

MASTER



TANZANIA HEADS OF ISLAMIC SCHOOL COUNCIL FORM IV INTER ISLAMIC MOCK EXAMINATION 2026

BASIC MATHEMATICS

MARKING SCHEME

SECTION A

1. (a)

	Kulwa	Dotto
2	24	36
2	12	18
2	6	9
3	3	9
3	1	3
	1	1

(01 Mark)

$$\text{LCM} = 2^3 \times 3^2 = 72 \text{ Minutes} \quad (01 \text{ Mark})$$

$$\frac{72 \text{ Min} \times 60 \text{ sec}}{1 \text{ min}} = 72 \times 60 \text{ sec}$$

$$= 4320 \text{ seconds} \quad (01 \text{ Mark})$$

∴ They will meet again after 4320 seconds

(b) Total lost = 8% = $\frac{8}{100} \times 80\text{kg} = 6.4\text{kg}$ (00 $\frac{1}{2}$ Mark)

$$\text{Total Mass left} = 80\text{kg} - 6.4\text{kg} \quad (00 \frac{1}{2} \text{ Mark})$$

$$= 73.6\text{kg} \quad (00 \frac{1}{2} \text{ Mark})$$

(i) Total mass left after peeling all banana is 73.6kg (00 $\frac{1}{2}$ Mark)

(ii) Number of peeled bananas = $\frac{\text{Total}}{\text{each}} = \frac{73.6\text{kg}}{200\text{g}} = \frac{73.6\text{kg}}{0.2\text{kg}}$ (00 $\frac{1}{2}$ Mark)

$$= 368 \text{ banana}$$

∴ There are peeled 368 Banana (01 Mark)

2. (a) (i)

$$\text{Solve for } y$$
$$2^{(y+7)} - 2^{(y+5)} = 3$$

$$2^y \cdot 2^7 - 2^y \cdot 2^5 = 3 \quad (00 \frac{1}{2} \text{ Mark})$$

$$2^y(2^7 - 2^5) = 3 \quad (00 \frac{1}{2} \text{ Mark})$$

$$2^y \frac{(96)}{96} = \frac{3}{96}$$

$$2^y = \frac{1}{32}$$

$$2^y = 2^{-5} \quad (00 \frac{1}{2} \text{ Mark})$$

$$y = -5 \quad (00 \frac{1}{2} \text{ Mark})$$

$$(ii) \quad \frac{\sqrt{x} - \sqrt{y}}{2 + \sqrt{y}} = \text{Rationalize factor} = 2 - \sqrt{y}$$

$$\frac{(\sqrt{x} - \sqrt{y})(2 - \sqrt{y})}{(2 + \sqrt{y})(2 - \sqrt{y})} = \frac{2\sqrt{x} - \sqrt{xy} - 2\sqrt{y} + y}{4 - 2\sqrt{y} + 2\sqrt{y} - y} \quad (01 \text{ Mark})$$

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

$$= \frac{2\sqrt{x} - \sqrt{xy} - 2\sqrt{y} + y}{4 - y} \quad (01 \text{ Mark})$$

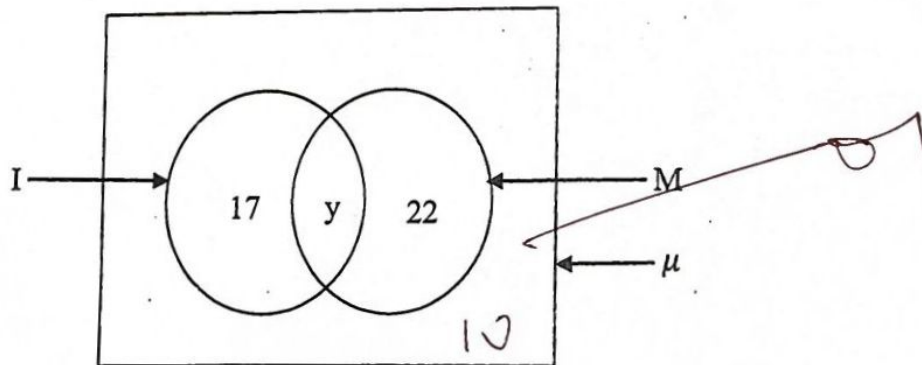
$$(b) \quad \log 5 = \log(10/2) = \log 10 - \log 2 \quad (01 \text{ Mark})$$

$$= 1 - 0.3010$$

$$= 0.6990$$

$$\therefore \log 5 = 0.6990 \quad (01 \text{ Mark})$$

3. (a) Let $\mu = \{\text{All people in the group}\}$
 $I = \{\text{People who had been to Iringa}\}$
 $M = \{\text{People who had been to Mbeya}\}$ *Mtarara*
 $y = \{\text{People who had been both}\}$



$$17 + y + 22 + 10 = n(\mu) \quad (01 \text{ Mark})$$

$$y + 49 = 50$$

$$y = 50 - 49$$

$$y = 1 \quad (01 \text{ Mark})$$

$\therefore$ Only 1 person had been to both Iringa and Mbeya *Mtarara* (01 Mark)

