

Lecture 2

1. Algorithm:

As stated earlier an algorithm can be defined as a finite sequence of effect statements to solve a problem. An effective statement is a clear, unambiguous instruction that can be carried out. Thus an algorithm should specify the action to be executed and the order in which these actions are to be executed.

Studying algorithms helps you develop widely applicable analytical skills—you learn not just how to solve individual problems but to develop recipes for getting answers to many problems.

Algorithm properties:

- Finiteness: the algorithm must terminate a finite number of steps.
- Non-ambiguity: each step must be precisely defined. At the completion of each step, the next step should be uniquely determined.
- Effectiveness: the algorithm should solve the problem in a reasonable amount of time.

Write an algorithm to add two numbers entered by user.

Step 1: Start

Step 2: Declare variables num1, num2 and sum.

Step 3: Read values num1 and num2.

Step 4: Add num1 and num2 and assign the result to sum.

sum ← num1 + num2

Step 5: Display sum

Step 6: Stop

Write an algorithm to find the largest among three different numbers entered by user.

Step 1: Start

Step 2: Declare variables a,b and c.

Step 3: Read variables a,b and c.

Step 4: If $a > b$

 If $a > c$

 Display a is the largest number.

 Else

 Display c is the largest number.

Else

 If $b > c$

 Display b is the largest number.

 Else

 Display c is the greatest number.

Step 5: Stop

Write an algorithm to find all roots of a quadratic equation $ax^2+bx+c=0$.

Step 1: Start

Step 2: Declare variables a, b, c, D, x1, x2, rp and ip;

Step 3: Calculate discriminant

$$D \leftarrow b^2 - 4ac$$

Step 4: If $D \geq 0$

$$r1 \leftarrow (-b + \sqrt{D}) / 2a$$

$$r2 \leftarrow (-b - \sqrt{D}) / 2a$$

Display r1 and r2 as roots.

Else

Calculate real part and imaginary part

$$rp \leftarrow -b / 2a$$

$$ip \leftarrow \sqrt{(-D)} / 2a$$

Display $rp + j(ip)$ and $rp - j(ip)$ as roots

Step 5: Stop

Write an algorithm to find the factorial of a number entered by user.

Step 1: Start

Step 2: Declare variables n, factorial and i.

Step 3: Initialize variables

factorial \leftarrow 1

i \leftarrow 1

Step 4: Read value of n

Step 5: Repeat the steps until i=n

5.1: factorial \leftarrow factorial*i

5.2: i \leftarrow i+1

Step 6: Display factorial

Step 7: Stop