

Mathematics: applications and interpretation
Standard level
Paper 1

10 November 2025

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

Candidate session number

1 hour 30 minutes

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Instructions to candidates

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- A graphic display calculator is required for this paper.
- Answer all questions.
- Answers must be written within the answer boxes provided.
- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- A clean copy of the **mathematics: applications and interpretation SL formula booklet** is required for this paper.
- The maximum mark for this examination paper is **[80 marks]**.



Answers must be written within the answer boxes provided. Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. Solutions found from a graphic display calculator should be supported by suitable working. For example, if graphs are used to find a solution, you should sketch these as part of your answer. Where an answer is incorrect, some marks may be given for a correct method, provided this is shown by written working. You are therefore advised to show all working.

1. [Maximum mark: 5]

Consider the following list of 10 data items.

16 19 21 19 18 12 16 21 21 32

This data has a mean of 19.5.

Find the value of the

- (a) mode. [1]
- (b) median. [1]
- (c) standard deviation. [1]
- (d) range. [2]

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2. [Maximum mark: 6]

The number of words that a child understands is modelled by the equation

$$y = -167 + 6264 \log_{10} x, \text{ for } x \in \mathbb{R}^+,$$

where x is the number of years since the child was born, and y is the number of words the child understands.

- (a) Use the model to predict the number of words that a child understands when $x = 10$. [2]

To be fluent in a language, a child must understand at least 5000 words.

- (b) Use the model to predict how long it takes for a child to become fluent. Give your answer correct to four significant figures. [2]

- (c) Determine if the model is realistic for a child on their first birthday. Give a reason to support your decision. [2]

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3. [Maximum mark: 6]

Abigail is planning an end-of-school celebration. She asks all her classmates to choose both a main course and an ice cream flavour.

She organizes the replies from her classmates into the following table.

		Main course			
		Burgers	Chicken skewers	Salad	Pasta
Ice cream flavour	Chocolate	15	10	12	16
	Strawberry	11	14	13	12
	Vanilla	10	21	11	5

- (a) Find the total number of classmates who replied. [1]

Abigail performs a χ^2 test for independence at the 5% significance level to see if the main course choice is independent of the ice cream flavour choice.

- (b) Write down the null hypothesis. [1]

- (c) Find the p -value of Abigail's test. [2]

- (d) Write down the conclusion of the test in context. Justify your answer. [2]

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4. [Maximum mark: 5]

The heights of pine trees in a particular forest are normally distributed, with a mean of 35 metres and a standard deviation of 5.5 metres.

- (a) Write down the probability that a randomly chosen pine tree has a height of less than 35 metres. [1]
- (b) Find the probability that a randomly chosen pine tree has a height of greater than 25 metres. [2]
- (c) In the forest, 8% of pine trees have a height of less than k metres. Find the value of k . [2]

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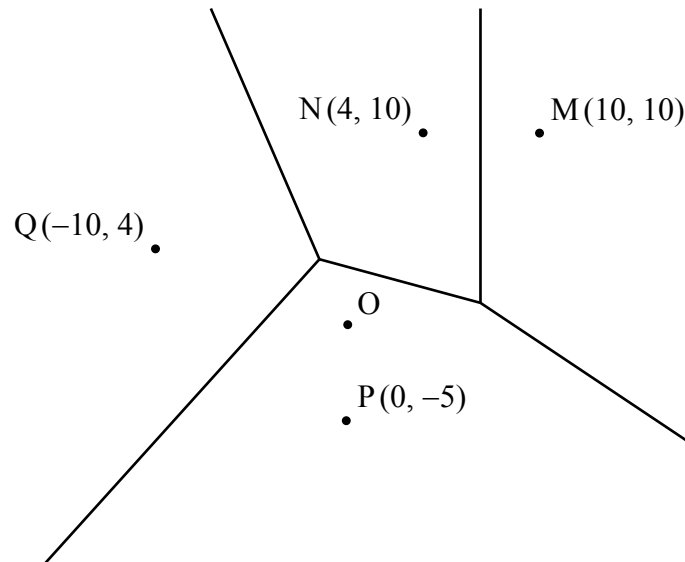
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5. [Maximum mark: 9]

The following Voronoi diagram represents a map of a town. It shows the location of four bakeries, at points $M(10, 10)$, $N(4, 10)$, $P(0, -5)$ and $Q(-10, 4)$. The town centre is at location O with coordinates $(0, 0)$.



Olga is at the town centre and wants to go to the nearest bakery.

- (a) Write down the nearest bakery to Olga. [1]

Before going to the nearest bakery, Olga checks on her phone and finds that it is closed.

- (b) Find which bakery or bakeries Olga should go to instead. Justify your answer. [3]

- (c) Write down the equation of the line containing all the points that are of equal distance from bakery M and bakery N . [1]

- (d) Find the equation of the perpendicular bisector of $[MP]$. [4]

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20EP07

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6. [Maximum mark: 6]

A function is defined by $f(x) = \frac{4}{x} - 3$, for $-6 \leq x \leq 10, x \neq 0$.

