S475/1
SUBSID.MATHEMATICS
Paper 1
2022
$2\ ^{2}/_{3}$ hours

MATIGO MOCK EXAMINATIONS 2022

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

Answer **all** *the* **eight** *questions in section and only* **four** *questions in section* **B**.

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 *working* **must** *be shown clearly.*

Begin each answer on a fresh sheet of paper.

Where necessary, take acceleration due to gravity $g = 9.8ms^{-2}$

Graph paper is provided.

Silent non-programmable scientific calculators and mathematical tables with a list formula may be used.

 Turn Over

SECTION 40 MARKS

Answer **all** *questions in this section*

1. The roots of the equation $3x^2 - 3\rho x - 1 = 0$ and $\propto$ and β. Given that $\propto^2 + \beta^2 = \frac{10}{9}$. Find the possible values of ρ. *(5 marks)*

2. A constant **C** is added to 5, 7, and 11 to give the first three terms of a geometric progression. Determine the;

i) Value of **C**.

ii) Common ratio. *(5 marks)*

3. The position vectors $\underset{\sim}{O\rho} = \begin{pmatrix} -5 \\ 12 \end{pmatrix}$ and $\underset{\sim}{Oq} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$ form the sides of a triangle **OPQ**. Use vectors to find angle **OPQ.** *(5 marks)*

4. Find the number of possible arrangements of the letters in the word **SOLOMON** in which all the O's are not together. *(5 marks)*

5. Two events **A** and B are such that $(A) = \frac{3}{5}$, $P(B) = \frac{1}{4}$. Find the probability of A or B, if **A** and **B** are;

(i) Mutually exclusive

ii) Independent events. *(5 marks)*

6. Two judges **X** and **Y** placed in order of performance of six houses **ABC……F** in a music and dance competition of a certain school as shown in the table below.

House	A	B	C	D	E	F
Judge X	3	1	4	1	5	6
Judge Y	4	6	3	5	2	1

Calculate a rank correlation coefficient and comment on whether the judges had any thing in common. *(5 marks)*

7. Three items required by a certain family were food **(F),** water **(W)** and shelter **(S)**. The monthly expenditure on **F**, **W**, and **S** were shillings 150,000, 108, 000 and 120,000 respectively. If **F** and **W** were each twice as important as **S**, Using shelter as the base, determine the weighted price index and comment on the cost of living.

(5 marks)

8. Three forces of 2N, $2\sqrt{3N}$, and 8N act in the direction of S 030^0 E, N 060^0 W, and N 090^0 W respectively. Find the magnitude of the resultant force. *(5 marks)*

SECTION B (6 MARKS)

*Answer only **four** questions*

9. The table below shows the ages at which men marry in a certain society.

19	22	28	22	19	20
30	24	29	21	36	31
34	21	26	23	39	33
32	27	25	37	36	18
17	22	27	25	21	35
16	21	38	26	24	38

a) Starting with a lowest age of 16 years form a frequency distribution table with classes of width 5 years. Use the table to find to one decimal place the;

i) Mean age.

ii) Standard deviation. *(10 marks)*

b) Draw a histogram and use it to find the modal age at which men marry. *(5 marks)*

10. The following table below shows the termly expenditure in million shillings of a certain school on food and other utilities for the years 2014 to 2017.

YEAR	**TERM**		
	1	**2**	**3**
2014	23.4	92.6	65.3
2015	43.1	27.5	97.8
2016	70.4	47.2	29.6
2017	100.3	72.8	49.8

a) Calculate a four point moving averages.

b) i) On the same axes, plot and draw graphs of the original data and the four – point moving averages.

ii) Comment on your answer basing on the original data and the moving average.

c) Use your graph in (b) to estimate the amount that will be spent by the school in 1^{st} term of 2018. *(15 marks)*

11. a) A continuous random variable **X** is given by X~ N (20, 25)

Determine,

i) $P(x < 24.3)$

ii) $P(x < 18.5)$

iii) $P(14.4 < x < 25.9)$. *(9 marks)*

b) The probability density function (p. d. s) of a random variable **X** is given by

$$f(x) = \begin{cases} kx\ ; 0 < x < 1 \\ \frac{-k}{2}\ (x - 3)\ ; 1 < x < 3 \\ 0 \quad \text{else where} \end{cases}$$

i) Sketch $f(x)$ and hence or otherwise find the value of **K**.

ii) Determine $P\left(x \geq \frac{1}{2}\right)$. *(6 marks)*

12. a) Given the matrix A = $\begin{pmatrix} 3 & 0 & 2 \\ 0 & -1 & 2 \\ 0 & 3 & -2 \end{pmatrix}$. Show that 12 **I** = 13A – A^3, where **I** is a 3×3 identify matrix. *(9 marks)*

b) Use matrix method to solve the simultaneous equations
$15x - 6y = 3,\ 6x + 9y = 24.$ *(6 marks)*

13. The gradient function of a curve is given by $\frac{dy}{dx} = 3 - 2x$.

a) Given that the curve passes through $P(0,4)$. Find the equation of the curve. *(4 marks)*

b) Determine the co- ordinates of turning points (s) on the curve hence sketch the curve. *(6 marks)*

c) Find the area enclosed between the X –axis and the curve. *(5 marks)*

14. The motion of a lift, when ascending from rest is in three stages. First it accelerates at $3ms^{-2}$ until it reaches a certain speed. It then maintains this speed for a certain period of time after which it slows with a retardation of $2.4ms^{-2}$ until it comes to rest.

a) Find the reaction between the floor of the lift and two passengers whose total mass is 150kg, for each of the three stages.

b) If the time of acceleration was 2 seconds, find the steady speed reached at the end of this time.

c) Given that the total time taken from start to stop in 8 seconds, draw a velocity time graph for the journey of the lift and use it to find the time it took while moving at a steady speed.

END