

**MT ST HENRY'S HIGH  
SCHOOL MUKONO IN  
CONJUNCTION WITH  
MATIGO  
EXAMINATIONS  
BOARD**



POWERED BY APEX EXAMINATIONS COUNCIL

**S.4 MATHEMATICS SEMINAR HELD AT MT ST HENRY'S HIGH SCHOOL  
FOR NEW LOWER SECONDARY CURRICULUM ON SATURDAY 21<sup>ST</sup> JUNE  
2025 FORMAT 456/1**

**Section A** comprises of two compulsory items and **Section B** comprises of Part **I** and Part **II** each having two questions and a learner answers one question from part

**CONSTRUCT:** appreciates and uses computational skills, analysis, spatial and logical reasoning in making decisions to solve problems in real-life situations.

Item	Element of construct	Topics covered
SECTION A: compulsory		
Item one	<b>Numbers</b> Learner appreciates and uses computational skills to solve problems in real-life situations.	1. Number bases
		2. Working with integers
		3. Rectangular Cartesian Coordinates in 2-Dimensions
		4. Fractions, percentages and decimals
		5. Numerical concepts 1 and 2 (a) Indices (b) Surds
		6. Ratios and proportions
Item Two	<b>Patterns and algebra</b> Learner appreciates and uses analysis to solve problems in real-life situations	1. Sequences and patterns
		2. Equations of lines and curves
		3. Algebra 1 and 2
		4. Mapping 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
SECTION B		
PART I (choose one question)		

Items 3 and 4	DATA AND PROBABILITY	1. Data collection and presentation
		2. Graphs
	Learner appreciates and uses logical reasoning to solve problems in real-life situations	3. Set theory
		4. Data collection and display and presentation
		5. Matrices
		6. Probability
		PART II (choose one question)
Items 5 and 6	GEOMETRY AND MEASURES	1. Geometric construction skills
		2. Bearings
		3. General and angle properties of geometric figures
		4. Reflection
		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 figures
		11. Nets, areas, and volumes of solids
		12. Trigonometry 1 and 2
		13. Vectors
		14. Matrix transformation
		15. Circle properties
		16. Lines and planes in three dimensions

### S.4 SEMINAR ITEMS 2025

#### NUMBERS

##### ITEM ONE

Suzan a married woman has recently got a job where she will earn two million eight hundred eighty five thousand shillings only, her friend has advised her to spend wisely in the following way, use  $\frac{1}{5}$  of her salary as her contribution towards monthly groceries, **30%** for her parents' upkeep, **Shs.400,000** for her own personal use and invest the rest. As a supportive wife she has agreed with her husband that they will be sharing the grocery cost and that she will contribute **2** parts while he contributes **3** parts, she wants to know how much each of them will contribute towards the monthly grocery shopping.

##### TASK

- Show Suzan the actual amounts she will have to spend as she has been advised.
- How much will they spend on monthly grocery shopping?

##### ITEM TWO

A camping site attracts visitors among which include children, men and women. On a certain day, the manager of the site recorded the attendance as ratios. **Men : Women = 5:4** and **Women : Children = 3 :7**. In total **224** children visited the camping site that day. However, the manager was not sure of the number of men and women who visited the site that day.

In 2024, the cost of a ticket to the campsite for children was at half price that for adults and that a ticket for adults cost **UGX30,000**. In order to attract more customers, the manager instructed the attendants to set the ticket charges for 2025 such that their cost is less by **20%**. However, the attendants were not sure of the exact costs to set for 2025.

**Task:**

- (a) Help the manager to find the total number of men and women who visited the camping site that day.
- (b) Determine the amount of money collected by the camping site on that day.
- (c) Determine the cost for the tickets for children and in 2025.

## PATTERNS AND ALGEBRA

### ITEM THREE

After occupying his new house with his entire family, a man was told that the cost of water used will be equal to the sum of a constant service fee of **shs.3500** and the cost of the number of units used per month. In the first month he paid **shs.15500** for **4** units used and in the second month he was sent a bill of **shs.33500** for the 10 units used. He wants to determine the cost of each unit for proper budgeting.

