

**S.4 MATHEMATICS SEMINAR AT UGANDA MARTYRS CENTENARY SCHOOL
KANGULUMIRA FOR THE COMPETENCE BASED CURRICULUM HELD ON
SATURDAY**

12TH JULY 2025

POWERED BY SUPER PLATINUM MATHEMATICS

SETTING FORMART FOR 456/1

SECTION A is made of two compulsory items and section B is made up of two Parts I and II each having two items and a learner answers only one item in each part

ITEM	AREA OF CONSTRUCT	TOPICS COVERED
SECTION A: COMPULSORY		
Item one	Numbers	1) Number bases
		2) Working with integers
		3) Fractions, percentages and decimals
		4) Numerical concept 1 (indices)
		5) Numerical concept 2 (surds)
		6) Ratios and proportions
Item two	Patterns and algebra	1) Sequence and patterns
		2) Equation of lines and curves
		3) Algebra 1and 2
		4) Mappings and relations
		5) Vectors and translations
		6) Inequalities and regions
		7) Equation of a straight line
		8) Simultaneous equations
		9) Quadratic equations
		10) Composite functions
		11) Linear programming
		12) Loci
SECTION B		
PART I (CHOOSE ONE ITEM)		
Item 3 and 4	Data and probability	1) Data collection
		2) Statistics
		3) Graphs
		4) Set theory
		5) Matrices
		6) Probability
PART II (CHOOSE ONE ITEM)		
Item 5 and 6	Geometry and measures	1) Geometric construction skills
		2) Bearings
		3) General and angle properties of geometrical figures
		4) Reflection
		5) Business mathematics

	6) Time and timetables
	7) Similarities and enlargement
	8) Circles
	9) Rotation
	10) Length and area properties of two-dimensional geometrical figures
	11) Nets, areas and volumes of solids
	12) Trigonometry 1 and 2
	13) Vectors and translations
	14) Vectors
	15) Matrix transformations
	16) Circle properties
	17) Lines and planes in three dimensions

SECTION A

THEME: NUMBERS

ITEM ONE

Mr Kintu has three children he plans to visit on Saturday. He wants to give them some pocket money such that the first born gets 40% of the money, the second born to get $0.\overline{24}$ and the remainder to be given to the youngest child. The second born revealed to you that he got UGX. 24,000. Mr kintu also plans to construct a goat shed for his goats, the base should be rectangular to fit in the corner allocated by his family. The corner is of area 2.5 m^2 and the dimensions of the goat shed and 128cm by $(256)^{\frac{3}{4}}\text{cm}$.

Tasks:

- How much money did the first and last children get?
- Determine the simplified area of the goat shed in centimeters in form a^n .
- Based on your calculations, will the goat shed fit in the corner?

ITEM TWO

Mr. Kapata owns a small bakery. He buys flour in 50 kg bags costing UGX150,000 each and sugar in 25 kg bags costing UGX 90,000 each. To bake a batch of bread he uses 1.5 kg of flour and 0.5 kg of sugar. He gets a 5% discount on flour orders over UGX 500,000. This month, he plans to bake 200 batches of bread and buy 8 bags of flour and the required amount of sugar. He sells each batch of bread for UGX 7,500, having incurred additional costs (yeast, energy, labour) of UGX1,000 per batch.

Task:

- Help the Mr. Kapata to know the total cost of the 8 bags of flour, considering the discount.

- (b) How many kilograms of sugar are needed and the minimum number of sugar bags he must buy? Calculate the cost of the sugar.
- (c) What is his total revenue from selling all 200 batches of bread?
- (d) Find the overall percentage profit/loss for the month based on the cost of flour, sugar, and the additional costs per batch.

ITEM THREE

A farmer has a rectangular field of maize of length $(\sqrt{243} + \sqrt{48})$ metres and a width of $\sqrt{75}$ metres. To protect his maize, he plans to fence off the field. It is known that the fencing wire costs UGX7,500 per metre. After harvesting the maize, he plans divide in two parts one to be left home for eating and another portion for sale in a ratio of 2:3 respectively. He hopes to leave home some 400kilograms for eating.

