APNA COLLEGE

Patterns

(Class Slides)

Note: We are sharing these slides as lot of mathematical logic building was done on paper.

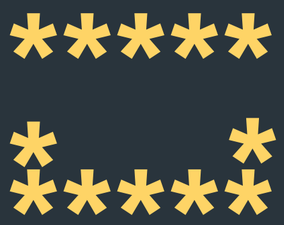
Hope these will help you in your learning process 

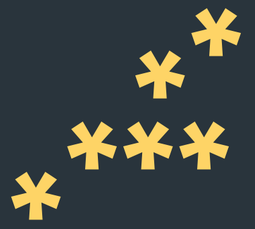
APNA COLLEGE

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

```
1
12
123
1234
```

```
A
BC
DEF
GHIJ
```

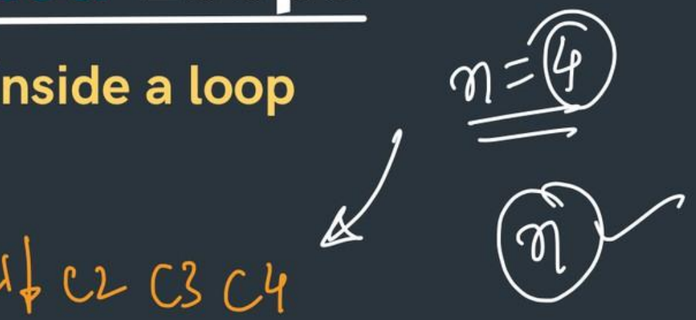




```
1
2  3
4  5  6
7  8  9  10
11 12 13 14 15
```

Nested Loops

Loop inside a loop



	C1	C2	C3	C4
Row1 →	1	1	1	1
R2 →	2	2	2	2
R3 →	3	3	3	3
R4 →	4	4	4	4

1. Outer loop : no of Rows
2. Inner loop : no of columns / each row
3. Work in inner loop (each row)
   i print

```
for(int i=1; i<=4; i++){
    for(int j=1; j<=4; j++){
        cout << i << " ";
    }
}
```

APNA COLLEGE

Print Star pattern

n = 4

R1 * 1st
R2 ** 2 st
R3 *** 3 st
R4 **** 4 st

① outer loop → Rows (i) → Row no.
n times (1 to n)

② inner loop (each rows/columns)
i times (1 to i)

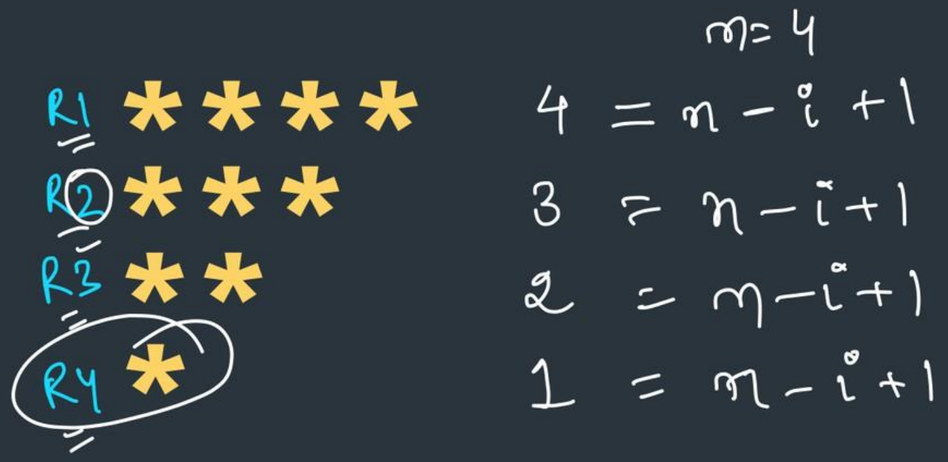
③ work ?
cout << "*"

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

n = 4

APNA COLLEGE

Print Inverted Star pattern



n = 4

$4 = n - i + 1$

$3 = n - i + 1$

$2 = n - i + 1$

$1 = n - i + 1$

① outer loop (rows)
(1 to n)

② inner loop (each row)
(1 to n-i+1)

③ work?
cout << "*"

n = 4

APNA COLLEGE

Print Half Pyramid pattern

n = 4

R1 1 — 1

R2 12 — 1 to 2

R3 123 — 1 to 3

R4 1234 — 1 to 4

1 to i

① outer loop (rows)
(1 to n)

② inner loop (each row)
(1 to i) ⇒ j

③ work?
cout << j ;

```
for(int i=1 ; i<=n ; i++) {
    for(int j=1 ; j<=i ; j++) {
        cout << j ;
    }
    endline
}
```

n = 4

APNA COLLEGE

Print Character Pyramid pattern

```
A
BC
DEF
GHIJ
```

n = 4

n = 4

char ch = 'A'

① outer loop (row)
(1 to n)

② inner loop (each row)
(1 to i)

③ work ?

```
cout << ch;
ch++;
```

Print Hollow Rectangle pattern

first or last → 5 stars
(1) (n)

n = 4

① Outer loop (rows)
(1 to n)

② Inner loop (each row)

```
cout << "*"; //First
for( 1 to n-1) {
    1st or last → "*"
    else → " "
}
cout << "*"; //Last
```

③ work

APNA COLLEGE

n=4

Inverted & Rotated Half-Pyramid

R1 — 3 sp + 1 st
R2 — 2 sp + 2 st
R3 — 1 sp + 3 st
R4 — 0 sp + 4 st

	n − i spaces
i=1	4−1 = 3
i=2	4−2 = 2
i=3	4−3 = 1
i=4	4−4 = 0

n = 4

① outer loop (rows)
(1 to n)