To reduce on the money he spends on water every month the man decided to dig a well of 11 metres where he will place a water pump, he has been told that the cost of digging the well will be as follows **shs.20,000** for the first meter, **shs.21,500** for the second meter, **shs.23,000** for the third meter and so on, the cost kept increasing in that way for every meter. The man has saved **shs.350,000** for the job so he needs to determine the cost of digging the last meter and the total cost of digging the well.

**Task:**

- (a) Develop a mathematical relationship that will help the man determine the cost of each unit of water.
- (b) (i) Using your mathematical skills help the man to determine the cost of digging the last meter.  
(ii) Will the money he has saved be enough for digging the well?

### ITEM FOUR

An engineer was contracted by a certain hotel to design a new parking lot. On reaching the hotel, the engineer picked up measurements for two straight lines perpendicular to each other. For the first line, he picked two points which he recorded as **(2, -4)** and **(-6, 9)** and for the second line he picked up only one point and recorded it as **(-4, 6)**.

The new parking lot is to be rectangular in shape, with its breadth **3 m** less than its length. Its area is to be **4** square meters more than the area of the old parking lot whose shape is in form of an isosceles triangle of height **12 m** with its base as the breadth of the rectangular parking lot.

Now the engineer wants to know the exact measurements of their new parking lot.

**Task:**

Help the engineer to;

- (a) Form the equations of the two perpendicular lines to help him develop an artistic impression.
- (b) Determine the measurements of the rectangular parking lot

### ITEM FIVE

Your brother is a student of Makerere University. During holidays he makes baskets and mats which he sells in exhibitions and to tourists to raise money to support his education. According to his records, in a week, he makes fewer than 10 mats and the number of mats he makes is at least equal to the number of baskets he makes.

He takes  $2\frac{1}{4}$  hours to make a basket and  $1\frac{1}{2}$  hours to make a mat. He works for a maximum of **22.5** hours a week.

He realized that he can make **\$40** profit on each basket he sells and **\$28** on each mat he sells.

**Task:**

- (a) Write mathematical statements that show the relation between the baskets and mats made.
- (b) Show the feasible region of the relation on the cartesian plane.
- (c) Help your brother to determine the possible number of baskets and mats that your brother should make in order to get a maximum profit.

**ITEM SIX**

Your sister is a member of NASECO FARMERS. After being trained on how to add quality to their products and increase output she was given one machine to help her in planting and she recorded her expected daily operations in one week. She wanted to plant two types of seeds; maize and g-nut seeds. She wanted to plant at least **3** sacks of maize seed, not more than **8** sacks of g-nut seed and less than **12** maize and g-nut seed sacks altogether. The number of g-nut seed sacks she wanted to plant was more than three quarters of the number of maize seed sacks to be planted.

**Task:**

- (a) (i) Write down mathematical inequalities to represent the above conditions.  
(ii) Show clearly the feasible region on a Cartesian plane.
- (b) Help your sister to find the minimum number of maize and g-nut seed sacks she should plant in one week. State the number of each sack to be planted to get the minimum number of sacks altogether.

**DATA AND PROBABILITY**

**ITEM SEVEN**

A tour and travel company wanted to find out whether to organize a tour in the cities of Dubai, Cairo and Paris. The tour would only be organized if the probability of a person having visited at least two cities was less than **50%**.

Among the **90** people who submitted their visiting proposals at the company's head office, **41** people had visited Dubai, **39** people had visited Cairo, **15** people had visited Paris and Cairo, **8** people had visited Paris and Dubai only. The number of people who had visited Dubai and Cairo only were twice the number of people who had visited Cairo only.

Additionally, **74** people had visited at least one city. **4** people had visited all the three cities and a certain number of people had never visited any of the three cities.

**Task:**

Help the company travel agent to;

- (a) Find the total number of people who had;
  - (i) visited Paris
  - (ii) had not visited any of the three cities.
- (b) Based on calculations, advise the company travel agent whether to organize the tour or not. Give a reason for your answer.