Tasks:

- (a) Determine the perimeter of the field, giving your answer in the simplest surd form.
- (b) Calculate the exact area of the field in square metres.
- (c) Advise the farmer on the total cost of the fencing wire required to go around the field once.
- (d) How many kilograms are expected to be harvested?

TEME: PATTERNS AND ALGEBRA

ITEM FOUR

A certain school in kampala is to transport learners to a mathematics seminar in Kangulumira, all the **300** learners are to be transported. There are two types of cars available, a coaster which can carry **30** people and a bus which can carry **60** people. The drivers available on duty that day are **10**. The trips made by coasters should be **at most 5**. The trips made by a bus should be **atleast twice** as many as those made by the coaster. It is known that the cost of hiring a coaster per trip is **UGX. 400,000** while that of a bus is **UGX. 900,000** The transport officer is not sure of the number of trips to order for of each type of car in order to minimize on the transport costs.

On reaching the seminar, your teacher discovered that the width of the main hall is 50metres less than its length. The school estates officer informed him that the area is **3600m²**

Tasks;

As a senior four learner, use your knowledge of inequalities to;

- (a) Form mathematical relations to represent the given information
- (b) Represent the information on the graph
- (c) Help the transport master to know the number of trips of each car to order for and determine the minimum cost.
- (d) What are the actual dimensions of the hall?

ITEM FIVE

Your friend plans to open up a pineapple processing factory in Nazigo town. He wants to buy two types of used motor cycles namely Bajaj and TVS for his pineapple plantations' supervisors to ease the process of supervising the different pineapple plantations. A Bajaj costs **shs. 2,000,000** and requires **shs. 16,000** per month to maintain it. A TVS costs **shs. 2,400,000** and requires **shs. 10,000** per month to maintain it. The factory owner has **shs. 18,000,000** to spend on the purchase of the motorcycles and **shs. 120,000** per month for maintenance. He would like to buy **at least 4** Bajaj motorcycles and **at least 2** TVS motorcycles. However, your friend does not know the number of motor cycles of each type that he can buy in order to minimize the maintenance costs.

Task

- (a) (i) write down all the mathematical constraints representing the above information.
(ii) Show the constraints on the feasible region.
- (b) Determine the possible number of motorcycles of each type that the factory owner should buy in order to achieve his target and hence find the amount saved.

ITEM SIX

Samalie has opened up a drug shop and needs to buy A and B drugs to stock her shop. At one wholesale pharmacy, in town she was told that 2 tins of drug A and 3 boxes of drug B would cost shs. 50,000 while 2 tins of A and a box of B would cost shs35,000. She needs to determine the cost of a tin of A and a box of B so as to set her price of the drug shop.

She also wants to sell her plot she bought in the neighboring village in order to buy the one in the village where the drug shop is located however, she is not sure of the exact dimensions but she knows that it is triangular in shape with two sides at right angles to each other and one side exceeds the other by 2m the longest side is 10m. she has asked for help to determine the exact dimensions of the

Tasks

- (a) Determine the cost of one tin of A and a box of B
- (b) Determine the dimensions of the land

ITEM SEVEN

RXZ Factory Limited employs 200 workers who specialize in producing roofing and non-roofing materials. Among the male staff, $\frac{3}{5}$ are skilled in manufacturing roofing materials and $\frac{5}{7}$ of the female staff also excel in producing roofing materials. The remaining 68 workers are involved in creating non - roofing materials. The factory is set to update its Information Document and thus needs to know the ratio of male to female staff. A self- employed carpenter from RXZ factory earns £180 for the sale of a rocking chair and £ 90 for the sale of a table. It takes 2 hours to make a rocking chair and 5 hours to make a table. He is limited to working 40 hours per week. The average manufacturing cost is £ 15 per rocking chair and £ 45 per table. He wishes to keep his manufacturing costs at almost £ 315 per week. The carpenter wants to know the weekly number of rocking chairs and tables that he should manufacture in order to

maximize his weekly sales.

