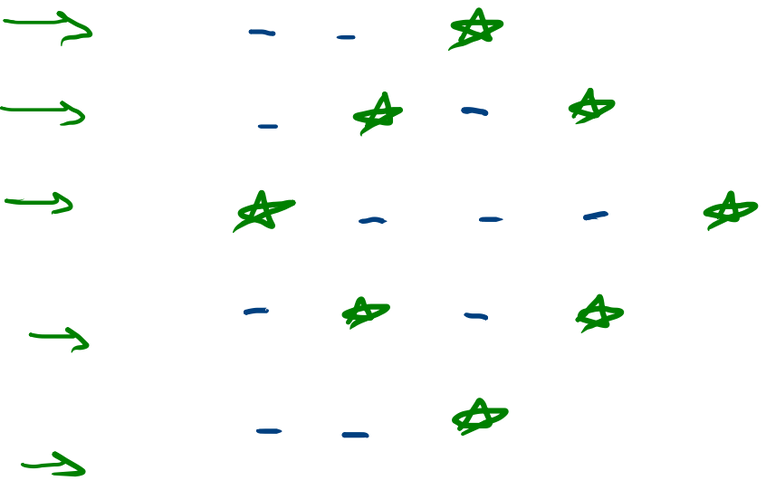
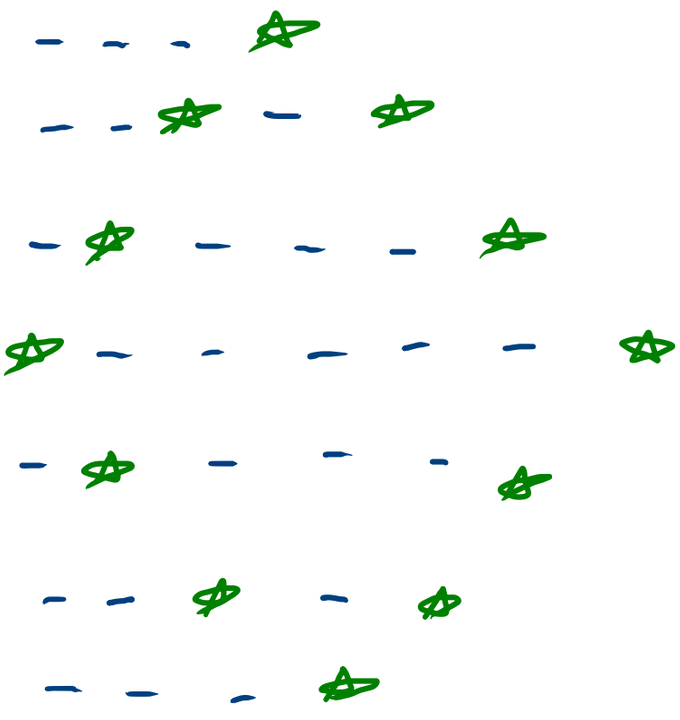
n = 5



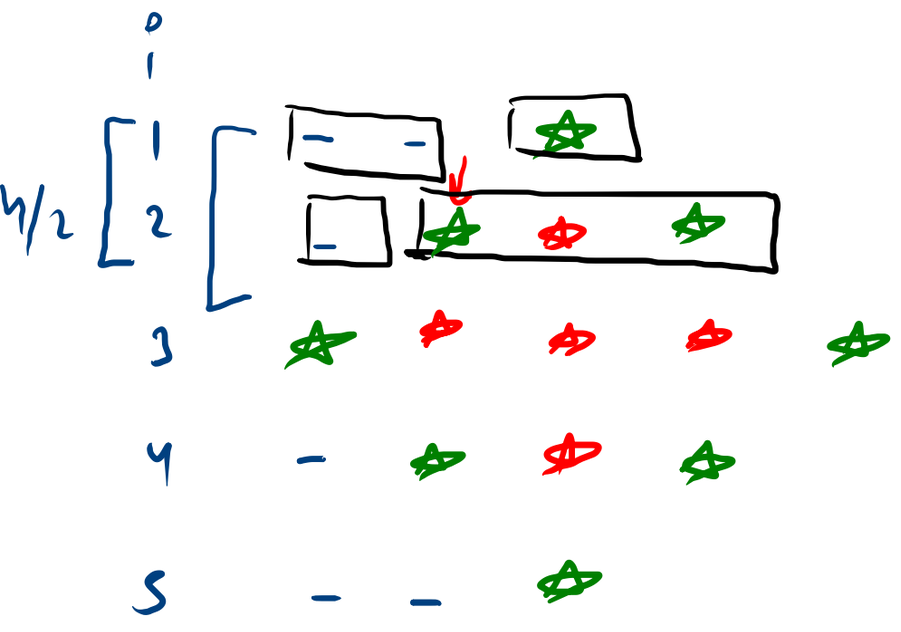
n = 7



7-3=4

space = n-3
= 4

h = 5



	Space	Star
h/2	2	1
	↓ -1	↓ +2
	1	3
	0	5
	↓ +1	↓ -2
	1	3
	↓ +1	↓ -2
	2	1

n = 5

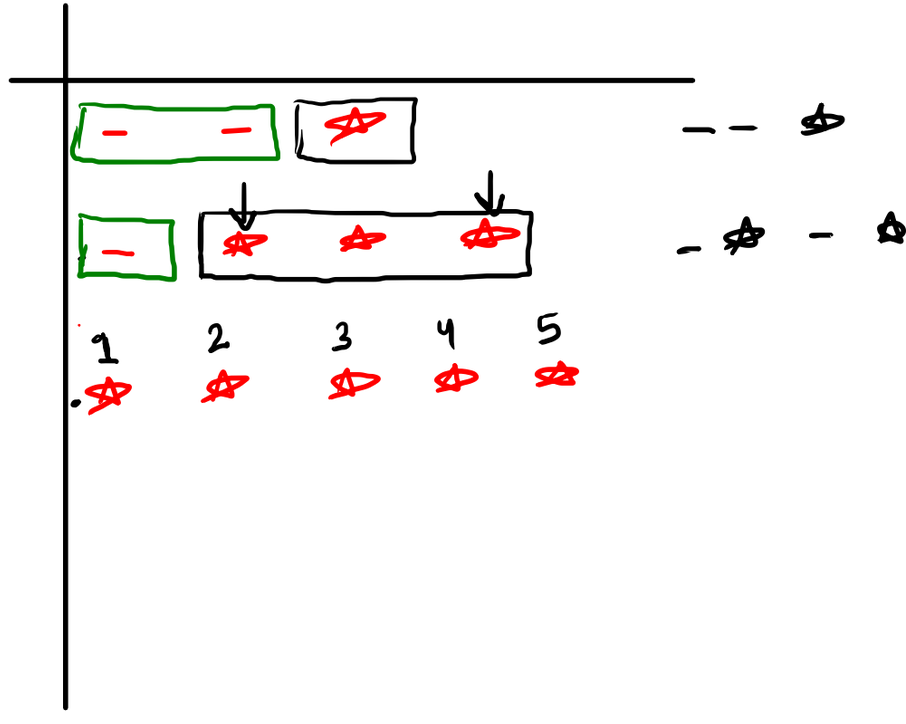
```java
int space = n/2; n-3
int star = 1;

for(int i=1;i<=n;i++){
    // space
    for(int j=1;j<=space;j++){
        System.out.print("\t");
    }
    //star   6 <=5
    for(int j=1;j<=star;j++){
        System.out.print("*\t");
    }

    System.out.println();

    if(i<=n/2){
        space--;
        star = star+2;
    }else{
        space++;
        star = star-2;
    }
}
```

