

EXAMINATION PAPER TWENTY FROM THE SUB MATHS CLINIC

S475/1

SUBSIDIARY MATHEMATICS

Paper 1

June 2024

$2\frac{2}{3}$ hours

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

*Attempt all **eight** questions in Section **A** and any **four** from Section **B** with at least one question from each part. Any additional question(s) will not be marked.*

All necessary working must clearly be shown.

Graph papers are 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 $\log_2 x + \log_2 x^2 + \log_2 x^3 = 24$. Find the value of x . (05marks)

2. Events A and B are independent such that $P(A) = 0.3$ and $P(B) = 0.2$, Find;

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

(ii) $P(A \cap B)$ (05marks)

3. Given that 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 $M = M + R = P^2 + 3Q$ (05marks)

4. The mean of n number is 5. If the number 13 is included with the n numbers, the new mean becomes 6. Find the value of n. (05marks)

5. Solve the differential equation $\frac{dy}{dx} = \frac{x+1}{y}$.

Hence find the solution given that $y = 5$ at $x = 2$. (05marks)

6. The monthly price of a bunch of banana in 2015 is as follows;

Months	Jan	Feb	March	April	May	June	July	Aug
Price (Shs)	4500	5000	5200	5500	6000	6500	5700	7000

Calculate the 4-months moving average for the data. (05marks)

7. Show that $\sin(x + 60)^\circ + \sin(x - 120)^\circ = 0$ (05marks)

8. A discrete random variable x has a probability distribution given by

$$P(x = x) = \begin{cases} kx : x = 1, 2, \dots, 5 \\ 0 & \text{elsewhere.} \end{cases}$$

(i) Determine the value of k

(ii) Find the mean (05 marks)

SECTION B (60 MARKS)

Attempt four questions with at least one question from each part

PART ONE: PURE MATHEMATICS

PART TWO

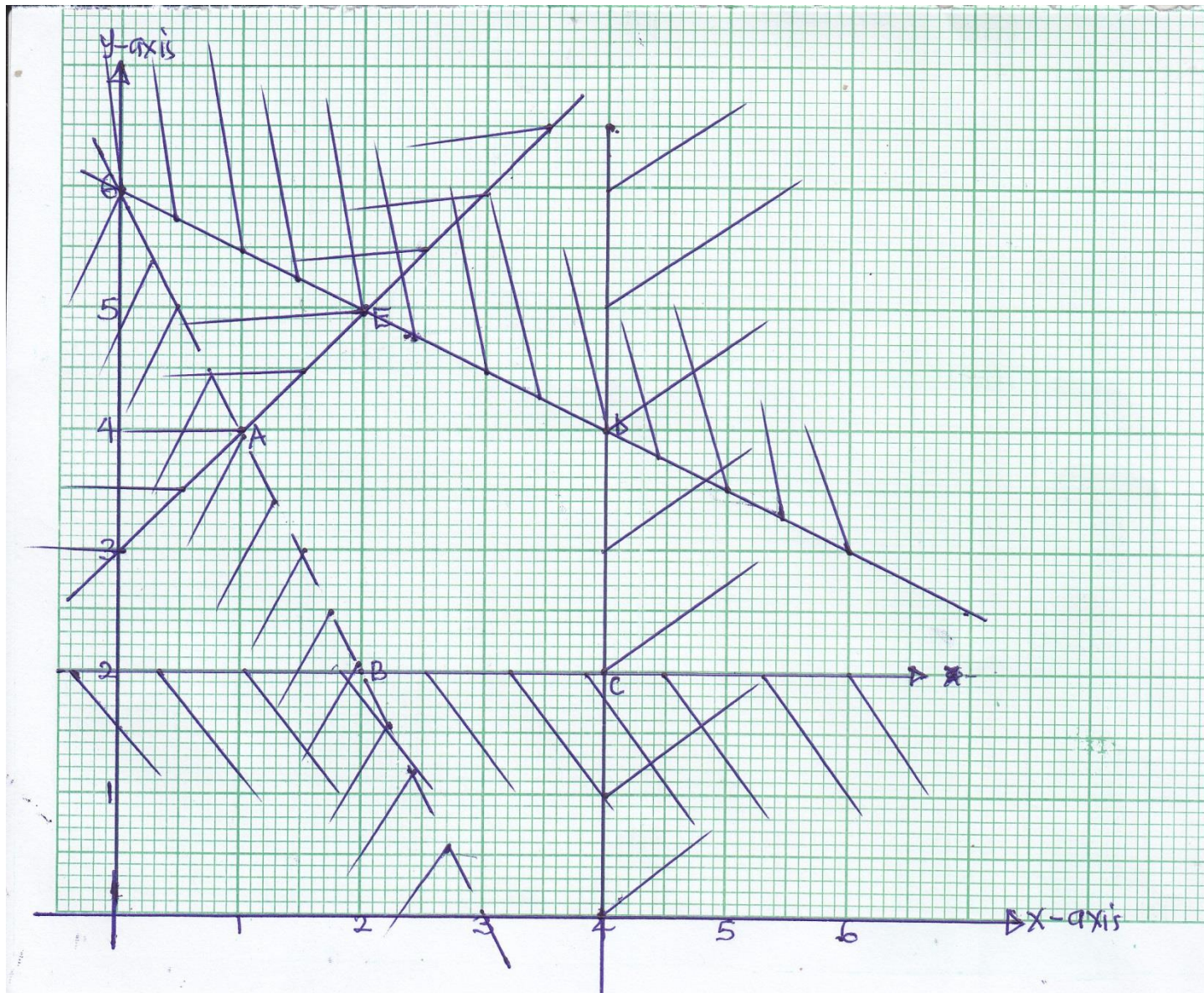
9. (a) The sum of the 5th, 6th and 7th terms of an arithmetic progression is 95 and 10th term is 49. Find the;
- (i) Common difference and first term (07marks)
- (ii) Sum of the first 22 terms of the progression. (02marks)
- b) An employee decided to make monthly savings of his salary by starting with Shs. 60,000 in January 2010. He constantly increased the savings every month by Shs. 5,000. Find the total of his savings at the end of August 2011. (06marks)
10. A curve has the equation $y = x^3 - \frac{3}{2}x^2 - 6x + 12$.
- (a) Write down an expression for $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.
- (b) Find the x – coordinates of the two stationary points on the curve. Hence determine the nature of the stationary values. (15marks)
11. A hot body at a temperature of 100⁰C is placed in a room of temperature 20⁰C. Ten minutes later, it's temperature is 60⁰C.
- (a) Form a differential equation for the rate of change of temperature θ of the body with time, t (03 marks)
- (b) Solve the differential equation formed in (a) above. (10 marks)

