Fr. Conceicao Rodrigues College of Engineering Fr. Agnel Ashram, Bandstand, Bandra (W), Mumbai - 400050
Department of Computer Engineering
Academic Term II: 23-24

Class: B.E (Computer), Sem – VI Subject Name: Artificial Intelligence Student

Name: Sumit Sanjay Rai **Roll No: 9570**

Practical No:	**8**
Title:	Programming in PROLOG
Date of Performance:	**25/03/2024**
Date of Submission:	**01/04/2024**

Rubrics for Evaluation:

Sr. No	Performance Indicator	Excellent	Good	Below Average	Marks
1	On time Completion & Submission (01)	01 (On Time)	NA	00 (Not on Time)	
2	Logic/Algorithm Complexity analysis (03)	03(Correct)	02(Partial)	01 (Tried)	
3	Coding Standards (03): Comments/indention/Naming conventions Test Cases /Output	03(All used)	02 (Partial)	01 (rarely followed)	
4	Post Lab Assignment (03)	03(done well)	2 (Partially Correct)	1(submitted)	
Total					

Signature of the Teacher:

A) Tower of Hanoi

Source code:

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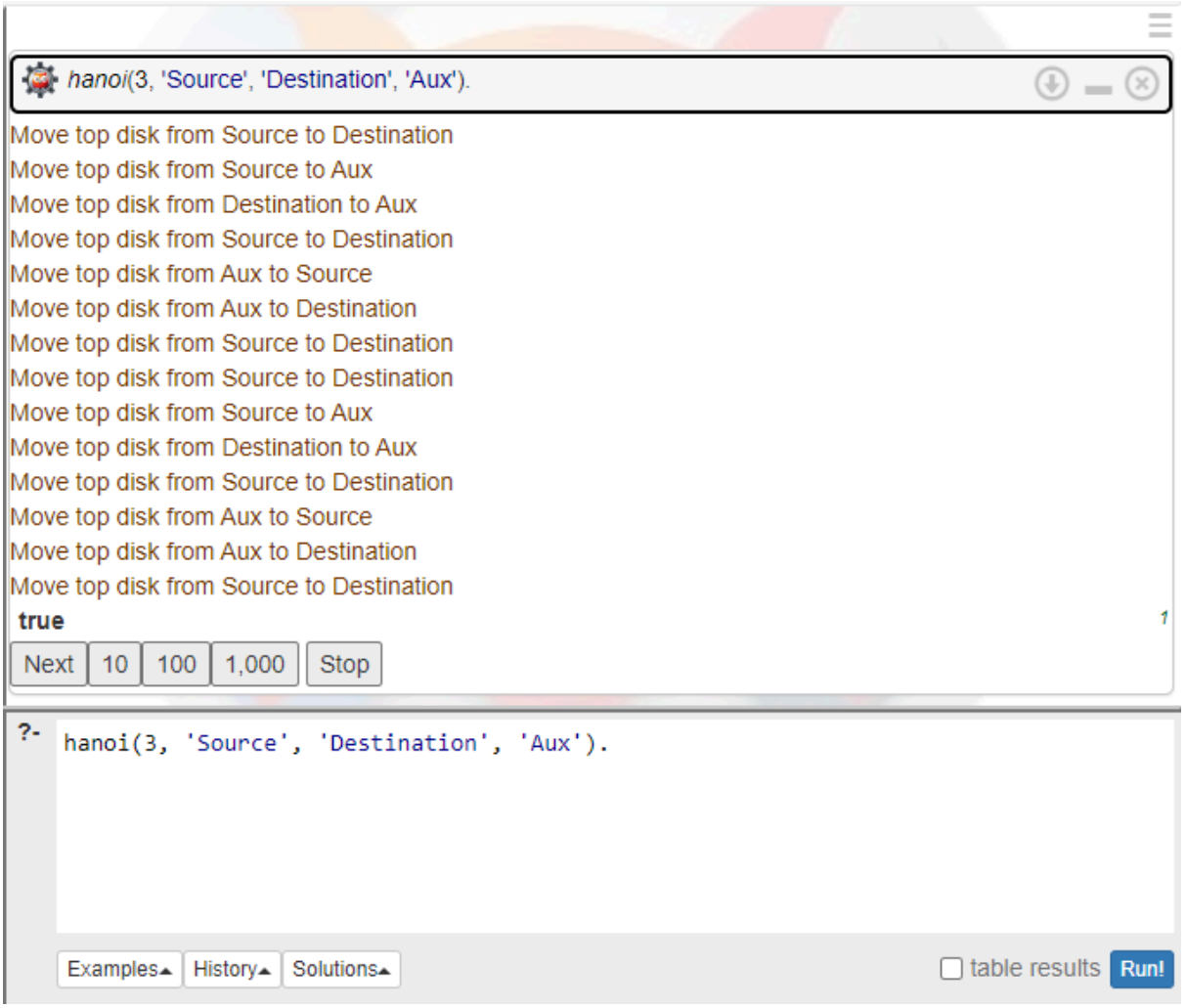
Program

```
% Define predicate hanoi/3 for solving Tower of Hanoi problem
hanoi(1, Source, Destination, _) :-
    write('Move top disk from '),
    write(Source),
    write(' to '),
    write(Destination),
    nl.

hanoi(N, Source, Destination, Aux) :-
    N > 1,
    M is N - 1,
    hanoi(M, Source, Aux, Destination),
    hanoi(1, Source, Destination, _),
    hanoi(M, Aux, Destination, Source).

% Example usage:
% To solve Tower of Hanoi problem with 3 disks
?- hanoi(3, 'Source', 'Destination', 'Aux').
```

