

Class/ Index Number	Centre Number/ 'O' Level Index Number	Name
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新加坡海星中學
MARIS STELLA HIGH SCHOOL
PRELIMINARY EXAMINATION
SECONDARY FOUR

MATHEMATICS

4052/1

Paper 1

17 August 2026

Candidates answer on the Question Paper.

2 hours 15 minutes

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

Answer **all** the questions.

The number of marks is given in brackets [] at the end of each question or part question.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

The total of the marks for this paper is 90.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142.

For Examiner's Use		
Subtotal		90
Statement		
Presentation		
Units		
Rounding off		

Mathematical Formulae*Compound interest*

$$\text{Total amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

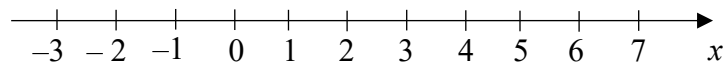
$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

Answer **all** the questions.

- 1 (a) Solve the inequalities $7x - 6 < 2(3x - 1) \leq 5(x - 1) + 2$.

Answer [2]

- (b) Represent your answer to **part (a)** on this number line.



[1]

- 2 Expand and simplify $(3x - 2y)(x + 4y)$.

Answer [2]

- 3 Given that $729^3 = \frac{1}{9^{2x}}$, find the value of x .

Answer $x =$ [2]

- 4 Jonathan has \$10 000 to invest.

A bank offers an interest of 1.95% per annum, compounded monthly for 8 years.

Calculate the total amount of interest he will receive after 8 years if he invests in the bank.

Give your answer correct to the nearest cent.

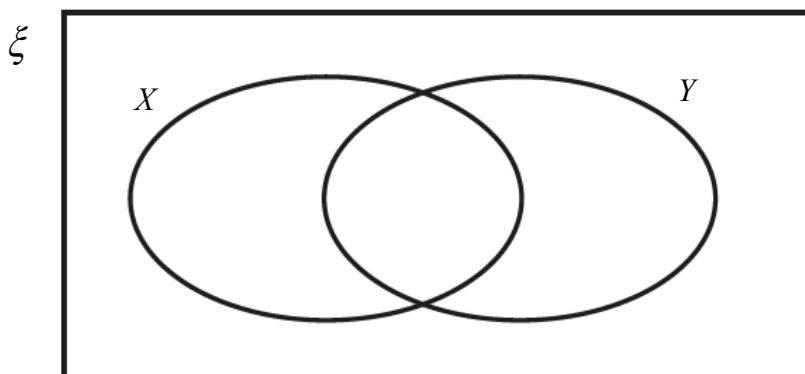
Answer \$ [3]

- 5 (a) The sets ξ , P and Q satisfy the conditions $n(\xi) = 50$, $n(P) = 10$ and $n(Q) = 38$.

Find the smallest possible value of $n(P \cup Q)$.

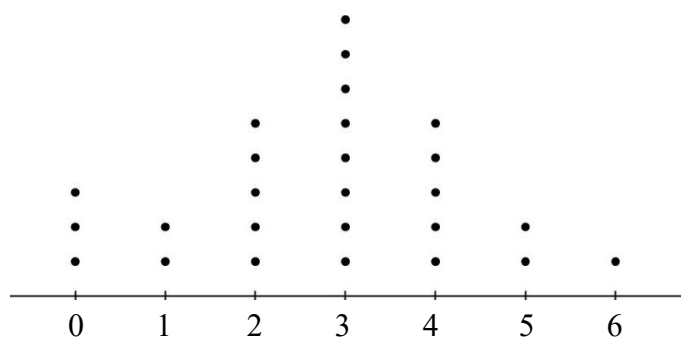
Answer [1]

- (b) On the Venn diagram, shade the region which represents $(X \cup Y)'$.



[1]

- 6 The Marist Football Team plays home and away matches in a weekend league that comprises 14 teams. The dot diagram below represents the total number of goals scored in these matches.



- (a) Johnson said that the modal and median number of goals scored are the same.

Do you agree with Johnson? Explain your answer.

..... [1]

- (b) Johnson did not include all the 3 matches which ended goalless, as he reckoned that there are zero goals anyway. He calculated the mean number of goals scored as:

$$\text{Mean} = \frac{(1 \times 2) + (2 \times 5) + (3 \times 8) + (4 \times 5) + (5 \times 2) + (6 \times 1)}{(2 + 5 + 8 + 5 + 2 + 1)} = 3.13 \text{ (3 s.f.)}$$

Do you agree with his method of computation? Explain your answer.

