456/1
MATHEMATICS
Paper 1
2024
$2\frac{1}{4}$ hours

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

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

*Section **A** has **two** compulsory items.*

*Section **B** has **two** parts; **I** and **II.** Answer **one** item from each part.*

*Answer **four** examination items in all.*

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

***All** answers **must** be written in the answer sheets provided.*

Graph paper is provided.

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

SECTION A

Answer **all** items in this section.

Item 1. *(20 scores)*

A census enumerator has been sent to count people in your village. He has been given an i−pad that is fully charged for the exercise. Unfortunately, there is a small note of the PIN to help you access the software for the exercise. The note indicates that the pin number is a two digit number in base ten. This number is equal to five times the sum of the digit. It is also nine less than the number formed by interchanging the digits. The enumerator comes to your home and seeks assistance to to help him find the PIN for the i−pad.

The census in Uganda is held every after 10 years. It was last held in 2014 and then previously 2004. The census in 2024 has revealed that there are $\mathbf{14,400}$ people in your village. This has increased by $\mathbf{60}\%$ as revealed by the census in 2014 having been previously increased by by $\mathbf{80}\%$ earlier in 2004.

The enumerator claims for transport refund every after four days, for the 4-day journey made in the exercise. He travels a certain amount on the first day, then half of that on the second day, third of that the third day and finally a quarter of that on the fourth day. The enumerator travelled a total distance of 50km during the four-day exercise. Each kilometer travelled is paid UGX28,000

Task:

(a) Help the enumerator encrypt the **PIN.**

(b) How many people were in the village in 2004.

(c) How much did she receive on each day.

(d) In your view why do you think the National Census is necessary.

Item 2. *(20 scores)*

Your family is designing a parking lot for day and night parking of motorcycles using the piece of land that has been just been bought in the middle of the city centre. The land is rectangular in shape with a length of 3m longer than the width and the area of this portion is $\mathbf{108}\boldsymbol{m}^{\mathbf{2}}\mathbf{.}$

The other portion of the land is a car park that will have only taxi and bus. Taxis are allowed $\mathbf{100}\boldsymbol{m}^{\mathbf{2}}$ and buses are allowed $\mathbf{200}\boldsymbol{m}^{\mathbf{2}}$ and there is only $\mathbf{500}\boldsymbol{m}^{\mathbf{2}}$ of parking space available. Not more than 40 vehicles are allowed at a time. There are always both types of vehicles and at most 15 taxis are allowed at a time. The parking fee for taxis is $\mathbf{UGX5},\mathbf{000}$ and that of a bus is $\mathbf{UGX8},\mathbf{000}$.

Each bus carries $\mathbf{78}$ passengers when full. The bus has a total of $\mathbf{30}$ seats, some of the seats are for $\mathbf{3}$ passengers and others are for $\mathbf{2}$ passengers.

Task:

(a) Find the dimensions of the portion of the parking space for the motorcycles.

(b) How many vehicles of each type should be parked in the parking lot to maximize income?

(c) Determine the number of seats for the three passengers and for the two passengers.

(d) In your view what precautions should be taken when putting in place the parking lot.

SECTION B

This section has two parts; **I** and **II**

Part I

Answer **one** item from this part

Item 3. *(20 scores)*

In your class, there are boys and girls. There are $\mathbf{20}$ boys whose average weight is $\mathbf{50}\boldsymbol{kg}$ while the average weight of the entire class of $\mathbf{50}$ students is $\mathbf{56}\boldsymbol{kg}$.

Every student in your class offers agriculture and as project for the class, each student was tasked to plant a coffee seedling in February term one. At the beginning of March, they measured the heights of the seedlings in (cm) and recorded there heights in there reports to their agriculture teacher as shown below.

4.7	2.7	2.3	4.6	3.7	2.8	2.9	3.6
4.9	3.9	4.5	3.4	4.2	3.5	1.7	1.1
2.0	3.7	3.3	3.8	3.8	1.8	3.1	3.6
4.1	1.4	1.6	2.1	2.8	2.6	3.3	4.0
3.2	4.3	3.5	2.4	4.4	4.1	2.9	3.2

The teacher was interested in knowing the average height of the seedlings.

The class teacher grouped the students and gave the students a mind game of finding out the hidden discs. The game was intended in testing the students ability to discover and explore hidden ideas in scenario questions. The discs were of four colours of white, green, red and orange. Three groups X, Y and Z. group X found out 6 white, 9 green and 4 red discs, group Y found out 6 green, 9 red 4 oranges and 4 white discs while group Z found out 3 orange, 3 white, 4 red and 10 red discs. 12 points are awarded for each white disc, while green, red and orange discs are awarded 6, 5 and 7 points respectively.

