

# IB Maths: AA SL

## Past Paper 2

### 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 A
Topic	Past Paper 2
Difficulty	Medium

**Level: IB Maths**

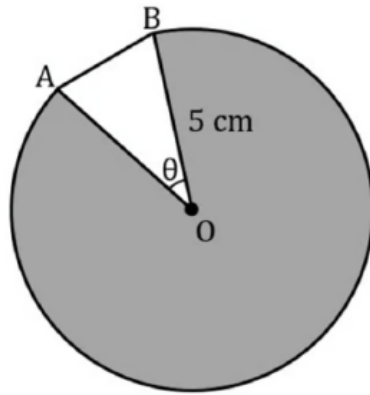
**Subject: IB Maths AA SL**

**Board: IB Maths**

**Topic: Past Paper 2**

### Question 1

A circular pond with radius 0.8 m contains 16 lily pads. The diagram below shows the shape of each lily pad as part of a circle with centre  $O$  and radius 5 cm,  $\widehat{AOB} = \theta$ .



The lily pads cover 5 % of the pond's surface.

(a) Find the surface area of each lily pad.

[2 marks]

(b) Find the value of  $\theta$ , giving your answer in radians.

[2 marks]

(c) Find the area of the triangle  $AOB$ .

[2 marks]

## Question 2

A six-sided biased die is weighted in such a way that the probability of obtaining a “one” is  $\frac{3}{7}$ .

The die is tossed 10 times. Find the probability of obtaining

(a) at most four “ones”.

[3 marks]

(b) the fourth “one” on the tenth toss.

[3 marks]

## Question 3

A car safety expert is investigating a possible link between the tread depth of a car’s tyres and the car’s stopping distance.

Using the same car on the same track under the same weather conditions the expert records the average tread depth, ( $x$  mm), from the car’s four tyres and the stopping distance, ( $y$  m), when the car’s brakes are applied at a particular speed.

<b>Tread depth (<math>x</math>)</b>	6.8	1.4	4.1	0.9	5.7	1.9	3.5	2.6	2.9
<b>Stopping distance (<math>y</math>)</b>	29	45	33.5	49.5	31	42	34	36.5	36

- (a) (i) Calculate the Pearson product moment correlation coefficient for these data.
- (ii) State the type of linear correlation that is shown between tread depth and stopping distance.

[2 marks]

Let  $L$  be the regression line of  $y$  on  $x$ .

- (b) (i) Find the equation of  $L$  in the form  $y = a + bx$ .
- (ii) Give an interpretation of the values of  $a$  and  $b$  in the context of the investigation.

[3 marks]

### Question 4

On 1st January 2021, Nerys invests  $\$P$  in an account that pays a nominal annual interest rate of 4.2 %, compounded **monthly**.

The amount of money in Nerys' account **at the end of each year** follows a geometric sequence with common ratio,  $r$ .

- (a) Find the value of  $r$ , giving your answer to four decimal places.

[3 marks]

Nerys makes no further deposits to or withdrawals from the account.

- (b) Find the year in which the amount of money in Nerys' account will become double the amount she invested.

[3 marks]

### Question 5

Ali makes cone shaped candles which have a radius of 63 mm and a height of 122 mm.

- (a) Find the volume of each candle expressing your answer in the form  $a \times 10^k$ ,  $1 \leq a \leq 10$  and  $k \in \mathbb{Z}$ .

[3 marks]

Ali melts three cones down and remoulds them to make one candle in the shape of a sphere.

- (b) Find the radius of the sphere, correct to 2 significant figures.

[3 marks]

### Question 6

The velocity,  $v \text{ m s}^{-1}$ , of a particle, at time  $t$  seconds, is given by  $v(t) = 10e^{0.5t} \sin 2t$ ,  $0 \leq t \leq \pi$ .

(a) Find the maximum speed of the particle and at what time this occurs.

[3 marks]

(b) Find the initial acceleration of the particle.

[2 marks]

(c) Show that the distance travelled by the particle is 48.0 m to the nearest 0.1 m.

[2 marks]

### Question 7

For cans of a particular brand of soft drink labelled as containing 330 ml, the actual volume,  $V$  ml, of soft drink in a can is normally distributed with mean 330 and variance  $\sigma^2$ .

