Class/ Index Number	Centre Number/ 'O' Level Index Number	Name
/	/	

新加坡海星中学

MARIS STELLA HIGH SCHOOL
PRELIMINARY EXAMINATION
SECONDARY FOUR

MATHEMATICS **4052/1**

Paper 1

18 August 2025

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		

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Mathematical Formulae

Compound interest

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

Mensuration

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

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

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

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

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

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

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

Trigonometry

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

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

Statistics

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

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

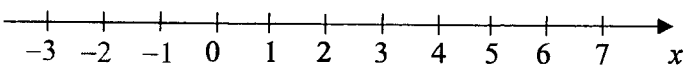
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1 Simplify $x^3 - x(x+2)(x-2)$.

Answer ..... [2]

2 Represent the solution set of the simultaneous inequalities $x \leq 3$ and $-2 < x < 6$ on the number line below.

Answer



[1]

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3 The cash price for a car was \$150000.
Sally paid a downpayment of \$90000 and paid the remaining amount by monthly instalments for 5 years.
A simple interest of x% per annum was charged and that her monthly instalment was \$1090.

(a) Find the value of x.

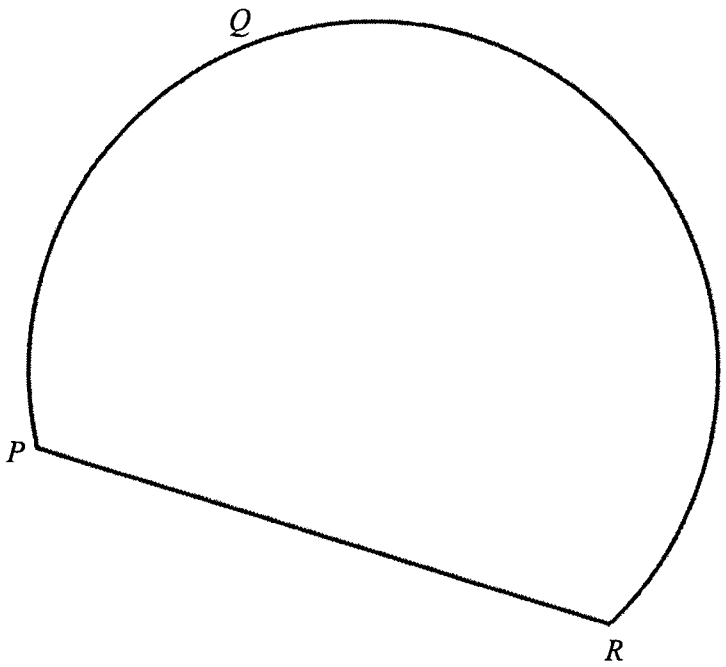
Answer x = ... [4]

(b) Calculate the extra cost of using hire purchase as a percentage of the cash price.

Answer ..... % [1]

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4 The diagram shows a segment of a circle, PQR.



(a) A point X on the perimeter of the segment is such that $PX = RX$.
Find and label the position of X. [1]

(b) On the diagram, construct the angle bisector of angle XPR. [1]

(c) On the diagram, shade a region inside PQR that is closer to PR than PX, and closer to P than R. [1]

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5 **(a)** An interior angle of a regular n-sided polygon is 1.5 times its exterior angle. Find the value of n.

Answer n = ... [3]

(b) What is the name of the n-sided polygon given in part (a) ?

Answer ..... [1]

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6 The scale of Map *A* is given as 1: 200 000.

(a) The length of a road on the map is 6 cm.
Calculate the actual distance, in kilometres, of the road.

Answer ..... km [2]

(b) The scale of Map *B* is 1: 250 000 and the size of an island on Map *B* is $3.6\,cm^2$.
Calculate the area of the same island, in square centimetres, on Map *A*.

Answer ..... cm^2 [2]

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7 Factorise

(a) $2+5x-3x^2$,

Answer ..... [2]

(b) $3x^2-24y+4x-18xy$.

Answer ..... [2]

8 The first four terms in a sequence are 2, 6, 18, 54.

(a) Find an expression, in terms of n, for the nth term of the sequence.

Answer ..... [1]

(b) Explain why the number 98415 is not a term of the sequence.

.....

.....

