About Me

Incoming SDE Intern + SDE (FTE) @ **Delhivery**

SDE Intern + SDE (FTE) offer @ **Chaayos**

Technical Content Writer/Engineer @ **Scaler**

Technical Content Writer/Engineer @ **PrepBytes**

Ex – Technical Content Writer @ **InterviewBit**

Ex – Technical Content Engineer @ **Pepcoding**

Offers from other Ed-tech institutions like Unstop (Dare2Compete), TuteDude, etc.

Syllabus

Time & Space Complexity

① Getting Started

② Arrays & Strings
- → Two Pointer + Sliding Window
- → Greedy Algorithms
- → ☆ Searching & Sorting

☆ ③ Recursion & Backtracking

④ Object Oriented Programming (Java)

Data Structures & Algorithms

⑤ Linked List

⑥ Stack & Queue

☆ ⑦ Binary Tree & Binary Search Tree

⑧ Hashmap & Heap

☆ ⑨ Graphs

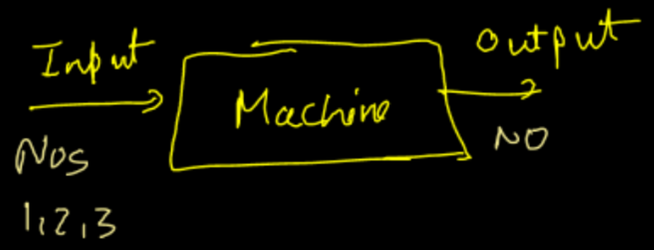
☆ ⑩ Dynamic Programming

⑪ Number Theory & Bit Manipulation

⑫ Trie

Computer → Human convinience

↳ Machine



Communication

Computer understands Binary lang (0 and 1s)

Humans understand Human Lang → instructions + emotions

Prog Lang

① Compiler → Software that converts Prog Lang to Binary Lang

Input/output

```java
// "static void main" must be defined in a public class.
public class Main {
    public static void main(String[] args) {

    }
}
```

comments

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        //this is a comment
    }
    //this is also a comment
}
```

Print in Java

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        System.out.print("DSA classes");
    }
}
```

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        System.out.print("Guneet Malhotra");
        System.out.print("DSA Classes");
    }
}
```

```
Finished in 69 ms
Guneet MalhotraDSA Classes
```

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        System.out.print("Guneet Malhotra ");
        System.out.print("DSA Classes");
    }
}
```

```
Finished in 82 ms
Guneet Malhotra DSA Classes
```

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        System.out.print("Guneet Malhotra");
        System.out.print(" DSA Classes");
    }
}
```

```
Finished in 84 ms
Guneet Malhotra DSA Classes
```

System.out.print("Rohan");

RI

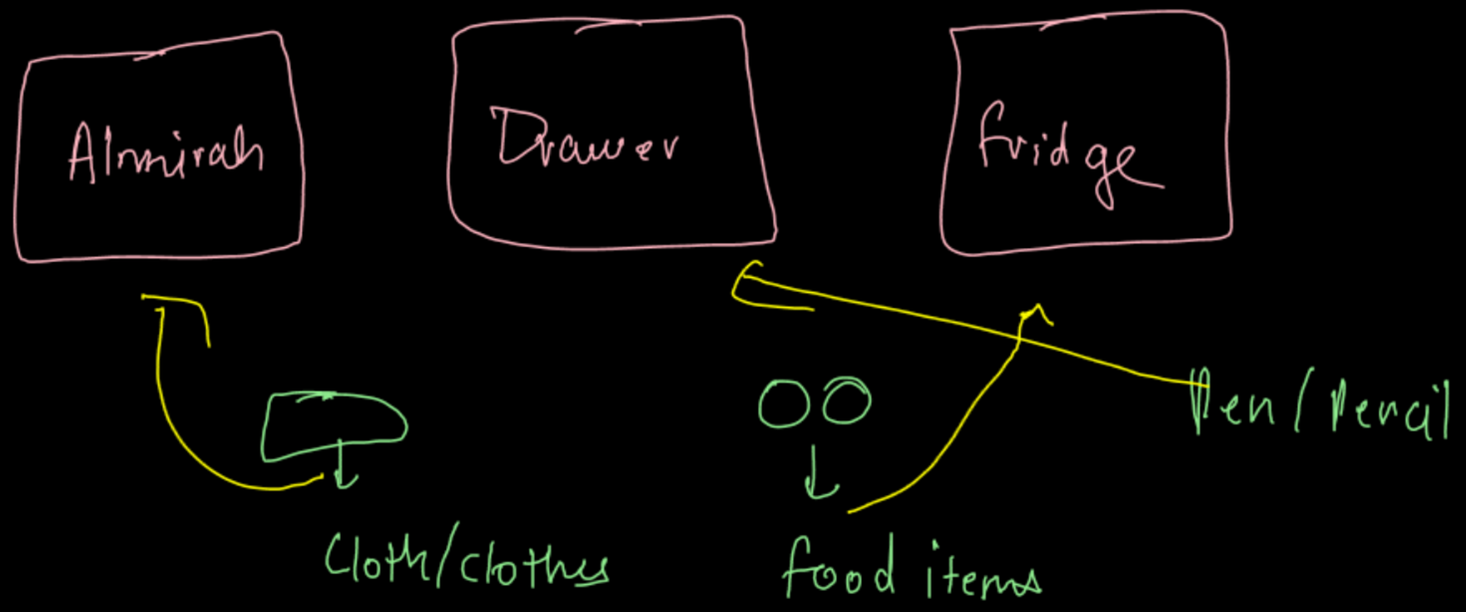
Rohan
I

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        System.out.println("Guneet Malhotra");
        System.out.print("DSA Classes");
    }
}
```

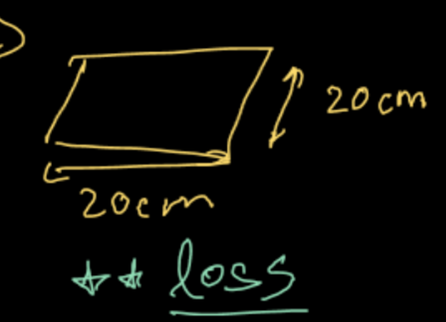
```
Finished in 122 ms
Guneet Malhotra
DSA Classes
```

Data types in Java

Type of containers.



