SECTION A (60 MARKS)

01 @

2	90	15	20
2	45	15	10
3	45	15	5
3	15	5	5
5	5	5	5

--- (01 mark)

The Lcm $= 2\times2\times3\times3\times5 = 180$ --- (01 mark)

∴ The smallest number of sweets that can be put into bags is 180 sweets. --(01 mark)

(b) let $x = 0.9\dot{3}$ --- (i) - (01 mark)

multiply by 10 both sides

$10x = 9.3\dot{3}$ --- (ii) -- (01 mark)

eqn (ii) − eqn (i)

$10x - x = 9.3\dot{3} - 0.9\dot{3}$

$\frac{9x}{9} = \frac{8.4}{9}$

$x = \frac{84}{90} = \frac{42}{45} = \frac{14}{15}$

∴ $0.9\dot{3} = \frac{14}{15}$ --- (01 mark)

02 @ $\frac{9^{2n}}{3^n} = \frac{1}{27}$

$3^{4n-n} = 3^{-3}$ ----- (01 mark)

$4n - n = -3$

$\frac{3n}{3} = \frac{-3}{3}$

$n = -1$ --- (01 mark)

02 (b) $\log 64^{\frac{1}{3}} - \log y^2 = \log 64$

$\log (4^3)^{\frac{1}{3}} - \log y^2 = \log 64$ ---------- (01 mark)

$\log 4 - \log 64 = \log y^2$

$\log_{10}\left(\frac{4}{64}\right) = \log_{10} y^2$

$\sqrt{\frac{1}{16}} = \sqrt{y^2}$

$y = \frac{1}{4}$. ---------- (01 mark)

(c) $\left(\frac{2\sqrt{5}+3\sqrt{2}}{2\sqrt{6}-3\sqrt{7}}\right)\left(\frac{2\sqrt{6}+3\sqrt{7}}{2\sqrt{6}+3\sqrt{7}}\right)$ --- (01 mark)

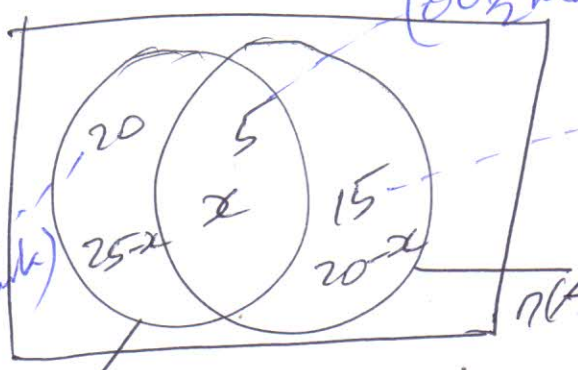
$= \frac{4\sqrt{30}+6\sqrt{35}+6\sqrt{12}+9\sqrt{14}}{4\times 6+6\sqrt{42}-6\sqrt{42}-9\times 7}$

$= \frac{4\sqrt{30}+6\sqrt{35}+12\sqrt{3}+9\sqrt{14}}{24-63}$

$= \frac{4\sqrt{30}+6\sqrt{35}+9\sqrt{14}+12\sqrt{3}}{-39}$. ---- (01 mark)

$\therefore \frac{2\sqrt{5}+3\sqrt{2}}{2\sqrt{6}-3\sqrt{7}} = \frac{4\sqrt{30}+6\sqrt{35}+9\sqrt{14}+12\sqrt{3}}{-39}$.

03 (a)



(00½ mark) Let
(00½ mark) # of students who take commerce.
(00½ mark) A — # of students who take Agriculture.
(00½ mark) $n(A) = 20$
(00½ mark) $n(C) = 25$

$25 - x + x + 20 - x = 40$ ---- (01 mark)

$45 - x = 40$

$x = 45 - 40 = 5$

∴ 5 students take both subjects. ---- (01 mark)

(b) The number of students who take commerce only are 20 students. (01 mark)

(c) The number of students who take only one subject are $20 + 15 = 35$ students. ---- (01 mark)

04 (a) $(6, 2)$ and $(0, -2)$
x_1, y_1 x_2, y_2

$\text{slope } (m) = \frac{y_2 - y_1}{x_2 - x_1}$ ---- (00½ mark)

$m = \frac{-2 - 2}{0 - 6} = \frac{-4}{-6} = \frac{2}{3}$ ---- (00½ mark)

