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Data
Structures
&
Algorithms

23/08/2023
Wednesday

* Algorithm -

Series or sequence of steps we need to follow to solve a problem is known as Algorithm.

for instance, algorithm to find simple interest →

(*Costumer's point of view*)

Step 1 - Take three inputs and store them in the variables P, R and T.

(*Input-output algorithm - 1*)

Step 2 - Multiply these variables and divide them by 100.
i.e. $\frac{P \cdot R \cdot T}{100}$.

(*Input-output algorithm - 2*)

Step 3 - Store the result in variable S.I.

Step 4 - Print S.I.

* How to Approach a problem?

• Understand the problem.

• Write input values.

(*Customer's point of view*)

• Create logic or algorithm.

(*Programmer's point of view*)

Problem Statement



Solution (Brain)



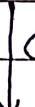
Rough solution

(Flowcharts, Pseudocodes)



User-friendly language → HLL

(source code)



Compiler

Machine level language

* FLOWCHARTS -

Flowchart is a graphical or diagrammatical representation of an algorithm.

* FLOWCHART COMPONENTS -

1.

(Terminator)

(Oval-shaped)

for start / end.

2. Input-output block (Parallelogram-shaped)

Input-output block

(Parallelogram-shaped)

(Start)

To read, write, print

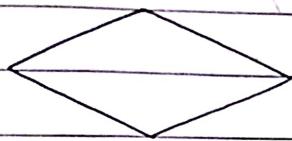
3. Process block (Rectangle-shaped)

Process block

(Rectangle-shaped)

for calculation, initialisation, declaration

4. Decision making block (Diamond-shaped)

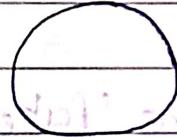


(Diamond)

Decision making block

for using conditions

5. Connectors (Circle-shaped)

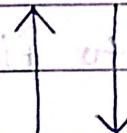


(Circle-shaped)

Connectors (circle) are used to connect

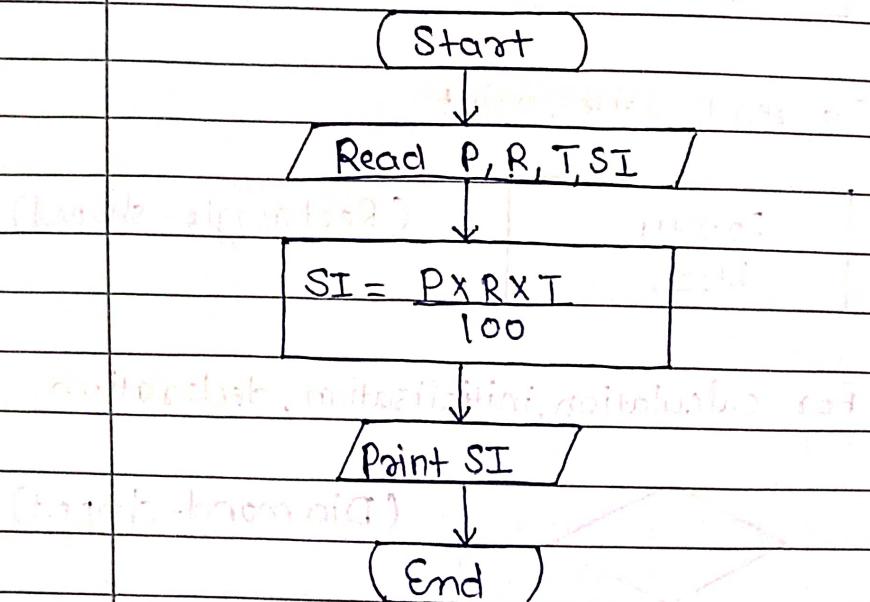
To connect different flowcharts

6. Arrows



Flow of execution

For instance, flowchart to find Simple Interest -



* PSEUDOCODES -

Pseudocode literally means 'fake code'. It is used to represent an algorithm in a form that humans can easily understand.

