S3 First Term Examination (2025 – 2026)

Mathematics

(2 hours)

Date: 6th January 2026

Time: 8:30 a.m. – 10:30 a.m.

Name: _____

Class: _____ No.: _____

Instructions to students:

1. This paper consists of THREE parts, Conventional Questions, Multiple-choice Questions and Bonus Question. There are Section A1, Section A2 and Section B in Conventional Questions. Section A1 carries 35 marks, Section A2 carries 25 marks, Section B carries 20 marks, Multiple-choice Questions carry 20 marks and Bonus Question carries 3 marks.

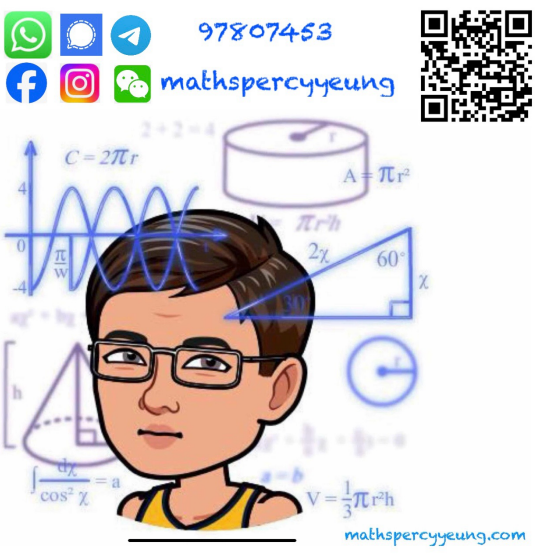
2. The maximum score of this paper is 100.

3. Attempt ALL questions in Conventional Questions and Multiple-choice Questions.
   Write your answers in the spaces provided in this Question/Answer Booklet.

4. Unless otherwise specified, show your workings clearly.

5. Unless otherwise specified, numerical answers should either be exact or correct to 3 significant figures.

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



Conventional Questions

Section A1 (35 marks)

1. Simplify $(h^4k^6)^{-5}(h^{-1}k^3)^4$ and express the answer with positive indices. (3 marks)

2. Make c the subject of the formula $-8d = \dfrac{7c}{11-2c}$. (3 marks)

3. Factorize

(a) $6xy-9y$,

(b) $4x^2-16x+15$,

(c) $4x^2-16x+15-6xy+9y$.

(4 marks)

4. (a) Solve the inequality $\frac{3-x}{2}-\frac{3x}{5}\geq\frac{17-x}{10}$.

(b) Write down the greatest integer satisfying the inequality in **(a)**.

(4 marks)

5. The value of a car depreciates by 12% per year. If the present value of the car is \$520 000,

   (a) find its value after two years,

   (b) find its value three years ago.

(5 marks)

6. In Figure 1, $ABCD$ is a square. E is a point lying on BC. Find x and y. (4 marks)

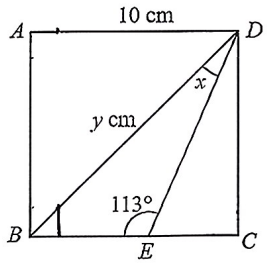


Figure 1

7. In Figure 2, $ABCD$ is a parallelogram. CB is produced to E such that $CD = CE$. AB and DE intersect at F. $\angle DEC = 57°$, $CD = 16$ cm and $AD = 10$ cm. Find x and BE. (5 marks)

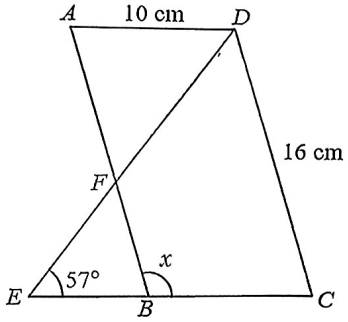


Figure 2

8. In Figure 3, D is a point lying on BC such that AD is a median of ΔABC. It is given that $AD = BD$ and $\angle ABC = 56°$. Find $\angle DCA$. (4 marks)

