2026.M28

2026L003G2EL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2026

Mathematics

Paper 2

Ordinary Level

Monday 8 June Morning 9:30 - 12:00

300 marks

Examination Number

Date of Birth / /

For example, 3rd February 2005 is entered as 03 02 05

Centre Stamp

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Instructions

There are **two** sections in this examination paper.

Section A	Concepts and Skills	150 marks	6 questions
Section B	Contexts and Applications	150 marks	4 questions

Answer questions as follows:

- any **five** questions from Section A – Concepts and Skills
- any **three** questions from Section B – Contexts and Applications.

Write your Examination Number in the box on the front cover.

Write your answers in blue or black pen. You may use pencil in graphs and diagrams only.

This examination booklet will be scanned and your work will be presented to an examiner on screen. Anything that you write outside of the answer areas may not be seen by the examiner.

Write all answers into this booklet. There is space for extra work at the back of the booklet. If you need to use it, label any extra work clearly with the question number and part.

The superintendent will give you a copy of the *Formulae and Tables* booklet. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

In general, diagrams are not to scale.

You will lose marks if your solutions do not include relevant supporting work.

You may lose marks if you do not include appropriate units of measurement, where relevant.

You may lose marks if you do not give your answers in simplest form, where relevant.

Write the make and model of your calculator(s) here: | |

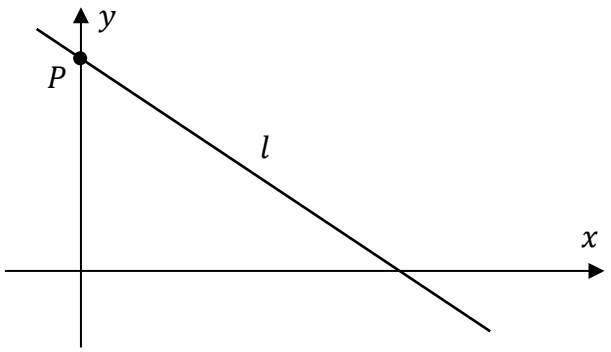
Section A — Concepts and Skills — 150 marks

Answer **any five questions** from this section.

Question 1 **(30 marks)**

The diagram below shows the line l:

$$2x + 3y - 18 = 0$$



(a) l cuts the y-axis at the point P.

(i) Show that the point P is $(0, 6)$.

(ii) The line l cuts the x-axis at the point $(9, 0)$.

Find the area of the triangle, in units^2, made between the x-axis, the y-axis, and the line l.

(b) **(i)** Find the slope of the line l:

$$2x + 3y - 18 = 0$$

(ii) The line k passes through the points $A(4, -2)$ and $B(r, 7)$ and is **perpendicular** to the line l, where $r \in \mathbb{Z}$.

Work out the value of r.

Question 2 **(30 marks)**

(a) Eight schools (**A**, **B**, **C**, **D**, **W**, **X**, **Y**, and **Z**) are competing in a chess tournament.
The schools are divided into two groups, as shown in the table below.

Group 1	**A**	**B**	**C**	**D**
Group 2	**W**	**X**	**Y**	**Z**

At the beginning of the tournament, each school has an **equal chance** of winning its group.
The winner of group 1 will play the winner of group 2 in the final.

(i) Complete the table below to show all possible pairings for the final.
Some have already been completed for you.
For example, **AW** means that school **A** and school **W** play in the final.

		Group 2			
		W	**X**	**Y**	**Z**
Group 1	**A**	**AW**	**AX**		
	B				**BZ**
	C				
	D		**DX**		**DZ**

(ii) Write down the probability that School **B** plays in the final.

(iii) School **D** withdraws before the tournament begins.
The groups remain the same but without school **D**.
Each remaining school in Group 1 still has an equal chance of winning that group.

Work out the probability that school **B** or school **Z**, but **not both**, now play in the final.

(b) Erika and Peter play against each other in a different chess tournament.
The probability that Erika wins a game is $0{\cdot}6$ and this remains the same each time they play.

There are no draws.

(i) Write down the probability that Peter wins a game.

(ii) The first player who wins **two** games wins the match.
For example, Erika could win the match by winning the first game, losing the second game, and winning the third game.

Work out the probability that Erika wins the **match**.

Question 3 **(30 marks)**

(a) Tara is going on a school trip.
She must choose one activity from each of three categories shown below:

Category 1	Category 2	Category 3
Zipline	Pottery	Pizza-Making
Kayaking	Painting	Baking
Archery	Drama	Smoothie-Bar
Rock Climbing	Animation	BBQ
Paddle-Boarding	Singing	
	Crochet	

(i) Find how many different choices are possible if Tara chooses one activity from each of the three categories.

(ii) The organisers need to remove **one** activity from **one** of the categories.

From which category should they remove an activity if they want to keep the **greatest** number of possible choices?
Use calculations to support your answer.

Answer: (Tick (✓) **one** box only) Category 1 ☐ Category 2 ☐ Category 3 ☐

Calculations:

(b) Tara is sitting her fifth-year summer exams.
She will have exams in 7 subjects which can be arranged in any order on the timetable.

(i) In how many ways could the order of the 7 exams be arranged?

