

FLOWCHARTING

25.1 INTRODUCTION

The flowchart is a means of visually presenting the flow of data through an information processing systems, the operations performed within the system and the sequence in which they are performed. In this lesson, we shall concern ourselves with the program flowchart, which describes what operations (and in what sequence) are required to solve a given problem. The program flowchart can be likened to the blueprint of a building. As we know a designer draws a blueprint before starting construction on a building. Similarly, a programmer prefers to draw a flowchart prior to writing a computer program. As in the case of the drawing of a blueprint, the flowchart is drawn according to defined rules and using standard flowchart symbols prescribed by the American National Standard Institute, Inc.

25.2 OBJECTIVES

At the end of this lesson, you will be able to understand:

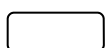
- the meaning of flowchart
- the basic parts of the flowchart such as flowchart symbols and the flow lines connecting these symbols.
- the advantages and limitations of flowchart

25.3 MEANING OF A FLOWCHART

A flowchart is a diagrammatic representation that illustrates the sequence of operations to be performed to get the solution of a problem. Flowcharts are generally drawn in the early stages of formulating computer solutions. Flowcharts facilitate communication between programmers and business people. These flowcharts play a vital role in the programming of a problem and are quite helpful in understanding the logic of complicated and lengthy problems. Once the flowchart is drawn, it becomes easy to write the program in any high level language. Often we see how flowcharts are helpful in explaining the program to others. Hence, it is correct to say that a flowchart is a must for the better documentation of a complex program.

25.4 GUIDELINES FOR DRAWING A FLOWCHART

Flowcharts are usually drawn using some standard symbols; however, some special symbols can also be developed when required. Some standard symbols, which are frequently required for flowcharting many computer programs are shown in Fig. 25.1



Start or end of the program

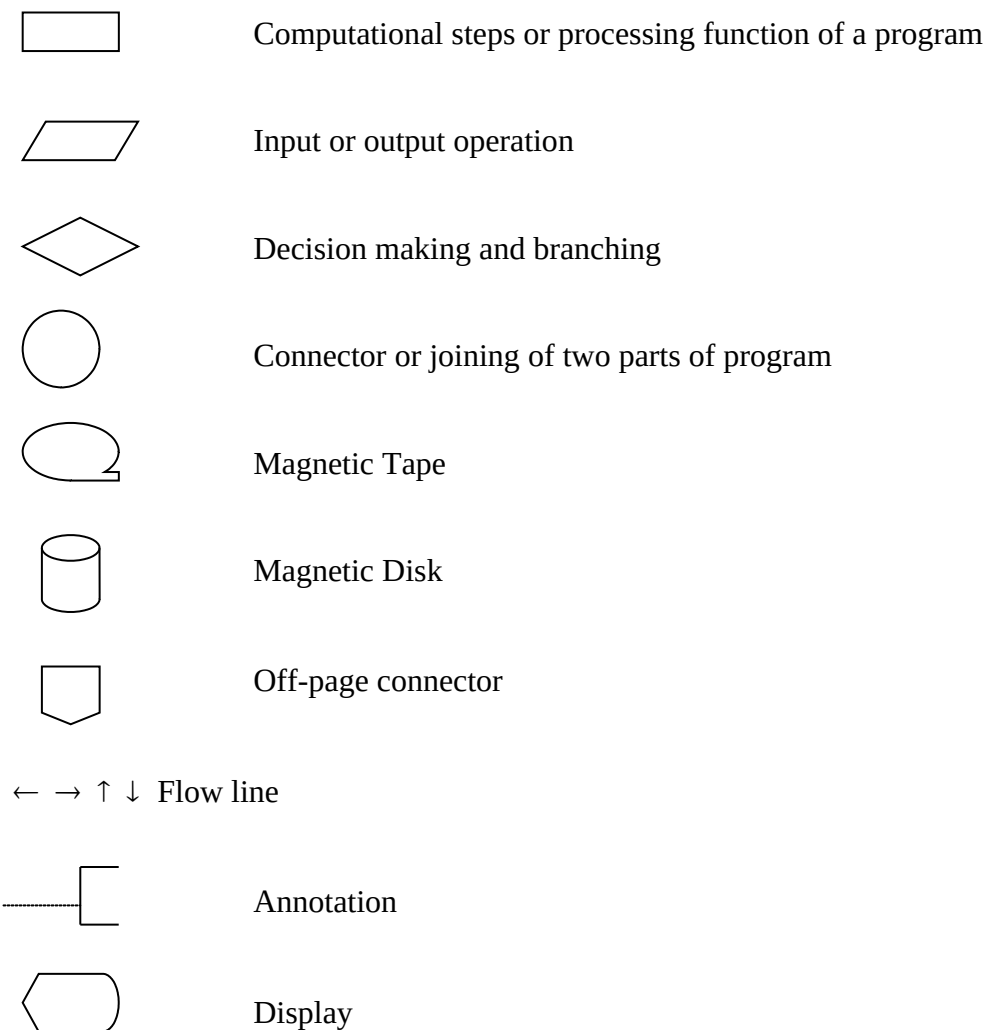
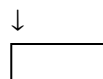
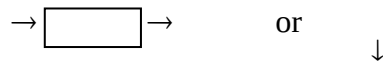


