Discrete Structures Group Assignment Instructions

Objective:
In this assignment, your group is required to solve a set of logic puzzles and submit the solutions as programmable implementations. You may use any programming language of your choice (e.g., Python, C++, Java). The goal is to create a program that can compute and display the correct solutions for the puzzles using logical and algorithmic approaches.

The Group Assignment is designed to attain the following Course Learning Outcomes:

CLO3 Demonstrate personal skills in constructing formal proofs of validity (A3)

Assignment Guidelines:

1. **Group Formation:**
    - Each group should consist of **4-5 students**.
    - Work collaboratively and ensure equal contribution from all members.
2. **Puzzle Solutions:**
    - You are given a set of logic puzzles (refer to the attached puzzle questions). Each group choose ONLY ONE puzzle. Each puzzle requires logical deduction to determine the correct answers.
    - Your task is to write a **programmable solution** for chosen puzzle. The solution must:
        - Take inputs (where necessary).
        - Use appropriate algorithms or data structures to process the logic of the puzzle.
        - Output the correct solution in a clear and readable format.
3. **Programming Language:**
    - You may choose **any programming language** (e.g., Python, Java, C++, etc.) that you are comfortable with to implement your solution.
    - Ensure that your code is well-commented, readable, and structured according to best coding practices.
4. **Submission Requirements:**
    - Submit a **hardcopy** of the following:
        - **Group Members' Names, profile & pictures.**
        - The **puzzle questions**.
        - A detailed **solution write-up** that explains how you approached and solved each puzzle programmatically.
        - The **source code** of your solution for puzzle. Ensure that the code is .
        - The **output** generated by running your code (screenshots or printed output).

5. **Evaluation Criteria:** Your group assignment will be evaluated based on:
    - **Correctness of Solutions** (Did the program produce the right output for the puzzle?)
    - **Code Efficiency** (Is the solution implemented in an efficient way? Does it make use of logical structures effectively?)
    - **Interactivity** (Is the system/project communicate with users? Interactivity can be implemented in various form such as kiosk, quiz or game)
    - **Clarity of Write-up** (Does the explanation of the solution make sense? Is it detailed and logical?)
6. **Deadline:**
    - The hardcopy must be submitted by **[25th January 2025, SUNDAY]** before 6pm
    - The digital files must be uploaded **[for epjj students only]**.

Important Notes:

- **Plagiarism is strictly prohibited**. All solutions must be your group's original work.
- Late submissions will incur a penalty unless an extension is requested and approved in advance.
- Any questions regarding the assignment should be addressed to **[norasiah@tmsk.uitm.edu.my]**.

Puzzle 1:

There are five students—Alice, Bob, Charlie, Dave, and Eve—who participate in a programming competition. Each student uses a unique programming language from a set of five (Python, Java, C++, Ruby, and Swift) to solve different types of problems (Math, Logic, Sorting, and Graph). Each student solves **maxima** three different problem types, and each programming language is used by exactly one student.

Here are the clues to help solve the puzzle:

1. **Bob** solves Logic problems but does not use **C++**.
2. **Charlie** uses **Swift** and solves Graph problems.
3. The student using **Python** solves Math problems but does not solve Sorting problems.
4. **Alice** solves Math problems but does not use **Ruby** or **Swift**.
5. The student using **C++** does not solve Logic or Graph problems.
6. **Eve** solves Sorting problems but does not use **Java** or **Python**.
7. **Dave** does not solve Graph problems and does not use **Ruby**.
8. **The student solving Sorting problems also solves Logic problems**.

9. Only two students solve Graph problems.
10. The student using **Java** solves exactly two types of problems.

Task: Determine which student uses which programming language and which types of problems each of them solves.

Puzzle 2:

There are five students—John, Kate, Liam, Mia, and Noah—who each own a different type of robot. The robots specialize in one of five tasks (Cleaning, Cooking, Gardening, Coding, or Security), and each student has exactly two robots. Every task is covered by at least one robot, and each student has unique combinations of tasks.

Here are the clues:

1. **John** owns a **Coding robot** but does not have a **Cleaning robot**.
2. The **Gardening robot** belongs to **Liam**, who does not have a **Security robot**.
3. **Mia** has a **Cooking robot** and a **Cleaning robot**.
4. **Noah** does not own the **Gardening robot** and has neither **Cooking** nor **Cleaning robots**.
5. **Kate** owns the **Security robot** but does not own a **Gardening robot**.
6. **Mia** does not have a **Coding robot**.
7. The **Cooking robot** does not belong to **Liam**.

Task: Figure out which students own which types of robots and which tasks they cover.

Puzzle 3:

There are five engineers—Alex, Bella, Chris, Diana, and Eric—who each work on a unique programming project. The projects are classified into five categories (Web Development, Data Science, AI, Game Development, and Cybersecurity). Each engineer works on maximum two projects, and each project category is represented at least once.

Here are the clues:

1. **Alex** works on **Game Development** but not on **Web Development**.
2. **Bella** is involved in **AI** but not **Cybersecurity**.
3. The **Cybersecurity project** is handled by **Chris**, who also works on **Web Development**.
4. **Diana** does not work on **AI** but is involved in **Data Science**.
5. **Eric** handles **Game Development** and **Cybersecurity** but not **Data Science**.
6. **Bella** does not work on **Data Science**.
7. The **AI project** involves two engineers.

Task: Determine which engineer works on which projects.

Puzzle 4:

Five researchers—Fred, Gina, Harry, Irene, and Jack—are testing five new software tools, each for a different purpose (Data Analysis, Machine Learning, Networking, Encryption, and Image Processing). Each researcher tests **maximum** three tools, and no two researchers test the same combination of tools.

Here are the clues:

1. **Gina** tests the **Networking** tool but does not test the **Machine Learning** tool.
2. **Fred** tests the **Data Analysis** tool and also tests the **Machine Learning** tool.
3. The **Encryption tool** is tested by **Harry**, who also tests the **Image Processing** tool.
4. **Irene** does not test the **Networking** tool and only tests two tools also tested by **Fred**.
5. **Jack** tests the **Networking** and **Encryption** tools but not the **Data Analysis** tool.
6. **Fred** does not test the **Image Processing** tool.
7. Only two researchers test the **Machine Learning** tool.

Task: Figure out which researcher is testing which tools.

These puzzles should challenge the students' logic and deduction skills, encouraging them to break down complex problems systematically.