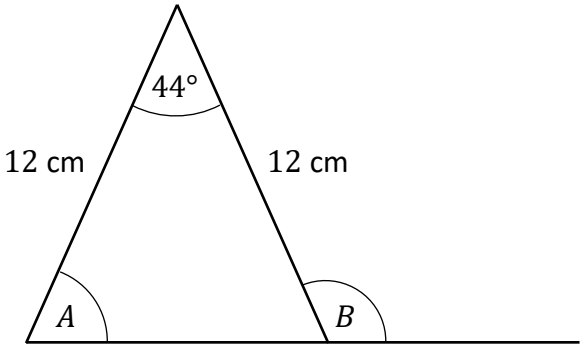
Tara will have 3 exams on Monday.

(ii) How many arrangements of 3 different exams can be made from the 7 exams?

(iii) It is decided that Maths will be the first subject examined on Monday.
How many arrangements can now be made for the remaining exams on Monday?

Question 4 **(30 marks)**

(a) The diagram below shows an isosceles triangle with the base extended.
Some measurements are given.



(i) Find the size of the angle marked A and the size of the angle marked B.

$|\angle A| =$ _____ $|\angle B| =$ _____

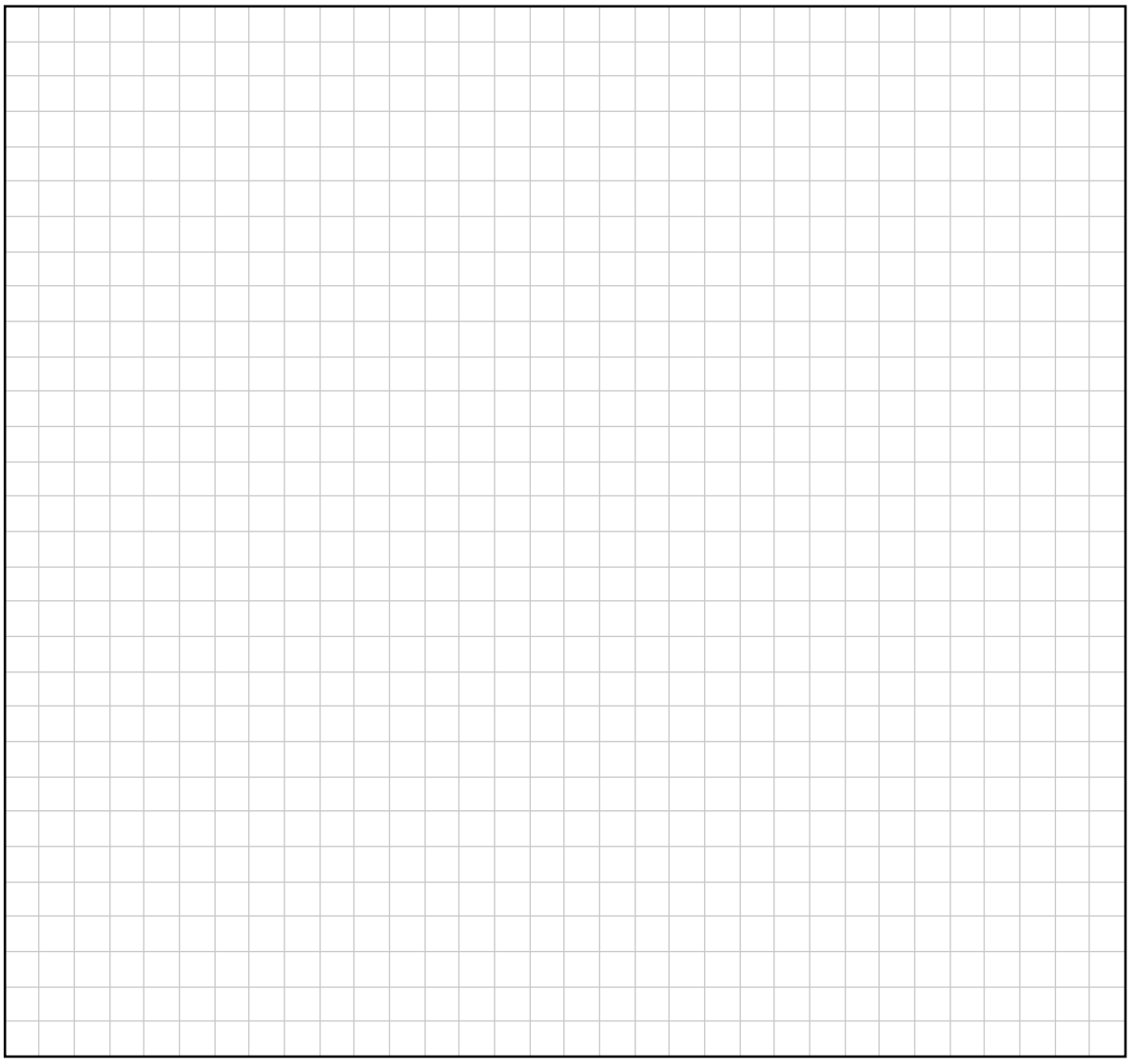
(ii) Find the area of the triangle.
Give your answer correct to the nearest whole number.

(b) A triangle PQR has the measurements:

$|PR| = 12$ cm,
$|PQ| = 9$ cm,
$|QR| = 10$ cm.

Use the **cosine rule** to work out the size of the angle $\angle QPR$.
Give your answer correct to the nearest degree.

Hint: It may be useful to draw a diagram.



Question 5

(a) 7 friends at a match guessed in which minute the first goal would be scored.
The guesses were:

$$8,\ 11,\ 15,\ 17,\ 20,\ 20,\ 23$$

(i) Write down the mode of the 7 numbers **and** find the range of the 7 numbers.

