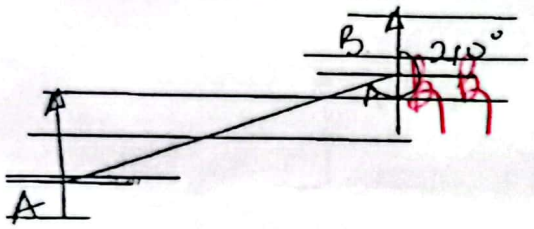
NAQ59

WAKISSHA JOINT MOCK EXAMINATIONS
MARKING GUIDE
Uganda Certificate of Education
UCE August 2023
MATHEMATICS 456/1

QN.	SECTION A	MARKS	COMMENT
1.	$3 \Delta 6 = (3)2 - 6(6)2$ M1 $= 9 - 216$ $= -207$ A1 $-207 \Delta 4 = (-207)^2 - 6(4)^2$ M1 M1√ $42,849 - 96$ $= 42,753$ A1	M1 A1 M1√ A1	C's (-207) CAO
		04	
2.	 Bearing of B from A is 030^0 B1 B1	B2 B1	For sketch with angle of 210^0 B1
		04	
3.	$\begin{pmatrix}3 & 0\\5 & 1\end{pmatrix}\begin{pmatrix}3 & 0\\5 & 1\end{pmatrix} - 4\begin{pmatrix}3 & 0\\5 & 1\end{pmatrix} + 3\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix} = 0$ B1 $\begin{pmatrix}9 & 0\\20 & 1\end{pmatrix} - \begin{pmatrix}12 & 0\\20 & 4\end{pmatrix} + \begin{pmatrix}3 & 0\\0 & 3\end{pmatrix} = 0$ M1 $\begin{pmatrix}-3 & 0\\0 & -3\end{pmatrix} + \begin{pmatrix}3 & 0\\0 & 3\end{pmatrix} = 0$ M1 $\begin{pmatrix}0 & 0\\0 & 0\end{pmatrix} = 0$ A1	B1 M1 M1 A1	Correct substitution For multiplication For simplifying
		04	
4.	$3(4p^2 - 9q^2)$ M1 $3\left[(2p)^2 - (3q)^2\right]$ M1 $3(2p - 3q)(2p + 3q)$ M1 A1	M1 M1 M1 A1	- Factorizing M1 difference of two squares - Factorising Answer
		04	
5.	Let the 3 passengers seat be x Let the 2 passenger seat be y $x + y = 30$ $3x + 2y = 78$ B1	B1	For both equations

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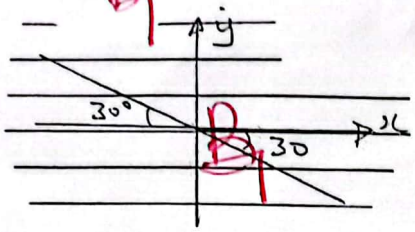
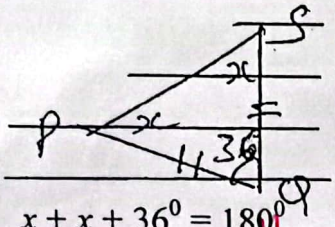
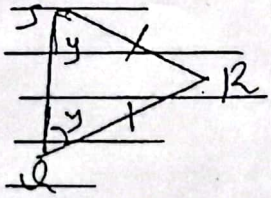
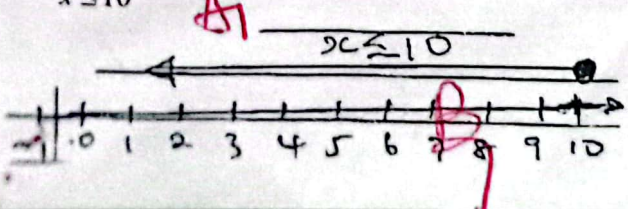
	$x = 30 - y$ $3(30 - y) + 2y - 78$ $90 - 3y + 2y = 78$ $-y = -12$ $y = 12$ $x = 30 - 12$ $\therefore x = 18$	M1 A1 A1	For substitution Accept alternative methods.
		04	
6.	$x = \tan^{-1}(0.5774)$ $x = 30^0$  $x_1 = 180^0 - 30^0 = 150^0$ $x_2 = 360^0 - 30^0 = 330^0$	B_1 B_1 B_1 B_1	For reading $x = 30^0$ For drawing For $x_1 = 150^0$ For $x_2 = 150^0$ ~~330°~~
		04	
7.	 $x + x + 36^0 = 180^0$ $2x = 144^0$ $x = 72^0$ $\angle SRQ = 180^0 - 72^0$ $\angle SRQ = 108^0$  $2y + 108^0 = 180^0$ $2y = 72^0$ $y = 36^0$	M1 A1 M1 A1	For forming equation m x For $x = 72^0$ For forming equation in y For $y = 36^0$
		04	
8.	$4 \times \frac{1}{4}(2x+3) \leq 4 \times 4 - 4 \times \frac{1}{4}(3-x)$ $2x + 3 \leq 16 - 3 + x$ $x \leq 10$  	M1 M1 A1 B1	Use of proper L.C.M Simplification Correct number line.
		04	