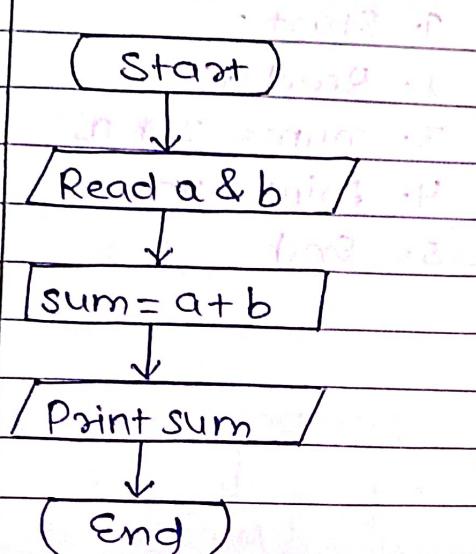
for instance, Pseudocode to find simple Interest -

1. Start.
2. Read P, R, T, SI.
3. $SI = \frac{P \times R \times T}{100}$
4. Print SI.
5. End.

Some Flowcharts and Pseudocodes -

1. To add two numbers -

Flowchart

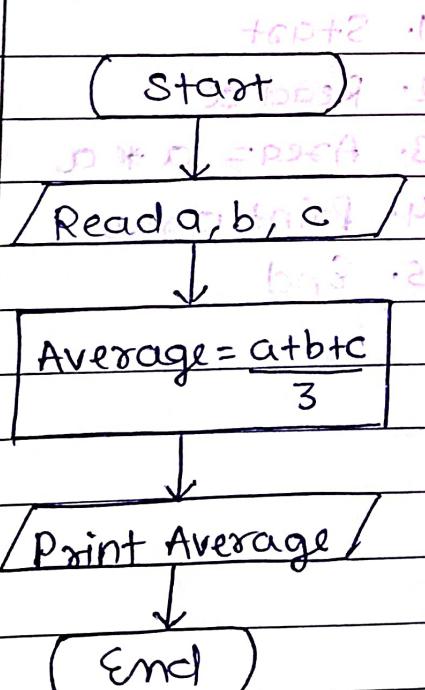


Pseudocode

1. Start
2. Read a & b
3. Sum = a + b
4. Print sum
5. End.

2. To calculate average of three numbers -

Flowchart

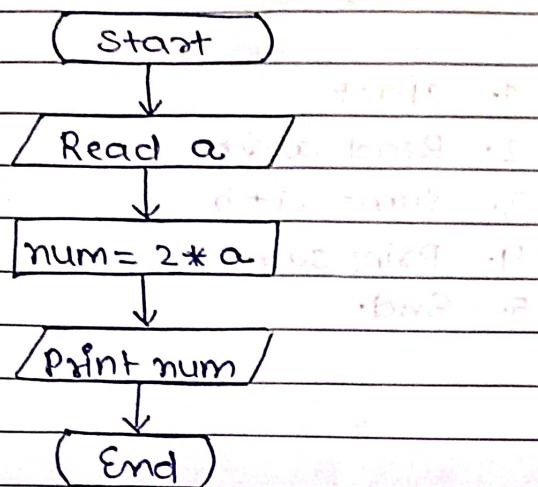


Pseudocode

1. Start
2. Read a, b, c
3. Average = $a+b+c$ / 3
4. Print Average
5. End

3. Print twice of a number -

Flowchart

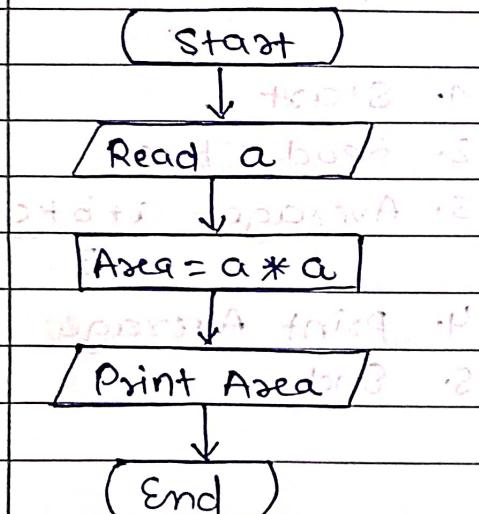


Pseudocode

```
1. Start.  
2. Read a  
3. num = 2 * a  
4. Print num  
5. End
```

