SECTION A (60 MARKS)

1 (a)

$$y = (-64)^{\frac{2}{3}}$$
$$= \left[(-4)^3\right]^{\frac{2}{3}}$$
$$= -4^{3\times\frac{2}{3}}$$
$$= -4^2$$
$$= 16$$ (03 marks)

(b) (a) 01 mark

i) $0.00168 \approx 0.0017 = 1.7\times10^{-3}$

ii) $0.000246 \approx 0.00025 = 2.5\times10^{-4}$

iii) $364589 \approx 360000 = 3.6\times10^{5}$

2 (a) 2.2 of wire have length of 10cm

0.5 kg = 500g of wire will have length of $\frac{500}{2.5} \times 10\text{cm} = 2000\text{cm}$

$= 2000\text{cm}$ (02 marks)

(b) Volume of Sphere $V = \frac{4}{3}\pi r^3$

If radius r increased by 5%, the new radius will be $1.05r$, and the new Volume will be

$$V = \frac{4}{3}\pi(1.05r)^3$$

$$\%\text{ Increase in Volume} = \frac{\frac{4}{3}\pi(1.05r)^3 - \frac{4}{3}\pi r^3}{\frac{4}{3}\pi r^3} \times 100\%$$
$$= \frac{(1.05)^3 - 1}{1} \times 100\%$$
$$\approx 16\%$$ (04 marks)

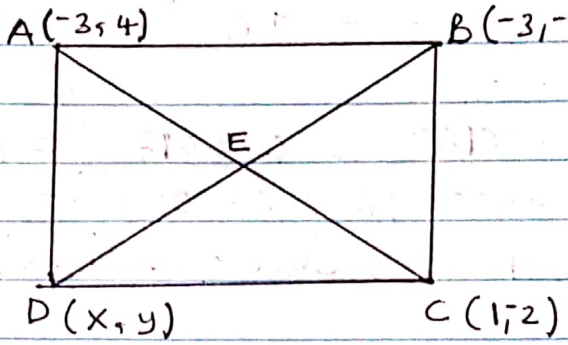
3 @ 03 marks

(a) $A \cap B = \{$All prime numbers less than 20$\}$

(b) Since all prime numbers are odd, then

$A \cup B = \{$All prime numbers $< 20\}$

4 (a)



→ If E is the coordinate of the point at which Diagonals AC and DB meets, its coordinate are $= \left(\frac{-3+1}{2}, \frac{4+(-2)}{2}\right)$

$= -1, 1$

→ Since E is the mid point of BD, we can find x and y using mid point formula. Thus

$\Rightarrow \frac{x+(-3)}{2} = -1$

$x = 1$

$\Rightarrow \frac{y+(-2)}{2} = 1$

$y = 4.$

Thus the coordinate of D are (1, 4)

(02 marks)

(b)

i) $\log 48 = \log (2^4 \times 3)$

$= 4\log 2 + \log 3$

$= 4(0.3010) + 0.477$

$= 1.681$ (02 marks)

ii) $\log \sqrt[3]{24} = \frac{1}{3} \log 24$

$= \frac{1}{3} \log (2^3 \times 3)$

$= \frac{1}{3} (3\log 2 + \log 3)$

$= \frac{1}{3} [3(0.3010) + 0.477]$

$= 0.46$ (02 marks)

5 The degree measure of an exterior(e) angle of any regular polygon with sides n $= \frac{360^\circ}{n}$ and the corresponding interior angle

$i = 180^\circ - e$ @02 marks

Thus

(a) $n = 9$

$e = \frac{360^\circ}{9}$

$= 40^\circ$

$i = 180^\circ - 40^\circ$

$= 140^\circ$

$\therefore$ exterior $= 40^\circ$, Interior $= 140^\circ$

(b) $n = 12$

$e = \frac{360^\circ}{12}$

$= 30^\circ$

$i = 180^\circ - e$

$i = 180^\circ - 30^\circ$

$= 150^\circ$

$\therefore$ exterior $= 30^\circ$, Interior $= 150^\circ$

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© $n = 15°$

$e = \frac{360°}{15°}$

$= 24°$

$i = 180° - e$

$= 180° - 24°$

$= \underline{156°}$

∴ exterior $24°$, Interior $= 156°$

6 a) Given that

$x \propto y \propto \frac{1}{z}$. This means

$\frac{xz}{y}$ = Constant .

