

# IB Maths: AA SL

## Past Paper 1

### Question Paper

**These practice questions can be used by students and teachers and is Suitable for IB Maths AA SL Past Papers**

Course	IB Maths
Section	Set B
Topic	Past Paper 1
Difficulty	Medium

**Level: IB Maths**

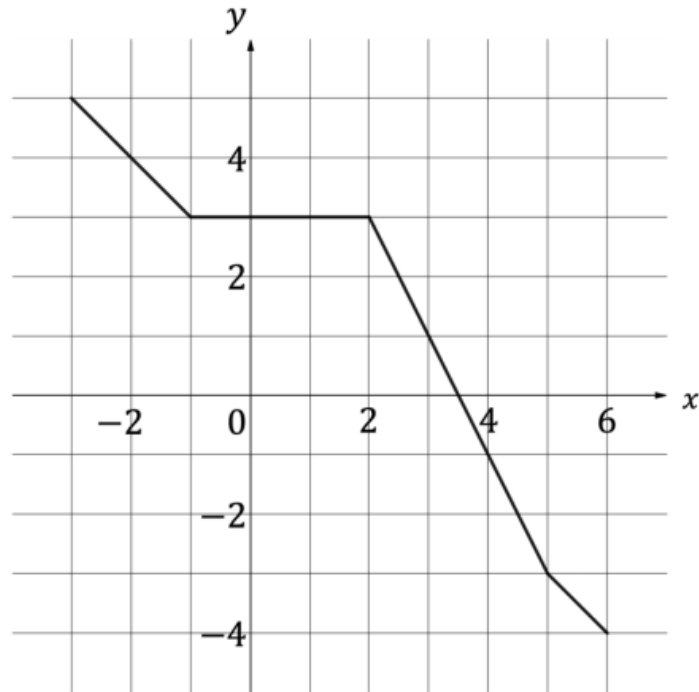
**Subject: IB Maths AA SL**

**Board: IB Maths**

**Topic: Past Paper 1**

### Question 1

The following diagram shows the graph of  $y = f(x)$ ,  $-3 \leq x \leq 6$ .



(a) Write down the value of

(i)  $f(-2)$

(ii)  $f^{-1}(1)$ .

[2 marks]

(b) Find the value of  $(f \circ f)(0)$ .

[1 mark]

(c) Given that  $g(x) = f(x + 5) - 5$ , find the domain and range of  $g$ .

[2 marks]

## Question 2

The diameter of our moon is roughly  $3.5 \times 10^3$  km. Honzos is a spherical moon in a nearby galaxy and its diameter is eight times larger than our moon's.

(a) State the radius of Honzos, giving your answer in standard form.

[2 marks]

Approximately 75% of the surface of Honzos is available for cultivation.

The approximate surface area of Honzos that is available for cultivation can be expressed in the form  $\pi(a \times 10^b) \text{ km}^2$ , where  $1 \leq a < 10$  and  $b \in \mathbb{Z}$ .

(b) State the values of  $a$  and  $b$ .

[3 marks]

## Question 3

Students are arranged for a graduation photograph in rows which follows an arithmetic sequence. There are 20 students in the fourth row and 44 in the 10th row.

(a) (i) Find the common difference,  $d$ , of the arithmetic sequence.

(ii) Find the first term of the arithmetic sequence.

[3 marks]

(b) Given there are 20 rows of students in the photograph, calculate how many students there are altogether

[3 marks]

### Question 4

The heights, in metres, of a flock of 20 flamingos are recorded and shown below:

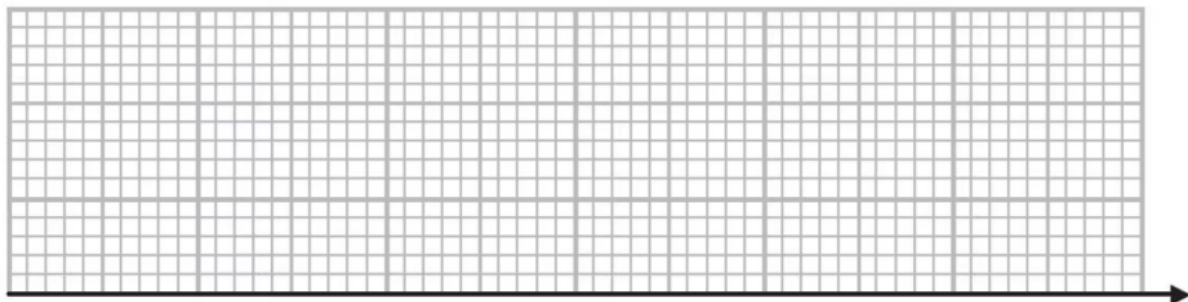
0.4	0.9	1.0	1.0	1.2	1.2	1.2	1.2	1.2	1.2
1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.5	1.5	1.6

An outlier is an observation that falls either more than  $1.5 \times$  (interquartile range) above the upper quartile or less than  $1.5 \times$  (interquartile range) below the lower quartile.