4. Print Area of square -

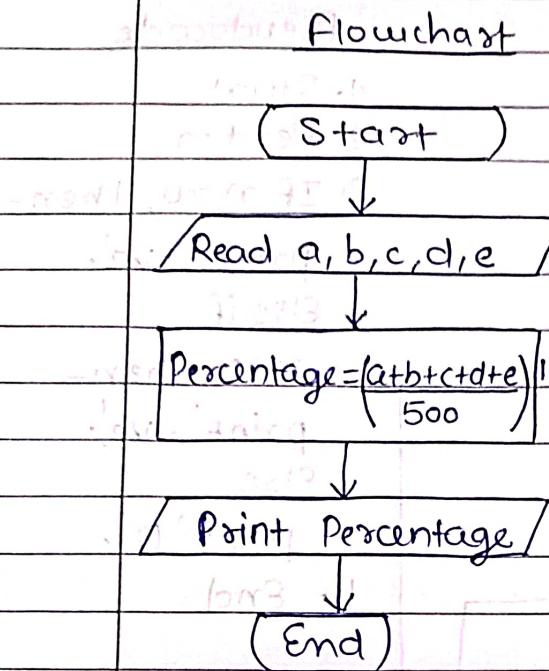
Flowchart



Pseudocode

```
1. Start  
2. Read a  
3. Area = a * a  
4. Print area  
5. End
```