(a) Find $f(10)$. [1]

(b) Find the range of f . [3]

(c) Find $f^{-1}(-2)$. [2]

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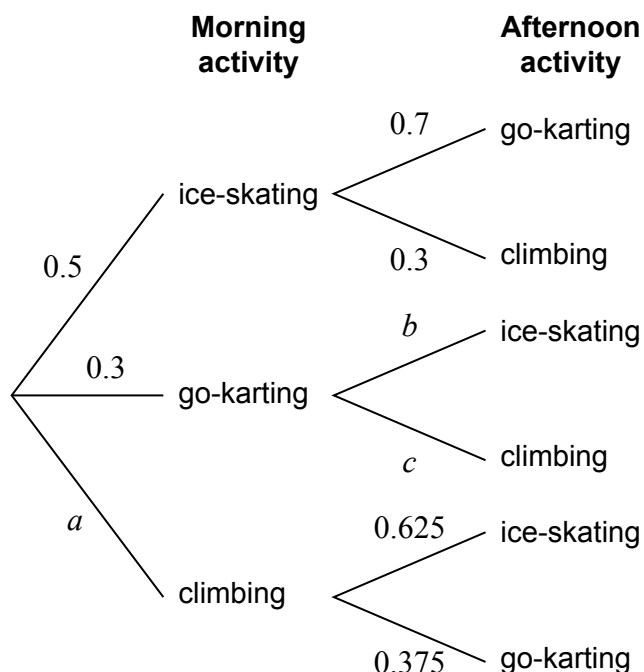
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7. [Maximum mark: 7]

At a sports centre, students choose one activity in the morning and a second, different activity in the afternoon. The tree diagram shows the probability of students choosing each morning and afternoon activity.



- (a) Write down the value of a . [1]
- (b) Find the probability of a student choosing ice-skating in the morning and climbing in the afternoon. [2]
- (c) Find an expression, in terms of b , for the probability of a student choosing go-karting in the morning and ice-skating in the afternoon. [1]
- (d) At the end of the day, 87.5% of the students chose ice-skating. Calculate the value of
- (i) b . [3]
- (ii) c .

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(Question 7 continued)

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8. [Maximum mark: 6]

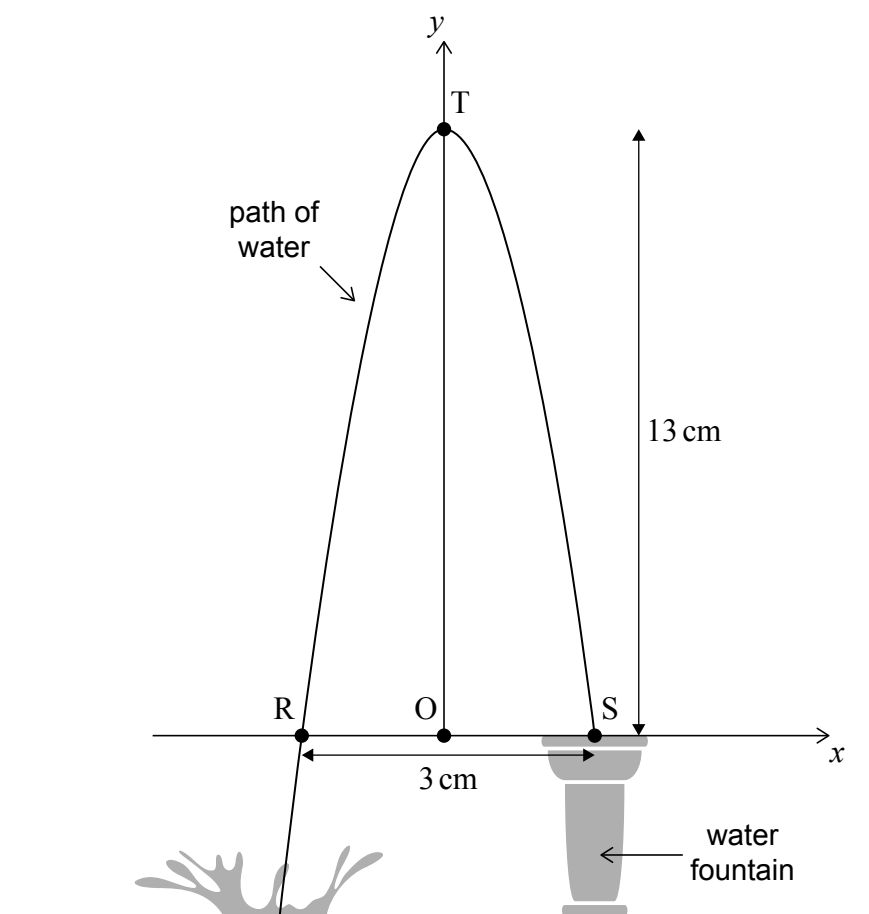
Eduardo takes a photograph of a water fountain. He notices the path of the water looks like a parabola, and he decides to model the curve using the equation

$$y = ax^2 + bx + c.$$

Eduardo takes measurements from the photograph. He finds the distance between the x -intercepts, R and S, to be 3 cm and the maximum height of the water to be 13 cm above the fountain.