- (a) (i) Find the values of  $Q_1$ ,  $Q_2$  and  $Q_3$ .  
(ii) Find the interquartile range.  
(iii) Identify any outliers.

[4 marks]

(b) Using your answers to part (a), draw a box plot for the data.



[3 marks]

### Question 5

Let  $f(x) = \frac{g(x)}{h(x)}$ , where  $g(2) = 4$ ,  $h(2) = -1$ ,  $g'(2) = 0$  and  $h'(2) = 2$ .

Find the equation of the tangent of  $f$  at  $x = 2$ .

[6 marks]

### Question 6

(a) Prove that  $\sqrt{3} \sin 2\theta + \cos 2\theta - 1 = 2 \sin \theta (\sqrt{3} \cos \theta - \sin \theta)$ .

[3 marks]

(b) Hence solve  $\sqrt{3} \sin 2\theta + \cos 2\theta + 3 \cos \theta - \sqrt{3} \sin \theta = 1$ , where  $0 \leq \theta < 360^\circ$ .

[5 marks]

### Question 7

Let  $f(x) = 2mx^2 + 3mx$  where  $x \in \mathbb{R}$  and  $m \neq 0$ . The line  $y = -3mx - 9$  meets the graph of  $f$  at exactly one point.

(a) Show that  $m = 2$ .

[3 marks]

$f$  can be written in the form  $(2x)(2x + h)$ , where  $h \in \mathbb{R}$ .

(b) Find the value of  $h$ .

[1 mark]

$f$  can also be written in the form  $4(x + q)^2 + r$ , where  $q, r \in \mathbb{R}$ .

(c) Find the values of  $q$  and  $r$ .

[3 marks]

(d) By sketching the graph of  $f$ , find the values of  $x$  where the graph is both negative and decreasing.

[3 marks]

(e) Find the area enclosed by  $f(x)$  and the  $x$ -axis.

[4 marks]

### Question 8

Let  $f(x) = kx \ln(3x^4)$  for  $x > 0$ , where  $k > 0$  is a constant.

(a) Given that  $f(a) = 0$ , find the value of  $a$ .

[3 marks]

(b) Find

(i)  $f'(x)$

(ii)  $f''(x)$ .

[5 marks]

(c) Show that the graph of  $f$  has exactly one minimum point and determine its  $x$ -coordinate.

[5 marks]

(d) Given that the  $y$ -coordinate of the minimum point is  $-4$ , find the value of  $k$ .

[3 marks]

### Question 9

Frank has a biased six-sided die.

The faces of the die are numbered 1 to 6.

Frank's score,  $X$ , is the number which lands face up after his die is rolled.

The following table shows the probability distribution for  $X$ .

Score, $x$	1	2	3	4	5	6
$P(X = x)$	$\frac{1}{10}$	$\frac{1}{20}$	$\frac{1}{5}$	$\frac{3}{20}$	$\frac{1}{5}$	$\frac{3}{10}$

Frank plays the game twice and adds the scores together.

(a) Find the probability Frank has a total score of 4, giving your answer as a fraction.

[3 marks]

Jenny has a different biased six-sided die.

On Jenny's die, the faces are numbered as multiples of 3.

Jenny's score,  $Y$ , is the number which lands face up after her die is rolled.

The following table shows the probability distribution for  $Y$ .

Score, $y$	3	6	9	12	15	18
$P(Y = y)$	$a$	$a$	$b$	$b$	$b$	$b$

It is given that the range of possible values for  $a$  is  $0 < a < \frac{1}{2}$ .

(b)

(i) Find the range of possible values for  $b$ .

(ii) Hence, find the range of possible values for  $E(Y)$ .

[4 marks]



Frank and Jenny each roll their die once. The probability that Frank's score is at least as high as Jenny's is  $\frac{23}{80}$ .

(c) Find the value of  $E(Y)$ .

[6 marks]