5. Calculate overall percentage from marks -

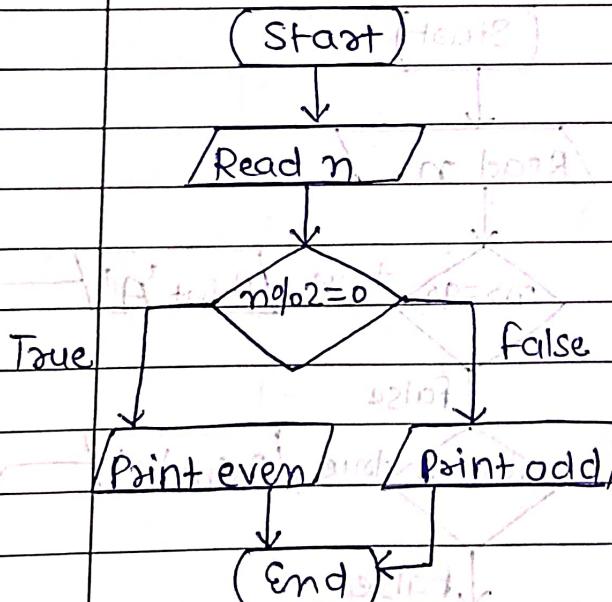


Pseudocode

1. Start
2. Read a, b, c, d, e
3. Percentage = $\frac{a+b+c+d+e}{500} \times 100$
4. Print Percentage.
5. End.

6. Check number is even or odd -

Flowchart Pseudocode

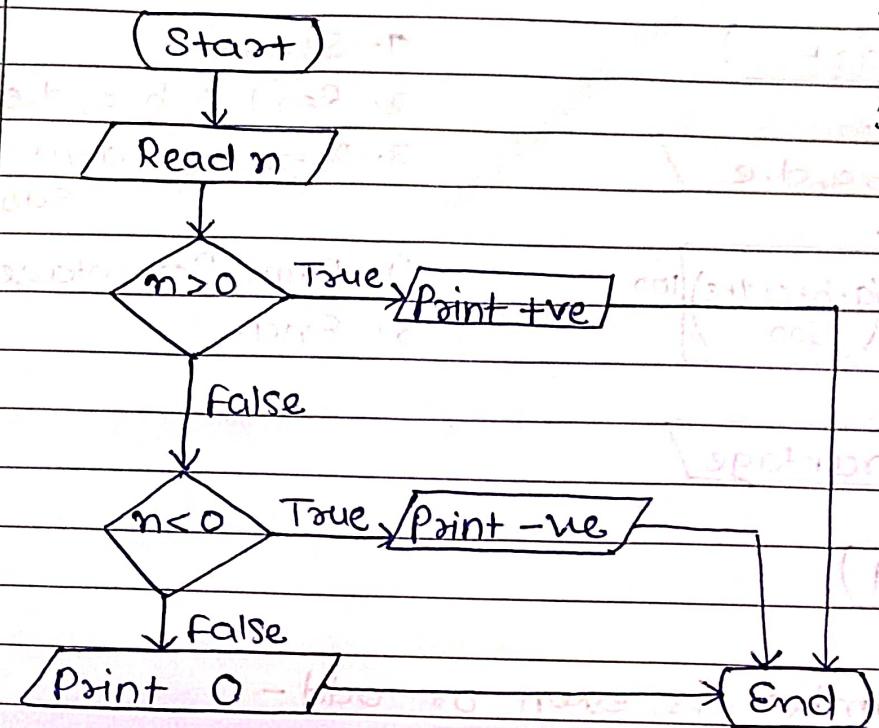


Pseudocode

1. Start
2. Read n.
3. If $n \% 2 = 0$, then-
 print 'even'
 else
 print 'odd'
4. End.

7. Check +ve, -ve or 0 →

Flowchart

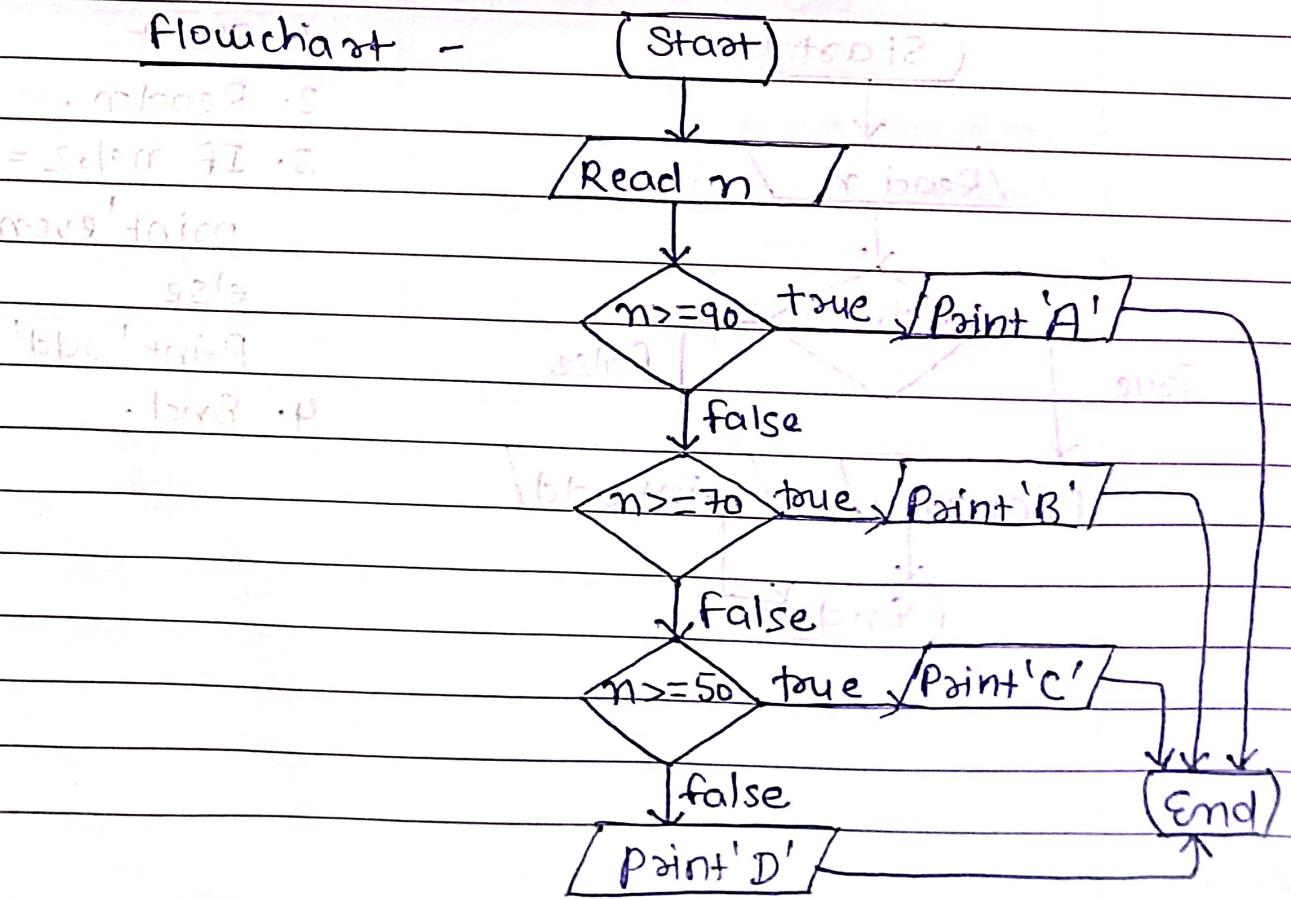


Pseudocode

```
1. Start  
2. Read n  
3. If  $n > 0$ , then-  
   print '+ve'.  
Else if  
    $n < 0$ , then-  
   print '-ve'.  
Else  
   print '0'.  
4. End
```

