

IB Mathematics SL

Paper 1

Mock Exam Revision Set 1

Learn Tuition Centre

1 hour 30 mins

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- You are not permitted to access any calculator for this paper.
- Section A: answer all the questions in the boxes provided.
- Section B: answer all the questions in the answer booklet 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** information booklet is required for this paper.
- The maximum mark for this examination paper is **90 marks**.

Section A

Answer all the questions in the spaces provided. Working may be continued below the lines, if necessary.

1. [Maximum Mark: 8]

Let $f(x) = \frac{1}{\sqrt{x}}$ and $g(x) = x^2 + 5$

- (a) State the domain of $f(x)$ [1]
- (b) Find $g(2)$ [1]
- (c) Find $g \circ f(x)$ [2]
- (d) Find the solutions to the equation when $g \circ f(x) = 6x$ [4]

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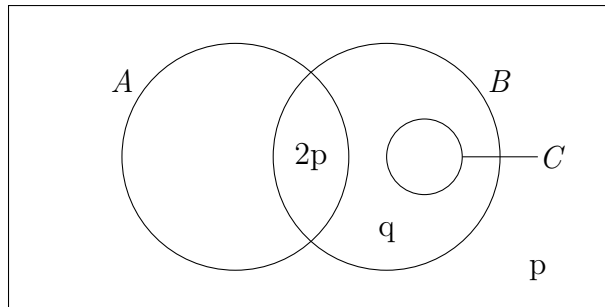
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2. [Maximum Mark: 6]

The following Venn diagram shows events A, B and C where $P(A) = 0.3$, $P(A \cup B) = 0.9$, $P(B \cap C) = 0.1$. The values of p and q are probabilities.



- (a) i. Find the value of p [1]
- ii. Find the value of q [3]
- (b) Find $P(B)$ [2]

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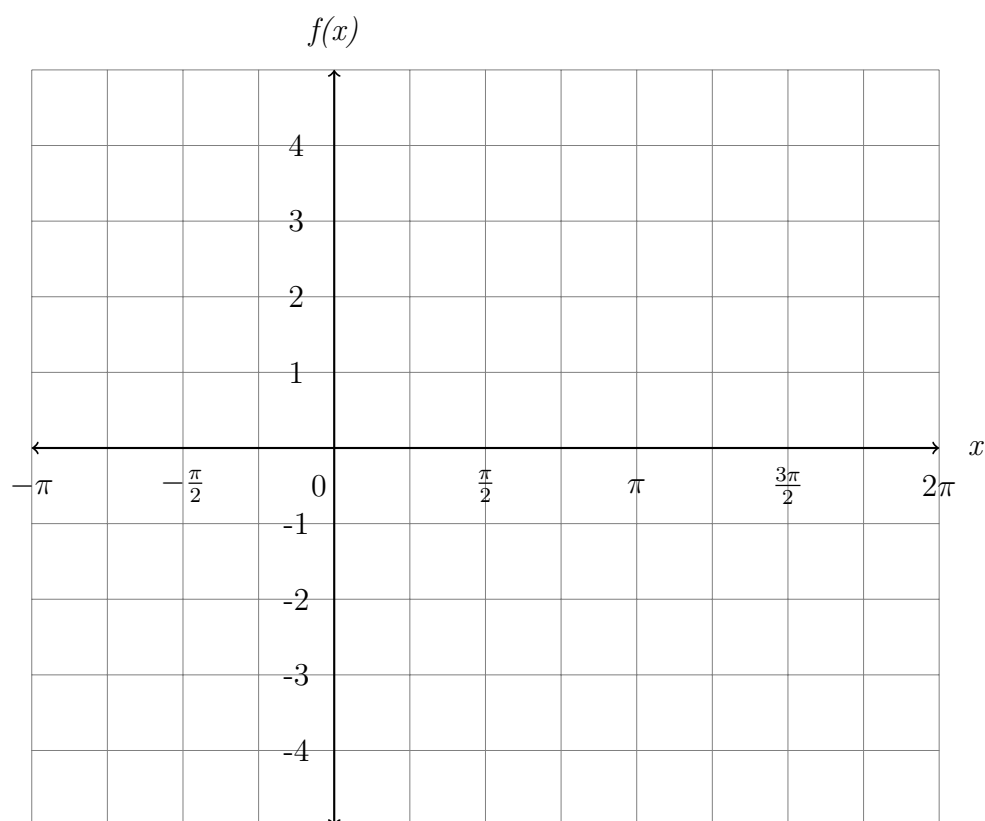
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3. [Maximum Mark: 7]

