456/1
MATHEMATICS
Paper 1
AUGUST, 2023
$2\frac{1}{2}$ *hours*

JINJA JOINT EXAMINATIONS BOARD

Uganda Certificate of Education

MOCK EXAMINATIONS – AUGUST, 2023

MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **ALL** *questions in Section* **A** *and* ***not more than*** **FIVE** *from section* **B**.

Any additional question(s) answered will not be marked.
All necessary calculations must be shown and should be done on the same page as the rest of the answer.

Mathematical tables and graph papers are provided.

Silent, non-programmable scientific calculators may be used.

SECTION A (40 MARKS)

Answer all questions in this section.

1. Factorize $a^2 - b^2$ completely.
   Hence, evaluate $6.76^2 - 3.24^2$ (04 marks)

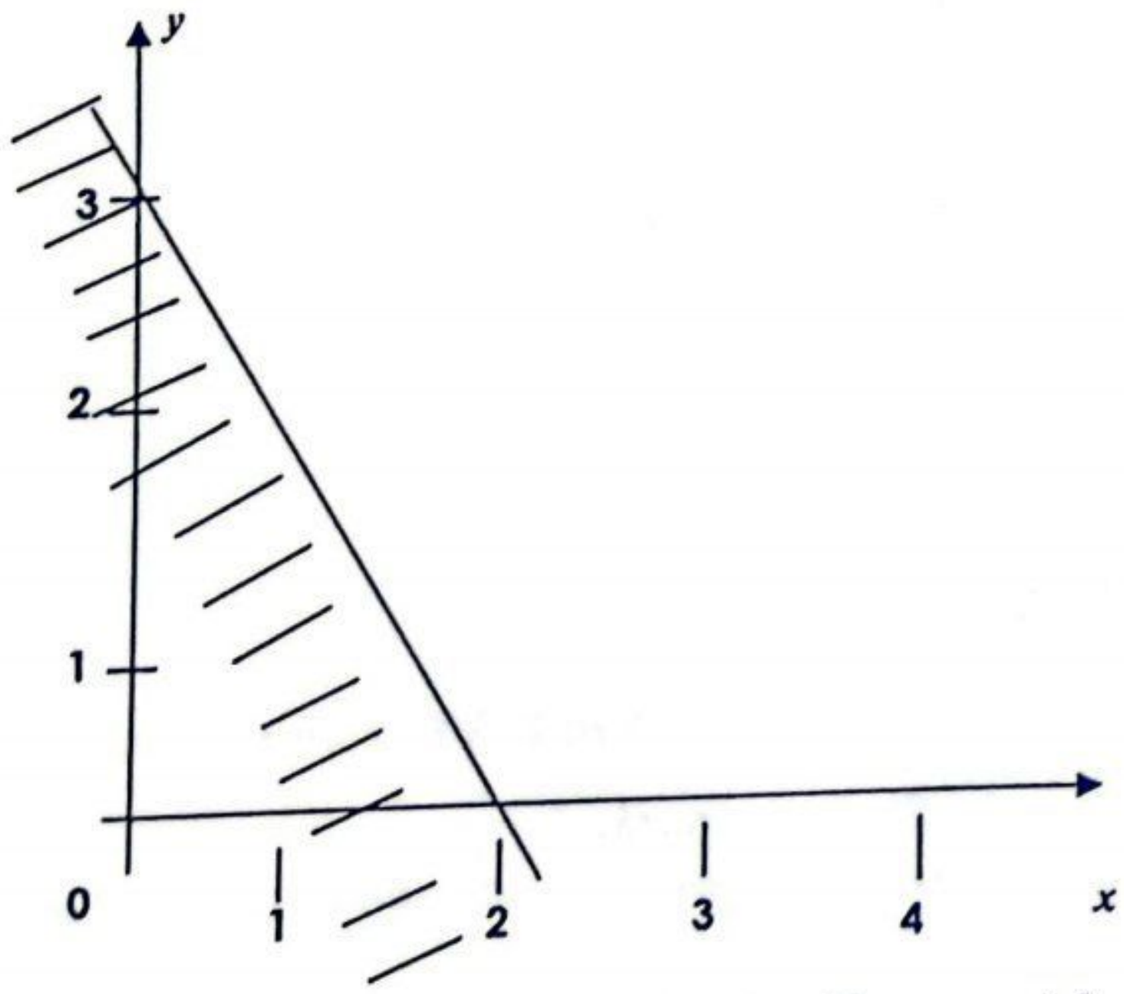
2. Solve for n in the equation below.
   $\frac{2n-1}{4} - \frac{2n-3}{5} = \frac{3}{4}$ (04 marks)

