



041

TANZANIA HEADS OF ISLAMIC SCHOOLS COUNCIL

FORM FOUR INTER ISLAMIC MOCK EXAMINATION

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,
- $\frac{4}{11} \times 100\% = \frac{400}{11}$ 01
- $= 36 \frac{4}{11}\% \text{ or } 36.36\%$
- (b) (i) $0.03785 \approx 0.0378$ (to 3 significant figures) 01
- (ii) $0.03785 \approx 0.038$ (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 $\frac{1}{2}$
- $\frac{2V^2}{3\mu} = \mu - a$ _____ 001/2
- $a = \mu - \frac{2V^2}{3\mu}$ _____ 001/2
- $a = \frac{3\mu^2 - 2V^2}{3\mu}$ _____ 001/2
- (b) $\frac{\sqrt{3}}{2-\sqrt{3}} - \text{R.F is } \frac{2+\sqrt{3}}{2+\sqrt{3}}$
- $\frac{\sqrt{3}}{2-\sqrt{3}} = \frac{\sqrt{3}}{2-\sqrt{3}} \times \frac{2+\sqrt{3}}{2+\sqrt{3}}$ _____ 00 $\frac{1}{2}$

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

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

$$= 2\sqrt{3} + 3 \quad \mathbf{01}$$

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

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

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

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

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

$$= \bar{1}.765 \quad \mathbf{01}$$

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

3. (a) Given that

$$n(u)=30$$

$$n(M)=15$$

$$n(E)=18$$

$$n(M \cup E)' = 4$$

From

$$n(u) = n(M \cup E) + n(M \cap E) \quad \mathbf{01/02}$$

$$n(M \cup E) = 30 - 4$$

$$n(M \cup E) = 26 \quad \mathbf{01/02}$$

From

$$n(M \cup E) = n(M) + n(E) - n(M \cap E) \quad \mathbf{01/02}$$

$$26 = 15 + 18 - n(M \cap E) \quad \mathbf{01/02}$$

$$26 = 33 - n(M \cap E)$$

$$26 - 33 = -n(M \cap E) \quad \mathbf{01}$$

$$-7 = -n(M \cap E)$$

$$n(M \cap E) = 7$$

$\therefore$ 7 students like both mathematics and English. $\mathbf{01}$

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

Let Ace be $A = \{\text{Aces}\}$

$$n(A) = 4$$

$$p(A) = \frac{4}{52} \quad \mathbf{01/02}$$

From:

$$p(A \cup B) = p(A) + p(B) - p(A \cap B) \quad \mathbf{01/02}$$

$$p(A \cup B) = \frac{4}{52} + \frac{26}{52} - \frac{2}{52}$$

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

$$= \frac{28}{52}$$

$$= \frac{7}{13} \quad \mathbf{01/02}$$

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

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

From

$$PR = PQ$$

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

Then

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

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

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

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

$$16x - 12x = 80 - 72 \quad \mathbf{01/02}$$

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

$$x = 2.$$

$\therefore$ The coordinate of a point p is (2,0). $\mathbf{01}$

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

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

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

$$= (16, -11) \quad \mathbf{01}$$

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

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

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

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

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

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

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

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

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

$$30+2x = 75$$

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

$$x = 22.5\text{m} \quad \mathbf{01}$$

$$(b) \text{ Perimeter} = 2nr \sin\left(\frac{180^\circ}{n}\right) \quad \mathbf{01}$$

$$n=8$$

$$p=88$$

$$2 \times 8r \sin\left(\frac{180}{8}\right) = 88. \quad \mathbf{01}$$

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

$$\frac{0.77r}{0.77} = \frac{11}{0.77} \quad \mathbf{01}$$

$$r = 14.37\text{cm}$$

$$\therefore \text{ The radius of the circle is } 14.37\text{cm} \quad \mathbf{01}$$

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

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

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

$$k = md \quad \text{01}$$

$$k = 12 \times 15$$

$$k = 180 \quad \text{01}$$

From

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

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

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

$$d = 9 \text{ days} \quad \text{01}$$

$\therefore$ They will take 9 days

- (b) Convert minutes into hours.