8. Student & Grade flowchart →

Flowchart -



Pseudocode - 1. Start

2. Read n

3. If $n \geq 90$, then -

 Print 'A'

 Else if, $n \geq 70$, then -

 Print 'B'

 Else if, $n \geq 50$, then -

 Print 'C'

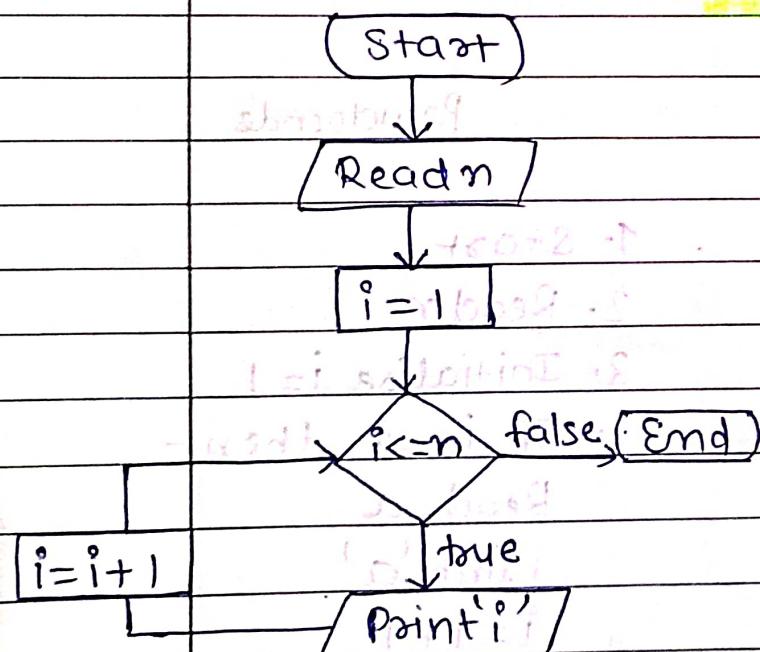
 Else

 Print 'D'

4. Stop.

9. Print counting from 1 to N -

Flowchart



Pseudocode

1. Start

2. Read n

3. Initialise $i = 1$

4. If $i \leq n$, then -

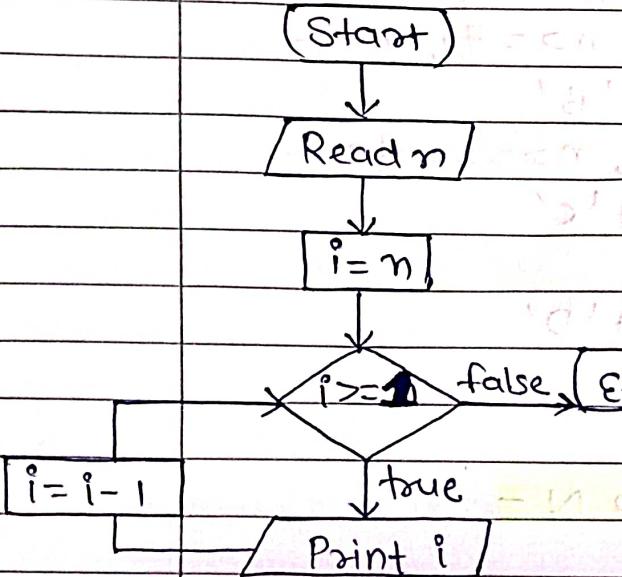
 print 'i'