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9.	$\frac{T}{2\pi} = \sqrt{\frac{L^2+M}{MH}}$ $\frac{T^2}{4\pi^2} = \frac{L^2+M}{MH}$ $\frac{T^2MH}{4\pi^2} = L^2+M$ $\frac{T^2MH}{4\pi^2} - M = L^2$ $L = \sqrt{\frac{T^2MH}{4\pi^2} - M}$	M1 M1 M1 A1	For division Squaring both sides for L^2
		04	
10.	$\{1,2,3,4,5,6,7,8,9,10\}$ $F_{10} = \{1,2,5,10\}$ Prime $= \{2,3,5,7\}$ $P(F_{10} \cup \text{prime}) = \frac{6}{10} = \frac{3}{5}$	B1 B1 B1 B1	
		04	
11.			

Marks	Cf	f	(x -	(x – A)	F(x-A)
29.5 – 34.5	2	2	32	-15	-30
34.5 – 39.5	7	5	37	-10	-50
39.5 – 44.5	17	10	42	-5	- 50
44.5 – 49.5	32	15	47	0	0
49.5 – 54.5	40	8	52	5	40
54.5 – 59.5	44	4	57	10	40
59.5 – 64.5	46	2	62	15	30
		46			-20

		B1	For x
		B1	For F
		B1	For (x – A)
		B1	For f(x – A)
		B1	$\Sigma f(x - A)$
		B1	Σf
(a)	Mean $= A + \frac{\Sigma f(x-A)}{\Sigma f}$	B1 B1	For plotting all correctly For curve
	$= 47 + \frac{-20}{46}$	M1	C"s -20 Double tic
	$= 46.565$marks	A1	
		B1	Labeling both axes
(b)	$= 46 - 25 = 21$students	B1	20, 21 23 24
		12	

12.

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

B3

b (i) $x^2 - 2x - 3 = 0$

$\therefore x = 3, x = -1$

B1 Proper use of scale
B1 For plotting correctly
B1 For smooth curve

(ii) $x^2 - 3x = 0$

$(y + 2x + 3) - 3x = 0$

$Y = x - 3$

B1 For x = 3
B1 For x = -1
M1 For generating equation

Intercepts

x	0	3
y	-3	0

A1 For $y = x - 3$
B1 For line $y = x-3$ on graph
B1 For x = 3 and $x = 0$

$\therefore x = 3, \ x = 0$

12

13.

(a)