Mode = _____

Range = _____

(ii) Write down the median of the 7 numbers.

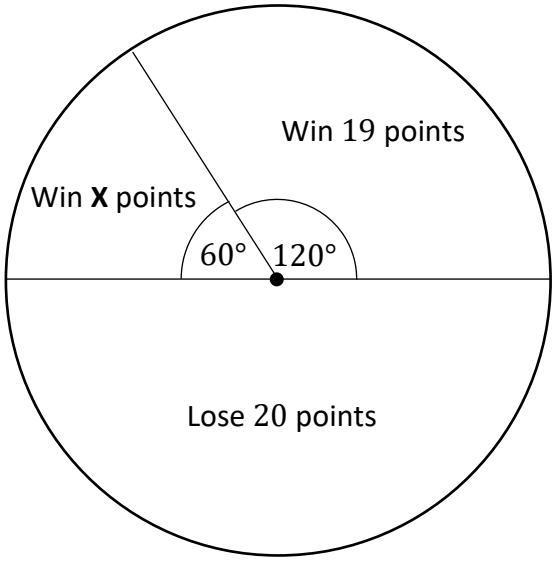
(iii) Seán joined these 7 friends just before the match started and also guessed in which minute the first goal would be scored.
The new median, including Seán's guess, is now 16.

Which of the following must be true about Seán's guess?
Justify your answer.
It may be helpful to try some values for Seán's guess.

Seán's guess must be:	Equal to 16	Less than or equal to 15	More than or equal to 17
(Tick (✓) **one** box only)	☐	☐	☐

Justification:

(b) A board game has a spinner. A player either wins or loses points depending on which sector the spinner lands on. The size of some of the angles of the sectors and the number of points won or lost for each sector are shown in the diagram below.

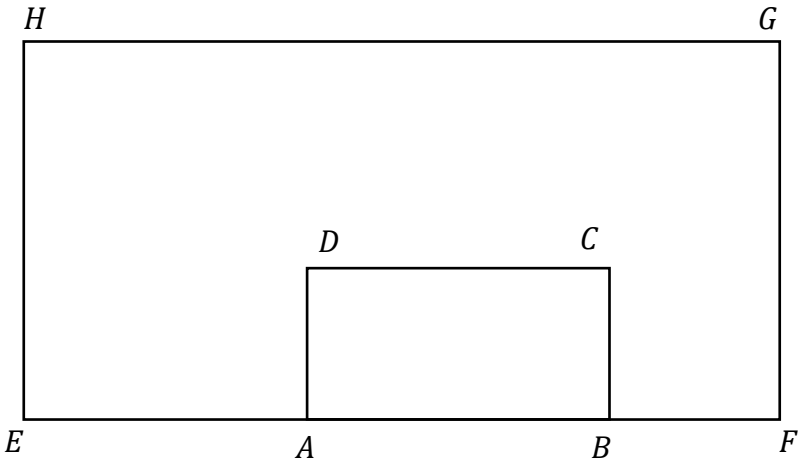


In one sector a player wins **X** points.
Work out the value of **X**, so that the spinner is **fair**, that is, so that the expected value of the number of points won is equal to 0 points.

X = _____

Question 6 **(30 marks)**

(a) The rectangle $EFGH$ is an enlargement of the rectangle $ABCD$, as shown in the diagram below. The points A and B lie on $[EF]$ as shown.



(i) Measure the length of $[AB]$ and the length of $[EF]$, in cm.

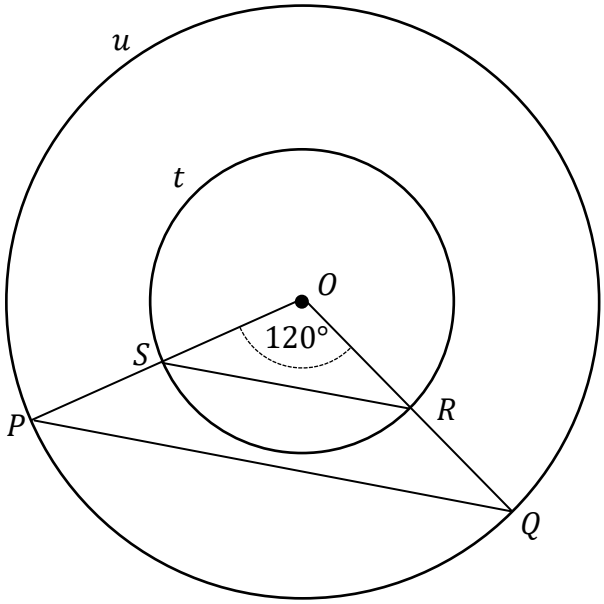
$|AB| =$ ☐ cm

$|EF| =$ ☐ cm

(ii) Use your answers to **(a)(i)** to work out the scale factor of the enlargement.

(iii) **Construct** the centre of enlargement on the diagram above, and **label** it K.

(b) The point O is the centre of the circle u, and also the centre of the circle t.
The points P and Q are on the circle u, and the points S and R are on the circle t.
$S \in [OP]$ and $R \in [OQ]$.
$|\angle QOP| = 120°$.



(i) Explain why $|OP| = |OQ|$.

(ii) Show that the triangles OPQ and OSR are similar.
Give a reason for each statement that you make, where relevant.

Section B — Contexts and Applications — 150 marks

Answer **any three** questions from this section.