Tasks;

- Help the RXZ Factory to know the ratio of its male to female staff.
- What are the linear inequalities and equations that satisfy all the conditions about the self-employed carpenter in RXZ factory?
- Show the feasible region of the self-employed carpenter's conditions on the Cartesian plane.
- Help the carpenter to know the weekly number of rocking chairs and tables that he should manufacture in order to maximize his weekly sales.

SECTION B

THEME: DATA AND PROBABILITY

ITEM EIGHT

Your brother Amos has organized a games with his friend Brian in the trading centre they agreed to play a game in which they will toss **a coin** and a **fair die** once. They were supposed to toss both at the same time and note the score on the uppermost face. To win this challenge you should have **a head** on a coin and **a square number** on the die

On the same day, Amos went to the wholesale shop to purchase some items for the week; he bought **3 kilograms** of rice, **2 kilograms** of sugar and **a litre** of cooking oil. On reaching home, his brother Brian felt challenged and also went to the same shop but for him he decided to buy **4 kilograms** of rice, and **$2\frac{1}{2}$ kilograms** of sugar. The prices per kilogram of the items were **ugx. 4,000**, **ugx.5000** and **ugx.8000** for rice, sugar and cooking oil respectively

Tasks:

- Determine the probability of losing the game
- Based on your calculations, advise your Brother Amos
- Represent the purchases as matrices
- What is the difference in the expenditure of the two brothers?

ITEM NINE

A poultry farm has three units: Sunrise, Meadow and Harvest. Each unit produces eggs and broilers, with the following monthly output.

Platinum: 75 trays of eggs and 50 broilers

Gold: 60 trays of eggs and 54 broilers

Bronze: 50 trays of eggs and 32 broilers

The farm sells each tray of eggs for 8,500 shillings and each broiler for 10,000 shillings. To optimize the packing process, the farm owner decides to weigh a sample of eggs and classify them according to their mass (in grams).

The table below shows the eggs and their masses.

Mass in grams	35-39	40-44	45-49	50-54	55-59	60-64	65- 69
Number of eggs	20	90	180	110	40	50	10

Mr. Kirabo plans to pack eggs in different masses to meet different customer requests.

Tasks;

- (a) Determine the sales he made after selling the farm outputs
- (b) Using a suitable statistical graph, determine the mass of majority of the eggs in the farm
- (c) Find the probability that a given pack of eggs weighs less than 50grams.

ITEM TEN

A city's transport department is working on improving traffic and public transport for a busy industrial area where 124 factory workers commute daily. They have conducted a survey to understand the preferred modes of transport used by the workers. The findings have revealed that 32 workers use buses, 50 use motorcycles, and 72 walk to work. Some workers use more than one mode of transport: 15 use both buses and walk, 18 use both buses and motorcycles, and 7 use both motorcycles and walk. 4 workers use only buses, while the number of workers who use none of the three transport modes (they might work remotely or use personal cars) exceeds those who use both motorcycles and walk only by 3. The transport planners claim that they will put traffic lights only if the chance of those who only walk exceeds 40%. The transport planners want to analyze this data to optimize road usage and reduce congestion, especially during peak hours.

Tasks:

- (a) Determine the number of workers who use all the three modes of transport.
- (b) Calculate the probability that a randomly selected worker uses at least two of the three modes of transport.
- (c) Advise the transport department, based on your calculations, whether to put traffic lights.

ITEM ELEVEN

At a given dairy factory, the manager requested the owner to change the nature of packaging material of packets of milk from thin polythene to a double walled thicker polythene to eliminate any possible chance of loss since the customers were buying larger quantities. The owner requested the manager to present the record of sales to per day. The packaging would be changed on two conditions

- If the average mass of packets sold is greater than the median or
- if the mass of majority of the packets bought are more than 40% of the packets.

The record of the masses in grams of packets of milk sold that day for 40 clients was as below

49	40	45	36	67	32	45	42	40	42
61	48	55	67	51	53	35	46	50	43
47	37	47	47	49	30	62	48	53	41
53	43	45	49	51	44	48	38	49	48

The owner needs this information presented graphically to make a decision. If 60% of the clients bought more than 48 packets of milk, a new packaging will be introduced at the factory.