(b) Given

$$\text{Sample space } S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29\}$$

$$n(S) = 29$$

$$E_1 = \{\text{multiples of 3}\} = \{3, 6, 9, 12, 15, 18, 21, 24, 27\}$$

$$n(E_1) = 9$$

$$E_2 = \{\text{divisible by 2}\} = \{2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28\}$$

$$n(E_2) = 14$$

$$P(E_1 \text{ or } E_2) = P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$$

$$(E_1 \cap E_2) = \{6, 12, 18, 24\}$$

$$n(E_1 \cap E_2) = 4$$

$$P(E_1 \text{ or } E_2) = P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$$

(01 Mark)

$$= \frac{nE_1}{nS} + \frac{nE_2}{nS} - \frac{n(E_1 \cap E_2)}{nS}$$

$$= \frac{\frac{9}{29}}{\frac{29}{29}} + \frac{\frac{14}{29}}{\frac{29}{29}} - \frac{\frac{4}{29}}{\frac{29}{29}} = \frac{9+14-4}{29}$$

$$= \frac{19}{29}$$

(01 Mark)

∴ The probability required is $\frac{19}{29}$

(01 Mark)

4. (a) Given that Mr. Mambo at $(-3, -2)$

Mr. Mbegu at midpoint of $(2, 13)$ and $(2, 7)$

$$\text{Midpoint } (x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

$$= \left(\frac{2+2}{2}, \frac{13+7}{2} \right)$$

(01 Mark)

$$= \left(\frac{4}{2}, \frac{20}{2} \right) = (2, 10)$$

Distance between the position of Mr. Mambo and Mr. Mbegu let be d

That is $(-3, -2)$ to $(2, 10)$

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

$$= \sqrt{(2 - -3)^2 + (10 - -2)^2} = \sqrt{5^2 + 12^2}$$

$$= \sqrt{25 + 144} = \sqrt{169}$$

$$d = 13 \text{ unit}$$

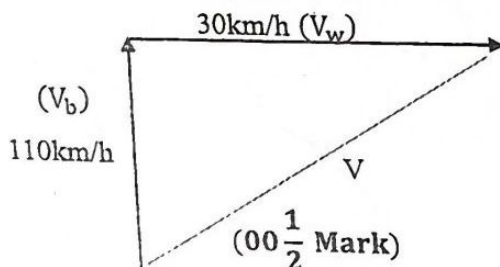
∴ The distance from Mr. Mambo to Mr. Mbegu is 13 unit

(01 Mark)

(b) let speed of boat be V_b

Speed of wind be V_w

Diagram



From Pythagoras theorem

$$\text{Actual speed} = \sqrt{V_b^2 + V_w^2} \quad (00\frac{1}{2} \text{ Mark})$$

$$V = \sqrt{(110)^2 + (30)^2}$$

$$= \sqrt{12100 + 900} \quad (01 \text{ Mark})$$

$$= \sqrt{13000}$$

$$= 114.017 \text{ km/h}$$

∴ The actual speed of the boat is 114.017 km/h

(01 Mark)

5. (a) Let e and i be exterior and interior angles respectively
Given $e:i = 1:5$

$$\frac{e}{i} = \frac{1}{5}$$

$$i = 5e$$

$$\text{But } i + e = 180 \quad (00\frac{1}{2} \text{ Mark})$$

$$5e + e = 180$$

$$6e = 180$$

$$e = \frac{180}{6}$$

$$e = 30^\circ \quad (01 \text{ Mark})$$

For number of sides

$$\frac{360}{e} = n$$

$$n = \frac{360}{30} = 12 \text{ sides} \quad (01 \text{ Mark})$$

$\therefore$ The number of sides of polygon is 12 sides $(00\frac{1}{2} \text{ Mark})$

- (b) Let A_1 be Area of smaller plot
 A_2 be Area of larger plot

$$\text{Given: } A_1 = 36\text{m}^2$$

$$\frac{L_2}{L_1} = \text{Ratio of height} = 5:3$$

$$\frac{A_1}{A_2} = \left(\frac{L_1}{L_2}\right)^2 \quad (01 \text{ Mark})$$

$$\frac{36}{A_2} = \left(\frac{3}{5}\right)^2$$

$$\frac{36}{A_2} = \frac{9}{25} \quad (01 \text{ Mark})$$

$$A_2 = \frac{36 \times 25}{9}$$

$$A_2 = 100\text{m}^2 \quad (01 \text{ Mark})$$

$\therefore$ The possible area of larger triangular plot is 100m^2

6. (a) Let mass of silver be S , Given mass of gold = 24 $(00\frac{1}{2} \text{ Mark})$

$$\frac{M_{\text{Gold}}}{M_{\text{Silver}}} = \frac{24}{S} = \frac{3/2}{9/4}$$

$$\frac{24}{S} = \frac{3}{2} \div \frac{9}{4} = \frac{3}{2} \times \frac{4}{9} \quad (00\frac{1}{2} \text{ Mark})$$

$$\frac{24}{S} = \frac{2}{3} \quad (01 \text{ Mark})$$

$$\frac{2S}{2} = \frac{24 \times 3}{2} = 36\text{g}$$

$$S = 36\text{g}$$

$\therefore$ The mass of silver = 36grams (01 Mark)

