EXERCISE

Q1. Select the best answer for the following MCQs.

i. Which of the following structure repeats one or more operation?
    A. Sequence
    B. Selection
    C. Loop
    D. Decision

ii. Which of the following structure allows a choice among various options?
    A. Sequence
    B. Selection
    C. Loop
    D. Decision

iii. Which of the following is a sequence of instructions written in a computer language to solve a problem?
    A. Algorithm
    B. Flowchart
    C. Program
    D. Problem Analysis

iv. What illustrates a sequence of operations to be performed to solve a problem in the form of a diagram?
    A. Algorithm
    B. Flowchart

C. Program

D. Problem Analysis

v.   What is represented by parallelogram in a flowchart?

A. Input/Output

B. Processing

C. Start/Stop

D. Decision

vi.   What is represented by a small circle in a flowchart?

A. Start/Stop

B. Decision

C. Processing

D. Connector

vii. Which symbol is used for decision in a flowchart?

A. Rectangle

B. Parallelogram

C. Diamond

D. Oval

viii. Which symbol is used for processing in a flowchart?

A. Rectangle

B. Parallelogram

C. Diamond

D. Oval

Answers

i.	C	ii.	B	iii.	C	iv.	B
v.	A	vi.	D	vii.	C	viii.	A

SHORT QUESTIONS

Q2. Give short answers to the following questions.

i.   Define computer

Ans: Computer:

A computer is a general-purpose electronic machine invented to help people solve various problems. Computer must be programmed by human beings to perform various tasks. Various programming techniques are used for solving problems on computer.

OR

Computer:

A computer is an electronic data processing device. It reads data processing and produces results accurately at a very high speed.

OR

Computer is a general-purpose programmable machine that has the ability to store, retrieve and process data that is represented in the form of 0s and 1s.

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

Ans: Algorithm

Algorithm means method, procedure, technique or plan. Algorithm is a step-by-step problem-solving method that is easy to understand and follow. It is a set of steps that clearly defines a sequence of operations to solve a problem.

Role of Algorithm in Problem Solving:

Algorithm plays an important role in computer programming. Computer programming is the process of taking an algorithm and coding it in a programming language. Formulating an algorithm is the first step for developing a computer program.

iii.   What is a flowchart?

Ans: Flowchart:

Flowchart is a diagrammatic representation of algorithm. It describes what operations are required to solve a given problem.

iv.   What are the advantages of using flowcharts?

Ans: Importance of Flowchart in Solving a Problem:

Flowchart illustrates the sequence of operations to be performed to solve a problem in the form of a diagram.

Computer programmers draw flowcharts before writing computer programs. Flowchart provides an easy way to analyze and find solutions of problems.

Once, the flowchart is drawn, it becomes very easy to write the program in any high-level language.
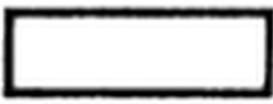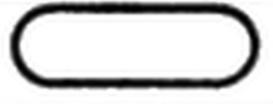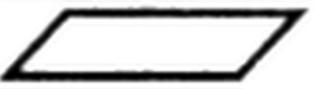
Flowchart is very helpful in communicating the problem-solving method to other people. It also helps in finding and removing errors in computer programs.

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

Ans: Flowchart Symbols:

Flowcharts are drawn using standard symbols. These symbols have specific meaning and are connected by arrows indicating the flow from one step to another.

Table 1-1 Flowchart symbols

Symbol Description	Symbol Shape	Symbol Description	Symbol Shape	
Flow Line	⟶	Process	▭	
Start/Stop	⬭	Decision	◇	
Input/Output	▱	Connector	○ On-Page	⬠ Off-Page

Flow line: ⟶

It is a line with arrow head used to connect various flowchart symbols and indicates the flow of control in the flowchart.

Start/Stop Symbol:

It is a rounded rectangular shaped symbol. It is used to indicate the start or end of a flowchart. We can only write the words Start or Stop inside this symbol. A flowchart can only have on start but it may have many ends.

Input/Output Symbol:

Parallelogram represents input or output operations in a flowchart. It contains the word READ or INPUT along with the variables for input operation or PRINT or OUTPUT along with the output data for output operation.