Fig. 25.1 Flowchart Symbols

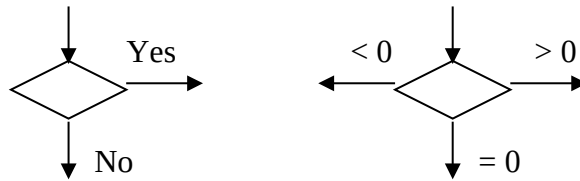
The following are some guidelines in flowcharting:

- (a) In drawing a proper flowchart, all necessary requirements should be listed out in logical order.
- (b) The flowchart should be clear, neat and easy to follow. There should not be any room for ambiguity in understanding the flowchart.
- (c) The usual direction of the flow of a procedure or system is from left to right or top to bottom.
- (d) Only one flow line should come out from a process symbol.





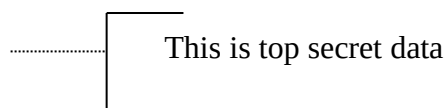
- (e) Only one flow line should enter a decision symbol, but two or three flow lines, one for each possible answer, should leave the decision symbol.



- (f) Only one flow line is used in conjunction with terminal symbol.



- (g) Write within standard symbols briefly. As necessary, you can use the annotation symbol to describe data or computational steps more clearly.



- (h) If the flowchart becomes complex, it is better to use connector symbols to reduce the number of flow lines. Avoid the intersection of flow lines if you want to make it more effective and better way of communication.
- (i) Ensure that the flowchart has a logical *start* and *finish*.
- (j) It is useful to test the validity of the flowchart by passing through it with a simple test data.

25.5 ADVANTAGES OF USING FLOWCHARTS

The benefits of flowcharts are as follows:

1. Communication: Flowcharts are better way of communicating the logic of a system to all concerned.
2. Effective analysis: With the help of flowchart, problem can be analysed in more effective way.
3. Proper documentation: Program flowcharts serve as a good program documentation, which is needed for various purposes.

