456/1
MATHEMATICS
Paper 1
July/Aug. 2024
2 ¼ hrs

UGANDA TEACHERS' EXAMINATIONS SCHEME

Uganda Certificate of Education

JOINT MOCK EXAMINATIONS

MATHEMATICS

Paper 1

2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists 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**.

All answers **must** *be written in the answer booklet(s) provided.*

Graph paper is provided.

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

Turn over

SECTION A

Answer **all** *items in this section.*

ITEM 1

Musoke is a retired worker who was saving with NSSF. He has got his savings of 120 millions. He wants to use his savings to construct single and double room rentals from which he wants to collect a minimum of shs 540,000 monthly. He intends to charge rent of shs 90,000 monthly from each double room and shs 60,000 monthly from each single room. He wants less than six double rooms. He also wants to construct at most twice as many single rooms as double rooms. It will cost him shs 12 millions to construct each double room and shs 10 millions to construct each single room.

TASK:

(a) Write down mathematical statements which relate the number of double rooms and single rooms.

(b) With the aid of a cartesian Plane, advise Musoke on how to maximize monthly rent collection.

ITEM 2

Your family wants to develop the family land by using 0.666..... of the land for agriculture, selling $\frac{1}{2}$ of the remaining land at shs 50 millions per hectare and keeping the rest of the land for family members who are out of the country. Your father has recently got a title for this land from a surveyor you don't trust. He kept it in a suitcase and locked it with a 2-digit PIN in base ten.This PIN is three times the sum of the digits but its second digit is five more than the first digit. When you got your father's PIN, you opened the suitcase and found out that the title was showing only 13.5 hectares which is 10% less than the real area of land.

TASK

Help the family members to know the;

(a) Real area of the land

(b) 2-digit PIN for the suitcase

(c) Simplified fraction of the whole land used for agriculture and hence determine the real area of the land for agriculture

(d) Amount of money to get from the sell of land.

SECTION B

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

PART I

Answer **one** *item from this part.*

ITEM 3

A thief steals a motorcycle at 8:00pm from your town and rides away at a constant speed of 50km/h.

The police patrol from the same town follows him after 30 minutes. The commander orders the driver of the patrol to drive at a steady speed of 75km/h. He tells the driver to just overtake the thief when they find him. After overtaking the thief, he should drive for only 15 minutes and take cover to catch the thief.

TASK:

With the aid of a graph paper, help patrol to determine;

(a) Where the thief is, as the patrol is setting off.

(b) When and where they will overtake the thief.

Turn Over

(c) The distance from your town where the thief will be caught.

(d) The time they are likely to catch the thief.

ITEM 4

A manager of a wholesale shop wants to recruit only 10 workers. He advertised these vacancies and got 40 applications. He subjected the applicants to an interview and they performed as follows;

3 applicants got from 20 to 24 points, 9 applicants got from 25 to 29 points, 9 applicants got from 30 to34 points, 10 applicants got from 35 to 39 points, 7 applicants got from 40 to 44 points and 2 applicants got from 45 to 49 points.

TASK:

(a) Advise the manager on the pass mark so as to get only the required number of workers.

(b) Your friend was an unsuccessful applicant because she did not raise the pass mark. The manager told her that her score is what most applicants got, but she could not understand.

Help your friend to know her score.

PART II

Answer **one** *item from this part.*

ITEM 5

A man wants to paint the walls and the ceiling of his bedroom. It has a floor of 4 metres by 5 metres. It has a door of size 2.5ft by 6ft and a window of 3ft by 4ft. the ceiling is 10 feet above the floor. The paint he wants to use, is sold in full tins and full jerrycans. A tin which can paint $250ft^2$, is sold at shs 14000. A jerrycan which can paint $300ft^2$ is sold at shs 18,000. He must buy either tins or jerrycans but not both. (NB: 1m = 3.3ft).

TASK:

Basing on calculation, advise the man on the paint he should buy to minimise the expenditure.

ITEM 6

Your father wants to make a triangular camping tent with a carpet on the floor. Each of the rectangular faces should be 5ft by 8ft where the shortest side of this face lies along the slanting edge of the tent. He wants the rectangular faces to make an angle of 45^0 with the carpet. Your father wants a tent similar to that in the figure below.

Turn Over

TASK:

Help your father to;

(a) Draw the frame of this tent.

(b) Determine the size of the carpet required to cover the floor of the tent

(c) Determine the size of the cloth required to cover the entire frame (excluding the floor)

E N D

456/1

MATHEMATICS

Paper 1

Jun/Jul. 2024

2 ¼ hours

Uganda Certificate of Education

MATHEMATICS (456/1)

TIME: 2hours 15 minutes

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Graph Paper is provided.

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

SECTION A

All questions are compulsory

Item one:

John plans to visit the shop that is **12km** south of his home and then the boutique that is **5km** east of t he shop and after drive back home using a direct route from the boutique to home. He is to use his m otorcycle that consumes **0.035liters** of fuel per km and he wants to know how much fuel he will need for the whole journey.

He has seven hundred fifty thousand Uganda shilling. He plans to use part in the shop and part in the boutique in the ratio of **3:2** respectively. He wants to spend **UGX.210,000** to buy shirts and **UGX.120,0 00** to buy trousers. However, he is not sure if his budget for the boutique will be enough.

From the shop, he is to buy **24** packets of cooking oil, **12** packets of sugar and **30** packets of salt. All o f these are to be used to make packages for some of his family members in the village. He wants ea ch package to have an equal number of items in it. He needs to know the highest numbers of packag es he can make from them.

Task:

a) How much fuel will he need for the whole journey?

b) Will the money he plans to use in the boutique be enough for what he plans to buy? Justify your answer.

c) How many packages will he make from the items he plans to buy?

Item two:

A certain catering and decoration company was called to cook **100kg** of rice at a certain party. Accor ding to their cooking notes, they put **22.5 liters** of water in **10kg** of rice and **67.5 liters** 0f water in **30kg** of rice. They want to use those notes to know how many liters to use in the rice they are ordered to cook but they are finding it hard.

The customer wants a tent at less than **UGX.250,000** and chairs at **UGX.200,000** at most. However, to maximize profit, the company wishes to provide both at **UGX.400,000** at least. The company is finding it hard to decide on how much to charge the customer for the two items respectively.

Task:

a) (i) Form a mathematical relationship between the quantity of rice and liters of water used to cook it according to their notes.

(ii) Use the relationship developed to help them determine the liters they will use in the rice they are ordered to cook.

b) (i) Form inequalities that are making it hard for the company to decide on how much to charge the tents and chairs respectively.

(ii) Use the inequalities, to help them decide on how much to charge for the tents and chairs respectively.

SECTION B

PART ONE (Attempt one item from this part)

Item three:

Your friend wants to sell dresses in your home area according to age. She requests you to recommend the dresses of a specific age he can display for most.

You gathered and summarized data to use it and find out the age of the majority of people in the community such that you recommend that. Below is the summery of your data:

Age groups (years)	30 – 34	35 –39	40 – 44	45 – 49	50 – 54	55 – 59
Number of people.	6	3	13	7	4	3

Task:

a) (i) What age is the majority of the people in the community?

(ii) What is the probability that your friend will succeed if he sews the dresses of that specific age?

(iii) According to the probability, is your recommendation a good choice? (Justify your answer).

Item four:

For your leaver's party campaign, members suggested that you buy and put on T-shirts as a class. You have three suggestions of sizes of T-shirts you can buy these are; Small size(S), Medium size (M) and Large size (L) T-shirts.

You will only buy the suggestion as the captain if **70%** of your fellow students can fit in at least two sizes. Below are your findings that you are going to base on to make a decision:

- The number of students who fit in medium size is equal to those who fit in large size and they are **100**.
- The number of students who fit in small size is **76**.
- Those who fit in small size and large size are **50**.
- Those who fit in medium size and large size are **70**.
- Those who fit in small size and medium size are **60**.
- Those who fit in none of the sizes are **4**.
- Some students fit in all the three sizes.
- The class is made up of **140** students.

Task:

a) Will you buy the suggestion of buying and putting on T-shirts as a class for your leaver's party campaign? Justify your answer.

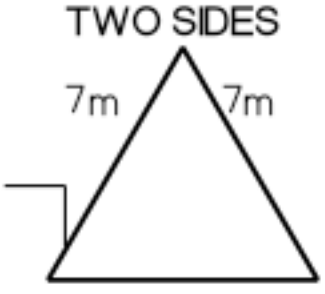
PART TWO

Attempt **one** item from this part

Item five:

A friend was given sketches below of the rooftop he plans to put on his house;

TWO SIDES



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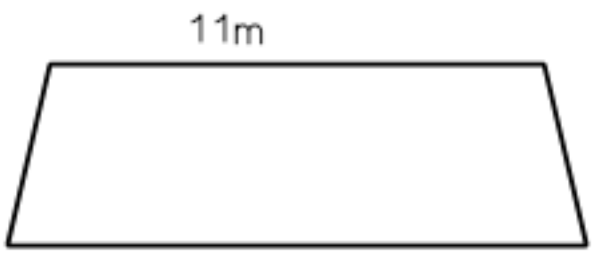

7m

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19m

The builder recommended iron sheets of **3ft** by **4ft** that cost **UGX.40,000** per sheet. Your friend needs to know how many iron sheets to buy and how much it will cost him. He requested for your help as a mathematics student.**(1ft = 0.3)**

He also plans to get a loan of **UGX. 4,000,000** that he plans to pay back in **3 years** to finance his other projects. One bank offers the loan at a simple interest rate of **10%** and the others offers the same lo anat a compound interest rate of **5%**. He is finding it hard to decide which bank to get a loan from.

Task:

a) How many iron sheets will he need to buy and how much will he need to buy them?

b) Which bank do you recommend him to get a loan from and why?

Item six:

Mary usually sets off from a landing site that is located on coordinate $O(-9, 7)$ on her grid map to isl and A which is located at coordinate $A(-6, 3)$ on her grid map during her day off. Island A is south east of landing site O. This time she plans to extend her tour from island A to another island B that is **9km** north east of island A and then sail back to the landing site through the direct route.

She plans to tour around island A for **3hours** and around island B for **4 hours**. Her journey is to start at 10:00am. She hopes to be back by 20:00hours since she has work the following day. She wants to know if it's possible to return by that time but she does not know the time the ship will take to sail the whole journey. The boat is usually ridden at an average speed of **64km/hr**.

She is in charge of paying her fellow workers. Some workers were given a salary increment to **UGX.650,000**. This includes allowances of **UGX.120,000**. She needs to know how much income tax she is to deduct from them and the net amount she is to pay them using the tax bands below:

TAXABLE INCOME (UGX)	TAX RATES (%)
0 – 200, 000	0
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Task:

a) (i) What is the total distance they are to sail?

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sail the whole journey?

(iii) Will she make it back at the planned time? (Justify your answer)

b) How much will she pay her fellow workers?

END

456/1

MATHEMATICS

Paper 1

Jun/Jul. 2024

2 ¼ hours

Uganda Certificate of Education

MATHEMATICS (456/1)

TIME: 2hours 15 minutes

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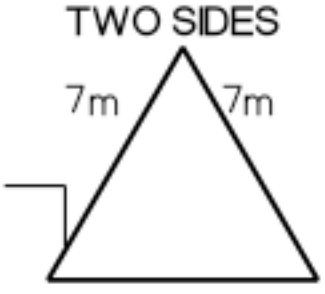

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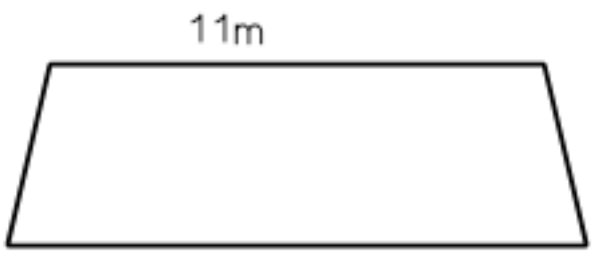

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456/1
MATHEMATICS
PAPER 1
July/August 2024
2¼ hours

WAKISSHA JOINT MOCK EXAMINATIONS

Uganda Certificate of Education

MATHEMATICS

Paper 1

2 hours 15 minutes

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SECTION A

Answer all items from this section.

Item 1.

Your friend is a market vender. She realizes that her customers prefer buying tomatoes in small quantities, so she decides to re-package her tomatoes into heaps of four. One day she bought nine heaps of tomatoes which had eight tomatoes each from the market at a cost of Ugx 2,000 per heap and was given a discount of 5%. She decides to sell her heaps of four tomatoes at Ugx 1,200 each and hence wants to find out how much gross profit she will earn from all her heaps. She further intends to visit Queen Elizabeth National Park in December 2024. Her uncle visited the same tourism centre last December 2023 with his 3 children and spent Ugx 17,000 on entrance ticket. Mr and Mrs Mukasa visited the same park in june 2024 with their child and spent Ugx.14,000. She plans to buy entrance tickets for herself, husband and five children and hence needs to know how much she will need. If park charges are adjusted every after five years.

Support material

Task:

How much;

a) Gross profits will she earn from her heaps after re-packaging? (08 scores)

b) Money will she spend in total to buy the tickets she needs? (12 scores)

Item 2.

Your Mathematics teacher is planning to transport not more than 400 students to a seminar in a neighbouring school located 10 kms away. He however does not know how many trips each vehicle will make so as to minimize transport expenses.

After consultations with the manager, Super free express bus company, the teacher realizes that if all students paid, their total contribution, should not be less than sh 360,000. The school is to hire a bus which carries 64 students per trip and a mini bus which carries 16 students per trip. The number of trips made by the bus should be at least two and those made by the minibus should be at most 6. The minibus should make more trips than the bus and the charges will be Ugx 40,000 and Ugx 90,000 per trip for the minibus and bus respectively.

Support material

Task:

(a) Help the teacher to find out the number of trips each vehicle should make to achieve his goal.

(b) What is the maximum number of students that the teacher can transport? (20 scores)

SECTION B

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

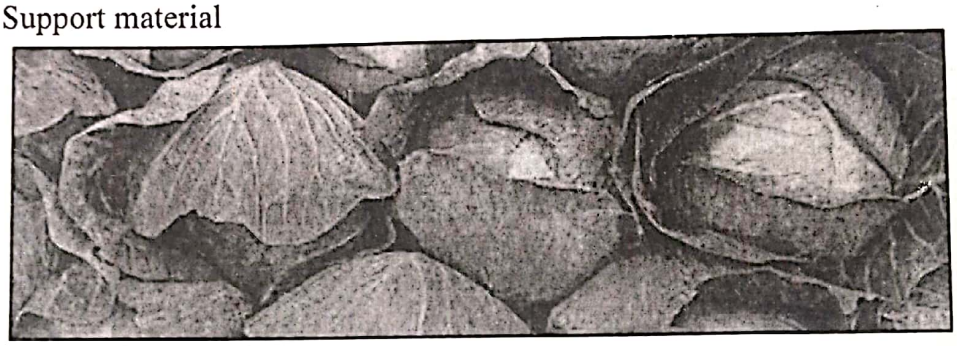
Part I

*Answer only **one** question*

Item 3.

Your guardian realizes during holidays that he may find it difficult to pay for sports uniform that costs Ugx 38,000 at the beginning of term III. He decides to keep you busy during the last week of your holiday moving around the village buying cabbages at Ugx 800 per cabbage. You will later group them into two groups: Group A shall be cabbages whose weight is below the average weight and Group B will be cabbages whose weight is above the average weight.

Support material



Later, you will sell the cabbages and the profits from the sales will be used to cover the cost of the sports uniform. Group A cabbages will be sold at Ugx 1350 each while Group B cabbages will be sold at Ugx 1650 each.

Before displaying the cabbages for sale, you measure and record their weights in grammes as follows.

104	99	107	96	101	84	102	78	106	108
63	104	86	111	102	100	95	100	65	112
76	87	95	85	95	103	61	105	73	99
83	102	102	97	92	90	113	107	88	102
110	91	90	109	82	66	92	91	108	73

Task

(a) Using suitable statistical method, find the average weight of the cabbages. (10 scores)

(b) If you sell all the cabbages at the planned selling price; will the guardian be able to meet his goal? (10 scores)

Item 4

Your Aunt who works very far away from home tells you to identify a shop that can give you beans, sugar and posho on credit and she pays for these consumables every after two weeks. She also tells you not to exceed Ugx 100,000 for the two weeks on average. After touring the trading centre you decide to pick consumables from a shop that sells a kg of beans at Ugx 4,000, a kg of sugar at Ugx 5500 and a kg of posho at Ugx 2400. You plan to always pick consumables on every Mondays and Thursdays, while taking records as follows;

Week one:

Monday: 2 kgs of sugar, 3 kgs of posho and 2 kgs of beans.

Thursday: 4 kgs of posho and 3 kgs of beans

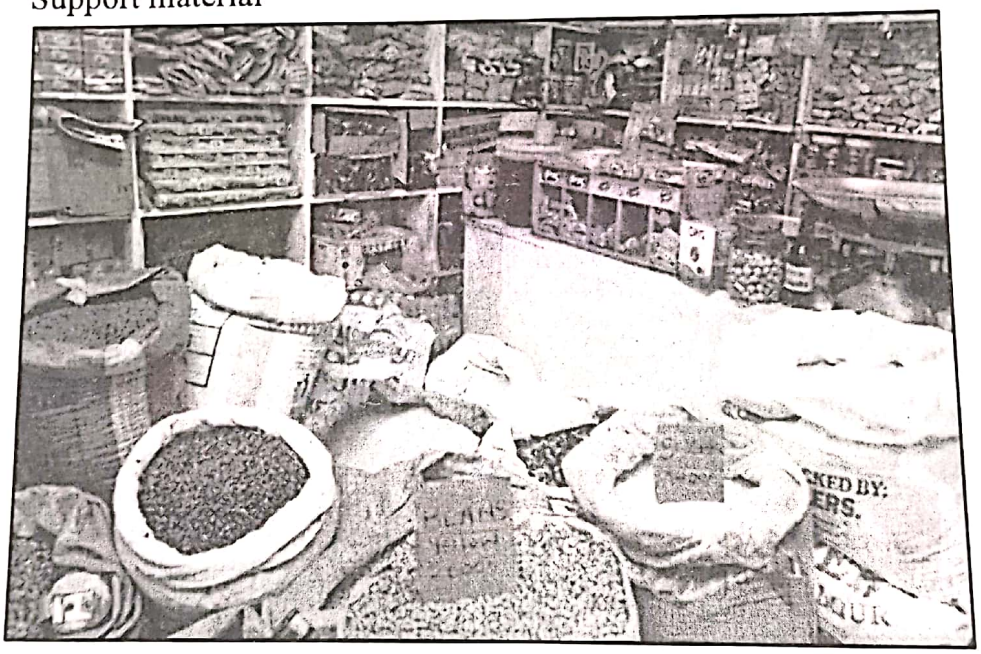
Week two;

You had visitors this week and picked more items as follows;

Monday: 3 kgs of sugar, 4 kgs of posho and 2 kgs of beans

Thursday: One kg of sugar, 2 kgs of beans and 5 kgs of posho.

Support material



Your Aunt is now back and asking you how much money you owe the shopkeeper.

Task

(a) How many kgs of each consumable did you pick from the shop all together for the two weeks?

(b) How much money will you tell your Aunt to pay?

(c) Did you fit in the planned expenditure budget proposal by your Aunt?

(20 scores)

SECTION B PART II

Attempt one question only

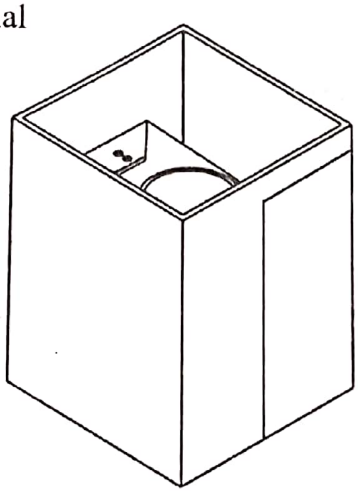
Item 5.

Your uncle has a bathroom with three walls and the floor that he wishes to tile. The person who wishes to do this work gave him the quotations required to complete this work as follows;

- Each box of tiles can cover a space of 1.5 square metres and costs Ugx 32,000.
- The two opposite walls measure 6 feet by 6 feet each.
- The floor and the other remaining wall measures 5 feet by 6 feet.
- Labour charges is Ugx 9000 per square metre.
- Other expenses on consumable materials namely: adhesive, sand, cement, spacers and grout amount to Ugx 200,000. He has money for all other expenses in hard cash but must borrow the money for tiles and labour from his siblings at a compound interest rate of 5%, if he can pay back by the end of 1.5 years.

However, Uncle is finding it hard to determine how much to borrow and how much is expected to pay back. Note: 1 feet = 0.305metres.

Support material



Task:

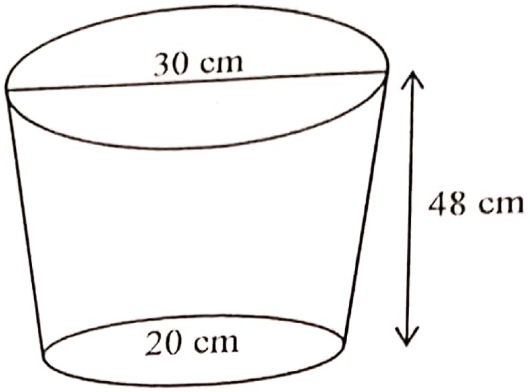
Help your uncle to find out how much money to borrow and how much to pay back to his siblings.

(20 scores)

Item 6

A manager owns a paint company which makes paint of various colours. He receives an order from his clients to make paint by mixing three colours; White(W), Blue(B) and Red(R) in the ratios W:B = 3:2 and B:R = 3:2. The customer orders for 380 litres of similar paint. Paint W costs Ugx 2200 per litre. Paint B costs Ugx 2700 per litre and Paint R costs Ugx 2850 per litre. The manager packs the similar paint made in buckets in a shape of a frustrum with top diameter 30 cm and bottom diameter 20 cm. The buckets are 48 cm deep as shown.

Turn Over



If the manager buys a cylindrical tank of diameter 1.8 m height 1.2 m which he wants to fill with paint so as to cater for any urgent demand that may arise.

Task

(a) (i) Determine the quantity of each paint in the mixture.

(ii) Find the amount of money needed to make 1 litre of the mixture.

(iii) Obtain the percentage profit made by selling the mixture at Shs. 3800 per litre.

(b) Help manager in determining the number of buckets that must be drawn to fill the tank.

(20 scores)

END

CANDIA NANCY S-4

E – Learning Teachers' Project Uganda

O & A Level Mathematics Seminar at Old Kampala S.S

Held on 23rd - June – 2024

Call: 0759-271390, 0705655497 0773-241666 (WhatsApp)

O- LEVEL 456/1 MATHEMATICS QUESTION PAPER

This paper will contain six (6) items with a duration of 2hours 15 minutes.

SECTION	ELEMENT OF CONSTRUCT	Number of items	
A (*Both items are compulsory*)	NUMBERS	1 ITEM	Both items MUST be done
	PATTERNS	1 ITEM	
B (*Attempt only one item of your choice from parts I and II respectively*)	DATA COLLECTION & PROBABILITY	2 ITEMS	Part I: ***Choose Only One***
	GEOMETRY & MEASUREMENTS	2 ITEMS (***Choose Only One***)	Part II: ***Choose Only One***
TOTAL NUMBER OF ITEMS TO BE PRESENTED BY THE CANDIDATES			4 items

SECTION A

THEME 1: **NUMBERS**

✓ Number bases
✓ Working with integers
✓ Fractions, percentages and decimals
✓ Numerical concepts (indices, surds and logarithms)
✓ Ratios and proportions

Item 1:

A certain region in Uganda is facing a severe drought, and the local community is struggling to access clean water. The regional government office has decided to distribute water among the affected villages. A simple regional population census is carried out, and its discovered that Village X has a population of 1500 people, village Y has 2000 people, and village Z has 1200 people. The government has 9000 litres of water to distribute amongst the villages.

Task:

If the government wants to distribute the water in the ratio of 3:4:2 among the villages, how many litres of water will each village receive?

Item 2:

In a certain district in Uganda, the Red Cross Society discovered that the average monthly expenditure on food by a family consisted of two parts:

One-part constant and the other part varying as the square of the number of children in the family. It was noted that a family of three children needed Shs. 17000 while that of seven children needed Shs. 21000.

Task:

(a) Determine the expression for the total amount of money, C, spent per month on food by a family with n children

(b) Determine the monthly food bill for

(i) a childless family

(ii) a family with five children

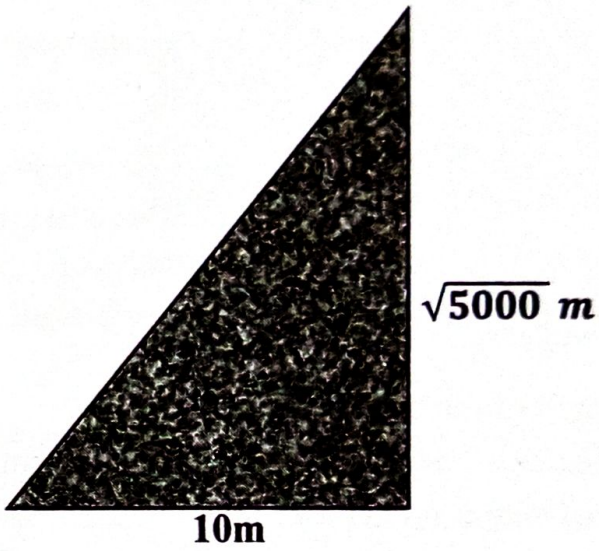
(c) A family with $(n-1)$ children is expecting another child. Help them determine the *extra cost of food*, per month, that will have to be met for the n^{th} child.

(d) Determine n such that the ratio of the average extra food cost per child in a family of n children is $\frac{5}{9}$ of the extra cost of food for the n^{th} child

Item 3

Juma has four plots of land in his village. He intends to give them out to his four sons, but unfortunately the plots do not relate in terms of size. Juma's close friend has accepted to give out an equivalent consolidated piece of land to enable Juma to distribute it to his children.

The surveyor's records indicate that there are 3 rectangular plots measuring $\sqrt{3200}\,m^2$, $\sqrt{1800}\,m^2$ *and* $\sqrt{9800}\,m^2$. The third plot has the structural map below.



Juma wants to reserve $\frac{1}{2}$ of the land for himself and distribute the remaining portion equally among his children.

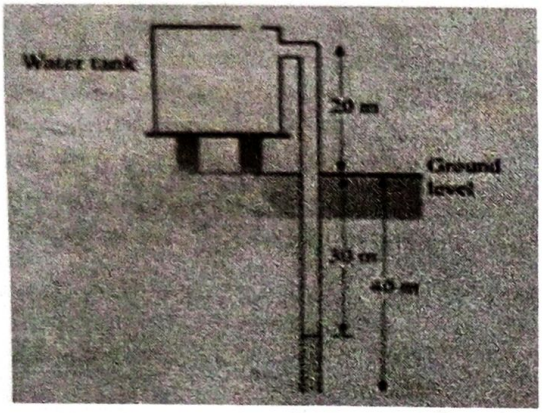
Task:

As a mathematician, help

a) Juma prepare a sharing plan for the piece of land.
b) Draw an abacus and illustrate this expression $4 \times 8^4 + 2\times 8^2 + 4\times 8^0$ on it.
c) Using the abacus only, work out the following;
   (i) $332_{six} + 25_{six}$
   (ii) $52_{eight} - 23_{eight}$

Item 4:

A school in a semi – arid region sunk a bore hole 40m deep. The water was to be pumped into an overhead tank whose top is 20m above the ground. The level of water in the pipe when pumping started was 30m below the ground and it rose by 5m every second as shown below.



Task:

Basing on your knowledge of integers,,

a) determine the vertical length of the pipe
b) Ignoring the horizontal distance travelled by the water, determine how long will it take for the water to start entering the tank.
c) State the height of the water levels at intervals of 2 seconds after the pumping started.
d) How long will it take for the water level to rise from $-30m$ to 10m above the ground?
e) If a hot water tap can fill a tank in 5 minutes while the cold water tap can fill the same tank in 3 minutes, the drain pipe can empty the full tank in $3\frac{3}{4}$ minutes. The two inlet taps and drain pipe are fully opened for $1\frac{1}{2}$ *hours* , after which the drain pipe is closed. Determine how much longer it will take to fill the tank.

Item 5:

In 2021, the total cost of manufacturing an article was Sh.1250 and this was divided between the cost of material, labour and transport in the ratio 8: 14: 3. In 2023 the cost of the material was doubled, labour cost increased by 30% and transport costs increased by 20%. Given that the cost of manufacturing the same article in 2024 was sh. 1981 as a result of increase in labour costs only.

Task:

a) determine the cost of manufacturing the article in 2023.
b) What would be the percentage increase in labour cost in 2024?

Item 6 :

Mr. Mukasa is a reknown shop keeper. He sells all kinds of grocery. Every Monday, he mixes two types of rice A and B in a ratio of 3 :2. Type A rice costs Shs. 6000 per kilogram and type B costs Shs. 5000 per kilogram.

He also has type A sugar that costs Shs. 5000 per kilogram and type B sugar costs Shs. 6000 per kilogram.

Mr. Mukasa supplies maize flour to three different neighboring schools all at once to cut down on the transport costs. He only does this when the bells of the schools are rung at the same time. Every Monday, Mr. Mukasa supplies these schools at exactly 8:00am. The schools have their time tables drafted following the following time intervals;

The first school has change of lesson interval every after 35 minutes

The second school has change of lesson interval every 40 minutes and

the third school has a change of lesson interval every 45 minutes

Task :

a) If you want to buy 23kg of the mixture, what would be the cost?
b) determine the ratio in which type A sugar will be mixed with type B sugar in order to produce a blend costing Shs. 5600.
c) If Mr. Mukasa's shop operates 24 hours throughout, determine the time in the week when the three bells will ring together again to have Mr. Mukasa' s supply

THEME 2 : **PATTERNS AND ALGEBRA**

⇒ Sequences and patterns
⇒ Equations of line and curves
⇒ Algebra 1 and 2
⇒ Mapping and relations
⇒ Inequalities and regions
⇒ Equation of a straight line

⇒ Rectangular Cartesian plane
⇒ Simultaneous equations
⇒ Linear programming
⇒ Loci

Item 8:

The Ministry of Health in Uganda is concerned about the spread of malaria in the country. They have collected data on the number of malaria cases in different districts, and the amount of insecticide used for mosquito control. the data is shown in the table below:

District	Malaria cases	Insecticide used in litres
Kampala	500	200
Mukono	300	150
Wakiso	400	180
Jinja	200	120
Mbale	350	160

Task:

(a)(i) Using the data above, create a relation between the number of malaria cases and the amount of insecticide used.

(ii) determine the function that models this relation

(b) Using the function in (a)(ii) above, determine how much insecticide should be used in a district with 600 malaria cases.

Item 9:

In a certain school the school fees were increased by Shs. 400000 per child. Because of this increase, 50 children left the school. Given that the total fees collection rose from Shs. 150,000,000 to Shs. 200,000,000.

Task: *You are the school bursar, and you've been tasked to*

(i) determine the number of children in the school

(ii) determine the school fees that each of the remaining children paid

(iii) give a logical conclusive statement from your observation and advise the school director accordingly.

Item 10:

A certain company has undertaken a contract to supply a customer with at least 260 units in total of products X and Y, during the next month. At least 50% of the total output must be units of X. The product are each made by two grades of labour, as follows:

	X hours	Y hours
Grade A labour	4	6
Grade B labour	4	2
Total	8	8

Although additional labour can be made available at short notice, the company wishes to make use of 1200 hours of Grade A labour and 800 hours of Grade B labour which has already been assigned to work on the contract next month. The total variable cost per unit is 120 Pound sterling and 100 Pound sterling for Y. The company wishes to minimize the expenditure on the contract next month.

Task:

Help the company determine how much of X and Y should be supplied in order to meet the terms of the contract.

ITEM 11:

An owner of a certain furniture company wishes to transport at least 600 desks from its stores to your school. The company has two types of trucks P and Q. Truck P can carry 50 desks at a cost of Sh. 40,000 per trip. Truck Q can carry 75 desks at a cost of Shs. 50,000 per trip. There is Shs. 600,000 available for transport. The number of trips made by truck P should not exceed 7. The number of trips made by truck Q should not exceed the number of trips made by truck P.

Task:

a). If x and y are the trips made by P and Q respectively, write down four inequalities satisfying the given conditions.

b). On the same axes, draw the graphs of the inequalities and shade the unwanted regions.

c). Using your graph to determine the number of trips each truck should make so as to minimize the transport cost. Hence, find the amount of money served on transport.

Item 12

A certain organization used lorries for transportation of building materials during the month of March and April 2024. The same amounts of diesel and oil were used. The amount of money spent on fuel are in the table below;

Month	Price of diesel per litre (Ushs.)	Price of oil per litre (Ushs.)	Total cost of fuel (Ushs.)
March	2500	5000	800,000
April	3000	8000	1,200,000

Taking x and y to represent the number of litres for diesel and oil respectively.

Task:

i. Write the matrix equation to show the cost of the purchase.

ii. Solve the equation to determine the number of litres used on both diesel and oil.

Item 13 :

In designing wedding deco box handler, a rectangular sheet of metal 8m long and 6m wide is used. Equal squares of side $x\,m$ are cut from the corners of the sheet. The remainder is bent to form an open rectangular box. The volume , $y\,m^3$ of the box is given by $y = 4x(4-x)(3-x)$

The table below shows how the cut sides correspond to the volume of the box.

$x\,(m)$	0	0.25	0.5	0.75	1.0	1.25	1.5	2.0	2.5
$y(m^3)$		10.3	17.5	21.9		24.1	22.5		7.5

Task:

a) Using the information given, you are required to copy and complete the table, and draw a graphical representation of the curve $y = 4x(4-x)(3-x)$ by using a scale of 2: 0.5 on the x – axis, and 1:5 on the y – axis.

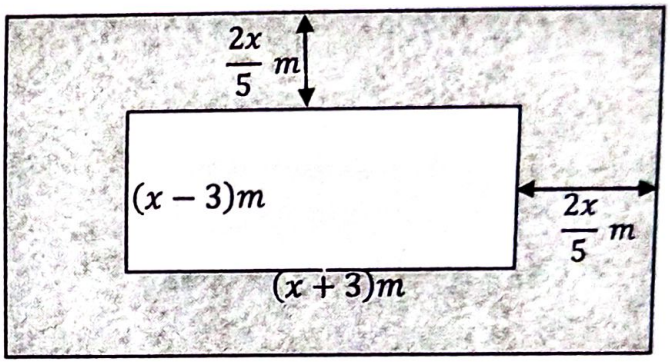
b) Using your graph, find the

(i) two possible values for the depth of box when its volume is 15 m^3

(ii) greatest possible volume of the box.

Item 14 :

Your school has organized a S.4 candidates' prom party. In order to have a good prom party, the floor of the dancing hall is designed with a carpeted margin all-around of $\frac{2x}{5}$ m wide leaving a dancing space of $(x-3)m$ *by* $(x+3)m$ as shown below.



Task: *You are required to compute the following, and hand your calculations to your class teacher.*

a) If the total area of the entire room is $315m^2$, calculate the value of x.

b) Determine the area of the carpeted margin.

c) If the carpet cost shs. 25000 per m^2. Calculate the total cost of the sealed margin.

Item 15 :

In a certain district, a plot of land has been designated for construction of a health facility to help the citizen access medical treatment. The plot is in the form of a trapezium with sides AB =74m, BC =48m, CD =56m, Angle ABC =81 ° and AB parallel to DC.

Task: As a mathematics learner, work out the following;

a) Using a scale 1cm to 10m, **construct** the plan of the plot.
b) On the plan **construct** locus L_1, of points equidistant from sides AB and AD and locus L_2 of points equidistant from sides DC and DA
c) If L_1 and L_2 meet at M, a TV mast, **locate** M
d) **Shade** the region inside the plot where trees can be planted such that they are at least 25m away from the mast.

Item 16 :

In a scientific investigation, the variables x *and* y are known to satify a law of the form $y = kt^x$ *where* k *and* t *are constants.* The data collected from an experiment was recorded as in the table below .

x	1	2	2.5	3	4
y	9.6	19.2	27.1	45.4	76.8

Task:

a) obtain a linear equation connecting x *and* y.
b) Suppose one of the recorded values of y is wrong, draw a suitable graph and identify the wrong value of y.
c) Use your graph to estimate the values of k and t.

Item 17:

In Term 2 , a certain S.3 student from one of the streams at his school picked a piece of paper bearing the following information.

A straight road L_1 has a slope $-\frac{1}{2}$ and passes through a point P(−1 , 3).
Another straight road L_2 passes through two points Q(1 , −3) and $R(4,5)$.

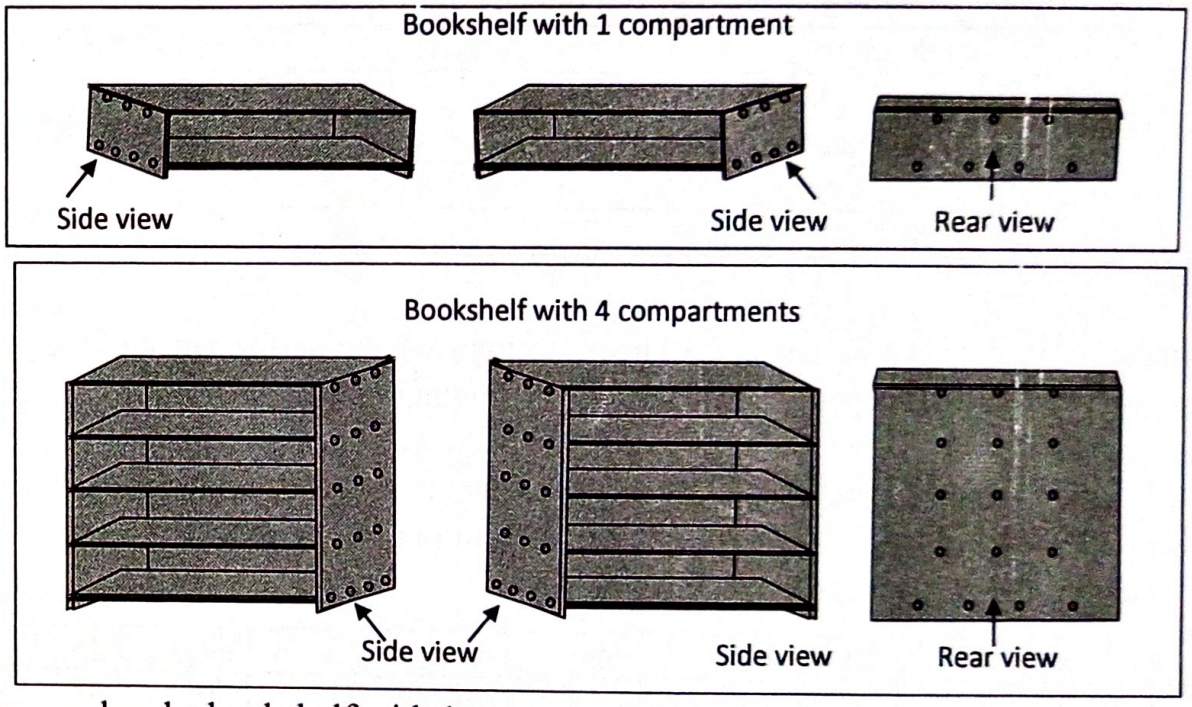
(a) The equation of road L_1 is
(b) Road L_2 has an equation given by
(c) The two road cross each other at the point
(d) The equation of another straight road that passes through R and is parallel to L_1 is given by
(e) The equation of another straight road that passes through point S (0 , 5) and is perpendicular to L_2 is given by

The student discovered that their stream had not yet covered the that learning area in mathematics, and his stream Mathematics teacher wasn't available to guide him.

Task: You are one of the students from the stream that had covered that area, and you had actually achieved all the learning out comes. By showing your working help the student to determine all the missing information.

Item 18:

Mbeiza is a carpenter. She specializes in making bookshelves with different numbers of compartments. She uses 12 nails for the base of a bookshelf, and 9 more nails for each compartment in the bookshelf.



Waiswa ordered a bookshelf with 1 compartment, Ami ordered a bookshelf with 2 compartments, Kidha ordered a bookshelf with 3 compartments and Moesha ordered a bookshelf with 4 compartments.

Task:

a) Complete the table to show the number of nails that Mbeiza used to make each of the four bookshelves.

Number of compartments	**1**	**2**	**3**	**4**
Number of nails				

b) Mbeiza realised a pattern in the number of nails she used to make the bookshelves with 1, 2, 3 and 4 compartments.

(i) Write two numbers to complete this algebraic expression to show the number of nails (y) that Mbeiza needs to make a bookshelf with p compartments.

$\_\_\_\_ + p(\_\_\_\_) = y$

(ii) What does the first number in the algebraic expression represent?

(iii) What does the second number in the algebraic expression represent?

c) Mbeiza received a new order, for 4 bookshelves with 6 compartments. She has to buy nails. Nails are sold in kilograms. In a kilogram there are 32 nails. Each kilogram costs UGX 5,000. Determine how much Mbeiza paid for the nails for the new order.

❖ Data collection and presentation
❖ Graphs
❖ Set theory
❖ Data collection and display
❖ Matrices
❖ Probability

Item 19:

The Director of studies of a certain school needs to improve the performance of the Physics department of his school. He can either add another teacher, 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 year which was 50. He then instructs the Physics department to give an assessment test. These were the student's marks.

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

He also visited the library and found out that the previous year's candidates had used three books for their revision, and these were Fielder (F), Broom Brock (B) or Vermont (V). From the librarian's records it is clear that all the candidates who did not use any of the books failed the subject greatly. Out of the **35** candidates this year **13** used F, **20** used B and **17** used V. **9** used F and V, **3** used F and B while **8** used B and V only. The records show that an unknown number of candidates used

all the three books. He observed that he should replace one book type of the three with Lion Hunt publisher since no student read it only alone.

Task:

(a) (i) Help the Director of studies 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.

(c) If the Director of studies intends to purchase more books to be used in the school library; He uses two stationery shops A and B and intends to purchase as shown below;

Option 1 : 3 copies of Fielder publishers, 12 of Broom Brock publishers and 15 of Lion Hunt publishers

Option 2 : 10 copies of Fielder publishers, 5 of Broom Brock publishers and 20 of Lion Hunt publishers.

He discovers that at shop A each copy of Fielder, Broom Brock and Lion Hunt would cost Shs. 20,000, Shs. 22,000 and Shs. 15000 respectively. And at shop be Lion Hunt would cost Shs. 20000, Fielder costs Shs 18000 and Broom Brock would cost Shs. 17000.

Given that the school has only Shs. 550000 to spend, use your knowledge of matrices to advise your school Director of studies on the right shop to purchase from, and the quantities to be purchased.

Item 20 :

The caterer of a school located in Makai division -Kana city is required to buy food stuffs for a school party. The foodstuffs to be bought include: 100 kg of rice, 150kg of meat and 200kg of Irish potatoes. The cost is UGX 3500, UGX15,000, and UGX1500 per kg of rice, meat and Irish potatoes respectively in Maaro farmers' market. The same items cost UGX. 3000, UGX. 12,000 and UGX. 1,100 per kg of rice, meat and Irish potatoes respectively, in Kaleewa farmers' market. To hire a pick-up from Maaro farmers' market to school costs UGX 60,000 while a pick-up hire from Kaleewa farmers' market is UGX95,000.

Task:

(a) What would be the easiest way to display the information provided above?

(b) Using the information provided above, how would the caterer decide on where to do the shopping from? Justify your answer.

CANDIA NANCY

Item 21:

In order to improve on the livelihood among the community, the government has embarked on distribution of improved seeds to boost the yield of agricultural product in a certain **sub**-county which has 4 wards. The wards are W, X, Y and Z. Basing on the size of land in each ward, for every 100 packets of seed, ward **W** gets 40 packets, ward **X** gets 10 packets, ward **Y** gets 30 packets and ward **Z** gets 20 packets. The government has procured 45,000 packets which are to be shared equitably according to the community.

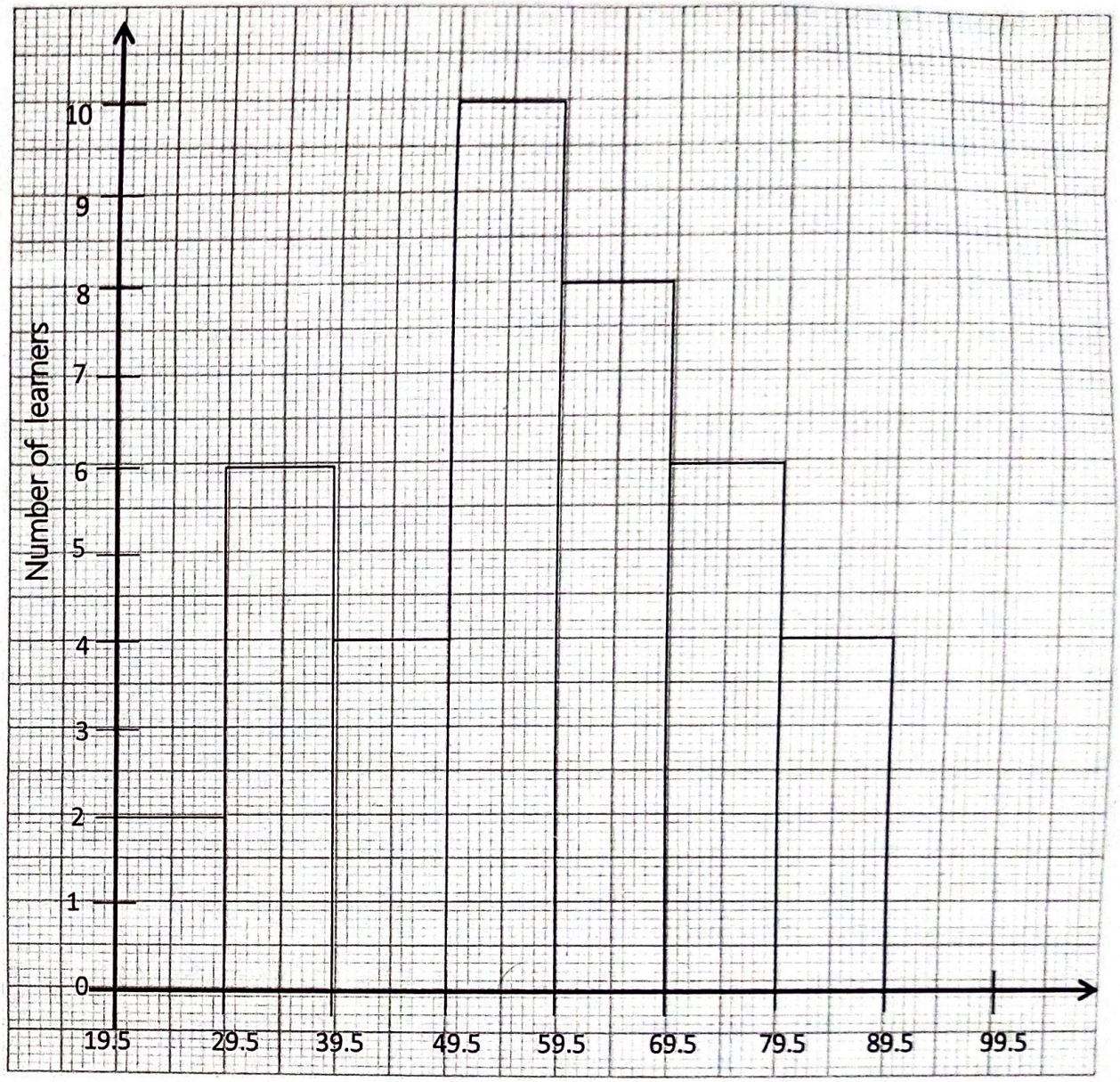
Task:

a) By using a statistical graph, help the local leaders to distribute these seeds to the community in wards.

b) Basing on your observation, how best would you advise the government in terms of distribution.

Item 22:

A certain mathematics teacher assessed his learners in some learning areas to really discover whether his learner were achieving the learning outcomes. In his analysis, he decided to present the results graphically as shown below.



Task: Help your teacher to ;

(a) determine the;
(i) number of learners
(ii) dominant class
(iii) Class width

(b) Use the graphical representation above, to construct a table and hence find the
i. average mark

ii. peak mark
iii. middle class.

(c) Construct a curving graph for the given data and use it to
i. estimate the central value and semi- interquartile range
ii. If a learner has to achieve an identifier of 2.4 in order to be considered to have achieved the learning outcomes, and that the teacher is set to re do the learning areas if at least 60 % of his class scores below the indicated identifier, otherwise, he proceeds to another learning area by analyzing the graph, draw a suitable conclusion on what should be done

(d) Candidates in a Mathematics (456) examination are required to answer 10 questions from section A and 5 questions from section B for full marks. Five candidates A, B, C, D, and E answered questions as follows.

Candidate	Section A	Section B
P	05	04
Q	07	03
R	04	04
S	09	04
T	08	02

The mark awarded are 4 for each question of section A and 12 for each question of section B.
Write down a:
i. 5 x 2 matrix for questions answered
ii. 2 x1 matrix for marks awarded
iii. Determine the mark for each candidate scored in the Mathematics (456) examination.

Item 23:
Research was made in a certain school to discover the number of science teachers who teach Physics(P), Chemistry(C), and Mathematics(M). The research findings summarized that; $\mathbf{n(P)=13,\ n(M)=16,\ n(\varepsilon)=25,\ n(C)\ 15,}$ $\mathbf{n(P\cap C)=\ 9,\ \ n(P\cap M\cap C^{I})=3,\ n(M\cap C)=11,\ n(M\cap C\cap P^{I})=3n(M\cap C^{I}\cap P^{I}).}$
Task: *As a mathematics learner, help your head teacher understand all about the research* **made** *by* ;

(a) Showing the given information on a Venn diagram and using it to find the number of teachers who teach;
(i) All the three subjects

(ii) None of the subjects

(b) Given that a teacher is picked at random, what is the probability that he/she teaches at least one subject?

PART II

THEME 4 : **GEOMETRY AND MEASUREMENTS**

➢ Geometrical construction
➢ Bearings
➢ General and angle properties of geometric figures
➢ Reflection
➢ Business arithmetic
➢ Time and tables
➢ Similarities and enlargement
➢ Circle
➢ Rotation
➢ Length and area properties of two dimensional geometrical figures
➢ Nets, areas and volumes of solids
➢ Trigonometry 1 and 2
➢ Vectors
➢ Business mathematics
➢ Matrix transformation
➢ Circle properties
➢ Lines and planes in three dimensions

Item 24 :

Maria is a landscape designer who wants to create a triangular-shaped garden bed in a park. She wants to inscribe a circle within the triangle and plant a tree at the center of the circle. The park authorities have given her a rectangular plot of land with dimensions 15 meters by 20 meters. Maria wants to use the entire plot to create the triangular garden bed.

Task:

(a) Construct a triangle using the entire rectangular plot (15m x 20m) as the

base and height.

(b) Inscribe a circle within the triangle, touching all three sides and determine the radius of the inscribed circle.

(c) Find the distance from the center of the circle (where the tree will be planted) to each vertex of the triangle.

Item 25:

Recently, Mr. Elau discovered that he needed to keep track of all expenses on utilities at his home. He normally pays for water, electricity, Netflix, and Garbage collection. He asks UMEME to send him a voucher showing his electricity bill for the months of December 2023 to May 2024. The table below shows Mr. Elau's electricity bill sent as required.

Meter readings		End of Month	Units	Charges (Shs.)	
Previous	Present	December 2023		Due	Credited
Bal. B/F				16998.25	12403.25
60057 CTL	60722	January 2024	665	5320.00 532.00	5000.00
60722 CTL	62885	May 2024	2163	17304.00 1730.40	19500.00

- CTL - Commercial Transactions Levy
- B/F - Balance carried forward

Task:

Upon receiving the bill, Mr. Elau fails to understand it, and asks you to help him

(a)find

(i) the total amount due at the beginning of June 2024

(ii) the percentage used to compute the CTL

(iii) his average monthly consumption of power in terms of units of electricity using the months of January, February, March, April and May.

(b) Represent this consumption in terms of money payable, including the CTL.

Item 26:

You have a cylindrical tank whose capacity is 30000m^3 at your home. During holidays, your father decides to paint the tank since its colour has faded due to the effects of weather. It is also known that the diameter of the tank is 10% smaller than its height, and that the outer surface (top and curved surface) should be painted.

Your father sends you to a nearby hardware shop to purchase the tins of paint required. You discover that every 5litres tin of paint costs Shs. 40,000 and can paint $60m^2$ of the surface.

Task:
As a mathematician, advise your father on the cost of paint needed for the repair of the tank.

Item 27:
One night, two prisoners escaped from the prison cell while the ground night guards were asleep. A guard at the top of the tower of height 78m saw the two prisoners approaching the exit gate due East of him. The angles of depression of the prisoners are 12^0 *and* 19^0. He quickly picked his phone to call and alert the guards at the exit gate to be on standby. The prisoners were running at a distance from each other and the prisoner ahead was about 20m away from the exit gate. The guards at the exit gate were alerted that in 2 minutes, one prisoner would be reaching the exit gate. They wanted to know in how many minutes the second prisoner would arrive so that they take cover.
Assuming both running at the same speed.

Task:
You are one of the guards. Help the other guards to ascertain the
(a) distance between the prisoners
(b) how many minutes it took the second prisoner to reach the exit gate.

Item 28:
Sarah bought a 4-inch mattress. She then went to John, a tailor, to buy a cloth for a cover to fit the mattress exactly. John sold her $4.6m^2$ of a cloth which he advised was exactly enough to cover the mattress quickly. John noted that the length of the cloth was twice its width, and that one inch was approximately 2.5m. Sarah paid for the mattress and cover cloth in Uganda Shillings, where the mattress cost Shs. 252500, and the cloth cover cost Shs. 36500.
Being a business woman, Sarah decided to sell the mattress by setting two options, where the cash price of a mattress is Shs. **350,000**, while Its hire purchase price is **12%** higher than the cash price. A buyer pays **10** monthly installments of ***shs.*** **24,000** each after paying a deposit.

Task:

Supposing you are a business analyst, help Sarah to;

a) determine the actual dimensions of the cloth.

b) Calculate in pound sterling

(i) The price of the mattress

(ii) the total cost of the mattress and its cover,

(1US dollar is equivalent to Shs. 3500, and that 1-pound sterling = 1.8 US dollar)

c) (i) the amount paid as a deposit by a certain customer who decides to buy the mattress by hire purchase rather than cash,

(ii) the savings the customer would make had he bought the mattress with cash rather than on installments

(iii) Sarah's percentage profit if the mattress is bought through hire purchase.

Item 29:

Your neighbor wants to sell a tree in his compound to a furniture making factory owner, who negotiates prices depending on the tree's height. For every 10m of the desired tree, the factory owner pays Shs. 50,000.

Being that the tree is very tall, your neighbor cannot easily ascertain its height so that he can determine how much he will earn when he accepts to sell it.

From the top of his house, the angle of elevation of the tree top is 34^0 and the angle of depression of its foot is 62^0. The tree is found to be 250m from the base of his house.

Task:

As a mathematician,

a) come up with a diagram that will help to determine the height of the tree.

b) help your neighbor to know the height of the tree by calculation.

c) Determine how much your neighbor should expect from the factory owner.

Item 30:

Mr. Walakira owns a construction company. He has been contracted to drain a swamp and have it prepared for rice planting project. He discovers that the swamp containing $4158m^3$ of water can easily be drained by a pump.

The pump is to be connected to a cylindrical pipe of diameter 7 cm, and can be operated for 8 hours per day. The rate at which the water flows out of the pipe is 1.5 metres per second.

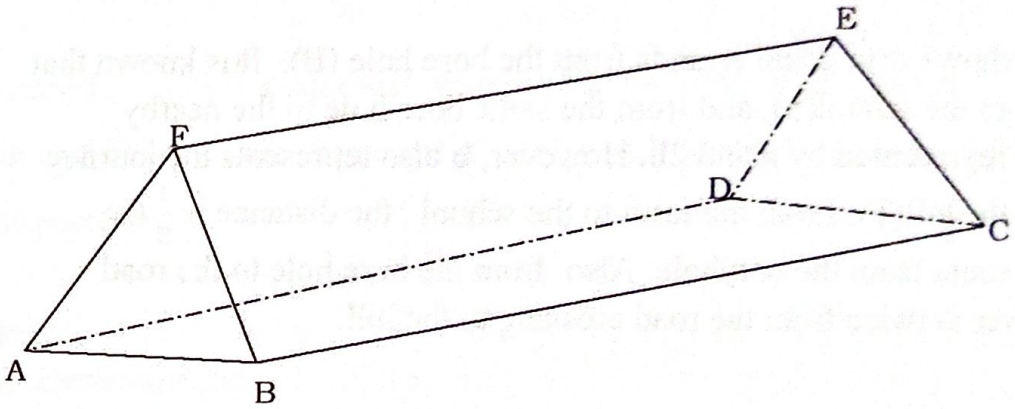
Given that the cost of hiring the pump is Shs. 12000 per day excluding the cost of diesel. The pump can consume 10 litres of diesel per hour, and the cost of diesel is Shs. 4700 per litre.

Task: *Mr. Walakira has hired you as a mathematician to help him determine the following*

a) the number of days it takes to drain the swamp
b) the total cost of draining the swamp.

Item 31:

The structure of the roof for the new dormitory at your school is as shown below.

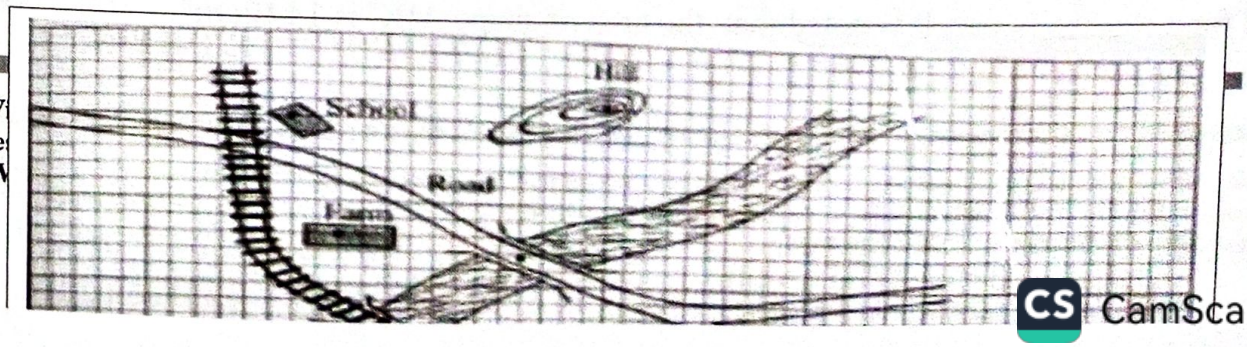


Given that the dimensions AB = 5m, $\overline{AF} = \overline{BF} = 3m$ *and* $\overline{BC} = 12.5m$.

Task: *You have been task to help determine to one decimal place the;*

a) total surface area of the roof.
b) volume occupied by the roof.
c) angle between the planes BCEF and ABCD
d) Basing on your calculations, what advice would you give the builders of the roof.

Item 32:



The picture above shows your usual errands from the bore hole (B). It is known that from the bore hole to the school(S), and from the same bore hole to the nearby hospital(H) can be represented by **a** and 2**b**. However, **b** also represents the journey from the school to the hill(T). From the farm to the school , the distance is $\frac{1}{3}$ the journey along that route from the borehole. Also, from the bore hole to the road crossing (R) the river is twice from the road crossing to the hill.

Task:

a) using your knowledge of vectors, draw a mathematical diagram from the picture and description given to you.

b) In terms of **a** and **b**, how would you present;

i. **BT**

ii. **TR**

iii. **SR**

iv. **SH**

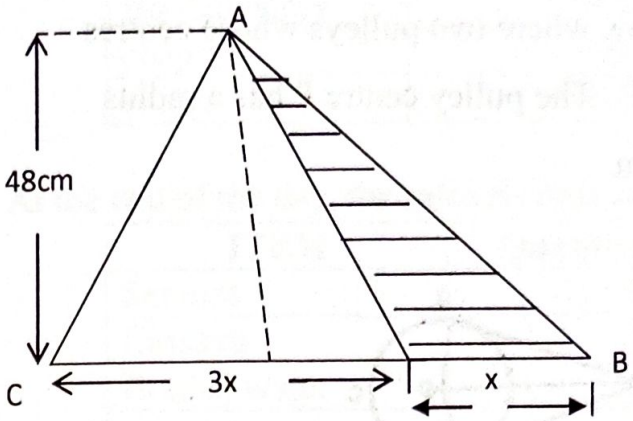
c) "S, R and H are such that they are all in a straight line", using vectors show that the statement is true.

d) Given that $\mathbf{a} = \begin{pmatrix}3\\5\end{pmatrix}$, $\mathbf{b} = \begin{pmatrix}1\\0\end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix}11\\10\end{pmatrix}$ and that $\rho\boldsymbol{a} + \sigma\boldsymbol{b} = \boldsymbol{c}$, find the scalars ρ *and* σ hence determine $|\sigma\boldsymbol{a} - \rho\boldsymbol{b}|$

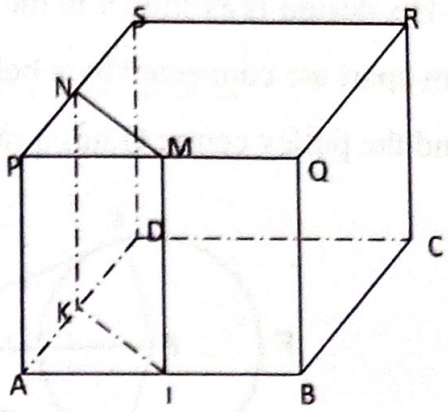
Item 33:

Your family intends to start up a poultry farm. Structure **I** below shows part of a roof for a chicken house. It is noted that the area of shape ABC is $1440cm^2$.

I



II



Structure **II** shows a cuboidal shape of the building with sides $AP = 10\ cm, AB = 20cm$ and $BC = 8\ cm$. The points K, L, M and N are the midpoints of AD, AB, PQ and PS respectively.

Task:

a) Determine the

(i) area of the painted region in structure **I**.

(ii) A standard corrugated iron sheet is to be used to shelter the shaded region. if the iron sheet covers approximately 51.4cm^2. determine how nay iron sheets are needed, and work out the amount required if each iron sheet costs shs. 45000.

b) In Building structure **II** , determine the length $|KL|$

c) What is the angle between the faces?

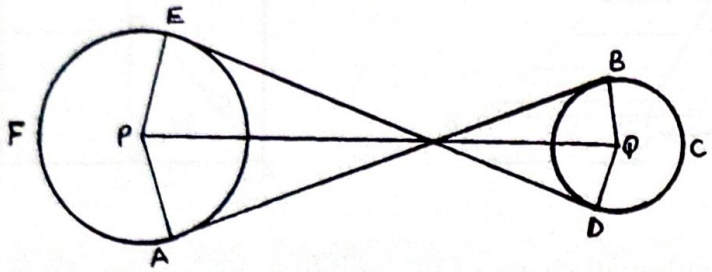
(i) $ABQP$ and the plane $KLMN$.

(ii) BDR and the base ABCD

d) if Point O is the point of intersection of the diagonals AC andBD. Find $|RO|$.

ITEM 34:

A mechanical engineering student in one university wants to design a belt runner system. His design is as shown in the figure below where two pulleys whose centres are 30cm apart are connected by a belt ABCDEF. The pulley centre P has a radius 13cm and the pulley centre Q has a radius of 4cm.



Task: *Suppose you are interested in discovering more about the design, by carrying out some calculations*, work out the;

(a) length AB
(b) reflex angles EPA and BQD.
(c) arc length AFE and BCD.
(d) total length of the belt.