**ITEM EIGHT**

In a game played by three S.4 students, a fair coin is tossed three times one after another by a player in order to determine who starts the game. A player who gets a head in all the three consecutive tosses starts the game. A box contains **6** red and **4** green marbles. A player picks a marble from the box, notices its colour and then puts it aside. The process is repeated and picks a second marble and a third marble and stops. If all the three marbles picked are of the same colour, the player wins the game. however, if the first and second marbles are of the same colour but the third marble picked is of different colour then the player is knocked out of the game.

**Task:**

Help the players to determine the probability of:

- (a) being the first player to start the game.
- (b) winning the game.
- (c) getting knocked out of the game.

**ITEM NINE**

A school nurse keeps a record of the height measured to the nearest centimeters of a group of students she treats for a certain infection at the school clinic. The data was summarized in the table below.

Height (cm)	Number of students
110–119	1
120–129	3
130–139	10
140–149	28
150–159	65
160–169	98
170–179	55
180–189	15

It is assumed that the mean height of students is **154.5cm** and the school administration wants to find out the average height and the height in which the greatest number of students treated falls.

**Task:**

- (a) Determine the average height of students measured.
- (b) Use a suitable graph to estimate the height in which the greatest number of students treated for the infection at school clinic falls.

**ITEM TEN**

A farmer in a certain village has visited a statistician to help him analyze his production per year of the crop he produced so that he can decide whether to change to a new seed variety, he plans to buy a new seed variety if the commonest mass-produced falls below **55 kg**. He stored his valuable information about the grain production in his house, Unfortunately, part of his information was destroyed by rats due to poor storage, luckily enough a certain page with this table was spared as shown below;

Mass (kg)	9.5- 19.5	19.5- 29.5	29.5- 39.5	39.5-49.5	49.5- 59.5	59.5- 69.5	69.5- 79.7	79.5- 89.5	89.5- 99.5
Number of bags	50	115	210	315	410	485	550	590	600

**Task**

Help the farmer to;

- (a) Retrieve the original information about his production in a frequency distribution table, and determine the mean production per year. (b)
- (i) Determine the commonest mass of grains he produced last season so as to plan well for the next season.
- (ii) Will the farmer change to a new seed variety?

### ITEM ELEVEN

Candidates who wish to get admitted to University through Mature Age entry scheme were given an aptitude test. The scores obtained in the aptitude test are given below.

72	43	36	57	47	68	75	79	82	31
52	47	74	52	29	72	57	72	87	73
32	52	62	55	42	47	37	57	22	81
27	53	37	64	62	32	47	37	52	88
55	25	30	67	70	52	67	36	38	76

The University want;

The data to be presented in a suitable table for all candidates using equal classes of width **10**. Starting with a class of **20–29**.

To know the score obtained by half of the candidates who sat the test.

The number of candidates whose score exceeded **54.5** and they want to know whether their percentage is below **50%** so as to give a remedial test.

#### Task:

- Represent the above information on a suitable table for easy interpretation.
- Determine the score attained by half of the candidates in the aptitude test.
- Find the number of candidates whose score exceeded **54.5** and also find whether they gave them a remedial test or not.

### ITEM TWELVE

At a school sports day there are **2** houses tiger and lion houses who are competing closely for the first position, the races left are the track and relay races, points are awarded for the first, second and third positions only the following table shows the points for each position.

	first	Second	Third
Track	3	2	1
Relay	7	5	2

During the races the performances recorded were as follows tiger house got **3** first, **4** seconds and nil thirds in the track events and **1** first, **2** seconds and **1** third in relays, while lion house had already calculated their total points for all the activities as **410**, The house prefect of tiger house knows that they already have **387** points and wants to determine if they have been able to win lion house by determining the points they have got in the races.

After the sports day the sports master wanted to get a team of those who will participate in the regional school's competition, out of a total of **21** racers **15** were excellent at the track race while **10** were excellent at the relays, he needs to determine those who are excellent in both events so as to form his teams well.

#### Task

- By organizing the information in rows and columns determine the total number of points tiger house got in the races.
- Which house emerged the winner?
- Help the sports master to determine the number of participants who are excellent in both events.