(b) $m \propto n^3 \propto \frac{1}{t}$

$$m \propto \frac{n^3}{t} \quad (00\frac{1}{2} \text{ Mark})$$

$$m = \frac{kn^3}{t}$$

$$k = \frac{mt}{n^3} \text{ where } m = 3, n = 2, t = 3$$

$$k = \frac{3 \times 3}{2^3} = 9/8 \quad (00\frac{1}{2} \text{ Mark})$$

$$m = \frac{kn^3}{t}$$

$$n^3 = \frac{mt}{9/8} \quad (01 \text{ Mark})$$

$$\sqrt[3]{n^3} = \sqrt[3]{\frac{8mt}{9}} = \sqrt[3]{\frac{8mt}{9}}$$

$$n = \sqrt[3]{\frac{mt}{9}} \quad (01 \text{ Mark})$$

7. (a) Given. Amina:Aisha: Fatma are 5:7:8
Sum of ratio = 5 + 7 + 8 = 20

Let profit be P

$$\text{Amina} = \frac{5}{20}P$$

$$\text{Aisha} = \frac{7}{20}P$$

$$\text{Fatma} = \frac{8}{20}P$$

$$\text{Fatma } \frac{8}{20}P = 1800 + \text{Amina } \frac{5}{20}P \quad (00\frac{1}{2} \text{ Mark})$$

$$\frac{8}{20}P = 1800 + \frac{5}{20}P$$

$$\frac{8}{20}P - \frac{5}{20}P = 1800$$

$$\frac{8-5}{20}P = 1800$$

$$\frac{3}{20}P = 1800$$

$$3P = \frac{1800 \times 20}{3}$$

$$P = 12,000 \text{ Tsh} \quad (01 \text{ Mark})$$

$$\therefore \text{Amina got} = \frac{5}{20} \times 12000 = 3000/= \quad (00\frac{1}{2} \text{ Mark})$$

$$\text{Aisha got} = \frac{7}{20} \times 12000 = 4200/= \quad (00\frac{1}{2} \text{ Mark})$$

$$\text{Fatma got} = \frac{8}{20} \times 12000 = 4800/= \quad (00\frac{1}{2} \text{ Mark})$$

- (b) (i) Gross profit = Net Sales - Cost of Sales

$$\text{Gross loss} = \text{Cost of Sales} - \text{Net Sales}$$

$$\text{Net Sales} = \text{Sales} - \text{Return on Sales}$$

$$= 245,000 - 15,000$$

$$= 230,00 \quad (00\frac{1}{2} \text{ Mark})$$

$$\text{Cost of sales} = \text{Opening Stock} + \text{Purchase} + \text{Carriage inward} - \text{Closing Stock}$$

$$= 120,000 + 180,000 + 30,000 - 70,000$$

$$= 260,000 \quad (00\frac{1}{2} \text{ Mark})$$

$$\begin{aligned}\text{Gross loss} &= \text{Cost of sales} - \text{Net sales} \\ &= 260,000 - 230,000 \\ &= 30,000\end{aligned}$$

$$\therefore \text{Gross loss} = 30,000/= \quad (01 \text{ Mark})$$

$$(ii) \quad \text{Net profit} = \text{Total Income} - \text{Expenses}$$

$$\text{Net loss} = \text{Expenses} - \text{Total Income}$$

Required to find net loss

$$\text{Net loss} = \text{Gross} + \text{other expenses}$$

$$= 30,000 + 42,000$$

$$= 72,000/=$$

$$\therefore \text{The net loss is } 72,000/= \quad (01 \text{ Mark})$$

$$8. \quad (a) \quad \text{Given } A_5 = 8, A_{11} = -34, S_{10} = ? d = ?, A_1 = ?$$

$$\text{From } A_n = A_1 + (n-1)d \quad \text{---} \quad \text{sol/c}$$

$$A_5 = A_1 + (5-1)d$$

$$A_5 = A_1 + 4d \dots \dots \dots (i)$$

$$A_{11} = A_1 + (11-1)d$$

$$A_{11} = A_1 + 10d \dots \dots \dots (ii)$$

$$\begin{cases} A_1 + 4d = 8 \\ A_1 + 10d = -34 \end{cases}$$

$$-6d = 42$$

$$d = -7 \quad (01 \text{ Mark}) \quad \text{---} \quad \text{sol/c}$$

For A_1

$$A_1 = 8 - 4d$$

$$A_1 = 8 - 4(-7)$$

$$A_1 = 36 \quad (01 \text{ Mark}) \quad \text{---} \quad \text{sol/c}$$

$$S_n = \frac{n}{2} (2A_1 + (n-1)d) \quad \text{---} \quad \text{sol/c}$$

$$S_{10} = \frac{10}{2} (2(36) + 9 \times -7)$$

$$= 5(72 - 63)$$

$$= 5 \times 9$$

$$= 45 \quad (01 \text{ Mark})$$

$\therefore$ Therefore, the sum of first 10 terms is 45.