Item 35:
During inter- house Games & Sports competition, a trader brought the following items to sell to parents and learners in a tent.

ITEM	UNIT AMOUNT (Shs.)
Samosa	500
Cassava	200
Bottled water	1000
Chapatti	1000
G.nuts	500

The trader stocks as follows and wants his capital back in one day plus some profits in queue to raise fees for his son.

ITEM	UNIT COST (Shs.)	Quantity
Samosa	1000	1700

Cassava	900	900
Bottled water	2000	2000
chapatti	700	700
G.nuts	500	500

At the end of the day, the sales records are as follows;

ITEM	Quantity sold (Shs.)
Samosa	1312
Cassava	900
Bottled water	1349
chapatti	528
G.nuts	500

In the evening, the trader wants to know if he made a loss or profit but he is not good at mathematics.

Task:

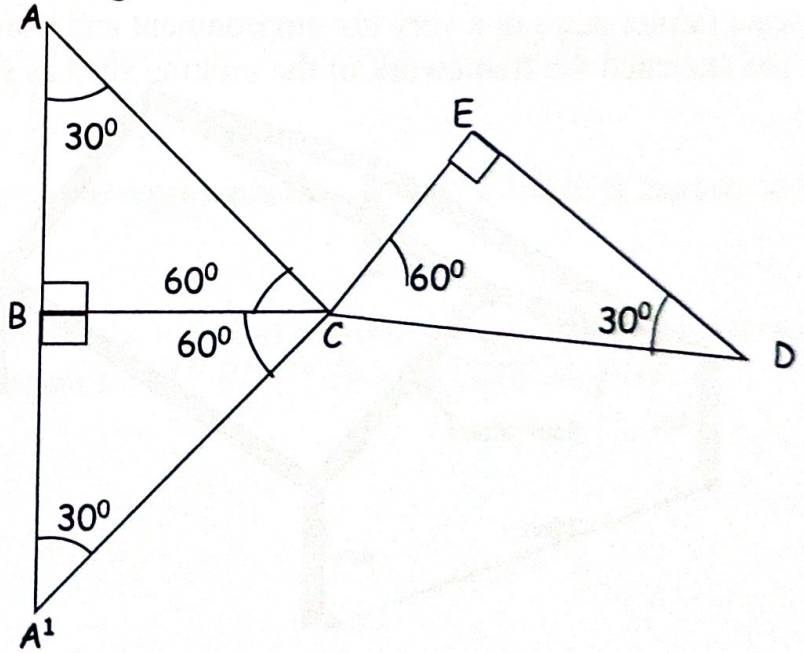
Help the trader to calculate the;

a) profit or loss for each item

b) Total profit or loss for the day's sales, hence express the total profit or total loss of the day's capital as a percentage.

Item 36:

Below is triangle ABC whose interior angles are 30^0, 90^0 and 60^0 respectively. Triangle DEC is congruent to triangle ABC. Point B, C and D lie on the same line.



Task:

(a) Which point would help you be able to map triangle ABC onto triangle DEC?
(b) What special geometrical name is given to that point identified in (a)
(c) How many degrees does triangle ABC have to undergo in order to fit onto triangle DEC?
(d) Describe the transformation that would completely map triangle ABC onto triangle DEC.
(e) What geometrical name would you use to describe line BC in relation to triangles ABC and A^{1}BC?
(f) Describe fully the transformation that maps ABC onto A^{1}BC.

Item 37:

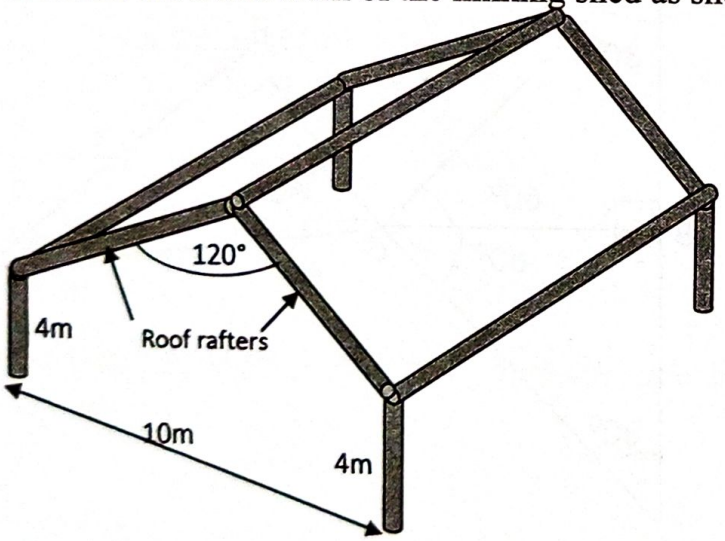
A regular pyramid with a square base, has a circle inscribed on the base of the pyramid. The edges of the square base of the pyramid are tangent to the circle. If the radius of the circle is 5cm, and each of the slant edges of the pyramid is 13cm;

Task: *As a mathematician*,

(a) Sketch a diagram represented by the information provided.
(b) Work out the height of the pyramid.
(c) determine the volume of the pyramid.
(d) Find the area of the part not covered by the circle on the base of the pyramid.

Item 38:

Labong a small-scale farmer stays in a very hot environment and wants to build a shed for his cows. He has sketched the framework of the milking shed as shown below.



Given that the walls are 10 metres apart and the top of the roof is halfway

between the walls. The sloping roof rafters meet at an angle of 120°.

Task:

(a) construct a scale drawing of the cross-section of the milking shed.

(b) What scale have you used?

(c) What is the length of the roof rafter?

(d) What is the angle of inclination of the roof?

(e) Sketch the same roof if the angle of inclination is more than what you obtained in (d) without changing the dimensions of the milking shed.

Item 39:

An insect walking on a piece of graph paper catches Musa's attention. He notices that it moves from coordinates A (2,0) to B (6,0) to C (6,4) and then to D (2,4). The polygon so formed from the insect's path is reflected in the mirror $y = -x$, to form the path image $A'B'C'D'$. Musa enjoys this outcome, and thus decides to rotate $A'B'C'D'$ through +90° about the origin to attain the final image $A''B''C''D''$.

Task: *As a mathematics learner,*

(a) Write down the matrices that would represent the: -
   (i) reflection
   (ii) rotation

(b) Using your knowledge of matrices, determine the coordinates of:
   (i) $A'B'C'D'$
   (ii) $A''B''C''D''$

(c) Draw a graphical representation of $ABCD$ and its images on the same graph.

(d) determine a single matrix of transformation which would directly make $ABCD$ appear as $A''B''C''D''$ and describe it fully.

Item 40:

Mukasa leaves town B at 1.06pm for village A riding non stop at a steady speed of 15kmh^{-1} and arrives in village A at 3.06 pm. Okot leaves village A at noon for town B. From town A Okot rides at a steady speed of 20km for 45 minutes. He then rests for 30 minutes and then continues with a steady speed of 15km/hr and reaches town B at 2.15 pm.

Task: You are tasked to analyse their journeys

(a) Represent Mukasa and Okot's motion on a distance time graph. (Use a scale of 1cm: 15minutes on the X-axis, 2cm: 5km on the y-axis)

(b) Use your graph to determine when the two cyclists passed each other and how far from B they were at this time.

(c) How far apart were the two cyclists at 2:00 pm?

Item 41.

A school was to buy a truck at a cost of sh180 million. The head teacher decided to go in for a 4 years' loan from a bank at an interest of 24% per annum, simple interest. The loan processing fee was 2% of the loan. The loan was to be paid termly of equal installments.

Task: *As a mathematician, you are required to determine;*

a) the interest to be paid in 4 years
b) the total amount to be paid on completion of the loan
c) amount to be paid termly
d) the percentage extra cost incurred by going in for a loan to buy the bus.

BONUS ITEMS:

Item 41.

Lubinga owns a taxi business, and mainly transport passengers from Kampala to Mukono and vice versa depending on where he is. One morning, he set off from Mukono on a bearing of 060^0 at a steady speed of 200 Km/hr for $1\frac{1}{2}$hrs to Kampala. Since there was traffic jam, he decided to change the course and travelled to Luzira on a bearing of 155^0 at an average speed of 720 Km/hr for 40 minutes;

Task: By using a scale of 1 cm to represent 50 km; draw an accurate diagram to show routes of the taxi,

a) From your diagram, find the;

(i) distance between Mukono and Luzira
(ii) bearing of Luzira from Mukono
(iii) time it will take to travel from Luzira to Mukono using the direct route at an average speed of 250 km/hr.

Item 42:

Ms. Aisha, an employee of Crown beverages earns a gross annual income of Shs. 8.4 million and the company offers a family allowance of only three children and the monthly allowances are spelt as follows;

- Medicine Shs. 30,000 per month
- Electricity Shs. 360,000 per annum
- Marriage is $\frac{1}{20^{th}}$ of the monthly gross income
- Rent Shs 120,000
- Insurance $\frac{1}{100^{th}}$ of the gross annual income
- Un married Shs. 10,000

Given that a child under 12 years of age is given shs.8,000, a child between fourteen and twenty inclusive is given Shs. 5,000, a child above 20 years but not exceeding 25 years is given Shs 4,000. Ms. Aisha is married with five children of whom three are aged less 10 years and others aged 14 and 26 respectively. The table below show the taxable income ranges with their respective rates (%);

Taxable income (Shs)	Rate
30,001 – 80,000	5
80,001 – 120,000	10.5
120,001 – 245,000	15.6
245,001 – 370,000	26.5
370,001 – 480, 000	34.6
480,001 – 640, 000	48.4
Above 640,000	45.5

Task:

You are the company accountant, how best would you determine

a) the taxable income and income tax paid by Aisha during the month of August.
b) the percentage of tax paid as his taxable income

c) the actual amount of money Ms. Aisha goes with.

d) Suppose Ms. Amina decides to purchase a Bluetooth player which depreciates at a rate of 20 % per annum. Three years later, she decided to sell it at a discount of 30% of the original cash price. If its valued at Shs. 80,000 after 3 years, how much did she get after three years.

Item 43

In a certain game, a player can only go to the next level after satisfying the current level. In this, the player is presented with three inverted cards each having a number 5,3,and 2 drawn and used to form a three digit number without repeating a digit. When the number formed is more than 400, the player goes to the next level in which he is presented with a box containing 6 Red and 5Blue identical marbles. He is required to pick a marble randomly, note its colour, and pick a second marble without replacement.

In order to go to the third level, the player must have picked marbles of the same colour. Given that on the third level he is presented with a coin and a die, he is required to toss the coin and throw a die. the final win only comes when a head shows and a prime number is obtained.

Task: ***You are tasked to compute the following accurately.***

a) determine the probability of going to level 2 of the game

b) What would be the probability of ;

(i) proceeding to the final level

(ii) obtaining marbles with different colours on level 2.

(iii) obtaining the second marble Red.

c) determine the chance of one player

(i) winning the entire competition

(ii) losing at level 2

ITEM 44

You are a heavy sleeper and without the aid of an alarm clock, you never wake up before 7:30 am. The probability then that you arrive punctually at school is $\frac{1}{5}$. If the alarm clock has been set the previous night, it rings at 7am, which gives you ample time, but the probability that it wakes you up is only $\frac{4}{5}$. You are also forgetful, and the probability that you remember to set the alarm is $\frac{1}{3}$.

Task: Calculate the probability that on any one morning,

a) you are awakened at 7am by the alarm clock
b) you forgot to set the alarm clock, but reached school punctually
c) you set the alarm, it fails to wake you up, yet you reach school punctually you are late for school.

ITEM 45

In one of the practical assessment scheduled to begin shortly, the laboratory attendant discovered that there are some chemical reagents missing, yet very crucial for the smooth running of the examination. The examination cannot start unless these reagents are available. Musiime is sent to quickly go and get them from a certain supplier in town Q. Musiime cycles as he leaves the school P, and takes 2 hours to reach town Q, 10km away. At Q, he rests for 30minutes and later returns to school P at a steady speed of 8kmh^{-1}. When Musiime delays, Mwesigwa who happens to be at Q, is given a phone call to help pick the reagents and deliver them quickly. Mwesigwa leaves town Q at the same time as Musiime, towards town P, travelling at $2\frac{1}{2}$ kmh^{-1} but midway in his journey, Mwesigwa discovers that he had been given a package containing apparatus for a different subject. He thus decides to return back the package to the supplier. He returns back to Q at a steady speed of 4 kmh^{-1}.

Task:

Using a scale of 1cm to represent 15 minutes on the horizontal and 1cm to represent 0.5km on the vertical axes respectively,

a) draw distance - time graphs to represent the two different journeys of the men.
b) how far from town Q did the two men by pass each other on the return journey?
c) determine Mwesigwa's average speed for the whole journey if he travels nonstop.

END.

SENIOR ONE SCENARIO BASED QUESTIONS

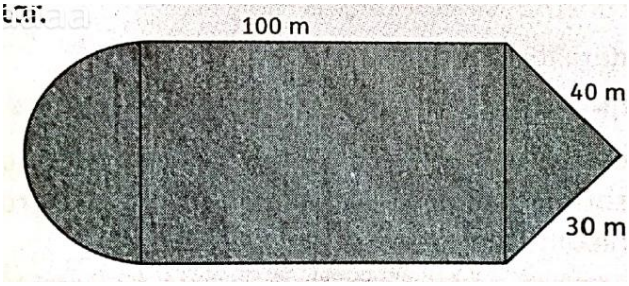
1. **Mr. Bwanika would wish to design his bedroom ceiling in form of an equilateral triangle surrounded by a circle with the sides of the triangle 6m. He wants to paint the triangular area with cream-coloured paint, which comes at a cost of UGX 15,000 per tin. Additionally, he plans to paint the circular region surrounding the triangle, excluding the triangle itself, with white paint, priced at UGX 12,000 per tin.**

   Mr Bwanika also wishes to design a circular seating area in his dining room and he has two options on his mind. Option A calls for two circular seating areas each with a 10 m radius and option B calls for a larger circular seating area with a 20 m radius.
   Task
   a) As a senior three student, help Mr Bwanika design a plan for the ceiling.
   b) How much do you think would be spent on paint if each tin of paint paints $1m^2$ area.
   c) Advise Mr Bwanika on which option will give him a bigger seating area.

2. **Mzee Zerubbabel invested his "senior citizen grant" of Shs.96000 in a Unit trust, which offers an interest rate of 8% per annum.**
   Mzee Zerubbabel's son Zachariah divided UGX17500 into two parts such that the interests on the first part at 8% simple interest per annum and on the other part at 6% simple interest per annum are equal.
   Task
   a) As a mathematician, help Mzee Zerubbabel establish how long it would take his money to accumulate to shs.126720.
   b) Help Zachariah to determine the interest accumulated on each part after one year.

3. **During Covid-19 pandemic, a liquid or spray sanitizer was used to kill the virus. Liquid sanitizer could be made using ethanol, hydrogen peroxide, glycerin and water. To make 20 liters of liquid sanitizer; 16 liters of ethanol , 1 liter of hydrogen peroxide, 0.4 liters of glycerin are required and water tops up to make 20 liters of the liquid sanitizer.**
   Tasks:
   a) What is the quantity of water that is used to make 20 liters of sanitizer?
   b) What is the fraction of each ingredient in 20 liters of sanitizer?
   c) What is the percentage of each ingredient in 20 liters of sanitizer?
   d) If you want to make 15 liters of sanitizer at once, what is the quantity of each ingredient that must.

4. **Juma wants to construct a perimeter wall around his plot of land. The plot of land is semi-circular at one end and has a right-angled triangle shape at the other end. The middle part of the land is rectangular.**



Task:

a) **Juma asks you to accurately construct the foundation plan for his perimeter wall. Explain how you have accurately constructed the perimeter wall plan. Discuss whether there are other ways of drawing an accurate plan.**

b) **Find the total cost of building the perimeter wall if the cost of building 1 meter is Ugx 35,000.**

c) **Find the total area of Juma's plot of land.**

5.

6. **Two learners were given a task of plotting the following points on the grid. A(0, 4) B (2, 2), C (4, 2), D (2, 0), E (4, -2), F (0, -1), G (-4, -2), H (-2, 0), I (-4, 2) and J (- 2, 2). Before they plotted the points, Jane told Musa that when plotting, for point A you move 4units to the right of the origin and no movement along the y-axis from the origin. For point C you move 2 units to the right of the origin and 4 units parallel to the y-axis in the positive direction. Musa said no for point A there is no movement along the x-axis, you only move 4 units along the y–axis. While for point C you move 4 units from the origin on the x-axis, then two units parallel to the y–axis.**

   a) Comment with reasons on Jane's explanation of plotting the points.

   b) Using Musa's explanation, plot the coordinates.

   c) Join the points to form a polygon. State the equation of the line of symmetry.

7. **Gareth and Barry each went with an equal amount of money for shopping at Mega Standard supermarket. Gareth spent Shs.95000 and Barry spent Shs.350000. After the shopping, Barry had 4/7 of what Gareth had remained with.**

   Gareth deposited some amount of money in the bank at a simple interest. After 15 years, the amount became seven times the amount deposited.

   Task

   a) How much did each (Gareth and Barry) go with for shopping?

   b) How many years will Gareth wait for the amount to become ten times if the interest remains the same?

8. Your guardian has a budget of Shs700,000 for your school expenses. To get to the school where your guardian wishes to take you for A-level, your guardian drove 4 km east from your home to

the stage and then 8km north to reach there. However, you realized later that there was a direct route from home to school your guardian could have used.

On reaching the school, you found out that, the school fees, admission fees and uniform fees are Shs900,000, Shs100,000 and Shs350,000 respectively. The school also offers a bursary of; 60% off school fees, free admission and eighty-seven thousand five hundred shillings off uniform fees to those who got first grade and according to your results, you qualify for this bursary.

It also has two payment plans on school fees that the guardians can choose from and they are:
- Paying in two installments that is to say; two thirds of the school fees at the beginning of the term and the balance at either visitation day or end of term.
- Paying in three equal installments; at the beginning of the term, on visitation day and end of term respectively.

Task:
(a) How far is it from your home to school if you travel through the direct route?
(b) (i) Since you qualify for the bursary, how much will you pay?
(ii) Will your guardian afford the school expenses according to his budget?
(c) (i) How much will those who are to pay school fees of Shs900,000, pay per installment, according to each of the payment plans?
(ii) Which payment plan would you recommend for them and why?

9. Your uncle has offered to drive you to your friend's birthday party. He normally drives his car at an average speed of 50 km/h, so he requests you to get directions to the party reception and the time you are supposed to be there so that you decide on when you can leave home to reach on time. You were informed that the party will start at 2:00 PM and the directions are:
- From your home, take the north eastern direction and reach the supermarket that is 20 km away.
- Then take the road that is south of the supermarket and it will take you 45 minutes to reach the junction.
- From the junction, take the southwestern road and drive 25 km to reach the party reception.

On reaching the party reception using the given directions, your friend remembers that there is a direct route from your home to the reception that you could have used but does not know how long it is.

Task: (a) (i) Describe the direction of your home from the party reception.
(ii) How far is the party reception from your home using the direct route?
(b) What time would you have to leave home for you to reach the party reception on time, if you used the direct route?

10. A shop keeper in Lugala community has a retail shop that deals in measured goods. In a certain week he decides to collect the data about the amount of rice (kgs) bought together with the number of people who buy a given amount. He found out that 5 people $\frac{1}{4}kg$ each, 10 people bought ½kg each, 12 people $1kg$, 28 people bought $2kg$ each, 7 people bought $5kg$ each, 4 people bought $10kg$ each.

    Tasks:
    a) Using a suitable table represent the above data.
    b) Determine the amount in kg sold that week
    c) If the cost of each kg of rice is shs.4500, help the shop keeper to know the quantity where he makes more money and how.
    d) In your own views, discuss why some people buy less kg of rice.

11. During a Mathematics lesson Graham borrowed a calculator from Joshua and he found a number on the screen 840 which made him wonder which two numbers can be multiplied to get the figure. Later in evening at 4:00pm, Graham traveled with his father in their family car to the beach carnival to have fun and his father drove from Ssembabule to Ggaba beach in Kampala at a steady speed of $60km/hr$ and he committed a traffic offense after he covered 2hours and was delayed by traffic officers for 30 minutes and proceeded to Kampala at a steady speed and reached Ggaba beach which is 500km from Ssembabule. The carnival was massive and it ended 3 hours later and they travelled back home at the same steady speed and reached Ssembabule.
    Tasks:
    a) Help Graham figure out all the possible values that Joshua could have typed in to get the number on the screen.
    b) At what time did Graham and the father reach Ggaba beach.
    c) At what time did Graham and the father arrive at their home after enjoying the carnival at the beach?

12. In Bukaaru village, Mr. Lubega had six children; Abdu, Isaac, James, Ashiraf, Mohammed and Tina. He made his will and kept it with a friend. After his death, children were fighting for the property as the elder son wanted to claim 50% as the heir. The lawyer saved the situation by reading the will. Tina was given 10% of the property. The remaining property was shared among the boys and the wife. Abdu was given 1/5, Isaac was given 15%, James was given 20%, Ashiraf was given 5% and Mohammed was given 20%. The remainder was given to the wife.
    TASK
    a) Help the family administrator to know how much property will each take given that Lubega had property worth UGX 6,000,000.
    b) What percentage of Mr. Lubega's property was allocated to his wife?

13. Five girls whose homes when marked on a grid make a trapezium, wanted to buy clothes. They realized that if they buy them in a bunch, it will be cheaper. So they mobilized themselves and each person contributed as follows:
    Girl 1: Contributed one hundred thirty-three thousand two hundred fifty shillings.
    Girl 2: Contributed 20% more than that of girl 1.
    Girl 3: Contributed $1\frac{1}{2}$ of the amount girl 1 contributed.
    Girl 4: Contributed a fraction that is $\frac{1}{5}$ less than the fraction of girl 3.
    Girl 5: She contributed the balance required to make the Shs.800, 000 required.
    TASK:
    a) What amount did each girl contribute?
    b) In which other way could they contribute the amount required fairly and according to that way, how much would each contribute?

14. The school plans to hold a Parents meeting and it expects 1000 parents. It plans to hire tents of capacity 50 seaters, they are to serve soda, a boiled egg and a piece of chicken. A tent is hired at sh. 100,000, a crate of soda has 24 bottles and costs sh.20,000, a tray of eggs consists of 30 eggs, each tray is at sh. 10,000, a chicken consists of 6 pieces, and each chicken costs sh.10,000. As a senior four student, using knowledge of number bases, help the school come up with a budget flame work for the event.

15. A couple wants to celebrate their anniversary. The wife promises to buy things worth 1.5million. and the husband promises to buy things that will cost an amount that is two quarters more than that of the wife. One of the older children promises to buy all the drinks on the budget which where, 3crates of soda each containing 24 bottles and 6 cartons of water each containing 6 bottles. To reach the venue, the couple planned to move 20km east from their home and then 30km north. However, the son plans to take the direct route from the parent's home to the venue.
    TASK:
    a) How much will the husband contribute?
    b) If the total amount on the budget was two million three hundred forty-six thousand, how much did the son contribute for soda and water?
    c) How many guests would you advise the couple to invite and why?
    d) What distance will the son travel?

16. 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 9:30 am. He was treated well and discharged and advised as follows. He was advised to spend three eighths 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.
(ii) How many hours of the day in a week does he have spend on visiting the hospital.

17. At Elijah's enterprise, a company that makes books. A machine produces the least number of books per turn, that enable packing in boxes in equal numbers of 24, 30 and 32 without any book being left out. On a given day, a school made an order of 1440 books.

Elijah had UGX.750,000 on his account and he wanted to buy a Washing Machine. He went at the shop and the price of the machine was UGX.960,000. He went home and waited. One month later, the price was decreased by 15% and then 9% in the second month.

TASK

a) Determine the least number of turns the machine has to make in order to supply the school.
b) Was Elijah able to buy the Machine after the decreases? If yes, was he able to remain with any balance.

18. 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 UGX 25,000 per km moved. The three schools through their Sports master agreed to share the cost of the bus equally amongst themselves. One that day they hired a bus from your school in Gayaza and they set off at 4:30am and increased the speed gradually to 90km/h reaching Mpigi at 6:45am. From there the bus driver maintained this same speed for hours reaching Masaka. From Masaka then he reduced slowly in speed reaching Lyantonde at 9:30am. The games started at 10:00am sharp and each team played six games.
School A won 3 games, drew 2 and lost 1 game. School B won 4 games and lost 2 games. School C won 2 games and drew 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 each school.

19. 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 5m yet on the other side he is to plant a tree every after 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 $500m^2$. He plans to use 25% of the land to plant maize, one fifth of the land for beans and $205m^2$ for growing ground nuts.

Tasks:

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

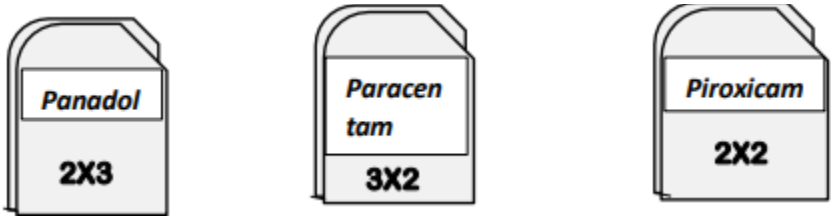
(b) Determine in m^2 the size of the land to be used for growing maize.

(c) Determine in m^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?

20. Omara went to the hospital and he was given a certain number of tablets of Panadol, Paracentam and Piroxicam to take starting from the morning.



He took his first doze in the morning and given more tablets equal to those he had remained with in order to complete a dozen of 20 tablets.

TASK

(i) Identify the number of tablets Omara took in the first doze.

(ii) (ii) If t represents the number of tablets he was given first, form an equation representing the above information hence find t.

21. In order to improve on the livelihood among the community, the government has embarked on distribution of improved seeds to boost the yield of agricultural product in Nwoya district, Koch Goma sub-county which has 4 wards. The wards are A, B, C and D. Basing on the size of land in each ward for every 100 packets of seed, ward A gets 30 packets, ward B gets 20 packets, ward C gets 40 packets and ward D gets 10 packets. The government has procured 45,000 packets which are allto be shared equitably according to the community.
    By using a statistical graph, help the local leaders to distribute these seeds to the community in wards. (Hint: Use a pie chart)

22. a) A Farmer said he annually spends at least 8000 per acre on spraying, weeding 24,000 per acre and shs 20,000 on pruning per acre. What is the spending on a farm of 20 acres?
    b) Given that the inflation rate according to bank of Uganda increased by 6.8%, implying that the price of commodities have increased by that mentioned rate. If the price of herbicides is now 4500/= per litre what is the original price of the herbicides per litre?
    c) The farmer mainly deals in growing green papers and noticed that on average he spends UGX 30 to produce a green paper and sells it at UGX100. At the end of a given planting season, the farmer produced 200 tonnes of green paper and managed to sell 150 tonnes only.
    i) Did the farmer make a profit or loss that season?
    ii) Calculate the percentage profit/ loss for the season.

23. a) Anita the shop keeper bought three bags of beans, rice and posho weighing 144kg , 90kg, and 54kg respectively. She wishes to repackage in smaller bags of equal weight.
    Anita, Kevin and Swale shared out money. Anita received 3/5 of the money, Kevin received 1/6 of the remainder and Swale received shs 36500 which was the actual amount of money that remained after Anita and Kevin had received their shares.
    Task
    a) Help Anita find out the highest weight of the smaller packs she can use without leaving any food stuffs in the big bags.
    b) Find how much money each received and also the total money that was shared among the three.

24. The caterer of a school located in kira Municipality is required to buy food stuffs for a school party. The foodstuffs to be bought include: 100 kg of rice, 150kg of meat and 200kg of Irish potatoes. The cost is UGX 4000, UGX18,000, and UGX1500 per kg of rice, meat and Irish potatoes respectively in kyaliwajara market. The same items cost UGX. 2500, UGX. 14,000 and UGX. 1,200 per kg of rice, meat and Irish potatoes respectively, in Gayaza market. To hire a pick-up from Kyaliwajara market to school costs UGX 50,000 while a pick-up hire from Gayaza farmers' market is UGX100,000.

Using the information provided above, how would the caterer decide on where to do the shopping from? Justify your answer.

25. You went to the gym on 1st February 2024 with Shs.100,000 with hope to come back with some balance of not below UGX.50,000 to cater for home expenses. Reaching their, you met a new friend. She tells you that she comes every 4days and you come every 6 days.

    You ask her how much she pays so that you compare with yours and she says "I paid a member ship fee and now I only pay UGX. 30,000 a month which caters for all days I choose to come". However, when it comes to you, you pay UGX.10,000 each day you visit the gym. And you visit the gym 5 days a month.

    After the gym you decide to hang out for a cup of coffee and a PIZZA and each of you had to pay forty-five thousand five hundred shillings. Later your friend got an emergency call and left before you exchanged contacts.

    TASK:

    a) i) What are the fewest number of days you will have to wait for, to meet your friend again?
       ii) using the number of days, mark the exact date on the calendar.
    b) i) how much do you spend on the gym a month?
       ii) comparing with how much your friend pays, what can you do and why?
    c) c) i) how much did you spend that day?
       ii) on the money you came with, how much balance did you take back home?
       iii) will you be able to cater for all home expenses? Explain why you say so.

26. Kevin's goal is to find a job that provides an income of atleast 40 million a year. A glass mart company offers her a job paying a basic salary of 12 million a year plus a commission of 6% of her sales.

    Kevin bought a suit at UGX.490,000. She wishes to sell it at UGX.495,000 cash. Every customer wanting to buy it have less money than the cash price Kevin want, yet Kevin is in need of an emergency money of UGX.50,000. He wants in 7 months to have sold this Suit.

    TASK

    a) Determine what Kevin's total sales will need to be for her to have a yearly income greater than or equal to 40 million.
    b) As a learner who studied business mathematics, advise Kevin what to do with the suit.

27. John plans to visit the shop that is 12km south of his home and then the boutique that is 5km east of he shop and after drive back home using a direct route from the boutique to home. He is to use his motorcycle that consumes 0.035liters of fuel per km and he wants to know how much fuel he will need for the whole journey. He has seven hundred fifty thousand Uganda shilling. He plans to use part in the shop and part in the boutique in the ratio of 3:2 respectively. He wants to spend

UGX. 210, 000 to buy shirts and UGX.120, 000 to buy trousers. However he is not sure if his budget for the boutique will be enough.

From the shop, he is to buy 24 packets of cooking oil, 12 packets of sugar and 30 packets of salt. All of these are to be used to make packages for some of his family members in the village. He wants each package to have an equal number of items in it. He needs to know the highest numbers of packages he can make from them.

TASK:

a) How much fuel will he need for the whole journey?

b) Will the money he plans to use in the boutique be enough for what he plans to buy? Justify your answer

c) How many packages will he make from the items he plans to buy?

28. You decided to have a joint graduation party with your sibling. This is to cost you a total of UGX.4,000,000. You are nearing the D-day and want to find out whether you have the amount required or not. So you decided to revise your contributions below:
Your parents contributed 12.5% of the money. Your sibling contributed 12.5% more than your parents and since you were the eldest, you contributed $2\frac{1}{2}$ of the amount your sibling contributed.
TASK:
Do you have the required amount for the party or should you postpone it?

29. Four boys whose homes once located on a grid map form a rectangle, would like to meet at the Centre of their homes to play soccer since they believe that location would be a fair distance for all of them. One boy is located on coordinate (4,6) and the other boy is located on coordinate (4,12).
TASK:
a) Where are the homes of the other two boys on the grid?
b) On which coordinate will they meet?

30. You moved 5km from your class while walking in the northwest direction to the staffroom looking for the teacher. Reaching the staffroom, you were told that the teacher is in the park so you turned in the 180^0 direction and moved 6km towards the teacher. Reaching the park, you realized that you had a wrong book! You want to go back to class to get the actual book but using a different pathway since the school has many pathways.
TASK:
a) Accurately illustrate how you moved from the class to the teacher in the beginning.
b) From your illustration, which other path way will you take to return to class?
c) On which bearing will you turn for you to take that pathway?

d) How far is the park from the class using that path way?
e) In comparison to the first distance you moved, is it wise to choose that pathway? Give a reason for your answer.

31. You work in an art and design shop. You print different objects on clothes as requested by your customers. A customer comes and requests you to print triangles, circles and squares on his cloth following a particular pattern that will make the clothe beautiful. However, he first gives you a piece of paper that is 12cm in length and 8cm in width to illustrate how you plan to arrange the shapes on the cloth. As you are still talking to the customer, someone calls you requesting you to compute something, so you request the customer to assist you with his phone calculator and on opening it you find a figure 455.
TASK:
a) Show how your illustration will look like.
b) Which input and operation do you think the customer would have put in the calculator to get the figure you found on the screen?

32. Opiku and Legu own a rabbit farm, from which they make an average profit of UGX 750,000 monthly. They re-invest three-eighths of the profit and share the rest of the money between themselves. Opiku receives $\frac{5}{12}$ of the profits.
Opiku has five small containers of capacities: 12, 16, 24, 56 and 72 litres which he can to use to fill up a bigger container.
TASK:
a) Determine how much Legu receives.
b) What is the capacity of the bigger container which can be filled up by each of the above containers exactly without a remainder when used separately?

33. Musuuza works for 40 hours a week at a supermarket. He is entiled to a weekly salary of UGX220,000 plus a 3% commission on sales on over UGX 5 million. Assume that he sells enough this week to get the commission.
Musuuza plans to set up a milk storage tank of volume 6,000 litres.
TASK:
a) Determine his weekly:
   i) Income when the weekly sales are worth UGX 6 million.
   ii) Sales when the weekly income is UGX 430,000
b) How deep should the tank be, if it is three meters long and two meters wide.

34. You are planning a trip to visit a historic site that is 30 kilometers away from your current location. The trip will take approximately 1.75 hours by car. The speed limit on the road is 80 kilometers per hour, and the site charges an admission fee of UGX 25,000. The museum offers a 40% discount on admission fees for students with disabilities.

When you arrive, you notice that the site displays some information in binary. The binary number 100101 represents the number of years since the site was established. You also notice that the site displays the current temperature in Celsius using binary number system and the temperature is 10010.11,

TASKS

a) What is the approximate percentage of the speed limit that you will be traveling at during the trip?

b) If you have UGX 100,000 in cash, what fraction of the admission fee will you have left after paying?

c) i) What is the number of years since the site was established in base 10?

ii) Express the temperature of the site using the decimal base system?

c) If you have a friend who qualifies for the discount, what amount would he pay as admission fees?

35. You are helping your friend plan a road trip to visit a national park that is 180 miles away. The trip will take approximately 3 hours to complete, and the speed limit on the highway is 65 miles per hour.

At the park entrance, there is a display showcasing the park's wildlife population. The display indicates that for every 5 Zebras, there are 3 hyenas and 2 elephants.

The park charges an entrance fee of UGX 70,000 per vehicle and the national park displays the number of visitors in binary system and the number is 1010101.

TASK

a) What is the approximate percentage of the speed limit that you will be traveling at during the trip?

b) What is the ratio of zebras to hyenas in the park's wildlife population?

c) If the park has a total of 900 animals, what is the approximate number of each type of animal (zebras,hyenas and elephants) in the population?

d) If your friend has UGX 350,000 in cash, what decimal value would represent the fraction of the entrance fee they have left after paying?

e) What is the number of visitors in the decimal number system?

36. A senior one student identified specific boarder points of different regions from his community map extract these included a swamp A(-6,0), B(-2, 0), C(-4,3), D(0,3), a bushy area E(-8,-1), F(0,-1), G(-8,-13), H(0,-13) and a community well, I(2,-1), J(4,-1), K(2,-3) and L(4,-3). (use 1cm to represent 1 unit)

The chairperson suggested that the bushy area should be partitioned into square gardens as large as possible, so that no area is left and each family gets one.

James a from another community tried the same assignment using his own community map also and calculated the total area of his village on the map as 30 Square Units. When he shared his findings with a friend, they found that his answer was 25% less than the actual total area.

Four other students Aisha , Angel, Agatha and Arshad attempted the same assignment and were awarded as follows, 15 out of 25, 31 out of 40, 45 out of 60, and 35 out of 80 respectively.

Arshad requested for a retake to improve his project grades, the teacher tasked him to find the total area of one of the students findings giving his answer in base eight. The student had $(1003_{four})sq\ units$ for the swamp, $(2015_{seven})sq\ units$ for the bush area and $(10121_{three})sq\ units$ for the well.

TASK;

a) i) Identify the shapes formed by the regions
   ii) Calculate the total area covered by these regions.
b) i) Help the chairperson figure out the size of each square garden.
   ii) How many families will benefit from this arrangement?
c) What is the actual total area of John's village on the map.
d) Help rank the four other students Aisha, Angel, Agatha and Arshad who attempted the same assignment according to their performance in an ascending order.
e) Find the answer Arshad should present to the teacher?

37. Your aunt is planning to enroll you in a boarding school for your O-level education. She has a budget of Shs 5,000,000 for your school expenses. To visit the school, she decides to take boda-boda. The boda-boda travels 3 km west from your home to the main road, then 4 km south to re ach the school. However, you later realize there's a shortcut path that leads directly from your home to the school. Upon reaching the school, your aunt learns that the school fees are Shs 3,000,000, boarding fees are Shs 1,500,000, and the cost of school supplies is Shs 500,000.

Fortunately, the school offers a scholarship program. Students with excellent primary school leaving exam results receive a 50% discount on school fees, a Shs 200,000 reduction in boarding fees, and a reduction of Shs 150,000 for school supplies. You are eligible for this scholarship based on your outstanding performance. The school also offers two payment options for school fees:

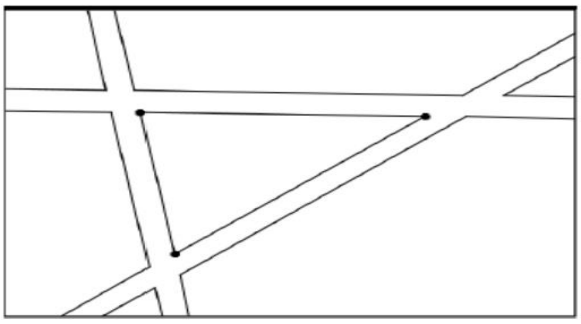
Option 1: Two Installments - Pay two-fifths of the school fees at the beginning of the

term and the remaining balance before the mid term exams.
Option 2: Four Installments - Pay equal amounts at the beginning of the term, before mid term exams, after midterm, and before final exams.

TASK:
a) What is the distance from your home to the school using the direct path?
b) i. Considering the scholarship, calculate the total amount your aunt will pay for your school expenses.
ii. Can your aunt afford the school expenses based on her budget?
c) i. For those paying the full school fees amount, calculate the amount paid per installment for each payment option.
ii. Which payment option would you recommend and why?

38. The Parks Department in a Ugandan village has acquired a new sprinkler system to water their flower equilateral triangular lawn, which is essential for maintaining the village greenery. The equilateral triangular lawn, with each side measuring 10 meters, is surrounded by pathways, and the sprinkler needs to be strategically placed to ensure effective coverage without wasting water on the pathways.

Diagram not on scale



TASK:
(a) Explain whether or not you think all of the lawn in the triangle can be watered with a circular sprinkler.
(b) Determine the best location inside the equilateral triangular lawn where the sprinkler should be positioned to maximize the watering coverage while avoiding the pathways.
(c) Estimate the area of the lawn that will not receive water effectively once the sprinkler is optimally placed.

38……

39……

40……

SENIOR TWO SCENARIO QUESTIONS

1. **John starts moving from home to the trading center which is on a bearing of 120° and a distance of 40km from home. From the trading center, he changes course and moves North East to his village, which lies 50km from the trading center.**
In the village, he wants to set up a poultry house (P), a kennel (K) and a pigpen(O) on his farmland. From the pigpen, 20 strides to the left, 30 strides upwards he wishes to set up a poultry house. From the poultry house, 30 strides to the right, 60 strides downwards he wants to construct a kennel. He also plans to construct a direct path from the pigpen to the kennel.
To set up this farm, he wishes to take a loan of 4 million, from Premium Bank at a simple interest rate of 15% per annum for a period of five years. To ensure safety of his individual projects, he plans to insure them. The insurance premiums paid for each project, depends on the value of each project as shown in the table below.

Project	Value of project	Insurance premium
Poultry	45% of the loan	15% of the project value
Kennel	20% of the loan	5% of the project value
Pigeon	$\frac{1}{4}$ of the loan	0.1 of the project value

TASKS.
(i)If he used a direct route from home to the village, what course would he take and how far would he move?
(ii) Of the two routes, which one is shorter?
(iii) If he travelled at an average speed of 60km/h how much time does he save by travelling along the shorter route.
Hint; use a scale of 2cm = 10km where suitable.
(i) Using a pigpen as a point of reference, what is the position of the kennel.
(ii) How long is the kennel from the pigpen?
(i) How much in total will he pay back to the bank after the 5 years?
(ii) Find out the total insurance premium he will pay every year.

2. **Teddy and Sons Wholesale shop buys 50kg bags of sugar, 25kg bags of rice and 100kg bags of maize flour from a factory at UGX 225,000, UGX 100,000 and UGX 250,000 per bag respectively. She then sells each bag of sugar, rice and maize flour at UGX 250,000, UGX 112,500 and UGX 300,000 respectively. Teddy pays an income tax of 15% of the monthly profit, a commission of 8% of the profit made on a monthly basis to her shop attendant and 10% of the monthly profit to SWICO insurance company. SWICO insurance company**

offers a discount of 6% of the basic premium expense to clients with CCTV cameras in their businesses. Given that Teddy installed CCTV cameras in her shop and sells 75 bags of sugar, 45 bags of rice and 60 bags of maize flour per month.

Teddy has plans of expanding her business and intends to apply for a loan of UGX 50,000,000, two banks A and B are willing to give her the loan where Bank A charges a simple interest rate of 9% per month for 2 years and Bank B charges a simple interest rate of 32% per four months for 2 years.
Task:

a) **Calculate Teddy's net profit per month.**
b) **Help Teddy to find out which bank to choose to apply for the loan given that she will pay the loan after 2 years.**

3. **You are planning to remodel the flooring in your kitchen. You have already measured the dimensions of the kitchen and found that it is a rectangular space with a length of 12 feet and a width of 9 feet. As you browse through different flooring options, you come across a display that shows the following pattern of square tiles:**
1 tile, 4 tiles, 9 tiles, 16 tiles, 25 tiles, ...
The display also shows the equations of various linear and quadratic functions. The display shows the equation of a straight line that represents the cost per square foot of a certain type of flooring. The line passes through the points (2, $4.50) and (4, $9.00). Another display shows the equation of a parabolic function that represents the cost per square foot of a different type of flooring. The equation is given as $y = 0.25x^2 + 2x + 1$.

TASKS
(a) i) Describe the pattern in the sequence of square tiles displayed. Determine the rule that generates the next number of tiles in the sequence.
ii) Write an equation that represents the n^{th} term of the sequence, where n represents the number of square tiles.
b) i) Find the slope of the line and write a mathematical statement of the line in slope-intercept form.
ii) Find the x-intercepts of the parabolic function.

c) **Suppose the cost of the flooring you choose is $6.75 per square foot. If you have a budget of $800 for the kitchen remodel, what decimal value would represent the fraction of the total cost that you have left after purchasing the necessary flooring?**

4. **You are planning a party at your house and need to purchase supplies. You've made a list of the items you need, including cups, plates, and napkins. You're also to hire one tent at UGX 100,000 and a chair for each guest at 500 @.**

At the local party supply store, you notice that a package of 24 glasses costs UGX 192,000, a package of 20 plates costs UGX 260,000, and a package of 50 napkins costs UGX 10,500. Each guest is supposed to be served with one glass, one plate and two napkins.

Earlier before the D-day for the party, you tasked your friend to come up with a mathematical statement that represents the relationship between the number of guests (x) and the number of chefs (z) required for the party. He came up with the equation y = 0.1z.

TASKS

a) How much will the store attendant charge a person who buys 65 glasses, 44 plates, and 120 napkins.

b) If you are expecting 200 guests at the party, what is going to be the total budget for the party including all the available expenses?

c) Write a mathematical statement that represents the relationship between the total expenditure (y) for any given number of guests (x).

d) Find the number of chefs needed for 200 guests.

e) The store offers a 15% discount on the total cost of the supplies if you purchase more than UGX 5 million worth of items.

i) Do you qualify for the discount if you purchase items enough to be supplied to the 200 guests?

ii) If yes, what would the new total cost be after the discount is applied?

5. 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 cannot 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 160 km North of Mbarara. From Masaka he moves west wards 150 km to Kampala. From Kampala he heads to Mukono which is in the direction S75^{o}W which is 90 km from Kampala. From Kampala he heads to Kayunga which is 148 km and south of Mukono. When he reached Kayunga he bought 400 cows and each costs UGX 850,000 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 30 cm 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.

6. In the press release by the Uganda bureau of Statistics, presented all Items Index and related Annual Inflation rates for 3 major components, between February 2015 – February 2016. The Annual Food Inflation decreased to 10.1 per cent for the year ending February 2016 compared to 12.8 per cent recorded for the year ended January 2016. On the other hand, the Annual Non-Food Inflation increased to 6.7 per cent for the year ending February 2016, compared to the 5.8 per cent recorded for the year ended January 2016. Key Drivers for higher Non-Food inflation were Transport (10.7 per cent), Clothing and Footwear (13.1 percent) and Miscellaneous Goods and Services (6.3 per cent).

Year		2015											2016	
Month		FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB
Rated inflation (%)	Food	2.0	3.2	0.6	8.0	6.4	7.2	6.4	8.8	12.4	13.2	13.6	12.0	10.6
	Non - food	4.4	4.8	5.2	4.4	3.2	6.0	6.4	7.2	7.2	7.6	8.0	7.2	7.8
	Headline	3.6	4.0	6.0	6.0	6.4	6.8	7.2	8.4	7.8	8.0	8.8	8.6	8.4

Source: Final press release Feb 2016

TASK
As a learner of mathematics, help the community members who a less educated to trend inflation rate with the help of a graph. Identify the month that registered a high food inflation rate and give reasons.

7. 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 himUGX128 million. 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 156 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.

8. James has a smart deep freezer at his shop. He usually monitors the temperature inside the freezer. He finds out that the temperature has dropped from -5'C as recorded at 7: 20am to -17°C

at 9:00am. At home, He has square garden and wishes to add a path way cutting across from one corner to the opposite corner.

The length of one of the sides of the garden is 10m. Besides the garden, he has another plot of land from which he wishes to lay bricks. There is a group of 12 men in the village who on average can lay 50 bricks every 3 minutes. However, James wants to do this work a little faster. In his mind, he wishes to lay 75 bricks in 2 minutes.

TASKS.
(a) Help James estimate the temperature inside the deep freezer at l10:00am.
(b) Help him also establish the length of the pathway in a simplest but most accurate way.
(c) How many men should James employ to meet his target if on average all men work at the same rate.

9. Customers of your family cake making company have always complained of too much sugar ingredient in the cakes bought. The company has 25 bakers together who can make 480 cakes in three days. However, your company has been hired to make 960 cakes in the five days remaining for a fourth coming cake festival in your town. The managing director has hired more 8 bakers and you have been selected to do a survey from the nearby related company to solve the problem of too much sugar in cakes. It has been realized that a delicious cake requires Sugar, coconut oil and flour that are mixed in the ratio of 2:3:5 respectively, each cake contains 0.75kg of flour.
   Hint:
   1 kilogram of sugar costs Shs 5,000.
   500 grams of coconut oil cost Shs 3,500
   1 kilogram of flour costs Shs 8,000
   Task:
   (a) Help your family to find if the available number of bakers can produce the required number of cakes in the stipulated time and advise them accordingly
   (b) Establish the total cost of sugar, coconut oil and flour required to make 960 delicious cakes.

10. A group of uneducated tourists came to visit Lira city in Uganda. Having reached the capital Kampala, they got confused onto what distance they are suppose to cover and the amount of fuel to fill in the vehicle tank to cover this distance(from Kampala to Lira city) yet they were even provided with the scale map shown in fig. 1 below. The map clearly shows the location of these two cities.

Fig 1. Shows part of the scale map given to tourist by the tourist guides on reaching Kampala.

Task:

a) The tourist are to follow a direct route from Kampala to lira. As a senior three student you have been instructed to guide these tourists basing on the scale map they have been given (refer to fig 1). In your guidance use their map to determine and explain to them the actual distance they are to cover in travelling from Kampala to Lira.

b) In each kilometer a diesel engine tourist vehicle consumes $\frac{1}{4}$ liter of fuel and a petrol engine tourist vehicle consumes $\frac{1}{2}$ liter of fuel. Determine the amount of fuel the tourist will have to fill in the vehicle tank in order to complete the journey from Kampala to Lira if they are to use:
   i) A diesel engine tourist vehicle.
   ii) A petrol engine tourist vehicle.

c) If each liter of petrol cost shs. 2500 and each liter of diesel cost shs. 6000. Advice the tourist which vehicle is most suitable for their journey and why?

11. Mr. Lwanyaga the head of mathematics department organized a mathematics study trip to Namanve where assembling of Toyota vehicle and manufacturing of Coca-Cola products are done, and in his report to the members of mathematics department shows the cost of hiring a school bus is constant for any a bus and other varies as the distance covered by the bus. He later reviled that if a bus covers 100km then charged kshs.4500 and kshs.4000 for a distance of 60km. The distance between the school and Namanve is 480km and they expected to live the school at 8:00am at an average speed of $100km/hr$ according to the school's study trip rules and procedures and after the trip they students would rest for forty-five minutes and then proceed back to school.

Tasks:

a) As the treasure of the mathematics department help Mr. Lwanyaga to know total expenses for the total journey.

b) By representing the journeys on a suitable graph explain the motion of the bus to the bus to the school administrators.

12. A Gagga bus left Kampala at 8:00 am and travelled towards Kasese at an average speed of 80km/hr. At 8:30 am, a link bus left Kasèse towards Kampala at an average speed of 20km per hour. Given that the distance between Kampala and Kasese is 400km.
    Task
    a) What do you think was the arrival time of link bus to Kampala, justify?
    b) As a senior three student what do you think is the meeting time and distance from Kampala.
    c) How far the Gagga bus is from Kasese when the link bus arrives in Kampala. Using (2cm: 50 km and 2cm: 1 hour)

13. Mr Okot wants to paint his room. The floor of the room is 5m long and 4m wide. The room is 3m high. The room has two doors each fixed in the walls that are opposite to each other, both 2m high and 75cm wide. It has one window in one of the longer walls and the window is 1m square. Draw a sketch of Mr Okot's room. Indicate the measurements of the floor, height, doors and window.

    TASK
    a) Afer a serious talk with the painter, it was agreed that the painter charges UGX 800 per square metre. Help Mr Okot to determine how much money he will pay the painter?
    b) If a 4-litre tin of paint costs UGX 70,000 and it paints 12 square metre of the wall and the walls already have an undercoat paint. How many tins would Mr Okot need to buy in order to paint his room and how much money will he require to paint his room?

14. In a Physics practical attempted by a senior four class, the force Y needed to move the load X by a machine is determined by a law $Y = aX + b$, where a and b are constants. The table below shows results which were obtained by one of the students.

Load(X)	1	2	3	4	5
Force(Y)	4	4.8	5.5	6.7	7

    (a) Plot the scatter diagram from the table above i.e Force (y) against the Load (x)
    (b) Draw the line of best fit and use it to find;
    (i) The Force corresponding to a Load of 3.5
    (ii) The load corresponding to a force of 6.2
    (iii) The Force corresponding to the load of 0 (zero)
    (c) Take any two points on the graph and use them to find the slope/gradient of the line of best fit.

(d) Compare your findings with the equation of the form $y = mx+$, hence find the law connecting Y and X, where $a = m$ and $b = c$ and state $Y = aX + b$.

15. Mr. Apeku Erias is an agent for three companies of soda: Coca cola. Pepsi and Riham beverages. He has highlighted the following places on the map of Africa where he intends to market these companies' products using her TikTok account. These include; South Africa, Burundi, Kampala, Dodoma, Accra, Bujumbura, Nairobi, Ghana, Johannesburg, Tanzania, Uganda, Kenya, Cairo, Kigali, Egypt and Rwanda.

    He earns 10% commission on every carton of soda sold. He sells each carton of Coca cola at UGX 11,000, Pepsi at UGX 11,000 and Riham at UGx10,000 On a good day, he sells 30 cartons of coca cola, 20 cartons of Pepsi and 10 cartons of Riham.

    TASKS:

    a)Help Mr Apeku to sort the places by use of an arrow diagram.
    b)i.List the places in the Domain set.
    ii. List the members of the range
    iii.What is the relationship between the domain and the range?
    iv.Describe the type of mapping in the arrow diagram in (a) above
    c) Help Apeku to know the commission earned on a good day from all the sales.

16. You are a farmer who is planning to plant a row of trees around the edge of your farm, you wish to plant a diferent type of tree every year, following a specific order. The order you want to follow starts with planting 2 apple trees in the first year, 4 oranges in the second year, 6 oranges in the third year and so on. Being a model farmer, you have been contracted by the government to organize a seminar about irrigation, of the 285 registered farmers in your village, two thirds have confirmed attendance, You plan to rent a conference room at UGX 400,000 and each attendant is to be given lunch worth 5500.

    To reach the venue of the seminar on time, you intend to leave your home at 7:00am and arrive at the conference center at 11:00am. You wish to use a boda boda for 4km and then board a taxi for the last 16km. On average, taxi's speed is 6km/hr greater than the boda boda's speed.

    TASKS
    (a) (i) Form a mathematical relation that you can use to predict the number of trees you would plant any year.
    (ii) lf you are planning to plant muvule trees in the 8^{th} year, using the relation in (i) above, how many trees would you plant?
    (b) (i) Form a mathematical formula relating total amount of money to be spent and the number of farmers expected to attend the seminar.

(ii) If you were given 1.5million shillings, using the formula in (i) above, how much will you save?

(c) Estimate the number of minutes you should spend on a boda boda if you are to arrive at the venue on time.

x

17. A ship leaves port M and sails on a bearing of 050^o heading towards island L. Two Navy destroyers sail from a naval base N to intercept the ship. Destroyer A sails such that it covers the shortest distance possible. Destroyer B sails on a bearing of 200^o to Island L. The bearing of N from M is 100^o and the distance NM = 300km.

    TASK

    Using a scale of 1cm to represent 50km;

    a) Determine the position of M, N and L

    b) Find the direction of N from L.

    c) Find the distance travelled by destroyer B.

18. The company manager is organizing a party for her colleagues. The cost of renting a local hall is UGX 2,000,000 for the evening. She then has to budget for food, which will cost approximately UGX 20,000 per person. The manager needs to ensure that the total cost of the evening stays within her budget. The manager has a maximum budget of UGX 5, 000,000.

    TASK:

    (a) Write down a formula connecting the total cost of the evening with the number of people attending.

    (b) Find the total cost for the evening if 25 people attend.

    (c) Find the greatest number of people she is able to invite.

    (d) In the end, only 16 people will attend. Calculate how much each person should be charged so that the manager covers her costs.

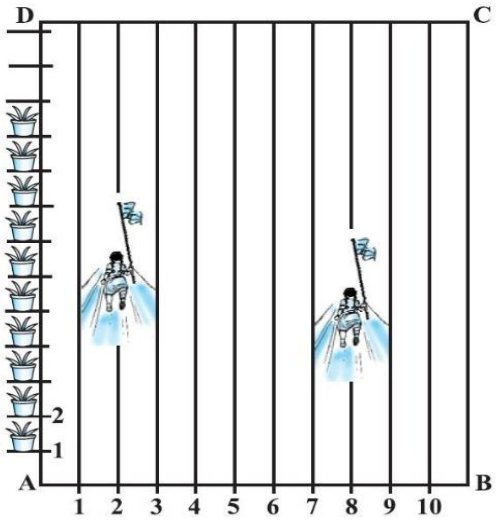
19. Your friend is shopping at a supermarket in Kampala during a clearance sale. He wants to buy a calculator that originally costs 120,000 UGX. The store has reduced the price of all calculators by 35% for the sale. Additionally, today there is an extra markdown of 40% applied to the sale price of all calculators.

    TASK:

    (a) Develop a function that calculates the sale price of the calculator today, where x is the

original price of the calculator.
(b) Using the function from (a), determine the final price your friend will pay for the calculator.

20. In preparation for the annual sports day that takes place in second term of every year , your school has marked lines with ash powder at intervals of 1 meter on a rectangular sports field ABCD. The field is 100 meters long (AD) and 50 meters wide (AB). To make the event more exciting, the school has set up a challenge where students need to post flags at specific locations on the field.



- 100 flower pots are placed at 1-meter intervals along the length AD.
- Two different lines (second and eighth) running parallel to AD are specifically used for this challenge.
- One student runs $\frac{1}{4}$ the length of the field along the 2nd meter line and posts a green flag.
- Another student runs $\frac{1}{5}$ the length of the field along the 8th meter line and posts a red flag.
- Taking one corner of the field (point A) as the origin, with the x-axis along the width (AB) and the y-axis along the length (AD), answer the following questions:

TASK:
(a) Find the coordinates of the green flag.
(b) Find the coordinates of the red flag.
(c) Find the distance between the two flags.
(d) If a blue flag is to be placed exactly halfway between the green and red flags, where should it be placed?
(e) Draw the locus of points that are equidistant from both the green and red flags and find it is equation.

MATH MUSCLES GROW WITH PRACTICE

21. A group of tourists has just arrived at Entebbe International Airport in Uganda for a safari adventure. They are interested in reaching the source of the Nile in Jinja. The touring company has approximated the distance from Entebbe to Jinja to be about 94 km, which should take around 3 hours without traffic, assuming an average speed of 30 km/h for the whole journey. Here are the directions they are following:
    - From Entebbe Airport, travel north for 35 kilometers to reach Kampala, the capital city.
    - From Kampala, head east on the Jinja highway. As they approached Mukono, approximately 25 km from Kampala, the guide was alerted by a friend coming from Jinja to change the route and use the Kayunga road due to an accident in Mabira. The driver changed the route at Mukono and went in the northeast direction to Kayunga, approximately 45 km away.
    - From Kayunga, they headed to Jinja on a bearing of 130^{o}, which took them 1 hour and 44 minutes as they enjoyed the scenary along the roadside.

    TASK
    (a) Deseribe the direction from Jinja to Entebbe.
    (b) How far is it from Mukono to Jinja using the direct route insteaf of the Kayunga route?
    (c) How long does the journey from Entebbe to Kampala take?
    (d) If each liter of fuel costs UGX 4900 and the car van consumes 1 liter per 10 km, how much fuel and money would they have saved if there was no accident in Mabira?
    (e) How much extra time did they spend on the road due to the detour, and what recommendations would you make to avoid such delays in the future?

    22……

    23…….

    24…….

SENIOR THREE SCENARIO QUESTIONS

1. **A baker is preparing for a local community event. She needs to bake several types of cakes, however she has to ensure she has the correct quantities of ingredients for each. Below are the types of cakes she plans to bake and their required quantities of ingredients:**
    - ✓ **Chocolate Cake: Requires 3 cups of flour, 2 cups of sugar, 4 eggs, and 1 cup of mixed ingredients per cake.**
    - ✓ **Vanill a Cake: Requires 4 cups of flour, 3 cups of sugar, 3 eggs, and 2 cups of mixed ingredients per cake.**
    - ✓ **Red Velvet Cake: Requires 5 cups of flour, 2 cups of sugar, and 1 cup of mixed ingredients per cake.**

- ✓ **Lemon Cake: Requires 2 cups of flour, 2 cups of sugar, 3 eggs, and 1 cup of mixed ingredients per cake.**

The baker has been asked to bake a total of 10 Chocolate Cakes, 8 Vanilla Cakes, 6 Red Velvet Cakes, and 5 Lemon Cakes.

TASK:

(a) Form a matrix to show the quantities of ingredients required for each type of cake.

(b) She wants to calculate the total quantity of each ingredient she will need for the event, help the baker using your knowledge of matrix multiplication.

(c) If each kilogram of flour goes for UGX 8000, each kilogram of sugar goes for UGX 5000, and each egg goes for UGX 300, and a cup of mixed ingredients goes for UGX 6000. Find out how much she will spend on making the cakes considering that each cup with the ingredient weighs 250grammes.

2. **Imagine you are a skilled image processing engineer working in a digital forensics laboratory. Your expertise lies in restoring and enhancing images to extract valuable information for investigative purposes. Today, you receive a blurred image taken from a surveillance camera that captured a critical moment in an ongoing investigation. To uncover the hidden details in the image, you must employ advanced image restoration techniques.**

As you dig into the image restoration process, you discover that the blurring effect on the image can be represented by a linear transformation. This transformation can be expressed as a matrix equation: Y = AX, where A is the blurring matrix given by $\begin{pmatrix} 2 & 0 \\ 2 & 3 \end{pmatrix}$, X represents the original image, and Y represents the blurred image.

After successfully restoring the blurred image and extracting valuable evidence, you discover that it contains confidential information that must be protected. To ensure the image's secrecy, you decide to encrypt it using matrix transformation. You develop an encryption matrix, denoted as E and is given as $\begin{pmatrix} 0 & -3 \\ -1 & 2 \end{pmatrix}$. The encryption process involves multiplying the original image matrix, X, by the encryption matrix, E, resulting in the encrypted image matrix, Z.

TASK

a) As the expert image processing engineer, explain how you can restore the original image from the blurred version Y and show the necessary workings where possible.

b) As the skilled image processing engineer, you must guide your team through the process of decryption to retrieve the original information. Show necessary workings where possible.

3. **Sky Electronics Manufacturing Company produces two different products: Smartphones and Tablets. Each product requires a specific number of labour hours, machine hours, and raw materials to manufacture. The company has the following production requirements per unit of each product:**

Smartphone:
- 3 labor hours
- 4 machine hours
- 5 units of raw materials

Tablets:
- 4 labor hours
- 5 machine hours
- 6 units of raw materials

The company has 144 labor hours, 186 machine hours, and 228 units of raw materials available for production this month.

The profit per unit for each product is as follows:
- Smartphone: UGX 114,000
- Tablet: UGX 95,000

On a certain day, a batch of 20 tablets and 30 smartphones were produced by the company and among them, there are a few defective tablets and smartphones. The probability of a tablet being defective is 0.2 and for a smartphone being defective is 0.12.

Task
a) i) Arrange the production requirements for the products in a rectangular grid of numbers in a way that preserves the data relationships.
ii) Represent the available resources in rows and columns in a way that preserves the original information.
iii) Carry out an operation on the corresponding elements of the data arrangements involved to determine the number of each product that can be produced using the available resources.
iv) Using rectangular array of numbers arranged in rows and columns find the total profit based on the production quantities and the given profit per unit.
b) If a product is picked at random from the batch, what is likelihood of picking a perfect product from this batch?

4. **A highly secure research institution has a sensitive laboratory room that requires a four-layered security protocol to access. The combination to access the laboratory is split into four parts; W, X, Y and Z. Each part of the combination is given to a different individual; Dr Edmond, Dr Edward, Dr Herman and Dr Frank respectively.**

The combination to access the laboratory is structured as follows: $\frac{Z+X}{W-Y}$

To access the laboratory, all the four individuals must be present and enter their respective parts simultaneously into the above structure to generate the final 10 digit access code which opens the laboratory.

If Dr Edmond has part $W = \frac{\sqrt{192}}{\sqrt{3}}$, Dr Edward has part $X = 3\sqrt{48} - \sqrt{75} - 2\sqrt{12}$, Dr Herman has part $Y = 2\sqrt{150} - \sqrt{96} - 2\sqrt{24}$ and Dr Frank has part $Z = \sqrt{18} + \sqrt{50}$.