## GEOMETRY AND MEASURES

### ITEM THIRTEEN

Daniel works with African Queen Uganda Limited a company that distributes goods. On a certain day, he left the company warehouse to the first trading center which is **80km** away on a bearing of **150°**. After delivering, he then moved Eastwards at an average speed of **60km/h** for **40** minutes to the second trading center. From this center, he took a bearing of **N50°E** and moved a distance of **60 km** to the third trading center. The cargo car he used had **20** liters of fuel at the beginning of the journey and its consumption rate is such that for every **15km** it uses **1** litre of fuel. At the third center, one of his clients showed him a direct route that would take him back to the company's ware house but he was undecided on whether to add fuel or not since he didn't know the distance of the direct route.

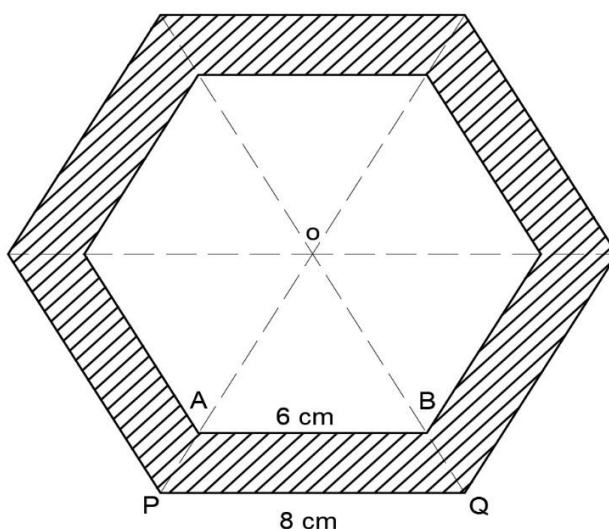
#### Task

Help Daniel to;

- Determine the distance of the direct route from the third trading center to the company's warehouse
- Decide whether to add more fuel in the car or not. Give a reason for your answer.

### ITEM FOURTEEN

A hotel owner has some space on which he wants to build a children's swimming pool with uniform depth, the designer has given him a sketch plan that is in a hexagonal shape shown below.



The path between the hexagons on the actual land will be layered with tiles so he needs to determine the area that the tiles will cover.

The actual swimming pool is to be five times the area of the sketch, and the water will be filled to a depth of **100cm**, he needs to determine the volume of water that will be needed to fill the pool to the required depth.

#### Task

- Determine the area between the two hexagons on the sketch.
- Help the owner to determine the volume of water that will be needed to fill the pool to the required depth.

### ITEM FIFTEEN

A group of A-Level Science students did a study about bacteria in the school laboratory. At the start of the experiment, there was **20,000** bacteria. The number of bacteria increased at the rate of **30%** per hour. The experiment was to run for **4** hours and they wanted to determine how many hours from the start of the experiment will the bacteria be one million.

In order to store the bacteria safely, the students decided to make a solid metallic block with dimensions **15cm x 10cm x 5cm** and two cylindrical holes closed at one end of diameter **7cm** were drilled out in

which they were to insert transparent test tubes. They also wanted to vanish the remaining block to prevent it from rusting at a rate of UGX 100 per square centimetre.

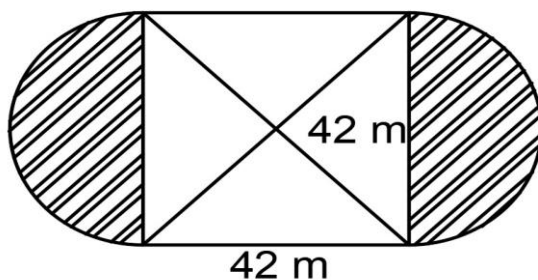
**Task:**

- (a) Help the students to:
- Find the number of bacteria after 4 hours of the experiment.
  - Find how many whole hours from the start of the experiment will the number of bacteria be one million.
- (b) Determine the amount of money needed to vanish the remaining block.

**ITEM SIXTEEN**

Your brother wanted to improve your compound at home. He decided to strike two poles of equal heights standing opposite to each other on either side of the compound which is 80 m wide. He marked a point **P** along the line joining the poles on the compound, and from that point he measured the angle of elevation of the top of one pole as  $60^\circ$  and the angle of depression from the top of another pole at point **P** as  $30^\circ$ . However, he didn't know the distance of the poles from the point **P** and their heights.

