Quick Answers

Question 1

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

(a) Calculate the exact value of Q.

[2]

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

(i) two decimal places

(ii) two significant figures.

[2]

a) sub in $a = 45°$ and $b = 2$ into Q.

$$Q = \frac{30 \sin 2(45°)}{8(2)} = \frac{30 \sin(90°)}{16}$$

$\sin(90°) = 1$

$Q = \frac{30}{16}$ or 1.875

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[2]

b) i) $Q = 1.88$ (2 dp)

ii) $Q = 1.9$ (2sf)

[2]

Question 2

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

(a) Write the angle of y in radians.

[1]

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

[2]

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

(i) one decimal place

(ii) three significant figures.

[2]

a) degrees $\times \frac{\pi}{180}$ → radians

$\cancel{36} \times \frac{\pi}{\cancel{180}5} = \frac{\pi}{5}$

$y = \frac{\pi}{5}$ radians

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[2]

b) sub in $x = 1.25$ and $y = 36°$ into R.

$R = \frac{4(1.25)}{6\cos 5(36°)} = \frac{5}{6\cos 180°}$

$\cos 180° = -1$

$R = -\frac{5}{6}$

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[1]

(b) Find the value of R. Give your answer as a fraction. $R = -\frac{5}{6}$

[2]

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

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(ii) three significant figures.

[2]

c) $R = -\frac{5}{6} = -0.8333...$

i) $R = -0.8$ (1dp)

ii) $R = -0.833$ (3sf)

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

(i) nearest integer

(ii) three significant figures.

[3]

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

[2]

a) Sub a and b into C.

$C = \sqrt[10]{\left(\frac{4.14 \times 10^6}{2.54 \times 10^{-7}}\right)^3}$

$C = 9197.0804...$

i) $C = 9197$ (nearest integer)

ii) $C = 9200$ (3sf)

b) $C = 9.197 \times 10^3$

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(i) nearest integer $C = 9197$ (nearest integer)

(ii) three significant figures.

[3]

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

[2]

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]

(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]

a) Volume of a cylinder formula

$V = \pi r^2 h$ (in formula booklet)

$r = 12.7$ $h = 14.4$

Sub r and h into formula.

$V = \pi (12.7)^2 (14.4)$

$V = 7296.58...$

i) $V = 7296.6\ cm^3$ (1dp)

ii) $V = 7300\ cm^3$ (3sf)

iii) $V = 7297$ (nearest integer)

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

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[3]

(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]

b) $V = 7.3 \times 10^3 \text{ cm}^3$

$V = 7300 \text{ cm}^3$ (3sf)

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]

(b) Calculate the lower and upper bound for the

(i) perimeter, P

(ii) area, A, of the field.

[4]

a) For L

Any value equal to or more than 25.15cm will be rounded up to 25.2 cm (1dp).

Any value less than 25.25cm will be rounded down to 25.2 cm (1dp).

For W

Any value equal to or more than 21.35cm will be rounded up to 21.4 cm (1dp).

Any value less than 21.45cm will be rounded down to 21.4 cm (1dp).

Write bounds as an inequality.

i) $25.15\text{m} \leq L < 25.25\text{m}$

ii) $21.35\text{m} \leq W < 21.45\text{m}$

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 $25.15\text{m} \leq L < 25.25\text{m}$

(ii) W. $21.35\text{m} \leq W < 21.45\text{m}$

[2]

(b) Calculate the lower and upper bound for the

(i) perimeter, P

(ii) area, A, of the field.

[4]

b) For lower bound use

$L = 25.15$ $W = 21.35$

$P = 2(25.15) + 2(21.35)$ $A = (25.15)(21.35)$

$P = 93\text{m}$ $A = 536.9525\text{m}^2$

For upper bound use

$L = 25.25$ $W = 21.45$

$P = 2(25.25) + 2(21.45)$ $A = (25.25)(21.45)$

$P = 93.4\text{m}$ $A = 541.6125\text{m}^2$

i) $93\text{m} \leq P < 93.4\text{m}$

ii) $537\text{m}^2 \leq A < 541\text{m}^2$ (3sf)

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]

i) Input equation into calculator.

$4 \times (6.2 \times 10^{-5}) = 0.00024$

Rewrite into form $a \times 10^k$, where $1 \leq a \leq 10$...

2.48×10^{-4}

ii) Input equation into calculator.

$(4 \times 10^5) - (5 \times 10^4) = 350\,000$

Rewrite into form $a \times 10^k$, where $1 \leq a \leq 10$...

3.5×10^5

iii) Input equation into calculator.

$(4321^{-1})(1.2 \times 10^{-1}) = 0.00002777...$

Rewrite into form $a \times 10^k$, where $1 \leq a \leq 10$...

2.78×10^{-5} (3sf)

Question 7

Consider the following four numbers.

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

(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]

(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]

a) i) $d = 2.72 \times 10^2$

$a = 0.272$ $b = 2720$ $c = 0.1$ $d = 272$

ii) $b = 0.0272 \times 10^5$

Consider the following four numbers.

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

(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]

(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]

b) Sub a, b, c and d into equation.