If we try to put item in small size container, there is a loss



** loss

Size in bytes

Integral (w/o decimal)	byte	1	30, 50, 700 etc.
	Short	2	
	int	4	
	long	8	
floating pt type (with decimal)	float	4	3.141, 8.632 etc
	double	8	
Characters →	char	2 → A-Z, a-z, 0-9, #, *, etc.	
True/false →	boolean	Not fixed	

11/

Range of Datatype

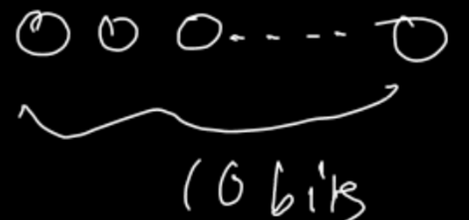
1 byte = 8 bits

$[-2^{N-1}$ to $2^{N-1}-1]$ → Here N is the no of bits.

Range of Short

Size = 2bytes = 2x8 = 16bits

$$\left[-2^{16-1} \text{ to } 2^{16-1} - 1 \right]$$



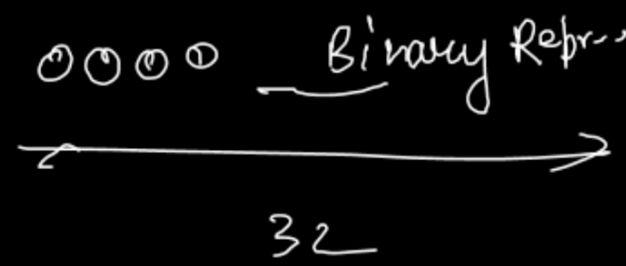
$$\left[-32768 \text{ to } 32767 \right]$$

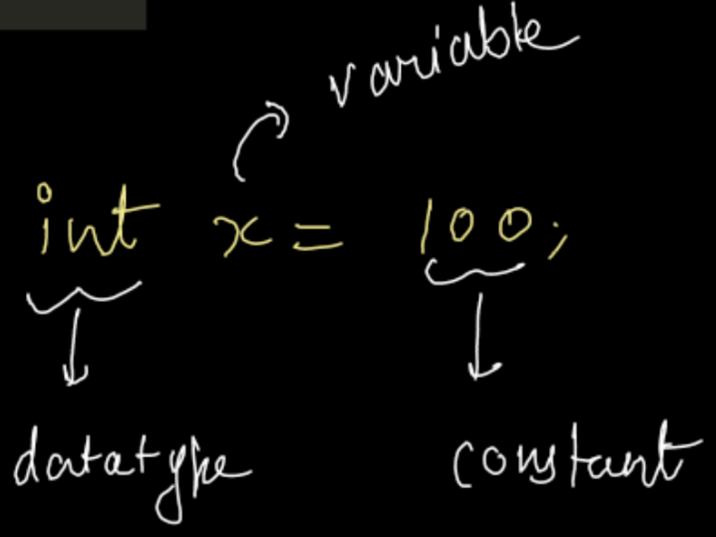
32768 → 17bit

Data loss

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        int x = 100;
        System.out.println(x);
    }
}
```

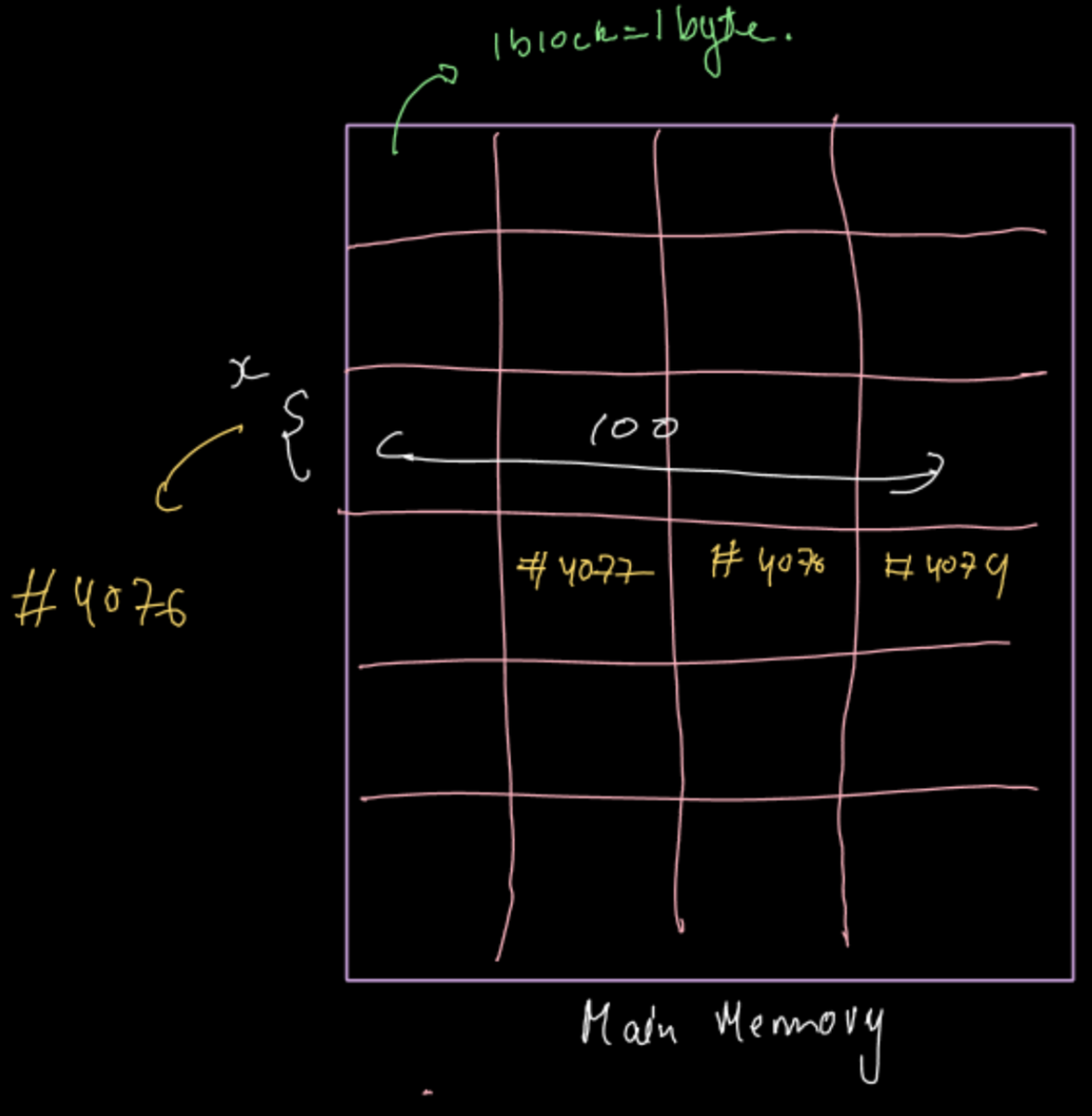
```
Finished in 62 ms
100
```





int x = 100;

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        int x = 100; (1)
        System.out.println(x);
    }
}
```



```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        int x = 100;
        System.out.println(x);

        char ch = 'a';
        System.out.println(ch);
    }
}
```

```
Finished in 64 ms
100
a
```