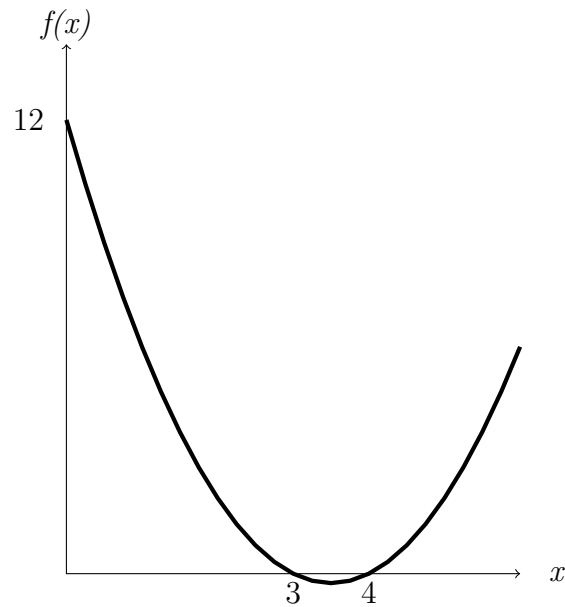
Let $f(x) = -2 \cos\left(\frac{1}{3}x + 2\pi\right) + 1$ for $-\pi < x < 2\pi$

- (a) i. Find the amplitude and the period of f . [2]
ii. Write the maximum and minimum values of $f(x)$ within the given domain [2]
- (b) Sketch the graph of f in the following grid. [3]



4. [Maximum Mark: 8]

The graph of a quadratic function is given below.



- (a) Find the equation of the curve in the form $f(x) = a(x - h)^2 + k$ [4]
- (b) Find the coordinates of the minimum point [1]
- (c) The graph of $-f(x)$ meets the line $y = -x$ at two points. Find the x -coordinates of these two points [3]

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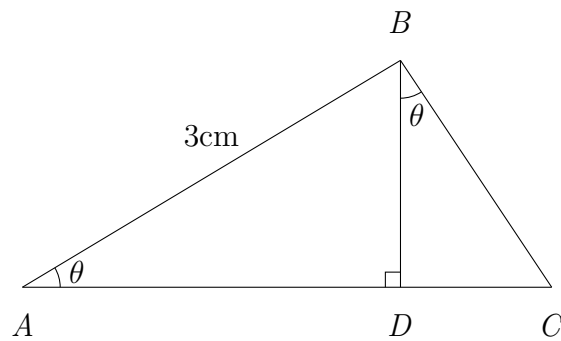
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5. [Maximum Mark: 5]

In the following figure if $AB = 3\text{cm}$, $\hat{A}BC = 90^\circ$, $\sin(\theta) = \frac{1}{3}$. Using this information find the area of the triangle BDC in its simplest form.



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6. [Maximum Mark: 6]

Let $f(k) = 2e^{2k} + 3e^k + 2$ and $g(k) = e^{2k} + 6$ where $k \geq 0$. The graphs of f and g intersect exactly at one point.