Process Symbol:

A rectangular block is used for any data processing operation. All the calculations appear inside the processing symbol such as "SUM=A+B" Variables are also initialized inside the process symbol such as K=1

Decision Symbol
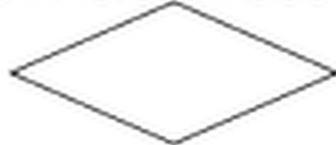
A diamond shaped symbol represents decision in a flowchart and it contains a condition. If the condition is true, the path marked YES is to be followed. If the condition is false, the path marked NO is to be followed. The words TRUE or FALSE can also be used instead YES or NO.

Connector Symbol

These symbols are used to connect one part of a flowchart to the other on the same page (On-page connector) or the new page (Off-page connector).

EXTENSIVE QUESTIONS

Q3. Describe the steps involved in problem solving.

Ans: The following Five steps are involved in problem solving on the computer.

i.   **Defining the Problem:**

Defining the problem is initial stage of problem solving. It is very important to understand the problem before the programmer starts working on its solution.

The following are the steps to properly define and understand the problem:

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

For example

Problem 1: A person is Unhappy with a Product or Service He/She has Purchased from A Company:

After reading the above statement, we understand that a customer has purchased any product or service from a Company and now the customer is not satisfied with it. This statement defines the problem clearly and requires the solution. It is a general type of problem.

Problem 2: Finding Average Marks of a Student:

It is clear from the problem statement that average marks of a student have to be found: This in numeric problem.

ii.   **Analyzing the Problem:**

At this stage of problem solving, the programmer investigates the problem and gathers as much information as possible to find a solution. The following questions are to 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 the best and why?
- How solution will be implemented?

To analyze the **Problem 1** (given above), the following points are to be kept in mind and some information is to be gathered.

Know the Outcome you Want:

- Think about what is important to you and what you want to achieve. For example, do you want a refund, a replacement?
- Would you like them provide the service again, this time meeting agreed standards?
- The more specific you are the more likely it is that you will get the outcome you want

Prepare for the Discussion:

- Find out about your legal rights
- Write down exactly what your complaint is, including details such as dates and times
- Gather any relevant paperwork, e.g. advertisement that misled you, or a quote that the trader gave you

Find out what the Organization's Complaint Process is and Follow this:

- Have a look on their website or on any documentation, they had given you

    To analyze Problem 2, the following information is required.

- What are the subject marks of the student in each subject?
- How many subjects are there?
- What is the formula to find the average marks?

iii.   **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.

    To plan the solution of the Problem 1 (given above), after analyzing the problem, the following planning is required.

How to discuss a Problem:

- Talk to the right person. The person you speak must have the ability to resolve the issue e.g. a store manager, business owner or supervisor.
- Focus on talking about the problem with the product or service, rather than taking issue with a person.
- Stay calm and reasonable. Explain the problem in detail and provide any evidence you may have.
- Tell them what outcome you want. It is the store or service provider's responsibility to resolve the problem, but it can be helpful to ask them for a specific solution.
- Expect questions. A store or service provider may ask you for more details.
- Ask to speak with someone else if you are not happy with the way the conversation is going. It is okay to walk away and come back later, or to follow up in writing.
- Listen to their response. Ask for time to consider it if you need to.

Consider Their Response:

- Does the response resolve your issue or Is it a reasonable comprise?
- Do you want to take the time and effort to carry on if the response is unsatisfactory?
- Based on what you know of your rights, do you think you have a solid basis to take the matter further?
  To solve the Problem 2 the following planning is required
- All subject marks are to be added together to find the sum of all the marks
- The sum is to be divided by the total number of subjects to find the average marks

iv.   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.

For example, many solutions can be considered to resolve the **Problem 1.**

Solution 1: The customer can lodge the complaint personally visiting the company.

Solution 2: The customer can also use the courier services to send the product back.

Solution 3: The customer can use company's website to file the complaint.

v.   **Select the Best Solution:**

After finding the candid solutions, only one solution can be selected. The selection of final solution of a problem should be based on the following criteria.

