

NAME:

NO:

CLASS:

ADMIRALTY SECONDARY SCHOOL



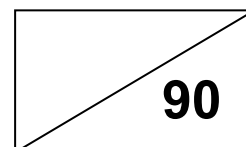
PRELIMINARY EXAMINATION 2025

SUBJECT : Elementary Mathematics
CODE/PAPER : 4052/01
LEVEL/STREAM : Secondary 4 Express / 5 Normal (Academic)
DATE : 26 August 2025
TIME : 0800h – 1015h
DURATION : 2 hours 15 minutes

Instructions to candidates:

1. Write your name, class and index number.
2. Answer **ALL** questions.
3. Calculators should be used 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, unless the question requires the answer in terms of π .
4. Essential workings must be shown. Omission of essential workings and illegible handwriting will result in loss of marks.



DO NOT TURN OVER THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

This question paper consists of **19** printed pages including this cover page.

Mathematical Formulae*Compound Interest*

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

Mensuration

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

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

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

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

$$\text{Area of a triangle } ABC = \frac{1}{2} bc \sin A$$

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

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

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 Solve the inequality $\frac{2x+5}{2} > 1-4x$.

Answer [2]

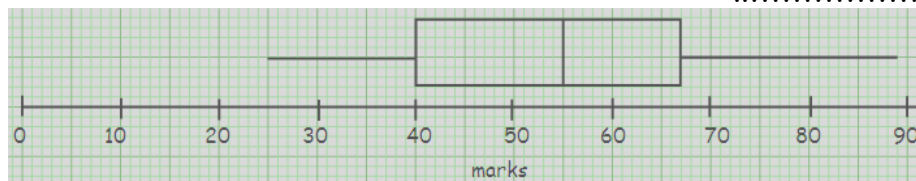
- 2 The population of a particular animal increased from 400 at the start of January 2023 to 620 at the start of January 2025. The population increased by $x\%$ every month. Find the value of x .

Answer $x =$ [2]

- 3 Find the smallest value of x such that the lowest common multiple (LCM) of x and 15 is 45.

Answer $x =$ [2]

4



The box-and-whisker plot shows information of the distribution of marks of 40 students for a Mathematics examination.

- (a) Use the box-and-whisker plot to find the median mark.

Answer [1]

- (b) Rachel says, “Approximately 40% of the students scored 40 marks or less”. Is she correct? Give a reason for your answer.

.....

[1]

- 5 The graph shows the number of unemployed workers in Country X for the last 10 years.



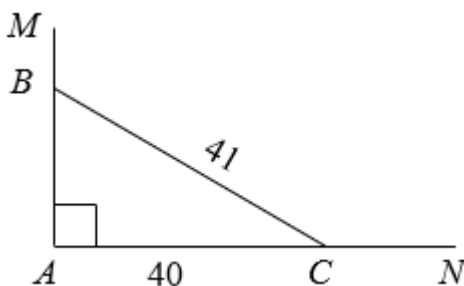
- (a) State one feature of the graph that may be misleading.

.....
 [1]

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

.....
 [1]

6



ABC is a triangle in which angle $BAC = 90^\circ$, $AC = 40$ cm and $BC = 41$ cm. AB is produced to M and AC is produced to N .

- (a) Express sine of angle MBC as a fraction.

Answer [1]

- (b) Express cosine of angle BCN as a fraction.

Answer [1]

7 Q is 25% greater than P . R is 30% smaller than Q . What is the ratio of $P : R$?

Answer : [2]

- 8 Given that $8^{1-b} = 16^{b-3}$, find the value of b .

Answer $b =$ [3]

- 9 Simplify $\frac{a}{(2a-1)^2} - \frac{2a}{1-2a}$.

Answer [3]

- 10 A map is drawn to a scale of 1 : 200 000.

(a) Find the actual distance, in km, represented by 8 cm on the map.

Answer km [1]

- (b) A town covers an area of 600 km². Find in, cm², the area representing the town on the map.

Answer cm² [2]

- 11 (a) Factorise $20ab - 4b$.

- (b) Factorise completely $3xy - 2ab - ay + 6xb$. *Answer* [1]

Answer [2]

12
$$c = \frac{k^2 + h^2}{h}$$

- (a) Find c when $k = 2.81$ and $h = 3.67$.
Give your answer correct to 2 significant figures.

Answer $c =$ [1]

- (b) Rearrange the formula to make k the subject.

Answer $k =$ [2]

- 13 (a) The sum of three angles of a quadrilateral is 285° . Find the fourth angle.

Answer $^\circ$ [1]

- (b) Each interior angle of a regular polygon is 165° . Find the number of sides of this polygon.

Answer [2]

14

$$\xi = \{\text{integers } x : 3 < x < 15\}$$

$$A = \{\text{prime numbers}\}$$

$$B = \{\text{multiples of 3}\}$$

$$C = \{\text{factors of 20}\}$$

- (a) List the elements in $(A' \cap C)'$.

