C PROGRAMMING
ASSIGNMENT 03.01

Problem 1: Write a C program that determines whether a given year is a leap year. A year is a leap year if:

- It is divisible by 4, and
- If it is a century year (ending in 00), it must also be divisible by 400.

Solution Approach:

1. Prompt the user to input a year.
2. Check if the year is divisible by 4.
3. If the year is divisible by 100, check if it is also divisible by 400.
4. Print a message indicating whether the year is a leap year or not.

Test Cases:

- **Test Case 1:**
  Input: `2000`
  Expected Output:
  `2000 is a leap year.`
- **Test Case 2:**
  Input: `1900`
  Expected Output:
  `1900 is not a leap year.`
- **Test Case 3:**
  Input: `2024`
  Expected Output:
  `2024 is a leap year.`
- **Test Case 4:**
  Input: `2023`
  Expected Output:
  `2023 is not a leap year.`

Problem 2: Write a C program that reads the value of an integer `m` and displays the value of `n` based on the following conditions:

- `n` is 1 if `m` is greater than 0.
- `n` is 0 if `m` is equal to 0.
- `n` is -1 if `m` is less than 0.

Solution Approach:

1. Prompt the user to input an integer `m`.
2. Use `if-else` statements to determine the value of `n` based on the value of `m`.
3. Print the value of `n`.

Test Cases:

- **Test Case 1:**
  Input: `10`
  Expected Output:
  `n is 1`
- **Test Case 2:**
  Input: `0`
  Expected Output:
  `n is 0`
- **Test Case 3:**
  Input: `-5`
  Expected Output:
  `n is -1`

Problem 3: Write a C program that accepts a coordinate point (x, y) in an XY coordinate system and determines in which quadrant the coordinate point lies. The quadrants are as follows:

- Quadrant I: $x > 0, y > 0$
- Quadrant II: $x < 0, y > 0$
- Quadrant III: $x < 0, y < 0$
- Quadrant IV: $x > 0, y < 0$
- Origin: $x = 0, y = 0$

Solution Approach:

1. Prompt the user to input the coordinates `x` and `y`.
2. Use `if-else` statements to determine the quadrant based on the values of `x` and `y`.
3. Print the quadrant in which the point lies.

Test Cases:

- **Test Case 1:**
  Input: `x = 3, y = 4`
  Expected Output:
  `The point (3, 4) lies in Quadrant I.`
- **Test Case 2:**
  Input: `x = -5, y = 7`
  Expected Output:
  `The point (-5, 7) lies in Quadrant II.`
- **Test Case 3:**
  Input: `x = -2, y = -3`
  Expected Output:
  `The point (-2, -3) lies in Quadrant III.`
- **Test Case 4:**
  Input: `x = 4, y = -6`
  Expected Output:

```
The point (4, -6) lies in Quadrant IV.
```

- **Test Case 5:**
  Input: `x = 0, y = 0`
  Expected Output:
  ```
  The point (0, 0) lies at the Origin.
  ```

Problem 4: Write a C program that finds the largest of three numbers. The program should prompt the user to input three numbers and then determine which one is the largest.

Solution Approach:

1. Prompt the user to input three numbers.
2. Use nested `if-else` statements to compare the three numbers and determine the largest.
3. Print the largest number.

Test Cases:

- **Test Case 1:**
  Input: `a = 10, b = 20, c = 15`
  Expected Output:
  ```
  The largest number is 20
  ```
- **Test Case 2:**
  Input: `a = 5, b = 5, c = 5`
  Expected Output:
  ```
  All numbers are equal
  ```
- **Test Case 3:**
  Input: `a = 30, b = 10, c = 25`
  Expected Output:
  ```
  The largest number is 30
  ```

Problem 5: Write a C program that determines eligibility for admission to a professional course based on the following criteria:

- Marks in Mathematics >= 65
- Marks in Physics >= 55
- Marks in Chemistry >= 50
- Total marks in all three subjects >= 190, or total marks in Mathematics and Physics >= 140

Solution Approach:

1. Prompt the user to input the marks obtained in Mathematics, Physics, and Chemistry.
2. Calculate the total marks in all three subjects.
3. Calculate the total marks in Mathematics and Physics.
4. Use `if-else` statements to check the eligibility criteria.
5. Print whether the candidate is eligible or not.

Test Cases:

- **Test Case 1:**
  Input: `Maths = 72, Physics = 65, Chemistry = 51`
  Total Marks: `188`
  Total Marks (Maths + Physics): `137`
  Expected Output:
  ```
  The candidate is not eligible.
  ```
- **Test Case 2:**
  Input: `Maths = 75, Physics = 60, Chemistry = 55`
  Total Marks: `190`
  Total Marks (Maths + Physics): `135`
  Expected Output:
  ```
  The candidate is eligible.
  ```
- **Test Case 3:**
  Input: `Maths = 65, Physics = 70, Chemistry = 50`
  Total Marks: `185`
  Total Marks (Maths + Physics): `135`
  Expected Output:
  ```
  The candidate is not eligible.
  ```
- **Test Case 4:**
  Input: `Maths = 66, Physics = 56, Chemistry = 70`
  Total Marks: `192`
  Total Marks (Maths + Physics): `122`
  Expected Output:
  ```
  The candidate is eligible.
  ```