$$(b) \quad \text{Given } A = 32,800, P = 25,000, n = 2, t = 1 \quad t = 2$$

$$A_n = P \left(1 + \frac{RT}{100n} \right)^{nt} \quad (00 \frac{1}{2} \text{ Mark})$$

$$32,800 = 25,000 \left(1 + \frac{R \times 1}{100 \times 2} \right)^{2 \times 2}$$

$$\frac{32}{25} = \left(1 + \frac{R}{200} \right)^4 \quad (01 \text{ Mark})$$

$$\frac{R}{200} = \sqrt[4]{1.28} - 1 = 0.1313 \quad (00 \frac{1}{2} \text{ Mark})$$

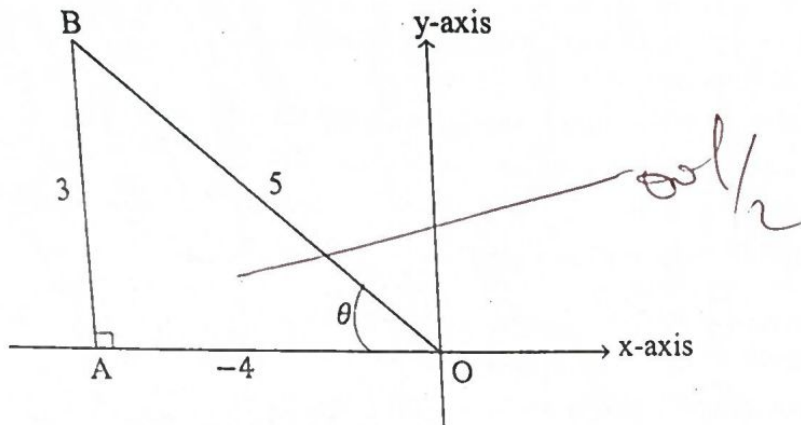
$$R = 0.1313 \times 200 = 26.26\% \quad 12.73\% \approx 13\%$$

$$\therefore \text{The rate is } 26.3\% \quad (01 \text{ Mark})$$

The rate is 12.73% or $\approx 13\%$

--- 01 mark

9. (a) Given $\tan \theta = -\frac{3}{4}$, $90^\circ < \theta < 180^\circ$
Diagram



From Pythagoras theorem

$$\begin{aligned} OB^2 &= OA^2 + AB^2 \\ &= (-4)^2 + (3)^2 \\ &= 16 + 9 \\ &= 25 \end{aligned} \quad (00\frac{1}{2} \text{ Mark})$$

$OB = 5$ unit

Then $\sin \theta = \frac{\text{Opp}}{\text{Hyp}} = \frac{3}{5} \quad (00\frac{1}{2} \text{ Mark})$

$\cos \theta = \frac{\text{Adj}}{\text{Hyp}} = \frac{-4}{5} \quad (00\frac{1}{2} \text{ Mark})$

Required $5(\sin \theta (\tan \theta)) + \cos \theta$
 $= 5 \left(\frac{3}{5} \right) \left(\frac{-3}{4} \right) + \frac{-4}{5} \quad (00\frac{1}{2} \text{ Mark})$
 $= \frac{-9}{4} + \frac{-4}{5} = \frac{-45-16}{20} = \frac{-61}{20}$
 $= \frac{-61}{20}$

(b) (i) $\cos 15^\circ = \cos(45 - 30)$

From $\cos(A - B) = \cos A \cos B + \sin A \sin B$

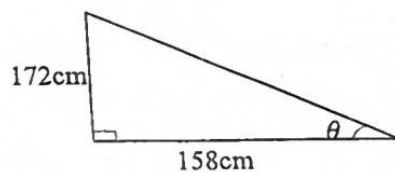
$\cos(45 - 30) = \cos 45 \cos 30 + \sin 45 \sin 30 \quad (00\frac{1}{2} \text{ Mark})$

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

$= \frac{\sqrt{6}}{4} + \frac{\sqrt{2}}{4} = \frac{\sqrt{6} + \sqrt{2}}{4} \quad (00\frac{1}{2} \text{ Mark})$

$\therefore \cos 15^\circ = \frac{\sqrt{6} + \sqrt{2}}{4} \quad (00\frac{1}{2} \text{ Mark})$

(ii)



From $\tan \theta = \frac{\text{opp}}{\text{Adj}} = \frac{172}{158} \quad (00\frac{1}{2} \text{ Mark})$