Operators in Java

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        int x = 100;
        System.out.println(x);

        char ch = 'a';
        System.out.println(ch);
    }
}
```

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        int x = 100;
        int y = x;
        System.out.println(x);
        System.out.println(y);
    }
}
```

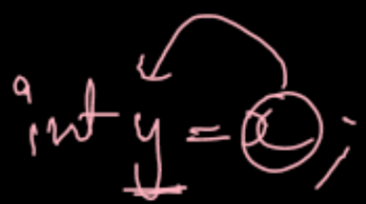
int x = 100;

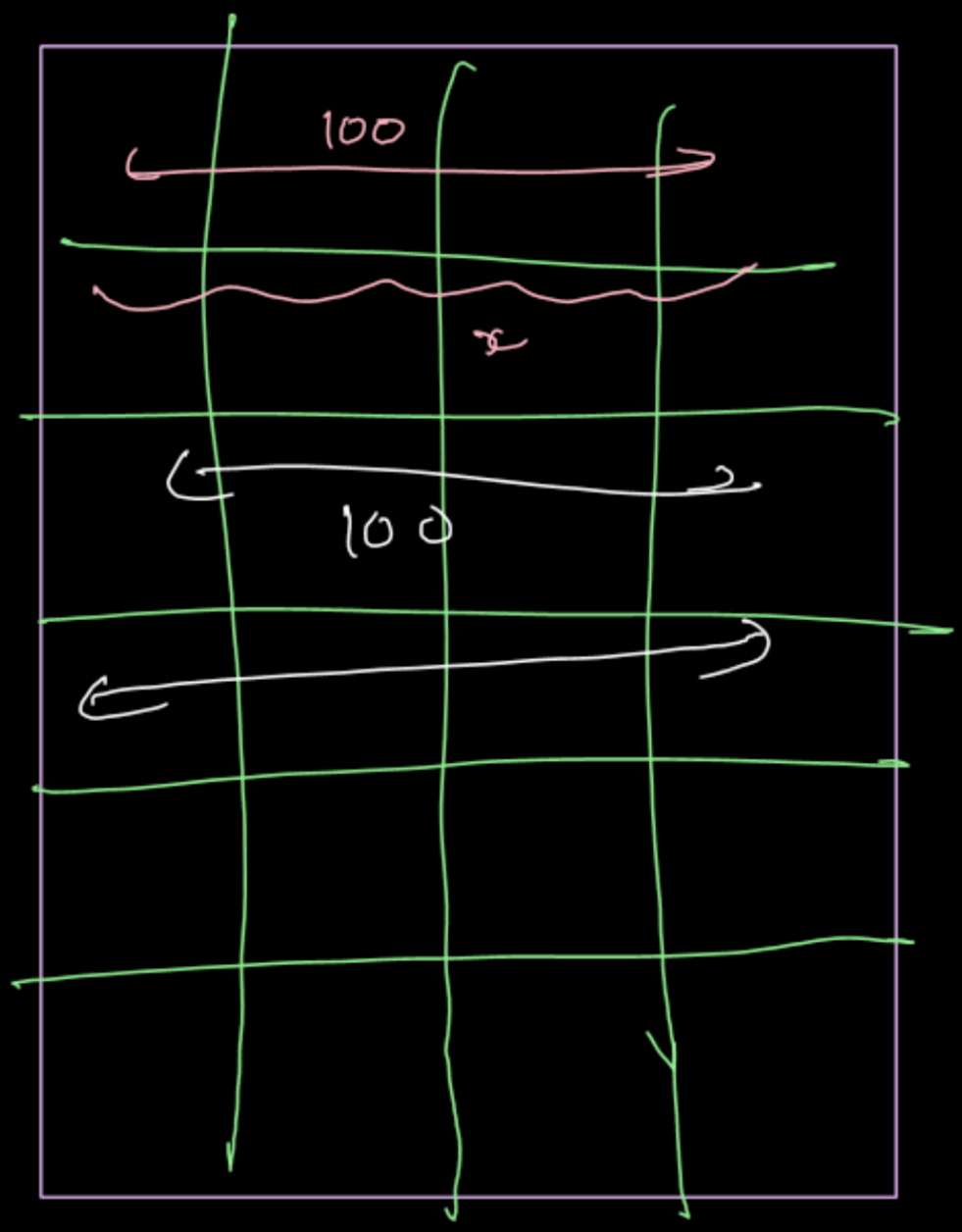
LHS ↓ RHS

assignment operator

RHS gets assigned to LHS

int y = x;


int y = 0;


