Introduction to Programming, Identifiers and Constants, Data Types

1. Write a C program to calculate the area of a rectangle. The program should take the width and height of the rectangle as input and output the area.

   Input: Width: 3, Height: 5

   Output: Area: 15

2. Write a C program to calculate the factorial of a given integer. The program should take an integer as input and output its factorial.

   Input: 7

   Output: Factorial of 7 is 5040

3. Write a C program to check whether a given integer is positive, negative, or zero. The program should take an integer as input and output the result.

   Input: -5

   Output: The number is negative

4. Write a C program to calculate the circumference of a circle. The program should take the radius of the circle as input and output the circumference. Use 3.14159 for π (Pi).

   Input: Radius: 10

   Output: Circumference: 62.8318

5. Write a C program to calculate the total number of days given a number of weeks. The program should take the number of weeks as input and output the total number of days.

   Input: 4

Output: Total days: 28

6. Write a C program to calculate the area of a triangle. The program should take the base and height of the triangle as input and output the area.

   Input: Base: 8, Height: 5

   Output: Area: 20

7. Write a C program to calculate the average of three floating-point numbers. The program should take three floating-point numbers as input and output their average.

   Input: 9.83, 12.4, 13.2

   Output: Average: 11.81

8. Write a C program to convert a given integer into its binary representation. The program should take an integer as input and output its binary representation.

   Input: 10

   Output: Binary representation: 1010

DECISION MAKING AND LOOPS

1. Prime Number Check

Problem:
Write a program to check whether a given number is prime or not using a for loop.

Example:
Input: 29
Output: 29 is a prime number

2. Factorial Calculation

Problem:
Write a program to calculate the factorial of a given number using a while loop.

Example:
Input: 5
Output: 120

3. Multiplication Table

Problem:
Write a program to print the multiplication table of a number provided by the user. Use a loop to generate the table up to 10.

Example:
Input: 7
Output:
7 x 1 = 7
7 x 2 = 14
...
7 x 10 = 70

4. Sum of Digits

Problem:
Write a program to calculate the sum of digits of a given integer using a while loop.

Example:
Input: 1234
Output: 10

5. Number Guessing Game

Problem:
Write a program that generates a random number between 1 and 100. The user has to guess the number. The program should provide feedback if the guess is too high or too low and keep asking until the correct number is guessed.

Example:
Input: 50
Output: Too high! Try again.

6. Palindrome Check

Problem:
Write a program that checks whether a given string or number is a palindrome using a loop.

Example:
Input: madam
Output: madam is a palindrome

7. Count Vowels and Consonants

Problem:
Write a program that counts the number of vowels and consonants in a given string using a for loop.

Example:
Input: Hello World
Output: Vowels: 3, Consonants: 7

8. Pattern Printing

Problem:
Write a program to print the following pattern using nested loops:

Example:
Input: 5
Output:
*
**
***
****
*****

Problem:
Write a program to print the following pattern using nested loops:

Example:
Input: 4
Output:

?*
**
***
****
****
***
**
*

Decision making & Branching

1. **Write a program that takes the ages of Ram, Shyam, and Ajay as input and determines the youngest among them.**

   Input:

   Enter age of Ram: 25

   Enter age of Shyam: 30

   Enter age of Ajay: 20

   Output:

   Ajay is the youngest.

2. **Given three points (x1, y1), (x2, y2), and (x3, y3), write a program to check if these points are collinear.**

   (HINT: if three points are collinear then, (y2-y1)(x3-x2)=(y3-y2)(x2-x1)

   Input 1:

   Enter x coordinates of point 1 (x1) 1

   Enter y coordinates of point 1 (y1): 2

   Enter x coordinates of point 2 (x2): 2

   Enter y coordinates of point2 (y2): 4

   Enter x coordinates of point 3 (x3): 3

   Enter y coordinates of point3 (y3): 6

   Output:

   The points are collinear

   Input 2:

Enter x coordinates of point 1 (x1): 1

Enter y coordinates of point 1 (y1): 2

Enter x coordinates of point 2 (x2): 2

Enter y coordinates of point2 (y2): 5

Enter x coordinates of point 3 (x3): 7

Enter y coordinates of point3 (y3): 3

Output:

The points are not collinear

3. **Write a program to compute the sum of integers divisible by 6 but not by 4, between 0 and n. Also, display how many such numbers exist.**

   Input: 30

   Output: sum= 54

   count=3

4. **Write a program that takes marks for five subjects, calculates the percentage, and assigns a letter grade based on the given ranges**.