$3p + 4 = q$

$P + O = 3$

$P = 3$

$3(3) + 4 = q$

$q = 13$

M1
A1
A1

(b) (i) Kikubo market

$$(40 \quad 25 \quad 40)\begin{pmatrix}20,000\\15,000\\25,000\end{pmatrix}$$

B1 For column matrices
B1 For row matrices

$(800,000 + 375,000 + 1,000,000)$

Shs. 2,175,000

M1 Multiplication
M1 A1 Simplification

Nakasero Market

$$(40 \quad 25 \quad 40)\begin{pmatrix}21,000\\14,000\\26,000\end{pmatrix}$$

$(840,000 + 350,000 + 1,040,000)$

Shs. 2,230,000

M1 Multiplication
M1 A1 Simplification

(ii) Difference

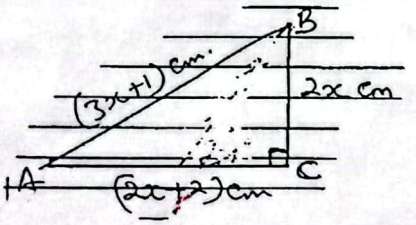
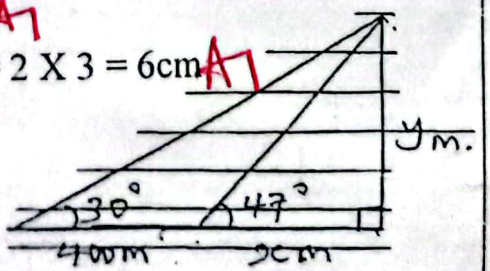
2,230,000 – 2,175,000