space = 2 + 0

star = + 3 5

i = + 2 3

~~j = 1 2 3 4 5 6~~



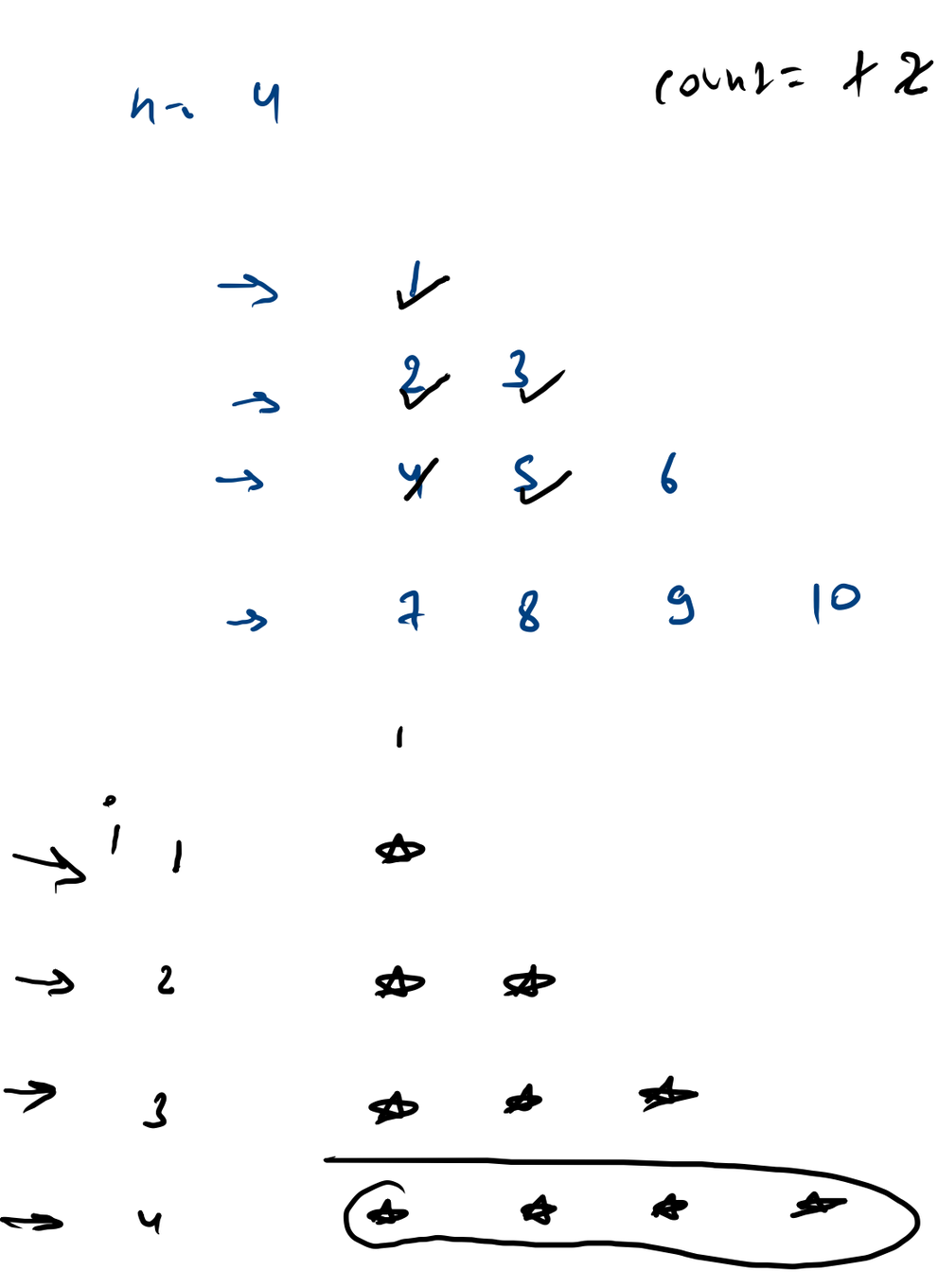
j fix = 1

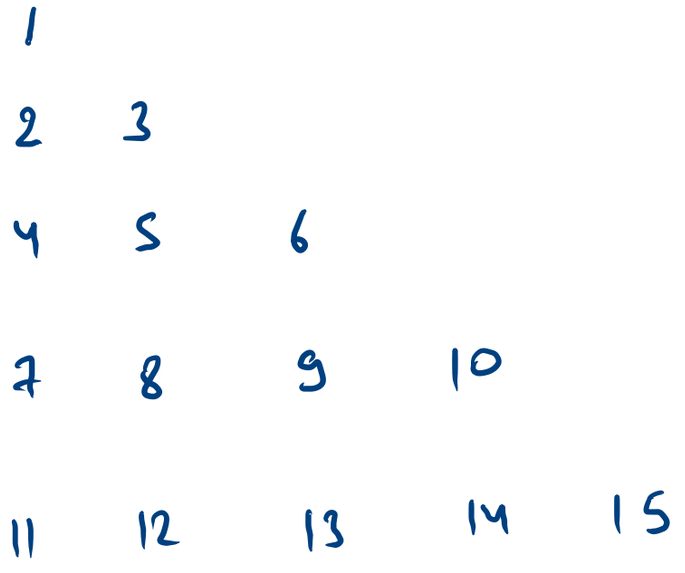
j last = star

h = 4

count = 1 2 3 4 5 6

h = 5





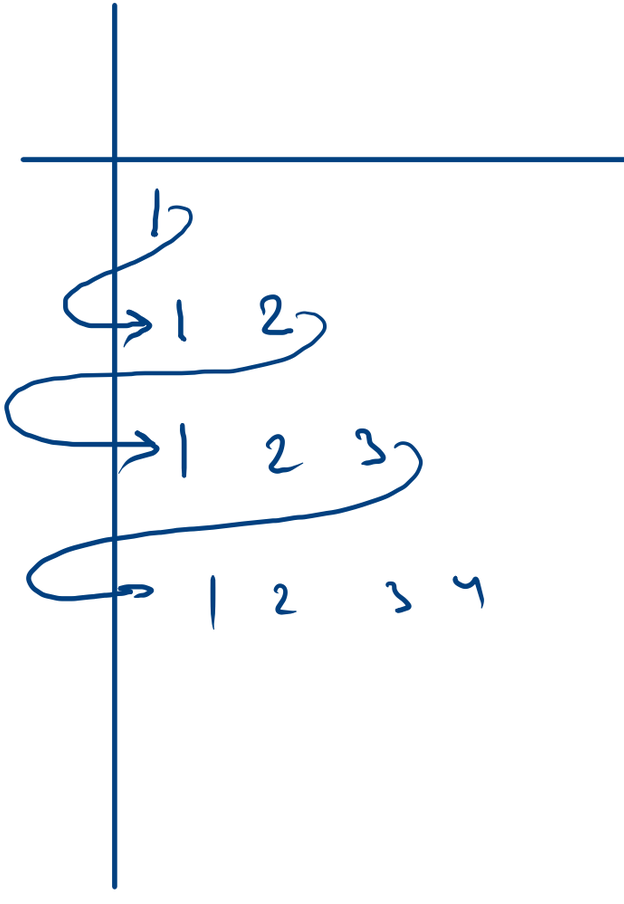
```java
Scanner scn = new Scanner(System.in);

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

n = 4

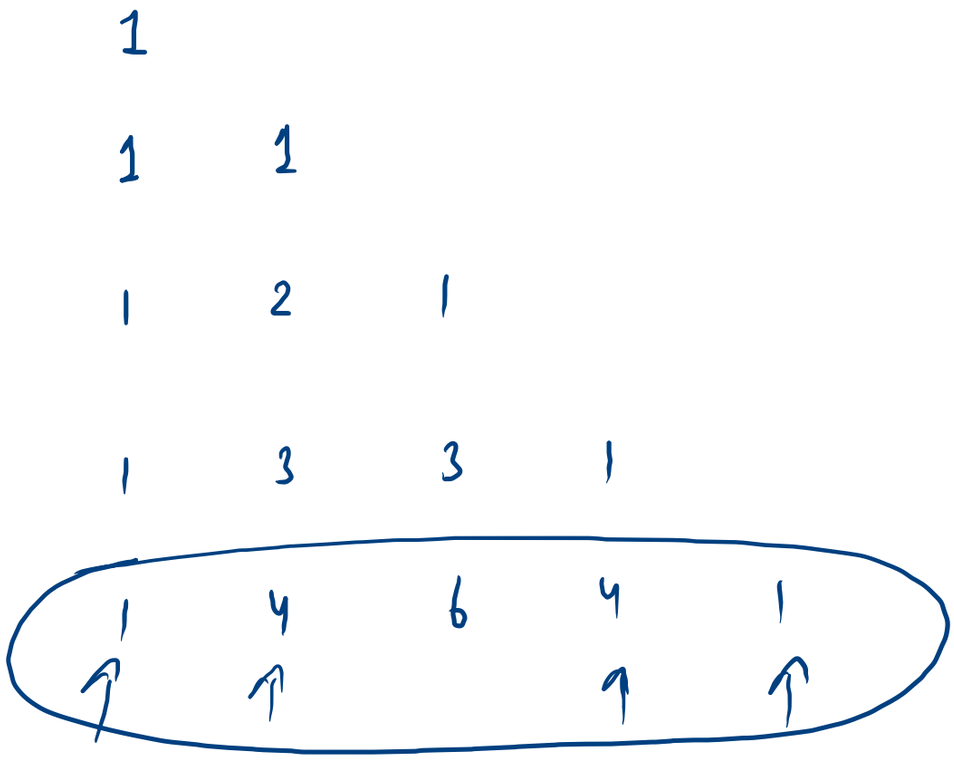
i = 1 2

~~count = 1 2 3~~

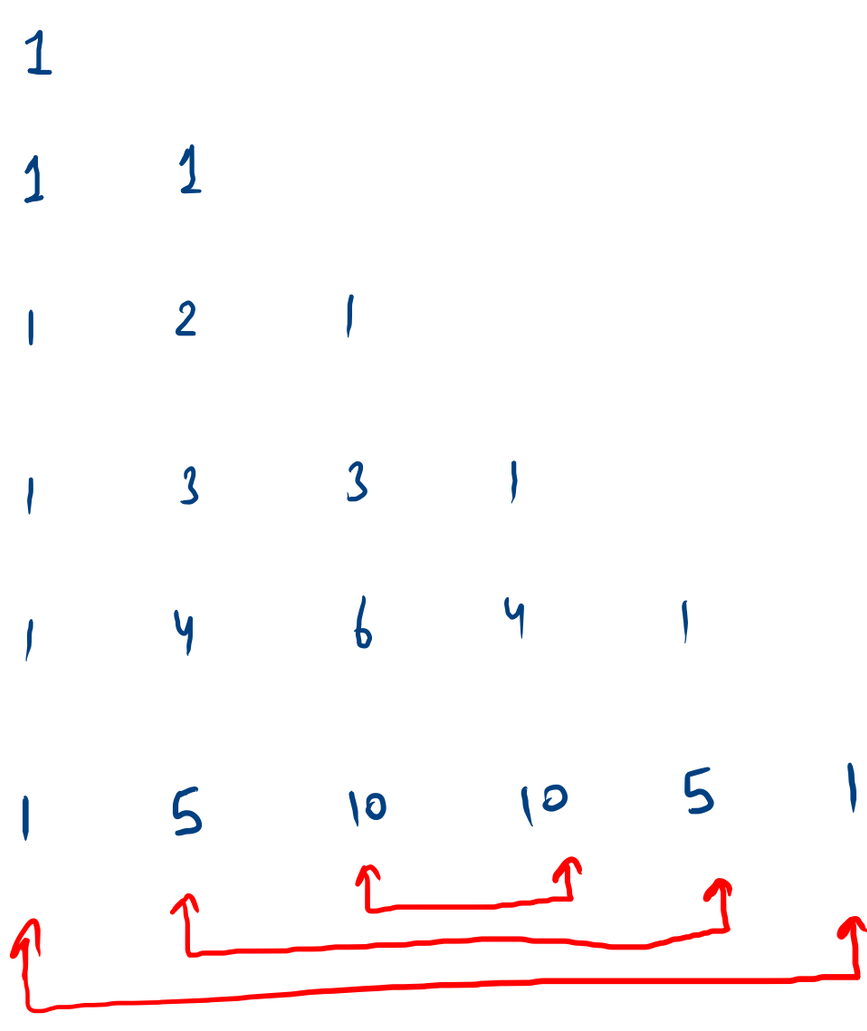
~~j = 1 2 3~~



h = 5



h = 6



$^{n}C_{r}$

i \ j	0	1	2	3	4	5
0	1					
1	1	1				
2	1	2	1			
3	1	3	3	1		
4	1	4	6	4	1	
5	1	5	10	10	5	1

$^{i}C_{j}$ $^{1}C_{1}$ $^{3}C_{1}$ $^{4}C_{1}$

$^{4}C_{1} \rightarrow {}^{4}C_{2}$

$^{i}C_{j} \rightarrow {}^{i}C_{j+1}$

$n=4$

$n=5$

$$^{5}C_{1} = \frac{5 \times 4 \times 3 \times 2 \times 1}{1 \times 4 \times 3 \times 2 \times 1}$$

$$^{5}C_{2} = \frac{5 \times 4 \times 3 \times 2 \times 1}{2 \times 3 \times 2 \times 1}$$