Answer [1]

- (b) Underline the correct statements from the list below.

$$A \cap B = \emptyset$$

$$A \cup C = \{4, 5, 7, 11\}$$

$$8 \notin C$$

$$9 \subset B$$

[2]

15

Simplify $\frac{x^4 - 81}{2x - 6}$.

Answer [3]

16

- (a) Express $y = x^2 + 5x - 4$ in the form $y = (x + p)^2 - q$.

Answer [2]

- (b) Write down the coordinates of the minimum point of the graph of $y = x^2 + 5x - 4$.

Answer (.....,) [1]

- 17 Each term in this sequence is found by adding the same number to the previous term.

$a, \quad 11, \quad b, \quad c, \quad 29, \quad \dots$

- (a) Find the values of a , b , and c .

Answer $a = \dots\dots\dots$
 $b = \dots\dots\dots$
 $c = \dots\dots\dots$ [2]

- (b) Write down an expression, in terms of n , for the n^{th} term.

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

- (c) Explain why the value of every term must be odd for all values of n .

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

- 18 (a) Write 0.00024 in standard form.

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

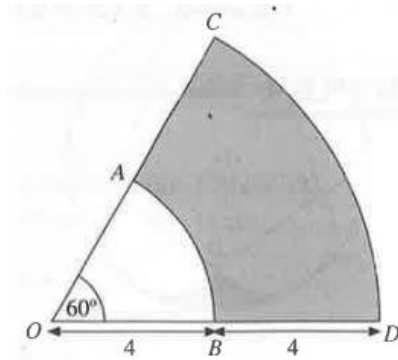
- (b) The distance between the Sun and Mercury is about 5.4246×10^4 megametres. Given that 1 megametre = 10^6 , express this distance in metres. Leave your answer in standard form.

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

- (c) Use the laws of indices to work out $(5.2 \times 10^{50}) - (2.0 \times 10^{49})$.
 Show your working and give your answer in standard form.

Answer $\dots\dots\dots$ [2]

19



The diagram shows the arcs AB and CD of two circles, centre O , with radii 4 cm and 8 cm respectively.

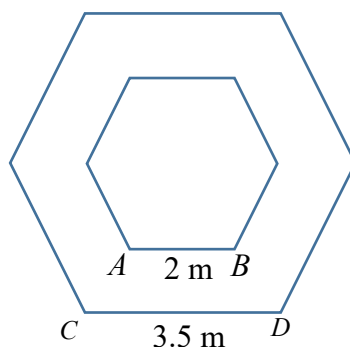
(a) Calculate the perimeter of the shaded region.

Answer cm [2]

(b) Calculate the area of the shaded region.

Answer cm^2 [2]

- 20** A hexagonal central stage is designed for a concert performance. It is divided into two sections. The shaded area is a raised stage, similar to the central stage, while the remaining area is a water stage.



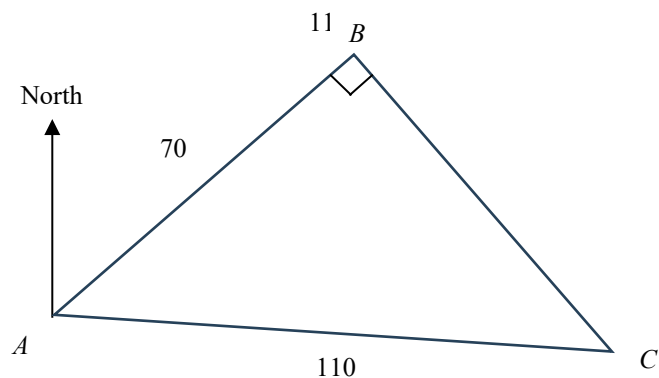
- (a) Given that $AB = 2$ m and $CD = 3.5$ m, find the value of $\frac{\text{area of raised stage}}{\text{area of water stage}}$.

Answer [2]

- (b) The area of the raised stage is 4 m^2 . Find the volume of water required to fill the water stage given that the depth is 5m.

Answer m^3 [2]

21



The diagram shows three towns, A , B and C . C is 110 km due east of A . Angle $ABC = 90^\circ$ and $AB = 70$ km.

(a) Calculate the distance BC .