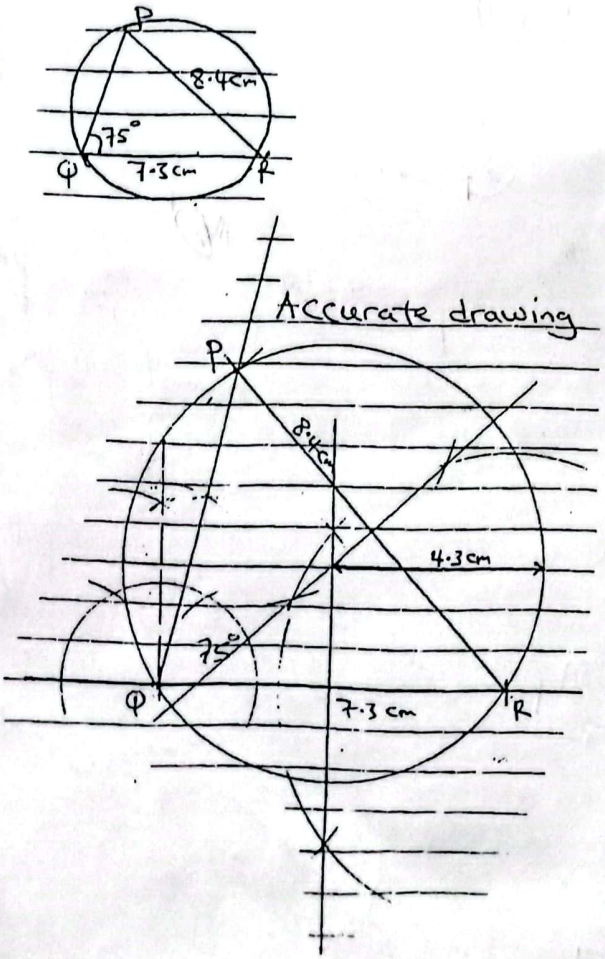
Shs. 55,000

Therefore it is cheaper to buy paint from Kikubo market

M1 difference
A1
B1 stating

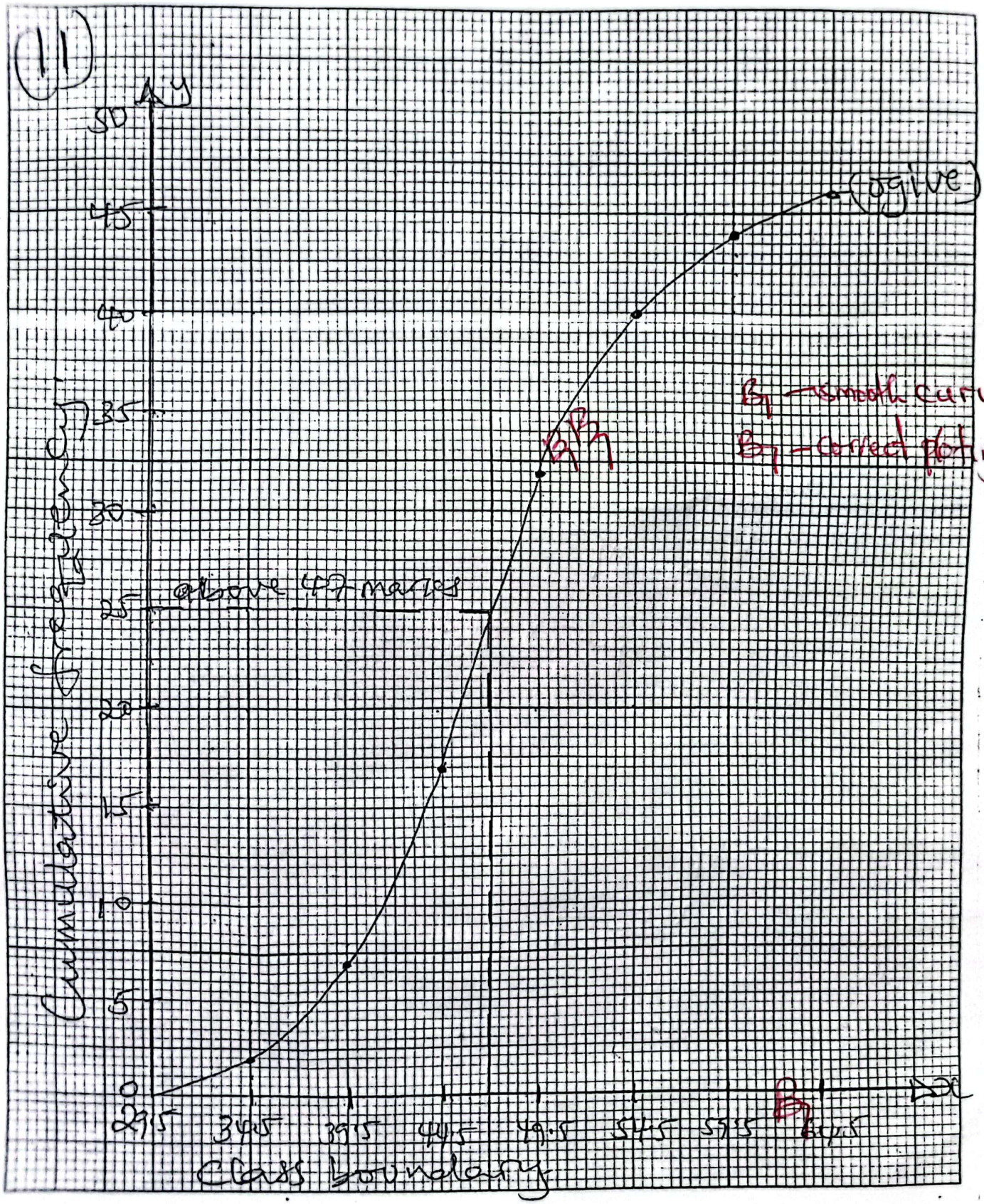
12

14 (a)	Determinant $(2 \times 2) - (3 \times 1) = 1$ Inverse $= \frac{1}{1}\begin{pmatrix} 2 & -3 \\ -1 & 2 \end{pmatrix} = \begin{pmatrix} 2 & -3 \\ -1 & 2 \end{pmatrix}$	B1	For determinant
	$\begin{pmatrix} 2 & -3 \\ -1 & 2 \end{pmatrix}\begin{pmatrix} 13 & 21 & 33 & 25 \\ 8 & 12 & 20 & 16 \end{pmatrix}$	M1	Pre multiplication of matrices
	$= \begin{pmatrix} 2 & 6 & 6 & 2 \\ 3 & 3 & 7 & 7 \end{pmatrix}$	A1	
	A(2,3) B(6,3), C(6,7), D (2,7)	A2	A1 for each two
(b)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\begin{pmatrix} 13 & 21 & 33 & 25 \\ 8 & 12 & 20 & 16 \end{pmatrix}$	M1	Pre multiplication of matrices
	$= \begin{pmatrix} 8 & 12 & 20 & 16 \\ -13 & -21 & -33 & -25 \end{pmatrix}$	A1	
	$A^{II}(8, -13)$, $B^{II}(12, -21)$, $C^{II}(20, -33)$ $D^{II}(16, -25)$	A2	A1 for each two.
(c)	$\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}\begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix} = \begin{pmatrix} 2 & 3 \\ -1 & -3 \end{pmatrix}\begin{pmatrix} 1 & 2 \\ -2 & -3 \end{pmatrix}$	M1	Accept alternatives.
	Det. $(-3 \times 1) - (2 \times -2) = 1$	M1	
	$\frac{1}{1}\begin{pmatrix} -3 & -2 \\ 2 & 1 \end{pmatrix} = \begin{pmatrix} -3 & -2 \\ 2 & 1 \end{pmatrix}$	A1	
		12	
15 (a)			
	$(2x)^2 + (2x+2)^2 = (3x+1)^2$	M1	Pythagoras theorem
	$4x^2 + 4 + 8x + 4x^2 = 9x^2 + 6x + 1$	M1	For quadratic
	$x^2 - 2x - 3 = 0$	M1	For factorizing
	$x = 3$ or $x = -1$	A1	C.A.O
	$\therefore x = 3$	A1	
15 (b)	Height $= 2 \times 3 = 6$cm 	B1	For sketch

