Diploma Programme
Programme du diplôme
Programa del Diploma

Mathematics: applications and interpretation
Standard level
Paper 1

14 May 2026

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

Session number

1 hour 30 minutes

Instructions to students

- 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]**.

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A005

19 pages

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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]

Planet Earth can be modelled as a sphere with a radius of $6371\,\text{km}$.

(a) Use this model to find the surface area of the Earth. [2]

The land area of the Earth is 148.9 million km^2. The remaining area is water.

(b) Use the model to find the percentage of the surface area of the Earth that is covered by water. [3]

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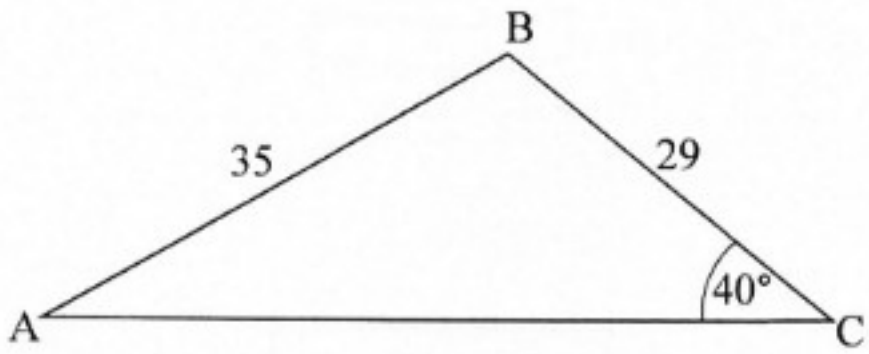
2. [Maximum mark: 6]

Triangle ABC is shown in the diagram, such that $AB = 35$ metres, $BC = 29$ metres and $A\hat{C}B = 40°$.

diagram not to scale



(a) Calculate the size of $C\hat{A}B$. [3]

(b) Calculate the area of triangle ABC. [3]

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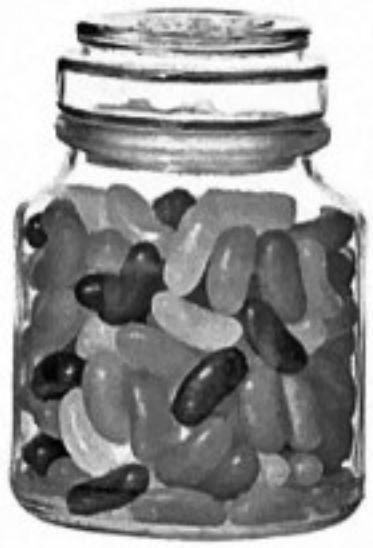
3. [Maximum mark: 5]

At a school fair, 200 people guessed the number of jelly beans in a jar. The person with the most accurate guess wins a prize.



The guesses are summarized in the following grouped frequency table.

Number of jelly beans guessed, n	Frequency
$60 < n \leq 80$	5
$80 < n \leq 100$	19
$100 < n \leq 120$	69
$120 < n \leq 140$	84
$140 < n \leq 160$	23

(a) Write down the modal group. [1]

(b) For the data in the table, calculate an estimate of the

(i) mean.

(ii) standard deviation. [3]

(c) Explain why the values found in part (b) are said to be estimates. [1]

(This question continues on the following page)

4. [Maximum mark: 6]

The table shows the temperature, T, in degrees Celsius (°C), in a park at midday on 8 different days. It also shows the number of children, n, playing in the park at that time on those days.

Temperature, T(°C)	12	15	21	18	20	16	23	25
Number of children, n	8	12	33	26	30	14	40	22

(a) (i) Calculate the product-moment correlation coefficient, r, for this data.

(ii) Find the equation of the regression line of n on T. [3]

(b) (i) Use your equation to estimate the number of children playing in the park at midday when the temperature is 30 °C.

(ii) Explain why your answer may not be accurate. [3]

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5. [Maximum mark: 5]

The population of Nova Antara can be modelled by the function $f(t) = a \times b^t$, where t is the number of years since the beginning of 2024.

At the beginning of 2024, the population was $104\,000$.

(a) Write down the value of a. [1]

At the beginning of 2025, the population was $105\,144$.