..... [1]

- 7 Express as a single fraction in its simplest form $\frac{30+6a}{(2a-3)(a+5)} - \frac{1}{3-2a}$.

Answer [3]

- 8 It takes 2 painters 6 hours to paint the interior of 1 flat.
Each painter can work for 8 hours a day.

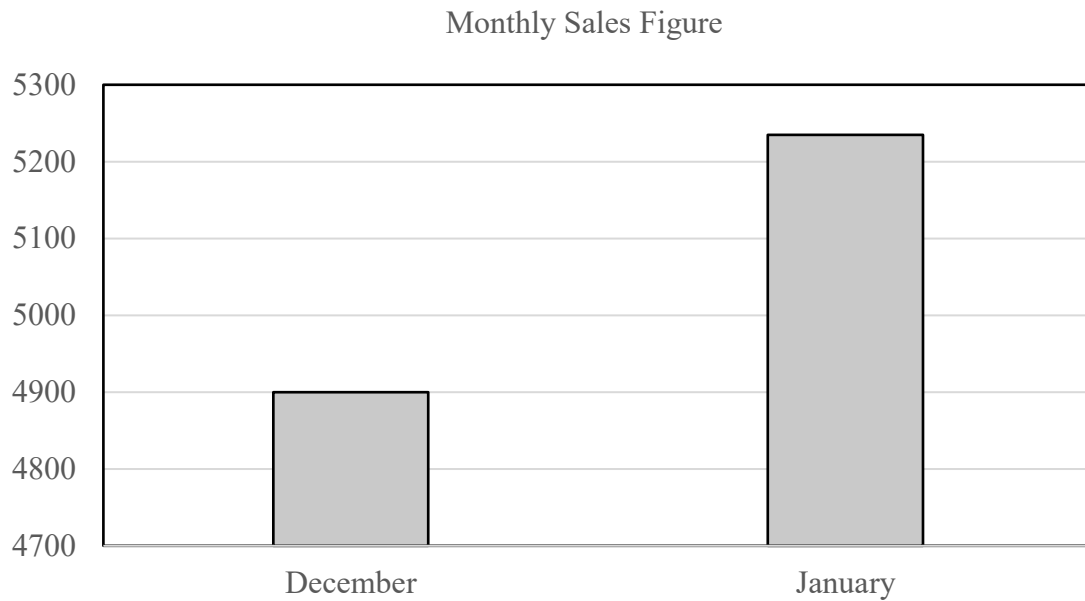
(a) Calculate the number of days it takes 1 painter to paint 6 flats.

Answer days [2]

(b) Calculate the number of painters needed to paint 36 flats in 6 days.

Answer painters [2]

- 9 Maya records the monthly sales figures (in thousands of dollars) for her shop over one year. She presents the graph below to her investors.



- (a) Estimate her monthly sales figure for January.

Answer \$ [1]

- (b) Explain why the graph may **not** show the true trend in sales over the year.

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..... [1]

- (c) (i) State one misleading feature of the graph.

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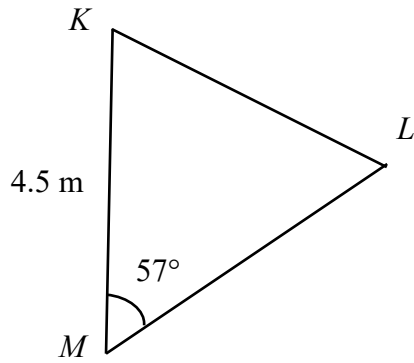
..... [1]

- (ii) Explain how this feature affects the reader's interpretation of the graph.

.....

..... [1]

10



In the triangle, $KM = 4.5$ m and angle $KML = 57^\circ$.

Given that the area of the triangle = 10.4 m^2 , calculate the distance LM .

