2024-2025 S3
1st TERM EXAM
MATH

2024-2025
S3 First Term Examination

MATHEMATICS

Question–Answer Book

6th January, 2025
8:15 am – 9:45 am (1 hour 30 minutes)

This paper must be answered in English

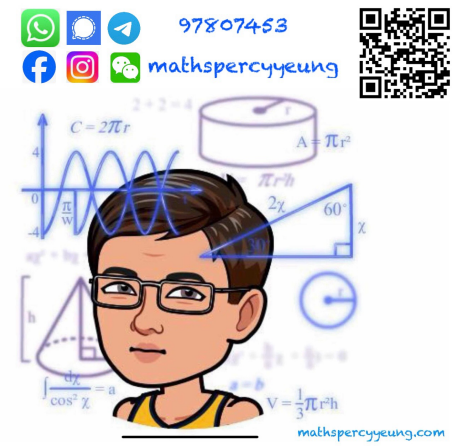
INSTRUCTIONS

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

2. 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 Total	**/30**
B (31 – 33)	
B (34 – 40)	
B Total	**/40**
C Total	**/30**
TOTAL	**/100**

Section A (30 marks)

Choose the best answer for each question.

1. Solve the equation $\frac{-x+8}{3}=5+2x$.

   A. $x=-4.6$

   B. $x=-\frac{7}{3}$

   C. $x=-1$

   D. $x=0$

2. A robot is sold for \$15 000 at a profit of 60%. The cost price of the robot is

   A. \$9 000 .

   B. \$9 375 .

   C. \$24 000 .

   D. \$25 000 .

3. The volume of perfume in a bottle is measured as 48.2 mL correct to the nearest 0.2 mL. Which of the following can be the actual volume of the perfume in the bottle?

   A. 48.05 mL

   B. 48.12 mL

   C. 48.3 mL

   D. 48.31 mL

4. $(a-2b)(3a+4b)-(3a+4b)^2=$

   A. $2(3a+4b)(a-3b)$.

   B. $-2(3a+4b)(a-3b)$.

   C. $-2(3a+4b)(3a-b)$.

   D. $-2(3a+4b)(a+3b)$.

5. If $h(h+k)=k(1+h)$, then $k=$

   A. h .

   B. $2h$.

   C. h^2 .

   D. $\frac{h^2-h}{2}$.

6. $16a^2-(3b-4c)^2=$

   A. $(4a+3b-4c)(4a-3b+4c)$.

   B. $(4a+3b+4c)(4a-3b+4c)$.

   C. $(4a-3b-4c)(4a-3b+4c)$.

   D. $(4a+3b-4c)(4a+3b+4c)$.

7. $64^{111}\times 7^{333}=$

   A. 28^{333} .

   B. 28^{444} .

   C. 448^{333} .

   D. 448^{444} .

8. $10101000000101_2=$

   A. $21\times 2^9+5$.

   B. $21\times 2^9+10$.

   C. $21\times 2^{10}+5$.

   D. $21\times 2^{10}+10$.

9. Which of the following algebraic expressions is equivalent to $-(3x)^4$?

   A. $3x^4$

   B. $-3x^4$

   C. $81x^4$

   D. $-81x^4$

10. $-4.326\times 10^{-5}=$

    A. –0.000 043 26 .

    B. –0.000 004 326 .

    C. 43 260 .

    D. 432 600 .

11. $\frac{125^{2k+1}}{25^{3k+1}}=$

    A. 1 .

    B. 5 .

    C. 5^k .

    D. 5^{-k} .

12. Which of the following has $x - 2$ as a factor?

A. $x^2 + 4$

B. $-x^2 - 4x - 4$

C. $2x^2 - 4x$

D. $4x^2 - 4$

13. The price of a mango is \$$x$. The price of an orange is half of that of a mango. If the total price of 4 mangoes and 5 oranges is less than \$78, which of the following inequalities can be used to find the range of values of x?

