

$$TC = O(1)$$

```
1
2 import java.io.*;
3 import java.util.*;
4
5 public class Solution {
6
7     public static void main(String[] args) {
8         /* Enter your code here. Read input from STDIN. Print output to STDOUT */
9         Scanner scn = new Scanner(System.in);
10
11         for(int i = 0; i < 26; i++)
12         {
13             if(i % 2 == 0)
14             {
15                 System.out.println((char)('a' + i));
16             }
17             else
18             {
19                 System.out.println((char)('A' + i));
20             }
21         }
22     }
23 }
24
25 }
```

```
1 import java.io.*;
2 import java.util.*;
3
4 public class Solution {
5
6     public static void main(String[] args) {
7         for(int i = 10; i >= 1; i--){
8             System.out.println("5x" + i + "=" + (5*i));
9         }
10    }
11 }
```

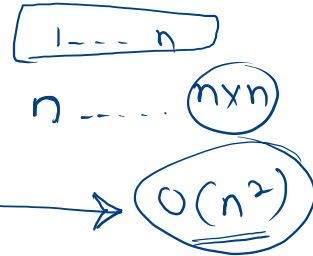
$$TC = O(1)$$

```

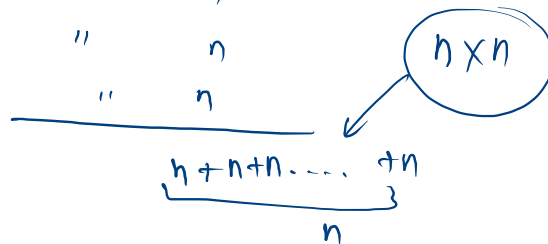
1
2 import java.util.*;
3 public class Main
4 {
5     public static void main(String[] args) {
6         Scanner scn = new Scanner(System.in);
7         int n = scn.nextInt();
8
9         for(int i = 0; i < n; i++){
10             for(int j = 0; j < n; j++){
11                 System.out.println("Geekster");
12             }
13         }
14     }
15 }
16

```

$n=5$



$i = 2$
 $i = 3$
 $i = 4$
 \vdots
 $i = n$



```
1
2 import java.util.*;
3 public class Main
4 {
5     public static void main(String[] args) {
6         Scanner scn = new Scanner(System.in);
7         int n = scn.nextInt();
8
9         for(int i = 0; i < n; i++){
10             for(int j = 0; j < n; j++){
11                 System.out.println("Geekster");
12             }
13         }
14
15         for(int i = 0; i < n; i++){
16             System.out.println("hi");
17         }
18     }
19 }
20
```

$$x^2 + x \rightarrow$$

```

1
2 import java.util.*;
3 public class Main
4 {
5     public static void func(int n){
6         for(int j = 0; j < n; j++){
7             System.out.println("Geekster");
8             for(int p = 0; p < n; p++){
9                 System.out.println("hi");
10            }
11        }
12    }
13
14    public static void main(String[] args) {
15        Scanner scn = new Scanner(System.in);
16        int n = scn.nextInt();
17
18        for(int i = 0; i < n; i++){
19            func(n);
20        }
21    }
22
23 }

```

n^2

$$1 \rightarrow n^2$$

$$n \rightarrow n \times n^2$$

$$= n^3$$

$$\downarrow$$

$$\underline{O(n^3)}$$

```
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);
```

```
    }
```

```
}
```

100 n \rightarrow $n=10$

$$5n \Rightarrow O(n)$$

$$10n \Rightarrow O(n)$$

$$n^2 + n + k$$

$$O(n^2)$$

$$2n^2 + n + k$$

$O(n^2)$

$$1 \rightarrow 10$$

$$1 \rightarrow n+n$$

$$1 \rightarrow 2n$$

$$\eta \rightarrow 2n \times n$$

```
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);
    }
}
```

$$\underline{n = 1000} \quad 10^3$$

$$2n^2 + n + k$$

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

$$\begin{array}{c} \downarrow \\ \boxed{2 \times 10^6} \end{array} \approx < \begin{array}{c} 2 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \\ \quad \quad \quad 1 \quad \quad \quad 8 \\ \boxed{2 \quad 0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 8} \end{array}$$

$$\begin{array}{l} 2 \cdot 10^6 \rightarrow 10^7 \\ 3 \cdot 10^6 \end{array}$$

```

11 public static void func(int n){
12     for(int i = 0; i < n; i += 2){
13         System.out.println("Hello");
14     }
15 }

```

$n/2$ itr

1

$1 \rightarrow 1$

$O(n/2)$

$n/2 \rightarrow n/2$

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

$\approx O(n)$


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

} $O(n)$

```
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);  
}
```

} $O(n^2)$

```

16 public static void main(String[] args) {
17     Scanner scn = new Scanner(System.in);
18     int n = scn.nextInt();
19
20     for(int i = 1; i <= n; i++){
21         for(int j = i; j <= n; j++){
22             System.out.println("Hello");
23         }
24     }
25