Question 7 **(50 marks)**

In a computer game there are a number of overhead lights that each create a circle on the ground. These circles are positioned using a co-ordinate diagram.

(a) One of the circles, c, has equation $x^2 + y^2 = 72$.

(i) Write down the centre and radius of the circle c.
Give the radius in surd form.

Centre $= ($, $)$ Radius $=$ _____

In the game, the player must move their character so they avoid the circles of light.

(ii) Tony's character is at the point $(-4, 9)$.
Investigate if the point $(-4, 9)$ is inside or outside the circle c.
Use calculations to support your answer.

Calculations:

The point $(-4, 9)$ is:	**inside** c	**outside** c
(Tick (✓) **one** box only)	☐	☐

(b) First, Tony moves his character from the point $A(-4, 9)$ to the point $B(0, 12)$.

(i) Find the equation of the line containing the points A and B.
Give your answer in the form $ax + by + c = 0$.

Next, Tony moves his character along a line l.
He does not want his character to enter the circle c, where:

$$l: \quad x + y = 12$$

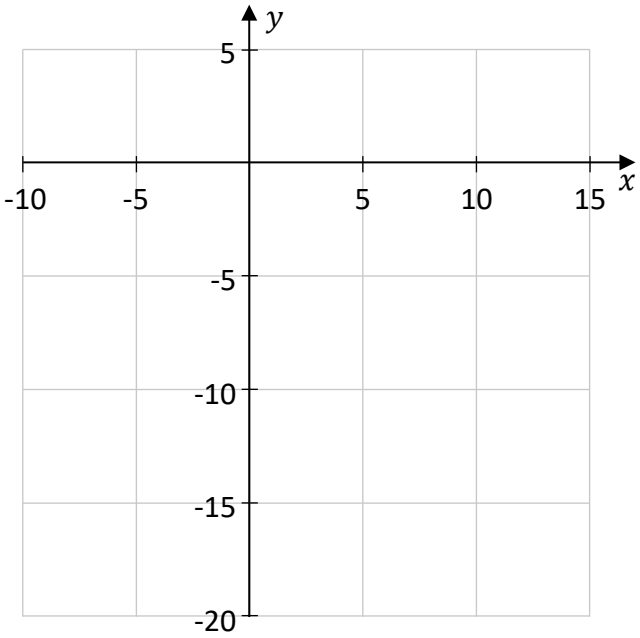
$$c: \quad x^2 + y^2 = 72$$

(ii) Using simultaneous equations, or otherwise, show that the line l is a tangent to the circle c.

This question continues on the next page.

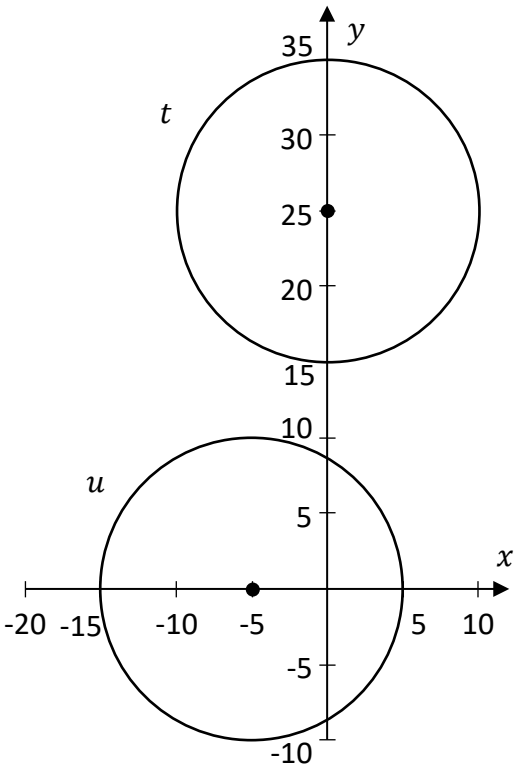
(c) Another light creates the circle s, with centre $(5, -10)$ and radius 10.

(i) **Construct** the circle s on the co-ordinate diagram on the right.



(ii) Write down the equation of the circle s.

(d) Two more lights create the circles t and u, each with radius 10.
t and u are shown on the co-ordinate diagram on the right.



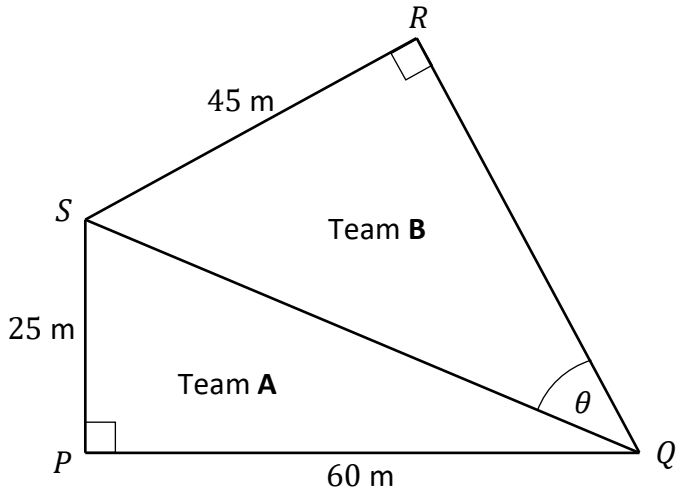
Tony wants to move his character along a **horizontal** line between the circle t and the circle u, without touching either circle.

Write down the equation of **one** such horizontal line.

