

### Ques1) Pattern : 1

$n = 5$

	1	2	3	4	5 (cols)
1	*				
2	*	*			
3	*		*		
4	*	*	*	*	
5	*	*	*	*	*

1<sup>st</sup> row  $\rightarrow$  1<sup>st</sup> col

Rows  $\rightarrow$  n

Outer loop  $\rightarrow$  1 for (for n Rows)

Inner loop  $\rightarrow$  i times for 1<sup>st</sup> Row

Print ("\* \* t") ;

### Ques2) Pattern : 2

Sample Input

5

Sample Output

1	*	*	*	*	*
2	*	*	*	*	*
3	*	*	*	*	*
4	*	*	*	*	*
5	*	*	*	*	*

```
int n = scn.nextInt();
for(int i=1;i<=n;i++) {
    for(int j=1;j<=i;j++) {
        System.out.print("*");
    }
    System.out.println();
}
scn.close();
```

Rows = n

1<sup>st</sup> row  $\rightarrow$  n-i+1 cols

Print ("\* \* t");

### Ques3) Pattern : 3

Sample Input

5

Sample Output

1				*
2			*	*
3		*	*	*
4	*	*	*	*
5	*	*	*	*

n  $\rightarrow$  Rows

n-1  $\rightarrow$  square } i<sup>th</sup> row  
i starts

```
int n = scn.nextInt();
for(int i=1;i<=n;i++) {
    for(int j=1;j<=i;j++) {
        System.out.print(" ");
    }
    for(int j=i+1;j<=n;j++) {
        System.out.print("*");
    }
    System.out.println();
}
```

### Ques4) Pattern : 4

Sample Input

5

Sample Output

1	*	*	*	*
2	*	*	*	*
3	*	*	*	*
4	*	*	*	*
5	*	*	*	*

n  $\rightarrow$  Rows

i-1  $\rightarrow$  spaces } i<sup>th</sup> row  
n-i+1 cols

```
for(int i=1;i<=n;i++) {
    for(int j=1;j<i;j++) {
        System.out.print(" ");
    }
    for(int j=i;j<=n;j++) {
        System.out.print("*");
    }
    System.out.println();
}
```

Ans

Pattern : 5

### Sample Input

5

### Sample Output

	*			
	*	*	*	
*	*	*	*	*
	*	*	*	
		*		

} First Half

} Second Half

First Half

$$k = n/2 + 1;$$

b rows

$k-i$  spaces }  $i^{\text{th row}}$

$2i-1$  cols }

Second Half

$n/2$  rows

$i$  spaces

dec-counter  $\rightarrow$  cols

$i^{\text{th row}}$

$\rightarrow$  dec-counter will start from  $n-2$  & decreases by 2  
everytime :

```
int n = scn.nextInt();
int k = (n/2) + 1;
for(int i=1;i<=k;i++) {
    for(int sp=1;sp<=k-i;sp++) {
        System.out.print("\t");
    }
    for(int j=1;j<=2*i-1;j++) {
        System.out.print("*\t");
    }
    System.out.println();
}

int dec_counter = n-2;
for(int i=1;i<=n/2;i++) {
    for(int sp=1;sp<=i;sp++) {
        System.out.print("\t");
    }
    for(int j=1;j<=dec_counter;j++) {
        System.out.print("*\t");
    }
    dec_counter -= 2;
    System.out.println();
}
```

## Ans Pattern: 6

### Sample Input

5

### Sample Output

1	*	*	*		*	*	*
2	*	*			*	*	
3	*				*		
4	*	*			*	*	
5	*	*	*		*	*	*

dec\_counter  
starts from  $n-2$   
& decs by 2  
in every iteration

First Half

$$k = n/2 + 1$$

k rows

$k-i+1$  stars }  $i^{th}$  row  
 $2i-1$  spans }  
 $k-i+1$  stars }

Second Half

$n/2$  rows

$i$  stars }  $i^{th}$  row  
dec\_counter spans }  
 $i$  stars }

```

int k = (n/2) + 1;
for(int i=1;i<=k;i++) {
    for(int j=1;j<=k-i+1;j++) {
        System.out.print("*\t");
    }
    for(int sp=1;sp<=2*i-1;sp++) {
        System.out.print("\t");
    }
    for(int j=1;j<=k-i+1;j++) {
        System.out.print("*\t");
    }
    System.out.println();
}

int dec_counter = n-2;
for(int i=1;i<=n/2;i++) {
    for(int j=1;j<=i+1;j++) {
        System.out.print("\t");
    }
    for(int sp=1;sp<=dec_counter;sp++) {
        System.out.print("\t");
    }
    for(int j=1;j<=i+1;j++) {
        System.out.print("*\t");
    }
    dec_counter -= 2;
    System.out.println();
}

