

# Topic:- what and why do we need loop statement.

Example 1:-

Case 1:-

o/p Console	
*	→ one time

Case 2:-

o/p Console	
*	} → seven time
*	
*	
*	
*	
*	
*	

Case 3:-

o/p Console	
*	} → 1 Lack time than
*	
*	
*	
*	
*	
100000	

so pln ("\*");

```

so pln ("*");
so pln ("*");
so pln ("*");
so pln ("*");
so pln ("*");
so pln ("*");
so pln ("*");

```

step by multiple time

Example 2:-

Case 1:-

o/p Console	
1	
2	
3	
4	
5	

so pln (1);

o/p Console

1
2
3
4
5

int q = 1;

```

so pln (a);
a = a + 1;

```

```

so pln ("1");
so pln ("2");
so pln ("3");
so pln ("4");
so pln ("5");

```

o/p:- 1  
1  
1  
1  
1

X

✓

Why do we need loop statement in java?  
Loop is a statement in java, it helps the programmer to execute a set of instruction repeatedly multiple times.

## Types of Loop Statement :-

- while
- do while
- for
- for each / enhanced for

## While :-

### Syntax :-

while (condition)  
statement ;

OR

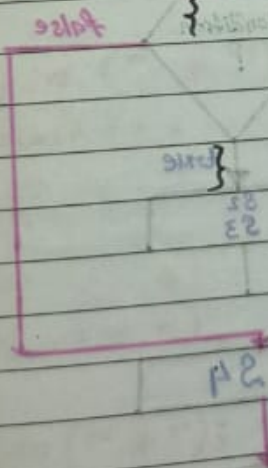
while (condition)

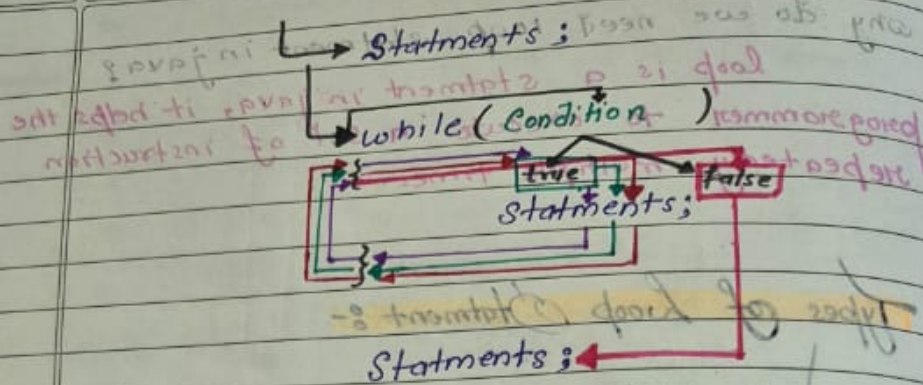
{

statement 1 ;

statement 2 ;

