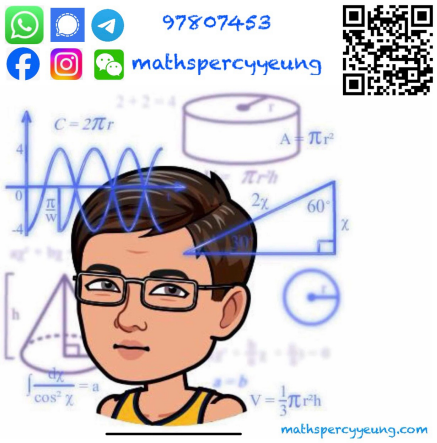
2024-2025 S3
2nd TERM EXAM
MATH



2024 – 2025
S3 Second Term Examination

MATHEMATICS

Question–Answer Book

9th June, 2025
8:15 am – 10:00 am (1 hour 45 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. Answer ALL questions in Section A. You should use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured. You should mark only ONE answer for each question. If you mark more than one answer, you will receive NO MARKS for that question.

3. Attempt ALL questions in Sections B and C. Write your answers in the spaces provided in this Question – Answer Book.

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

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

Sections	Marks
A Total	**/30**
B (31 – 33)	
B (34 – 41)	
B Total	**/40**
C Total	**/30**
TOTAL	**/100**

Section A (30 marks)

Choose the best answer for each question.

1. The volume of a glass of orange juice is 450 mL, correct to the nearest 5 mL. Find the percentage error of the measurement correct to 2 significant figures.

   A. 0.28%

   B. 0.56%

   C. 1.1%

   D. 2.2%

2. If $(x+2)(x+A)-4 \equiv x^2+B$, then $B=$

   A. –8.

   B. –4.

   C. –2.

   D. 0.

3. If $x-2y+7=2x+7y=3$, then $x=$

   A. –6.

   B. –2.

   C. –1.

   D. 1.

4. Express the value of $\dfrac{7.336\times10^{-3}}{1.4\times10^{-7}}$ in scientific notation.

   A. 5.24×10^{-10}

   B. 5.24×10^{-4}

   C. 5.24×10^{4}

   D. 5.24×10^{10}

5. Express $1\times2^8+1\times2^6+1\times2^5+22$ as a binary number.

   A. 10111011_2

   B. 101110110_2

   C. 1001100110_2

   D. 1001110110_2

6. Which of the following has the factor $3x-1$?

   A. $9x^2+1$

   B. $3x^2-23x-8$

   C. $12x^2+x-1$

   D. $(9x^2-6x+1)-21x+7$

7. If $p>q>0$, which of the following must be true?

   I. $\dfrac{q}{p}>1$

   II. $pq>q^2$

   III. $-p<-q$

   A. I only

   B. III only

   C. I and II only

   D. II and III only

8. Solve the inequality $3(x+8)\geq 8(x-2)$.

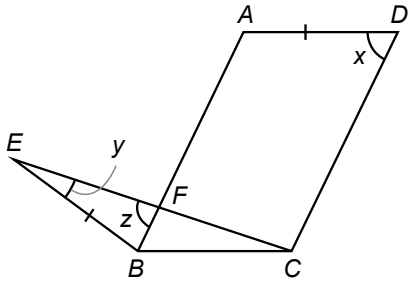
   A. $x\geq -8$

   B. $x\leq -8$

   C. $x\geq 8$

   D. $x\leq 8$

9. In the figure, $ABCD$ is a parallelogram. AFB and EFC are straight lines. It is given that $AD = EB$.



Which of the following must be true?

A. $x + y = z$

B. $y + z = x$

C. $x + y + z = 180°$

D. $x + 2y + z = 180°$

10. Ken deposits \$6 000 in a bank at an interest rate of 6% p.a. for 2 years, compounded half-yearly. Find the interest obtained correct to the nearest dollar.

A. \$365

B. \$742

C. \$753

D. \$1 506

11. If Mr. Wong's salaries tax charged at progressive rates is \$5 040, consider the salaries tax rates as follows, find his net chargeable income.