- (a) Find the value of k . [4]
(b) Hence find the coordinates of the point of intersection. [2]

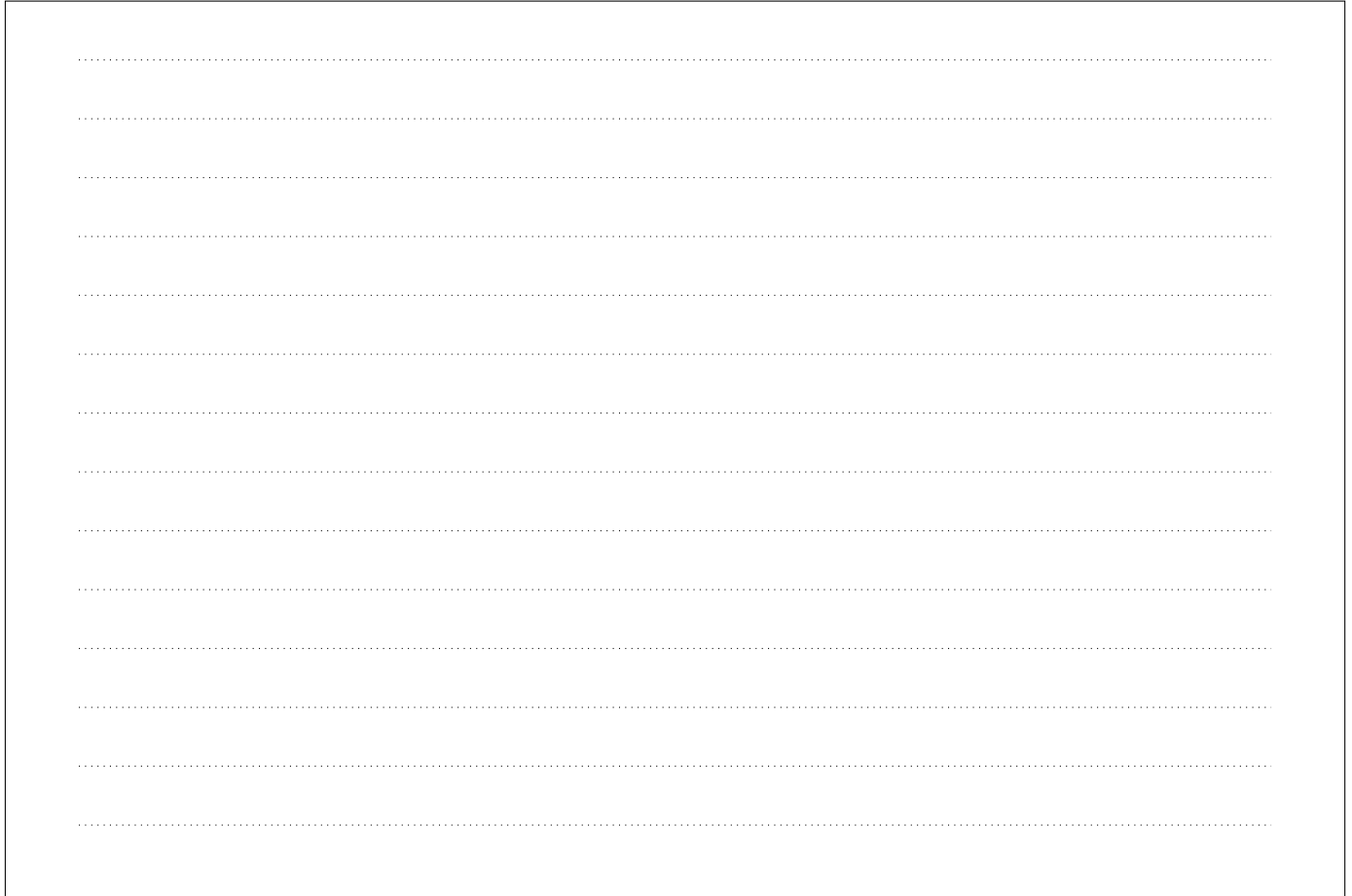
A large rectangular area containing horizontal dotted lines for writing answers.

7. [Maximum Mark: 5]

Given that $\log_9 x = a$ and $\log_3 y = b$ express the following in terms of a and b in its simplest form.

