

CHAPTER 1: Class X PROBLEM SOLVING

Q4. What do you mean by problem solving? Briefly describe the problem solving process.

Ans. Problem solving is a skill, which can be developed by well-organized approach. The following 9 steps can be followed to solve any problem:

- | | | |
|----------------------------|----------------------------------|-----------------------------------|
| 1). Problem Identification | 4). Design Algorithm & flowchart | 7). Implement the program |
| 2). Specify requirements | 5). Write Program (Coding) | 8). Maintain & update the program |
| 3). Analyze the problem | 6. Test & Debug the program | 9). Document the program. |

1. Problem Identification:

It is to identify the problem. It must be clear in mind what the problem is, and how it can be solved.

- i). Study the problem carefully.
- ii). See, if any solution is possible by the computer.
- iii). Identify the inputs and outputs.

2. Specify Requirements: (Get required documents)

At this stage, make the user requirements clear so that

- a). A proper solution could be suggested.
- b). Expected features of the program could be written.
- c). The restrictions can be defined under which program must be operated.

3. Analyze the Problem.

While analyzing, a big problem is decomposed into sub-problems. Then solve each sub-problem separately. (Called, Top Down design). We may approach the right solution by thinking.

- How many solutions are possible? & which one is the best?
- What are the input and outputs?
- How bigger problems can be divided into sub-problems?

4. Design Algorithm & Flowchart

Algorithm is a finite set of steps, stating the solution of the problem in simple words. Most algorithms perform three steps. i). Get data (Input). ii). Processing (computation) iii). Display results (Output)

Flowchart: Flowchart is the pictorial representation of an algorithm. It visually represents flow of data.

5. Coding: The process of writing program in computer language is called coding.

6. Test & Debug the Program:

Finding and removing errors from the program is called Testing & Debugging.

7. Implement the program:

After testing the program thoroughly, it must be installed on computer and put into operation. This is known as implementation of the program.

8. Maintain & update the program:

It is an ongoing process of upgrading the program to accommodate new hardware or software requirements.

9. Document the program. It is a detailed description of a program's algorithm, design, coding method, testing, and proper usage of the program.

Q5. What is debugging? How many types of errors can occur in a program? Describe briefly?

Ans: Debugging is the process of finding and removing errors in the program. There are three types of errors:

- (i). Syntax errors:** These errors are due to violation of grammatical rules of language. These errors are detected at compile time.
- ii). Run time errors (Execution errors):** Occurs when program directs the computer to perform an illegal operation such as dividing a number by zero. These errors are detected during the execution of program.
- iii). Logical errors:** are due to wrong logic in the program. The language translators do not detect these types of errors. Logical errors are identified by wrong output.

Q6. Define algorithm. Write a step-form algorithm for making a telephone call to your friend.

Ans: An algorithm is a finite set of steps to perform a particular task. Algorithm must be clear, effective and consists of numbered steps.

Q7. What are the advantages of flowchart? Discuss limitation of flowchart.

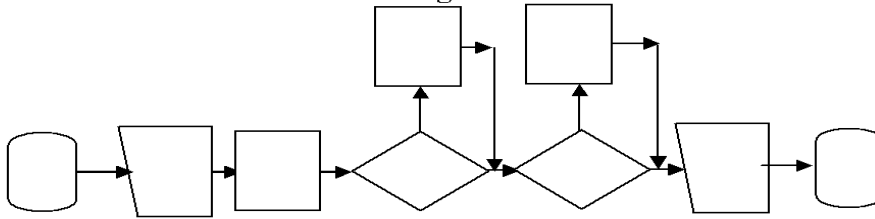
Ans: Advantages of Flowchart:

- i). Logic of algorithm (problem) can be explained more effectively.
- ii). It helps in maintenance of programs.
- iii). It acts as a guide for the programmer.
- iv). It helps in debugging process.

Limitations of Flowchart:

- i). It is difficult to draw flowcharts for complex problems.
- ii). If alterations are required the flowchart is to be redrawn.

Q8. Draw a flowchart to find the largest of three numbers.



Q9. Write an algorithm to calculate the area of a circle when the radius is given.

$(A_r = 3.14 * rad * rad)$

- Ans:** STEP 1: BEGIN
 STEP 2: PRINT "ENTER RADIUS "
 STEP 3: INPUT RADIUS
 STEP 4: AREA = 3.14 * RADIUS * RADIUS
 STEP 5: PRINT AREA
 STEP 6: STOP

Q10. Answer the following short questions:

(i) List steps that should be followed to solve problem.

1). Problem Identification	4). Design Algorithm & flowchart	7). Implement the program
2). Specify requirements	5). Write Program (Coding)	8). Maintain & update the program
3). Analyze the problem	6. Test & Debug the program	9). Document the program.

