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MATHEMATICS
Paper 1
July/August, 2023
$2\frac{1}{2}$ *hours*

MATIGO MOCK EXAMINATIONS BOARD

Uganda Certificate of Education
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.*

Turn Over

SECTION A: (40 MARKS)

Answer all questions in this section.

1. Given that a matrix $\boldsymbol{M} = \begin{pmatrix} \mathbf{1} & \mathbf{2} \\ \boldsymbol{c} & \boldsymbol{d} \end{pmatrix}$ and its inverse, $\boldsymbol{M^{-1}} = \begin{pmatrix} \mathbf{-3} & \mathbf{2} \\ \mathbf{2} & \mathbf{-1} \end{pmatrix}$. Find the values of $\boldsymbol{c}$ and $\boldsymbol{d}$ (4 marks)

2. Given that $\frac{\boldsymbol{2x-y}}{\boldsymbol{x-2y}} = \frac{\mathbf{4}}{\mathbf{3}}$, find the value of $\frac{\boldsymbol{y}}{\boldsymbol{x}}$. (4 marks)

3. The recorded annual rain fall in mm at Mt Rwenzori over a period of 15 years was as follows:

$$\mathbf{1170, 1410, 1600, 1230, 1680, 1730, 1460, 1220,}$$
$$\mathbf{1200, 1440, 1430, 1390, 1500, 1810, 1290}$$

Find their;

(i) Median (2 marks)

(ii) Mean (2 marks)

4. Solve the inequality $\mathbf{-9 \leq 2x + 5 \leq 1}$ and represent your solution on a number line (4 marks)

5. Factorise completely; $\mathbf{6t^2 + 5y^2 + 6ty + 5ty}$ (4 marks)

6. Solve the quadratic equation: $\mathbf{4x^2 - 9 = 0}$ (4 marks)

7. Under an enlargement scale factor $\mathbf{-2}$, $\boldsymbol{A}(\mathbf{4, 3})$ maps onto $\boldsymbol{A^I}(\mathbf{4, -5})$. Find the coordinates of the centre of enlargement. (4 marks)

8. Town $\boldsymbol{A}$ is 56km from town $\boldsymbol{B}$ on a bearing of $\mathbf{205°}$. Write down the bearing of $\boldsymbol{B}$ from $\boldsymbol{A}$. (4 marks)

9. Babirye arranges the three digits $\mathbf{4, 5}$ and $\mathbf{2}$ in a random order without repeating a digit. Find the probability that the number formed is;

(a) Odd. (2 marks)

(b) Prime. (2 marks)

10. One interior angle of a regular polygon is $\mathbf{60^0}$.

(i) Find the number of sides of the polygon. (3 marks)

(ii) Name the polygon in $(\boldsymbol{i})$ (1 mark)

SECTION B: (60 MARKS)

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

11. The table below represents marks obtained by 40 students in a class.

72	35	49	37	25	25	38	70	63	42
40	39	20	35	41	51	39	27	31	38
64	72	23	35	46	48	39	56	67	69
28	42	51	55	48	37	49	51	63	31

(a) Starting from 20 and using classes of width 10, make a frequency distribution table for the data. (3 marks)

(b) Use your table in (a) to draw a histogram and use it to estimate the modal mark. (6 marks)

(c) Estimate the median mark. (3 marks)

12. Port B is on a bearing of **080°** from port A a distance of $\mathbf{95}\boldsymbol{km}$. a submarine is stationed at port D on a bearing of **200°** from A, $\mathbf{124}\boldsymbol{km}$ from B. A ship leaves B and moves directly southwards to an island P, Which is on a bearing of 140° from A. on realizing the ship was heading for the island P, the submarine heads straight for the island to intercept the ship. Using a scale of 1 cm to represent 10km, make a scale drawing showing the relative positions of A, B,D and P. Hence find;

(a) the distance between A and D.

(b) the bearing of the submarine from the ship as it was setting off from B

(c) the bearing of the island P from D (12 marks)

13. (a) Draw a graph of $\boldsymbol{y = x^2 - 4x + 5}$ from $\boldsymbol{x = -2\ to\ x = 6}$ using a scale of $\mathbf{2}\boldsymbol{cm}$ to represent 1 unit on the $\boldsymbol{x - axis}$ and $\mathbf{1}\boldsymbol{cm}$ to represent two units on the $\boldsymbol{y - axis}$, use the graph drawn above to solve the equations;

(i) $\boldsymbol{x^2 - 4x = 5}$

(ii) $\boldsymbol{x^2 - 4x = 0}$

(b) Find the minimum value of the function. (12 marks)

14. (a) A transformation P maps points $\boldsymbol{A(1,3)}$ and $\boldsymbol{B(-2,-3)}$ onto points $\boldsymbol{A^I(2,4)}$ and $\boldsymbol{B^I(-3,-11)}$respectively find the matrix of the transformation. (6 marks)

(b) A point $\boldsymbol{P(2,4)}$ is rotated through 60° anticlockwise about the origin. Find $\boldsymbol{P^I}$, the image of P, leaving the co-ordinates in surd form. (6 marks)

15. (a) A cheetah runs 120 meters down a slope in this time it has gone vertically down 8 meters. Find the angle of the slope above the horizontal (4 marks)

(b) given that $\boldsymbol{tan\,\theta = \frac{7}{24}}$ and that $\boldsymbol{180° \leq \theta \leq 360°}$,without using a calculator or mathematical tables, find the value of; $\boldsymbol{\frac{sin\,\theta - cos\,\theta}{2}}$ (4 marks)

(c) The length of a diagonal of a rectangular flower bed is $\boldsymbol{13m}$ and the length of one side is 5m. Find the perimeter of the flower bed. (4 marks)

16. Given matrices $\boldsymbol{A} = \begin{pmatrix} \boldsymbol{2} & \boldsymbol{-1} \\ \boldsymbol{4} & \boldsymbol{-1} \end{pmatrix}$ and $\boldsymbol{B} = \begin{pmatrix} \boldsymbol{1} & \boldsymbol{1} \\ \boldsymbol{-4} & \boldsymbol{k} \end{pmatrix}$.

(a) If matrix B is a singular matrix, find the value of $\boldsymbol{k}$. (4 marks)

(b) Find $\boldsymbol{A^{-1}B}$. (4 marks)

(c) If $\boldsymbol{I}$ is a $\boldsymbol{2 \times 2}$ identity matrix, find $\boldsymbol{A - 2I}$. (4 marks)

17. A transport company has two types of Lorries 9 of type A and 5 of type B, there are 11 drivers available. The company has been contracted to transport at least 3600 bags of coffee from a certain cooperative store to the coffee board of Uganda, stores in Kawempe. Type A Lorries can each make 4 trips and carry 90 bags per trip. Type B makes Lorries make 3 trips per day and carry 150 bags each per trip. It costs Sh 150,000 per day to run a type A lorry and shs 240,000 per day to run a type B lorry How should the company organize the use of its lorries so as to

(a) run the Lorries at a minimum cost (4 marks)

(b) carry the maximum number of bags each day (4 marks)

(c) use the minimum number of drivers (4 marks)

END