TASK:

a) **Using the information provided, you are required to determine the 10-digit access code that unlocks the laboratory room. (Hint; a calculator should be used once at the very last step.)**

b) **Dr Herman had an argument with the top administrators of the institution that this arrangement of splitting the access code into different parts is a waste time and he suggested that the final code should just be given to one person. What is your thought on Dr Herman's suggestion?**

5. A fashion brand has three stores in different locations, each carrying three types of shirts: formal, casual, and sportswear. The stores have different inventory levels, buying prices, and selling prices for each type of shirt. The details are as follows:

Store A:
- Formal: 100 shirts, buying price Shs 15,000, selling price Shs 20,000
- Casual: 50 shirts, buying price Shs10,000, selling price Shs 15,000
- Sportswear: 75 shirts, buying price Shs 18,000, selling price Shs 25,000

Store B:
- Formal: 75 shirts, buying price Shs 12,000, selling price Shs 22,000
- Casual: 100 shirts, buying price Shs 9,000, selling price Shs 18,000
- Sportswear: 50 shirts, buying price Shs 15,000, selling price Shs 28,000

Store C:
- Formal: 50 shirts, buying price Shs 10,000, selling price Shs 25,000
- Casual: 75 shirts, buying price Shs 8,000, selling price Shs 20,000
- Sportswear: 100 shirts, buying price Shs 12,000, selling price Shs 30,000

TASK

Using matrices, help the brand's inventory manager to:

i) represent the inventory levels, buying prices, and selling prices of each store
ii) calculate the total value of each type of shirt across all stores
iii) determine the total value of inventory for each store
iv) calculate the total profit for each store if all shirts are sold.
v) identify which store has the highest total profit.

6. **A furniture manufacturer produces three products: chairs, tables, and desks. The production process involves three machines: Machine A, Machine B, and Machine C. The production data is as follows:**

Machine A:	Machine B:	Machine C:
- Chairs: 100 units, profit $10/unit	- Chairs: 75 units, profit $12/unit	- Chairs: 50 units, profit $15/unit
- Tables: 50 units, profit $15/unit	- Tables: 100 units, profit $18/unit	- Tables: 75 units, profit $20/unit
- Desks: 25 units, profit $20/unit	- Desks: 30 units, profit $25/unit	- Desks: 40 units, profit $30/unit

TASK: Using matrices,
a. Represent the production data and profit for each machine
b. Calculate the total profit for each product
c. Determine the total profit for each machine.

7. **You are a city planner working for the local government. Your team has been tasked with developing a zoning plan for a rapidly growing area of the city. The goal is to create distinct regions that allocate land for different types of development, such as residential, commercial, and industrial areas, while ensuring that they do not overlap or conflict with one another.**

To help visualize and analyze the zoning plan, your team has decided to use a coordinate plane, where the x-axis represents the east-west position and the y-axis represents the north-south position within the city. You will use a system of inequalities to define the boundaries of each zoning region, ensuring that the regions are clearly positioned and do not encroach on one another.

The city has designated a residential zoning region that is bounded by the following inequalities: $x \geq 5$, $x \leq 15$, $y \geq 10$, and $y \leq 20$.
The commercial zoning region is defined by the inequalities: $x \geq 10$, $x \leq 20$, $y \geq 5$, and $y \leq 15$. The city has also set aside a industrial zoning region, which is bounded by the inequalities: $x \geq 15$, $x \leq 25$, $y \geq 0$, and $y \leq 10$.
Suppose a developer proposes to build a new mixed-use development that would occupy a land area defined by the inequalities: $x \geq 12$, $x \leq 18$, $y \geq 8$, and $y \leq 16$.
The city is considering creating a "green belt" zone that would serve as a buffer (moderate the impact) between the residential and industrial areas. This green belt zone would be defined by the inequalities: $x \geq 10$, $x \leq 20$, $y \geq 10$, and $y \leq 20$.

TASKS

a) Sketch the residential zoning region on a coordinate plane and describe the characteristics of the land area that falls within this region.
b) Plot the commercial zoning region on the same coordinate plane and explain how it differs from the residential zoning region.
c) Sketch the industrial zoning region on the coordinate plane and discuss any potential overlaps or conflicts with the residential and commercial zoning regions.
d) Determine which zoning region(s) the proposed development would fall within, and explain any potential issues or considerations that the city planner should take into account.
e) Sketch the green belt zone on the coordinate plane and discuss how it could help mitigate any conflicts or compatibility issues between the different zoning regions.
f) As the city planner, develop a comprehensive zoning plan that incorporates all of the zoning regions discussed above, ensuring that the regions are clearly positioned and do not overlap. Explain how this zoning plan could be used to guide future development and growth in the city, and identify any potential challenges or considerations that the city may need to address.

8 You are a civil engineer working on a transportation planning project for a growing city. Your task is to design the layout of a new public transportation system, including bus routes and light rail lines, to improve connectivity and accessibility across different neighborhoods.

To visualize and analyze the transportation network, you decide to use a rectangular cartesian coordinate plane, where the x-axis represents the east-west direction and the y-axis represents the north-south direction within the city. You will use the equation of a straight line to model the paths of the bus routes and light rail lines, ensuring that they provide efficient and direct connections between key destinations.

As you work on the transportation plan, you need to consider factors such as population density, land use patterns, and the location of important landmarks and hubs, in order to optimize the network and meet the mobility needs of the city's residents.

The city has identified a major commercial district located at the coordinates (10, 15) and a residential neighborhood at the coordinates (5, 5).
A new light rail line is being planned to connect the city's central business district, located at the coordinates (15, 20), to a suburban employment hub at the coordinates (25, 10).
The city's transportation department has identified the need for a bus route that can serve multiple residential areas and shopping centers. One potential route connects the points (8, 12) and (18, 8), and then continues on to the point (25, 15).
A new mixed-use development is being planned at the coordinates (12, 18). The city wants to ensure that this development is well-connected to the existing public transportation network.

The city's transportation department is considering adding a new light rail line that will run parallel to an existing major roadway. The roadway is represented by the straight line with the equation $y = 0.5x + 10$.

TASKS

a) Determine the equation of the straight line that represents the most direct bus route connecting the major commercial district and the residential neighborhood. Explain how the slope and y-intercept of this line can be used to understand the characteristics of the bus route, such as the direction and distance of the trip.

b) Calculate the slope and y-intercept of the straight line that represents the path of the new light rail line, and discuss how these mathematical properties can inform the design and implementation of the transportation infrastructure.

c) Sketch the path of the bus route on a rectangular cartesian plane, and describe how the equation of each line segment can be used to analyze the efficiency and effectiveness of the overall route.

d) Determine the equation of the straight line that represents the most direct bus route between the new development and the nearest existing bus stop, located at the coordinates (8, 10).

e) Determine the equation of the line that represents the path of the new light rail line, if it is to be located 500 meters (on the y-axis) from the existing roadway.

9. **From the roof of a house, a boy can see a coconut tree, which is 20m away from the house. He measures the angle of elevation of the top of the tree as 21^o and the angle of depression of the bottom of the tree as 13^o.**

On the other side of the coconut tree there is a tall building 100m high. The angle of depression of the base of the coconut tree from the top of a tall building is 20.3^o.

TASK

a) Find the height of the coconut tree.

b) i) find the horizontal distance of the tall building from the tree.

ii) If there is a monument statue in between the tree and the tall building, 70m from the tree calculate the angle of depression of the base of the monument statue from the tall building.

10. **You find yourself at the entrance of the forest, facing due North. You spot a large tree in front of you. Using your trusty compass, you take a bearing of 40 degrees East of North to navigate deeper into the forest and you walk straight along this bearing for 200 meters until you reach the tree.**

As you continue walking into the forest on the same bearing, you come across a small river blocking your path which is 100 m from the big tree. You decide to find a safe crossing point. Using your compass, you take a new bearing of 70 degrees West of North to search for a suitable crossing.

TASK

a) How far North and East have you traveled from your starting point to be the tree?

b) If you walk along this new bearing for 150 meters, how far:

i) North and West have you traveled from the point you reached the river?

ii) East and North have you travelled from the point the entrance of the forest?

iii) what is the total distance you've covered from the starting point?

11. Bbula is an island found on lake Zzibi, there has been a serious problem of poor network on the island for a long time. The government together with the Network providers are planning to establish a Mast with the frequency that can cover the whole island. According to Engineers, the island is in a shape of a triangle ABC with $AB = 10km$ as the main landing site. Side $BC = 8km$ and $AC = 6km$.

(a) By scale drawing, help Engineers to come up with an accurate drawing of the island and use it to find;

(i) The angle ABC

(ii) Given that the Mast must be established where two perpendicular bisectors meet, establish with point M where the mast must be and find its perpendicular distance from the main landing site.

(iii) It is known that the frequency must cover the island, draw the locus of the frequency and measure its radius.

(b) Two points P and Q are 1000m apart. The angles of elevation of the top of the Mast from points P and Q are 60° and 30° respectively. Calculate the height of the Mast if;

(i) The points are on the same side of the Mast

(ii) The points are on opposite side of the Mast.

12. A private company was hired to administer an interview for World Food Program. 50 candidates sat for an aptitude test which was made up of Sections A, B and C. Two candidates did not attempt any question from any of the three sections. Three attempted questions from section A only, five from section B only four from section A and C only while 5 attempted questions from all the three sections. Those who attempted questions from A and B only were 3 less than those who attempted questions from sections B and C only and three times those who attempted questions from section C only.

TASK

As a student of Mathematics, help;

(a) Show the above information using an appropriate diagram

(b) Find how many candidates attempted questions

(i) from each section

(ii) from section C only.

(c) If a candidate is selected at random, what is the probability that he or she attempted questions from at least two sections?

(d) Given that those who attempted at most one question, did not make it to oral interviews, how many candidates were they?

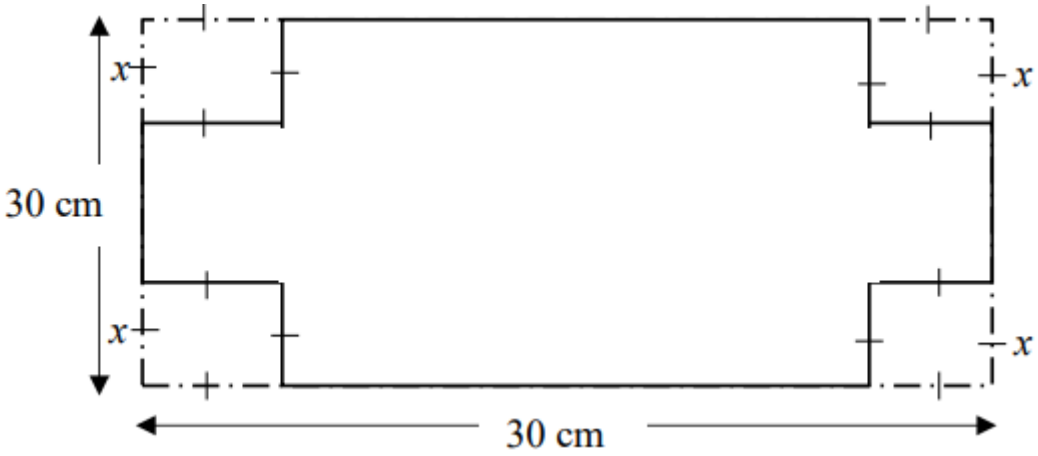
(e) In your opinion, why do you think the World Food Program hired a private company to carry out interviews?

13. A mathematician gave your friend a carpenter a task of making a rectangular ground floor of a rabbit house. The length of the house is to be $(x + 3)$m and the width is to y. Its perimeter should be 25m and its area must be $25m^2$. The mathematician adds that he needs the work to be finished in one day but the carpenter at one time he contracted 3men working at the same rate to assist him on his work and they only managed to work on $5m^2$. To be given this contract, your friend is required to make a clear diagram showing the numerical sizes of the length and width but fails to do so and comes to you for help.

Tasks;
(a) (i) Determine the length and width of the floor to be occupied by the house.
(ii) Make a sketch of the floor your friend can present to the mathematician to get the contract.
(b) Determine the number of workers who are needed to complete the house if they work at the same rate as the group the man as ever used.

14. Kasomba is a farm manager at Ngori production ltd. He has a task to buy fencing material to make a rectangular partition of an area $450m^2$ for cabbage production. The material is meant to cover three sides, since the other is already fenced with live fence. It has been confirmed a metre require fencing material at a cost of UGX.2000. Kasomba is given UGX.120,000 which is the exact amount needed to buy the fencing material for the three sides.

TASK
(a) Advise the farmer on how to choose the length and width of the partition to achieve his objective.
(b) The manager uses a rectangular piece of card measuring 30 cm by 24 cm to make an open box he would use to pack the produce. The net of an open box is has side x cm. The area of the net is 576 cm^2 made by removing a square from each corner of this piece of card. Each square that is removed



i) Form an equation in x and solve it to find the value of the height of the box.
ii) Determine the length and the width of the box.

15. The small individual farmers in a certain village are being cheated by the traders from towns by offering them low prices for their produce. These farmers decided to form groups and sell their produce through them at better prices. So far, they have two groups, Kamukamu and Tweziimbe. In the current season, they are selling milk, maize grain and beans.
Last month,
    - Kamukamu group had sales of 2,520 litres of milk, 35 bags of maize grain and 10 bags beans.
    - Meanwhile the Tweziimbe group had sales of 2,314 litres of milk, 41 bags of maize and 9 bags of beans.

    This month, the:
    - Kamukamu group had sales of 3,254 litres of milk, 42 bags of maize and 8 bags of beans.
    - Tweziimbe group managed to sell 2,719 litres of milk, 32 bags of maize and 11 bags of beans.

    The price for 1litre of milk, 1kg of maize and 1kg of beans is UGX. 700, UGX.1,000 and UGX.3,500 respectively. A bag of maize and beans is estimated to have 120kg each.

    TASK
    Organize the information for the two periods and use it to determine the total sales of both groups.

16. For your leaver's party campaign, members suggested that you buy and put on T-shirts as a class. You have three suggestions of sizes of T-shirts you can buy these are; Small size(S), Medium size (M) and Large size (L) T-shirts.
You will only buy the suggestion as the captain if 70% of your fellow students can fit in at least two sizes.
Below are your findings that you are going to base on to make a decision:

    The number of students who fit in medium size is equal to those who fit in large size and they are 100.
    The number of students who fit in small size is 76.
    Those who fit in small size and large size are 50.
    Those who fit in medium size and large size are 70.
    Those who fit in small size and medium size are 60.
    Those who fit in none of the sizes are 4.
    Some students fit in all the three sizes.
    The class is made up of 140 students.

    TASK:
    Will you buy the suggestion of buying and putting on T-shirts as a class for your leaver's party campaign? Justify your answer.

17. In the bid to determine the likelihood of a particular cell phone being successful on the market, your uncle who owns an electronics workshop tasked you to conduct a survey on 150 people on the streets of your town about

the usage of any of these cell phones. Galaxy (G), Flip phone (F), and I-phone (I), then he will decide whether to purchase more of a given type if the likelihood of those who used only that one type exceeds 0.1. 45 owned a flip phone, 60 owned an I-phone, 63 owned a Galaxy, 15 owned a Flip phone and an I-phone, 25 have owned both a Galaxy and an I-phone, 15 have owned both a Galaxy and a Flip phone only and 5 have owned all the three.

Task:

(a) Find out if there are people who have not owned any of the three.

(b) Calculate the probability of people who owned only one type of cell phone.

(c) Advise your uncle on whether to purchase more of these types.

18. A supplier of foodstuffs supplied three types of food items to three schools as follows;

First week;

Kasaka S.S; 2bags of posho, 1 bag of rice and 3bags of potatoes

Mpugwe S.S; 2bags of posho, and 2bags of rice.

Sazza S.S; l bag of posho, 1bag of rice and 2bags of cassava.

Second week;

Kasaka S.S; 3bags of posho and 2bags of cassava

Mpugwe S.S; lbag of posho, 2 bags of rice and lbag of cassava.

Sazza S.S; 3bags of posho and 1 bag of cassava.

The price of posho, rice and cassava is sh.20,000, sh.30,000 and sh.10,000 per bag respectively.

After the two weeks, he wanted to improve his mode of supply that is to say, supplying what is preferred more by the students in the schools.

Therefore he decided to make a random survey among a selected number of students from all the three schools. All the students sampled liked at least one of the foodstuffs. , 47 liked cassava (C), 53 liked posho, 23 liked posho only, 10 liked cassava only and 15 liked all the three foodstuffs. Forty five liked rice is 45 and 5 liked only rice.

TASK

(a) Arrange the amount of foodstuffs bought for each week and the prices using suitable arrays of rows and columns, and use them to determine which school spent most in the first two weeks.

(b) (i) Arrange the results of a survey using a suitable statistical diagram.

(ii) Use it to determine the number of students that prefer at least two foods stuffs.

(iii) How many students were randomly picked for this survey?

(iv) What is the chance that a student picked at random prefers rice? What conclusion can he draw from this value as per the requirements of his survey?

19. A family decides to paint the inner walls of its living room for New Year celebrations with a budget of Shs 400,000. The room is 5m long, 4m wide and 3m high. The room has two painted doors in the middle of the walls opposite to each other. Each door is 2m high and 0.75m wide. The room has one painted window in one

of the side walls which is 1m square. A painter charges Shs 800 per square meter painted and for every 10m square wall painted fully, consumes a 4 litre tin paint which he sells at Shs 70,000.

Task:

As a mathematics student; (a) Establish computations to find out if the budgeted money could be enough for this work.

(b) If a painter offers a discount of 10% on labour and 5% on every litre of paint. How much money shall the family save?

20. You have a piece of wood that is 12cm in length and 12cm in width. You to use it to make a simple money bank that is in shape of a cube and you use it to save your coins. You want to make it in such a way that to remove your money, you don't break it but rather you unfold it and then fold it back. You plan to start making it on 27th November 2023 and you want it to be done in one week!

TASK:

a. Accurately illustrate how many pieces of wood you would cut out of the piece of wood you have for your money bank clearly showing their width and length.

b. Show how you will arrange them on the floor such that when you start folding them, they form the shape you want.

c. What space will your money bank occupy?

d. On which date will your money bank be ready for use?

21. You are going to host some friends for a movie night. You have four options you can choose from: C= comedy, A= animation, M= musical, R= romance. You decided to ask them which one they would love to watch so that you choose one that is preferred by most of them. Below where their preferences:

C A A R R M M C M R C R R M AA R M AA R A RRR

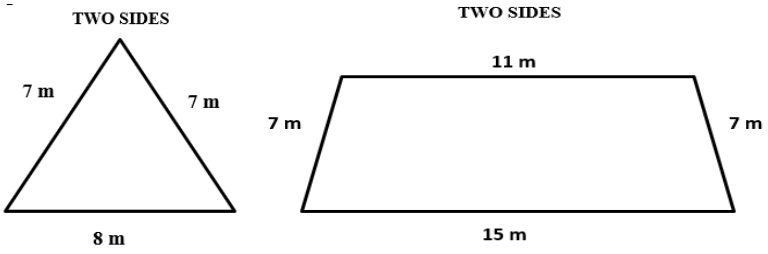
TASK:

a. Summarize your data.

b. Represent your data.

c. Which movie will you choose to show your friends?

22. A friend was given sketches below of the rooftop he plans to put on his house;



The builder recommended iron sheets of 3ft by 4ft that cost UGX.40, 000 per sheet. Your friend needs to know how many iron sheets to buy and how much it will cost him. (1ft = 0.3)

He also plans to get a loan of UGX.4, 000,000 that he is to pay back in 3 years to finance his other projects One bank offers the loan at a simple interest rate of 10% and the others offers the same loan at a compound interest

rate of 5%. He is finding it hard to determine which bank is cheaper to help him decide which of the two he can get a loan from.

TASK

a) How many iron sheets will he need to buy and how much will he need to buy them?

b) Which bank do you recommend him to get a loan from and why?

23. You have a piece of wood that is 12cm in length and 12cm in width. You to use it to make a simple money bank that is in shape of a cube and you use it to save your coins. You want to make it in such a way that to remove your money, you don't break it but rather you unfold it and then fold it back. You plan to start making it on 27th November 2023 and you want it to be done in one week!

TASK

a) Accurately illustrate how many pieces of wood you would cut out of the piece of wood you have for your money bank clearly showing their width and length.

b) Show how you will arrange them on the floor such that when you start folding them, they form the shape you want.

c) What space will your money bank occupy?

d) On which date will your money bank be ready for use?

24. On your way to school from home, you plan to pass via you're friend's home to pick your book. You travel by a motorcycle that travels at constant speed of 88km/h. You want to decide on what time to leave home such that you reach school at 7:30am. On a grid map where each square is $1km$, your home is located at coordinate (3, 3), your friend's home is at (2, 9) and your school at (7, 9). As you were thinking of how to travel, you realized that your painting was shifted from position B to position A as shown below and hence would wish to shift it back.

NOTE: Time in hours $= \frac{distance\ in\ km}{speed\ in\ km/h}$

TASK:

a) What time will you have to leave home for you to reach school on time?

b) How will you shift you painting back to its original position

25. Mr Lwanga Badru Sheila's father a S.4 South student went to Kampala on Independence day and visited three shops. A clothing Store shop that was offering a general 25% discount on all there stock. However for that independence day only, the store advertised an additional 10% discount to celebrate with the Ugandans independence day. The price tag on Sheila's sweater was marked UGX60,000. He then proceeded to SG furniture dealers and found this information on the show room entrance.

"BEST TERMS ON SOFA SETS"

CASH PRICE: UGX 4,200,000 with a 10% DISCOUNT

HIRE PURCHASE: DEPOSIT UGX 1,200,000 AND PAY 8 EAQUAL MONTHLY INSTALLMENTS OF UGX 431,250

Mr. Lwanga could not pay cash and opted for hire purchase. He then proceeded to his Saving scheme which gave him a top up loan of UGX3,000,000 at a compound interest rate of 4.8% per annum. If he was to pay back the loan in a period of 24 months.

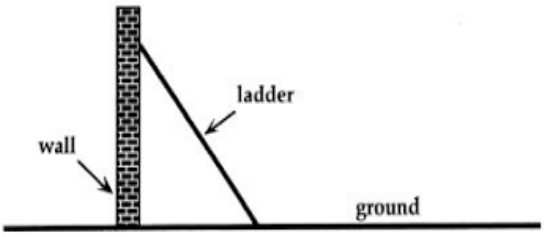
Tasks:

(a) What was the sale price of sweater.

(b) Find the extra amount of money he paid to the furniture dealer because he did not pay cash.

(c) How much interest did the SACCO earn from Mr Lwanga.

26. An internet router installer wants to install the router outside the building at a height of 15m from the ground floor since that's where the signals are. At first he puts the foot of un-adjustable ladder at 10m away from the wall on the ground and the head of the ladder on the wall at a height of 6m. However, he realized that he could not reach the position he wanted. He had to re-adjust the same ladder to make sure he reaches the position he wants!



TASK:

a) Illustrate the initial position of the ladder on a well labelled grid.

b) How steep is the ladder in that initial position?

c) Illustrate on the same grid how he can re-adjust the ladder to reach the position he wants.

d) How steep is the ladder in that new position?

e) Using the new positions, show the relation between the position of the ladder on the ground, on the wall and the slope? (show the mathematical relation)

f) How tall was the ladder used?

27. An investor wishes to buy a piece of land (family land) from your father to construct a factory. Your father and the whole family members have already accepted to have this land sold to this investor. The land is rectangular in shape and measures 150m by 100m in size. One longest side of this land is having its boundary covered by a water body. The investor is to pay each square meter of this land Uganda shs. 300000 according to the agreed terms and conditions regarding land price negotiation in this community. The investor is to fence the land immediately after payment.

Task.

a) As a senior three student, help your father and the whole family to determine the amount of money they should accept to receive from this investor for the whole piece of land (offer them understandable explanation where necessary).

b) If the investor is to fence this piece of land with barbed wire excluding or leaving out the side bounded by the water body and each roll of a barbed wire covers a distance of 25 meters in fencing and cost Uganda shs. 100000. Advice this investor on the amount of money he should have in order to fence this land

28. The government of Uganda is to set up a project in Kabasanda village, Butambala district. For this project to be set up, a group of villagers is to be displaced from their own land and compensated in cash money in order to relocate themselves to other places. The table below shows the affected villagers and pieces of land in hectares they own that are to be compensated.

Names	Land (in hectares)
Kateregga	2
Kirunda	3
Wasswa	1
Katende	4
Ssebagala	3

Task:

(i)(i) If in each hectare of land, a villager is to be given a compensation fee of shs. 2000000 and added a settlement allowance of shs. 800000. Form a mathematical function showing the relationship between the pieces of land (in hectares) and the total amount of money to be received in compensation. Taking x as pieces of land (in hectares) and f(x) as the total amount of money to be compensated

(ii) Using the relationship derived in a (i) above represent the above information on an arrow diagram. Show clearly the amount each villager will get in compensation.

(ii)b) Kirunda has just bought a piece of land in this village (3 hectares) at shs. 4000000 but unfortunately is amongst the people to be displaced as shown in table 1 above. Determine whether Kirunda will lose his land with a profit or loss and by how much.

(c) Mr. Kigenyi have 15 hectares of land in the same village. Determine by calculation how much he would have received in compensation if the whole of his land was to be covered up by the project set up plan.

29. Number plates, also known as license plates or registration plates are typically manufactured using a combination of digital printing technology and specialized equipment. Your guardian has three taxis that travel along Kampala-Gulu high way registered UBA443T, UBB223R and UBD132V, the numerical digits on the number plates were found to be in quinary base and he is interested in knowing which vehicle has digits which are a multiple of three so that he can paint that vehicle with a red color for easy identification.

All the three taxis leave Namayiba taxi park at 6:00am for their first route to different destinations, however they enter the after at different time intervals. The first taxi enters the taxi at 8:30am, the second taxi at 9:00am and the third one enters at 9:15am. The fuel consumption rate for all the three taxis is the same and it was observed that when any of the taxi had covered 60km, the fuel consumed costed UGX160,000 and when the taxi had travelled 15km, the fuel consumed was UGX0,000.

Task:

(a) Help your guardian know which taxi he will paint the red colour.

(b) At what time will the three taxis enter Namayiba taxi park all at the same time.

(c) What is the estimate cost on fuel consumption if the taxi plans to take your school for a tour to Jinja which is approximately 90km from Namayiba taxi park.

30. A family of your friend agreed to have family planning so that they can effectively plan for their children. They agreed to have a child spacing of two years so that their business of drinks (water and soda) can pick up with time. They had their first born in 2020. At their drinks shop they sell two types of water bottles, type A and type B and they make the water bottles by themselves. The same equipment can be used to make either water bottle. In making type A water bottles, one man can supervise 10 machines and this batch will give them a profit of UGX50,000 per day. Type B water bottles yield a profit of UGX250,000 a day using 25 machines and 8 men. There are 200 machines and 40 men available.

    The produced water is parked in cartoons and your school had a thanksgiving function and budgeted for 5 boxes of water type A and 4 boxes of water type B at a cost of UGX92,500. However, the bodaboda man that was sent to buy the water brought 4 boxes of water type A and 5 boxes of water type B and was given a demand note of UGX4,000 as balance remaining to be paid for what he bought.
    Task.
    (a) In which year do you think your friend's family have their sixth born.
    (b) (i) Show the feasible region of the relation on a Cartesian plane.
    (ii) Help your friend's family determine the maximum profit they will receive from the sale of the water bottles.
    (c) What do you think is the actual price of each carton of each water type.

31. In Uganda, many are worried about the fire problem in schools which is becoming a threatening hazard. Research experts have carried out a survey to investigate the likely cause of the rampant fires in Education institutions. Findings showed that, three categories of stake holders were found to be responsible for the fire outbreaks in Education institutions. 50 respondents said they are learners, 50 respondents said they are parents and 40 respondents said they are school administrators. 10 respondents attributed it to all categories. 15 attributed it to learners and parents, 20 attributed it to parents and school administrators and 15 attributed it to learners and school administrators.
    Task:
    a) Help the expert researchers to summarize their report and be able to establish number of respondents who attributed it to;
    i. Learners only
    ii. Parents only
    iii. School Administrators only
    b) Find the total number of the respondents in the survey.
    c) What is the probability that the fire problem in schools is attributed to learners?

32. 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 directionS75^{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 45itres and he is to buy 4 smaller buckets and 2 larger buckets.

TASKS.

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

d) Find the total cost he incurred in purchasing the cows.

e) What is the maximum amount of Yoghurt be bought for his guests.

33. 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 Pentagonal 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 UGX128,000,000. 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 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 UGX7.5millions weekly for 50 weeks or pay 24.5millions monthly for 15months. 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.

34. There are very few teachers who have three teaching subjects. A survey was done in your school and it was found that the school has a teaching staff of 22 teachers 8 of them teach mathematics, 7 teach physics and 4 teach Chemistry. Three teach both mathematics and Physics and one teaches Mathematics and Chemistry. No teacher teaches all the three subjects. The number of teachers who teach Physics and Chemistry is equal to that of those who teach Chemistry but not physics.

In the school staffroom there are two similar cans that have different heights. One 6cm and the other one 9cm. If the surface area of the larger can is 840 cm^2.

TASK

(a) Find the number of teachers who teach none of the three subjects.

(b) Find the probability that a teacher picked at random teaches only one subject.

(c) Find the surface area of the smaller can.

3. In a survey 100 people were asked which form of transport they used. 46 people only used bicycles (M). 21 people only used buses (N). 11 people only used motor bikes (P). 5 people used buses and bicycles but not motor bikes. 3 people used buses and motor bikes. 6 people used bicycles and motor bikes. 9 people declined to respond. Customs duty and purchase tax are levied on certain imported goods as:

Customs duty = 35% of the value of the good.

Purchase tax= 15% of (value +duty)

TASK

(a) Find the;

(i) number of people who used all the three forms of transport.

(ii) percentage of people who used only two forms of transport.

(b) Find the total amount levied on a disco deck valued at 1.7millions.

3. Mr Wakida is a business man who deals in an agricultural produce business. He visited four markets in week two of the month of May 2024.

In Nakasero market (N), he bought 3 bags of beans, 5 bags of maize, 10 bags of potatoes and 3 bags of millet.

In Gayaza market (G), he bought 1 bag of beans, 4 bags of potatoes and 2 bags of millet.

In Jinja market (J), he bought 4 bags of beans, 3 bags of maize, 6 bags of potatoes and 1 bag of millet.

In Masaka market (M), he bought 5 bags of beans and 1 bag of maize.

Mr Wakida bought each bag of beans at Shs. 45000, a bag of maize at Shs. 30000, a bag of potatoes at Shs. 15000 and a bag of millet at Shs. 50000

However, since he is a business man, he later sold off all the produce he had bought at Shs. 50000 per bag of beans, Shs. 35000 per bag of maize, Shs. 18000 per bag of potatoes and Shs. 55000 per bag of millet.

TASK:

a) Assist Mr Wakida to summarize the above information (number of bags bought, buying prices and selling prices of the bags) in matrix form.

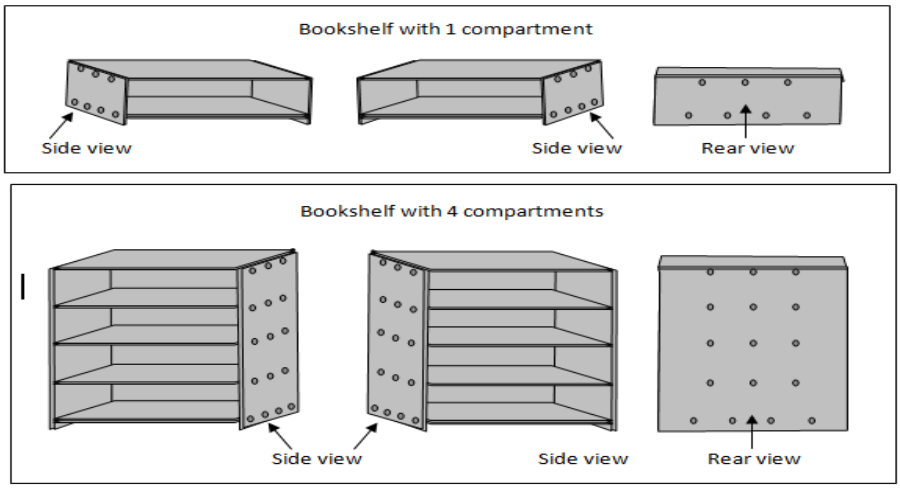
b) Using your knowledge of matrix multiplication help him to know:

i) the amount of money spent on the produce in each market.

ii) the amount of money he received after selling off all the bags.

c) Help him to know the amount of profit he made that week.

37. Acom is a carpenter. She specialises in making bookshelves with different numbers of compartments. She uses 12 nails for the base of a bookshelf, and 9 more nails for each compartment in the bookshelf.



Apwoyo ordered a bookshelf with 1 compartment.
Kyoteeka ordered a bookshelf with 2 compartments.
Muwonge ordered a bookshelf with 3 compartments.
Zesilo ordered a bookshelf with 4 compartments.

TASK:

a) Complete the table to show the number of nails that Acom used to make each of the four bookshelves.

Number of compartments	1	2	3	4
Number of nails				

b) Acom recognised a pattern in the number of nails he used to make the bookshelves with 1, 2, 3 and 4 compartments. Work out the algebraic expression that Acom can use to find the number of nails needed to make a bookshelf with any number (n) of compartments.

c) Acom received a new order, for 4 bookshelves with 6 compartments each. She has to buy nails. Nails are sold in kilograms. In a kilogram there are 32 nails. Each kilogram costs UGX 5,000. How much did Acom pay for the nails for the new order?

38. In Uganda, many are worried about the fire problem in schools which is becoming a threatening hazard. Research experts have carried out a survey to investigate the likely cause of the rampant fires in Education institutions. Findings showed that, three categories of stake holders were found to be responsible for the fire outbreaks in Education institutions. 50 respondents said they are learners, 50 respondents said they are parents and 40 respondents said they are school administrators. 10 respondents attributed it to all categories. 15 attributed it to learners and parents, 20 attributed it to parents and school administrators and 15 attributed it to learners and school administrators.

TASK:

a) Help the expert researchers to summarize their report and be able to establish number of respondents who attributed it to;

i. Learners only

ii. Parents only

iii. School Administrators only

b) Find the total number of the respondents in the survey.

c) What is the probability that the fire problem in schools is attributed to learners?

39. Mr. Livingstone is a very rich man in Mbarara city where he has constructed 36 houses. He wants to paint his houses by either green, white or black colour. Of these, 10 houses must have to be painted with Green colour and 6 houses must be painted by black colour. The 5 houses must be painted with green and white, 8 white and black and 4 houses must be painted with green and black.

All houses which are painted white are three more than those which are pointed black.

TASK

a) Determine the number of houses that were painted with all the three different colours.

b) Determine the number of houses painted with at least one of each of the three colours.

c) If the house is picked at random, what is the possibility that it is painted black or white only.

40. A group of students from Nairobi University agreed to contribute equally to buy mathematical calculators worth Ksh 1200 for a school library.

Five students pulled out and so the others agreed to contribute on extra Shs 10 each. Their contributions enabled them to buy calculators worth Shs. 200 more than they originally expected.

TASK

a) If the original number of students was X, write an expression of how much each was originally to contribute.

b) Write down two expressions of how much each contributed after the five people pulled out.

c) Calculate the number of people who made the contribution and find out how much did each contribute.

41. During their baking lesson, the students were given a recipe for 10 scones using the following ingredients:

(a) 80g butter

(b) 350g self-raising flour

(c) 30g sugar

(d) 2 eggs

However the student has the following ingredient and is preparing for the exhibition due to take place at school and wishes to bake 25 scones for the exhibition because he expects parents and visitors to support his entrepreneurial venture.

d) 100g butter
e) 1kg self-raising four
f) 50g sugar
g) 4 eggs

Task:
(a) Determine if the student has enough of each ingredient to bake 25 scones based on the recipe.
(b) Determine how much more of each ingredient the student needs to buy.
(c) If the prices of the ingredients are as follows:
b) Butter: 5,000 shillings per 100g
c) Self-raising flour: 6,000 shillings per kg
d) Sugar: 1,000 shillings per 50g
e) Eggs: 500 shillings per egg
Calculate the total cost for the additional ingredients needed.
(d) Determine how much the student should sell each scone. Electricity and other expenses are provided free by the school.

42. In a school survey, 200 students were asked about their internet usage habits. They were asked to choose from three activities: Social Media (like Facebook and TikTok), Academic Work (such as research and homework), and Playing Games. The results showed that 165 students use the internet for Social Media, 130 use it for Academic Work, and 100 use it for Playing Games. Among them, 70 students use it for both Social Media and Academic Work only, 60 use it for both Social Media and Playing Games, and 50 use it for both Playing Games and Academic Work. Addition ally, no students exclusively use the internet for playing games. Now, the school needs to decide whether to set rules if more than 60% of students spend their internet time on Social Media.

TASK:
(a) Calculate how many students use the internet for atleast one of these activities.
(b) Determine how many students don't use the internet at all.
(c) Estimate the percentage of students who use the internet solely for Academic Work.
(d) Based on the findings, advise the school on whether to implement rules or not.

43……

44……

45……

SENIOR FOUR SCENARIO QUESTIONS

1. **You went to a casino and decided to play a game of chance. The dealer shuffles a standard pack of 52 playing cards and offers you a bet; if you draw a card that meets certain conditions, you win different prizes depending on the conditions you meet. The conditions are:**

   i) If you draw a 6 or a king, you win a Consolation Prize of UGX 10,000.
   ii) If you draw a club or an ace, you win a Bronze Prize of UGX 50,000.
   iii) If you draw a black card (spades or clubs) or a heart, you win a Silver Prize of UGX100,000.
   iv) If you draw the ace of spades, you win the Grand Prize of UGX 1,000,000!

   TASK
   a) Find the likelihood of winning the consolation prize.
   b) Find the chance of winning bronze price.
   c) Find the odds in your favor of winning the silver prize.
   d) Find the possibility of winning the grand prize.

2. **A wildlife conservationist creates a TikTok account to track and analyze animal population trends. Her business plan states that her goal is to reach 50,000 subscribers by the end of 2 years (24 months from now). She hopes that if she achieves this goal, her site will be featured on a prominent National Geographic Channel. The initial user base resulting from pre-launch social media campaigns is 400 subscribers.**

   The wildlife conservationist posted a video on her TikTok account and initially had 80 views as soon as it was posted. The total number of views to date has been increasing exponentially according to the exponential growth function $y = 80e^{0.2t}$, where t represents time measured in days since the video was posted and y represents the total number of views.

   TASK
   a) Assuming a constant monthly growth rate, what rate is required to achieve 50,000 subscribers at the end of 24 months?"
   b) How many days does it take until 2500 people have viewed her video?

3. **The Art and Photography exhibition is being held on a large circular walking path of diameter 50m surrounding a gorgeous sculpture of height 6m situated in the center of the circular path. Three entrances to the exhibition A, B and C are marked on the circular walking path. Two entrances A and B are marked on the circular path forming a central angle of 60^o and the third entrance C, is marked on the shorter length of the circular path between A and B in such a way that it is equidistant from entrances A and B.**

The event organizer ordered for two rectangular boxes each of dimensions 8m×6mx4m to transport the sculpture and photography equipment. To minimize the amount of storage space needed for transportation, the rectangular boxes should be modified by cutting a triangular prism-shaped section from each rectangular box, with a cross section that is an isosceles triangle with base 6m and height 4m.

The event photographer captured a shot of the fountain sculpture but later found out that it was distorted and to enhance the image quality he used image editing software and applied the following transformations to obtain a clearer image:
- Rotated the image 45° clockwise about the origin.
- Enlarged the image by a scale of 2.
- Reflected the image across the y-axis to flip the mirror image.

TASK:
(a) i) Find the portion of length of the circular path from entrance A to entrance B.
ii) Find the inclination between the positions of entrances A, B and C.
iii) If a person 1.8 m tall stands on entrance C and looks towards the fountain top, find the angle of elevation to the top of the fountain.
(b) i) Find the storage space needed for each box if they are not to be cut into triangular prisms.
ii) Sketch the unfolded shape (net) of the cross-section formed when the triangular prism-shaped section is cut from the rectangular boxes.
iii) Determine the surface area of each triangular prism. .
iv) Calculate the total storage space saved by cutting the rectangular boxes into triangular prism shaped section boxes.
(c) Find a single rectangular array of numbers that can undo all the transformations to obtain the original image before corrections.

4. ***Imagine you are a photographer capturing stunning landscapes. One day, you come across a strange flower that changes color with each passing day. Intrigued by its beauty, you decide to document this color-changing phenomenon. On the first day, the flower is bright red and its colour intensity is 200 units. However, each day it fades by 10% of its color intensity.***

In your photographic pursuits, you encounter a different flower that gains color intensity over time. This flower starts with an intensity of 50 units and increases by 15% each day.

Continuing your exploration, you stumble upon a glowing firefly that emits light. The firefly's light intensity decreases exponentially over time and the initial light intensity of the firefly is 100 units, and it decreases by 5% every hour.

As a final challenge, you encounter a block of ice that melts at a constant rate. Initially, the ice block weighs 500 grams, and it melts at a rate of 2% of its weight per hour.

TASK

a) How many days will it take for the color intensity to drop below 50 units?

b) How many days will it take for the color intensity to exceed 200 units?

c) How many hours will it take for the light intensity to fall below 10 units?

d) How many hours will it take for the ice block to melt to 200 grams?

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Kaira prepared a birthday party at her home and invited her friends between the age of 20 to 54 years. She wanted to confirm which age bracket mostly could attend her party. So, she grouped them starting with (20 – 24) years. The people attended were of age,

30	22	38	25	41	37	33	40
39	38	51	32	48	34	43	24
25	31	37	43	23	46	36	47
39	44	26	36	37	41	29	32
40	38	42	31	49	28	54	35

TASK

a) Using clear mathematical procedures, find the age bracket which mostly attended her party and the most frequent age that attended her party.

b) Find the likelihood that the people who attend her party are of age ranging from 25 years to 36 years.

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 UGX 4500 and in February when he bought 700 bags, the cost of transporting each bag was UGX 8500. 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 **18bags** 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 UGX 240,000 and UGX 300,000 respectively yet he has allocated UGX 2,400,000 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**.

TASK:

(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.

11. 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. He asked the department to give a test and the these were the students' 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, 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:

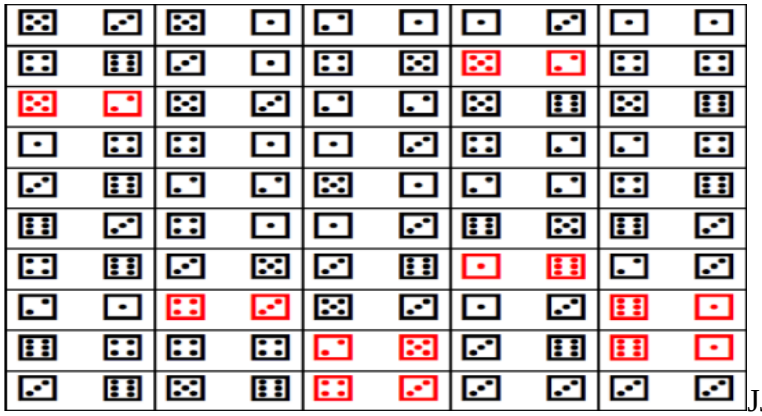
a) (i) Help the head teacher group the marks to make an informed decision one the fate of the department and defend it.

(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.

12. A friend of yours wanted to participate in the National Ludo Champions competitions. During his practice, he rolled a die several times and kept on taking a picture of each occurrence. He needs to find out whether he will compete favorably but he is unable to do so. He gives you the diagram below showing his scores so that you can guide him.



JJJ

Tasks:

(a) Use the information above and clearly show how to determine the score with the highest chance of occurring on top. Which score is it?

(b) Find the probability that an odd number occurred when the die was rolled.

(c) Present the information of the above scores on a statistical graph.

(d) Will your friend compete favorably in the competitions?

13. A certain catering and decoration company was called to cook 100kg of rice at a certain party. According to their cooking notes, they put 22.5 liters of water in 10kg of rice and 67.5 liters of water in 30kg of rice. They want to use those notes to know how many liters to use in the rice they are ordered to cook but they are finding it hard.

The customer wants a tent at less than UGX.250, 000 and chairs at UGX.200, 000 at most. However to maximize profit, the company wishes to provide both at UGX.400, 000 at least. The company is finding it hard to decide on how much to charge the customer for the two items respectively.

TASK:

a) (i) Form a mathematical relationship between the quantity of rice and liters of water used to cook it according to their notes.

(ii) Use the relationship developed to help them determine the liters they will use in the rice they are ordered to cook.

b) (i) Form inequalities that are making it hard for the company to decide on how much to charge the tents and chairs respectively

(ii) Use the inequalities, to help them decide on how much to charge for the tents and chairs respectively.

14. You have friends who rear cows and goats. During the festive season, they want to sell at most 10 of their cows and at least 8 of their goats. They also want to ensure that the number of goats they sell are less than twice the number of cows. They also do not want to sell more than 20 animals all together. They wish to maximise sales by selling each goat at Shs200,000 and each cow at Shs1.5 millions but they do not know the number of goats and cows to sell to fulfill their wish.

Task:
(a) write mathematical statements that show the relation between the cows and goats.
(b) Show the feasible region of the relation on the Cartesian plane.
(c) Help your friends to determine the maximum amount of money they will possibly make from the sale of cows and goats.

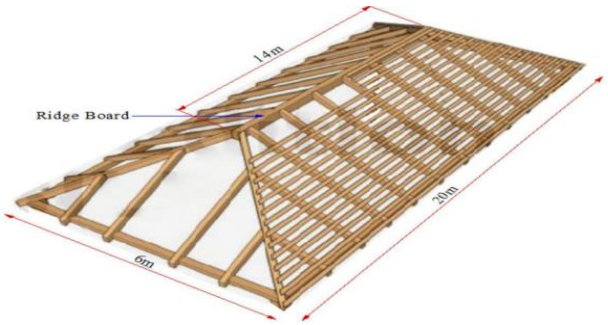
11. A day school holds a weekly assembly every Monday starting at 8:00 AM. The Head teacher has noticed a trend of learners arriving late for assembly. Since the school gates are opened at 7:30 AM, he decided to collect data from a sample of learners on their arrival times in minutes past 7:30 AM to make an informed decision about the assembly's start time. The collected data was as follows:

15	**18**	**20**	**22**	**17**	**25**	**23**	**28**	**26**	**21**
30	**33**	**35**	**32**	**36**	**39**	**42**	**37**	**41**	**28**
45	**48**	**29**	**31**	**26**	**27**	**30**	**33**	**34**	**31**
28	**35**	**40**	**42**	**37**	**39**	**36**	**38**	**29**	**43**
46	**47**	**30**	**32**	**31**	**45**	**27**	**44**	**46**	**49**
52	**53**	**55**	**51**	**50**	**56**	**57**	**58**	**59**	**51**

Task:
(a) Giving a reason, based on calculations using the data collected, suggest the time the assembly should always start.
(b) The deputy Head teacher advised the Head teacher to always start the assembly when at least 75% of the students are present. Based on the advise, determine the time the assembly should start.
(c) If you were the Head teacher, which of the two suggested assembly start times from (a) and (b) would you consider more appropriate and why?

12. The Ministry of Health in Uganda is conducting a survey about the existence of malaria in three districts: A, B and C. The ministry will then come up with control measures if the chance of a person testing positive having visited at least one of the districts is above 50%. The Ministry has intentionally selected a sample of people who visited the three districts and tested them for malaria. The test results have revealed that 50 people who visited district A, 60 people who visited district B and 40 people who visited district C tested positive for malaria. Additionally, 20 people who visited both districts A and B, 10 people who visited districts A and C, and 15 people who visited districts B and C tested positive for malaria. The Ministry has also discovered that 20 people who only visited district C tested positive for malaria and 40 people who visited the three districts tested negative for malaria.
Task:
(a) Determine the number of people that were tested for malaria by the ministry of health.
(b) Calculate the probability of a person testing positive having visited at least one of the three districts.
(c) Advise the Ministry of health, with a reason based on calculation, whether to come up with control measures or not.

17. Your neighbor has a building structure that is at a roofing stage with the roof frame installed as shown below:



The roof frame has a rectangular base with dimensions of 20 m by 6 m and the ridge board of 14 m centrally placed. The triangular faces are equilateral. She wants to use iron sheets that are available in two types; type A and type B. The iron sheet of type A costs Shs33,000 each and that of type B costs Shs42,000. Each iron sheet has a length of 10ft and usable width of 2.623 ft. (1ft = 0.3m) The hardware shop from which she wants to buy the iron sheets gives a discount of 6% on the total cost of every fifty (50) iron sheets of type A bought and a discount of 10% on the total cost of every seventy (70) iron sheets of type B bought.

She intends to borrow money from a bank to buy the iron sheets but she is not so sure of the amount to borrow.

Task:

(a) Help your neighbour to estimate the amount of money to be borrowed from the bank for either type of iron sheets.

(b) Give your neighbour advice, with reason(s), on the type of iron sheets to buy.

18. Your friend wants to sell dresses in your home area according to age. She requests you to recommend the age range that she can sell. You wish to recommend an age range with the modal age being the highest. Below is the summary of data you gathered:

Age groups (Years)	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59
Number of People	6	3	13	7	4	3

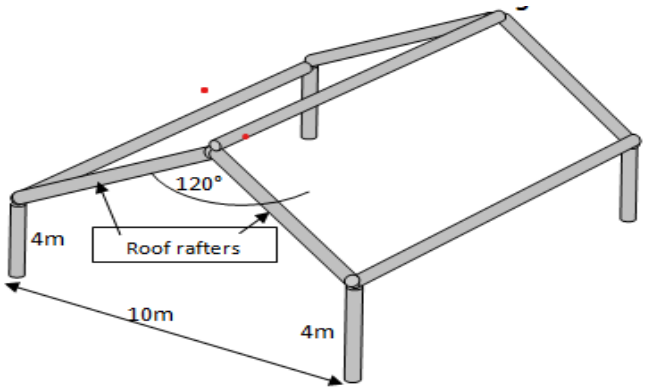
TASK

(i) Which age range will you recommend according to your data?

(i) What is the probability that your friend will succeed if she accepts your recommendation?

(i) According to the probability, is your recommendation a good choice? (Justify your answer)

19. Hadijah a small-scale farmer stays in a very hot environment and wants to build a shed for her cattle. She has sketched the framework of the milking shed as shown below.



The walls are 10 metres apart. The top of the roof is halfway between the walls. The sloping roof rafters meet at an angle of 120°.

TASK;

i. Construct a scale drawing of the cross-section of the milking shed.
ii. What scale have you used?
iii. What is the length of the roof rafter?
iv. What is the angle of inclination of the roof?
v. Sketch the same roof if the angle of inclination is more than what you obtained in (d) without changing the dimensions of the milking shed.

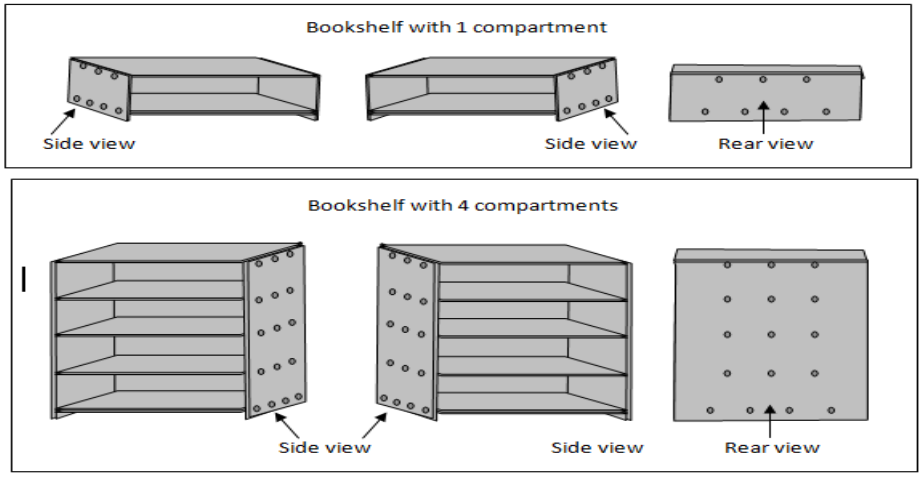
2. Mary usually sets off from a landing site that is located on coordinate O (9, 7) on the grid map to island A which is located at coordinate A (6, 3) during her day off. Island A is south east of landing site O. This time she plans to extend her tour from island A to another island B that is 9km north east of island A and then sail back to the landing site through the direct route.
She plans to tour around island A for 3hours and around island B for 4 hours. Her journey is to start at 10:00am. She hopes to be back by 20:00hours since she has work the following day. She wants to know if it's possible to return by that time. The boat is usually ridden at an average speed of 64km/hr.
She is in charge of paying her fellow workers. Some workers were given a salary increment to UGX.650, 000. This includes allowances of UGX. 120, 000. She needs to know how much income tax she is to deduct from them and the net amount she is to pay them using the tax bands below:

TAXABLE INCOME (UGX)	TAX RATES (%)
0 - 200,000	0
200,001 - 400,000	10
400,001 - 600,000	15

TASK
a) (i) what is the total distance they are to sail?

(ii) What is the total time the entire tour will take inclusive of the time the boat will take to sail the whole journey?
(iii) will she make it back at the planned time? (Justify your answer)
b) How much will she pay her fellow workers?

21 Janat is a carpenter. She specialises in making bookshelves with different numbers of compartments. She uses 12 nails for the base of a bookshelf, and 9 more nails for each compartment in the bookshelf.



Obong ordered a bookshelf with 1 compartment.

Achen ordered a bookshelf with 2 compartments.

Nambi ordered a bookshelf with 3 compartments.

Mugisha ordered a bookshelf with 4 compartments.

a) Complete the table to show the number of nails that Janat used to make each of the four bookshelves.

Number of compartments	1	2	3	4
Number of nails				

b) Janat recognised a pattern in the number of nails he used to make the bookshelves with 1, 2, 3 and 4 compartments.
(i) Write two numbers to complete this algebraic expression to show the number of nails (n) that Janat needs to make a bookshelf with b compartments.
(ii) What does the first number in the algebraic expression represent?

(iii) What does the second number in the algebraic expression represent?

c) Janat received a new order, for 4 bookshelves with 6 compartments. She has to buy nails.Nails are sold in kilograms. In a kilogram there are 32 nails. Each kilogram costs UGX 5,000. How much did Janat pay for the nails for the new order?

22. Okot wants to paint his room. The floor of the room is 5*m* long and 4*m* wide. The room is 3*m* high. The room has two doors each fixed in the walls that are opposite to each other, both 2*m* high and 75*cm* wide. It has one window in one of the longer walls. It is 1m square.

a) Draw a sketch of Okot's room. Indicate the measurements of the floor, height, doors and window.
b) A painter charges UGX 800 per square meter. How much money will Okot pay for the painter?
c) A 4-litre tin of paint costs UGX 70,000 and it paints 12*m* square of the wall. The walls already have an undercoat paint.
   i) How many tins would Okot need to buy in order to paint his room?
   ii) How much money will Okot require to paint his room?

23. John would like to continue with his studies at A-Level. He is challenged with raising tuition of UGX 200,000. John is gifted with a skill of making jewelry crafts. He has saved some money that can only help him buy glue and strings. So, he moves to different homes requesting for old calendars. From the old calendars, he makes necklaces and earrings. A necklace takes him an hour to make and sells for a profit UGX800. The pair of earrings takes him two hours to make but he gets a profit of UGX2000. He likes to make a variety by making at least as many necklaces as pairs of earrings. He has approximately 40hours per week for creating jewelry. He also knows that the crafts show vender wants sellers to have more than 20 items on display at the beginning of the show. Assuming he sells all his inventory, help him find;

a) how many of each of necklaces and earrings he should make to maximise his profit.
b) how much profit he makes in a week.
c) how many weeks he requires to raise his tuition?

24. A camping supply company produces back packs in two models; journey and trek. The journey models requires 4 hours of labour and the company makes a profit of Shs 40,000. The trek model requires 6 hours of labour and the company makes a profit of Shs 80,000. The distributor will accept no more than 4 trek models and 15 journey models per week.

Task:
(a) Write mathematical statements that show the relation between the two models.
(b) Show the feasible region of the relation on the Cartesian plane.
(c) If you were the manager, determine the minimum number of hours of labour that are required for the company to make a profit of at least Shs 400,000 per week.

25. A telecommunication company plans to introduce a new minutes bundle on the menu and employs callers to investigate people's opinion on the minutes of the package that will cost 1200Shs. The

callers made a survey on random calls of the customers to gather their opinion and use the average minutes. They collected the data collected below.

52	36	76	51	62	70	50	45
86	69	72	85	71	80	50	49
53	49	84	72	84	70	56	54
88	66	75	78	78	57	64	58
65	42	42	43	43	64	74	53

Task:

(a) Giving a reason based on computations using the collected data, suggest the suitable number of minutes to be added on the menu.
(b) The supervisor wishes to know the number of people who prefer minutes greater than 60. Help him/her to estimate this number of people.

26. Your brother received Shs 597,000 as a salary and complains of underpayment exhibited in one of the private secondary schools in which he was employed as a teacher at the start of the year. He further says the biggest percentage of his money goes to the government as tax. On acquiring the job he signed a three-year contract with the following terms and conditions. A teacher's monthly gross income has certain allowances deducted from it before it is subjected to the government income tax band. The allowances are as follows.
    - Married teacher Shs 18,000 per month
    - Un married teacher Shs 12,000 per month
    - Each child below 11 years Shs 5,000 per month
    - Each child above 11 years but below 18 years Shs 7,000 per month
    - Each lesson taught Shs 3,000
    - Each examination invigilated Shs 5000
    - Meeting allowance Shs 50,000 per meeting
    - Housing allowance Shs 240,000 per month
    - Lunch allowance Shs 2,000 per day

    Government Income Tax Band

Tax income (Shs)	Tax rate (%)
0 – 100,000	10
100,001 – 200,000	25
200,001 – 300,000	30
300,001 – 400,000	45
400,000 and above	50

Your brother earns a monthly a gross pay of 1,240,000 he is married with 3 children of ages 10, 15 and 19. Given that he has 64 lessons taught in a month, attended beginning of term staff meeting and invigilated 5 examination sessions. Hint: A month has 30 days.

Task:

(a) Help him find how much money and its percentage he pays to the government as tax.

(b) Establish the take home pay of your brother and advise him if there could be something wrong with his payment transactions.

27. Mr. kyagulanyi is a physician who works with Uganda Research Institute and they carried out search on rampart causes of eyes infection on young population (youth) and they discovered that most of them spent hours on television watching different kinds of programs, and their time of watching was recorded to the nearest hours.

1	3	0	3	1	4	5	4	3	2
0	4	6	2	2	2	3	2	2	7
3	1	0	2	3	3	0	1	7	2
5	4	2	1	1	3	4	2	4	4
0	0	1	2	1	3	1	2	7	2

Tasks:

i) Help Mr. kyagulanyi organize his data in suitable table.

ii) Represent Mr. kyagulanyi ‘s research data in a suitable statistical data presentation showing degrees.

iii) State the modal and medium time.

iv) With reasoning suggest others ways that may cause eye infection.

28. Your facilitator gathered information on the ages of some few learners in the school from different classes. Below are his records:

14, 15, 16, 17, 18, 21, 18, 17, 15, 16, 21, 21, 17, 14, 18, 15, 17, 17, 15, 16, 21, 18, 18, 21, 17, 15, 14, 21, 16, 17, 16, 21, 16, 15, 16, 21, 17, 18, 16, 17, 21, 18, 15, 17.

TASK:

a) In which other way can the facilitator record the information above such that even another person looking at it can easily tell the number of learners in each age group?

b) Illustrate your suggestion in (a) above.

c) State which age are the majority of the learners in the school.

d) Your facilitator wants to sell either cartoon stickers or stickers for different singers in the school. According to the above records, which stickers do you think will be suitable?

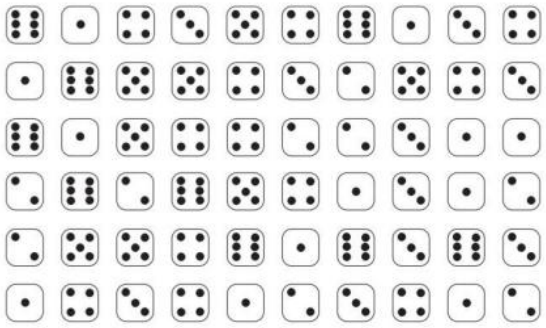
29. Your classmates are arguing whether to produce Sausages(S), or Popcorns (P), or cakes(C) or daddies (D) for the school project. To solve the argument, your class teacher assigned you as the group manager to make research and present the findings on a diagram and hence use it to decide. You questioned a group of 40 students from different classes of which product they prefer and below where there responses:

S	P	S	S	C	P	P	S	P	S
C	D	C	D	D	S	S	P	S	S
S	S	P	P	P	P	P	D	S	D
P	P	P	S	S	S	C	C	S	S

TASK:

a) Fulfill the teacher's assignment.
b) Which product do you think you and your fellow students will end up producing?

30. You are to participate in a Ludo game at school. Each of you was told to carry a dice that will help him or her to win. When you reached home, you decided to test your dice by rolling it 60 times while recording the value that appears. Below were the results of each roll you made:



TASK:

a) Summarize your scores.
b) Basing on your summary, which one is your lucky number on the dice?
c) Odd numbers and even numbers, which of the two has the highest probability on your dice?
d) You want to show your results to one of your friends at home so that he can help you to decide whether to take your dice or not. However, your friend understands diagrams more than numbers. Come up with a diagram that you will show to your friend.

31. A company was contracted to transport 1200 tonnes of sand. The company used type A and type B trucks to do the job. Each type A truck carries 10 tonnes of sand per trip while each type B truck carries 15 tonnes per trip. The total number of trips must not be less than 70 and type B trucks must make at least twice as many trips as type A trucks while the latter i.e. type A, must not make less than 10 trips. Taking x to represent the number of trips made by type A trucks and y to represent the number of trips made by type B trucks.

TASK:

(a) write down all the inequalities representing the above information.
(b) Represent the inequalities in (a) graphically. The company makes a profit of Shs 2000 per trip made by each type A truck and Shs 3000 per trip made by each type B truck.
(c) (i) Write down the objective function for profit.
(ii) Determine the number of trips, each type of truck must make to maximize the profit.
(iii) Hence calculate the maximum profit.

32. In MAXWEL STATIONERY SHOP, the manager gets the monthly allowances as follows.
Medical Shs 480,000 per annum
Transport Shs 50, 000
Housing Shs 10% of the gross monthly income
Marriage Shs $\frac{1}{80}$ of the gross annual income.
Lunch Shs 7,500 per week
Family allowance for four children using following system
12 years and below Shs 3000
Above 12 years but below 18 years Shs 2000

Okurut earns a gross annual income of shs 9,180,000 and his children are aged 5, 9, 15, 17 and 22. His tax structure is given below.

Taxable income (Shs)	Rate (%)
0 – 130, 000	5.0
130, 001 – 260, 000	10.0
260,001 – 360, 000	15.0
360,001 – 400, 000	20.5
Above 400, 000	30.0

TASK:
(a) Calculate Okurut's
(i) Monthly taxable income
(ii) Monthly income tax
(b)Express the net income paid as a percentage of his gross monthly income.
(Correct your answer to 1 d.p)

33. In an attempt to have some s.3 girls (suspected to be pregnant) tested for pregnancy at Sayidina Abubakar Secondary School, the school nurse decided to first measure the weight (kgs) of each suspected girl. The results for the weights were obtain and recorded as follows; 40, 42, 45,50,40,36,60,42,50,40,36,55,45,45. She is to use this data to decide whether these girls should undergo through the pregnancy test or not.
Task

a) i) Summarise for the school nurse the above information (data collected) in a frequency distribution table.
ii) According to the school nurse, if the average weight of these girls exceed 50kg, all of them are to go through the pregnancy test. Help the school nurse to decide whether to continue with this exercise (pregnancy test) or not. Give a reason.
iii) Determine the difference in weight between the heaviest girl and the lightest girl recorded by the school nurse.
iv) What weight is being shared by many girls according to your frequency distribution table.