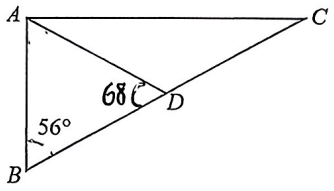


Figure 3

9. It is given that $2^n = a$ and $7^n = b$. Express $\frac{1}{98^n}$ in terms of positive integral powers of a and b.

(3 marks)

Section A2 (25 marks)

10. The salaries tax rates are as shown in the following table:

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%

The average monthly income of Sophia is \$24 700. If she has a total allowance of \$132 000, find her salaries tax payable. (4 marks)

11. A factory produces 150 bowls at a cost of \$6 000. However, 10% of the bowls are broken and cannot be sold. The manager sells all the remaining bowls and makes a profit of at least 80%. Find the range of the selling price of each bowl. (4 marks)

12. Mrs Tong plans to invest \$90 000 for 5 years. She may either deposit the money in a bank which offers interest at 7.5% p.a. compounded monthly or buy a government bond which offers simple interest at 10% p.a.. Which investment should she choose? Explain your answer. (5 marks)

13. (a) Simplify $\frac{12^{3n} \times 8^{-n}}{(-6)^{4n}}$, where n is a positive integer. Express your answer with a positive index.

(3 marks)

(b) It is given that $\left(\frac{4}{9}\right)^{n+2} = \left(\frac{3}{2}\right)^{n-1}$, where n is an integer. Find the value of n. (3 marks)

14. In Figure 4, $ABCD$ is a straight line with $AB = BC = CD$. $BGEC$ is a rhombus. AG produced and DE produced meet at F. Prove that ΔADF is a right-angled triangle. (6 marks)

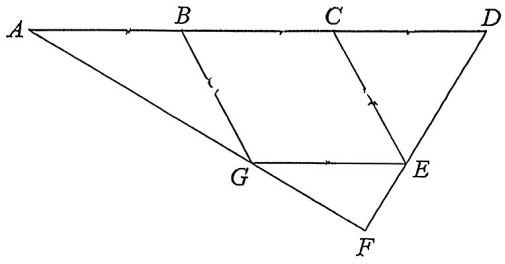


Figure 4

Section B (20 marks)

15. If the height of a right cylinder increases by 60% and its curved surface area remains unchanged, find the percentage change in the volume of the cylinder. (6 marks)

16. (a) Express 10100_2 in the expanded form.

(b) Using the result in **(a)**, express $(10100_2)^3$ as a binary number without converting 10100_2 into a denary number.

(6 marks)

17. In Figure 5, H is both the orthocentre and the centroid of ΔABC. AH, BH and CH are produced to meet BC, CA and AB at D, E and F respectively.

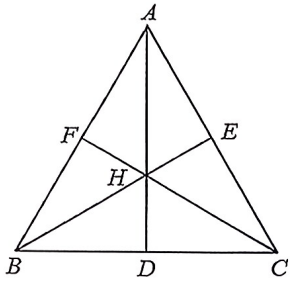


Figure 5

(a) Prove that H is also the circumcentre of ΔABC.

(b) Prove that $\Delta ADB \cong \Delta ADC$.

(c) Find $\angle BAC$.

(8 marks)

Multiple-choice Questions (20 marks)

Each question carries 2 marks. Put a ✓ for the correct answers in the boxes.

	18	19	20	21	22	23	24	25	26	27
A										
B										
C										
D										

18. $\dfrac{(125^{n+2})^3}{625^{2n+4}} =$

A. 5.

B. 5^{n+2}.

C. 5^{2n+6}.

D. 5^{7n+14}.

19. In a Mathematics competition of 20 questions, 10 marks will be awarded for each correct answer, 5 marks will be deducted for each wrong answer. Raymond answers all questions in the competition, and his score is not less than 100. At least how many questions does he answer correctly?

A. 6

B. 7

C. 13

D. 14

20. If $p < q$, which of the following must be true?

I. $-p > -q$

II. $p > p - q$

III. $p^2 < pq$

A. I only

B. II only

C. I and II only

D. I and III only.

21. A sum of money is deposited in a bank at an interest rate of 12% p.a. compounded yearly. If the interest received after 7 years is \$6 000, find the principal. (*Give the answer correct to the nearest \$1 000.*)

A. \$3 000

B. \$4 000

C. \$5 000

D. \$6 000

22. The salaries tax rates are as shown in the following table:

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%

In this financial year, Tom has a total allowance of \$140 000 and he has to pay a salaries tax of \$15 300. Find his annual income.

