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MATHEMATICS
Paper 1
July/Aug. 2023
2½ hours

HOIMA DIOCESE EXAMINATIONS BOARD

UCE Mock Examination, 2023

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 questions will **not** *be marked.*

All *necessary calculations* **must** *be done in the answer booklets provided. Therefore, no paper should be given for rough work.*

Graph papers may be provided.

Neat work is a **must**.

Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

SECTION A: (40 MARKS)

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

1. Without using mathematical tables or calculators, evaluate: $7.25^2 - 2.75^2$. *(04 marks)*

2. Given that: $\cos\theta = -\frac{1}{2}$ and $0° \leq \theta \leq 360°$, solve the equation. *(04 marks)*

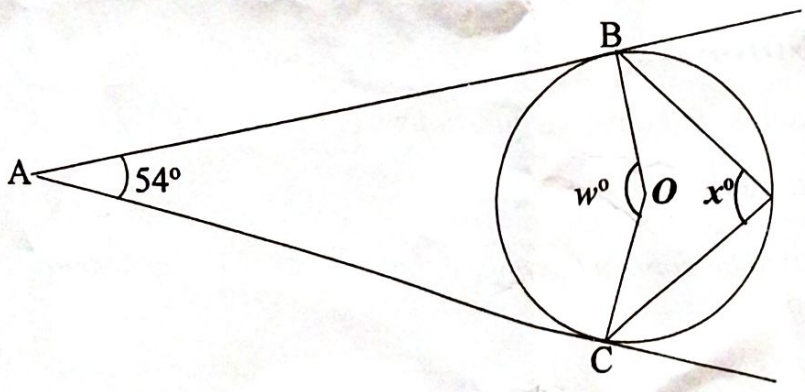
3. A point $A(0, 3)$ is reflected in the line $y + x = 0$. Find the coordinate of its image A'. *(04 marks)*

4. Simplify: $\frac{t^2-5t}{t^2-25}$.

   Hence, make t the subject of the equation, if $P = \frac{t^2-5t}{t^2-25}$. *(04 marks)*

5. If $\frac{2p-3q}{3p-2q} = 4$, evaluate $\frac{p^2+q^2}{2pq}$. *(04 marks)*

6. In the figure below, O is the centre of the circle. $\overrightarrow{AB}$ and $\overrightarrow{AC}$ are tangent to the circle. Find the value of angles $w°$ and $x°$. *(04 marks)*



7. Solve the inequality and state the solution set:

   $$-m + 9 < 12 - \frac{7}{10}m$$ *(04 marks)*

8. A rectangle has sides of length 3 cm and 4 cm. A second rectangle similar to the first has diagonal of length 10 cm. What is the ratio of the area of the first rectangle to the area of the second rectangle? *(04 marks)*

9. The table below shows the ages of students in a certain class.

Age (in years)	11	12	8
Number of students	n	10	n

   If the mean age of the students is 10, find the value of n. *(04 marks)*

10. A bag contains blue, red and white beads. If a bead is chosen at random, the probability of picking a blue bead is $\frac{2}{9}$ and the probability of picking a red bead is $\frac{1}{3}$. What is the probability of picking a white bead? *(04 marks)*

SECTION B: (60 MARKS)

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

11. The lengths of **58** plants, in cm, were recorded as follows:

Length (cm)	11 - 20	21-30	31- 40	41 - 50	51 - 60
Frequency (f)	4				
Cumulative frequency		12	28	48	

(a) Copy and complete the table. *(04 marks)*

(b) Calculate the mean and median. *(04 marks)*

(c) Plot a histogram and use it to estimate the modal length. *(04 marks)*

12. (a) Solve the simultaneous equations:

$$4y - x = 6$$
$$5x - 2y^2 = 12$$

(08 marks)

(b) The equal angles of an isosceles triangle are $(2x + y)^\circ$ and $(3y - x)^\circ$. The third angle is $(2y - x)^\circ$. Find x and y. *(04 marks)*

13. (a) A woman's age and her son's age add to 45 years. Five years ago, the woman was 6 times as old as her son. How old was the woman when the son was born?

(b) Express in simplest form: $\dfrac{2K^2 + KL - 3L^2}{2K^2 - 5KL + 3L^2}$ and hence evaluate the final expression if $K = 10$, and $L = 5$. *(12 marks)*

14. (a) An aeroplane flies from airport A to airport B at a bearing of 060°, for 800 km. Airport C is at a bearing of 130° from airport A, at a distance of 640 km. Construct an accurate diagram for the above information. (Use a scale of 1 cm to represent 100 km).

(b) Find the bearing and distance of airport B from airport C.

(c) If the aeroplane used a speed of 80 km h^{-1} to fly directly from airport C to airport B, find the time taken. *(12 marks)*

15. (a) Given that matrix $A = (p \quad 1-p)$, $B = \begin{pmatrix} 4 & 10 \\ 4 & 8 \end{pmatrix}$ and $C = (4-p \quad q)$.
If the product of A and B is equal to $2C$, find the value of q. *(05 marks)*

(b) Sarah, Peter and Peran bought the following items as shown in the table below:

	Sarah	Peter	Peran
Books	5	2	2
Pens	3	4	6
Pencils	6	1	3

(i) Represent this information in a matrix form.

(ii) The cost of a book is sh 3000, a pen is sh 700 and a pencil sh 550. Using matrix multiplication, obtain the money spent by all the three children. *(07 marks)*

16. A mother buys x note-books at sh 6000 each and y pens for sh 8000 each. She has sh 80000 to spend on this buying and there must be at least four note-books and at least four pens.

(a) Write three inequalities in x and y which satisfy these conditions. *(03 marks)*

(b) Illustrate them graphically by shading out the unwanted regions. *(07 marks)*

(c) Write down the integral solution set. *(02 marks)*

17. A triangle with coordinates $P(2, 3)$, $Q(6, 3)$ and $R(4, 6)$ is given a transformation represented by the matrix $M = \begin{pmatrix} 0 & -3 \\ -1 & 2 \end{pmatrix}$ and $N = \begin{pmatrix} 2 & 3 \\ 1 & 0 \end{pmatrix}$ to form $P'Q'R'$ and $P''Q''R''$ respectively.

(a) Find the coordinates of $P'Q'R'$ and $P''Q''R''$. *(06 marks)*

(b) Find a single matrix that maps PQR onto $P''Q''R''$ and describe it fully. *(04 marks)*

(c) Obtain a single matrix that would map $P''Q''R''$ back onto PQR. *(02 marks)*

END