② inner loop (each row)

a) Spaces (1 to n−i)
cout << " " ← work

b) Stars (1 to i)
cout << "*" ← work

cout << endl

APNA COLLEGE

Print Floyd's Triangle

num = 1

R1 1 — 1 el
R2 2 3 — 2 el
R3 4 5 6 — 3 el
R4 7 8 9 10 — 4 el
R5 11 12 13 14 15 — 5 el

ith — i times (1 to i)

① outer loop (rows) (1 to n)

② inner loop (each row elements) (1 to i)

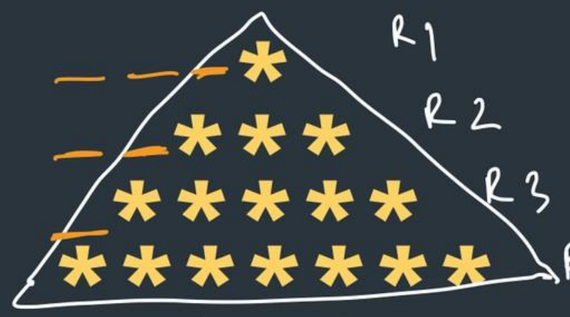
③ work?

```
cout << num;
num++;
```

APNA COLLEGE

Diamond Pattern

n = 4



3sp + 1st
2sp + 3st
1sp + 5st
0sp + 7st

1st pyramid

① outer loop (rows)
(1 to n)

② inner loop (each row elements)

a) (1 to n-i) cout << " "

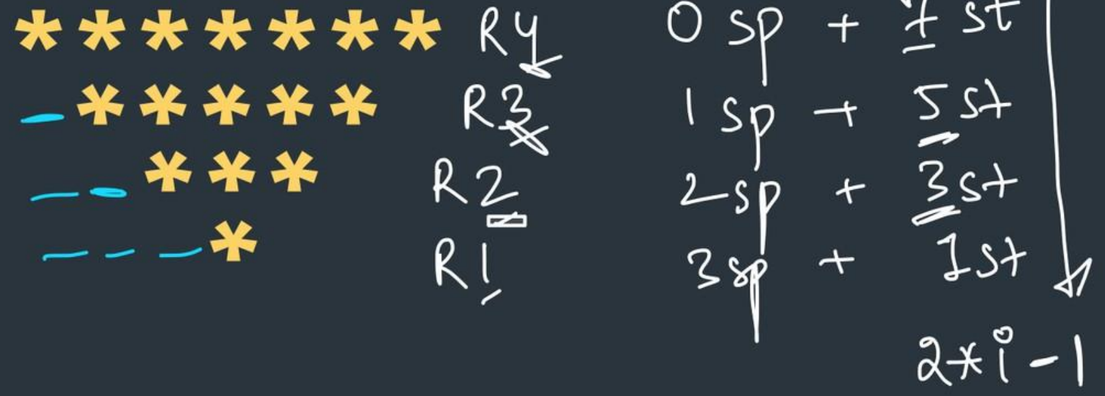
b) (1 to 2*i-1) cout << "*"

i=1 → 1 2*i-1 = 1
i=2 → 3 2*i-1 = 3
i=3 → 5 2*i-1 = 5
i=4 → 7 2*i-1 = 7

n = 4

Diamond Pattern

n = 4

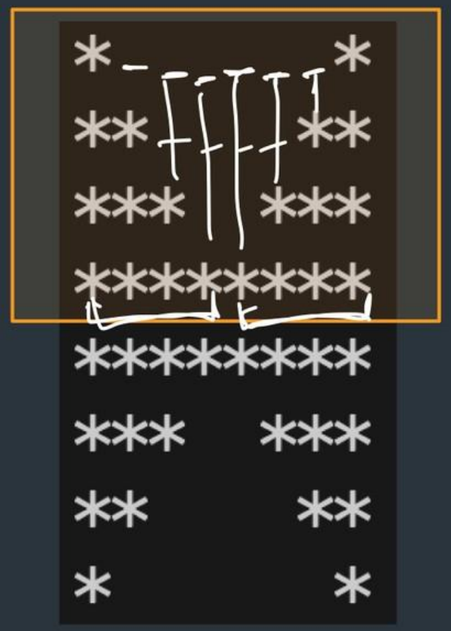


2nd pyramid

1. outer loop (rows) (n to 1)
2. inner loops (each row elements)
   a) sp (1 to n-i)
   b) st (1 to 2*i-1)

n=4

Print Butterfly Pattern



R1 : 1st + 6sp + 1st

R2 : 2st + 4sp + 2st

R3 : 3st + 2sp + 3st

R4 : 4st + 0sp + 4st

$2 * (n - i)$

Pattern1

① outer loop (rows) (1 to n)

② inner loop

a) stars (1 to i)

b) spaces (1 to 2*(n-i))

c) stars (1 to i)

n = 4

APNA COLLEGE

Print Butterfly Pattern

n = 4

R4 4 st 0 sp 4 st
R3 3 st 2 sp 3 st
R2 2 st 4 sp 2 st
R1 1 st 6 sp 1 st

$2 * (n - i) = 2 * (4 - 1) = 6$

$i = 1$

Pattern

① outer loop (rows) (n to 1)

② inner loop

a) stars (1 to i)

b) spaces (1 to 2*(n-i))

c) stars (1 to i)

n = 4

APNA COLLEGE