```

## Ques Pattern 7

Sample Input					
5					
Sample Output					
1	*				
2		*			
3			*		
4				*	
5					*

$i = j \rightarrow \text{print } *$   
 $\text{else space}$

$n \rightarrow \text{rows}$

$n \rightarrow \text{cols}$

$\text{print } * \text{ when } i=j$

```
int n = scn.nextInt();

for(int i=1;i<=n;i++) {
    for(int j=1;j<=n;j++) {
        if(i == j) {
            System.out.print("*\t");
        } else {
            System.out.print("\t");
        }
    }
    System.out.println();
}
```

## Ques Pattern : 8

Sample Input					
5					
Sample Output					
1	2	3	4	5	*
2	*				
3		*			
4			*		
5				*	

$* \rightarrow r+c = n+1$

rows  $\rightarrow n$

cols  $\rightarrow n$

$\text{if } (i+j == n+1) \rightarrow *$   
 $\text{else } " "$

```
int n = scn.nextInt();

for(int i=1;i<=n;i++) {
    for(int j=1;j<=n;j++) {
        if(i+j == n+1) {
            System.out.print("*\t");
        } else {
            System.out.print("\t");
        }
    }
    System.out.println();
}
```

## Ques Pattern: 9

Sample Output				
1	2	3	4	5
*				*
	*		*	
		*		
	*		*	
*				*

$n \rightarrow \text{rows}$  &  $n \rightarrow \text{cols}$

$\text{if } (i == j \text{ || } i+j == n+1) \rightarrow *$   
 $\text{else } \backslash\backslash \backslash \backslash$

```
for(int i=1;i<=n;i++) {
    for(int j=1;j<=n;j++) {
        if(i+j == n+1 || i==j) {
            System.out.print("*\t");
        } else {
            System.out.print("\t");
        }
    }
    System.out.println();
}
```

## Ques Pattern 10

Sample Output				
1	2	3	4	5
*		*		*
	*		*	
*			*	
	*		*	
*				*

first half

$\hookrightarrow$  if we start rows from  $1$  i.e  $n/2 + 1$   
 till  $n$  then we have to print same  
 pattern as above i.e  $j=i$  &  $i+j=n+1$

```
for(int i=n/2+1;i<=n;i++) {
    for(int j=1;j<=n;j++) {
        if(i == j || i+j == n+1) {
            System.out.print("*\t");
        } else {
            System.out.print("\t");
        }
    }
    System.out.println();
}
```

second half

$\hookrightarrow$  start from  $2$  to  $n/2 + 1$   $\underline{\text{or} k}$   
 then we will print  $j=i$  &  $i+j=n+1$

```
for(int i=2;i<=n/2+1;i++) {
    for(int j=1;j<=n;j++) {
        if(i == j || i+j == n+1) {
            System.out.print("*\t");
        } else {
            System.out.print("\t");
        }
    }
    System.out.println();
}
```

Sample Output				
1	2	3	4	5
*		*		*
	*		*	

## Ques) Pattern 11

Sample Input

5

Sample Output

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

$i^{\text{th}} \text{ row} \rightarrow i^{\text{th}} \text{ cols}$

Print : counting

```
// write ur code here
int n = scn.nextInt();

int count=1;
for(int i=1;i<=n;i++) {
    for(int j=1;j<=i;j++) {
        System.out.print(count + "\t");
        count++;
    }
    System.out.println();
}
```

## Ques) Pattern :12

Example

Sample Input

5

Sample Output

0				
1	1			
2	3	5		
3	13	21	34	
4	89	144	233	377

```
// write ur code here
int n = scn.nextInt();

int a = 0;
int b = 1;
for(int i=1;i<=n;i++) {
    for(int j=1;j<=i;j++) {
        System.out.print(a + "\t");
        int c = a + b;
        a = b;
        b = c;
    }
    System.out.println();
}
```