A. \$109 000

B. \$195 000

C. \$249 000

D. \$335 000

23. In Figure 6, *PQRS* and *PXRY* are parallelograms. *SYXQ* is a straight line. $\angle RQX$ is 5° greater than $\angle SPY$. Find $\angle SPY$.

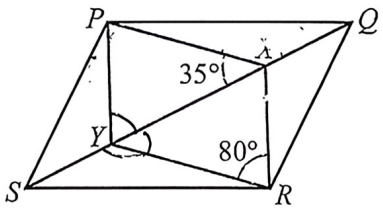


Figure 6

A. 30°

B. 35°

C. 45°

D. 65°

24. In Figure 7, P and Q are the mid-points of AB and AD respectively. BRC and DSC are straight lines. $PQ = 6$, $RS = 8$ and $PQ \parallel RS$. If $RC = 9.6$, find BR.

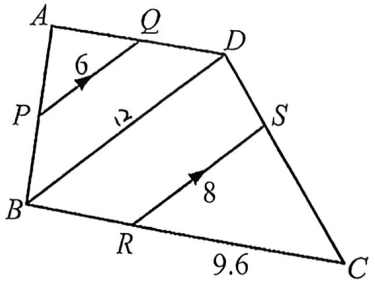


Figure 7

A. 3.2

B. 4.8

C. 6.4

D. 7.2

25. In Figure 8, E and F are the mid-points of DA and CB respectively. AC and BD intersect EF at G and H respectively. It is given that $EF \parallel AB$. If $CD = 3$ and $AB = 7$, find GH.

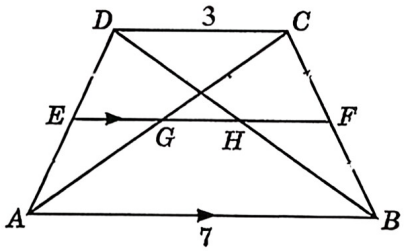


Figure 8

A. 1

B. 1.5

C. 2

D. 3.5 ×

26. In Figure 9, $AQBS$ is a parallelogram, $PQ = SR$ and $\angle PQA = \angle RSB$. Which of the following may not be true?

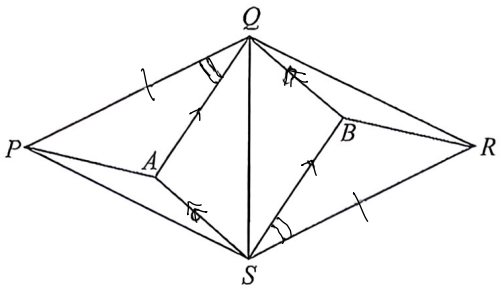


Figure 9

A. $PA = RB$

B. $QR \,//\, PS$

C. QS bisects $\angle PSR$.

D. $\angle APS = \angle QRB$

27. In Figure 10, $PSTR$ is a straight line. $QP = QT$, $\angle TQR = \angle TRQ$ and QS is an altitude of ΔPQR. Which of the following must be true?

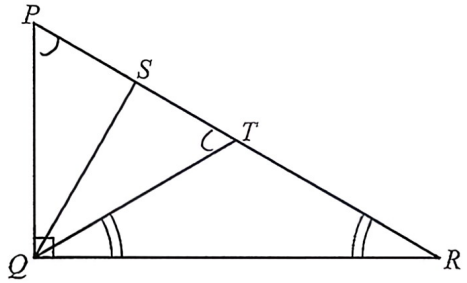


Figure 10

I. QT is a median of ΔPQR.

II. QS is a perpendicular bisector of ΔPQT.

III. QT is an angle bisector of ΔQRS.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

Bonus Question (3 marks)

28. Two positive numbers x and y satisfy the following simultaneous linear equations:

$$\begin{cases} 3x+4y=15 \\ 2x+3y=k \end{cases}, \text{ where } k \text{ is an integral constant.}$$

Determine the value(s) of k.

End of Paper