Task.

(a) On average, are girls heavier than boys; explain your answer.

(b) What is average height of the seedlings.

(c) What is the minimum height of a viable seedling if only ten seedlings are viable?

(d) Arrange the information above properly and determine which group won the game.

Item 4. *(20 scores)*

Your neighbor has a cup board of twenty identical cups of which eight are red, seven re white and the rest are black. She has received some visitors from the village who have come to celebrate the graduation of her daughter at night and is planning to give them a cup of tea at night. She is told that only two of the visitors like tea and so goes to the cupboard to pick the two cups. Unfortunately, power goes off and she barely seeing anything. She outs her hand carefully in the cupboard and picks the two cups one after the other, each cup she picks the colour is noted and she puts tea for the visitors.

The following day on the graduation party day of her first daughter, she received a total of fourty guests and availed them with three types of drinks, Novida(N), Fanta(F) and Mountain Dew(M). a total of 17 guests took Novida and this was the same number of guests that took Mountain Dew, while nineteen guests took Fanta. She noted that two guests wanted Nivana mineral water, 5 guests took Novida and Fanta, 6 took Novida and Mountain Dew while seven took Mountain Dew and Fanta.

Task:

(a) What is the probability that both cups picked had the same color?

(b) What is the chance that a guest picked at random preferred only one drink?

Part II

Answer **one** item from this part

Item 5. *(20 scores)*

A tourist planning to travel to Uganda from the United Kingdom establishes from google map that Jinja is $\mathbf{80}\boldsymbol{km}$ due East and $\mathbf{40}\boldsymbol{km}$ due north of Kampala and Luwero is $\mathbf{40}\boldsymbol{km}$ due East and $\mathbf{80}\boldsymbol{km}$ due North of Kampala. He also notes a straight road connecting Luwero to Jinja and confirms that Kayunga along this route is midway Jinja and Luwero. On the straight Kampala-Jinja highway, he takes note of a small town called Mukono midway the journey. On his tourist visit, he plans to fly from Kampala to Jinja and travelled by road to Luwero making a stopover at Kayunga where he will drop his colleague who plans to connect from Kayunga to Kampala so he can see the beautiful Kalerwe Market. A Uber taxi from Kayunga to Kampala usually charges $\boldsymbol{UGX}\mathbf{10,000}$ per km for locals but the fee doubles for tourists.

Task:

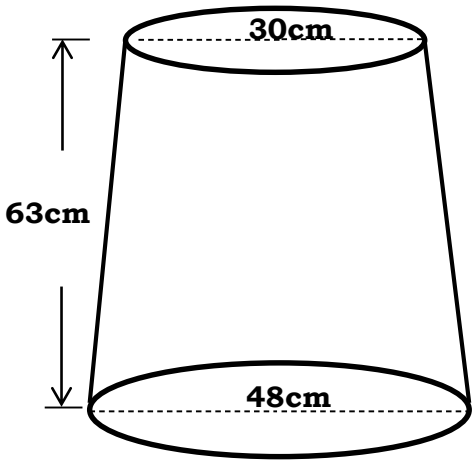
(a) Determine the displacement of Jinja from Luwero hence determine the distance between the two towns.

(b) At an exchange rate of $\mathbf{UGX4800}$ per UK pound, how many pounds will the tourist part with to connect to Kampala from Kayunga using Uber taxi.

(c) Identify some of the tourist attractions that tourists can come and see in any of the areas mentioned.

Taxi 6. *(20 scores)*

Paul is a man in your village who fetches water to earn a living. He uses his bucket of height $\mathbf{63}\boldsymbol{cm}$. the bucket has a top diameter of $\mathbf{30}\boldsymbol{cm}$ and a bottom diameter of $\mathbf{48}\boldsymbol{cm}$ as shown below. Your family is organizing your eighteenth birthday and Paul has been contacted to fetch water for the party and he has to fill a 500 litres tank. He is payed $\boldsymbol{UGX}\mathbf{500}$ per bucket.



As he was slopping down the well to fetch the water, he observes a crested crane at the top of the tree of height 20m at an elevated angle of 30^o, when he moved closer towards the tree to observe it clearly, the elevated angle increased by 12^o and he was able to see the bird clearly. Paul has a height of $\boldsymbol{1.2m}$.

(a) How much was Paul paid for the task.

(b) How close did he move to see the bird clearly?

END