$i^{\text{th}} \text{ row} \rightarrow i^{\text{th}} \text{ cols}$

Print : fibonacci nos

## Ques Problem 13

Example	
Sample Input	
5	
Sample Output	
1 1 1 1 2 1 1 3 3 1 1 4 6 4 1	

i<sup>th</sup> row  $\rightarrow$  i cols

Print : i starts from 1  
but j starts from 0  
we are printing  $i_c_j$  at every cell.

We can calculate  $i_{c_{j+1}}$  from  $i_{c_j}$  using the formula

$$i_{c_{j+1}} = \frac{i_{c_j} * (i-j)}{(j+1)}$$

Deriving the above formula

$$\textcircled{1} \quad {}^n C_m = \frac{n!}{(n-m)! m!}$$

$$\textcircled{2} \quad {}^n C_{m+1} = \frac{n!}{(n-(m+1))! (m+1)!}$$

```
int n = scn.nextInt();
for(int i=0;i<n;i++) {
    int icj = 1;
    for(int j=0;j<=i;j++) {
        System.out.print(icj + " ");
        int icjpl1 = (icj * (i-j)) / (j+1);
        icj = icjpl1;
    }
    System.out.println();
}
```

Expand \textcircled{2}

$${}^n C_{m+1} = \frac{n!}{((n-1)-1)! ((m+1) + 1)!}$$

Using \textcircled{1} i.e  $\frac{n!}{m!} \geq {}^n C_m * (n-m)!$

$$\begin{aligned} {}^n C_{m+1} &= \frac{{}^n C_r (n-r)!}{(m+1)((n-r)-1)!} \\ &= \frac{{}^n C_r (n-r) * (n-r-1)!}{(m+1)(n-r-1)!} \end{aligned}$$

$${}^n C_{r+1} = \frac{{}^n C_r (n-r)}{m+1}$$

$n \Leftrightarrow i \quad m \Leftrightarrow j$

$$i_{c_{j+1}} = \frac{i_{c_j} (i-j)}{(j+1)}$$

## Ques Problem 14

Multiplication Table of N

```
// write ur code here
int n = scn.nextInt();
for(int i=1;i<(n+1);i++) {
    System.out.println(n + " * " + i + " = " + n*i);
}
```

Ans) Pattern : 15

Sample Input

5

Sample Output

1		1		
2	2	3	2	
3	3	4	5	4
4		2	3	2
5			1	

first Half

$$k = \frac{n}{2} + 1$$

Span  $\rightarrow k - i$

print time  $\rightarrow 2^{i-1}$  times

What to print?

↳ In the first half print inc counting

and it starts from row no

↳ In the second half print dec counting

Second Half

Span  $\rightarrow i$

dec\_counter  $\in [n-2]$

i<sup>th</sup> row will have dec\_counter

cols & no will keep on decreasing by 2 .

What to Print?

if  $j \leq \frac{\text{dec\_counter}}{2} + 1$

Print inc counting which

starts from  $(\frac{n}{2}) - i + 1$

else Print dec - counting.

```

int dec_counter = n-2;
for(int i=1;i<=n/2;i++) {
    for(int sp=1;sp<=i;sp++) {
        System.out.print("\t");
    }

    int c = (n/2) - i + 1;
    for(int j=1;j<=dec_counter;j++) {
        if(j<=(dec_counter)/2 + 1) {
            System.out.print(c + "\t");
            c++;
        } else {
            if(j==dec_counter/2 + 2) c = c-2;
            System.out.print(c + "\t");
            c--;
        }
    }

    System.out.println();
    dec_counter -= 2;
}

