

# IB Maths: AI HL

## Number Toolkit

### Topic Questions

**These practice questions can be used by students and teachers and is Suitable for IB Maths AI HL Topic Questions**

Course	IB Maths
Section	1. Number & Algebra
Topic	1.1 Number Toolkit
Difficulty	Medium

**Level: IB Maths**

**Subject: IB Maths AI HL**

**Board: IB Maths**

**Topic: Number Toolkit**

### Question 1

Let  $Q = \frac{30 \sin 2a}{8b}$ , where  $a = 45^\circ$  and  $b = 2$ .

(a) Calculate the exact value of  $Q$ .

[2 marks]

(b) Give your answer from part (a) correct to

- (i) two decimal places
- (ii) two significant figures.

[2 marks]

Nina estimates the value of  $Q$  to be 2.

(c) Calculate the percentage error in Nina's estimate.

[2 marks]

## Question 2

Let  $R = \frac{4x}{6 \cos 5y}$ , where  $x = 1.25$  and  $y = 36^\circ$ .

(a) Find the value of  $R$ . Give your answer as a fraction.

[2 marks]

(b) Give your answer from part (a) to

- (i) one decimal place
- (ii) three significant figures.

[2 marks]

Kieran estimates the value of  $R$  to be  $-1$ .

(c) Calculate the percentage error in Kieran's estimate.

[2 marks]

### Question 3

Consider the numbers  $a = 4.14 \times 10^6$  and  $b = 2.54 \times 10^{-7}$ .

(a) Calculate  $C = \sqrt[10]{\left(\frac{a}{b}\right)^3}$ . Give your answer correct to the nearest integer.

[2 marks]

(b) Give your answer to part (a) in the form  $a \times 10^k$ , where  $1 \leq a \leq 10$  and  $k \in \mathbb{Z}$ .

[2 marks]

(c) Calculate the percentage error if  $C$  was approximated to be 9000.

[2 marks]

### Question 4

A cylinder has radius of 12.7 cm and height of 14.4 cm.

(a) Calculate the volume of the cylinder correct to

- (i) one decimal place
- (ii) three significant figures
- (iii) the nearest integer.

[3 marks]

(b) Write your answer to part (a) (ii) in the form  $a \times 10^k$ , where  $1 \leq a \leq 10$  and  $k \in \mathbb{Z}$ .

[2 marks]

### Question 5

A rectangular field has length,  $L$ , of 25.2 m and width,  $W$ , of 21.4 m, each correct to 1 decimal place.

(a) Calculate the lower and upper bound for

(i)  $L$

(ii)  $W$ .

[2 marks]

(b) Calculate the lower and upper bound for the

(i) perimeter,  $P$

(ii) area,  $A$ , of the field.

[4 marks]

### Question 6

Calculate the following, giving your answer in the form  $a \times 10^k$ , where  $1 \leq a \leq 10$  and  $k \in \mathbb{Z}$ .

(i)  $4 \times (6.2 \times 10^{-5})$

(ii)  $(4 \times 10^5) - (5 \times 10^4)$

(iii)  $(4321^{-1})(1.2 \times 10^{-1})$ .

[6 marks]

### Question 7

Consider the following four numbers.

$$a = 0.272 \quad b = 0.0272 \times 10^5 \quad c = e(10e)^{-1} \quad d = 2.72 \times 10^2$$

(a) Write down

(i) the number that is in the form  $a \times 10^k$ , where  $1 \leq a \leq 10$  and  $k \in \mathbb{Z}$

(ii) the largest of these numbers.

[2 marks]

(b) (i) Find the value of  $a + b - c + d$ .

(ii) Give your answer to part (b)(i) in the form  $a \times 10^k$ , where  $1 \leq a \leq 10$  and  $k \in \mathbb{Z}$ .

[4 marks]

### Question 8

Five Olympic barbells labelled, “2.2 m in length”, were delivered to an Olympic weightlifting team. The coach measured each barbell to check its length, in metres, and recorded the following:

2.18, 2.21, 2.23, 2.19, 2.24

- (a) (i) Find the mean of the coach’s recorded measurements.
- (ii) Calculate the percentage error between the mean and the stated length of 2.2 m.

[3 marks]

The weights of the barbells are labelled 20 kg. The coach also weighed each barbell, in kg, and recorded the following:

20.3, 19.9, 20.3, 20.4, 20.1

- (b) (i) Find the mean of the coach’s recorded weights.
- (ii) Calculate the percentage error between the mean and the stated weight of 20 kg.

[3 marks]

### Question 9

In a game show, there is a transparent box filled with identical cubes. Contestants must estimate the number of cubes in the box. The box is 60 cm wide, 80 cm long and 20 cm tall.

- (a) Find the volume of the box.

[2 marks]

Monica estimates the volume of one cube is  $300\text{cm}^3$ . She uses this value to estimate the number of cubes in the box.

(b) Find Monica's estimated number of cubes in the box.

[2 marks]

The actual number of cubes in the box is 280.

(c) Find the percentage error in Monica's estimated number of cubes in the box.

[2 marks]

### Question 10

Solve the following systems of linear equations using technology.

(i)

$$\begin{aligned}5x + 3y - 2z &= -12 \\3x - 4y - z &= 17 \\10x - 10y + z &= 65\end{aligned}$$

(ii)

$$\begin{aligned}4x - 5y + z &= 50 \\3x + y + 3z &= -16 \\6x - 2z &= 61 + y\end{aligned}$$

[6 marks]



## Question 11

Solve the following systems of linear equations using technology.

(i)

$$2x - 5y - 7z = -21$$

$$3z + x - 4y = 44$$

$$x + z - y = 12$$

(ii)

$$z - x - y = -11$$

$$5x + 11z - 2y = -28$$

$$3y - 4z + x = 30$$

[6 marks]