CHAPTER 1: FLOWCHART CONSTRUCTION

1.1   INTRODUCTION

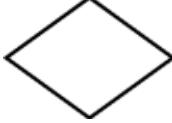**What is a flowchart?**

A flowchart is a pictorial way of visualizing each step of a program/code using distinct shapes to represent different functionalities of the code.

Why do we use it?

Flowcharts help us to understand the chronological order of a program, that is, which line of code will be executed after which line.

1.2   SIGNIFICANCE OF THE SHAPES

A flowchart uses different shapes to exhibit different operations of a code. A flowchart contains the following shapes:

Shape	Functionality	Visual Representation
Ellipse	Used to illustrate the "start" and "end" of a program	
Parallelogram	Used for inputs (prompt messages and user inputs) and outputs (print statements)	
Rectangle	Used for calculations and initializing variables	
Diamond	Used as conditional statements (if/else, loops)	
Circle	Used as connectors where multiple blocks of code either converge or diverge	
Arrow	Used to illustrate the sequence of the program by pointing from one shape to another	

## 1.3   CONVERTING SCENARIOS INTO FLOWCHARTS

Till now, you have the basic introduction to flowcharts and you are familiar with the shapes of a flowchart. Now let's apply our knowledge in some scenarios.

✔ **Scenario 1:** Let's design a flowchart of a program that will display the message "Hello There." and observe the steps carefully below.
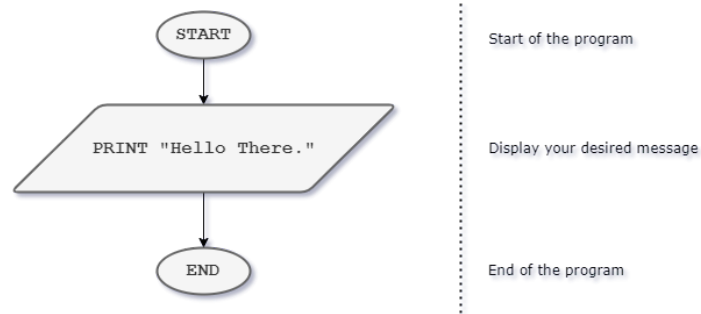
For displaying anything, we use the PRINT statement. Simple, isn't it? Now can you design a flowchart of a program that displays your name? Try it by yourself.

✔ **Scenario 2:** Now, let's talk about some numbers. Suppose, we want to display the summation of two numbers. You need to take these two numbers as user input and store them somewhere. Let's see the flowchart below:
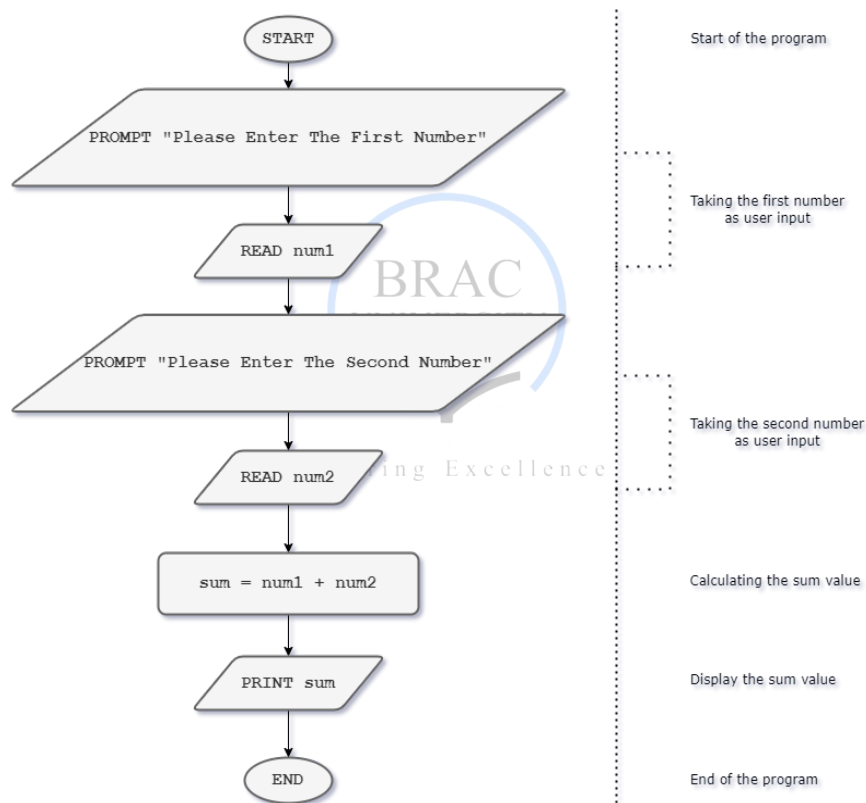
To take user inputs, we need PROMPT and READ. PROMPT is used for displaying a prompt message to the user and READ is used for storing the value from a variable (we will learn all the details about variables in Chapter 2). In this scenario, after taking two number inputs, we can access those values from variables num1 and num2 respectively. We can then store the summation of these two numbers in another variable called sum and display it.