Equation, $y = m(x - x_1) + y_1$

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

$y = \frac{2}{3}x - 4 + 2$

$y = \frac{2}{3}x - 2$ ---- (01 mark)

(b) x-intercept $(y = 0)$ ---- (01 mark)

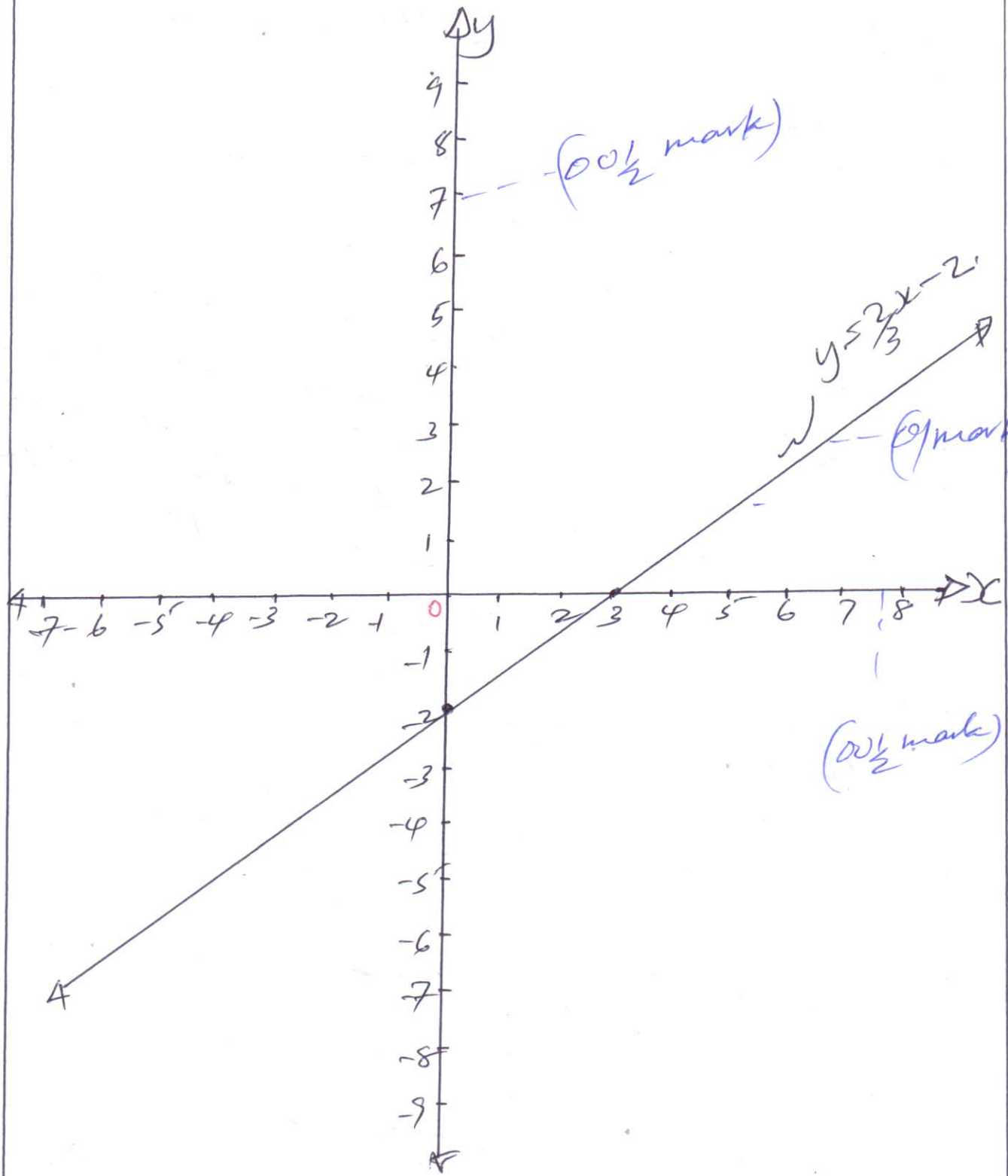
$0 = \frac{2}{3}x - 2$

$\frac{3}{2} \times 2 = \frac{2}{3}x \times \frac{3}{2}$

$x = 3$ ---- (01 mark)

04 (e) $y = \frac{2}{3}x - 2$

x	0	3
y	-2	0



05 @ (i) Exterior angles + Interior angle = 180°

(e) (i)

$e + i = 180°$ ---- (01 mark)

$36° - 36° + i = 180° - 36°$

$i = 144°$ --- (01 mark)

∴ The size of interior angle is 144°.