3. A number is chosen at random from the integers 2 to 20. Find the probability that the number chosen is either a multiple of 3 or a square number. (04 marks)

4. Given that $a * b = a^2 - 2b$, find the value of $(4 * 5) * 9$. (04 marks)

5. Two towns P and Q are such that the bearing of P from Q is 235^0.
   Find the bearing of Q from P. (04 marks)

6. Determine the inequality which is represented by the unshaded region on the graph below:



(04 marks)

7. From the top of a building of height 30m, a cat is seen on the ground at an angle of depression of 25^0. Determine how far the cat is from the building. Correct your answer to 3 significant figures. (04 marks)

8. Find the inverse of the matrix $\begin{pmatrix} -1 & 4 \\ -1 & 2 \end{pmatrix}$ (04 marks)

9. The point A (1,-4) is mapped on to A '(4, 5) after an enlargement centre P with scale factor 2. Using vectors, Determine the coordinates of P. (04 marks)

10. The marks of a student in 5 subjects were 63, 87, 59, 81 and 54. The average mark in 6 subjects was 71. Determine the mark in the sixth subject. (04 marks)

SECTION B (60 MARKS)

11.(a) (i) Make a the subject from this equation:
$\frac{d}{4c} = B + \frac{1}{a}$.

(ii) Find the value of a when B = 2, c= 20 and d = 170. (06 marks)

(b) Mary is 7 years younger than Peter. Tom is twice as old as Mary. The sum of all their ages is 43 years. Calculate;

(i) Peter's age

(ii) Mary's age. (06 marks)

12.(a) Given that matrix A = $\begin{pmatrix} 1 & 2 \\ 4 & 3 \end{pmatrix}$, B = $\begin{pmatrix} -2 & 3 \\ 2 & 1 \end{pmatrix}$ and C = $\begin{pmatrix} -10 & 4 \\ 5 & 9 \end{pmatrix}$, find matrix M such that $M = A^2 + 2B - C$. (06 marks)

(b) Solve the following simultaneous equations using matrix method.
$5x + 2y = 2$
$5y + 3x = 24$.

13. The table below shows the cummulative frequencies of the heights in cm of senior one students of a certain school.

Class	*c.f*
145 – 149	2
150 – 154	7
155 – 159	16
160 – 164	26
165 – 169	33
170 – 174	38
175 – 179	40

(a) Use the table to calculate:
(i) The modal height
(ii) The mean height
(08 marks)

(b) Use the table to draw a cumulative frequency curve (Ogive) and use it to estimate the median height.
(04 marks)

14. a) Copy and complete the table below for the function $y = x^2 - 4x + 2$

	−2	−1	0	1	2	3	4	5	6
	4	1	0	1	4	9	16	25	36
−4x	8				−8				−24
+2	2	2	2	2	2	2	2	2	2
y	14				−2				14

(02 marks)

b) Using a scale of 2cm to represent 1 unit on the horizontal axis and 1cm to represent 1 unit on the vertical axis, draw a graph for the function $y = x^2 - 4x + 2$ for the domain $-2 \leq x \leq 6$.
(04 marks)

c) use your graph to solve the equation $x^2 - 4x + 2 = 0$
(02 marks)

d) On the same axes, draw a graph for the function $y = 6 - x$.
(01 marks)

e) Use your graphs to solve the equation $x^2 - 3x - 4 = 0$.
(03 marks)

15. Using a ruler, a pencil and a pair of compasses only;
a) (i) Construct a triangle with AB = 8.5cm, AC = 10cm and angle BAC = 75^0.
(ii) Measure angle ABC
(05 marks)

b) (i) Construct an inscribing circle to the triangle
ii) Measure the radius of the circle.
iii) Calculate the area of the circle you have constructed. Correct your answer to 2 significance figures. [$\prod = 3.14$]
(07 marks)

