

# Unit 01

## Programming Techniques

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### EXERCISE

**Q1. Select the best answer for the following MCQs.**

MCQ #	1	2	3	4	5	6	7	8
Answer	C	B	C	B	A	D	C	A

**Q2. Give short answers to the following questions.**

**i. Define computer.**

Computer

- A *computer* is a general purpose electronic machine that helps people to solve various problems.
- Computer must be programmed to perform various tasks.
- Various programming techniques are used to solve problems on computer.

**ii. What is algorithm and what is the role of algorithm in problem solving?**

Algorithm

An algorithm is a step-by-step procedure to solve a problem that is easy to understand and follow.

Role of Algorithm in Problem Solving

- Algorithm plays a very important role in computer programming.
- Computer programming is the process of taking an algorithm- and coding it in a programming language.
- It is the first step in the program development.

**iii. What is a flowchart?**

Flowchart

- Flowchart is a diagrammatic representation of an algorithm.
- It describes what operations are required to solve a problem.
- Computer programmers draw flowcharts before writing programs.

**iv. What are the advantages of using flowcharts?**

Advantages of Flowchart

- It provides an easy way to analyze and find solutions of problems.
- It is very helpful to share the problem-solving method with other people.
- It helps in finding and removing errors in computer programs.
- It is very easy to convert flowchart into a program in any programming language.

**v. Draw any four graphical symbols used in flowchart and explain them.**

- **Start/Stop:** It is a round rectangle that shows the start or end of the flowchart. A flowchart has only one start but it may have many ends.
- **Input/Output:** Parallelogram symbol represents input or output operations in a flowchart.

- **Process:** A rectangle is used to represent data processing. Calculations are represented by the process symbol. Variables are also initialized inside the process symbol.



- **Decision:** A diamond shape is used to represent decisions in a flowchart. It contains a condition and if the condition is True, then one path is selected otherwise another path is selected.

## EXTENSIVE QUESTIONS

### Q3. Describe the steps involved in problem solving.

#### Steps in Problem Solving

There are **five** steps in problem solving on the computer.

1. Defining the problem
2. Analyzing the problem
3. Planning the solution of the problem
4. Candid solutions of a problem
5. Select the best solution

#### Defining The Problem

Defining the problem is the first stage of problem solving. It is very important to understand the problem before the programmer starts working on its solution. Following steps are used to properly define and understand the problem.

- Carefully read the problem to understand what it says.
- Find out what the problem asks to do.
- What information can be obtained from the problem?
- What is required to be calculated as the solution of the problem?

#### Analyzing The Problem

At this stage of problem solving, the programmer investigates the problem and gathers maximum information to find a solution. Following questions can be asked to analyze the problem.

- Is it possible to solve the problem on a computer?
- What is to be done to find the solution of the problem?
- What is the proper sequence of steps to solve the problem?
- What are the inputs and what output is required?
- How many solutions are possible?
- Which solution is best and why?
- How solution will be implemented?

#### Planning The Solution of The Problem

Planning the solution of the problem is a creative stage of problem solving. It refers to dividing the solution into steps and arranging them into proper order that will solve the problem.

#### Candid Solutions of a Problem

All the possible solutions of a problem that produce correct result are known as candid solutions. To find candid solutions of a problem, programmer has to look for different methods to solve the problem and come up with several solutions.

**Select The Best Solution**

The selection of final solution of a problem should be based on the following criteria.

- **Speed:** The selected solution should be efficient.
- **Cost:** It should be cost-effective.
- **Complexity:** It should be simple and contain minimum number of instructions.

**Q4. Write an algorithm to calculate the area of a rectangle for given breadth and length.****Algorithm (Area of Rectangle)**

Step 1: Start

Let the length and breadth, Length be 5 and Breadth be 7

Step 2: CALCULATE the area, Area

Area=Length \* Breadth

Step 3: Print Area

Step 4: Stop

**Q5. Write an algorithm that inputs length in inches and calculates and prints it in centimeters.****Algorithm**

Step 1: Start

Step 2: Input Length in inches, INCHES

Step 3: CALCULATE centimeter, CENTI

CENTI=INCHES/2.54

Step 4: Print CENTI

Step 5: Stop

**Q6. Write an algorithm that input marks and prints the message "PASS" or "FAIL". Passing marks are 33.****Algorithm**

Step 1: Start

Step 2: Input marks, MARKS

Step 3: Check the value of MARKS

IF MARKS>=33 THEN Print "PASS" ELSE Print "FAIL"

