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Structured Programming

Lecture2 – Flowcharts

Flowcharts

The flowchart is a diagram that visually presents the flow of data through processing systems. Algorithms are nothing but a sequence of steps for solving problems. So a flowchart can be used for representing an algorithm. A flowchart will describe the operations are required to solve a given problem.

Flowchart Symbols There are 6 basic symbols commonly used in the flowcharting of assembly language Programs: Process, input/output, Decision, Connector, Terminal, and Flow Line Process. This is not a complete list of all the possible flowcharting symbols, it is the ones used most often in the structure of Assembly language programming.

Flowcharts

Symbol	Name	Function
	Process	Indicates any type of internal operation inside the Processor or Memory
	input/output	Used for any Input / Output (I/O) operation. Indicates that the computer is to obtain data or output results
	Decision	Used to ask a question that can be answered in a binary format (Yes/No, True/False)
	Connector	connects sections of the flowchart, so that the diagram can maintain a smooth, linear flow
	Terminal	indicates start or end of the program or algorithm
	Flow Lines	Shows direction of flow

General Rules for flowcharting

1. All boxes of the flowchart are connected with Arrows. (Not lines)
2. Flowchart symbols have an entry point on the top of the symbol with no other entry points. The exit point for all flowchart symbols is on the bottom except for the Decision symbol.
3. The Decision symbol has two exit points; these can be on the sides or the bottom and one side.
4. Generally, a flowchart will flow from top to bottom.
5. Connectors are used to connect breaks in the flowchart. Examples are:
 - From one page to another page.
 - From the bottom of the page to the top of the same page.
6. All flowcharts are start and end with a terminal symbol.

Types of flowchart

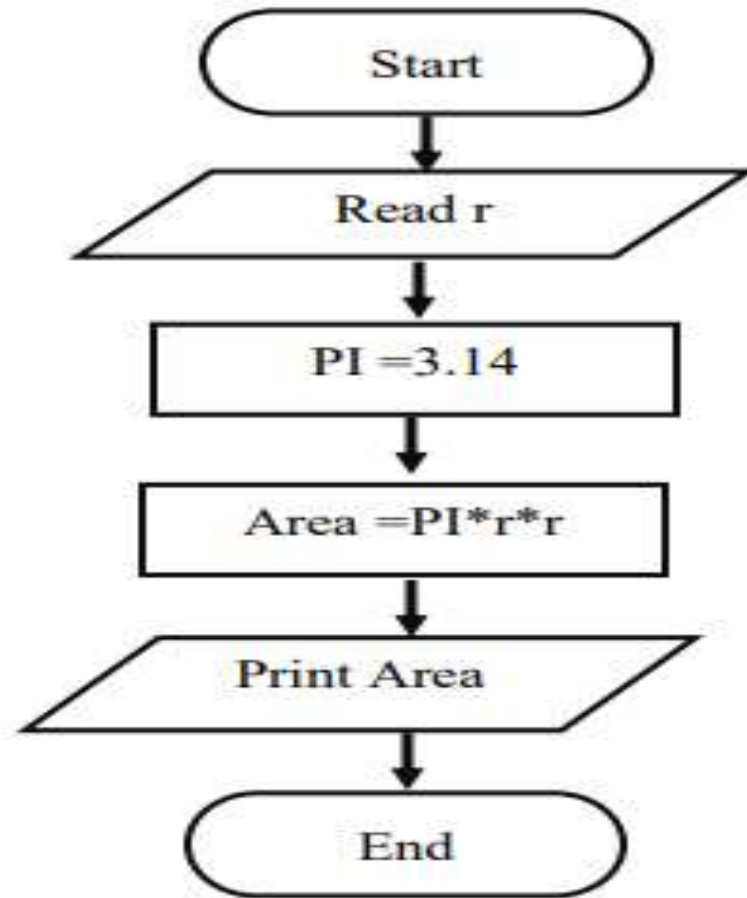
There are three types from flowcharts:

1. Simple Sequential Flowcharts
2. Branched Flowcharts
3. Loop Flowcharts

- Simple Sequential Flowcharts

The solution steps for this type of flowchart are arranged in a straight series from the beginning of the program to the end so that it is free of branches and loops

Example 1: Draw a flowchart to find the area of a circle of radius r .



