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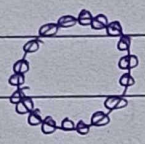
Lecture - 4

For loop + While loop + pattern printing

A pandit say "OM" 108 times till locket does not end.



For repeating one works we use loops :

If Computer is a pandit then he write :

```
for (int i=0 ; i<108 ; i++)
    Cout << " OM";
```

* Write a table using program :

```
3 * 1  = 3
3 * 2  = 6
  :
3 * 10 = 30
```

Constant ↙ ↙ Increment by 1. → 3xi (always)

i have some limit till where it go.

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```
for (int i=1; i<=10; i++) {
    cout <<"3 * " << i << " = " << 3*i <<endl;
}
```

* Write a program to check prime Number:

prime number: divided by 1 & itself.

Let check for 15

We can check 2 to 14

if any number from 2 to 14 can divide 15 then it is not prime.

15 % 2 == 1 ✗

15 % 3 == 0 ✓ (Not prime)

Break the loop.

* Code:

```
#include <iostream>
using namespace std;
int main() {
    int num;
    cin >> num;
    for (int n=2; n<=num-1; n++) {
        if (num % n == 0) {
            cout << "Not prime";
            break;
        }
        cout << " prime Number";
    }
    return 0;
}
```

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break : If We put break, then it exit from loop permanently.

put some edge case :

1 is Not prime.

Code :

```
int main () {
    int n;
    cin >> n;
    if (n < 2) {
        Cout << " Not prime ";
        return 0;
    }
    for (int num = 2; num <= n-1; n++) {
        if ( n % num == 0) {
            Cout << " Not a prime";
            return 0;
        }
    }
    cout << " prime";
    retun 0;
}
```

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* Fibonacci series :-

0 1 1 2 3 5 8 13 21 34

→ 1st element → 0 (fixed)
→ 2nd element → 1 (second)

Third → 1st + 2nd = 0 + 1 = 1
4th → 2nd + 3rd = 1 + 1 = 2
5th → 3rd + 4th = 1 + 2 = 3

$$n^{th} \rightarrow (n-1)^{th} + (n-2)^{th}.$$

First = 0
second = 1
current = 0 + 1 = 1 (Third)

Now,

First ← second
First = 1
Second ← current
second = 1
current = 1 + 1 = 2 (Fourth)

→ Code :

```
int n;
cin >> n;
int first = 0;
int second = 1;
int current;
for (int i = 3; i <= n; i++) {
    current = first + second;
```

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```
        first = second;
        second = current;
    }

    cout << current;
    return 0;
}
```

→ The upper code work on n > 2.

→ Edge case. (put before loop)

```
if(n < 3)
    return (n-1);
```

or

We write

```
if(n==1 || n==2)
    return (n-1);
```

* n = 3>2; // True
  cout << n; // output = 1

n = 3 > 2 > 1;
cout << n;

n = (3 > 2) > 1
      1
  = 1 > 1 // false
  output = 0.

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* Operator : (precedancy)

	Operator	Associativity
	(,), [,], →, .	Left to right
unary	!, ~, ++, --, +, -, *, & (type), sizeof	Right to left
Arithmetic	*, /, %	Left to Right
	+, -	
shift	<< >>	,,
comparison	<, <=, >=, >	,,
	==, =	,,
Bitwise	&	,,
logical	&&, ||, ?:	,,
Assignment	=, +=, -=, *=, /=, %=, !=, <<=, >>=	Right to left.

```
n = (3 > 2) > 1
      1
    1 > 1  → false
return 0;
```

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* Pattern :

1)

	Col 1	2	3	4
Row 1	00	01	02	03
Row 2	10	11	12	13
Row 3	20	21	22	23
Row 4	30	31	32	33

First Approach :

Make 4 for loop and in every for loop print 1 four times.

```
for (int i=1 ; i<=4; i++)
    Cout << "1";
for (int i = 1; i<= 4; i++)
    Cout << "1";
```