$i = i + 1$

5. When condition goes false
exit the loop.

10. Print counting from N to 1 -

Flowchart

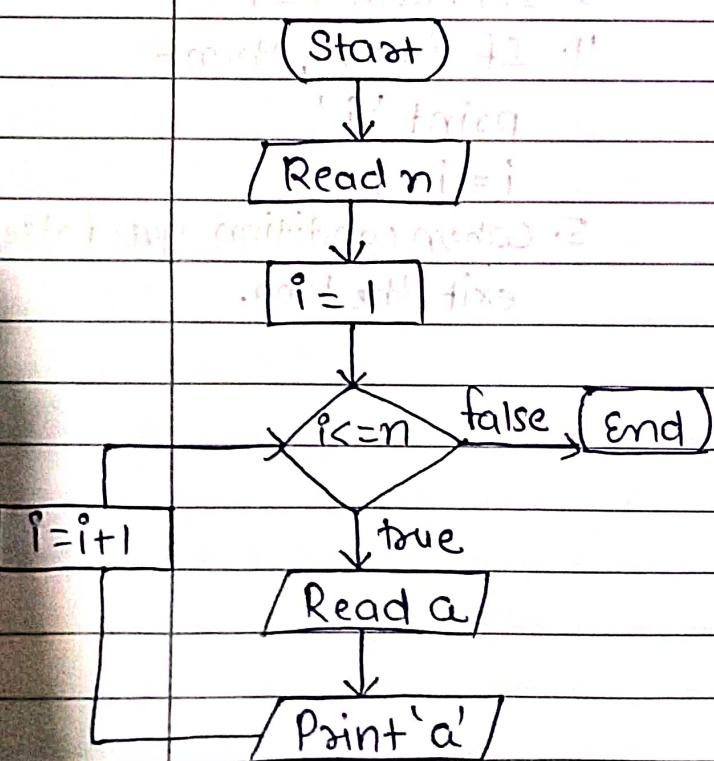


Pseudocode

1. Start
2. Read n
3. Initialise $i = n$
4. IF $i \geq 1$, then -
 - print i
 - $i = i - 1$
5. When condition goes false, exit the loop.

11. Taking input n times -

Flowchart

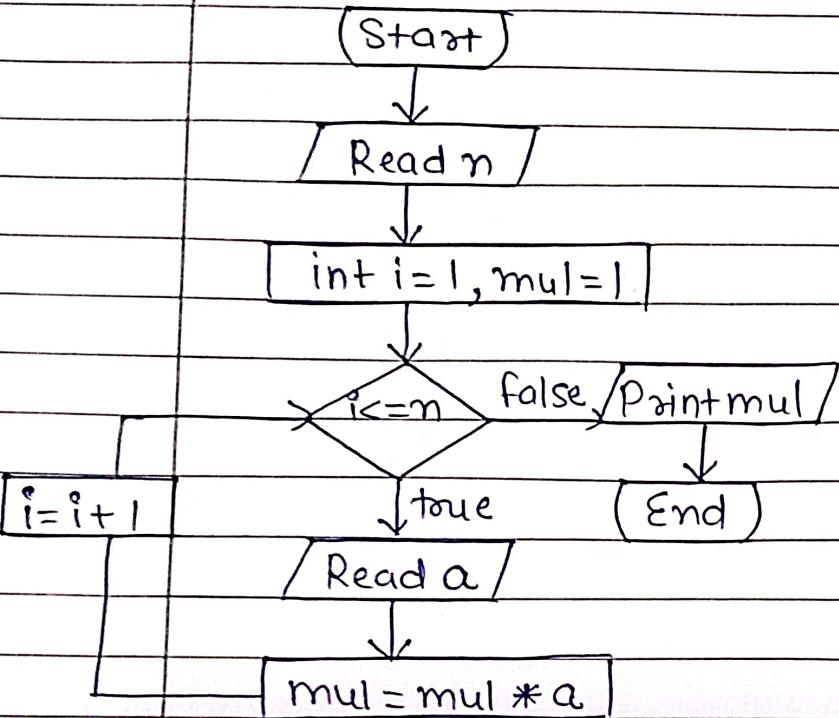


Pseudocode

1. Start
2. Read n
3. Initialise $i = 1$
4. If $i \leq n$, then -
 - Read a
 - Print 'a'
 - $i = i + 1$
5. When condition goes false, exit the loop.

12. Multiply n numbers from user -

Flowchart

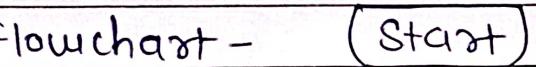


Pseudocode

1. Start
2. Read n
3. Initialise $i=1, \text{mul}=1$
4. If $i \leq n$, then -
 - Read a
 - $\text{mul} = \text{mul} * a$
 - $i = i + 1$
5. When goes false, point mul and exit the loop.

13. Print 1 to N but only even numbers -

Flowchart -



Pseudocode

1. Start
2. Read n
3. Initialise $i=1$
4. If $i \leq n$, then -
 - if $i \% 2 = 0$, then-
 - print i
 - (a) $i = i + 1$
 - when false, goto step (a).
5. When $i \leq n$ goes false, exit the loop.