**456/1**

MATHEMATICS

**Paper one**

20th March, 2023

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

**Uganda certificate of education**

PRE-REGISTRATION EXAMINATIONS-2024

**MATHEMATICS**

2 hours 30 minutes

**INSTRUCTIONS TO CANDIDATES:**

- This paper consists of ***six*** items.
- Attempt any ***four*** items in this paper. All items carry equal scores.
- All necessary working and explanations should be written on the answer sheets provided.
- Mathematical sets, silent ***non*** programmable calculators may be used.
- Graph papers are easily provided.

| **FOR EXAMINER'S USE ONLY** | | | | |
|---|---|---|---|---|
| **ITEM ATTEMPTED** | | | | |
| **SCORES** | | | | |

**ITEM ONE:**

A certain member of your family re-wrote each digit of his 4-digit **ATM** card pin from number system ten (base ten) to another number system less than four. He did this in fear of theft. Now he is sick in the hospital, he can neither talk nor write but the money on his account is needed to finance hospital bills. Here is how he wrote the pin: 12 20 22 10. Assuming that you have been able to encrypt the **ATM** pin for the family and funds are available to take care of him. The hospital has a nurse who takes checks on him after every two hours and a medical doctor who checks on him after every four and half hours. Both medical personnel last checked on him together at $\mathbf{9}:\mathbf{30am}$. He was treated well and discharged and advised as follows. He was advised to spend three−eights of the day resting, one sixth of the day eating, two thirds of the remainder having a healthy diet and the rest of time of the day visiting the hospital for further checkup.

**TASKS:**

(a) (i) Which number system do you think he used to re-write the pin and why?

(ii) Use the identified number system to help your family members to regenerate the original pin.

(b) (i) At what time did will both the nurse and medical doctor check on him again at the same time.

(c) How many hours of the day in a week does he have spend on visiting the hospital. *(25 scores)*

**ITEM TWO:**

A produce wholesale dealer in Kalerwe Farmers Market has a broker who has been helping him order for his produce on his half. However he has been informed that his broker left for Saudi Arabia in quest for greener pastures, he is much troubled yet he wants to order for **1200 bags** of produce. He visited his business books and noticed that in January, when he bought **300 bags**, the cost of transporting each bag was **UGX4500** and in February when he bought **700 bags**, the cost of transporting each bag was **UGX8500**. He has resorted to do the ordering and buying by himself.

In preparation for Easter he went to Luuka Village to buy some produce with his lorry. Unfortunately his Lorry broke down and opted for two vehicles a Pickup and an Isuzu Diana. The pickup can transport **18 bags** while the Isuzu Diana can transport **30 bags**. The number of bags to be transported must exceed **120**. Each trip the Pickup and Isuzu Diana makes cost **UGX240,000** and **UGX300,000** respectively yet he has allocated **UGX2,400,000** to cater for transport.

The number of trips made by the pickups should not exceed those made by the Isuzu Diana by more than **2**.

**TASKS:**

(a) Determine the cost the whole sale dealer will pay for the **1200 bags**.

(b) Help the dear obtain how many trips each vehicle will make in order to minimize the cost of transport. *(25 scores)*

**ITEM THREE:**

There is a quarantine of all cattle and goats in some parts of Western Uganda especially Mbarara District. The area honorable Member of parliament (M.P) wants to throw for his constituents a celebration party for the success of the Parish Development Model (PDM) and he has invited a lot of guests. However due t the quarantine he can not buy any animals from Mbarara and he has been advised to go to Kayunga where cheap cattle and good Yoghurt can be found. He moves from Mbarara to Masaka which is **160km** North of Mbarara. From Masaka he moves west wards **150km** to Kampala. From Kampala he heads to Mukono which is in the direction $\boldsymbol{S75^{o}W}$ which is **90km** from Kampala. From Kampala he heads to Kayunga which is **148km** and south of Mukono.

When he reached Kayunga he bought **400** cows and each costs **UGX850,000** per cow. The farmer and owner of the cow first gives a **5**% discount on each cow plus an additional **10**% discount for any number of cows bought in excess of **250**.

In order to package the yoghurt, he bought two identical types of buckets. A smaller bucket with a base radius of **30cm** and a larger bucket with a base radius of **50cm**. He intends to use the buckets to keep the Yoghurt for his guests. The capacity of the smaller bucket is **45 litres** and he is to buy **4** smaller buckets and **2** larger buckets.