Step 4: Stop

**Q7. Write an algorithm to find the sum of given sequence. SUM=20+25+30+35+40+45+50+55+60****Algorithm**

Step 1: Start

Initialize SUM to 0 and K to 20

SUM=0, K=20

Step 2: ADD K to SUM

SUM=SUM+K

Step 3: Increment K by 5

K=K+5

Step 4: Check the value of K

IF K<=60 THEN GOTO Step 2 otherwise GOTO Step 5

Step 5: Print SUM

Step 6: Stop

**Q8. Write an algorithm to find the product of given numbers. PRODUCT=1x3x5x7x9x11x13x15**

**Algorithm**

Step 1: Start

Initialize PROD to 1 and K to 1  
 PROD=1, K=1

Step 2: Multiply K with PROD

PROD=PROD \* K

Step 3: Increment K by 2

K=K+2

Step 4: Check the value of K

IF K<=15 THEN GOTO Step 2 otherwise GOTO Step 5

Step 5: Display PROD

Step 6: Stop

**Q9. Write an algorithm to print multiplication table of a number in reverse order.**

**Algorithm (Table in Reverse Order)**

Step 1: Start

Let the number, N be 5

Step 2: Initialize K to 10

K=10

Step 3: FIND the product

P=N\*K

Step 4: Display N, K, P

Step 5: Decrement K by 1

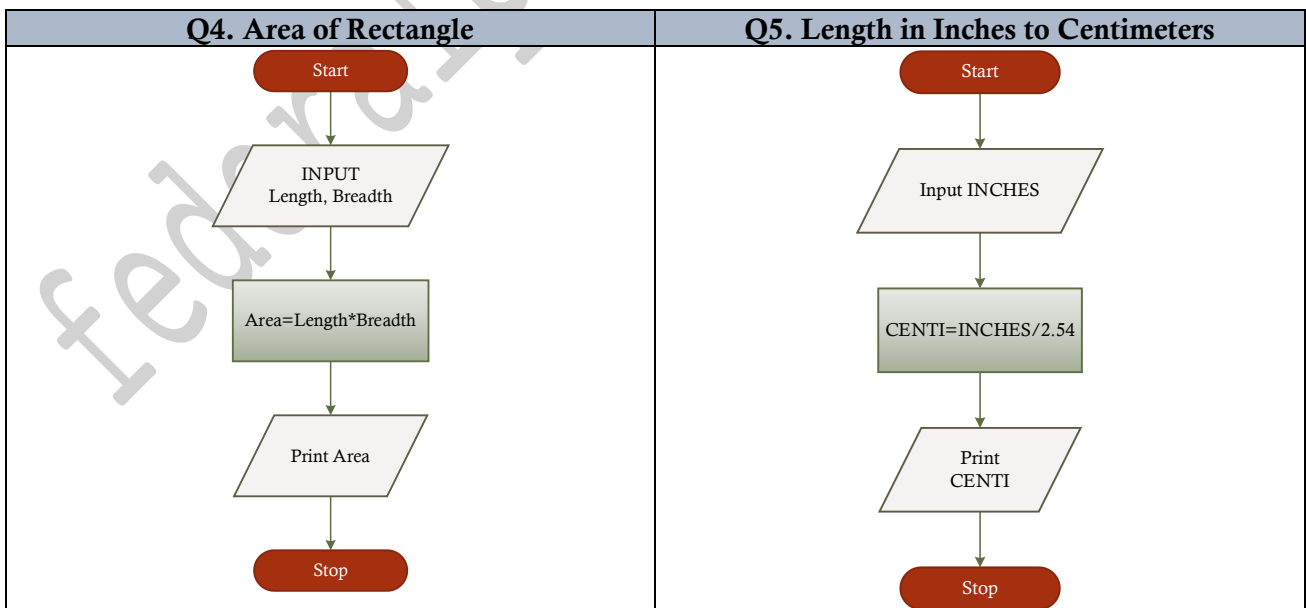
K=K-1

Step 6: Check the value of K

IF K>=1 THEN GOTO Step 3 otherwise GOTO Step 7

