



THE UGANDA INTER SCHOOL VIRTUAL OLEVEL MATHEMATICS  
SEMINAR 2025.

Saturday 28<sup>th</sup> June 2025 (9:00 a.m)

**INSTRUCTIONS TO STUDENTS AND TEACHERS:**

Dear students and teachers we would like to welcome you to participate in the forthcoming Mathematics seminar for senior four students. This is in preparation for the forthcoming final exams(UNEB) and the Mock Examinations. **This is a free seminar and no one should charge you any fees.**The process to be followed by both the teachers and students is suggested below:

1. Teachers share the Seminar questions with their students and ask for volunteers to discuss any of the questions. Questions should be pinned up and learners write down all the questions in their books.
2. Teachers talk to the school administrators to allow the children participate as presenters in the seminar on Saturday 28th June from 09:00am - 2:00 pm. Other students will just be participants.
3. The student together with the teachers select atleast two best done presentations and the students to represent the school.The solutions and pictures/videos should be uploaded on padlethttps://bit.ly/S4MATHSEMINAR2023 and on email kazibastephen42@gmail.com
4. Hold a mock presentation where all your discussants present to the rest of the class.After that release the rest of the class and record your best presenter in a very quiet environment but with good light.Record each part of the question separately .
5. The teacher could now train the student on how to present on zoom as far as sharing a screen and using the whiteboard. Alternatively the students' presentation will be loaded on the computer screen and they explain to us their solution.

**SEMINAR DETAILS**

S.4 virtual Mathematics seminar 2025.

**Time:** 28th June 2025, 09:00 AM

Join Zoom Meeting

<https://zoom.us/j/95098796408?pwd=bwBPdWpPV50951eHxPSSaoE3wvn3Ao.1>

**Meeting ID:**95098796408

**Passcode:** HeLP2025

Item	Element of Construct	Topics
Item one	Numbers	<ol style="list-style-type: none"> <li>1. Number bases</li> <li>2. Working with Integers</li> <li>3. Rectangular Cartesian Coordinates in 2- Dimensions</li> <li>4. Fractions, percentages and decimals</li> <li>5. Numerical concepts 1 and 2               <ol style="list-style-type: none"> <li>(a) Indices</li> <li>(b) Surds</li> </ol> </li> <li>6. Ratios and Proportions</li> </ol>
Item two	Patterns and Algebra	<ol style="list-style-type: none"> <li>1. Sequence and patterns</li> <li>2. Equation of lines and curves</li> <li>3. Algebra 1 and 2</li> <li>4. Mappings and relations</li> <li>5. Vectors and translation</li> <li>6. Inequalities and regions</li> <li>7. Equation of a straight line</li> <li>8. Simultaneous equations</li> <li>9. Quadratic equations</li> <li>10. Composite functions</li> <li>11. Equations and inequalities</li> <li>12. Linear programming</li> <li>13. Loci</li> </ol>
Item three and four	Data and Probability	<ol style="list-style-type: none"> <li>1. Data collection/display and presentation</li> <li>2. Graphs</li> <li>3. Set theory</li> <li>4. Matrices</li> <li>5. Probability</li> </ol>
Item five and six	Geometry and Measures	<ol style="list-style-type: none"> <li>1. Geometric Constructions Skills</li> <li>2. Bearings</li> <li>3. General and angle properties of geometric figures</li> <li>4. Reflection</li> <li>5. Business mathematics</li> <li>6. Time and time tables</li> <li>7. Similarities and enlargement</li> <li>8. Circles</li> <li>9. Rotation</li> <li>10. Length and area properties of two-dimensional geometrical figures.</li> <li>11. Nets, areas and volumes of solids</li> <li>12. Trigonometry</li> <li>13. Vectors</li> <li>14. Matrix transformations</li> <li>15. Circle properties</li> <li>16. Lines and planes in three dimensions</li> </ol>

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## NUMBERS

1. Irene received her May salary of UGX 2,800,000. She is drawing a financial plan for her child in Senior Four and intends to allocate the money in the ratio 4:2:1 for school fees, school requirements, and upkeep respectively. According to the school policy, a student must pay 75% of the school fees on the reporting day. The remaining 25% can be paid before midterm. However, if a parent opts to pay only 75% on the reporting day, they are required to write a commitment letter, which costs UGX 25,000.