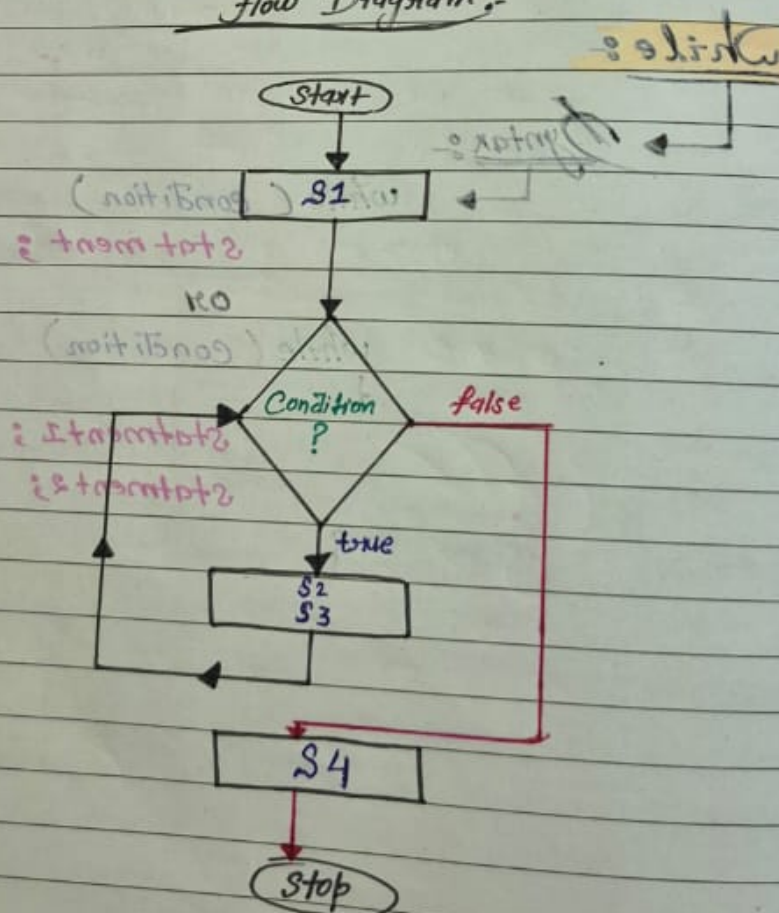
}





"Here Condition is used to iterate the loop if condition is true iterates if false Terminates from the loop."

### Flow Diagram:-



Write a java program to print \* 5 times.

Count = 0	✓	→	*	print
1	✓	→	*	print
2	✓	→	*	print
3	✓	→	*	print
4	✓	→	*	print
5	X	→	X	terminated from loop.

Condition :-

Count <= 4	Count < 5
0 <= 4 ✓	0 < 5 ✓
+1 1 <= 4 ✓	1 < 5 ✓
+1 2 <= 4 ✓	2 < 5 ✓
+1 3 <= 4 ✓	3 < 5 ✓
+1 4 <= 4 ✓	4 < 5 ✓
+1 5 <= 4 X	5 < 5 X

→ Code :-

```

int Count = 0;
while (Count < 5)
{
    println("*");
    Count++;
}

```

Example:-

```

int Count = 0;
while (Count < 5)
{
    println("*");
    Count = Count + 1; // Count += 1; // Count++;
}

```

Q7 write a java program to print multiples of 3 upto 10 times.

one operand and operator is common.

3	x	1	=	3
3	x	2	=	6
3	x	3	=	9
...				
3	x	10	=	30

This part of data is changing by increasing the current value by 1

Code:-

class Program1

public static void main (String[] args)

int no = 1;

while (no <= 10)

System.out.println(3 \* no);

no++;

\*

Count++

Topic :-

```
int i = 3;
```

```
while (i <= 8) {
```

```
if (i % 2 == 0) {
    solve(i);
}
```

```
    }  
    i++;
```

3

2. Interpretation

$$2m^2 + 9m + 12$$

## Tracing

i	<del>3</del>	<del>4</del>	<del>5</del>	<del>6</del>	<del>7</del>	<del>8</del>	9
---	--------------	--------------	--------------	--------------	--------------	--------------	---

*i*

3


$$j \leq 8$$
$$3 \leq \delta \rightarrow T$$
$$\text{if } (3 \% 2 \Rightarrow 1 == 0) \rightarrow F$$

4

$$4 \leq 8 \rightarrow T$$

$i \neq (4 \% 2 \Rightarrow 0 \neq 0) \rightarrow T$  print  $\rightarrow 4$

5

.. ②  $5 < 8 \rightarrow \neg$

$$\text{if } (54.2 \Rightarrow 1 = F0) \rightarrow F$$

6

$$6 \leq 8 \rightarrow T$$

if (67.2 == 0.0) → T print → 6

7

$$7 \leq 8 \rightarrow T$$

if  $(7 \% 2 \Rightarrow 1 == 0) \rightarrow F$

8

$$\delta < \epsilon \rightarrow T + \text{asm} + \text{tbl}$$

if (8%2 == 0) → T print 8

9

$$g \leq f \rightarrow F$$

↳ Terminated from the loop

# do while :- it is a loop statement in java, it uses 2 keywords

do  
while

Syntax :-

```
do {
    statement1;
    statement2;
    :
} while (condition);
```