$\tan \theta = 1.0886 \quad (00\frac{1}{2} \text{ Mark})$

$\theta = \tan^{-1} 1.0886 = 47^\circ 25'$

$\therefore$ The angle of elevation of the sun is $47^\circ 25'$ $(00\frac{1}{2} \text{ Mark})$

10. (a) Given $(ax - 1)$ and $(x - 3)$ are factors of $2x^2 - bx + 3$
 $(ax - 1)(x - 3) = 2x^2 - bx + 3$
 $ax^2 - 3ax - x + 3 = 2x^2 - bx + 3$
 $ax^2 - (3a + 1)x + 3 = 2x^2 - bx + 3$ (01 Mark)

By comparing the corresponding terms coefficients:

$$ax^2 = 2x^2$$

$$a = 2 \quad (00\frac{1}{2} \text{ Mark})$$

$$-(3a + 1)x = -bx$$

$$3a + 1 = b$$

Substituting $a = 2$:

$$3(2) + 1 = b$$

$$b = 6 + 1$$

$$b = 7 \quad (01 \text{ Mark})$$

$$\therefore \text{The value } a = 2 \text{ and } b = 7 \quad (00\frac{1}{2} \text{ Mark})$$

(b) Let x students planned the picnic.
 Then $(x - 8)$ students who attended the picnic

Total bus charges = 1440 Tsh

$$\frac{1440}{x-8} - \frac{1440}{x} = 30$$

$$\frac{1}{x-8} - \frac{1}{x} = \frac{30}{1440} \quad (00\frac{1}{2} \text{ Mark})$$

$$\frac{x - (x-8)}{(x-8)x} = \frac{1}{48}$$

$$\frac{x - (x-8)}{x(x-8)} = \frac{1}{48}$$

$$\frac{8}{x(x-8)} = \frac{1}{48}$$

$$x^2 - 8x = 48 \times 8 \quad (00\frac{1}{2} \text{ Mark})$$

$$x^2 - 8x - 384 = 0$$

$$x^2 - 24x + 16x - 384 = 0 \quad (00\frac{1}{2} \text{ Mark})$$

$$(x + 16)(x - 24) = 0$$

$$x = -16 \text{ or } x = 24 \quad (00\frac{1}{2} \text{ Mark})$$

Thus 24 students planned the picnic

$$\text{Number of students who attended the picnic} = 24 - 8 = 16 \quad (00\frac{1}{2} \text{ Mark})$$

$$\therefore 16 \text{ students attended the picnic} \quad (00\frac{1}{2} \text{ Mark})$$

(SECTION B)

1. (a) Frequency Distribution Table

Class Interval	f	Class Mark (x)	fx	cf
16.5-19.5	5	18	90	5
20.5-23.5	8	22	176	13
24.5-27.5	10	26	260	23
28.5-31.5	6	30	180	29
32.5-35.5	1	34	34	30
	N=30		$\sum fx = 740$	

(01 Mark)

(01 Mark) (01 Mark)

$$i = 4$$

$$\frac{L+U}{2} = 18$$

$$L + U = 36 \dots\dots\dots (i)$$

$$U - L = i - 1$$

$$U - L = 3 \dots\dots\dots (ii)$$

$$U = 3 + L$$

$$L + 3 + L = 36$$

$$2L = 36 - 3$$

$$L = 16.5$$

$$U = 19.5 \quad (01 \text{ Mark})$$

$$\text{Mean } \bar{X} = \frac{\sum fx}{N} = \frac{740}{30}$$

$$\bar{X} = 24.67$$

$$\text{Mean } \bar{X} = 24.67 \quad (01 \text{ Mark})$$

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

$$\text{Median class} = 24.5 - 27.5$$

$$L = 24, N/2 = 15, n_b = 13, n_w = 10, i = 4$$

$$\text{Median} = 24 + \left(\frac{15-13}{10} \right) 4 = 24 + 0.8 = 24.8$$

$$\text{Median} = 24.8 \quad (01 \text{ Mark})$$

(b) Given length of an arc $L = 80\text{m}$
Radius of the circular track $r = 50\text{m}$
Require $\theta = ?$

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

$$\theta = \frac{180L}{\pi r} \quad (01 \text{ Mark})$$

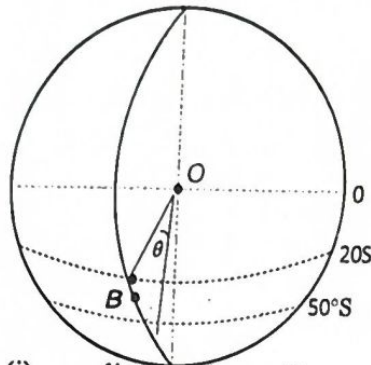
$$\theta = \frac{180 \times 80}{3.14 \times 50} \quad (01 \text{ Mark})$$

$$\theta = \frac{14400}{157}$$

$$\theta = 91.72^\circ = 91^\circ 43'$$

$\therefore$ He turned at angle $91^\circ 43'$ (01 Mark)