34. Sayidina Abubakar Secondary School has just bought a new school bus a few weeks ago and the school stakeholders need to know the amount of fuel consumed by this bus per week for proper adjustment on the school budget. In an attempt to respond to this concern, the head teacher provided the committee with the information summarised in a table. Unfortunately he couldn't recall the right amount of fuel this bus consume every Wednesdays and Thursdays ; all he could remember correctly is that this bus uses the same amount of fuel on Wednesday and on Thursday and that on average, fuel consumption of this bus for the whole week is 10 litres.

Days	Mon	Tue	Wed	Thur	Fri	Sat	Sun
Fuel (litres)	10	7			8	12	15

Task

i) From the information the head teacher has given, help the secretary of this committee to determine the amount of fuel the bus consume on Wednesday and Thursday

ii) If each liter of fuel cost shs. 3500. Advice this committee on the amount to be budgeted if this bus is to run for 4 consecutive weeks without resting even a single day.

35. Your school demonstration farm holds monthly sales of cattle on the first Saturday of every month. How the farm care taker has noticed that there is a trend of the same animals remaining un sold every month because the farm attendants just select the animals which are near, and so he wants to obtain the average weight of all animals at the farm. He has agreed that this month all animals with a weight greater than the average weight of the animals be sold each at UGX 890,000 per animal. The data in kg of the weights of the animals is given in the table below.

86	85	56	59	67	62	63	50	91	62
56	27	50	54	80	61	52	52	16	28
66	46	55	58	56	77	26	40	42	51
35	45	68	51	49	40	93	84	79	63
52	53	25	93	27	71	66	52	30	12

Additionally he is going to sell 15 goats, 25 sheep and 10 ducks each at UGX140,000 per goat, UGX215,000 per sheep and UGX36,000 per duck respectively.

Task
(a) Giving a reason based on calculations, using the data collected, suggest the most minimum mass that can be accepted to be sold on this first Saturday this month.
(b) How many cattle will be sold on this first Saturday this month.
(c) Help the farm care taker know how much money he expects to get from the sales this month.

36. Malaria is a life threatening disease spread through mosquitoes that feed on humans, with symptoms such as high fevers and shaking chills. As one of the top diseases impacting Ugandans, it is at a risk to cover 90% of the Ugandan Population and is a leading cause of sickness and death especially in children. The mosquitoes breed easily in bushy areas and in stagnant water and in order to prevent it, health official have advised that we sleep under a mosquito net, slash all the bush around us and remove all stagnant water around us. In a bid to curb the disease, health officials from your district visited your village to distribute mosquito nets, however they found that some homes were harboring mosquitoes around us.

    Fifty two homes were visited in your village, it was found that only four homes had mosquito nets, had cleared all the bushes around and had no stagnant water around and thus had managed to control malaria, the other homes had problems of malaria. It was found that equal number of homes had neither mosquito nets nor had slashed their bushes, of which twelve homes had no mosquito nets and had not slashed their bushes round them, thus harboring mosquitoes. Twenty four homes all together had stagnant water available in their soak pits and open manholes, of whom eleven had neither mosquito nets nor removed the stagnant water. Thirteen homes had bushes around and also had stagnant water present in their homes. Eight homes had no single mosquito net, had huge bushes around and had stagnant water in their homes.

    Task:
    (a) Determine the number of mosquito nets to be distributed, if each home that lacked a mosquito net was to be given exactly four nets.
    (b) Calculate the probability that a home visited needed also to have their bushes slashed.
    (c) Display the data on a statistical diagram.
    (d) Advise the district officials with reason based on calculations to come up with control measures for malaria.

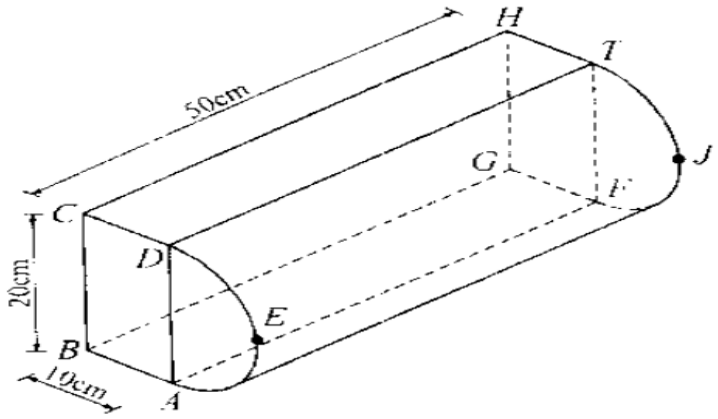
37. National Medical Stores (NMS) is a government parastatal mandated to procure, store and distribute essential medicines and medical supplies to all public health facilities in the country. It uses trucks and lorries to do the distribution. However there is concern about delay of the trucks to return to the parking lot in Wandegeya. On a particular day a lorry and a truck are sent to deliver drugs to Hoima Regional referral hospital and Kiryandongo hospital respectively. They were expected to return to the parking lot in Wandegeya which is exactly half way between Hoima and Kiryandongo. Both vehicles drive at a steady speed of 80km/hr and set off at 3:00am from the NMS offices in Entebbe.

From the point of setting off the lorry turns in the direction of 060o and drives with a steady speed reaching Hoima at 6:00am. The lorry sets off from NMS offices and moves to Kiryandongo which is 330km the offices in the direction of 200^o each spends averagely two and half hours off loading the drugs.

Task.

(a) Help the manager record the time each vehicle is expected to return to the parking lot in Wandegeya.
(b) What is shortest distance between Entebbe and Wandegeya.
(c) In your view how can the health system be improved in your area.

38. Your is starting a poultry farm after getting funds from the parish development model PDM. Your neighbor borrowed UGX48.52 millions from PDM to be returned after one and half years at a rate of 0.5% per month simple interest a so he has ordered for chicken drinkers from Biyinzika Poultry Farmers with the shape ABCD in which ABCD is a rectangle and ADE is a semi-circle of diameter AD.
BC = 20cm, AB = 10cm and CH = 50cm.



Biyinzika Poultry farmers sells the each drinker at UGX 21,500, but offers a discount of 10 percentage on the total cost for every fifty drinkers and an additional 5% on the total cost on any excess of 50 drinkers bought. Because your neighbor is buying five hundred birds, he intends to buy 80 drinkers but does not know the capacity of each drinker which will help him buy water tank to harvest the water for the business.

Task:
(a) Help your neighbor estimate how much money he will return to the PDM after the one and half years.
(b) How much will he spend on buying the drinkers.
(c) Estimate the capacity of each drinker and advise your neighbor, with reasons on the capacity of the tank to buy.

39. Henry is a farmer in Mityana district who practices both farming and rearing of animals on a large scale. Due to demand of products that come out of animals, henry puts much emphasis on rearing of birds and cows on his farm. All together there at least 200 heads of birds and cows and There are at most 240 legs of birds and cows on the farm, the number of birds on the farm are two times than cows on the farms. Henry wishes to maximizes profits by selling each bird at shs. 50,000 and each cow at shs.1.5million but doesn't know the number of birds and cows to sell to fulfill his wish.

    Task:

    (a) write mathematical statements that show the relation between the cows and birds.
    (b) Show the feasible region of the relation on the Cartesian plane.
    (c) Help your friends to determine the maximum amount of money they will possibly make from the sale of cows and goats.

40. A school headteacher 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 candidates used three books for there revision. Longhorn, Baroque or Maths Clinic. From the librarian's records its 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.

41. An organization wants to build a school in a certain community. Below were the reasons they identified as to why children were not schooling.

A = school is boring. **B** = no school fees. **C** = we want to work.

They carried out research on a sample of **50** children in that community to find out which reason has the highest probability amongst the above and hence base on that to either build the school or not. Children gave one reason, others gave two and the others gave three as shown below.

A	B,C	B	A,C	A	B,C	B	A,C	A,B,C	B
C,B	B	B,C	A,B,C	A,C	B	C	B	C	B
B	A,B,C	B,A	A	B	A	C,B	A,B	B,A	C
C	A,C	B,A	B	C,B	C	C	A	B	B,C
A,C	B	A	A	C	B,A	C	B	A	A,C

TASKS:

(a) Present the data in such a way that the total responses for each reasons A, B and C respectively are clearly shown

(b) (i) Which reason has the highest probability?

(ii) What is the probability?

(iii) Basing on the value of probability should they build the school or not? Give a reason for your answer.

42. A carpenter is re-known for crafting traditional wooden doors with elaborate geometric patterns. The carpenter wishes to make a door with a circular design at its center. The carpenter needs to ensure the design fits perfectly within the rectangular frame of the door. The door frame available is rectangular with dimensions 2.5 meters in height and 1.5 meters in width. The circular design should be touching the two parallel sides of the door frame. Vanish is packed in tins of a litre and the cost of one litre of vanish is UGX 9,000. It is known that one litre of vanish can be used to paint one square meter.

TASKS:

(a) (i)Help the carpenter determine how much of the door will be covered by the circular design so that it fits perfectly within the door frame.

(ii) Will one tin of vanish be enough for the circular design? Give a reason for your response.

(b) With a reason(s), help the carpenter determine how much will be spent to buy vanish that will paint the entire front face of the door.

43. 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 4:50pm. From your home where you started from, you ran a distance of 5km northwest to place P, then from P, you turned south and ran 4km until you were at place Q that is west of your home and then ran back and arrived at 5:12pm. Your competitor ran the same distance during training at a speed of 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?

44. St Paul's Kitovu Secondary school is to transport its S.4 students for fieldwork in Kasenyi. All the 400 students are to be transported using either coasters or buses. Each coaster can carry 40 people while each bus can carry 80 people. The transport department of the school has only 8 drivers on duty and up to four coasters. If the cost of hiring a coaster is shs. 150,000 and that of hiring a bus is shs. 300,000.

While in Kasenyi their geography teacher Mr Kefa visited Mr Sembatya's shop from which he found that three shirts and two trousers cost shs. 105,000 at Mr. Sembatya's shop. Two shirts and five trousers cost shs. 180,000 at the same shop;

Task:

a) (i) Write down the five inequalities representing the above information.

(ii) Represent the inequalities on a graph paper.

(iii) Find the possible number of coasters and buses that can be used and hence determine the minimum cost.

b) Find the cost of;

(i) each shirt and each trouser.

(ii) three items of each type at the shop.

45. Kampala (K) and Arua (A) are about 450km apart. At 7:30a.m, a bus starts from Arua and moves towards Kampala (K) at a steady speed of 100km/hr while a lorry starts from Kampala (K) an hour later moving at an average speed of 60km/hr to Arua (A). At 10.00a.m, the bus is stopped at town

C by police and ordered to reduce speed. After 30 minutes at C, it resumes its journey at a reduced average speed of 50km/hr until it reaches Kampala (K).

TASKS:

(a) State the difference in time when the two vehicles arrive at their destinations.

(b) Determine when and at what distance from Arua the two vehicles meet.

(c) Find the average speed of the bus.

46. Your parents are organizing to celebrate your 18th birthday and want it to be a memorable one. They went to Akamwesi mall which has a CINEMAX and it has two tickets.

Tickets to a play cost 9 $dollars$ for adults and 5 $dollars$ for children. If the show sold 180 tickets and earned 1380 dollars,

George your brother has been planning for this birthday for three weeks. He buys the following items in three weeks. Week one he buys 2 packets of tea , 2 tins of margarine , 3 kg of sugar and 4 packets of biscuits. Week two he buys 2 tons of margarine, 3 kg of sugar and 4 packets of biscuits . Week three he buys 2 packet of tea , 2 kg of sugar and 3 packets of biscuits. A packet of tea costs shs 1,000 , a tin of margarine costs shs 2,500, a kilogramme of sugar costs shs 3,500 and a packet of biscuits costs shs 2000. Your parents then demarcated the land they are to use for the party and plan to demarcate it. represented the plot of land he inherited using the following inequalities.

$40x + 60y \geq 480$
$30{,}000x + 45{,}000y < 600{,}000$
$x \leq 12$
$y \geq 2x$

He wants to fence it using poles(x) and barbed wire (y) and the cost function is given by $C = 45000x + 30{,}000y$

TASK;

(a) how many of each type of tickets were sold?

(b) Find his total expenditure in the three weeks.

(c) find the maximum cost.

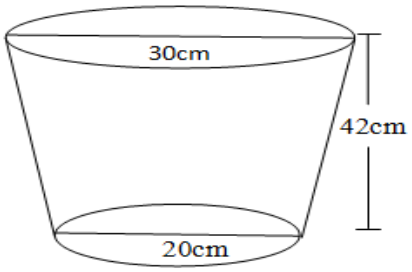
47. The length of a rectangular plot of land exceeds the width by $7ft$ and its area is 60 $sq\ ft$. Three business partners Wambusa, Aisha and Wekesa contributed Shs 300,000 , 500,000 and 700,000 respectively to start a business. They decided that $\frac{1}{3}$ of the profit was to be ploughed back to the business, $\frac{1}{5}$ of the remainder would be kept for emergencies and the rest to be shared in the ratio of their capital contributions. In that year the profit realized was one and a quarter times that of capital.

TASK:

(a) Find the dimensions of the rectangle

(b) Determine the amount received by each partner that year.

48. A bucket is in shape of a frustrum with an open end of diameter 30cm and a bottom diameter of 20cm. The bucket which is 42cm deep is used to fill an empty cylindrical tank of diameter 1.8m and Height 1.2m.



Three hundred and sixty litres of a homogeneous paint is made by mixing three paints **A**, B and C. The ratio by amount of paint A to point B is 3:2 and that of B to C is 1:2. Paint A costs shs 1800 per litre, paint B costs shs 2400 per litre and paint C shs 1,275 per litre. Taking π =3.142

TASK:

(a) (i) Determine the capacity of the bucket in litres correct to 3dp.

(ii) The capacity of the tank in litres correct to 2 dp.

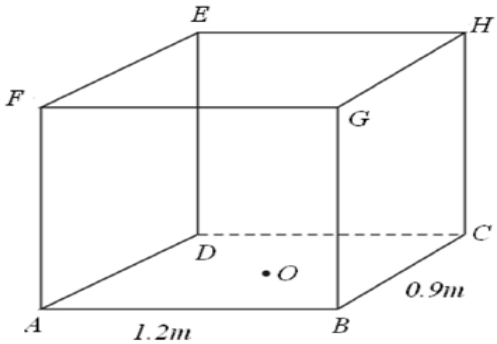
(iii) The number of bucket that must be drawn to fill the tank.

(b) (i) The amount of each paint in the mixture.

(ii) The amount of money need to make 1 litre of the mixture.

(iii) The percentage profit made by selling the mixture at shs 2,210 per litre.

49. Mr Kyeswa is buying a container to start a hardware in Kisoba Village to sell bags of cement. Each bag occupies an area of 0.8cubic meters. The container is $ABCDEFGH$ with $AB = 12m$, $BC = 9m$, $ADEF$ is a square and O is the point of intersection of $AC$and BD.



(a) Find the distances;

(i) BE,

(ii) OH.

(b) Determine the angle formed between;

(i) line BE and the base,

(ii) plane BDH and the base.

c) Calculate the number of bags that can be accommodated.

50. Mr Pamungu bought a car in January 2017 from his friend at shs. 12,500,000 and the value of the car depreciates at a rate of 10% per annum.

Recently Mr Pamungu toured Germany but got an emergency back home and left Germany for Uganda through Switzerland. While in Switzerland he bought a watch worth 54 Deutsche Marks (Germany currency) for his wife.

Mr Pamungu is a secondary school teacher as a requirement by the government pays PAYE every month according to the tax structure below.

Income (shs) per month	**Tax rate(%)**
01-50,000	5%
50,001 - 100,000	9.5%
100,001 - 180,000	15%
180,001 - 300,000	18%
300,001 - 400,000	23%
400,001 - 500,000	30%
Above 500,000	35%

Mr Pamungu earns Shs.760,000 and his allowances include

Marriage allowance	-	shs.50,000 per month
Water and electricity	-	shs.60,000 per month
Housing allowance	-	shs 150,000 per month
Medical allowance	-	shs.300,000 per annum
Transport allowance	-	shs.3,000 per day
Paying for insurance and relief	-	shs.180,000 per annum

Family allowance for only three children for children in the age bracket;

- 0 to 10 years shs 12,000 per child,
- Between 10-15 years shs. 9000 per child.
- 15 years and above shs5000.

Given that the employee has five children, two of whom are aged between 0 and 10, the other two aged between 10 and 15 while the other 18 years. (A month has 30 days)

TASKS;

(a) Calculate the value of Pamungu's car by January 2020.

b) Given that 1 Swiss Franc = 1.28 Deutsche Marks,1 Swiss Franc = 1,350 Ugandan Shillings; find the value of the watch in;

(i)Swiss Francs

(ii)Ugandan Shillings.

(b) Determine the Mr Pamungu's 's net-income

(c) Determine the percentage of his gross income that goes to tax.

51. Mr. Ediangu is a government official working with Uganda Police. His gross monthly salary is shs 900,000, which includes the following allowances; water and electricity shs 20,000; relief and insurance shs 30,000; housing allowance shs. 50,000; medical allowance shs 25,000; transport allowance shs 28,000; marriage allowance shs 20,000 and family allowance shs 47,000.

The taxation body in Uganda has its income tax structure is shown in the following table:

TAXABLE INCOME PER MONTH IN SHILLINGS	TAX RATE (%)
0 - 50,000	10.0
50,0000 - 110,000	20.0
110,000 - 200,000	24.5
200,000 - 350,000	35.0
350,000 - 600,000	40.0
Above 600,000	49.0

TASK:

As a student who has studied Business Mathematics, help Mr Ediangu to determine his net pay in dollars if the exchange rate is 1dollar = Ugx. 3,840.

52. Arch-Bishop SS is to transport its S. 4 students for fieldwork in Kasenyi. All the 400 students are to be transported using either coasters or buses. Each coaster can carry 40 people while each bus can carry 80 people. The transport department of the school has only 8 drivers on duty and up to four coasters. If the cost of hiring a coaster is shs. 150,000 and that of hiring a bus is shs. 300,000.

While in Kasenyi their geography teacher Mr Kefa visited Mr Sembatya's shop from which he found that three shirts and two trousers cost shs. 105,000 at Mr. Sembatya's shop. Two shirts and five trousers cost shs. 180,000 at the same shop;

Task:

a) (i) Write down the five inequalities representing the above information.

(ii)Represent the inequalities on a graph paper.

(iii) Find the possible number of coasters and buses that can be used and hence determine the minimum cost.

b) Find the cost of;

I. each shirt and each trouser.

II. three items of each type at the shop.

53. Kampala (K) and Arua (A) are about 450km apart. At 7:30 a.m, a bus starts from Arua and moves towards Kampala (K) at a steady speed of 100km/hr while a lorry starts from Kampala (K) an hour later moving at an average speed of 60km/hr to Arua (A). At 10.00 a.m, the bus is stopped at town C by police and ordered to reduce speed. After 30 minutes at C, it resumes its journey at a reduced average speed of 50km/hr until it reaches Kampala (K).

TASKS:

a) State the difference in time when the two vehicles arrive at their destinations.

b) Determine when and at what distance from Arua the two vehicles meet.

c) Find the average speed of the bus.

54. Two carpenters, Tom and Alex, receive an order to build two wooden crates of different sizes. The specifications require that one crate must have 2 more wooden boards than the other, and furthermore, the sum of the squares of the number of wooden boards in each crate is 52.

The two carpenters are also working on a rectangular soft board for home designs: the original rectangular soft board had a perimeter of 36 meters but they had to make some adjustments to the board to meet their customer's specifications. They took two meters off its length and added three meters to its breadth. By so doing, the area increases by 20 square meters.

Tom, one of the carpenters is 1.5m tall and stood on top of a building 34m tall to have a view of his town after a long day's work. In a straight line from where he is standing he saw a beggar seated on the entrance of a barbershop and also saw also a road safety sign which had fallen on the ground at angles of depressions of 50^{o} and 65^{o} respectively.

TASKS:

a) What is the number of wooden boards required for each crate?

b) What were the original dimensions of rectangular softboard before some adjustments were made?

c) How far is the beggar seated from were the road safety sign fallen?

55. Your parents are organizing to celebrate your 18^{th} birthday and want ot to be a memorable one. They went to Akamwesi mall which has a CINEMAX and it has two tickets.

Tickets to a play cost 9 dollars for adults and 5 dollars for children. If the show sold 180 tickets and earned 1380 dollars,

George your brother has been planning for this birthday for three weeks. He buys the following items in three weeks.

Week one:

He buys 2 packets of tea , 2 tins of margarine , 3 kg of sugar and 4 packets of biscuits.

Week two:

He buys 2 tons of margarine, 3 kg of sugar and 4 packets of biscuits . Week three he buys 2 packet of tea , 2 kg of sugar and 3 packets of biscuits.

A packet of tea costs shs 1,000 , a tin of margarine costs shs 2,500, a kilogramme of sugar costs shs 3,500 and a packet of biscuits costs shs 2000.

Your parents then demarcated the land they are to use for the party and plan to demarcate it. represented the plot of land he inherited using the following inequalities.

$$40x + 60y \geq 480$$
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$$x \leq 12$$
$$y \geq 2x$$

He wants to fence it using poles(x) and barbed wire (y) and the cost function is given by $C = 45000x + 30{,}000y$

TASK;

I. how many of each type of tickets were sold?
II. Find his total expenditure in the three weeks.
III. find the maximum cost.

56. Henry is a farmer in Mityana district who practices both farming and rearing of animals on a large scale. Due to demand of products that come out of animals, henry puts much emphasis on rearing of birds and cows on his farm. All together there at least 200 heads of birds and cows and There are at most 240 legs of birds and cows on the farm, the number of birds on the farm are two times than cows on the farms. Henry wishes to maximizes profits by selling each bird at shs. 50,000 and each cow at shs.1.5million but doesn't know the number of birds and cows to sell to fulfil his wish.

TASK:

(a) write mathematical statements that show the relation between the cows and birds.
(b) Show the feasible region of the relation on the Cartesian plane.
(c) Help your friends to determine the maximum amount of money they will possibly make from the sale of cows and goats.

57. Due to Poor performance in Mathematics that was observed among learners. The school administration through academic board came up with strategies to improve on the learner's performance. Some of the strategies are that a prize is given to learners scoring above 70% and a remedial exam be given to learners scoring at most 50%. A Mathematics examination was given to S.3 learners and marks were obtained as below;

38	74	28	32	10	31	49	34	50
30	56	50	42	38	64	24	64	09
18	35	12	52	41	27	08	48	22
42	43	52	59	72	70	15	79	29

TASKS:

Using a classes with equal class width of 10 marks and starting with a class having the lowest class mark of 1;

a) Help the administration to find;

i) The number of learners to be awarded prizes.

ii) The number of learners to be give remedial examination.

b) What is the average performance of the class?

58. John moves to his village. From home, he travels 25km on bearing of 250° to trading centre, from there, he changes course and heads N30°W and moves 55km up to the village. In the village, He wishes to construct a country home, to fund this project, he is to take a loan from the bank worth 25 million at an interest rate of 5% compounded yearly for a period of 10 years.

He earns agross income of UGX 943,500, and entitled to the following allowances as well.

Housing and transport, 10% of his gross income

Insurance premium of UGX 36500

Marriage and child allowance of UGX 126,500

Medical care of UGX 92,400.

He is also subjected to the following tax rates

Taxable income (UGX)	Tax rates (%)
1 - 90,000	6
90,001 - 200,000	14
200,001 - 320,000	20
320,001 - 440,000	30
440,001 - 520,000	42
520,001 and above	47

TASK

(a) (i) If he used the direct route from his home to the village, and for each kilometer he travels, his car consumes 0.5 liters of petrol, how many liters would his car consume?

(ii) How much would he save in this case?

(b)(i) How much money will he pay back in the bank every month.

(ii) If the bank is to give him the loan on condition that the money he is to pay back every month is not more than 50% of his net income, will he get the loan or not? Justify.

59. The government of Uganda through Mulago hospital carried out free medical checkup for its state ministers in order to enable them attend the Allied Membership meeting (NAM) which took place in Uganda at the start of the year 2024. However, each Minister was weighed and the masses of those who attended the medical health function were recorded as follows.

64	58	52	73	62	50	60	64
49	47	58	45	58	74	66	73
48	46	55	52	51	69	59	44
60	42	48	54	73	61	58	50
41	53	54	46	43	61	67	70

TASK

a) Form a frequency distribution table using classes of size 5 and starting with class of 40-44

b) Giving a reason, based on the statistics calculation. What do you think was the average weight and most appearing weight.

c) Assuming you're the medical doctor who carried out the test, represent the information on a statistical graph to obtain the modal weight.

60. Your uncle owns a small bakery and plans to bake two types of loaves of bread: whole wheat bread and white bread. Due to the bakery's oven capacity, your uncle can bake atmost 15 loaves of bread in a day. He wants to bake atleast 3 loaves of whole wheat bread.
Additionally, he wants to bake more whole wheat bread than white bread because it is more popular among his customers. The selling prices are as follows:

Whole wheat bread is sold at Shs 6500 per loaf.

White bread is sold at Shs 5000 per loaf.

To cover his costs and make a profit, your uncle needs to earn more than Shs 30,000 from the sales each day.

TASK:

(a) Write mathematical statements that show the relation between the whole wheat bread and white bread.

(b) Show the feasible region of the relation on the Cartesian plane.

(c) How many loaves of each type should your uncle bake in order to make the maximum profit?

(d) What is the minimum number of loaves he can bake and still make a profit?

61. A manufacturer operates a production facility with 30 worker units (both male and female, considered equally efficient) and 17 units of capital. Two products, A and B, are produced using these resources. The production requirements and prices are:

    - Product A: 2 worker units, 3 capital units, priced at UGX 100,000 per product.
    - Product B: 3 worker units, 1 capital unit, priced at UGX 120,000 per product.

    TASK:
    (a) Formulate mathematical constraints representing the relationships between the units of goods A and B produced.
    (b) Graph the feasible region of the constraints on a Cartesian plane.
    (c) Determine the optimal production levels to maximize total revenue.
    (d) Do you agree with this view of the manufacturer that men and women workers are equally efficient and so should be paid at the same rate?

62. A shipping company needs to transport a large batch of rectangular boxes, each with a length of 8 meters, a width of 6 meters, and a height of 4 meters. To optimize storage space in the cargo hold, the company plans to cut off a triangular prism-shaped section from each box, with a cross-section that is an isosceles triangle with base 6 meters and height 4 meters.

    Tasks:
    (a) Find the storage space needed for each box if they are not to be cut into triangular prisms. .
    (b) Sketch the unfolded shape (net) of the cross-section of both the rectangular boxes and the triangular prism-shaped section cut from the rectangular boxes.
    (c) Determine the surface area of a single triangular prism that will be transported.
    (d) Calculate the total storage space saved by cutting the rectangular boxes into triangular prism shaped section boxes if 100 rectangular boxes were transported.

63. A photographer uses image processing software to correct distortions in a photograph. The software uses matrix transformations to apply corrections. The photographer wants to:

    i) Rotate the image by a positive quarter turn about the origin.
    ii) Scale the image by 2 times under the enlargement centre O(0,0).
    iii) Reflect the image across the y-axis to flip the mirror image.
    The image can be represented by a 2x2 matrix given as $\begin{pmatrix} 2 & 4 \\ 3 & 4 \end{pmatrix}$ where each column represents a pixel coordinate.

    TASKS:
    (a) Write the matrix representation of each transformation.
    (b) Multiply the matrices to find the composite transformation matrix.

(c) Apply the composite transformation matrix to the image matrix to correct the distortions.
(d) Find a single matrix that can undo all the transformations to obtain the original distorted image before corrections.

64. A landscape architect designs a circular walking path around a fountain. The path has a diameter of 20 meters, and the fountain is 6 meters tall. Two benches, A and B, are placed on the path, forming a central angle of 60°. A third bench, C, is placed on the path, equidistant from benches A and B.

TASKS:
(a) Find the portion of length of the circular path from bench A to bench B.
(b) Find the inclination between the positions of bench A, B and C.
(c) If a person 1.8 m tall stands at bench C which is 0.3 m tall and looks towards the fountain, find the angle of elevation to the top of the fountain.

65. A cooperative society of farmers has 50 hectares of land to grow two crops A and B. The profits from crops A and B per hectare are estimated as Shs 10,500,000 and Shs 9,000,000 respectively. To contol weeds, a liquid herbicide has to be used for crops A and B at the rate of 20 litres and 10 litres per hectare, respectively. Further not more than 800 litres of herbicide should be used in order to protect fish and wildlife using a pond which collects drainage from this land. Keeping in mind that the protection of fish and other wildlife is more important than earning profit respectively.

TASK:
(a) Write mathematical statements that show the relation between the hectare of land to be allocated to crop A and B respectively.
(b) Show the feasible region of the relation on the Cartesian plane.
(c) How much land should be allocated to each crop so as to maximize the total profit?
(d) Do you agree with the message that the protection of wildlife is utmost necessary to preserve the balance in environmnent?

66. A certain company in Kampala is analyzing the optimal departure time for its 40 employees to ensure they reach home by 6:00 PM, minimizing their commute time and avoiding peak traffic congestion. The company conducts a survey to track the times employees typically arrive home after work, measured in minutes past 5:00 PM.

15	20	25	30	35	40	45	50	55	60
65	70	75	20	25	30	35	40	45	50
55	60	65	70	75	80	25	30	35	40
45	50	55	60	65	70	75	80	30	35

TASK

(a) Based on calculations using the collected data, suggest an optimal departure time for employees to begin their commute home.
(b) Following advice to allow employees to leave work when at least 50% of them have already arrived home, determine the optimal departure time.
(c) As the company management, which of the two suggested departure times from (a) and (b) would you choose to ensure employees reach home by 7:00 PM, and why?

67. A layer chicken farmer decided to weigh a sample of 800 eggs on his farm and classify them according to their mass (m grams) to optimize the packing process. The frequency distribution of the egg masses is as follows:

Mass in grams	Number of eggs
$40-44$	36
$45-49$	142
$50-54$	286
$55-59$	238
$60-64$	76
$65-69$	22

The farmer's plan is to pack eggs in given weights.

TASK:
(a) Determine the median mass of an egg from the given frequency distribution to understand the central tendency of the egg weights.
(b) What would be the percentage of eggs which would be classified as large(over 62 grams)
(c) The farmer plans to pack eggs that weigh over 62 grams, with each pack containing 12 eggs. If each pack costs UGX 12,000, calculate the total revenue the farmer will earn from selling all the large eggs and compare the revenue earned from selling the same eggs to a middle man who he is buying at UGX 9000. What ad vice will you offer to the farmer.

68. In preparation for the upcoming national voter registration drive in Uganda, the Electoral Commission needs to determine the optimal opening time for registration centers across various districts. This decision aims to facilitate maximum voter registration and ensure efficient processing of the data of the citizens eager to participate in the upcoming elections.
Here are the arrival times of citizens at a sample voter registration center in minutes past the scheduled opening time (8:00 AM):

11	66	21	88	33	67	41	45	47	41
27	62	32	43	31	34	66	20	21	36
26	75	80	45	12	44	58	48	42	38
56	63	68	24	21	65	68	63	72	38

TASK
(a) Based on calculations using the collected data, suggest an opening time for voter registration centers.

(b) Following advice to open registration centers when at least 50% of expected citizens have arrived, determine the opening time.
(c) As the Electoral Commission of Uganda, which of the two suggested opening times from (a) and (b) would you choose, and why?

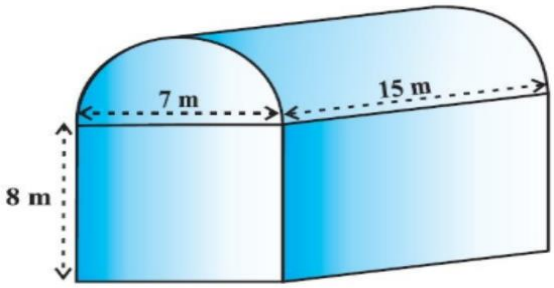
69. Your relative, is planning to start a small bakery business and seeks your advice on financial matters related to her venture. She plans to invest a total of $10,000 into the business and wants to understand the financial implications of different financing options. She has approached two money lenders and she is asking for your input before she takes on the decision.

    Lender 1: Your relative, wants to borrow UGX 50,000,000 from a local bank to purchase baking equipment. The bank offers her two different repayment plans:
    Option 1: Simple Interest - The loan is offered at an annual interest rate of 20% and to be paid after 2 years.
    Option 2: Compound Interest - The loan is offered at an annual interest rate of 4% and is to be paid after 2 years.

    Lender 2: Your relative is considering a hire purchase agreement with a bakery equipment supplier. The total cost of the equipment is $5, 000, and the hire purchase agreement specifies a down payment of $1,000 followed by monthly payments of $400 for 24 months. The supplier will consider a constant dollar rate at 1$ = UGX3, 800

    TASK
    (a) Calculate the total repayment amount for each financial option over the loan term and compare them to determine which option would be more cost-effective for your relative bakery business.
    (b) Analyze the monthly cash flow implications for your relative under each financing option, considering her ability to manage operational expenses alongside loan repayments.
    (c) Based on your calculations and analysis in (a) and (b), provide your relative, with a recommendation on which financial option would be optimal for her bakery business, taking into account both total repayment amount and monthly cash flow considerations.

70. Your neighbor runs an industry in a shed that is in the shape of a cuboid surmounted by a halfcylinder (placed on top). The dimensions of the cuboid base are 15 m by 7 m, and the height is 8 m.



TASK:

Your neighbor wants to install air conditioning units in the shed. The installation company offers two types of units: Type X and Type Y. Each Type X unit costs $2,500 and each Type Y unit costs $3,200. The Type X unit covers $100m^3$ of air, while the Type Y unit covers $150m^3$ of air. For bulk purchases, the company offers a 5% discount on the total cost for every 10 Type X units purchased and a 79% discount on the total cost for every8 Type Y units purchased. The neighbor plans to buy enough cover the entire volume of the shed. He intends to borrow money from a bank to buy the air conditioning units but is unsure of the amount needed.

(a) Find the volume of the air that the shed can hold.

(b) If the industry requires machinery which would occupy a total space of $300m^3$ and there are 20 workers each of whom would occupy 0.08 space on an average, how much air would be in the shed when it is working?

(c) Calculate the number of air conditioning units required for both Type X and Type Y units based on the usable air volume.

(d) Estimate the total cost and the amount of money your neighbor needs to borrow for purchasing the required air conditioning units for both Type X and Type Y.

(e) Advise your neighbor, with reasons, on the type of air conditioning units to buy.

71…….

72…….

73…….

456/1
Mathematics
Paper 1
July/August 2024
2¼ hours

BUGANDA EXAMINATIONS COUNCIL MOCKS

Uganda Certificate of Education

MATHEMATICS

PAPER 1

2HOURS 15 MINUTES

INSTRUCTIONS TO CANDIDATES

- This paper consists 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 booklet(s) provided
- Graph paper is provided
- Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used

Turn over

SECTION A

Answer **all** items in this section

Kasawuli a farmer in Bulamogi Sub County wishes to sale his goats; to get his farm, the buyer walked 5km west from his home to Kaliro town, then 12km South to Kasawuli's home, however, Kasawuli realized there was a direct route from the buyers' home to his home he could have used.

After the sales, Kasawuli wishes to starta hardware in the town that is valued AT UGX 12.5 million. He has received 45% of the required amount from the sale of his goats and wants to top up the balance. He has approached two money lenders Juma and Saidi who lend money according to the following conditions.

JUMA	SAIDI
He lends at a simple interest rate of 8% per annum payable in 24 equal monthly installments	He lends at a compound interest rate of 8% per annum payable in 24 equal monthly installments.

Mr. Kasawuli wants to decide on which of the two money lenders to opt for.

Tasks

(a) How far is Kasawuli's home from the buyers if he travelled directly?
(b) Help Mr. Kasawuli find how much money he intends to borrow
(c) Which of the two money lenders would you recommend Mr. Kasawuli to opt for
(d) Having selected for Mr. Kasawuli the right money lender how much does he pay per installment?

Item 2

Mrs. Mukasa is going to bake chocolate cakes and yellow cakes for sale. She wants to bake at least **2** chocolate cakes. She also wants to bake more yellow cakes than chocolate cakes. Due to limited time and facilities she cannot bake more than **10** cakes.

The chocolate cakes are to be sold at **shs. 1500** and the yellow cakes are to be sold at **shs. 1000**. To make a profit, more than **shs. 8000** must be realized from the sales.

Tasks

(i) How many cakes of each type should Mrs. Mukasa bake in order to make maximum profit?
(ii) What is the minimum number of cakes she can bake and still make a profit?

SECTION B

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

Answer ***one*** item from this part

Part I

Item 3

The school principal holds staff briefing which lasts 20 minutes every Friday starting at 7.20 a.m. However, teachers asked the principal to adjust on the time of the briefings since the lessons start at 8.40 a.m after the briefing, he asked for the arrival book at the school gate to make a decision about the start time.

The following data was collected in minutes

15	18	33	48	35	47	53	21	51	46	38	30
30	20	35	29	40	30	35	28	26	59	44	36
28	22	32	31	42	32	51	31	41	28	58	27
46	17	36	26	37	31	50	43	34	32	23	57
52	25	39	27	39	45	56	49	29	33	42	

Tasks:

(a) With reasons, basing on calculations, using the collected data, suggest the suitable time the briefing should start.

(b) The dean of students advised the headteacher to start the briefing at least when 80% of the teachers are present; basing on the advice determine the time the briefing should start

(c) If you the Principal, which of the two suggested briefing time would you consider and why?

Item 4

The District Education Officer (DEO) in Yumbe district visited one school in his area to establish reasons as to why the performance of students was not good and in his survey, he sampled 160 students from the school, of which 75 have pencils, 87 have books and 93 have rulers, 25 had both pencils and books, 30 have both pencils and rulers while 47 have both books and rulers. Every student had at least one of the items.

Tasks:

(a) (i) As a student of Mathematics, illustrate the information on a diagram.

(ii) Find the number of students who had all the three items.

(b) (i) How many students have only pencils?

(ii) The proportional of students with only one item.

Part II

*Answer **one** item from this part*

Item 5

There is a quarantine of all cattle and goats in some parts of Western Uganda especially Mbarara District. The area honorable Member of Parliament (MP) 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 to the quarantine he cannot buy any animals from Mbarara and he has advised to go to Kayunga where cheap cattle and good yoghurt can be found. He moves west wards **150**km to Kampala. From Kampala he heads to Mukono which is in the direction **S750W** which is **90**km from Kampala. From Kampala he heads to Kayunga which is **148**km and South of Mukono.

When he heads to Kayjgna he bought **400** cows and each costs **UGX 850,000** 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**.

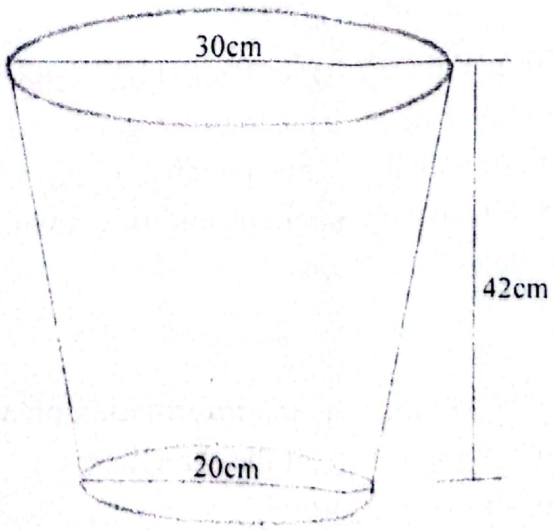
Tasks

a) Direct the honourable 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

Item 6

A bucket is in shape of a frustum with an open end of diameter **30**cm and a bottom diameter of 20cm. the bucket which is **42**cm deep is used to fill an empty cylindrical tank of diameter **1.8**m and height **1.2m**.



Three hundred and sixty litres of a homogenous paint is used by mixing three paints A, B and C, the ratio by amount of point A to point B is **3:2** and that of **B** to **C** is **1:2**. Paint **A** costs shs. **1800** per litrepait B costs shs. **2400** per litre and paint Cshs.**1,275** per litre.

Tasks:

(a)(i) Determine the capacity of the bucket in litres correct to 3dp.

(ii) The capacity of the tank in litres correct to 2dp.

(iii) The number of bucket that must be drawn to fill the tank

(b)(i) The amount of each paint in the mixture

(ii) The amount of money need to make 1 litre of the mixture

(iii) The percentage profit made by selling the mixture at shs. 2,210 perlitre.

END

456/1

MATHEMATICS

Paper 1

Jun/Jul. 2024

2 ¼ hours

DIOCESE OF KIGEZI

CHURCH OF UGANDA

Uganda Certificate of Education

MATHEMATICS (456/1)

TIME: 2hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists 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 booklet(s) provided.*

Graph Paper is provided.

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

SECTION A

All questions are compulsory

Item one:

John plans to visit the shop that is **12km** south of his home and then the boutique that is **5km** east of the shop and after drive back home using a direct route from the boutique to home. He is to use his motorcycle that consumes **0.035liters** of fuel per km and he wants to know how much fuel he will need for the whole journey.

He has seven hundred fifty thousand Uganda shilling. He plans to use part in the shop and part in the boutique in the ratio of **3:2** respectively. He wants to spend **UGX.210,000** to buy shirts and **UGX.120,000** to buy trousers. However, he is not sure if his budget for the boutique will be enough.

From the shop, he is to buy **24** packets of cooking oil, **12** packets of sugar and **30** packets of salt. All of these are to be used to make packages for some of his family members in the village. He wants each package to have an equal number of items in it. He needs to know the highest numbers of packages he can make from them.

Task:

a) How much fuel will he need for the whole journey?

b) Will the money he plans to use in the boutique be enough for what he plans to buy? Justify your answer.

c) How many packages will he make from the items he plans to buy?

Item two:

A certain catering and decoration company was called to cook **100kg** of rice at a certain party. According to their cooking notes, they put **22.5 liters** of water in **10kg** of rice and **67.5 liters** 0f water in **30kg** of rice. They want to use those notes to know how many liters to use in the rice they are ordered to cook but they are finding it hard.

The customer wants a tent at less than **UGX.250,000** and chairs at**UGX.200,000** at most. However, to maximize profit, the company wishes to provide both at **UGX.400,000** at least. The company is finding it hard to decide on how much to charge the customer for the two items respectively.

Task:

a) (i) Form a mathematical relationship between the quantity of rice and liters of water used to cook it according to their notes.

(ii) Use the relationship developed to help them determine the liters they will use in the rice they are ordered to cook.

b) (i) Form inequalities that are making it hard for the company to decide on how much to charge the tents and chairs respectively.

(ii) Use the inequalities, to help them decide on how much to charge for the tents and chairs respectively.

SECTION B

PART ONE (Attempt one item from this part)

Item three:

Your friend wants to sell dresses in your home area according to age. She requests you to recommend the dresses of a specific age he can display for most.

You gathered and summarized data to use it and find out the age of the majority of people in the community such that you recommend that. Below is the summery of your data:

Age groups (years)	30 – 34	35 –39	40 – 44	45 – 49	50 – 54	55 – 59
Number of people.	6	3	13	7	4	3

Task:

a) (i) What age is the majority of the people in the community?
(ii) What is the probability that your friend will succeed if he sews the dresses of that specific age?
(iii) According to the probability, is your recommendation a good choice? (Justify your answer).

Item four:

For your leaver's party campaign, members suggested that you buy and put on T-shirts as a class. You have three suggestions of sizes of T-shirts you can buy these are; Small size(S), Medium size (M) and Large size (L) T-shirts.

You will only buy the suggestion as the captain if **70%** of your fellow students can fit in at least two sizes. Below are your findings that you are going to base on to make a decision:

- The number of students who fit in medium size is equal to those who fit in large size and they are **100**.
- The number of students who fit in small size is **76**.
- Those who fit in small size and large size are **50**.
- Those who fit in medium size and large size are **70**.
- Those who fit in small size and medium size are **60**.
- Those who fit in none of the sizes are **4**.
- Some students fit in all the three sizes.
- The class is made up of **140** students.

Task:

a) Will you buy the suggestion of buying and putting on T-shirts as a class for your leaver's party campaign? Justify your answer.

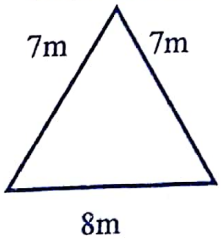
PART TWO

Attempt **one** item from this part

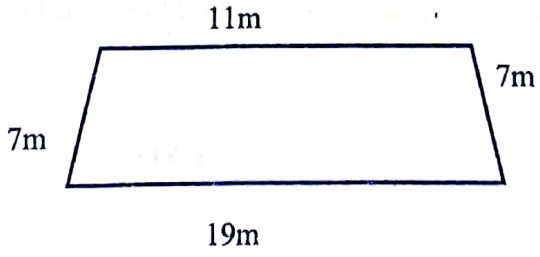
Item five:

A friend was given sketches below of the rooftop he plans to put on his house;

TWO SIDES



TWO SIDES



The builder recommended iron sheets of **3ft** by **4ft**that cost **UGX.40,000**per sheet. Your friend needs to know how many iron sheets to buy and how much it will cost him. He requested for your help as a mathematics student.**(1ft = 0.3)**

He also plans to get a loan of **UGX. 4,000,000** that he plans to pay back in**3 years** to finance his other projects. One bank offers the loan at a simple interest rate of **10%** and the others offers the same loanat a compound interest rate of **5%**. He is finding it hard to decide which bank to get a loan from.

Task:

a) How many iron sheets will he need to buy and how much will he need to buy them?
b) Which bank do you recommend him to get a loan from and why?

Item six:

Mary usually sets off from a landing site that is located on coordinate $O(-9, 7)$ on her grid map to island Awhich is located at coordinate $A(-6,3)$ on her grid map during her day off. Island A is south east of landing site O. This time she plans to extend her tour from island $A$to another island B that is **9km** north east of island A and then sail back to the landing site through the direct route.

She plans to tour around island A for **3hours** and around island $B$for **4 hours**. Her journey is to start at 10:00am. She hopes to be back by 20:00hours since she has work the following day. She wants to know if it's possible to return by that time but she does not know the time the ship will take to sail the whole journey. The boat is usually ridden at an average speed of **64km/hr**.

She is in charge of paying her fellow workers. Some workers were given a salary increment to **UGX.650,000**. This includes allowances of **UGX.120,000**. She needs to know how much income tax she is to deduct from them and the net amount she is to pay them using the tax bands below:

TAXABLE INCOME (UGX)	TAX RATES (%)
0 – 200, 000	0
200, 001 – 400, 000	10
400, 001 – 600, 000	15

Task:

a) (i) What is the total distance they are to sail?
(ii) What is the total time the entire tour will take inclusive of the time the boat will take to sail the whole journey?

(iii) Will she make it back at the planned time? (Justify your answer)
b) How much will she pay her fellow workers?

END

456/1
MATHEMATICS
PRE-MOCK
JUNE/JULY 2024

$2\frac{1}{4}$ ***HOURS***

JOURNEY OF SUCCESS EXAMINATIONS BOARD

UGANDA LOWER SECONDARY SCHOOL CERTIFICATE OF EDUCATION

PRE-MOCK ASSESSMENTS

MATHEMATICS

DURATION: 2 HOURS : 15 MINUTES

INSTRUCTIONS TO CANDIDATES.

- *This paper consists of section **A** and section **B**.Attempt any **four items** from all.*
- *Section **A** has two compulsory examination items.*
- *Section **B** has two parts; part **I** and part **II**. Choose one question from each part of section **B***
- *Start every question from a flesh sheet of paper. Relevant illustrations may be used.*
- *Use only blue/ black ink-pen for writing.*
- *silent non programmable scientific calculators may be used.*

SECTION A (COMPULSORY)

ITEM 1

Mzee kayega sent his two daughters (AISHA and PEACE) for their school shopping. Aisha was given shs68,000 and Peace was given shs26,000. While in the shopping, Aisha used half of her money and she was given 4 pens and 12 books and kept the rest for up keep. Peace used all her money and she was given 6 pens and 8 books. After reaching school, peace was told to add more two books and more 2 pens yet she had no money. ***She asked her sister Aisha to help her***.

TASK

a) Help peace to determine the total amount of money that she now needs. **(08 scores)**

b) If Aisha gives peace all the money in (a) above, how much will she remain with? **(06 scores)**

c) Using her balance, how much can Aisha now spend on every day if a term has 7 weeks and 5 days remaining to the end?, **(06 scores)**

ITEM 2

ERIC wanted to start a farm in Nyenga town but he had to seek for permission from the town clerk. Since Nyenga is a town, ERIC was supposed to fence his land before the farm can be allowed to start. He was given a document showing the restrictions and the demarcations that he must follow. These included;

- $y-2x < 8$,
- $5y - 2x < 32$,
- $y > 2$
- and $x < 4$

In these conditions, he was told that **x** represents the number of cattle and **y** represents the number of goats he can have on the farm. Every cattle is bought at 1.5million but sold at 1.8millions and every goat is bought at shs250,000 but sold at shs300,000.

He has failed to interpret the conditions and he now needs your help.

Task

a) Make a suitable illustration that can be used to interpret this situation of restrictions and demarcations. **(10 scores)**

b) Help ERIC to determine the possible number of animals of each type that he can have on the farm. **(04 scores)**

c) What is the maximum capital he needs to buy all the required animals and the amount he can earn? **(06 scores)**

SECTION B
PART I
Answer only one (1) item

ITEM 3

Kajimu a boda boda man started his journey from **Iganga** at 7:00am cycling towards **kamuli** via **kaliro**. While on his journey, he was knocked down by an unkown vehicle in **kaliro** (*40km away from Iganga*) at exactly 11:00am . The police arrived but they realised that the vehicle that caused the accident just continued driving towards **kamuli**(*120km away from Iganga*).

The police has caught two suspected vehicles and these include;

* A bus that started at 8:30am from **iganga** and reached **kamuli** 04:00pm using a constant speed.

* A tax that started at 7:30am from **iganga** and also reached **kamuli** at 04:00pm using a constant speed.

The police is stranded and needs your help such that they can help the sick kajimu.

Task

a) Help the police and draw a suitable illustration showing all the movements of the three vehicle involved. **(10 scores)**

b) Use your illustration to guide the police in determining the vehicle that knocked kajimu. **(04 scores)**

c) Make evidence about the speeds that all these vehicles were using before the accident. **(06 scores)**

ITEM 4

KAJUBI who is a shop attendant in MANDE's shop was told to make the shopping weekly in oder to keep the business records. Kajubi bought and sold items in **june** as follows;

Week 1: 5 sucks of sugar, 4 boxes of soap and 3 crates of soda.

Week 2: 2 boxes of soap, 4 sucks of sugar.

Week 3: 3 sucks of sugar and 4 crates of soda.

Week 4: 1 suck of sugar, 5 boxes of soap and 2 crates of soda.

Every suck of sugar was bought at shs180,000 but sold at shs200,000 , a box of soap has 24 bars and each bar is bought at shs3,000 but sold at shs3,500 while each crate of soda is bought at shs18,000 but sold at shs22,000.

Kajubi is supposed to make a clear record of his WEEKLY stock, expenditure, income and profits for accountability. He lacks the best knowledge and a mathematical technique to do all the above. He can only keep the job if he makes a profit.

TASK

a) Help kajubi to make all the above weekly records for the month of June. **(04 scores)**

b) What was the total stock in June? **(04 scores)**

c) Help kajubi to determine his overall financial performance in buying and selling to keep the job **(12 scores)**

PART II

Choose only one (1) item.

ITEM 5

James is a married man with a big family but he wishes to educate all of them very well. His older sons (Michael aged 18 years and Tom aged 21 years) are going to the university for further studies. Each of them is required to have a laptop and he has found the shop selling them at a cash price of 1.5M each. He has agreed with the shop keeper to give him a discount of 5% on each laptop before he pays an initial deposit and followed by installments of shs90, 000 per month for two years since he cannot pay in cash. Due to lack of money, he got a loan of sh2500, 000 from a bank at a simple interest rate of 5% per annum. He is to use
40% of the loan as the deposit for the two laptops and the rest as university fees

James must handle this situation with his monthly pay of shs750, 000 including a monthly allowance of shs100,000 yet he is also taxed as follows

EARNING	TAX RATE
<100,000	0
-< 200,000	10%
-<300,000	15%
-<400,000	20%
-<500,000	30%
-<600,000	40%
600,001 +	45%

James is stranded and he needs your help on the following;

a) How much will he buy the laptops at the end of the two years? **(04 scores)**

b) The amount for the loan that he must pay **(04 scores)**

c) His net SALARY per month? (04 **scores)**

e) The money he can pay per month to complete the loan that he got (04 **scores)**

f) After paying all his monthly charges above, how much can he save per month? (04 **scores)**

ITEM 6

Mzee Nsubuga's home is located near four major towns,

Town **A** is directly 5km to the south *(down wards)*,

Town **B** is 4km to the east (right) but 6km northwards *(up),*

Town **C** is 4km to the west *(left*) but 2 km to the south *(downwards*),

Town **D** is 4km to the west *(left)* but 12 km north wards *(up).*

There is a road connecting **A** to **C** and a road from **B** to **D**

Jane left Mzee Nsubuga's home and went to town **A** while john left Mzee Nsubuga's home to go to town **B**.

Jane then moved straight to town **C** while John then moved straight to town **D** with an intention to meet somewhere. They are not sure whether it will be possible for them to meet

Task

a) Find out whether these two straight roads can enable them to meet any where?

(06 scores)

b) What is the total distance that;

i) Jane moved to reach town **C** **(03 scores)**
ii) John moved to reach town **D** **(03 scores)**

c) Who will spend more if Jane uses shs2500 for every km and john uses shs3000 for every km moved? **(04 scores)**

d) Determine the shortest distance that John can move to meet Jane at town **C** from

(04 scores)

END

Item	Element of Construct	Topics
Item one	Numbers	1. Number bases 2. Working with Integers 3. Rectangular Cartesian Coordinates in 2-Di-mensions 4. Fractions,percentages and decimals 5. Numerical concepts 1 and 2 (a) Indices (b) Surds 6. Ratios and Proportions
Item two	Patterns and Algebra	1. Sequence and patterns 2. Equation of lines and curves 3. Algebra 1 and 2 4. Mappings and relations 5. Vectors and translation 6. Inequalities and regions 7. Equation of a straight line 8. Simultaneous equations 9. Quadratic equations 10. Composite functions 11. Equations and inequalities 12. Linear programming 13. Loci
Item three and four	Data and Probability	1. Data collection/display and presentation 2. Graphs 3. Set theory 4. Matrices 5. Probability
Item ve and six	Geometry and Measures	1. Geometric Constructions Skills 2. Bearings 3. General and angle properties of geometric gures 4. Re ection 5. Business mathematics 6. Time and time tables 7. Similarities and enlargement 8. Circles 9. Rotation 10. Length and area properties of two-dimensional geometrical gures. 11. Nets, areas and volumes of solids 12. Trigonometry 13. Vectors 14. Matrix transformations 15. Circle properties

		16. Lines and planes in three dimensions

Item	Area of construct	Topics covered
SECTION A: compulsory		
Item one	**Numbers** Learner appreciates and uses computationalskills to solve problems in real- life situations.	✓ Number bases
		✓ Working with integers
		✓ Fractions, percentages and decimals
		✓ Numerical concepts 1 and 2
		✓ Ratios and proportions
Item Two	**Patterns and algebra** Learner appreciates and uses analysis to solve problems in real-life situations	✓ Sequences and patterns
		✓ Equations of lines and curves
		✓ Algebra 1 and 2
		✓ Mapping and relations
		✓ Inequalities and regions
		✓ Equation of a straight line
		✓ Rectangular Cartesian plane
		✓ Simultaneous equations
		✓ Linear programming
		✓ Loci
SECTION B		
PART I (choose one question)		
Items 3 and 4	**DATA AND PROBABILITY**	✓ Data collection and presentation
		✓ Graphs
		✓ Set theory
		✓ Data collection and display

	Learner appreciates and uses logical reasoning to solve problems in real-life situations	✓ Matrices
		✓ Probability
PART II (choose one question)		
Items 5 and 6	**GEOMETRY AND MEASURES**	✓ Geometric construction skills
		✓ Bearings
		✓ General and angle properties of geometric figures
		✓ Reflection
		✓ Business arithmetic
		✓ Time and time tables
	Learner appreciates and uses spatial reasoning to solve real-life situations	✓ Similarities and enlargement
		✓ Circles
		✓ Rotation
		✓ Length and area properties of two-dimensional geometrical figures
		✓ Nets, areas, and volumes of solids
		✓ Trigonometry 1 and 2
		✓ Vectors
		✓ Business mathematics
		✓ Matrix transformation
		✓ Circle properties
		✓ Lines and planes in three dimensions

SECTION A

(Numbers, Patterns and Algebra)

ITEM 1

The new farm manager who started work at Sugar Corporation of Uganda Limited's Lugazi farm on Monday was unable to access the farm store, which held critical records, due to password–protected locks. He reached out to the farm owner, who replied with a message revealing that the password was a two-digit base eleven numeral. The pin had the characteristic that the total of its digits equaled 17, with the first digit being 4 greater than the second.

He gained entry to the store and obtained access to the records, revealing that the farm had a sizable amount of land available for crop cultivation. He intended to allocate 14% of the land for corn, 30% for wheat, and the remainder for soya beans, with a specific focus on planting corn on 42 – acres. Meanwhile, he discovered that his 12 farm workers could cultivate 15 acres every 4 days.

TASK

a) Educate the new manager on the pin‟s decimal representation.
b) Ascertain the farm‟s total land area and the remaining acres suitable for soybean growth.
c) Help the farm manager understand how long it will take workers to get the land ready for planting.

ITEM 2

At the beginning of term two, Kumasi secondary school's administration faced a pressing issue: - a shortage of dormitory space for students. To address this sleeping accommodation deficit, the school's management developed a plan to construct new hostels with a rectangular design, where the length is $\sqrt{3}$ times the width, resulting in a perimeter of $(14+6\sqrt{3})$ units. To fund this project, the administration required a 97% collection rate of school fees from students

By the end of the first week of the term, two-thirds of the student body had settled their fees. In the subsequent week, an additional 100 students paid their fees, resulting in a significant increase in the proportion of students who had paid their fees, reaching three-quarters of the total student population.

TASK

a) Guide the school management to ascertain the land area, ensuring a surd form solution with rationalized numerals and simplified radicals.
b) Ascertain the precise number of students in the school.
c) Guide the school administration on whether the construction can be undertaken, withsupporting reasons.

ITEM 3

Mr. Alex, a seasoned bus driver at the New Taxi Park, was hired to transport 377 students for a field trip from Mukono to Entebbe. When the geography teacher inquired about the best route, Mr. Alex expertly outlined two alternative routes, ensuring a smooth and informed journey from Mukono to Entebbe. The shorter route takes 2 hours and 26 minutes to complete, with the driver maintaining an average speed of 54km/h for the first **x** kilometers and 37.5km/h for the last **y** kilometers. The longer route, which is 5km longer than the shorter route, takes the driver 2 hours and 12 minutes to complete at an average speed of 60km/h. The driver also charges a fare of Shs 1000 per student per kilometer.

TASK

a) Create two mathematical models involving **x** and **y** which can be used to help in the analysisof the two routes.
b) Help Mr. Alex by revealing the hidden values of x and y from the equations in (a) above.
c) Guide the geography teacher on the best route, highlighting the benefits of your proposedoption.

ITEM 4

Garden City Shopping Mall in Kampala is experiencing a massive turnout of customers, leading to acritical shortage of parking spaces. To address this challenge, the mall's management has planned aninnovative solution: - a triangular rooftop parking design, exclusively designed for compact cars, each spanning an area of 0.2 square units, to cater for the growing demand of space. The parking area is bounded by the following constraints; $x + y < 3$, $x - y + 3 \geq 0$, and $y + 1 \geq 0$. To capitalize on the high demand for parking, the mall plans to impose a parking fee of Shs 2500 per vehicle, with calculations indicating that on peak days, the cars will occupy a total area of 12.4 square units, yielding a significant income source.

TASK

a) (i) Create a graphical representation on paper to help Garden City management accuratelyvisualize and understand the layout and boundaries of the new parking design.
(ii) Assist the management in identifying the accurate coordinates and size of the new parkingarea in square units.

Will the new design accommodate the expected maximum number of vehicles? If so, determine the maximum number of cars that can be accommodated in the new parkingarea at full capacity.

b) Forecast the mall‟s daily highest revenue on a peak day.

ITEM 5

Following the passing away of your cousin's father, the family convened a month later to settle his estate and read his will, to which you were invited. However, a surprise revelation emerged when the youngest child revealed a mysterious envelope left by their father, containing a secretive message. The envelope contained a piece of paper with the number 31, which needed to be converted to a ternary numeral system (**base three**) to unlock the secret code to gain access to his office strongbox. But, to their dismay, **none** of the family members recalled how to perform the conversion, and they turned toyou for assistance. the secret code to gain access to his office strongbox.

Upon opening the safe, they discovered a staggering **349 million** shillings and **a will** outlining the distribution of the wealth. The will stipulated that the wife was to receive 40% of the total, the eldest son was to receive one-third of the remaining amount, and the two younger children were to share the balance in a 2:3 ratio according to their birth order. To ensure a fair and impartial distribution, your expertise was sought once again to calculate the exact share for each beneficiary, preventing any potential disputes or biases.

TASK;

a) Show how you helped your cousins unlock the safe, showing each step clearly
b) Show, with step-by-step calculations, how you helped the family allocate the funds among its members, and share your thoughts on the distribution's fairness.

ITEM 6

The Uganda Women's Finance and Credit Trust has arranged a group outing for its members, using two vehicles; a bus and a van. with 171 participants having paid the required fees, a total of UGX 400,000 has been allocated for transportation costs. Your sister, who is responsible for managing thetransportation, needs your mathematical expertise to optimize the vehicle hire strategy. She wants tominimize transportation costs while ensuring the van, which is faster and can carry 19 people at UGX 50,000 per trip, makes more trips than the bus, which can carry 57 people at UGX 80,000 per trip.

TASK;

(a) Express the information as mathematical statements

(b) Help your sister **minimize** transportation expenses by determining the number of trips eachvehicle should make, using the mathematical statements in (a) above.

ITEM 7

Molly started a wholesale business while still at her parent‟s home. Below is how she plans to useher net profits.

- 20% of the net profits to be re-invested in the business.

- Part of the balance is to be saved in her savings account and the rest is to be for her major personal expenses. This will be in the ratio of 1:3 respectively.

She plans to move out of her parent‟s house if the portion of her net profits that she plans to spendon her major personal expenses can cover all of them. Her major expected personal expenses are; house rent of about UGX.300,000, and groceries of about UGX. 200,000 and transport of about UGX. 100,000. The business made a net profit of one million five hundred thousand Uganda shillings in the first month.

She bought 36 bars of bathing soap and 18 packets of detergent that were all to be packed by her worker in such a way that each package contained the same number of both items. The packages were to be given to those who bought goods in plenty as gifts. All packages were given out beforeMolly got to know the highest number of packages that her worker was able to make out of the bought items.

TASK:

a) (i) How much of her net profit does she plan to re-invest in the business?
b) (ii) How much of her net profit does she plan to spend on personal expenses?
(ii) Will Molly move out of her parents' house? Justify your answer.
c) Help Molly to know the highest number of packages her worker was able to make out of theitems she bought.

ITEM 8:

James is starting a baking business, selling cakes and cookies. To estimate profits, he consulted a friend in the industry. The friend shared data from their own experience: Initial phase: 40 cakes, 30 cookies, total profit UGX 29,000; Later phase: 50 cakes, 20 cookies, total profit UGX 31,000.

James aims to start by producing at least 120 items (cakes and cookies combined). Since cakes sell more, he wants to make at most 80 cakes and at most 60 cookies. He needs to determine the optimal number of cakes and cookies to produce initially.

TASK;

a) What are the expected earnings from each cake and cookie, based on his friend's experience?
b) (i) What mathematical inequalities are making decision-making hard for James?
(ii) Use the inequalities to help him decide on the highest number of cakes and cookies he canstart with.