4. **Efficient Coding:** The flowcharts act as a guide or blueprint during the systems analysis and program development phase.
5. **Proper Debugging:** The flowchart helps in debugging process.
6. **Efficient Program Maintenance:** The maintenance of operating program becomes easy with the help of flowchart. It helps the programmer to put efforts more efficiently on that part

25.6 LIMITATIONS OF USING FLOWCHARTS

1. **Complex logic:** Sometimes, the program logic is quite complicated. In that case, flowchart becomes complex and clumsy.
2. **Alterations and Modifications:** If alterations are required the flowchart may require re-drawing completely.
3. **Reproduction:** As the flowchart symbols cannot be typed, reproduction of flowchart becomes a problem.
4. **The essentials of what is done can easily be lost in the technical details of how it is done.**

IN-TEXT QUESTIONS 1

1. Fill in the blank.
 - (i) A program flowchart indicates the _____ to be performed and the _____ in which they occur.
 - (ii) A program flowchart is generally read from _____ to _____
 - (iii) Flowcharting symbols are connected together by means of _____
 - (iv) A decision symbol may be used in determining the _____ or _____ of two data items.
 - (v) _____ are used to join remote portions of a flowchart
 - (vi) _____ connectors are used when a flowchart ends on one page and begins again on other page
 - (vii) A _____ symbol is used at the beginning and end of a flowchart.
 - (viii) The flowchart is one of the best ways of _____ a program..
 - (ix) To construct a flowchart, one must adhere to prescribed symbols provided by the _____.

(x) The programmed uses a _____ to aid him in drawing flowchart symbols.

25.7 FEW EXAMPLES ON FLOWCHARTING

Now we shall present few examples on flowcharting for proper understanding of this technique. This will help in student in program development process at a later stage.

Example 1

Draw a flowchart to find the sum of first 50 natural numbers.

Answer: The required flowchart is given in Fig. 25.2.

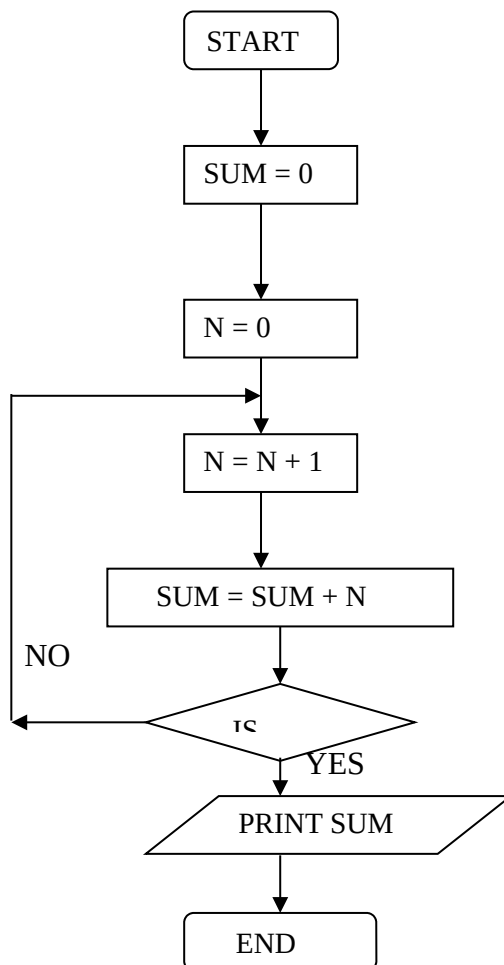


Fig. 25.2 Sum of first 50 natural numbers

Fig 2.2 Flowchart for computing the sum of first 50 natural numbers.

Example 2

Draw a flowchart to find the largest of three numbers A,B, and C.

