

ST. LAWRENCE SENIOR SECONDARY SCHOOL SSONDE
 NAMUGONGO
 P.O BOX 304, MUKONO

UGANDA ADVANCED CERTIFICATE OF EDUCATION (UACE)
BEGINNING OF TERM I EXAMINATIONS 2026
S.6 P425/1 PURE MATHEMATICS (Paper 1)
 Time Allowed: **3 HOURS**

STUDENT NAME:

PERSONAL NUMBER:**SIGNATURE:**

DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO BY THE INVIGILATOR

INSTRUCTIONS TO CANDIDATES:

1. Do not write anything in this paper, any rough work should be written in the response booklet(s) provided and crossed out.
2. The time allowed for this paper is strictly **3 Hours** and no additional time shall be granted.
3. This paper consists of **three** sections; **A, B** and **C** with a total of **6 items**.
4. Section A has 2 items, attempt **any one** item.
5. Section B has **One COMPULSORY item**
6. Section C has **Three** items, attempt any **two** of your choice
7. A total of **FOUR ITEMS** should be attempted. Any additional item(s) attempted will not be marked.
8. Begin each item on a fresh page and clearly indicate them in the response booklet provided
9. Tidy handwriting, meaningful mathematical judgement and conclusion may increase your chances of excelling.
10. Silent non-programmable calculators and list of logarithmic tables may be used.

FOR SCORER'S USE ONLY

SECTION	A		B	C			TOTAL
ITEM	1	2	3	4	5	6	
SCORE							
INITIAL							

SECTION A

Attempt any One item in this Section

ITEM 1

Mr. Oguti is organising for a party in his ancestral home and would like to hire some vehicles to help in transporting the guests. The number of vehicles to be hired is a product of the two values that satisfy the equation $\log_2 x - \log_x 8 = 2$ and each vehicle will be hired at UGX. 450,000 In order to make his plan a success, he is to withdraw some money from centenary bank but he has forgotten the PIN. When he checked his dairy book, he found a hint for the PIN and this was;

- The first two digits satisfy the equation $9^x - 12(3^x) + 27 = 0$ and had to be written in ascending order.
- The next two digits are a and b which are obtained from expressing $\frac{1+\sqrt{3}}{2-\sqrt{3}}$ in the form $a + b\sqrt{3}$ such that in the PIN a takes position three and b takes the last position.

When he consulted a certain supplier, he was told that 4 Sackets of salt, 3 bars of soap and 2kg of sugar altogether cost \$ 8.2 and also 2 Sackets of salt, 4 bars of soap and 3kg of sugar will cost altogether \$ 10.35. Similarly, 1 Sacket of salt, 3 bars of soap and 8 kg of sugar will cost \$ 14.8. Under keen analysis, Mr. Oguti's function requires that he must purchase 100 Sackets of salt, 60 bars of soap and 120 kg of sugar.

His major intentions are to know the number of vehicles to be hired hence their total cost, generate his centenary bank account PIN and determine how much he should have to purchase salt, soap and sugar for his function

Task:

Help Mr. Oguti to:

- a) Determine with clear justification how much money he will spend on hiring the vehicles
- b) Generate his centenary account PIN
- c) Determine how much money he will spend for the purchase of salt, sugar and soap required for his party.

ITEM 2

A charcoal dealer in Moroto district noticed that the rate of consumption of charcoal in Mbale, Gulu and Jinja satisfy and do not go against the following equations:

$$10x + 12y + 17z = 2072 \dots \dots \dots \text{(Transportation equation)}$$

$$5x + 8y - z = 820 \dots \dots \dots \text{(Production equation)}$$

$$2x + 18y + 34z = 2,080 \dots \dots \dots \text{(Storage equation)}$$

Where x, y and z represent the number of sacks consumed in Mbale, Gulu and Jinja respectively.

He works with 6 other boys and whenever they sell all the charcoal, he sits with his boys on a round table to have a discussion and this time round he wants to select 3 men of whom each of them will be put in one town and his interests are in knowing how many possible ways they can sit in the round table and how many ways he can choose the men to be placed in those towns.

When he called his brother, who is an Engineer in China, he said that in a complex plane, he (charcoal dealer) was in position $4 - 3i$ and the brother was at position $-9 - 7i$ which are

distances in thousands of kilometres. He was trying to explain to his brother how the business is progressing and he said that the money he collects every year from when he started his business follows an Arithmetic Progression (AP) whose fifth term is \$ 4500 and 12th term is \$8000. They want to get all the money collected by the end of the first 15 years and put in a fixed deposit account that compounds it at 1.4% per month and need to know how long it takes (to the nearest year) to accumulate to at least \$ 121,000.

His brother from China also told him that he needs some people whom he will sponsor to go to Canada, Australia and Japan such that the number of people (x) satisfies the polynomial $P(x) = x^3 - 6x^2 + 11x - 6$ at the instant when $P(x) = 0$ where x is the number of people going to a given country. The least number will go to Australia and the highest will go to Japan.

Task:

Help the charcoal dealer and his brother to determine;

- The consumption rate of charcoal in stated towns/cities
- How many possible ways they can sit in the round table and how many ways he can choose the men to be placed in those towns.
- The actual distance between the two brothers (in exponent form correct to 2dp)
- How many years he will need to accumulate the amount stated
- With justification how many people will visit the stated places hence the total number of people to be sponsored.