$\frac{x_1 z_1}{y_1} = \frac{x_2 z_2}{y_2}$

$\frac{5 \times z}{4} = \frac{4 \times z}{5}$

$z = \frac{50}{16}$

$= \frac{25}{8}$ (02 marks)

b) $w \propto \frac{1}{hd}$

$w = \frac{k}{hd}$

$k = w_1 h_1 d_1$ (01 mark)

$w_1 d_1 h_1 = w_2 d_2 h_2$

$w_2 = \frac{k}{h_2 d_2}$

$\frac{9}{13} = \frac{6}{8} \times \frac{d_2}{52}$

$d_2 = 48$ days (03 marks)

7

Dr					Cr
LIABILITIES			**ASSETS**		
Capital	70,000		INTANGIBLE ASSETS		
less: Net loss	5,000		Goodwill		5,000 (01) ✓
	65,000		FIXED ASSETS		
less: Drawing	5000	(01)	Motor Van	25000	
	✓	60,000	Building	45000	
creditors		10,000			70,000 (01) ✓
Loan from bank		20,000	CURRENT ASSETS		
			stock	✓ 5000	
			Debtor	✓ 2500	
			Cash at bank	✓ 6000	02
			Cash in hand	✓ 1500	
					15,000
	01/2	90,000 ✓		01/2	90,000 ✓

Total = 06 marks

8 (a)

Magnesium = 3 , Oxygen = 2

y , 1.4 kg

$$\frac{3}{2} = \frac{y}{1.4\,kg}$$

$$\frac{2y}{2} = \frac{3 \times 1.4\,kg}{2}$$

$$y = 2.1\,kg$$

∴ Mass of Magnesium = 2.1 kg. (03)

(b) I = 5000

R = 10%

P = 5000

T = ?

$$T = \frac{100I}{PR} \qquad \text{(01 mark)}$$

$$= \frac{100 \times 5000}{5000 \times 10}$$

$$= 10 \text{ Years} \qquad \text{(02 marks)}$$

9 (a) By Pythagoras theorem in ΔABC

$$(\overline{AB})^2 + (\overline{BC})^2 = (\overline{AC})^2$$

$$(\overline{BC})^2 = 100 - 36$$

$$(\overline{BC})^2 = 64$$

$$(\overline{BC}) = 8 \qquad 0\frac{1}{2}$$

But

$$\overline{BC} = x + 4 = 8$$

$$x = 8 - 4$$

$$x = 4 \text{ cm} \qquad 0\frac{1}{2}$$

Again applying pythagoras theorem in ΔABD gives,

$$6^2 + x^2 = y^2$$

$$36 + 4^2 = y^2$$

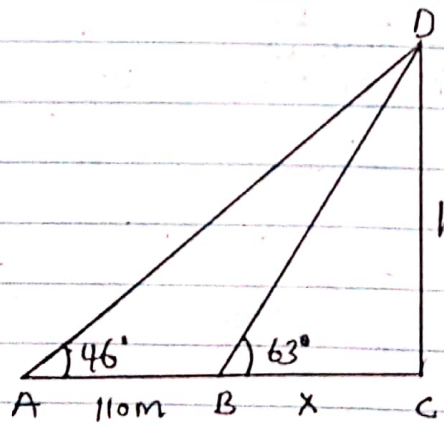
$$36 + 16 = y^2$$

$$y^2 = 52$$

$$y = \sqrt{52}$$

$$y = 7.21 \text{ cm} \qquad \text{(02 marks)}$$

(b)



$$\tan 63^\circ = \frac{h}{x}$$

$$h = x \tan 63^\circ \quad \text{—(i)}$$

Again

$$\tan 46^\circ = \frac{h}{110+x}$$

$$h = (110+x)\tan 46^\circ \quad \text{—(ii)}$$

equating —(i) and —(ii)

$$(110+x)\tan 46^\circ = x \tan 63^\circ$$

$$x = 122.9\ m$$

But

$$h = x \tan 63$$
$$= 122.9 \times 1.9626\ M$$
$$= 241.1\ m \qquad \text{(03 marks)}$$

(10)

(a) i) @ 01½ marks

$$4a^2 - 81b^2 = (2a)^2 - (9b)^2$$
$$= (2a + 9b)(2a - 9b)$$

ii) $25 - 5x - 2x^2 = 25 - 10x + 5x - 2x^2$

$$= 5(5-2x) + x(5-2x)$$
$$= (5+x)(5-2x).$$

(b) $$T = f\sqrt{\frac{K-d}{K}}$$

Square both sides

$$T^2 = f^2 \frac{(K-d)}{K}$$

$$T^2 = f^2\left(1 - \frac{d}{k}\right)$$

$$\frac{d}{k} = 1 - \frac{T^2}{f^2}$$

$$\frac{d}{k} = \frac{f^2 - T^2}{f^2}$$

$$\frac{k}{d} = \frac{f^2}{f^2 - T^2}$$

$$k = \frac{df^2}{f^2 - T^2}$$ (03 marks)