Algorithm

Step1: Start

Step2: Read\input r

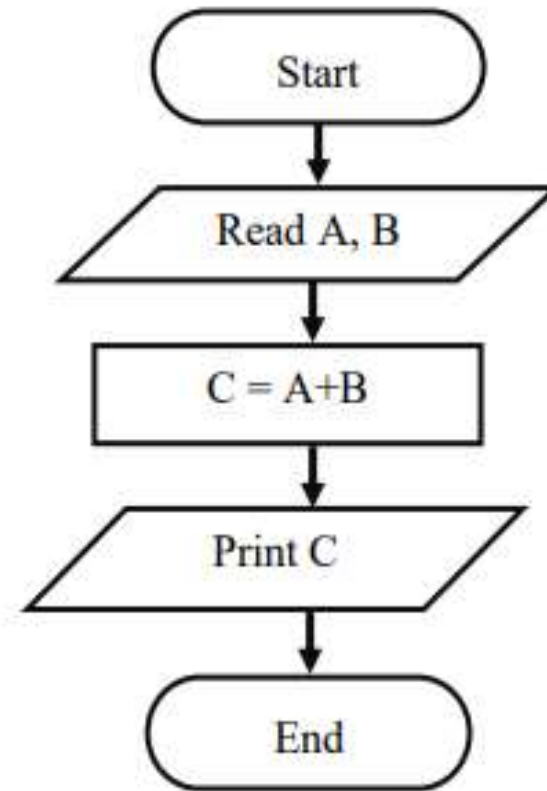
Step3: Input $\text{PI} \leftarrow 3.14$

Step4: $\text{Area} \leftarrow \text{PI} * r * r$

Step5: Print Area

Step6: End

Example 2: Draw a flowchart that gets two numbers and prints the sum of their value.



