TC = O(1)

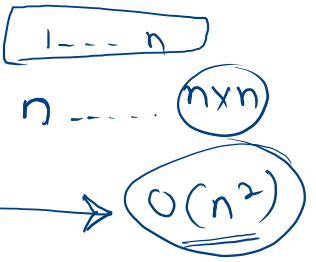
```java

import java.io.*;
import java.util.*;

public class Solution {

    public static void main(String[] args) {
        /* Enter your code here. Read input from STDIN. Pri
        Scanner scn = new Scanner(System.in);

        for(int i = 0; i < 26; i ++)
        {
            if(i % 2 == 0)
            {
               System.out.println((char)('a' + i));
            }
            else
            {
                System.out.println((char)('A' + i));
            }
        }


    }
}
```

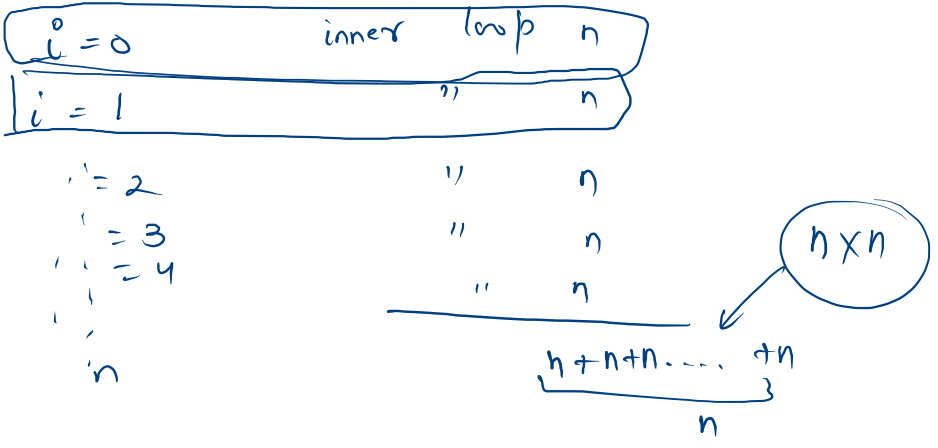
```java
import java.io.*;
import java.util.*;

public class Solution {

    public static void main(String[] args) {
        for(int i = 10; i >= 1; i--){
            System.out.println("5x" + i + "=" + (5*i));
        }
    }
}
```

TC = O(1)

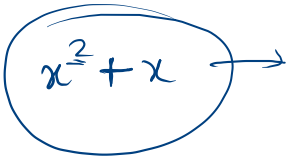
```java
import java.util.*;
public class Main
{
    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int n = scn.nextInt();

        for(int i = 0; i < n; i++){
            for(int j = 0; j < n; j++){
                System.out.println("Geekster");
            }
        }
    }
}
```

n = 5





```java
import java.util.*;
public class Main
{
    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int n = scn.nextInt();

        for(int i = 0; i < n; i++){
            for(int j = 0; j < n; j++){
                System.out.println("Geekster");
            }
        }

        for(int i = 0; i < n; i++){
            System.out.println("hi");
        }
    }
}
```



```java
import java.util.*;
public class Main
{
    public static void func(int n){
        for(int j = 0; j < n; j++){
                System.out.println("Geekster");
                    for(int p = 0; p < n; p++){
                        System.out.println("hi");
                    }
            }
    }

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

        for(int i = 0; i < n; i++){
            func(n);
        }


    }
```

n^2

$1 \longrightarrow n^2$

$n \longrightarrow n \times n^2$

$= n^3$

$\downarrow$

$O(n^3)$

```java
public class Main
{
    public static void func(int n){
        for(int i = 0; i < n; i++){
            System.out.println("Hello");
        }
    }
    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int n = scn.nextInt();

        for(int i = 0; i < n; i++){
            func(n);
        }

        func(n);


    }
}
```

n

k

n^2

n

$5n \Rightarrow O(n)$

$10n \Rightarrow O(n)$

$n^2 + n + k$

$O(n^2)$

$n = 10$

$100n$

$2n^2 + n + k$

$O(n^2)$

```java
public class Main
{
    public static void func(int n){
        for(int i = 0; i < n; i++){
            System.out.println("Hello");
        }
    }
    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int n = scn.nextInt();

        for(int i = 0; i < n; i++){
            func(n);
            func(n);
        }

        func(n);


    }
}
```

1 → 10

k

1 → n

$2n^2$

1 → n+n

1 → 2n

n → 2n × n

n

$n = 1000 \quad 10^3$

$2n^2 + n + K$

$2 \times 10^6 + 10^3 + 8$

$= \quad 2\,000\,000$
$\qquad\qquad\quad 1 \quad\; 8$

$2 \times 10^6 \approx < \quad 2\,001\,008$

$2 \cdot 10^6 \rightarrow 10^7$

$3 \cdot 10^6$

```java
public static void func(int n){
    for(int i = 0; i < n; i += 2){
        System.out.println("Hello");
    }
}
```

n/2 itr

1

1 ⟶ 1

n/2 ⟶ n/2

$O(n/2)$

$O\left(\frac{1}{2} \cdot n\right)$

$= O(n)$

```java
public static void func(int n){
    for(int i = 0; i < n; i += 2){
        System.out.println("Hello");
    }
}
public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();

    for(int i = 0; i < n; i++){
        func(n);
        func(n);
    }

    func(n);
```

O(n)

$O(n^2)$

```java
public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();

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

n = 10

i = 1 → (n)

= 2 → (n-1)

= 3 → (n-2)

= .

.

= 10 → 1

$n + (n-1) + (n-2) + \cdots + 3 + 2 + 1$

$n(n+1)/2 = \frac{1}{2}(n^2+n)$

$O(n^2)$