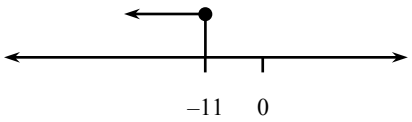
A. $4x + 5\left(\frac{x}{2}\right) > 78$

B. $4x + 5\left(\frac{x}{2}\right) < 78$

C. $4x + 5(2x) > 78$

D. $4x + 5(2x) < 78$

14. The solutions of an inequality in x are represented on the number line as shown.



Which of the following can be a solution of the inequality?

I. $x = -8$

II. $x = -11$

III. $x = -15$

A. I only

B. II only

C. III only

D. II and III only

15. If $a > b > 0$ and $k < 0$, which of the following must be true?

I. $a^2 < ab$

II. $ak < bk$

III. $\frac{a}{k^2} > \frac{b}{k^2}$

A. I only

B. II only

C. I and III only

D. II and III only

16. How many negative integers satisfy the inequality $30 - 25x < 21x + 98$?

A. 0

B. 1

C. 2

D. 3

17. If the price of a car is decreased by 40% and then increased by 35%, find the overall percentage change in the price of the car.

A. +89%

B. –9%

C. –19%

D. –86%

18. Carol deposits \$37 000 in a bank at a simple interest rate of 4% per annum. What is the amount that she will get after 18 months?

A. \$2 220

B. \$37 222

C. \$38 480

D. \$39 220

19. Eddie sells two cars for \$240 000 each. He gains 25% on one and loses 25% on the other. After the two transactions, Eddie

A. loses \$32 000.

B. gains \$20 000.

C. gains \$24 000.

D. has no gain and no loss.

20. The rainfalls in a city in 2017 and 2020 were 8000 mm and 6859 mm respectively. If the rainfall in the city decreases by r% per year, find r.

A. 4.7

B. 5

C. 6

D. 14.2

21. Refer to the progressive salaries tax rates as shown below.

Net chargeable income	Tax 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%

If Winnie paid \$28 410 as salaries tax, find her net chargeable income.

A. \$73 000

B. \$140 920

C. \$273 000

D. \$340 920

22. \$$P$ is invested at r% per annum, compounded half-yearly. The interest received after n years is

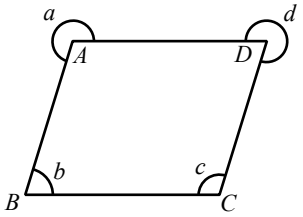
A. $\$\left[P\left(1+\frac{r\%}{2}\right)^{n}-P\right]$.

B. $\$P\left(1+\frac{r\%}{2}\right)^{n}$.

C. $\$\left[P\left(1+\frac{r\%}{2}\right)^{2n}-P\right]$.

D. $\$P\left(1+\frac{r\%}{2}\right)^{2n}$.

23. In the figure, $ABCD$ is a parallelogram.



Which of the following must be true?

I. $a + c = 360°$

II. $b + c = 180°$

III. $a + d = 540°$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

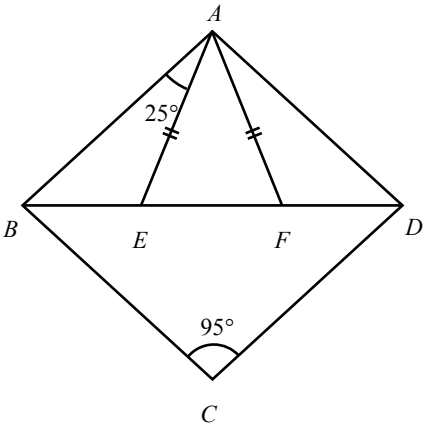
24. In the figure, $ABCD$ is a rhombus. E and F are points on BD such that $AE = AF$, $\angle BAE = 25°$ and $\angle BCD = 95°$. Find $\angle EAF$.

A. 42.5°

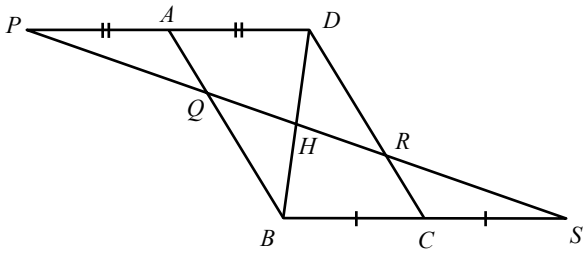
B. 45°

C. 50°

D. 85°



25. In the figure, $ABCD$ is a parallelogram. PAD and BCS are straight lines. AB, DB and DC intersect PS at Q, H and R respectively. $PA = AD$ and $BC = CS$.



