Algorithm and Building blocks

Program

- Program is a collection of instructions that will perform some task.

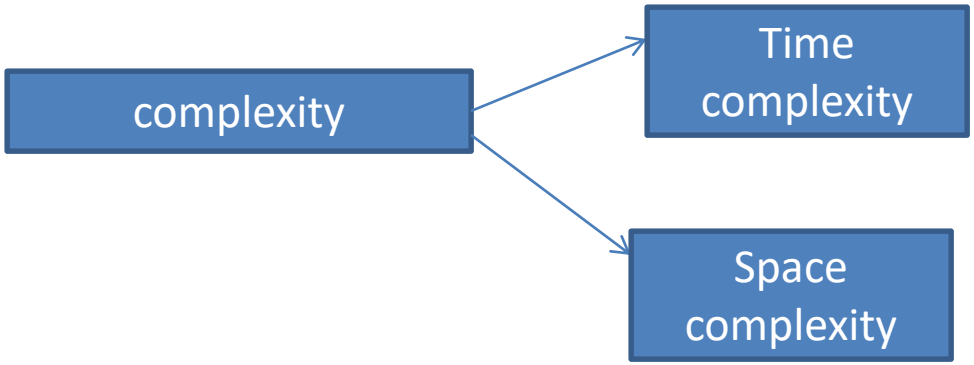
```
a = input(" Please Enter the First Number: ")
b = input(" Please Enter the second number: ")
sum = int(a)+int(b)
print('The sum of {0} and {1} is {2}'.format(a, b, sum)
```

Problem Solving Steps

- Analyze the problem.
- Identify the solution for the problem and divide it into small task.
- (Algorithm,Flowchart,pseudocode) has to be prepared.
- Based on the above method program will be created.
- Then it has to be executed

Algorithm

- Algorithm is a sequence of instructions written in the form of English phrases required for producing the desired result
- It involves identifying variable names and types that would be solving the problem



- Time complexity specifies the amount of time required by an algorithm to give desired output
- Space complexity specifies the amount of memory required by an algorithm for performing desired task
- Algorithm that takes less time and less memory space is the best one

Characteristics of Algorithm

- The steps in the algorithm must be simple and must not be ambiguous .
- It should be written in sequence.
- Ensure that the algorithm will terminate.
- It should conclude after a finite number of steps
- Algorithm must solve the given problem

Qualities of good Algorithm

- An algorithm is considered as good ,if
- It uses most efficient logic(time complexity)
- It uses minimal system memory for its execution
- It should able to generate most accurate results

Building blocks of Algorithm

- There are three building blocks

Building Block	Common name
Sequence structure	Action
Selection structure	Decision
Iteration structure	Repetition or Loop

Sequence structure

- The execution of the statements is done sequentially
- It uses top-down approach.
- Addition of two numbers
  - Step1: Start
  - Step2: Read a, b
  - Step3: Add the value of a with b and store the result in sum.
  - Step4: Display the value of sum
  - Step5: Stop
- Finding the area of a circle
  - Step1: Start
  - Step2: Read the value of r
  - Step3: Calculate area = 3.14*r*r
  - Step4: Print area
  - Step5: Stop

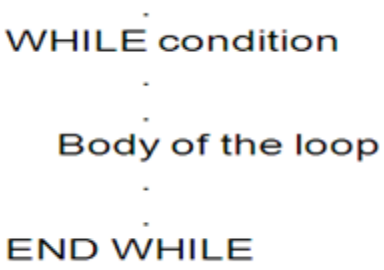
Selection structure

- Two sets of statement blocks are written in a program along with one or more conditions
- The execution occurs if the condition is true, if the condition is false else part is executed
- It is used for making decisions
- Find the largest among three Numbers
  - Step1: Start
  - Step2: Read the value of a, b, c
  - Step3: IF (a>b) and (a>c) THEN
    print a is largest
    ELSE IF (b>c) THEN
    print b is largest
    ELSE
    print c is largest
  - Step4: Stop

```
IF condition THEN
   process 1
        .
        .
ELSE
   process 2
        .
        .
   END IF
        .
        .
```

Iteration structure(looping)

- The execution of this structure is repeated many times if the conditional statement is true.
- Finding the Factorial
  - Step1: Start
  - Step2: Read the value of n and set i =1
  - Step3: While i <= n do
    fact =fact * i
    i = i + 1
    else Goto step5
  - Step4: Go to step 3
  - Step5: print the value of fact
  - Step6: Stop



- **Advantages of algorithm**
  - It is a step-wise representation, which makes it easy to understand.
  - it is easy to understand for anyone even without programming knowledge.
  - Every step in an algorithm has its own logical sequence so it is easy to debug.
  - By using algorithm, the problem is broken down into smaller pieces or steps hence, it is easier for programmer to convert it into an actual program
- **Disadvantages of algorithm**
  - Writing algorithm takes a long time.
  - An Algorithm is not a computer program, it is rather a concept of how a program should be