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MATHEMATICS

Paper 1

July/ August, 2025

2hrs and 15 minutes



ALLIANCE EXAMINATIONS BOARD - 2025

Uganda Certificate of Education

Mathematics

Paper One

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.
- ✓ 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

(This section is compulsory)

ITEM ONE.

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 **ugx** 25000

Task

- Determine the total number of books that the school received from the ministry of education and sports.
- How many books will the librarian arrange in each shelf?
- Determine the amount of money spent in buying each box of books

ITEM TWO.

Garden City Shopping Mall in Kampala is experiencing a massive turnout of customers, leading to a critical shortage of parking spaces. To address this challenge, the mall's management has planned an innovative 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

- Create a graphical representation on paper to help Garden City management accurately visualize and understand the layout and boundaries of the new parking design.
 - Assist the management in identifying the accurate coordinates and size of the new parking area 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 parking area at full capacity.
- Compute the mall's daily highest revenue on a peak day.

SECTION B

This Section has two Parts; I and II

Part I

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

ITEM THREE.

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 FOUR.

In a certain town, there is a section of the road where many accidents occur and the residents believe it 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 put at 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;

- Assist the chairperson in determining the average speed at which vehicles pass that point.
- Present a graphical analysis to guide the committee's choice of implementing traffic calming measures.

Part II

Answer one item from this part.

ITEM FIVE.

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. The bank'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 of 3 about the center (-5, -2), creating a logo with four triangles. Paint only the enlarged triangle with a red-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

- Assist the designer in creating a precise layout of the logo, showcasing the exact placement of the four triangles on the same material.
 - Specify the exact vertices of the new triangles.
- Using data-driven insights, recommend to the bank owners whether to adjust

their allocation for logo painting expenses

ITEM SIX.

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 (%)
1- 80,000	7.5
80,001 – 160,000	12.5
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	52.0

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 and logical 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.

END