Which of the following must be true?

I. $PQ = QR = RS$

II. $BH = DH$

III. $BH \perp QR$

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

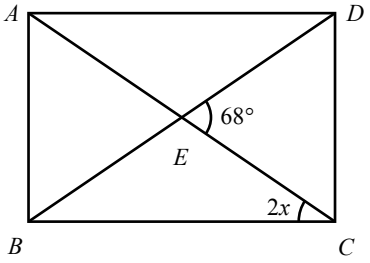
26. In the figure, $ABCD$ is a rectangle. AC and BD intersect at E. $\angle CED = 68°$. Find x.

A. 56°

B. 34°

C. 28°

D. 17°



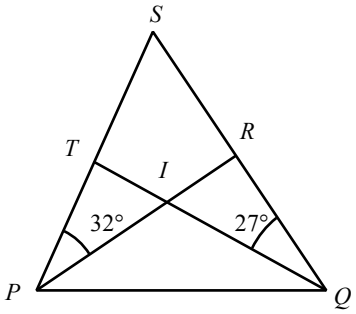
27. In the figure, I is the in-centre of ΔPQS. It is given that $\angle RPS = 32°$ and $\angle TQS = 27°$. Find $\angle PRS$.

A. 82°

B. 84°

C. 86°

D. 88°



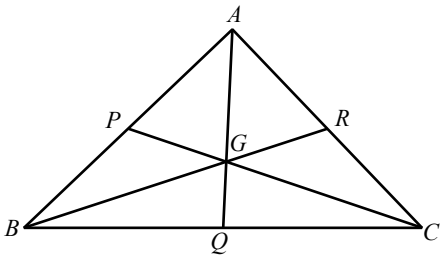
28. In the figure, G is the centroid of ΔABC. AG, BG and CG are produced to meet BC, AC, and AB at Q, R and P respectively. It is given that $AP = 21$ cm, $CQ = 29$ cm and $CR = 20$ cm. Find the area of ΔABC.

A. 760 cm^2

B. 800 cm^2

C. 840 cm^2

D. 880 cm^2



29. In the figure, AC and BD intersect at E. AC is the perpendicular bisector of BD. Which of the following must be true?

I. $BE = DE$

II. $AB = AD$

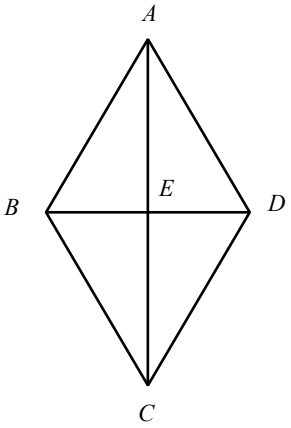
III. $AE = EC$

A. I and II only

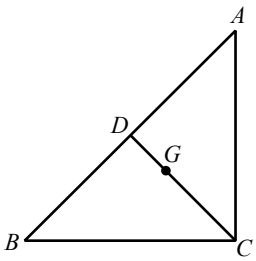
B. I and III only

C. II and III only

D. I, II and III



30. In the figure, D is a point on AB such that the centroid G of ΔABC lies on CD.



Which of the following must be true?

A. CD is the angle bisector of $\angle ACB$.

B. CD is the perpendicular bisector of AB.

C. CD is an altitude of ΔABC.

D. $AD = BD$

Section B (40 marks)

31. The cost price of a game console is \$1250. The game console is sold at a profit of 28%.
    (a) Find the selling price of the game console.
    (b) If the game console is sold at a discount of 20% on its marked price, find the marked price of the game console.