```
for i ← 0 to n-1
    for j ← 0 to i
        print ^iC_j
```

$^{4}C_{0}$ $^{4}C_{1}$ $^{4}C_{2}$ $^{4}C_{3}$ $^{4}C_{4}$

$^{n}C_{r} \rightarrow {}^{n}C_{n-r}$

$^{4}C_{1} \rightarrow {}^{4}C_{4-1} = {}^{4}C_{3}$

$$^{4}C_{1} = \frac{4 \times 3 \times 2 \times 1}{1 \times 3 \times 2 \times 1}$$

$$^{i}C_{j+1} = \frac{\lfloor i}{\lfloor i-(j+1) \;\; \lfloor j+1}$$

$$^{4}C_{1} = \frac{\lfloor i}{\lfloor i-j-1 \;\; \lfloor j+1}$$

$$= \frac{\lfloor i}{\lfloor i-j \;\; \lfloor j} \times \frac{(i-j)}{(j+1)}$$

$$= {}^{i}C_{j} \times \frac{(i-j)}{(j+1)}$$

$$^{4}C_{0}$$

$$\lfloor 5 = 5\times4\times3\times2\times1$$

$$5 \times \lfloor 4$$

$$\lfloor n = n \times \lfloor n-1$$

$$\frac{\lfloor n}{n} = \lfloor n-1$$

$$\frac{\lfloor i-j}{i-j} = \lfloor i-j-1$$

$$\lfloor 5 = 5 \times \lfloor 4$$

$$\lfloor n+1 = (n+1) \times \lfloor n$$

$$\lfloor j+1 = (j+1) \times \lfloor j$$

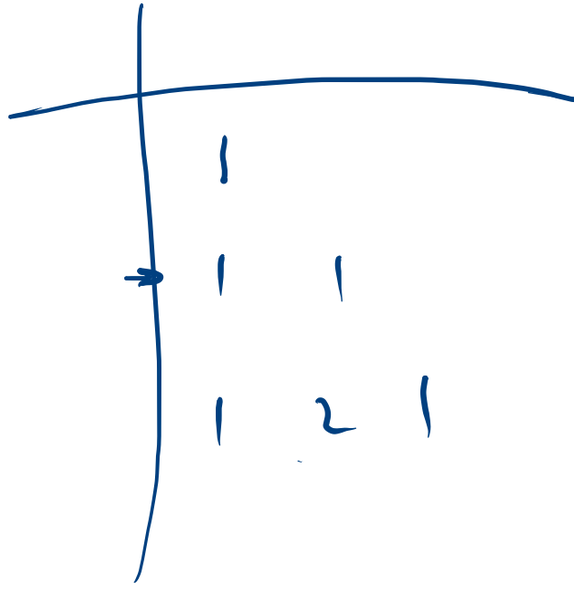
```java
for(int i=0;i<n;i++){
    int val = 1;

    for(int j=0;j<=i;j++){
        System.out.print(val+"\t");
        val = val * (i-j) / (j+1);
    }
    System.out.println();
}
```

n = 4

i = 0 1

~~val 1~~

~~j 0 1 2~~



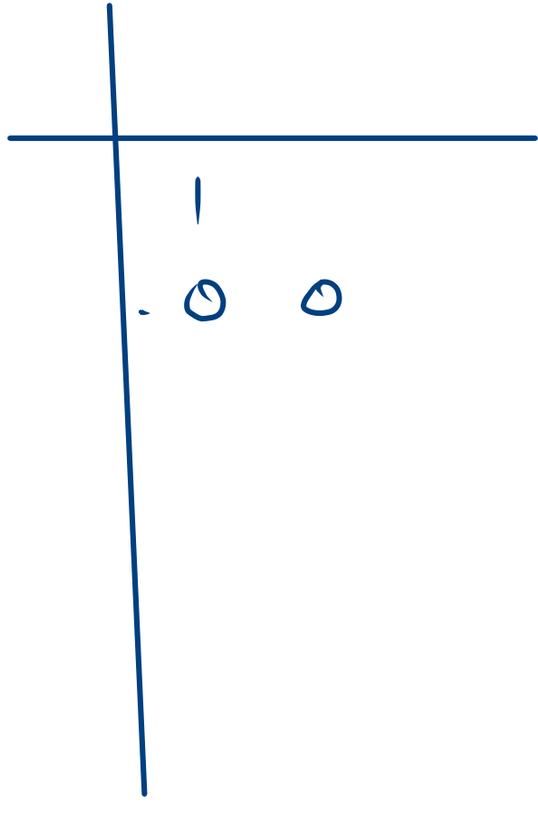
```java
int n = scn.nextInt();

int val = 1;
for(int i=0;i<n;i++){
    val=1
    for(int j=0;j<=i;j++){
        System.out.print(val+"\t");
        val = val * (i-j) / (j+1);
    }
    System.out.println();
}
```

n = 5

val = 100

i = 0 1

j = 0 1



n = 3

i ← 1 to 10

print(n