(a) $\log_3(xy)$ [2]

(b) x^2y [3]

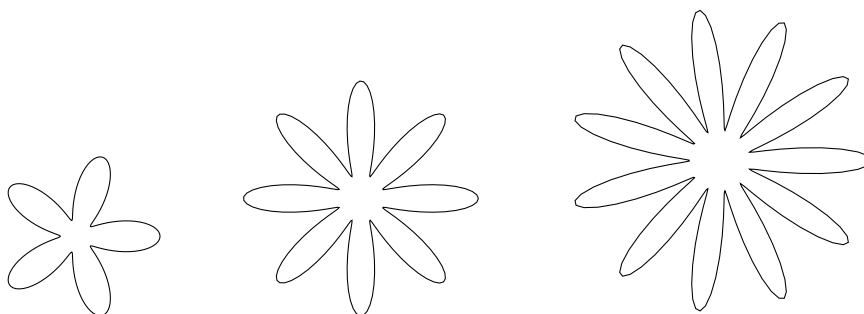


Section B

Answer all questions in the answer booklet provided. Start each question on a new page.

1. [Maximum Mark: 14]

Three smallest members of a family of flowers seen in nature are given below. The radius of the circle formed by each flower is provided.

Flower 1, $R=5mm$ Flower 2, $R=6mm$ Flower 3, $R=7mm$

(a) Write a relationship between the r th flower in the family and its number of petals P_r . [2]

(b) Write a relationship between the r th flower in the family and its radius R_r . [2]

(c) Hence show that the relationship between the number of petals and the radius of the flower for any flower is, [3]

$$P_r = 3R_r - 10$$

(d) A certain flower in the same family of flowers has a radius of $16mm$. What is the number of petals in this flower? [1]

(e) Mary managed to collect specimens of first 20 members of this family, what is the total no. of petals in all the flowers combined? [3]

i. She plans on displaying the flower specimens side by side without any gaps on a display board. She wants to leave $10mm$ gaps at each end. What is the maximum length of the display board required? [3]

ii. What is the width of the display board required if she is to maintain the $10mm$ gap around the largest flower? [1]

2. [Maximum Mark: 15]

Let

$$f(x) = \frac{4 \sin x \cos x}{(1 + \sqrt{2} \sin x)(1 - \sqrt{2} \sin x)}$$

(a) Show that the above expression simplifies to $2 \tan 2x$ [3]

(b) i. Show that the derivative of $f(x)$ is, [3]

$$f'(x) = \frac{4}{\cos^2(2x)}$$

ii. Find $f'(\pi)$ [1]

(c) $f(x)$ has a turning point at $x = \pi$ show that it is a point of inflexion. [5]

(d) Let

$$g(x) = 2 \sin 2x$$

Find all the solutions for $f(x) = g(x)$ when $0 < x \leq 4\pi$. [3]

3. [Maximum Mark: 16]

The vector equation of the line L_1 is given by,

$$\frac{x-2}{4} = \frac{y+1}{2} = -z$$

- (a) i. Find the vector equation of the line in the form of $r = \mathbf{a} + t\mathbf{b}$ where t is a parameter. [2]
 ii. Let point A be a point on L_1 when $t = 0$. State the coordinates of A . [1]

- (b) Another line L_2 which is parallel to L_1 passes through the point $(0, 5, -17)$. Find the vector equation of L_2 in the form of $r = \mathbf{c} + s\mathbf{d}$ where s is a parameter. [1]

- (c) A third line L_3 meets L_1 at point $B = \begin{pmatrix} 2p \\ 3 \\ -2 \end{pmatrix}$ and L_2 at point $C = \begin{pmatrix} 4 \\ q+3 \\ -18 \end{pmatrix}$. Given that the distance between AB is $\sqrt{84}$ and distance between BC is $\sqrt{308}$ and $p \geq 0$ and $q \geq 0$. Find p and q . [4]

- (d) Show that the vector equation of L_3 is,

$$\begin{pmatrix} 10 \\ 3 \\ -2 \end{pmatrix} + r \begin{pmatrix} -6 \\ 4 \\ -16 \end{pmatrix} \text{ where } r \text{ is a parameter.}$$

[3]

- (e) Show that the angle $\hat{A}BC = 90^\circ$. [2]

- (f) Find the area of the triangle ABC in its simplest form. [2]