SECTION B (40 MARKS)

(11)

a) $\text{Mean} = A + \frac{\Sigma fd}{\Sigma f}$

But

$\Sigma f = 100$

$$\bar{x} = 75.5 + \frac{-970}{100}$$

$$\bar{x} = 75.5 + -9.7$$

$$= 65.8$$ (03 marks)

b) $\text{Median} = L_o + \left[\frac{N/2 - \Sigma f_a}{f_m}\right] c$ (01/2)

But

$L_o = 60.5$, $N = 100$

$\Sigma f_a = 32$, $f_m = 34$, $c = 10$

$$\text{Median} = 60.5 + \left[\frac{100/2 - 32}{34}\right] 10$$

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Median = 65.79 (03 marks)

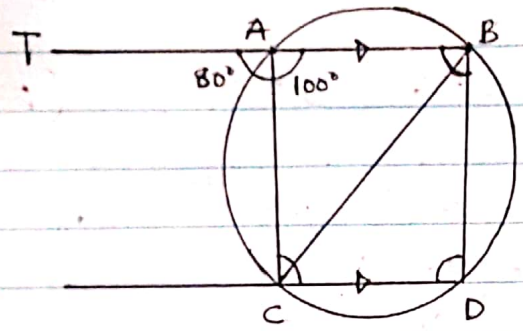
c) Mode $= L_o + \left[\frac{t}{t_1+t_2}\right] c$ (01/2)

$= 60.5 + \left[\frac{12}{12+9}\right] 10$

$= 66.21$ (03 marks)

(12)

(a)



$80° + C\hat{A}B = 180°$ (Sum of $\angle$s in straigh line)

$C\hat{A}B = 100°$ (01 mark)

$100° + C\hat{D}B = 180°$ (Sum of opposite $\angle$s of cyclic quadrilateral)

$C\hat{D}B = 80°$ (01 mark)

$80° = A\hat{C}D$ (opposite Interior angle)

Then

$80° + A\hat{B}D = 180°$ (Sum $\angle$s of opposite cyclic quadrilateral)

$\therefore A\hat{B}D = 100°$ (03 marks)

(b) Circumference, C

$C = 2\pi R \cos\theta$ (01 mark)

$= 2\pi \times 6370km \times \cos 30°$

$= 22/7 \times 910 \times \sqrt{3}/4$

$= 20020\sqrt{3}km$

(04 marks)

(13) a)

i) If the sequence is 3, x, y, -24 is arithmetic Progression

the Common difference gives

$$x-3 = y-x = 24-y$$

$$x+3 = y-x \Rightarrow 2x-y=3 \quad \text{—(i)}$$

$$y-x = 24-y \Rightarrow x-2y=24 \quad \text{—(ii)}$$

Solve eqn —(i) and —(ii) simultaneously

$$\begin{cases} 2x-y=3 \\ x-2y=24 \end{cases}$$

$\therefore x=-6, \quad y=-15$ (03 marks)

ii) If the sequence is geometrical progression then the Common ratio is

$$r = \frac{x}{3} = \frac{y}{x} = \frac{-24}{y}$$

Thus we have

$$\frac{x}{3} = \frac{y}{x} \Rightarrow x^2 = 3y \quad \text{—(i)}$$

And

$$\frac{y}{x} = \frac{-24}{y} \Rightarrow y^2 = -24x \quad \text{—(ii)}$$

From eqn —(i)

$$y = \frac{x^2}{3} \quad \text{and} \quad y^2 = \frac{x^4}{9} \quad \text{—(iii)}$$

From eqn —(ii) and —(iii):

$$\frac{x^4}{9} = -24x \quad \text{or} \quad \frac{x^3}{9} = -24$$

$$x = \sqrt[3]{9 \times (-24)} = -6$$

$$y = \frac{x^2}{3} = \frac{(-6)^2}{3} = 12$$

$\therefore x=-6, \quad y=12$ (03 marks)

(b) Let the total number of rows be n

a = First term

d = Common difference

Then

$$a_n = a + (n-1)d$$

→ Starting from the bottom row, the number of logs is decreasing by 2 Thus, $d = -2$ and $a = 60$