**Children who do not fulfil this requirement are not allowed into school.**

The school fees amount to Two million Uganda shillings only. Irene kept her ATM PIN as 762 in a base less than nine in her notebook. When this number is converted to base seven, it becomes a secure four-digit code that she will use to access her ATM services.

### Task

- Help Irene distribute her salary according to her planned ratio.
  - Based on your calculations, will Irene's child be allowed to report to school? Justify your answer.
  - What is the four-digit decimal PIN that Irene will use to access her ATM services?
  - Suppose Irene chooses to pay only 75% of the school fees and writes a commitment letter.
    - How much money will she spend in total on fees and the letter?
    - How much will she have left from the amount she had allocated for school fees?
2. A group of 12 Ugandans in the diaspora, currently working in Saudi Arabia, have been saving money monthly with a trusted businessman in Uganda. Each of them contributed UGX 850,000 per month from January to May 2025. The businessman has informed them that their total savings can now buy a piece of land in a good location near Kampala. Here's the plan:

70% of the total savings will be used to buy the land.

From the remaining balance,  $\frac{2}{3}$  will be used to pay the land surveyor.

The group also requested that the land be cleared before development. The businessman explained that 6 workers can clear the land in 8 days and each worker is paid UGX 10,000 per day, but the group prefers it cleared within 4 days. Whatever remains after these expenses will be kept as starting capital for the next phase of the development.

### Task

- Help the diaspora members calculate the cost of the land based on their total savings.
  - What is the take home pay for the land surveyor after the land has been purchased?
  - How many more workers does the businessman need to hire to meet the demand of the diaspora people?
  - How much money will remain as their start capital?
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## PATTERNS AND ALGEBRA

3. A textile company in Jinja produces short-sleeved shirts and long-sleeved shirts. Market research indicates an expected daily demand of at least 100 short-sleeved shirts and 80 long-sleeved shirts. Due to production capacity limits, the factory can make no more than 200 short-sleeved shirts and 170 long-sleeved shirts each day. To fulfill a shipping contract, a total of at least 200 shirts must be shipped daily. Each short-sleeved shirt sold results in a loss of UGX 2,000, while each long-sleeved shirt produces a profit of UGX 5,000.

### Task

- Express the conditions for making shirts as inequalities.
  - Show the feasible region for these inequalities on a Cartesian plane.
  - Determine the number of short-sleeved and long-sleeved shirts that should be manufactured daily to maximize net profits.
4. A furniture manufacturing company in Uganda produces tables and chairs for local schools and offices.

Producing one table costs UGX 50,000 and requires 2 labour hours.

Producing one chair costs UGX 30,000 and requires 3 labour hours.

The company has a weekly production budget of UGX 2,000,000 and can utilise up to 150 labour hours.

Each table is sold at UGX 90,000.

Each chair is sold at UGX 60,000.

### Task:

- Express the production constraints as inequalities and equations.
  - Represent the feasible region determined by the constraints on a Cartesian plane.
  - Determine the number of tables and chairs the company should produce in a week to maximize profits.
5. A carpenter in Uganda operates his workshop on a rectangular piece of land. The length of the land is 4 metres longer than its width, and the total area of the land is 96 square metres. From this space, he produces beds for schools and homes. Recently, the carpenter received an order from a school that wants both single beds and double-decker beds. From his past records, he knows that when he sells 2 single beds and 1 double-decker bed, he makes a profit of UGX 25,000, and when he sells 3 single beds and 3 double-decker beds, he earns a profit of UGX 54,000. Now, the school has asked him to supply 5 single beds and 2 double-decker beds, and the carpenter wants to estimate how much profit he will make from this order.

### Task:

- What is the width of the carpenter's land?
- How much profit will the carpenter earn from the school's order?

6. Mr. Musoke has been experiencing health issues and has been advised to follow a strict daily diet. His diet must meet specific nutritional requirements each day. Two food items, milk and salad have been recommended, and their nutrient content and costs are summarised in the table below:

Nutrient	Milk(Glass)	Salad(500mg)	Minimum Nutritional requirement
Vitamin A	2mg	50mg	100mg
Calcium	30 mg	8mg	240mg
Cost/Unit	Ugx 1500	Ugx 2000	

He has also been advised to take some proteins as shown in the table below.

