Programming (COMP4008-PRG)
3rd exercise

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The 8 queens puzzle

You are asked to implement a Python function that solves the *8 queens puzzle.* The 8 queens puzzle consists of placing 8 queens on a chess board, so that, none of the queens could capture any other. Note that queens can move orthogonally or diagonally in any direction.

You should implement a function `solve` that when called, it prints the first solution of the puzzle and then it waits for input. Once the user presses "enter", the next solution is printed and so on. Here is how running the program should look like:

```
solve ()
Q . . . . . . .
. . . . Q . . .
. . . . . . . Q
. . . . . Q . .
. . Q . . . . .
. . . . . . Q .
. Q . . . . . .
. . . Q . . . .
more?
```

Hints:

- In any row, there is exactly one queen. Hence, *all you need to compute* is the column in which each of the 8 queens can be placed.
- You should implement a recursive function *solve(n)* that finds a place for the n^{th} queen and then calls itself recursively for the $n + 1$ queen (unless all the queens have been placed). It should systematically explore all the possibilities using *backtracking.*
- You are allowed (and encouraged) to define extra functions (other than *solve(n)*) to improve the quality of your code if necessary.

To get full marks:

- Your program should be able to find all the solutions for the puzzle.
- It should be easy to modify your program, so that, it works for different board sizes.
- The code should be as simple as possible and you should use comments to explain how it works.
- You should use recursion to implement backtracking.

You are free to use your favourite Python IDE to do this. Once you have completed your program, name your code as “ex03”.py, and submit it on Moodle.

Important notes:

- Use only the operations that have been introduced in the lectures.
- Optionally, if you finish and submit before the deadline, you can demo your code to one of the demonstrators in the lab and they will give you feedback.
- Doing or not doing the demo does not affect your mark.
- We will not give you the marks immediately during the demo.
- Make sure you note down the name of the demonstrator if you do the demo. *You cannot resubmit your solution after demoing it to us.*
- You may be (randomly) selected to demo your solution the week after the deadline. Lab demonstrators will contact you to ensure you attend the lab session. *Being unable to explain your solution may affect your mark.*
- **Submission deadline: 16th of November at 3pm**.