12. (a)



$$\theta = 50 - 20$$

$$\theta = 30^\circ$$

$$d = ?$$

00 1/2

formular 00 1/2

$$d = \theta \times$$

$$d = 30 \times \frac{1}{180}$$

07 n

(i) distance in n.mile
 $= \theta \times 60 = 30 \times 60 = 1800 \text{ n.mile}$

(01 1/2 Mark)

$$t = 3 \text{ hrs}$$

$$\text{speed} = ?$$

$$S = \frac{d}{t}$$

$$S = \frac{1800 \text{ n.mile}}{3} = 600 \text{ knots}$$

$$\therefore \text{The speed is } 600 \text{ Knots} \quad (01 \text{ Mark})$$

(ii) distance in km

$$d = \frac{\pi R \theta}{180} \quad (00 \frac{1}{2} \text{ Mark})$$

$$d = \frac{3.14 \times 6370 \times 30}{180}$$

$$d = 3,333.6 \text{ km} \quad (01 \text{ Mark})$$

$$S = \frac{d}{t}$$

$$S = \frac{3,333.6}{3}$$

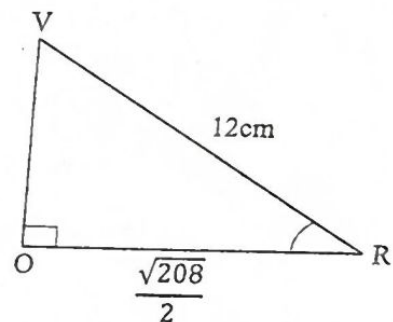
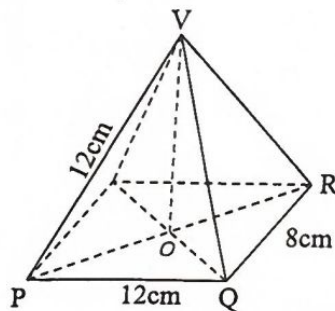
$$1,111.2 \text{ km/h}$$

$$\therefore \text{The speed is } 1,111.2 \text{ km/h}$$

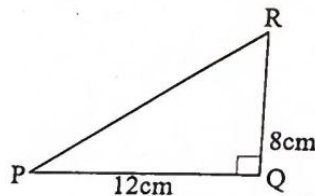
(01 Mark)

00 1/2

(b)



(i)



$$\cos \theta = \frac{\frac{\sqrt{208}}{2}}{12} \quad (00 \frac{1}{2} \text{ Mark})$$

$$\theta = \cos^{-1} 0.6009$$

$$\theta = 53^\circ 3' \quad (01 \text{ Mark})$$

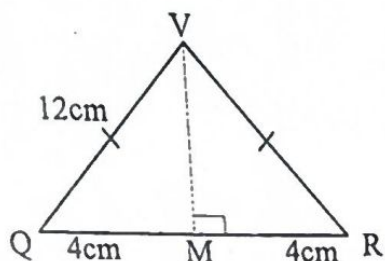
$\therefore$ The angle that VR make with PQRS is $53^\circ 3'$

$$(PR)^2 = (PQ)^2 + (QR)^2 \quad (00 \frac{1}{2} \text{ Mark})$$

$$(PR)^2 = (12)^2 + (8)^2 = \sqrt{208}$$

$$PR = \sqrt{208} \text{ cm} \quad (00 \frac{1}{2} \text{ Mark})$$

(ii) Consider ΔVQR



By Pythagoras theorem

$$(VQ)^2 = (VM)^2 + (QM)^2$$

$$(12)^2 = (VM)^2 + (4)^2$$

$$(VM)^2 = 144 - 16$$

$$VM = \sqrt{128}$$

$$VM = 11.66\text{cm.} \quad (00\frac{1}{2} \text{ Mark})$$

$$\text{Height of } \Delta VQR = 11.66\text{cm.}$$

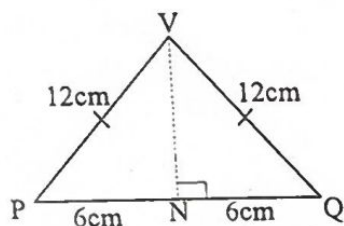
$$\text{Area of } \Delta VQR = \frac{1}{2} \times 11.66 \times 8 \quad (00\frac{1}{2} \text{ Mark})$$

$$= 46.64\text{cm}^2$$

$$2 \text{ surface Area} = 2 \times 46.64$$

$$= 93.28\text{cm}^2 \quad (00\frac{1}{2} \text{ Mark})$$

Consider ΔVPQ



$$(VN)^2 = (VP)^2 - (PN)^2$$

$$(VN)^2 = (12)^2 - (6)^2 = 144 - 36$$

$$VN = \sqrt{108} = 10.39 \quad (00\frac{1}{2} \text{ Mark})$$

$$\text{Area of } \Delta VPQ = \frac{1}{2} \times 10.39 \times 12$$

$$= 62.34\text{cm}^2 \quad (00\frac{1}{2} \text{ Mark})$$

$$2 \text{ surface Area} = 2 \times 62.34 = 124.68\text{cm}^2$$

$$\therefore \text{Total surface area} = 93.28 + 124.68 = 217.96\text{cm}^2 \quad (00\frac{1}{2} \text{ Mark})$$