SECTION B: PART I (DATA AND PROBABILITY)

ITEM 9

To enhance the yields of Rice, Beans, Sugarcane, and Peas in Iganga district, the Ministry of Agriculture's Farmer Training and Capacity Building program conducted a survey, yielding the following findings; Among the 80 rice farmers surveyed, 45 also grow beans, 60 cultivate sugarcane, and 5 focus solely on peas and rice. Additionally, 5 farmers dedicate their land solely to rice. The number of farmers who grow beans, sugarcane, peas, and rice is equal to those who grow peas,

sugarcane, and rice. Moreover, the farmers who cultivate rice, and sugarcane only are equal in number to those who grow rice, peas, and beans, and are 5 fewer than those who grow all four crops.

The ministry plans to provide support to these farmers as follows:

- A farmer who cultivates all four crops (beans, sugarcane, peas, and rice) will receive a package consisting of 4 tractors and a cash grant of UGX 3,000,000.
- One who plants only three crops will receive 3 tractors and UGX 2,000,000.
- A farmer who grows two crops only will receive 2 tractors and UGX 1,500,000.
- For a single crop will receive 1 tractor and UGX 1,000,000.

This support aims to motivate farmers to diversify their crops and boost their productivity.

The ministry needs to calculate the total cost of **tractors** for farmers, based on the number of tractors needed for each group, with each tractor costing UGX 68,000,000.

TASK

a) Assist the ministry in determining:
   (i) The total number of farmers cultivating all four crops
   (ii) The number of farmers growing only three crops
   (iii) The chance of selecting a farmer who grows only two crops in Iganga district
   (iv) The likelihood of selecting a farmer who does not grow Peas
b) Set the total funding required for the ministry's farmer support initiative.

ITEM 10

To address concerns about battery durability, Uganda Batteries Limited (UBL), a trusted manufacturer since 1967, conducted a thorough test on a random sample of 50 batteries. Their experts carefully selected and examined these batteries, yielding the following results (rounded to the nearest minute):

423	369	387	411	393	394	405	369	372	410
371	377	389	409	392	408	409	396	431	391
431	401	363	391	405	382	396	381	438	422
400	381	399	415	428	422	397	399	401	398
396	372	410	419	386	390	362	373	391	402

The director has decided to withdraw batteries with a life equal to or less than the average lifespan of the tested samples and has directed the experts to manufacture only batteries that achieve at least 99 % of the median life of the 50 tested batteries.

TASK

a) (i) Organize the data into intervals of 10 using a statistical table and analyze the trends to recommend the most effective battery replacement strategy to the director
   (ii) Elaborate on the reasoning that led to your conclusion in a) i)
b) (i) Develop a graphical display to illustrate the data, allowing the director and their team toestimate the median, visualize and analyze the information
   (ii) Identify the target battery lifespan for manufacturing, as recommended by the director.
   (iii) Analyze the graph and explain the situation, backing your argument with data and logical reasoning.

c) Aid the manager in recognizing the chance of selecting a battery with a lifespan greater thanor equal to the median value.

ITEM 11

The recently concluded Uganda Secondary Schools Sports Association (USSSA) tournament was largely dominated by schools from the western region, prompting head teachers of participating schools to request detailed reports from their games‟ teachers on transportation and prize monies received during the football competition

The four schools that dominated include; Fort Porto SS, Tororo SS, Nyakasura HS, and Kyogera HS. Due to limited funds, the four schools decided to use two buses; Fort Portal ss and Tororo ss used the Tausi bus which charges UGX. 24,000 per Km while Kyogera HS and Nyakasura HS used Global coaches that charge UGX. 28,000 per Km.

On the tournament day, Tausi Bus embarked on its journey from Mbarara to Kampala at 4:30 a.m., cruising at a steady 80 Km/hr and arriving in Kampala at 9:00 a.m. Simultaneously, Global Bus set off from Sanga town, 50 Km from Mbarara, at 4:30 a.m. and traveled at a constant 50 Km/hr for 3 hours and 30 minutes before pausing for 30 minutes. It then resumed its journey at a steady 67.5 Km/hr until it reached Kampala, with the bus fare being equally distributed among the participating schools that used the bus.

Upon arrival in Kampala, the four schools competed in a two-round football tournament 1st

round

	Win	Draw	Loss
Fort Portal	1	3	2
Tororo	2	2	2
Nyakasura	3	2	1
Kyogera	0	2	4

2nd round

	Win	Draw	Loss
Fort Portal	1	2	3
Tororo	2	1	3
Nyakasura	2	3	1
Kyogera	1	4	1

The tournament followed a standard point system: three points for a victory, one point for a draw, and zero points for a defeat. Additionally, the four teams shared a prize pot of UGX 24,000,000, allocated proportionally to their points tally

TASK

a) (i) Assist the games teachers in plotting the buses' routes on a graph, enabling a more helpful evaluation of their journey.
(ii) Provide the games teachers with the information needed to determine each school's transportation expenditure.
(iii) Ascertain the first bus to arrive in Kampala and the time gap between its arrival and the subsequent bus.

b) Ascertain the winning and last teams and amount given to each team that participated in the tournament.

ITEM 12

The school administration aims to enhance the mathematical abilities of senior 3 students. Last year, the students achieved an average score of 64% by the end of term one, and this year's performance at the same stage is as follows;

30	47	26	86	64	87	49	25	26	43
38	52	44	45	56	59	76	46	27	89
57	89	73	90	48	58	51	88	32	56
62	68	52	66	67	69	49	95	92	66
74	36	32	54	39	35	69	92	50	71

The school administration is contemplating either adding **another teacher**, **buying more books,** or **both**. The school administration will **do both** if the average for this year‟s performance at the end of term one is lower than that of the previous year.

According to the library survey report, last year's students primarily utilized three mathematics textbooks: Longhorn (L), Baroque (B), and Active Mathematics (A). Notably, students who did not use any of these three textbooks struggled significantly in the subject, resulting in poor grades. This year, out of 35 students, the textbook usage breaks down as follows: 13 students used Longhorn, 20 used Baroque, and 17 used Active Mathematics. Additionally, 9 students used both Longhorn and Active Mathematics, 7 used both Longhorn and Baroque, and 8 used both Baroque and Active Mathematics. Notably, 5 students did not use any of the three textbooks;

The school administration has a budget to double the number of students who utilize all three textbooks.

TASK:

a) Provide a data-driven analysis to inform the school administration's decision on whether tohire an additional teacher, purchase more books, or implement both solutions.
b) (i) Guide the school administration on the number of books they can purchase, consistent withtheir initial budgetary framework.
(ii) Do you have any other recommendation to the school administration regarding the book purchase? Explain your reasoning.

ITEM 13.

A non-governmental organization aims to teach French, German, and English to lower primaryschool children in its community schools.

The organization intends to offer language instruction in French, German, and English to students in their schools. They plan to offer permanent positions to candidates who can teach all three languages, while those who can teach one or two languages will be hired on a contract basis. To fill these positions, they are soliciting applications from qualified teachers. Out of the applications received, 29 candidates can teach French, with 7 able to teach French only and 22 able to teach French plus one or both of the other languages. 27 candidates can teach German, with 9 able to teachGerman only and 18 able to teach German plus one or both of the other languages. 30 candidates canteach English, with 11 able to teach English only and 19 able to teach English plus one or both of theother languages. The organization will only consider candidates who are proficient in at least two languages for oral interviews. Your friend has been tasked with identifying the eligible candidates

and needs your assistance in analyzing the data to determine the number of candidates who meet thecriteria.

TASK

(a) Apply your mathematical expertise to help your friend know the number of candidateseligible for an oral interview.

(b) The organization has a program for teachers who can teach all three languages (French, German, and English). They'll be rotated among schools and paid more. What's the likelihood of a random applicant being in this program?

ITEM 14

In a certain town, there is a section of the road where many accidents occur and the residents believeit is due to over speeding so they have requested the authorities to build humps along that section, the chairperson of the roads committee has decided to do some research so a checkpoint has been putat that section to measure the speed of 50 vehicles passing that point. They will put humps if the research shows that the percentage of vehicles passing that point at a speed greater than the speed limit is greater than those who abide by the speed limit. The road sign shows a speed limit of 55km/hr for that section. The results for the 50 vehicles sampled are shown in the table below.

Speed(km/hr)	20-30	30- 40	40- 50	50- 60	60- 70	70- 80	80- 90	90- 100
Number of vehicles	5	8	7	9	6	5	4	6

TASK;

(a) Assist the chairperson in determining the average speed at which vehicles pass that point.

(b) Present a graphical analysis to guide the committee's choice of implementing traffic calming measures.

ITEM 15

The headteacher of a certain school wants to hold a meeting on one of the following days: Monday,Tuesday, or Wednesday. The purpose of the meeting is to communicate something important.

The headteacher wants to schedule the meeting in a way that the probability of some teachers (out of70) not attending the meeting is less than 0.5 (or 50%).

The following information shows which teachers attend school on Monday, Tuesday, and Wednesday and which teachers are absent:10 teachers come on Monday only.

Ten teachers attend school only on Tuesday, twelve teachers attend school only on Wednesday, eightteachers attend school on both Monday and Wednesday, and Seven teachers attend school on both Monday and Tuesday. Nine teachers attend school on both Tuesday and Wednesday. Three teachers attend school on all three days. Some teachers do not attend school on any of the three days

TASK:

a) Is it advisable for the headteacher to hold the meeting on any of the days he has chosen?Support your answer with a reason.
b) Which day would you recommend out of the three options, and what is the basis for your recommendation?

ITEM 16.

A sports organization is selecting team members to participate in marathon competitions from a group of 60 individuals. The selection process will occur in two phases. In Phase One, participants who complete the race within 137 minutes or less will qualify for Phase Two. Then, in Phase Two, those who finish within 122 minutes or less will be selected to participate in the actual competitions,which is the ultimate goal.

The following is a breakdown of the times achieved by the participants in Phase One;

Finish time (mins)	120 - 124	125 -129	130 -134	135 -139	140 -144
Number of people	15	14	13	11	7

TASK:

a) (i) How many participants advanced to Phase Two?
(ii) What is the likelihood that some of the qualifiers from Phase Two will go on to participate in the final competitions?
(iii) Based on the probability value, what is the likelihood of the organization finding suitable participants for the competitions from the group?

ITEM 17.

Maria, a surveyor, embarks on a journey from Mukono to a Kampala construction site to perform crucial soil testing, as the soil's sand content plays a critical role in ensuring foundation stability and preventing potential settlement or foundation failure due to excessive sand. Maria's journey begins with a 30 Km stretch on a bearing of 080° to Kalagi, followed by a 330° turn and a 40 Km drive to Gayaza. Finally, she heads on a bearing of 30° to reach the construction site in Kampala which is on a bearing of 020° from her starting point in Mukono. Upon arrival, she collects soil samples at variousdepths and records the sand content percentage in the table below:

Soil depth (x)	35	65	55	25	45	75	20	90	51	60
Percentage of sand (y)	86	70	84	92	79	68	96	58	86	77

Maria needs to create an appropriate graph to visualize the relationship between depth and sand content and calculate the total cost of surveying materials; including 50 meters of measuring tape at UGX. 10,000, 20 soil sampling bags at UGX. 5,000 each, and fuel at UGX. 6,000 per Km that she traveled. She will submit the calculations to apply for funding from her company.

TASK

a) Help Maria draw a precise diagram illustrating her journey, including bearings and distances.

b) (i) Develop a scatter plot to illustrate the relationship between depth and sand content, aidingMaria in her data analysis.

(ii) Describe the relationship between soil depth and sand percentage, including any trends orpatterns you observe.

(iii) Plot a line of best fit through the scatter diagram data, and use it to:

- Predict the sand percentage at a depth of 31 cm
- Estimate the depth at which the sand percentage is 54%.

c) Assist Maria in preparing a budget proposal to fund her project activities, including her returntrip to Mukono via the same route. (20 marks)

SECTION B: PART II GEOMETRY AND MEASURES

ITEM 18.

The school club is holding a fundraiser by selling chappattis, which they've made and packaged in special containers. Each chapatti is 14 cm in diameter, has a uniform thickness of 6 cm, and is divided into six slices. The containers, shaped like a chapatti slice, each have a marked price of UGX 1000 and can hold 14,784 cubic centimeters. The cost of making each slice is UGX 140. By the end of the day, they had sold 2,000 chapattis at UGX 400 per slice, and the seller of the containers gives a 10% discount to whoever buys by cash terms. (take $\pi = \frac{22}{7}$)

TASK

a) (i) Help the members of a school club to know the number of slices that can be loaded intoeach container.

(ii) Ascertain the number of containers needed to pack the entire batch of slices.

b) (i) How much money was generated from the fundraising event?

(ii) Provide a calculation-based recommendation to the club on whether to continue this business venture in the future, given that the containers were bought on cash terms.

ITEM 19

Stanbic Bank, a prominent African financial institution, seeks to revamp its logo to align with its values and appeal to a newer, younger demographic generation. The current logo, a triangle with

coordinates A(2, 3), B(4, 1), and C(1, 2) on a white rectangular background, is due for a refresh. Thebank's graphic designer has suggested the following design modifications to enhance the logo;

Keep the original triangle in place, but turn it 90 degrees counterclockwise around the origin. Then, mirror the resulting triangle across the horizontal axis. Next, scale up the new triangle by a factor of3 about the center (-5, -2), creating a logo with four triangles. Paint only the enlarged triangle with ared-to-white ratio of 3:5, using red paint that costs UGX 20,000 per square centimeter and white paint that costs UGX 15,000 per square unit. The bank has set a budget limit of UGX 205,000 per logo for painting.

TASK

a) (i) Assist the designer in creating a precise layout of the logo, showcasing the exact placementof the four triangles on the same material.

(ii) Specify the exact vertices of the new triangles.

b) Using data-driven insights, recommend to the bank owners whether to adjust their allocationfor logo painting expenses.

ITEM 20.

Uganda Crop Care Limited (UCCL) has secured a contract to supply liquid fertilizer in Kenya, with a requirement to package it in cylindrical tanks measuring 15 meters in height and 4 meters in radius.Currently, the company stores its liquid fertilizer in metallic buckets with dimensions of 10 meters inheight, 1 meter in lower radius, and 3 meters in upper radius. To fulfill the order, UCCL needs to determine the number of buckets required to fill 100 tanks. Each metallic bucket costs UGX 8000 to manufacture, and the company sells the fertilizer at UGX 3600 per liter. The manager at UCCL needs to calculate the number of buckets needed and evaluate the cost implications.

TASK

a) Ascertain the number of buckets needed to fill all the required tanks.
b) Establish the total cost that will be required to manufacture the required metallic buckets.
c) Based on calculations, evaluate UCCL‟s potential for success.

ITEM 21.

In Mukono town, a mobile vendor, previously operating outdoors, has been hindered by inclement **weather conditions** affecting their seating area. To combat this, they have decided to acquire four „three-sided table surfaces‟, identical in size, to provide a shielded space. Each table will feature **a central hole** to accommodate a circular umbrella, covering the **tabletop's vertices**. With a side that is distinct from the two equal sides, measuring 4.5 meters, the tables will form isosceles triangles with two equal angles of **65** degrees each. The furniture maker quotes a price of Shs. 300,000 per table, offering a 5% discount for cash payments, providing a more conducive and protected environment forthe vendor's operations.

The mobile vendor requires the tables to be fabricated within a tight 48-hour deadline. The furniture maker began working on the tables on Monday at 7: 30 am, with a schedule of 7:30 am to 4: 00 pm, including a 30-minute break from 1:30 pm to 2:00 pm. Each table surface requires 5 hours of work tobe completed.

TASK

a) Assist the furniture maker in drafting designs for the **tabletop surfaces** that meet the mobile vendor‟s requirements.
b) How much will the mobile vendor pay in cash for the four tables?
c) When will the tables be ready for delivery?
d) Recommend the minimum umbrella radius to the mobile vendor for optimal table shading.

ITEM 22.

James, a petroleum engineering master's graduate from Makerere University, has landed a job at a Ugandan NGO. The organization offers a comprehensive benefits package, including.

- Housing allowance: Shs. 14,000 per month
- Marriage allowance: y
- Medical allowance: Shs. 50,700 per annum
- Transport allowance: Shs. 10,000 per month

However, James must pay an annual insurance premium of Shs. 68,900. He has five children, with three under 8, one 16-year-old, and a 20-year-old. The NGO provides a family allowance for four children, as follows: Shs. 3,400 for each child above 18 years; Shs. 4,200 for each child between 10- 18 years; Shs. 5,400 for each child below 9 years.

The tax rates for working-class citizens in Uganda are shown in the table below:

Income (Shs) per annum	Tax rate (%)
1st Shs. 80,000	7.5
Next Shs. 80,000 (80,001 – 160,000)	12.5
Next Shs. 80,000 (160,001 – 240,000)	20.0
240,001 – 320,000	30.0
320,001 – 400,000	36.5
400,001 – 480,000	45.0
Above 480, 000	52

The accountant revealed to James that his **annual income taxes** would be Shs 100,320. James was confused because he didn't understand how his income was calculated, and he didn't know how to figure out his **gross annual income**. He also learned that his annual **total tax free – income** would **exceed his taxable income by 24%.**

James aims to **constantly** set aside half of his annual net income to purchase **a 40 m x 22** m plot in Kayunga village within the next ten years, taking advantage of the stable land prices. The land is expected to be priced at UGX 4,000 per square meter within this time frame.

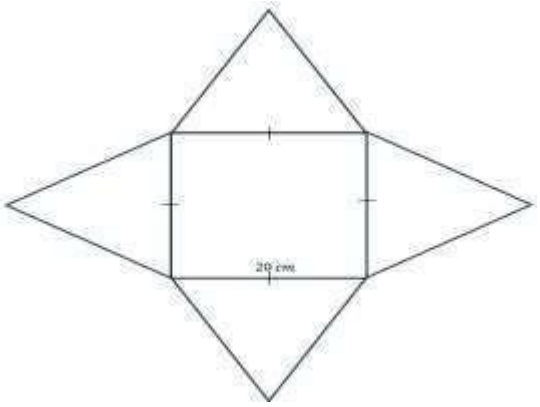
TASK

a) (i) Help James arrive at his accurate taxable income figure through careful calculation andlogical thinking.
   (ii) Assist James in understanding his annual marriage allowance compensation.
   (iii) Support James in figuring out his annual take-home pay.

b) Assist James in determining if he can reach his goal of purchasing the land within the desired timeframe.

ITEM 23

Your sister has started a new role in packaging design, and her boss has given her a new gift-wrappingdesign to assemble as a sample for a client meeting tomorrow. She's running into trouble and needs your help to get it finished overnight.



She is also supposed to determine the material that will be needed to make each for her company to plan well.

Your sister also tells you that she will be getting a salary of UGX.1,000,000 per month which includes, a transport allowance of UGX.200,000 and a lunch allowance of UGX.6000 per day only for the five days she works.

She wants to open up an insurance policy for her child that will need her to pay a premium of UGX.250,000 per month and also remain with UGX.400,000 for upkeep for the month but also has to pay tax using the rates below;

Taxable income	Tax rates %
0 - 235000	0
235000 - 335000	10
335000 - 410000	20
410000 - 1500000	30

She's uncertain if she'll have sufficient funds left to cover the insurance premium.

TASK

(a) (i) Show her what the pack will look like after it has been assembled.

(ii) Use your mathematics to help your sister determine the material required to make one pack.

(b) Will your sister be able to pay her child‟s premium?

ITEM 24

Your father is one of the organizers of a marathon they want to draw the map of the route that the participants will during the race.

At their chosen starting point they chose to take a road that turned E30°S and they moved for 5km where they set up point **B** which will be used as a checkpoint, they then turned through 235° moving a distance of 9km to point **C** which will be the finishing point, however on returning to the office they decided that the finishing point should be put at point **A** to cut costs of organizing the two places but they were not sure of the details of that route from **C** to A that had to be included on the map.

They want to hire a vehicle that will be used to film the racers, the vehicle available consumes 2 litres per km and a litre costs UGX.5500, the owner of the vehicle has asked for UGX.500,000 plus fueling the vehicle for the total distance to be covered but the vehicle owner plans to buy fuel from the fuel station where he is given a discount of 5% for every 100,000 worth of fuel he buys since he is a regularcustomer.

TASK;

(a) Help your father determine the direction from point C to the new finishing point A that will beshown on the map to be drawn.

(b) (i) You are required to determine the total cost of hiring the vehicle.

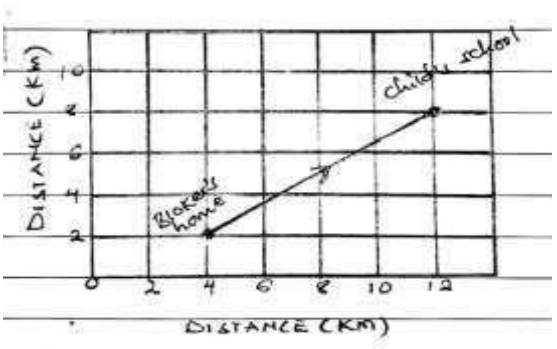
(ii) Do you think the vehicle owner will save some money on fuel if so how much?

ITEM 25

A man took out a loan of 5,000,000 Ugandan shillings from the bank at a compound interest rate of20% and was supposed to repay it within 3 years. However, with the deadline approaching, he has yet to raise the necessary amount.

He decides to sell one of his plots of land for 14,000,000 Ugandan shillings to raise the funds to payoff the loan. However, the buyer negotiates a 10% discount on the price. If he accepts the offer and sells the land, the broker will charge a 5% commission on the sale price. Additionally, the LC1 is requesting 350,000 Ugandan shillings to sign the agreements. He is uncertain whether the remainingamount will be sufficient to cover the loan he needs to repay.

He needs to pick up the child from school by 5:00 pm. However, it's currently 4:45 pm, and he's justleaving the broker's house, which is located a certain distance away from the school (as shown below). Considering he drives at an average speed of 50km/h, he's unsure if he'll arrive on time.



TASK:

a) (i) What is the outstanding loan amount he needs to settle with the bank?
(ii) Will he be able to pay off the loan if he sells the land?

b) Will he arrive at the child's school on time?

ITEM 26

Moses, an employee at a gift box manufacturing company, has been tasked with designing a foldablegift box with square faces and a capacity of 2744 cubic centimeters. He's struggling to create a sketch that will guide him in arranging the faces of the box to fold and close, as well as determining the dimensions of each cardboard piece to cut and join to achieve the desired outcome.

He normally receives a monthly salary of 300,000 Ugandan shillings with no additional allowances. However, the company will start deducting taxes from his pay every month, and he needs to determine his new take-home pay. The company will follow the tax brackets shown below:

Monthly taxable income (Ugx.)	Rate(%)
0–100,000	0
100,001–200,000	5
200,001–300,000	10

He needs to deliver the gift box to the customer and charges a delivery fee based on the amount of fuel used. His motorcycle uses 0.035 liters of fuel per kilometer, and he travels at an average speed of 20 meters per second. With fuel priced at 5,000 Ugandan shillings per liter, he wants to calculate the delivery fee. According to the customer, the journey will take 45 minutes.

TASK:

a) Help Moses develop a sketch outlining the specifications he needs.
b) What is the new salary Moses will be receiving monthly?
c) How much will Moses charge the customer for delivery?

ITEM ONE

Mr. Karimthe head of mathematics department organized a mathematics study trip to Namanve where assembling of Toyota vehicle and manufacturing of Coca-Cola products are done, and in his report to the members of mathematics department shows the cost of hiring a school bus is constant for any a bus and other varies as the distance covered by thebusviledthatifabuscovers100kmthenchargedkshs.4500andkshs.4000 for a distance of 60kmnce between the school and Namanve is 480km and they expected to live the schoolm at an average speed of 100ingtotheschool'sstudytriprulesandproceduresandafterthetripthey students would rest minutes and then proceed back to school.

Tasks:

a) AsthetreasureofthemathematicsdepartmenthelpMr.Karimtoknowtotal expenses for the total journey.

b) Byrepresentingthejourneysonasuitablegraphexplainthemotionofthebustothebus to the school administrators.

ITEM 2

At Elijah‟s enterprise, a company that makes books. A machine produces the least number of books per turn, that enable packing in boxes in equal numbers of 24, 30 and 32 without any book being left out. On a given day, a school made an order of 1440 books. Determine the least number of turns the machine has to make in order to supply the school.

ITEM3

Mutebi had UGX.750,000 on his account and he wanted to buy a Washing Machine. He went at the shop and the price of the machine was UGX.960,000. He went home and waited. One month later, the price was decreased by 15% and then 9% in the second month. Was Mutebi able to buy the Machine after the decreases? If yes, was he able to remain with any balance.

ITEM3

ThepopulationofUgandaisestimatedtobethefastestgrowingpopulationinAfrica. It is estimated to be increasing by over 1,340,000 people every year Since 2020 whose population was estimated to be 49,718,000 people. The research team finds it difficult to present such big population values in 2020 and 2022 on a chart. Advise the search team on some other way they can present these big population values in a reduced way without changing the meaning.

ITEM 4

Kevin‟s goal is to find a job that provides an income of at least 40 million a year. A glass mart company offers Her a job paying a basic salary of 12 million a year plus a commissionof6%ofhersales.

Determine what Kevin‟s total sales will need to be for her to have a yearly income greater than or equal to 40 million.

ITEM5

Anengineerstandingonarampat(400ft,300ft).theramprises195feetovera horizontal distance of 3000 feet to reach the top car parking yard.

Determinetheequationthatwouldhelptheengineerknowthedisplacementforany other positiononthe ramp.

ITEM 6

In the press release by the Uganda bureau of Statistics, presented all Items Index and related Annual Inflation rates for 3 major components, between February 2015 – February 2016. The Annual Food Inflation decreased to 10.1 per cent for the year ending February2016 compared to 12.8 per cent recorded forthe year ended January 2016.Ontheotherhand,theAnnualNon-FoodInflationincreasedto6.7percentfor the year ending February 2016, compared to the 5.8 per cent recorded for the year ended January 2016. KeyDriversforhigherNon-FoodinflationwereTransport(10.7percent),Clothing and Footwear (13.1 percent) and Miscellaneous Goods and Services (6.3 per cent).

ITEM 7

Thesmallindividualfarmersinacertainvillagearebeingcheatedbythetradersfrom towns by offering them low prices for their produce. These farmers decided to form groups and sell their produce through them at better prices.

Sofar,theyhavetwogroups,Kamukamu andTweziimbe.Inthecurrentseason,they are selling milk, maize grain and beans. Last month, Kamukamu group had sales of 2,520 litres of milk, 35 bags of maize grain and 10 bags beans. Meanwhile the Tweziimbe group had sales of 2,314 litres of milk, 41 bags of maize and 9 bags of beans.

Thismonth,theKamukagrouphadsalesof3,254litresofmilk,42bagsofmaizeand 8 bags of beans while the Tweziimbe group managed to sell 2,719 litres of milk, 32 bags of maize and 11 bags of beans. The price for 1litre of milk, 1kg of maize and 1kg of beans is UGX. 700, UGX.1,000 and UGX.3,500 respectively. A bag of maize and beans is estimated to have 120kg each.

Organizetheinformationforthetwoperiodsanduseittodeterminethetotalsalesof both groups. (15)

ITEM8

On a certain village of 40 families, it was found out that 12 families keep a dog (D), 18 families keep a cat(C), 10 familieskeepahen(H),5familieskeepDand, 7 keep C and H and 4 keep D and H. 3 families keep neither of thethree dogs, cats or hens. This data was collected by learners, by use of a venn – diagram, help them to find the numberoffamiliesthatkeepallthethreeanimalsandbirds.

Ifyou aretaskedtoshare1600kgsoffeedstofamilies dependingonthenumberofhowmuchanimalsinthatgroup,showeachsectionon the venn – diagram will get.

ITEM 8

Ben and Musa went to borrow money from the same Bank. Benopted forsimple interest of 8% per annum for two years whileMusaoptedforcompoundinterest of 5% per annum for two years. If each borrowed 600,000/=. Help them to know who paid more money and by how much so they can know the cheapest alternative in case they are to borrow money for the second time.

"Get yourself a Boda – boda cycle on loan term. Pay 600,000/= cash as deposit and100,000/=perweekfor80weeks.Oneoftheboda-bodaridderhasaskedyouto help him compute the total cost of the Boda- boda cycle attheendof 80 weeks. Show how you can help him.

ITEM 8

A farmer has a metal sheet of length 12m which must be used toformarightangle. The hypotenuse of the triangle must be 5m. Help the farmer to get the measurements of the other twosides of the cage.

(b)In a certain factory the production of product T depends on the amount used of productX.thesystemofproductionisrelatedbytheequationf(x)=x^2+1.Ifduring

acertain weekvariablesofx where(3,4,5,6,7,8,9),Helpthefarmerofthe factory to determine the expected range of product T.

ITEM9

Acensusenumeratorhasbeensenttocountpeopleinyourvillage.Hehasbeengiven 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 numberisatwodigitnumberinbaseten.Thisnumberisequaltofivetimesthesum of thedigit.Itisalsoninelessthanthenumberformedbyinterchangingthedigits.The enumeratorcomesto yourhomeandseeksassistanceto to help himfindthePINfor the i-pad.

ThecensusinUgandaisheldeveryafter10years.Itwaslastheldin2014andthen previously 2004. The census in 2024 has revealed that there are people in your village. This has increased by % as revealed by the census in 2014 having been previouslyincreasedbyby rliierin 2004.

Theenumeratorclaimsfortransportre ryafterfourdays,forthe4-day journey madeintheexercise.Hetravelsacerta tonthefirstday,thenhalfofthaton the second day, third of that the third day and finally a quarter of th e fourth day.

Theenumeratortravelledatotaldistanceof50kmduringthefour-dayexercise.Each kilometer travelled is paid UGX28,000

Task:

(a) Helptheenumeratorencryptthe**PIN.**

(b) Howmanypeoplewere inthe villagein2004.

(c) Howmuch did shereceiveon each day.

ITENM10

Yourfamilyisdesigninga arkinglotfordayandnightparkingofmotorcyclesusing the piece of land that has been just been bought in the dle of the city centre. The land is rectangular in shape with a length of 3mlonger than the width and the a a of this portion is ^{2}. The other portion of the land is a car park that will have only taxi and bus. Taxis are a owed ^{2}and buses are allowed ^{2}and there is only ofparkingspaceavailabl Notmorethan40vehiclesareallowedatatime.There are always botht fvehiclesandatmost15taxisareallo heparking fee for taxisis ,andthatofa bus is

UGX5 000 **UGX8, 000**

Each bus carries 78 passengers when full. The bus has a total of 30 seats, some of the seats are for passengers and the others are for passengers.

Task:

(a) Find the dimensions of the portion of the parking space for $\frac{3}{2}$ 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.

Item 11

Your father has decided to explore other options for your A-level education since the expenses at the previous school were beyond the budget. After some research, he has found another school that offers a more affordable option. He drove 30km east and 40km north to reach the school and found out that the details of the new school were as follows:

□ The school fees are Shs 750,000 per term, an admission fee of Shs 80,000 and the uniform costs is Shs 300,000. The school offers a 60% bursary on the school fees for students who scored a first grade in their O-level exams, and you qualify for this bursary.

Your father is considering the following two payment plans offered by the new school:

□ Paying the full amount (school fees, admission, and uniform) at the beginning of the term.

□ Paying the school fees in three equal instalments at the beginning of the term, on visitation day, and at the end of the term, while paying the admission and uniform fees upfront.

Tasks:

(a) Calculate the total cost of attending the new school, considering that you qualify for the bursary.

(b) Determine which payment plan would be more suitable for your father's budget and explain your reasoning.

(c) If your father chooses the three-installment plan, calculate the amount to be paid in each installment.

(d) How far is it from your home to school if you travel through the direct route?

Item 12

Basoga Bainho (BABA) FM is hosting a highly anticipated concert, Ekituudha, at Kyabazinga Stadium Bugembe. The concert is expected to attract a large audience and the organizers have set two different ticket prices to cater for different income levels. The concert tickets are being sold at two different prices:

- Tickets for the VIP seating area are priced at Sh. 10,000 each.
- Tickets for the general seating area are priced at Sh. 5,000 each.

The organisers have a total of 30 tickets available for the concert. After the initial sales period, the total amount raised from the ticket sales is Sh. 800,000.

Task;

As the finance manager for the Ekituudha, determine how many tickets were sold at the price of Sh. 5,000 and Sh. 10,000.

Item 13

Walugosi is a middle-class employee working in a private company in Uganda. He earns a gross monthly income of UGX 1,200,000. Walugosi is married and has four children- twoaged6and8,oneaged15,andoneaged19.Walugosireceivesvarious allowances from his employer, including:

- Insuranceand relief:UGX222,000per annum
- Waterand electricity:UGX21,000permonth
- Medical:UGX318,000perannum
- Housingallowance:UGX55,000permonth
- Transportallowance:UGX42,000permonth
- Familyallowanceforthethree childrenunder18 years old.

Walugosiisconcernedabouttheamountofincometaxhehastopayeachmonthand wants to understand how it is calculated based on the tax structure below;

Taxableincome(UGX)permonth			Taxrate(%)
1	-	40,000	8.0
40,0001	-	100,000	16.5
100,001	-	200,000	24.0
200,001	-	350,000	32.5
350,001	-	510,000	43.0
Above510,000			48.5

Task;

Walugosiapproachesyou,anexpertintaxcalculationstohelphim determine, i)The income tax he has to pay monthly.

ii) Hisnetincome

iii) Whatpercentageofhisgross monthlyincomegoestotax?

iv) Withthehelpoftworelevantexample(s),helpWalugosiunderstand why it is important to pay tax.

1. During their baking lesson , the students were given a recipe for 10 scones using the following ingredients:

   - 80g butter
   - 350g self-raising our
   - 30g sugar
   - 2 eggs

   However the student has the following ingredient and is preparing for the exhibition due to take place at school and wishes to bake 25 scones for the exhibition because he expects parents and visitors to support his entrepreneurial venuture.

   - 100g butter
   - 1kg self-raising our
   - 50g sugar
   - 4 eggs

   Task:

   (a) Determine if the student has enough of each ingredient to bake 25 scones based on the recipe.

   (b) Determine how much more of each ingredient the student needs to buy.

   (c) If the prices of the ingredients are as follows:

      - Butter: 5,000 shillings per 100g
      - Self-raising our: 6,000 shillings per kg
      - Sugar: 1,000 shillings per 50g
      - Eggs: 500 shillings per egg

      Calculate the total cost for the additional ingredients needed.

   (d) Determine how much the student should sell each scone .Electricity and other expenses are provided free by the school.

2. Your aunt is planning to enroll you in a boarding school for your O-level education. She has a budget of Shs 5,000,000 for your school expenses. To visit the school, she decides to take a boda-boda. The boda-boda travels 3 km west from your home to the main road, then 4 km south to reach the school. However, you later realize there's a shortcut path that leads directly from your home to the school. Upon reaching the school, your aunt learns that the school fees are Shs 3,000,000, boarding fees are Shs 1,500,000, and the cost of school supplies is Shs 500,000. Fortunately, the school o ers a scholarship program. Students with excellent primary school leaving exam results receive a 50% discount on school fees, a Shs 200,000 reduction in boarding fees, and a Shs 150,000 voucher for school supplies. You are

eligible for this scholarship based on your outstanding performance. The school also o erstwo payment options for school fees:

- Option 1: Two Installments - Pay two- fths of the school fees at the beginning of theterm and the remaining balance before the midterm exams.
- Option 2: Four Installments - Pay equal amounts at the beginning of the term, before midterm exams, after midterm, and before nal exams.

Task:

(a) What is the distance from your home to the school using the direct path?

(b) i. Considering the scholarship, calculate the total amount your aunt will pay for yourschool expenses.

ii. Can your aunt a ord the school expenses based on her budget?

(c) i. For those paying the full school fees amount, calculate the amount paid per installment for each payment option.

ii. Which payment option would you recommend and why?

PATTERNS AND ALGEBRA

3. Your uncle owns a small bakery and plans to bake two types of loaves of bread: whole wheat bread and white bread. Due to the bakery's oven capacity, your uncle can bake at most 15 loaves of bread in a day. He wants to bake at least 3 loaves of whole wheat bread. Additionally, he wants to bake more whole wheat bread than white bread because it is more popular among his customers. The selling prices are as follows:

   Whole wheat bread is sold at Shs 6500 per loaf.

   White bread is sold at Shs 5000 per loaf.

   To cover his costs and make a pro t, your uncle needs to earn more than Shs 30,000 fromthe sales each day.

   Task:

   (a) Write mathematical statements that show the relation between the whole wheat breadand white bread.

   (b) Show the feasible region of the relation on the Cartesian plane.

   (c) How many loaves of each type should your uncle bake in order to make the maximumpro t?

   (d) What is the minimum number of loaves he can bake and still make a pro t?

4. The company manager is organizing a party for her colleagues. The cost of renting a local hall is UGX 2,000,000 for the evening. She then has to budget for food, which will cost approximately UGX 20,000 per person. The manager needs to ensure that the total cost of the evening stays within her budget.The manager has a maximum budget of UGX 5, 000, 000

   Task:

   (a) Write down a formula connecting the total cost of the evening with the number of people attending .

   (b) Find the total cost for the evening if 25 people attend.

   (c) Find the greatest number of people she is able to invite.

   (d) In the end, only 16 people will attend. Calculate how much each person should be charged so that the manager covers her costs.

5. Your friend is shopping at a supermarket in Kampala during a clearance sale. He wants to buy a calculator that originally costs 120,000 UGX. The store has reduced the price of all calculators by 35% for the sale. Additionally, today there is an extra markdown of 40% applied to the sale price of all calculators.

   Task:

   (a) Develop a function that calculates the sale price of the calculator today, where x is the original price of the calculator.

   (b) Using the function from (a), determine the nal price your friend will pay for the calculator.

6. A manufacturer considers that men and women workers are equally e cient and so he pays them at the same rate. He has 30 units of male workers and 17 units of female workers and capital respectively, which he uses to produce two types of goods, A and B. To produce one unit of A, 2 workers and 3 units of capital are required, while 3 workers and 1 unit of capital are required to produce one unit of B. Goods A and B are priced at UGX 100,000 and UGX 120,000 per unit respectively.

   Task:

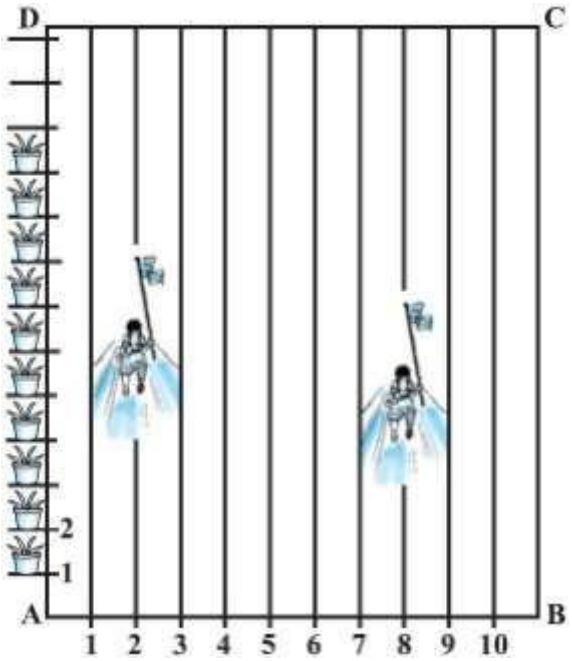
   (a) Write mathematical statements that show the relation between the units of goods A and B produced

   (b) Show the feasible region of the relation on the Cartesian plane

   (c) How should he use his resources to maximize the total revenue?

   (d) Do you agree with this view of the manufacturer that men and women workers are equally e cient and so should be paid at the same rate?

7. In preparation for the annual sports day that takes place in second term of every year , your school has marked lines with ash powder at intervals of 1 meter on a rectangular sports eld ABCD. The eld is 100 meters long (AD) and 50 meters wide (AB). To make the event more exciting, the school has set up a challenge where students need to post ags at speci c locations on the eld.



- 100 ower pots are placed at 1-meter intervals along the length AD.
- Two di erent lines (second and eighth) running parallel to AD are speci cally used forthis challenge.
- One student runs $\frac{1}{4}^{th}$ the length of the eld along the 2nd meter line and posts a green ag.
- Another student runs $\frac{1}{5}^{th}$ the length of the eld along the 8th meter line and posts a red ag.

Taking one corner of the eld (point A) as the origin, with the x-axis along the width (AB)and the y-axis along the length (AD), answer the following questions:

Task:

(a) Find the coordinates of the green ag.

(b) Find the coordinates of the red ag.

(c) Find the distance between the two ags.

(d) If a blue ag is to be placed exactly halfway between the green and red ags, whereshould it be placed?

(e) Draw the locus of points that are equidistant from both the green and red ags and nd it is equation.

8. A cooperative society of farmers has 50 hectares of land to grow two crops A and B. The pro ts from crops A and B per hectare are estimated as Shs 10,500,000 and Shs 9,000,000 respectively. To control weeds, a liquid herbicide has to be used for crops A and B at the rate of 20 litres and 10 litres per hectare, respectively. Further not more than 800 litres of herbicide should be used in order to protect sh and wildlife using a pond which collects drainage from this land. Keeping in mind that the protection of sh and other wildlife is more important than earning pro t respectively.

Task:

(a) Write mathematical statements that show the relation between the hectare of land tobe allocated to crop A and B respectively

(b) Show the feasible region of the relation on the Cartesian plane

(c) How much land should be allocated to each crop so as to maximize the total pro t?

(d) Do you agree with the message that the protection of wildlife is utmost necessary to preserve the balance in environment?

DATA AND PROBABILITY

9. In a school survey, 200 students were asked about their internet usage habits. They were asked to choose from three activities: Social Media (like Facebook and TikTok), Academic Work (such as research and homework), and Playing Games. The results showed that 165 students use the internet for Social Media, 130 use it for Academic Work, and 100 use it for Playing Games. Among them, 70 students use it for both Social Media and Academic Work only, 60 use it for both Social Media and Playing Games, and 50 use it for both Playing Games and Academic Work. Additionally, no students exclusively use the internet for playing games. Now, the school needs to decide whether to set rules if more than 60%of students spend their internet time on Social Media.

Task:

(a) Calculate how many students use the internet for at least one of these activities.

(b) Determine how many students don't use the internet at all.

(c) Estimate the percentage of students who use the internet solely for Academic Work.

(d) Based on the ndings, advise the school on whether to implement rules or not.

10. A certain company in Kampala is analyzing the optimal departure time for its 40 employees to ensure they reach home by 6:00 PM, minimizing their commute time and avoiding peak tra c congestion. The company conducts a survey to track the times employees typically arrive home after work, measured in minutes past 5:00 PM.

15	20	25	30	35	40	45	50	55	60
65	70	75	20	25	30	35	40	45	50
55	60	65	70	75	80	25	30	35	40
45	50	55	60	65	70	75	80	30	35

Task:

(a) Based on calculations using the collected data, suggest an optimal departure time for employees to begin their commute home.

(b) Following advice to allow employees to leave work when at least 50% of them have already arrived home, determine the optimal departure time.

(c) As the company management, which of the two suggested departure times from (a) and (b) would you choose to ensure employees reach home by 7:00 PM, and why?

11. A baker is preparing for a local community event. She needs to bake several types of cakes, however she has to ensure she has the correct quantities of ingredients for each. Below are the types of cakes she plans to bake and their required quantities of ingredients:

- Chocolate Cake: Requires 3 cups of our, 2 cups of sugar, 4 eggs, and 1 cup of mixed ingredients per cake.
- Vanilla Cake: Requires 4 cups of our, 3 cups of sugar, 3 eggs, and 2 cups of mixed ingredients per cake.
- Red Velvet Cake: Requires 5 cups of our, 2 cups of sugar, and 1 cup of mixed ingredients per cake.
- Lemon Cake: Requires 2 cups of our, 2 cups of sugar, 3 eggs, and 1 cup of mixed ingredients per cake.

The baker has been asked to bake a total of 10 Chocolate Cakes, 8 Vanilla Cakes, 6 RedVelvet Cakes, and 5 Lemon Cakes.

Task:

(a) Form a matrix to show the quantities of ingredients required for each type of cake.

(b) She wants to calculate the total quantity of each ingredient she will need for the event. Help the baker using your knowledge of matrix multiplication.

(c) If each kilogram of our goes for UGX 8000, each kilogram of sugar goes for UGX 5000, and each egg goes for UGX 300, and a cup of mixed ingredients goes for UGX 6000. Find out how much she will spend on making the cakes considering that each cup with the ingredient weighs 250grammes.

12. A layer chicken farmer decided to weigh a sample of 800 eggs on his farm and classify them according to their mass (m grams) to optimize the packing process. The frequency distribution of the egg masses is as follows:

Mass in grams	Number of eggs
40 – 44	36
45 – 49	142
50 – 54	286
55 – 59	238
60 – 64	76
65 – 69	22

The farmer's plan is to pack eggs in given weights.

Task:

(a) Determine the median mass of an egg from the given frequency distribution to under- stand the central tendency of the egg weights.

(b) What would be the percentage of eggs which would be classified as large(over 62 grams)

(c) The farmer plans to pack eggs that weigh over 62 grams, with each pack containing 12 eggs. If each pack costs UGX 12,000, calculate the total revenue the farmer will earn from selling all the large eggs and compare the revenue earned from selling the same eggs to a middle man who he is buying at UGX 9000.What advice will you o er to the farmer.

13. In preparation for the upcoming national voter registration drive in Uganda, the Electoral Commission needs to determine the optimal opening time for registration centers across various districts. This decision aims to facilitate maximum voter registration and ensure e cient processing of the data of the citizens eager to participate in the upcoming elections. Here are the arrival times of citizens at a sample voter registration center in minutes past the scheduled opening time (8:00 AM):

11	66	21	88	33	67	41	45	47	41
27	62	32	43	31	34	66	20	21	36
26	75	80	45	12	44	58	48	42	38
56	63	68	24	21	65	68	63	72	38

Task:

(a) Based on calculations using the collected data, suggest an opening time for voter reg- istration centers.

(b) Following advice to open registration centers when at least 50% of expected citizens have arrived, determine the opening time.

(c) As the Electoral Commission of Uganda, which of the two suggested opening times from (a) and (b) would you choose, and why?

GEOMETRY AND MEASURES

14. Your relative, is planning to start a small bakery business and seeks your advice on nancial matters related to her venture. She plans to invest a total of $10, 000 into the business and wants to understand the nancial implications of di erent nancing options. She has approached two money lenders and she is asking for your input before she takes on the decision.

Lender 1 : Your relative ,wants to borrow UGX 50,000,000 from a local bank to purchasebaking equipment. The bank o ers her two di erent repayment plans:

- Option 1: Simple Interest - The loan is o ered at an annual interest rate of 20% andto be paid after 2 years.

- Option 2: Compound Interest - The loan is o ered at an annual interest rate of 4% and is to be paid after 2 years

Lender 2: Your relative is considering a hire purchase agreement with a bakery equipment supplier. The total cost of the equipment is $5, 000, and the hire purchase agreement speci esa down payment of $1, 000 followed by monthly payments of $400 for 24 months.The supplier will consider a constant dollar rate at 1$ = *UGX*3, 800

Task:

(a) Calculate the total repayment amount for each nancial option over the loan term and compare them to determine which option would be more cost-e ective for your relativebakery business.

(b) Analyze the monthly cash ow implications for your relative, under each nancing option, considering her ability to manage operational expenses alongside loan repay- ments.

(c) Based on your calculations and analysis in (a) and (b), provide your relative, with a recommendation on which nancial option would be optimal for her bakery business, taking into account both total repayment amount and monthly cash ow considerations.

15. A group of tourists has just arrived at Entebbe International Airport in Uganda for a safari adventure. They are interested in reaching the source of the Nile in Jinja. The touring company has approximated the distance from Entebbe to Jinja to be about 94 km, which should take around 3 hours without tra c, assuming an average speed of 30 km/h for the whole journey. Here are the directions they are following:

- From Entebbe Airport, travel north for 35 kilometers to reach Kampala, the capital city.
- From Kampala, head east on the Jinja highway. As they approached Mukono, approx- imately 25 km from Kampala, the guide was alerted by a friend coming from Jinja to change the route and use the Kayunga road due to an accident in Mabira. The driver changed the route at Mukono and went in the northeast direction to Kayunga, approximately 45 km away.
- From Kayunga, they headed to Jinja on a bearing of 130^0, which took them 1 hour and 44 minutes as they enjoyed the scenery along the roadside.

Task

(a) Describe the direction from Jinja to Entebbe.

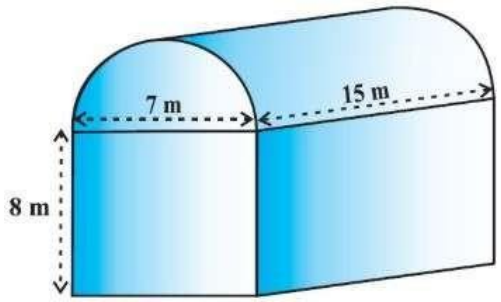
(b) How far is it from Mukono to Jinja using the direct route instead of the Kayunga route?

(c) How long does the journey from Entebbe to Kampala take?

(d) If each liter of fuel costs UGX 4900 and the car van consumes 1 liter per 10 km, how much fuel and money would they have saved if there was no accident in Mabira?

(e) How much extra time did they spend on the road due to the detour, and what recom- mendations would you make to avoid such delays in the future?

16. Your neighbor runs an industry in a shed that is in the shape of a cuboid surmounted by ahalf-cylinder. The dimensions of the cuboid base are 15 m by 7 m, and the height is 8 m.



Your neighbor wants to install air conditioning units in the shed. The installation company o ers two types of units: Type X and Type Y. Each Type X unit costs $2,500 and each Type Y unit costs $3,200. The Type X unit covers $100m^3$ of air, while the Type Y unit covers $150m^3$ of air. For bulk purchases, the company o ers a 5% discount on the total cost for every 10 Type X units purchased and a 7% discount on the total cost for every 8 Type Y units purchased. The neighbor plans to buy enough units to cover the entire volume of the shed. He intends to borrow money from a bank to buy the air conditioning units but isunsure of the amount needed.

Task:

(a) Find the volume of the air that the shed can hold.

(b) If the industry requires machinery which would occupy a total space of $300m^3$ and there are 20 workers each of whom would occupy 0.08 space on an average, how much air would be in the shed when it is working?

(c) Calculate the number of air conditioning units required for both Type X and Type Y units based on the usable air volume.

(d) Estimate the total cost and the amount of money your neighbor needs to borrow for purchasing the required air conditioning units for both Type X and Type Y.

(e) Advise your neighbor , with reasons, on the type of air conditioning units to buy.

17. The Parks Department in a Ugandan village has acquired a new sprinkler system to water their ower equilateral triangular lawn , which is essential for maintaining the village green-ery. The equilateral triangular lawn, with each side measuring 10 meters , is surrounded by pathways, and the sprinkler needs to be strategically placed to ensure e ective coverage without wasting water on the pathways.

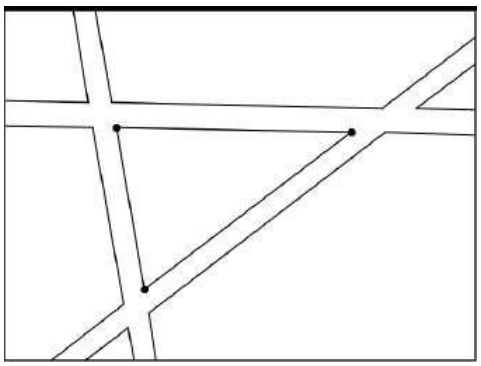


Diagram not on scale

Task:

(a) Explain whether or not you think all of the lawn in the triangle can be watered witha circular sprinkler

(b) Determine the best location inside the equilateral triangular lawn where the sprinklershould be positioned to maximize the watering coverage while avoiding the pathways.

(c) Estimate the area of the lawn that will not receive water e ectively once the sprinkleris optimally placed.

Question 1

KarynownsabakeryinKampala. Sheusesa baseeightsystemtodisplaythepricesof different prices of bread in dollars. In her display, each digit from 0 to 7 represents a specific price value as shown in the table below

Digit	Pricevalueindollars
0	2.5
1	3.0
2	3.5
3	4.0
4	4.5
5	5.0
6	5.5
7	6.0

She sells each loaf of bread at 256 base eight. Oscar is a business man who buys 100 loavesof breaddailyfromthe bakeryand sellseachloaf atUGX70000.Heisgivena discount of 5% on every loaf of bread.

Task

a) Determinethepriceof1loafofbreadindollars

b) Giventhat1USD=UGX3800,HelpOscartodeterminehispercentageprofit.

Question2

Your mathematics teacher has promised to award his best three students Maria, Monica andMariamwith126counterbooks.EachcounterbookcostsUGX12000inthe market. Maria will receive 42 counter books in base 6. Monica will receive 36 counter books in base 8. Mariam will receive the share of her counter books in base 10.To provide accountabilityto the school head teacher, the mathematics teacher intends to present the data on appropriate chart to the head teacher.

Task

a) DetermineHowmuchmoneywasspentinbuyingMariam"sCounterbooks

b) Helptheteachertopresentthedatatotheschoolheadteacher.

Question3

WilsonandRonaldarestudentsofthesameschool.Theyareworkingonamathematics assignment that involves number bases. Wilson is working in base 6 while Ronald is working in base 8. Wilsons number is 24 written on a white cardboard while Ronald‟s number is 32 written on a blue cardboard. They are all aiming at find the least number that can divide all the two numbers. Wilson′s class has 5 streams with 15 students each
whileRonald‟sclasshas2streamswith24studentseach. Theschoolwishestodetermine the minimum number of students each stream should have so that they contain the same number of students.

Task

a) HelpWilsonandRonaldtodeterminetheleastnumberthatcandivideallthetwo numbers
b) Helptheschooltodeterminethenumberofstudentseachstreamshouldhave?

Question4

Yourschoolhasreceivedanewsetofmathematicsbooksforthelowersecondaryschool curriculum from the ministry of education and sports. The school is arranging the books into boxes to hand them over to the school librarian. The school decides to arrange the books in rows on different number bases. The first box is arranged in base 2, the second box in base 3 and the third in base 5. Each box has equal number of books in each row.
Thefirstboxcontainsrowsofbooks.Thesecondboxcontains9rowsofbooksandthe third box contains 8 rows of books. The librarian is creating selves and each self will contain equal number of books. Each book costs UGX25000

Task

a) Determinethetotalnumberof booksthattheschoolreceivedfromtheministryof education and sports.
b) Howmanybookswillthelibrarianarrangeineachshelf?
c) Determinetheamountofmoneyspentinbuyingeachboxofbooks

Question5

Scovia locks her phone with a password “MATH” after using it. Each letter in the passwordrepresentsanumberinbasefive.Mrepresents13,Arepresents1,Trepresents 20 and 8 represents 8. Ruth wants to use the phone but needs to combine the numbers in base 10 to unlock the phone. Scovia bought the phone at UGX780000. She plans to sell the phone to Ruth at UGX1080000. Scovia plans to use part of the moneyto buy a crate of soda that has 24 bottles for her birthday and save the rest. Each bottle of soda costsUGX12000.

Task

a) WhatnumbershouldRuthusetounlockthephone?
b) DetermineScovia‟spercentageprofit
c) Expressthe amountofmoneythatwillbeusedtobuythecrateof sodaasa percentage of the amount of money that will be save.

Question6

A telecommunication company in Uganda offers a special promotion to all customers havingtheirbrandsmartphone.Thepromotionallowscustomerstoconverttheirloyalty points to a specific amount of money in US dollars and finally to Ugandan shillings (UGX)basingona uniquenumber basesystem. Inthis system, thedigit3intheloyalty pointsisequivalenttothedigit5inthedecimalsystem.Joshuaaccumulates243loyalty points every week. Each loyalty point can be converted to UGX 11400. The company sells each phone at a profit of 5%. They sell each phone at UGX585000.

Task

a) DeterminetheamountofmoneyJoshuareceivedforhisloyaltypointsinUSdollars for last week. Hence determine the total amount of money he will receive within 6 weeks.
b) Determinethecostpriceofeachphone.

Question7

James and Joan are students in the same school. James is holding a white card with numbers 24 and 45 written in base 6 on it. Joan is holding a blue card with the same numberswritteninbase8onit.Theyallwant tofindtheleastnumberthat candividethe two numbers on their respective cards. James claims that he will be the first to obtain the correct answer since he is 5 years older than Joan.

Task

a) DeterminethecorrectanswerJameswillfind
b) HowoldisJoanifthesumoftheagesofthetwostudentsis39.

Working with integers

Question1

YourschoolplanstoraiseUSD1100thatwillbeusedintheconstructionofanewschool library. The school organized a school carnival to raise moneythat will enable it achieve

thetarget.Thetablebelowshowstheincomegeneratedandtheexpensesforin US dollars for the school carnival.The expenses are indicated in brackets

Games	Sports	Donations	Flyers(expenses)	Decorations(expenses)
650	530	52	28	75

Theheadteacheroftheschoolplanstopresenttheabovedatatotheschoolmanagement committee in one of the meetings this Saturday.

Task

a) Didtheschoolreachits goal?
b) Usingtwodifferentcharts,helptheheadteachertorepresentthedatatotheschool management committee
c) Giventhat1USD = 3800UGX,determinethetotalamountofmoneytheschool remained with after expenses in UGX.

Question2

A football team gains 3 points on the first tournament, loses 6 points on the second tournament, loses 3 points on the third tournament and gains 4 points on the fourth tournament. Each point gained is awarded UGX54500 and each point lost is deducted UGX12500.Theteamhas40playerswho are eitherleftfootedorrightfooted.28players arerightfootedwhile17playersareleftfooted.Aplayerwhoisbothleftandrightfooted is awarded UGX 258000 by the football association.

Task

a) Determinethetotalamountofmoneythefootballteamobtainedfromthefour tournaments
b) Howmuch moneydidthefootballmanagementspendinawardingtheplayerswho are both right and left footed? (write your answer in words)

Question3

You are playing a game on your computer using a spinner. You start with the spinner at blueandscore48,andspinthespinnerfourtimestoorange,spinthe spinnerthreetimes again to green and finally spin the spinner 6 times to red. Each spin gives a score of 4.

Task

a) Writeyourtotalscoreinwords
b) Usingtwodifferentcharts,displaythescoresatblue,orange,greenandred

Question4

James bought three bags at UGX 45000 each after being given a discount of 5% on the original price of each of the bags from a shop in Kampala. He bought oranges at UGX500 each and put in the bags. Each bag contained 8 oranges. James then decided to sharethemwithhisfourfriendJoshua,Jakin,JackandJadonbydividingthemequallyin to four groups. He bought 10 more oranges later on and added them to the total number of oranges he had. James realized that he had to multiply the sum of the oranges by 2 to determine the final count. Joshua being the oldest of the other four friends by 2 years claims that he should be given more oranges. The sum of the ages of the five people when pressed on a calculator was found to be 77.

Task

a) Determinethetotalamountofmoneyofthefinalcount.
b) Whatistotaloriginalcostofthethree bags
c) Determinetheagesofthefivepeople.

Question5

Your sports teacher is organizing a sports event this Saturday. He wants to buy sports equipment sets that include basketballs and footballs for their activities. He has three different sets to choose from: Set A includes 8 basketballs and 12 footballs, Set B includes 6 basketballs and 18 footballs and Set C includes 10 basketballs and 15 footballs. Each ball in set A costs UGX80000, each ball in set B costs UGX 8000 more than that in Set A and each ball in Set C costs UGX12000 more than that in Set B.The sportsteacherwantstofigureoutthetotalnumberofeachtypeofballheneedstobuyto ensure that each activity group has the required number of balls without shortage or wastage.

Task

a) Determinethetotalamountofmoneyhemustspendinbuyingtoballstoachievehis target.
b) ThesportsteacherhasUGX7800000forbuyingtheballs,hewantstouse10%ofthe balance to purchase mineral water. Determine how much he has to spend on mineral water.

Question6

Your high school friend spent UGX15000 in buying apples. He wants to distribute the apples equallyamong his other friends. If he gives each friend x apples , he will have 3 apples remaining. Each apple costs UGX1000. Emily, Michael and Sophia are among yourbestfriendsaswell.Emilyhas18applesinherbag.Michaelhas24bagsinhisbag

whileSophiahas30applesinherbagtoo.Theywanttofindthehighestequalnumberof apples that should be put in each bag and the least equal number of apples each bag can contain.

Task

a) Determinethenumberofapples(x)eachfriendwillreceivefromyour friend.
b) HelpEmily,MichaelandSophiatoaddressthechallenge.

Question7

Your brother went to school to do mathematics practice on the chalkboard. During his practice, he pressed a number on a calculator, added the square of 5 to the number. He laterrealizedthatwhenhedividestheresultby4,hegets5timesthenumber.Afterthe practice, your brother left school and walked 5 kilometers to a trading centre to buy
water, he then walked in the north east to his friend"s home and rested there for some hoursbeforewalking6kilometersinthewesterndirectionto asupermarkettobuysome scholastic materials for mathematics practice in the coming days. Your home is 5 kilometers due south of the supermarket.

Task

a) Helpyourbrothertofindoutthenumber.
b) Howfaris yourhomefromtheschoolusingthedirectroute?

Fractions,percentagesanddecimal

Question1

Youruncleworksasasalesagentinacementmanufacturingcompany.Heispaidabasic monthlysalaryof UGX1800000. He is paid UGX400000 for every 25 bags of cement he sells. Your uncle sells 400 bags of cement in a month. He decides to save 20% of total salaryeverymonth and share the 10% of it among his four children in the ratio of 2:3:4:1 accordingto theirages. Theeldestchildreceivesthehighestamountof money.Hisdaily expenses are UGX 20000. The rest of the money is invested in to the family business.

Task

a) Howmuch moneyisinvestedintothefamilybusinesseverymonth?
b) Workouthowmuchmoneytheyoungestchildgets

Question2

Annetboughtfruitsconsistingof mangoes,guavas,orangesandpassionfruitsintheratio of2:4:4:2fromafruitstore.Heate$\frac{1}{4}$ofthefruitsandgaveaway40%of theremaining oranges to his friends. She sold the rest of the fruits to his neighbor at UGX1500 each. Eachfruitinthefruitstorecostsa UGX800.Shebought14passionfruitsfromthefruit store.

Task

a) Determineherpercentageprofit.
b) Displaytheinformationusinganappropriatechart.

Question3

A secondaryschool consists of 24 lower secondaryschool prefects. The prefects plan to holdameetingthisSaturdayinoneoftheschoolhall.Theschoolhallcanaccommodate many people as it has single seats arranged in 8 rows and 12 columns. The school has bought 48 bottles of mineral water, 120 bottles of soda and 84 cups of juice. 17 prefects drink soda, 12.5% of the prefects do not drink soda or juice and 9 prefects drink juice.

EachbottleofthedrinkscostsUGX4000

Task

a) Usingappropriatechart,displaythecategoriesofdrinksbought
b) Workouthowmuchmoneywasusedtobuybottlesofdrinksforpeoplewhodrink both soda and juice if they will drink two bottles each.

Question4

Oscar wants to design a triangular garden in her backyard. The base of the triangular gardenis12metres longandtheheightis8metres.Heplanstodividethegarden into threeequalsectionstoplantdifferentflowers.Oscardecidestoallocate$\frac{1}{3}$ofthegardento roses,$\frac{1}{4}$totulipsandtheremainingsectiontosunflowers.Oscarrealizesthattheroses need 40% of their section to grow properly, the tulips need 25% and the sunflowers require35%.Oscardecidestoinstalladecorativeborderaroundtheperimetersothatit just touches the edges of the garden and the border costs UGX50000 per metre.

Task

a) Whatisthetotalcostofinstallingthedecorativeborder?
b) Whatistheareainsquaremetersallocatedtoeachtypeof flower?

c) Findouthowmanysquaremetresofeachflowerbedshouldbeallocatedforoptimal growth.