(c) Determine the temperature of the body after a further 10 minutes ie; When

$t = 20$ minutes.

(02 marks)

12. In the figure below A,B,C,D and E are vertices of the feasible region.



(a) Find all the inequalities, which satisfy the feasible region.

(b) Use that graph to minimize $7x + 2y$.

(c) Find the area enclosed by the feasible region

(15 marks)

PART TWO: STATISTICS

13. (a) Events A and B are independent where $P(A \cap B) = \frac{1}{4}$ and

$$P(A \cup B) = \frac{1}{4}. \text{ Find;}$$

- i) $P(A)$
 - ii) $P(B)$ (07marks)
- (b) At a certain police traffic checking point, the probability that a driver is found drunk is 0.6. Out of 8 drivers checked, find the;
- i) Expected number of drunkard drivers
 - ii) Probability that exactly 3 drivers are found drunk
 - iii) Probability that more than 6 drivers are found drunk (08marks)

14. The following table shows the number of pairs of shoes sold by a certain shoe company in each quarter of the years 2013, 2014 and 2015.

Year	Quarter			
	1	2	3	4
2013	234	926	653	431
2014	275	978	704	472
2015	296	1003	728	498

- (a) Calculate the four point quarterly moving averages. (06 marks)
- (b) On the same axes, plot and draw graphs of the given data and the four point moving averages. (06 marks)

- (c) Use your graph in (b) to estimate the number of shoes which were sold in the first quarter 2016. (03marks)

15. The frequency distribution table below shows the heights of 80 students to the nearest cm.

Heights (cm)	Number of student
150-154	3
155-159	7
160-164	10
165-169	15
170-174	25
175-179	12
180-184	6
185-189	2

- (a) Calculate the mean and standard deviation. (09 marks)
- (b) Plot an Ogive and use it to estimate the median mark (06 marks)

16. A continuous random variable x has a probability density function given by

$$f(x) = \begin{cases} \frac{k}{2} & 0 \leq x \leq 2 \\ \frac{k}{2}(3-x) & 2 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

- (a) Sketch the graph of $f(x)$ (04 marks)
- (b) Hence or otherwise determine the value of k . (04 marks)
- (c) Find (i) mean (04 marks)
- (ii) $P(0.5 < x < 1.5)$ (03 marks)

END

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