SECTION B

This item is compulsory

ITEM 3

During the outbreak of the COVID – 19 pandemic which hit the entire globe and affected many activities including public transport. The pandemic also caused fear and panic with many people always worried of their lives. Some scientists from South Korea decided to go to space and while in space, they noticed that one day they moved from place A(1,1,4) to place B(0, –1,2) which are distances in space in thousand kilometres and they were really interested in the cartesian equation of their path in space and the distance they had moved that day.

Meanwhile, the Ministry of health in Uganda under the leadership of Dr. Jane Ruth Acheng requested for some emergency helicopters for transportation of drugs and vaccines within the country. There were three main COVID – 19 ICU (Intensive Care Units) in regional referral hospitals in Lira at position (2,6), Mbale at position (5,8) and Kampala at position (8,4) which are distances in hundreds of kilometres. Due to limited resources, the president gave a directive that one helicopter would be enough and had to move from a flying station X mid-way between Kampala and Mbale to another station midway between Lira and Mbale.

He later added that, a railway line that will be perpendicular to the route used by the helicopter and passing through Mukono at position (5,5) would be established to help in transportation of food to the medical personnel.

Due to high demand for leisure and COVID – 19 updates, UCC gave a directive that Radio signals had to be tuned at an angle θ in order to listen to ALJAZEERA news. The angle θ whose working range was $-2\pi \leq \theta \leq 2\pi$ satisfied the equation $\sin \theta + \cos \theta - 1 = 0$

Task:

- Help the scientists from South Korea to determine the cartesian equation of their path and the distance, it actually is

- b) Help the ministry of health to determine the paths (equations) of the helicopter and the rail way.
- c) Justify at what angles the radio signals should be tuned in order to listen to ALJAZEERA news.

SECTION C

Attempt any two items in this Section

ITEM 4

During the outbreak of the Anthrax disease in cattle in Northern Uganda, Jimmy Akena Foundation decided to purchase some drugs from Kenya to help his people especially those in Lira, Gulu and Arua who were severely affected by the disease. The drug had a concentration that varied with time and was simply modelled as $C(t) = \frac{t-1}{t^3+2t^2+t}$ which sparked interest to know the change rate of concentration with time, $\frac{dC}{dt}$ and as well determine its value when the time, $t = 10$. Due to the bulk nature of the concentration equation, they are interested in decomposing it into simpler fractions.

However, it was later noted that since the storage container was plastic in nature and in form of a cylinder, its radius was increasing at a rate of $0.49\pi\text{cms}^{-1}$. This container was also noted that the diameter, d was related to the height, h by an equation, $d = \sqrt{3}h$. The drug management team is interested in knowing the time rate of increase in the volume of the container at the time when the radius is 1.2 cm

Task:

Help the team of Jimmy Akena Foundation to;

- a) Determine the change rate of concentration of the drug when $t = 10$.
- a) Decompose the model of concentration into simpler fractions
- b) Determine the actual rate of change of the volume of the container (correct to 2dp)

(Take $\pi = \frac{22}{7}$)

ITEM 5

After the General elections on for the electoral position which among them included the Presidential and parliamentary positions which was carried out on 15th January, 2026, the candidate for Serere Woman Member of Parliament, decided to start providing her services to the people even before the swearing in exercise took place. She decided to create metallic boxes to help her constituents improve on their savings. The welder told her that he had only rectangular metal sheets whose length is 50cm and width 40cm. She gave him guidance to cut off a square of dimension, x from each corner of the rectangular sheet and then fold it to make a hollow box since the top part would be covered with different material. This was in order that the volume of the box had to be maximum.

When she visited another constituency, they told her that they had a huge piece of land that was to be used as an academy. The land had a constant perimeter of 3020meters and you are to help them to fence it but your interest is to first know the length of the sides when the area is maximum.

When she visited the last constituency, they told her that they needed her to help and construct a school in some piece of land donated by an NGO. The land encloses an area between the curve $y = x^3 e^{2x}$ and the x-axis from the points when $x = 1$ up to $x = 4$

Task:

Give a detailed report to the elected woman member of parliament for Serere district and for each constituency, justify their needs with relevant and appropriate mathematical calculations.

ITEM 6

In a certain habitat, the distance moved by a certain animal from the time it gets up in the morning is given by $y = Ae^t + Be^{-2t}$ where y is the distance moved, A and B are constants depending on the health of the animal.

The Uganda Wild Life Authority has been informed by an expert that this simply means that the general equation of motion of the animal is given by $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 0$ and you need to ascertain the truth about this motion.

In correspondence to this, the rate of cooling of the body of the animal is directly proportional to the excess temperature of the animal over its surrounding. On Monday morning, the temperature of the environment was constantly at 15°C and that day, the animal got up at 7:00am with a recorded temperature of 39.6°C and by 8:00am, the temperature had dropped up to about 30°C .

This was very unusual and the health team assured that the animal needed to be treated with a drug which required the body temperature of the animal to be at about 20°C .

Their confusion is in finding how much drug is to be administered but they were given some guidance on it as follows:

They will use a cylindrical syringe whose sum of height and circumference is $4.5\pi\text{cm}$

The amount of the drug in the cylindrical syringe must be as maximum as possible to the nearest cubic centimetres.

Task:

- a) Ascertain with justification the truth about the motion of the animal
- b) Help the health team to determine at what time the animal should be administered with the drug and what quantity of the drug must be administered (correct to the nearest minute and cubic centimetre)

***** THE END *****

“Good Things Come to Those Who Strive Harder for Them, Never Give Up!!” @OSRO