TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL

FORM FOUR INTER ISLAMIC MOCK EXAMINATION

041 **BASIC MATHEMATICS**

MARKING SCHEME **2025**

SECTION A

1. (a) (i) Let x = $0.\dot{3}\dot{6}$ _____ (i)

100x = $36.\dot{3}\dot{6}$ _____ (ii)

100x – x = $36.36 - 0.\dot{3}\dot{6}$ **01**

$\frac{99x}{99} = \frac{36}{99}$

$X = \frac{4}{11}$

$\therefore 0.\dot{3}\dot{6} = \frac{4}{11}$ 01

(ii) To convert into percentage,

$\frac{4}{11}x100\% = \frac{400}{11}$ **01**

$= 36\frac{4}{11}\%$ or 36.36%

(b) (i) 0.03785 ≈ 0.0378 (to 3 significant figures) **01**

(ii) 0.03785 ≈ 0.038 (to 3 decimal places) **01**

(iii) $0.03785 = 3.785 \times 10^{-2}$. **01**

2. (a) $V = \sqrt{\frac{2\mu(\mu-a)}{2}}$

$V^2 = \frac{3\mu(\mu-a)}{2}$ _____ $00\frac{1}{2}$

$\frac{2V^2}{3\mu}$=μ-a _____ 001/2

$a = \mu - \frac{2V^2}{3\mu}$ _____ 001/2

$a = \frac{3\mu^2-2V^2}{3\mu}$ 001/2

(b) $\frac{\sqrt{3}}{2-\sqrt{3}}$ – R.F is $\frac{2+\sqrt{3}}{2+\sqrt{3}}$

$\frac{\sqrt{3}}{2-\sqrt{3}} = \frac{\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$ _____ $00\frac{1}{2}$

$= \frac{2\sqrt{3}+3}{4-3}$ **01**

$= \frac{2\sqrt{3}+3}{1}$

$= 2\sqrt{3}+3$ **01**

$\therefore \frac{\sqrt{3}}{2-\sqrt{3}} = 2\sqrt{3}+3.$

(c) Given $\log_{10} x = \bar{1}.413$

$\log_{10}\sqrt{x} = \log_{10} x^{\frac{1}{2}}$ **01/02**

$= \frac{1}{2}\log_{10} x$ **01/02**

$= \frac{1}{2}[\bar{1}.413]$

$= \bar{1}.765$ **01**

$\therefore \log_{10}\sqrt{x} = \bar{1}.765$

3. (a) Given that

n(u)=30

n(M)=15

n(E)=18

n(MUE)'= 4

From

n(u) = n(MUE)+ n(MUE)' **01/02**

n(MUE)=30-4

n(MUE) = 26 **01/02**

From

n(MUE) = n(M)+n(E)- n(MnE) **01/02**

26 = 15 + 18 – n(MnE) **01/02**

26 = 33 – n(MnE)

26 – 33 = - n(MnE) **01**

-7 = -n(MnE)

n(MnE) = 7

∴7 students like both mathematics and English. **01**

3. (b) Number of sample space n(s) = 52.

Let Ace be A={Aces}

n(A) = 4

$p(A) = \frac{2}{52}$ **01/02**

From:

p(AUB) = p(A) + p(B) – p(AnB) **01/02**

$p(AuB) = \frac{4}{52} + \frac{26}{52} - \frac{2}{52}$

$= \frac{30}{52} - \frac{2}{52}$ **01/02**

$= \frac{28}{52}$

$= \frac{7}{13}$ **01/02**

∴ The probability that a card selected is Ace or Black is $\frac{7}{13}$.

4. (a) Let coordinates of point p(x,0)

From

PR = PQ

But $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ _____ $00\frac{1}{2}$

Then

$\overline{PR}^2 = \overline{PQ}^2$

$(x-8)^2 + (0-4)^2 = (x-6)^2 + (0-6)^2$ _____ $00\frac{1}{2}$

$x^2 - 16x + 64 + 16 = x^2 - 12x + 36 + 36$

$-16x + 80 = 12x + 72$

$16x - 12x = 80 - 72$ **01/02**

$\frac{4x}{4} = \frac{8}{4}$

x = 2.