Question5

The village hunters standing by the roadside need to navigate through the game park to find three different wild animals, cob, rhino and porcupine resting at three different places. The village hunters need to move northeast to find the cob and turn southward to find the rhino before turning southwest to find where the porcupine is resting. The distancefromtheroadtothecobis25%ofthetotaldistanceandthedistancetotherhino is 40% of the total distance. The remaining distance to the porcupine accounts for the remaining 35%. The distance to the cob from the village hunters is 500 metes

Task

a) Workoutthetotaldistancethevillagehuntersneedtocover.
b) Whatangleshouldthehuntersturnthroughiftheyaretomovefromtheroadtothe porcupine?

Question6

Mr.Amara isavillage farmer.He ownsatriangulargardenwithsidesmeasuring $(x+2)$ metres, $x+5)$ metres and $(x+8)$ meters. Mr. Amara wants to build a circular fence around the garden in such a way that it just touches the corners of the garden without enteringittokeepoutanimals.ThefencingmaterialcostsUGX7800permeter.Hewants tofence$\frac{1}{4}$ofthe perimeterofthegardenandleavetheremainderunfencedforan entrance.Theperimeterofthegardenis45metres.Thegardenwillbeusedtogrowtrees and each tree will occupy $2m^2$of space of the garden

Task

a) Determinethecostoffencingthegarden
b) Workoutthetotalnumberoftreesthatcanbeplantedinthegarden

Question7

Your sister, Mercy works in one of the non-governmental organizations in Uganda. She is paid a monthly salary of UGX8800000. Your sister decides to invest a portion of her totalsavingsinafixeddepositaccountthatoffersasimpleinterestrateof5%permonth. Sheinvests$\frac{1}{3}$ofhertotalsavingswhichamountstoUGX1400000.Mercysaves30% of hermonthlysalaryandusestheremaindertopayschoolfees.

Task

a) Determinetheamountofmoneyshewithdrawsfromthefixeddepositaccountafter4 years.
b) Workouthertotalsavingsin2 years.

Coordinate plane

Question1

You and your friend have tickets to watch a football match in Kampala in which only 12500spectatorsareexpectedtoattend.YousitinsidetheVIPsectionand yourfriend sits at $(-5,-3)$. The football pitch is located at positions $(-4,-3),(4,3),(-4,3)\ and\ (4,3)$. Each unit is equal to 20 metres. The football match hasbeenorganizedbythefootballassociationtoraisefundsrequiredtofencethefootball pitch where by each spectator will pay UGX1000. UGX 20000 will be used to fence every 2 meters of the perimeter of the pitch and 40% of the balance will be distributed equally by the football association to the 46 football players that will participate the football match and the remainder will be saved in a bank account that offers a 8% simple interest rate per month.

Task

a) Usingasuitablegraph,displaythepositionofyourfriendanddeterminetheareaof the football pitch.
b) Workouttheamountofmoneythefootballassociationwillwithdrawfromthebank after 3 years

Question2

Yourschoolislocatedat$(2,-1)$,whichis2blockseastand1blocksouthof thecentre of town. To get from your house to the school, you walk 5 blocks west and 2 blocks north. The school is near the houses of four of your friends Alex, Bernard, Cathy and Dalton.Alex‟shouseis600metersnorthoftheschool,Bernard‟shouseis300metreson 60° east of north of the school. Cath‟s house is half kilometer on south of east of the schoolwhileDalton‟shouseissouthwestoftheschool.Dalton‟shouseis400metres from the school.

Task

a) Isyourschooloryourschoolclosertothecentreoftown?useasuitablegraph
b) Showaccuratelythepositionofthehousesofthefourfriendsanddeterminehowfar Dalton‟s house is from Alex‟s house

Question3

Three people Amon, Anthony and Mark are village friends. They decided to go hunting for wild animals in a village forest.They left their bottle of water at point A(2,4) and theirspearsatpointB(-1,1)andstartedtracingthewildanimalsfrompointC(5,3).While exploring the area the next day, they discovered a mysterious circular rock enclosing the area formed by three points just touching the tips of the three points

Task

a) Usingagraphandsuitablegeometricinstruments,showthedesignofthearea covered by circular rock
b) Workoutthe areaofthecircularrock

Question4

Jerome is a village farmer in Iganga district. He has rectangular farm land whose corners are at points $A(2,3), B(2,7), C(8,7), and\ (8,3)$. He bought the farm land from his neighbor2 yearsagoatatotalcostofUGX8400000.Jeromeplanstosellthefarmlandto his friend Destiny. He wants to sell each square meter of the farm land at UGX120000 and save the profits obtained in a fixed deposit account that offers a 2% simple interest rate per month for 2 years. Each unit of the length or width of the farm land represents 5 metres of the actual size.

Task

a) Usingasuitablegraph,presentthedesignofthefarmland
b) HowmuchmoneywillJeromewithdrawfromthebankafter2years?

Question5

Your school has designed a rectangular meal card whose corners are at points P(2,7), Q(6,7)R(6,-2)andS(2,-2)tohelpinschoolfeescollection.Themealcardisuniquewith a triangular design whose tips are at points (1,2),(3,4) and (5,6) inside it. A student in senior one has drawn a circular design that just touches the three edges of the triangular design.

Task

a) Presentthedesignofthecardonasuitablegraph
b) Workoutthe areaofthecardcoveredbythecirculardesign

Question6

A new football coach of an English premier club is designing a new style of play for his team on a coordinate plane that represents a football pitch. The goalposts are located at points $A(2,4)$ and $B(2,-4)$.Thefootballcoachwantstheteamtopracticerunninga play to facilitate counter attack against the opponent where the centre back starts the ball at point $Q(-3,1)$ and throws the ball in a straight line to the wide midfielder at point $(4,-2)$.The football club has a total of 40 players. 28 of the players can defend, 14 can attackwhile2oftheplayerscanneitherattacknordefend.Aplayerwhocanbothdefend and attack receives a weekly bonus

Task

a) Thefootballcoachwouldliketopresenthisnewstyletotheboardofdirectorsofthe club, help him to address this challenge.
b) Writeanequationthatrepresentsthepathoftheball
c) Howmanyplayersreceivetheweeklybonus?

Question7

Your school has planted trees in a rectangular pattern to beautifythe school compound. Thedesignoftheplantedtreesshowstree Aatpoint(3,5),TreeBatpoint $(-2,4)$, Tree C at point $(1,-1)$ and Tree D at point $(-3,-2)$. The school wants to create a walking paththatconnectsallthetreesinthemostefficientwaypossibleandastraightroadthat passes diagonally from a tree at one corner to the tree in the other corner.

Task

a) Usingasuitablegraphshowthedesignoftheplantedtrees
b) Findthetotaldistanceofthewalkingpaththatconnectsallthefourtrees
c) Determinethelengthofthediagonalpathandwriteitsequation.

SECTION A

Answer **all** items in this section.

Item 1 *(20 scores)*

You decided to have a joint graduation party with your family members which will cost atotal of Uganda shilling four million. You are nearing a D-day and you want to find out whether you have enough required amount of money or not. And below are the contributions.

- your parents promised to contribute **30%** of the money.
- Your friends promised **10%** more than that your parents promised.
- And since you are the owner of the party, you contributed **20%** of the requiredamount.

When you went for shopping, you moved **6*km*** due East from your home and the **8*km*** dueSouth to reach the market, but the old man on the way told you that there is a shortest route you would use to reach the market directly to save time. And you made a booking of shillings, one million, seventy five thousand for all items required for the party.

Task

a) How far is it from your home to the market if you used the shortest route as the oldman told you?

b) Make a simple budget for the party according to the booking.

c) Do you have the required amount for the party? Justify.

d) How much would you remain with according to the budget?

e) What advise can you give the party organizing committee?

Item 2 *(20 scores)*

Your friend would like to continue with his studies at A-Level. But he is challenged with raising tuition of UGX 200,000. He is gifted with a skill of making jewelry craft. He has saved some money that can only help him buy glue and strings. So moves to different homes requesting for old calendars from which he makes jewelry. A necklace takes him an hour to make and sells a profit UGX 800. The pair of earrings takes him two hours to make but he gets a profit of UGX 2000. He likes to make a variety by making at least as many necklaces as pairs of earrings. He has approximately 40 hours per week for creatingjewelry. He also knows that the crafts vender wants sellers to have more than 20 items ondisplay at the training of the show, he likes to make a variety by making at least as many necklaces as pairs of earrings. Assuming he sells all his inventory. Help your friend to find:

Task

a) How many of each of the necklace and earrings he should make so as to make asmore profits as possible?

b) How much profit he makes a week?

c) How many weeks he requires to raise his tuition?

d) Which amounts will you choose to charge amongst the above and why choosethat?

SECTION B

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

Answer **one** item from this part

Item 3 *(20 scores)*

So as to boost the mathematics performance in your class, the head of mathematics department want to motivate learners but she wants to set a pass mark such that **most** ofthe learners are awarded the mathematics test was given and the following are the marksscored. It was noted that 60% of the students failed.

86	85	56	59	67	62	63	50	91	62
56	27	50	54	80	61	52	52	16	28
66	46	55	58	56	77	26	40	42	51
35	45	68	51	49	40	93	84	79	63
52	53	25	93	27	71	66	52	30	12

The motivates as shown in the table below.

On the day of the academic assemble, the class teacher went for shopping and he found out that it is possible to buy 5 counter books and 7 rulers at a total cost of 11,800 from thestaff stationary shop or 6 rulers and 8 counter books at a total cost 14,000 from the same the staff stationary shop. The teacher is interested in buying 5 counter books and five rulers.

Task:

a) Help the head of mathematics department determine the score to base on.

b) Assist the departmental head find the pass mark for the class.

c) help the head of department to determine the items.

Item 4 *(20 scores)*

The Ministry of Health in Uganda is conducting a survey about the existence of malaria in three districts: A, B and C. The ministry will then come up with control measures if thechance of a person testing positive having visited at least one of the districts is above 50%. The Ministry has intentionally selected a sample of people who visited the three districts and tested them for malaria. The test results have revealed that 50 people who visited district A, 60 people who visited district B and 40 people who visited district C tested positive for malaria. Additionally, 20 people who visited both districts A and B, 10people who visited districts A and C, and 15 people who visited districts B and C tested positive for malaria. The Ministry has also discovered that 20 people who only visited district C tested positive for malaria and 40 people who visited the three districts tested negative for malaria.

Task:

(a) Determine the number of people that were tested for malaria by the ministry ofhealth.

(b) Calculate the probability of a person testing positive having visited at least one ofthe three districts.

(c) Advise the Ministry of health, with a reason based on calculation, whether to comeup with control measures or not.

Part II

Answer **one** item from this part

Item 5 *(20 scores)*

In preparation for S.4 prom party, you were chosen by your fellow candidates to be a chairperson of organizing committee. You moved from school to Town **A** for shopping of party items which is *160km* north of your school. From town **A** you moved west wards *150km* to town **B**. from **B** you headed to town **C** in the direction **S75^{O}W** which is *90km* from B. from **C** you continued to town **D** which is *148km* and south of **B**. but after you discovered that there is the shortest route you could use to move directly from school to town **D**.

In the shopping, you bought 400 chicken and each cost UGX 35,000. The farmer gave you 2% discount on each chicken. You also bought two identical jerry cans of cooking oil. The larger being of height 30cm and smaller of 25cm. the larger has a capacity of 10liters and the smaller 5 litters. And you bought 4 smaller and 2 larger jerry cans.

Task

a) With relevant sketch and calculations, determine how far you would move if you usedthe shortest route.

b) Determine the total cost incurred in purchasing chicken.

c) What is the maximum amount of cooking oil you bought for the party?

Item 6 *(20 scores)*

The youths of a certain village have been playing football on Mr. Kizito‟s land. Of recent,Mr. Kizito has decided to cultivate his land to plant cassava and the youths are no longer having where to play football from. On reporting to the chairperson and the aspiring M.P of their area, the chairperson has promised them land that measures 60m by 120m and theaspiring M.P, a tractor to level this land into a football pitch. The youths are therefore to contribute for the fuel to be used by the tractor.

Support material

- The dimensions of the pitch should be 100m by 50m.
- Scale 1cm represents 10m
- The cost of fuel by liter is 5000/=
- The tractor uses 10 liters every after 30minutes.

Task:

(a) Help the youth leader of the village to:

(i) Design the given piece of land.

(ii) Determine the area of the proportion of land that remains after theconstruction of the football pitch.

(iii) Decide on what the remaining land should be used for

(b) If the tractor levels 100m^2 in one hour, how much money should be raised by the youth to level the ground.

END

Item 1:

A certain region in Uganda is facing a severe drought, and the local community is struggling to access clean water. The regional government office has decided to distribute water among the affected villages. A simple regional population census is carried out, and its discovered that Village X has a population of 1500 people, village Y has 2000 people, and village Z has 1200 people. The government has 9000 litres of water to distribute amongst the villages.

Task:

If the government wants to distribute the water in the ratio of 3:4:2 among the villages, how many litres of water will each village receive?

Item 2:

In a certain district in Uganda, the Red Cross Society discovered that the average monthly expenditure on food by a family consisted of two parts:

One-part constant and the other part varying as the square of the number of children in the family. It was noted that a family of three children needed Shs. 17000 while that of seven children needed Shs. 21000.

Task:

(a) Determine the expression for the total amount of money, C, spent per month on food by a family with n children

(b) Determine the monthly food bill for

(i) a childless family

(ii) a family with five children

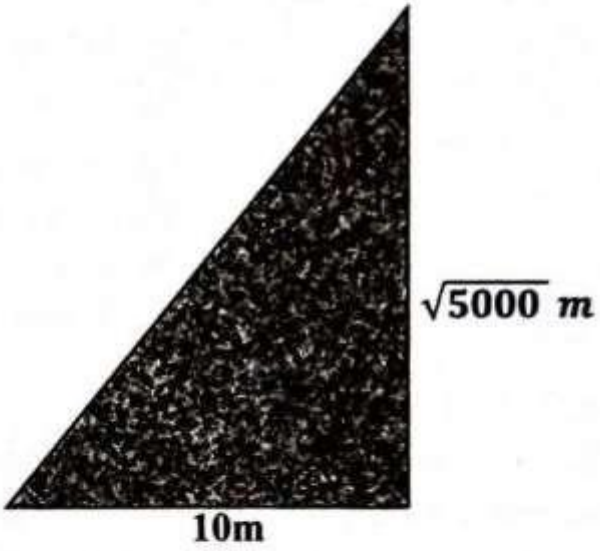
(c) A family with $(n-1)$ children is expecting another child. Help them determine the *extra cost of food*, per month, that will have to be met for the n^{th} child.

(d) Determine n such that the ratio of the average extra food cost per child in a family of n children is $\frac{5}{9}$ of the extra cost of food for the n^{th} child

Item 3

Juma has four plots of land in his village. He intends to give them out to his four sons, but unfortunately the plots do not relate in terms of size. Juma's close friend has accepted to give out an equivalent consolidated piece of land to enable Juma to distribute it to his children.

The surveyor's records indicate that there are 3 rectangular plots measuring $\sqrt{3200}\ m^2$, $\sqrt{1800}\ m^2$ *and* $\sqrt{9800}\ m^2$. The third plot has the structural map below.



Juma wants to reserve $\frac{1}{2}$ of the land for himself and distribute the remaining portion equally among his children.

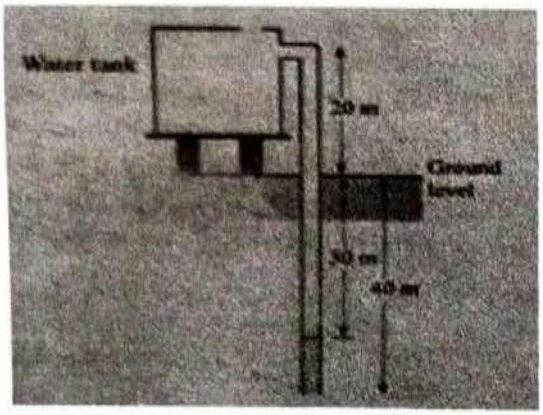
Task:

As a mathematician, help

a) Juma prepare a sharing plan for the piece of land.
b) Draw an abacus and illustrate this expression $4 \times 8^4 + 2\times 8^2 + 4\times 8^0$ on it.
c) Using the abacus only, work out the following;
   (i) $332_{six} + 25_{six}$
   (ii) $52_{eight} - 23_{eight}$

Item 4:

A school in a semi – arid region sunk a bore hole 40m deep. The water was to be pumped into an overhead tank whose top is 20m above the ground. The level of water in the pipe when pumping started was 30m below the ground and it rose by 5m every second as shown below.



Task:

Basing on your knowledge of integers,,

a) determine the vertical length of the pipe
b) Ignoring the horizontal distance travelled by the water, determine how long will it take for the water to start entering the tank.
c) State the height of the water levels at intervals of 2 seconds after the pumping started.
d) How long will it take for the water level to rise from $-30m$ to 10m above the ground?
e) If a hot water tap can fill a tank in 5 minutes while the cold water tap can fill the same tank in 3 minutes, the drain pipe can empty the full tank in $3\frac{3}{4}$ minutes. The two inlet taps and drain pipe are fully opened for $1\frac{1}{2}$ *hours* , after which the drain pipe is closed. Determine how much longer it will take to fill the tank.

Item 5:

In 2021, the total cost of manufacturing an article was Sh.1250 and this was divided between the cost of material, labour and transport in the ratio 8: 14: 3. In 2023 the cost of the material was doubled, labour cost increased by 30% and transport costs increased by 20%. Given that the cost of manufacturing the same article in 2024 was sh. 1981 as a result of increase in labour costs only.

Task:

a) determine the cost of manufacturing the article in 2023.
b) What would be the percentage increase in labour cost in 2024?

Item 6 :

Mr. Mukasa is a reknown shop keeper. He sells all kinds of grocery. Every Monday, he mixes two types of rice A and B in a ratio of 3 :2. Type A rice costs Shs. 6000 per kilogram and type B costs Shs. 5000 per kilogram.

He also has type A sugar that costs Shs. 5000 per kilogram and type B sugar costs Shs. 6000 per kilogram.

Mr. Mukasa supplies maize flour to three different neighboring schools all at once to cut down on the transport costs. He only does this when the bells of the schools are rung at the same time. Every Monday, Mr. Mukasa supplies these schools at exactly 8:00am. The schools have their time tables drafted following the following time intervals;

The first school has change of lesson interval every after 35 minutes

The second school has change of lesson interval every 40 minutes and

the third school has a change of lesson interval every 45 minutes

Task :

a) If you want to buy 23kg of the mixture, what would be the cost?
b) determine the ratio in which type A sugar will be mixed with type B sugar in order to produce a blend costing Shs. 5600.
c) If Mr. Mukasa's shop operates 24 hours throughout, determine the time in the week when the three bells will ring together again to have Mr. Mukasa' s supply

THEME 2 : **PATTERNS AND ALGEBRA**

⇒ Sequences and patterns
⇒ Equations of line and curves
⇒ Algebra 1 and 2
⇒ Mapping and relations
⇒ Inequalities and regions
⇒ Equation of a straight line

⇒ Rectangular Cartesian plane
⇒ Simultaneous equations
⇒ Linear programming
⇒ Loci

Item 8:

The Ministry of Health in Uganda is concerned about the spread of malaria in the country. They have collected data on the number of malaria cases in different districts, and the amount of insecticide used for mosquito control. the data is shown in the table below:

District	Malaria cases	Insecticide used in litres
Kampala	500	200
Mukono	300	150
Wakiso	400	180
Jinja	200	120
Mbale	350	160

Task:

(a)(i) Using the data above, create a relation between the number of malaria cases and the amount of insecticide used.

(ii) determine the function that models this relation

(b) Using the function in (a)(ii) above, determine how much insecticide should be used in a district with 600 malaria cases.

Item 9:

In a certain school the school fees were increased by Shs. 400000 per child. Because of this increase, 50 children left the school. Given that the total fees collection rose from Shs. 150,000,000 to Shs. 200,000,000.

Task: *You are the school bursar, and you've been tasked to*

(i) determine the number of children in the school

(ii) determine the school fees that each of the remaining children paid

(iii) give a logical conclusive statement from your observation and advise the school director accordingly.

Item 10:

A certain company has undertaken a contract to supply a customer with at least 260 units in total of products X and Y, during the next month. At least 50% of the total output must be units of X. The product are each made by two grades of labour, as follows:

	X	Y
Grade A labour	4	6
Grade B labour	4	2
Total	8	8

Although additional labour can be made available at short notice, the company wishes to make use of 1200 hours of Grade A labour and 800 hours of Grade B labour which has already been assigned to work on the contract next month. The total variable cost per unit is 120 Pound sterling and 100 Pound sterling for Y. The company wishes to minimize the expenditure on the contract next month.

Task:

Help the company determine how much of X and Y should be supplied in order to meet the terms of the contract.

ITEM 11:

An owner of a certain furniture company wishes to transport at least 600 desks from its stores to your school. The company has two types of trucks P and Q. Truck P can carry 50 desks at a cost of Sh. 40,000 per trip. Truck Q can carry 75 desks at a cost of Shs. 50,000 per trip. There is Shs. 600,000 available for transport. The number of trips made by truck P should not exceed 7. The number of trips made by truck Q should not exceed the number of trips made by truck P.

Task:

a). If x and y are the trips made by P and Q respectively, write down four inequalities satisfying the given conditions.

b). On the same axes, draw the graphs of the inequalities and shade the unwanted regions.

c). Using your graph to determine the number of trips each truck should make so as to minimize the transport cost. Hence, find the amount of

Item 12

A certain organization used lorries for transportation of building materials during the month of March and April 2024. The same amounts of diesel and oil were used. The amount of money spent on fuel are in the table below;

Month	Price of diesel per litre (Ushs.)	Price of oil per litre (Ushs.)	Total cost of fuel (Ushs.)
March	2500	5000	800,000
April	3000	8000	1,200,000

Taking x and y to represent the number of litres for diesel and oil respectively.

Task:

i. Write the matrix equation to show the cost of the purchase.

ii. Solve the equation to determine the number of litres used on both diesel and oil.

Item 13 :

In designing wedding deco box handler, a rectangular sheet of metal 8m long and 6m wide is used. Equal squares of side $x\,m$ are cut from the corners of the sheet. The remainder is bent to form an open rectangular box. The volume , $y\,m^3$ of the box is given by $y = 4x(4-x)(3-x)$

The table below shows how the cut sides correspond to the volume of the box.

$x\,(m)$	0	0.25	0.5	0.75	1.0	1.25	1.5	2.0	2.5
$y(m^3)$		10.3	17.5	21.9		24.1	22.5		7.5

Task:

a) Using the information given, you are required to copy and complete the table, and draw a graphical representation of the curve $y = 4x(4-x)(3-x)$ by using a scale of 2: 0.5 on the x – axis, and 1:5 on the y – axis.

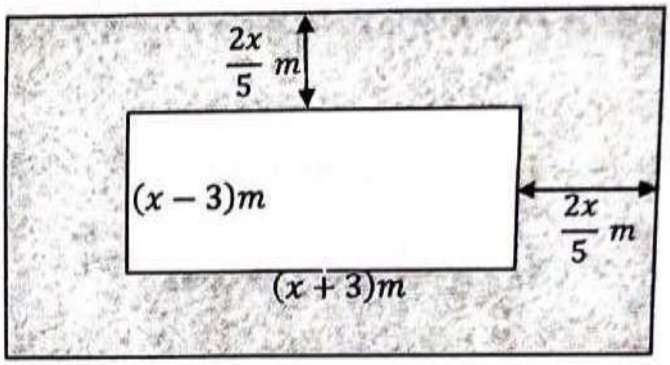
b) Using your graph, find the

(i) two possible values for the depth of box when its volume is 15 m^3

(ii)greatest possible volume of the box.

Item 14 :

Your school has organized a S.4 candidates' prom party. In order to have a good prom party, the floor of the dancing hall is designed with a carpeted margin all-around of $\frac{2x}{5}$ m wide leaving a dancing space of $(x-3)m$ *by* $(x+3)m$ as shown below.



Task: *You are required to compute the following, and hand your calculations to your class teacher.*

a) If the total area of the entire room is $315m^2$, calculate the value of x.

b) Determine the area of the carpeted margin.

c) If the carpet cost shs. 25000 per m^2. Calculate the total cost of the sealed margin.

Item 15 :

In a certain district, a plot of land has been designated for construction of a health facility to help the citizen access medical treatment. The plot is in the form of a trapezium with sides AB =74m, BC =48m, CD =56m, Angle ABC =81 ° and AB parallel to DC.

Task: As a mathematics learner, work out the following;

a) Using a scale 1cm to 10m, **construct** the plan of the plot.
b) On the plan **construct** locus L_1, of points equidistant from sides AB and AD and locus L_2 of points equidistant from sides DC and DA
c) If L_1 and L_2 meet at M, a TV mast, **locate** M
d) **Shade** the region inside the plot where trees can be planted such that they are at least 25m away from the mast.

Item 16 :

In a scientific investigation, the variables x *and* y are known to satify a law of the form $y = kt^x$ *where* k *and* t *are constants.* The data collected from an experiment was recorded as in the table below .

x	1	2	2.5	3	4
y	9.6	19.2	27.1	45.4	76.8

Task:

a) obtain a linear equation connecting x *and* y.
b) Suppose one of the recorded values of y is wrong, draw a suitable graph and identify the wrong value of y.
c) Use your graph to estimate the values of k and t.

Item 17:

In Term 2 , a certain S.3 student from one of the streams at his school picked a piece of paper bearing the following information.

A straight road L_1 has a slope $-\frac{1}{2}$ and passes through a point P(−1 , 3).
Another straight road L_2 passes through two points Q(1 , −3) and $R(4,5)$.

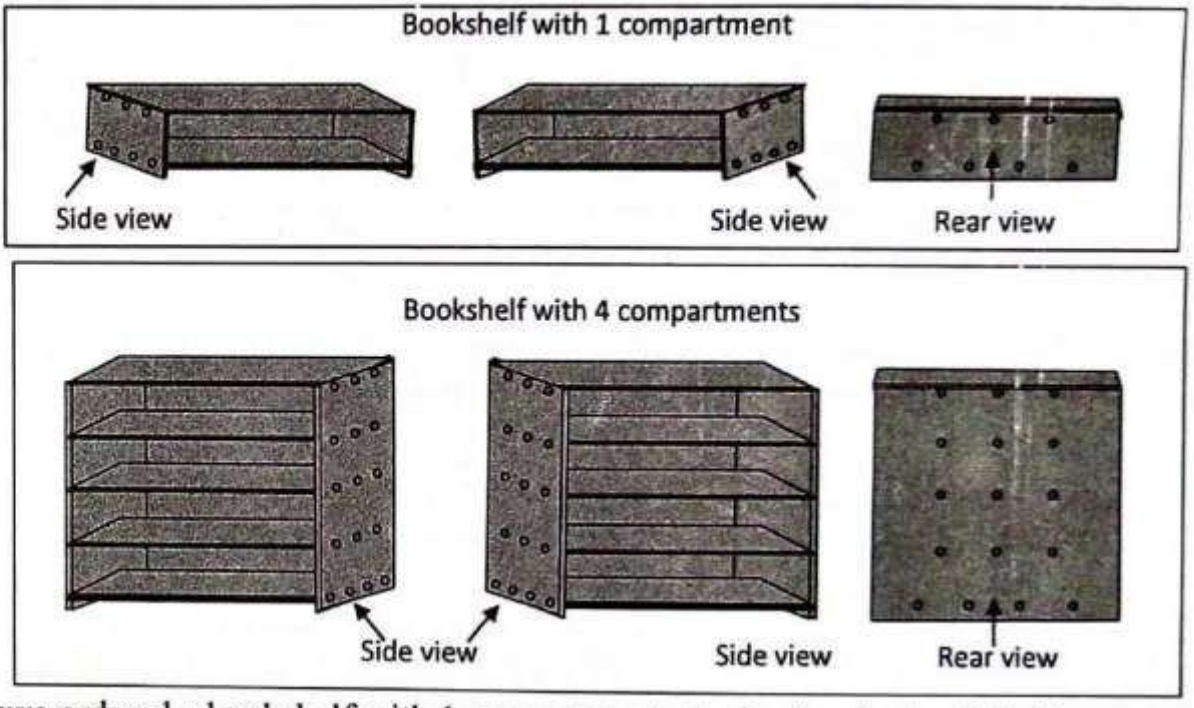
(a) The equation of road L_1 is
(b) Road L_2 has an equation given by
(c) The two road cross each other at the point
(d) The equation of another straight road that passes through R and is parallel to L_1 is given by
(e) The equation of another straight road that passes through point S (0 , 5) and is perpendicular to L_2 is given by

The student discovered that their stream had not yet covered the that learning area in mathematics, and his stream Mathematics teacher wasn't available to guide him.

Task: You are one of the students from the stream that had covered that area, and you had actually achieved all the learning out comes. By showing your working help the student to determine all the missing information.

Item 18:

Mbeiza is a carpenter. She specializes in making bookshelves with different numbers of compartments. She uses 12 nails for the base of a bookshelf, and 9 more nails for each compartment in the bookshelf.



Waiswa ordered a bookshelf with 1 compartment, Ami ordered a bookshelf with 2 compartments, Kidha ordered a bookshelf with 3 compartments and Moesha ordered a bookshelf with 4 compartments.

Task:

a) Complete the table to show the number of nails that Mbeiza used to make each of the four bookshelves.

Number of compartments	**1**	**2**	**3**	**4**
Number of nails				

b) Mbeiza realised a pattern in the number of nails she used to make the bookshelves with 1, 2, 3 and 4 compartments.

(i) Write two numbers to complete this algebraic expression to show the number of nails (y) that Mbeiza needs to make a bookshelf with p compartments.

$\_\_\_\_ + p(\_\_\_\_) = y$

(ii) What does the first number in the algebraic expression represent?

(iii) What does the second number in the algebraic expression represent?

c) Mbeiza received a new order, for 4 bookshelves with 6 compartments. She has to buy nails. Nails are sold in kilograms. In a kilogram there are 32 nails. Each kilogram costs UGX 5,000. Determine how much Mbeiza paid for the nails for the new order.

❖ Data collection and presentation
❖ Graphs
❖ Set theory
❖ Data collection and display
❖ Matrices
❖ Probability

Item 19:

The Director of studies of a certain school needs to improve the performance of the Physics department of his school. He can either add another teacher, 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 year which was 50. He then instructs the Physics department to give an assessment test. These were the student's marks.

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

He also visited the library and found out that the previous year's candidates had used three books for their revision, and these were Fielder (F), Broom Brock (B) or Vermont (V). From the librarian's records it is clear that all the candidates who did not use any of the books failed the subject greatly. Out of the **35** candidates this year **13** used F, **20** used B and **17** used V. **9** used F and V, **3** used F and B while **8** used B and V only. The records show that an unknown number of candidates used

all the three books. He observed that he should replace one book type of the three with Lion Hunt publisher since no student read it only alone.

Task:

(a) (i) Help the Director of studies 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.

(c) If the Director of studies intends to purchase more books to be used in the school library; He uses two stationery shops A and B and intends to purchase as shown below;

Option 1 : 3 copies of Fielder publishers, 12 of Broom Brock publishers and 15 of Lion Hunt publishers

Option 2 : 10 copies of Fielder publishers, 5 of Broom Brock publishers and 20 of Lion Hunt publishers.

He discovers that at shop A each copy of Fielder, Broom Brock and Lion Hunt would cost Shs. 20,000, Shs. 22,000 and Shs. 15000 respectively. And at shop be Lion Hunt would cost Shs. 20000, Fielder costs Shs 18000 and Broom Brock would cost Shs. 17000.

Given that the school has only Shs. 550000 to spend, use your knowledge of matrices to advise your school Director of studies on the right shop to purchase from, and the quantities to be purchased.

Item 20 :

The caterer of a school located in Makai division -Kana city is required to buy food stuffs for a school party. The foodstuffs to be bought include: 100 kg of rice, 150kg of meat and 200kg of Irish potatoes. The cost is UGX 3500, UGX15,000, and UGX1500 per kg of rice, meat and Irish potatoes respectively in Maaro farmers' market. The same items cost UGX. 3000, UGX. 12,000 and UGX. 1,100 per kg of rice, meat and Irish potatoes respectively, in Kaleewa farmers' market. To hire a pick-up from Maaro farmers' market to school costs UGX 60,000 while a pick-up hire from Kaleewa farmers' market is UGX95,000.

Task:

(a) What would be the easiest way to display the information provided above?

(b) Using the information provided above, how would the caterer decide on where to do the shopping from? Justify your answer.

Item 21:

In order to improve on the livelihood among the community, the government has embarked on distribution of improved seeds to boost the yield of agricultural product in a certain **sub**-county which has 4 wards. The wards are W, X, Y and Z. Basing on the size of land in each ward, for every 100 packets of seed, ward **W** gets 40 packets, ward **X** gets 10 packets, ward **Y** gets 30 packets and ward **Z** gets 20 packets. The government has procured 45,000 packets which are to be shared equitably according to the community.

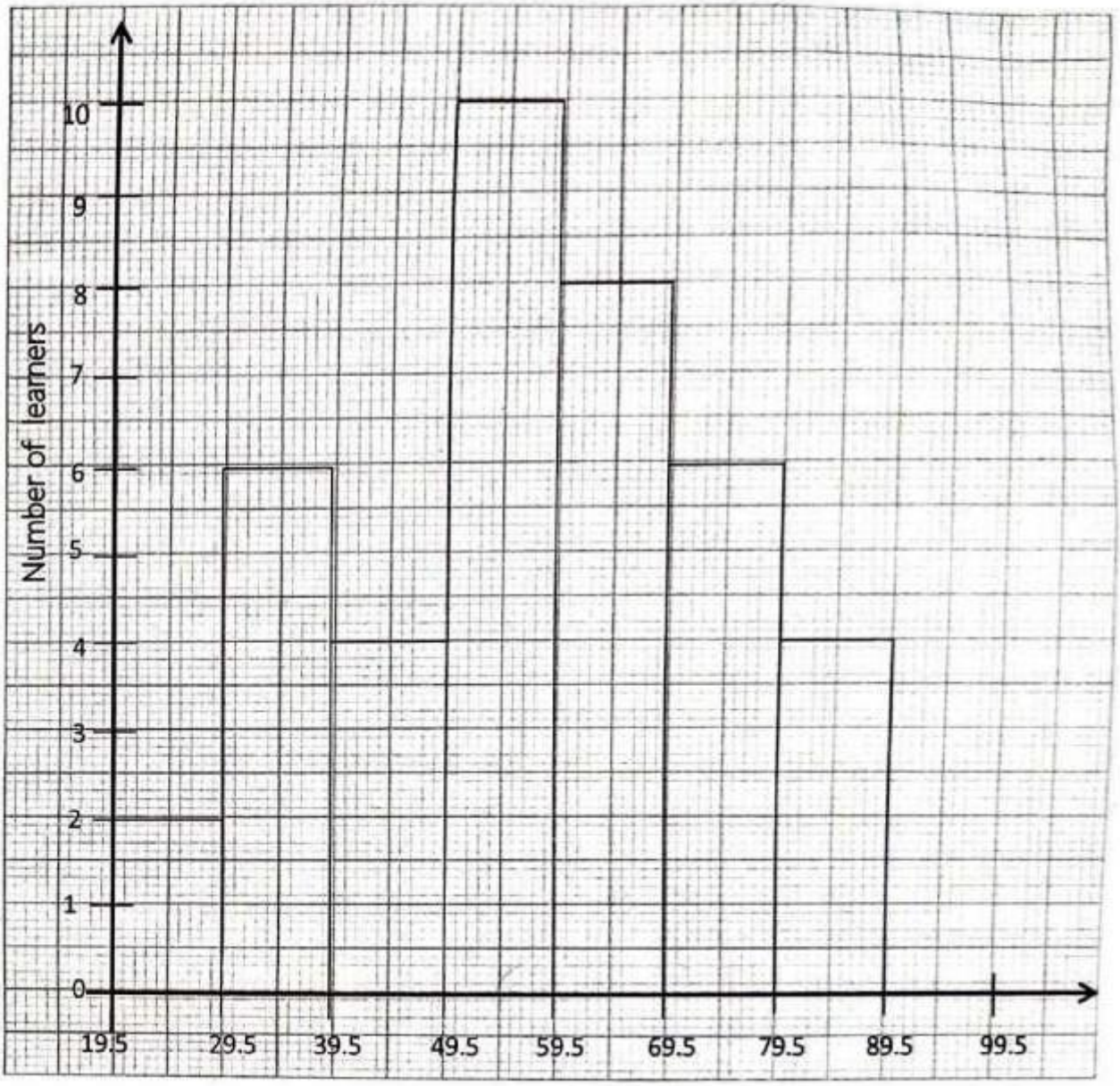
Task:

a) By using a statistical graph, help the local leaders to distribute these seeds to the community in wards.

b) Basing on your observation, how best would you advise the government in terms of distribution.

Item 22:

A certain mathematics teacher assessed his learners in some learning areas to really discover whether his learner were achieving the learning outcomes. In his analysis, he decided to present the results graphically as shown below.



Task: Help your teacher to ;

(a) determine the;
(i) number of learners
(ii) dominant class
(iii) Class width

(b) Use the graphical representation above, to construct a table and hence find the
i. average mark

ii. peak mark
iii. middle class.

(c) Construct a curving graph for the given data and use it to
i. estimate the central value and semi- interquartile range
ii. If a learner has to achieve an identifier of 2.4 in order to be considered to have achieved the learning outcomes, and that the teacher is set to re do the learning areas if at least 60 % of his class scores below the indicated identifier, otherwise, he proceeds to another learning area by analyzing the graph, draw a suitable conclusion on what should be done

(d) Candidates in a Mathematics (456) examination are required to answer 10 questions from section A and 5 questions from section B for full marks. Five candidates A, B, C, D, and E answered questions as follows.

Candidate	Section A	Section B
P	05	04
Q	07	03
R	04	04
S	09	04
T	08	02

The mark awarded are 4 for each question of section A and 12 for each question of section B.
Write down a:
i. 5 x 2 matrix for questions answered
ii. 2 x1 matrix for marks awarded
iii. Determine the mark for each candidate scored in the Mathematics (456) examination.

Item 23:
Research was made in a certain school to discover the number of science teachers who teach Physics(P), Chemistry(C), and Mathematics(M). The research findings summarized that; $n(P)=13$, $n(M)=16$, $n(\varepsilon)=25$, $n(C)$ 15, $n(P \cap C)= 9$, $n(P \cap M \cap C^{I})=3$, $n(M \cap C)= 11$, $n(M \cap C \cap P^{I})=3n(M \cap C^{I} \cap P^{I})$.
Task: *As a mathematics learner, help your head teacher understand all about the research* **made** *by* ;

(a) Showing the given information on a Venn diagram and using it to find the number of teachers who teach;
(i) All the three subjects

(ii) None of the subjects

(b) Given that a teacher is picked at random, what is the probability that he/she teaches at least one subject?

PART II

THEME 4 : **GEOMETRY AND MEASUREMENTS**

➢ Geometrical construction
➢ Bearings
➢ General and angle properties of geometric figures
➢ Reflection
➢ Business arithmetic
➢ Time and tables
➢ Similarities and enlargement
➢ Circle
➢ Rotation
➢ Length and area properties of two dimensional geometrical figures
➢ Nets, areas and volumes of solids
➢ Trigonometry 1 and 2
➢ Vectors
➢ Business mathematics
➢ Matrix transformation
➢ Circle properties
➢ Lines and planes in three dimensions

Item 24 :

Maria is a landscape designer who wants to create a triangular-shaped garden bed in a park. She wants to inscribe a circle within the triangle and plant a tree at the center of the circle. The park authorities have given her a rectangular plot of land with dimensions 15 meters by 20 meters. Maria wants to use the entire plot to create the triangular garden bed.

Task:

(a) Construct a triangle using the entire rectangular plot (15m x 20m) as the

base and height.

(b) Inscribe a circle within the triangle, touching all three sides and determine the radius of the inscribed circle.

(c) Find the distance from the center of the circle (where the tree will be planted) to each vertex of the triangle.

Item 25:

Recently, Mr. Elau discovered that he needed to keep track of all expenses on utilities at his home. He normally pays for water, electricity, Netflix, and Garbage collection. He asks UMEME to send him a voucher showing his electricity bill for the months of December 2023 to May 2024. The table below shows Mr. Elau's electricity bill sent as required.

Meter readings		End of Month	Units	Charges (Shs.)	
Previous	Present	December 2023		Due	Credited
Bal. B/F				16998.25	12403.25
60057	60722	January 2024	665	5320.00	5000.00
CTL				532.00	
60722	62885	May 2024	2163	17304.00	19500.00
CTL				1730.40	

- CTL - Commercial Transactions Levy
- B/F - Balance carried forward

Task:

Upon receiving the bill, Mr. Elau fails to understand it, and asks you to help him

(a)find

(i) the total amount due at the beginning of June 2024

(ii) the percentage used to compute the CTL

(iii) his average monthly consumption of power in terms of units of electricity using the months of January, February, March, April and May.

(b) Represent this consumption in terms of money payable, including the CTL.

Item 26:

You have a cylindrical tank whose capacity is $30000m^3$ at your home. During holidays, your father decides to paint the tank since its colour has faded due to the effects of weather. It is also known that the diameter of the tank is 10% smaller than its height, and that the outer surface (top and curved surface) should be painted.

Your father sends you to a nearby hardware shop to purchase the tins of paint required. You discover that every 5litres tin of paint costs Shs. 40,000 and can paint $60m^2$ of the surface.

Task:
As a mathematician, advise your father on the cost of paint needed for the repair of the tank.

Item 27:
One night, two prisoners escaped from the prison cell while the ground night guards were asleep. A guard at the top of the tower of height 78m saw the two prisoners approaching the exit gate due East of him. The angles of depression of the prisoners are 12^0 *and* 19^0. He quickly picked his phone to call and alert the guards at the exit gate to be on standby. The prisoners were running at a distance from each other and the prisoner ahead was about 20m away from the exit gate. The guards at the exit gate were alerted that in 2 minutes, one prisoner would be reaching the exit gate. They wanted to know in how many minutes the second prisoner would arrive so that they take cover.
Assuming both running at the same speed.

Task:
You are one of the guards. Help the other guards to ascertain the
(a) distance between the prisoners
(b) how many minutes it took the second prisoner to reach the exit gate.

Item 28:
Sarah bought a 4-inch mattress. She then went to John, a tailor, to buy a cloth for a cover to fit the mattress exactly. John sold her $4.6m^2$ of a cloth which he advised was exactly enough to cover the mattress quickly. John noted that the length of the cloth was twice its width, and that one inch was approximately 2.5m. Sarah paid for the mattress and cover cloth in Uganda Shillings, where the mattress cost Shs. 252500, and the cloth cover cost Shs. 36500.
Being a business woman, Sarah decided to sell the mattress by setting two options, where the cash price of a mattress is Shs. **350,000**, while Its hire purchase price is **12%** higher than the cash price. A buyer pays **10** monthly installments of ***shs.*** **24,000** each after paying a deposit.

Task:

Supposing you are a business analyst, help Sarah to;

a) determine the actual dimensions of the cloth.

b) Calculate in pound sterling

(i) The price of the mattress

(ii) the total cost of the mattress and its cover,

(1US dollar is equivalent to Shs. 3500, and that 1-pound sterling = 1.8 US dollar)

c) (i) the amount paid as a deposit by a certain customer who decides to buy the mattress by hire purchase rather than cash,

(ii) the savings the customer would make had he bought the mattress with cash rather than on installments

(iii) Sarah's percentage profit if the mattress is bought through hire purchase.

Item 29:

Your neighbor wants to sell a tree in his compound to a furniture making factory owner, who negotiates prices depending on the tree's height. For every 10m of the desired tree, the factory owner pays Shs. 50,000.

Being that the tree is very tall, your neighbor cannot easily ascertain its height so that he can determine how much he will earn when he accepts to sell it.

From the top of his house, the angle of elevation of the tree top is 34^0 and the angle of depression of its foot is 62^0. The tree is found to be 250m from the base of his house.

Task:

As a mathematician,

a) come up with a diagram that will help to determine the height of the tree.

b) help your neighbor to know the height of the tree by calculation.

c) Determine how much your neighbor should expect from the factory owner.

Item 30:

Mr. Walakira owns a construction company. He has been contracted to drain a swamp and have it prepared for rice planting project. He discovers that the swamp containing $4158m^3$ of water can easily be drained by a pump.

The pump is to be connected to a cylindrical pipe of diameter 7 cm, and can be operated for 8 hours per day. The rate at which the water flows out of the pipe is 1.5 metres per second.

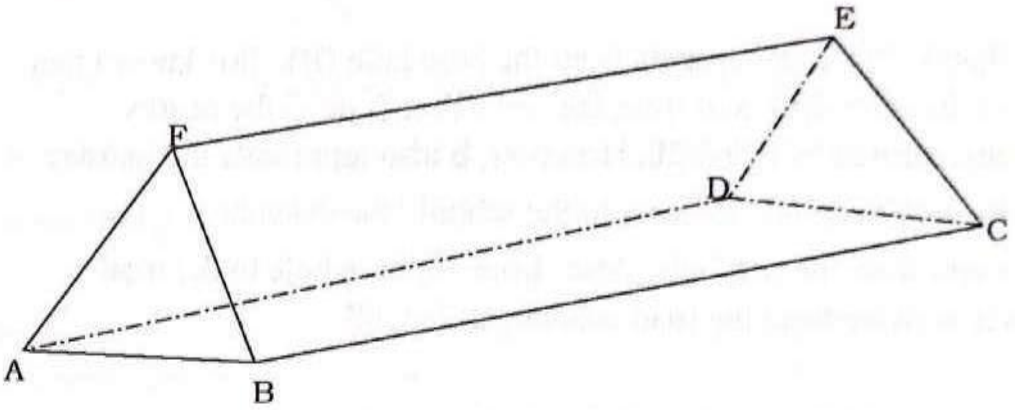
Given that the cost of hiring the pump is Shs. 12000 per day excluding the cost of diesel. The pump can consume 10 litres of diesel per hour, and the cost of diesel is Shs. 4700 per litre.

Task: *Mr. Walakira has hired you as a mathematician to help him determine the following*

a) the number of days it takes to drain the swamp
b) the total cost of draining the swamp.

Item 31:

The structure of the roof for the new dormitory at your school is as shown below.

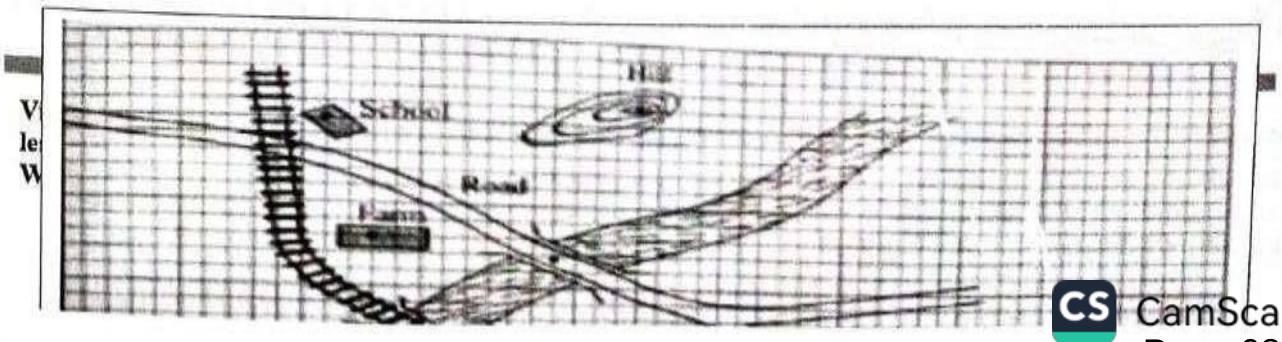


Given that the dimensions AB = 5m, $\overline{AF} = \overline{BF} = 3m$ *and* $\overline{BC} = 12.5m$.

Task: *You have been task to help determine to one decimal place the;*

a) total surface area of the roof.
b) volume occupied by the roof.
c) angle between the planes BCEF and ABCD
d) Basing on your calculations, what advice would you give the builders of the roof.

Item 32:



The picture above shows your usual errands from the bore hole (B). It is known that from the bore hole to the school(S), and from the same bore hole to the nearby hospital(H) can be represented by **a** and 2**b**. However, **b** also represents the journey from the school to the hill(T). From the farm to the school , the distance is $\frac{1}{3}$ the journey along that route from the borehole. Also, from the bore hole to the road crossing (R) the river is twice from the road crossing to the hill.

Task:

a) using your knowledge of vectors, draw a mathematical diagram from the picture and description given to you.

b) In terms of **a** and **b**, how would you present;

i. **BT**

ii. **TR**

iii. **SR**

iv. **SH**

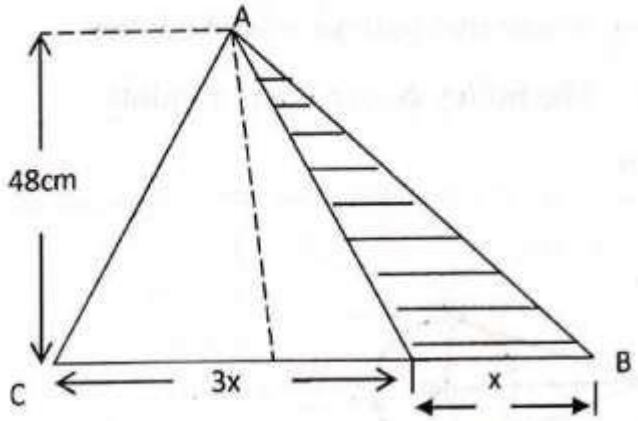
c) "S, R and H are such that they are all in a straight line", using vectors show that the statement is true.

d) Given that $\mathbf{a} = \begin{pmatrix}3\\5\end{pmatrix}$, $\mathbf{b} = \begin{pmatrix}1\\0\end{pmatrix}$ and $\mathbf{c} = \begin{pmatrix}11\\10\end{pmatrix}$ and that $\rho\boldsymbol{a} + \sigma\boldsymbol{b} = \boldsymbol{c}$, find the scalars ρ *and* σ hence determine $|\sigma\boldsymbol{a} - \rho\boldsymbol{b}|$

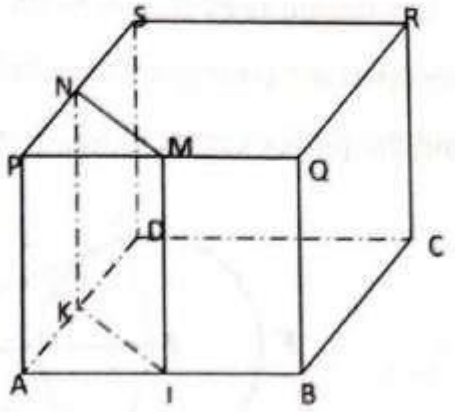
Item 33:

Your family intends to start up a poultry farm. Structure **I** below shows part of a roof for a chicken house. It is noted that the area of shape ABC is $1440cm^2$.

I



II



Structure **II** shows a cuboidal shape of the building with sides $AP = 10\ cm, AB = 20cm$ and $BC = 8\ cm$. The points K, L, M and N are the midpoints of AD, AB, PQ and PS respectively.

Task:

a) Determine the

(i) area of the painted region in structure **I**.

(ii) A standard corrugated iron sheet is to be used to shelter the shaded region. if the iron sheet covers approximately $51.4cm^2$. determine how nay iron sheets are needed, and work out the amount required if each iron sheet costs shs. 45000.

b) In Building structure **II** , determine the length $|KL|$

c) What is the angle between the faces?

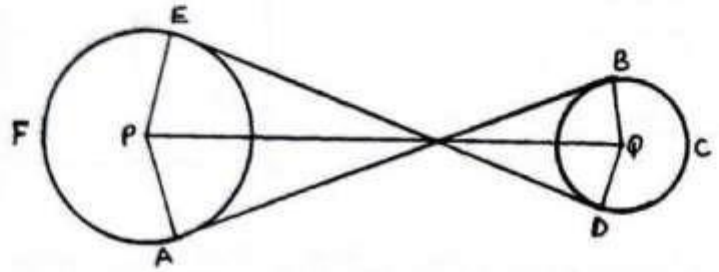
(i) $ABQP$ and the plane $KLMN$.

(ii) BDR and the base ABCD

d) if Point O is the point of intersection of the diagonals AC andBD. Find $|RO|$.

ITEM 34:

A mechanical engineering student in one university wants to design a belt runner system. His design is as shown in the figure below where two pulleys whose centres are 30cm apart are connected by a belt ABCDEF. The pulley centre P has a radius 13cm and the pulley centre Q has a radius of 4cm.



Task: *Suppose you are interested in discovering more about the design, by carrying out some calculations*, work out the;

(a) length AB
(b) reflex angles EPA and BQD.
(c) arc length AFE and BCD.
(d) total length of the belt.

Item 35:
During inter- house Games & Sports competition, a trader brought the following items to sell to parents and learners in a tent.

ITEM	UNIT AMOUNT (Shs.)
Samosa	500
Cassava	200
Bottled water	1000
Chapatti	1000
G.nuts	500

The trader stocks as follows and wants his capital back in one day plus some profits in queue to raise fees for his son.

ITEM	UNIT COST (Shs.)	Quantity
Samosa	1000	1700

Cassava	900	900
Bottled water	2000	2000
chapatti	700	700
G.nuts	500	500

At the end of the day, the sales records are as follows;

ITEM	Quantity sold (Shs.)
Samosa	1312
Cassava	900
Bottled water	1349
chapatti	528
G.nuts	500

In the evening, the trader wants to know if he made a loss or profit but he is not good at mathematics.

Task:

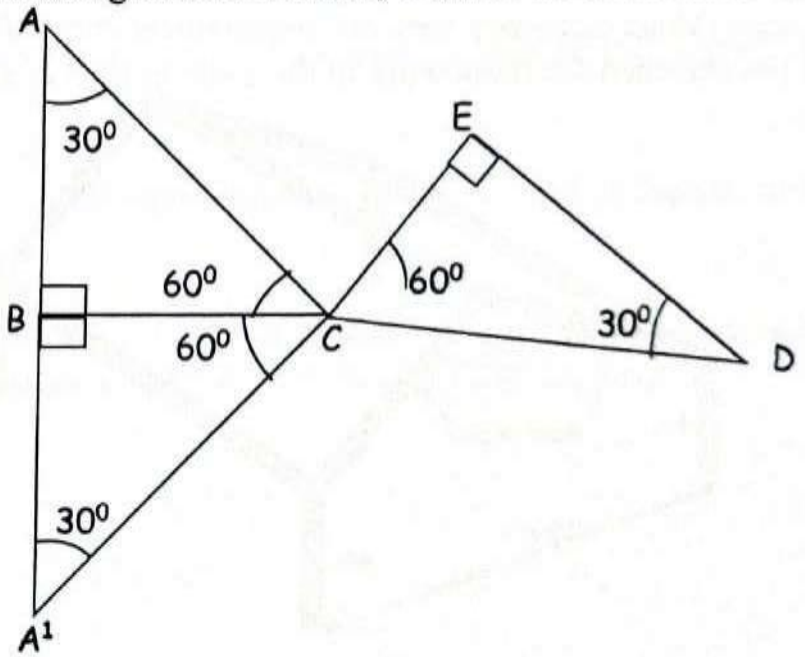
***Help the trader to calculate the*;**

a) profit or loss for each item

b) Total profit or loss for the day's sales, hence express the total profit or total loss of the day's capital as a percentage.

Item 36:

Below is triangle ABC whose interior angles are 30^0, 90^0 and 60^0 respectively. Triangle DEC is congruent to triangle ABC. Point B, C and D lie on the same line.



Task:

(a) Which point would help you be able to map triangle ABC onto triangle DEC?
(b) What special geometrical name is given to that point identified in (a)
(c) How many degrees does triangle ABC have to undergo in order to fit onto triangle DEC?
(d) Describe the transformation that would completely map triangle ABC onto triangle DEC.
(e) What geometrical name would you use to describe line BC in relation to triangles ABC and A^{1}BC?
(f) Describe fully the transformation that maps ABC onto A^{1}BC.

Item 37:

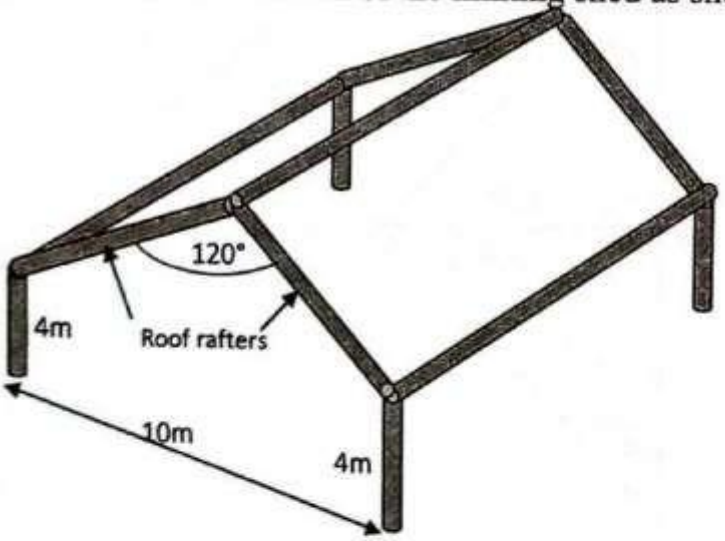
A regular pyramid with a square base, has a circle inscribed on the base of the pyramid. The edges of the square base of the pyramid are tangent to the circle. If the radius of the circle is 5cm, and each of the slant edges of the pyramid is 13cm;

Task: *As a mathematician,*

(a) Sketch a diagram represented by the information provided.
(b) Work out the height of the pyramid.
(c) determine the volume of the pyramid.
(d) Find the area of the part not covered by the circle on the base of the pyramid.

Item 38:

Labong a small-scale farmer stays in a very hot environment and wants to build a shed for his cows. He has sketched the framework of the milking shed as shown below.



Given that the walls are 10 metres apart and the top of the roof is halfway

between the walls. The sloping roof rafters meet at an angle of 120°.

Task:

(a) construct a scale drawing of the cross-section of the milking shed.

(b) What scale have you used?

(c) What is the length of the roof rafter?

(d) What is the angle of inclination of the roof?

(e) Sketch the same roof if the angle of inclination is more than what you obtained in (d) without changing the dimensions of the milking shed.

Item 39:

An insect walking on a piece of graph paper catches Musa's attention. He notices that it moves from coordinates A (2,0) to B (6,0) to C (6,4) and then to D (2,4). The polygon so formed from the insect's path is reflected in the mirror $y = -x$, to form the path image $A'B'C'D'$. Musa enjoys this outcome, and thus decides to rotate $A'B'C'D'$ through +90° about the origin to attain the final image $A''B''C''D''$.

Task: *As a mathematics learner,*

(a) Write down the matrices that would represent the: -
   (i) reflection
   (ii) rotation

(b) Using your knowledge of matrices, determine the coordinates of:
   (i) $A'B'C'D'$
   (ii) $A''B''C''D''$

(c) Draw a graphical representation of $ABCD$ and its images on the same graph.

(d) determine a single matrix of transformation which would directly make $ABCD$ appear as $A''B''C''D''$ and describe it fully.

Item 40:

Mukasa leaves town B at 1.06pm for village A riding non stop at a steady speed of 15kmh^{-1} and arrives in village A at 3.06 pm. Okot leaves village A at noon for town B. From town A Okot rides at a steady speed of 20km for 45 minutes. He then rests for 30 minutes and then continues with a steady speed of 15km/hr and reaches town B at 2.15 pm.

Task: You are tasked to analyse their journeys

(a) Represent Mukasa and Okot's motion on a distance time graph. (Use a scale of 1cm: 15minutes on the X-axis, 2cm: 5km on the y-axis)

(b) Use your graph to determine when the two cyclists passed each other and how far from B they were at this time.

(c) How far apart were the two cyclists at 2:00 pm?

Item 41.

A school was to buy a truck at a cost of sh180 million. The head teacher decided to go in for a 4 years' loan from a bank at an interest of 24% per annum, simple interest. The loan processing fee was 2% of the loan. The loan was to be paid termly of equal installments.

Task: *As a mathematician, you are required to determine;*

a) the interest to be paid in 4 years
b) the total amount to be paid on completion of the loan
c) amount to be paid termly
d) the percentage extra cost incurred by going in for a loan to buy the bus.

BONUS ITEMS:

Item 41.

Lubinga owns a taxi business, and mainly transport passengers from Kampala to Mukono and vice versa depending on where he is. One morning, he set off from Mukono on a bearing of 060^0 at a steady speed of 200 Km/hr for $1\frac{1}{2}$hrs to Kampala. Since there was traffic jam, he decided to change the course and travelled to Luzira on a bearing of 155^0 at an average speed of 720 Km/hr for 40 minutes;

Task: By using a scale of 1 cm to represent 50 km; draw an accurate diagram to show routes of the taxi,

a) From your diagram, find the;

(i) distance between Mukono and Luzira
(ii) bearing of Luzira from Mukono
(iii) time it will take to travel from Luzira to Mukono using the direct route at an average speed of 250 km/hr.

Item 42:

Ms. Aisha, an employee of Crown beverages earns a gross annual income of Shs. 8.4 million and the company offers a family allowance of only three children and the monthly allowances are spelt as follows;

- Medicine Shs. 30,000 per month
- Electricity Shs. 360,000 per annum
- Marriage is $\frac{1}{20^{th}}$ of the monthly gross income
- Rent Shs 120,000
- Insurance $\frac{1}{100^{th}}$ of the gross annual income
- Un married Shs. 10,000

Given that a child under 12 years of age is given shs.8,000, a child between fourteen and twenty inclusive is given Shs. 5,000, a child above 20 years but not exceeding 25 years is given Shs 4,000. Ms. Aisha is married with five children of whom three are aged less 10 years and others aged 14 and 26 respectively. The table below show the taxable income ranges with their respective rates (%);

Taxable income (Shs)	Rate
30,001 – 80,000	5
80,001 – 120,000	10.5
120,001 – 245,000	15.6
245,001 – 370,000	26.5
370,001 – 480, 000	34.6
480,001 – 640, 000	48.4
Above 640,000	45.5

Task:

You are the company accountant, how best would you determine

a) the taxable income and income tax paid by Aisha during the month of August.
b) the percentage of tax paid as his taxable income

c) the actual amount of money Ms. Aisha goes with.

d) Suppose Ms. Amina decides to purchase a Bluetooth player which depreciates at a rate of 20 % per annum. Three years later, she decided to sell it at a discount of 30% of the original cash price. If its valued at Shs. 80,000 after 3 years, how much did she get after three years.

Item 43

In a certain game, a player can only go to the next level after satisfying the current level. In this, the player is presented with three inverted cards each having a number 5,3,and 2 drawn and used to form a three digit number without repeating a digit. When the number formed is more than 400, the player goes to the next level in which he is presented with a box containing 6 Red and 5Blue identical marbles. He is required to pick a marble randomly, note its colour, and pick a second marble without replacement.

In order to go to the third level, the player must have picked marbles of the same colour. Given that on the third level he is presented with a coin and a die, he is required to toss the coin and throw a die. the final win only comes when a head shows and a prime number is obtained.

Task: ***You are tasked to compute the following accurately.***

a) determine the probability of going to level 2 of the game

b) What would be the probability of ;

(i) proceeding to the final level

(ii) obtaining marbles with different colours on level 2.

(iii) obtaining the second marble Red.

c) determine the chance of one player

(i) winning the entire competition

(ii) losing at level 2

ITEM 44

You are a heavy sleeper and without the aid of an alarm clock, you never wake up before 7:30 am. The probability then that you arrive punctually at school is $\frac{1}{5}$. If the alarm clock has been set the previous night, it rings at 7am, which gives you ample time, but the probability that it wakes you up is only $\frac{4}{5}$. You are also forgetful, and the probability that you remember to set the alarm is $\frac{1}{3}$.