Now, hopefully you can design flowcharts of adding, subtracting, multiplying two or more numbers and many more.

✔ **Scenario 3:** Let's calculate the area of a circle now. You know the formula of calculating its area. Your task is to take the value of the circle radius from the user and then calculate the

area. For simplicity, assume the value of pi will be 3.1416 for this problem. Let's design the flowchart:

```
        START                                    Start of the program

PROMPT "Please Enter The Radius Value"

                                                 Taking the radius
                                                 as user input
        READ rad

    area = 3.1416 * rad * rad                    Calculating the area

        PRINT area                               Display the area value

         END                                     End of the program
```
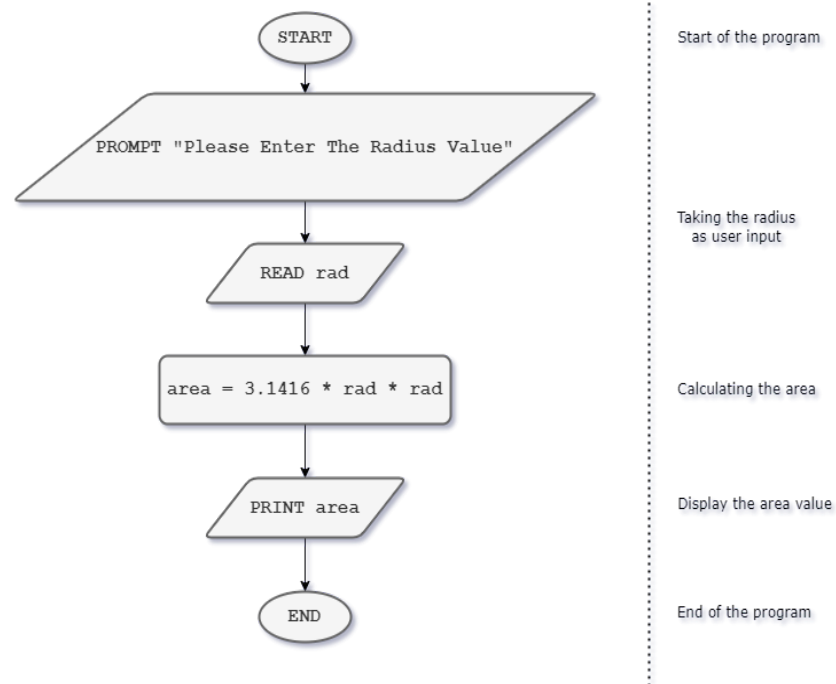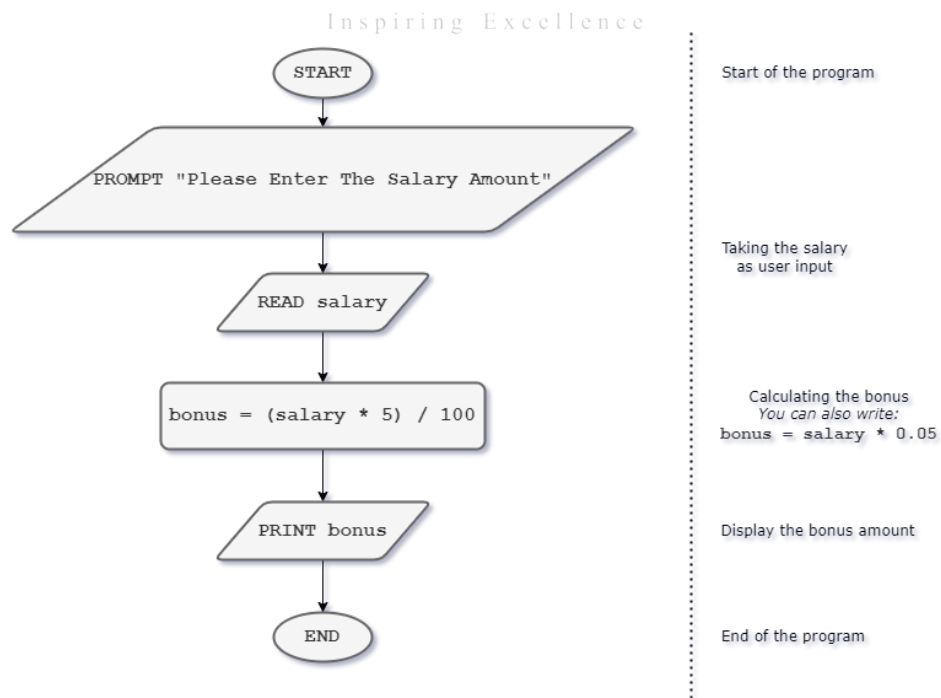
Similarly, you will be able to calculate the circumference of the circle. Additionally, you can design flowcharts by calculating the area of squares, triangles, rectangles and so on.