   A: 90-100, B: 80-90 , C: 70-80, D: 50-70, E: 40-50: F: Below 40

   Input: Enter marks for 5 subjects: 85 90 78 88 92

   Output: percentage secured by the student is 86.6%

   Grade assigned to the student is B

5. **Write a program to check if a given year is a leap year.**

   Input: 2024

   Output: 2024 is a leap year

   Input: 1900

   Output: 1900 is not a leap year

6. **Write a program to determine whether a given character is uppercase, lowercase, digit or not an alphanumeric (Alphanumeric is a term that consists all of the letters and numbers)**

   Input: a

   Output: a is lowercase

   Input: 6

   Output: 6 is a digit

   Input: U

   Output: U is uppercase

   Input: *

   Output: * is not an alphanumeric

7. **Implement a basic calculator that performs addition, subtraction, multiplication, or division based on user input.**

   Input:

   Enter first number: 15

   Enter second number: 5

   Enter operation (+, -, *, /): /

   Output: 3

8. **Write a program to calculate the Body Mass Index (BMI) and categorize the result as underweight, normal, overweight, or obese.**

   Underweight : 0-18.4, Normal: 18.5 to 24.9 , Overweight: 24.9 - 29.9, Obese: more than 30

   Input:

   Enter weight in kg: 70

   Enter height in meters: 1.75

   Output:

BMI: 22.86

Category: Normal

9. **Write a program that checks whether a given point (x, y) lies inside, on, or outside a circle, based on the circle's center (0,0) and radius.**

   (HINT: Calculate the distance of point from center of the circle, if distance= radius= point lies on circle . If distance is less than radius, point lies inside circle. If distance is more than radius, point lies outside circle**)**

   Input 1:

   Enter the radius of the circle: 5

   Enter the x coordinate of the point: 3

   Enter the y coordinate of the point: 4

   Output: The point (3,4) lies on the circle.

   Input 2:

   Enter the radius of the circle: 5

   Enter the x coordinate of the point: 6

   Enter the y coordinate of the point: 7

   Output: The point (6,7) lies outside the circle.

   Input 3:

   Enter the radius of the circle: 5

   Enter the x coordinate of the point: 1

   Enter the y coordinate of the point: 1

   Output: The point (1,1) lies inside the circle.

10. **Write a program that reads a month (1-12) and a year from the user and determines the number of days in that month. The program should handle leap years for February.**

    Input:

Enter month (1-12): 2

Enter year: 2023

Output:

Month 2 of year 2023 has 28 days

Topic: Input, Output and Conditional statements

1. Odd or Even Number

- Problem: Write a program to take an integer as input and print whether the number is odd or even.
- Input:
  Enter a number: 5
- Output:
  5 is an odd number

---

2. Maximum of Two Numbers

- Problem: Write a program that takes two integers as input and prints the larger of the two numbers using an if-else statement.
- Input:
  Enter first number: 8
  Enter second number: 15
- Output:
  15 is the larger number

---

3. Vowel or Consonant

- Problem: Write a program that takes a character as input and checks whether it is a vowel or consonant.
- Input:
  Enter a character: e

- Output:
  e is a vowel

---

4. Positive, Negative, or Zero

- Problem: Write a program to take an integer as input and check whether the number is positive, negative, or zero.
- Input:
  Enter a number: -9
- Output:
  The number is negative

---

5. Check Leap Year

- Problem: Write a program to check if a given year is a leap year or not.
- Input:
  Enter a year: 2020
- Output:
  2020 is a leap year

---

6. Check Divisibility by 5 and 11

- Problem: Write a program that takes an integer as input and checks whether it is divisible by both 5 and 11.
- Input:
  Enter a number: 55
- Output:
  55 is divisible by both 5 and 11

---

7. Grading System

- Problem: Write a program that takes marks (0-100) as input and prints the grade.
- Input:
  Enter your marks: 82
- Output:
  Your grade is B

---

8. Character Case Checker

- Problem: Write a program to input a character and check whether it is an uppercase letter, lowercase letter, or a non-alphabetic character.
- Input:
  Enter a character: Z
- Output:
  Z is an uppercase letter

---

9. Find the Smallest of Three Numbers

- Problem: Write a program to take three integers as input and print the smallest of the three.
- Input:
  Enter first number: 12
  Enter second number: 5
  Enter third number: 9
- Output:
  The smallest number is 5

---

10. Even or Odd Using Ternary Operator

- Problem: Write a program to check whether a number is even or odd using the ternary operator.
- Input:
  Enter a number: 10
- Output:
  10 is an even number

