Xebia

C++ Programming Lab Manual

C++ Basic Coding Skills

Q1. A teacher wants to calculate the average marks of three students to determine the class performance. Implement a solution to accept three numbers and compute their average.

Q2. An architect wants to calculate the space covered by a circular fountain. Implement a solution to compute the area of a circle.

Q3. A weather app developer needs to provide both Celsius and Fahrenheit readings. Implement a solution to convert Fahrenheit temperature into Centigrade or vice versa.

Q4. A shopkeeper wants to calculate the total bill amount after applying a 20% discount on the purchase. Implement a solution to accept item no., quantity, and unit price. Compute the amount and apply 20% discount.

Q5. A student wants to swap the values of two variables for practising coding basics.
Implement a solution to swap two numbers using different techniques.

Q6. An HR system needs to calculate employees' net salaries, including a fixed 12% bonus for each worker. Implement a solution to accept the number of employees and their basic salary. Compute bonus, net salary, and display results.

Q7. A game compares three players' scores to find who is ahead. Implement a solution to accept three scores and identify the winner.

Q8. A monitoring system generates a sequence of numeric event IDs from **1 to N**.
To make logs easier to analyse, the system applies **tags** to certain events based on predefined rules:

- Events whose ID is divisible by **3** are tagged as **"Buzz"**
- Events whose ID is divisible by **5** are tagged as **"Fuzz"**
- Events divisible by **both 3 and 5** receive **both tags**

Q9. A text editor auto-detects whether an input letter is a vowel, a consonant or a number. Implement a solution to classify the symbol.

Q10. A calendar app calculates whether February has 29 days. Implement a solution to check if a year is a leap year or not.

Q11. A wholesale supplier applies 10% discount if the order > 1000 items. Implement a solution to compute total expenses and apply a discount accordingly.

Q12. A civil engineer classifies a triangle design as equilateral, isosceles, or scalene. Implement a solution to check the triangle type based on its sides.

Q13. A mathematics tool computes the exact roots of a quadratic equation for teaching purposes. Implement a solution to calculate the roots of a quadratic equation.

Q14. Develop a menu-driven calculator program in C++ to perform basic arithmetic operations.
The program should continue executing based on the user's choice and display the result of each operation.

Q15. A data analytics tool finds the maximum sales figure from multiple entries.
Implement a solution to accept 'n' numbers and display the largest.

Q16. A cybersecurity tool verifies prime numbers used in encryption keys. Implement a solution to accept a number and check whether it is prime.

Q17. A learning application analyzes numbers for mathematical properties.
Design a solution to check whether a given number is a **Perfect number or an Armstrong number**.

Q18. A String-matching tool validates if IDs are palindromes. Implement
a solution to check whether a given ID is a palindrome.

Q19. A network security system generates prime numbers in a range for encryption key pools. Implement a solution to find all prime numbers within a given range.

Q20. A printing press needs to repeat labels in a fixed tabular layout. Implement a solution to display:

1 2 3 4 5

1 2 3 4 5

1 2 3 4 5

Q20. A board displays reverse seating layouts for events. Implement a solution to print:

5 4 3 2 1

5 4 3 2

5 4 3

5 4

5

Q21. A CAD tool generates rectangular hollow frames. Implement a solution to display:

```
 ********
*        *
*        *
*        *
*        *
*        *
*        *
 ********
```

Q22. A jewelry design tool generates hollow diamond outlines for patterns. Implement a solution to display a hollow diamond pattern of *.

```
    *
   * *
  *   *
 *     *
*       *
 *     *
  *   *
   * *
    *
```

Q23. A fireworks display system arranges sparks in butterfly style. Implement a solution to display a butterfly star pattern.

Q24. A typing practice app displays the alphabets in pyramid form. Implement a solution to display:

A

AB

ABC

ABCD

ABCDE

Q25. A security system generates list of prime keys within given range. Implement a solution to display all prime numbers between two limits.

A web-based application enforces **strong password policies** during user registration to improve account security. The system requires that every password must satisfy the following conditions:

- Contain **at least one uppercase letter (A–Z)**
- Contain **at least one lowercase letter (a–z)**
- Contain **at least one digit (0–9)**
- Contain **at least one special character** from the set
  @ # $ % ! & *

You are required to develop the code so that the password validation logic can be implemented in the application.

Q26. The school report card system stores subject marks for each student.
Implement a solution to accept marks in 5 subjects, compute the **total** and **percentage**, and display the result.

Q27. A supermarket software maintains item price lists. Implement a solution to store the prices of 10 items in an array and display the **maximum price**.

Q28. A data processing system classifies even and odd inputs separately. Implement a solution to store 5 elements in an array, compute **sum of all even** and **sum of all odd** numbers.

Q29. A weather monitoring app records 30-day temperature logs. Implement a solution to store daily temperatures in an array and display the **minimum temperature** for the month.

Q30. A payroll system maintains employee salary records. Implement a solution to accept salary of 10 employees in an array, compute **total salary** and **average salary**, then display the result.

Q31. A manufacturing QC system checks defect codes divisible by both 3 and 5.
Implement a solution to store 5 elements in an array and count how many numbers are divisible by **3 and 5**.

Q32. A stock market app tracks first and second highest stock values. Implement a solution to find the **largest** and **second largest** number in an array of size 5.

Q33. A grading system stores marks of multiple students in arrays. Implement a solution to accept marks in 5 subjects for 3 students, then display:

- marks in **2nd subject of 1st student**, and
- marks in **5th subject of 3rd student**.

Q34. A graphics rendering engine adds pixel intensity matrices. Implement a solution to store two 3×3 matrices and compute their **sum**.

Q35. A data analytics tool flips rows and columns for better visualization. Implement a solution to store a 3×3 matrix and compute its **transpose**.

Q36. A machine learning model multiplies matrices for neural network layers. Implement a solution to multiply two matrices of order m×n and p×q (if valid).

Q37. A registration system rejects usernames that contain spaces or special characters. Write a C++ program to validate whether a given string can be accepted as a username.

Q39. In software applications such as **data analytics and probability systems**, combinatorial values are frequently required. To ensure efficiency, developers avoid factorial-based solutions and use **iterative logic with loops**.
As a **Junior Software Developer**, design a **C++ program** to generate **Pascal's Triangle** for a given number of rows.

Q40. A content-management system receives user-entered text that may contain inconsistent spacing, mixed letter cases, and invalid characters.
For reliable storage and processing, the system must **normalize and validate** the input string.
Develop a C++ program that performs the following tasks on a given input string:

1. Remove leading, trailing, and extra spaces between words

2. Convert the string to **sentence case** (first character uppercase, remaining lowercase)
3. Count and display:
    - Total number of words
    - Total number of digits
    - Total number of special characters
4. Validate that the final string contains **only alphabets, digits, and spaces**

Display appropriate messages based on the validation result.