1.1 Number Toolkit

Question Paper

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

Time allowed: 80

Score: /65

Percentage: /100

Question 1a

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

(a) Calculate the exact value of Q.

[2 marks]

Question 1b

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

(i) two decimal places

(ii) two significant figures.

[2 marks]

Question 1c

Nina estimates the value of Q to be 2.

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

[2 marks]

Question 2a

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

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

[2 marks]

Question 2b

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

(i) one decimal place

(ii) three significant figures.

[2 marks]

Question 2c

Kieran estimates the value of R to be -1.

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

[2 marks]

Question 3a

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]

Question 3b

(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]

Question 3c

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

[2 marks]

Question 4a

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]

Question 4b

(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 5a

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]

Question 5b

(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 7a

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]

Question 7b

(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 8a

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]

Question 8b

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 9a

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]

Question 9b

Monica estimates the volume of one cube is 300cm^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]

Question 9c

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)

$$5x + 3y - 2z = -12$$
$$3x - 4y - z = 17$$
$$10x - 10y + z = 65$$

(ii)

$$4x - 5y + z = 50$$
$$3x + y + 3z = -16$$
$$6x - 2z = 61 + y$$

[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]