Tasks;

- (a) Represent the information on a frequency distribution table with using classes of class size 5 grams
- (b) Will a new packaging be introduced at the factory? Give a reason.

GEOMETRY AND MEASURES

ITEM TWELVE

A graphic designer was working on a company logo based on a simple triangle with corners at $A(1,1)$, $B(4, 1)$, and $C(1, 5)$ on a digital grid. As part of the design process, he first created a mirrored version of the triangle by reflecting it across the x-axis, resulting in a new triangle $A'B'C'$. Then, to explore variations, he took this new triangle $A'B'C'$ and enlarged it with scale factor -2 around the center of the grid (the origin) to get the final shape $A''B''C''$. She needed to know the precise locations of the corners of the transformed triangles and understand the overall effect of the two steps combined. The cost of this design per square centimeter is UGX. 240.

Task:

- (a) Help the designer to know the exact coordinates of the two images.
- (b) Describe a single geometric transformation that would map triangle ABC directly onto triangle $A''B''C''$.
- (c) determine the amount of money the designer will get from the image triangle $A''B''C''$.

ITEM THIRTEEN

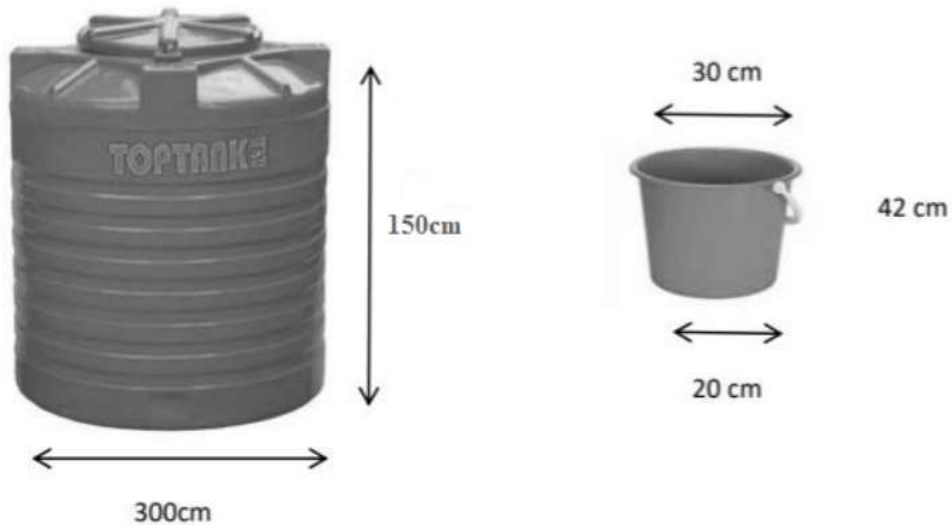
A new district doctor in town A has been sent to collect essential drugs from a distant town C which is 160km from A through town B. He begins driving at 7:00am with an average speed of 60kmh^{-1} but plans to rest for an hour in town B after the first two hours. He must reach the supplier in town C by 10:30am or risk a delay in treating several patients. Town B is south of town A and town C is on bearing of 60° from B. The new doctor has trouble locating the towns.

Task.

- a) Make a scaled guide showing the location of the towns A, B and C
- b) What is the shortest distance between towns A and C?
- c) Advise the doctor on the minimum speed he should drive at to reach town C in time.

ITEM FOURTEEN

A certain hotel in central Uganda, is facing a water supply issue. They have been informed that the water will run out three weeks before it is replenished. The manager has access to a nearby borehole, from which water must be collected using a bucket. The bucket has a top diameter of 30 cm, a bottom diameter of 20 cm, and a height of 42 cm. The collected water is stored in a cylindrical tank that needs to be filled. The tank has a diameter of 300 cm and is 150 cm high. If 1 litre of water is shs 2,000 and each bucket carried is shs 500.



