S475/1
SUBSIDIARY
MATHEMATICS
Paper 1
July/August 2024
2 hours and 40 minutes

# KANUNGU DISTRICT JOINT MOCK EXAMINATIONS BOARD 2024

## UGANDA ADVANCED CERTIFICATE OF EDUCATION

## SUBSIDIARY MATHEMATICS

### Paper 1

### 2 hours and 40 minutes

INSTRUCTIONS TO CANDIDATES:

- Answer all the eight (8) questions in section A.
- Answer only four questions from section B with at least one question from each part.
- Any additional question(s) will not be marked.
- Each question in section A carries 5 marks while each question in section B carries 15 marks.
- All necessary working must be shown clearly
- Begin each question on a fresh sheet of paper.
- Graph paper is provided.
- Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.

## SECTION A

**Answer all questions in this section.**

1. Given that $\log_3 x = 2\log_3 4 - \log_3 5 + \log_3 9$, find the value of x. (05 marks)
2. The mean of eight numbers 13,5,6,10,k,11,8,and 7 is 9, find
   (a) Value of k (02 marks)
   (b) Standard deviation (03 marks)
3. Given the vectors $\underset{\sim}{a} = 2\underset{\sim}{i} - 4\underset{\sim}{j}$ and $\underset{\sim}{b} = 3\underset{\sim}{i} + 5\underset{\sim}{j}$, evaluate the modulus of $|5\underset{\sim}{a} + 2\underset{\sim}{b}|$ (05 marks)
4. Events A and B are such that P (A) $= {}^{6}/_{13}$, P (B) $= {}^{2}/_{5}$ and P (A/B) $= {}^{1}/_{4}$. Find;
   (a) P(AnB) (02 marks)
   (b) P(AUB) (03 marks)
5. Solve the equation $2\sec^2\theta + \tan\theta = 3$ for $0° \leq \theta \leq 360°$ (05 marks)
6. Given that the matrix $P = \begin{pmatrix} 1 & 2 \\ 4 & 5 \end{pmatrix}$, $Q = \begin{pmatrix} -1 & 1 \\ 3 & 2 \end{pmatrix}$ and $R = \begin{pmatrix} 4 & 6 \\ 10 & 15 \end{pmatrix}$. Find the matrix M if $M + R = P^2 + 3Q$. (05 marks)
7. Evaluate $\int_{-1}^{2} \left(\frac{2x^4 - x^5}{x^2}\right) dx$. (05 marks)
8. The $10^{th}$ term of an arithmetic progression is greater than the $5^{th}$ term by 5. If the sum of th first fourteen terms is 147. Find the common difference and the first term of the series. (05 marks)

## SECTION B.

Answer only four questions from this section with at least one question from each part. All questions carry equal marks.

### PART ONE: PURE MATHEMATICS.

9. (a) The roots of the equation $x^2 - 4x + 7 = 0$ are $\alpha$ and $\beta$. Form an equation whose roots ar $\frac{-2}{\alpha}$ and $\frac{-2}{\beta}$ (05 marks)

   (b) Express $\sqrt{5} + \frac{1-\sqrt{5}}{\sqrt{5}-2}$ without a surd in it. (05 marks)

   (c) Determine the value of x in the equation. $16^x = 8^{(4x-2)}$ (05 marks)
10. The wholesaler wishes to transport at least 240 bags of sugar from a factory to his shop. He has a lorry that can carry 90 bags per trip and a pick up that can buy 20 bags per trip. The cost of each trip is sh. 50,000 for the lorry and shs.15, 000 for a pick up. He has shs.180, 00 available to transport the sugar. The pickup makes more trips than the lorry. If x is the number of trips to be made by the lorry and y the trips to be made by the pick up;
    a) Write down the five inequalities to represent the given information. (05 marks)
    b) Represent the inequalities in the graph (06 marks)
    c) Use the graph to find the possible number of trips to be made by the lorry and the pickup Hence find the minimum cost of transporting the bags of sugar. (04 marks)

11. The equation of a curve is $y=3+2x-x^2$,

a) Determine the:
   i. Coordinates and the nature of turning point of the curve. (06 marks)
   ii. Y and x intercept of the curve (04 marks)

b) (i) sketch the curve (02 marks)
   (ii) Find the area enclosed by the curve and x-axis. (03 marks)

12.

a) Solve the differential equation $3y\frac{dy}{dx} = \frac{1}{x^2}$ given that y =2 when x = 1. (05 marks)

b) The rate of birth of children is directly proportional to the number of children being b
at a given time t in years. Given that initially 20 children are born and after 4 years th
increase by 10. If N is the number of children being produced at any time t.

   i. Form a differential equation connecting N and t.
   ii. Solve the differential in (i) above.
   iii. Find the time taken for the number of children to increase to 80. (10 marks

## PART TWO: STATISTICS

13. Ten students scored the pair of marks in Economics and mathematics as follows;

A(62,75,) B(54,58), C(46,46), D(34,37), E(54,37), F(36,45), G(24,11), H(17,22), I(47,
and J(70,70).

a)
   i. Draw a scatter diagram of economics (x) and mathematics(y)
   ii. Draw a line of best fit and estimate the score in mathematics for a studer
   scored 52 in economics. (08 marks)

b) Calculate the rank correlation coefficient between the score of economics and
mathematics and hence comment on your result. (07 marks)

14. The table below shows the probability distribution of the number of decoders sold by a
TV agent in a certain town.

| Number of decoders sold (x) | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Probability P(X=x) | 0.02 | 0.34 | d | 0.41 | 0.10 | 0.06 |

Determine:

a) Value of d (03 marks)
b) E(x) (05 marks)
c) Standard deviation (05 marks)
d) $P(X \leq 3)$ (02 marks)

15. The table below shows the marks scored in mathematics examination by students in a certai school.

| Marks (%) | Number of students |
|---|---|
| 30-39 | 12 |
| 40-49 | 16 |
| 50-59 | 14 |
| 60-69 | 10 |
| 70-79 | 8 |
| 80-89 | 4 |

a) Use the distribution table to calculate;
   i. The mean 52.79 (04 marks)
   ii. The median mark (04 marks)
b) Plot a histogram and use it to estimate the modal mark (07 marks)

16. The table below shows the tax collection of a town council in millions of shillings for six consecutive months.

| Month | Jan | Feb | Mar | April | May | June |
|---|---|---|---|---|---|---|
| Tax (in millions) | 21.5 | 24.3 | 21.8 | 26.2 | 22.7 | 28.9 |

a) Construct the 3-month moving averages for the given data (06 marks)
b) Plot the 3-month moving averages and the original data on the same axes marks)
c) Use your graphs to estimate the town council's tax collection for the month o July. (03 marks)

END.