

**MATHEMATICS
STANDARD LEVEL
PAPER 1**

INSTRUCTIONS TO CANDIDATES

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- You are not permitted access to any calculator for this paper.
- Section A: answer all questions in the boxes provided.
- Section B: answer all questions in the answer booklet provided. Fill in your session number on the front of the answer booklet, and attach it to this examination paper and your cover sheet using the tag 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 SL** formula booklet is required for this paper.
- The maximum mark for this examination paper is [90 marks].

Full marks are not necessarily awarded for a correct answer with no working. Answers must be supported by working and/or explanations. 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.

SECTION A

Answer **all** questions in the boxes provided. Working may be continued below the lines if necessary.

1. [Maximum mark: 7]

Let $f(x) = x^2 + x - 6$.

(a) Write down the y -intercept of the graph of f . [1]

(b) Solve $f(x) = 0$. [3]

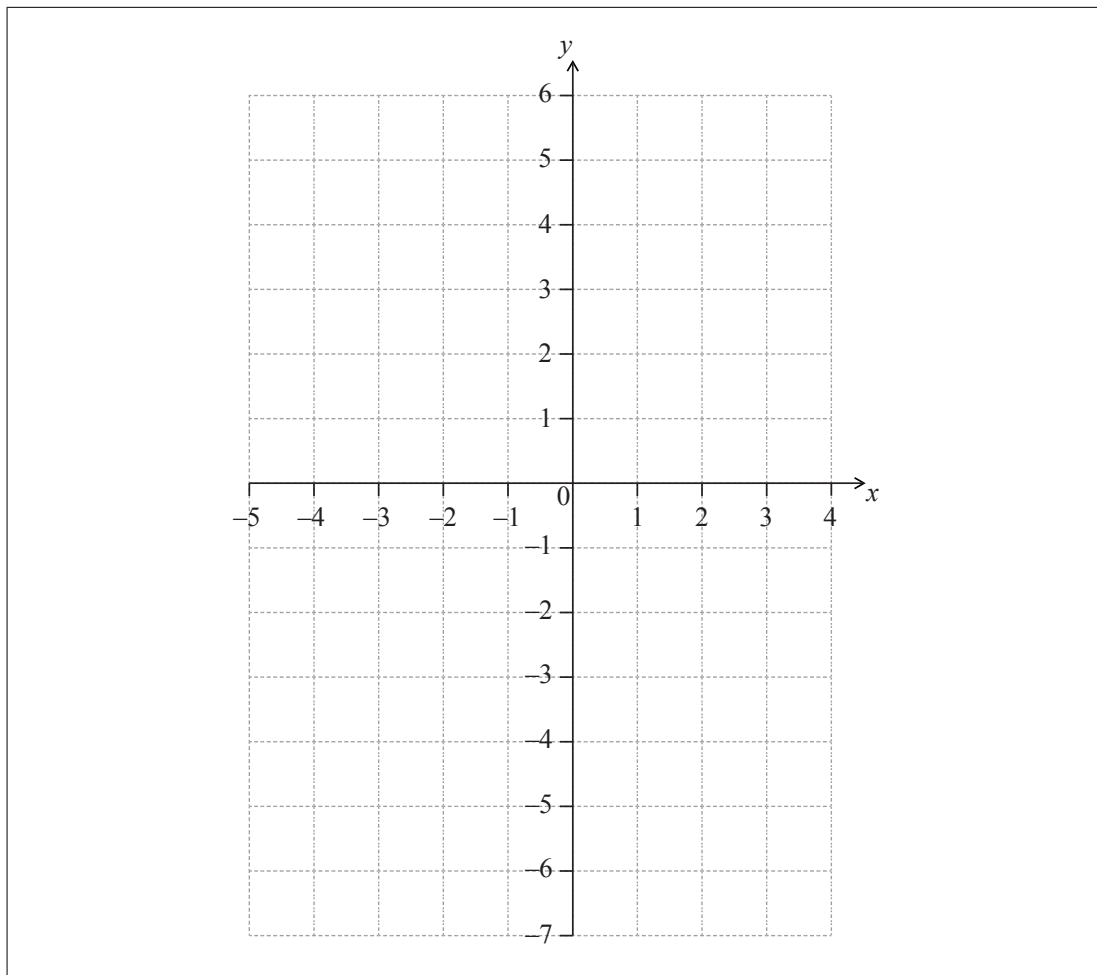
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(Question 1 continued)

- (c) On the following grid, sketch the graph of f , for $-4 \leq x \leq 3$.

