12.2
Search trees and backtracking
The queens problem
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[Diagram of a chessboard with three queens]
The queens problem
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The queens problem

Q: How many queens can one place on the board?
Q: Can one place 8 queens on the board?
The eight queens puzzle

Problem published in 1848, solved in 1850.

Q: How to solve problem for general $n$?
The eight queens puzzle

Problem published in 1848, solved in 1850.

Q: How to solve problem for general $n$?
Strategy: Search tree
Search tree for 5 queens
Backtracking: Informal definition

Recursive search over an implicit tree, where we “backtrack” if certain possibilities do not work.
n queens C++ code

```c++
void generate_permutations(int * permut, int row, int n )
{
    if ( row == n ) {
        print_board( permut, n );
        return;
    }

    for ( int val = 1; val <= n; val++ )
        if ( isValid( permut, row, val ) ) {
            permut[ row ] = val;
            generate_permutations( permut, row + 1, n );
        }
}
generate_permutations( permut, 0, 8 );
```
THE END

... (for now)