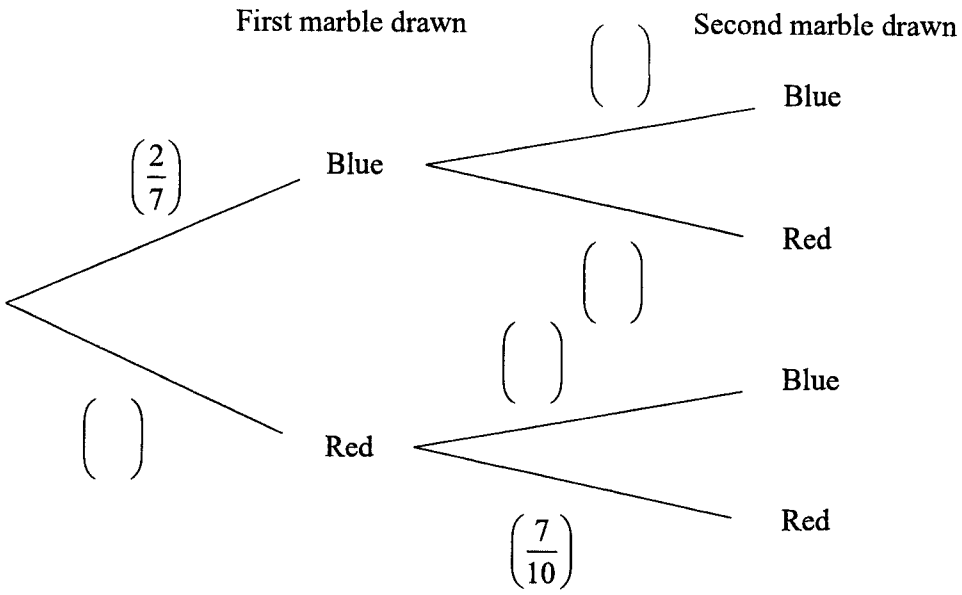
..... [1]

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9 A bag contains 21 marbles, of which 6 are blue and 15 are red.

Two marbles are drawn at random, one after the other, from the box without replacement.

(a) Complete the tree diagram below. [2]



(b) Find the probability that

(i) both marbles drawn are blue,

Answer ..... [1]

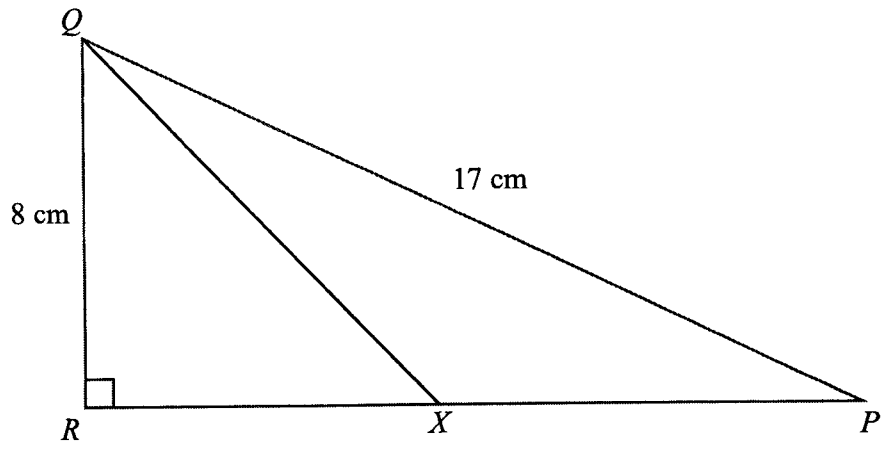
(ii) at most one of the marbles drawn is red.

Answer ..... [2]

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10 In the diagram, PXR is a straight line,

$\angle PRQ = 90°, PQ = 17$ cm, $QR = 8$ cm and area of $\Delta PXQ = 36$ cm^2.



Calculate

(a) RX,

Answer ..... cm [3]

(b) $\cos \angle QXP$.

Answer ..... [2]

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11 **(a)** 6 workers can paint a building in 44 days.

Find the additional number of workers needed if the building is to be painted in 11 days.

Answer ..... workers [3]

(b) A is inversely proportional to B^2.

If B increases by 20%, find the percentage decrease in A.

Answer ..... % [2]

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12 It is given that $a = \dfrac{b+2cd}{b-cd}$.

(a) Evaluate a when $b = -8$, $c = 0.873$ and $d = -2$.
Give your answer correct to **2 significant figures.**

Answer $a =$ ..... [2]

(b) Express b in terms of a, c and d.

