

Algorithms

Homework 3: due 27 May 2025

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.