Output:


hanoi(3, 'Source', 'Destination', 'Aux').
Move top disk from Source to Destination
Move top disk from Source to Aux
Move top disk from Destination to Aux
Move top disk from Source to Destination
Move top disk from Aux to Source
Move top disk from Aux to Destination
Move top disk from Source to Destination
Move top disk from Source to Destination
Move top disk from Source to Aux
Move top disk from Destination to Aux
Move top disk from Source to Destination
Move top disk from Aux to Source
Move top disk from Aux to Destination
Move top disk from Source to Destination
true
1
Next
10
100
1,000
Stop
?-
hanoi(3, 'Source', 'Destination', 'Aux').
Examples
History
Solutions
table results
Run!

B) N-queen

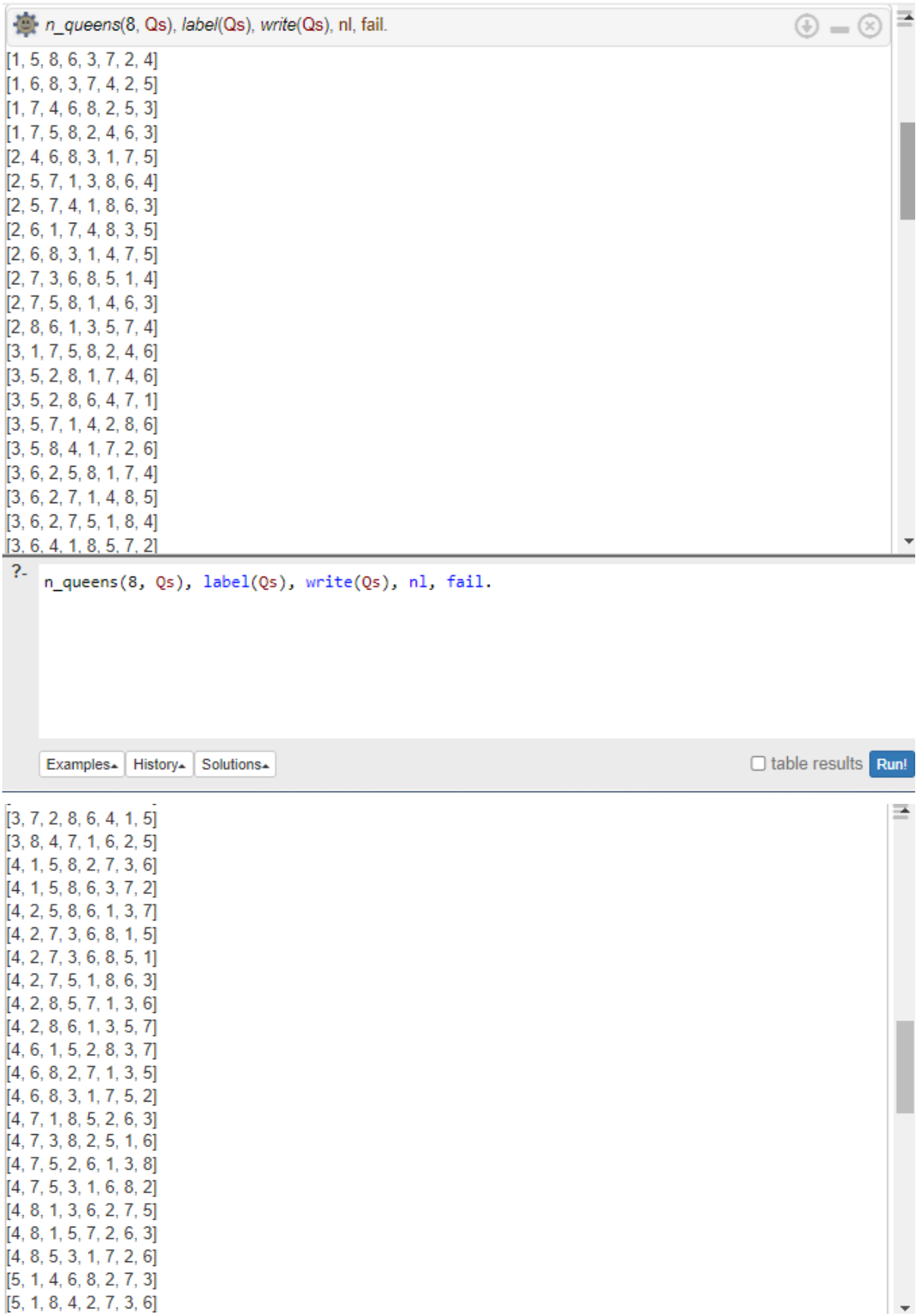
Source code:

SWISH File Edit Examples Help

Program Program

```
:- use_module(library(clpfd)).

% Step 1: Initialize N queens and insert in Qs
n_queens(N, Qs) :-
    length(Qs, N),
    Qs ins 1..N,
    safe_queens(Qs).

% Step 2: Set safe_queens to null
safe_queens([]).

% Step 3: Verify if attack is possible
safe_queens([Q|Qs]) :-
    safe_queens(Qs, Q, 1),
    safe_queens(Qs).

% Step 4: Continue till Qs id matches N
safe_queens([], _, _).

% Step 5: If Q meets no attack, declare Q as safe and add to safe_queens
safe_queens([Q|Qs], Q0, D0) :-
    Q0 #\= Q,
    abs(Q0 - Q) #\= D0,
    D1 #= D0 + 1,
    safe_queens(Qs, Q0, D1).

% Example usage:
% To solve N-Queens problem for N = 8
% Query: ?- n_queens(8, Qs), label(Qs), write(Qs), nl, fail.
% This will find all solutions for placing 8 queens on an 8x8 chessboard.
```