```
3*1=3
3*2=6
3*3=9
3*4=12
3*5=15
3*6=18
```

3 * 1 = 3

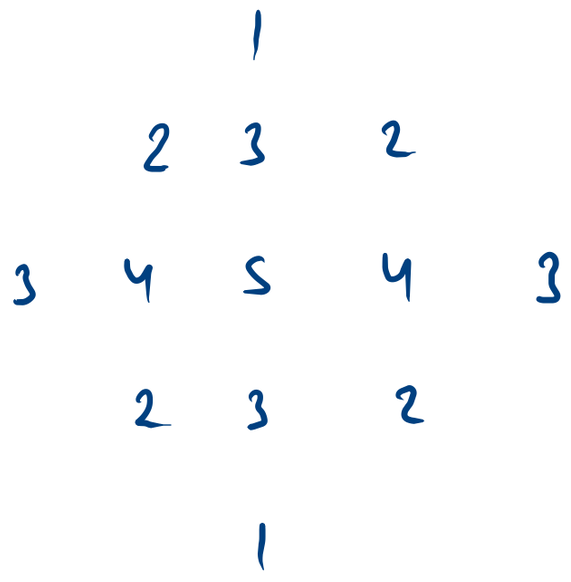
3 * 2 = 6

3 * 3 = 9

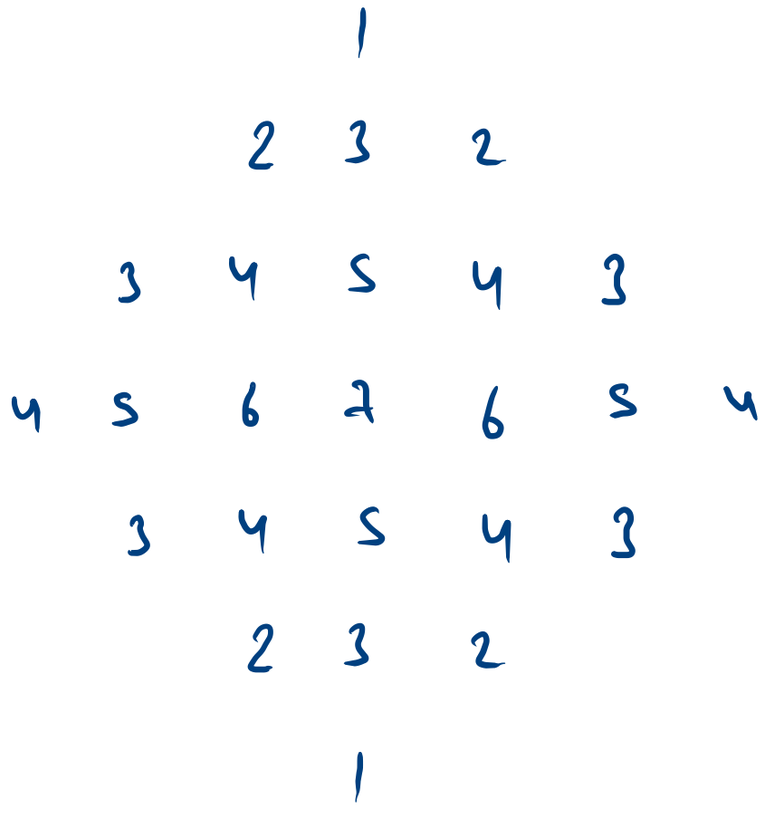
⋮

3 * 10 = 30

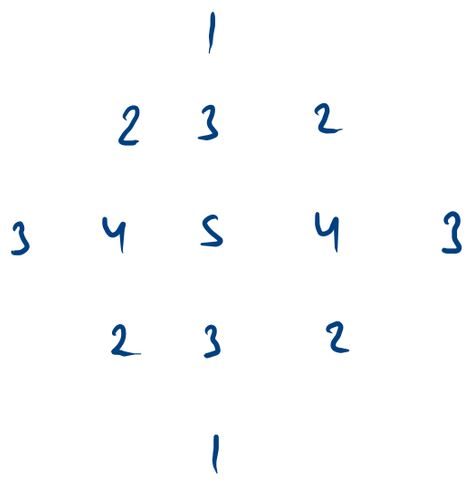
n = 5

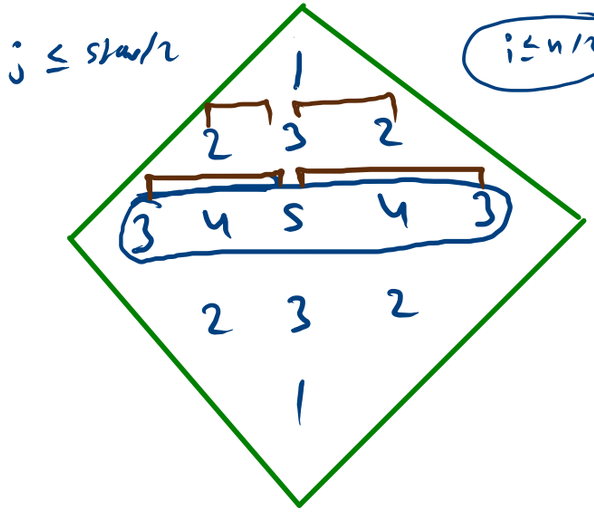


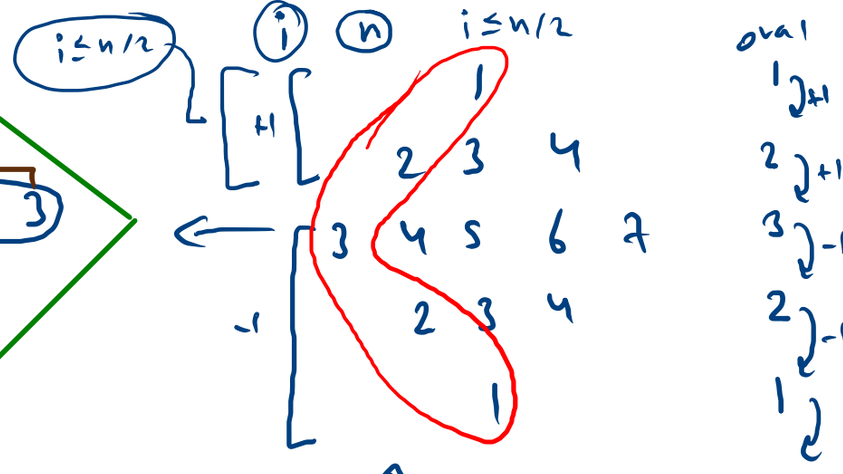
n = 7

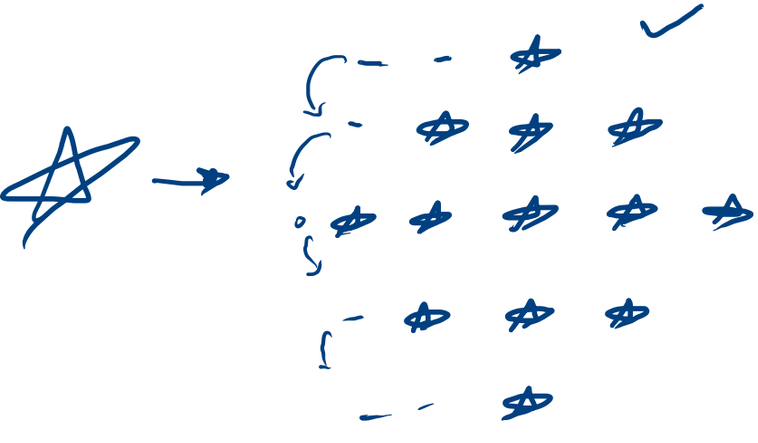


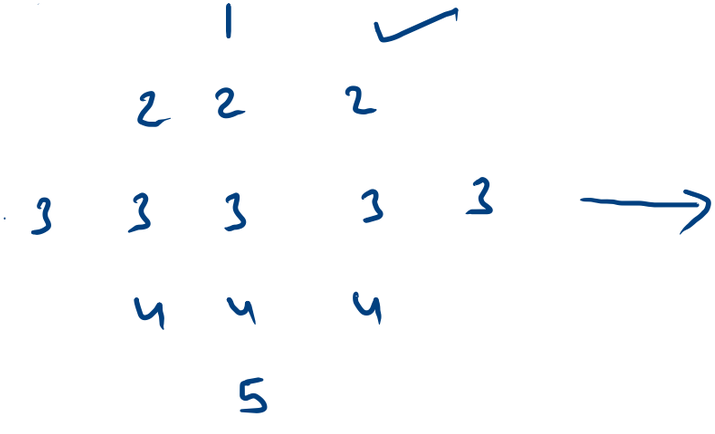
n = 5

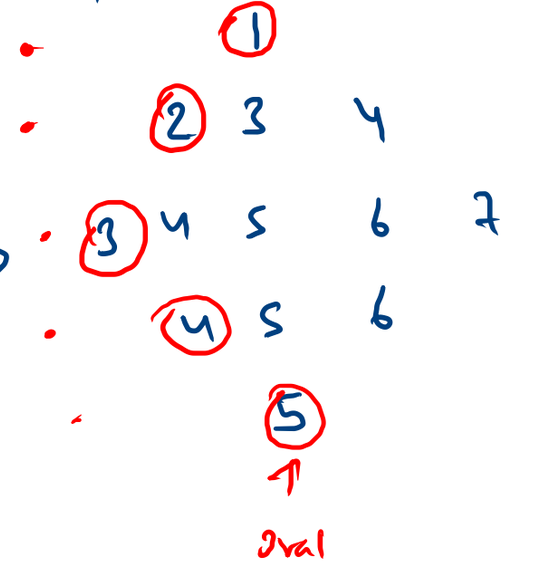

1
2 3 2
3 4 5 4 3
2 3 2
1


j ≤ star/2
1
2 3 2
3 4 5 4 3
2 3 2
1


i≤n/2
i
n
i≤n/2
+1
1
2 3 4
3 4 5 6 7
-1
2 3 4
1
oval
1 +1
2 +1
3 -1
2 -1
1




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


1
2 3 4
3 4 5 6 7
4 5 6
5
oval

