Backtracking Algorithms

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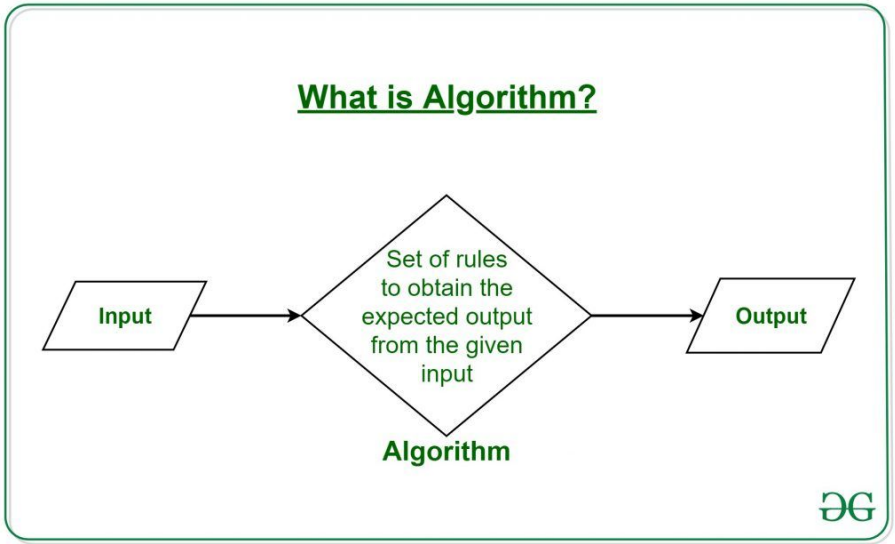
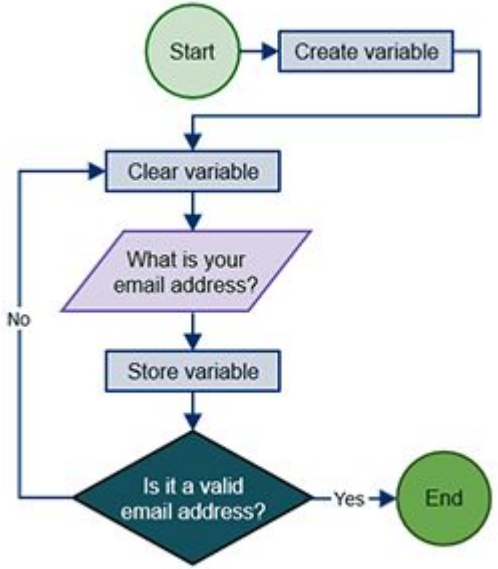
What is an Algorithm?

- Procedure or formula used for solving a problem based on a sequence of specified actions
- Algorithms have been used in our day-to-day lives for centuries to help us achieve a particular outcome



The Six Properties of an Algorithm

- An algorithm must have a specified input
- Must have a specified output
- Definite
- Effective
- Finite
- Independent



How Are Algorithms Useful in Programming?

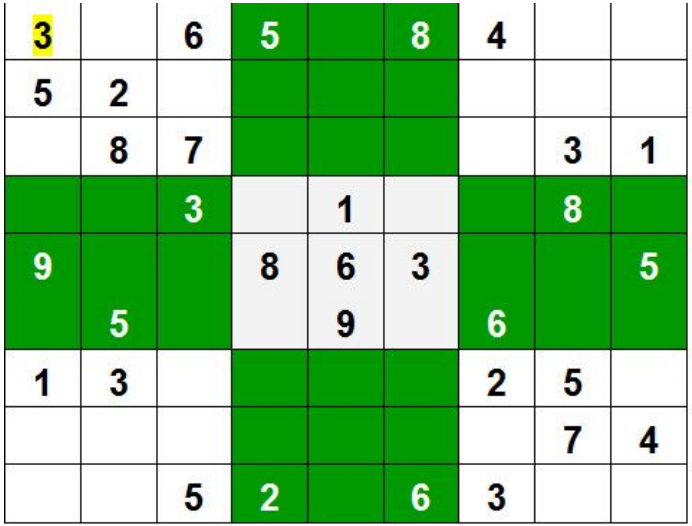
- Algorithms are the backbone of computer science
- Algorithms are used to find the best possible way of solving a problem. In doing so they improve the efficiency of a program.
- The right choice of an algorithm will ensure that a program consumes the least amount of memory. Apart from memory, the algorithm can determine the amount of processing power that is needed by a program

Backtracking Algorithms

- Problem-solving algorithm that uses a brute force approach for finding the desired output
- Divide the problem into subproblems, each which can be attempted to be solved; however, if the desired solution is not reached, move backwards in the problem until a path is found that moves it forward.
- If the current solution is not suitable, then backtrack and try other solutions. Thus, recursion is used in this approach

Situations Where Backtracking Algorithms Can Be Useful

- When one would need to find all possible solutions
- Used to solve **puzzles or problems** include: Puzzles such as eight queens puzzle, crosswords, verbal arithmetic, Sudoku, and Peg Solitaire.



Conclusion

- Algorithms are a useful tool for problem solving in programming
- An algorithm must have a specified input and output, it must be definite, effective, finite, and independent
- Backtracking algorithms are usually utilized for solving problems by finding all possible solutions