15 (b)	$\tan 47^0 = \frac{y}{x}$ $y = x \tan 47^0$ ..... (i) $\tan 30^0 = \frac{y}{400+x}$ $y = (400 + x) \tan 30^0$ $x \tan 47^0 = (400 + x) \tan 30^0$ $x \tan 47^0 = (400 + x) \tan 30^0$ $x = \frac{400\tan 30^0}{\tan 47^0 - \tan 30^0}$ $x = 466.528$m. Height = 466.528 x tan 47^0 = 500.290m	M1 M1 M1 A1 M1 A1 √	Accept alternatives For more decimal places double tick
		12	
16 (a)	Sketch  	B1 ~~B2~~ B1 B1 B1 B1 B1 B1 B1	Sketch For 75^0 $\overline{QR}$ $\overline{PR}$ bisectors circle
(b)	Radius = 4.3cm 4.4 ± 0.1 Length PQ = 6.2cm 6.6 ± 0.1	B1 B1	radius $\overline{PR}$
(c)	Area = 3.143 x 4.3 x 4.3 = 58.1cm^2	M1 A1	~~A1~~ Wrong Radius Used
		12	

17 (a)	(-3,3) and (7,0)		
	Grad. $\frac{0-3}{7-{}^{-}3} = \frac{{}^{-}3}{10}$ M1	M1	
	$0 = \frac{{}^{-}3}{10}(7) + C$		
	$C = \frac{21}{10}$		
	$\therefore y = \frac{{}^{-}3}{10}x + \frac{21}{10}$ A1	A1	Accept other alternatives of derwing equation
	$\therefore y \geq \frac{{}^{-}3}{10}x + \frac{21}{10}$, $10y + 3x \geq 21$ A1	A1	
	Another line (-3,3) & (6,6)		
	Grad. $\frac{6-3}{6-{}^{-}3} = \frac{3}{9} = \frac{1}{3}$ M1	M1	
	$6 = \frac{1}{3}(6) + C$		
	$C = 4$		
	$\therefore y = \frac{1}{3}x + 4$ M1	A1	
	$y \leq \frac{1}{3}x + 4$, $3y - x = 12$ A1	A1	
	another line (0,0) & (6,6)		
	grad $= \frac{6-0}{6-0} = 1$ M1	M1	
	$0 = 0 + C$, $C = 0$		
	$y = x$ A1	A1	
	$y \geq x$, $x \leq y$ A1	A1	
(b)	Feasible points.	B1	
	(2,4) (1,4) (3,5) (4,5) (6,6) B1		(6,5) [0,7]
	$\therefore$ (4,5) $(4 \times 5) + (5 \times 3) = 35$ B1	B1	Including (6,6)
	(6,6) $(6 \times 5) + (6 \times 3) = 48$		
	$\therefore$ 48 is maximum value B1	B1	
		12	

(ii)