Net chargeable income	Tax rates
On the first \$40 000	2%
On the next \$40 000	7%
On the next \$40 000	12%
Remainder	17%

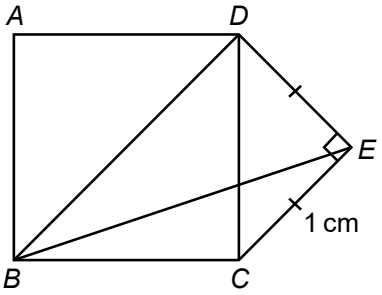
A. \$42 000

B. \$92 000

C. \$102 000

D. \$252 000

12. In the figure, $ABCD$ is a square and ΔCDE is a right-angled isosceles triangle. Find BE.



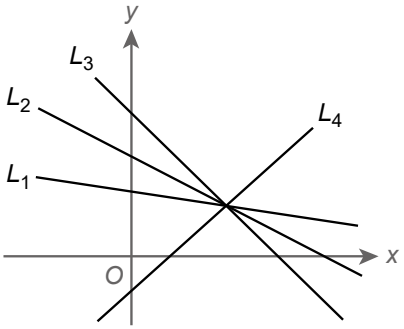
A. $\sqrt{3}$ cm

B. 2 cm

C. $\sqrt{5}$ cm

D. $(\sqrt{2}+1)$ cm

13. In the figure, which straight line has the smallest slope?



A. L_1

B. L_2

C. L_3

D. L_4

14. Find the coordinates of the intersection of the y-axis and the straight line passing through points $P(-3, -14)$ and $Q(2, 6)$.

A. $(0, -4)$

B. $(0, -2)$

C. $(0, -1)$

D. $(0, 2)$

15. $\dfrac{1}{\tan^2(90°-\theta)}+\dfrac{\sin^2\theta}{\sin^2(90°-\theta)}=$

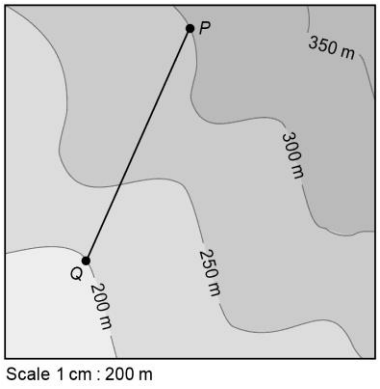
A. $2\cos^2\theta$.

B. $2\tan^2\theta$.

C. 1.

D. 0.

16. The figure shows a map with the scale of $1\text{ cm}:200\text{ m}$. From the map, we have $PQ=4$ cm. Find the inclination of PQ correct to 3 significant figures.



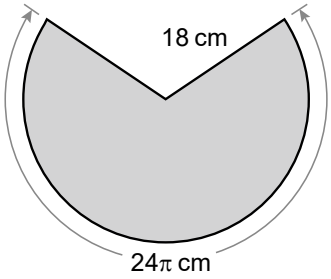
A. 82.9°

B. 26.6°

C. 14.0°

D. 7.13°

17. The sector in the figure is rolled up into a right circular cone. Find the volume of the circular cone correct to 3 significant figures.



A. $2\,020\,\text{cm}^3$

B. $2\,710\,\text{cm}^3$

C. $4\,070\,\text{cm}^3$

D. $6\,070\,\text{cm}^3$

18. Two fair dice are rolled. Find the probability that the sum of numbers obtained from the two dice is a multiple of 6.

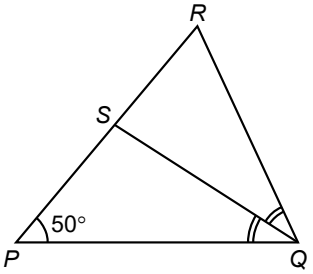
A. $\dfrac{1}{36}$

B. $\dfrac{5}{36}$

C. $\dfrac{1}{6}$

D. $\dfrac{2}{9}$

19. In the figure, PSR is a straight line. QS is the angle bisector of $\angle PQR$, $PQ=PR$ and $\angle QPR=50°$. Find $\angle QSR$.