∴ The coordinate of a point p is (2,0). **01**

(b) Given that $\underline{a} = (4, -3)$ and $\underline{b} = (-2, 1)$

$3a - 2b = 3(4, -3)$ and $-2(-2,1)$

$= (12, -9) - (-4,2)$

$= (16, -11)$ **01**

$|3\underline{a} - 2\underline{b}| = \sqrt{x^2 + y^2}$ _____ $00\frac{1}{2}$

$= \sqrt{16^2 + (-11)^2}$ **01**

$|3\underline{a} - 2\underline{b}| = \sqrt{377}$

Unit vector $\frac{16,-11}{\sqrt{377}}$ _____ $00\frac{1}{2}$

5. (a) $\Delta AKL \sim \Delta ABC$

$\frac{AK}{AB} = \frac{KL}{BC} = \frac{AL}{AC} = k$ _____ $00\frac{1}{2}$

$\frac{KL}{BC} = \frac{AL}{AC}$ _____ $00\frac{1}{2}$

$\frac{12}{30} = \frac{15}{15+x}$ **01**

$\frac{2}{5} = \frac{15}{15+x}$

$30+2x = 75$

$\frac{2x}{2} = \frac{45}{2}$

$x = 22.5m$ **01**

(b) Perimeter $= 2nrsin\left(\frac{180^o}{n}\right)$ **01**

$n=8$

$p=88$

$2 \times 8rsin\left(\frac{180}{8}\right) = 88.$ **01**

$2rSin\left(\frac{180}{8}\right) = 11$

$\frac{0.77r}{0.77} = \frac{11}{0.77}$ **01**

$r = 14.37cm$

∴ The radius of the circle is 14.37cm **01**

6. (a) Let M be number of men and d be working days.

$M \propto \frac{1}{d}$

$m = \frac{k}{d}$

k = md **01**

k=12x15

k = 180 **01**

From

m = $\frac{k}{d}$

d = $\frac{k}{m}$

$d = \frac{180}{20}$

d = 9 days **01**

∴ They will take 9 days

(b) Convert minutes into hours.

1hr = 60 min

? = 336 min

= $\frac{336 \times 1}{60}$ **01**

= $\frac{28}{5}$ hrs or 5.6 hrs

Amount paid = $\frac{28}{5} \times 1800$ **01**

= 10080.

He will be paid 10080 shillings. 01

7. (a) (i)Total cost = 3kg x 3000 + 2kg x 5000

= 9000 + 10000

= 19000 **01/02**

Cost per kilogram = $\frac{Total\ cost}{Total\ weight}$

= $\frac{19000}{5}$

= 3800 **01**

(ii) Cost per kilogram is 3800 shillings

Selling price = 4200 shillings

Profit made = selling price – cost price **01/02**

Profit = 4200 – 3800

= 400

% Profit = $\frac{Profit}{Cost\ price} \times 100\%$ _____ $00\frac{1}{2}$

= $\frac{400}{3800} \times 100\%$

= 10.53% _____ $00\frac{1}{2}$

∴ The percentage profit is 10.53%

(b) (i) The cost of goods sold

Cost = Opening stock + purchases – closing stock

= 40000 + 100000 – 60000

= 140000 – 60000

= 80000 **01**

(ii) Average stock

Average stock = $\frac{Opening\ stock+closing\ stock}{2}$ _____ $00\frac{1}{2}$

= $\frac{40000+60000}{2}$

= $\frac{100000}{2}$

= 50,000 _____ $00\frac{1}{2}$

(iii) Gross profit

Gross profit = sales – cost of goods sold _____ $00\frac{1}{2}$

= 160000 – 85000

= 75,000.

∴ The Gross profit is 75,000. _____ $00\frac{1}{2}$

8. (a) Let the numbers be x and y.