Algorithm

Step1: Start

Step2: Input A,B

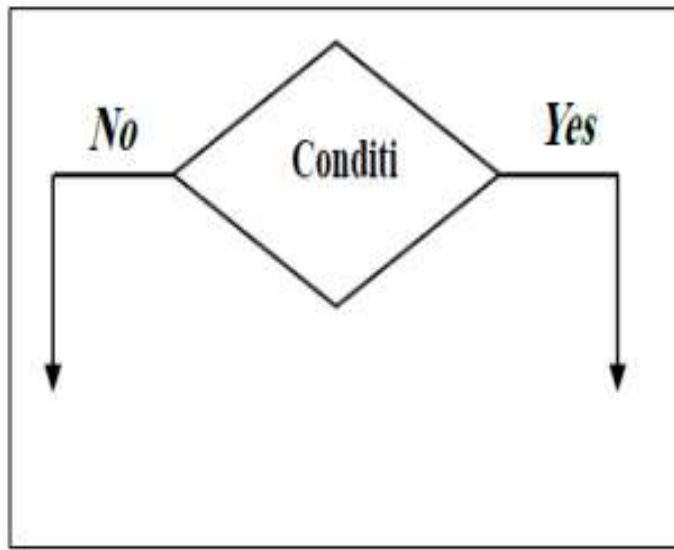
Step3: $C \leftarrow A + B$

Step4: Output C

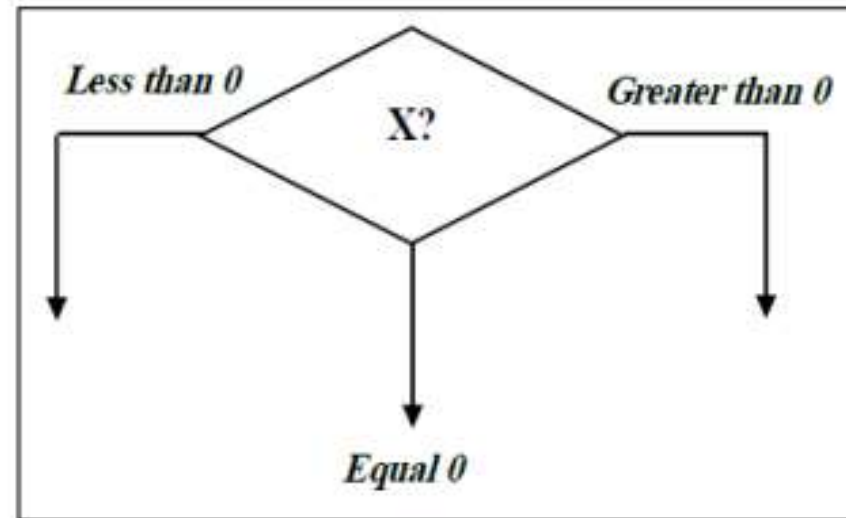
Step5: End

Types of flowchart

- **Branched Flowcharts**
- This type of flowchart is used when there is a need to make a decision or a tradeoff between two or more choices.
- There are two types of branched flowcharts as shown below:

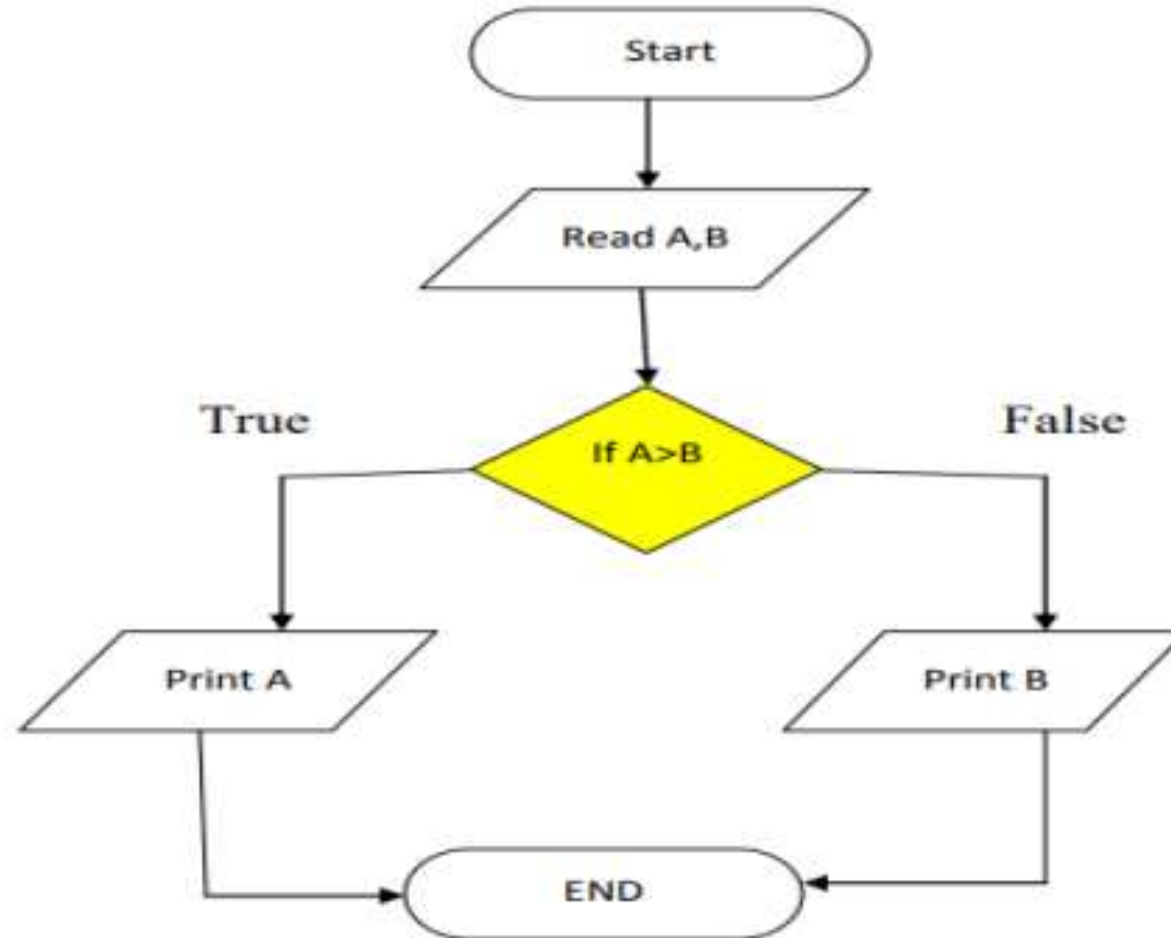


Two branches decision



Three branches decision

Example 3: Draw a flowchart to find the greater number between two numbers.