These measurements are shown on the following diagram, where the point $(0, 0)$ is indicated as O and the vertex, T, is on the y -axis.

diagram not to scale



- (a) Write down the value of c . [1]
- (b) (i) Write down the coordinates of S. [2]
- (ii) Use the coordinates for S to write down an equation, in terms of only a and b . [3]
- (c) Find the value of a and the value of b in Eduardo's model. [3]

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(Question 8 continued)

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20EP13

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9. [Maximum mark: 6]

Consider the function $f(x) = x^3 - 2x^2 + 5x - 7$.

(a) Find $f(1)$. [2]

(b) Find $f'(x)$. [2]

(c) Find the equation of the line that is tangent to the curve $y = f(x)$ at $x = 1$. [2]

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10. [Maximum mark: 7]

In a job assessment there are 15 multiple choice questions, each with 5 answers. Only one answer is correct for each question.

Adil completes the assessment by randomly choosing every answer. All answers are equally likely to be chosen. Each of Adil's choices are independent.

(a) Write down the expected number of correct answers. [2]

(b) Find the probability that Adil correctly answers exactly 3 questions. [3]

If Adil answers 7 or more questions correctly, he will be offered a job.

(c) Find the probability that Adil is offered a job. [2]

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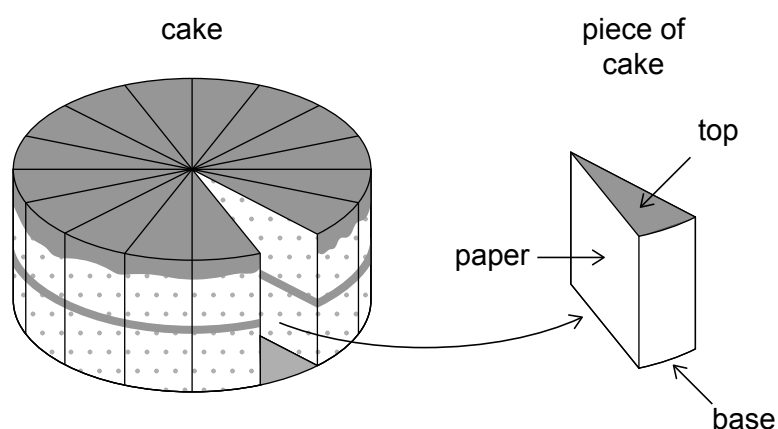
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11. [Maximum mark: 6]

A cylindrical-shaped cake has diameter 22 cm and height 10 cm. Coco cuts the cake into 16 pieces of equal size, as shown in the diagram.



(a) Find the volume of one piece of cake.

[3]

Paper is wrapped around all three **vertical** sides of a piece of cake.

(b) Find the area of the paper used to wrap around one piece of cake, given that the paper fits exactly.

[3]

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12. [Maximum mark: 6]

The amount of a radioactive material present in a sample, in micrograms, can be modelled by

$$f(t) = ab^t, \text{ for } t \geq 0,$$

where t represents the number of days since the sample was taken.

Paula takes two samples of this material, sample X and sample Y.

The initial amount of radioactive material in sample X is 100 micrograms, and after 138 days the amount of radioactive material present is 50 micrograms.

(a) For sample X,

(i) write down a .

(ii) find b , given that $b > 0$.

[3]

After 30 days there were 4 micrograms of the radioactive material present in sample Y.

(b) Use your value of b found in part (a)(ii) to find the initial amount of radioactive material in sample Y.

[3]

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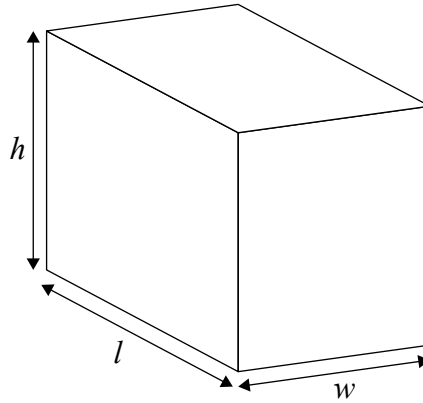
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13. [Maximum mark: 5]

Soraya is designing a gift box in the shape of a rectangular prism, as shown in the diagram.

diagram not to scale



The length, l , of the box is 1.5 times the width, w , of the box. This can be expressed as $l = 1.5w$. The height, h , of the box is also labelled on the diagram.

The box has a volume of $10\,000\text{ cm}^3$. Soraya wants to minimize the surface area of the box. Find the width of the box.

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