Work flow :-

Statement;

do {

statement 1;

statement 2;

:

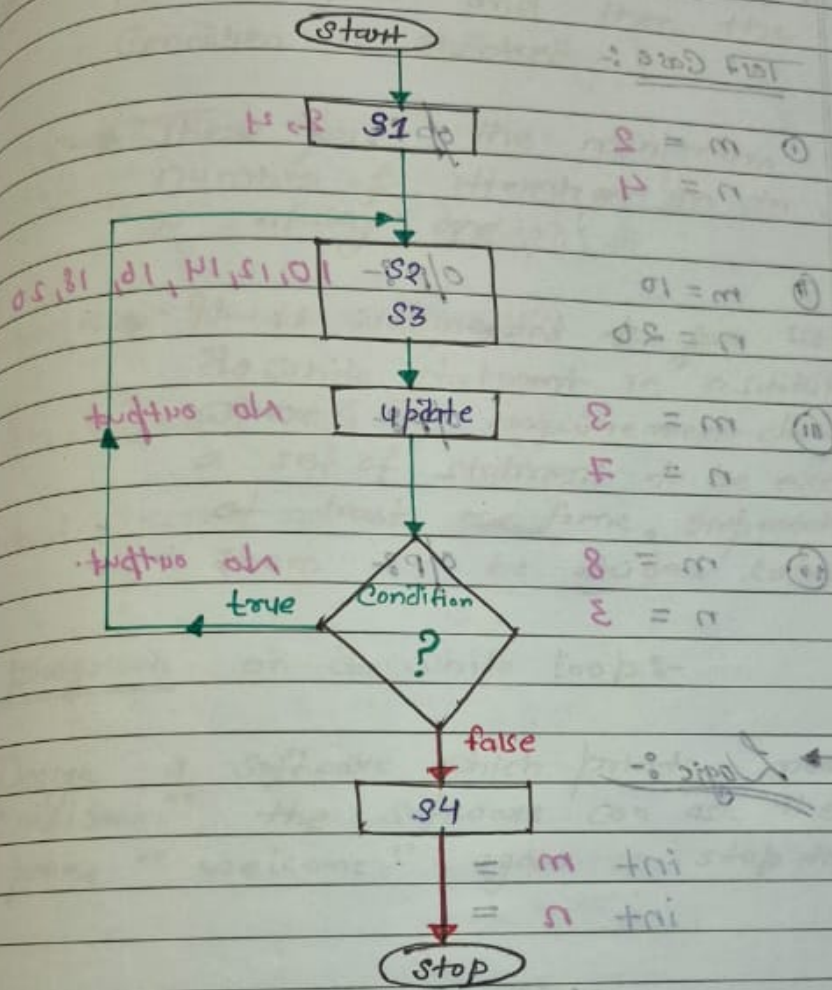
while (condition);

Statement;

;

do while loop

# Flow Diagram :-



$(0 == m \% n) ? 1$   
 $:(m) \text{ nldog}$   
 $++m$   
 $:(n > m) \text{ glidog}$

Q7 write a java program to print even nos  
between range of  $m$  &  $n$  ( $m < n$ )

Test Case :-

(i)  $m = 2$   
 $n = 4$

o/p :- 2, 4

(ii)  $m = 10$   
 $n = 20$

o/p :- 10, 12, 14, 16, 18, 20

(iii)  $m = 3$   
 $n = 7$

o/p :- No output

(iv)  $m = 8$   
 $n = 3$

o/p :- No output.

→ Logic :-

int  $m =$   
int  $n =$

do {

if ( $m \% 2 == 0$ )

$\text{Sopln}(m);$

$m++;$

}

while ( $m < n$ );

→ In do while statement loop block is executed first and then the condition is checked.

→ There is no minimum number of iteration in do while as it is "always" executed.

→ It is recommended to use do while statement in a situation where the requirement demands a set of statement to be executed at least one time, repetition of them will be decided later.

→ Program on do while loop:-

Design a software which prints a message "welcome", the software can ask the user print "welcome" again or stop the software.