Nutrient	Milk(Glass)	Salad(500mg)	Maximum Nutritional requirement
Protein	8mg	50mg	400mg

### Task

- Formulate mathematical inequalities representing Mr. Musoke's daily nutritional requirements in terms of milk and salad.
  - Graph the feasible region that satisfies the inequalities on the Cartesian plane.
  - Determine the combination of milk and salad that will meet the minimum nutritional requirements at the lowest cost per day.
7. Melissa is watching a video on her phone. After 5 minutes, she notices her phone battery has dropped to 90%. The battery is draining at a constant rate, and she expects it will take a total of 50 minutes from full charge until the battery is completely empty if she continues watching videos without stopping. At the same time, Melissa is planning to buy a new phone during the upcoming festive season. Her dream phone costs UGX 500,000. The shop offers a 15% discount for customers who pay in cash. Additionally, as a loyal customer, Melissa is offered an extra 5% discount on the already reduced price.

### Tasks:

- Find a function  $f(t)$  that models the battery percentage remaining  $t$  minutes after Melissa starts watching the video, assuming the battery drains at a constant rate.
  - What is the constant rate at which Melissa's phone battery drains?
  - Using the function, calculate the battery percentage after 30 minutes of watching the video.
  - Form a function that Melissa can use to find the final price after both discounts. Then use your function to calculate the final price.
8. During Sports Day, Solomon throws a javelin. The height  $y$  (in metres) of the javelin at a horizontal distance  $x$  metres from the throw point is modelled by the equation:

$$y = -x^2 + 20x$$

**Task:**

- (a) Show the javelin's path on the graph paper
- (b) Find the highest point reached by the javelin.
- (c) Determine how far the children should stand to avoid accidents when Solomon throws the javelin.

## DATA AND PROBABILITY

9. During Term I, the school administration allowed S.6 students access to social media platforms during evening hours for relaxation and research purposes. However, the School Academic Committee is now concerned that this might have affected student performance. To investigate whether the use of social media may have had an influence, the committee collected data on the average marks scored by a sample of S.6 students. The school pass mark is set at 45% average. Here is the data collected:

Average mark scored	Number of students
1 – 10	2
11 – 20	7
21 – 30	6
31 – 40	22
41 – 50	8
51 – 60	9
61 – 70	8
71 – 80	5
81 – 90	1
91 – 100	2

**Task:**

- (a) Using appropriate statistical calculations, determine whether access to social media might have had an effect on academic performance.
- (b) Using a visual representation, demonstrate how the Academic Committee can present their findings to the School Board. Hence estimate where the majority of learners' scores lie and state the exact score for the learners.

10. A poultry farmer in Uganda is preparing feeds for three different stages of layer birds: Starter, Grower, and Finisher. Each feed type is made by mixing three ingredients: concentrate, broken maize, and maize bran, in the following proportions .

Feed Type	Concentrate (kg)	Broken maize(kg)	Maize bran(kg)
Starter	50	57	36
Grower	50	67	39
Finisher	50	84	45

The cost of the ingredients per kilogram is as follows:

Each kilogram of Concentrate costs four thousand two hundred Uganda shillings.

Each kilogram of Broken Maize costs one thousand six hundred Uganda shillings.

Each kilogram of Maize Bran costs nine hundred Uganda shillings.

The farmer has a total budget of UGX 5,000,000 available to produce a combination of feeds for the birds during this cycle.

**Task**

- Represent the quantities and cost for each feed type in a structured matrix format suitable for analysis.
  - Considering the current market prices and the farmer's available budget, determine whether it's financially feasible to produce the required feed combinations to support the birds through all three stages.
  - Given the anticipated 5% increase in the cost of all ingredients in the next stocking season, estimate the adjusted expenditure the farmer should plan for to maintain the same feeding cycle.
11. In Kampala district, the government inspected 100 cars at a local garage to check their roadworthiness. The inspection revealed some common causes of failure: faulty tires, steering problems, and bodywork faults. Out of the 100 cars, 36 had faulty tires, 42 had steering issues, and 30 had bodywork problems. Some cars had multiple problems: 8 cars had both faulty tires and steering issues, 7 had both steering and bodywork problems, and 12 had both bodywork and tire faults. Additionally, the number of cars that failed due to other unrelated reasons was 5 more than the number of cars that had all three problems . The district committee discussed that if more than 50% of the cars have at least two of these problems, then they will launch a district-wide roadworthiness campaign to improve vehicle safety.

**Task:**

Using the data from the sample vehicles tested, would you advise the district to introduce the campaign across the whole district? Give a clear reason to support your advice.

