

S475/1
SUBSID. MATHEMATICS
Paper 1
Nov/ Dec. 2014
2½ hours



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 40 minutes

INSTRUCTIONS TO CANDIDATES:

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

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 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.

Where necessary, take $g = 9.8 \text{ ms}^{-2}$

SECTION A: (40 MARKS)

Answer all the questions in this section

1. The roots of the equation $2x^2 + 4x - 1 = 0$ are α and β . Find the value of $\alpha^2 + \beta^2$. (05 marks)
2. The ninth term of an Arithmetic Progression (A.P) is greater than the fifth term by 6. The sum of the first twelve terms is 123. Find the:
 - (a) common difference of the A.P. (03 marks)
 - (b) first term of the A.P. (02 marks)
3. (a) How many arrangements can be made using the letters in the word "TROTting"? (03 marks)
(b) In how many of these arrangements are the letters N and G next to each other? (02 marks)
4. Solve the differential equation $\frac{dy}{dx} = 2x + 5$, given that $y = -1$ when $x = 3$. (05 marks)
5. A class of n students sat for a Mathematics test. Given that $\sum fx = 400$, $\sum fx^2 = 6500$ and the mean $\bar{x} = 16$, where x is the mark and f the frequency; determine the value of
 - (a) n . (02 marks)
 - (b) the standard deviation. (03 marks)
6. Show that $\sec^2 \theta + \operatorname{cosec}^2 \theta = \sec^2 \theta \operatorname{cosec}^2 \theta$. (05 marks)
7. In a Binomial experiment, the probability of a success for n trials is 0.6. If the mean is 7.2, find the
 - (a) value of n . (02 marks)
 - (b) probability of obtaining 7 successes. (03 marks)
8. A cyclist rides along a straight road from shop P to shop Q . He passes shop P with a velocity of 2 ms^{-1} and accelerates uniformly at 1.25 ms^{-2} until he attains a velocity of 12 ms^{-1} at shop Q . Find the:
 - (a) time taken by the cyclist to reach Q . (03 marks)
 - (b) distance PQ . (02 marks)

SECTION B: (60 MARKS)

Answer only four questions from this section.

9. The table below shows the marks of 8 students in the mid-term test and end of term test in Economics.

Mid-term tests (x)	99	71	50	67	77	81	96	72
End of term test (y)	99	55	35	60	75	70	99	50

- (a) (i) Draw a scatter diagram for the data.
(ii) On the same diagram draw a line of best fit.
(iii) Use the line of best fit to find the value of y when $x = 85$.
(08 marks)
- (b) Calculate the Spearman's rank correlation coefficient. Comment on your result.
(07 marks)

10. (a) Given that $A = \begin{pmatrix} 2 & -3 \\ 1 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 4 & 1 \\ 0 & -2 \end{pmatrix}$;

find

- (i) AB
(ii) BA .

Comment on your result.

(05 marks)

- (b) A family bought the following items for three successive days. The first day it bought three bunches of matooke, two kilograms of rice, five kilograms of meat and two kilograms of sugar. The second day it bought only one kilogram of sugar. The third day the family bought a bunch of matooke and two kilograms of rice. A bunch of matooke costs Shs15,000. A kilogram of rice, meat and sugar cost Shs3,300, Shs8,000 and Shs3,000 respectively.

- (i) Represent the family's requirements in a 3×4 matrix.
(ii) Write down the cost of each item as a column matrix.
(iii) Use the matrices in b (i) and (ii) to find the family's total expenditure for the three days.
(10 marks)

11. (a) The table below shows the price (U Shs) of flour and eggs in the years of 2000 and 2010.

COMMODITY	PRICE (UShs)	
	2000	2010
Flour (kg)	3000	5000
Eggs (1tray)	5000	7000

Taking 2000 as the base year, calculate the:

- (i) price relative of each commodity.
(ii) simple aggregate price index.

Comment on your result.

(08 marks)

- (b) The data below shows items with their corresponding price relatives and weights

ITEM	PRICE RELATIVE	WEIGHT
Food	120	172
Clothing	124	160
Housing	125	170
Transport	135	210
Others	104	140

- (i) Find the cost of living index.
(ii) Comment on your result.

(07 marks)

12. Given the curve $y = 3x^3 - 4x^2 - x$;

- (a) find the turning points of the curve. (10 marks)
(b) distinguish between the nature of the turning points. (05 marks)

13. The table below shows the probability distribution of the number of Compact Discs (CDs) sold.

Number of CD's (x)	0	1	2	3	4
Probability, $P(X = x)$	0.05	0.28	c	0.22	0.09

Determine the:

- (a) value of c . (03 marks)
(b) probability that at least 2 CD's are sold. (03 marks)
(c) expectation, $E(X)$. (03 marks)
(d) standard deviation. (06 marks)

14. (a) A brick of mass 750 g is dragged by a horizontal force at a uniform speed along a rough horizontal surface, through a distance of 20 m. The work done against friction is 49.8 J. Calculate the coefficient of friction between the brick and the surface. (06 marks)
(b) A truck of mass 8 tonnes has a maximum speed of 20 ms^{-1} up an incline of $\arcsin \frac{1}{50}$ when the engine is working against resistances of 30,000 N. Calculate the maximum power of the engine. (09 marks)