Base area = $L \times W$

$$= 12 \times 8$$

$$= 96\text{cm}^2$$

13. (a) Given

$$P = \begin{pmatrix} 2 & 1 \\ -3 & 2 \end{pmatrix} \quad I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$P^2 - rP = SI$$

$$\begin{pmatrix} 2 & 1 \\ -3 & 2 \end{pmatrix} \begin{pmatrix} 2 & 1 \\ -3 & 2 \end{pmatrix} - r \begin{pmatrix} 2 & 1 \\ -3 & 2 \end{pmatrix} = S \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 4 \\ -12 & 1 \end{pmatrix} - \begin{pmatrix} 2r & r \\ -3r & 2r \end{pmatrix} = \begin{pmatrix} S & 0 \\ 0 & S \end{pmatrix} \quad (01 \text{ Mark})$$

$$1 - 2r = S, \quad 4 - r = 0, \quad -12 + 3r = 0, \quad 1 - 2r = S$$

$$4 - r = 0$$

Total = $217.96 + 96$

The total surface area = ~~313.96~~
313.96

$$r = 4 \quad (01 \text{ Mark})$$

$$1 - 2r = S$$

$$1 - 2(4) = S$$

$$S = 1 - 8$$

$$S = -7$$

find r only

r = 4
r = 0
Total 3 marks

$\therefore$ The value of $r = 4, S = -7$ (01 Mark)

(b) Let x be the number of cows
 y be the number of chickens.

$$x + y = 6 \dots\dots\dots (i)$$

$$4x + 2y = 200 \dots\dots\dots (ii) \quad (01 \text{ Mark})$$

$$\begin{pmatrix} 1 & 1 \\ 4 & 2 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 60 \\ 200 \end{pmatrix} \quad (00 \frac{1}{2} \text{ Mark})$$

Let $A = \begin{pmatrix} 1 & 1 \\ 4 & 2 \end{pmatrix}$
 $|A| = 2 - 4 = -2$

$$|A| = -2 \quad (00 \frac{1}{2} \text{ Mark})$$

$$A^{-1} = \frac{1}{|A|} \begin{pmatrix} \text{Disjoint of} \\ \text{matrix A} \end{pmatrix}$$

$$A^{-1} = \frac{1}{-2} \begin{pmatrix} +2 & -1 \\ -4 & 1 \end{pmatrix} \quad (00 \frac{1}{2} \text{ Mark})$$

$$A^{-1}A \begin{pmatrix} x \\ y \end{pmatrix} = A^{-1}K$$

$$I \begin{pmatrix} x \\ y \end{pmatrix} = A^{-1}K$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{-2} \begin{pmatrix} +2 & -1 \\ -4 & 1 \end{pmatrix} \begin{pmatrix} 60 \\ 200 \end{pmatrix}$$

$$= \frac{1}{-2} \begin{pmatrix} 120 - 200 \\ -240 + 200 \end{pmatrix} = \frac{1}{-2} \begin{pmatrix} -80 \\ -40 \end{pmatrix}$$

$\begin{pmatrix} -1 & 1/2 \\ 1/2 & -1/2 \end{pmatrix} \rightarrow \text{inverse}$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -80/-2 \\ -40/-2 \end{pmatrix} = \begin{pmatrix} 40 \\ 20 \end{pmatrix}$$

$$x = 40, \quad y = 20 \quad (01 \text{ Mark})$$

$\therefore$ The man owns 40 cows and 20 chickens. (00 $\frac{1}{2}$ Mark)

(c) Given the line $13x + 2y = 6$ and $(a, b) = (-2, 4)$

$$A = (0, 3), B = (2, 0)$$

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

$$A' = (0, 3) + (-2, 4) = (-2, 7) \quad (01 \text{ Mark})$$

$$B' = (2, 0) + (-2, 4) = (0, 4) \quad (01 \text{ Mark})$$

Slope of A' & B'

$$m = \frac{7-4}{-2-0} = \frac{3}{-2} = -3/2 \quad (01 \text{ Mark})$$

$$\text{Slope } m = -3/2$$

Equation

$$\frac{y-4}{x-0} = -3/2$$

$$2(y-4) = -3(x)$$

$$2y - 8 = -3x$$

$$3x + 2y = 8$$

$\therefore$ The equation image is $3x + 2y = 8$ (01 Mark)

14. (a) Given $h(x) = \sqrt{2x+3}$ Required: $h^{-1}(x)$

$$y = \sqrt{2x+3}$$

Interchange variables x and y

$$x = \sqrt{2y+3}$$

$$x^2 = 2y+3$$

$$\frac{2y}{2} = \frac{x^2-3}{2}$$

$$y = \frac{x^2-3}{2}$$

$$h^{-1}(x) = \frac{x^2-3}{2} \quad (01 \text{ Mark})$$

$$\text{Domain of } h^{-1}(x) = \{x : x \in \mathbb{R}\} \quad (01 \text{ Mark})$$

$$\text{Range of } h^{-1}(x) : \{y : y \geq -3/2\} \quad (01 \text{ Mark})$$

- (b) Let x be the number of weeks of Jamal's machine.
 y be the number of weeks of Juma's machine.

