

(ii) Find the volume of frustum *ABCDEFGH*. (4 marks)



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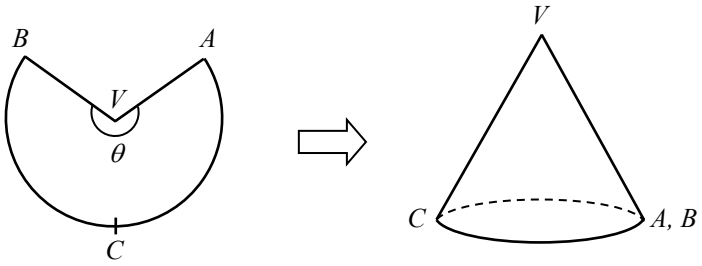
3. In the figure, sector $VACB$ is folded to form a right circular cone by joining VA and VB. The height and the volume of the cone are 12 cm and 324π cm^3 respectively.



(a) Find the base radius of the cone. (2 marks)

(b) Find θ. (2 marks)

(c) Suppose another sector S is similar to sector $VACB$. The area of sector S is double the area of sector $VACB$. If sector S is folded in the same way as sector $VABC$ to form a right circular cone, find the volume of this cone correct to 3 significant figures. (3 marks)

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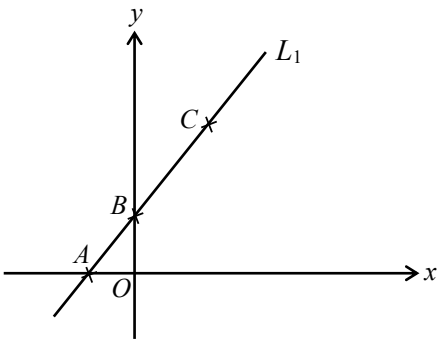
4. In the figure, O is the origin. The straight line L_1 cuts the x-axis and y-axis at $A(-8, 0)$ and $B(0, k)$ respectively. $C(k, 30)$ is a point lying on L_1 such that $AB : BC = 2 : 3$.



(a) Find the value of k. (2 marks)

(b) A straight line L_2 passes through C such that L_1 is perpendicular to L_2.

(i) Find the x-intercept of L_2.

(ii) Suppose L_2 cuts the x-axis at the point D. P is a point lying on AD such that $BP = 20$. Is BP parallel to CD? Explain your answer.

(6 marks)

Answers written in the margins will not be marked.

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End of Paper