The probability that  $V$  is greater than 336 is 0.1288.

(a) Find  $P(330 < V < 336)$ .

[2 marks]

(b) (i) Find  $\sigma$ , the standard deviation of  $V$ .

(ii) Hence, find the probability that a can of soft drink selected at random will contain less than 320 ml of soft drink.

[5 marks]

Tilly buys a pack of 24 cans of this soft drink. It may be assumed that those 24 cans represent a random sample. Let  $L$  represent the number of cans that contain less than 320 ml of soft drink.

(c) Find  $E(L)$ .

[3 marks]

(d) Find the probability that exactly two of the cans contain less than 320 ml of soft drink.

[2 marks]

A can selected at random contains more than 320 ml of soft drink.

(e) Find the probability that it contains between 330 ml and 335 ml of soft drink.

[3 marks]

### Question 8

Consider a function  $f$  such that  $f(x) = 3 \sin(2x + \alpha)$  where  $0 \leq x \leq 2\pi$  and  $0 \leq \alpha \leq \frac{\pi}{2}$ .

(a) Write down the amplitude of  $f$ .

[1 mark]

The graph of  $y = f(x)$  passes through the point  $\left(\frac{\pi}{3}, \frac{3}{2}\right)$ .

(b) (i) Find the value of  $\alpha$ .

(ii) Find the  $x$ -coordinates of the three other points where the graph of  $f(x) = \frac{3}{2}$ .

[4 marks]

The function  $g$  is given by  $g(x) = pf(x) + q$  where  $0 \leq x \leq 2\pi$  and  $p, q \in \mathbb{R}$ .

The graph of  $y = g(x)$  passes through the origin and intercepts the graph of  $y = f(x)$  at the points where  $f(x)$  is at its maximum value.

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

[5 marks]

(d) In the case when  $\alpha = 0$ , show that  $g$  can be written in the form

$g(x) = k(m \sin x \cos x + n)$ , where  $k$ ,  $m$  and  $n$  are integers to be found.

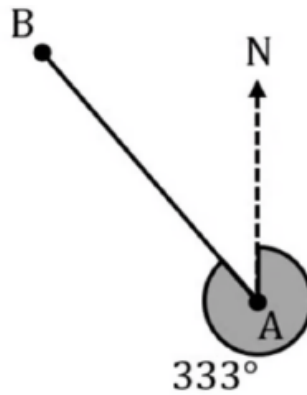
[3 marks]

## Question 9

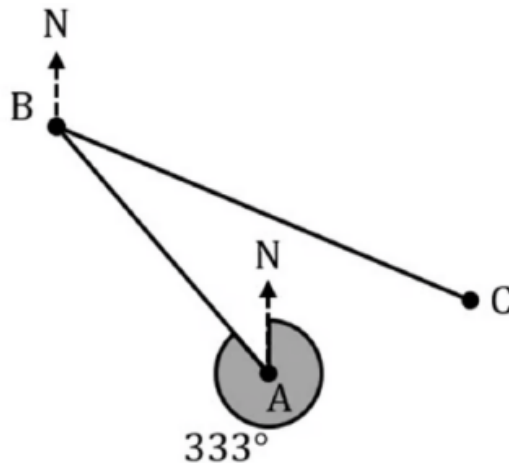
Lucy sets out for a bike ride from her house at point A to her friend Heather's house at point B. She rides at an average speed of 7.4 km/h for 15 minutes, travelling in a straight line on a bearing of  $333^\circ$  from her house.

(a) Find the distance from point A to point B.

[2 marks]



Lucy and Heather both leave point B on a bearing of  $102^\circ$  and continue to ride in that direction for a distance of 2.8 km until they reach a nature reserve at point C.



At the nature reserve, Lucy gets a puncture so decides to walk back to her house directly from point C. She is able to walk along a straight line the entire way from C to A.

- (b) (i) Show that  $\widehat{ABC}$  is  $51^\circ$ .
- (ii) Find the distance from the nature reserve to Lucy's house at point A.

[5 marks]



(c) Find  $\widehat{BAC}$ .

[3 marks]

(d) Find the bearing that Lucy must take to go home to point A.

[3 marks]

It takes Lucy 48 minutes to walk home.

(e) Find the average speed Lucy must have walked on her journey home.

[3 marks]