(ii) number of sides $(n) = \frac{360°}{\text{exterior angle}}$

$n = \frac{360°}{36} = 10$ sides. -- (01 mark)

(b) Area of Trapezium $= \frac{1}{2}(a+b)h$

$A = \frac{1}{2}(a+b)h$ --- (01 mark)

$2 \times 121 = \frac{1}{2}(9+b)11 \times 2$

$\frac{121 \times 2}{11 \times \cancel{2}} = (9+b)\frac{11 \times \cancel{2}}{11 \times \cancel{2}}$ ---- (01 mark)

$11 \times 2 = 9 + b$

$b = 22 - 9 = 13.$

∴ The other side is 13cm. -- (01 mark)

06 @ $x + 5 \propto \frac{y^2}{2z}$ ------ (01 mark)

$x + 5 = \frac{ky^2}{2z}$, $x = 5, y = 2, z = 4$

$5 + 5 = \frac{4k}{2 \times 4}$ $k = 20$ -- (01 mark)

06 (a) $x+5 = \frac{20y^2}{2z}$ but $x=10$, $y=3$

$10+5 = \frac{20\times 3^2}{2z}$ ---- (01 mark)

$\frac{30z}{30} = \frac{2\cancel{0}\times\cancel{9}^{3}}{\cancel{2}\cancel{0}}$

$z = 6$ ---- (01 mark)

$\therefore z = 6$ when $x=10$ and $y=3$.

(b) 10.6 m Total length of a wire

0.53cm The length of one piece of wire.

$1m = 100cm$

$10.6m = xc$

$x = 1060cm$. ---- (01 mark)

Number of pieces $= \frac{1060cm}{0.53cm} = 2000$ pieces. ---- (01 mark)

7 (a) Buying price shs. 18,000/=

percentage loss 15%

Selling price?

%age loss $= \frac{B.P - S.P}{B.P} \times 100\%$ ---- (01/2 mark)

$\frac{15}{100} = \frac{18,000 - S.P}{18,000} \times \frac{100}{100}$

$0.15 \times 18,000 = 18,000 - S.P$

Selling price $= 15,300/=$ ---- (01/2 mark)

07 (b) $I = \frac{PRT}{100}$, $I = 8000/-$, $T = 6\text{yrs}$ ——— (01 mark)
$P = ?$ $R = 15\%$

$\frac{100}{9P} \frac{8000}{} = \frac{P \times 15 \times 6}{100} \times \frac{100}{90}$ ——— (01 mark)

$P = \frac{80,000}{9} = 8888.89/-$ ——— (01 mark)

∴ The principle is Sh. 8,888.89/-.

08. @ $a_3 = 16$, $a_7 = 1$

$a_1 r^2 = 16$ -- (i)

$a_1 r^6 = 1$ --(ii)

eqn (i) divide by eqn (ii)

$\frac{a_1 r^2}{a_1 r^6} = \frac{16}{1}$

$r^{-4} = 2^4$

$(\frac{1}{r})^4 = 2^4$

$\frac{1}{r} = 2$

$r = \frac{1}{2}$ ——— (01½ mark)

from eqn (i) substitute $r = \frac{1}{2}$ but $r = \frac{1}{2}$

$a_1 r^2 = 16$

$4 \times a_1 \times \frac{1}{4} = 16 \times 4$.

$a_1 = 64$.

$a_n = a_1 r^{n-1}$

$a_{10} = 64 \times (\frac{1}{2})^9 = 2^6 \times 2^{-9} = 2^{-3} = \frac{1}{8}$ ——— (01½ mark)

08 (b) $S_{13} = 286$

$S_n = \frac{n}{2}(2A_1 + (n-1)d)$ ---- (01 mark)

$S_{13} = \frac{13}{2}(2A_1 + 12d)$ ---- (01 mark)