Answer: The required flowchart is shown in Fig 25.3

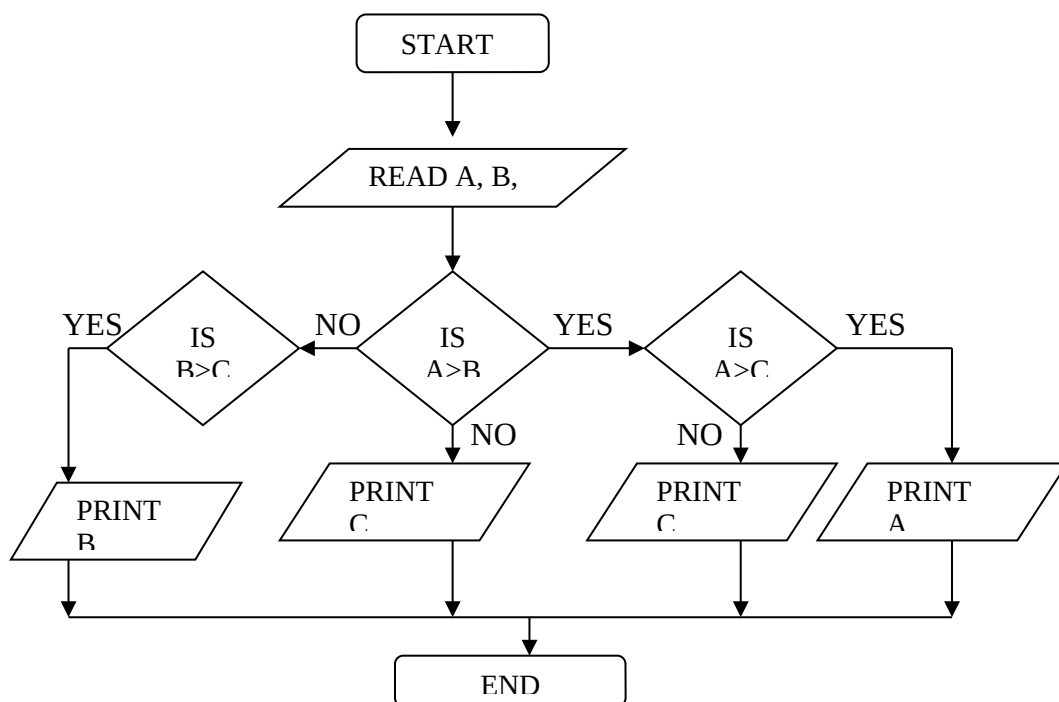


Fig 25.3 Flowchart for finding out the largest of three numbers

Example 3

Draw a flowchart for computing factorial N (N!)

Where $N! = 1 \times 2 \times 3 \times \dots \times N$.

The required flowchart has been shown in fig 25.4

Answer:

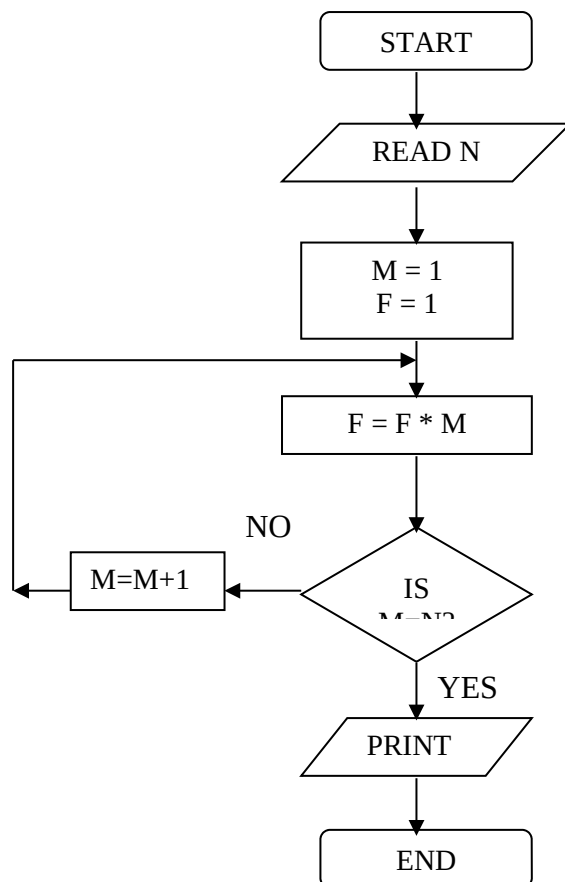


Fig 25.4 Flowchart for computing factorial N

Example 4

A company's salesmen are selling toothpaste and tooth powder. The company having 50 salesmen gives 10% commission on the sale of toothpaste and 20% commission on tooth powder.