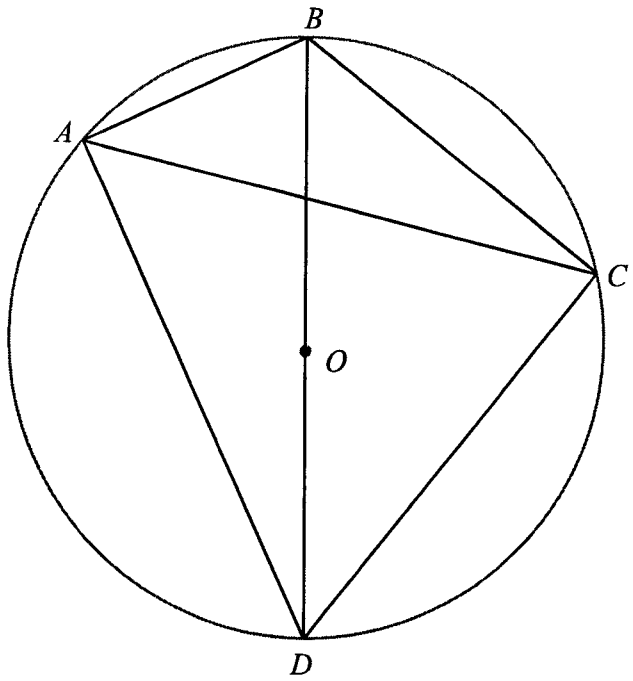
Answer $b =$ ..... [2]

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13 The diagram shows four points A, B, C and D which lie on the circumference of a circle with centre O.

BD is the diameter of the circle.

Angle $BDC = 30°$ and angle $BCA = 20°$.



Find, giving reasons for each answer,

(a) angle ABD,

Answer Angle ABD ..... [3]

(b) angle ABC.

Answer Angle ABC = ... [2]

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14 Solve these simultaneous equations.

$$3y + \frac{1}{2} = 15x$$
$$3x - 2y = 5$$

You must show your working.

Answer $x =$ .....

$y =$ ..... [3]

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15 Bank A pays a compound interest of 2% per annum compounded half-yearly.
Matthew will be making a deposit of $10 000.

Calculate how much interest Matthew will earn after 3 years.

Answer $..... [3]

16

$\varepsilon = \{x : x \text{ is an integer and } 0 < x < 11\}$
$A = \{x : x \text{ is a factor of } 20\}$
$B = \{x : x \text{ is a prime number}\}$

(a) List the elements of

(i) A,

Answer ..... [1]

(ii) $A \cup B$.

Answer ..... [1]

(b) Find $n(A' \cap B)$.

Answer ..... [2]

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17 **(a)** Write 2574 in standard form.

Answer ..... [1]

(b) Find the difference between 3.7×10^{105} and 4.6×10^{106}.
Give your answer in standard form.

Answer ..... [1]

18 Written as a product of prime factors,

$$588 = 2^2\times3\times7^2 \text{ and } 1400 = 2^3\times5^2\times7.$$

Find

(a) the smallest integer, m, such that $1400m$ is a perfect cube.

Answer m = ... [1]

(b) the greatest integer that will divide both 1400 and 588 exactly.

Answer ..... [1]

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19 For the month of January, the amount of money, in dollar, saved individually by 13 students are shown below.

January 58, 43, 64, 68, 60, 92, 79, 94, 88, 67, 80, 41, 24
(in dollars)

(a) Find

(i) the mean savings of the 13 students for the month of January,

Answer $..... [1]

(ii) the standard deviation of the savings in January.

Answer $..... [2]

(b) The amount of money, in dollar, saved by the same group of students were calculated again in February as shown below.

February 58, 43, 64, 68, 60, 92, 79, 94, 88, 67, 80, 41, **10**
(in dollars)

Given that only the lowest amount saved by a student in February was changed to \$10, state how the mean and standard deviation will change in February as compared January.

.....

.....

..... [2]

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20 The base and the height of a triangle are each reduced by 40% followed by an increase of 50%. Find the percentage reduction of the area of the final triangle compared to the original triangle.