Algorithm

Step1: Start

Step2: Read/input A and B

Step3: If $A > B$ then

Step4: Print A

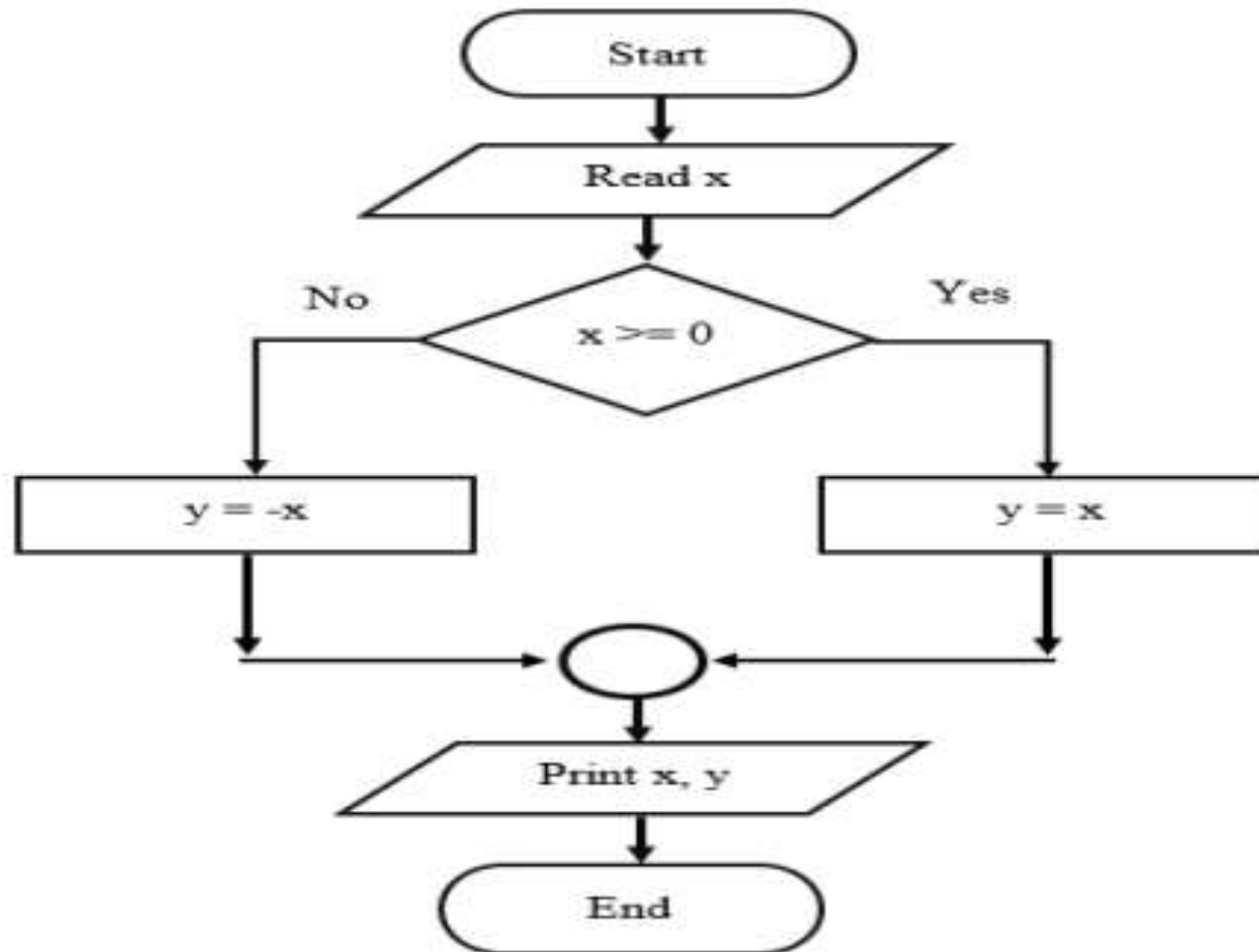
Step4: if $B > A$ then

Step5: Print B

Step6: End

Example 4: Draw a flowchart to find the value of y.

$$y = \begin{cases} -x, & \text{if } x < 0 \\ x, & \text{if } x \geq 0 \end{cases}$$