A. 32.5°

B. 65°

C. 82.5°

D. 115°

20. The following table shows the volume distribution of 80 right prisms. Find the median volume of the prisms.

Volume (cm^3)	898	899	900	901	902
Frequency	26	15	16	15	8

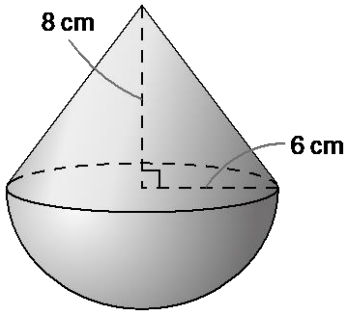
A. 898 cm^3

B. 899 cm^3

C. 899.5 cm^3

D. 899.55 cm^3

21. The figure shows a solid formed by a right circular cone and a hemisphere. The radius of the hemisphere is 6 cm and the height of the circular cone is 8 cm. Find the total surface area of the solid.



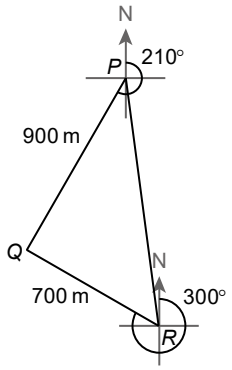
A. $132\pi\ \text{cm}^2$
B. $168\pi\ \text{cm}^2$
C. $204\pi\ \text{cm}^2$
D. $240\pi\ \text{cm}^2$

22. If the true bearing of point A from B is $108°$, then the true bearing of point B from A is
A. $018°$.
B. $162°$.
C. $288°$.
D. $338°$.

23. If $2^{x+2}=\left(\frac{1}{4}\right)^{-2x-7}$, find the value of x.
A. -4
B. -3
C. -2
D. 4

24. The weight of Winnie increased by 2% from January to February, and then decreased by 5% from February to March. Find the percentage change in the weight of Winnie from January to March.
A. -3.1%
B. -3%
C. -0.999%
D. -0.969%

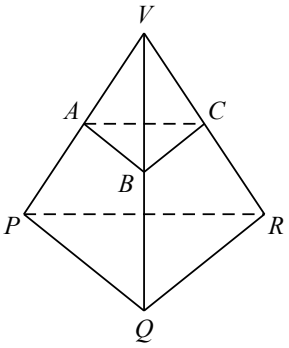
25. In the figure, the true bearings of point Q from point P and point R are $210°$ and $300°$ respectively. $PQ=900\ \text{m}$ and $QR=700\ \text{m}$. Find the true bearing of P from R correct to the nearest degree.



A. $171°$
B. $172°$
C. $351°$
D. $352°$

26. A copper sphere of volume $276\pi\ \text{cm}^2$ is melted and recast into three smaller spheres, where the ratio of their radii is $1:3:4$. Find the volume of the largest sphere among them.
A. $192\pi\ \text{cm}^3$
B. $81\pi\ \text{cm}^3$
C. $27\pi\ \text{cm}^3$
D. $3\pi\ \text{cm}^3$

27. In the figure, the volumes of the pyramids $VABC$ and $VPQR$ are 27 cm^3 and 64 cm^3 respectively. Planes ABC and PQR are parallel.



Area of ΔABC : Area of ΔPQR =

A. $\sqrt{27} : \sqrt{64}$.
B. $\sqrt{37} : \sqrt{64}$.
C. 3 : 4.
D. 9 : 16.

28. A card is drawn randomly from a deck of 52 playing cards. The probability of drawing a face card(i.e. J, Q or K) is

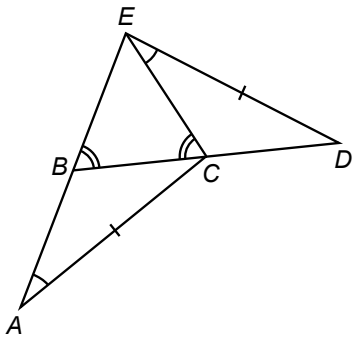
A. $\frac{1}{52}$.
B. $\frac{1}{13}$.
C. $\frac{3}{13}$.
D. 1.