(b) Find the exact value of b. [2]

(c) Use the model to estimate the population of Nova Antara at the beginning of 2034.
Give your answer correct to the nearest integer. [2]

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6. [Maximum mark: 5]

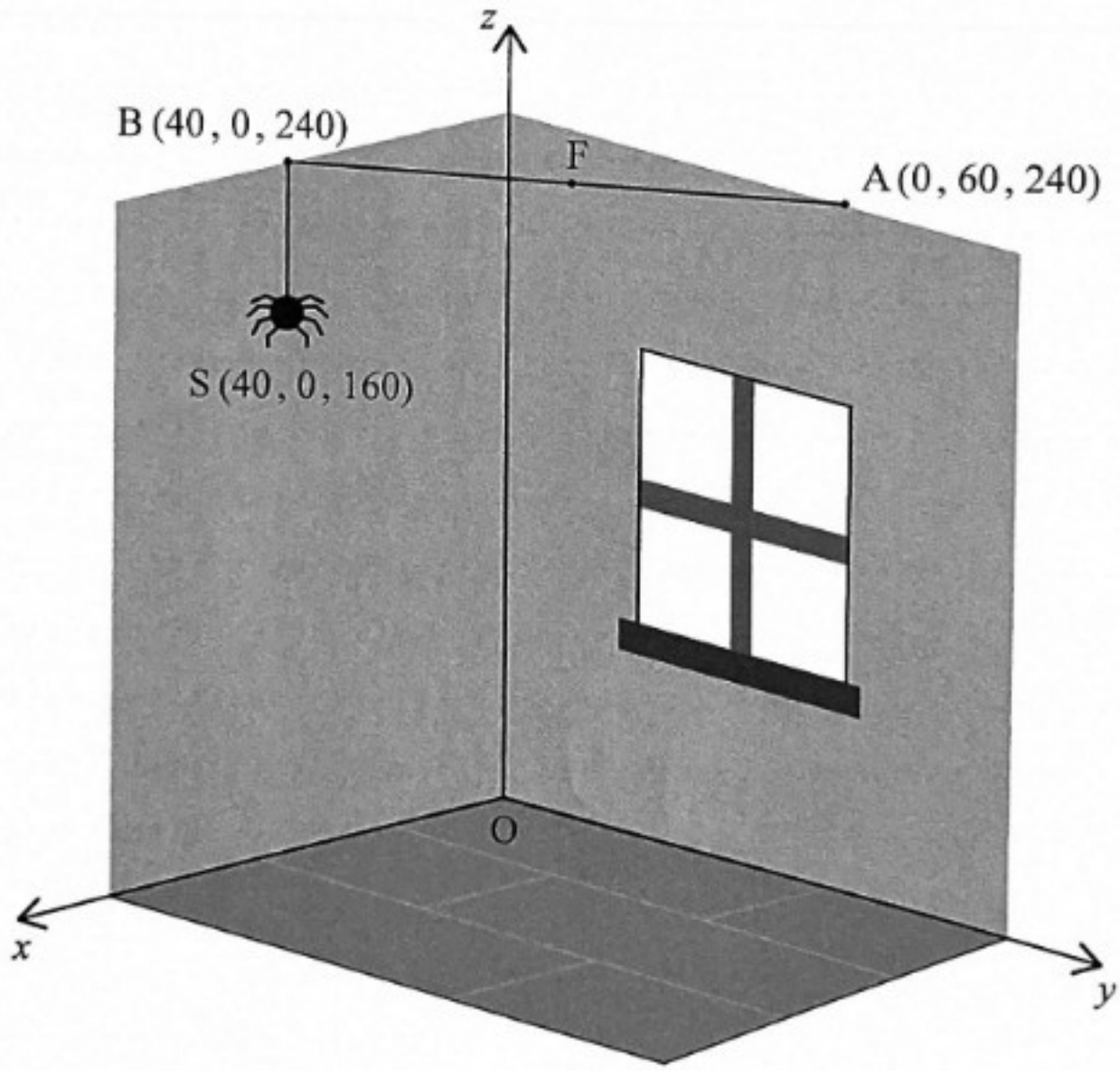
A spider's web lies across the corner of a room that can be modelled using the Cartesian coordinate system in three dimensions. The origin, O, is located where the two walls meet the floor. All measurements are in centimetres.

One thread of the web lies in a straight line from point $A(0, 60, 240)$ to point $B(40, 0, 240)$.

A fly is trapped on the thread at the midpoint, F, of AB. The spider is hanging vertically from point B on a second thread, and is at point $S(40, 0, 160)$.

