Algorithms

Homework 3: due 6 June 2023

1. The n-queens problem is to find all ways to place n queens on an $n \times n$ chessboard so that no two can attack. The chessboard may have at most 3 holes such that a queen cannot go through a hole and cannot be placed on a hole. You are to write a program that solves the n-queens problem in two different ways:

- an iterative backtracking algorithm, and
- a recursive backtracking algorithm.

Your program should output the number of ways to place n queens for $n \geq 4$. You should make your algorithms as efficient as possible.

2. Your program should proceed as follows.

(1) Read n and at most 3 hole positions.

(2) Run your iterative backtracking algorithm for the given input and measure the time. Print the output and the time.

(3) Run your recursive backtracking algorithm for the given input and measure the time. Print the output and the time.

- Describe how your algorithm works and how you made your algorithms as efficient as possible.
- Compare the running time of your iterative backtracking algorithm and that of your recursive backtracking algorithm, and discuss the results.
- Hand in your report, program, and an example running.
- Write down the environment you run your program and how to run your program in your report.
- Write comments appropriately in your program.