

S475/1

SUB-SIDIARY MATHEMATICS

July/ August 2023

2 Hours 40 Minutes

ASSHU ANKOLE JOINT MOCK EXAMINATIONS 2023

Uganda Advanced Certificate of Education

SUB-SIDIARY MATHEMATICS

2 Hours 40 Minutes

INSTRUCTIONS TO CANDIDATES

- Answer **all eight** questions in section **A** and **four** questions from section **B** with at least **one** question each part (ie Part I- Pure Mathematics and Part II Statistics)
- Each of **4** questions attempted in Section **B** carry 15 marks.
- All 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.

SECTION A (40 MARKS)

1. The roots of the equation $3x^2 - 4x + 3 = 0$ are α and β . Find the value of $\left(\frac{\alpha}{\beta} + 1\right)\left(\frac{\beta}{\alpha} + 1\right)$ (5marks)

2. Two events A and B are such that $P(A) = 0.7, P(B) = 0.2$ and $P(A/B) = 0.1$. Find

(i) $P(A \cup B)$ (03 marks)

(ii) $P(A \cap B')$ (02 marks)

3. Solve the simultaneous equations using matrix method.

$$2x - 3y = 8$$

$$4x + y = 2$$

(05 marks)

4. Evaluate $\int_2^5 \left(\frac{2x^5 + 3x^2}{x^2} \right) dx$ (05 marks)

5. The table below shows production of Tea (in kg) in Muhinga county

Year	Months		
	1 st	2 nd	3 rd
2016	490	410	380
2017	520	420	405
2018	560	450	415

Calculate a four – point moving average for the data. (05 marks)

6. The probability that Allen wins a game is $\frac{2}{3}$. She plays 8 games. What is the probability that she wins

(i) exactly 5 games $\frac{dy}{dx}$ (02 marks)

(ii) at least 7 games (03 marks)

	A	A'
B	B∩A	B∩A'
B'	B'∩A	B'∩A'

7. Solve the differential equations $\frac{dy}{dx} = \frac{x^2 - 1}{y}$, given that $x = 3$ and $y = 2$

(05 marks)

8. The table below shows shopping costs (in UGX) for a student for the years 2020 and 2021.

Item	Shopping costs (in UGX)		Weight
	2020	2021	
Millet flour	10,000	12,000	3
Soap	5,000	7,000	2
Sugar	4,000	5,000	1

$$\text{price index} = \frac{\text{current}}{\text{base}} \times 100$$

$$A.P.I = \frac{\text{price index}}{\text{price index}} \times \text{weight}$$

$$\frac{\sum A.P.I}{\sum w}$$

$$\alpha^2 + \beta^2 = (\alpha + \beta)^2 - 2\alpha\beta$$

Using the year 2020 as the base year, calculate the weighted aggregate price index.

SECTION B (60 MARKS)

Part I (Pure Mathematics)

9. (a) Given that $\tan A = \frac{4}{3}$ and A is acute angle. Find the value of $\cot A + \sec A$. (06 marks)
- (b) Solve the equation $10 \cos^2 \theta + 9 \sin \theta = 12$ for $0^\circ \leq \theta \leq 360^\circ$ (09 marks)
10. (a) In an arithmetic progression (A.P), the third term is 10 and ninth term is four times the second term. Find;
- (i) first term and common difference of the progression (06 marks)
- (ii) sum of the first twenty terms. (03 marks)
- (b) Find the sum of the Geometric progression
 $1024 + 512 + 256 + \dots + 1$ (6 marks)
11. Points A (5, 2), B(3, 7) and C(9, -2) lie in the same x-y plane.
- (a) Find (i) BA and BC (04 marks)
- (ii) Angle ABC (06 marks)
- (b) Find the coordinates of point D such that AC = 2BD. (5 marks)
12. The equation of the curve $y = x(8 - x)$. Determine
- (i) the coordinates and nature of the turning point of the curve. (06 marks)
- (ii) Sketch the curve (04 marks)
- (iii) Find area enclosed between the curve and the x-axis (05 marks)

at
at
at

PART II (STATISTICS)

13. A continuous random variable x , has probability density function (pdf) given by

$$f(x) = \begin{cases} k(4x - x^2) & 0 \leq x \leq 4 \\ 0 & \text{else where} \end{cases}$$

where k is a constant. Find the

- (i) value of a constant k (4 marks)
- (ii) $P(X < 2)$ (4 marks)
- (iii) $E(X)$ (3 marks)
- (iv) $\text{Var}(X)$ (4 marks)
14. The table below shows marks of students obtained in a sub-math test marked out of 30.

Marks	10-12	13-15	16-18	19-21	22-24	25-27	28-30
Number of students	3	7	16	10	8	5	1

(a) Draw a histogram and use it to estimate the modal mark (06 marks)

(b) Calculate the

(i) mean mark

(ii) standard deviation

(09 marks)

15. Telephone calls from school office are monitored and found to be normally distributed with mean duration of 452 seconds and standard deviation of 123 seconds. Determine

a) The probability of the length of a call being between 300 and 480 seconds (7marks)

b) The proportion of calls likely to last for more than 720 seconds. (8 marks)

16. Eight applicants for a certain job obtained the following marks in aptitude and written tests

Applicant	A	B	C	D	E	F	G	H
Aptitude test (x)	33	45	30	42	46	35	40	48
Written tests (y)	57	60	40	70	58	48	54	68

(a) (i) Draw a scatter diagram for the data.

(ii) Draw a line of best fit on your scatter diagram.

(iii) Use the line of best fit to find the value of x when y = 55

(8 marks)

(iv) Calculate the spearman's rank correlation coefficient. Comment on it.

(07 marks)

$$\frac{1}{2} d^2$$

$$1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

END

$$Z = \frac{x - m}{s}$$