$\frac{2}{13} \times \frac{13}{2}(2A_1 + 12d) = 286 \times \frac{2}{13}$

$2A_1 + 12d = 44$, but $d = 3$

$2A_1 + 12 \times 3 = 44$

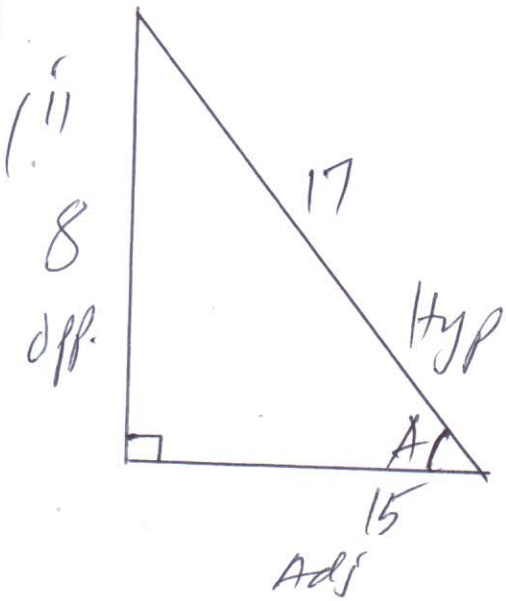
$2A_1 = 44 - 36 = 8$

$\frac{2A_1}{2} = \frac{8}{2}$

$A_1 = 4$

$\therefore$ The first term is 4. ---- (01 mark)

9 (a)



$\tan\hat{A} = \frac{Opp}{Adj}$

$(Opp)^2 = (Hyp)^2 - (Adj)^2$

$= 17^2 - 15^2$ ---- (01 mark)

$Opp = \sqrt{64} = 8$ ---- (01 mark)

$\therefore \tan\hat{A} = \frac{8}{15}$ ---- (01 mark)

(ii) $\sin\hat{A} = \frac{Opp}{Hyp}$

$\therefore \sin\hat{A} = \frac{8}{17}$ ---- (01 mark)

09 (b) $\overline{PT}^2 = \overline{PQ}^2 - \overline{QT}^2$

$= 15^2 - 9^2 = 144$

$\overline{PT} = \sqrt{144} = 12\text{cm}$ --- (01/2 mark)

$\overline{RT}^2 = \overline{PR}^2 - \overline{PT}^2$

$= 13^2 - 12^2 = 25$

$\overline{RT} = \sqrt{25} = 5\text{cm}$ ---- (01/2 mark)

10 (a) for perfect square

$b^2 = 4ac$; $b=1, a=1$ --- (01/2 marks)

$c = c$

$\frac{1^2}{4} = \frac{4 \times 1 \times c}{4}$

$c = 1/4$

$\therefore$ The value of c is 1/4 --- (01/2 mark)

for $x^2 + x + c$ to be a perfect square.

(b) solve for x by completing the square method.

$\frac{2x^2}{2} + \frac{7x}{2} + \frac{6}{2} = \frac{0}{2}$

$x^2 + \frac{7}{2}x = -3$ ---- (01 mark)

$x^2 + \frac{7}{2}x + (\frac{7}{4})^2 = -3 + \frac{49}{16}$ --- (01 mark)

$\sqrt{(x+\frac{7}{4})^2} = \pm\sqrt{\frac{1}{16}}$

$x = \frac{-7 \pm 1}{4} = \frac{-6}{4}$ or -2 --- (01 mark)

$\therefore x = -3/2$ or -2.

SECTION B (40 MARKS)

11 (a) $7+11+20+X+2=45$

$40+X-40=45-40$

$X=5$ ---(01 mark)

∴ The value of X is 5.

(b) (i) mean $(\bar{X}) = \frac{\Sigma fx}{N}$ ---(01 mark)

C.I	c.m(x)	f	fx
45-55	50	7	350
56-66	61	11	671
67-77	72	20	1,440
78-88	83	5	415
89-99	94	2	188
		N=45	Σfx=3,064

---(01 mark)

$\bar{X} = \frac{3,064}{45} = 68.09$. ---(01 mark)

(ii) mode $= L + \left(\frac{\Delta_1}{\Delta_1+\Delta_2}\right)C$ ---(01 mark)

$= 66.5 + \left(\frac{9}{9+15}\right)\times 11$ ---(01 mark)

∴ Mode = 70.625. ---(01 mark)

(iii) median $= L + \left(\frac{N}{2} - \frac{\Sigma fb}{fm}\right)C$ ---(01 mark)

$= 66.5 + \left(\frac{45}{2} - \frac{18}{20}\right)\times 11$ ---(01 mark)

