



S.5 MATH

PAPER 1 ASSIGNMENT

MODULE 01

GROUP ASSIGNMENT CODE: MATH | M1-M01

GROUP NAME: **STREAM:**

GROUP CHAIRPERSON: **EXPECTED SCORE:**

ITEM 1:

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?

ITEM 2:

In the fast-growing metropolis of Emerald City, the Department of Urban Transport is launching an ambitious project: constructing **two major straight 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** and **y-intercept** of **each** road segment.
2. Find the **midpoint** of **each** road segment.
3. Find the **length** of **each** road segment.
4. Determine **if** the roads **intersect**, and if they do, **compute the point of intersection**.
5. Calculate the **inclination angle** between the two roads to evaluate how they meet.

ITEM 3:

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**. Correct 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 **original** concentration to triple.

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

ITEM 4:

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 **d (in meters)**, from the drone's ideal cruising level **is modeled as a function of time, t (in minutes)** after launch. The deviation follows this mathematical model:

$$d = 6\cos(t) - 3\sin^2(t) + 1$$

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, t** when the drone is exactly at its programmed cruising altitude (i.e., when the **deviation, $d = 0$**). Round your answer to **3 significant figures**.

(b) Identify the **time(s), t** when the drone **descends to 7 meters below its intended altitude**.

Assume you are part of the engineering team, perform the tasks!

ITEM 5:

As part of a training exercise for emergency response engineers, a test was conducted using a steel rescue stretcher suspended in mid-air by **six tension cables**.

Each cable pulled the stretcher with a different force and direction:

- **Two upward vertical pulls** of **8 N** and **16 N**
- **One downward pull** of **20 N**
- **Two horizontal pulls** to the **left** with magnitudes **9 N** and **6 N**
- **One horizontal pull** to the **right** with a magnitude of **18 N**

Your task is to determine the **resultant force** acting on the stretcher and the **net effect** this would have on its motion.

In a separate simulation, engineers modeled a supply drone attached to **five directional anchors** via tethers. Each anchor pulls with the following magnitudes and directions:

- **50 N** at **45°**
- **80 N** at **135°**
- **90 N** at **210°**

- 70 N at 300°
- 30 N at 15°

Based on this model, determine the **single equivalent force** acting on the drone and the **direction it would move** under the influence of these forces.

 **Task:**

As a learner of applied mechanics, carry out calculations to solve each of the two cases above, determining both the **magnitude** and **direction** of the resultant forces involved.

~ END ~

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