Speed:

The selected solution of the problem should be efficient. In other words, it means when the solution is implemented in a programming language, the program should run fast.

Cost:

The selected solution of the problem should provide a cost-effective way of implementation.

Complexity:

The selected solution of the problem should not be complicated. It should contain minimum number of instructions/simple steps.

Q4. Write an algorithm to calculate the area of a rectangle for given breadth and length.

Ans: Step 1:   Input the Width (W) and Length (L) of a rectangle

Step2: Calculate the area (A) by multiplying L with W

Step 3: Print A

Q5. Write an algorithm that inputs length in inches and calculate and prints it in centimeters.

Ans: Step 1: Input the length in inches (LI)

Step 2: Calculate the length in cm (LCM) by multiplying LI with 2.54

Step 3: Print LCM

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

Ans:

Step 1: Input Marks (M)

Step 2: Check if (M<33) then Print "FAIL" GOTO Step 4

Step 3: ELSE Print "PASS"

Step 4: Stop

Q7. Write an algorithm to find the sum of given sequence.

SUM= 20+25+30+40+45+50+55+60

Ans:

Step 1: Start

Initialize SUM to 0 and K=5

   SUM=0,K=5

Step 2: Add K to SUM

   SUM=SUM+K

Step 3: Increment K by 5

   K=K+5

Step 4: Check if the value of K is less than or equal to 60

   IF K≤100 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= 1×3×5×7×9×11×13×15

Ans:

Step 1: Start

   Initialize variable K to 1 and prod=1

   K=1   Prod=1

Step 2: Increment K by 2

   K= K+2

Step 3: Find the Product

   Prod= Prod ×k

Step 4: Check If the value of K is less than 16

   If K<16 THEN GOTO Step 2 otherwise GOTO Step 5

Step 5: Print product

        Print Prod

Step 6: Stop

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

Ans:

Step 1: Enter the number N whose table is to be generated

Step 2: Initialize the value of 1 with 10

        I=10

Step 3: Find the product of N and I

        Prod=N ×I

Step 4: Print N, I and Prod

    Print N   I and Prod

Step 5 Decrease the value of I by 1
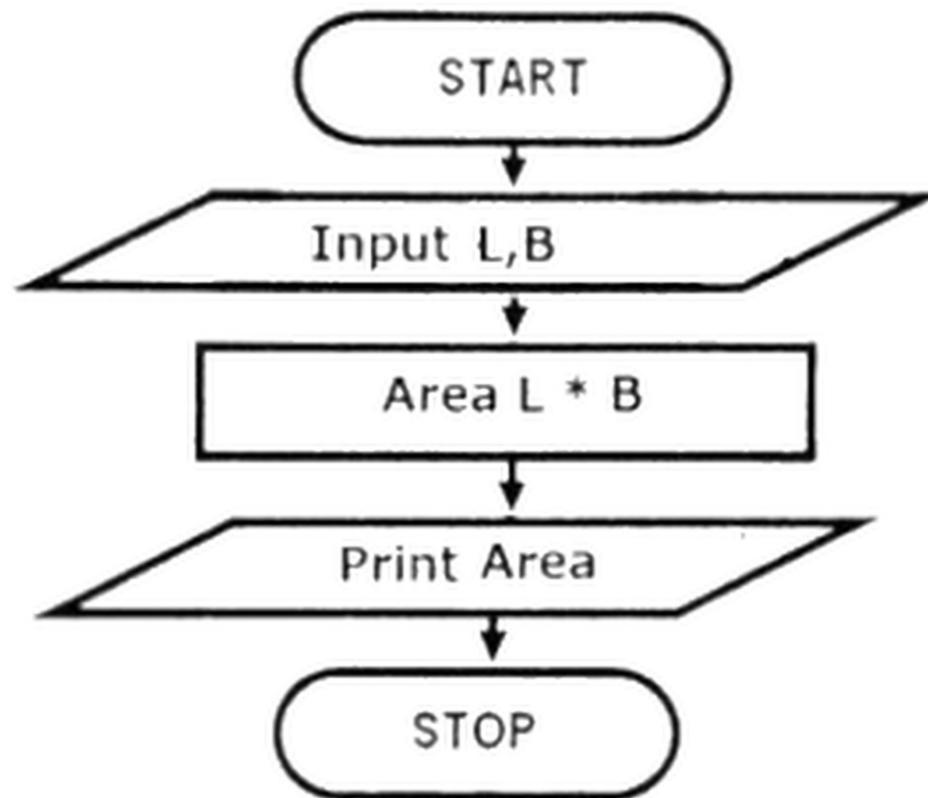
        I=I – 1

