UGANDA ADVANCED CERTIFICATE OF EDUCATION

PRE - REGISTRATION EXAMINATIONS 2026

PRINCIPAL MATHEMATICS PAPER 1

Time: **3HOURS**

INSTRUCTIONS TO CANDIDATES:

- *This paper consists of* **three** *sections;* **A, B** and **C.** *It has six examinations items.*
- *Section* **A** *has* **two** *items. Answer* ***one*** *item* ***only****.*
- Section **B** has **one compulsory** item.
- *Section* ***C*** *has three items. Answer two items only*
- *Answer a total of* **four** *items.*
- *Any additional item(s) answered will* **not** *be scored.*
- **All** *answers* **must** *be written in the answer booklets /sheetsprovided.*
- *Graph paper is provided.*
- *Silent non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

FOR OFFICIAL USE ONLY		
SECTION A *(Algebra)*	**ITEM 1**	
	ITEM 2	
SECTION B *(Geometry)*	**ITEM 3**	
SECTION C *(Calculus)*	**ITEM 4**	
	ITEM 5	
	ITEM 6	
	TOTAL	

SECTION A *(Algebra)*

manipulate a wide range of algebraic expressions and equations, evaluate logical proofs and apply these skills to strategically solve real-world problems.

ITEM 1

Mr. Kato is a livestock farmer in Uganda. He bought a rectangular piece of land and is in the process of obtaining a land title. A computer system is used to determine the dimensions of the land, and the length is represented by the expression: $\log_2 y - \log_y 8 = 2$ metres
Mr. Kato also wants to build a kraal for his cows. To estimate the cost of materials, he asks three of his friends about their recent purchases:

- John bought 4 poles, 2 iron sheets, and 10 kg of nails for UGX 93,000.
- Mark bought 2 poles, 3 iron sheets, and 5 kg of nails for UGX 76,500.
- Paul bought 3 poles, 1 iron sheet, and 8 kg of nails for UGX 64,000.

Mr. Kato plans to buy 10 poles, 5 iron sheets, and 20 kg of nails.

In addition, Mr. Kato rears cattle and wants to improve his income through saving. Each year, he sells 3 cows at UGX 1,100,000 each. He saves 15% of his earnings at the beginning of every year in a bank that offers 13.5% compound interest per annum. He plans to buy a lorry costing UGX 7,000,000.

TASK

As a mathematics student,

a) Determine the dimensions of the land.

b) Hence, determine how much Mr. Kato will spend on constructing the kraal.

c) Estimate how long it will take Mr. Kato to raise enough money to buy the lorry.

ITEM 2

On Monday, the birthday girl rang three friends and invited them to her party. Each friend was asked to invite three more friends the following day and continue the process. By Sunday, invitations had spread widely, and many guests were expected to attend.

Among the invited guests were **5 Members of Parliament (MPs)** and **7 LC5 Chairpersons** from different districts in Uganda.

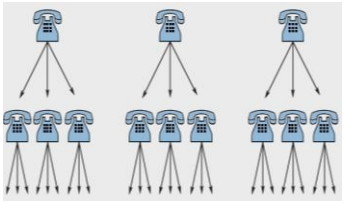
During the event:

- The **5 MPs** are to be seated on chairs arranged in a straight row, with the Speaker at the extreme right position.
- The **7 LC5 Chairpersons** are to be seated around a circular table for a discussion session.

Later, a **group of 6 people** is to be selected from both the MPs and LC5 Chairpersons to cut the birthday cake. The group must include at least 2 MPs.

Meanwhile, one of the invited friends bought gifts and wants to wrap them using a cardboard measuring 40 cm by 30 cm by cutting equal squares from each corner and folding the sides to form an open box. She wants the box to have a volume of 936 cm^3, but is unsure about the size of the squares to cut.

Support



Task.

As a mathematics student.

a) Estimate the total number of people likely to attend the party on Sunday.
b) Determine the number of different seating arrangements
c) Advice the friend on how best to wrap the gift using the cardboard.

SECTION B (Geometry)

Applying geometric concepts and spatial reasoning to interpret relationships in mathematical and real-life contexts for informed problem solving.

ITEM 3

A homeowner in Kampala wants to install a flat solar panel on a sloped roof to maximize energy efficiency. The position of the panel is modelled as a plane in three-dimensional space. Three points on the roof are identified relative to a corner of the house taken as the origin A(2,1,3) B(4,2,1) C(−1,3,2)

A beam of sunlight is represented by a line with direction vector: $\vec{d} = \underset{\sim}{i} - 2\underset{\sim}{j} + 2\underset{\sim}{k}$

Solar panels operate most efficiently when sunlight strikes perpendicular to the surface.

A battery is installed at point: P(1,2,1)

TASK
As a mathematics student,
a) Find the equation the solar panel.
b) Comment on whether the panel is optimally positioned
c) Determine the minimum length of wire required to connect the battery to the panel.

SECTION C (Calculus)

Analysing and modelling of real-life situations involving rates of change, accumulation, and optimization of resources.

ITEM 4

Engineers at AA Motors Corporation are analysing the motion of a prototype electric vehicle. The vehicle's velocity is modelled by

$$v(t) = 2t + \cos(t),$$

where $t$is time in seconds and $v$is in meters per second.

To evaluate its performance along the Entebbe Expressway, the engineers estimate the distance covered from $t = 0$to $t = \frac{\pi}{2}$ seconds using **7 ordinates** based on a suitable numerical integration method.

However, one engineer questions the accuracy of this approximation and suggests determining the exact value of the distance for comparison.

Tasks

As a mathematics student, determine:

a) the engineers' estimated distance covered.

b) The percentage error between the numerical estimate and the exact value of the distance.

ITEM 5

Engineers at Kiira Motors Corporation are testing the battery performance of an electric bus operating between Kampala and Jinja City. In their tests, data showing how battery voltage $V(t)$varies with time t(in hours) is recorded as follows:

t(hours)	0	1	2	3
$V(t)$(volts)	400	370	330	290

However, during the experiment, the sensor fails at $t = 1.5$hours, leaving a missing value. The engineers are also interested in predicting the voltage at $t = 4$hours.

A newly qualified engineer suggests using the function:

$$V(t) = 400e^{-0.1t}$$

to estimate the voltage at any instant, although this requires the use of Maclaurin series.

TASK

As a mathematics student:

a) Find the missing values in the data.

b) Confirm whether the function provides a better approximation of the voltage at $t = 4$hours.

ITEM 6

A construction engineer is designing a rectangular compound wall along a straight river. The wall will not be constructed along the river side, so only three sides are fenced.

The engineer has 120 meters of fencing material. The boss wants to determine how the fencing material should be cut and used to maximize the enclosed area.

Inside the compound, a cylindrical water tank of radius 2 m is installed. A pump removes water from the tank at a constant rate of 2 m^3 per second.

The boss is concerned about:

- how the fencing material should be used efficiently
- how fast the water level changes in the tank

TASK

As a mathematics student, help the boss to:

a) Determine how the fencing material should be cut to maximize the area.

b) Determine how fast the water level is changing in the tank.

END

Call for guide at a fee:754857296