Thus

$$2 = 60 + (n-1)(-2)$$

$$n = 30$$

Total number of logs

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$S_{30} = \frac{30}{2}(2 \times 60 + (30-1)(-2)$$

$$= 930 \text{ logs}$$

∴ There are 930 logs altogether. (04 marks)

(14)

a)

$f(-5) = -5$ (01)

$f(0) = 0$ (01)

$f(10) = 11$ (01)

b) $y = x$

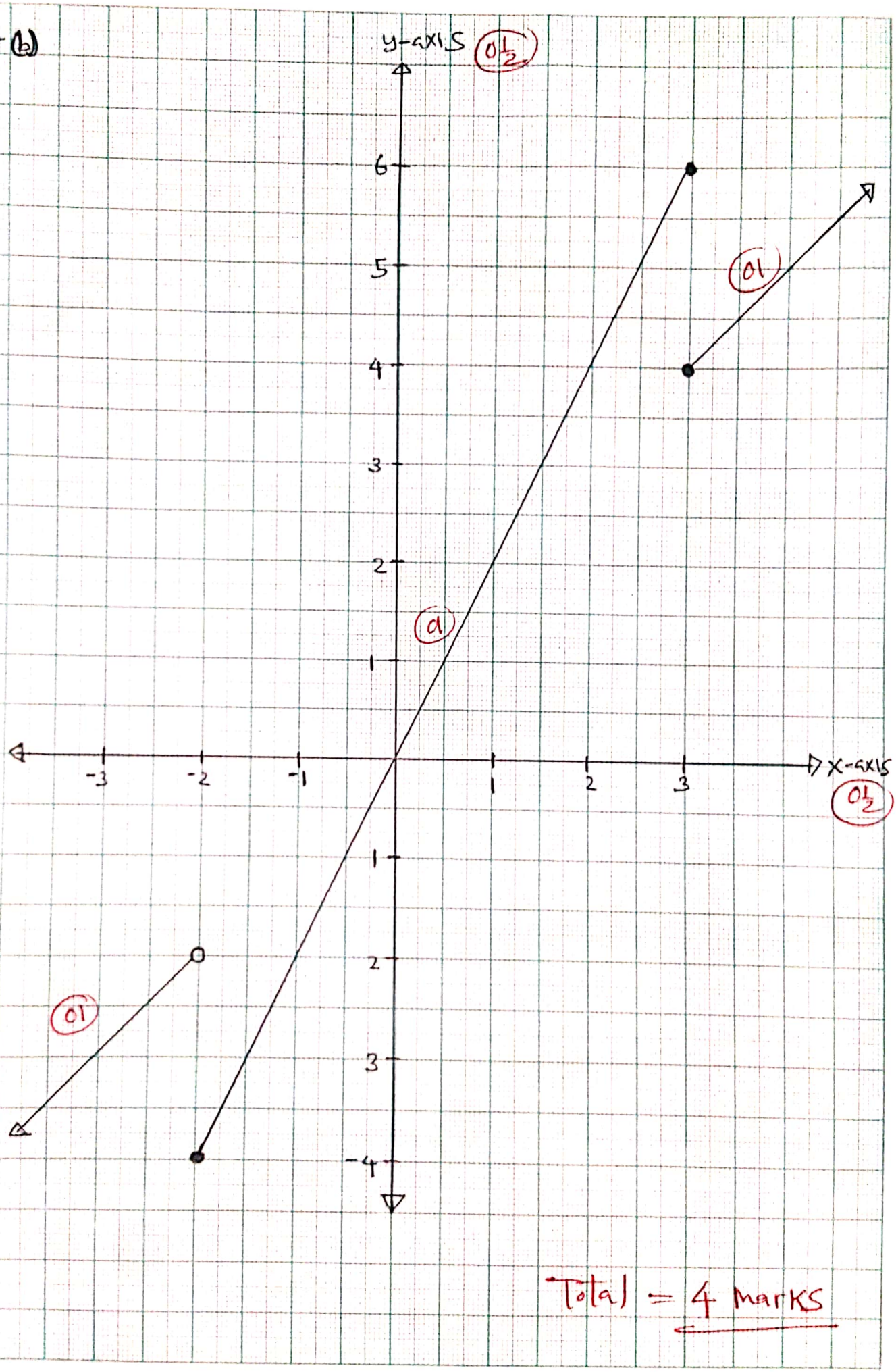
x	-2	-1	0	1	2	3
y	-4	-2	0	2	4	6

(01)

c) Domain = {all Real numbers} (01)

Range = {all real numbers} (01)

14(b)



01½

01

01

01½

Total = 4 marks

(1cm x 1cm) squares of (10mm x 10mm)