(4 marks)

32. Factorize
    (a) $4x^3 - 20x^2y$,
    (b) $4x^3 - 20x^2y - xy^2 + 5y^3$.

(4 marks)

33. Simplify $\frac{1}{4m+5}-\frac{1}{5-4m}$. (3 marks)

34. Simplify $\left(\frac{x^{-6}y^{0}}{3x^{2}y^{-5}}\right)^{3}$ and express the answer with positive indices. (3 marks)

35. If n is a positive integer, simplify $\frac{6^{n}-2^{n}}{2^{n}}$. (3 marks)

36. It is given that the weight of a carbon atom is 1.993×10^{-23} g and the weight of a hydrogen atom is 1.673×10^{-24} g. A methane molecule is composed of one carbon atom and four hydrogen atoms.

(a) Express the weight of a methane molecule in scientific notation.

(b) How many methane molecules are there in 1 kg of methane?
(Express your answer in scientific notation and give your answer correct to 2 significant figures.)

(4 marks)

37. Solve the inequality $\frac{8-7x}{5} \le \frac{6-4x}{3}$ and represent the solutions graphically. (4 marks)

38. The sum of two consecutive integers is not greater than 130. Suppose that the smaller integer is x.

(a) Set up an inequality in x.

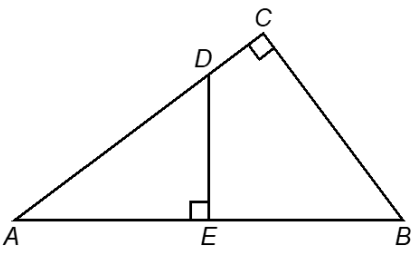
(b) By solving the inequality in (a), find the largest possible values of the two integers.

(5 marks)

39. Jackie wants to borrow \$720 000 from a bank for 10 years. Bank A offers an interest rate of 6% per annum, compounded monthly. Bank B offers an interest rate of 6.2% per annum, compounded half-yearly. Which bank should he choose in order to pay less interest? Explain your answer. (5 marks)

40. In the figure, AEB and ADC are straight lines. $AC \perp BC$, $DE \perp AB$, $BC = 24$, $AD = 25$ and $CD = 7$.
    (a) Prove that $\Delta ADE \sim \Delta ABC$.
    (b) Prove that DE is the perpendicular bisector of AB.

(5 marks)



Section C (30 marks)

41. There are some red balls, green balls and blue balls in a box. The ratio of the numbers of red, green and blue balls is 3 : 4 : 5. Suppose that the numbers of red balls and green balls increase by 15% and 20% respectively and the total number of balls in the box remains unchanged.

    (a) Find the percentage change in the number of blue balls. (4 marks)

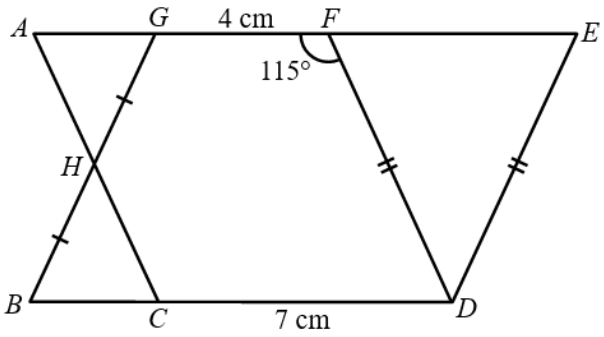
    (b) If the number of green balls is increased by 16, find the final number of blue balls in the box. (3marks)

    (c) The cost of each ball in the box is \$2. Finally each red ball and green ball were sold at \$3 and \$4.5 respectively and the percentage profit of selling all balls is 55%. Find the selling price of each blue ball. (3 marks)

42. In the figure, $ACDF$ and $BDEG$ are parallelograms. $AGFE$ and BCD are straight lines. AC and BG intersect at H. $BH = HG$, $DE = DF$, $GF = 4$ cm, $CD = 7$ cm and $\angle GFD = 115°$.

(a) Find $\angle HBC$. (4 marks)

(b) Find the length of EF. (6 marks)



43. (a) Factorize

(i) $2x^2 - 9x + 9$,

(ii) $6x^2 + 23x - 48$.

(2 marks)

(b) Hence, factorize $2x^3 - 15x^2 - 14x + 48$. (4 marks)

(c) Logan claims that $2x^3 - 14x^2 - 12x + 48$ must have $x + 2$ as a factor. Do you agree? Explain your answer. (4 marks)

END OF PAPER