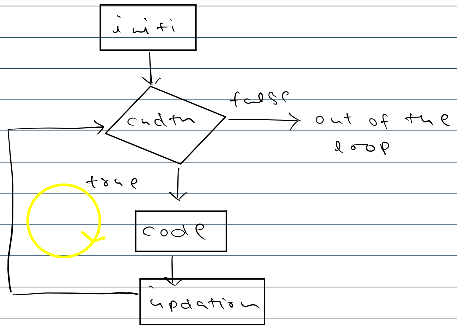
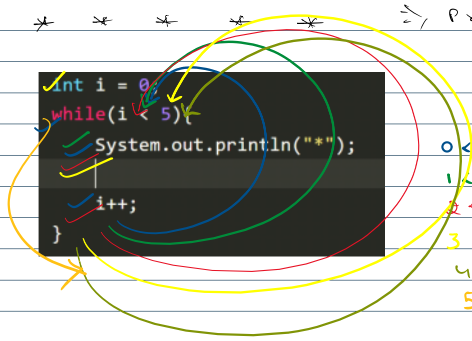
```
initialisation
while(condition) {
    //code

    updation
}
```



Patterns

* * * * * ⇒ Print 5 stars



```
int i = 0;
while(i < 5){
    System.out.println("*");

    i++;
}
```

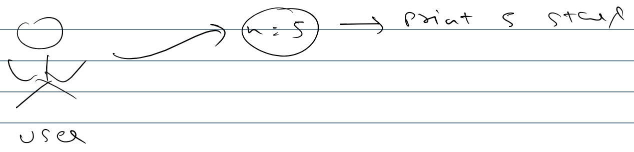
i : ~~0~~ ~~1~~ ~~2~~ ~~3~~ ~~4~~ 5

*
*
*
*
*

0 < 5 ⇒ ✓ ⇒ i++
1 < 5 ⇒ ✓ ⇒ i++
2 < 5 ⇒ ✓ ⇒ i++
3 < 5 ⇒ ✓ ⇒ i++
4 < 5 ⇒ ✓ ⇒ i++
5 < 5 ⇒ ✗ ⟶ out of loop

```
public class Main {
    public static void main(String[]
args) {
        int i = 0;
        while(i < 5){
            System.out.print("* ");

            i++;
        }
    }
}
```

How to take input from user



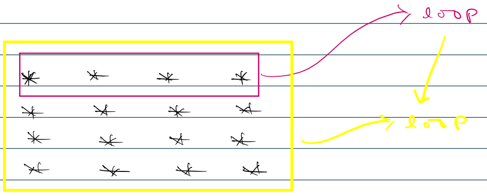
```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        System.out.println("Enter a number: ");
        int n = sc.nextInt();
        System.out.println("Your entered number is: " + n);
    }

}
```

Pattern 2

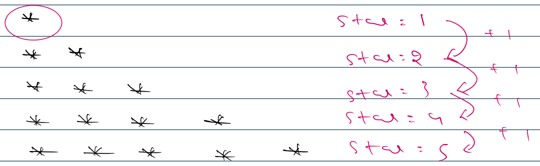
loop inside loop

```
outer loop {

        inner loop
```

}

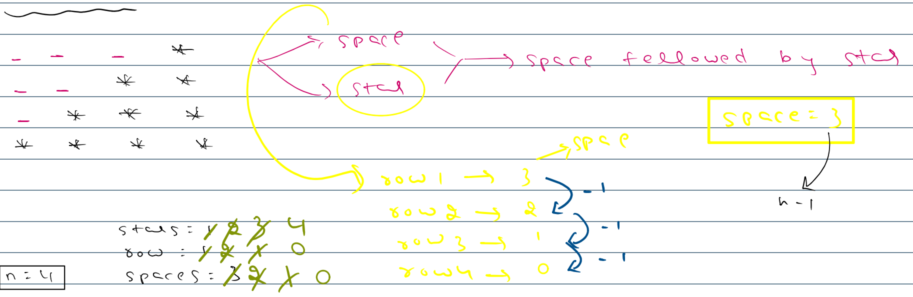


Pattern 3

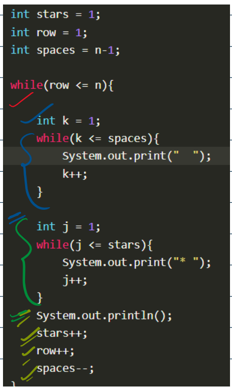


```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();

        int stars = 1;
        int row = 1;

        while(row <= n){

            int j = 1;
            while(j <= stars){
                System.out.print("* ");
                j++;
            }
            System.out.println();
            stars++;
            row++;
        }

        sc.close();
    }
}
```