Arithmetic mean = $\frac{x+y}{2}$

$\frac{x+y}{2} = 15$

x+y = 30 _____ (i) _____ $00\frac{1}{2}$

Geometric mean = $\sqrt{xy}$

9 = $\sqrt{xy}$

9^2 = xy

xy = 81 _____(ii) _____ $00\frac{1}{2}$

From equation

x+y = 30

y=30 - x _____ (iii)

Substituting eqn (iii) into (ii)

x(30-x) = 81

$30x - x^2 = 81$

$x^2-30x+81=0$. **01**

By General Form:

$X = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$X = \frac{30\pm\sqrt{(-30)^2\ 4x1x81}}{2x1}$

$X = \frac{30\pm\sqrt{576}}{2}$

$X = \frac{30\pm24}{2}$

X = 15 $\pm$ 12.

X = 15 + 12 or x = 15 – 12.

X = 27 or x = 3

∴ The numbers are 27 and 3 respectively. **01**

(b) Given that

Amount $A_5 = 60000$

n = 5 years

R = 10%

t = 4

Principal p = ?

From

An = $p\left(1+\frac{R1}{100t}\right)^{nt}$ _____ $00\frac{1}{2}$

A5 = $p\left(1+\frac{10}{100\times4}\right)^{5\times4}$ _____ $00\frac{1}{2}$

$60000 = p(1+0.025)^{20}$

$60000 = p(1.025)^{20}$

$\frac{60000}{1.6386} = \frac{1.6386p}{1.6386}$ **01**

p = 36616.26

Zaina should deposit 36616.26 shillings. **01**

9. (a) Sides of a triangle are: 9cm, 12cm and 15cm.

By Pythagoras theorem

(i) $C^2 = a^2 + b^2$ _____ $00\frac{1}{2}$

$15^2 = 9^2 + 12^2$

$15^2 = 81 + 144$ **01**

$15^2 = 225$ or

225 = 225 _____ $00\frac{1}{2}$

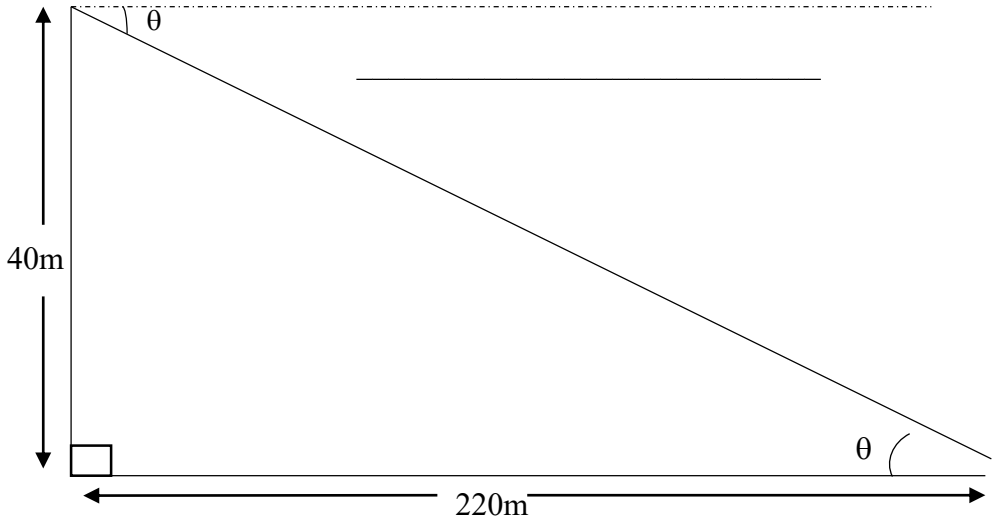
Since the triangle obey Pythagoras theorem, then the triangle is Right – Angled Triangle **01**

(ii) **A=**$\frac{1}{2}$bh _____ $00\frac{1}{2}$

=1/2(9x12) _____ $00\frac{1}{2}$

=54cm^2 _____ 01

(b) Diagram



$00\frac{1}{2}$

From $\tan\theta = \frac{Opposite}{Adjacent}$ _____ $00\frac{1}{2}$

$\text{Tan}\ \theta = \frac{40}{220}$ _____ $00\frac{1}{2}$

$\theta = tan^{-2}\left(\frac{2}{11}\right)$

$\theta = 10.3^{o}$ or $10^{o}18'$.

∴ The angle of depression is $10^{o}18'$ _____ $00\frac{1}{2}$.