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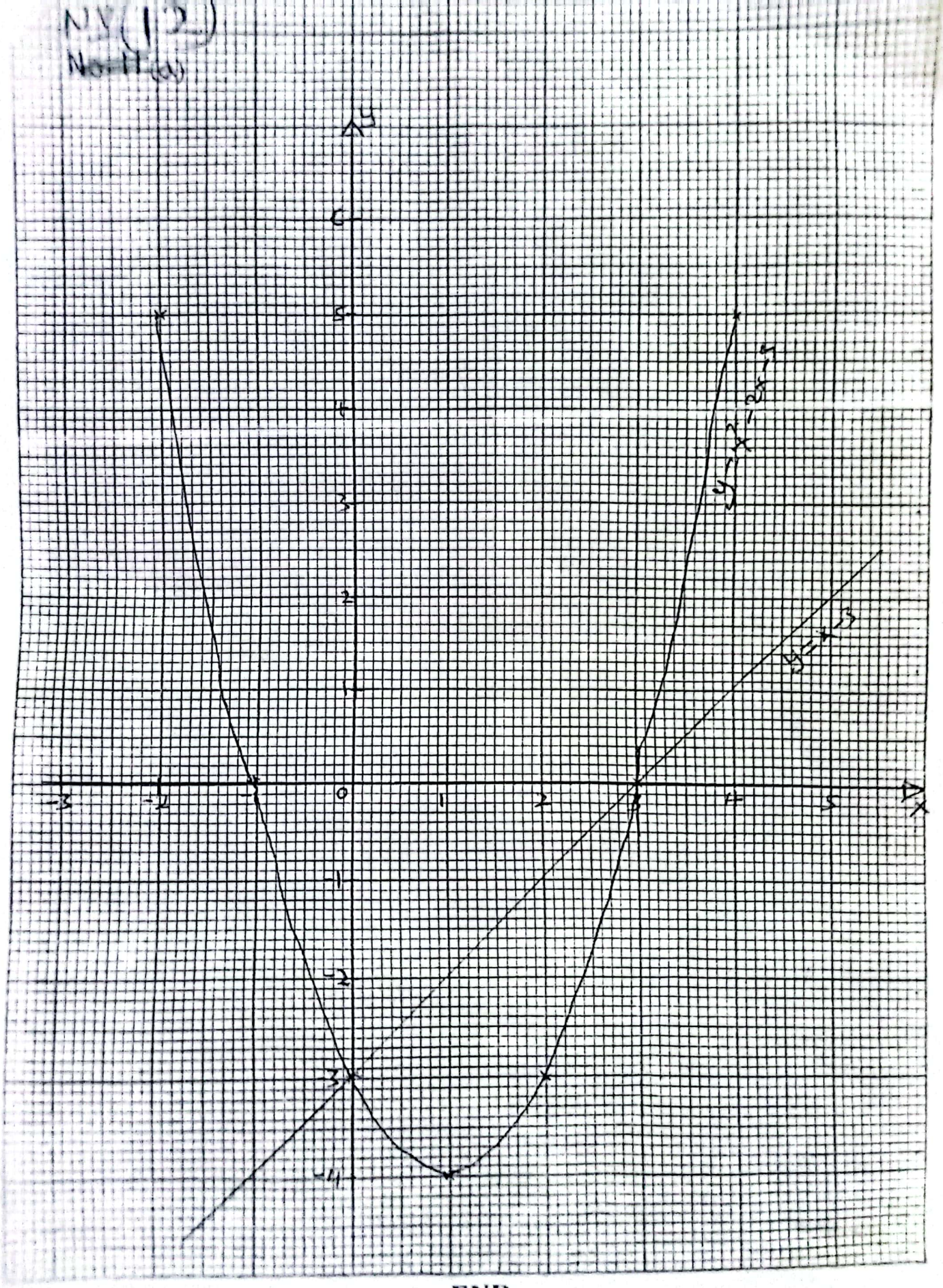

END

456/1
MATHEMATICS
PAPER 1
July/August 2023
2½ hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

- *Answer **all** questions in section **A** and any **five** questions from section **B**.*
- *Any additional question(s) answered will not be marked.*
- *All necessary calculations **must** be done in the same answer booklet/sheets provided, with the rest of the answers. Therefore no paper should be given for rough work.*
- *Graph paper is provided.*
- *Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

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SECTION A (40 marks)

Answer **all** *questions in this section.*

1. Given that $x \Delta y = x^2 - 6y^2$, evaluate $(3 \Delta 6) \Delta 4$. (4 marks)

2. The bearing of point A from point B is 210^0.
Find the bearing of point B from point A. (4 marks)

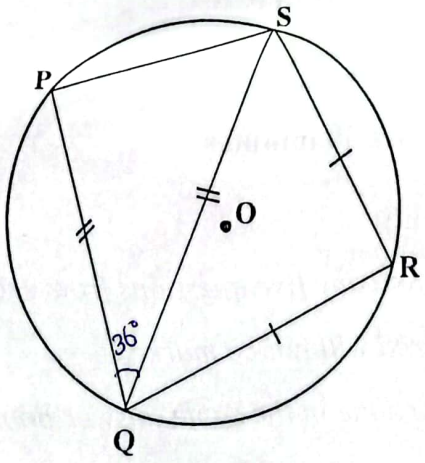
3. Given that matrix $P = \begin{pmatrix} 3 & 0 \\ 5 & 1 \end{pmatrix}$. Show that $P^2 - 4P + 3I = 0$ where **I** is the identity matrix of order 2 by 2. (4 marks)

