भारतीय प्रौद्योगिकी संस्थान तिरुपति

IIT TIRUPATI

INDIAN INSTITUTE OF TECHNOLOGY TIRUPATI
DEPARTMENT OF MATHEMATICS AND STATISTICS

MA517M-Basic Programming Laboratory

Tutorial Problem - 3 28 August 2025

Examples

1. Write a C++ program to find all prime numbers between 1 to n.
2. Write a C++ program to calculate the sum of the first n even natural numbers. Receive n as an input.
3. Write a C++ program to calculate the sum of the first n natural numbers that are divisible by 7 but not by 63.
4. Write a C++ program to calculate the sum of the fourth power of the first n natural numbers. If the user enters a non-negative number, ask for a positive number (Use a while loop or a do while loop)
5. Write a C++ program to get an input of a positive or negative integer until zero is given. Terminate the program when the input is zero. Find the minimum, maximum, and average of all numbers fed as input (Use for loop and break statement).
6. Write a C++ program to calculate the factorial of a non-negative integer.
7. Write a C++ program to check whether the given input integer is one of the following. (Get input from the user which one does he/she like to check. Use if ... else)
   (a) Palindrome
   (b) Perfect
   (c) Armstrong
   (d) Prime
8. Write a C++ program to calculate the sum of the Taylor series of the following functions. Get x and n as input. (Get input from the user which one does he/she like to check. Use if ... else. Use math functions from math.h library such as $exp(x), sin(x)$ and $cos(x)$ to check the accuracy of your calculations.
   (a) e^x

(b) $\sin(x)$

(c) $\cos(x)$

9. Write a `C++` program to compute and print the sum of divisors of numbers from 1 to n, where n is an input given by the user.

   Definition: For a positive integer k, the sum of divisors is defined as

   $$\sigma(k) = \sum_{d \mid k} d.$$

   Examples: $n = 6 \implies \sigma(1) = 1, \sigma(2) = 3, \sigma(3) = 4, \cdots, \sigma(6) = 12$

10. Write a `C++` to implement the following Euclid's Algorithm using for or while loop

    Euclid's Algorithm:

    $$\gcd(a, b) = \begin{cases} b, & \text{if } a \bmod b = 0, \\ \gcd(b,\ a \bmod b), & \text{otherwise.} \end{cases}$$

11. Write a `C++` program to estimate the probability that two integers chosen uniformly at random from $\{1, 2, \ldots, n\}$ are coprime.

    Definition: Two integers a, b are said to be *coprime* if $\gcd(a, b) = 1$. If $n = 4$, the pairs and gcd values are:

    $$(1,1), (1,2), (1,3), (1,4)$$
    $$(2,1), (2,2), (2,3), (2,4)$$
    $$(3,1), (3,2), (3,3), (3,4)$$
    $$(4,1), (4,2), (4,3), (4,4)$$

    Among 16 pairs, 10 are coprime. So $P = \frac{10}{16} = 0.625$.

12. Write a C++ program to find the sum of all array of elements, the maximum and minimum element of an array.

13. Write a C++ program to find the frequency of each element in an array.

14. Write a C++ program to sort an array in ascending order and descending order.

15. Write a C++ program to get two arrays, merge them into a single array, and then sort them in ascending order.

16. Write a C++ program to get two matrices (A and B), add (A+B), subtract (A-B), and scalar multiply kA.

17. Write a C++ program to find the transpose of a matrix and trace of the matrix (if square).

18. Write a C++ program to multiply two rectangular matrices (Check whether the dimensions agree).

19. Write a C++ program to check whether the given square matrix is upper triangular, lower triangular or diagonal, or symmetric.