**The 4-Queens Problem Solution:**

The 4-Queens problem is a specific case of the broader N-Queens problem, which is a classic combinatorial challenge in Computer Science and Mathematics. It requires placing **N queens** on an **N×N chessboard** such that no two queens attack each other.

For the 4-Queens problem, where **N=4** , the chessboard is of size **4×4**, and the task is to place **4 queens** in a manner that adheres to the following conditions:

1. **No two queens in the same row**: Since a queen can attack all positions in the same row, each queen must be placed in a different row.

2. **No two queens in the same column**: Similar to rows, a queen can also attack all positions in the same column, so each queen must occupy a unique column.

3. **No two queens on the same diagonal**: Queens attack diagonally as well, so their positions must ensure they are not aligned along any diagonal.

**SOLUTION:**

This problem can be solved using backtracking, a systematic trial-and-error approach to explore all possible arrangements:

* Starting from the first row, attempt to place a queen in each column one by one.
* Move to the next row, placing a queen in a column that satisfies all constraints.
* If no valid position is found for a row, backtrack to the previous row, adjust the queen’s position, and continue.

Here are the Two possible arrangements-

**First-**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Q1 |  |  |
|  |  |  | Q2 |
| Q3 |  |  |  |
|  |  | Q4 |  |

* **Queen 1**: Row 1, Column 2 (1,2)
* **Queen 2**: Row 2, Column 4 (2,4)
* **Queen 3**: Row 3, Column 1 (3,1)
* **Queen 4**: Row 4, Column 3 (4,3)

**Second-**

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Q1 |  |
| Q2 |  |  |  |
|  |  |  | Q3 |
|  | Q4 |  |  |

* **Queen 1**: Row 1, Column 3 (1,3)
* **Queen 2**: Row 2, Column 1 (2,1)
* **Queen 3**: Row 3, Column 4 (3,4)
* **Queen 4**: Row 4, Column 2 (4,2)