University of Colombo School of Computing
SCS 1304 - Problem Solving Strategies and Computation Approaches

Lab Sheet 02

Select the correct answer

01. In computational thinking, the step of 'Solution Implementation & Evaluation' includes:

a) Only creating the actual solution

b) Only implementing the solution without evaluation

c) Evaluating the solution's correctness and efficiency

d) Ignoring the testing phase

02. The role of algorithms in problem-solving primarily includes:

a) Identifying irrelevant details to ignore

b)Focusing on the hardware requirements

c) Abstracting and generalizing solutions

d) Creating and evaluating detailed step-by-step procedures

03. What does the Divide and Conquer Approach typically involve?

a) Solving the problem as a whole without breaking it down

b) Dividing the problem into subproblems, solving each one, and combining the results

c) Randomly guessing the solution

d) Using simple heuristics to find an optimal solution

04. Abstraction in computational thinking involves:

a) Ignoring all details of a problem

b) Focusing on the most important details while ignoring the irrelevant

c) Creating a physical model of the problem

d) Detailing every single aspect of the problem

05. Which approach is characterized by breaking a problem down into subproblems that can be solved independently?

a) Pattern Recognition

b) Abstraction

c) Algorithm Design

d) Decomposition

06. In computational thinking, what does algorithm design specifically entail?

a) Identifying patterns in data

b) Ignoring irrelevant information

c) Developing step-by-step instructions to solve a problem

d) Breaking down a problem into smaller parts

07. Which of the following best describes the purpose of decomposition in computational thinking?

a) Ignoring irrelevant information

b) Creating step-by-step instructions to solve a problem

c) Combining small problems into a larger problem

d) Breaking down a complex problem into smaller, more manageable parts

08. Which computational thinking skill is essential for identifying patterns across different components of a problem?

a) Algorithm Design

b) Abstraction

c) Pattern Recognition

d) Decomposition

09. Declarative programming focuses on:

a) How the program should run step by step

b) Describing what the program should achieve

c) Detailed procedural steps

d) Implementing complex control flows

10. Which of the following best describes the Brute-Force Approach?

a) It divides a problem into subproblems

b) It systematically tests all possible solutions

c) It involves using heuristics to find a solution quickly

d) It uses algorithms that make locally optimal choices

11. What is a primary benefit of pattern recognition in computational thinking?

a) It helps to combine different patterns into a complex one

b) It identifies similarities and trends to simplify complex problems

c) It focuses on irrelevant details

d) It creates detailed flowcharts for algorithms

12. Which problem-solving approach involves creating algorithms that are efficient and optimal for the given problem?

a) Greedy Approach

b) Brute-Force Approach

c) Backtracking Approach

d) Divide and Conquer Approach

13. What is the first step in the problem-solving process using computational thinking?

a) Problem Specification

b) Solution Implementation

c) Algorithmic Expression

d) Evaluation

14. Which computational thinking approach is most closely associated with model development?

a) Pattern Recognition b) Decomposition

c) Algorithmic Expression d) Problem Specification

15. In the context of algorithmic expression, which of the following is NOT typically used?

a) Flowcharts b) Pseudocode

c) UML diagrams d) SQL queries

16. Continuous integration and continuous delivery (CI/CD) tools help with:

a) Decomposing problems into smaller parts

b) Automating the coding process

c) Automating development, deployment, and testing

d) Creating algorithms

17. Which step of computational thinking involves presenting solutions in a way that both humans and computers can understand?

a) Decomposition

b) Pattern Recognition

c) Abstraction

d) Algorithm Design

18. The 'Greedy Approach' in problem-solving is best described as:

a) Making the globally optimal choice at each step

b) Systematically testing all possible solutions

c) Breaking down the problem into smaller, manageable parts

d) Making the locally optimal choice at each step

19. Which of the following is NOT a typical strategy in problem-solving?

a) Means-Ends Analysis

b) Algorithm and Heuristic

c) Trial and Error

d) Random Guessing

20. Which of the following is a key characteristic of imperative programming?

a) Ignoring the sequence of operations

b) Focusing on the control flow of the program

c) Using SQL for database queries

d) Describing what you want the program to achieve

Answer the following questions based on the given data.

01. You are provided with a dataset from a food delivery platform containing the following columns: Date, Total Orders, Revenue, Average Delivery Time (minutes), and Customer Ratings. The data spans the last 6 months. Your task is to identify patterns in the data to make informed business decisions.

Month	Total Orders	Revenue ($)	Average Delivery Time (min)	Customer Ratings (out of 5)
August	1500	30,000	35	4.2
September	1800	36,000	33	4.3
October	1700	34,000	30	4.0
November	1600	32,000	32	4.1
December	2000	40,000	28	4.4
January	*To be predicted*	*To be predicted*	*To be predicted*	*To be predicted*

A. Identify the months with the highest and lowest revenue. What patterns can you observe regarding order volume and customer satisfaction during these months?

B. Compare the average delivery time across the months. Are there any observable trends or anomalies? Suggest possible reasons.

C. Evaluate the consistency of customer ratings over the months. What might this indicate about the service quality?

D. Predict the likely number of orders and revenue for the upcoming month. Justify your prediction using observed trends.

E. Suggest two improvements the company could implement to reduce delivery time and improve customer satisfaction.

F. Discuss how analyzing patterns in delivery data can influence strategic decisions. Provide one concrete example.

2. UCSC is planning to launch an **Online Event Registration System** for managing academic workshops, guest lectures, and student development programs. This platform must allow users (students, staff, and external participants) to **view available events**, **register**, **cancel registrations**, and **receive automated notifications**. Users should be able to access the platform via mobile or desktop, and the system must support secure login, personalized dashboards, and real-time updates. The admin panel should allow event organizers to create new events, view participant lists, and send communications.

A. List the major functions that the **Online Event Registration System** must perform. For each major function identified, break it down further into sub-functions or tasks. Provide at least two sub-functions for each major function.

B. Explain how functional decomposition helps in managing the complexity of the system development. Provide an example from your decomposition to illustrate this benefit.

3. Within the university's new event registration platform, you are responsible for designing the logic behind the **"Register for Event"** function. The goal is to guide users smoothly from the point they log in, to successfully securing a place in the event. This process needs to handle normal and exceptional flows (e.g., fully booked events) and update the system to reflect real-time participation status. An automated email should be triggered once the registration is successful.

Hint:

Think about what a user would normally do when registering for an event online. When creating the flowchart, begin with the user logging in and selecting an event. The system should then check if the event has available slots. If it's full, the user should be shown a message and the process ends. If there is space, the user fills out a registration form, confirms the registration, and the system updates the records and sends a confirmation message before ending the process.