---

11. Eligibility to Vote

- Problem: Write a program that takes age as input and prints whether the person is eligible to vote.
- Input:
  Enter your age: 17
- Output:
  You are not eligible to vote

---

12. Simple Calculator Using switch-case

- Problem: Write a simple calculator program that performs addition, subtraction, multiplication, or division.
- Input:
  Enter first number: 15
  Enter second number: 5
  Choose operation (+, -, *, /): /
- Output:
  The result is 3

---

13. Find Roots of a Quadratic Equation

- Problem: Write a program to input the coefficients of a quadratic equation ($ax^2 + bx + c$) and find its roots.
- Input:
  Enter coefficient a: 1
  Enter coefficient b: -3
  Enter coefficient c: 2
- Output:
  The roots are 2 and 1

---

14. Number is Multiple of 3 or 7

- Problem: Write a program to check whether an input number is a multiple of 3 or 7, or neither.
- Input:
  Enter a number: 21
- Output:
  21 is a multiple of both 3 and 7

---

15. Largest of Four Numbers

- Problem: Write a program that takes four numbers as input and prints the largest.
- Input:
  Enter four numbers: 23 12 45 10

- Output:
  The largest number is 45

---

16. Sum of Positive and Negative Numbers

- Problem: Write a program that takes five integers as input and calculates the sum of positive and negative numbers separately.
- Input:
  Enter five numbers: 4 -3 7 -8 2
- Output:
  Sum of positive numbers: 13
  Sum of negative numbers: -11

---

17. Check Alphabet, Digit, or Special Character

- Problem: Write a program to input a character and check whether it is an alphabet, digit, or a special character.
- Input:
  Enter a character: @
- Output:
  @ is a special character

---

18. Number in Word Format

- Problem: Write a program that takes an integer between 1 and 5 as input and prints the corresponding word.
- Input:
  Enter a number: 3
- Output:
  Three

---

19. Simple Interest Calculator

- Problem: Write a program to input the principal amount, rate of interest, and time, and calculate the simple interest.

- Input:
  Enter principal amount: 1000
  Enter rate of interest: 5
  Enter time (in years): 3
- Output:
  The simple interest is 150

---

20. Triangle Type Checker

- Problem: Write a program that takes three angles of a triangle as input and checks whether the triangle is equilateral, isosceles, or scalene.
- Input:
  Enter three angles: 60 60 60
- Output:
  The triangle is equilateral

---

21. Sum of Digits

- Problem: Write a program to input a number and find the sum of its digits.
- Input:
  Enter a number: 123
- Output:
  Sum of digits: 6

---

22. Reverse a Number

- Problem: Write a program to input an integer and print its reverse.
- Input:
  Enter a number: 456
- Output:
  Reverse: 654

---

23. Armstrong Number

- Problem: Write a program to check whether a number is an Armstrong number.

- Input:
  Enter a number: 153
- Output:
  153 is an Armstrong number

---

24. Palindrome Number

- Problem: Write a program to check if a number is a palindrome.
- Input:
  Enter a number: 121
- Output:
  121 is a palindrome number

---

25. Check if a Number is Prime

- Problem: Write a program that takes an integer as input and checks whether it is a prime number.
- Input:
  Enter a number: 29
- Output:
  29 is a prime number

---

26. Find Factorial

- Problem: Write a program to find the factorial of a number.
- Input:
  Enter a number: 5
- Output:
  Factorial of 5 is 120

---

27. Find Greatest Common Divisor (GCD)

- Problem: Write a program to input two integers and find their greatest common divisor (GCD).
- Input:
  Enter two numbers: 12 15

- Output:
  GCD of 12 and 15 is 3

---

28. Find LCM of Two Numbers

- Problem: Write a program to input two integers and calculate their least common multiple (LCM).
- Input:
  Enter two numbers: 4 6
- Output:
  LCM of 4 and 6 is 12

---

29. Sum of N Natural Numbers

- Problem: Write a program to input a positive integer n and calculate the sum of the first n natural numbers.
- Input:
  Enter a number: 5
- Output:
  Sum of first 5 natural numbers is 15

---

30. Check Perfect Number

- Problem: Write a program to check whether a given number is a perfect number.
- Input:
  Enter a number: 28
- Output:
  28 is a perfect number

---

31. Count the Number of Digits

- Problem: Write a program to input a number and count the total number of digits.
- Input:
  Enter a number: 12345
- Output:
  The number has 5 digits

---

32. Fibonacci Sequence Up to N Terms

- Problem: Write a program to input a number n and print the first n terms of the Fibonacci sequence.
- Input:
  Enter the number of terms: 6
- Output:
  Fibonacci sequence: 0 1 1 2 3 5