∴ Median = 68.975. ---(01 mark)

MARKING SCHEME:

12. Given 2nd, 4th and 8th $=$ G_1, G_2, and G_3. ---- 00½

A_1+d, A_1+3d and $A_1+7d = G_1, G_1r$ and G_1r^2 -- 00½

Common ratio (r)

$$\frac{A_1+3d}{A_1+d} = \frac{A_1+7d}{A_1+3d}$$ ------ 00½

$$(A_1+d)(A_1+7d) = (A_1+3d)(A_1+3d)$$

$$A_1^2+7A_1d+1A_1d+7d^2 = A_1^2+3A_1d+3A_1d+9d^2$$ -- 00½

$$8A_1d+7d^2 = 6A_1d+9d^2$$

$$8A_1d-6A_1d = 9d^2-7d^2$$ --- 00½

$$\frac{2A_1d}{2d} = \frac{2d^2}{2d}$$

$$A_1 = d \quad \text{---(i)}$$ ------ 00½

(a) $3^{rd}+5^{th} = 20$

$A_1+2d+A_1+4d = 20$ ------ 00½

$2A_1+6d = 20$ ---(ii)

but $A_1 = d$.

$2d+6d = 20$ ------ 00½

$8d = 20$

$d = \frac{20}{8}$ ------ 00½

$d = 5/2$ ∴ Common difference (d) $= 5/2$ --- 00½

(b) Common ratio (r) $= \frac{A_1+3d}{A_1+d}$ or $\frac{A_1+7d}{A_1+3d}$ but $A_1 = d$ --- 00½

$$= \frac{d+3d}{d+d}$$ ------ 00½

$$= \frac{4d}{2d}$$ ------ 00½

$= 2$

∴ Common ratio (r) $= 2$ --- 00½

(c) Sum of the first 9 terms of an A.P

$S_n = \frac{n}{2}(2A_1 + (n-1)d)$ but $n = 9$, $A_1 = \frac{5}{2}$ and $d = \frac{5}{2}$. ——→ 00½