Answerm [2]

11 A patient has to take three types of pills at regular intervals.

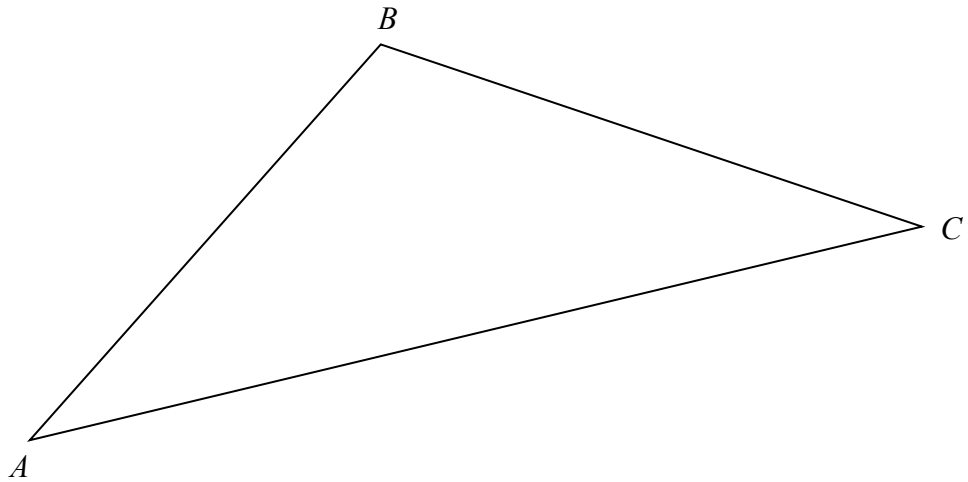
Pill A once every 4 hours, Pill B once every 6 hours and Pill C once every 8 hours.

He started taking all three pills at 0800 hours

At what time will he take all three pills together again?

Answer hours [2]

- 12 The diagram below shows a triangle ABC .



- (a) Construct the perpendicular bisector of AC . [1]
- (b) Construct the bisector of angle BAC . [1]
- (c) A point D is to be plotted inside the triangle.
It is closer to A than C , and closer to side AB than AC .

Shade the region where D can be plotted. [1]
-

- 13** In 2025, Singapore's Median Monthly Household Income (MMHI) was \$12 446. In 2020, MMHI was \$9099, an increase by 5% from 2015.

Calculate the percentage of increase in MMHI from 2015 to 2025.

Answer% [3]

- 14** In a hexagon, three of the interior angles are 120° , 140° and 160° , while the remaining three interior angles are in the ratio of 1 : 3 : 4.

Find the largest exterior angle.

Answer [3]

- 15 Given that n is an integer, explain why $\frac{12n+9}{6}$ can never be an integer.

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..... [2]

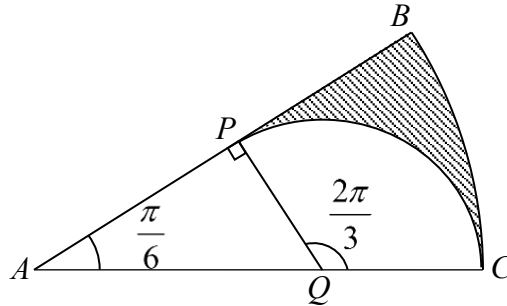
- 16 Solve the equation $x^2 = 9 - 7x$ by completing the square.
Give your solutions correct to 2 decimal places.

Answer $x = \dots\dots\dots$ or $\dots\dots\dots$ [3]

- 17** The diagram shows a sector ABC of a circle with centre at A .

PQC is a sector of another circle with centre at Q . APB is tangent to this circle at point P .

Angle $BAC = \frac{\pi}{6}$ radian and angle $PQC = \frac{2\pi}{3}$ radian.



- (a) Given that the length of arc PC is 2π cm, find the length of PQ .

Answer cm [1]

- (b) Calculate the length AQ .

Answer cm [1]

- (c) Calculate the shaded area.

Answer cm^2 [4]

- 18 Solve these simultaneous equations.

$$4x + 3y = 18$$

$$5x - 2y = 11$$

You must show your working.

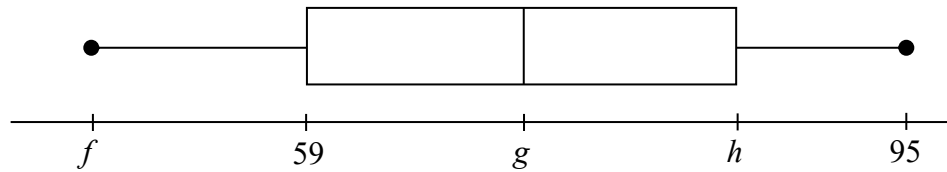
Answer $x =$

$y =$ [3]

- 19 The marks scored by 11 students in a Mathematics test are listed below.

59, 95, 68, 82, f , g , h , 53, 75, 92, 62

The above data is represented in a box-and-whiskers diagram.