This information is shown on the diagram.

diagram not to scale



(a) Find the coordinates of F. [2]

(b) Calculate the distance between the spider and the fly. [3]

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7. [Maximum mark: 9]

Sae Yung works in a café. On a particular day, Sae Yung asks 180 people who visit the café their age and whether they prefer a hot drink or a cold drink.

The table shows the data she collects.

	Age, n years		
	$n < 30$	$30 \leq n \leq 50$	$n > 50$
Hot drink	21	18	19
Cold drink	62	26	34

One of the 180 people is chosen at random.

(a) Write down the probability that this person is less than 30 years of age and prefers a cold drink. [1]

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(b) Given that this person is more than 50 years of age, find the probability that they prefer a hot drink. [2]

Sae Yung performs a χ^2 test at the 1% significance level to determine if age and preferred type of drink are independent.

(c) Write down the null hypothesis. [1]

(d) Calculate

(i) the χ^2 test statistic.

(ii) the p-value. [3]

The critical value for this test is 5.991.

(e) Write down the conclusion for the test, giving a reason for your answer. [2]

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(This question continues on the following page)

8. [Maximum mark: 6]

A bean plant increases in height by 14% each day. At the end of day 1, the bean plant is $3\,\text{cm}$ high.

(a) Find the height of the bean plant at the end of day 10. [3]

(b) Calculate the number of days it takes the bean plant to be higher than 1.9 metres. [3]

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9. [Maximum mark: 8]

Samira invests $\$2000$ in a bank that pays a nominal annual interest rate of 1.8%, compounded monthly.

(a) Calculate the value of Samira's investment at the end of 5 years, correct to two decimal places. [3]

(b) Calculate the number of years it would take for Samira's investment to reach $\$5000$. Give your answer correct to the nearest year. [2]

Samira wants to buy a car for $\$4000$. She withdraws $\$1400$ from the bank and borrows the remaining money at a nominal annual interest rate of 3.8%, compounded monthly.

She repays the loan in monthly payments, at the end of each month, over 2 years.

(c) Calculate her monthly payments, correct to two decimal places. [3]

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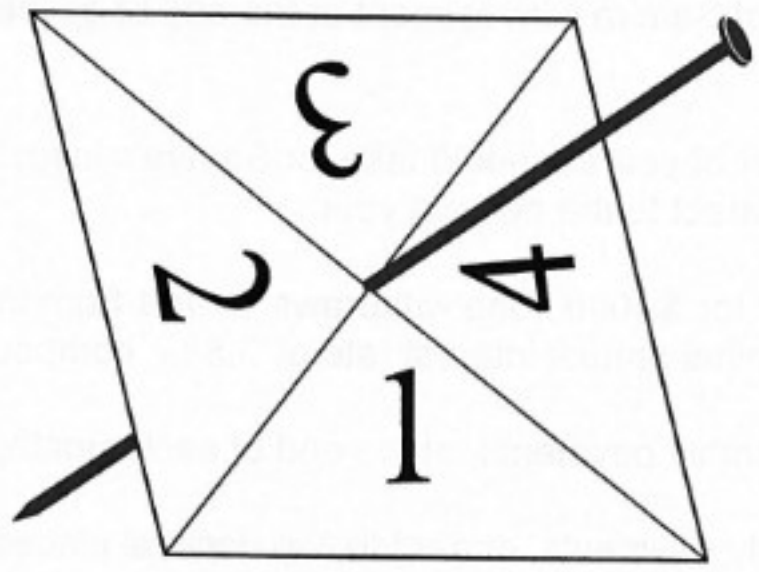
10. [Maximum mark: 6]

Kalia makes a four-sided spinner showing the numbers 1, 2, 3 and 4. She believes that the spinner is unbiased.



To test her belief, she spins the spinner 60 times and records the number on which the spinner lands.

The results of her 60 spins are shown in the following table.

Number	1	2	3	4
Observed frequency	12	18	9	21

Kalia performs a χ^2 goodness of fit test at the 10% significance level.

(a) Write down the null and alternative hypotheses. [1]

(b) Write down the expected frequency of the spinner landing on 1. [1]

(c) (i) Determine the p-value.

(ii) State what the result of the test indicates about Kalia's spinner. Justify your answer. [4]

(This question continues on the following page)

11. [Maximum mark: 7]

The first term of an arithmetic sequence is 18 and its common difference is 7.

(a) Find the 42^{nd} term of the sequence. [2]

The sum of the first n terms of the sequence is 9475.

