

S475/1
SUBSIDIARY
MATHEMATICS

Paper 1

2026

$2\frac{1}{2}$ hours



UGANDA NATIONAL EXAMINATIONS BOARD

Uganda Advanced Certificate of Education

SUBSIDIARY MATHEMATICS

Paper 1

2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

*This examination paper consists of two sections; **A** and **B**. It has **six** examination items.*

*Section **A** consists of **two compulsory** items.*

*Section **B** has two parts, **I** and **II** each with two optional items. Respond to only **two** items from Section **B**, choosing **one** item from **each** of the parts, **I** and **II**.*

*Respond to **four** items in all.*

*Any additional item(s) responded to will **not** be scored.*

Begin each item on a fresh page.

***All** necessary working **must** be shown clearly.*

Graph paper is provided.

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

SECTION A

All items in this section are compulsory.

Item 1

During preparations for a large campaign rally, the public address management team must position high power public address speakers in such a way that the candidates' speech can be clearly heard across the crowd.

The rally ground is represented on a coordinate plane such that the stage is at $S(0,0)$.

Two speakers have already been installed at $A(90,30)$ and $B(-70,60)$. A third speaker has been provided to be mounted only if the angle between sound projections SA and SB is more than 90° .

For quality sound from the speaker, the microphone used by the candidate should be fixed on a stand and projected at an acute angle determined by the mathematical relationship;

$$2\sin^2\theta + \cos\theta = 1, \text{ from the horizontal.}$$

The public address management team needs guidance on whether the third speaker is needed and the angle at which the microphone should be projected.

Task:

Basing on calculations, with (a) justification(s), provide the guidance needed by the public address management team.

Item 2

A certain community in Uganda relies on a nearby forest for firewood. Over the years, there has been an increase in the demand of firewood which has caused a decrease in the number of trees in the forest.

Environmentalists have modeled the number of trees T in the forest over time as;

$T(x) = 200000 - 1500x^2$, where x is the time in years for the forest to get depleted.

The community leadership is concerned that if this decrease continues at the same rate, the forest will get depleted and therefore plans to have a sensitization meeting with the community members.

During the meeting, the community leadership needs to make a detailed analysis of the model including representing it graphically with a clear interpretation of the turning point and intercepts, so that community members understand how big the forest initially was and when it will be depleted.

Recently another forest in a neighbouring community caught fire and by the time fire fighters started putting out the fire, 100 hectares had burnt. It took 5 hours for the fire fighters to stop the fire completely.

The fire fighters observed that the rate at which the fire spread was proportional to the area of the forest burnt and that the proportionality constant was **0.1** hectares per hour. However, the fire fighters need to estimate the area of the forest remained after their intervention.

Task:

- (a) Make the detailed analysis needed by the community leadership during the meeting.
- (b) Address the need of the fire fighters.

SECTION B

*Respond to only **two** items from this section, choosing **one** item from each of the parts **I** and **II**.*

PART I.

Item 3

A bakery in a certain town is expanding its bread production to meet the increasing demand and has been given a contract to produce and supply 690 trays of bread to a supermarket within 10 days.

To fulfil the contract, the bakery has started by producing 6 trays of bread on the first day, will produce 9 trays on the second day, 12 trays on the third day and the bread production will keep increasing by the same constant number of trays each subsequent day.

The bakery manager wants to determine how long it will take to fulfil the contract if production continues to increase in the same pattern.

The bakery produces 6 different types of bread. A nearby shop wants to order for 3 different types of bread, however, the shopkeeper does not know the different possible number of selections to choose from if the order in which the types are chosen does not matter.

Task:

- (a)
 - (i) Assess whether the production pattern will enable the manager to fulfil the contract.
 - (ii) Recommend an alternative production pattern for the manager to fulfil the contract, assuming that 6 trays are produced on the first day.
- (b) Determine the number of possible bread type selections, the shopkeeper can choose from.

Item 4

Members of a football club had a meeting in January and agreed to give back to the community through a charity program.

Starting from February, each member was tasked to make an initial saving of Sh1000 and ensure that for each subsequent month, every member saves twice the amount he saved the previous month, up to November.

In the meeting, there was a well-wisher who promised to give them a contribution of half of each member's total saving if they raised their initial saving to Sh 5000 per member and instead use the mathematical relationship;

$A_n = 5000 \times 3^n$ to generate each member's total savings so that the charity program would take place in a month following their last month of saving.

However, members do not know the month they can have their charity program if they are to use the well-wisher's mathematical relationship to save.

During the meeting, the executive committee which consists of 8 members, five of which are female, was tasked to formulate an organizing committee for the charity program from among themselves. The organizing committee should consist of 6 members with **at most** 2 males.

The executive committee needs help to establish the month when the charity program will take place the well-wisher's suggestion and also determine the number of ways of selecting the organizing committee.

Hint:

In the relationship $A_n = 5000 \times 3^n$,

A_n represents each member's total savings following the well-wisher's suggestion and it is half of the total saving each member would have made using the method they had agreed upon.

n is the number of months they would take to save the amount A_n .

Task:

Determine the;

- (i) Month when the charity program will take place.
- (ii) number of ways of selecting the organizing committee.

PART II.

Item 5

The health department of a certain municipality operates a morning out patients' clinic that provides malaria testing and treatment to residents from the nearby community. Patients arrive at different times from 8:00AM to 10:00 AM.

After 8:00 a.m., health workers record the arrival time, T , measured in hours, for a randomly selected patient.

The municipal statistician modeled the arrival time of patients in the distribution below.

$$f(t) = \begin{cases} K(2t - t^2), & 0 \leq t \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

Clinic records also show that the total number of patients arriving between 8:00 a.m. and 10:00 a.m. varies from day to day. The number of arriving patients, X , can be modeled by a normal distribution whose mean is 60 and variance 100.

The clinic currently prepares 65 malaria testing kits each morning and a shortage occurs when the number of patients exceeds the available kits.

The municipal health officer wants to establish how often shortages might occur over several days. The officer models the number of shortage days in a week of 5 working days as a Binomial distribution. It is a requirement to avail more kits should the likelihood of having a shortage for at least two days exceed 45%.

Task:

- Evaluate the likelihood of a randomly selected patient arriving between 9:00 a.m. and 10:00 a.m.
- Determine the probability that the number of patients arriving on a given day exceeds the 65 available testing kits.
- Assess whether the officer should prepare more kits.

Item 6

A school is preparing eight students to represent it at a regional mathematics competition. During a performance review meeting, the performance in two tests of the eight students was displayed as follows:

Student	Test P(%)	Test Q(%)
A	70	68
B	60	58
C	65	65
D	45	50
E	55	50
F	50	48
G	63	62
H	52	54

Their teacher, Ms. Winslet, needs to use the data to inform the school about the;

- i) Test in which students' performance was more consistent.
- ii) Relationship in performance in the two tests.
- iii) Likelihood that a randomly selected student from the group scored above 52 in test Q and hence the implication of this likelihood on the general performance of the students.

Task:

Generate the information Ms. Winslet shall give to the school.