S475/1
SUBSIDIARY MATHEMATICS
AUGUST - 2025
2 hours 40 min

JINJA JOINT EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

MOCK EXAMINATIONS – JULY / AUGUST, 2025

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 min

INSTRUCTIONS TO CANDIDATES

- ✓ *This paper consists of two sections; **A** and **B**.*
- ✓ *Section **A** is **compulsory.***
- ✓ *Section **B** consists of **two** parts; **one** and **two**. Answer only **four** questions from this section, choosing **at least one** question from each part.*
- ✓ *Any additional question(s) answered 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 answer 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.*

 Turn Over

SECTION: A (40 MARKS)

1. The roots of the equation $2x^2 - px + q = 0$ are m and n and that $m + n = 6$ and $m^2 + n^2 = 18$. Find the values of p and q. *(05 marks)*

2. Find the probability of arranging the letters of the word "**COMPREHENSIVE**" in a line if the E_s are separated. *(05 marks)*

3. Given matrices $A = \begin{pmatrix} 4 & 1 \\ -1 & 2 \end{pmatrix}$ and $B = \begin{pmatrix} -5 & -2 \\ -3 & -4 \end{pmatrix}$. Find $det(AB)$. *(05 marks)*

4. Solve the equation $3cot\theta = 2sin\theta$ for $0^0 \leq \theta \leq 360^0$. *(05 marks)*

5. The table below shows the points obtained by 8 teams in two rounds of a particular tournament.

Team	A	B	C	D	E	F	G	H
Round 1(x)	22	51	30	40	50	40	39	29
Round 2(y)	27	42	35	37	49	40	31	26

Calculate the spearman's rank correlation coefficient and comment on your result. *(05 marks)*

6. Differentiate $y = \frac{2(x^2-1)^2}{x^2}$ with respect to x. *(05 marks)*

7. The table below shows the number of counter books sold at St. George's book house and the 3-monthly moving averages.

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Number of counter books sold	57	50	a	60	b	61	c	47
3-monthly moving averages.		49	50	56	d	64	57	

Determine the values of a, b, c and d. *(05 marks)*

8. A continuous random variable X has a probability density function given by;

$$f(x) = \begin{cases} a(x^2 - 1); 0 \leq x \leq 3 \\ 0; \quad elsewhere \end{cases}$$

where a is a constant

Find the;

(i) value of a *(02 marks)*

(ii) $E(X)$. *(03 marks)*

Turn Over

SECTION B: (60 MARKS)

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 certain man in Bwayuya village would like to construct rentals (single rooms and double rooms). Altogether, he needs to have **a maximum** of 15 rentals. A single room requires shs 9 million to construct it and a double room rental requires shs 10.5 million to construct it. The man has **a minimum** of 63million for construction. There must be **at least** 3 single rooms according to his plan. He also needs to have **more** double rooms than single rooms. In that area, they charge shs 80,000 for a single room and shs 180,000 for a double room rental per month.

   Using x and y to denote the number of single rooms and double rooms constructed respectively;

   (a) Write down **four** inequalities to represent the above information. ***(04 marks)***

   (b) Represent the above inequalities on a graph by shading the unwanted regions ***(07 marks)***

   (c) List all the possible combinations of single rooms and double rooms that the man must construct to maximize revenue and hence find the maximum revenue per month. ***(04 marks)***

10. **(a)** $2x + 3, x + 3$ and $x + 5$ are the three consecutive terms in a geometric progression(G.P). Find the two possible values of the common ratio. ***(07 marks)***

    (b) The 7^{th} term of an arithmetic progression (A.P) is 40 and the sum of the first 12 terms is 540.

    Find the;

    (i) common difference of the A.P. ***(05 marks)***

    (ii) first term of the A.P. ***(03 marks)***

11. The position vectors of points A, B, C and D are $-2i - 4j$, λi, $5i + 2j$ and βj respectively where λ and β are scalars and that the dot product of vectors $\overrightarrow{OB}$ and $\overrightarrow{OC}$ is 15 and that of $\overrightarrow{OC}$ and $\overrightarrow{OD}$ is -14.

    (a) Find;

    (i) the values of the scalars λ and β. ***(06 marks)***

    (ii) $\overrightarrow{AB}$ ***(02 marks)***

    (iii) $\overrightarrow{BD}$ ***(02 marks)***

    (b) Find the angle between vectors $\overrightarrow{AD}$ and $\overrightarrow{CD}$ ***(05 marks)***

 Turn Over

12. (a) Solve the differential equation $2y\frac{dy}{dx} - 3x^2 = 4$; given that $y(1) = 3$ *(05 marks)*

(b) The rate of increase of the number of people (x) suffering from flu at a certain school is proportional to the number of people infected at any time(t). Initially, 100 students had been infected. After 2 days the number of students with flu had tripled.

(i) Form a differential equation to model the above statement. *(02 marks)*

(ii) Solve the above differential equation. *(05 marks)*

(iii) Determine when the number of students with flu will reach 800. *(03 marks)*

PART TWO: STATISTICS

13. The table below shows the marks (%) obtained by candidates in a subsidiary mathematics test in a certain school.

Marks(%)	$0-<20$	$20-<40$	$40-<60$	$60-<80$	$80-<100$
Number of candidates	5	11	28	9	12

(a) Calculate the;

(i) mean mark

(ii) median mark *(07 marks)*

(b) Draw a cumulative frequency curve (Ogive) and use it to estimate the number of candidates who scored;

(i) less than 30%

(ii) above 56% *(08 marks)*

14. A discrete random variable X has a probability distribution as the shown below;

$P(X = -1) = 0.1,\ P(X = 0) = 0.2,\ P(X = 1) = a,\ P(X = 2) = 0.3$ and $P(X = 3) = b$. Given that $P(X < 2) = 0.45$.

(a) Find the;

(i) value of a and b. *(04 marks)*

(ii) $E(X)$ *(04 marks)*

(iii) $P\left(x \geq 1 / x \leq 2\right)$ *(04 marks)*

(b) Sketch the distribution. *(03 marks)*

 Turn Over

15. The prices of some selected items used by a certain bakery to make bread are as shown below.

ITEM	PRICES		WEIGHT
	2020	**2022**	
Eggs per tray	10500	12,000	3
Wheat flour per kg	5800	6400	15
Sugar per kg	4400	4000	7
Food colour per packet	1200	1500	2
Milk per litre	1800	2200	5

Using 2020 as the base year,

(a) Calculate the;

(i) price relative for each item *(05 marks)*

(ii) simple aggregate price index. *(03 marks)*

(iii) weighted aggregate price index and comment on your result. *(04 marks)*

(b) Estimate the price of an item in 2022 given that its price was UGX. 5200 in 2020. *(03marks)*

16. The weights of apples produced at a certain farm are normally distributed with mean weight of 200g and variance of 121g.

(a) Find the probability that an apple selected at random weighs;

(i) less than 190g *(03 marks)*

(ii) more than 207g *(03 marks)*

(iii) between 195g and 209g *(04 marks)*

(b) Given that 75% of the apples produced on a certain day at the farm weighed above x grams. Find the value of x *(05 marks)*

 End