```java
    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int n = scn.nextInt();

        for(int i = 1; i <= n; i++){
            for(int j = 1; j <= 10; j++){
                System.out.println("Hello");
            }
        }
```

common

$O(1)$ ✓ best

$O(\log_2 n)$ ✓ ⇓

$O(n)$ ✓

$O(n \log n)$

$O(n^2)$ ✓

$O(n^3)$ worst

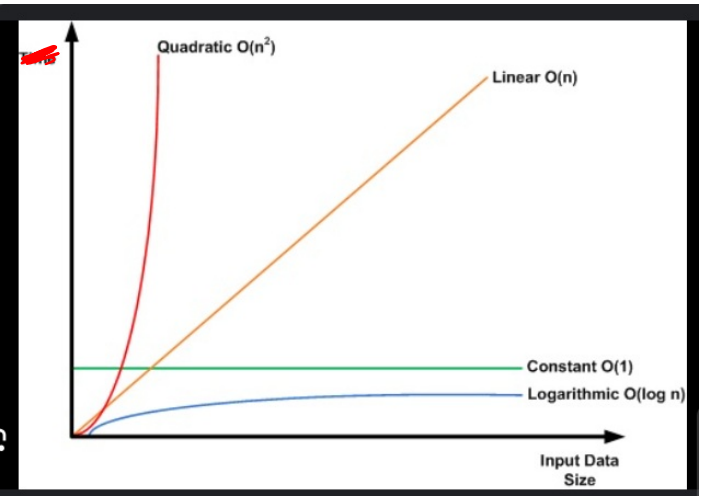
$n = 10^4$

$O(\log_2 n)$ → binary search *M2

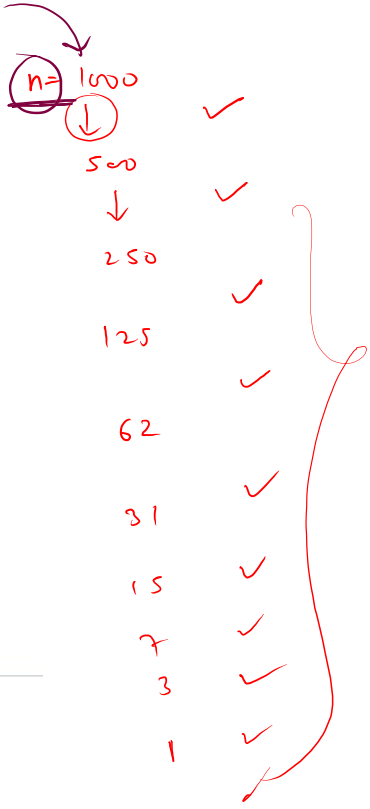
↳ assignment

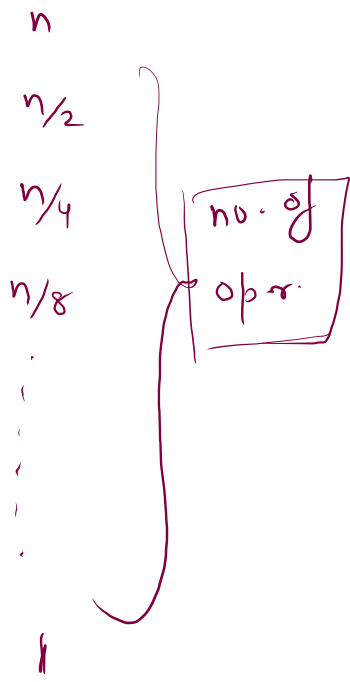
$O(n \log n)$ → sort * M2

log


Quadratic O(n²)
Linear O(n)
Constant O(1)
Logarithmic O(log n)
Input Data Size

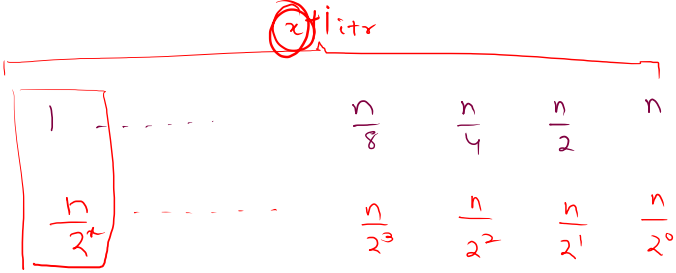
no. of opr & input.






```java
import java.io.*;
import java.util.*;

public class Solution {

    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int n = scn.nextInt();
        int steps = 0;
        while(n >= 1){
            n = n / 2;
            steps++;
        }
        System.out.println(steps);
    }
}
```

i++



$$1 = \frac{n}{2^x}$$

$$2^x = n$$

$$\log_2 2^x = \log_2 n$$

$$x \log_2 2 = \log_2 n$$

$$x \times 1 = \log_2 n$$

$$\boxed{x = \log_2 n}$$

$$f(n) = \log_2 n$$

$1 \le r \le 10^4$
$1 \le n \le 10^7$

$1 \le n, r \le 10^4$

```java
public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
        int n = scn.nextInt();
        int r = scn.nextInt();
        int result=1;

        for(int i=n;i>n-r;i--){
            result*=i;
        }
        System.out.println(result);

    }
}
```

O

$n=10$
$r=2$

worst

$i = 1$

-9999

1 -> -9999

10^7

$n \times m$

$O(r)$

$O(n)$

n^2

$1 \le n, m \le 10^4$

$n \approx m$

n^2

SC → how many extra space your code is take v/s no. of i/p.

↳ apart from i/p & o/p part