100
x
100
y

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        int x;
        x = 100;
        System.out.println(x);
    }
}
```

$x = \cancel{GV}\ 100$

```
Finished in 50 ms
100
```

* Initialization of values is a must in Java.

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        int x;
        System.out.println(x);
    }
}
```

```
Finished in N/A
Line 5: error: variable x might not have been initialized [in Mai
n.java]
        System.out.println(x);
                           ^
```

Arithmetic Operators

\+ plus

\- minus

* multiply

/ divide

% modulus

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        int x = 10;
        int y = 30;
        int res = x / y;
        System.out.println(res);
    }
}
```

10/30 = 1/3 = 0.33 --

X

= 0

int x = 1.99

= 1

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        int x = 10;
        int y = 30;
        float res = (float)x / y; //typecasting
        System.out.println(res);
    }
}
```

→ process of converting 1 DT to another.

integer operator → decimal truncates

x is converted to float 10 → 10.00

float / int = float

10/30 →

```
      0
30 ) 10
     -0
     ---
     10
```

→ Quotient is the ans of integer /.

→ remainder is the ans of modulus.

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        int x = 10;
        int y = 30;
        int res = x % y;
        System.out.println(res);
    }
}
```

```
Finished in 70 ms
10
```

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

```
Finished in 108 ms
256
```

stdin

```
256
```

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

        float f = scn.nextFloat();
        System.out.println(f);
    }
}
```

```
Finished in 164 ms
256
10.987
```

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

    }
}
```

```
Finished in N/A
java.util.InputMismatchException
  at line 939, java.base/java.util.Scanner.throwFor
  at line 1594, java.base/java.util.Scanner.next
  at line 2258, java.base/java.util.Scanner.nextInt
  at line 2212, java.base/java.util.Scanner.nextInt
  at line 5, Main.main
```

stdin

```
10.987
```

```java
import java.util.*;
public class Main {
    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        char ch = scn.nextChar();
        System.out.println(ch);
    }
}
```

```
Finished in N/A
Line 5: error: cannot find symbol [in Main.java]
        char ch = scn.nextChar();
                      ^
  symbol:   method nextChar()
  location: variable scn of type Scanner
```

Next Char is not a method.

Getting Started (Lecture : 2)

→ Conditional statements
- if - else
- if - else if - else ladder
- switch case

} comparison operators + logical operators

→ functions in Java (with Memory concepts)

→ Loops
- for
- while
- do - while

} continue + break

Questions
- Even or odd 1
- Even or odd 2
- factorial

Conditional Statements

```java
import java.util.*;
public class Main {

    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        boolean b = scn.nextBoolean();
        System.out.println(b);
    }
}
```

When we want the code (part of it) to execute in a certain condition.

If - Else

```java
import java.util.*;
public class Main {

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

        System.out.println("Start");

        if(guessNo == 10) {
            System.out.println("You have won the game");
        } else {
            System.out.println("You have lost the game");
        }

        System.out.println("end");
    }
}
```

→ true

```
Finished in 153 ms
Start
You have won the game
end
stdin
10
```

guessNo == 10

LHS — comparison operator — RHS

if LHS = RHS

→ value of this statement is true

else it is false

```
if (condition) {
    ≡
} else {
    ≡
}
```

condition → true

First block → if condition is true then this executes

Second block → if condition is false, then this executes

```java
import java.util.*;
public class Main {

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

        System.out.println("Start");

        if(guessNo >= 10 && guessNo <= 20) {
            System.out.println("You have won the game");
        } else {
            System.out.println("You have lost the game");
        }

        System.out.println("end");
    }
}
```

Greater than or equal to

Less than or equal to

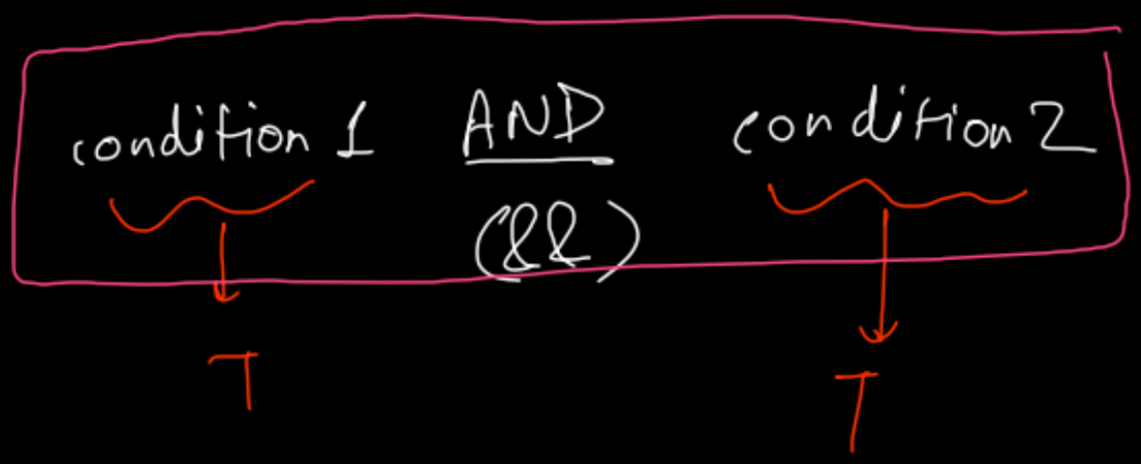
logical AND

HW

> → Greater than

< → Less than

AND



then AND value will be true

else value is false

Logical Or