$S_9 = \frac{9}{2}(2 \times \frac{5}{2} + (9-1)\frac{5}{2})$ ———— 00½

$S_9 = 4.5(5 + 8 \times \frac{5}{2})$ ———— 00½

$S_9 = 4.5(5 + 4 \times 5)$ ———— 00½

$S_9 = 4.5(5 + 20)$

$S_9 = 4.5(25)$ ———— 00½

$S_9 = 112.5$

∴ The sum of the first 9 terms of an A.P is 112.5 00½

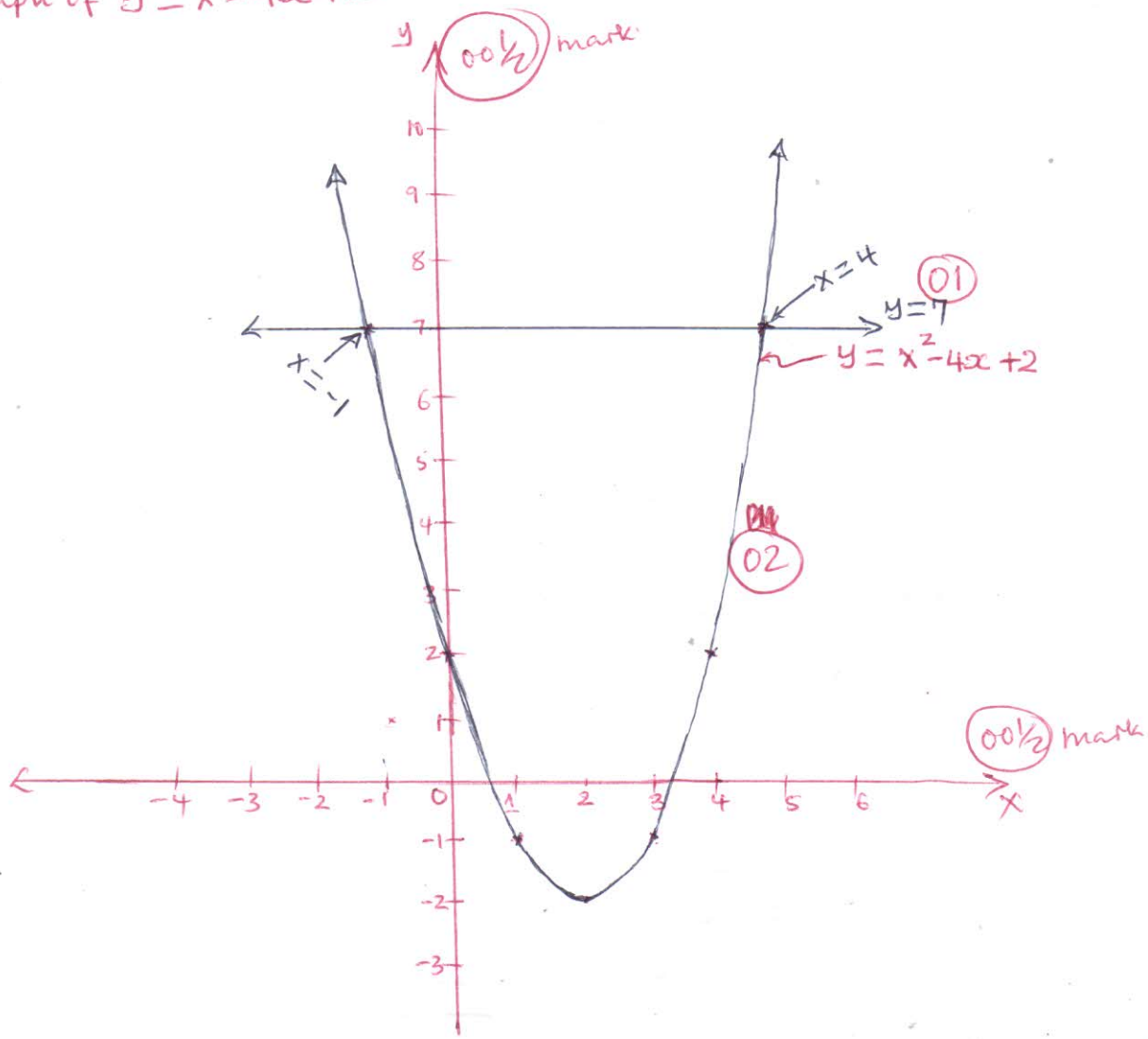
Soln:

13 (b) Table of values for $y = x^2 - 4x + 2$

x	-2	-1	0	1	2	3	4	5
y	10	7	2	-1	-2	-1	2	7

01

Graph of $y = x^2 - 4x + 2$



12 (a) (i) Accra, London and Hull lie on the prime meridian. — (03 ma

(ii) Nakuru and Kampala lie on the Equator. — (02 marks)

(b) Town X (76°E) at 4:30pm

GMT (0°) time?

difference in degrees of longitude (θ) = 76° + 0° = 76° — (02 marks

difference in local time

76° × 4min = 304min — (02 marks

Time at GMT is 4:30pm — 5 hrs 4min.

i.e at GMT time will be 11:26 am. — (01 mark)