$$1 \text{ hr} = 60 \text{ min}$$

$$? = 336 \text{ min}$$

$$= \frac{336 \times 1}{60} \quad \text{01}$$

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

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

$$= 10080.$$

$$\text{He will be paid } 10080 \text{ shillings.} \quad \text{01}$$

7. (a) (i) Total cost = $3 \text{ kg} \times 3000 + 2 \text{ kg} \times 5000$

$$= 9000 + 10000$$

$$= 19000 \quad \text{01/02}$$

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

$$= \frac{19000}{5}$$

$$= 3800 \quad \text{01}$$

(ii) Cost per kilogram is 3800 shillings

Selling price = 4200 shillings

Profit made = selling price – cost price 01/02

$$\text{Profit} = 4200 - 3800$$

$$= 400$$

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

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

$$= 10.53\% \quad \text{00}\frac{1}{2}$$

∴ The percentage profit is 10.53%

(b) (i) The cost of goods sold

$$\text{Cost} = \text{Opening stock} + \text{purchases} - \text{closing stock}$$

$$= 40000 + 100000 - 60000$$

$$= 140000 - 60000$$

$$= 80000 \quad \text{01}$$

(ii) Average stock

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

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

$$= \frac{100000}{2}$$

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

(iii) Gross profit

$$\text{Gross profit} = \text{sales} - \text{cost of goods sold} \quad \text{00}\frac{1}{2}$$

$$= 160000 - 85000$$

$$= 75,000.$$

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

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

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

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

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

$$\text{Geometric mean} = \sqrt{xy}$$

$$9 = \sqrt{xy}$$

$$9^2 = xy$$

$$xy = 81 \quad \text{(ii)} \quad \text{---} \quad 00\frac{1}{2}$$

From equation

$$x+y = 30$$

$$y = 30 - x \quad \text{(iii)}$$

Substituting eqn (iii) into (ii)

$$x(30-x) = 81$$

$$30x - x^2 = 81$$

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

01

By General Form:

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

$$X = \frac{30 \pm \sqrt{(-30)^2 - 4 \times 1 \times 81}}{2 \times 1}$$

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

$$X = \frac{30 \pm 24}{2}$$

$$X = 15 \pm 12.$$

$$X = 15 + 12 \text{ or } x = 15 - 12.$$

$$X = 27 \text{ or } x = 3$$

∴ 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

$$A_n = p \left(1 + \frac{R}{100} \right)^{nt} \quad \text{00}\frac{1}{2}$$

$$A_5 = p \left(1 + \frac{10}{100} \right)^{5 \times 4} \quad \text{00}\frac{1}{2}$$

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

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

$$\frac{60000}{1.6386} = \frac{1.6386p}{1.6386} \quad \text{01}$$

$$p = 36616.26$$

Zaina should deposit 36616.26 shillings. 01

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

By Pythagoras theorem

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

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

$$15^2 = 81 + 144 \quad \text{01}$$

$$15^2 = 225 \text{ or}$$

$$225 = 225 \quad \text{00}\frac{1}{2}$$

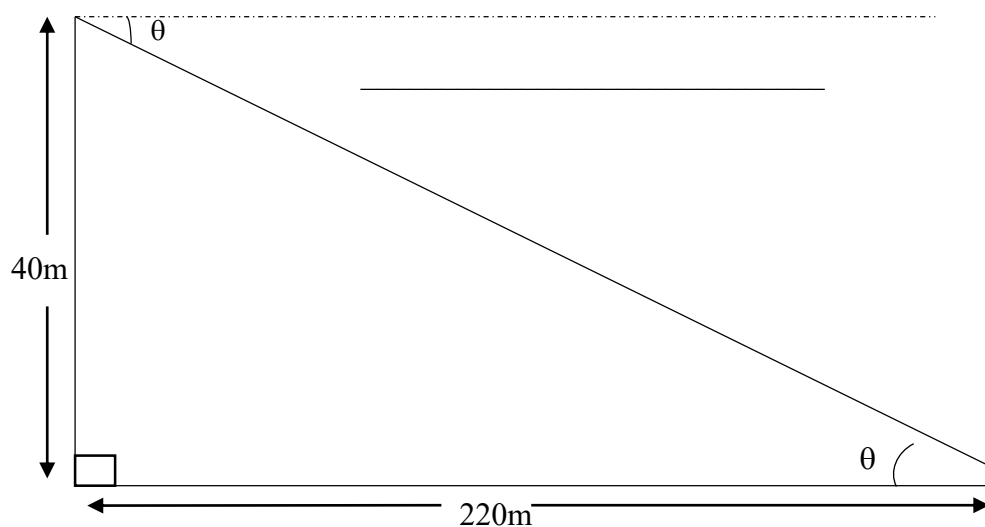
Since the triangle obey Pythagoras theorem, then the triangle is Right – Angled Triangle 01