10. (a) $\frac{x-3}{x+2} = \frac{x+1}{x-4}$

(x-3) (x-4) = (x+2) (x+1) **01**

$X^2 - 7x + 12 = x^2 + 3x + 2.$

-7x + 12 = 3x + 2

-7x – 3x = 2 – 12 _____ 01

$\frac{-10x}{-10} = \frac{-10}{-10}$

$x = 1$ **01**

(b) Let g be number of goats (4 legs) and C be number of chicken (2 legs).

g + c = 21 _____ (i)

4g + 2c = 76 _____ (ii) **01**

By elimination method

2 g + c = 21

1 4g + 2c = 76

- 2g+2c = 42
  4g+2z = 76

$\frac{-2g}{-2} = \frac{-34}{-2}$ **01**

g = 17

Taking eqn (1)
g + c = 21
c = 21 – 17
c = 4 **01**
∴ Abdallah own 17 goals and 4 chicken.

SECTION B

11. (a)

CI	X	f	d = x – A	fd
15 – 20	17.5	4	-12	-48
21 – 26	23.5	6	-6	-36
27 – 32	29.5	14	0	0
33 – 38	35.5	6	6	36
39 – 44	41.5	2	12	24
45 – 50	47.5	8	18	144
Σ		N = 40		120
	$00\frac{1}{2}$	$00\frac{1}{2}$	$00\frac{1}{2}$	$00\frac{1}{2}$

A = 29.5 **02**

(i) The mean:

Mean $= A + \frac{\sum fd}{N}$ _____ $00\frac{1}{2}$

$= 29.5 + \frac{120}{40}$

$= 29.5 + 3$

$= 32.5$ **01**

∴ The mean weight is 32.5kg.

(ii) The mode:

Mode class = 27 – 32.

Mode $= L + \left(\frac{t_1}{t_1+t_2}\right) i$ _____ 01

$= 26.5 + \left(\frac{8}{8+8}\right) 6$

$= 26.5 + \frac{48}{16}$

$= 26.5 + 5$

$= 29.5$

∴ The mode is 29.5 **01**

(iii) The median

Median $= L + \left(\frac{N/_2 - n_b}{n_w}\right) i$ _____ 01

The median class is 27 – 32.

Median $= 26.5 + \left(\frac{20-10}{14}\right) 6$

$= 26.5 + \frac{10}{14} \times 6$

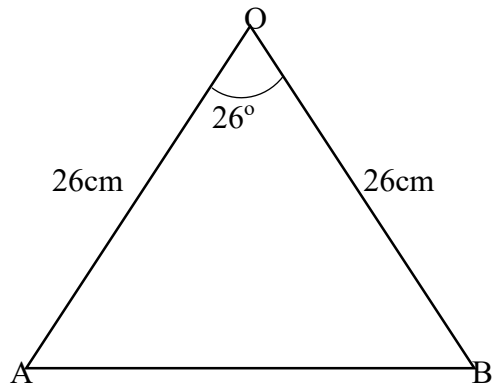
$= 26.5 + \frac{30}{7}$

$= 26.5 + 4.29$

$= 30.79$

∴ The median is 30.79. **01**

(b) Diagram



01

Length

$$L = \frac{\pi r\theta}{180}$$

$$L = \frac{3.14 \times 26 \times 26}{180}$$

L = 11.79cm

∴ The length of an Arc is 11.79cm. **02**

12. (a) A(10°S, 38°E) B(10°S, 43°E).

θ = 10°

$\propto = 43 - 38$

$\propto = 5^o$ **01**

$$D = \frac{\pi R \propto \cos\theta}{180^O}$$

$$D = \frac{3.14 \times 6370 \times Cos\ 10^o}{180^o}$$

$$= \frac{98489.64}{180}$$

$= 547.16km$ or 549.74km or 550km **02**

The distance between towns A and B is 547.16km.