✔ **Scenario 4:** Suppose, you are a loyal employee of a renowned company. You need to calculate the bonus you will receive during the upcoming festive season. The bonus will be 5% of your monthly salary. Let's design a simple flowchart for that.

```
        START                                    Start of the program

PROMPT "Please Enter The Salary Amount"

                                                 Taking the salary
                                                 as user input
        READ salary

                                                 Calculating the bonus
    bonus = (salary * 5) / 100                   You can also write:
                                                 bonus = salary * 0.05

        PRINT bonus                              Display the bonus amount

         END                                     End of the program
```

Now, let's assume, at the end of each month, you have to pay 2.5% of your monthly salary as income tax. So, your festival bonus is now calculated using 5% of your monthly salary after deducting the income tax. Think what steps need to be modified and re-design the above flowchart.

1.4   WORKSHEET

A. Write a short description and draw a flowchart to make a cup of tea or coffee. The steps could vary person to person.

B. Draw a flowchart to find the result of addition of two numbers given by a user. Also, find their average.

C. Draw a flowchart to take temperature in Fahrenheit and convert it to Celsius and print it.

D. Draw a flowchart which takes a number from the user and then multiply it with 10, then add 2050 to the result and divide the number by 5 and show the final result as output.

E. Write a flowchart that finds the number of hours, minutes, and seconds in a given number of seconds. For example, how many hours, minutes, and seconds are there in 10,000 seconds?

F. Write a flowchart to print the area of a triangle taking base and height input from the user.

G. Write a flowchart that reads the values for the three sides x, y, and z of a triangle, and then calculates its area. The area is calculated as follows:
   Area = s (s - x) (s - y) (s - z), where s is (x + y + z)/2

H. Assume there are two variables x and y. Take Values of these variables from the user. For example, the user gave the following two values.
   x = 46;
   y = 27;
   Now exchange / swap values in such a way so that printing the variable x gives 27 and y gives 46.

I. Take the value of a, b, c from the user. Then swap the values and print in such a way that:
   Value of a goes to b
   Value of b goes to c
   Value of c goes to a

J. Suppose a government employee has to pay 3000 taka plus 2.5% tax of his yearly salary. Now take the salary input from a user and print his tax.