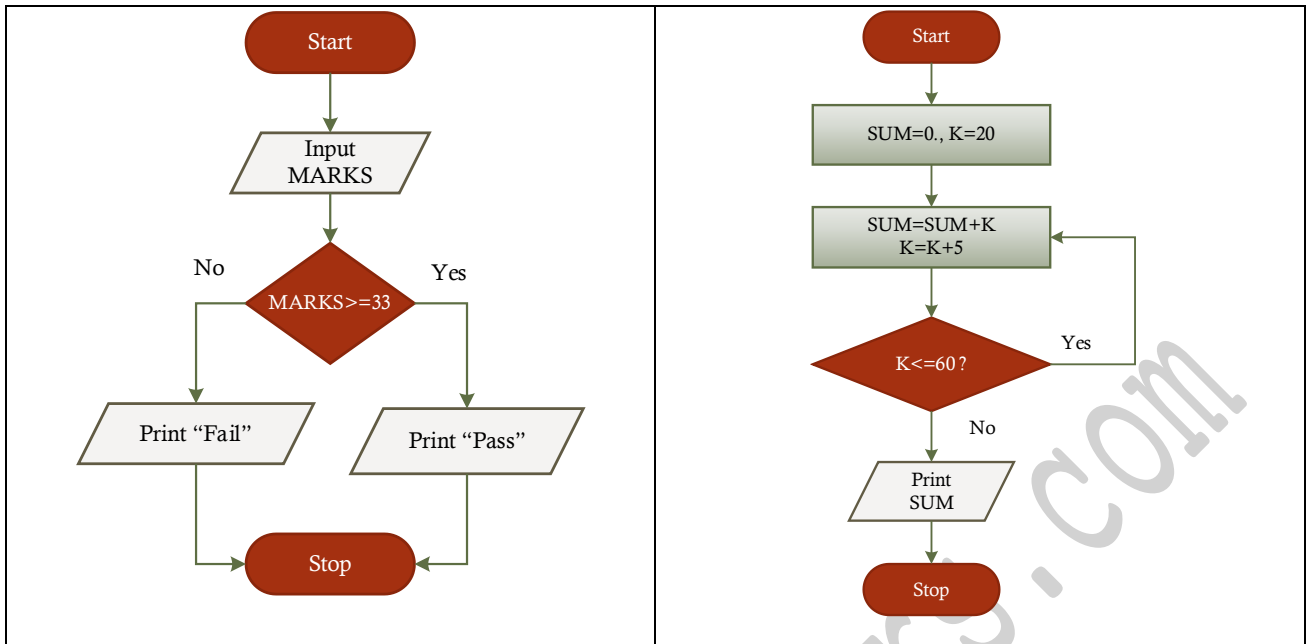
Step 7: Stop

**Q10. Convert the algorithms of questions Q4 to Q9 to flowcharts.**

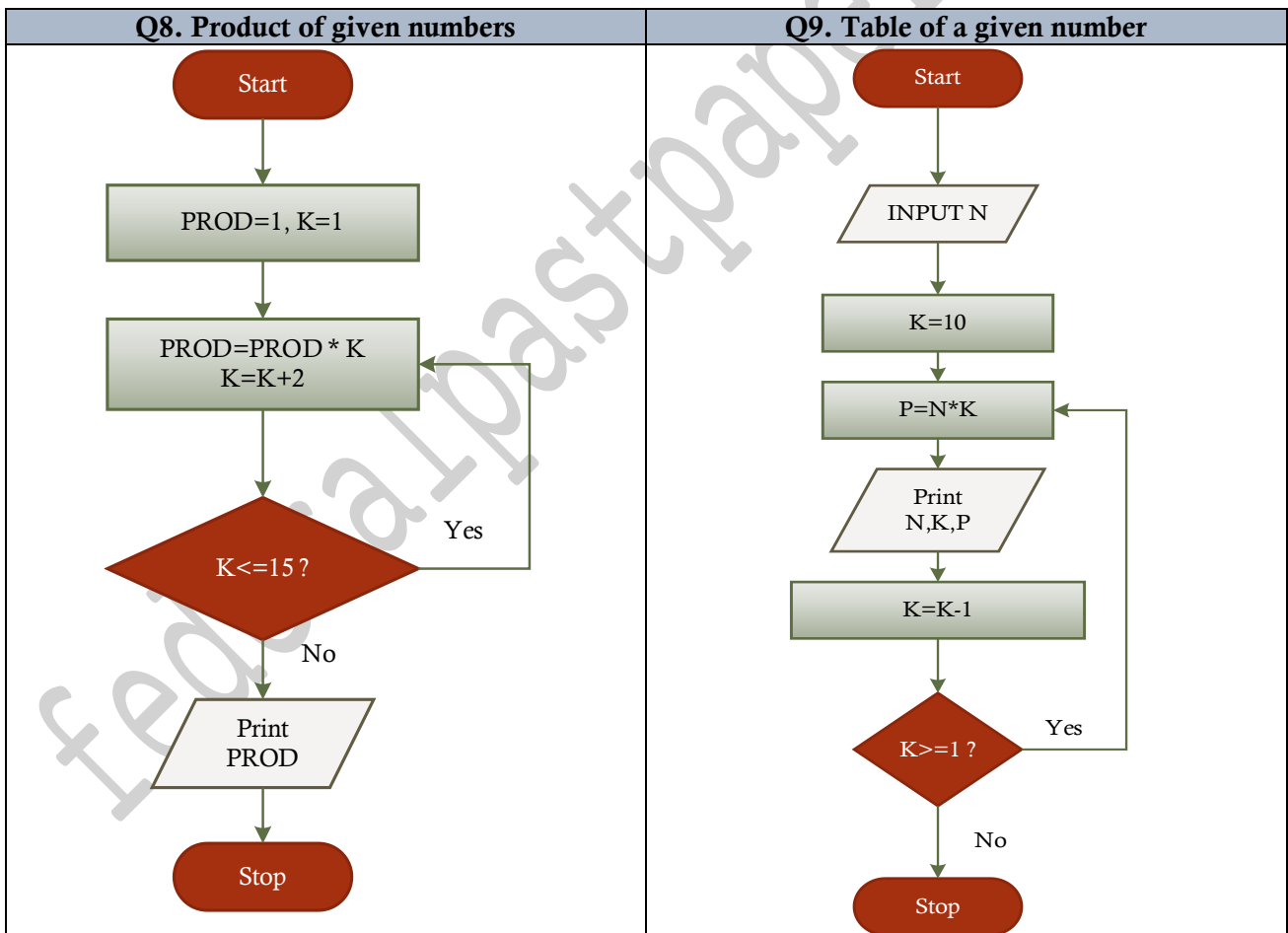


**Flowcharts**

Q6. Flowchart (Pass/Fail)	Q7. Flowchart (Sum of Sequence)
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Flowcharts



**SLO-BASED SHORT QUESTIONS**

**Q1. Write about the criteria for selecting the best solution of a problem.**

**Selecting The Best Solution**

The selection of final solution of a problem should be based on the following criteria.

- **Speed:** The selected solution should be efficient.
- **Cost:** It should be cost-effective.
- **Complexity:** It should be simple and contain minimum number of instructions.

**Q2. Describe the criteria for measuring efficiency of an algorithm on the basis of:**

- **Inputs needed**
- **Processing to be completed**
- **Decision to be taken**
- **Output to be provided**

An efficient algorithm should have:

- Least number of inputs required.
- Requires minimum data processing time.
- Less number of decision statements.
- Accurate results in very short time.

