S.5 MATHEMATICS- 2025

GROUP ASSIGNMENT M001

GROUP NAME: ..... STREAM: .....

GROUP CHAIRPERSON: ..... EXPECTED SCORE: .....

ITEM 1: EQUATIONS AND INEQUALITIES.

A catering service offers three types of lunch packs: Mini, Standard, and Deluxe. Each pack includes a specific number of sandwiches, fruit cups, and juice boxes:

- Mini pack: 1 sandwich, 2 fruit cups, 1 juice box
- Standard pack: 2 sandwiches, 1 fruit cup, 3 juice boxes
- Deluxe pack: 3 sandwiches, 3 fruit cups, 2 juice boxes

At the end of one afternoon, the total items delivered were: • 23 sandwiches, • 22 fruit cups and • 25 juice boxes

❓ Your Task:

How many Mini, Standard, and Deluxe packs were delivered that afternoon? (06 scores)

ITEM 2: DESCRIPTIVE STATISTICS.

A home decor outlet, "Chic Dwellings," recorded the sales prices for fifty decorative items sold during the month of May. The prices, expressed in thousands of shillings, are listed below:

01	07	30	28	13	16	29	25	15	24
30	13	11	22	21	12	02	08	26	18
17	12	18	20	14	15	19	16	03	17
24	27	13	10	11	24	16	12	18	13
08	18	23	28	14	04	08	14	30	14

Management's Objectives:

The sales director at Chic Dwellings requires an analysis of this sales data to inform future strategies. Specifically, they want to:

(i). Organize the data into a frequency distribution table. This table should use consistent price intervals of 5,000 shillings, beginning with the interval that includes 1,000 shillings.

(ii). Visually identify the price range that occurred most frequently in May's sales. This will help in deciding which decorative items to prioritize for stock in June.

(iii). Calculate the typical (average) selling price of the decorative items.

📌 Your Assignment:

Assist the sales director by:

(a). Constructing the requested frequency distribution table.

(b). Creating an appropriate graph to illustrate the most frequent price range.

(c). Calculating the mean (average) selling price for the decorative items sold.

(d). Determine the number of decorative items whose price is above 19000.

(12 scores)

ITEM 3: CO-ORDINATE GEOMETRY I.

In the fast-growing metropolis of Emerald City, the Department of Urban Transport is launching an ambitious project: constructing two major arterial roads to reduce congestion and link newly developing neighborhoods.

🚧 Road A: From Westhaven Point to Eastmoor Terminal

According to the planning grid:

- Westhaven Point is at coordinate (8, 40)
- Eastmoor Terminal lies at (22, 18)

🚦 Road B: From Northbridge Park to Southgate Circle

- Northbridge Park is located at (10, 6)
- Southgate Circle sits at (4, 28)

Before breaking ground, engineers must analyze how these roads will align within the city's layout. To ensure safety and ease of navigation, they must determine whether the roads intersect and, if so, at what angle. A sharp angle could result in a risky junction — or a future hotspot for traffic jams and accidents.

Meanwhile, local delivery riders — always the first to test new shortcuts — are watching the surveyors with keen interest.

🧠 Your Task:

To support Emerald City's planners, do the following:

1. ✅ Find the equation of each road segment (as a straight line).
2. ✅ Determine if the roads intersect, and if they do, compute the point of intersection
3. ✅ Calculate the inclination angle between the two roads to evaluate how they meet

(12 scores)

ITEM 4: NUMERICAL CONCEPTS.

In a high-security pharmaceutical laboratory, scientists are testing a sensitive compound used in the development of antiviral medication. This compound contains a radioactive isotope that gradually loses its potency over time when dissolved in solution.

At the start of the experiment, the concentration of the isotope is 4 moles per liter. Researchers are tracking its decay to determine safe handling protocols and predict when reinforcement or neutralization might be necessary. The decay follows the mathematical model:

$$N = 4(0.76)^t$$

Where:

- N is the concentration in moles per liter and t is time in seconds

🔍 Tasks for the Research Team:

(a) Predict the concentration of the isotope after 4 seconds. Round your answer to 1 decimal place.

(b) Determine how long it will take for the concentration to drop to half of its original level.

(c) In the rare event of a reaction causing the isotope concentration to triple, immediate isolation of the solution is required. Advise how long it would take for the concentration to reach three times its starting amount if such a reaction occurred.

As a mathematics student, assist the research team to accomplish the tasks!

(12 scores)

ITEM 5: TRIGONOMETRY.

In a high-tech drone flight research center, engineers are testing the altitude stability of an advanced surveillance drone during its early flight stage over simulated terrain.

The altitude deviation, denoted by h (in meters), from the drone's ideal cruising level is modeled as a function of time, r (in minutes) after launch. The deviation follows this mathematical model:

$$h = 6\cos(r) - 3\sin^2(r) + 1$$

📌 Note to students: For this investigation, assume that $180^\circ = 1$ radian (π) to simplify calculations when interpreting trigonometric values.

This model helps the flight team assess and correct any instability that could interfere with the drone's stealth or energy efficiency during missions.

🧠 Tasks for the Engineering Team:

(a) Determine the time r when the drone is exactly at its programmed cruising altitude (i.e., when the deviation $h = 0$). Round your answer to 2 decimal places.

(b) Identify the time(s) r (if any) when the drone descends to 7 meters below its intended altitude.

Assume you are part of the engineering team! (12 scores)

END!!!

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