Question 8 **(50 marks)**

Contestants on a reality show are based on an island.
They are divided into Team **A** and Team **B**.

(a) The diagram below shows the camp for each team.
Both camps are in the shape of right-angled triangles.
Some measurements are also shown.



(i) A fence runs along the line SQ to separate the two camps.

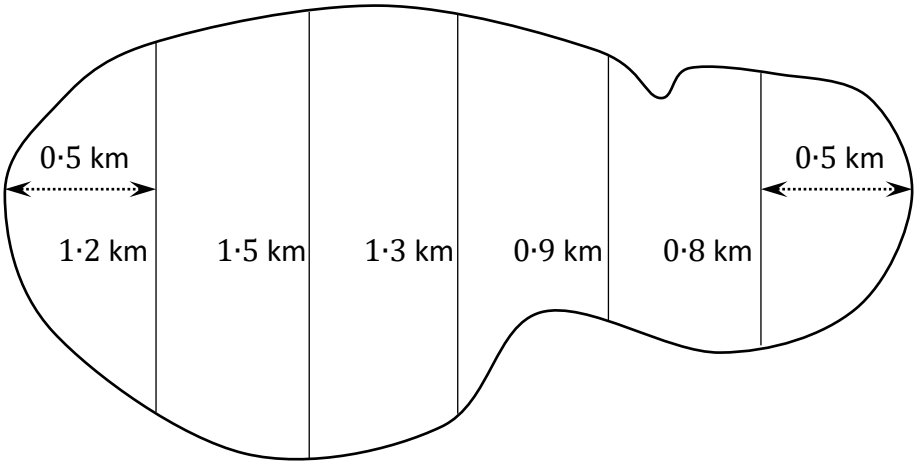
Use the theorem of Pythagoras to show that $|SQ| = 65$ m.

(ii) Find the size of the angle marked θ in the diagram, that is, find $|\angle SQR|$.
Give your answer correct to 1 decimal place.

This question continues on the next page.

The teams must complete tasks.

(b) One task is to approximate the area of the island.
A contestant uses a map and measures the width of the island at $0{\cdot}5$ km intervals.
These widths are given in the diagram below.

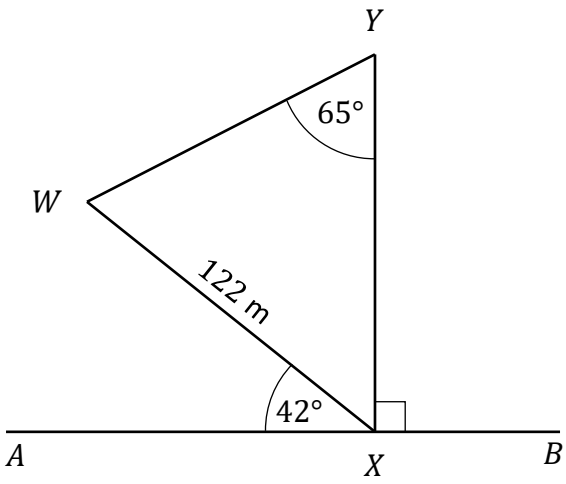


Use the **trapezoidal rule** to estimate the area of the island, in km^2.

(c) Another task is to row a boat from the point W to the point X, and then to the point Y.

As shown in the diagram below:

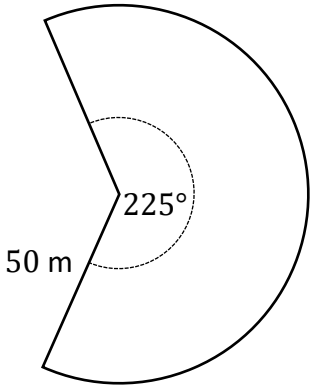
XY is perpendicular to AB,
$|\angle AXW| = 42°$,
$|\angle XYW| = 65°$, and
$|WX| = 122$ m.



Work out the distance from X to Y.
Give your answer correct to the nearest metre.

This question continues on the next page.

(d) The final task involves contestants building a fence around a piece of land. The piece of land is in the shape of a sector with an angle of $225°$ and a radius of 50 m, as shown in the diagram on the right.



(i) The team must build a fence all around the perimeter of the sector.

Work out the **total length** of the perimeter of the sector.
Give your answer correct to the nearest metre.

(ii) The following year, the **area** of the sector is **doubled**.
This is done by increasing the radius. The angle of the sector remains $225°$.

Work out the length of the new radius of the sector.
Give your answer in metres, correct to 1 decimal place.

Question 9 **(50 marks)**

Noreen went to a music festival.

(a) Noreen counted the number of songs each of 10 bands played during their particular set. The results are shown in the table below.

10	5	10	11	10
12	9	10	12	13

(i) Work out the mean and standard deviation of the 10 numbers in the table above. Give each answer correct to 1 decimal place.

Mean $=$ _____ Standard deviation $=$ _____

(ii) One band played 5 songs.
Is this an outlier for the data in the table above?
Refer to a measure of variability to explain your choice.

Answer: 5 is an outlier 5 is **not** an outlier
(Tick (✓) **one** box only) ☐ ☐

Explanation:

This question continues on the next page.

(b) The number of hours people at the festival spent watching bands were roughly normally distributed.
The mean was 17 hours.
The middle 95% of people spent between $14{\cdot}2$ and H hours watching bands.

Using the Empirical Rule, find the standard deviation **and** find the value of H.