(i) Inequalities

$$50x + 25y \geq 400 \quad \equiv 2x + y \geq 16 \quad (01 \text{ Mark})$$

$$x + y \leq 12 \quad (01 \text{ Mark})$$

$$x \geq 0, \quad y \geq 0$$

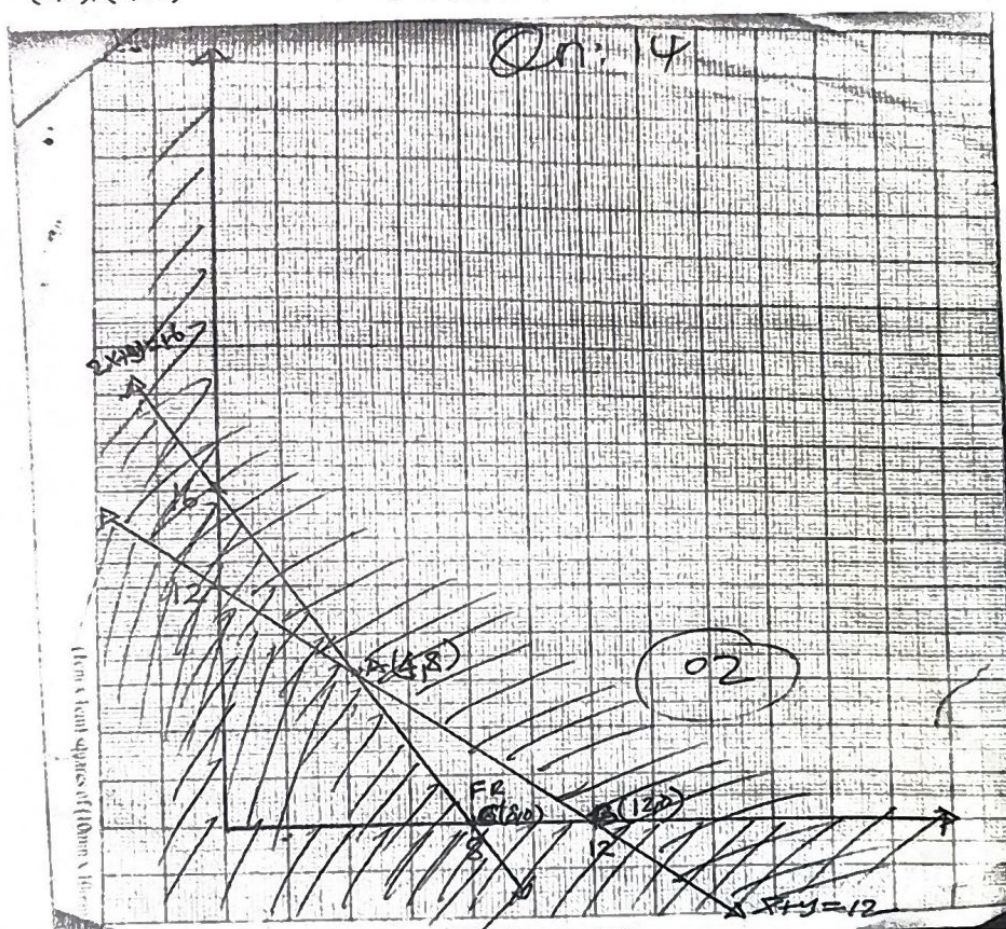
(ii) Objective function is to maximize

$$f(x, y) = 300,000x + 100,000y \quad (01 \text{ Mark})$$

The x - and y -intercepts

$$2x + y = 16 \quad x + y = 12$$

$$(8, 0), (0, 16) \quad (12, 0), (0, 12)$$



Corner Point	$F(x,y) = 300,000x + 100,000y$	Value
A(4,8)	$F(4,8) = 300,000(4) + 100,000(8)$	2,000,000
B(12,0)	$F(12,0) = 300,000(12) + 0$	3,600,000
C(8,0)	$F(8,0) = 300,000(8) + 0$	2,400,000

- ∴ Jamal's machine should operate for 4 weeks and Juma's machine should operate for 8 weeks to make these series at the least cost. (01 Mark)
- (iii) The minimum cost is 2,000,000 Tsh. (01 Mark)

Wabillah Tawfiq