TC1:-

welcome

Do you want to print again

Y

welcome

Do you want to print again

TC2:-

welcome

Do you want to print again

N

→ Code :

```

class Program2
{
    public static void main (String[] args)
    {
        Scanner s = new Scanner(System.in);
        do {
            s.nextLine();
            System.out.println("Welcome");
            System.out.println("Do you want to print again?");
            System.out.println("Type Y for yes, N for no");
            char ch = s.next().charAt(0);
            while (ch == 'Y');
            // for lower case only
            (ch == 'y' || ch == 'Y')
            // for both case
        } while (ch == 'Y' || ch == 'y');
    }
}

```

TC 1 -	TC 2 -
welcome	welcome
Do you want to print again?	Do you want to print again?
Y	Y
welcome	welcome
Do you want to print again?	Do you want to print again?

## for loop :-

It is a keyword, used as loop statement.

### Syntax :-

**for** (initialization ; condition ; updation)

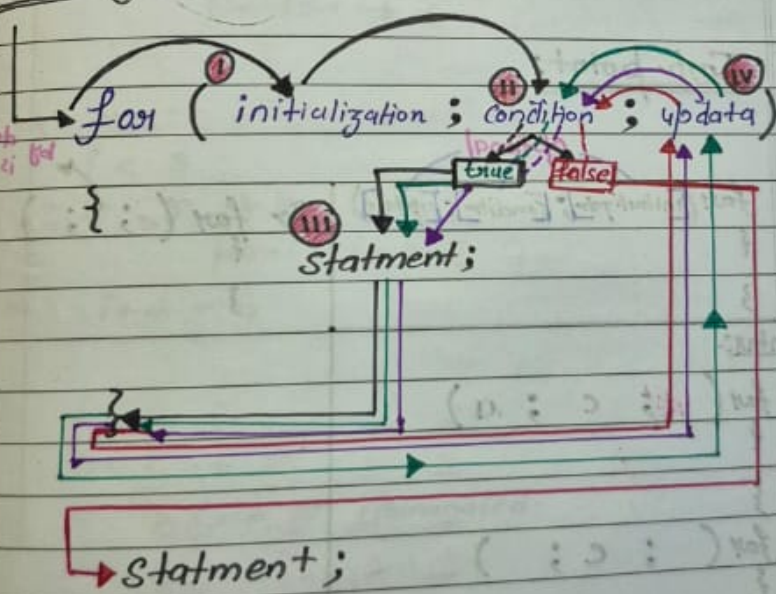
statement;  
statement;

if only one statement is present that braces are optional.

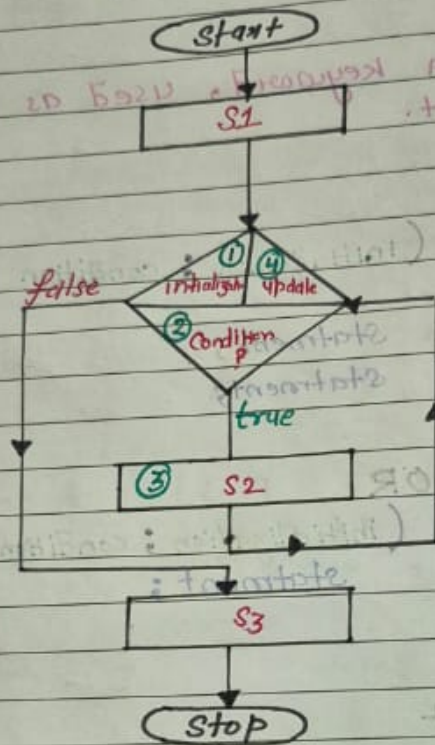
OR

**for** (initialization ; condition ; updation)  
statement;

### Work flow :-



## Workflow :-



## Imp. point:

for (initial; *optional* condition; *optional* update)

for ( ; ; )

