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MATHEMATICS
Paper 1
July/Aug. 2022
2½ hours

HOIMA DIOCESE EXAMINATIONS BOARD

UCE Mock Examination, 2022

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.*

Squared 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)

Attempt **all** *questions in this section.*

1. Solve the equation: $\frac{P-3}{2} - \frac{2P-3}{5} = \frac{1}{4}$ (*04 marks*)

2. Given that $\tan\theta = \frac{7}{24}$ and that $180° \leq \theta \leq 360°$, without using a calculator or mathematical tables, find the value of $\sin\theta - \cos\theta$. (*04 marks*)

3. A woman has children whose ages in years are $2, 4, 6, 6, 8, 13, 17, 20,$ and 23

Determine the

(i) median age of the children

(ii) mean age of the children (*04 marks*)

4. Find the values of x and y in

$$(1 \quad 3 \quad 2)\begin{pmatrix} 4 & 3 \\ x & 2 \\ 10 & y \end{pmatrix} = (2 \quad 7 \quad 17)$$ (*04 marks*)

5. A basket contains 6 mangoes and 4 tomatoes. If two fruits are selected at random without replacement, find the probability that the two fruits selected are mangoes. (*04 marks*)

6. Given that $p * q = p + q + pq$

(i) Evaluate $3 * 5$

(ii) Find x if $7 * x = 23$ (*04 marks*)

7. An object at $(0, 0)$ undergoes a translation $\boldsymbol{A} = \begin{pmatrix} 5 \\ -12 \end{pmatrix}$, then followed by translation $\boldsymbol{B} = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$

(i) Find a single translation equivalent to the two translation $\boldsymbol{A}$ and $\boldsymbol{B}$

(ii) How far is the object from $(0, 0)$ (*04 marks*)

8. Factorise; $4x^2 - 5x - 6$, and hence solve $4x^2 - 5x - 6 = 0$. (*04 marks*)

9. Solve the inequality: $\frac{5x+2}{3} - \frac{7x+2}{5} < 3$ (*04 marks*)

10. Form a quadratic equation in terms of m for the roots 3 and $\frac{-7}{5}$. (*04 marks*)

SECTION B (60 MARKS)

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

11. Using a ruler, a pencil and a pair of compasses only

(a) Construct a triangle $\boldsymbol{ABC}$ in which angle $\boldsymbol{BAC} = 30°$, angle $\boldsymbol{ABC} = 120°$ and $\boldsymbol{AB} = 8\ cm$

(b) Measure and record the length $\boldsymbol{AC}$ and $\boldsymbol{BC}$.

(c) Draw an inscribed circle in the triangle. Measure and record its radius.

(d) Calculate the area of the circle. (*12 marks*)

12. The table below shows the weight in kilograms of children sampled in a primary school.

Weight	Number of children
$15 - 19$	2
$20 - 24$	4
$25 - 29$	7
$30 - 34$	3
$35 - 39$	5
$40 - 44$	6
$45 - 49$	1

(a) State the modal class and hence calculate the mode.

(b) Draw a cumulative frequency curve and use it to estimate the median weight correct to one decimal place.

(c) Find the probability that a child selected at random from the school weighs 40 kg and above. (*12 marks*)

13. (a) Factorise: $x^2 - 4\,(x - y)^2$ (*04 marks*)

(b) The hypotenuse of a right-angled triangle is of length $(m^2 + n^2)$. Given that one of the other sides is $(m^2 - n^2)$ in length, determine the length L of the third side hence fine L when $m = \frac{1}{6}$ and $n = 15$. (*12 marks*)

14. The vertices of a triangle P are $A(2,1), B(3,3)$ and $C(4,1)$. Triangle P is mapped onto its image P^I by the transformation defined by $\begin{pmatrix} 2 & 0 \\ 0 & 1 \end{pmatrix}$.

P^I is then mapped on P^{II} by the transformation $\begin{pmatrix} 1 & 0 \\ 0 & 2 \end{pmatrix}$.

(a) Determine the coordinates of:
   (i) triangle P^I
   (ii) triangle P^{II}

(b) Plot triangle P, P^I and P^{II} on the same axes. Use the graph to describe a single matrix $\boldsymbol{M}$ that would map P onto P^{II}. (*12 marks*)

15. Draw the graph of the function

(a) $y = x^2 - 6x + 7$ and $y = x - 2$ using the same scales and axes for values of $x: 0 \leq x \leq 6$. (*08 marks*)

(b) Use your graph to:

   (i) State the line of symmetry of the curve $y = x^2 - 6x + 7$.

   (ii) Solve the equation $x^2 - 8x + 9 = 0$. (*04 marks*)

16. (a) Given that $\begin{pmatrix} -1 & 3 \\ -1 & 2 \end{pmatrix}\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5 \\ 8 \end{pmatrix}$. Find the value of x and y. (*06 marks*)

(b) Use matrix method to determine the point of intersection of the lines $2y - 3x = 10$ and $4x + y + 6 = 0$. (*06 marks*)

17. The municipal council plans to construct a parking yard for x-minibuses and y-lorries. Minibuses are allowed 10 m^2 of space and lorries 20 m^2 of space and there is only 500 m^2 space available. Not more than 40 vehicles are allowed at a time. There are always both types of vehicles and most 15 lorries allowed at a time.

(a) (i) Write down five inequalities to represent the above information.
   (ii) Represent the inequalities in (a) (i) on the same axes. (*05 marks*)

(b) Given that the parking charges for a minibus is shs.50,000 and that for a lorry is shs. 60,000 per day.
   (i) Write down an expression for the total cost of parking charges for both vehicles.
   (ii) Use the graph to determine the maximum cost for parking charges that can be obtained of the municipal council. (*07 marks*)

END