(ii) Time taken:

Speed = 50km/hr

From

Speed = $\frac{Distance}{Time\ taken}$ 01

Time = $\frac{Distance}{Speed}$

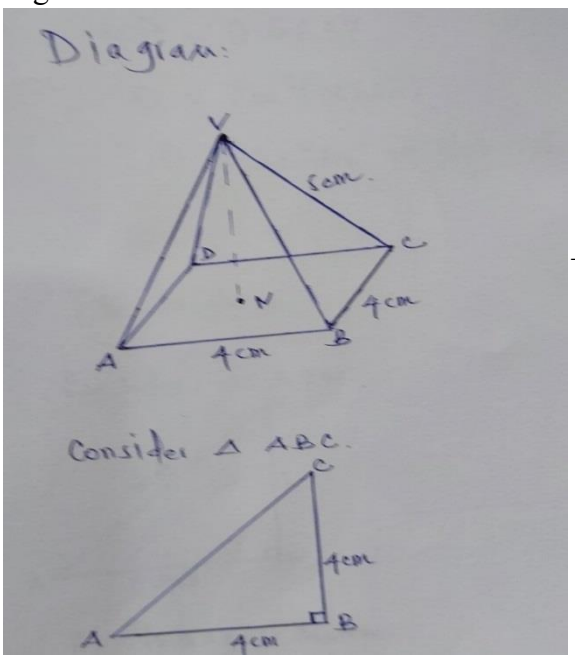
Time = $\frac{547.16}{50}$

Time = 10.9 hours

≈ 11 hours

∴ It will take 11 hours to reach town B. 01

(b) Diagram



05

By using Pythagoras theorem

AC2 = AB2+BC2

AC2 = 42+42

AC2 = 16+16

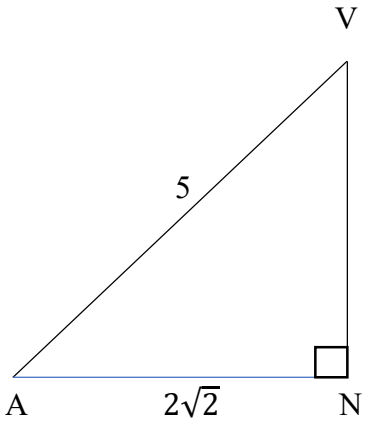
$\sqrt{AC^2} = \sqrt{32}$

AC = $4\sqrt{2}$ or AC = 5.66 cm.

AN = $\frac{AC}{2}$ **01**

AN=$2\sqrt{2}$ or 2.83 cm.

Consider Δ VAN



Cos θ = $\frac{Adjacent}{Hypotense}$

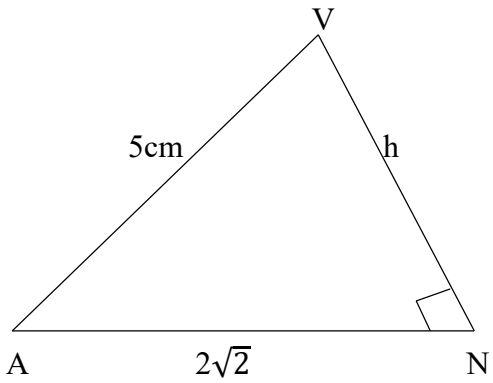
Cos θ $\frac{2\sqrt{2}}{5}$

Cos θ = 0.5657

θ = Cos^{-1}(0.6557)

θ = 55°.55° or θ = 55°33’

(ii) The height



By Pythagoras theorem

$AV^2 = AN^2 + VN^2$

$5^2 = (2\sqrt{2})^2 + h^2$

$25 = 8 + h^2$ **01**

$\sqrt{17} = \sqrt{h^2}$

h = $\sqrt{17}$cm or h = 4.12cm.