Task: Calculate the probability that on any one morning,

a) you are awakened at 7am by the alarm clock
b) you forgot to set the alarm clock, but reached school punctually
c) you set the alarm, it fails to wake you up, yet you reach school punctually you are late for school.

ITEM 45

In one of the practical assessment scheduled to begin shortly, the laboratory attendant discovered that there are some chemical reagents missing, yet very crucial for the smooth running of the examination. The examination cannot start unless these reagents are available. Musiime is sent to quickly go and get them from a certain supplier in town Q. Musiime cycles as he leaves the school P, and takes 2 hours to reach town Q, 10km away. At Q, he rests for 30minutes and later returns to school P at a steady speed of $8kmh^{-1}$. When Musiime delays, Mwesigwa who happens to be at Q, is given a phone call to help pick the reagents and deliver them quickly. Mwesigwa leaves town Q at the same time as Musiime, towards town P, travelling at $2\frac{1}{2}kmh^{-1}$ but midway in his journey, Mwesigwa discovers that he had been given a package containing apparatus for a different subject. He thus decides to return back the package to the supplier. He returns back to Q at a steady speed of $4\ kmh^{-1}$.

Task:

Using a scale of 1cm to represent 15 minutes on the horizontal and 1cm to represent 0.5km on the vertical axes respectively,

a) draw distance - time graphs to represent the two different journeys of the men.
b) how far from town Q did the two men by pass each other on the return journey?
c) determine Mwesigwa's average speed for the whole journey if he travels nonstop.

END.

ITEMONE:

A certain member of your family re-wrote each digit of his 4-digit **ATM** card pin from numbersystemten(baseten)toanothernumbersystemlessthanfour.Hedidthisinfear oftheft.Nowheissick in thehospital,hecanneithertalk norwritebutthemoneyon his account is needed to finance hospital bills. Here is how he wrote the pin: 12 20 22

10.Assumingthatyouhavebeenabletoencryptthe**ATM** pinforthefamilyandfundsare availabletotakecareofhim.Thehospitalhasanursewhotakeschecksonhimafterevery 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) Whichnumbersystemdoyouthinkheusedtore-writethepinandwhy?

(ii) Usetheidentifiednumbersystemtohelpyourfamilymembersto regenerate the original pin.

(b) (i) Atwhattimedidwillboththenurseandmedicaldoctorcheckonhim again at the same time.

(c) Howmanyhoursofthedayinaweekdoeshehavespendonvisitingthe hospital.

ITEMTWO:

AproducewholesaledealerinKalerweFarmersMarkethasabroker whohasbeenhelping 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 Februarywhen he bought **700 bags**, the costof 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.Thepickupcantransport**18bags** whiletheIsuzuDianacantransport**30bags**. The number of bags to betransported mustexceed **120**.Each tripthe Pickup and Isuzu Diana makes cost **UGX240,000** and **UGX300,000** respectively yet he has allocated **UGX2,400,000**tocaterfortransport.

Thenumberoftripsmadebythepickupsshouldnotexceedthosemadebytheisuzu Diana by more than **2**.

TASKS:

(a) Determinethecostthewholesaledealerwillpayforthe **1200bags**.

(b) Helpthedearobtainhowmanytripseachvehiclewillmakeinorderto minimize the cost of transport.

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) andhehasinvitedalotofguests.Howeverduetthequarantinehecannotbuyanyanimals 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 $S75^{o}W$ which is **90km** from Kampala. From Kampala he heads to Kayunga which is **148km** and south of Mukono.

WhenhereachedKayungahebought**400**cowsandeachcosts**UGX850,000**percow.

Thefarmerandownerofthecowfirstgivesa**5**%discountoneachcowplusanadditional **10**%discountforanynumberofcowsboughtinexcessof **250**.

Inordertopackagetheyoghurt,heboughttwoidenticaltypesofbuckets.Asmallerbucket with a base radius of **30cm** and alarger 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 **45litres**andheistobuy**4**smallerbucketsand**2**largerbuckets.

TASKS.

(a) DirectthehonorableMPontheshortestrouteheshouldtakeandtheshortest distance between Mbarara and Kayunga.

(b) Findthetotalcostheincurredinpurchasingthecows.

(c) WhatisthemaximumamountofYoghurtbeboughtforhis guests.

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 exactlyin theplot of land available. He wants to know the actual cost of constructing the church. He also has to buy a Sino Truck to transportallbuildingmaterialsandrequirements.Thecontractorinformshimthatthearea of each triangle that can be formed from the hexagonal church will cost him **UGX128,000,000**.

He then proceeded to Nina Motors to buy the Sino truck. A brand new Sino Truck costs fourhundredeightymillionsoncash.Itcanalsobeboughtbypayingadepositofaquarter of the cash price value and either pay **UGX7.5 millions** weekly for **50 weeks** or pay **24.5millions** monthlyfor**15months**.Thepastordoesnothavetherequiredmoneyto obtain the Sino Truck on cash.

TASKS:

(a) Helpthepastordeterminethecostofthechurch.

(b) HowmuchextrawillhepayfortheSinoTruckandexplainwhy.*(25scores)*

ITEM FIVE:

A school head teacher isthinkingof how he canboostthe mathematicsdepartment ofyour 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 islowerthanthatofthepreviouswhichwas **47**. Heaskedthedepartmenttogiveatestand 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

Healsovisitedthelibraryandfoundoutthat theprevious‟scandidatesusedthreebooksfor there revision. Longhorn, Baroque or Maths Clinic. Fromthe 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 Cliniconly.Therecordsshowthat **2** used allthethreebooks.Heobservedthat heshouldreplaceonebooktypeofthethreewithFountainpublishersincenostudentread it only alone.

TASKS:

(a) (i) Helptheheadteachergroupthemarkstomakeaninformeddecision one the fate of the department and defend it.

(ii) Displaythestudentsmarksingroupsonasimplestatistics diagram.

(b) (i) Helptheheadteacheridentifythebookheshouldreplaceandexplain why?

(ii) Findtheprobabilitythatastudentselectedfromtheclass failed.

ITEMSIX:

Three schools from a Gayaza region want to participate in the National Schools Football SportsGalatobeheldinLyantondedistrictplayground.Unfortunatelynoneoftheschools 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 increased the speed gradually to $\mathbf{90}\boldsymbol{km/hr}$ reachingMpigiat$\mathbf{6}:\mathbf{45}\boldsymbol{am}$. Fromtherethebusdriver maintainedthissame speed for $\mathbf{2}\ \frac{\mathbf{1}}{\mathbf{4}}$ hours reaching Masaka. From Masaka the he reduced slowly in speed reachingLyantondeat $\mathbf{9}:\mathbf{30}\boldsymbol{am}$.Thegamesstartedat$\mathbf{10}:\mathbf{00}\boldsymbol{am}$sharpandeachteam playedsixgames.

School Awon**3** games,drew**2** andlost**1** game.School Bwon**4** games andlost**2** games. School C won **2** games and drew **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) Findhowmucheachschoolpaidforthebus.

(b) Decidethecashprizefor school.

ITEM SEVEN

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 $\mathbf{5}\boldsymbol{m}$yet on the other side he is to plant a tree every after $\mathbf{6}\boldsymbol{m}$. 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 againdirectlyopposite.His land has an areaof $\mathbf{500}\boldsymbol{m}^{\mathbf{2}}$.Heplanstouse $\mathbf{25}\%$ oftheland to plant maize, one fifth of the land for beans and $\mathbf{205}\boldsymbol{m}^{\mathbf{2}}$dor growing ground nuts.

Tasks:

(a) Helpthemandeterminehowmanytreeseedlingsheneedstobuytojust plantthis first phase.

(b) Determinein$\boldsymbol{m}^{\mathbf{2}}$thesizeoftheland tobeusedforgrowingmaize.

(c) Determinein$\boldsymbol{m}^{\mathbf{2}}$thesizeofthelandtobeusedforgrowingbeans.

(d) Expressthearea tobeusedforgrowinggroundnutsinstandardform.

(e) Doyouthinkhepartitionedtheentirelandproperly?Givearea reason.

ITEM EIGHT

Amathematician gaveyourfriend acarpenteratask ofmakingarectangularground floor of a rabbit house. The length of the house is to be $(\boldsymbol{x}+\mathbf{3})\boldsymbol{m}$ and the width is to $\boldsymbol{ym}$. Its perimeter should be $\mathbf{25}\boldsymbol{m}$ and its area msut be $\mathbf{25}\boldsymbol{m}^{\mathbf{2}}$. The mathematician adds that he needstheworktobefinishedinonedaybuthehasevercontracted $\mathbf{3}\boldsymbol{men}$ workingatthe

samerateand theyonlymanaged to workon $5m^2$.Tobegiven this contract,yourfriendis required to make a clear diagram showing the numerical sizes of the length and width but fails to do so and comes to you for help.

Tasks:

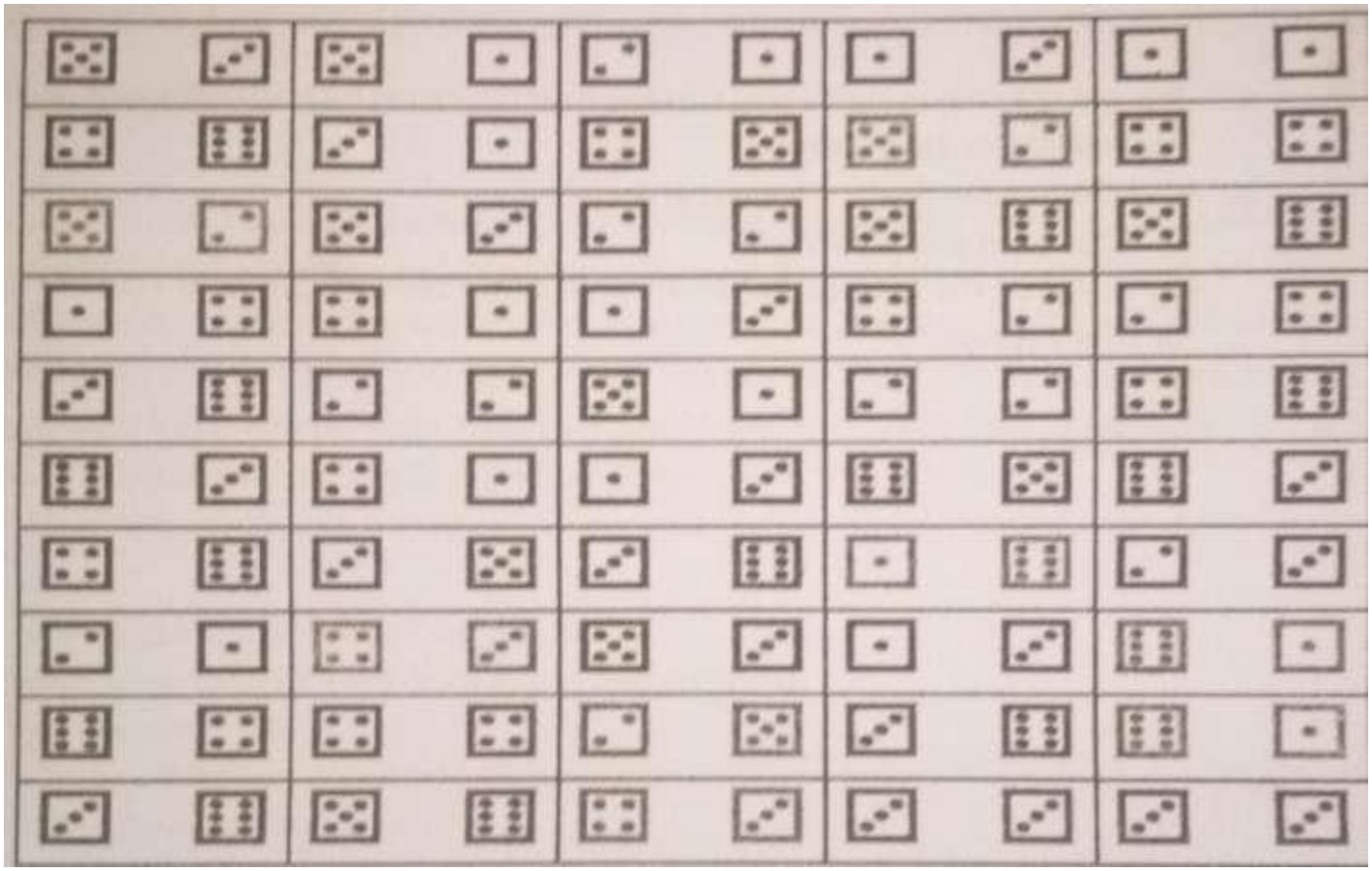
(a) (i) Determinethelengthandwidthofthefloortobeoccupiedbythe house.

(ii) Makeasketchoftheflooryourfriendcanpresenttothemathematiciantoget the contract.

(b) Determinethenumberofworkerswhoareneededtocompletethehouseiftheyall work at the same rate as the group the man has ever used.

ITEMNINE

A friend of yours wanted to participate in the National Ludo Champions competitions. During his practice, he rolled a die several times and kept on taking a picture of each occurrence.Heneedstofindoutwhetherhewillcompetefavorablybutheisunabletodo so. He gives you the diagram below showing his scores so that you can guide him.



Tasks:

(a) Usetheinformationaboveandclearlyshowhowtodeterminethescorewith the highest chance of occurring on top. Which score is it?

(b) Findtheprobabilitythatanoddnumberoccurredwhenthediewas rolled.

(c) Presenttheinformationoftheabovescoresonastatisticalgraph.

(d) Willyourfriendcompetefavorablyinthecompetitions?Giveareason.

ITEMTEN

Anorganizationwantstobuildaschoolinacertaincommunity.Belowwerethereasons they identified as to why children were not schooling.

A=schoolisboring. **B**=noschoolfees. **C**=wewant to work.

They carried out research on a sample of **50** children in that community to find out which reasonhasthehighestprobabilityamongsttheaboveandhencebaseonthattoeitherbuild the school or not. Children gave one reason, others gave two and the others gave three as shown below.

A	B,C	B	A,C	A	B,C	B	A,C	A,B,C	B
C,B	B	B,C	A,B,C	A,C	B	C	B	C	B
B	A,B,C	B,A	A	B	A	C,B	A,B	B,A	C
C	A,C	B,A	B	C,B	C	C	A	B	B,C
A,C	B	A	A	C	B,A	C	B	A	A,C

Tasks:

(a) Presentthedatainsuchawaythatthetotalresponsesforeachreasons**A**,**B**and **C**respectivelyareclearly shown

(b) (i) Whichreasonhasthehighest probability?

(ii) Whatisthe probability?

(iii) Basingonthevalueofprobabilityshouldtheybuildtheschoolornot? Give a reason for your answer.

ITEM ELEVEN

A carpenter is re-known for crafting traditional wooden doors with elaborate geometric patterns. The carpenter wishes to make a door with a circular design at its center. The carpenterneedstoensurethedesignfitsperfectlywithintherectangularframeofthedoor. The door frame available is rectangular with dimensions **2.5meters** in height and **1.5meters** inwidth.Thecirculardesignshouldbetouchingthetwoparallelsidesofthe door frame. Vanish is packed in tins of a litre and the cost of one litre of vanish is ***UGX*9,000**.Itisknownthatonelitreofvanishcanbeusedtopaintonesquare meter.

Tasks:

(a) (i) Helpthecarpenterdeterminehowmuchofthedoorwillbecoveredby the circular design so that it fits perfectly within the door frame.

(ii) Willonetinofvanishbeenoughfor thecirculardesign?Giveareason for your response.

(b) Withareason(s),helpthecarpenterdeterminehowmuchwillbespenttobuy vanish that will paint the entire front face of the door.

ITEM TWELVE

Youareanathleteandsooncompetingwithsomeone.Youwantedtotestyourchancesof winning the racebytesting yourspeed and time in relation tothat of your competitoryou started to run at **4:50pm**.Fromyour home where you started from, you ran a distanceof

5km north−westtoplace**P**,thenfrom**P**,youturnedsouthandran**4*km*** untilyouwereat place **Q** that is west of your home and then ran back and arrived at **5:12pm**. Your competitor ran the same distance during training at a speed of **10m/s**.

Tasks:

(a) Whatisthetotaldistancethatyouran?

(b) Whatisthetotaltimeyoutooktorunthatdistance?

(c) Howfastwereyou?

(d) (i) Doyouthinkyouwillwintheraceornot?

(ii) Whydoyouthinkthat way?

ITEM THIRTEEN:

A school head teacher isthinkingof how he can boostthe mathematicsdepartment ofyour 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 50 students islowerthanthatoftheprevious whichwas**64**.

Heaskedthedepartmenttogiveatestand the these were the student‟s marks.

86	30	26	64	87	47	49	26	43	25
45	38	44	56	59	52	76	27	89	46
90	57	73	48	58	89	51	32	56	88
66	62	52	67	69	68	49	92	66	95
54	74	32	39	35	36	69	50	71	92

Healsovisitedthelibraryandfoundoutthattheprevious‟scandidatesusedthreebooksfor there revision. Longhorn, Baroque or Maths Clinic. Fromthe librarian‟s records its is clear that all the candidates that did not use any book failed the subject greatly. Out of the **35** candidatesthisyear**13**usedLonghorn,**20**usedBaroqueand**17**usedMaths Clinic.

9 used Longhorn and Maths Clinic, **3** used Longhorn and Baroque while **8** used Baroque and Maths Cliniconly.Therecordsshowthat **2** used allthethreebooks.Heobservedthat heshouldreplaceonebooktypeofthethreewithFountainpublishersincenostudentread it only alone.

TASKS:

(a) (i) Helptheheadteachergroupthemarkstomakeaninformed decision one the fate of the department and defend it.

(ii) Displaythestudentsmarksingroupsonasimplestatistics diagram.

(b) (i) Helptheheadteacheridentifythebookheshouldreplaceand explain why?

(ii) Findtheprobabilitythatastudentselectedfromtheclass failed.

ITEM FOUTRTEEN

St. JULIAN is to transport its S. 4 students for fieldwork in Kasenyi.All the 400 students aretobetransportedusingeithercoastersorbuses.Eachcoastercancarry40peoplewhile eachbuscancarry80people.Thetransportdepartmentof theschoolhasonly8driverson duty and up to four coasters.If the cost of hiring a coaster is shs. 150,000 and that of hiring a bus is shs. 300,000.

While in Kasenyi their geography teacher Mr Kefa visited Mr Sembatya‟s shop fromwhichhefoundthat threeshirtsandtwotrouserscostshs.105,000atMr.Sembatya‟s shop. Two shirts and five trousers cost shs. 180,000 at the same shop;

Task:

(a) (i) Writedownthefiveinequalitiesrepresentingtheabove information.

(ii) Representtheinequalitiesonagraphpaper.

(iii) Find the possible number of coasters and buses that can be used and hence determine the minimum cost.

(b) Findthecost of;

(i) eachshirtandeachtrouser.

(ii) threeitemsofeachtypeatthe shop.

ITEM FIFTEEN:

Simon is the district inspector of schools in Butambala district found that his causal workersuseonethirdofhisfarmforbananas,onequarterforcoffeeandtwofifthofthe remainder for mixed farming.She still has some six acres of unused land.

Buddo S.S has a student population of 1200 students.On a particular day Simon invited theentirefora, $^{1}/_{5}$oftheboysand $^{1}/_{4}$ofthegirlswenttoWAKISSHAresourcecentre for a sports meeting.If 936 students were left behind.

ThepriceofSimon"shousewasvaluedat45millionshillings.Itincreasedby25%after the first year but in the second year, the value of the house depreciated by 10%.

Task:

(a) Findthesizeofhis farmandclearlyillustrateitonadiagram.

(b) Findhowmanymoreboysthangirlsattendedthemeeting.

(c) Findthevalueofherhouseattheendofthesecond(2^{nd})year.

ITEM SIXTEEN:

Kampala (K) and Arua (A) are about 450km apart.At 7:30 a.m, a bus starts from Arua and moves towards Kampala (K) at a steady speed of 100km/hr while a lorry starts from Kampala (K) an hour later moving at an average speed of 60km/hr to Arua (A).At 10.00 a.m, the busisstopped attown C bypoliceand ordered to reduce speed.After 30 minutes atC,itresumesitsjourneyatareducedaveragespeedof50km/hruntilitreachesKampala (K).

Task:

(a) Statethedifferenceintimewhenthetwovehiclesarriveattheirdestinations.

(b) DeterminewhenandatwhatdistancefromAruathetwovehicles meet.

(c) Findtheaveragespeedofthebus.

ITEM SEVENTEEN:

You are only two children in the family and the chairperson of your village has come to your home to register the details of you and your sibling. Unfortunately both parents are notaroundandyouhegivesthemacalltofindyourpresentages.Themotherinformshim that the two ages differ by 4. the father informs him that the sum of the squares of your ages is 136.

Your neighbor makes a rectangular flower bed by taking two meters off its length and adding three meters to its breadth. Byso doing, he increases the area by 20 square meters. Mosesis1.5mtall and standingontopofabuilding 34mtall.In astraight linefromwhere he is standing he can see a car and bicycle at angles of depressions of 50° and 65°respectively.

A magician on Easter day organized a presentation in your village to entertain the village. Hehadabadthat containsxredballsand(x -8)whiteballs.Iftheprobabilityofdrawinga redball is $\frac{2}{3}$.

Tasks:

(a) Helpthechairpersongettherightagesofyouandyoursibling.

(b) Whatisitsfinalareaoftheflowerbed?

(c) Howfaristhebicyclefromthecar?

(d) Findthenumberofballsinthebag.

ITEM EIGHTEEN

The cost of manufacturing Blue band in a factory is determined by the components milk x and flavor y**.**If the constraints for the production are$3y+2x\leq 15, 2x-3y\leq 5, x\geq 1andy\geq 0$. The factory has only chicken and goats. When the manager counted the heads of the stock inthe farm, the number totalledto200. When thenumber oflegs was counted, the number totalled to 540.

Task

(a) Giventhatthecostfunction fortheproductionofbluebandis $c=x+2y$findthe;

(i) Minimumcost

(ii) Maximumcost

(b) Howmanychickenswerethereonthefarm?

ITEM NINETEEN

Yourparentsareorganizingtocelebrateyour18th birthdayandwantottobeamemeorable one. They went to Akamwesi mall which has a CINEMAX and it has two tickets.

Ticketstoaplaycost9$dollars$ foradultsand5$dollars$ forchildren.Iftheshowsold180 tickets and earned 1380 dollars, George your brother has neen planning for this birthday for three weeks. He buys the followingitemsinthreeweeks.Weekonehebuys2packetsoftea,2tinsofmargarine, 3 kgof sugarand4 packetsof biscuits.

Week twohe buys2 tinsof margarine , 3 kg

of sugarand4 packetsof biscuits . Week three he buys2 packetof tea , 2 kgof sugar and 3packetsofbiscuits.Apacketofteacostsshs 1,000 ,atinofmargarinecostsshs 2,500,akilogrammeof sugarcostsshs 3,500and apacketofbiscuitscostsshs2000. Your parents then demarcated the land they are to use for the party and plan to demarcate

it.representedtheplotoflandheinheritedusingthefollowinginequalities.$40x+60y\geq 480$

…(i) $30{,}000x+45{,}000y<600{,}000$…(ii) $x\leq 12$…(iii) $y\geq 2x$…(iv)

Hewantstofenceitusingpoles(x)andbarbedwire(y)and thecostfunction isgiven by

$C=45000x+30{,}000y$

Task;

(a) howmanyofeachtypeofticketswere sold?

(b) Findhistotalexpenditureinthethreeweeks.

(c) findthemaximumcost.

ITEM TWENTY

Thelength ofarectangularplotofland exceedsthewidthby$7ft$ andits areais $60sq.ft$. Three business partners Wambusa, Aisha and Wekesa contributed Shs 300.000, 500.000

and 700.000 respectivelytostart abusiness.Theydecided that$\frac{1}{3}$oftheprofit wastobe ploughedbacktothebusiness,$\frac{1}{5}$oftheremainderwould bekept foremergencies andthe resttobesharedintheratiooftheircapitalcontributions.Inthatyeartheprofitrealized was one and a quarter times that of capital.

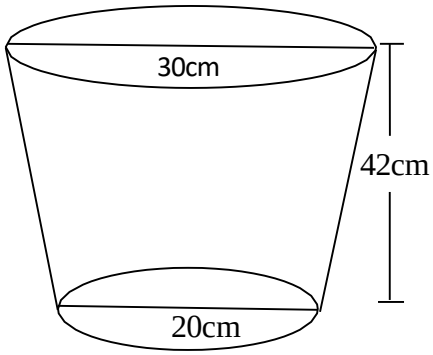
Task:

(a) Findthedimensionsoftherectangle

(b) Determinetheamountreceivedbyeachpartnerthat year.

ITEMTWENTYONE

A bucket is in shape of a frustrum with an open end of diameter 30cm and a bottom diameterof20cm.thebucketwhichis42cmdeepisusedtofillanemptycylindricaltank of diameter 1.8m and Height 1.2m



Takingπ=3.142.

Threehundredandsixtylitresofahomogeneouspaintismadebymixingthreepaints **A**,B and C. The ratio by amount of point **A** to point **B** is 3:2 and that of **B** to C is 1:2. Paint A costs shs 1800 per litre paint **B** costs shs 2400 per litre and paint C shs 1,275 per litre

Task:

(a) (i) Determinethecapacityofthebucketinlitrescorrectto3dp.

(ii) Thecapacityofthetankinlitrescorrectto2dp.

(iii) Thenumberofbucketthatmustbedrawntofillthe tank.

(b) (i) Theamountofeachpaintinthe mixture

(ii) Theamountofmoneyneedtomake1litreofthe mixture

(iii) Thepercentageprofitmadebysellingthemixtureatshs2,210perlitre.

ITEMTWENTYTWO

Thereareveryfewteacherswhohavethreeteachingsubjects.Asurveywasdoneinyour schoolanditwasfoundthattheschoolhasateachingstaffof22teachers8ofthemteach mathematics, 7 teach physics and 4 teach Chemistry. Three teach both mathematics and Physics and one teaches Mathematics and Chemistry. No teacher teaches all the three

subjects.ThenumberofteacherswhoteachPhysicsandChemistryisequaltothatofthose who teach Chemistry but not physics.

Intheschoolstaffroomthereareatwosimilarcansthahavedifferentheights.One6cmand the other one 9cm. If the surface area of the larger can is 840 cm^2.

Task

(a) Findthenumberofteacherswhoteachnoneofthethree subjects.

(b) Findtheprobabilitythatateacherpickedatrandomteachesonlyonesubject.

(c) Findthesurfaceareaofthesmallercan.

ITEMTWENTYTHREE

The traffic police arrests all motorists travlelling along Kampala-Jinja highway with a speedgreaterthan80km/hr.

Amotoristtravelledthefirst90kmatanaveragespeedof60 km/hrandforthenext$3\frac{1}{2}$ hourshetravelledatanaveragespeedof80km/hr.

Onacertaindayacartravellingat$s$km/hrcanbestoppedwithinadistance$d$metres where $\boldsymbol{d}=\frac{\boldsymbol{s^2}}{\boldsymbol{200}}+\frac{\boldsymbol{s}}{\boldsymbol{10}}$ Thetablebelowgivessomevaluesof$\boldsymbol{d}$against$\boldsymbol{s}$.

s	0	10	20	30	40	50	60	70	80	90	100
d	0			7.5				31.5			60

(a) Findoutifthemotoristwillbe arrested.

(b) Findthestoppingdistanceforacarmovingat46km/hrandat85km/hr.Alsofind the speed at which a car is moving if its stopping distance is 35 metres.

ITEMTWENTYFOUR

In a survey 100 people were asked which form of transport they used. 46 people only used bicycles(M).21peopleonlyusedbuses(N).11peopleonlyusedmotorbikes(P).5people used buses and bicycles but not motor bikes. 3 people used buses and motor bikes. 6people used bicycles and motor bikes. 9 people declined to respond.

Customsdutyandpurchasetaxareleviedoncertainimportedgoodsas Customs duty = 35% of the value of the good.

Purchasetax=15%of(value +duty)

Task

(a) Findthe;

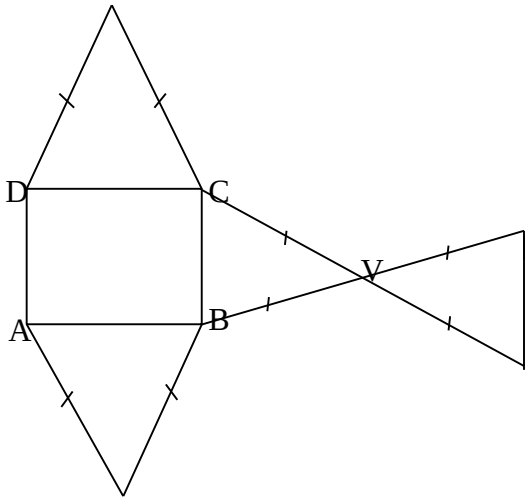
(i) numberofpeoplewhousedallthethreeformsoftransport.

(ii) percentageofpeoplewhousedonlytwoformsof transport.

(b) Findthetotalamountleviedonadiscodeckvaluedat1.7millions.

ITEMTWENTYFIVE

Thefigurebelowshowsanetofarightpyramidwitharectangularbase ABCD.

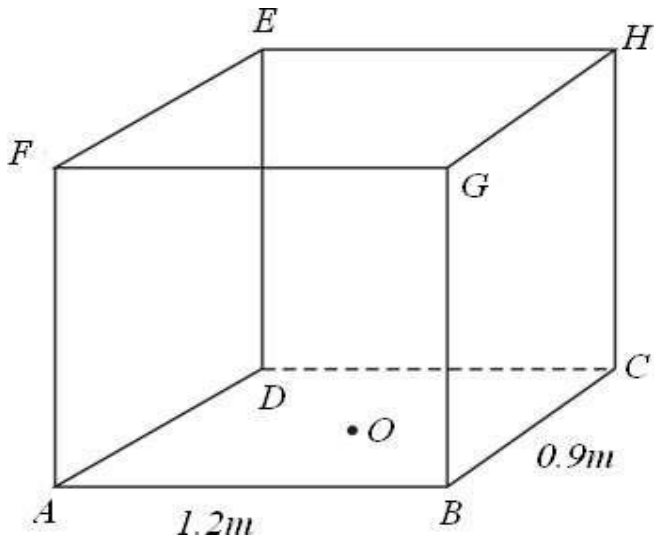


If **V** isthevertexofthepyramid **VABCD** abovethebase **ABCD**, and the slant sides of AB=16cm,BC=12cm, each triangle measure 26cm.

a) Drawtherightpyramidshowingclearlypoints VABCD,
b) Findtheheightofthepyramid.
c) Findtheareaofplane VAB
d) Findtheanglebetween;
   (i) EdgeVAandthebase
   (ii) FaceVABandthebase.

ITEMTWENTYSIX

Mr kyeswa is buying aconatinertostartahardwareinKisoobaVillagetosellbagsof cement.Eachbagoccupiesanareaof0.8cubicmeters.Thecontaineris $ABCDEFGH$ with $AB=12m, BC=9m, ADEF$ isasquareand O isthepointofintersectionof AC and BD.



(a) Findthedistances;

(i) BE,

(ii) OH.

(b) Determinetheangleformedbetween;

(i) lineBEandthe base,

(ii) planeBDHandthebase.

(c) Calculatethecapacityofthecuboidaboveinlitres andhowmanybagscanbe accommodated.

ITEMTWENTYSEVEN

Pamungu bought a car in January 2017 from his friend at shs. 12,500,000. If the car depreciatesatarateof10%perannum.CalculatethevalueofPamungu‟scarbyJanuary 2020.

AUgandantouristleftGermanyforUgandathroughSwitzerland.WhileinSwitzerlandhe bought a watch worth 54 Deutsche Marks (Germany currency).

1SwissFranc=1.28DeutscheMarks

1SwissFranc=1,350Ugandan Shillings

Asecondaryschoolteacherasarequirementbythegovernmentpays PAYEeverymonth according to the tax structure below.

Income(shs)per month	**Taxrate(%)**
01-50,000	5%
50,001-100,000	9.5%
100,001-180,000	15%
180,001-300,000	18%

300,001-400,000	23%
400,001-500,000	30%
Above500,000	35%

TheteacherearnsShs.760,000andhisallowancesinclude

Marriage allowance - shs.50,000permonth

Waterandelectricity - shs.60,000permonth

Housingallowance - shs150,000per month

Medicalallowance - shs.300,000perannum

Transport allowance - shs.3,000 per day Paying

for insurance and relief - shs.180,000perannum

Familyallowanceforonlythreechildren.Forchildrenintheagebracket 0 to 10 years, shs 12,000 per child,

Between10-15yearsshs.9000perchild 15 years and above shs 5000.

Giventhattheemployeehasfivechildren,twoofwhomareagedbetween0and10,the other two aged between 10 and 15 while the other 18 years. (A month has 30 days

(a) Findthevalueofthewatchin;

(i) SwissFrancs

(ii) UgandanShillings.

(a) Determinetheteacher"sNet-income

(b) Determinethepercentageofhisgrossincomethatgoestotax.

SECTIONA

Answer**all**itemsinthis section.

Item1. *(20scores)*

Number plates, also known as license plates or registration plates are typically manufactured using a combination of digital printing technology and specialized equipment. Your guardian has three taxis that travel along Kampala-Gulu high way registered $\boldsymbol{UBA\ 443T}$, $\boldsymbol{UBB\ 223R}$ and $\boldsymbol{UBD\ 132V}$, the numerical digits on the number plateswerefoundtobeinquinarybaseandheisinterestedin knowingwhichvehiclehas digits which are a multiple of three so that he can paint that vehicle with a red color for easy identification.

All thethree taxisleave Namayiba taxipark at $\boldsymbol{6{:}00am}$ for their first route to different destinations,howevertheyentertheafteratdifferenttimeintervals.Thefirsttaxienters the taxi at $\boldsymbol{8{:}30am}$, the second taxi at $\boldsymbol{9{:}00am}$ and the third one enters at $\boldsymbol{9{:}15am}$.

The fuel consumption rate for all the three taxis is the same and it was observed that when anyofthetaxihadcovered $\boldsymbol{60km}$,thefuelconsumedcosted$\boldsymbol{UGX160{,}000}$ andwhenthe taxi had travelled $\boldsymbol{15km}$, the fuel consumed was $\boldsymbol{UGX\ 40{,}000}$.

Task:

(a) Helpyourguardianknowwhichtaxihewillpaintthered colour.

(b) AtwhattimewillthethreetaxisenterNamayibataxiparkallatthesametime.

(c) Whatistheestimatecostonfuelconsumptionifthetaxiplanstotakeyourschool for a tour to Jinja which is approximately 90km from Namayiba taxi park.

Item2. *(20scores)*

Afamilyofyourfriend agreedtohavefamilyplanningsothattheycaneffectivelyplanfor their children. They agreed to have a child spacing of two years so that their business of drinks (water and soda) can pick up with time. They had their first born in 2020.

Attheirdrinksshop theyselltwotypes ofwaterbottles,typeAand typeBand theymake the water bottles by themselves. The same equipment can be used to make either water bottle.In making type Awater bottles,oneman can supervise10 machines andthis batch

willgivethemaprofitof***UGX*50,000**perday.TypeBwaterbottlesyieldaprofitof

***UGX*250,000** adayusing25 machinesand8men.Thereare200machines and40men available. Theproducedwaterisparkedincartoonsandyourschool hadathanksgivingfunctionand budgeted for 5 boxes of water *type A* and 4 boxes of water *type B* at a cost of

***UGX*92,500**. However,thebodabodamanthatwassenttobuythewaterbrought4 boxes of water *type A* and 5 boxes of water *type B* and was given a demand note of

***UGX*4000**asbalanceremainingtobepaidforwhathebought.

Task.

(a) Inwhichyeardoyouthinkyourfriend‟sfamilyhavetheirsixth born.

(b) (i) Showthefeasibleregionoftherelationona Cartesianplane.

(ii) Helpyourfriend‟sfamilydeterminethemaximumprofittheywillreceive from the sale of the water bottles.

(c) Whatdoyouthinkistheactualpriceofeachcartonofeachwatertype.

SECTIONB

Thissectionhastwoparts;**I**and**II Part I**

Answer**one**itemfromthis part

Task3. *(20scores)*

Your school demonstration farm holds monthly sales of cattle on the first Saturday of everymonth.Howthefarmcaretakerhasnoticed thatthereis atrendofthesameanimals remaining un sold every month because the farm attendants just select the animals which are near, and so he wants to obtain the average weight of all animals at the farm. He has agreed that this month all animals with a weight greater than the average weight of the animals be sold each at UGX 890,000 per animal. The data in kg of the weights of the animals is given in the table below.

86	85	56	59	67	62	63	50	91	62
56	27	50	54	80	61	52	52	16	28
66	46	55	58	56	77	26	40	42	51
35	45	68	51	49	40	93	84	79	63
52	53	25	93	27	71	66	52	30	12

Additionallyheisgoingtosell15goats,25sheepand10duckseachat$\boldsymbol{UGX\,140{,}000}$ pergoat,$\boldsymbol{UGX\,215{,}000}$persheepand$\boldsymbol{UGX\ 36{,}000}$perduck respectively.

Task

(a) Givingareasonbasedoncalculations,usingthedatacollected,suggestthemost minimummass that can be accepted tobesold on this first Saturdaythis month.

(b) HowmanycattlewillbesoldonthisfirstSaturdaythismonth.

(c) Helpthefarmcaretakerknowhowmuch moneyheexpectstoget fromthesales this month.

Item4. *(20scores)*

Malaria is a life threatening disease spread through mosquitoes that feed on humans, with symptoms such as high fevers and shaking chills. As one of the top diseases impacting Ugandans, it is at a risk to cover 90% of the Ugandan Population and is a leading cause of sickness and death especially in children. The mosquitoes breed easily in bushy areas and instagnantwaterandinordertopreventit,healthofficialhaveadvisedthatwesleepunder a mosquito net, slash all the bush around us and remove all stagnant water around us.

In a bid to curb the disease, health officials from your district visited your village to distributemosquitonets,howevertheyfoundthatsomehomeswere harboringmosquitos around us.

Fifty two homes were visited in your village, it was found that only four homes had mosquito nets, had cleared all the bushes around and had no stagnant water around and thus had managed to control malaria, the other homes had problems of malaria. It was found that *equalnumber*ofhomes had neithermosquito netsnorhadslashed theirbushes, ofwhich*twelve*homeshadnomosquitonetsandhadnotslashedtheirbushesroundthem, thusharboringmosquitoes.*Twentyfour*homesalltogetherhadstagnantwateravailable in

theirsoakpitsandopenmanholes,ofwhom*eleven*hadneithermosquitonetsnorremoved thestagnant water. *Thirteen* homes hadbushes around and alsohad stagnant water present in their homes. *Eight* homes had no single mosquito net, had huge bushes around and had stagnant water in their homes.

Task:

(a) Determinethenumberofmosquitonetstobedistributed,ifeachhomethatlackeda mosquito net was to be given exactly four nets.

(b) Calculatetheprobabilitythatahomevisitedneededalsotohavetheirbushes slashed.

(c) Displaythedataonastatisticaldiagram.

(d) Advisethedistrictofficialswithreasonbasedoncalculationstocomeupwith control measures for malaria.

PartII

Answer**one**itemfromthis part

Item5. *(20scores)*

National Medical Stores (NMS) is a government parastatal mandated to procure, store and distribute essential medicines and medical supplies to all public health facilities in the country. It uses trucks and lorries to do the distribution. However there is concern about delay of the trucks to return to the parking lot in Wandegeya. On a particular day a lorry and a truck are sent to deliver drugs to Hoima Regional referral hospital and Kiryandongo hospital respectively. Theywere expected to return to the parking lot in Wandegeya which isexactlyhalfwaybetweenHoimaandKiryandongo. Bothvehiclesdriveatasteadyspeed of $\mathbf{80}\boldsymbol{km/hr}$ and set off at $\mathbf{3}:\mathbf{00}\boldsymbol{am}$ from the NMS offices in Entebbe. From the point of setting off the lorry turns in the direction of 060^o and drives with a steady speed reaching Hoima at $\mathbf{6}:\mathbf{00}\boldsymbol{am}$. The lorrysetsoff fromNMS offices and movesto Kiryandongo whish is 330km the offices in the direction of 200^o. each spends averagely two and half hours off loading the drugs.

Task.

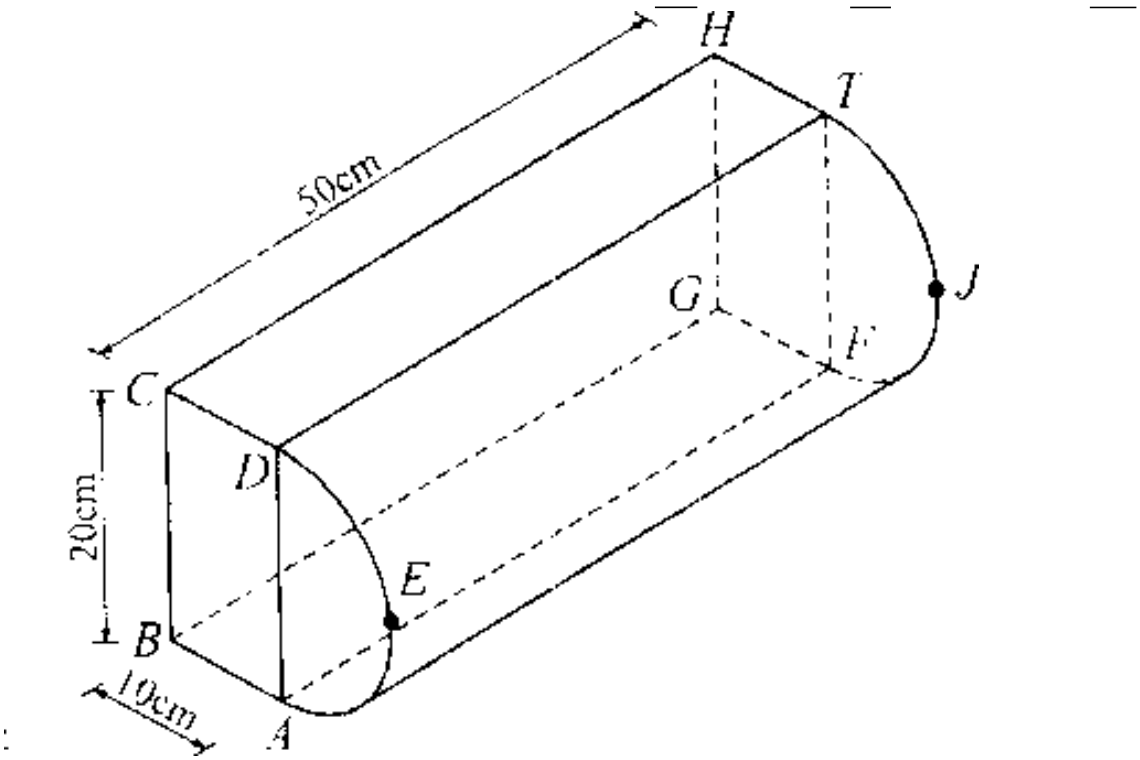
(a) Helpthemanagerrecordthetimeeachvehicleis expectedtoreturntotheparking lot in Wandegeya.

(b) WhatisshortestdistancebetweenEntebbeandWandegeya.

(c) Inyourviewhowcanthehealthsystembeimprovedinyour area.

Item6. *(20scores)*

Your is starting a poultry farm after getting funds from the parish development model PDM.Yourneighborborrowed**UGX48.52millions** from***PDM*** tobereturnedafterone and half years at a rate of **0.5**% per month simple interest a so he has ordered for chicken drinkers from Biyinzika Poultry Farmers with the shape *ABCD* in which *ABCD* is a rectangle and *ADE* is a semi-circle of diameter *AD*.*BC*= 20cm,*AB*= 10cm and*CH* = 50cm.



BiyinzikaPoultryfarmers sellstheeachdrinkeratUGX21,500,butoffersadiscountof 10 percentage onthetotal cost for everyfiftydrinkers and an additional 5% on thetotal costonanyexcessof50drinkersbought. Becauseyourneighborisbuyingfivehundred

birds,heintendstobuy80drinkersbutdoesnotknowthecapacityofeachdrinker which will help him buy water tank to harvest the water for the business.

Task:

(a) Helpyourneighborestimatehowmuchmoneyhewillreturntothe PDMafterthe one and half years.

(b) Howmuchwillhespendonbuyingthedrinkers.

(c) Estimatethecapacityofeachdrinkerandadviseyourneighbor,withreasonsonthe capacity of the tank to buy.

1. BbulaisanislandfoundonlakeZzibi,therehasbeenaseriousproblemof poornetwork on the island for a long time. The government together with the Network providers are planning to establish a Mast with the frequency that can cover the whole island. According to Engineers, the island is in a shape of a triangle ABC with $AB = 10km$ as the main landing site. Side $BC = 8km$ and $AC = 6km$.

(a) Byscaledrawing,helpEngineerstocomeupwithanaccuratedrawingofthe island and use it to find;

(i) TheangleABC

(ii) GiventhattheMastmustbeestablishedwheretwoperpendicularbisectors meet, establish with point M where the mast must be and find its perpendicular distance from the main landing site.

(iii) Itisknownthatthefrequencymustcovertheisland,drawthelocusofthe frequency and measure its radius.

(b) Two points P and Q are 1000m apart. The angles of elevation of the top of the MastfrompointsPandQare60° and30° respectively.Calculatetheheightof the Mast if;

(i) ThepointsareonthesamesideoftheMast

(ii) ThepointsareonoppositesideoftheMast.

2. (a) A senior four student, was given three points A(4,0), B(0,3) and C(4,3) of a triangleABCandaskedtoenlargebybothascalefactor2andascalefactor -2onthe same axes with the center as the origin, the learner could not distinguish between a positive and negative scale factor!Guide the learner through and state the images;

(i) Of triangle$A_1B_1C_1$,scalefactor2

(ii) Oftriangle$A_2B_2C_2$,scalefactor-2

Iftriangle$A_1B_1C_1$isan imageoftriangle $A_2B_2C_2$underenlargement,statethe center and scale factor of enlargement.

(b) You aregiven two cylinders oneoflength12cmandvolume $630cm^3$,another with length 14cm and volume $420cm^3$.

Statewithreasonswhetherthecylindersaregeometricallysimilar.

Whatwouldhavebeenthevolumeofthesmalleroneforthe cylinderstobe similar?

PartIII (PatternsandAlgebra)

3. InaPhysicspracticalattemptedbyaseniorfourclass, TheforceYneededtomovethe load X by a machine is determined by a law $Y = aX + b$, where a and b are constants. The table below shows results which were obtained by one of the students.

Load(X)	1	2	3	4	5
Force(Y)	4	4.8	5.5	6.7	7.2

(a) Plotthescatterdiagramfromthetableabovei.e Force(y)againsttheLoad(x)

(b) Drawthelineofbestfitanduseittofind;

(i) TheForcecorrespondingtoaLoadof3.5

(ii) Theloadcorrespondingtoaforceof6.2

(iii) TheForcecorrespondingtotheloadof0(zero)

(c) Takeanytwopointsonthegraphandusethemtofindtheslope/gradientofthe line of best fit.

(d) Compareyourfindingswiththeequationoftheform$y = mx + c$,hencefindthe law connecting Y and X, where $a=m$ and $b=c$and state $Y=aX + b$.

4. Duringfootballtraining,thecoachmarkedthreepointsonthegroundformingatriangle OPQ, he labelled displacement OP as vector **p**, and displacement OQ as vector **q**.
HefurthermarkedpointRonOQsuchthat$OR:RQ=3:1$,andSonOPsuchthat
$OS:SP=1:2$.HestationedpointTasthepointofintersectionofPRand SQ.

(a) Usingtheknowledgeofvectors,expressPRandQSintermsofvectors**p**and**q**.

(b) Giventha$\boldsymbol{PT=\lambda PR}and\boldsymbol{QT=\beta QS}$,expressOTintermsof;

(i) $\boldsymbol{\lambda}$,$\boldsymbol{p}$and$\boldsymbol{q}$

(ii) $\boldsymbol{\beta}$,$\boldsymbol{p}$and$\boldsymbol{q}$

Hencefindthevalueof$\boldsymbol{\lambda}$and$\boldsymbol{\beta}$

DeterminetheratiosinwhichTdividesSQandPR.

PartIV (DataandProbability)

5. A private company was hired to administer an interview for World Food Program. 50 candidates sat for an aptitude test which was made up of Sections A, B and C. Two candidatesdidnotattemptanyquestion fromanyofthethreesections.Threeattempted questionsfromsectionAonly,fivefromsectionBonlyfourfromsectionAandConly while5 attemptedquestions fromall the three sections. Thosewhoattempted questions fromA and Bonlywere3 less than thosewho attemptedquestionsfromsections Band C only and three timesthose who attempted questions from section C only.

Asaseniorfourstudent,help;

(a) Showtheaboveinformationusinganappropriatediagram

(b) Findhowmanycandidatesattemptedquestions

(i) fromeachsection

(ii) fromsectionConly.

(c) Ifacandidateisselectedatrandom,whatistheprobabilitythatheorsheattempted questions from at least two sections?

(d) Giventhatthosewhoattemptedatmostonequestion,didnotmakeittooral interviews, how many candidates were they?

(e) Inyouropinion,whydoyouthinktheWorldFoodProgramhiredaprivatecompany to carry out interviews?

6. Thetablebelowshowsthecumulativefrequencyofmarksobtainedbyagroupofsenior four students in a Mathematics test to be presented to the academic committee. Onthedayofpresentation,theteacherinchargecouldnotmakeit.

Youareaskedtoanalyzethedatafurtherforthelayman"sunderstandingwithvisualaid of a graphical representation.

Marks	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Cumulative frequency(F)	18	52	110	152	176	186	192	200

Carryoutthefollowingforthecommittee

(a) Findthemeanandthemodal mark.

(b) The80th percentile.

(c) Drawacumulativefrequencycurveanduseittoestimate the;

(i) median

(ii) rangeofthemiddle50%ofthemarks

(iii) numberofstudentswhowouldpassifthepassmarkwasfixedat45.

Senior one and two end of cycle sample questions

Number bases

Question 1

Karyn owns a bakery in Kampala. She uses a base eight system to display the prices of different prices of bread in dollars. In her display, each digit from 0 to 7 represents a specific price value as shown in the table below

Digit	Price value in dollars
0	2.5
1	3.0
2	3.5
3	4.0
4	4.5
5	5.0
6	5.5
7	6.0

She sells each loaf of bread at 256 base eight. Oscar is a business man who buys 100 loaves of bread daily from the bakery and sells each loaf at UGX 70000. He is given a discount of 5% on every loaf of bread.

Task

a) Determine the price of 1 loaf of bread in dollars
b) Given that $1USD = UGX3800$, Help Oscar to determine his percentage profit.

Question 2

Your mathematics teacher has promised to award his best three students Maria, Monica and Mariam with 126 counter books. Each counter book costs UGX12000 in the market. Maria will receive 42 counter books in base 6. Monica will receive 36 counter books in base 8. Mariam will receive the share of her counter books in base 10. To provide accountability to the school head teacher, the mathematics teacher intends to present the data on appropriate chart to the head teacher.

Task

a) Determine how much money was spent in buying Mariam's Counter books
b) Help the teacher to present the data to the school head teacher.

Question 3

Wilson and Ronald are students of the same school. They are working on a mathematics assignment that involves number bases. Wilson is working in base 6 while Ronald is working in base 8. Wilsons number is 24 written on a white cardboard while Ronald's number is 32 written on a blue cardboard. They are all aiming at find the least number that can divide all the two numbers. Wilson′s class has 5 streams with 15 students each while Ronald's class has 2 streams with 24 students each. The school wishes to determine the minimum number of students each stream should have so that they contain the same number of students.

Task

a) Help Wilson and Ronald to determine the least number that can divide all the two numbers
b) Help the school to determine the number of students each stream should have?

Question 4

Your school has received a new set of mathematics books for the lower secondary school curriculum from the ministry of education and sports. The school is arranging the books into boxes to hand them over to the school librarian. The school decides to arrange the books in rows on different number bases. The first box is arranged in base 2, the second box in base 3 and the third in base 5. Each box has equal number of books in each row. The first box contains rows of books. The second box contains 9 rows of books and the third box contains 8 rows of books. The librarian is creating selves and each self will contain equal number of books. Each book costs UGX25000

Task

a) Determine the total number of books that the school received from the ministry of education and sports.
b) How many books will the librarian arrange in each shelf?
c) Determine the amount of money spent in buying each box of books

Question 5

Scovia locks her phone with a password "MATH" after using it. Each letter in the password represents a number in base five. M represents 13, A represents 1, T represents 20 and 8 represents 8. Ruth wants to use the phone but needs to combine the numbers in base 10 to unlock the phone. Scovia bought the phone at UGX780000. She plans to sell the phone to Ruth at UGX1080000. Scovia plans to use part of the money to buy a crate of soda that has 24 bottles for her birthday and save the rest. Each bottle of soda costsUGX12000.

Task

a) What number should Ruth use to unlock the phone?
b) Determine Scovia's percentage profit
c) Express the amount of money that will be used to buy the crate of soda as a percentage of the amount of money that will be save.

Question 6

A telecommunication company in Uganda offers a special promotion to all customers having their brand smartphone. The promotion allows customers to convert their loyalty points to a specific amount of money in US dollars and finally to Ugandan shillings (UGX) basing on a unique number base system. In this system, the digit 3 in the loyalty points is equivalent to the digit 5 in the decimal system. Joshua accumulates 243 loyalty points every week. Each loyalty point can be converted to UGX 11400. The company sells each phone at a profit of 5%. They sell each phone at UGX585000.

Task

a) Determine the amount of money Joshua received for his loyalty points in US dollars for last week. Hence determine the total amount of money he will receive within 6 weeks.
b) Determine the cost price of each phone.

Question 7

James and Joan are students in the same school. James is holding a white card with numbers 24 and 45 written in base 6 on it. Joan is holding a blue card with the same numbers written in base 8 on it. They all want to find the least number that can divide the two numbers on their respective cards. James claims that he will be the first to obtain the correct answer since he is 5 years older than Joan.

Task

a) Determine the correct answer James will find
b) How old is Joan if the sum of the ages of the two students is 39.

Working with integers

Question 1

Your school plans to raise USD1100 that will be used in the construction of a new school library. The school organized a school carnival to raise money that will enable it achieve

the target. The table below shows the income generated and the expenses for in US dollars for the school carnival. The expenses are indicated in brackets

Games	Sports	Donations	Flyers (expenses)	Decorations (expenses)
650	530	52	28	75

The head teacher of the school plans to present the above data to the school management committee in one of the meetings this Saturday.

Task

a) Did the school reach its goal?
b) Using two different charts, help the head teacher to represent the data to the school management committee
c) Given that $1USD = 3800UGX$, determine the total amount of money the school remained with after expenses in UGX.

Question 2

A football team gains 3 points on the first tournament, loses 6 points on the second tournament, loses 3 points on the third tournament and gains 4 points on the fourth tournament. Each point gained is awarded UGX54500 and each point lost is deducted UGX12500. The team has 40 players who are either left footed or right footed. 28 players are right footed while 17 players are left footed. A player who is both left and right footed is awarded UGX 258000 by the football association.

Task

a) Determine the total amount of money the football team obtained from the four tournaments
b) How much money did the football management spend in awarding the players who are both right and left footed? (write your answer in words)

Question 3

You are playing a game on your computer using a spinner. You start with the spinner at blue and score 48, and spin the spinner four times to orange, spin the spinner three times again to green and finally spin the spinner 6 times to red. Each spin gives a score of 4.

Task

a) Write your total score in words
b) Using two different charts, display the scores at blue, orange, green and red

Question 4

James bought three bags at UGX 45000 each after being given a discount of 5% on the original price of each of the bags from a shop in Kampala. He bought oranges at UGX500 each and put in the bags. Each bag contained 8 oranges. James then decided to share them with his four friend Joshua, Jakin, Jack and Jadon by dividing them equally in to four groups. He bought 10 more oranges later on and added them to the total number of oranges he had. James realized that he had to multiply the sum of the oranges by 2 to determine the final count. Joshua being the oldest of the other four friends by 2 years claims that he should be given more oranges. The sum of the ages of the five people when pressed on a calculator was found to be 77.

Task

a) Determine the total amount of money of the final count.
b) What is total original cost of the three bags
c) Determine the ages of the five people.

Question 5

Your sports teacher is organizing a sports event this Saturday. He wants to buy sports equipment sets that include basketballs and footballs for their activities. He has three different sets to choose from: Set A includes 8 basketballs and 12 footballs, Set B includes 6 basketballs and 18 footballs and Set C includes 10 basketballs and 15 footballs. Each ball in set A costs UGX80000, each ball in set B costs UGX 8000 more than that in Set A and each ball in Set C costs UGX12000 more than that in Set B. The sports teacher wants to figure out the total number of each type of ball he needs to buy to ensure that each activity group has the required number of balls without shortage or wastage.

Task

a) Determine the total amount of money he must spend in buying to balls to achieve his target.
b) The sports teacher has UGX 7800000 for buying the balls, he wants to use 10% of the balance to purchase mineral water. Determine how much he has to spend on mineral water.

Question 6

Your high school friend spent UGX15000 in buying apples. He wants to distribute the apples equally among his other friends. If he gives each friend x apples , he will have 3 apples remaining. Each apple costs UGX1000. Emily, Michael and Sophia are among your best friends as well. Emily has 18 apples in her bag. Michael has 24 bags in his bag

while Sophia has 30 apples in her bag too. They want to find the highest equal number of apples that should be put in each bag and the least equal number of apples each bag can contain.

Task

a) Determine the number of apples (x) each friend will receive from your friend.
b) Help Emily, Michael and Sophia to address the challenge.

Question 7

Your brother went to school to do mathematics practice on the chalkboard. During his practice, he pressed a number on a calculator, added the square of 5 to the number. He later realized that when he divides the result by 4, he gets 5 times the number. After the practice, your brother left school and walked 5 kilometers to a trading centre to buy water, he then walked in the north east to his friend's home and rested there for some hours before walking 6 kilometers in the western direction to a supermarket to buy some scholastic materials for mathematics practice in the coming days. Your home is 5 kilometers due south of the supermarket.

Task

a) Help your brother to find out the number.
b) How far is your home from the school using the direct route?

Fractions, percentages and decimal

Question 1

Your uncle works as a sales agent in a cement manufacturing company. He is paid a basic monthly salary of UGX1800000. He is paid UGX400000 for every 25 bags of cement he sells. Your uncle sells 400 bags of cement in a month. He decides to save 20% of total salary every month and share the 10% of it among his four children in the ratio of 2:3:4:1 according to their ages. The eldest child receives the highest amount of money. His daily expenses are UGX 20000. The rest of the money is invested in to the family business.

Task

a) How much money is invested in to the family business every month?
b) Work out how much money the youngest child gets

Question 2

Annet bought fruits consisting of mangoes, guavas, oranges and passion fruits in the ratio of 2:4:4:2 from a fruit store. He ate $\frac{1}{4}$ of the fruits and gave away 40% of the remaining oranges to his friends. She sold the rest of the fruits to his neighbor at UGX1500 each. Each fruit in the fruit store costs a UGX800. She bought 14 passion fruits from the fruit store.

Task

a) Determine her percentage profit.
b) Display the information using an appropriate chart.

Question 3

A secondary school consists of 24 lower secondary school prefects. The prefects plan to hold a meeting this Saturday in one of the school hall. The school hall can accommodate many people as it has single seats arranged in 8 rows and 12 columns. The school has bought 48 bottles of mineral water, 120 bottles of soda and 84 cups of juice. 17 prefects drink soda, 12.5% of the prefects do not drink soda or juice and 9 prefects drink juice. Each bottle of the drinks costs UGX4000

Task

a) Using appropriate chart, display the categories of drinks bought
b) Work out how much money was used to buy bottles of drinks for people who drink both soda and juice if they will drink two bottles each.

Question 4

Oscar wants to design a triangular garden in her backyard. The base of the triangular garden is 12 metres long and the height is 8 metres. He plans to divide the garden in to three equal sections to plant different flowers. Oscar decides to allocate $\frac{1}{3}$ of the garden to roses, $\frac{1}{4}$ to tulips and the remaining section to sunflowers. Oscar realizes that the roses need 40% of their section to grow properly, the tulips need 25% and the sunflowers require 35%. Oscar decides to install a decorative border around the perimeter so that it just touches the edges of the garden and the border costs UGX50000 per metre.

Task

a) What is the total cost of installing the decorative border?
b) What is the area in square meters allocated to each type of flower?

c) Find out how many square metres of each flower bed should be allocated for optimal growth.

Question 5

The village hunters standing by the roadside need to navigate through the game park to find three different wild animals, cob, rhino and porcupine resting at three different places. The village hunters need to move northeast to find the cob and turn southward to find the rhino before turning southwest to find where the porcupine is resting. The distance from the road to the cob is 25% of the total distance and the distance to the rhino is 40% of the total distance. The remaining distance to the porcupine accounts for the remaining 35%. The distance to the cob from the village hunters is 500 metes

Task

a) Work out the total distance the village hunters need to cover.
b) What angle should the hunters turn through if they are to move from the road to the porcupine?

Question 6

Mr. Amara is a village farmer. He owns a triangular garden with sides measuring $(x + 2)$ metres, $x + 5)$ metres and $(x + 8)$ meters. Mr. Amara wants to build a circular fence around the garden in such a way that it just touches the corners of the garden without entering it to keep out animals. The fencing material costs UGX7800 per meter. He wants to fence $\frac{3}{4}$ of the perimeter of the garden and leave the remainder unfenced for an entrance. The perimeter of the garden is 45 metres. The garden will be used to grow trees and each tree will occupy $2m^2$ of space of the garden

Task

a) Determine the cost of fencing the garden
b) Work out the total number of trees that can be planted in the garden

Question 7

Your sister, Mercy works in one of the non-governmental organizations in Uganda. She is paid a monthly salary of UGX8800000. Your sister decides to invest a portion of her total savings in a fixed deposit account that offers a simple interest rate of 5% per month. She invests $\frac{1}{3}$ of her total savings which amounts to UGX1400000. Mercy saves 30% of her monthly salary and uses the remainder to pay school fees.

Task

a) Determine the amount of money she withdraws from the fixed deposit account after 4 years.
b) Work out her total savings in 2 years.

Coordinate plane

Question 1

You and your friend have tickets to watch a football match in Kampala in which only 12500 spectators are expected to attend. You sit inside the VIP section and your friend sits at $(-5,-3)$. The football pitch is located at positions $(-4,-3),(4,3),(-4,3)\ and\ (4,3)$. Each unit is equal to 20 metres. The football match has been organized by the football association to raise funds required to fence the football pitch where by each spectator will pay UGX1000. UGX 20000 will be used to fence every 2 meters of the perimeter of the pitch and 40% of the balance will be distributed equally by the football association to the 46 football players that will participate the football match and the remainder will be saved in a bank account that offers a 8% simple interest rate per month.

Task

a) Using a suitable graph, display the position of your friend and determine the area of the football pitch.
b) Workout the amount of money the football association will withdraw from the bank after 3 years

Question 2

Your school is located at $(2,-1)$, which is 2 blocks east and 1 block south of the centre of town. To get from your house to the school, you walk 5 blocks west and 2 blocks north. The school is near the houses of four of your friends Alex, Bernard, Cathy and Dalton. Alex's house is 600 meters north of the school, Bernard's house is 300 metres on 60° east of north of the school. Cath's house is half kilometer on south of east of the school while Dalton's house is south west of the school. Dalton's house is 400 metres from the school.