(ii) What is analysis? Describe its importance in solving a problem.

Ans: Analysis is technique in which problem is a decomposed into sub-problem. After identify the problem and specifying the requirements, the problem is analyzed by considering the following points.

- (a). How many solutions are possible?
- (b). Which one is the best solution?
- (c). What are inputs & outputs?
- (d). How bigger problem divided into sub problems.

(iii) What method should be adopted to solve complex problems? Discuss briefly.

Ans.: We should decompose the complex problems into sub-modules (small parts of program.). This method is called **Top-Down Design**, which lead us to the right direction.

(iv) What do you mean by syntax of a programming language? Is it necessary to know the syntax for solving a problem on computer?

Ans.: Every programming language has its own rules and regulation to write instructions, which are called syntax of the language. Yes it is necessary to know the syntax of the language so that language can understand the instruction. Otherwise you may have "syntax error" message.

(v). Differentiate runtime errors and logical errors.

Runtime Error: Errors detected during the execution of a program are called runtime error. Such errors occur due to an illegal operation like dividing a number by zero. (5/0).

Logical Error: Logical errors: are due to wrong logic in the program. The language translators do not detect these types of errors. Logical errors are identified by wrong output.

(vi). Why documentation is considered vital in problem solving process? Give reasons.

Documentation is a detailed description of the program. Which is very much important for the following reasons.

- (i). It is valuable for the user who will operate the program according to the documentation.
- ii). It is also valuable for the programmer who can be called for update/modify the program later.

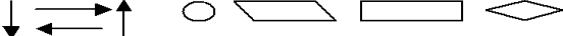
(vii). Is it necessary for an algorithm to solve a problem in finite number of steps? If yes, why?

Yes it is necessary the algorithm must solve the problem in finite number of steps. Because finite steps solve the problem efficiently and effectively.

(viii). Write purpose of the following flowchart symbols.

	Diamond	It is used for decision making and branching.
	I/O Box	It is used for input & output data.
	Connector	It is used to connect different parts of the flowchart.
	On/Off Page Connector	It is used to connect different parts of the flowchart on different/same pages.
	Processing	It is used to write mathematical formulas.
		It is used to write functions or sub-programs.

(ix). Compare flowchart and algorithm?

FLOWCHART	ALGORITHM
<ul style="list-style-type: none"> Flowchart is the pictorial form of algorithm. It is used to view the flow of data. Some flowchart symbols are arrows, process, diamond, input/output box, connector etc. 	<ul style="list-style-type: none"> It is a finite set of steps, which accomplished a particular task. It must be clear, finite and effective. Its simplest form is called step-form algorithm. It consists of numbered steps.

(x). Write an algorithm to calculate the distance covered by a car moving at an average speed of $v \text{ ms}^{-1}$ in time t . the program should input average speed v and time. t .

Ans: 1. BEGIN

2. PRINT "Enter Average Speed Of Car"
3. INPUT V
4. PRINT "Enter Total Time"
5. INPUT T
6. $S = V * T$
7. PRINT "Distance traveled = " S
8. END

General Questions

1. Define a program: A program is a set of instructions given to the computer to solve a particular problem
2. Define Desk Checking. It is the process of carefully observing the working of an algorithm, on the paper, to check result of the program is called Desk Checking.
3. What is Syntax: The grammatical rules of any programming language are called it syntax.

4. Write the strategy for developing algorithm.

Strategy for developing algorithm.

Step 1: Investigation.

Identify the processes, the major decisions, repetitions and the variables.

Step 2: Preliminary algorithm.

i). Make a high-level algorithm ii). Step through the algorithm & find out solution of problem if any.

Step 3. Refining the algorithm.

Group together processes & variables & test the algorithm again by stepping through it.

5. Write the guideline for drawing a flow chart.

- All requirements should be listed in logical order
- It should be clear & easy to follow.
- Only one flow line should come out from a process symbol.
- Only one flow line must enter a decision symbol but flow lines must leave it.
- Only one flow line is used in conjunction with terminal symbol.
- Write the comments within remarks symbol.
- In case of complex flow chart, use connector symbols to reduce number of flow lines
- Test the validity of flow chart by passing test data.

6. Write an algorithm to find the sum of first 50 natural numbers.

BEGIN

```

N=0: SUM=0
DO WHILE (N<=50)
N=N+1
SUM=SUM+N
WEND
PRINT SUM :

```

END

7. Write an algorithm to find the factorial of a given number.

BEGIN

```

Fact = 1
N = 1
Print "enter a number"
Input num
For n = 1 to num
Fact = fact * n
Next n
Print fact

```

End