<u>Computer Programming</u>

<u>Assignment #01</u>

<u>BSE-1B</u>

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<u>Algorithms</u>

<u>Question #01</u>

Imagine you are developing a GPS navigation system. You are given a map with various locations and the roads connecting them. Your task is to write an algorithm to find the shortest path from one location to another. You can assume that you have a list of locations and the distance between each pair of locations. Your algorithm should output the shortest path and the total distance.

<u>Ans</u>:

- Step 1 : Start
- Step 2 : Name all the locations on the map accordingly with numbers starting from 1.
- Step 3: Identify the starting and the destination location.
- Step 4: Set the initial location to 0.
  - Set the name of every location other than the destination location to "neighbor"
- Step 5: Find the unvisited location with the shortest distance from the starting location.
- Step 6: Add this unvisited location to list of locations.
- Step 7: If the distance through the current location is shorter than the known distance to its neighbor, update it in the list.
- Step 8: Note the track of the previous location that leads to neighbor

- Step 9: Once visited all locations, start from the destination location and follow the previous locations back to the initial location '0', building the shortest path.
- Step 10: The path obtained in Step 9 is the shortest path
    - Total distance is the distance you calculated to the destination location.

Question #02

You are working on a project where you need to sort a list of numbers in ascending order. Design an algorithm to efficiently sort a list of integers. You should consider various sorting algorithms, evaluate their time complexity, and choose the most suitable one for the task.

Ans:

- Step 1: Start.
- Step 2: Choose a number from the list for comparison and name it as "**key**".
- Step 3: Go through the list and put the number greater than the **key** on the left on left of the key variable and the number lesser than the key on the right side of the key side and run until the last number and stop.
- Step 4: Now having smaller sub lists, Repeat Step #3 for the same sub lists on the left and right hand side of the key variable
- Step 5: Combine all the sub lists to create a fully sorted list.
- Step 6: Stop.

I have used the bubble sorting algorithm for this because of its low complexity and high efficiency in problem solving.

Question #03

The Fibonacci sequence is a series of numbers where each number is the sum of the two preceding ones (e.g., 0, 1, 1, 2, 3, 5, 8, 13, …). Write an algorithm to calculate the nth Fibonacci number. Your algorithm should be efficient and capable of handling large values of n.

Ans:

- Step 1: Start
- Step 2: Declare variables t1,t2,t3,n.
- Step 3: Assign t1=0, t2=1
- Step 4: Take range from user and store it in variable n.
- Step 5: Run a loop from 1 to the range entered.
- Step 6: Display the first two terms of the series stored in t1,t2 using cout.
- Step 6: t3 is the result of addition of t1 and 2

  Assign value of t2 to t1

      Assign value of t3 to t2
- Step 7: Display t3
- Step 8: Stop

Question #04

You are tasked with creating an algorithm for a store's inventory management system. Your algorithm should be able to add and remove items from the inventory, update the quantity of existing items, and generate reports of the items and their quantities. Design an algorithm that efficiently manages the store's inventory based on these requirements.

Ans:

- Step 1: Start
- Step 2: Imagine a list of inventory of all the items of a store.
- Step 3: If there is a new product, name it with a ID and store it as "ProductId" with a unique ID and quantity of the product.
  - If the item is already existing in the list, update the quantity with respective ProductID.
- Step 5: If you lose an item or sell it, apply decrement to the quantity of ProductID.
  - If the quantity of the ProductID goes zero, remove the ProductID from the list of inventory
- Step 6: For generating reports, take the ProductID and quantity of ProductID and display it accordingly.
- Step 7: Stop