29. The mean, the median and the mode of the IQs of the boys in S2 are x, y and z respectively. If the mean, the median and the mode of the IQs of the girls in S2 are also x, y and z respectively, which of the following must be true?

I. The mean of the IQs of the S2 students is x.
II. The median of the IQs of the S2 students is y.
III. The mode of the IQs of the S2 students is z.

A. I only
B. I and II only
C. II and III only
D. I, II and III

30. In the figure, ABE and BCD are straight lines.



Which of the following must be true?

I. EC is a median of ΔBED.
II. CB is a median of ΔAEC.
III. $AE = BD$

A. I and II only
B. I and III only
C. II and III only
D. I, II and III

Section B (40 marks)

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

32. Solve the simultaneous equations $\begin{cases} 2x+3y=19 \\ 6x-5y=15 \end{cases}$. (3 marks)

33. The height of Tai Mo Shan is measured as 1 000 m. If the percentage error of the measurement is 5%, find the least possible height of Tai Mo Shan. (3 marks)

34. Simplify $\dfrac{(2xy^2)^{-4}}{x^3}$ and express your answer with positive indices. (3 marks)

35. Factorize

(a) $6p^2+7pq-3q^2$,

(b) $6p^2+7pq-3q^2-6p-9q$.

(3 marks)

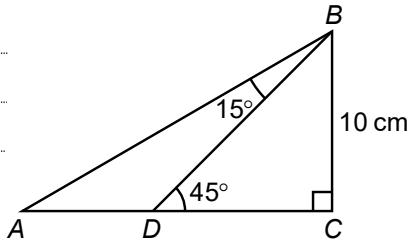
36. (a) Solve the inequality $\dfrac{4x+1}{5}+3\geq x$ and represent the solutions graphically.

(b) How many non-negative integers satisfy the inequality $\dfrac{4x+1}{5}+3\geq x$?

(4 marks)

37. The mean height of potted flowers in a greenhouse is 27 cm. If one more pot of flowers of height 23 cm is put inside the greenhouse, the mean height of potted flowers decreases by 0.04 cm. Find the original number of pots of flowers in the greenhouse. (3 marks)

38. In the figure, ADC is a straight line. $\angle ABD = 15°$, $\angle BDC = 45°$ and $BC = 10\text{ cm}$. Find the length of AD in surd form. (4 marks)

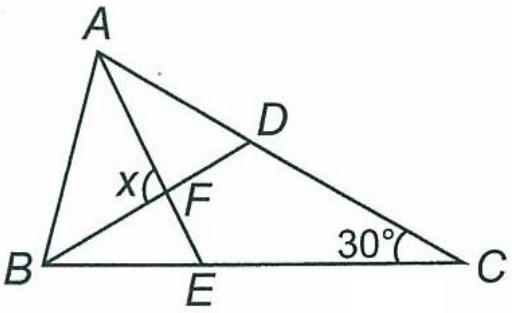


39. In the figure, *ADC*, *BEC*, *AFE* and *BFD* are straight lines. *BD* and *AE* are angle bisectors of $\angle ABC$ and $\angle BAC$ respectively. Given that $AC = BC$.

(a) Find $\angle ABC$.

(b) Find x.

(4 marks)



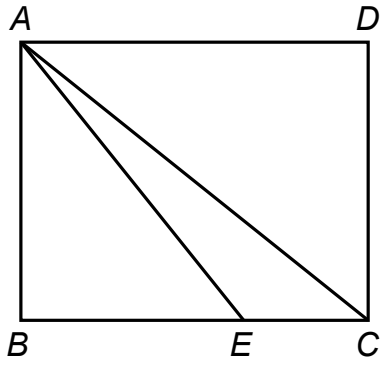
40. Wesley deposits \$73 000 in Wealthy Bank for 1 year and he will receive a simple interest of \$3 285.

(a) Find the interest rate per annum.

(b) If Wesley withdraws the amount and deposits it in Fortune Bank at the same interest rate per annum for 3 years but the interest is compounded every 2 months, find the interest obtained in these 3 years. (Give your answer correct to the nearest dollar.)