**TASKS.**

(a) Direct the honorable MP on the shortest route he should take and the shortest distance between Mbarara and Kayunga.

(b) Find the total cost he incurred in purchasing the cows.

(c) What is the maximum amount of Yoghurt be bought for his guests. *(25 scores)*

**ITEM FOUR:**

Holy Prayers Ministries International for a long time has been soliciting money to construct a church which can congregate all the church members. The Senior Pastor has a vision of a Hexagonal church which can fit exactly in the plot of land available. He wants to know the actual cost of constructing the church. He also has to buy a Sino Truck to transport all building materials and requirements. The contractor informs him that the area of each triangle that can be formed from the hexagonal church will cost him **UGX 128,000,000**.

He then proceeded to Nina Motors to buy the Sino truck. A brand new Sino Truck costs four hundred eighty millions on cash. It can also be bought by paying a deposit of a quarter of the cash price value and either pay **UGX7. 5 millions** weekly for **50 weeks** or pay **24. 5 millions** monthly for **15 months**. The pastor does not have the required money to obtain the Sino Truck on cash.

**TASKS:**

(a) Help the pastor determine the cost of the church.

(b) How much extra will he pay for the Sino Truck and explain why. *(25 scores)*

**ITEM FIVE:**

A school head teacher is thinking of how he can boost the mathematics department of your school. He can either add another teacher or buy more books or both. He has decided that he will do both if the average performance for this year's performance for the 40 students is lower than that of the previous which was **47**. He asked the department to give a test and the these were the student's marks.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 50 | 71 | 40 | 48 | 61 | 70 | 30 | 62 |
| 44 | 63 | 60 | 51 | 55 | 25 | 32 | 65 |
| 54 | 45 | 65 | 50 | 45 | 40 | 25 | 45 |
| 48 | 45 | 30 | 38 | 30 | 28 | 24 | 48 |
| 30 | 48 | 28 | 35 | 50 | 48 | 50 | 60 |

He also visited the library and found out that the previous's candidates used three books for there revision. Longhorn, Baroque or Maths Clinic. From the librarian's records its is clear that all the candidates that did not use any book failed the subject greatly. Out of the **35** candidates this year **13** used Longhorn, **20** used Baroque and **17** used Maths Clinic. **9** used Longhorn and Maths Clinic, **3** used Longhorn and Baroque while **8** used Baroque and Maths Clinic only. The records show that **2** used all the three books. He observed that he should replace one book type of the three with Fountain publisher since no student read it only alone.

**TASKS:**

(a) (i) Help the head teacher group the marks to make an informed decision one the fate of the department and defend it.

(ii) Display the students marks in groups on a simple statistics diagram.

(b) (i) Help the head teacher identify the book he should replace and explain why?

(ii) Find the probability that a student selected from the class failed.

*(25 scores)*

**ITEM SIX:**

Three schools from a Gayaza region want to participate in the National Schools Football Sports Gala to be held in Lyantonde district play ground. Unfortunately none of the schools has a school bus and they want to hire a bus for the one day for the activity. The bus charges 25,000km per km moved. the three schools through there Sports master agreed to share the cost of the bus equally amongst them selves. One that day they hired a bus from your school in Gayaza and they set off at $\mathbf{4}:\mathbf{30}\boldsymbol{am}$ and moved at a speed of $\mathbf{90}\boldsymbol{km/hr}$ reaching Mpigi at $\mathbf{6}:\mathbf{45}\boldsymbol{am}$. From there the bus driver reduced the speed for $\mathbf{2}\frac{\mathbf{1}}{\mathbf{4}}$ hours reaching Masaka. From Masaka the driver reduced slowly in speed reaching Lyantonde at $\mathbf{9}:\mathbf{30}\boldsymbol{am}$. The games started at $\mathbf{10}:\mathbf{00}\boldsymbol{am}$ sharp and each team played six games.

School A won $\mathbf{3}$ games, drew $\mathbf{2}$ and lost $\mathbf{1}$ game. School B won $\mathbf{4}$ games and lost $\mathbf{2}$ games. School C won $\mathbf{2}$ games and drew $\mathbf{4}$ games. The organizers award three points for a win, one point for a draw and no point for a loss. They declared these schools the first three schools in order of their points they obtained from the games. They were to receive the price money of sixteen millions five hundred thousand shillings.

**TASKS:**

(a) Find how much each school paid for the bus.

(b) Decide the cash prize for school.

**END**