Task

a) Is your school or your school closer to the centre of town? use a suitable graph
b) Show accurately the position of the houses of the four friends and determine how far Dalton's house is from Alex's house

Question 3

Three people Amon, Anthony and Mark are village friends. They decided to go hunting for wild animals in a village forest. They left their bottle of water at point A(2,4) and their spears at point B(-1,1) and started tracing the wild animals from point C(5,3). While exploring the area the next day, they discovered a mysterious circular rock enclosing the area formed by three points just touching the tips of the three points

Task

a) Using a graph and suitable geometric instruments, show the design of the area covered by circular rock
b) Work out the area of the circular rock

Question 4

Jerome is a village farmer in Iganga district. He has rectangular farm land whose corners are at points $A(2,3), B(2,7), C(8,7), and\ (8,3)$. He bought the farm land from his neighbor 2 years ago at a total cost of UGX8400000. Jerome plans to sell the farm land to his friend Destiny. He wants to sell each square meter of the farm land at UGX120000 and save the profits obtained in a fixed deposit account that offers a 2% simple interest rate per month for 2 years. Each unit of the length or width of the farm land represents 5 metres of the actual size.

Task

a) Using a suitable graph, present the design of the farm land
b) How much money will Jerome withdraw from the bank after 2 years?

Question 5

Your school has designed a rectangular meal card whose corners are at points P(2,7), Q(6,7) R(6,-2) and S(2,-2) to help in school fees collection. The meal card is unique with a triangular design whose tips are at points (1,2),(3,4) and (5,6) inside it. A student in senior one has drawn a circular design that just touches the three edges of the triangular design.

Task

a) Present the design of the card on a suitable graph
b) Work out the area of the card covered by the circular design

Question 6

A new football coach of an English premier club is designing a new style of play for his team on a coordinate plane that represents a football pitch. The goalposts are located at points $A(2,4)$ and $B(2,-4)$. The football coach wants the team to practice running a play to facilitate counter attack against the opponent where the centre back starts the ball at point $Q(-3,1)$ and throws the ball in a straight line to the wide midfielder at point $(4,-2)$.The football club has a total of 40 players. 28 of the players can defend, 14 can attack while 2 of the players can neither attack nor defend. A player who can both defend and attack receives a weekly bonus

Task

a) The football coach would like to present his new style to the board of directors of the club, help him to address this challenge.
b) Write an equation that represents the path of the ball
c) How many players receive the weekly bonus?

Question 7

Your school has planted trees in a rectangular pattern to beautify the school compound. The design of the planted trees shows tree A at point (3,5), Tree B at point $(-2,4)$, Tree C at point $(1,-1)$ and Tree D at point $(-3,-2)$. The school wants to create a walking path that connects all the trees in the most efficient way possible and a straight road that passes diagonally from a tree at one corner to the tree in the other corner.

Task

a) Using a suitable graph show the design of the planted trees
b) Find the total distance of the walking path that connects all the four trees
c) Determine the length of the diagonal path and write its equation.

SECONDARY MATHEMATICS TEACHERS' ASSOCIATION

SMATA

20 24

O'LEVEL MATHEMATICS SEMINAR

THE 8TH ANNUAL GRAND MATHS CBC NLSC SEMINAR RELOADED AT

ST. JOSEPH OF NAZARETH HIGH SCHOOL

Saturday 29th June,2024

SECTION A: COMPULSORY

Elements of Construct (THEMES)

ITEM 1 : NUMBERS

- Number bases
- Working with integers
- Fraction,percentages and decimals
- Numerical concept 1 (Indices)
- Numerical concept 2 (Surds)
- Rectangular Cartesian Coordinates
- Ratios and proportion

ITEM 2 : PATTERNS & ALGEBRA

- Sequences and patterns
- Equations of line and curves
- Algebra 1 & 2
- Loci
- Mapping and relations
- Inequalities and regions
- Equation of a straight line
- Simultaneous equations
- Linear programming

SECTION B: PART I & PART II

Elements of Construct (THEMES)

ITEM 3 & 4: DATA AND PROBABILITY

- Data collection and presentation
- Graphs
- Set theory
- Data collection and display
- Matrices
- Probability

ITEM 5 & 6: GEOMETRY AND MEASURES

- Geometric Construction Skills
- Bearings
- General and angle properties of geometric figures
- Reflection
- Business arithmetic
- Time and tables
- Similarities and enlargement
- Circle
- Rotation.
- Length and area properties of 2D-geom. figures
- Nets areas and volumes of solids
- Trigonometry 1

SEMINAR ITEMS

MATHEMATICS CONSTRUCT:

To produce a graduate who appreciates and uses Computational skills, Spatial reasoning, Trend analysis for decision-making in solving Societal Problems.

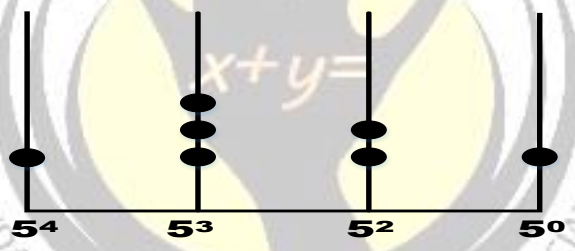
CATEGORY A: GENERAL ITEMS

THEME 1: NUMBERS

ITEM ONE:

Two twins A and B where presented with an abacus to write the number on it. A wrote one thousand fifty-five and the other wrote one thousand fifty-one. They need your help to know who amongst them is correct.

The abacus:



Twin A was sent to buy 2kg of sugar. He did not find sugar at the usual shop so he bought it at another shop and was given a balance of Ugx.37, 000 on the Ugx.50, 000 he went with. The mom asked him how much he was charged for each Kg but unfortunately, he did not ask the shop attendant.

Both twins have to go to school. They usually pay 60% of the school fees at the beginning and the rest on Visitation day according to school policy. School fees were increased to Ugx.600, 000 and now the parents need to know the school fees they are to pay for both of them at the beginning.

TASK:

a) Who amongst the two twins was correct about the number presented on the abacus?
b) How much was Twin A charged for a kg of sugar?
c) How much will the parents pay at the beginning for both twins?

THEME 2: PATTERNS AND ALGEBRA

ITEM TWO:

A man wants to construct single rooms and double rooms in his plot of land. He wants both to cover a space that is less than $5000ft^2$. He wants the double rooms to cover a space of at least $3000ft^2$. The space covered by single rooms should be three times less than the space of double rooms. He wishes to maximize income by charging each single room at Ugx. 200,000 and each double room at Ugx. 400,000. So he needs to decide on how many rooms of each category he should construct to match his specifications and at the same time maximize income.

TASK

a) (i) Form mathematical inequalities and expressions describing his situation.

(ii) Suggest to him the space of single rooms and double rooms he can construct in and justify your suggestion.

THEME 3: DATA AND PROBABILITY

ITEM THREE:

Your guardian operates a catering company. He gave you a list of major ingredients he will need to cook beans and beef at the two occasions he was called at such that you help him account for how much he will need in total for both.

OCCASION ONE:

BEEF: 1bucket of tomatoes, 2 bunches of onions and 2 liters of cooking oil.

BEANS: $\frac{1}{2}$ bucket of tomatoes, 1bunch of onions, and 1liter of cooking oil.

OCCASION TWO:

BEANS: $\frac{1}{2}$ bucket of tomatoes, I bunch of onions, and 1litre of cooking oil

BEEF: $1\frac{1}{2}$ bucket of tomatoes, 3 bunches of onions and 2litres of cooking oil.

UNIT PRICES:

A bucket of tomatoes is Ugx. 10,000, a bunch of onions Ugx. 5,000 and a liter of cooking oil at Ugx. 7,000.

TASK:

a) What are the total quantities of each ingredient he will need for beef and beans respectively for both occasions combined?
b) How much money will he need for both beef and beans respectively for both occasions combined?
c) (i) If the total amount on the budget for both occasions is Ugx. 400,000. what percentage of that amount will go on ingredients?
(ii) According to the percentage, should he cut the budget for ingredients or not? Justify your answer.

THEME 4: GEOMETRY AND MEASURES

ITEM FOUR:

One of your friends wants to create a house with a prism rooftop for the mathematics project. He wants to account for the size of ply wood plus the amount he will need to buy it using his measurements below:

HOUSE BASE:

- 2 side walls will measure 45cm by 20cm.
- 2 front and back walls will measure 17cm by 20cm.

ROOF:

- 2 isosceles triangular faces will have a base of 45cm and a height of 18cm.
- The rectangular faces will have a length of 17cm and a width equivalent to the slanting edges of the triangular faces.

He also wants the ridge of his roof to be at the Center of the two rectangular faces. He wants determine the angle at which he will meet the two faces to achieve that.

Note:
$1\ ft^2\ of\ ply\ wood = Ugx.1000$ and $1ft = 30.5cm$

TASK:

a) How many ply woods will he need and how much will he spend on them?
b) At what angle will he meet the rectangular faces of the roof to achieve what he wants?

CATEGORY B: DISCUSSION ITEMS

THEME 1: NUMBERS

ITEM 1

On their Prom party, five students plan to buy their class teacher a gift. The initial plan was that each one buys their own gift to give to the class teacher but later they realized that If they do it as a group would be cheaper. So they mobilized themselves and each person contributed as follows;

Student A contributed one hundred thirty-three thousand two hundred fifty shillings.

B contributed $1\frac{1}{2}$ of the amount of A.

C contributed 20% more than that of A.

D contributed a fraction which is $\frac{1}{5}$ less that of B of the amount of A contributed.

E She contributed the balance required to make shs 800,000/= which was the cost of the gift. On the day of Prom, the money was given to student E to pick the gift from the nearby shop. From school, she used a boda-boda moving at $10kmh^{-1}$, they moved for 30 minutes due east and then 15 minutes due north to reach the shop.

Tasks:

a). Help to direct another student to locate the shop from school in coordinate form.

b). What amount did each student contributed and who of the five contributed more money.

d). In which other way could they contribute the money more fairly and how much would each contribute that way?

ITEM 2

On Wednesday 01, May, 2024, Aunt Nyanya a tomato seller in a market purchased 8 packs of polythene bags of tomatoes, each containing 10 tomatoes from a farmer. She then sold a-quarter of the total number of packs before meeting her long time friend Peter who decided to take her out for coffee at a hotel. The she left the tomatoes with a colleague in the market.

At the hotel Peter ordered for 2 cups of tea each costing five thousand one hundred shillings and 2 plates of food each at shs 20,000/=. While enjoying the meal, Peter told her that he comes to the hotel gym every after 4 days and she also decided to be coming there every after a week to exercise.

On her departure, Peter gave her shs. 20,000/= for transport and on reaching the market, she found a sixth of the remaining packs of tomatoes damaged and could not be sold. She decided to re-park the un-damaged ones in new packs of five tomatoes to sell in small quantities that are preferred by customer.

Tasks:

a). How many packs of fives and five fives did aunt Nyanya get after repacking?

b). What percentage of the number of tomatoes got damaged?

c). Help Peter and Aunt Nyanya to know when they will meet again at the hotel.

d). How much money (in words) did Peter spend on the Outing?

THEME 2: PATTERNS AND ALGEBRA

ITEM 3

A certain number of people agreed to contribute an equal amount of money to buy books worth Ugx.12,000 for a school library.

After sometime, five of them backed out and this made one of them that remained suggest that each should contribute Ugx.100 in

excess. Their collection enabled them to buy books worth Ugx 2000 more than originally expected.

However, after buying these books, they got other funds and found it necessary to stock more books for the library. To transport these additional books, they used two means of transport, a Boda-boda and a Tuku-tuku. When a Boda-boda had made **four** trips and a Tuku-tuku **three** they had transported 116 books altogether while when a Boda-boda had made **five** trips and a Tuku-tuku **2** trips they had transported 110 books altogether.

a) How many people really made.
b) How much each was originally going to contribute for the buying of books?
c) How many books does each of the two means of transport carries per trip?

ITEM 4

You have friends who manufacture televisions and radios. During Christmas season, they want to sell at least 100 of their televisions and at least 150 of their radios. They have also found that they cannot sell more than 600 televisions and radios combined. They wish to maximize sales by selling each television at a profit of Ugx 90,000 and each radio at a profit of 30,000 but they do not know the number of televisions and radios to sell to fulfill their wish.

Task:

a) Write mathematical statements that show the relation between televisions and radios.
b) Show the feasible region of the relation on the Cartesian plane.
c) Help your friends to determine how many of each type should be sold to make the maximum profit.

ITEM 5

A fashion designer makes two types of designs; one design on trousers and another design on dresses. He takes 3 hours to make a design on a trouser and 4 hours to make a design on a dress. He works for a maximum of 120 hours to make designs on trouser and dresses. It costs him shs 4000 to make a design on a trouser and shs 1500 to make a design on a dress. The total cost does not exceed shs 90,000. He must make designs on trousers for at least 8 trousers and make designs on dresses for more than 12 dresses. He makes a profit of shs 400 on each trouser and shs 700 on each dress.

Task:

a) Write down mathematical statements that shows the relationship between the trousers and dresses.

b) Show the feasible region of the relation on the Cartesian plane.

c) Help the designer to determine the maximum possible profit he makes.

ITEM 6

A trader in Mpigi town who deals in Electronics specializes in importation of Televisions (**TVs**) from JAPAN on a weekly basis. He particularly imports two types of TVs i.e Sonny and Global-Star. In the first week of August, 2024, he wants to import a minimum of 2 Global–star **TVs**. Also he wants to import more Sonny TVs than Global-star TVs. Due to the shipping expenses and taxes, he cannot import more than 10 TVs a week. A Global – star TV is to be sold for 1.5 million while as Sonny TV to be sold for 1 million. More than 8 million must be realized from the sales, if profits are to be made.

Task:

a). Help the trader realize the number of TVs of each type he can import for a maximum profit.

b). If a trader is to remain in business, what is the least number of TV's he can import and still make a profit?

c). Given that the shipping space provided to him measures 12m by 4m, work out an equation that models the number of square meters for each TV for a maximum profit.

THEME 3: DATA AND PROBABILITY

ITEM 7

A Company holds daily morning briefings at 8:05 am for all its workers who walk to work from different places of residence. The company supervisor notices that some workers miss important communication because they arrive late. He decided to collect data about their time of arrival so that he can make necessary adjustments and also help some of them to become residents near the company premises. The collected data of their time of arrival in minutes from the start of the briefing was as follow;

52	49	11	16	32	28	32	55	38	24
15	23	33	20	40	39	22	37	53	30
29	58	38	44	31	21	18	39	25	47
51	49	35	24	47	34	48	44	55	19
27	38	41	59	33	52	27	36	46	46
32	28	47	54	34	21	58	37	26	42

Task

(a) With a reason based on the calculation from the data above, suggest the appropriate time when the morning briefs should always start.

(b) The company manager suggests that the first 25% of the workers be given transport refund, between 25% and 75% be given accommodation and the rest be stopped. Determine the maximum time of arrival one should not exceed to qualify for;

(i) Transport refund (ii) Accommodation

(c) How many workers would be stopped from work.

ITEM 8

A school is wishing to offer bursaries to sports men and women as long as more than 60% play at least one of the games in Football F, Net ball N, and Basket ball B while more than 40% must know how to play at least two of the three games.

It was discovered that out of 100 students who had applied, 40 student played football, 45 played Netball while 50 played Basket ball. 24, 18 and 19 students played F and N, F and B and B and N respectively. 18 students applied but did not know how to play any of the three games.

Task

a) Basing on the calculation from the information given, advise whether the school should offer sports bursaries.
b) Calculate the probability that a student picked at random played only one sport game.

ITEM 9:

A parent intends to make shopping of scholastic materials for his children who are going back to school for a new term by the names of Jane, Mary and Darin. They budgeted as below basing on the list of requirements that they were given by their class teachers.

- Jane: 6 exercise, 3 pencils, 2 Graph books, 3 pens
- Mary: 3 pencils, 1 Graph book, 6 exercise books, 3 pens
- Darine: 2 Graph books, 4 exercise books, 3 pencils and 5 pens

At that time the prices were 1 Graph book shs 2000, 1 pencil shs 100, 1 exercise book shs 1,500 and 1 pen shs 500.

On reaching school they found out that the canteen manager had increased prices of the items by 10% and also they found out that the school administration had decided that on each item listed they

should increase the number for each by 2 since school administration had decided that the students extend by two weeks when the term ends in order to compensate for the time students had lost the previous term.

Before leaving their home, they were given by their father shs 200, 800/= so that they can finish the clearing process at school and then after wards they share equally the remaining money to be used as their pocket money.

Task:

a). Assuming they were to buy the items before going to school, using the matrices help the father to determine how much he would give to each child.

b). By use of matrices determine how much each child paid to the canteen attendant in order to acquire the items.

c). Help the children determine how much each shared as pocket money after buying the items from the school canteen.

THEME 4: GEOMETRY AND MEASURES

ITEM 10

Quality Star Hotel is faced with a problem of water supply. The owner has instructed the Hotel Manager to contract **WaterServe Ltd** a water fetching company in the locality to fill the newly bought water tank at the Hotel within a period of not more than two weeks using an effective and efficient water fetching system.

WaterServe Ltd has two **systems A** and **B** of fetching water. In system A, water is fetched using Jerrycans and system B that uses Buckets as shown below.

The Hotel tank has a base of diameter 280 cm and height of 4 m and the jerrycans are of dimensions of 20 cm by 25 cm by 40 cm while the buckets each has diameters of 400 mm and 200 mm respectively.

In a day, WaterServe Ltd can only fetch 120 Jerrycans of water under system A or 100 Buckets when uses system B. The cost of water from the Commercial Reservoir is **shs 5/=** per litre. ($\mathbf{1}\ \boldsymbol{litre} = \mathbf{1000}\ \boldsymbol{cm^3}$**).** The transport charge per Jerrycan is **shs 300/=**

and **shs 400/=** per Bucket. The Hotel uses **560 litres** of water on a daily basis. (Take $\pi = \frac{22}{7}$).

The Hotel management policy requires that the water budget should always be submitted **three weeks** before the tank becomes empty to avoid any crisis.

The Hotel manager would like to make a budget in order to get money from his boss to facilitate the work but he is uncertain of the suitable system of fetching water to choose and the total amount of money he can request from his boss.

Task

(a) Help the Hotel Manager to make the right decision by choosing the most suitable system of fetching water that meets the requirements of his boss.
(b) With reasons, advise the Manager of Quality Star Hotel when exactly he should submit the Water budget to his boss.

ITEM 11

An international businessman who operates in United States of America (USA) has recently relocated his family to your village and settled near your home as your immediate neighbour. After a week, his wife realizes that her P.5 boy needs a boarding school. Your Cousin who is well informed about primary education offers to help her by driving them as they search to find a better school for her child. He drives them to the nearest Pearl Hill Junior school 40km away due East of their home.

Your Cousin drives at his usual average speed of **40** $\boldsymbol{kmh^{-1}}$. His car's fuel consumption is **8 km/litre**.

The Boy's father who is in USA, agrees to refund your cousin all the fuel costs and allowance of **5 US dollar per hour** spent during the entire process and Journey. A litre of Petrol costs shs **5,750/=** and **1 US dollar = Ug.shs 3,800/=** and Uganda is **7 hours** ahead of USA.

On reaching Pearl Hill Junior School at **9:20 am**, she finds out that it is a purely day school. After 15 minutes of interaction, the Headteacher refers them to Full Care Primary School (**FPS**) a good boarding school in the locality and gives your cousin the following directions:

- From Pearl Hill Junior School, take the southern direction and reach the Community Library that is 70 km away.
- From there, then take the South Eastern road and drive for half an hour to reach Full Care Primary School (**FPS**).

After reaching **FPS**, the boy was subjected to an interview for $\mathbf{1\frac{1}{4}}$ ***hours*** and later admitted. Before leaving **FPS,** they are informed of a direct route back home which they take after a quarter of an hour of consultation.

Task

a) (i) Describe the direction of your neighbour's home from Full Care Primary School.

(ii) At what time would they have reached Full Care Primary School after leaving Pearl Hill Junior School.

b) Help your cousin to determine;

(i) When he should communicate with the boy's father in USA upon reaching home immediately after the journey. (Give the time basing on USA time-zone)

(ii) The duration of the entire journey

(iii) How much money in US dollars he should demand from the boy's father upon returning home.

ITEM 12

A hawker who sells watches leaves his home in Lambu town at 0600 hours and moves to Mbuye town which is 165 km north of Lambu town. From Mbuye town, he moves east wards for one hour at a speed of 150 kmh^{-1} to Katoomi town. He then heads to Nabuti TC which is in a direction of $S20^0E$ and moves at a speed of 45 kmh^{-1} for 2 hours. From Nabuti TC, he moves South wards to Tanda market which is 135 km away.

The hawker buys golden and silver watches at Ugx. 25,000 and Ugx 20,000 each respectively and sells them at Ugx 30,000 each and Ugx 25,000 each respectively. He sells the watches at a discount of 5% off the total cost for any customer who buys more than 2 watches. While in Tanda market, he meets his friend who buys 3 golden and 5 silver watches.

In the evening, he uses the direct route and returns home in Lambu at 8:00pm. In an hour's time, he receives a call from his brother in Canada. The call lasted for a quarter an hour and Uganda's time is 7 hours ahead of Canada's time.

Task

a). What direction and distance did the hawker take through the direct route?

b). i) What percentage profit does he make on each type of watch?

ii) How much did the watches cost his friend?

c). i) How much time did he spend away from home?

ii) At what time did his brother ended the call end? (Answer in Canada's time)

ITEM 13

A bucket of homogeneous paint is in shape of a frustum with an open end of diameter 28cm, bottom diameter of 18 cm and 22cm deep. The bucket of paint is used to paint a cylindrical pillar of a storeyed building. The pillar measures a diameter of 100m and is 140m high.

Two hundred thirty five litres of the paint is made by mixing three paints A, B and C. The ratio by amount of paint A to B is 4:5 and that of B to C is 6:8. Paint A costs shs. 7200 per litre, paint B costs shs. 18,000 per litre and paint C, shs. 6375 per litre.

($\boldsymbol{Take\ \pi = \frac{22}{7}}$ **, 1 *litre of paint can paint* 440 *square meters***)

TASK

Determine;

a) i). the number of litres of paint needed to paint the cylindrical pillar.

ii). the capacity of the bucket in litres.

iii). the number of buckets of paint required to paint the pillar.

b) i). the amount of each paint in the mixture.
ii). how much is 1 litre of mixture.

THE END

THANK YOU

"SMATA"

Together for Mathematics

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456/1
Math
Paper 1
July 2024
2 ¼ hours

ACEITEKA JOINT MOCK EXAMINATIONS 2024

Uganda Certificate of Education

MATHEMATICS

Paper 1

Time: 2 Hour 15 Minutes

INSTRUCTIONS:

*Both items in **Section A** are compulsory.*

Section B has part I and part II. For each part attempt only one question.

Use none programmable scientific calculators.

All working should be written in the answer booklet provided.

SECTION A

(Attempt both items in this section)

ITEM 1

A gym instructor has just bought some rolls from a dealer that can be subdivided into smaller mats to be used during floor exercises the rolls are $80m^2$,$150m^2$ and $60m^2$, the instructor wants to cut them for resale to his clients who come to the gym without one at UGX 25,000 each, but cannot establish the exact dimensions that he can use such that all small mats cut out, are of the same area. As his friend, he knows that you can help him using your mathematical skills so he asks you to do so.

On a good day he made a collection amounting to eight hundred fifty thousand shillings of which he is to use, 15% is to be banked, 1/5 of the remainder for utility bills and the rest will be shared with his brother taking 3 parts and the instructor taking 2 parts as they had agreed as joint owners of the business, so he gives you all the money and asks you to send his brother's share on his mobile money account.

TASK:

a) Using your mathematics skills show your friend how much money he will earn from the resale of the gym mats he will get from the rolls.

b) Show your friend how you came up with the amount you have sent to his brother.

ITEM 2.

A carpenter has decided to start his own company, he has rented a small room where he will store his products, he has only UGX. 120,000 remaining that he wants to use to make tables and chairs as his first products, he knows that a chair will cost him UGX. 20,000 to make while a chair will cost him UGX. 12,000, but each table will get him a profit of UGX.80,000 while a table can get him a profit of UGX. 45,000 the space remaining in his store can accommodate at least 8 items altogether, he needs your help to decide how many tables and chairs he should make in order to maximize profit.

At the workshop he makes sofa sets, a set of 3 small chairs and one big chair costs UGX. 1500,000 while a set of 2big and one small costs UGX. 2,000,000 he has got a client who wants to buy one small chair and one big chair but he does not have the price for individual items.

TASK:

a)(i) write mathematical inequalities and expressions showing the conditions for the carpenter.

(ii) use the inequalities to help him decide on the number of tables and chairs he can make so as to maximize profit.

(b) what price should he charge the client for each item.

SECTION B

PART 1.

Attempt one item from this part.

ITEM 3

A company making soft drinks M, N and F wants to start producing its drinks according to the market demands so a research is done by giving any respondent a drink of his preference in a certain town, of the 45 people that responded, they found that the number of those who liked M was equal to those who liked N,10 liked M and F ,11 liked F and N while 6 liked M and N only, 26 liked F and 5 liked M only, the number of those who liked F only was double those who liked N only.

Task:

(a) Which drink should be produced more and why.

(b) If a person is chosen at random from that town what is the probability that he does not like any of the drinks made by the company.

ITEM 4:

A village cyclist club wants is to select members that are to participate in the district cycling competition, they registered 60 people for the race from which they are to do the selections which is in two phases.

Those who will qualify for phase two from phase one, will be those who could finish within a time less than the overall average time for all participants. Those in phase two to qualify for the district competitions, have to finish within 125 minutes and less.

Below is the summary of time in which the people finished the race in phase one;

Finish time (mins)	120-124	125 - 129	130 - 134	135 - 139	140 - 144
Number of people	15	14	13	11	7

a) How many qualified for phase two?

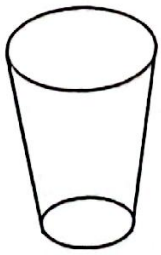
b) What is the probability that out of those that qualified for the second phase, the organization will get some who will participate in the district competition.

PART 11

Attempt one item from this part.

ITEM 5

A client at your uncle's workshop has brought an order for baking tins that he wants to use to make a wedding cake, he wants each tin to have a diameter of 24cm at the bottom, 36cm at the top and a height of 28cm. Your uncle asks you to determine the material that will be needed to make one tin so that he can order for the materials from town to make the order.



The client has also just bought a machine that makes ice-cream cones, it makes cones of diameter 9cm but he can adjust the height depending on the volume of ice-cream he wants, he also intends to fill each cone with $63cm^3$ of ice-cream.

TASK:

(a) Determine the material that will be needed to make one baking tin.

(b) Determine the height of the cone that should be put in the machine.

ITEM 6.

A certain school has organized a trip for the p7 class. The teacher in charge has identified the travel routes that they will take, from school they are to move east for a distance of 120km to a town A where they will spend the night, there after they will turn N50°W and move a distance of 200km to town B for the second night , from town B they are to return to school but he was told that there is a direct route from B to school although he does not know the route, but wants to know if it will help them to save some money on fuel if they use that route or not.

In this school a teacher who teaches a p7 class, is paid UGX. 1,200,000, a housing allowance of UGX. 300,000, utilities allowance of UGX. 100,000 and an off station allowance of UGX. 150,000 for all teachers of p7, the teachers are also required to pay 5% of their gross salary to a social security fund. the school bursar is in hospital but they must be paid their salary for the month before they take the children for the trip, the country's tax rates are as below.

Monthly taxable income	Tax rate %
0 - 300,000	0
300,001 - 600,000	10
600,001 - 900,000	15
900,001 and above	20

TASK:

(a) By use of your mathematical skills which route would you advise them to use if they want to save on fuel costs.

(b) Help the administrator to determine the amount of money he should deposit on each teacher's account.

END

MATHEMATICS SEMINAR ITEMS ON SATURDAY 15/06/2024
AT NAALYA SECONDARY SCHOOL LUGAZI CAMPUS

ITEM	AREA OF CONSTRUCT	TOPICS COVERED
Item 1	NUMBERS	✔ Number bases
		✔ Working with integers
		✔ Fractions, percentages and decimals
		✔ Numerical concept 1 and 2
		✔ Ratios and proportions
Item 2	PATTERNS AND ALGEBRA	✔ Sequences and patterns
		✔ Equations of line and curves
		✔ Algebra 1 and 2
		✔ Mapping and relations
		✔ Inequalities and regions
		✔ Equation of a straight line
		✔ Rectangular Cartesian plane
		✔ Simultaneous equations
		✔ Linear programming
		✔ Loci
Item 3 and 4	DATA AND PROBABILITY	✔ Data collection and presentation
		✔ Graphs
		✔ Set theory
		✔ Data collection and display
		✔ Matrices
		✔ Probability
Items 5 and 6	GEOMETRY AND MEASURES	✔ Geometrical construction
		✔ Bearings
		✔ General and angle properties of geometric figures
		✔ Reflection
		✔ Business arithmetic
		✔ Time and tables
		✔ Similarities and enlargement
		✔ Circle
		✔ Rotation
		✔ Length and area properties of two-dimensional geometrical figures
		✔ Nets, areas and volumes of solids
		✔ Trigonometry 1 and 2
		✔ Vectors
		✔ Business mathematics
		✔ Matrix transformation
		✔ Circle properties
		✔ Lines and planes in three dimensions

SECTION A:

This contains patterns and algebra where the two numbers set are compulsory to the candidate

ITEM. 1.

The Prime Minister for Buganda Kingdom visited Mityana S.S and appreciated efforts put in project work by the agriculture department. He noted that $\frac{1}{8}$ of the school farm is used for banana plantations, ¼ for cattle keeping and $\frac{7}{10}$ of the remainder for multi-purpose projects. This leaves 9 acres of the school land untouched.

The school has teaching staff of 180 teachers of which $\frac{1}{3}$ of the male staff teach science subjects and $\frac{2}{5}$ of the female staff teach Art subjects and 112 teach other subjects.

Task;

(a) Which fraction of land is used for multipurpose projects

(b) (i) How many acres of land does the school have

(ii) Use a clear diagram to partition the land?

(c) Find the percentage of female teacher who teach Art subjects

ITEM 2.

Your care taker wishes to raise money to pay for fees for three of his other children who do different courses in the university for three years and each year has 2 semesters.

He has one of his pieces of land measuring 180m by 60m that he is planning to sell

He is to pay accommodation fee of one million shillings for each of his children every semester in addition to the fees below according to the course each child is doing. Below are the courses chosen by each child at the University with respect to their abilities.

COURSE	DUCATION	ENGINEARING	BUSSINESS ADMINISTRATION
FEE PER SEMESTER	120%of the accommodation fee	One and a half of the accommodation	300,000 less than expenditure for Education.

He wishes to use 1.6666... of his total expenditure to the University to construct a bridge, which will shorten the distance between his home and the farm because he has to walk 40m west of

the home then 20m north wards to access the farm. He is to find the accurate length of the shortest distance in order to find the exact cost of each meter of the material to be used in the construction which also includes the labor costs.
The remaining part of the money would exactly be enough to pay for your school fees for third term.
He has two plans A and B

- Plan A is to sell the whole piece of land at ninety million shillings
- Plan B is to partition the land into largest squared plots which could be sold at shs. 41,000,000 each plot.

a. i). How much money does your care taker pay to the university all together?
ii). In which other way does he have to write the portion of money to be used for constructing the bridge
b. i). Determine the sides of each largest square plot
ii) What would be the accurate length of the bridge.
c. Which of the plans would help your care taker to raise the money to meet all his stated plans and why
d. Basing on the above plan how much would be your exact fees and the exact cost of each meter of material used for constructing the bridge.

ITEM 3.

A tailor is planning to design a budge ABC in triangular shape basing on the X –Y plane such that A is 3 cm in the north of the origin, line segment AB has x - intercept of -2 whereas the x-intercept of line segment AC is 4.
Task;
(a). Help the tailor to come up with the accurate design
(b). How many budges can the tailor make from a material of area $0.225m^2$.
(c). Deduce inequalities satisfying the region covered by one accurate budge.

ITEM 4.

At the function of re- opening Mandela National Stadium, 6 people had a simple game in which player Number 1 kicked the ball from the origin O to player A by a displacement $\begin{pmatrix}2\\6\end{pmatrix}$, then player A displaced it to B by $\begin{pmatrix}2\\-3\end{pmatrix}$, player B to C by $\begin{pmatrix}1\\0\end{pmatrix}$, C to player 1 by $\begin{pmatrix}-5\\-3\end{pmatrix}$.

Player 1 decided to make a straight kick to the referee who was in position

(8,8).

By coincidence, all the people in the game looked in the mirror which was fixed on the x-

axis wall and saw their images in different positions.

Tasks:

(a). (i) Which role does number one play in a football match.

(ii). By use of vector geometry summarize the touches the players made in a Cartesian plane

(iii). Which translation describes vector AC and AR?

(b). Deduce the relation in form of (x, y) of the straight path between number 1 and the referee. Hence state the range for the relation.

(c). Determine the position vectors for each of the people in the mirror

(d). With clear reasons, justify the properties that all the 6 people were in the mirror.

ITEM 5.

Your school has been chosen to host the finals of the district foot ball tournament between two schools A and B. Your head teacher wants to find out the highest number of guests to invite and he has given you an assignment to organize a specific rectangular space for them around the field which is $(3x + y)\ m$ long and $(2x + 4)$ m wide with a total area of $72\ m^2$ and the distance a round it is $34m$, according to your estimates the longest side of the space will accommodate the number of chair three times its length and the width will accommodate the number of chairs which are two times the width of the space.

During the day of the match the two teams did not score any goal for the 88 minutes of play until the captain of team B made a technical shot which referees failed to identify if it was a score since the goal posts which are usually at a maximum height of $2.44m$ did not have the upper bars or nets, however the match was monitored by the highest technology with a device that would detect the motion of the ball from point to point and translates it into an equation. The motion of the ball from the shot made by the captain followed an equation $h = 3t - t^2$, with h being the height of the ball for the 3 seconds, $t = 0\ s$, $t = \frac{1}{2}s$, $t = 1s$, $t = 1\frac{1}{2}s$, $t = 2s$, $t = 2\frac{1}{2}s$ $t = 3s$. the ball was at its maximum height at the goal post. the referees approached you to help them make clear judgment so that they determine the winner of the district trophy.

Task

a. i). Determine the dimensions of the space to be occupied by guests.

ii). Advice your head teacher with reasons on how to utilize the space in order to invite the maximum number of guests.

iii)What would be the maximum number of guests to be invited?

b. i). Represent the motion of the ball clearly indicating the position of the ball corresponding to the stated time.

ii). Trace the path taken by the ball

iii) Estimate the time the ball is at a height of 0.85m and when the ball is on the ground.

c. Basing on your analysis and giving a reason advise the referees on the decision to

take.

ITEM 6.

School A has a total of 450 students in both secondary and primary sections.
During Lugogo trade show, it took all the students for academic purpose. At the entrance, the cashier sold each secondary ticket at shs. 1200 and that of primary at shs. 700. This made the cashier to collect shs. 475,000 from all the students.
Suppose another school B from Gayaza attended with 210 O`level students, 5 Arts students 12 science students and 96 primary students.

a) Help the cashier to establish the number of students per section of school A to put in the report. 4
b) How much money did the cashier collect from school B.
c) Apart from the method you have used in (a) above, explain any two other methods the cashier could apply.

ITEM 7.

You are in a management committee that is organizing a fare well party. The committee wants to establish the number of people to attend the party keeping the cost as minimum as possible. You have been assigned a department of drinks which has a maximum amount of shs. 450,000. you are planning to buy creates of soda and Jerrycans of juice Each create of soda costs 20,000 shillings, a Jerrycan of juice is shs. 30, 000. You intend to buy more creates of soda than Jerrycans of juice. The Jerrycans of juice should be more than 6 and the creates of soda should be less than 12.
Each person will be served only one type of drink once and in the budget 24 students are to take a create of soda and 20 students are to take a full Jerrycan of juice.

Task

a. Write down mathematical statements to show the relation between the number of creates of soda and the number of Jerrycans of juice.
b. Show the feasible regions of the relation on the Cartesian plane
c. With reasons basing on calculations help the committee to establish the number of students who are to attend the party at a minimum cost.

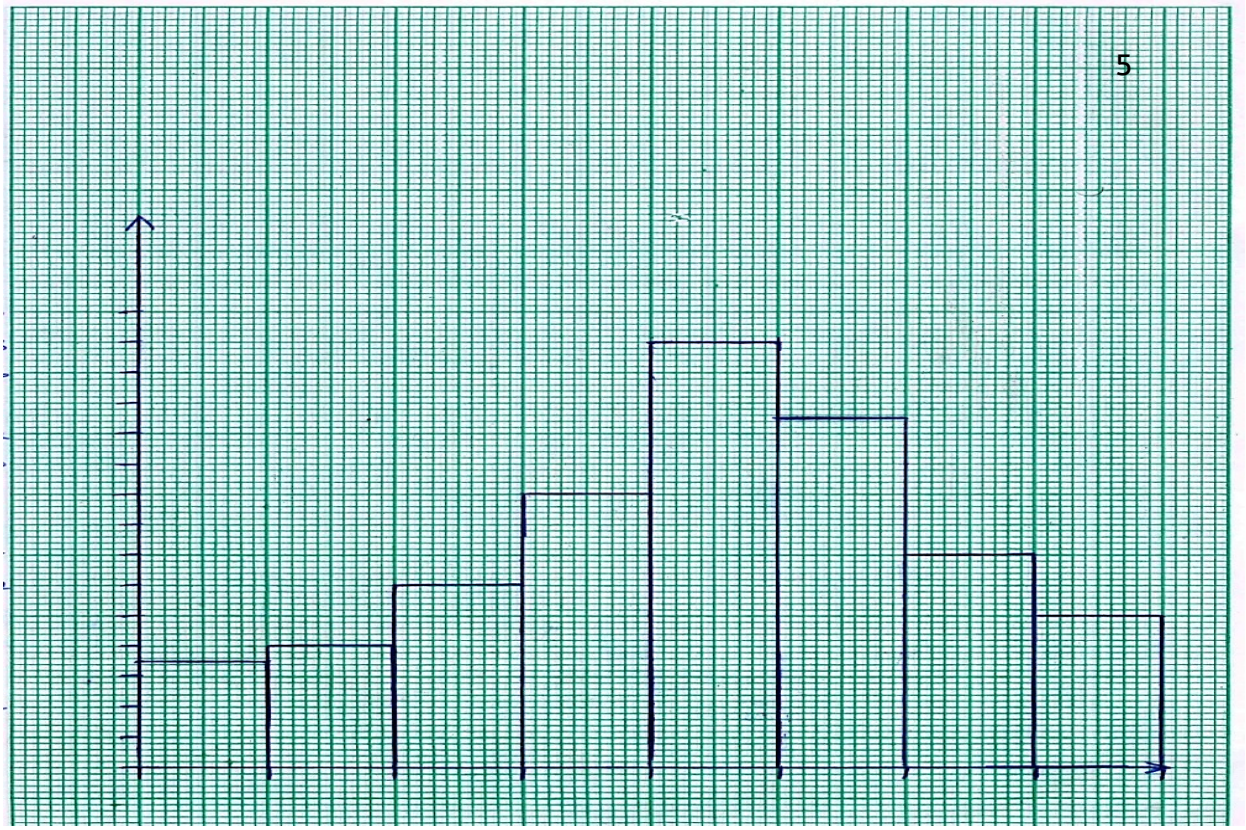
SECTION B (I)

This contains data collection and probability from which a candidate picks 1 number out of the 2

ITEM 8.

In 2020, schools closed, the economy was shut down and many people got infected of which some died.

The Covid 19 pandemic made us to loose 35% people in East Africa, 30% in the central Africa, 15% in the West Africa and 120 people in the northern Africa



The horizontal axis starts at 19.5kg and has a width of 10kg. The vertical axis starts at 0 and has a scale of 1cm : 2 people.

Task:

(a) As the head of ministry of health in one of the African countries, which suitable method would you use to present the death rate to the W. H .O and how would you advise the entire continent?

(b) Use the graph above to estimate the modal weight of those who survived.

(c) What was the average weight of the group that survived?

ITEM 9.

The government wants to improve the lively hood of people in your community by buying them goats, cows or sheep but it doesn't know the exact number of animals to buy and which animals to buy in larger quantities for the first phase of the project. a group of people were sampled for the first phase of the project, among them 50 denied the idea because they didn't have space to

keep any of the animals,30choose to keep goats only, those who chose to keep only sheep were half of those who chose to keep only goats and five more than those who chose to keep only cattle.38 chose to keep both cattle and goats, 58 choose to keep both cattle and sheep, 30 could keep both goats and sheep. 80 people all together accepted to keep goats.

Task;

a) Determine the number of people who were sampled
b) Calculate the chance that a person selected from the sample keeps at least two categories of animals
c) How many people choose one type of animals?

6

ITEM 10.

During holidays you help your guardian to sell a retail shop which is in the city center. he normally does his shopping every two weeks in two markets A and B. He decided to include rice, posho and beans in the shopping least.

In the first week, he bought ***300kg*** of rice, ***200kg*** of posho and ***160kg*** of beans from market A. from market b he bought ***120kg*** of rice ***300kg*** of posho and ***280kg*** of beans

In the second week he bought ***180kg*** of rice and ***250kg*** of posho from market A, from market B he bought ***160kg*** of rice ***300kg*** of posho and ***200kg*** of beans. He bought each kilogram of rice at ***shs. 4500***, that of posho at ***shs. 2200*** and that of beans at ***shs 5000.***

Two customers a boy and a girl visited the shop with ***shs. 29,400*** each. The girl bought ***5kg*** of rice and ***2kg*** of posho while the boy bought ***3kg*** of rice and ***4kg*** of posho. However, you gave him back a change of ***shs. 5600*** which was enough to buy only ***1 kg*** of beans. The girl complained bitterly why you didn't give her ang change yet they each bought **7kg** of both items.

Your guardian also wants to find out if he can gain by buying the three goods he has included in his list and if so which one of them will he buy in large quantities during the next purchase.

Task

a. i). Organize the goods purchased by your guardian in each week

ii). What are his overall purchases for the two weeks?

b. i) By organizing what the boy and the girl purchased, help the girl to understand why you did not give her change using a calculation.

ii)Basing on a calculation and giving a reason advise your guardian to either

continue buying the three goods or not.

c. Which profit did the guardian get in the two weeks.

7

ITEM 11.

The DOS of Old Kampala S.S is planning to take S.4 students to Nalya S.S Main compass for a mathematics seminar scheduled on 15th / June / 2024.While thinking about the type of vehicle to use, he discovers that the overall expenditure for a trip is directly proportional to the distance and inversely proportional to the number of students the costa carries. He then made a budget such that shs.138, 000 is available if the costa carries 20 students for 50km and sh. 104,900 available if the costa carries 25 students in a distance of 38km.

The total distance between the two schools is 84km and 40 students are expected to leave the school once at 8:30am in a costa moving at a steady speed of 40km/hr.

The seminar took $3\frac{2}{5}$ hours before students going back to their mother school.

They boarded the same costa but this time it was moving at a speed of 44km/h before it got a mechanical problem when it had just travelled for 1hour. It took the costa 30 minutes to resume the journey until they reached at 4:30pm.

Tasks:

a) As the head prefect, help the DOS to know the total expenses for the entire journey.

b) By use of a graph, describe the motion of the costa to the board of governors.

c) If you were the driver, which safety measures would you consider before starting your vehicle.

SECTION B (II)

This contains geometry and measurements from which a candidate picks 1 number out of the 2

ITEM 12.

Joseph and Mathias are new employees in a motor company. The company offers each of them a total monthly pay of shs. 1.5 million. The monthly total payments for Joseph include the benefits totaling to 300,000 while that of Matthias include the benefits like; Housing shs. 100,000, daily transport shs 4000, break and Lunch shs120, 000 and family shs 150,000 at the end of the month they received less and different amount of money in their accounts and they went to the finance office which is always busy. They were given a tax revenue document that they failed to understand and they came to you for help with the document below.

Taxable income (shs)	Percentage deduction
First shs 100,000	10 %
Next shs 100,000	15 %
Next shs 200,000	22%
Next shs 300,000	28 %
Rest of the money	30%

8

Mathias decided to buy a motor cycle priced at shs 7,000,000 from the same company. The company has two payment options. Cash payments which usually offer a deduction of 5% of the marked price or paying 10% of the price followed by monthly payments of shs 500,000 each month for 14 months.

Task

a) Basing on the financial document justify that the two employees received different amounts in their accounts and who received more.
b) Which mode of purchasing the motorcycle farvours Mathias and why.

ITEM 13.

A company selling newspapers spends shs.1450 to produce a copy of news paper and sells it at shs. 2500.

On a certain day, the company produced 3200 copies and managed to sell 1500 copies only hence making a loss.

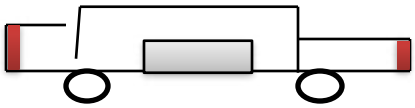
This left the manager wondering on what should be done to maximize profits.

He later realized that there was need to closely monitor production costs, widen the market base and buy more 4 vehicles of (Toyota Land Cruiser) to improve on transport.

He went to the bank and was given a loan of 900 millions at a compound interest rate of 8% per annum.

He then visited spear motor and bought 4 vehicles on cash basing on the advert below.

Toyota Land Cruiser on sale!!!!!!
Marked price shs. 250,000,000
Cash price shs. 21% less than marked price
Hire purchase terms, Deposit 18 million and pay
24 millions per month for 8 months



Task

(a). Determine the percentage loss the company made

(b).(i) Which amount did the company pay to the bank after 3 years.

(ii). How can a loan benefit you as a business person?

(c). How much money did the manager save for the company after buying 4 Land Cruisers on cash rather than on hire purchase terms?

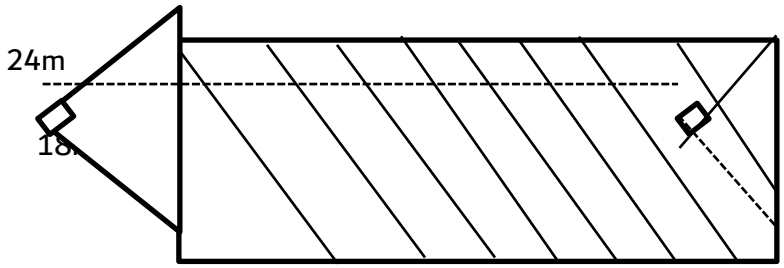
(d). Which strategies should the company apply to maximize profits?

ITEM 14.

Your Uncle 1.5m tall is a city engineer, he was contracted to supervise the renovation of your classroom.

On arrival at the site, entered in the class and stood in one position where he sighted two points at the ceiling A and B through angles of elevation 22.6◦ and 30◦ respectively which were in bad condition due to its leaking roof.

Given that points A and B are of the same height from the ground and your Uncle was at a horizontal distance of 12m from the foot of point B. The engineer concluded with a report to replace the roof with a triangular prism below.



The cost of each iron sheet of area $2.1875m^2$ is shs. 75,000.

Task: Help your Uncle to,

a) Work out the distance between the two points A and B
b) Understand the height between the floor and the ceiling of your classroom
c) Compute the space the triangular roof has to occupy.
d) Determine the number of iron sheets and their total costs to accomplish the task.
e) As a technician in construction, how can you make buildings strong?

ITEM 15.

One of the districts that benefited from the parish model received **361,500,000shillings.** A total of **400** beneficiaries who always gather at the district headquarters selected a committee to go and buy cows of relatively the same size and reserve for each of members **25,000 shillings** to help in transporting animals to their respective homes, the committee decided to pick you from your **residence** which is **40km north** of the **district headquarters** to

help them make some decisions. You asked them a commission of 0.5% of the total sale from any farm and accepted .You then took them to the **first** farm which is **60km** and **N 40^0 W** of your **residence**, this is the only route from the district headquarters to this farm. The cost of a cow in this farm is **900,000 shillings**, the committee then requested you to take them to the **second farm** which is **80km east** of the **first farm** to inquire the cost of a cow. They were informed that it is **920,000 shillings** however, the farm owner gives a reduction of **5%** for customers who buy in larger quantities, they would also go back from the second farm to the district headquarters using a shorter route. The estimated cost for 1km is **500shillings**

The committee also wants to buy yoghurt from the farm for every member, each litter of yoghurt costs **3,000 shillings** from either farms. They are to carry the yoghurt using two uniform cylindrical cans, 4 small ones with a capacity of **20liters** and height of **0.5 m** each and **2** larger ones of height of **1 m each.** all are to be filled to capacity.

The committee failed to agree on which farm to buy the cows considering the transport costs other expenses and their budget. They then asked you for help them with the appropriate decision on which farm to buy cows, and they also agreed that whichever amount that remains out of your decision would be given to you as your upkeep at school.

10

Task

a. i). Determine accurately where and how far from the district headquarters is the second farm.
   ii). What would be total transport cost for the two-way journey to and from each farm.

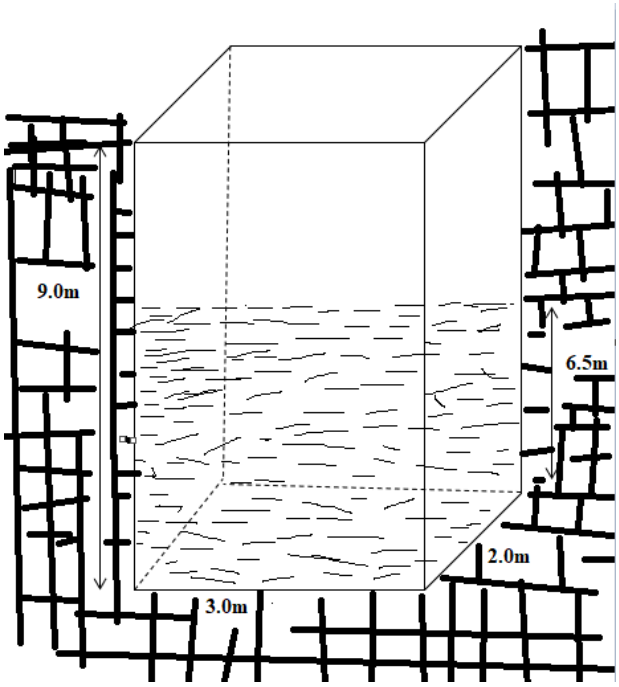
b. i). Find the quantity of yoghurt each of the ***400*** members is to take if they are to receive equal shares
   ii). What would be the total cost for the yoghurt?

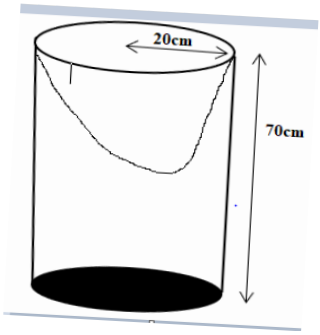
c. Basing on calculations and giving reasons advise the committee on which farm to buy cows.

d. How much commission did you receive if the committee agreed with your suggestion?

ITEM 16.

Your friend's family built an under-ground water tank which is 9 m deep it has water to a height of **6.5m** and they are selling each ***20 liters*** Jerrycan at ***1000 shillings.*** They normally fetch the water from the tank using a uniform metallic can of height ***70cm*** and circular closed base of radius ***20cm*** by tying the rope on its handle.





After fetching ***400*** full cans, he descided to visit you and forgot the tank open, ~~he~~ 11 then requested to come with you to help him fetch more water however you found out that the neighbours goat had fallen in the tank,when you flashed the touch from the top conner of the tank you were able to see the legs of the goat at the opposite bottom conner.You want to find the new depth of water and the angle at which you were able to see the goat.

Task

a) Determine how much money your friend was to get from the water if he had fetched all the water in the tank, how much was he able to get.

b) At which angle were you able to see the goat

c) What was the new depth of water?

ITEM 17.

The sports field in your school is circular, during the inter-house competition, the referee at the circumference from the far end of the field invited the school coach and the sports master to have a brief meeting at the center of the field. The coach and the sports master were at the end points of the touchline but opposite to the referee. Both coach and the sports master each had to run ***25m*** straight to the center. The coach was at ***$S40^0E$*** of the referee and the sports master was ***$S25^0W$*** of the referee. You and your friend left the position of the coach at the same time at a speed of ***2m/s*** to the house master. You took a direct path and your friend took a circular path, you wanted to find who would reach faster. The whole section of the field behind the touchline was to be occupied by guests.

You realized that there was demand for soda and water by the people in the field, you went and borrowed **140.000** shillings from a savings group where your guardian is a member, they told you to return the money with **5%** of what you borrowed, you went and bought **100** bottles of soda at **80,000** shillings, **50** bottles of Rwenzori water at **35,000** shillings and **50** bottles of ice land water at **20,000** shillings. you then sold each bottle of soda and Rwenzori water at **1,000** shillings and a bottle of Iceland water at 500 shillings, you spent **5,000** shillings on

transportation.

Task

a. i). determine the angle at which the coach and the sports master met at the center of the field.
   ii). Between you and the friend who reached the house master first, basing on the calculation what was the difference in your times of arrival.
   ii). Which space is occupied by the guests.

b. Basing on a calculation and giving a reason was your idea of borrowing money beneficial.

THE END

KAMSSA

PRE REGISTRATION EXAMINATIONS 2024
Uganda Certificate of Education
MATHEMATICS
2 Hours and 15 minutes

INSTRUCTIONS TO CANDIDATES

- This paper consists 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
- Graph paper is provided

SECTION A
Answer all items in this sections

Item 1

Elimu school bought 25 textbooks and 35 exercise books for Ugsh 135,000 from Kampala General bookshop. From the same bookshop Soma school bought 21 textbooks and 38 exercise books and spent Ugsh 13,000 less than Elimu school.
However, in Soroti cheap bookshop the cost of a text book was 5% less and that of an exercise book was 5% more than in Kampala General bookshop.
Mengo school bought the same number of textbooks and exercise books as Elimu school in Soroti cheap bookshop.

Task

a) As a senior four student, help Elimu school and Soma school to find out the price of each item in Kampala general bookshop.
b) What is the difference in the amount spent by Mengo school and Elimu school?

Item 2

Mr. Waguwenda is a business man who deals in an agricultural produce business. He visited four markets in week two of the month of March 2024.
In Nakasero market (N), he bought 3 bags of beans, 5 bags of maize, 10 bags of potato and 3 bags of millet.
In Gayaza market (G), he bought 1 bag of beans, 4 bags of potatoes and 2 bags of millet.

In Jinja market (J), he bought 4 bags beans, 3 bags of maize, 6 bags of potatoes and 1 bag of millet.
In Masaka market (M), he bought 5 bags of beans and 1 bag of maize.
Mr. Waguwenda bought each bag of beans at Shs. 45000, a bag of maize at Shs. 30000, a bag of potatoes at Shs. 15000 and a bag of millet at Shs. 50000.
However, since he is a business man, he later sold off all the produce he had bought at Shs. 50000 per bag of beans, Shs. 35000 per bag of maize, Shs. 18000 per bag of potatoes and 55000 per bag of millet.

Task

a) Assist Mr. Waguwenda to summarize the above information in matrix form.
b) Using your knowledge of matrix multiplication help him to know the amount of money spent on the produce in each market.
c) With clear evidence, help him to know whether he made a loss or profit.

SECTION B
This section has two parts I and II
Answer **one** item from each part

Part I

Item 3

The government of Uganda through Mulago hospital carried out free medical checkup for its state ministers in order to enable them attend the Allied Membership meeting (NAM) which took place in Uganda at the start of the year 2024.
However, each Minister was weighed and the masses of those who attended the medical health function were recorded as follows.

64	58	52	73	62	50	60	64
49	47	58	45	58	74	66	73
48	46	55	52	51	69	59	44
60	42	48	54	73	61	58	50
41	53	54	46	43	61	67	70

Task

a) Form a frequency distribution table using classes of size 5 and starting with class of 40-44
b) Giving a reason, based on the statistics calculation. What do you think was the average weight and most appearing weight.
c) Assuming you're the medical doctor who carried out the test, Represent the information on a statistical graph to obtain the modal weight.

Item 4

Mr. Livingstone is a very rich man in Mbarara city where he has constructed 36 houses.
He wants to paint his houses by either green, white or black colour. Of these, 10 houses must have to be painted with Green colour and 6 houses must be painted by black colour. The 5 houses must be painted with green and white, 8 white and black and 4 houses must be painted with green and black.
All houses which are painted white are three more than those which are pointed black.

Task

a) Determine the number of houses that were pointed with all the three different colours.
b) Determine the number of houses painted with at least one of each of the three colours.
c) If the house is picked at random, what is the probability that it is a black or white only.

Part II
Answer one item from this part

Item 5

A group of students from Nairobi University agreed to contribute equally to buy mathematical calculators worth Ksh 1200 for a school library.
Five students pulled out and so the others agreed to contribute on extra Shs 10 each. Their contributions enabled them to buy calculators worth Shs. 200 more than they originally expected.

Task

a) If the original number of students was X, write an expression of how much each was originally to contribute.
b) Write down two expressions of how much each contributed after the five people pulled out.
c) Calculate the number of people who made the contribution and find out how much did each contribute.

Item 6

A ship leaves port M and sails on a bearing of 050^0 heading towards island L. Two Navy destroyers sail from a naval base N to intercept the ship. Destroyer A sails such that it covers the shortest distance possible. Destroyer B sails on a bearing of 200 to Island L. The bearing of N from M is 100^0 and the distance NM = 300km

Task

Using a scale of 1cm to represent 50km;
a) Determine the position of M, N and L
b) Find the direction of N from L.
c) Find the distance travelled by destroyer B.

END

456/1

MATHEMATICS

Paper 1

Jun/Jul. 2024

2 ¼ hours

Uganda Certificate of Education

MATHEMATICS (456/1)

TIME: 2hours 15 minutes

INSTRUCTIONS TO CANDIDATES:

This paper consists 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 booklet(s) provided.*

Graph Paper is provided.

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

SECTION A

All questions are compulsory

Item one:

John plans to visit the shop that is **12km** south of his home and then the boutique that is **5km** east of t he shop and after drive back home using a direct route from the boutique to home. He is to use his m otorcycle that consumes **0.035liters** of fuel per km and he wants to know how much fuel he will need for the whole journey.

He has seven hundred fifty thousand Uganda shilling. He plans to use part in the shop and part in the boutique in the ratio of **3:2** respectively. He wants to spend **UGX.210,000** to buy shirts and **UGX.120,0 00** to buy trousers. However, he is not sure if his budget for the boutique will be enough.

From the shop, he is to buy **24** packets of cooking oil, **12** packets of sugar and **30** packets of salt. All o f these are to be used to make packages for some of his family members in the village. He wants ea ch package to have an equal number of items in it. He needs to know the highest numbers of packag es he can make from them.

Task:

a) How much fuel will he need for the whole journey?

b) Will the money he plans to use in the boutique be enough for what he plans to buy? Justify your answer.

c) How many packages will he make from the items he plans to buy?

Item two:

A certain catering and decoration company was called to cook **100kg** of rice at a certain party. Accor ding to their cooking notes, they put **22.5 liters** of water in **10kg** of rice and **67.5 liters** 0f water in **30kg** of rice. They want to use those notes to know how many liters to use in the rice they are ordered to cook but they are finding it hard.

The customer wants a tent at less than **UGX.250,000** and chairs at **UGX.200,000** at most. However, to maximize profit, the company wishes to provide both at **UGX.400,000** at least. The company is finding it hard to decide on how much to charge the customer for the two items respectively.

Task:

a) (i) Form a mathematical relationship between the quantity of rice and liters of water used to cook it according to their notes.

(ii) Use the relationship developed to help them determine the liters they will use in the rice they are ordered to cook.

b) (i) Form inequalities that are making it hard for the company to decide on how much to charge the tents and chairs respectively.

(ii) Use the inequalities, to help them decide on how much to charge for the tents and chairs respectively.

SECTION B

PART ONE (Attempt one item from this part)

Item three:

Your friend wants to sell dresses in your home area according to age. She requests you to recommend the dresses of a specific age he can display for most.

You gathered and summarized data to use it and find out the age of the majority of people in the community such that you recommend that. Below is the summery of your data:

Age groups (years)	30 – 34	35 –39	40 – 44	45 – 49	50 – 54	55 – 59
Number of people.	6	3	13	7	4	3

Task:

a) (i) What age is the majority of the people in the community?

(ii) What is the probability that your friend will succeed if he sews the dresses of that specific age?

(iii) According to the probability, is your recommendation a good choice? (Justify your answer).

Item four:

For your leaver's party campaign, members suggested that you buy and put on T-shirts as a class. You have three suggestions of sizes of T-shirts you can buy these are; Small size(S), Medium size (M) and Large size (L) T-shirts.

You will only buy the suggestion as the captain if **70%** of your fellow students can fit in at least two sizes. Below are your findings that you are going to base on to make a decision:

- The number of students who fit in medium size is equal to those who fit in large size and they are **100**.
- The number of students who fit in small size is **76**.
- Those who fit in small size and large size are **50**.
- Those who fit in medium size and large size are **70**.
- Those who fit in small size and medium size are **60**.
- Those who fit in none of the sizes are **4**.
- Some students fit in all the three sizes.
- The class is made up of **140** students.

Task:

a) Will you buy the suggestion of buying and putting on T-shirts as a class for your leaver's party campaign? Justify your answer.

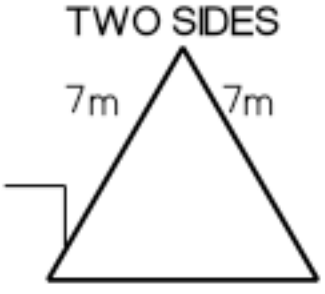
PART TWO

Attempt **one** item from this part

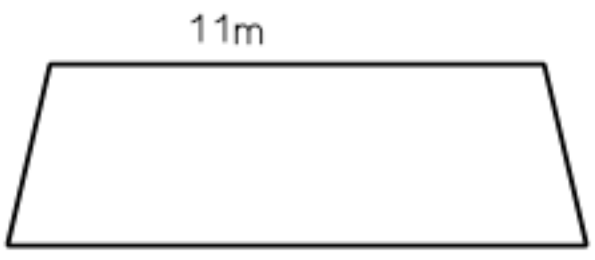
Item five:

A friend was given sketches below of the rooftop he plans to put on his house;

TWO SIDES



TWO SIDES



7m

7m

8m

19m

The builder recommended iron sheets of **3ft** by **4ft** that cost **UGX.40,000** per sheet. Your friend needs to know how many iron sheets to buy and how much it will cost him. He requested for your help as a mathematics student.**(1ft = 0.3)**

He also plans to get a loan of **UGX. 4,000,000** that he plans to pay back in **3 years** to finance his other projects. One bank offers the loan at a simple interest rate of **10%** and the others offers the same lo anat a compound interest rate of **5%**. He is finding it hard to decide which bank to get a loan from.

Task:

a) How many iron sheets will he need to buy and how much will he need to buy them?

b) Which bank do you recommend him to get a loan from and why?

Item six:

Mary usually sets off from a landing site that is located on coordinate $O(-9, 7)$ on her grid map to isl and A which is located at coordinate $A(-6, 3)$ on her grid map during her day off. Island A is south east of landing site O. This time she plans to extend her tour from island A to another island B that is **9km** north east of island A and then sail back to the landing site through the direct route.

She plans to tour around island A for **3hours** and around island B for **4 hours**. Her journey is to start at 10:00am. She hopes to be back by 20:00hours since she has work the following day. She wants to know if it's possible to return by that time but she does not know the time the ship will take to sail the whole journey. The boat is usually ridden at an average speed of **64km/hr**.

She is in charge of paying her fellow workers. Some workers were given a salary increment to **UGX.650,000**. This includes allowances of **UGX.120,000**. She needs to know how much income tax she is to deduct from them and the net amount she is to pay them using the tax bands below:

TAXABLE INCOME (UGX)	TAX RATES (%)
0 – 200, 000	0
200, 001 – 400, 000	10
400, 001 – 600, 000	15

Task:

a) (i) What is the total distance they are to sail?

(ii) What is the total time the entire tour will take inclusive of the time the boat will take to

sail the whole journey?

(iii) Will she make it back at the planned time? (Justify your answer)

b) How much will she pay her fellow workers?

END