[3]



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2. [Maximum mark: 6]

In an arithmetic sequence, the first term is 2 and the second term is 5.

- Find the common difference. [2]
- Find the eighth term. [2]
- Find the sum of the first eight terms of the sequence. [2]

[illegible]

4. [Maximum mark: 6]

(a) Write down the value of

(i) $\log_3 27$;

(ii) $\log_8 \frac{1}{8}$;

(iii) $\log_{16} 4$.

[3]

(b) Hence, solve $\log_3 27 + \log_8 \frac{1}{8} - \log_{16} 4 = \log_4 x$.

[3]

[illegible]

diagram not to scale

A right-angled triangle ABC is shown, with the right angle at vertex C . Vertex B is vertically above C , and vertex A is horizontally to the right of C . A small square at vertex C indicates the right angle.

- (a) Show that $\cos A = \frac{12}{13}$. [2]
- (b) Find $\cos 2A$. [3]

Do **NOT** write solutions on this page.

SECTION B

Answer **all** questions in the answer booklet provided. Please start each question on a new page.

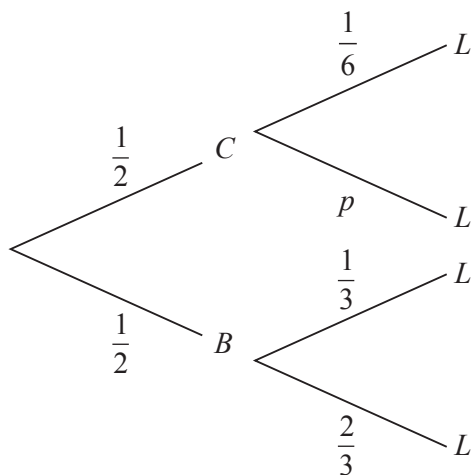
7. [Maximum mark: 15]

Adam travels to school by car (C) or by bicycle (B). On any particular day he is equally likely to travel by car or by bicycle.

The probability of being late (L) for school is $\frac{1}{6}$ if he travels by car.

The probability of being late for school is $\frac{1}{3}$ if he travels by bicycle.

This information is represented by the following tree diagram.



(a) Find the value of p . [2]

(b) Find the probability that Adam will travel by car and be late for school. [2]

(c) Find the probability that Adam will be late for school. [4]

(d) Given that Adam is late for school, find the probability that he travelled by car. [3]

Adam will go to school three times next week.

(e) Find the probability that Adam will be late exactly once. [4]

8. Let $f(x) = 3x^2 - 6x + p$. The equation $f(x) = 0$ has two equal roots.

(a) (i) Write down the **value** of the discriminant.

(ii) Hence, show that $p = 3$.

[3]

The graph of f has its vertex on the x -axis.

(b) Find the coordinates of the vertex of the graph of f .

[4]

(c) Write down the solution of $f(x) = 0$.

[1]

(d) The function can be written in the form $f(x) = a(x-h)^2 + k$. Write down the value of

(i) a ;

(ii) h ;

(iii) k .

[3]

9. Let $f(x) = \frac{2x}{x^2 + 5}$.

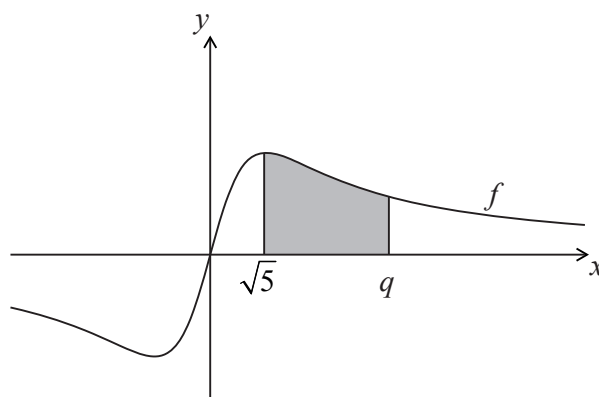
(a) Use the quotient rule to show that $f'(x) = \frac{10 - 2x^2}{(x^2 + 5)^2}$.

[4]

(b) Find $\int \frac{2x}{x^2 + 5} dx$.

[4]

The following diagram shows part of the graph of f .



(c) The shaded region is enclosed by the graph of f , the x -axis, and the lines $x = \sqrt{5}$ and $x = q$. This region has an area of $\ln 7$. Find the value of q .

[7]