16. A triangle KLM with vertices are K(0,1), L(4,1) and M(1,2) is mapped onto triangle $K^IL^IM^I$ by a reflection along line y = x. Triangle $K^IL^IM^I$ is then mapped onto triangle $K^{II}L^{II}M^{II}$ by a transformation whose matrix is $\begin{pmatrix} -2 & 2 \\ -3 & 4 \end{pmatrix}$.

a) Use I(1,0) and J(0,1) to find the matrix for the reflection along line y = x.
(02 marks)

b) Find the coordinates of :
i) K^I, L^I and M^I
ii) K^{II}, L^{II} and M^{II}
(06 marks)

c) Determine the matrix of the single transformation which maps triangle $K''L''M''$ back onto triangle KLM. (04 marks)

17. (a) By shading the unwanted regions, show on a graph the region satisfying the inequalities below:

(i) $x \geq 0$

(ii) $y \geq 0$

(iii) $x + y \leq 6$

(iv) $x + 2y \leq 8$. (08 marks)

(b) Use your graph to find the values of x and y which give the maximum values for both $x + y$ and $x + 2y$. (04 marks)

End

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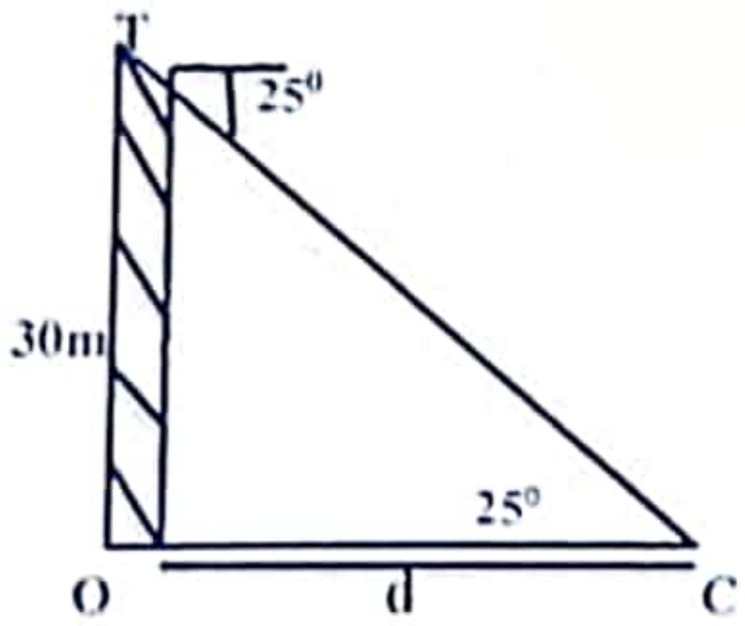
456/1 MATHEMATICS

MARKING GUIDE

NO.	SOLUTIONS	MARKS	COMMENTS
Q.1	$a^2 - b^2 = (a + b)(a - b)$	M_1	
	$6.762 - 3.242 = (6.76 + 3.24)(6.76 - 3.24)$	M_1	
	$= (10.00)(3.52)$	M_1	
	$= 35.2$	A_1	
		04	
Q.2	$\frac{2n-1}{4} - \frac{2n-3}{5} = \frac{3}{4}$		
	$5(2n - 1) - 4(2n - 3) = 3(5)$	M_1	
	$10n - 5 - 8n + 12 = 15$	M_1	
	$2n = 8$	M_1	
	$n = 4$	A_1	
		04	
Q.3	S.= {2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19,20}	B_1	
	E = {3, 4, 6, 9, 12, 15, 16,18}	B_1	
	$P(E) = \frac{8}{19}$	M_1A_1	
		04	
Q.4	$a \bullet b = a^2-2b$ $4 \bullet 5 = 4^2 - 2x5$ $= 16 - 10$ $= 6$ $6 \bullet 9 = 6^2 - 2x9$ $= 36 - 18$	M_1 A_1 M_1	For his 6
	$= 18$	A_1	
		04	