(b) Find a quadratic equation in terms of n that represents this information.
Give your answer in the form $an^2 + bn + c = 0$. [3]

(c) Find the value of n. [2]

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12. [Maximum mark: 5]

The gradient of a curve $y = f(x)$ can be expressed as $f'(x) = 6x^2 - 2x + 3$.

The curve passes through the point $(2, 12)$.

Find $f(x)$.

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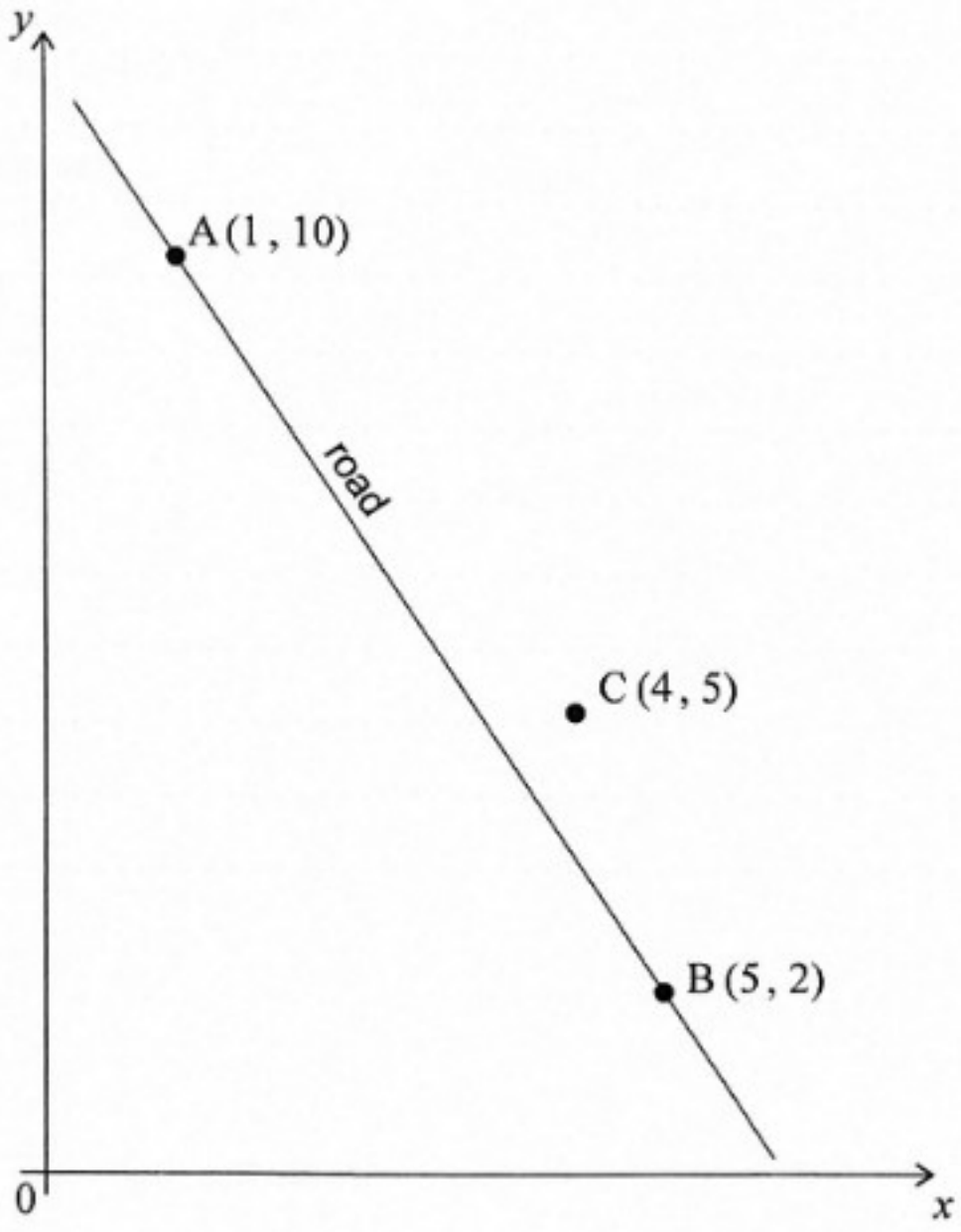
13. [Maximum mark: 7]

The diagram shows part of a road that passes through the points $A(1, 10)$ and $B(5, 2)$.

A new factory is built at the point $C(4, 5)$.

diagram not to scale



Otto owns a food truck. He wants to park it on the road as close as possible to the new factory.

Calculate the coordinates of the point, D, where Otto should park his food truck.

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