**Q3. What is meant by the following terms?**

- **Algorithm**
- **Efficiency of an Algorithm**
- **Candid solutions**

**Algorithm**

It is a step-by-step procedure to solve a problem that is easy to understand and follow.

**Efficiency of algorithm**

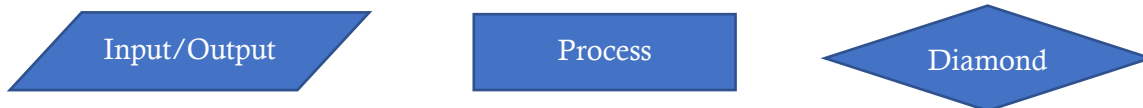
The efficiency of an algorithm is determined by the amount of computer resources used in it. These resources can be processing time, memory and storage space.

**Candid Solutions**

All the possible solutions of a problem that produce correct result are known as *candid solutions*.

**Q4. Draw and write purpose of Input/ Output, Process and Decision symbols used in flowchart.**

- **Input/Output:** Parallelogram symbol represents input or output operations in a flowchart.
- **Process:** A rectangle is used to represent data processing. Calculations are represented by the process symbol. Variables are also initialized inside the process symbol.
- **Decision:** A diamond shape is used to represent decisions in a flowchart. It contains a condition and if the condition is True, then one path is selected otherwise another path is selected.



