456/1

MATHEMATICS

Paper one

27th March, 2023

2 hours

Uganda certificate of education

S.2 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 **9**:**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:

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 $\mathbf{160km}$ North of Mbarara. From Masaka he moves west wards $\mathbf{150km}$ to Kampala. From Kampala he heads to Mukono which is in the direction $\boldsymbol{S75^{O}W}$ which is $\mathbf{90km}$ from Kampala. From Kampala he heads to Kayunga which is $\mathbf{148km}$ and south of Mukono.

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

In order to package the yoghurt, he bought two identical types of buckets. A smaller bucket with a base radius of $\mathbf{30cm}$ and a larger bucket with a base radius of $\mathbf{50cm}$. He intends to use the buckets to keep the Yoghurt for his guests. The capacity of the smaller bucket is $\mathbf{45\ litres}$ and he is to buy $\mathbf{4}$ smaller buckets and $\mathbf{2}$ 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 THREE *(25 scores)*

A man intends to plant trees on the two sides of the road which leads to his land. On one side of the road, he is to plant a tree every after $\boldsymbol{5m}$ yet on the other side he is to plant a tree every after $\boldsymbol{6m}$. at the start of the road, two trees are to be planted

directly opposite each other. In the first phase of planting trees, he will plant trees, until another pair of tress is again directly opposite. His land has an area of $\mathbf{500}\boldsymbol{m}^{\mathbf{2}}$. He plans to use $\mathbf{25}$% of the land to plant maize, one fifth of the land for beans and $\mathbf{205}\boldsymbol{m}^{\mathbf{2}}$ dor growing ground nuts.

Tasks:

(a) Help the man determine how many tree seedlings he needs to buy to just plant this first phase.

(b) Determine in $\boldsymbol{m}^{\mathbf{2}}$ the size of the land to be used for growing maize.

(c) Determine in $\boldsymbol{m}^{\mathbf{2}}$ the size of the land to be used for growing beans.

(d) Express the area to be used for growing ground nuts in standard form.

(e) Do you think he partitioned the entire land properly? Give a reason.

ITEM FOUR *(25 scores)*

You are an athlete and soon competing with someone. You wanted to test your chances of winning the race by testing your speed and time in relation to that of your competitor you started to run at $\mathbf{4}$: $\mathbf{50pm}$. From your home where you started from, you ran a distance of $\mathbf{5km}$ north−west to place **P**, then from **P**, you turned south and ran $\mathbf{4}\boldsymbol{km}$ until you were at place **Q** that is west of your home and then ran back and arrived at $\mathbf{5}$: $\mathbf{12pm}$. Your competitor ran the same distance during training at a speed of $\mathbf{10m/s}$.

Tasks:

(a) What is the total distance that you ran?

(b) What is the total time you took to run that distance?

(c) How fast were you?

(d) (i) Do you think you will win the race or not?

(ii) Why do you think that way?

END