```
1  import java.util.*;
2  public class Main {
3
4      public static void main(String[] args) {
5          Scanner scn = new Scanner(System.in);
6          int guessNo = scn.nextInt();
7
8          System.out.println("Start");
9
10         if(guessNo == 10 || guessNo == 20) {
11             System.out.println("You have won the game");
12         } else {
13             System.out.println("You have lost the game");
14         }
15
16         System.out.println("end");
17     }
18 }
```

logical OR

cond 1 OR cond 2

if min one is true

answer is true

Logical Not

```java
import java.util.*;
public class Main {

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

        System.out.println("Start");

        if(!(guessNo == 10 || guessNo == 20)) {
            System.out.println("You have won the game");
        } else {
            System.out.println("You have lost the game");
        }

        System.out.println("end");
    }
}
```

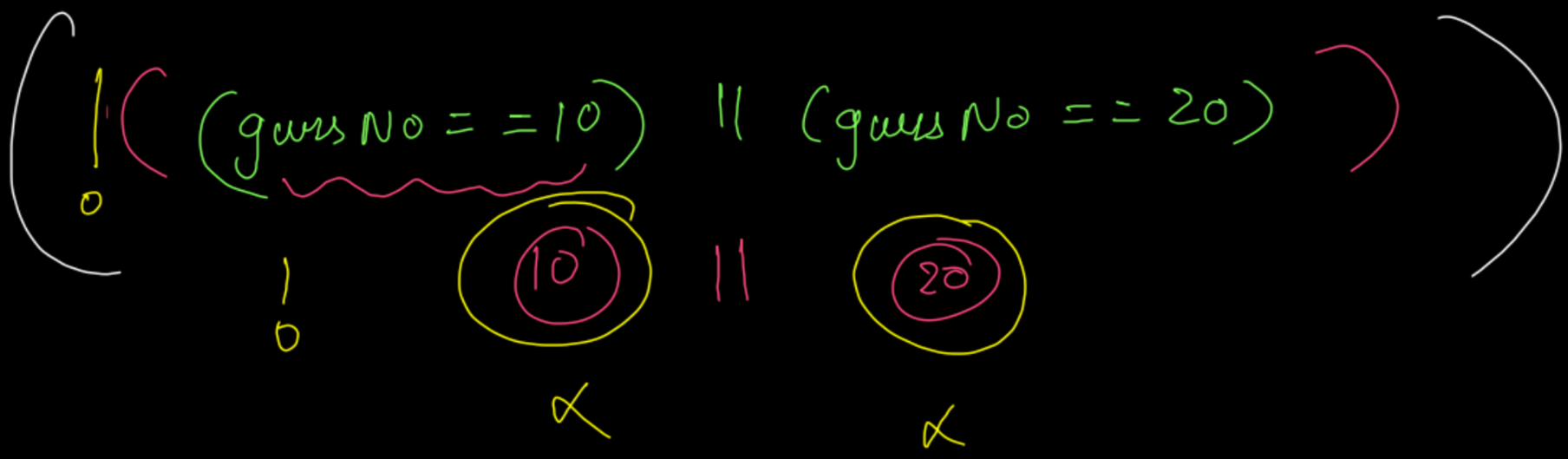
Logical not

! (condition)

↳ it negates the condition

True → false

false → True



Not Equal to

```java
import java.util.*;
public class Main {

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

        System.out.println("Start");

        if(guessNo != 10) {
            System.out.println("You have won the game");
        } else {
            System.out.println("You have lost the game");
        }

        System.out.println("end");
    }
}
```

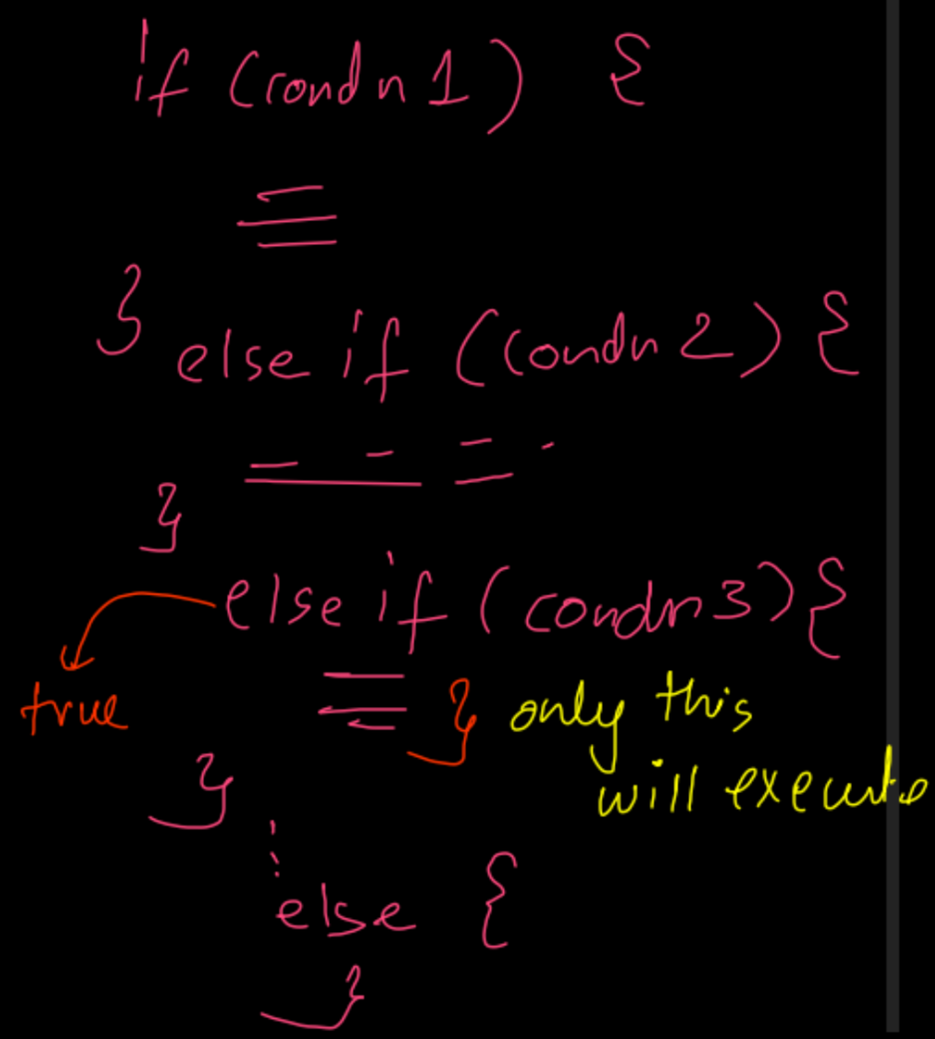
Not equal to

LHS is NOT equal to RHS

Then statement value is true else false.

If – else if – else ladder