13. (a) Given

$A = \begin{pmatrix} 3 & 5 \\ 4 & -2 \end{pmatrix}$

$A^2 + 2A = \begin{pmatrix} 3 & 5 \\ 4 & -2 \end{pmatrix}\begin{pmatrix} 3 & 5 \\ 4 & -2 \end{pmatrix} + 2\begin{pmatrix} 3 & 5 \\ 4 & -2 \end{pmatrix}$ **01**

$= \begin{pmatrix} 9+20 & 15-10 \\ 12-8 & 20+4 \end{pmatrix} + \begin{pmatrix} 6 & 10 \\ 8 & -4 \end{pmatrix}$ **01**

$= \begin{pmatrix} 29 & 5 \\ 4 & 24 \end{pmatrix} + \begin{pmatrix} 6 & 10 \\ 8 & -4 \end{pmatrix}$

$A^2 + 2A = \begin{pmatrix} 35 & 15 \\ 12 & 20 \end{pmatrix}$ **01**

(b) $p = \begin{pmatrix} x & -3 \\ x & x \end{pmatrix}$

$|p| = -2$

$|p| = x^2 - (-3x) = -2$

$x^2+3x+2 = 0$ **01**

$x^2+x+2x+2=0$

$x(x+1)+2(x+1)=0$ **01**

$(x+1)(x+2) = 0$

$x-11=0$ or $x+2=0$

$x = -1$ or $x = -2$ **01**

(c) (i) $(x,y) \xrightarrow{T} (x^1, y^1)$

$x^1 = 2+x$

$y^1 = y.$

$\begin{pmatrix} y^1 \\ y^1 \end{pmatrix} = \begin{pmatrix} 2 \\ 0 \end{pmatrix} + \begin{pmatrix} x \\ y \end{pmatrix}$

T = (2, 0) **01**

∴ The value of T is (2,0)

Image of (-3,4) under T.

$\begin{pmatrix} x^1 \\ y^1 \end{pmatrix} = \begin{pmatrix} 2 \\ 0 \end{pmatrix} + \begin{pmatrix} -3 \\ 4 \end{pmatrix}$

$$\begin{pmatrix} x^1 \\ y^1 \end{pmatrix} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$$ **01**

Reflection on line y – x = 0.

y = x

then $\propto = 45^o$

$$\begin{pmatrix} x^1 \\ y^1 \end{pmatrix} = \begin{pmatrix} Cos2 \propto & Sin2 \propto \\ Sin2 \propto & -Cos90^o \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix}$$ **01/02**

$$\begin{pmatrix} x^{11} \\ y^{11} \end{pmatrix} = \begin{pmatrix} Cos90^o & Sin90^o \\ Sin90^o & -Cos90^0 \end{pmatrix} \begin{pmatrix} -1 \\ 4 \end{pmatrix}$$ **01/02**

$$\begin{pmatrix} x^{11} \\ y^{11} \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \begin{pmatrix} 4 \\ -1 \end{pmatrix}$$

$$\begin{pmatrix} x^{11} \\ y^{11} \end{pmatrix} = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$$ **01**

∴ The final image is (4, -1)

14. (a) $h(x) = ax^2 + 4x$.

(i) Value of a:

$h(-1) = 3$.

$3 = a(-1)^2 + 4x\ (-1)$. _____ 00-$\frac{1}{2}$

$3 = a - 4$.

$a = 3+4$

$a = 7$) _____ 00-$\frac{1}{2}$

(ii) Domain and Range:

$h(x) = 7x^2 + 4x$. **01/02**

Domain = $\{x: x \epsilon R\}$ **01**

Range:

Range = $\left\{y: y \geq \frac{4ac-b^2}{4a}\right\}$ **01/02**

$= \left\{y: y \geq \frac{4x7x0-4^2}{4\times7}\right\}$

$= \left\{y: y \geq \frac{-16}{28}\right\}$

$= \left\{y: y \geq \frac{-4}{7}\right\}$ **01**

(b) Let x = Number of A and y = Number of B.

Constraints

$3x+4y \leq 120$

$2x+y \leq 50$). ____ $00\frac{1}{2}$

$x \geq 0, y \geq 0$.

