

A program is the expression of an algorithm in a programming language. Thus, the success of a program depends upon the algorithm. Therefore, the logic of the problem must be clearly expressed in algorithm. The logic of the problem can be expressed in various manners. One of the most preferred methods is the graphical method of representing the problem's solution, which is known as flowchart.

Another useful tool for designing algorithms is *pseudo-code*. In the coming subsections, we are talking about both these tools.




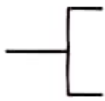



5.3.1 Flowcharts

A flowchart is a pictorial representation of step by step solution of a problem.

A flowchart not only pictorially depicts the sequence in which instructions are carried out in an algorithm but also is used as an aid in developing algorithms. One must be familiar with such an important tool used in programming. This section briefly discusses the technique of flow charting.

FLOWCHART
A flowchart is a pictorial representation of step by step solution of a problem.

There are various flowchart symbols that carry different messages and are used for different purposes. These symbols are shown below :

Symbol	Purpose	Symbol	Purpose
	Start/Stop		Flow of control symbol
	Input/Output		Annotation
	Processing		Connector
	Decision Box		

Following section illustrates the working and use of flow charts along with algorithm development.

Writing Algorithms

To write algorithms, such a language should be used that is close enough to the programming language(s) (in which the programs are to be written) so that a hand translation is relatively easy to accomplish. Thus, we have chosen a language for algorithms that resembles our programming language Python.

Let us discuss certain rules for writing algorithms.

Identifiers

Identifiers are the names given to various components of a program by the programmer e.g., to variables that hold values, to functions, modules etc.

While choosing names for identifiers, make sure that these are meaningful and not unnecessarily long or short names.

Assignment

The assignment of values to variables is done through assignment statement as :

variable ← <expression>

e.g., A ← 10

In an algorithm, the left arrow (←) denotes the act of assigning the value of its right-hand the variable on its left. Some people take liberty and use assignment operator to assign variables in algorithms.

Sequence

The steps of an algorithm are executed in the sequence of top to bottom. One after another steps must be listed in the correct order.

Selection/Conditional Statements

A conditional statement in an algorithm takes the following form :

```

if condition :
    statement      # block 1
OR
if condition :
    statement      # block 1
else
    S2              # block 2
    
```

There may be one or more if-then-else statements embedded in another if-then-else statement. Figure 5.1 depicts conditional statements pictorially.

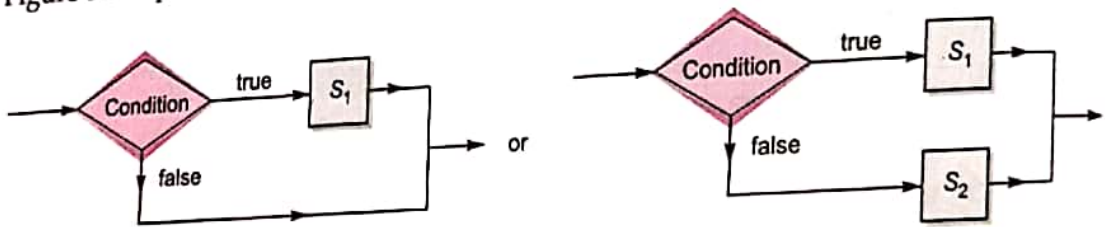


Figure 5.1 The conditional If statements

Repetition – Looping Statement

A looping statement (also called iteration statement) lets you repeat a set of statements depending upon a condition. To accomplish iteration, the **for loop** and **while loop** are used.

for looping statement

```

for item in sequence :
    : St          # block of statements
    :
    
```

St represents the set of statements to be repeated for each item in the sequence. When the statements block gets executed for each item in the sequence, the for-loop stops.

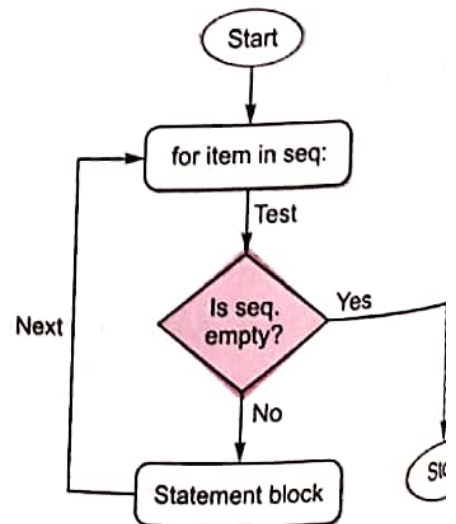


Figure 5.2 (a) for loop process.

while looping statement

```
while condition :
    : St      # block of statements
    :
```

St represents the set of statements to be repeated. The while iteration statement tests the condition before entering into the loop. Thus, if the condition is false even before entering into the loop, the while-loop will never get executed.

Let us now consider some examples of algorithms and flowcharting.

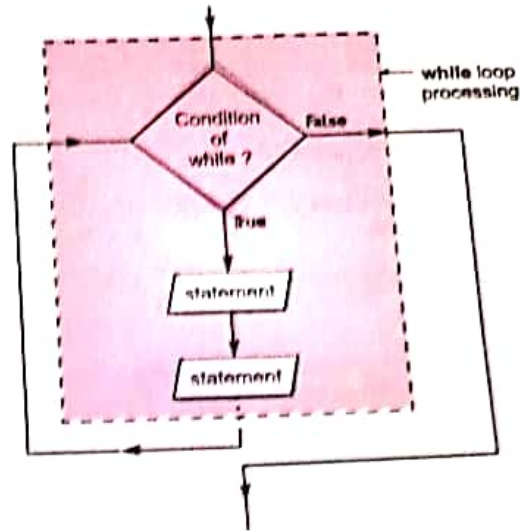


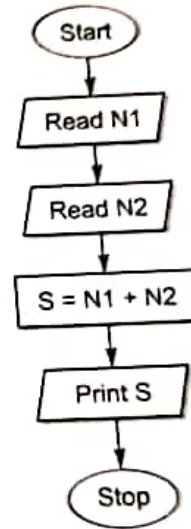
Figure 5.2 (b) while loop processing

EXAMPLE 2 Draw a flowchart to add two numbers, along with algorithm in simple English.

SOLUTION

Algorithm

- Step 1. Start
- Step 2. Get two numbers N1 and N2
- Step 3. $S \leftarrow N1 + N2$
- Step 4. Print the result S
- Step 5. Stop



EXAMPLE 3 Draw a Flowchart to find Area and Perimeter of Rectangle, along with algorithm in simple English.

L : Length of Rectangle, B : Breadth of Rectangle

AREA : Area of Rectangle, PERIMETER : Perimeter of Rectangle

SOLUTION

Algorithm

- Step 1. Start
- Step 2. Input Side-Length & Breadth say L, B
- Step 3. $AREA \leftarrow L \times B$
- Step 4. $PERIMETER \leftarrow 2 \times (L + B)$
- Step 5. Print AREA, PERIMETER
- Step 6. Stop