```java
import java.util.*;
public class Main {

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

        System.out.println("Start");

        if(guessNo == 10) {
            System.out.println("You have won the game");
        } else if(guessNo == 20) {
            System.out.println("You have won the game");
        } else {
            System.out.println("You have lost the game");
        }

        System.out.println("end");
    }
}
```



Multible Else if

```java
import java.util.*;
public class Main {

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

        System.out.println("Start");

        if(guessNo == 10) {
            System.out.println("You have won the game");
        } else if(guessNo == 20) {
            System.out.println("You have won the game");
        } else if(guessNo == 30) {
            System.out.println("You have won the game");
        }
        else {
            System.out.println("You have lost the game");
        }

        System.out.println("end");
    }
```

```
if (condition) {
}
```

```
if ( )
{
}
```

```
if (condn1) {
}
else if (condn2) {
}
if (condition3) {
}
```

If there are multiple (if) statements one after another then they are checked.

```java
import java.util.*;
public class Main {

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

        System.out.println("Start");

        if(x == 10) {
            System.out.println("You have won the game");
        } else if(x == 20) {
            System.out.println("You have lost the game");
        }
        if(x == 100) {
            System.out.println("You have won the game");
        }

        System.out.println("end");
    }
}
```

```
Finished in 163 ms
Start
You have lost the game
end
stdin
20
100
```

for Loop

Print your name 10 times

```java
import java.util.*;
public class Main {

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

        for(int i=1;i<=10;i++) {
            System.out.println("DSA Classes");
        }
    }
}
```

```
Finished in 110 ms
DSA Classes
DSA Classes
DSA Classes
DSA Classes
DSA Classes
DSA Classes
DSA Classes
DSA Classes
DSA Classes
DSA Classes
```

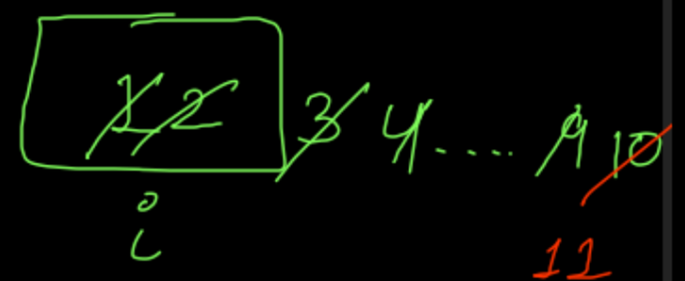
Generally used when exact no of iterations is known.

initial condition

condition

```
for (int i = 1; i <= 10; i++) {
    Syso("DSA");
}
```

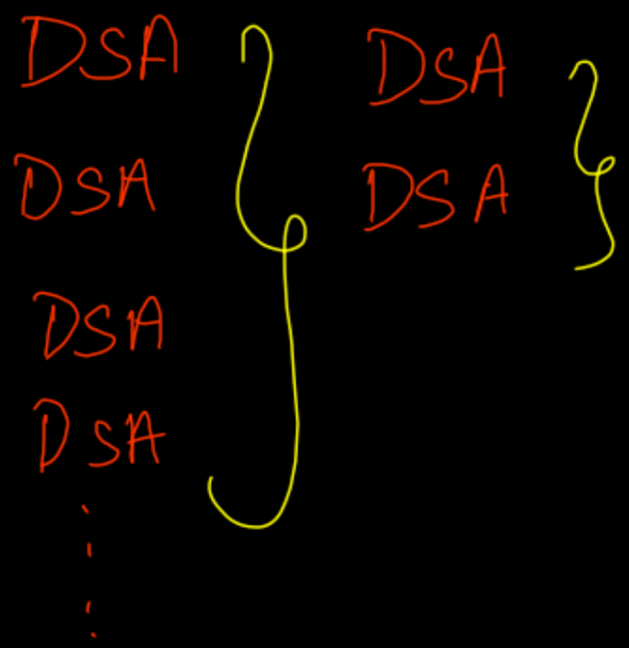
① ② ③



i++ → i = i + 1

(1) + 1

(2)



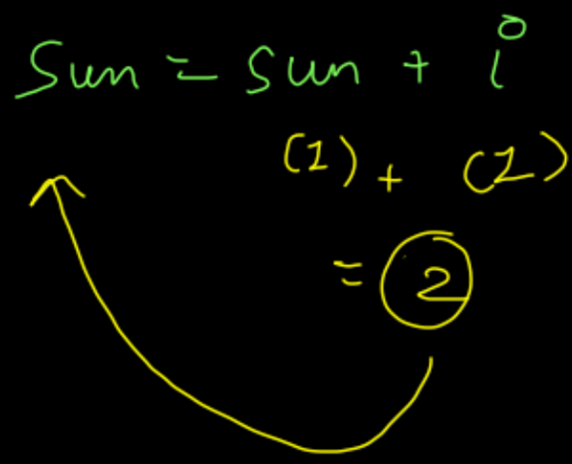
Counting 1 to N