Pattern 4



n = 4



```
int stars = 1;
int row = 1;
int spaces = n-1;

while(row <= n){

    int k = 1;
    while(k <= spaces){
        System.out.print("  ");
        k++;
    }

    int j = 1;
    while(j <= stars){
        System.out.print("* ");
        j++;
    }
    System.out.println();
    stars++;
    row++;
    spaces--;
}
```

k = ~~1~~ ~~2~~ ~~3~~ 4

1 <= 4 → 1 <= 3 → k++

2 <= 3 → k++

3 <= 3 → k++

j = ~~1~~ 2

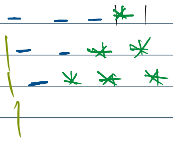
1 <= 1 => ✓ → j++

2 <= 1 => × → out of loop

k = ~~1~~ ~~2~~ 3

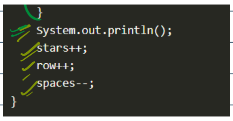
2 <= 4 => ✓ 1 <= 2 => ✓ => k++

2 <= 2 => ✓ => k++



```
import java.u
public class M
  public stat
    Scanne
    int n =

    int sta
    int rov
    int spa

    while(r

      int
      whi
        
        
      }

      int j
      whi
```

```
util.Scanner;

Main {
tic void main(String[] args) {
er sc = new Scanner(System.in);
= sc.nextInt();

rs = 1;
v = 1;
aces = n-1;

row <= n){

 k = 1;
ile(k <= spaces){
System.out.print("  ");
k++;


j = 1;
ile(j <= stars){
System.out.print("* ");
```



```
    }
    System.out.println();
    stars++;
    row++;
    spaces--;
}
```

2<=4 => ✓

k = ~~1~~ ~~2~~ 3
1<= 2 => ✓ => k++
2 <= 2 => ✓ => k++
3 <= 3 => x → out of loop

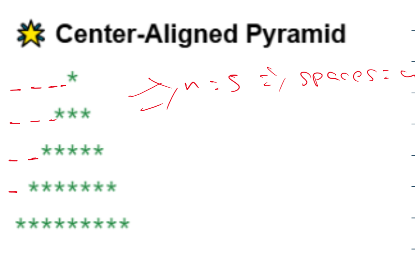
j = ~~1~~ ~~2~~ 3
1 <= 2 => ✓ => j++
2 <= 2 => ✓ => j++
3 <= 2 => x → out of loop

3 <= 4 => ✓

k = ~~1~~ 2
1 <= 1. => ✓ => k++
2 <= 1 => X => out of loop

j = ~~1~~ ~~2~~ ~~3~~ 4
1 <= 3 => ✓ => j++
2 <= 3 => ✓ => j++
3 <= 3 => ✓ => j++
4 <= 3 => x => out of loop

```
int j
whi
    s
    j
}
Sys
star
row
spa
}

sc.close
    }
}
```



Center-Aligned Pyramid

```
----*
---***
--*****
-*******
*********
```

=> n = 5 => spaces = 4

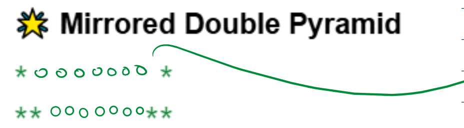
spaces = n - 1 (- n)

stars = 1 (+2)

row 1 => 4 spaces, 1 star
row 2 => 3 spaces, 3 star
row 3 => 2 spaces, 5 star
row 4 => 1 space, 7 star
row 5 => 0 spaces, 9 stars

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();

        int stars = 1;
        int row = 1;
        int spaces = n-1;

        while(row <= n){

            int k = 1;
            while(k <= spaces){
                System.out.print("  ");
                k++;
            }

            int j = 1;
            while(j <= stars){
                System.out.print("* ");
                j++;
            }
            System.out.println();
            stars = stars + 2;
            row++;
            spaces--;
        }

        sc.close();
    }
}
```

=> n = 5



Mirrored Double Pyramid

```
*ooooooo *
** ooooooo**
```

n = 5

stars = 1

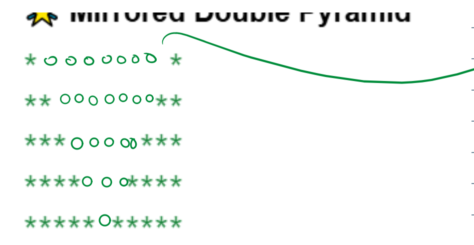
spaces = 2* n - 1

=> 9, 7, 5, 3, 1 => spaces

2, 4, 6, 8, 10 => stars