**Q5. Write an algorithm to find the sum, product and average of five given numbers?**

**Algorithm**

Step 1: Start

Let the five numbers be A=5, B=6, C=7, D=8 and E=9

Step 2: FIND the sum (SUM)

$$\text{SUM} = A + B + C + D + E$$

Step 3: FIND the product (PROD)

$$\text{PROD} = A * B * C * D * E$$

Step 4: FIND the average (AVG)

$$\text{AVG} = \text{SUM} / 5$$

Step 5: Output SUM, PROD, AVG

Step 6: Stop

**Q6. Briefly describe 'flowchart' and 'algorithm'.**

**Flowchart**

- Flowchart is a diagrammatic representation of an algorithm.
- It describes what operations are required to solve a problem.
- Computer programmers draw flowcharts before writing programs.

**Algorithm**

- Algorithm means method, procedure, technique or plan.
- Algorithm is a step-by-step procedure to solve a problem that is easy to understand and follow.
- Algorithms are very helpful in writing computer programs.

**Q7. Write an algorithm to find a cube of a number.**

**Algorithm**

Step 1: Start

Let the number, N be 5

Step 2: CALCULATE the cube, C

$$C = N^3$$

Step 3: Output C

Step 4: Stop

**Q8. Write an algorithm to find whether a given number is prime number or not.**

**Algorithm (Prime number or not)**

Step 1: Start

Step 2: INPUT a number, N

Step 3: Let K=2

Step 4: Repeat Step4 to Step 7 until K<N

Step 5: if N%K=0 THEN GOTO Step 6 otherwise GOTO Step 8

Step 6: Print N, "is not prime"

Step 7: Stop

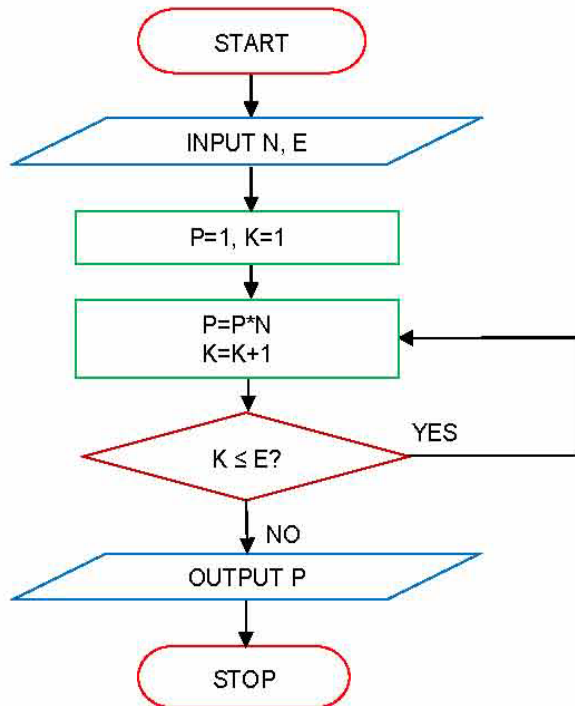
Step 8: K=K+1

Step 9: Print N, "is prime"

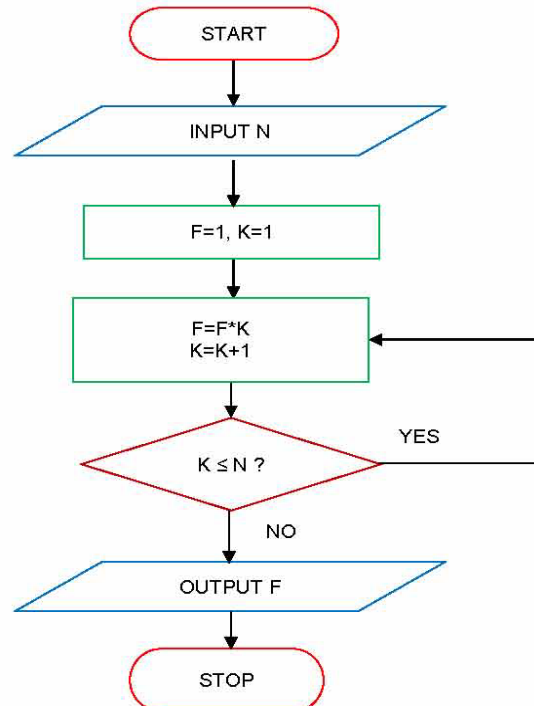
Step 10: Stop

**SLO-BASED LONG QUESTIONS**

**Q1. Draw a flowchart to calculate the exponent of a given number. (4)**



**Q2. Draw a flowchart to find factorial of a number. (4)**



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