Assignment 8: Introduction to Algorithms

Assignment Description:

Explore the fundamentals of algorithms, their significance in computer science, and their role in solving real-world problems.

**Questions**:

Introduction to Algorithms: Define what an algorithm is and why it is a fundamental concept in computer science. Provide a real-world example of an algorithm's application.

**Solution** 1:

An algorithm is a step-by-step, finite set of instructions used to solve a specific problem or perform a task. It's fundamental in computer science because it forms the basis for designing and implementing software solutions. An example is the "Quick Sort" algorithm used for sorting data efficiently.

Question 2: Recursion Introduction

Explain the concept of recursion in computer science. Provide a code example in Java to solve a simple problem using recursion.

**Solution** 2:

Recursion is a programming concept where a function calls itself to solve a problem. It's often used for problems that can be broken down into smaller, similar subproblems. Here's a Java code example for calculating the factorial of a number using recursion:

java

public int factorial(int n) {

if (n <= 1) {

return 1;

} else {

return n \* factorial(n - 1);

}

}

Question 3: Recursive VS Iterative

Compare and contrast recursive and iterative approaches in solving problems. Explain when it's more suitable to use recursion and when to use iteration.

**Solution** 3:

Recursive and iterative approaches both solve problems, but they differ in how they do it. Recursion uses function calls to break down problems into smaller subproblems, while iteration uses loops to repeatedly execute a set of instructions. Recursion is suitable for problems with a clear base case and when the problem can be divided into subproblems. Iteration is preferable for problems that require repetition and can be solved using loops.