(5 marks)

41. In the figure, $ABCD$ is a rectangle. E is a point lying on BC such that $\angle AEB = \angle BAC$.



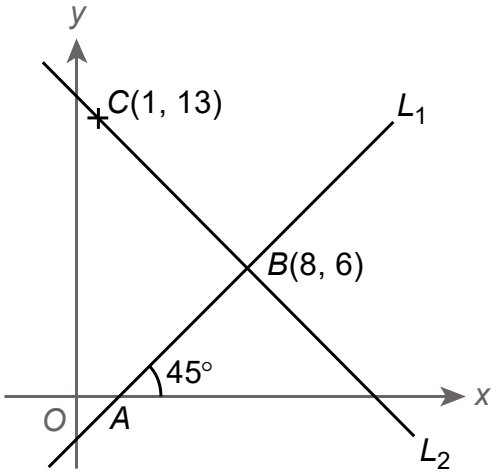
(a) Prove that $\Delta ADC \sim \Delta ABE$.

(b) Given that $BE = 16$ cm and $EC = 9$ cm, find the area of ΔAEC.

(5 marks)

Section C (30 marks)

42. In the figure, straight line L_1 with the inclination of 45° cuts the x-axis at A. Straight line L_2 passes through point $C(1, 13)$ and cuts L_1 at $B(8, 6)$.



(a) Prove that $L_1 \perp L_2$. (3 marks)

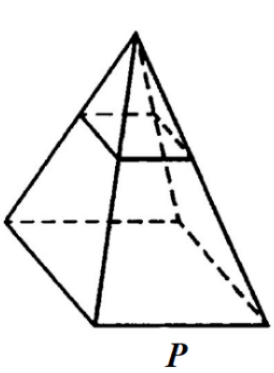
(b) Find the coordinates of A. (2 marks)

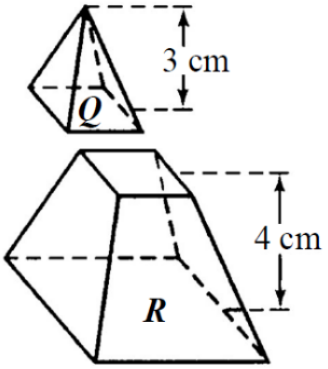
(c) (i) If straight line L_3 which is parallel to L_2 passes through the mid-point of AB and cuts the x-axis at point D, find the coordinates of D.

(ii) Find the area of ΔACD.

(5 marks)

43. In the figure, a pyramid P with a square base is divided into a small pyramid Q similar to P and a frustum R. The heights of Q and R are 3 cm and 4 cm respectively.





(a) Joe claims that $\dfrac{\text{volume of } Q}{\text{volume of } R} = \dfrac{27}{64}$. Do you agree? Explain your answer. (4 marks)

(b) If the total surface area of all lateral faces of Q is 81 cm^2, find the total surface area of all lateral faces of R. (3 marks)

(c) It is given that the length of a side of the base of P is 14 cm. Using the result of (a), or otherwise, find the volume of R. (3 marks)

44. The exam scores of the students in Class A are shown as follows:

36 47 31 69 35 47 47 68 34 69

(a) (i) Find the mean, median and mode of the exam scores of the students in Class A.

(ii) If a student is selected from Class A, find the probability that the exam score of the student selected is not less than 47.

(4 marks)

(b) The stem-and-leaf diagram below shows the distribution of the exam scores of the students of Class B. It is given that the mean and the median of this distribution is 41 and 38 respectively.

Stem (tens)	Leaf (units)
2	0 5 6 7
3	3 3 a
4	3
5	1 2 9
6	0 b

(i) Find a and b.

(ii) The table below shows the values of book coupons teachers will give to the students based on their exam scores.

Exam Scores	60 or higher	greater than 40 but less than 60	40 or below
Values of Book Coupons	\$100	\$50	\$0

If a student is randomly selected from Class B, find the expected value of the book coupons teachers will give to that student.

(iii) The students whose exam scores are greater than 50 can join a mathematics competition. One student is selected from Class A and Class B each respectively to join the competition. Find the probability that the sum of the exam scores of the two selected students is greater than 130.

(6 marks)

END OF PAPER