

Task 5

(a) Java Program to Convert Temperature from Fahrenheit to Celsius

Code:

```
import java.util.Scanner;

public class FahrenheitToCelsius {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Input a degree in Fahrenheit: ");
        double fahrenheit = scanner.nextDouble();

        double celsius = (fahrenheit - 32) * 5 / 9;

        System.out.println(fahrenheit + " degree Fahrenheit is equal to " + celsius + " in Celsius");

        scanner.close();
    }
}
```

Explanation: This program converts a temperature from Fahrenheit to Celsius. It first takes the temperature in Fahrenheit as input from the user. The conversion formula used is:

Celsius = (Fahrenheit - 32) * 5 / 9.

The program then calculates the Celsius value and prints the result. For example, if the input is 212, the output will be 100.0 degrees Celsius.

(b) Java Programs for the Given Problems

1. Program to Test if a Year is a Leap Year

Code: import java.util.Scanner;

```
public class LeapYear {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter a year: ");
        int year = scanner.nextInt();

        boolean isLeap = (year % 4 == 0 && year % 100 != 0) || (year % 400 == 0);
```

```

        if (isLeap) {
            System.out.println(year + " is a leap year.");
        } else {
            System.out.println(year + " is not a leap year.");
        }

        scanner.close();
    }
}

```

Explanation: This program checks whether a given year is a leap year or not. A leap year is determined by the following rules:

- If the year is divisible by 4 but not by 100, it is a leap year.
- If the year is divisible by 400, it is also a leap year.

The program takes a year as input, applies these conditions, and prints whether the year is a leap year or not. For example, the year 2024 is a leap year.

2. Program to Evaluate the Series: $2 + 32 + 52 + \dots$ Up to n Terms

Code:

```

import java.util.Scanner;

public class Series1 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the number of terms (n): ");
        int n = scanner.nextInt();

        int sum = 0;
        int term = 2;

        for (int i = 1; i <= n; i++) {
            sum += term;
            term += 30;
        }

        System.out.println("The sum of the series is: " + sum);
    }
}

```

```

        scanner.close();
    }
}

```

Explanation: This program calculates the sum of a specific series: $2 + 32 + 52 + \dots$ up to n terms. Each term in the series increases by 30 (e.g., 2, 32, 52, 82, etc.). The program initializes the first term as 2 and adds 30 to it in each iteration. The sum of the series is computed and printed. For example, if $n = 3$, the sum will be $2 + 32 + 52 = 86$.

3. Program to Evaluate the Series: $1 - 2 + 3 - 4 + \dots$ Up to n Terms

Code:

```

import java.util.Scanner;

public class Series2 {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the number of terms (n): ");
        int n = scanner.nextInt();

        int sum = 0;

        for (int i = 1; i <= n; i++) {
            if (i % 2 == 0) {
                sum -= i;
            } else {
                sum += i;
            }
        }

        System.out.println("The sum of the series is: " + sum);

        scanner.close();
    }
}

```

Explanation: This program evaluates the sum of an alternating series: $1 - 2 + 3 - 4 + \dots$ up to n terms. The program alternates between adding and subtracting terms based on their position in the series. If the term is odd, it is added; if even, it is subtracted. For example, if $n = 4$, the sum will be $1 - 2 + 3 - 4 = -2$.

4. Program to Find the Factorial of a Number

Code:

```
import java.util.Scanner;

public class Factorial {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter a number: ");
        int num = scanner.nextInt();

        long factorial = 1;

        for (int i = 1; i <= num; i++) {
            factorial *= i;
        }

        System.out.println("Factorial of " + num + " is: " + factorial);

        scanner.close();
    }
}
```

Explanation: This program calculates the factorial of a given number. The factorial of a number n is the product of all positive integers from 1 to n . For example, the factorial of 5 is $1 * 2 * 3 * 4 * 5 = 120$. The program uses a loop to multiply the numbers iteratively and prints the result.

5. Program to Find the Power for a Given Base and Exponent**Code:**

```
import java.util.Scanner;

public class Power {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the base: ");
        int base = scanner.nextInt();

        System.out.print("Enter the exponent: ");
        int exponent = scanner.nextInt();

        long result = 1;

        for (int i = 1; i <= exponent; i++) {
```

```

        result *= base;
    }

    System.out.println(base + " raised to the power of " + exponent + " is: " + result);

    scanner.close();
}
}

```

Explanation: This program calculates the power of a given base and exponent. For example, if the base is 2 and the exponent is 3, the result is $2^3 = 8$. The program uses a loop to multiply the base by itself `exponent` times and prints the result.

6. Program to Find the Bangla Season from a Given Month Using if/switch

Code:

```

import java.util.Scanner;

public class BanglaSeason {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter a month (1-12): ");
        int month = scanner.nextInt();

        String season;

        switch (month) {
            case 1:
            case 2:
                season = "Winter";
                break;
            case 3:
            case 4:
            case 5:
                season = "Spring";
                break;
            case 6:
            case 7:
            case 8:
                season = "Summer";
                break;
            case 9:
            case 10:
            case 11:

```

```

        season = "Autumn";
        break;
    case 12:
        season = "Late Autumn";
        break;
    default:
        season = "Invalid month";
        break;
}

System.out.println("The season is: " + season);

scanner.close();
}
}

```

Explanation: This program determines the Bangla season based on a given month (1-12). It uses a switch statement to map months to seasons:

- **Winter:** January (1), February (2)
- **Spring:** March (3), April (4), May (5)
- **Summer:** June (6), July (7), August (8)
- **Autumn:** September (9), October (10), November (11)
- **Late Autumn:** December (12)

For example, if the input is 4, the output will be Spring.

7. Program to Find the Largest Number in a List of Array

Code:

```

import java.util.Scanner;

public class LargestNumber {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the number of elements: ");
        int n = scanner.nextInt();

        int[] array = new int[n];

        System.out.println("Enter the elements:");
        for (int i = 0; i < n; i++) {
            array[i] = scanner.nextInt();
        }
    }
}

```

```

int largest = array[0];

for (int i = 1; i < n; i++) {
    if (array[i] > largest) {
        largest = array[i];
    }
}

System.out.println("The largest number is: " + largest);

scanner.close();
}
}

```

Explanation: This program finds the largest number in a list of numbers stored in an array. It initializes the first element as the largest and then iterates through the array to compare each element. If a larger number is found, it updates the largest number. Finally, the program prints the largest number. For example, if the array is [5, 10, 3, 8], the output will be 10.

8. Program to Sort Numbers in Ascending Order

Code:

```

import java.util.Scanner;
import java.util.Arrays;

public class SortNumbers {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);

        System.out.print("Enter the number of elements: ");
        int n = scanner.nextInt();

        int[] array = new int[n];

        System.out.println("Enter the elements:");
        for (int i = 0; i < n; i++) {
            array[i] = scanner.nextInt();
        }

        Arrays.sort(array);

        System.out.println("Sorted numbers in ascending order:");
        for (int num : array) {

```

```
        System.out.print(num + " ");  
    }  
  
    scanner.close();  
}  
}
```

Explanation: This program sorts a list of numbers in ascending order. It uses the `Arrays.sort()` method, which sorts the array in place. After sorting, the program prints the numbers in ascending order. For example, if the input array is [5, 2, 9, 1], the output will be [1, 2, 5, 9].