Given that the range is 47, the median is 72 and the interquartile range is 27,

- (a) find the value of f ,

Answer $f = \dots\dots\dots$ [1]

- (b) find the value of g ,

Answer $g = \dots\dots\dots$ [1]

- (c) find the value of h ,

Answer $h = \dots\dots\dots$ [1]

- (d) calculate the mean mark scored.

Answer $\dots\dots\dots$ [1]

- 20** In a standard triathlon, Darryl achieved the following results.

	Distance	Time	Speed
Swim	1.5 km	x mins	1.875 km/h
Bike	40 km	2 hours	20 km/h
Run	y km	72 mins	$8\frac{1}{3}$ km/h

- (a)** Calculate the value of x .

Answer $x = \dots\dots\dots$ [1]

- (b)** Calculate the value of y .

Answer $y = \dots\dots\dots$ [1]

- (c)** Calculate the average speed of the whole triathlon in km/h.

Answer $\dots\dots\dots$ km/h [2]

- 21** Johnny planned to visit Japan in early June, so he changed 1000 Singapore dollars (SGD) into Japanese yen (JPY) at the rate of SGD1=JPY123.7.
However, his trip was cancelled, so he had to change his Japanese yen back to Singapore dollars. The rate was SGD1=JPY125.5 when he converted his yen back to dollars.

Calculate the amount of money lost or gained as a result of these exchanges.

Answer \$..... [3]

- 22** During a shooting competition, the probability that Jack hits a target is $\frac{3}{5}$ and the probability that Jill hits the same target is $\frac{2}{3}$.
Both shoot at the target once.

(a) Find the probability that both Jack and Jill hit the target.

Answer [1]

(b) Find the probability that the target is hit by at least one of them.

Answer [2]

- 23** A cuboid, with a volume of 1215 cm^3 , is filled with cubes of volume of 1 cm^3 .
Each side of the cuboid is at least 5 cm long.
Find the possible dimension(s) of the cuboid.

Answer

[3]

- 24** The number of atoms in 1 gram of hydrogen is approximately 6.02×10^{23} .
A sample contains 5×10^{-4} grams of hydrogen atoms.

(a) Find the number of atoms in the sample. Give your answer in standard form.

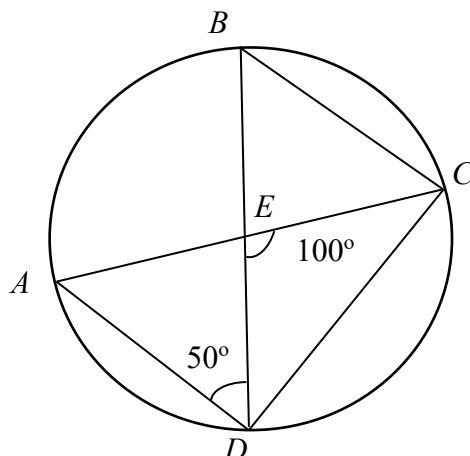
Answer [1]

(b) Each atom has a diameter of $1.06 \times 10^{-10} \text{ m}$.

If all the atoms were laid end to end in a straight line, find the total length of the line in kilometers. Give your answer in standard form.

Answer km [2]

- 25** The diagram shows four points A , B , C and D which lie on the circumference of a circle. BD and AC intersect at point E . Angle $DEC = 100^\circ$ and angle $ADB = 50^\circ$.



- (a)** Jackson claimed that line AD is parallel to line BC . Justify if Jackson's claim is correct and give a reason for each step of your working.

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..... [3]

- (b)** Determine if point E is the centre of the circle.

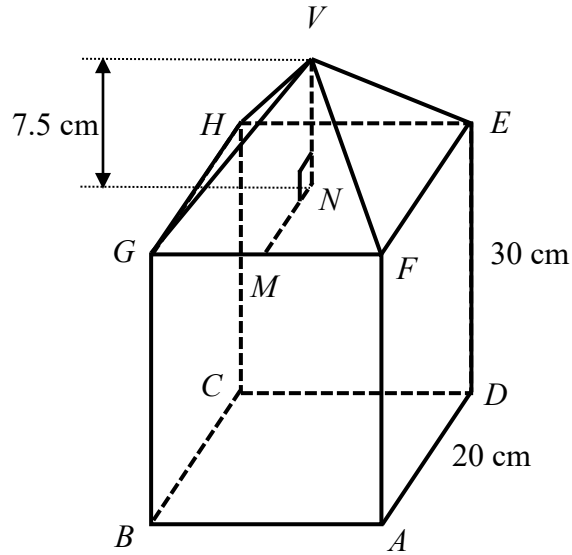
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..... [1]

26



The diagram shows a solid formed from a square pyramid and a cuboid.