```java
int space = n/2;
int star = 1;

int oval = 1;
for(int i=1;i<=n;i++){
    int ival = oval;

    for(int j=1;j<=space;j++){
        System.out.print("\t");
    }

    for(int j=1;j<=star;j++){
        System.out.print(ival + "\t");
        ival++;
    }

    System.out.println();

    if(i <= n/2){
        space--;
        star = star+2;
        oval++;
    }else{
        space++;
        star = star-2;
        oval++;
    }
}
```

n = 5

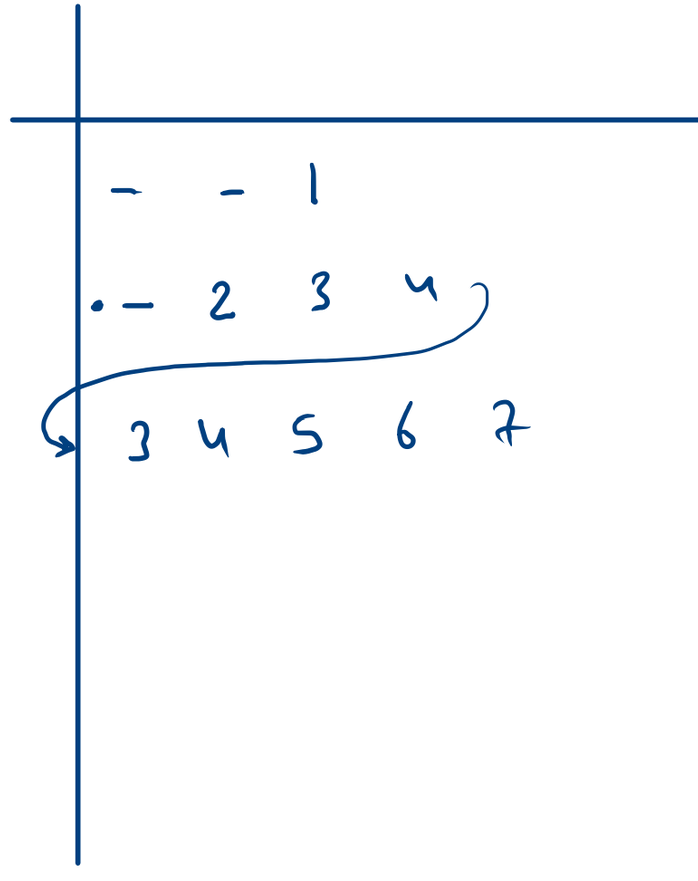
space = 2 1 0

star = 1 3 5

oval = 1 2 ③

i = 1 2 3

ival = 3 4 5 6 7 8