Draw a flowchart to compute and print the total sale and the total commission for each salesman.

Answer: The required flowchart is shown in Fig 25.5

Note:

S = Salesman number

P1 = Amount of sales of paste

P2 = Amount of sales of powder

K = Counter for the number of salesman

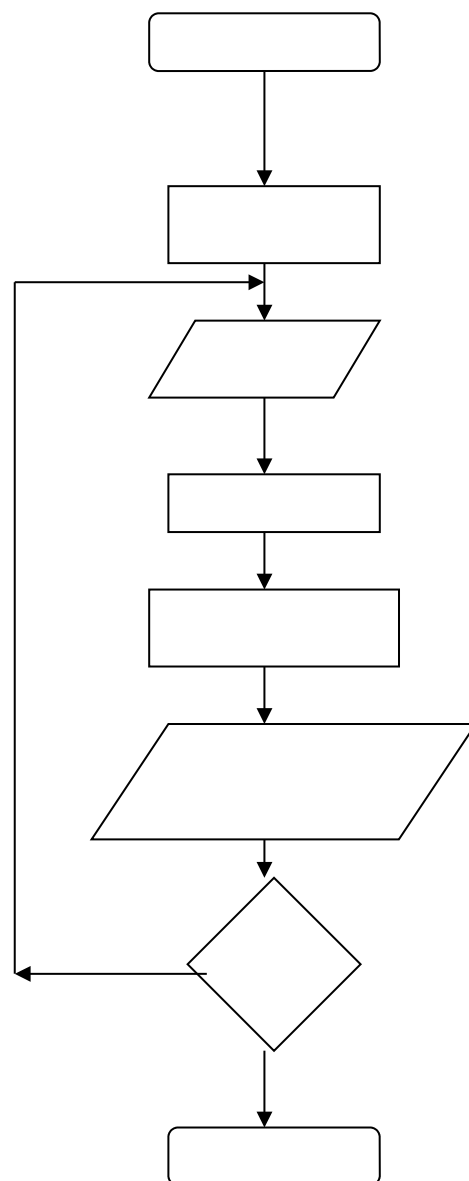


Fig 25.5: Flowchart for Computing Commission on Different Items

Example 5

Modify the flowchart in Example 4 to print the following heading.

Salesman No Total Sale Total commission

Under these heading, write the values of these variables for the 50 salesmen. At the end, the totals of the entire sale and the entire commission should also be printed out.

Answer: The required flowchart is shown in Fig 25.6

Note:

TS = Total sales

TC = Total commission

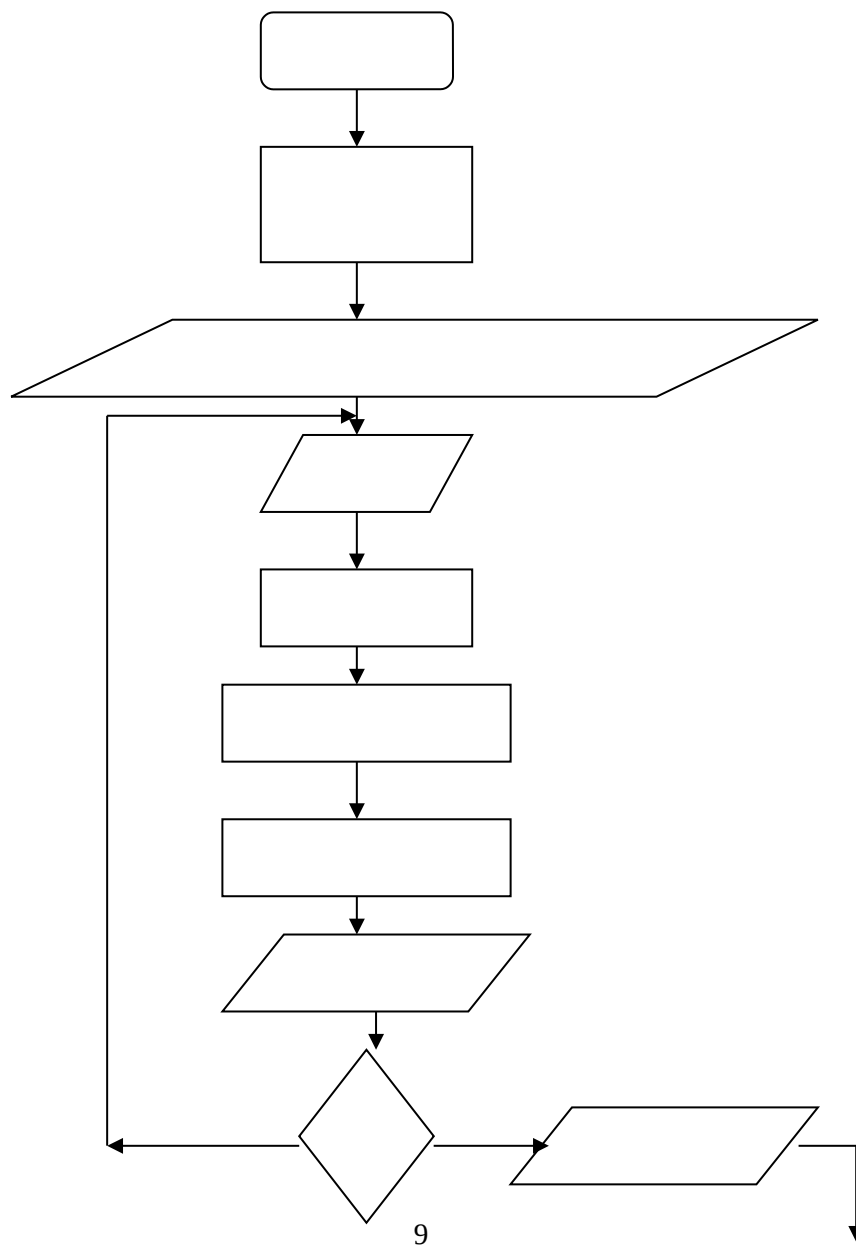









Fig: 25.6 Flowchart for writing proper heading and its contents

IN-TEXT QUESTION 2

1. What are name and the use of the following symbols?

- (a)  (b)  (c)  (d)  (e) 

2. Define Flowcharting.

25.8 WHAT YOU HAVE LEARNT

In this lesson, we have discussed the advantages and limitation of flowcharting. We have also shown some examples of flowcharting. This will help the students in learning this technique easily.

25.9 TERMINAL QUESTIONS

1. Draw a flowchart to read a number N and print all its divisors.
2. Draw a flowchart for computing the sum of the digits of any given number
3. Draw a flowchart to find the sum of given N numbers.
4. Draw a flowchart to computer the sum of squares of integers from 1 to 50
5. Draw a flowchart to arrange the given data in an ascending order.

25.10 FEEDBACK TO IN-TEXT QUESTIONS

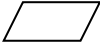
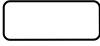

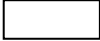

IN-TEXT QUESTIONS 1

1. (i) Operations, sequence
(ii) Top, down
(iii) Flow lines
(iv) Equality, inequality
(v) connectors

- (vi) Off -page
- (vii) Terminal
- (viii) documenting
- (ix) ANSI (American National Standards Institute)
- (x) Flowcharting template

IN-TEXT QUESTIONS 2

1.

1.	Symbol	Name	Use
(a)		input/output	To represent input of data for processing or output of processed information.
(b)		Terminal	To indicate start or end of a program
(c)		Decision marking	To make logical construction to check some condition.
(d)		Process	To represent an operation or a set of operation
(e)		Connector	To link one part of flowchart to another

2. Flowcharting is a technique of showing logical flow of data in pictorial form and integration of programming steps for solving a given problem.