Answer ..... % [3]

21 Solve the equation $\frac{x}{4}-\frac{3x-2}{5}=-1$.

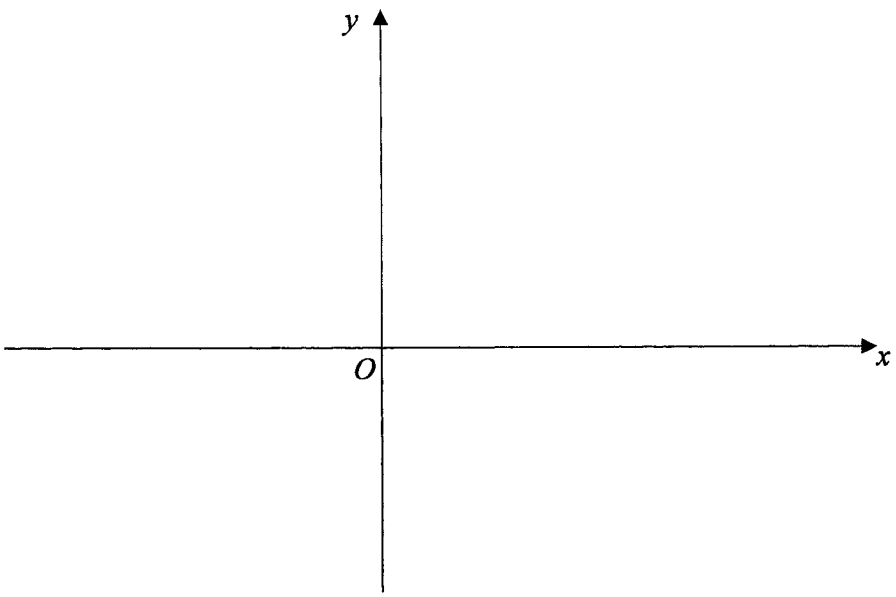
Answer x = ... [3]

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22 **(a)** Solve the equation $x^2 - \frac{3}{4}x - 5 = 0$ by completing the square.
Give your solutions correct to 2 decimal places.

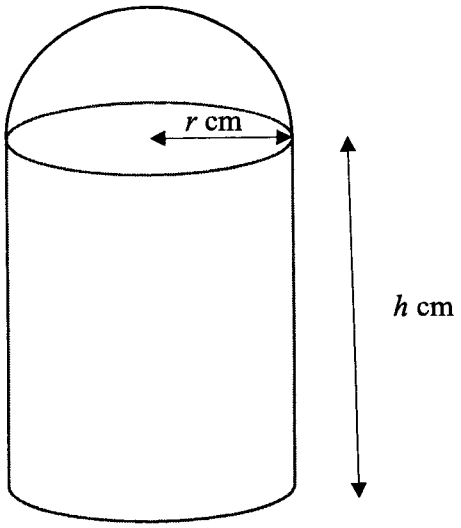
Answer $x =$ ..... or $x =$ ..... [3]

(b) Hence, sketch the graph of $y = x^2 - \frac{3}{4}x - 5$, indicating all intercepts and turning point(s) clearly. [2]



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23 A hollow container is made by joining a hemisphere of radius r cm to an open cylinder of radius r cm and height h cm.



(a) If the ratio of the capacity of the hemisphere to the capacity of the cylinder is 1 : 4, show that $h = \frac{8}{3}r$.

Answer

[2]

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(b) If the total capacity of the container is $\frac{80\pi}{3}$ cm^3, find the radius.

Answer ..... cm [2]

(c) Find the area of the metal sheet used to make the container.
Leave your answer in terms of π.

Answer ..... cm^2 [2]

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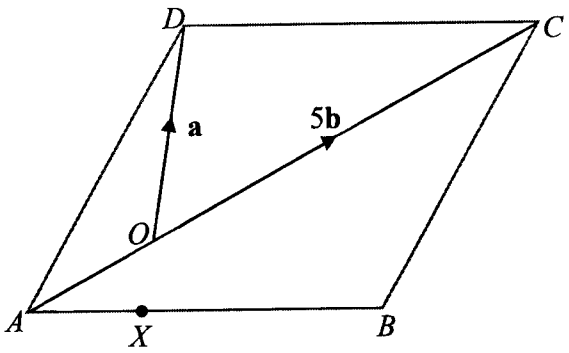
24 **The diagram is not drawn to scale.**

$\overrightarrow{AC} = 6\overrightarrow{AO}$ and $AX : XB = 1 : 4$.

$ABCD$ is a parallelogram.

AOC is the diagonal of the parallelogram.

The position vectors of C and D, relative to O are $5\mathbf{b}$ and $\mathbf{a}$ respectively.



Express each of the following in terms of **a** and **b**.

(a) $\overrightarrow{AD}$,

Answer ..... [1]

(b) $\overrightarrow{AX}$,

Answer ..... [2]

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(c) position vector of X.

Answer ..... [2]

End of Paper

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