```java
int space = n/2;
int star = 1;

int oval = 1;
for(int i=1;i<=n;i++){
    int ival = oval;

    for(int j=1;j<=space;j++){
        System.out.print("\t");
    }

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

    System.out.println();

    if(i <= n/2){
        space--;
        star = star+2;
        oval++;
    }else{
        space++;
        star = star-2;
        oval--;
    }
}
```

1 ≤ 2
2 ≤ 2
3 ≤ 2 ✗
4 ≤ 2

3 ≤ 2

n = 5

space = ~~2~~ ~~1~~ ~~0~~ 1

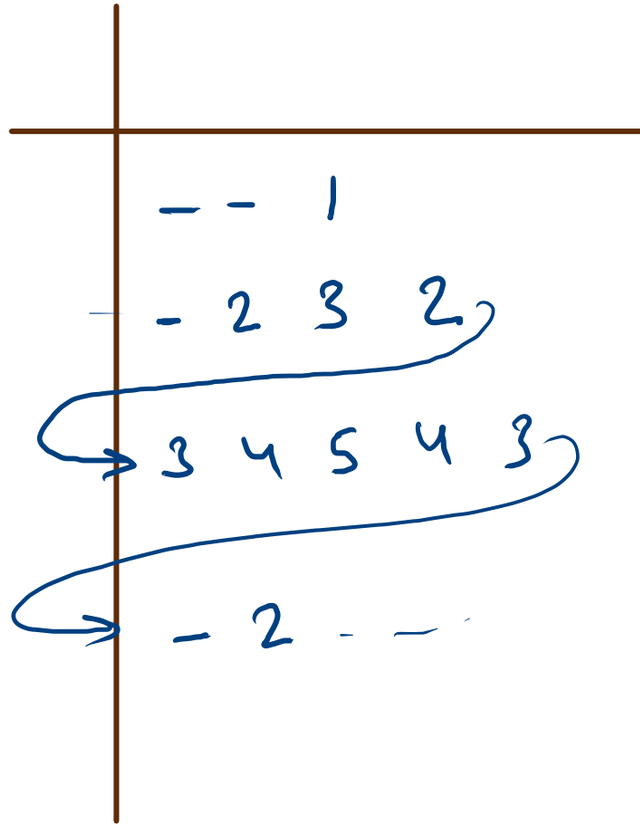
star = 1 3 5 3

oval = 1 2 3 2

i = 1 2 3

ival = 3 4 5 4 3 2

j = 1 2 3 4 5



```java
int space = n/2;
int star = 1;

int oval = 1;
for(int i=1;i<=n;i++){
    int ival = oval;

    for(int j=1;j<=space;j++){
        System.out.print("\t");
    }

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

    System.out.println();

    if(i <= n/2){
        space--;
        star = star+2;
        oval++;
    }else{
        space++;
        star = star-2;
        oval--;
    }
}
```

n = 5

space = 2

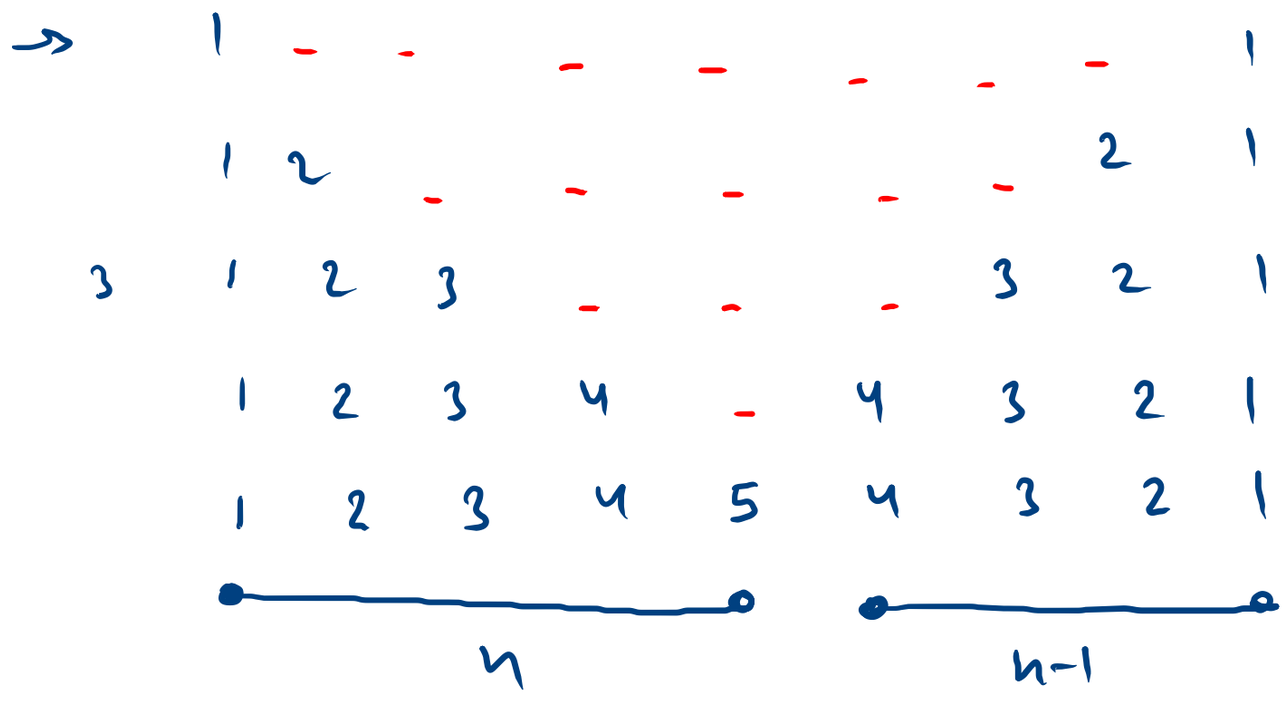
star = 1

oval = 1

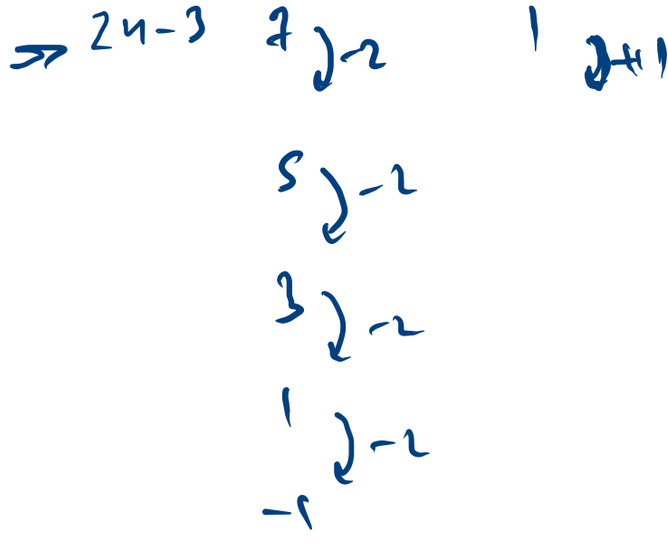
i = 1

ival = 1

n = 5



space star



$n + n-1 - 2 = 2n-3$

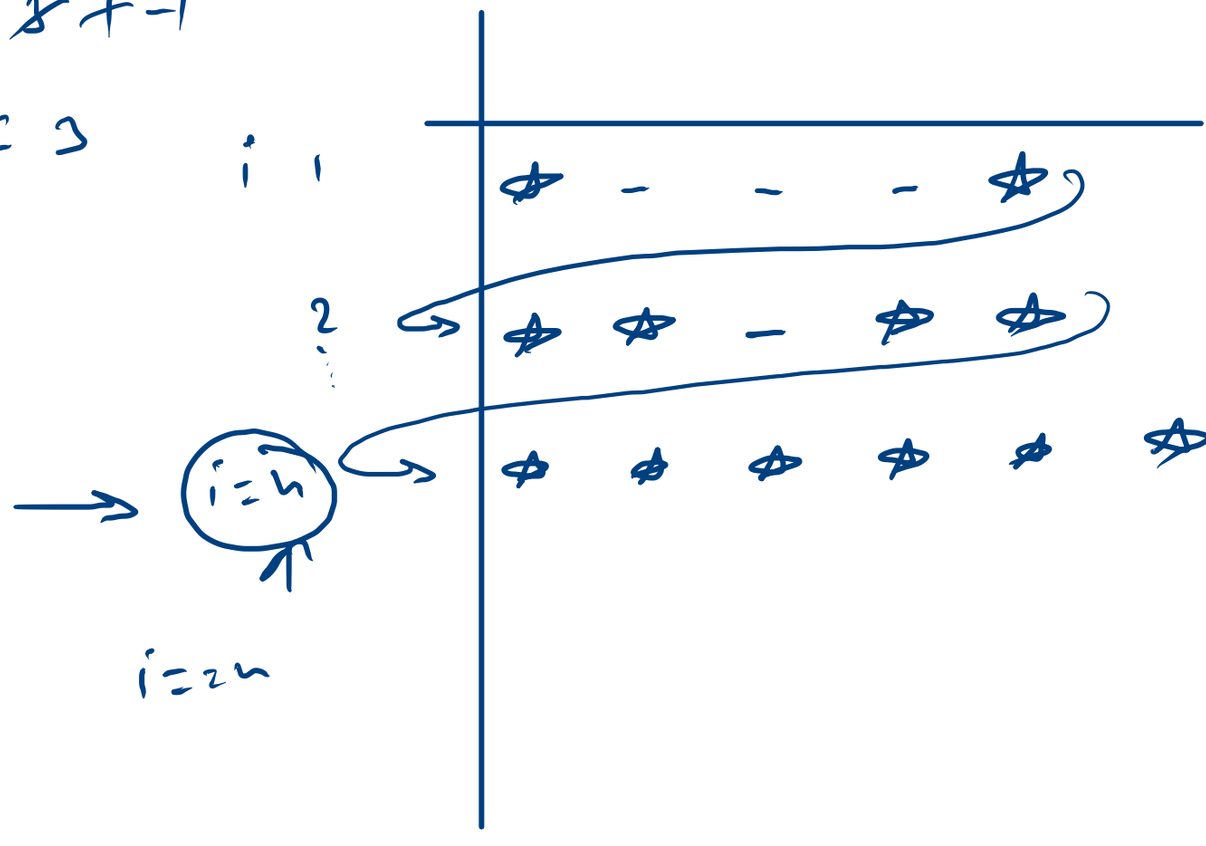
```java
int star = 1;
int space = 2*n-3;
for(int i=1;i<=n;i++){