He wanted to design a square lawn with sides measuring 42 m and also put two circular flower beds on either side of the square lawn with a centre at the point where the two diagonals of the square lawn intersect according to his sketch design shown in the figure below. However, he was not sure of the total area the two circular flower beds will occupy.



**Task:**

Help your brother to:

- determine the height of the poles and the distance of the point **P** from each of the poles.
- find the total area of the two circular flower beds to be put on the square lawn.

**ITEM SEVENTEEN**

Residents of Kasese near river Nyamwamba were displaced, their homes destroyed and lives of some their beloved ones lost due to the continuous floods caused by excess flowing waters from the river. The government decided to put up a temporary camp to house the flood victims. Now a certain organization which has come up to offer relief by providing milk daily to the camp. They contacted a supplier of milk who sells it in a container which is in form of a frustum of a cone of height 30cm and the radii of the lower and upper circular ends are 20cm and 40cm respectively. 880 litres of milk are needed daily for a camp and each litre is available at a cost of UGX1,500. Now the supplier wants to know the number of containers to supply and the amount it will cost the organization to make it possible.

**Task:**

- How many such containers of milk are needed for the camp?
- What cost will it put on the organization to make it possible to give the relief?
- What value is indicated through this organization?



### ITEM EIGHTEEN

Anne works with a private hospital in Kampala. Her gross monthly income has allowances deducted from it before it is subjected to taxation. The allowances include; marriage **UGX 25,000**, unmarried **UGX 10,000**, insurance premium **UGX 15,000** and children allowance, **UGX 5,000** for those below 10 years and **UGX8000** for those above 10 years and below 18 years.

Anne is married and a mother to Linda, James and Daniel aged **10, 14** and **20** years of age. She is insured and pays **UGX65,000** as income tax per month. The hospital has appointed a new accountant who wants to determine Anne's monthly gross income.

The income tax is indicated as below.

Income per month	Rate (%)
0 - 100,000	10
100,001 - 200,000	15
200,001 - 300,000	20
300,001 - 400,000	25
400,001 - 500,000	30
500,000 and above	35

#### Task:

Help the hospital accountant to determine the:

- (a) Gross monthly income Anne earns.
- (b) Portion of Anne's income available for taxation. (c) Percentage of Anne's income that goes to taxes.

### ITEM NINETEEN

A surveyor visited a site where he used his tools to locate the boundaries of the land ,at the starting point **O(0,0)** he read coordinates of points **A** as **(7,6)** and **B** as **(9,2)** ,however it rained heavily and he was unable to complete the job but he knows that the plot is in the shape of a parallelogram ,he requests for help to determine the coordinates of a point **C** that complete the plot and to determine the distance from **A** to **C**.

The surveyor has been given a job offer at a company that deducts tax according to the tax bands below

Income	Rate %
235000	0
235001 - 400,000	15
400,001 – above	30

He has been earning **shs.1,050,000** as his income but the new company has told him that he will earn **shs.1800,000** which includes a transport allowance of **shs.200,000**, he wants to determine the amount of money he will get on his bank account, so he can decide whether to accept the job offer or not.

#### Task

- (a) Help the surveyor to:
  - (i) Determine the coordinates of point **C**.
  - (ii) Determine the distance from point **A** to point **C**.
- (b) Determine if the surveyor will accept the new job offer or not.

### ITEM TWENTY

Your friend wants to design a food pyramid as her project under (DO IT YOURSELF CLUB) to guide healthy eating and its impact on dietary choices to the community. According to her design, the pyramid will have a rectangular base measuring **8ft** by **6ft** with a slanting height of **13 ft** and its vertex directly above the centre of the base. The cost of painting the plane surfaces is **UGX 4500** per square meter.

But she was not sure the angle at which each slanting pole can be made with the base of the rectangular and the volume to which the pyramid can hold the items for demonstration the total cost of painting the food pyramid. (Hint: **1 ft = 30.48cm**)

**Task:**

Help your friend to determine:

- a) The volume to which the pyramid can hold demonstration items.
- b) The angel between a slanting side and the base of the food pyramid.
- c) The total cost of painting the food pyramid.

**SPECIAL THANKS;  
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