Answer $BC = \dots\dots\dots$ km [1]

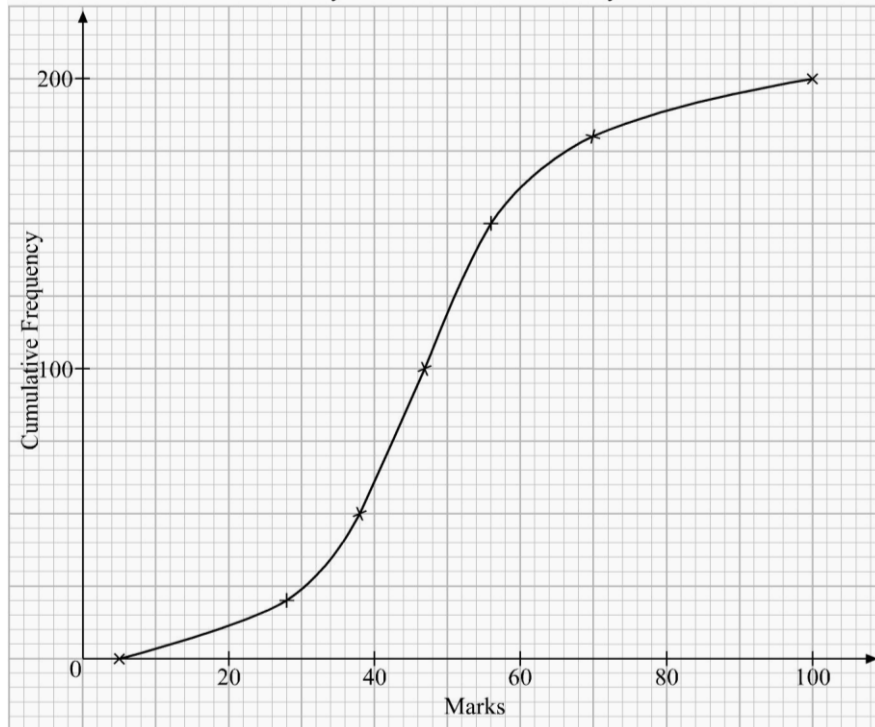
(b) Calculate the bearing of B from A .

Answer $\dots\dots\dots^\circ$ [3]

- 22** The points A and B are $(-2, 1)$ and $(6, -5)$ respectively. The line AB intersects the x -axis at M and the y -axis at N . M is the point $(p, 0)$ and N is the point $(0, q)$. The line CD is parallel to the line AB . The line CD intersects the y -axis at E . E is the point $(0, p + q)$. Find the equation of CD .

Answer [5]

- 23** A group of 200 students took a Chemistry test.
The cumulative frequency curve below shows the distribution of their marks.



- (a) Use the curve to find the interquartile range.

Answer [2]

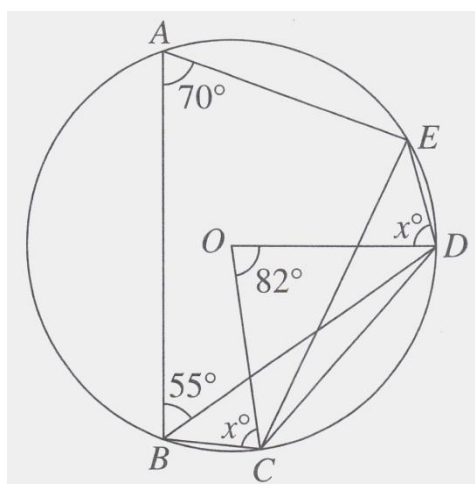
- (b) To achieve a distinction, these students need to score 70 marks or more. If one of them is chosen at random, what is the probability that he has obtained a distinction grade?

Answer [2]

- (c) Another group of 200 students who sat for the same Chemistry test had the same interquartile range as the first group, but a higher median mark. Describe how the cumulative frequency curve for this second group might differ from that of the first group.

Answer [1]
.....

24



O is the centre of the circle through A , B , C , D , and E .

Angle $COD = 82^\circ$, angle $ABD = 55^\circ$, angle $BAE = 70^\circ$ and angle $BCO = \text{angle } EDO = x^\circ$.

Giving a reason for each step of your working, find

(a) angle ODC ,

.....
 [1]

(b) angle AEC ,

.....

 [2]

(c) x .

.....

 [3]

- 25** The daily amounts of money (in dollars) spent by Susan over a period of 7 days are recorded as follows:

10 $2x^3$ 20 9 13 7 14

The mean amount of Susan's expenses is \$12.70.

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

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

- (b)** Assuming the value of x is 2.5, find the standard deviation of Susan's expenses.

Answer \$..... [1]

- (c)** The mean and standard deviation of Susan's expenses for 14 days are \$12.07 and \$3.24 respectively. For the same 14 days, the mean and standard deviation of Paul's expenses are \$14 and \$5.50 respectively. Compare the distributions for the expenses of Susan and Paul.

1.

2.

 [2]

- 26** It is given that $\overrightarrow{PQ} = \begin{pmatrix} 6 \\ 1 \end{pmatrix}$ and the point Q is $(-5, 4)$. The point R is $(a, 2)$ where a is a negative number. $|\overrightarrow{RQ}| = \sqrt{148}$.
- (a)** Find the coordinates of P .

Answer (.....,) [1]

- (b)** Find the value of a .

Answer $a =$ [3]

- (c)** It is given that $\overrightarrow{RT} = \begin{pmatrix} 18 \\ 3 \end{pmatrix}$. What two facts can be deduced about R , Q and T ?

1.

2.

[3]

End of Paper