Q.5	 The bearing is 055^0	B_1 B_1 B_2	Q -235⁰ P -55⁰
		04	
Q.6	Points are (2, 0) and (0, 3) Grad = $\frac{3-0}{0-2} = \frac{3}{2}$ Equation of line is $\frac{y-0}{x-2} = \frac{3}{2}$ $2y = -3x + 6$ $2y + 3x = 6$ *Inequality is* $2y + 3x \geq 6$	M_1 M_1 B_2	
		04	
Q.7	 $\tan 25^0 = \frac{30}{d}$ $d = \frac{30}{\tan 25^0}$ $= 64.34m \quad = 64.3cm$	B_1 M_1 A_1 A_1	
		04	

	$= \frac{1}{\frac{10}{80}}$ or $\frac{1}{\frac{1}{8}}$ $= 8$	 A_1	
b(i)	Let Peter be P years. P | M | T P | P - 7 | 2(P -7) $P + P - 7 + 2(P - 7) = 43$ $2P - 7 + 2P - 14 = 43$ $4P = 64$ $P = 16\ years$ Mary is 16 -7 = 9 years	B_1 M_1 M_1 A_1 M_1 A_1	
		12	
Q.12	$A^2 = \begin{pmatrix}1 & 2\\4 & 3\end{pmatrix}\begin{pmatrix}1 & 2\\4 & 3\end{pmatrix}$ $= \begin{pmatrix}9 & 8\\16 & 17\end{pmatrix}$ $2B = 2\begin{pmatrix}-2 & 3\\2 & 1\end{pmatrix}$ $= \begin{pmatrix}-4 & 6\\4 & 2\end{pmatrix}$ $M = \begin{pmatrix}9 & 8\\16 & 17\end{pmatrix} + \begin{pmatrix}-4 & 6\\4 & 2\end{pmatrix} - \begin{pmatrix}-10 & 4\\5 & 9\end{pmatrix}$ $M = \begin{pmatrix}15 & 10\\15 & 10\end{pmatrix}$	M_1 A_1 M_1 A_1 M_1 A_1	For his $\begin{pmatrix}9 & 8\\16 & 17\end{pmatrix}$ OR $\begin{pmatrix}-4 & 6\\4 & 2\end{pmatrix}$
(b)	$5x + 2y = 2$ $3x + 5y = 24$	M_1	Rearranging

	$\begin{pmatrix}5 & 2\\3 & 5\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}2\\24\end{pmatrix}$	M_1	
	$\begin{pmatrix}5 & -2\\-3 & 5\end{pmatrix}\begin{pmatrix}5 & 2\\3 & 5\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}5 & -2\\-3 & 5\end{pmatrix}\begin{pmatrix}2\\24\end{pmatrix}$	M_1	
	$\begin{pmatrix}19 & 0\\0 & 19\end{pmatrix}\begin{pmatrix}x\\y\end{pmatrix}=\begin{pmatrix}-38\\114\end{pmatrix}$	M_1	
	$\begin{pmatrix}19x\\19y\end{pmatrix}=\begin{pmatrix}-38\\114\end{pmatrix}$		
	$19x=-38 \Rightarrow x=-2$	A_1	
	$19y=114 \Rightarrow y=6$	A_1	
		12	

Q.13(a)

CLASS	C.f	f	x	fx
145- 149	2	2	147	294
150- 154	7	5	152	760
155- 159	16	9	157	1413
160- 164	26	10	162	1620
165- 169	33	7	167	1169
170- 174	38	5	172	860
175- 179	40	2	177	354
	$\Sigma f = 40$			$\Sigma fx = 6,470$

		M_1	For his **f**
		M_1	For his **x**
		M_1	For his **fx**
		A_1	For his $\Sigma fx = 6,470$

(i) Modal height

$= 159.5 + \left(\frac{1}{1+3}\right)5$ — M_1

$= 159.5 + \frac{5}{4}$

$= 160.75$ — A_1

(ii) Mean $= \frac{6470}{40}$ — M_1

$= 161.75$ — A_1

(b)

Labeling axes as **c.f** V^s Heights or class boundaries. — B_1

-smooth curve drawn — B_1

All points plotted correctly smooth curve drawn. — B_1

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(To be fastened together with other answers to paper)

UACE

Candidate's Name ..Q:13.....

Signature .....

Random No.

Personal Number

Subject Name ..... Paper code ..... /