Objective function:

$f(x,y) = 10000x + 12000y$

Table of values of $3x + 4y = 120$). ____ $00\frac{1}{2}$

X	0	25
Y	30	0

Table of values of $2x + y = 50$

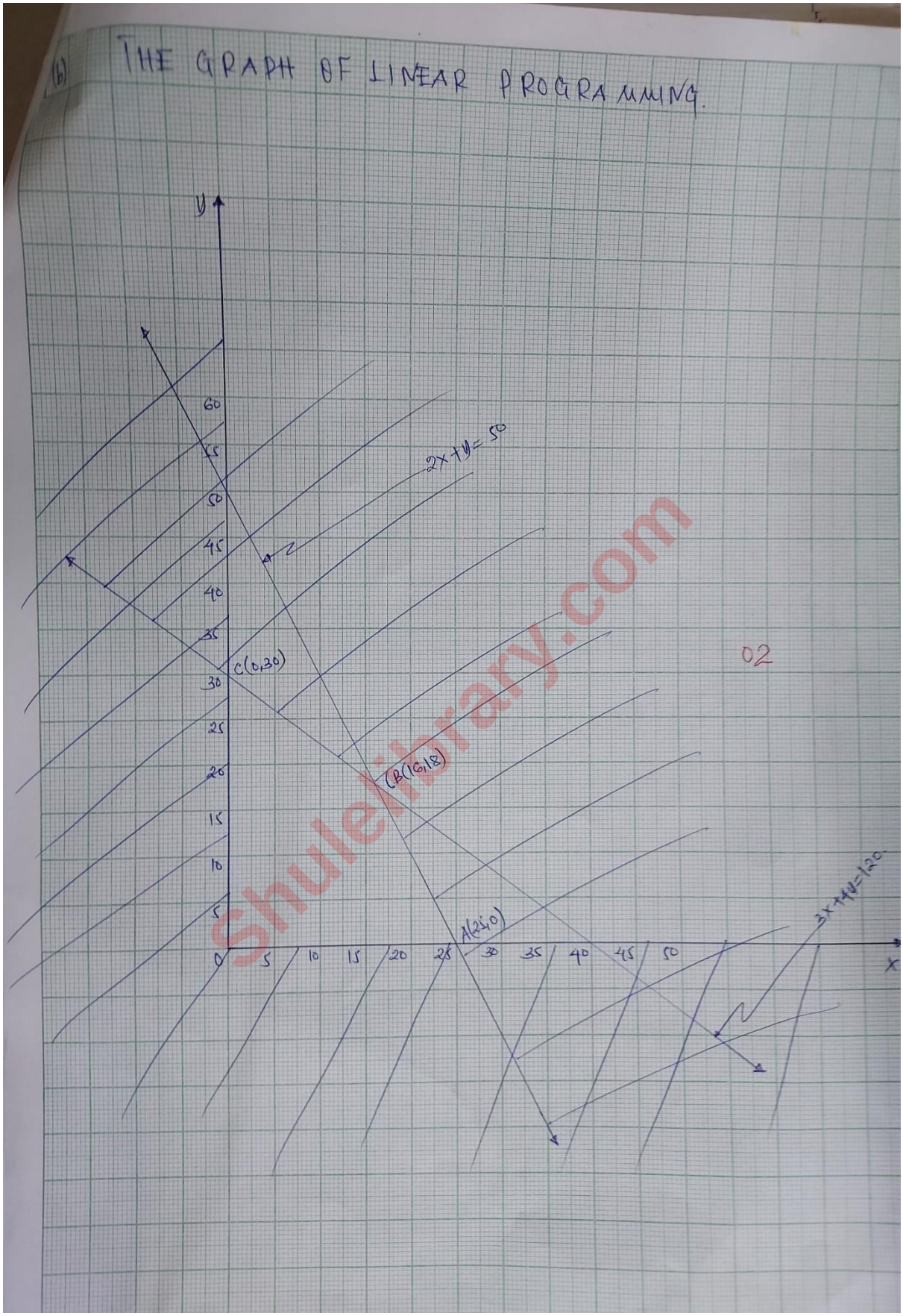
X	0	25
Y	50	0

Point	p(x,y) = 10000x + 12000y	Profit
0(0,0	10000x0 + 12000x0	0
A(25,0)	10000x25 + 12000x0	250,000
B(16, 18)	10000x16 + 18x12000	376,000
C(0,30)	10000x0 + 12000x30	360,000

02

∴ In order to generate the maximum profit of 376,000 shillings the company must produce 16 and 18 batteries of type A and B respectively. **01**

(b) THE GRAPH OF LINEAR PROGRAMMING.



02