Standard deviation $=$ _____ $H =$ _____

(c) A random sample of 540 people was picked from all those who attended the music festival in 2025. They were asked if they had also attended the festival in 2024.

(i) Show that, for this sample, the margin of error for a population proportion is $4{\cdot}3\%$, correct to 1 decimal place.

(ii) 350 of the 540 people had been at the festival in 2024.

Work out the percentage of people in this sample who attended the festival in 2024.
Give your answer correct to the nearest percent.

(iii) In the past (before 2025), 67% of people who attend the festival in a given year also attended the festival the previous year.

Use your answers to parts **(c)(i)** and **(c)(ii)** to test the claim that this percentage has changed for the people who attended the festival in 2025, at the 5% level of significance.

Show relevant calculations, state your conclusion, and give a reason for your conclusion.

Calculations:

Conclusion:

Reason for the conclusion:

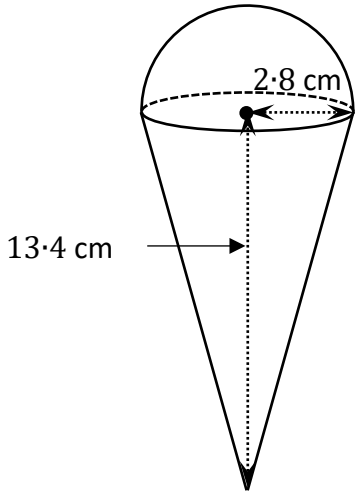
(iv) The organisers want to reduce the margin of error for the survey.
Should they increase or decrease the number of people in the sample?
Remember the margin of error for the population proportion was $4{\cdot}3\%$.
Use calculations to support your answer.

Answer:	Increase	Decrease
(Tick (✓) **one** box only)	☐	☐

Calculations:

Question 10 **(50 marks)**

(a) An ice-cream cone has a radius of $2{\cdot}8$ cm and a vertical height of $13{\cdot}4$ cm, as shown in the diagram below. The entire cone is filled with ice-cream.
There is also a hemisphere, of the same radius, of ice-cream on top of the cone.



By finding the volume of the cone and the volume of the hemisphere, work out the total volume of ice-cream, correct to the nearest cm^3.

(b) Some soft drinks companies have changed the dimensions of their cylindrical cans.
The table below shows the approximate dimensions of the old and the new designs.

	Old Can Design (Cylinder)	**New Can Design (Cylinder)**
Radius	$3{\cdot}3$ cm	3 cm
Height	$11{\cdot}5$ cm	h

(i) Each can design has a volume of $393{\cdot}4$ cm^3, correct to 1 decimal place.

Work out the height, h, of the **new** can design.
Give your answer correct to 1 decimal place.

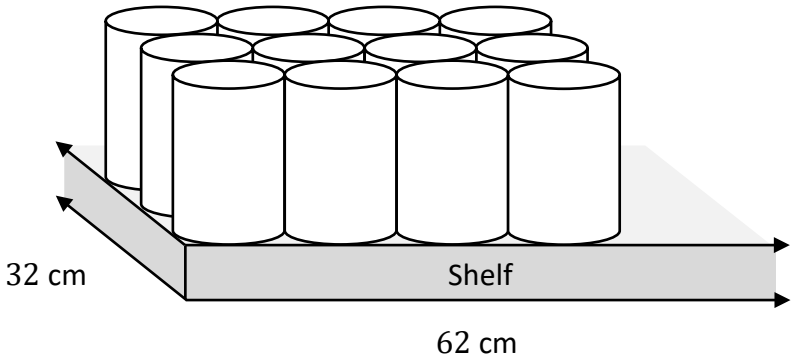
(ii) The **total surface area** of the new can design is $318{\cdot}6$ cm^2 correct to 1 decimal place.

Work out the **percentage increase** in the total surface area from the **old** can design to the **new** can design. Give your answer as a percent correct to 1 decimal place.

This question continues on the next page.

(iii) Remember that the radius of the old can is $3{\cdot}3$ cm and that the radius of the new can is 3 cm.

A shop has a shelf of length 62 cm and depth 32 cm.
All cans are placed upright and are not stacked on top of each other.
The cans are in rows, where the first row is placed along the edge of the shelf and each other row is placed directly behind the first row.
The **entire base** of each can must be in contact with the shelf.
The diagram below shows some of the cans on the shelf.

