1.1 Number Toolkit

Question Paper

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

Time allowed: 60

Score: /47

Percentage: /100

Question 1a

Let $P = \frac{(4\sin 2q - 2)(6\tan q + 2)}{10(r+s)^2}$, where $q = 30°$, $r = 6$ and $s = 2$.

(a) Calculate the exact value of P.

[2 marks]

Question 1b

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

(ii) two decimal places.

(iii) two significant figures.

[2 marks]

Question 1c

Michael estimates the value of P to be 0.015

(c) Calculate the percentage error of Michael's estimate.

[2 marks]

Question 2a

Let $W = \frac{(2\cos 2x + y)(\tan\frac{x}{2} - z)}{10(5\sin x + z^2)}$, where $x = 90°$, $y = -1$ and $z = 2$.

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

[2 marks]

Question 2b

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

(ii) three decimal places.

(ii) three significant figures.

[2 marks]

Question 2c

Louis estimates the value of W to be 0.03.

(c) Calculate the percentage error of Louis' estimate.

[2 marks]

Question 3a

A prism has a cross sectional area of 5.83×10^7 cm^2 and volume of 4.22×10^8 cm^3.

(a) Calculate the height of the prism.

[2 marks]

Question 3b

Lily estimates the height of the prism to be 7 cm.

(b) Calculate the percentage error in Lily's estimate.

[3 marks]

Question 4a

Mary has found the exact answer for R is $\frac{45}{16}$.

(a) Write down the exact answer of R as a decimal.

[1 mark]

Question 4b

Mary rounds her exact answer so that the percentage error is 6.67%.

(b) State the number of significant figures Mary rounded the exact answer to and write down the approximate value of R used in calculating the percentage error.

[4 marks]

Question 5a

It is given that $\sin a = \frac{\sqrt{3}}{2}$ and $\sin b = \frac{1}{2}$, where $a \leq 180°$ and $b \leq 180°$.

(a) Find the size of the angles a and b.

[2 marks]

Question 5b

A circle has radius r equal to $\sqrt{\frac{\sin a}{\sin b}}$ cm.

(b) Find the area of the circle, giving your answer in terms of π.

[2 marks]

Question 5c

James rounds the answer from part (b) to the nearest integer.

(c) Calculate the percentage error of James' estimate.

[3 marks]

Question 6a

A medium rare steak should have an internal temperature of 55°C to 56°C. Max decides to go 10 different steak houses, he measures the internal temperature of a medium rare steak at each establishment and records the following:

51.0, 52.1, 62.9, 49.0, 59.8, 50.2, 54.3, 47.7, 48.6, 65.4

(a) Find the mean internal temperature of Max's recordings.

[1 mark]

Question 6b

Max goes to 5 more steak houses and calculates the mean of all 15 restaurants to be 55.2°C.

(b) Calculate the mean internal temperature from the 5 additional steak houses Max went to.

[3 marks]

Question 6c

Max records one last steak that has an internal temperature of T °C.

(c) Calculate the interval of T such that the mean internal temperature for all 16 steaks is within the temperature range for a medium rare steak.

[3 marks]

Question 7

The diameter of Earth is 1.274×10^7 m, correct to four significant figures. The circumference of Mars is 2.134×10^7 m, correct to four significant figures.

Modelling Earth and Mars as perfect spheres, find the difference between the volume of Earth and the volume of Mars, giving your answer in the form $a \times 10^k$, where $1 \leq a < 10, k \in \mathbb{Z}$.

[5 marks]

Question 8

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]