Step 6: If the value of I is > 0 then goto step 3 otherwise goto step 5
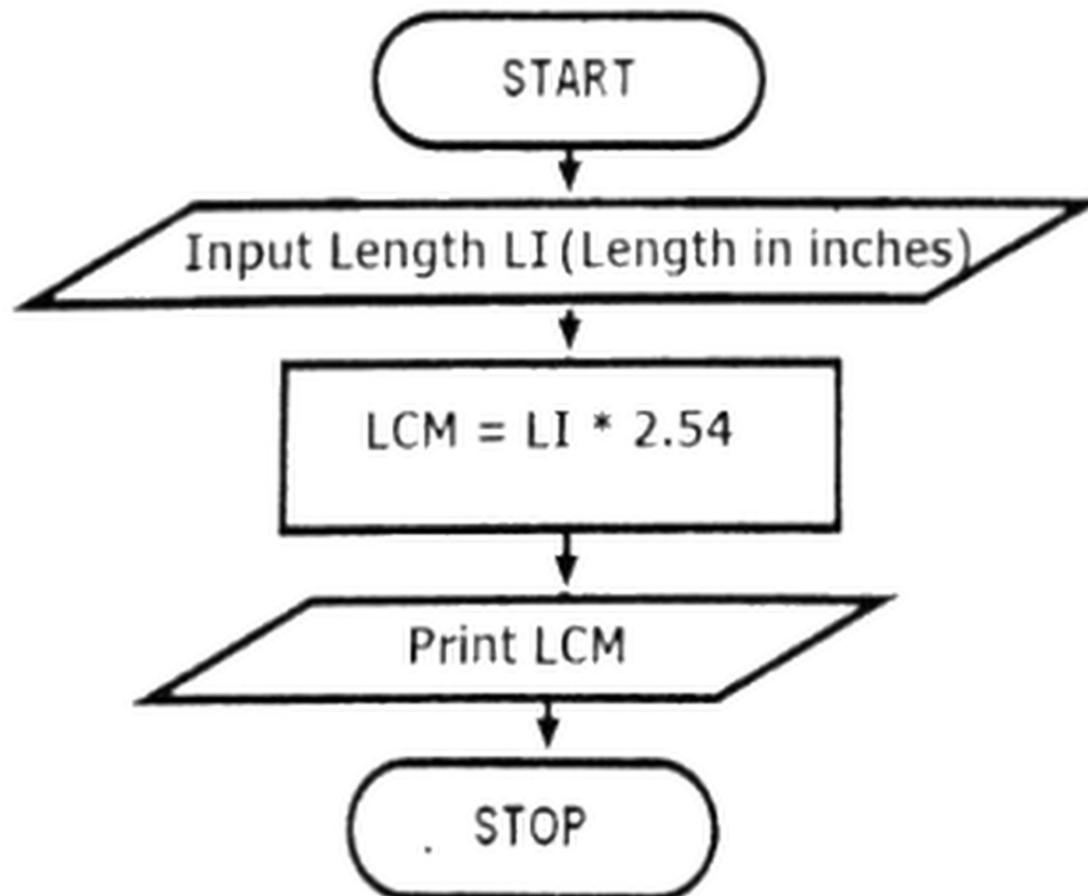
Step 7 stop

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

i.   **Write an algorithm to calculate the area of a rectangle for given breadth and length.**