    for(int j=1;j<=star;j++){
        System.out.print("*\t");
    }
    for(int j=1;j<=space;j++){
        System.out.print("\t");
    }if(i==n) star--;
    for(int j=1;j<=star;j++){
        System.out.print("*\t");
    }

    star++;
    space -= 2;
    System.out.println();
}
```

n = 3

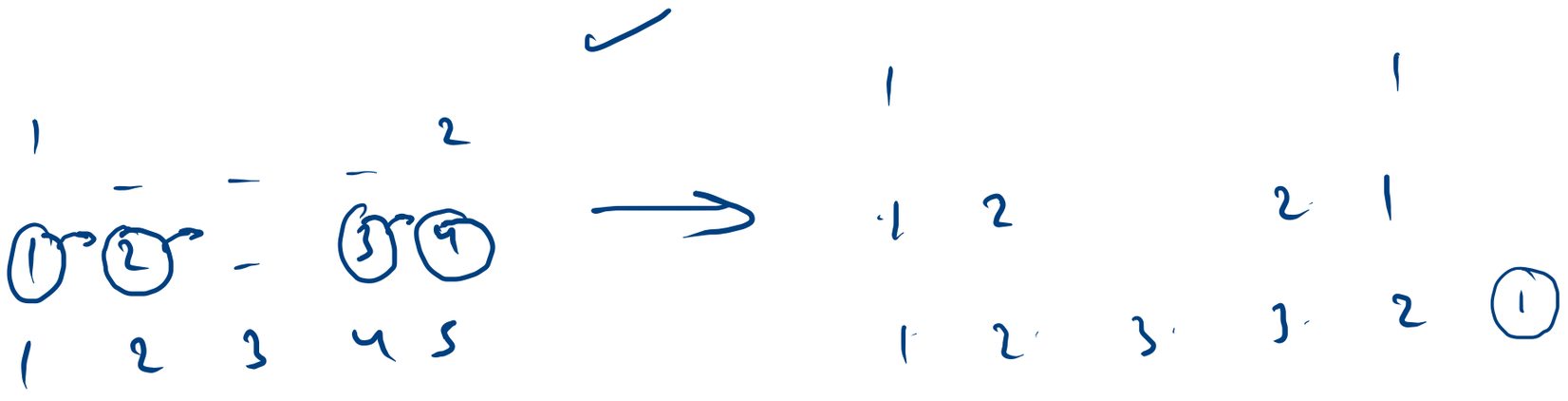
star = + x 3

space = x + -1

i = x x 3



h = 3



```java
int star = 1;
int space = 2*n-3;
for(int i=1;i<=n;i++){
    int val = 1;

    for(int j=1;j<=star;j++){
        System.out.print(val+"\t");
        val++;
    }
    for(int j=1;j<=space;j++){
        System.out.print("\t");
    }
    val--;
    if(i==n){
        star--;val--;
    }
    for(int j=1;j<=star;j++){
        System.out.print(val+"\t");
        val--;
    }

    star++;
    space -= 2;
    System.out.println();
}
```

n = 3

star = 1 2 3 4 5 4 3

space = 3 2 1 -> 0

i = 1 2 3 4 5 6

val = 1 2 3 4 5 6 5 4 3 2 1 0

j = 1 2 3 4 5

1 2 3 4 5 4 3 2 1