$AD = 20$ cm, $DE = 30$ cm and $VN = 7.5$ cm.

N is vertically below the vertex V and M is the mid-point of GF .

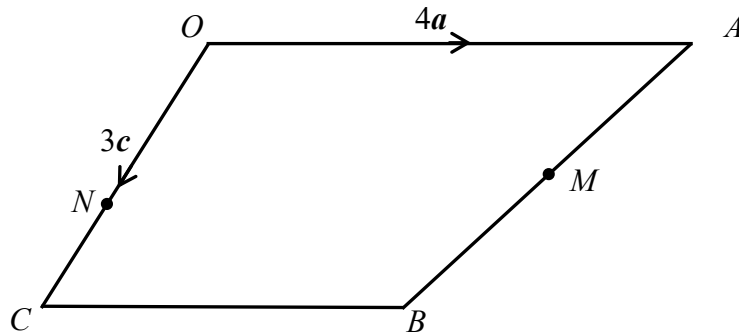
- (a) Calculate the volume of the solid.

Answer cm^3 [2]

- (b) Calculate the surface area of the solid.

Answer cm^2 [4]

- 27 In the diagram, $OABC$ is a trapezium where OA is parallel to CB . $\overrightarrow{OA} = 4\mathbf{a}$, $\overrightarrow{OC} = 3\mathbf{c}$ and $CB = \frac{3}{4}OA$. M is the midpoint of AB , and N is the point on OC such that $ON : NC = 2 : 1$.



- (a) Express $\overrightarrow{OB}$ in terms of $\mathbf{a}$ and $\mathbf{c}$, as simply as possible.

Answer $\overrightarrow{OB} = \dots\dots\dots$ [2]

- (b) Express $\overrightarrow{MN}$ in terms of $\mathbf{a}$ and $\mathbf{c}$, as simply as possible.

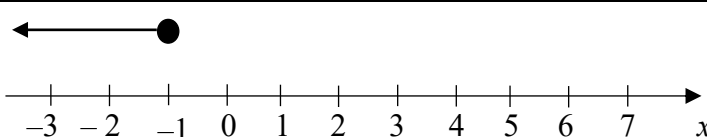
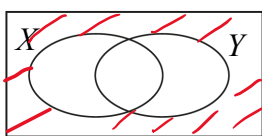
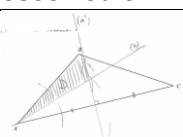
Answer $\overrightarrow{MN} = \dots\dots\dots$ [4]

- (c) The area of triangle $MNC = 33.5 \text{ cm}^2$.
Find the area of triangle MNO .

Answer cm^2 [2]

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Maris Stella High School
2026 Secondary Mathematics
Prelim Examination Paper 1 Answer Keys

Qn	Answer Key
1	a) $x \leq -1$ b) 
2	$3x^2 + 10xy - 8y^2$
3	$x = -4\frac{1}{2}$
4	\$1686.78
5	a) 2 b) 
6	a) Yes. Modal goals is 3 goals and the median goals =3. b) No, I disagree. By excluding the matches which ended goalless, the calculated mean is larger than the actual mean.
7	$\frac{7}{2a-3}$
8	a) 9 days b) 9 painters
9	a) \$5220 000 – \$5240 000 b) The graph only shows 2 months' sale, so fluctuations btw other mths are not captured. c)i) The vertical axis does not start at zero. c)ii) This makes small differences appear much larger, misleading the reader into thinking sales varied far more than they actually did.
10	5.51 m
11	0800 hours
12	
13	43.6%
14	142.5°
16	$x = 1.11$ or $x = -8.11$
17	a) 3 cm b) 6 cm c) 3.99 cm^2
18	$x = 3, y = 2$
19	a) 48 b) 72 c) 86 d) 72
20	a) 48 b) 10 c) 12.875 km/h
21	\$14.34 lost
22	a) $\frac{2}{5}$ b) $\frac{13}{15}$
23	5 cm by 9 cm by 27 cm or 9 cm by 9cm by 15 cm.
24	a) 3.01×10^{20} b) $3.19 \times 10^7 \text{ km}$
26	a) 13000 cm^3 b) 3300 cm^2
27	a) $3(c+a)$ b) $\frac{1}{2}(c-7a)$ c) 67 cm^2