4. Factorise completely $12p^2 - 27q^2$. (4 marks)

5. A school bus carries 78 passengers when full. The bus has a total of 30 seats.
Some of the seats are for 3 passengers and others are for 2 passengers.
Determine the number of seats for three passengers and for two passengers. (4 marks)

6. Given that $\tan x = 0.5774$. Find the two possible values of x for which $\tan x = -0.5774$. (4 marks)

7. In the figure below PQ = QS and RQ = RS, angle PQS = 36^0, where O is the centre. (4 marks)



Find angle SQR. (4 marks)

8. Solve the inequality
$\frac{1}{4}(2x + 3) \leq 4 - \frac{1}{4}(3 - x)$, hence show your answer on the number line. (4 marks)

9. Make L the subject of the expression $T = 2\pi\sqrt{\frac{L^2+M}{MH}}$ (4 marks)

10. A number is chosen at random from the integers 1 to 10.
Find the probability that the number chosen is either a factor of 10 or a prime number. (4 marks)

SECTION B (60 marks)

Answer any **five** *questions from this section. All questions carry equal marks.*

11. The table shows marks scored by 46 students in a mathematics test.

Marks	Cummulative frequency
29.5 – 34.5	2
34.5 – 39.5	7
39.5 – 44.5	17
44.5 – 49.5	32
49.5 – 54.5	40
54.5 – 59.5	44
59.5 – 64.5	46

(a) Caculate the mean mark, using the working mean of 47 marks. (8 marks)

(b) Draw a cumulative frequency curve and use it to estimate the number of students who scored above 47 marks. (4 marks)

12. (a) Draw a graph of $y = x^2 - 2x - 3$ for $-2 \leq x \leq 4$.
Use a scale of 2 cm to represent 1 unit on both axes. (6 marks)

(b) Use your graph in (a) above to solve equations:-

(i) $x^2 - 2x - 3 = 0$. (2 marks)

(ii) $x^2 - 3x = 0$. (4 marks)

13. (a) Given that $\begin{pmatrix} 3 & 2 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 3 & p \\ 1 & 2 \end{pmatrix} = \begin{pmatrix} 11 & q \\ 3 & 3 \end{pmatrix}$ Find the values of p and q. (3 marks)

(b) A painter bought 40 tins of Red paint, 25 tins of Yellow paint and 40 tins of Orange paint. In Kikuubo market, the price of a tin of Red, Yellow and Orange paint is Shs. 20,000/=, Shs. 15,000/= and Shs. 25,000/= respectively.
In Nakasero market, the price of a tin of Red, Yellow and Orange paint is Shs. 21,000/=, Shs. 14,000/= and Shs. 26,000/= respectively.
By writing the matrices, for the items bought as row matrix and the cost of items bought as column matrix. Use matrix multiplication to find;

(i) the cost of the paints in each market. (6 marks)

(ii) where is it cheaper to buy the paints from and by how much? (3 marks)

2230
2175

14. A transformation matrix $\begin{pmatrix} 2 & 3 \\ 1 & 2 \end{pmatrix}$ maps the vertices of a quadrilateral ABCD on to $A^{I}(13,8)$ $B^{I}(21,12)$ $C^{I}(33,20)$ and $D^{I}(25,16)$

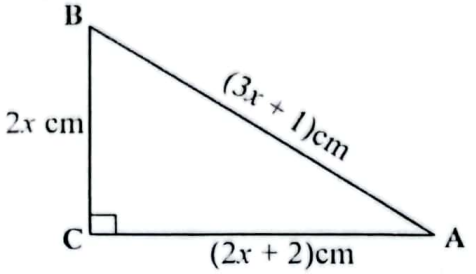
(a) Find the coordinates of ABCD. (5 marks)