```
j = 1;
ile(j <= stars){
System.out.print("* ");
j++;

tem.out.println();
rs++;
/++;
ces--;


e();
```

=> 9



⭐ Mirrored Double Pyramid

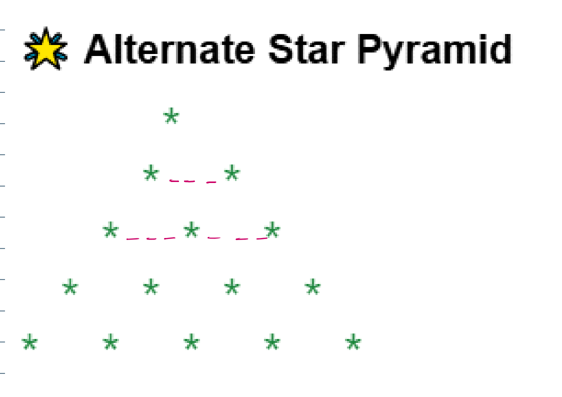
```
*oooooooo *
** ooooooo**
***ooooo***
****o o o****
*****o*****
```

spaces = 2*n - 1

9,7,5,3,1 ⇒ spaces
2,4,6,8,10 ⇒ stars

1 + 1 → 2
2 + 2 → 4
3 + 3 → 6
4 + 4 → 8
5 + 5 → 10

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();

        int stars = 1;
        int row = 1;
        int spaces = 2*n-1;

        while(row <= n){

            int l = 1;
            while(l <= stars){
                System.out.print("*");
                l++;
            }

            int k = 1;
            while(k <= spaces){
                System.out.print(" ");
                k++;
            }

            int j = 1;
            while(j <= stars){
                System.out.print("*");
                j++;
            }
            System.out.println();
            stars = stars + 1;
            row++;
            spaces = spaces -2;
        }

        sc.close();
    }
}
```



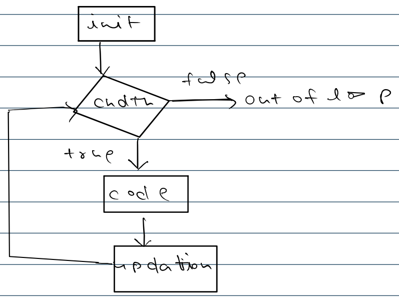
🌟 Alternate Star Pyramid

```
        *
      * ___ *
    * ___ * _ __*
  *   *   *   *
*   *   *   *   *
```

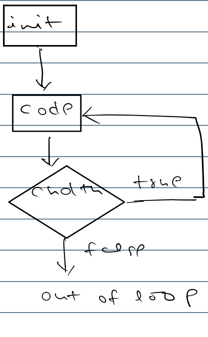
"* " → initial space ⇒ 5

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();

        int stars = 1;
        int row = 1;
        int spaces = n-1;

        while(row <= n){

            int k = 1;
            while(k <= spaces){
                System.out.print("  ");
                k++;
            }

            int j = 1;
            while(j <= stars){
                if(j%2 != 0){
                    System.out.print("* ");
                }
                else{
                   System.out.print("  ");
                }

                j++;
            }
            System.out.println();
            stars = stars + 2;
            row++;
            spaces--;
        }

        sc.close();
    }
}
```

```
initialisation;
while(cndtn) {            ⇒     for( init; cndtn; updation) {
    //code                               //code
    updation                      }
}
```



```
init;
do {
   //code

} while(cndtn);
```



Pattern

```
      n=5                   n=1     n=2      n=3

*  *  *  *  *                *      * *     * * *
*           *                       * *     *   *
*           *                               * * *
*           *
*  *  *  *  *
```

```
import java.util.Scanner;

public class Pattern1 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();

        int row = 1;
        while(row <= n){
            int i = 1;
            if(row == 1 || row == n){
                while(i <= n){
                    System.out.print("* ");
                    i++;
                }
            }
            else{
               while(i <= n){
                    if(i==1 || i==n){
                        System.out.print("* ");
                    }
                   else{
                      System.out.print("  ");
                   }
                    i++;
                }
            }

            System.out.println();
            row++;
        }

        sc.close();
    }
}
```

```
import java.util.Scanner;

public class Pattern1 {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();

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

```
            }

            System.out.println();
        }

        sc.close();
    }
}
```