```java
import java.util.*;
public class Main {

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

        int num = scn.nextInt();

        for(int i=1;i<=num;i++) {
            System.out.println(i);
        }
    }
}
```

Sum of 1 to N

num = 10

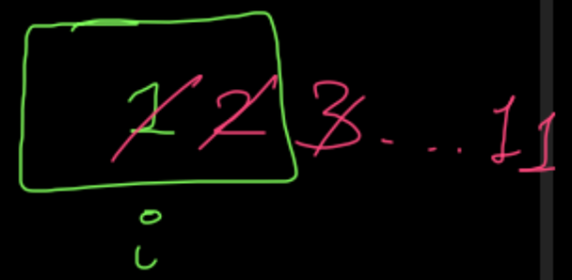
```java
import java.util.*;
public class Main {

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

        int num = scn.nextInt();
        int sum = 0;
        for(int i=1;i<=num;i++) {
            sum = sum + i;
        }

        System.out.println(sum);
    }
}
```



```java
import java.util.*;
public class Main {

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

        int num = scn.nextInt();
        int sum = 0;
        for(int i=1;i<=num;i++) {
            sum += i; //sum = sum + i
        }

        System.out.println(sum);
    }
}
```

While Loop (when we don't know exact no of iterations. But, we know the condition)

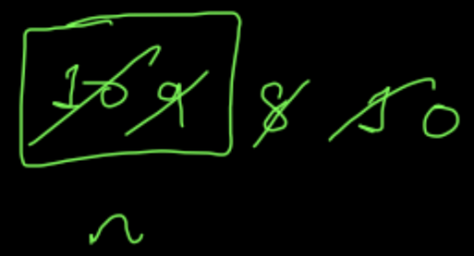
```java
import java.util.*;
public class Main {

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

        int i = 1; → initialization
        while(i <= 10) { → condition
            System.out.println("DSA Classes"); } ②
            i++; ③
        }
    } →
}
```



DSA
DSA
DSA
.
.
.

Count N to 1

```java
import java.util.*;
public class Main {

    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int n = scn.nextInt();
        while(n >= 1) { (1)
            System.out.println(n);(2)
            n--;  (3)
        }
    }
}
```

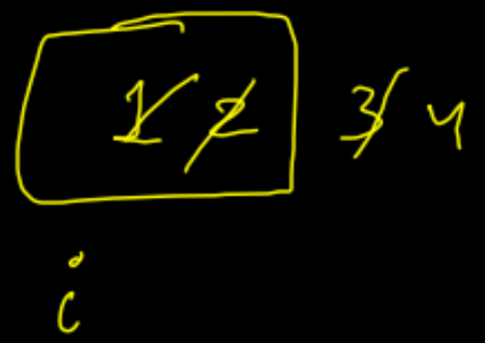


10
9
⋮
1

n-- → n = n - 1

Do while Loop

```java
import java.util.*;
public class Main {

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

        int i = 1; → initialization
        do{
            System.out.println("DSA"); → ①
            i++; → ②
        } while(i<=10); → ③
    }
}
```



```java
int i = 11;

while(i <= 10) {
    System.out.println("DSA");
    i++;
}
```

0

$11 \leq 10 \rightarrow$ false

0x

Loop not executed

```java
int i = 11;
do{
    System.out.println("DSA");
    i++;
} while(i<=10);
}
```

1

DSA

i = 12

$12 \leq 10$ ✗

Continue in Loops

```java
import java.util.*;
public class Main {

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

        for(int i=1;i<=10;i++) {
            if(i % 3 == 0) {
                continue;
            }
            System.out.println(i);
        }
    }
}
```

① ③ ② ↓ Skips the current iteration

```
Finished in 119 ms
1
2
4
5
7
8
10
```

1 2 ~~3~~ 4

1
2
4

i % 3 == 0

Break in loops

```java
import java.util.*;
public class Main {

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

        for(int i=1;i<=10;i++) {
            if(i % 3 == 0) {
                break;
            }
            System.out.println(i);
        }
    }
}
```

break from the loop
i.e exit the loop.

Switch Case

```java
import java.util.*;
public class Main {

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

        switch(num) {
            case 10:
                System.out.println("Option 10");
                break;
            case 20:
                System.out.println("Option 20");
                break;
            case 30:
                System.out.println("Option 30");
                break;
            default:
                System.out.println("Please select out of 10, 20 or 30");
        }

```

or character or String

Getting Started - Lecture 3

① Unary Operators

② functions and their Memory Mappings

DSA Sheet Questions

① Even or Odd - 1

② Even or odd - 2

③ factorial

④ Sum or Product

⑤ Sum of Even Nos Till N

Unary Operators

Operand 1 operator Operand 2

+, -, *, /, %, &&, || etc

operator Operand

++
--

++ → pre, post

-- → pre, post

Operand operator

+ (Unary Operator)

```java
import java.util.*;
public class Main {

    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int x = +3 + 5;
        System.out.println(x);

    }
}
```

Unary

Binary

- (Unary Operator)

```java
import java.util.*;
public class Main {

    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int x = -3 + 5;
        System.out.println(x);

