Indian Institute of Technology, Indore
Computer Science & Engineering
CS 354N: Assignment III-Prolog
Date- 21-01-2025

Some general instructions:

- Name your file in "Assignment_3_yourRollno.pdf" format.
- Submission of the assignment should be made using the Google Classroom platform only.
- Plagiarism in any form will not be tolerated.
- You are allowed to do only one submission before the deadline. Avoid the multiple submissions. In such case, only the last submitted file will be used for evaluation.
- Last date for submission of the assignment: **28-01-2025**
- Submit a single file (report) containing procedure (screenshot of main procedures/code/Results).

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1) Determine the greatest common divisor of two positive integer numbers. Use Euclid's algorithm.
Example:
?- gcd(36, 63, G).
G = 9

Define gcd as an arithmetic function; so you can use it like this:
?- G is gcd(36,63).
G = 9

2) You are given two jugs, a 4-gallon one and 3-gallon one. Neither has any measuring marks on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug? Write a prolog code to solve this problem.

3) There is a monkey at the door into a room. tn the middle of the room a banana is hanging from the ceiling. The monkey is hungry and wants to get the banana, but he cannot stretch high enough from the floor. At the window of the room there is a box the monkey may use. The monkey can perform the following actions: walk on the floor, climb the box, push the box around (if it is already at the box) and grasp the banana if standing on the box directly under the banana. Can the monkey get the banana?
One important task in programming is that of finding a representation of the problem in terms of concepts of the programming language used. In our case we can think of the 'monkey world' as always being in some state that can change in time. The current state is determined by the positions of the objects. For example, the initial state of the world is determined by:
(1) Monkey is at door.
(2) Monkey is on floor.
(3) Box is at window.
(4) Monkey does not have banana.

Write a prolog code to help monkey to get banana.

4) This is a classical problem in computer science. The objective is to place eight queens on a chessboard so that no two queens are attacking each other; i.e., no two queens are in the same row, the same column, or on the same diagonal.
Hint: Represent the positions of the queens as a list of numbers 1..N. Example: [4,2,7,3,6,8,5,1] means that the queen in the first column is in row 4, the queen in the second column is in row 2, etc. Use the generate-and-test paradigm.

5) The wolf, the goat, the cabbage: Another famous problem is this one: How can a knight jump on an NxN chessboard in such a way that it visits every square exactly once?
Hints: Represent the squares by pairs of their coordinates of the form X/Y, where both X and Y are integers between 1 and N. (Note that '/' is just a convenient functor, not division!) Define the relation jump(N,X/Y,U/V) to express the fact that a knight can jump from X/Y to U/V on a NxN chessboard. And finally, represent the solution of our problem as a list of N*N knight positions.