(b) The image $A^{I}B^{I}C^{I}D^{I}$ is rotated through a negative quarter turn about the origin to form $A^{II}B^{II}C^{II}D^{II}$. Write down the coordinates of $A^{II}B^{II}C^{II}D^{II}$ (4marks)

(c) Find a single transformation matrix that would map quadrilateral $A^{II}B^{II}C^{II}D^{II}$ back to ABCD. (3marks)

215-180

15. (a) In the figure below, angle BCA is 90^0



Find the value of x and hence determine the height BC. (5 marks)

(b) The angle of elevation of the top of the cliff from Tom's home is 30^0. Tom moved from his home towards the cliff, after covering a distance of 400 m, the angle of elevation of the top of the cliff at that point is 47^0. Determine the height of the cliff. (7 marks)

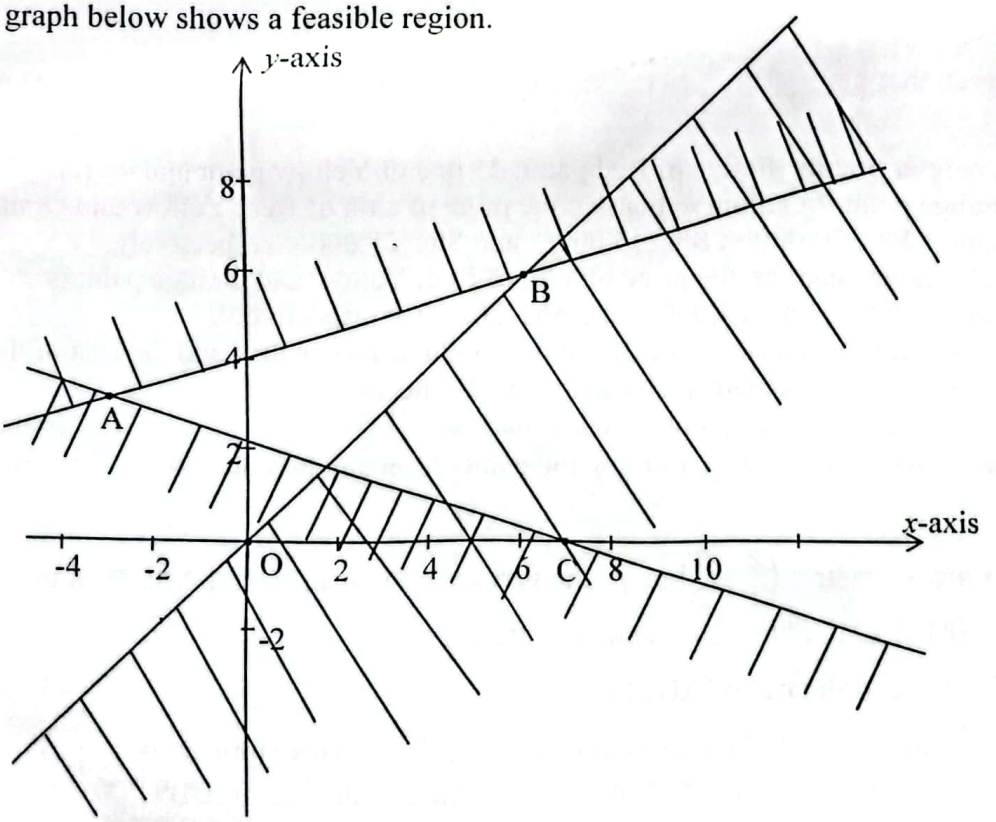
16. (a) Using a pair of compasses, a ruler and a pencil only, construct a triangle PQR where $\overline{QR}$ = 7.2 cm, angle PQR = 75^0 and $\overline{PR}$ = 8.4 cm

(b) Draw a circle to circumscribe the triangle PQR. Measure the radius of a circle and the length $\overline{PQ}$.

(c) Find the area of the circle formed, through PQR. (Use $\pi = 3.143$). Correct your answer to one decimal place.

(12 months)

17. The graph below shows a feasible region.



Use the graph above to;

(a) form inequalities representing the feasible region. (9 marks)

(b) find the maximum value of $5x + 3y$ from the feasible region. (3 marks)

END

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