Ans: Flowchart for the area of a rectangle for given breadth and length:

```
                          ┌─────────────┐
                          │    START    │
                          └─────────────┘
                                 │
                          ╱─────────────╲
                         ╱   Input  L,B   ╲
                        ╱─────────────────╲
                                 │
                          ┌─────────────┐
                          │   Area L * B  │
                          └─────────────┘
                                 │
                          ╱─────────────╲
                         ╱   Print Area   ╲
                        ╱─────────────────╲
                                 │
                          ┌─────────────┐
                          │     STOP    │
                          └─────────────┘
```

ii.   **Write an algorithm that inputs length in inches and calculate and prints it in centimeters.**

```
                          ┌─────────────┐
                          │    START    │
                          └─────────────┘
                                 │
                   ╱──────────────────────────────╲
                  ╱  Input Length LI (Length in inches) ╲
                 ╱──────────────────────────────────────╲
                                 │
                          ┌─────────────────┐
                          │  LCM = LI * 2.54  │
                          └─────────────────┘
                                 │
                          ╱─────────────╲
                         ╱   Print LCM    ╲
                        ╱─────────────────╲
                                 │
                          ┌─────────────┐
                          │  .  STOP    │
                          └─────────────┘
```
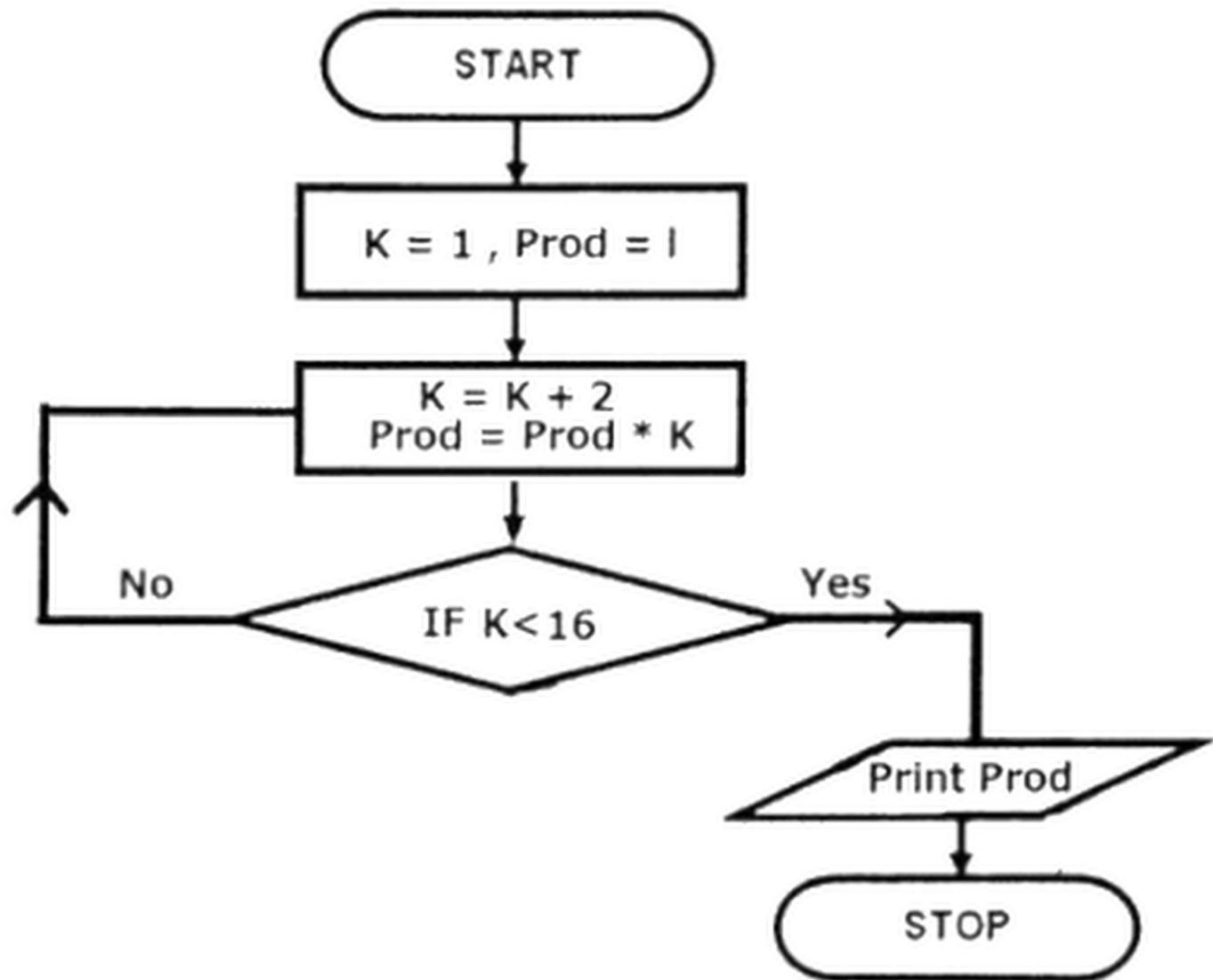
iii. **Write an algorithm that inputs marks and prints the message "PASS" or "FAIL". Passing marks are 33.**
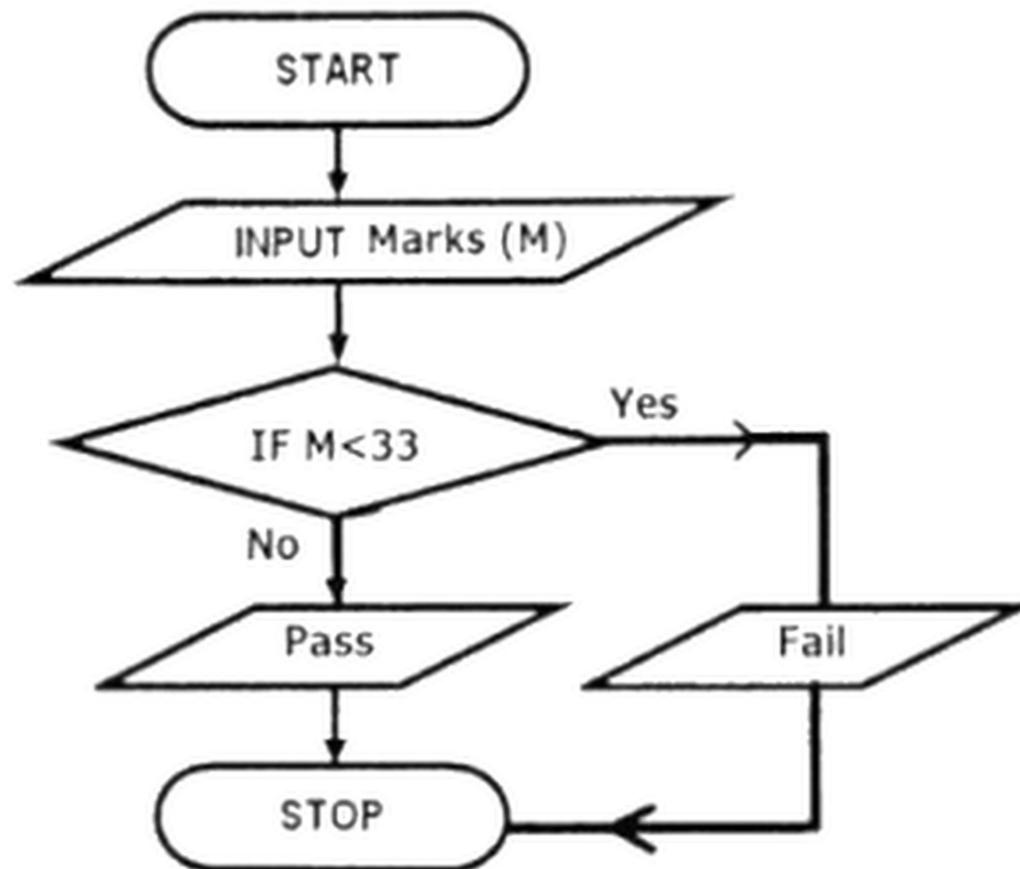
iv. **Write an algorithm to find the sum of given sequence.**
SUM= 20+25+30+35+40+45+50+55+60
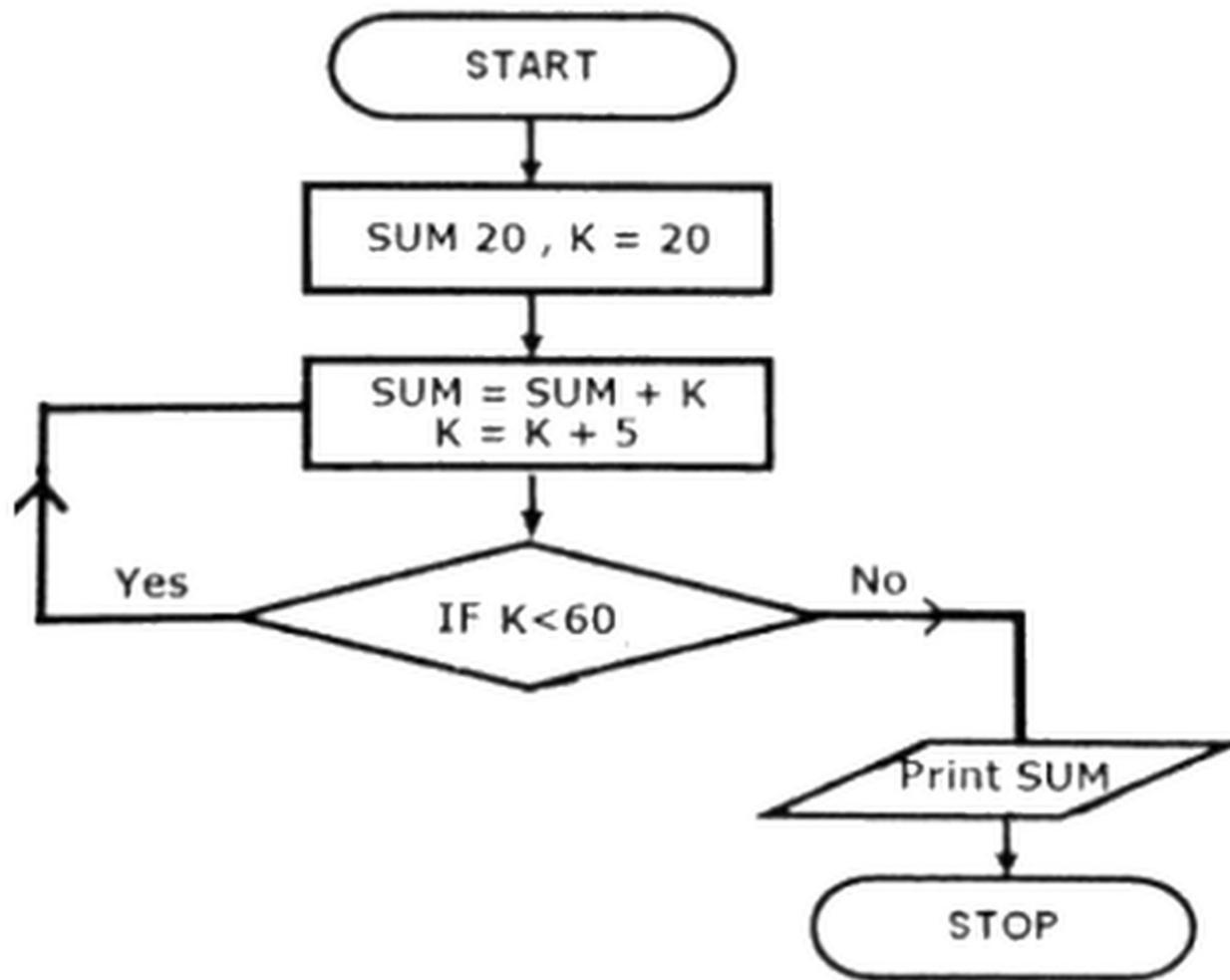
v.   **Write an algorithm to find the product of given numbers**
     PRODUCT=1*3*5*9*11*13*15

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

START

Enter a number N

I = 10

Prod = N * I

Print N, I, Prod

I = I - 1

Yes   IF I > 0   No

STOP