---

33. Check Pythagorean Triplet

- Problem: Write a program to input three numbers and check if they form a Pythagorean triplet.
- Input:
  Enter three numbers: 3 4 5
- Output:
  The numbers form a Pythagorean triplet

---

34. Check if a Number is a Palindrome Using Conditional Operator

- Problem: Write a program to check if a number is a palindrome using the ternary operator.
- Input:
  Enter a number: 121
- Output:
  121 is a palindrome number

---

35. Check if Two Numbers Are Co-prime

- Problem: Write a program to input two numbers and check whether they are co-prime.
- Input:
  Enter two numbers: 5 9
- Output:
  5 and 9 are co-prime numbers

---

36. Count Vowels and Consonants in a String

- Problem: Write a program to input a string and count the number of vowels and consonants.
- Input:
  Enter a string: Hello
- Output:
  Vowels: 2
  Consonants: 3

---

37. Check Whether a Triangle is Valid

- Problem: Write a program to input the three sides of a triangle and check if the triangle is valid.
- Input:
  Enter the sides of the triangle: 7 10 5
- Output:
  The triangle is valid

---

38. Sum of Prime Numbers Between Two Numbers

- Problem: Write a program to input two integers and find the sum of all prime numbers between them.
- Input:
  Enter two numbers: 10 20
- Output:
  Sum of prime numbers between 10 and 20 is 60

---

39. Check if a Year is a Century Year

- Problem: Write a program to input a year and check if it is a century year.
- Input:
  Enter a year: 1900
- Output:
  1900 is a century year but not a leap year

---

40. Sum of Even and Odd Digits of a Number

- Problem: Write a program to input a number and calculate the sum of its even and odd digits separately.
- Input:
  Enter a number: 4567
- Output:
  Sum of even digits: 10
  Sum of odd digits: 12

I/O and Conditional Statements

1. **Write a program that compares 2 numbers**

   Input:
   Enter a: 15
   Enter b: 10

   Output:
   a is greater than b

   Input:
   Enter a: 5
   Enter b: 10

   Output:
   a is less than b

   Input:
   Enter a: 10
   Enter b: 10

   Output:
   a is equal to b

2. **Take a date as input and find out what day it is. (Assume the first day of the year was a Monday, and that it's not a leap year)**

   Input:
   Enter Day: 17
   Enter Month: 6

Output:
17/6 is a Sunday

3. **Given the coordinates (x, y) of a center of a circle and its radius, write a program which will determine whether a point lies inside the circle, on the circle or outside the circle**

   Input:
   Circle:
   x: 5
   y: 5
   Radius: 2
   Point:
   x: 6
   y: 6

   Output:
   Inside the circle

4. **If the three angles (in degrees) of a triangle are entered through the keyboard, write a program to check whether the triangle is valid or not. The triangle is valid if the sum of three angles is 180**

   Input:
   a: 60
   b: 110
   c: 10

   Output:
   Valid Triangle

   Input:
   a: 60
   b: 120
   c: 60

   Output:
   Invalid Triangle

5. **Write a program using switch statements to check whether the entered character is a letter, number or special character.**

Input:
Enter character: $
Output:
Special character

Input:
Enter character: Z
Output:
Letter

Input:
Enter character: 6
Output:
Digit

6. **Write a program that takes multiple words as input and prints it back out**
   Input:
   I love Computer Science

   Output:
   Your input: I love Computer Science

7. **Write a program to take 2 numbers as input and print their quotient up to 1 decimal point.**
   Input:
   a: 10
   b: 3

   Output:
   3.3

8. **Write a program that takes a number as console input and outputs whether is odd or even**
   Input:
   ./myprogram 5

   Output:
   Odd

9. **Write a program that takes a number as input and then takes input for an array of that size and prints it out**
   Input:

5
1
2
3
4
5

Output:
1 2 3 4 5

10. **Write a program that takes prints the contents of a file**
test.txt
Hello from a text file!

Input:
-

Output:
Hello from a text file!

Operators and Logical Expressions

1.) **Write a program that takes a number as input and checks if it is even or odd using the modulus operator (%) and the conditional operator.**

Input:
Enter a number: 15

Output:
The number 15 is odd.

2.) **Write a program that takes three integers and uses the logical AND (&&) operator to check if all the numbers are positive.**

Input:
Enter first number: 5
Enter second number: -3
Enter third number: 8

Output:
Not all numbers are positive.

3.) **Write a program that checks whether a given temperature lies within a safe temperature range. The safe range is between two limits provided by the user (inclusive).**

(HINT: Use relational operators to check if the temperature is within the range.)

