SAMPLE EXAMINATION PAPER ONE

S475/1
SUBSIDIARY
MATHEMATICS
Paper 1
May June 2023
2 hours 40 mins

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

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INSTRUCTIONS TO CANDIDATES:

Attempt all **eight** *questions in* Section **A** *and any* **four** *from* Section **B with** atleast one question from each part.

All necessary working must clearly be shown.

Any additional question(s) wil not be marked.

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. If *A* and *B* are independent events such that $\boldsymbol{P}\ (A) = ¼$ and $\boldsymbol{P}\ (B) = \frac{3}{5}$ find

(i) $\boldsymbol{P}\ (AUB)$
(ii) $\boldsymbol{P}\ (A'UB')$ *(05 marks)*

2. Find the angle between the vectors $\boldsymbol{a} = 2\boldsymbol{i} + 3\boldsymbol{j} + \boldsymbol{k}$ and $b = 3\boldsymbol{i} - \boldsymbol{j} + 2\boldsymbol{k}$. *(05 marks)*

3. 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. *(05 marks)*

4. Ndeeba cell wants to choose a committee of 9 people from 10 men and 8 women. It can consist either of 5 men and 4 women or 4 men and 5 women. How many different committees can be chosen? *(05 marks)*

5. Show that $\text{Sin}(x + 60)^0 + \text{Sin}(x - 120)^0 = 0$ *(05 marks)*

6. *X* has probability distribution as shown the table below.

X	1	2	3	4	5
P (X = x)	*a*	*3a*	*7/20*	*1/5*	*1/20*

Find the average of *a* and *E(x).* *(05 marks)*

7. Solve the differential equation: $\frac{dy}{dx} = \frac{2x}{y+1}$ *(05 marks)*
Given that $y = 2$, when $x = 1$.

8. Use crammers rule to solve the simultaneous equations
$3x - y = 4$
$5x + 9y = -30$ *(05 marks)*

SECTION B (60 MARKS)

Attempt four questions with at least one question from each part

PART ONE

9. The table below shows the number of printed copies in thousands and their cost in millions.

Number of printed copies ***(x)*** *(000s)*	14	29	55	74	18	36	61	79
Cost of printing ***y*** *(000,000s)*	96	81	54	38	93	73	50	35

(a) Draw a scatter diagram to represent the data and comment. *(06 marks)*

(b) Calculate Spearman's rank correlation coefficient and comment. *(07 marks)*

(c) Estimate the cost of printing 40,000 copes. *(01 mark)*

10. The table below shows the prices in US dollars and weights of the five components of an engine in 1998 and 2005.

Component	**A**	**B**	**C**	**D**	**E**
Price *($) 1998*	35	70	43	180	480
Price *($) 2005*	60	135	105	290	800
Weight	6	5	3	2	1

Taking 1998 as the base year:

(a) Calculate for 2005 the
- (i) simple aggregate price index. *(05 marks)*
- (ii) price relative of each component. *(05 marks)*
- (iii) weighted aggregate price index. *(03 marks)*

(b) Estimate the cost of an engine in 1998 given that its cost in 2005 was US$ 1600. *(02 marks)*

11. (a) In a group, the expected number of people who wear watches is 4 and variance is 3.2. if the number of people who wear watches follows a binomial distribution, find the probability that:
- (i) a person chosen at random from the group wears a watch. Hence find the number in the group. *(05 marks)*
- (ii) 7 people in the group wear watches. *(02 marks)*

(b) The mean weight of pawpaws is approximately normally distributed with mean 1.8 kg and standard deviation 0.3 kg. Calculate the probability that a pawpaw picked at random will weight:

(i) more than 1.63 kg. *(03 marks)*

(ii) between 1.68 kg and 2.10 kg. *(05 marks)*

12. In an investigation carried out, the masses of 50 animals were noted and recorded as below.

88	108	113	103	104	100	105	86
92	116	117	102	100	110	99	106
116	101	105	83	103	100	95	109
92	108	92	99	107	98	105	113
101	96	107	101	118	106	102	97
93	101	111	96	93	92	87	118
114	101						

(a) Construct a frequency distribution table with equal class intervals of 5kg taking 85-89 as the first class.

(b) Calculate the mode weight. *(05marks)*

(c) Draw a cumulative frequency curve and use it to estimate.

(i) Semi-interquartile range.

(ii) The 80^{th} percentile *(10marks)*

PART TWO

13. (a) Solve for x and y given that:

$$\begin{pmatrix} x+2y & 14 \\ -3 & y-2 \end{pmatrix} = \begin{pmatrix} 4 & 14 \\ -3 & 3x+7 \end{pmatrix}$$

(06 marks)

(b) A poultry farm has three units *A*, *B* and *C*. every month, Unit *A* produces 30 trays of eggs and 20 broilers, Unit *B* produces 40 trays of egs and 15 broilers and Unit *C* produces 35 trays and 10 broilers. A tray of eggs costs Shs 3,000 and Shs 4,000 for each broiler.

(i) Represent the above information in a 3 x 2 matrix for the eggs and broilers. *(01 mark)*

(ii) Form a 2 x 1 cost matrix. *(01 mark)*

(iii) Find the total sales at the farm given all eggs and broilers were sold. *(05 marks)*

(iv) If the farm pays 17% to URA, find its total income. *(02 marks)*

14. (a) By completing square, solve the equation $2x^2 - 3x - 5 = 0$ *(04marks)*

(b) Find the equation whose roots are $\frac{3}{5}$ and $\frac{1}{2}$. *(04marks)*

(c) The roots of the equation $3x^2 + 2x - 4 = 0$ are a and b.

Find the equation whose roots are $\frac{1}{a}$ and $\frac{1}{b}$ *(07marks)*

15. Given the curve $y = 6 - x - x^2$.

(a) Find the turning point of the curve and determine its nature.

Hence sketch the curve. *(10marks)*

(b) Find the area bound by the curve and the x - axis between $x = -3$ and $x = 2$. *(05marks)*

16. Mr. Kato is going to bake chocolate cakes and yellow cakes to sell. He wants at least two chocolate cakes. Besides, he wants more yellow cakes than chocolate cakes. Due to limited time and facilities, he cannot bake more than ten cakes. The chocolate cakes are to be sold for Shs. 1500 each and the yellow cakes for Shs. 1000 each. To make profit, more than Shs. 8000 must be realized from the sales. (Suppose he bakes x chocolate cakes and y yellow cakes).

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

(b) (i) On the same axes, plot the graphs of the inequalities and shade the unwanted regions. *(06 marks)*

(ii) List all the possible numbers of chocolate cakes and yellow cakes Mr. Kato can bake. *(03 marks)*

(c) How many cakes of each type should Mr. Kato bake in order to make the maximum profits? *(02 marks)*

END