by default condition is true every time

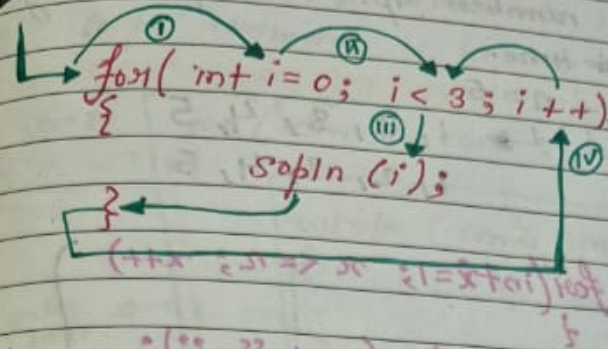
## Syntax:-

1) for ( ; c ; u )  
{  
}  
2) for ( ; c ; )  
{  
}

# Topic:- Tracing of for loop:-

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→ Code:-



i		$i < 3$
0	$0 < 3 \rightarrow T$ $print:- i \rightarrow 0$ $i++ \rightarrow 1$	
1	$1 < 3 \rightarrow T$ $print:- i \rightarrow 1$ $i++ \rightarrow 2$	
2	$2 < 3 \rightarrow T$ $print:- i \rightarrow 2$ $i++ \rightarrow 3$	
3	$3 < 3 \rightarrow F$ Loop is Terminated.	

## Topic:- Nested Loop:-

q) print numbers upto  $n$  separated by comma.  
n ~~this~~ time.

TC:-  $n=5$   
 $\rightarrow 1, 2, 3, 4, 5$   
 $1, 2, 3, 4, 5$

```
for(int x=1; x <= n; x++)
```

```
    printf("%d, ", x);
```

```
}
```

X 

```
for(int x=1; x <= n; x++)
```

```
    printf("%d, ", x);
```

This is not good way because if i want to print 100 times then i have to write for loop 100 times

```
for(int i=1; i <= n; i++)
```

```
    for(int x=1; x <= n; x++)
```

```
        printf("%d, ", x);
```

```
    }
```

$\rightarrow$  o/p:-  $n=5;$

1, 2, 3, 4, 5

1, 2, 3, 4, 5

1, 2, 3, 4, 5

1, 2, 3, 4, 5

1, 2, 3, 4, 5

# Nested loops

Placing a loop statement inside another loop statement is known as nested loop.

```

Ex- for (init; cond; updation)
    {
        while (condition)
        {
            // inner loop
        }
    }
    // outer loop
    
```

## Work flow of nested loop :-

0	$i < 2$ $0 < 2 \rightarrow T$	$for(int i=0; i < 2; i++)$
j	$0 < 2$ $0 < 2 \rightarrow T$ $i * j = 0 * 0 = 0$ $1 < 2$ $1 < 2 \rightarrow T$ $i * j = 0 * 1 = 0$ $2 < 2$ $2 < 2 \rightarrow F$	$for(int j=0; j < 2; j++)$ $\{$ $soln(i * j);$ $\}$ $soln(j);$
1	$i < 2$ $1 < 2 \rightarrow T$ $0 < 2$ $0 < 2 \rightarrow T$ $i * j = 1 * 0 = 0$ $1 < 2$ $1 < 2 \rightarrow T$ $i * j = 1 * 1 = 1$ $2 < 2$ $2 < 2 \rightarrow F$	$\}$ $\}$ $\}$
2	$i < 2$ $2 < 2 \rightarrow F$	<p>Loop terminated.</p>

Work flow:-

inner loop get fully executed for every iteration (cycle) of the outer loop.

Topic:- program on loop statements:-

Q.P1:- write a java program to print the Factorial of (the given) numbers.

TC1:- i/p:- 3 o/p:- 6

TC2:- i/p:- 5 o/p:- 120

TC3:- i/p:- 9 o/p:- 362880

$$3! = 3 * 2 * 1$$

$$5! = 5 * 4 * 3 * 2 * 1$$

$$9! = 9 * 8 * 7 * 6 * 5 * 4 * 3 * 2 * 1$$

→ Code:-

for loop class Factorial

```

public static void main (String[] args)
{
    int prod = 1;
    int no = 0;
    for (int i = 1; i <= no; i++)
    {
        prod = prod * i;
    }
    println (prod);
}