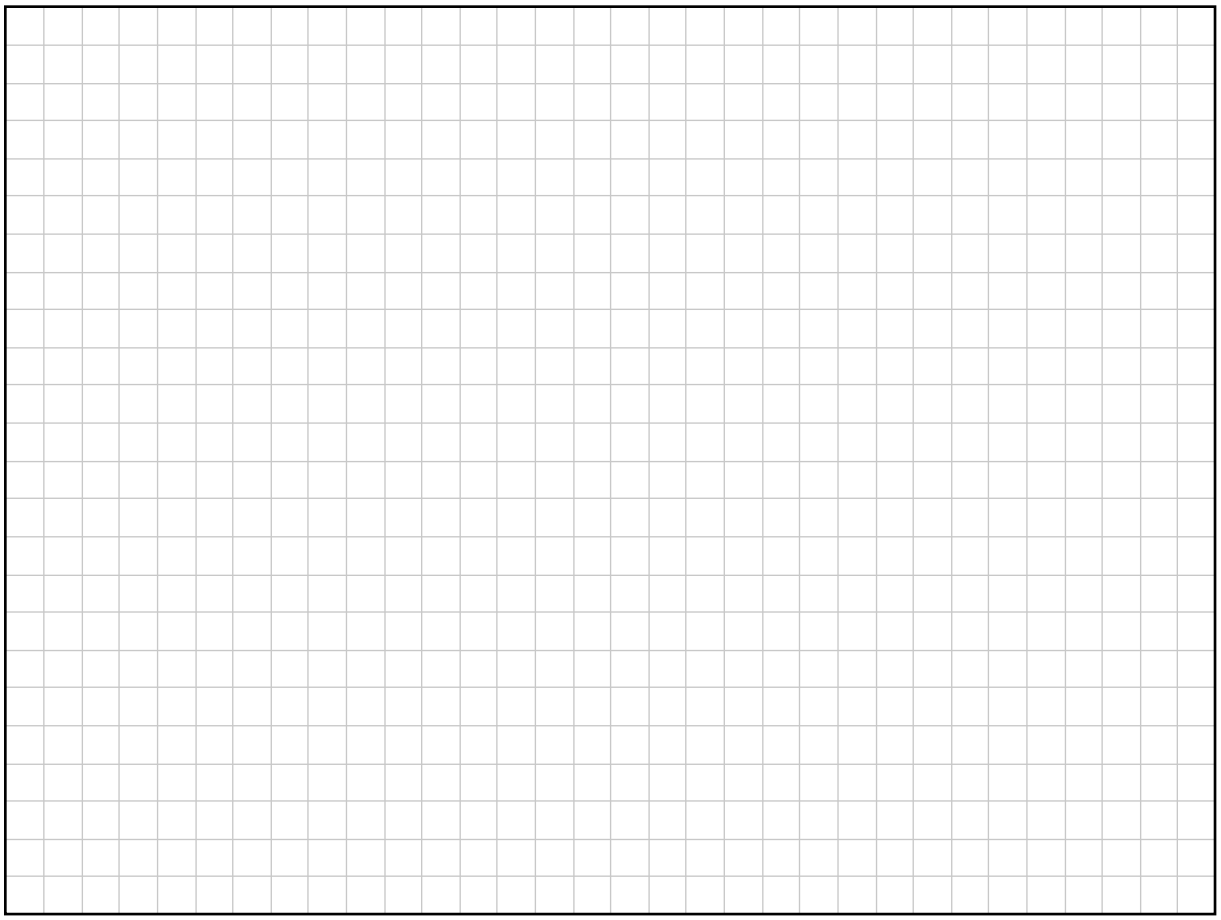


Work out how many **more** cans could be placed on this shelf if the **new** can design was used instead of the **old** can design.

Answer = _____

(c) In 2020, a soft drink had 35 grams of sugar in a 330 millilitre can.
In 2021, the company made a new recipe with 30% less sugar.
In 2025, the company reduced the sugar in the 2021 recipe by a **further** 20%.

Work out how many grams of sugar are in a 500 millilitre bottle of the 2025 recipe.
Give your answer correct to 1 decimal place.



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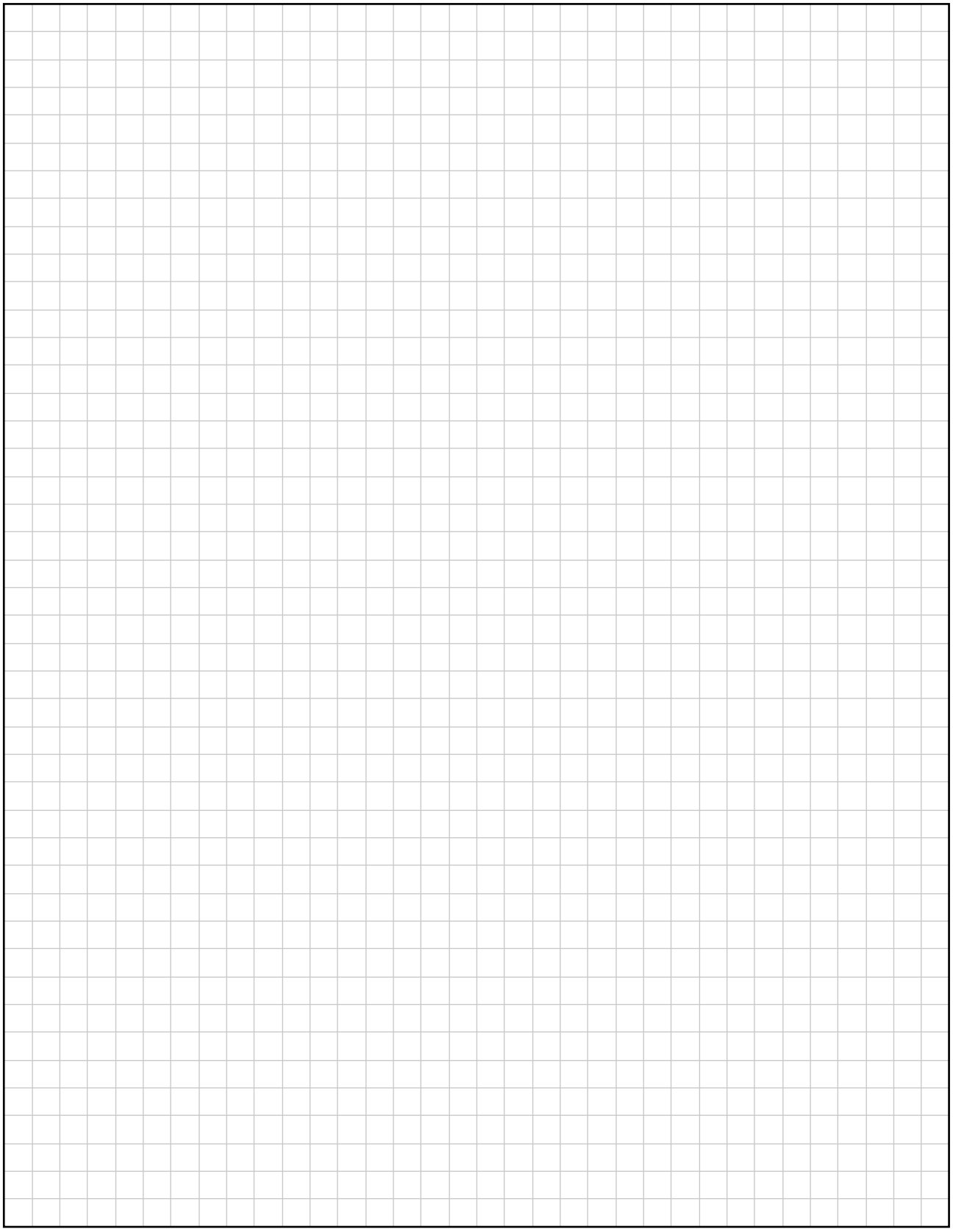