Because of the scarcity, the manger plans to purchase another bigger tank to support the existing one. At the shop, the tanks can be bought in cash by paying shs. 960,000 or in installment terms by paying first 50% of the cash price and the rest in three equal monthly installments each of shs. 180,000.

Tasks;

- Determine the number of buckets needed to fill the tank completely.
- how much money that will be spent on water over three weeks if the hotel uses 60 liters of water per day
- if the hotel management chooses the cash terms, how much money will they save as compared to one who opts for installment method of payment.

ITEM FIFTEEN

Your brother is a carpenter and he has been contracted to make stools for a restaurant. According to the restaurant manager, the stools should have a round wooden top of radius 0.2m. the available pieces of timber are triangular of the adjacent sides are 60cm and 65cm which intersect at angle of 75° . Your brother is not sure if these pieces of wood can make the stool tops.

In a close discussion with the manager of the restaurant, he informed your brother about the benefits of being an employee at the restaurant. They provide housing allowance of shs. 30,000 monthly, meals of shs 15,000 daily and accommodation of shs. 200,000 per month. These allowances contribute to the gross pay shs. 900,000 per month

However, they pay a tax as follows

Taxable income (UGX.)	Tax rate(%)
0- 100,000	Free
100,001 – 150,000	10
150,001 – 250,000	20
Above 250,000	30%

Tasks

- (a) While the pieces of wood be able to produce the required stool tops? Give a reason for your answer
- (b) Determine the take home pay for an employee at the restaurant
- (c) What percentage of the employee's salary that goes to tax?

ITEM SIXTEEN

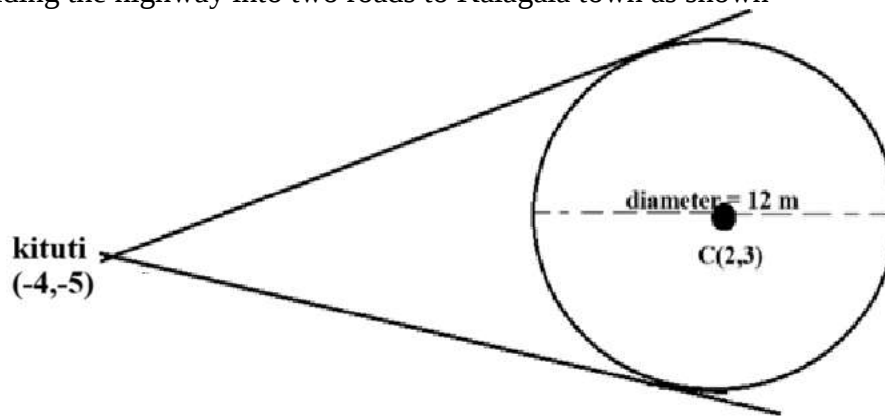
Your friend wants to design a food prism as project at school to advise the public on safe ways of carrying food. The prism should have a rectangular base of 60mm by 80mm. The vertical height perpendicular to the width of the base from the cross sectional side should be 150mm. However, he is not sure of the size of material that will be required but it is known that 1square centimeter of the material costs shs 120.

Tasks;

- (a) Determine the angle the slanting faces make at the top of the base
- (b) Estimate the volume of food that can be packed inside the food prism (in cubic centimetres)
- (c) The cost of material that will be required to make the prism

ITEM SEVENTEEN

There is a public outcry on the number of accidents on Kituti – Kalagala junction, the local government team resolved to put a speed limit on road users especially on motorists and humps after every 300metres but the issue has not been solved. An expert from Uganda National Roads Authority suggests construction of around about of diameter 12metres and dividing the highway into two roads to Kalagala town as shown



If the road project is to cost shs. 890,000 per meter and in the same trading centre, it was observed that the angle of elevation to the top of a building from point on the road A is 38° when a distance of 30m is moved towards the building, the angle of elevation is now 72° . Help construction team to;

- (a) Determine the length of each road
- (b) How much money is required for the project to be complete
- (c) To calculate the height of the building.

END