```

One Pattern : 16

## Example

## Sample Input

Sample Output												
1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13
1	2	3	4	5	6	7	8	9	10	11	12	13

```
int n = scn.nextInt();
int dec_counter = 2*n-3;
for(int i=1;i<=n;i++) {
    for(int j=1;j<=i;j++) {
        System.out.print(j + "\t");
    }
    for(int sp=1;sp<=dec_counter-sp++ ) {
        System.out.print("\t");
    }
}
if(i != n) {
    for(int j=i;j>=1;j--) {
        System.out.print(j + "\t");
    }
}
else {
    for(int j=i-1;j>=1;j--) {
        System.out.print(j + "\t");
    }
}
dec_counter -= 2;
System.out.println();
```

rows : ✓

$$cols = 2^{n-1}$$

$$\text{dec\_counter} = 2^{n-3}$$

i<sup>th</sup> Row :

for  $C_j = 1 \dots i \angle = i; j^{++}$

{ sys0(j),

3

for ( $sp = 1$  ;  $sp \leq dec\_count(s, sp)$ )

```
    sys(" ")),
```

三

if ( $i \geq n$ ) {

for ( $j = i-1$ ;  $j \geq 1$ ;  $j++$ ) {

$\text{sysol}(j)$ ,

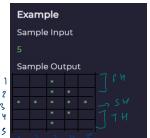
3

for ( $j = i; j < yso.length; j++$ )

$$3 \quad 3 \quad 1 \quad = 9$$

println( )

### Ques Pattern 17



First Half :

i<sup>th</sup> row:  $n/2$  spaces then i stars

Second Half : (Middle row)

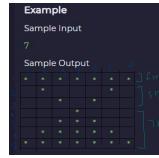
$n/2$  stars

Third Half:

(n<sup>th</sup> row:  $n/2$  spaces and n-i stars)

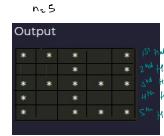
```
int n = scanner.nextInt();
for(int i=1;i<=n;i++) {
    for(int j=1;j<=n;j++) {
        if(j>n/2) {
            System.out.print(" ");
        }
        else {
            System.out.print("*");
        }
    }
    System.out.println();
}
for(int i=n;i>=1;i--) {
    for(int j=1;j<=n;j++) {
        if(j>n/2) {
            System.out.print(" ");
        }
        else {
            System.out.print("*");
        }
    }
    System.out.println();
}
```

### Ques Pattern 18



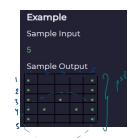
```
for (int counter = n/2; counter >= 1; counter--) {
    for (int i = 1; i <= n; i++) {
        if (i > n/2) {
            System.out.print(" ");
        } else {
            System.out.print("*");
        }
    }
    System.out.println();
}
for (int i = 1; i <= n; i++) {
    for (int j = 1; j <= n; j++) {
        if (j > n/2) {
            System.out.print(" ");
        } else {
            System.out.print("*");
        }
    }
    System.out.println();
}
```

### Ques Pattern 19



```
for (int i = 1; i <= n; i++) {
    for (int j = 1; j <= n; j++) {
        if (i > n/2) {
            System.out.print(" ");
        } else {
            System.out.print("*");
        }
    }
    System.out.println();
}
for (int i = 1; i <= n; i++) {
    for (int j = 1; j <= n; j++) {
        if (j > n/2) {
            System.out.print(" ");
        } else {
            System.out.print("*");
        }
    }
    System.out.println();
}
for (int i = 1; i <= n; i++) {
    for (int j = 1; j <= n; j++) {
        if (i > n/2) {
            System.out.print(" ");
        } else {
            System.out.print("*");
        }
    }
    System.out.println();
}
for (int i = 1; i <= n; i++) {
    for (int j = 1; j <= n; j++) {
        if (j > n/2) {
            System.out.print(" ");
        } else {
            System.out.print("*");
        }
    }
    System.out.println();
}
for (int i = 1; i <= n; i++) {
    for (int j = 1; j <= n; j++) {
        if (i > n/2) {
            System.out.print(" ");
        } else {
            System.out.print("*");
        }
    }
    System.out.println();
}
```

### Ques Pattern 20



```
int n = scanner.nextInt();
for (int i = 1; i <= n; i++) {
    for (int j = 1; j <= n; j++) {
        if (i > n/2) {
            System.out.print(" ");
        } else if ((i <= n/2) && (j <= n - i + 1)) {
            System.out.print("*");
        } else {
            System.out.print(" ");
        }
    }
    System.out.println();
}
```

2nd part all is

3rd