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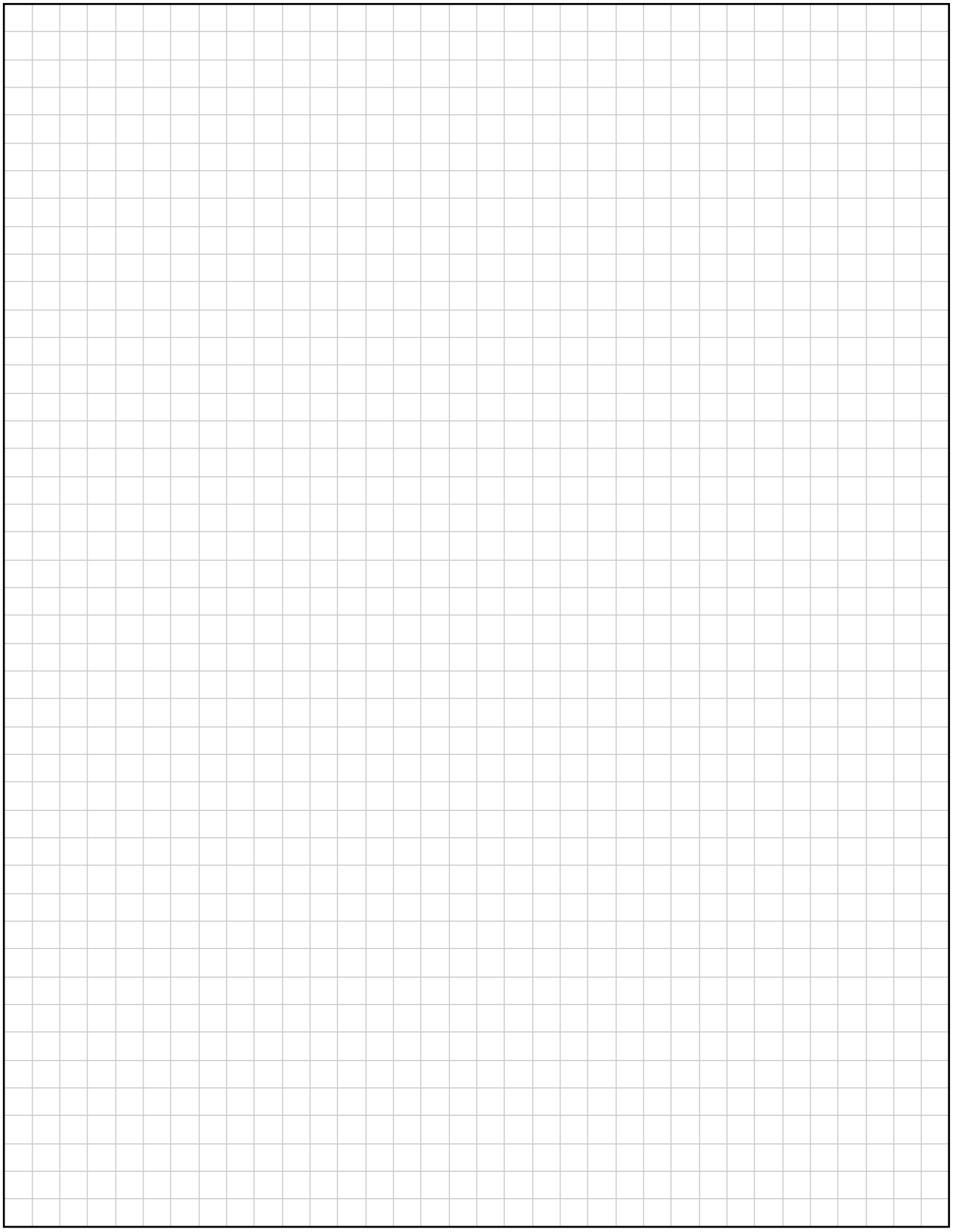

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Leaving Certificate – Ordinary Level

Mathematics - Paper 2

Monday 8 June

Morning 9:30 - 12:00