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MATHEMATICS
PAPER 1
2024
$2\frac{1}{4}$ **hours**

KIBAALE HIGH SCHOOL- NAMUTUMBA

S.4 END OF TERM I EXAMS 2024

MATHEMATICS

PAPER 1

TIME: 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.

Strictly use a graphical paper for graphical work.

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

SECTION A

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

Item 1.

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 cost 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 2.

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.

SECTION B

This section has two parts; I and II

Part I

(Answer one Item from this part)

Item 3.

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 - two aged 6 and 8, one aged 15, and one aged 19. Walugosi receives various allowances from his employer, including:

- Insurance and relief: UGX 222,000 per annum
- Water and electricity: UGX 21,000 per month
- Medical: UGX 318,000 per annum
- Housing allowance: UGX 55,000 per month
- Transport allowance: UGX 42,000 per month
- Family allowance for the three children under 18 years old.

Walugosi is concerned about the amount of income tax he has to pay each month and wants to understand how it is calculated based on the tax structure below;

Taxable income(UGX) per month			Tax rate (%)
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
Above 510,000			48.5

Task;

Walugosi approaches you, an expert in tax calculations to help him determine,

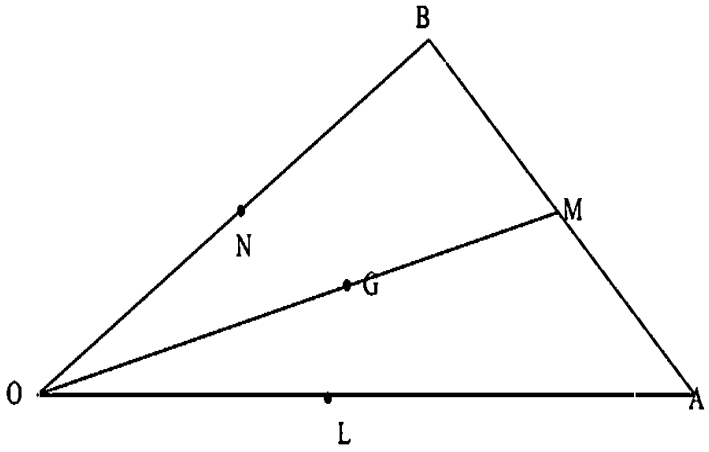
i) The income tax he has to pay monthly.

ii) His net income

iii) What percentage of his gross monthly income goes to tax?

iv) With the help of two relevant example(s), help Walugosi understand why it is important to pay tax.

Item 4.



A surveyor is mapping a triangular plot of land, with vertices labelled as O, A, and B. The surveyor has determined the following:

- L, M, and N are the midpoints of the sides OA, AB, and OB, respectively.
- G is a point on the line segment OM, such that the ratio of OG to OM is 2:3.

The surveyor needs to express the vectors representing the positions of various points on the plot in terms of the given vectors $\tilde{\boldsymbol{a}}$ and $\tilde{\boldsymbol{b}}$, which represent the positions of vertices A and B, respectively.

Task;

Help the surveyor;

(a) Express the following vectors in terms of $\tilde{\boldsymbol{a}}$ and $\tilde{\boldsymbol{b}}$,

(i) OM (ii) OG (iii) BG (iv) GL

(b) Determine whether the points B, G, and L are on the same line.

Part II

(Answer one Item from this part)

Item 5

A civil engineering firm is designing a new bridge over a river. The bridge will have a triangular truss structure, and the engineers need to analyze the transformation of the truss during the design process. The initial design of the truss has vertices $\boldsymbol{A(0,0), B(0,-2), and\ C(2,0)}$. The engineers then applied a transformation M to the truss, resulting in vertices $\boldsymbol{A'(0,0), B'(0,-4), and\ C'(4,0)}$. After analyzing the transformed truss, the engineers then applied another transformation using the matrix $\boldsymbol{N = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}}$ to the transformed truss$A'B'\ C'$, resulting in a new truss with vertices A'', B'', and C''. Finally, the engineers want to find a single transformation matrix P that would map the transformed truss A''B''C'' back to the original truss ABC.

Task;

Help the engineers understand the structural integrity of the bridge by determining;

(i) The transformation matrix M that was applied to the original truss.

(ii) The coordinates of the new truss vertices A'', B'', and C''.

Item 6

A refrigerator is marked for UGX. 860,000. A discount of 10% is given on cash payments. The fridge can also be bought under hire purchase terms by paying a deposit of UGX. 360,000 followed by ten monthly installments of UGX. 75,000 each.

Patricia is interested in buying the refrigerator.

Task;

Help her determine;

(i) Calculate how much she would pay if she decides to pay cash

(ii) How much she would pay if she decides to buy it by hire purchase?

(iii) If she wants to save some money by buying the refrigerator cheaply, help her calculate which mode is cheaper.

END

SET BY:

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