$0.272 + 0.0272 \times 10^5 - e(10e)^{-1} + 2.72 \times 10^2$

$0.272 + 2720 + 0.1 + 272$

$= 2992.172$

i) 2990 (3sf)

ii) 2.99×10^3

Question 8

Solve the following systems of linear equations using technology.

(i)

$$2x - 5y + z = 10$$
$$3x + 3y - 2z = 1$$
$$x + y + z = 2$$

(ii)

$$x - 4y + 2z = -13$$
$$5x - 4y + 3z = 17$$
$$2x - 5y - z = -18$$

(iii)

$$5y + 5z = 20$$
$$x + 2y - z = -12$$
$$7x - 4z = -4$$

[9]

Input the systems of linear equations into your GDC.

i) $x = 2, \quad y = -1, \quad z = 1$

ii) $x = 7, \quad y = 6, \quad z = 2$

iii) $x = 4, \quad y = -4, \quad z = 8$

Question 9

(a) Write $\frac{3}{x^2+5x+4}$ as a sum of partial fractions.

[2]

(b) Write $\frac{9-x}{x^2+3x-10}$ as a sum of partial fractions.

s[3]

(c) Write $\frac{3x-23}{2x^2-5x-12}$ as a sum of partial fractions.

[3]

a) Firstly, factorise the denominator

$x^2 + 5x + 4 = (x+4)(x+1)$

$$\frac{3}{x^2+5x+4} = \frac{A}{x+4} + \frac{B}{x+1} = \frac{A(x+1)+B(x+4)}{(x+4)(x+1)}$$

$3 = A(x+1) + B(x+4) = Ax + A + Bx + 4B$

$\therefore Ax + Bx = A + B = 0 \quad$ and $\quad A + 4B = 3$

$\therefore A = -1 \quad$ and $\quad B = 1$

$$-\frac{1}{x+4} + \frac{1}{x+1}$$

(a) Write $\frac{3}{x^2+5x+4}$ as a sum of partial fractions.

[2]

(b) Write $\frac{9-x}{x^2+3x-10}$ as a sum of partial fractions.

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(c) Write $\frac{3x-23}{2x^2-5x-12}$ as a sum of partial fractions.

[3]

b) Firstly, factorise the denominator

$x^2 + 3x - 10 = (x+5)(x-2)$

$$\frac{9-x}{x^2+3x-10} = \frac{A}{x+5} + \frac{B}{x-2} = \frac{A(x-2)+B(x+5)}{(x+5)(x-2)}$$

$9 - x = A(x-2) + B(x+5) = Ax - 2A + Bx + 5B$

$Ax + Bx = -x \longrightarrow A + B = -1 \quad$ and $\quad -2A + 5B = 9$

$\therefore A = -2 \quad$ and $\quad B = 1$

$$-\frac{2}{x+5} + \frac{1}{x-2}$$

(a) Write $\frac{3}{x^2+5x+4}$ as a sum of partial fractions.

[2]

(b) Write $\frac{9-x}{x^2+3x-10}$ as a sum of partial fractions.

s[3]

(c) Write $\frac{3x-23}{2x^2-5x-12}$ as a sum of partial fractions.

[3]

c) Firstly, factorise the denominator

$2x^2 - 5x - 12 = (2x+3)(x-4)$

$$\frac{3x-23}{2x^2-5x-12} = \frac{A}{2x+3} + \frac{B}{x-4} = \frac{A(x-4)+B(2x+3)}{(2x+3)(x-4)}$$

$3x - 23 = A(x-4) + B(2x+3) = Ax - 4A + 2Bx + 6B$

$Ax + 2Bx = 3x \longrightarrow A + 2B = 3 \quad$ and $\quad -4A + 6B = -23$

$\therefore A = 5 \quad$ and $\quad B = -1$

$$\frac{5}{2x+3} - \frac{1}{x-4}$$

Question 10

Write $\frac{33-12x}{(x+1)(x-2)^2}$ as the sum of partial fractions in the form $\frac{A}{x+1}+\frac{B}{x-2}+\frac{C}{(x-2)^2}$.

[5]

$$\frac{33-12x}{(x+1)(x-2)^2} = \frac{A}{x+1} + \frac{B}{x-2} + \frac{C}{(x-2)^2}$$

$$\frac{33-12x}{(x+1)(x-2)^2} = \frac{A(x-2)^2 + B(x+1)(x-2) + C(x+1)}{(x+1)(x-2)^2}$$

$$33-12x = A(x^2-4x+4) + B(x^2-x-2) + Cx + C$$

$$33-12x = Ax^2 - 4Ax + 4A + Bx^2 - Bx - 2B + Cx + C$$

$$\therefore Ax^2 + Bx^2 = 0 \rightarrow A + B = 0 \quad \text{or} \quad A = -B$$

$$-4Ax - Bx + Cx = -12x \rightarrow -4A - B + C = -12 \quad -①$$

$$4A - 2B + C = 33 \quad -②$$

Sub in $A = -B$ into ① and ②

$$-4(-B) - B + C = 3B + C = -12$$

$$4(-B) - 2B + C = -6B + C = 33 \qquad \therefore 9B = -45$$

$$\therefore B = -5, \quad A = 5, \quad C = 3$$