**Programming and Problem Solving through C Language**

**O Level / A Level**

**Chapter -2 : Algorithms for Problem Solving**

**Algorithm** can be defined as: “A sequence of activities to be processed for getting desired output from a given input.”

Before writing an algorithm for a problem, one should find out what is / are the inputs to the algorithm and what is / are expected output after running the algorithm.

While writing algorithms we will use following symbol for different operations:
- ‘+’ for Addition
- ‘-‘ for Subtraction
- ‘*’ for Multiplication
- ‘/’ for Division and
- ‘=’ for assignment. For example A = X*3 means A will have a value of X*3.

**Example of Algorithm**

**Problem 1:** Find the area of a Circle of radius r.

Inputs to the algorithm:
Radius r of the Circle.
Expected output:
Area of the Circle

Algorithm:
Step1: Read\input the Radius r of the Circle
Step2: Area= PI*r*r // calculation of area
Step3: Print Area

**Problem 2:** Write an algorithm to read two numbers and find their sum.

Inputs to the algorithm: First num1. Second num2.
Expected output: Sum of the two numbers.
**Algorithm:**

Step1: Start

Step2: Read\input the first num1.

Step3: Read\input the second num2.

Step4: Sum = num1+num2 // calculation of sum

Step5: Print Sum

Step6: End

**Problem 3:** Convert temperature Fahrenheit to Celsius

**Inputs to the algorithm:**

Temperature in Fahrenheit

**Expected output:**

Temperature in Celsius

**Algorithm:**

Step1: Start

Step 2: Read Temperature in Fahrenheit F

Step 3: C = \( \frac{5}{9} \times (F - 32) \)

Step 4: Print Temperature in Celsius: C

Step5: End
Problem 3: Exchanging Values of Two Variables

- Problem definition: Exchanging values of two variables.
- Analysis: Two variables x and y contains two different values.
- Swap the values of x and y such that x has y’s value and y has x’s value.
- Solving by example: Let us consider two variables x and y containing values 8 and 20 respectively.
- The original values of x and y are:

```
   x   y
  ——  ——
  8   20
```

- The requirement is once the algorithm is performed, the results should be

```
   x   y
  ——  ——
  20   8
```

- If you think by just saying,
  
  ```
  x=y;  y=x;
  ```

  The value gets swapped, then you are mistaken.

- These instruction are atomic in nature and hence x = y means that the value of x is lost.

- So, we have to use a temporary variable temp to store the value of x.

```
   temp  x  y
                ——  ——  ——
              8     8   20
   temp = x;

   x = y;
  ——  ——  ——
  8   20   20

   y = temp;
  ——  ——  ——
  8   20   8
```
The value of 'x' and 'y' is swapped.

**Algorithm Definition**

Step 1: Start.

Step 2: Get the values of x and y.

Step 3: Store x's value to temp. (temp: = x)

Step 4: Store y's value to x. So, x has y's value now (x: = y)

Step 5: Store temp's value (the value of the old 'x') in y.

Step 6: Stop.