

## Pseudocode for N-Queens problem.

Assume the positions of the queens are represented by an n-tuple  $(Q_0, \dots, Q_{n-1})$  where  $0 \leq Q_i < N$  for each  $i$ .

We use a boolean function `validPosition` defined as follows

```
boolean validPosition( k )
    for i = 0 to k - 1 do
        //If two queens are on the same row or same diagonal
        if (  $Q_i = Q_k$  ) OR (  $\text{abs}( Q_i - Q_k ) = \text{abs}( i - k )$  )
            return false

    return true

placeQueens( N )

     $Q_0 = 0$ 
    k = 0 //Start with  $Q_0$  on row 0

    while ( k < N ) do
        while( ( k < N ) AND ( validPosition( k ) is false ) ) do
             $Q_k = Q_k + 1$  //Advance this queen one row

        if( ( k = N - 1 ) AND (  $Q_k < N$  ) ) //All queens are validly placed
            print solution (  $Q_0, \dots, Q_{N-1}$  )
            STOP

        else if ( ( k < N - 1 ) AND (  $Q_k < N$  ) )
            k = k + 1 // Not done yet; Now try to place the next queen
             $Q_k = 0$ 

        else
            //The positions of the first k queens cannot possible lead
            //to a solution. So, we must backtrack.
            k = k - 1
            if( k < 0 )
                //Opps, we have not found any position for the first queen
                //that could lead to a solution. Guess it can't be done!
                print "no solution possible"
                STOP
            else
                 $Q_k = Q_k + 1$  //Advance this queen (the one we backtracked to)
                //one more space
```