Step1: Start

Step2: input X

Step3: if $x \geq 0$ then $y = x$

Step4: if $x < 0$ then $y = -x$

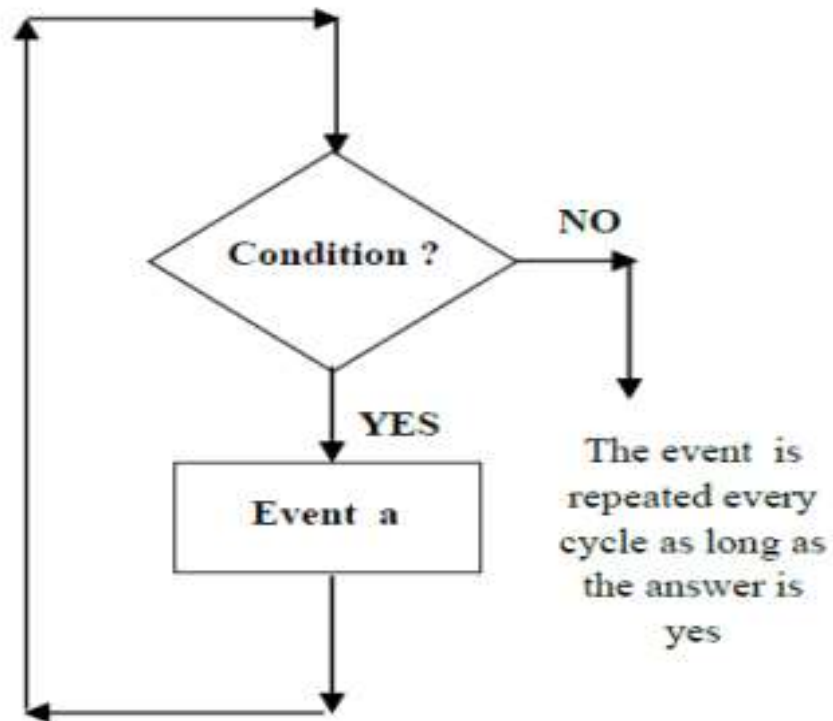
Step5: Print y

Step 6: End

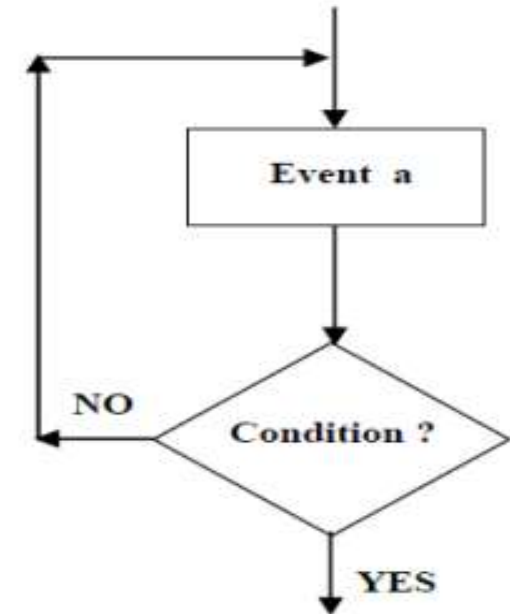
Types of flowchart

- Loop Flowcharts

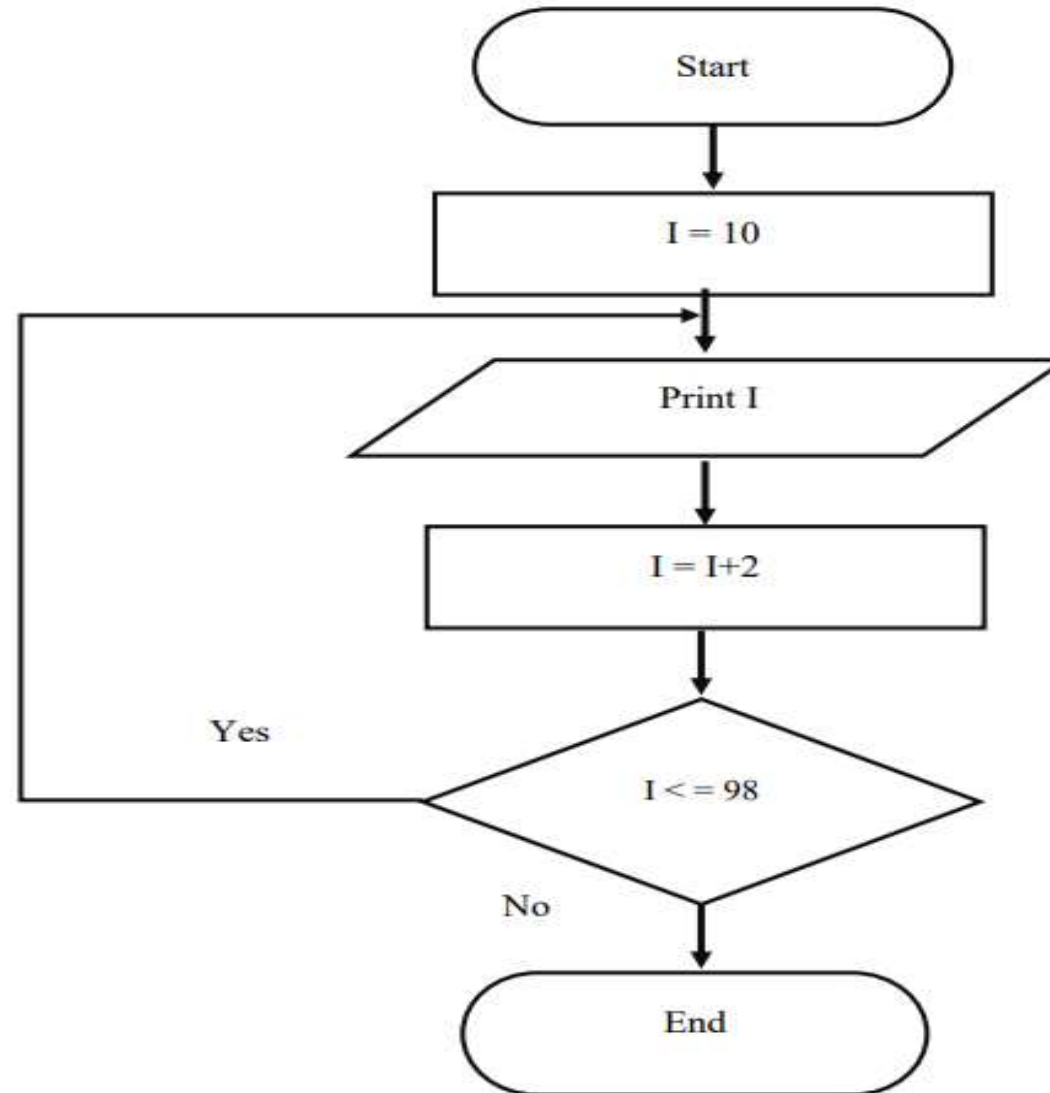
In this type of flowchart, we need to return a process or set of processes in the program a specific or unspecified number of times, and the overall form of these flowcharts is as follows:



The event is repeated every cycle until the answer is yes



Example 5: Draw a flowchart for printing even numbers between 9 and 99.



