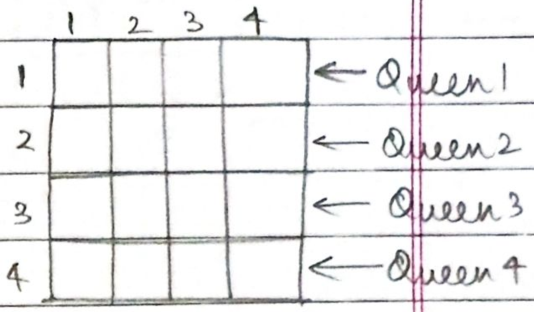
06.04.2020 n-Queens Problem

- the problem is to place n queens on ~~the~~ an n×n chessboard so that no 2 queens attack each other by being in the same row, column or diagonal.

Let us consider the 4-queens problem.

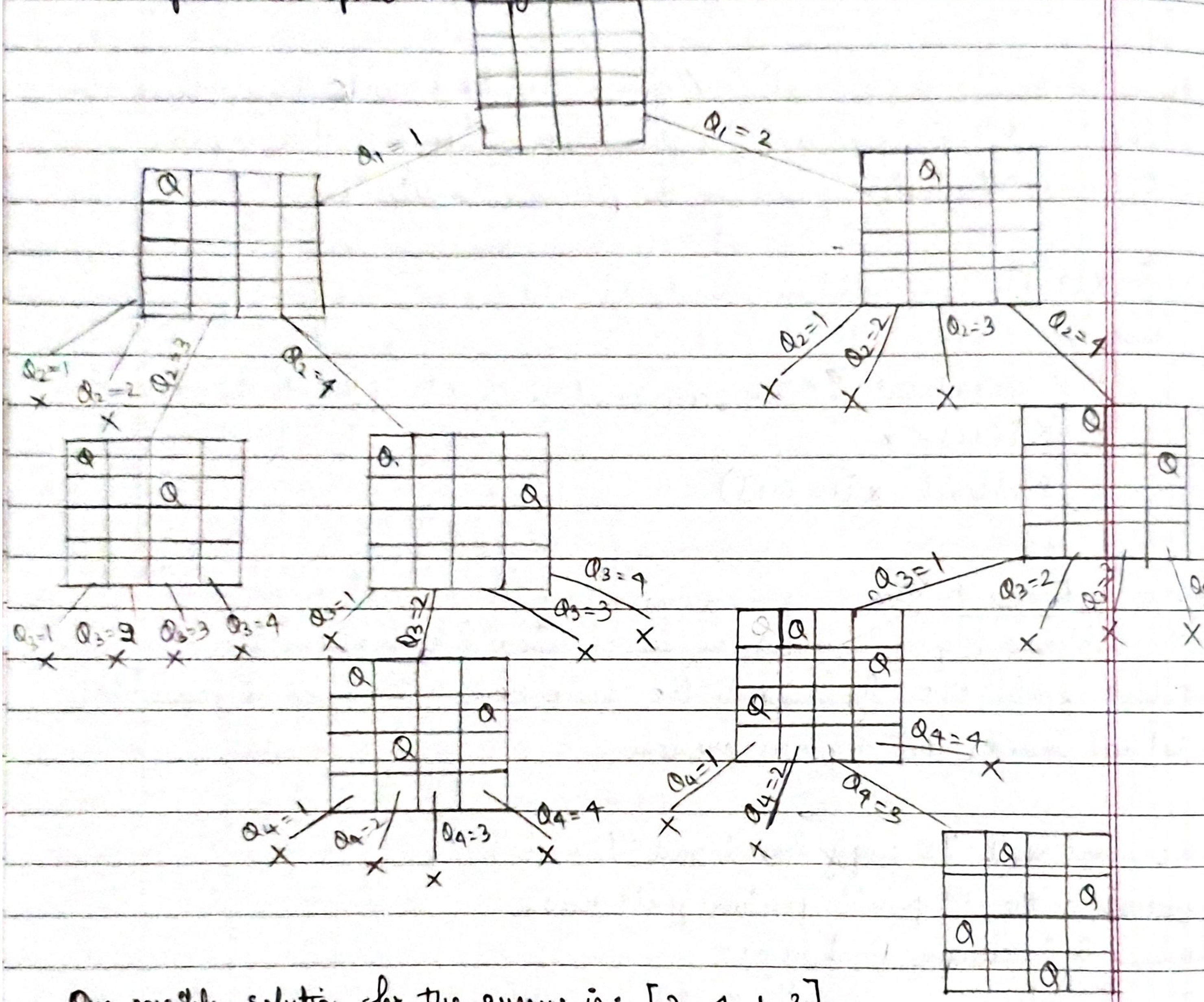


Board for the 4 queens problem.

- we start with the empty board and then place queen 1 in the 1st possible position of its row, which is in column 1 of row 1.
- Then we place queen 2, after trying unsuccessfully columns 1 and 2, in the 1st acceptable position for it, which is square (2,3), the square in row 2 and column 3.
- This proves to be a dead end because there is no acceptable position for queen 3.
- So the algorithm backtracks and puts queen 2 in the next possible position at (2,4).

- Then queen 3 is placed at (3,2), which proves to be another dead end
- The algorithm then backtracks all the way to queen 1 & moves it to (1,2). Queen 2 then goes to (2,4), queen 3 to (3,1) and queen 4 to (4,3), which is a solution to the problem.

- The ~~space~~ state-space tree of this search is:



One possible solution for the queens is: [2, 4, 1, 3],
where each elt in the array represents the column no. of the ith queen (i from 1 to 4).

The other solution is the mirror image: [3, 1, 4, 2]