Output:


n_queens(8, Qs), label(Qs), write(Qs), nl, fail.
[1, 5, 8, 6, 3, 7, 2, 4]
[1, 6, 8, 3, 7, 4, 2, 5]
[1, 7, 4, 6, 8, 2, 5, 3]
[1, 7, 5, 8, 2, 4, 6, 3]
[2, 4, 6, 8, 3, 1, 7, 5]
[2, 5, 7, 1, 3, 8, 6, 4]
[2, 5, 7, 4, 1, 8, 6, 3]
[2, 6, 1, 7, 4, 8, 3, 5]
[2, 6, 8, 3, 1, 4, 7, 5]
[2, 7, 3, 6, 8, 5, 1, 4]
[2, 7, 5, 8, 1, 4, 6, 3]
[2, 8, 6, 1, 3, 5, 7, 4]
[3, 1, 7, 5, 8, 2, 4, 6]
[3, 5, 2, 8, 1, 7, 4, 6]
[3, 5, 2, 8, 6, 4, 7, 1]
[3, 5, 7, 1, 4, 2, 8, 6]
[3, 5, 8, 4, 1, 7, 2, 6]
[3, 6, 2, 5, 8, 1, 7, 4]
[3, 6, 2, 7, 1, 4, 8, 5]
[3, 6, 2, 7, 5, 1, 8, 4]
[3, 6, 4, 1, 8, 5, 7, 2]
?-
n_queens(8, Qs), label(Qs), write(Qs), nl, fail.
Examples
History
Solutions
table results
Run!
[3, 7, 2, 8, 6, 4, 1, 5]
[3, 8, 4, 7, 1, 6, 2, 5]
[4, 1, 5, 8, 2, 7, 3, 6]
[4, 1, 5, 8, 6, 3, 7, 2]
[4, 2, 5, 8, 6, 1, 3, 7]
[4, 2, 7, 3, 6, 8, 1, 5]
[4, 2, 7, 3, 6, 8, 5, 1]
[4, 2, 7, 5, 1, 8, 6, 3]
[4, 2, 8, 5, 7, 1, 3, 6]
[4, 2, 8, 6, 1, 3, 5, 7]
[4, 6, 1, 5, 2, 8, 3, 7]
[4, 6, 8, 2, 7, 1, 3, 5]
[4, 6, 8, 3, 1, 7, 5, 2]
[4, 7, 1, 8, 5, 2, 6, 3]
[4, 7, 3, 8, 2, 5, 1, 6]
[4, 7, 5, 2, 6, 1, 3, 8]
[4, 7, 5, 3, 1, 6, 8, 2]
[4, 8, 1, 3, 6, 2, 7, 5]
[4, 8, 1, 5, 7, 2, 6, 3]
[4, 8, 5, 3, 1, 7, 2, 6]
[5, 1, 4, 6, 8, 2, 7, 3]
[5, 1, 8, 4, 2, 7, 3, 6]

[6, 3, 5, 8, 1, 4, 2, 7]
[6, 3, 7, 2, 4, 8, 1, 5]
[6, 3, 7, 2, 8, 5, 1, 4]
[6, 3, 7, 4, 1, 8, 2, 5]
[6, 4, 1, 5, 8, 2, 7, 3]
[6, 4, 2, 8, 5, 7, 1, 3]
[6, 4, 7, 1, 3, 5, 2, 8]
[6, 4, 7, 1, 8, 2, 5, 3]
[6, 8, 2, 4, 1, 7, 5, 3]
[7, 1, 3, 8, 6, 4, 2, 5]
[7, 2, 4, 1, 8, 5, 3, 6]
[7, 2, 6, 3, 1, 4, 8, 5]
[7, 3, 1, 6, 8, 5, 2, 4]
[7, 3, 8, 2, 5, 1, 6, 4]
[7, 4, 2, 5, 8, 1, 3, 6]
[7, 4, 2, 8, 6, 1, 3, 5]
[7, 5, 3, 1, 6, 8, 2, 4]
[8, 2, 4, 1, 7, 5, 3, 6]
[8, 2, 5, 3, 1, 7, 4, 6]
[8, 3, 1, 6, 2, 5, 7, 4]
[8, 4, 1, 3, 6, 2, 7, 5]
false