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12. On the day of a regional development meeting in Tororo, approximately 94 km from Iganga, two leaders from Iganga district were heading to attend. The Area MP left Iganga at exactly 8:00 a.m., driving at a constant speed of 40 km/h. Fifteen minutes later, the LC5 Chairman also began his journey. He drove faster, at a constant speed of 60 km/h, determined to catch up with the MP before reaching Tororo. After driving for three quarters of an hour, the LC5 Chairman was intercepted by traffic police for overspeeding and was delayed for 30 minutes before continuing his journey at his original speed. Both were scheduled to attend the meeting at 11:00 a.m. sharp.

**Task:**

- (a) Represent the journeys of both the MP and the LC5 Chairman on a graph.
- (b) At what time and distance did the LC5 Chairman overtake the MP before being stopped?
- (c) Did both leaders reach Tororo in time for the meeting?

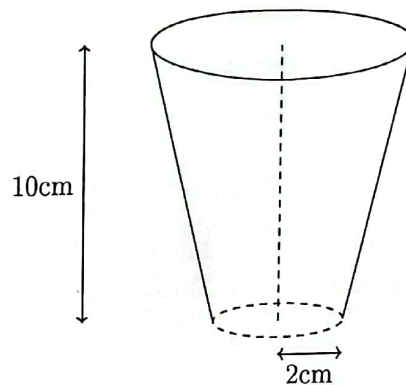
## GEOMETRY AND MEASURES

13. During their Geography fieldwork, students of S.4 set off for a trip to explore three study areas. They left school at 6:00 a.m., at a bearing of 000 for their first destination, 60 km away. They arrived at 7:40 a.m. and spent 45 minutes learning and taking notes. From there, they travelled on a bearing of N60E to the second destination. The bus moved at an average speed of 60 km/h, and they arrived at 9:15 a.m.. After a 1 hour and 5 minutes session, they continued to the third area, which was located 120 km directly west of the second. The driver maintained a speed of 70 km/h, and the students spent 2 hours learning at that final site. After completing their activities, the driver was advised to take a direct route from the third destination back to the school. However, since he was unfamiliar with the road, he drove at an average speed of 50 km/h. He was unsure whether they would return before the school's 4:00 p.m. deadline. The students were eager to know if they would make it back in time.

**Task:**

- (a) Determine the distance of the direct route from the third study area back to the school.
- (b) Determine whether the students will reach school before 4:00 p.m.

14. Stephen is starting a juice business and plans to serve his juice in specially designed conic cups. Each cup has a height of 10 cm, a top diameter of 8 cm, and a bottom radius of 2 cm. He intends to wrap the curved surface of each cup with branded paper displaying his business details.



He has found a supplier who charges UGX 30,000 per square metre for the wrapping material. Each cup will also be completely filled with juice, and Stephen has received an order to supply 20 litres of juice to a local client.

#### Task

- Estimate the amount of wrapping paper (in square metres) required to cover the curved surface of one conic cup.
  - Determine how many cups are needed to fulfil the 20-litre juice order, and calculate the total cost of wrapping all the cups needed.
  - Why is it important for Stephen to carry out these calculations before starting production?
15. Michael runs a small business in Uganda and employs three workers who report every day of the month. Each employee earns a gross monthly salary of UGX 930,000. In addition, Michael provides a daily transport allowance of UGX 2,000 and a daily food allowance of UGX 5,000.
- In June, the Uganda Revenue Authority (URA) deducted Pay As You Earn (PAYE) from each employee's salary, in line with national tax laws which require every employee to contribute income tax to the government.
- The PAYE tax bands are summarised in the table below:

Monthly taxable income(Ugx)	Tax rate%
0 – 235000	0
235001 – 335,000	10.0
335,001 – 410,000	20.0
410,001 and above	30.0

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Michael is also planning to expand his business by purchasing a plot of land offered by a neighbour for UGX 34,000,000 (cash price). The neighbour is also willing to accept:

- A 60% down payment, and
- Monthly instalments of UGX 950,000 for 1 year and 4 months .

However, a friend has advised Michael to instead obtain a bank loan to pay the full amount at once. The bank charges compound interest at a rate of 5% per annum, payable in 3 years.

**Task**

- (a) Compute how much income tax was deducted from each employee in June.
- (b) Determine the net income each employee takes home after PAYE, and find the total cost Michael incurs in that month including allowances.
- (c) Compare the total amount payable under both land acquisition options and advise Michael using calculations on which method is financially better.

**END**