$$(ii) \quad A = \frac{1}{2}bh \quad \text{00}\frac{1}{2}$$

$$= \frac{1}{2}(9 \times 12) \quad \text{00}\frac{1}{2}$$

$$= 54 \text{ cm}^2 \quad \text{01}$$

(b) Diagram



00 $\frac{1}{2}$

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

$$\tan \theta = \frac{40}{220}$$

00 $\frac{1}{2}$

$$\theta = \tan^{-1} \left(\frac{2}{11} \right)$$

$$\theta = 10.3^\circ \text{ or } 10^\circ 18'$$

$\therefore$ The angle of depression is $10^\circ 18'$ 00 $\frac{1}{2}$

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

$$(x-3)(x-4) = (x+2)(x+1) \quad 01$$

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

$$-7x + 12 = 3x + 2$$

$$-7x - 3x = 2 - 12 \quad 01$$

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

$$x = 1 \quad 01$$

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

$$g + c = 21 \quad (i)$$

$$4g + 2c = 76 \quad (ii) \quad 01$$

By elimination method

$$2 \quad g + c = 21$$

$$1 \quad 4g + 2c = 76$$

$$- \quad 2g + 2c = 42$$

$$4g + 2c = 76$$

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

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:

$$\begin{aligned}\text{Mean} &= A + \frac{\Sigma fd}{N} \text{ } 00\frac{1}{2} \\ &= 29.5 + \frac{120}{40} \\ &= 29.5 + 3 \\ &= 32.5\end{aligned}$$

01

∴ The mean weight is 32.5kg.

(ii) The mode:

Mode class = 27 – 32.

$$\begin{aligned}\text{Mode} &= L + \left(\frac{t_1}{t_1+t_2}\right) i \text{ } 01 \\ &= 26.5 + \left(\frac{8}{8+8}\right) 6 \\ &= 26.5 + \frac{48}{16} \\ &= 26.5 + 5 \\ &= 29.5\end{aligned}$$

01

∴ The mode is 29.5

(iii) The median

$$\text{Median} = L + \left(\frac{N/2 - n_b}{n_w}\right) i \text{ } 01$$

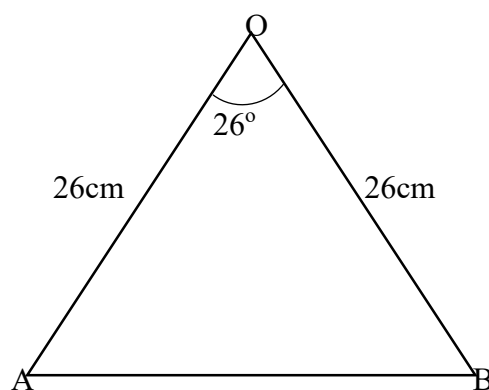
The median class is 27 – 32.

$$\begin{aligned}\text{Median} &= 26.5 + \left(\frac{20-10}{14}\right) 6 \\ &= 26.5 + \frac{10}{14} \times 6 \\ &= 26.5 + \frac{30}{7} \\ &= 26.5 + 4.29 \\ &= 30.79\end{aligned}$$

01

∴ The median is 30.79.

(b) Diagram



01

Length

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

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

$$L = 11.79 \text{ cm}$$

∴ The length of an Arc is 11.79cm.

02

12. (a) A(10°S, 38°E) B(10°S, 43°E).

$$\theta = 10^\circ$$

$$\alpha = 43 - 38$$

$$\alpha = 5^\circ$$

01

$$D = \frac{\pi R \alpha \cos \theta}{180^\circ}$$

$$D = \frac{3.14 \times 6370 \times \cos 10^\circ}{180^\circ}$$

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

$$= 547.16 \text{ km or } 549.74 \text{ km or } 550 \text{ km}$$

02

The distance between towns A and B is 547.16km.

(ii) Time taken:

$$\text{Speed} = 50 \text{ km/hr}$$

From

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

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

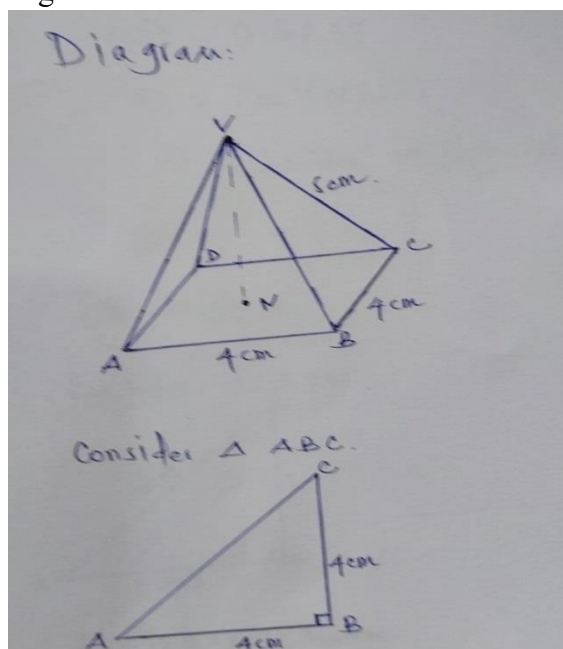
$$\text{Time} = \frac{547.16}{50}$$

$$\text{Time} = 10.9 \text{ hours}$$

$$\approx 11 \text{ hours}$$

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

(b) Diagram



05

By using Pythagoras theorem

$$AC^2 = AB^2 + BC^2$$

$$AC^2 = 4^2 + 4^2$$

$$AC^2 = 16 + 16$$

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

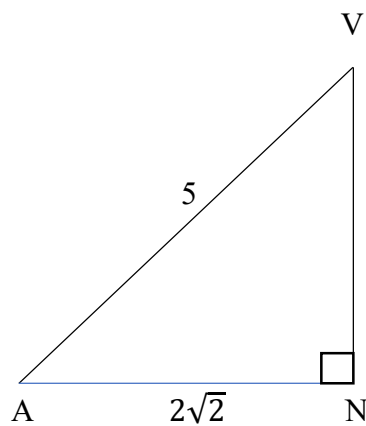
$$AC = 4\sqrt{2} \text{ or } AC = 5.66 \text{ cm.}$$

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

01

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

Consider ΔVAN



$$\cos \theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

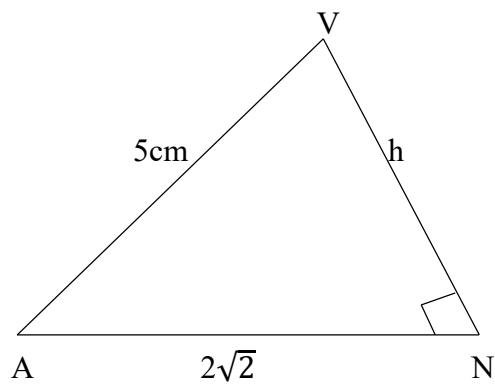
$$\cos \theta = \frac{2\sqrt{2}}{5}$$

$$\cos \theta = 0.5657$$

$$\theta = \cos^{-1}(0.5657)$$

$$\theta = 55.55^\circ \text{ or } \theta = 55^\circ 33'$$

(ii) The height



By Pythagoras theorem

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

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

$$25 = 8 + h^2$$

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

01

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

13. (a) Given

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

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

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

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

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

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

$$|p| = -2$$

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

$$x^2 + 3x + 2 = 0 \quad 01$$

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

$$x(x+1) + 2(x+1) = 0 \quad 01$$

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

$$x - 1 = 0 \text{ or } x + 2 = 0$$

$$x = -1 \text{ or } x = -2 \quad 01$$

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

$$x^1 = 2 + x$$

$$y^1 = y.$$

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

$$T = (2, 0) \quad 01$$

∴ The value of T is (2,0)

Image of (-3,4) under T.

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

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

Reflection on line $y - x = 0$.

$$y = x$$

then $\alpha = 45^\circ$

$$\begin{pmatrix} x^1 \\ y^1 \end{pmatrix} = \begin{pmatrix} \cos 2\alpha & \sin 2\alpha \\ \sin 2\alpha & -\cos 2\alpha \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} \quad \mathbf{01/02}$$

$$\begin{pmatrix} x^{11} \\ y^{11} \end{pmatrix} = \begin{pmatrix} \cos 90^\circ & \sin 90^\circ \\ \sin 90^\circ & -\cos 90^\circ \end{pmatrix} \begin{pmatrix} -1 \\ 4 \end{pmatrix} \quad \mathbf{01/02}$$

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

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

$\therefore$ The final image is (4, -1)

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

(i) Value of a:

$$h(-1) = 3.$$

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

$$3 = a - 4.$$

$$a = 3 + 4$$

$$a = 7 \quad \mathbf{00-\frac{1}{2}}$$

(ii) Domain and Range:

$$h(x) = 7x^2 + 4x. \quad \mathbf{01/02}$$

$$\text{Domain} = \{x: x \in \mathbb{R}\} \quad \mathbf{01}$$

Range:

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

$$= \left\{ y: y \geq \frac{4 \times 7 \times 0 - 4^2}{4 \times 7} \right\}$$

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

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

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

Constraints

$$3x + 4y \leq 120$$

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

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

Objective function:

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

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

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

$\therefore$ 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.