What if pattern is of 100 lines
In this we can repeat same loop.
We have to use loop for this. We use nested loop here.
(loop ke andar loop) :-

```
int main() {
    for (int i = 0; i < 4; i++) {
        for (int j = 0; j < 4; j++) {
            Cout << "1";
        }
        Cout << endl;
    }
    return 0;
}
```

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2)

1	2	3	4
1	2	3	4
1	2	3	4
1	2	3	4

00 1	01 2	02 3	03 4
10 1	11 2	12 3	13 4
20 1	21 2	22 3	23 4
30 1	31 2	32 3	32 4

↓

It print value of (col + 1) in each box.

We use nested loop.

```
int main() {
    for (int row = 0; row < 4; row++) {
        for (int col = 0; col < 4; col++) {
            cout << col+1;
        }
        Cout << endl;
    }
    return 0;
}
```

3)

4	3	2	1
4	3	2	1
4	3	2	1
4	3	2	1

00 4	01 3	02 2	03 1
10 4	11 3	12 2	13 1
20 4	21 3	22 2	23 1
30 4	31 3	32 2	33 1

At every box (4 - col):

```
for (int row = 0; row < 4; row++) {
    for (int col = 0; col < 4; col++) {
        Cout << 4 - col;
    }
    Cout << endl;
}
```

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4)

1	2	3	4	00(1) 01(2) 02(3) 03(4)
5	6	7	8	10(5) 11(6) 12(7) 13(8)
9	10	11	12	20(9) 21(10) 22(11) 23(12)
13	14	15	16	30(13) 31(14) 32(15) 33(16)

At Every box it in incremented by 1

Start With

Cout = 1

When it prints:

then cout++;

Code:

```
int count = 1;
for (int row = 0; row < 4; row++) {
    for (int col = 0; col < 4; col++) {
        cout << count++ << " ";
        count ++;
    }
    cout << endl;
}
```

5)

*	00
* *	10 11
* * *	20 21 22
* * * *	30 31 32 33

Every row कहां तक जा रहा है।

row के value तक।

1 row = 1

2nd row = 2

3rd row = 3

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Code:

```
int n = 4;
for(int row = 0; row < n; row++) {
    for(int col = 0; col <= row; col++) {
        cout << " * ";
    }
    cout << endl;
}
```

5)

```
1
1 2
1 2 3
1 2 3 4
```

```
00 1
10 1 11 2
20 1 21 2 22 3
30 1 31 3 32 3 33 4
```

It stops when

col <= row

and

prints col + 1.

```
for (int row = 0; row < 4; row++) {
    for (int col = 0; col <= row; col++) {
        cout << col + 1;
    }
    cout << endl;
}
```

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6)

a	a	a	a	00 a	01 a	02 a	03 a
b	b	b	b	10 b	11 b	12 b	13 b
c	c	c	c	20 c	21 c	22 c	23 c
d	d	d	d	30 d	31 d	32 d	33 d

1st Approach:

Make 4 loop one by one and print 'a' in first loop and 'b' in second loop and increase in Next loop.

```
for (int i=0; i<4; i++){
        cout <<" a";
    }
for (int i=0; i<4; i++){
        cout <<" b";
    }
```

2nd Approach (By Nested loop):-

In this it uses typecasing.

In 1st loop it print a

ASCII value of a = 98

Code:

```
for (int row = 0; row < 4; row++){
        char c = 'a' + row;
    for (int col=0; col < 4; col++){
        cout << c <<" ";
    }
    cout <<endl;
}
```

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7)

a	00 a
a b	10 a 11 b
a b c	20 a 21 b 22 c
a b c d	30 a 31 b 32 c 33 d

→ on every row print till row number.

→ what to print

→ at every column change the value changes.

```
for (int row = 0; row < 4; row++) {
        char c = 'a';
    for (int col = 0; col < 4; col++) {
            c = 'a' + 0;
            cout << c << " ";
        }
    cout << endl;
}
```

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