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MATHEMATICS  
Paper 1  
AUGUST, 2023  
2½ 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.*

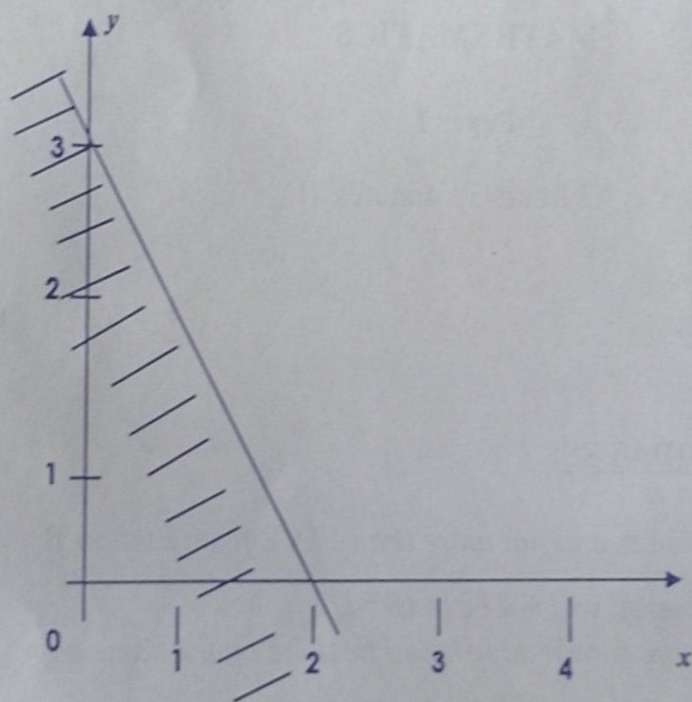
*Silent, non-programmable scientific calculators may be used.*



**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  $235^\circ$ .  
 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  $25^\circ$ . 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 cumulative 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  $AB = 8.5\text{cm}$ ,  $AC = 10\text{cm}$  and angle  $BAC = 75^\circ$ .

(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. [ $\pi = 3.14$ ]

(07 marks)

16. A triangle KLM with vertices are  $K(0,1)$ ,  $L(4,1)$  and  $M(1,2)$  is mapped onto triangle  $K'L'M'$  by a reflection along line  $y = x$ . Triangle  $K'L'M'$  is then mapped onto triangle  $K''L''M''$  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)  $K'$ ,  $L'$  and  $M'$

ii)  $K''$ ,  $L''$  and  $M''$

(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)