```

$$n=10$$

$$i=1$$



$$(n)$$

$$=2$$



$$(n-1)$$

$$=3$$



$$(n-2)$$

$$=1$$

$$\vdots$$



$$2$$

$$=10$$



$$1$$

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

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

$$O(n^2)$$

```
16 public static void main(String[] args) {  
17     Scanner scn = new Scanner(System.in);  
18     int n = scn.nextInt();  
19  
20     for(int i = 1; i <= n; i++){  
21         for(int j = 1; j <= 10; j++){  
22             System.out.println("Hello");  
23         }  
24     }  
25 }
```

n

10

$O(n)$

common {

✓
 $O(1)$
best

✓
 $O(\log_2 n)$
↓

✓
 $O(n)$

$O(n \log n)$
↓

✓
 $O(n^2)$

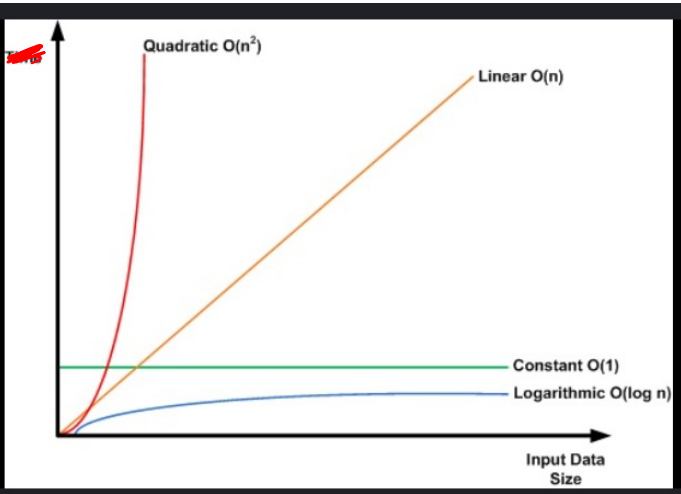
$O(n^3)$
worst

$n = 10^4$

*M2
binary
search
↓
Q → assignment

sort
★
M2

log



no. of opr & input.

n = 1000
↓

500

↓

250

125

62

31

15

7

3

1

✓

✓

✓

✓

✓

✓

✓

✓

✓

✓

n

$n/2$

$n/4$

$n/8$

⋮

⋮

⋮

⋮

1

no. of
opr.

i++

```
1 import java.io.*;
2 import java.util.*;
3
4 public class Solution {
5
6     public static void main(String[] args) {
7         Scanner scn = new Scanner(System.in);
8         int n = scn.nextInt();
9         int steps = 0;
10        while(n >= 1){
11            n = n / 2;
12            steps++;
13        }
14        System.out.println(steps);
15    }
16 }
```

Iteration

| | | | | | |
|-----------------|-----|-----------------|-----------------|-----------------|-----------------|
| 1 | ... | $\frac{n}{8}$ | $\frac{n}{4}$ | $\frac{n}{2}$ | n |
| $\frac{n}{2^k}$ | ... | $\frac{n}{2^3}$ | $\frac{n}{2^2}$ | $\frac{n}{2^1}$ | $\frac{n}{2^0}$ |

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

$$2^k = n$$

$$\log_2 [2^k] = \log_2 [n]$$

$$\cancel{k \log_2 2}^1 = \log_2 n$$

$$k \times 1 = \log_2 n$$

$$k = \log_2 n$$

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

$$1 \leq r \leq 10^4$$

$$1 \leq n \leq 10^7$$

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

```

1 public static void main(String[] args) {
2     Scanner scn = new Scanner(System.in);
3     int n = scn.nextInt();
4     int r = scn.nextInt();
5     int result=1;
6
7     max for(int i=n; i>n-r; i--){
8         result*=i;
9     }
10    System.out.println(result);
11
12 }
13 }

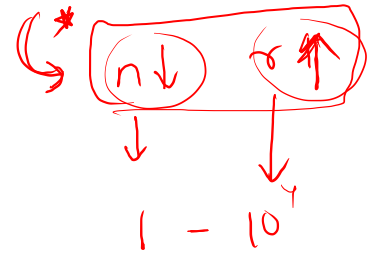
```

0

$$n=10$$

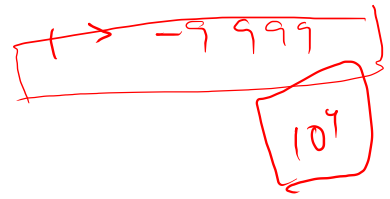
$$r=2$$

worst



$$i=1$$

$$-9999$$



$$n \times m$$

$$O(r)$$

$$O(n)$$

$$n^2$$

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

$$n \approx m$$

$$n^2$$

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

↳ apart from i/p & o/p
part