Input 1:

Enter the lower limit of the safe range: 15

Enter the upper limit of the safe range: 25

Enter the current temperature: 20

Output 1:

The temperature 20°C is within the safe range.

Input 2:

Enter the lower limit of the safe range: 15

Enter the upper limit of the safe range: 25

Enter the current temperature: 30

Output 2:

The temperature 30°C is outside the safe range.

4.) **Write a program that checks if a person is eligible for a senior citizen discount based on their age. The user inputs their age, and if the age is 60 or above, they are eligible for the discount.**

Input 1:

Enter your age: 65

Output 1:
You are eligible for the senior citizen discount.

5.) **Write a program that checks whether a given password meets the following requirements:**

It should have at least 8 characters.

It should contain both uppercase and lowercase letters.

It should contain at least one number.

Input 1:
Enter the password: Pass1234

Output 1:
The password is valid.

Input 2:
Enter the password: abc123

Output 2:
The password is invalid (must have at least 8 characters and contain both uppercase and lowercase letters).

6.) **Write a program that calculates and checks whether a given coordinate (x, y) lies inside a rectangular region defined by four vertices. The user enters the coordinates of the rectangle's vertices in any order, and the program checks if the point lies inside the rectangle.**

(HINT: You may need to check the position of the point relative to the boundaries formed by the vertices.)

Input:

Enter the coordinates of vertex 1 (x1, y1): 0, 0
Enter the coordinates of vertex 2 (x2, y2): 4, 0
Enter the coordinates of vertex 3 (x3, y3): 4, 3
Enter the coordinates of vertex 4 (x4, y4): 0, 3
Enter the coordinates of the point (x, y): 2, 2

Output:
The point (2, 2) lies inside the rectangle.

7.) **Write a program that simulates a banking system where a user can deposit or withdraw money. The program should check for sufficient balance before allowing a**

withdrawal. It should also keep a log of transactions and display the final balance along with the transaction history.

Input:
Enter the initial balance: 1000
Choose an operation (1- Deposit, 2- Withdraw, 3- Check Balance, 4- Exit): 1
Enter the amount to deposit: 500
Choose an operation (1- Deposit, 2- Withdraw, 3- Check Balance, 4- Exit): 2
Enter the amount to withdraw: 200
Choose an operation (1- Deposit, 2- Withdraw, 3- Check Balance, 4- Exit): 3

Output:
Your current balance is: 1300.
Transaction History:

Deposited: 500
Withdrawn: 200

8.) **Write a program that calculates whether a loan application should be approved or not based on the following conditions:**

1. **The applicant's age must be between 21 and 60 (inclusive).**
2. **The applicant's credit score must be 700 or above.**
3. **The applicant's annual income must be above a certain threshold (which varies based on the credit score):**
    - **If the credit score is between 700 and 750, the income must be at least $50,000.**
    - **If the credit score is between 751 and 800, the income must be at least $40,000.**
    - **If the credit score is above 800, the income must be at least $30,000.**

Use logical operators to evaluate all the conditions. Output whether the loan application is approved or rejected.

Input 1:
Enter applicant's age: 35
Enter credit score: 720
Enter annual income: 55,000

Output 1:
Loan application is approved.

Input 2:
Enter applicant's age: 45
Enter credit score: 810
Enter annual income: 25,000

Output 2:
Loan application is rejected (income too low for the given credit score).

Operators

1. **Write a C program that takes two integers as input and uses the ternary operator to find and print the larger of the two integers.**

Sample Input:

7

12

Sample Output:

Larger number: 12

2. **Write a C program that takes two integers as input and demonstrates the use of bitwise AND (&), OR (|), and XOR (^) operators.**

Sample Input:

6

3

Sample Output:

Bitwise AND: 2

Bitwise OR: 7

Bitwise XOR: 5

3. **Write a C program that uses relational and logical operators to determine if a given integer n is within the range 10 to 50 (both inclusive), and if it is an even number.**

Sample Input:

24

Sample Output:

Number is within range and even.

4. **Write a C program that takes an integer input and demonstrates the use of left shift and right shift operators. Show the results of shifting the integer by 2 bits to the left and right.**

Sample Input:

8

Sample Output:

Original value: 8

Left shift by 2: 32

Right shift by 2: 2

5. **Write a C program that takes two floating-point numbers and compares them using relational operators to determine:**

- If the first number is greater than the second.
- If they are equal.
- If the first number is less than or equal to the second.

Sample Input:

3.5

4.2

Sample Output:

First number is less than second number.

Numbers are not equal.

First number is less than or equal to second number.