Algorithm

Step1: Start

Step2: $i = 10$

Step3: Print i

Step4: $i = i + 2$

Step5: If $(i \leq 98)$ then
go to line 3

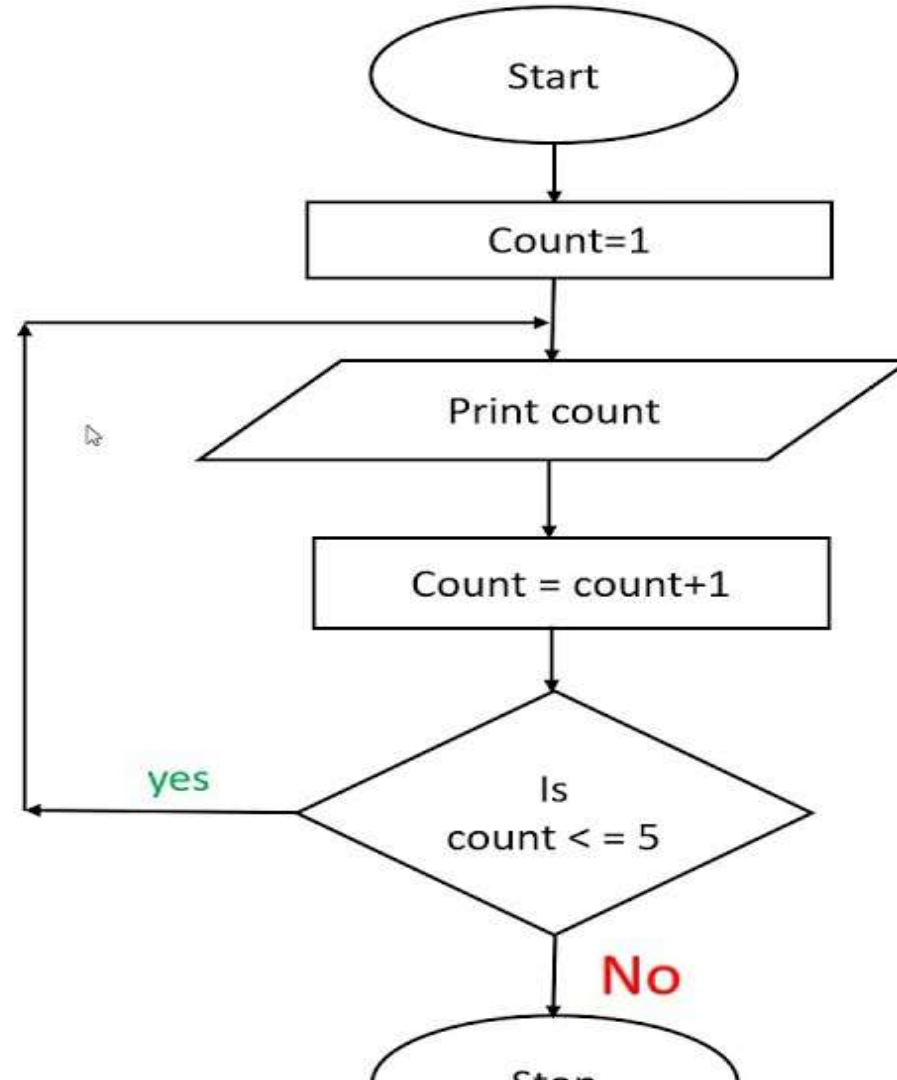
Step6: End

Example 6: Draw a flowchart that print the numbers between 1 to 5

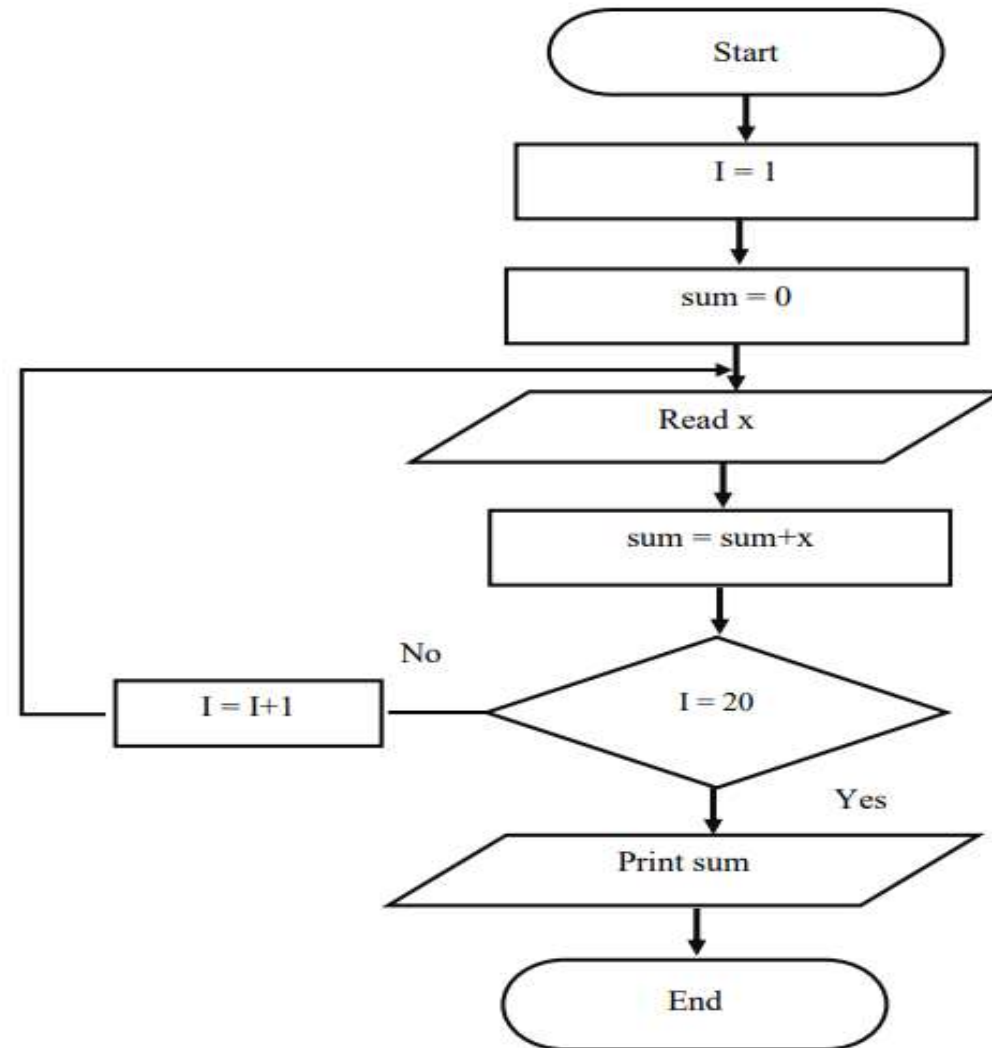
Flowchart to print 1 to 5 .

count
6 **+1**

1
2
3
4
5



Example 7: Draw a flowchart to find the sum of 20 numbers.



Exercises

1. Draw a flowchart to find the area and perimeter of circle have known radius (R).
2. Draw a flowchart to find the values of variables A, B, and C from the following equations

$$A = X^2 + 2Y$$

$$B = 2X - 3A$$

$$C = A^2 + XB$$

3. Draw a flowchart to print the series: 5,8,11,14,17.....50
4. Draw a flowchart to check the input number is odd or even.
5. Draw a flowchart to print the series: 2,4,8,16,32.....1024.