

EXPERIMENT 03

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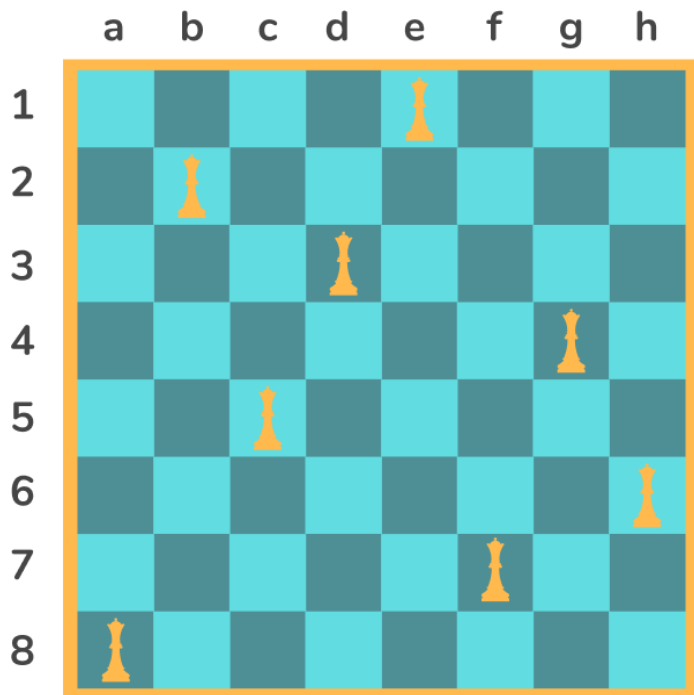
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Aim: Identify a problem statement for an Intelligent Agent

Theory:

8 Queens' Problem:

Given a **8 X 8** chessboard. The task is to place **8** queens on the board, such that no two queens attack each other. Return all distinct possible solutions for the **8 queens problem**.



Efficient Approach: Backtracking

The idea is to apply a backtracking approach to solve the problem. The backtracking function does the following:

- Places only 1 queen per row satisfying the conditions.
- Places only 1 queen per column satisfying the conditions.

For the diagonals, the value of (**row** – **col**) is constant and the main diagonal is **0**.

Every square has value (row - col). Diagonals share the same values

	0	1	2	3	4	5	6	7
0	0	-1	-2	-3	-4	-5	-6	-7
1	1	0	-1	-2	-3	-4	-5	-6
2	2	1	0	-1	-2	-3	-4	-5
3	3	2	1	0	-1	-2	-3	-4
4	4	3	2	1	0	-1	-2	-3
5	5	4	3	2	1	0	-1	-2
6	6	5	4	3	2	1	0	-1
7	7	6	5	4	3	2	1	0

Similarly, for **anti-diagonal**, the value of (**row** + **col**) is constant.

Every square has value (row - col). Anti-Diagonals share the same values

	0	1	2	3	4	5	6	7
0	0	1	2	3	4	5	6	7
1	1	2	3	4	5	6	7	8
2	2	3	4	5	6	7	8	9
3	3	4	5	6	7	8	9	10
4	4	5	6	7	8	9	10	11
5	5	6	7	8	9	10	11	12
6	6	7	8	9	10	11	12	13
7	7	8	9	10	11	12	13	14

From the above, we can keep track of the rows and columns which have been used already. Therefore, no more queens can be placed in such rows/columns.

The problem formulation is as follows:

- **States:** Any arrangement of n0 to 8 queens on the board is a state.
- **Initial State:** No queens on the board.
- **Actions:** Place a queen in such a way that it does not conflict with either vertically, horizontally or diagonally.
- **Transition Model:** It returns the resulting state as per the given state and actions.
- **Goal test:** All 8 queens must be placed on board without any conflict.
- **Path cost:** Number of steps required - 92

Conclusion: Thus, we learned how to place all 8 queens on board without any of them conflicting with other queens either horizontally or vertically or diagonally.