```

while loop :-

```

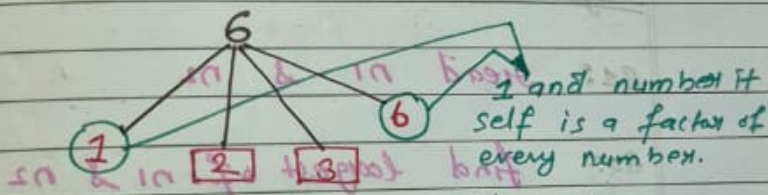
int result = 1;
int i = 2;
while (i <= n)
{
    result = i * result;
    i++;
}
sopl(result);
    
```

Program 2 :-

Write a program to find the factors for a given natural numbers.

TC1 :- i/p :- 9 o/p :- 1, 3, 9

TC2 :- i/p :- 15 o/p :- 1, 3, 5, 15



for loop

```

int no = ; int i = 2;
for (int i = 2; i <= no/2; i++)
    if (no % i == 0)
        sopl(i);
    
```

while loop

```

int no = ; int i = 2;
while (i <= no/2)
{
    if (no % i == 0)
        sopl(i);
    i++;
}
    
```

### Program 4:-

write a program to calculate the GCD (HCF) of two given natural numbers.

TC1:-  $n_1 = 15$   $i/p = 25$   $d/p = 5$

TC2:-  $i/p = 6$   $(n_1/p = 9)$   $d/p = 3$

$n_1 = 15 \rightarrow 1, 3, 5, 15$   
 $n_2 = 25 \rightarrow 1, 5, 25$   
 $\therefore (+ \text{HCF}) \text{ nldo2}$   
 $\text{HCF} \rightarrow 5$

$n_1 = 18 \rightarrow 1, 2, 3, 6, 9, 18$   
 $n_2 = 36 \rightarrow 1, 2, 3, 4, 6, 9, 12, 18, 36$

$\therefore \text{HCF} \rightarrow 18$

### Algorithm:-

S1:- Read  $n_1$  &  $n_2$

S2:- find largest of  $n_1$  &  $n_2$

S3:- initialize  $\text{HCF} = 1$  ;  $i = \text{on } + n_1$   
 $\therefore i = i + n_1$  ( $+1$  :  $\text{on } + n_1$  ;  $i = i + n_1$ ) ref

S4:- find HCF

4.1:- check for (if from  $i$  & largest  $\neq 2$  upto 2

4.2:- if ( $n_1 \% i == 0$  &  $n_2 \% i == 0$ )

$\text{HCF} = i$  ;  $(i) \text{ nldo2}$   
 $\text{break;}$

S5:- ++  $i$  print  $\text{HCF}$

Code:

```
int n1 = s.nextInt();
int n2 = s.nextInt();
// find largest
int largest = n1 > n2 ? n1 : n2;
// initialize hcf = 1
int hcf = 1;
// find common fact from i = largest/2 upto 2
for (int i = largest/2; i >= 2; i--)
{
    // check for common factor
    if (n1 % i == 0 && n2 % i == 0)
    {
        hcf = i;
        break;
    }
}
// end of for
sopl(hcf);
i++;
```

Goal: find

```
i = sum + nr
i = sum + nr
sum = sum + sum = i + nr
(++i : i) ref
{
    sum % i && 0 == sum % i ? i
    {
        i(i) mld 2
        i mld 2
    }
}
```

Program 5: write a java program to find the LCM of two numbers.

LCM =  $\frac{i/p \times j/p}{\text{HCF}}$   
 $\text{LCM} = \frac{i/p \times j/p}{\text{HCF}}$

```
while (true) {
    int num1 = ;
    int num2 = ;
    int i = num1 > num2 ? num1 : num2;
    if (i % num1 == 0 && i % num2 == 0) {
        System.out.println(i);
        break;
    }
    i++;
}
```

for loop:

```
int num1 = ;
int num2 = ;
int i = num1 > num2 ? num1 : num2;
for ( ; ; i++) {
    if (i % num1 == 0 && i % num2 == 0) {
        System.out.println(i);
        break;
    }
}
```