13 (a) $T(0,0) \longrightarrow (-3,-7)$ — (00½ mark) ~~(01½ marks)~~

$(x',y') = (x,y) + (a,b)$

$(-3,-7) = (0,0) + (a,b)$ — (00½ mark) ~~(01½ marks)~~

$(a,b) = (-3,-7)$

$\therefore (x',y') = (2,6) + (-3,-7) = (-1,-1)$

$\therefore T(2,6) \longrightarrow (-1,-1)$ — (00½) ~~(02 mark~~ 01 mark

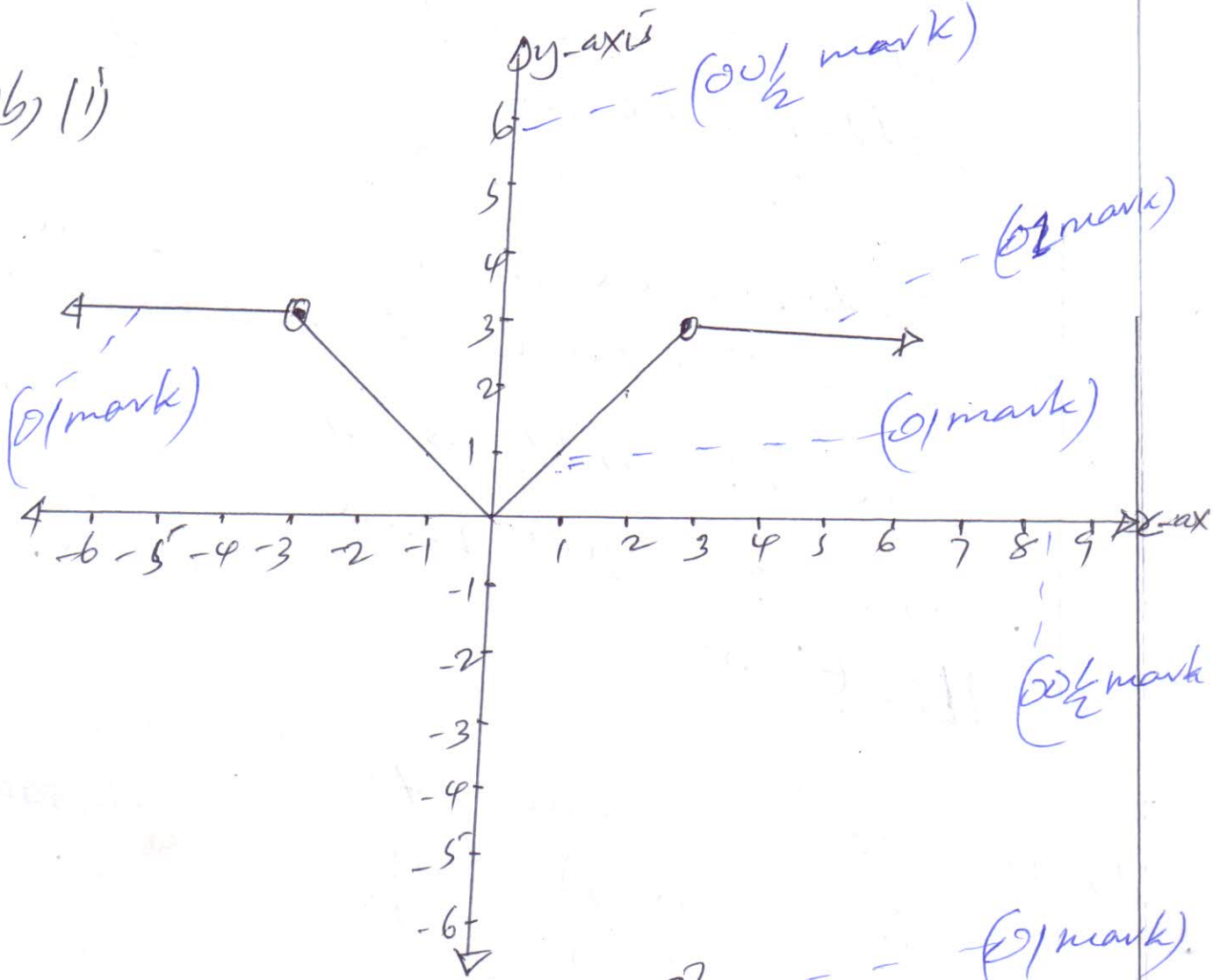
13 (b) $M_{y=x}(x, y) = (y, x)$ - - - (00½) (01 mark) (02 marks)

$M_{y=x}(-4, 3) = (3, -4)$ - - - - - (01 mark) (02 marks)

14 (a) Domain $= \{0, 1, 3\}$ - - - - (02 marks)

Range $= \{2, 5\}$ - - - (02 marks)

(b) (i)



(00½ mark)

(02 mark)

(01 mark)

(01 mark)

(00½ mark)

(ii) Domain $= \{x : x \in \mathbb{R}\}$ - - - (01 mark)

Range $= \{y : 0 \leq y \leq 3\}$ - - (01 mark)

X X

Soln

13 b(i) From the graph the minimum value of y is -2 -- (00½)
and the corresponding value of x is 2. -- (00½)

(ii) Compare $y = x^2 - 4x + 2$ and $x^2 - 4x - 2 = 3$.

$x^2 - 4x + 2 = y$ and $x^2 - 4x - 2 - 3 = 0$

$x^2 - 4x + 2 = y$ and $x^2 - 4x - 5 = 0$

$x^2 - 4x + 2 = y$ and $x^2 - 4x + 2 - 7 = 0$

$x^2 - 4x + 2 = y$ and $x^2 - 4x + 2 = 7$

Then $y = 7$. -- (00½)

From the graph above, values of x are -1 or 4.

Hence the solutions to $x^2 - 4x - 2 = 3$ are -1 or 4 -- (00½)