    }
}
```

Unary

Binary

++ (Increment Operator)

Post

x++; ⟶ x = x + 1

ov + 1

Pre

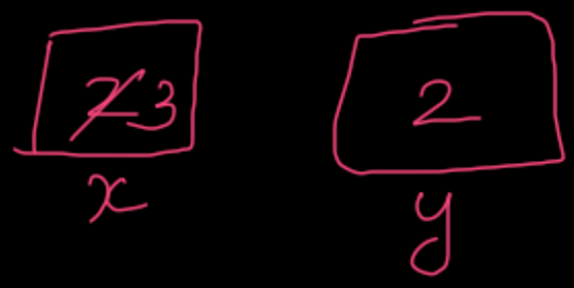
++x; ⟶ x = x + 1

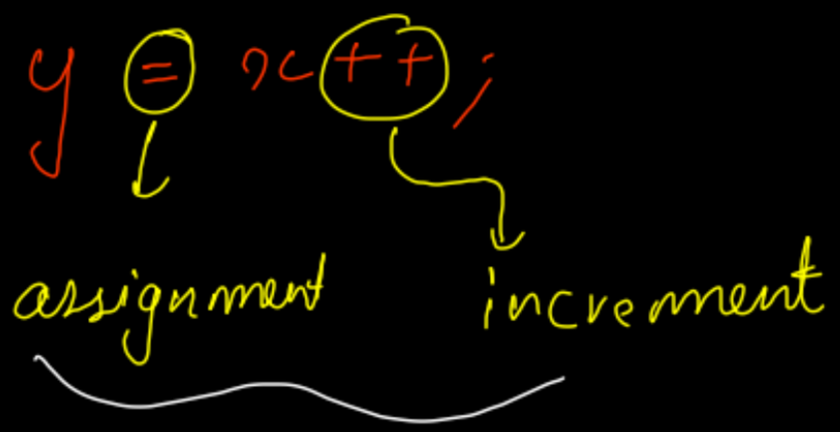
y = x++ ⟶ These ⟵ y = ++x

2 statements are different.

Post Increment

```java
import java.util.*;
public class Main {

    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int x = 2;
        int y = x++;
        System.out.println(x);
        System.out.println(y);
    }
}
```



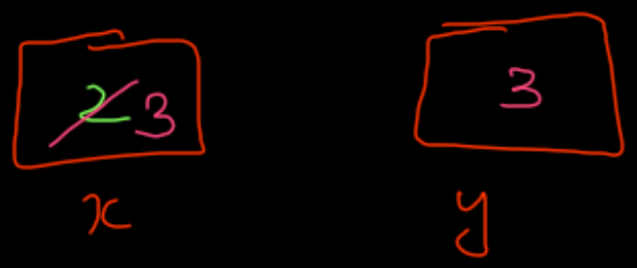


① $y = x$

② $x = x + 1$

Pre Increment

```java
import java.util.*;
public class Main {

    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int x = 2;
        int y = ++x;
        System.out.println(x);
        System.out.println(y);
    }
}
```



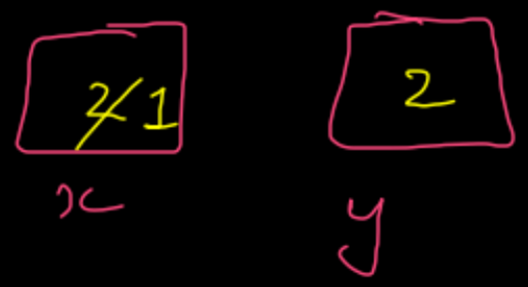
$y = ++x;$

① $x = x + 1$

② $y = x$

Post Decrement

```java
import java.util.*;
public class Main {

    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int x = 2;
        int y = x--;
        System.out.println(x);
        System.out.println(y);
    }
}
```



y = x - - ;

① y = x

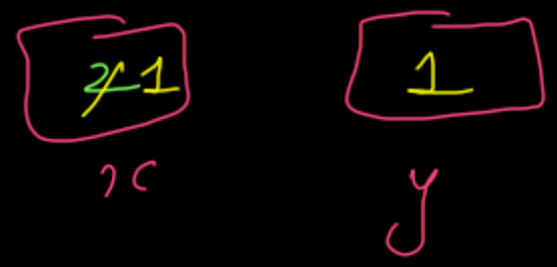
② x = x - 1

x - - ;

↳ x = x - 1 ;

Pre decrement

```java
import java.util.*;
public class Main {

    public static void main(String[] args) {
        Scanner scn = new Scanner(System.in);
        int x = 2;
        int y = --x;
        System.out.println(x);
        System.out.println(y);
    }
}
```



y = --x;

① x = x - 1

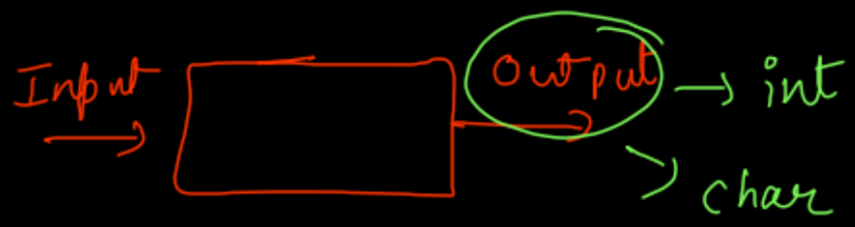
② y = x

functions

```java
import java.util.*;
public class Main {

    public static void counting() {
        //code
    }

    public static void main(String[] args) {
        //some code
    }
}
```

name

Return type



datatype

void means function does not return anything.

```java
import java.util.*;
public class Main {

    public static void counting(int n) {
        //code
    }

    public static void main(String[] args) {
        //some code
    }
}
```

parameter

```java
import java.util.*;
public class Main {

    public static void counting(int n) {
        //code
        for(int i=1;i<=n;i++) {
            System.out.println(i);
        }
    }

    public static void main(String[] args) {
        //function call
        counting(10);

    }
}
```

function body

function call

```java
import java.util.*;
public class Main {

    public static void counting(int n) {
        //code
        for(int i=1;i<=n;i++) {
            System.out.println(i);
        }
    }

    public static void main(String[] args) {
        //function call
        counting(10);
        System.out.println();
        counting(20);
    }
}
```

Execution of Java program starts from the main method (function)

```java
import java.util.*;
public class Main {
    public static void counting(int n) {
        //code
        for(int i=1;i<=n;i++) {
            System.out.println(i);
        }
    }

    public static void main(String[] args) {
        //function call
        int x = 10;
        counting(x);
        System.out.println();
    }
}
```

function definition

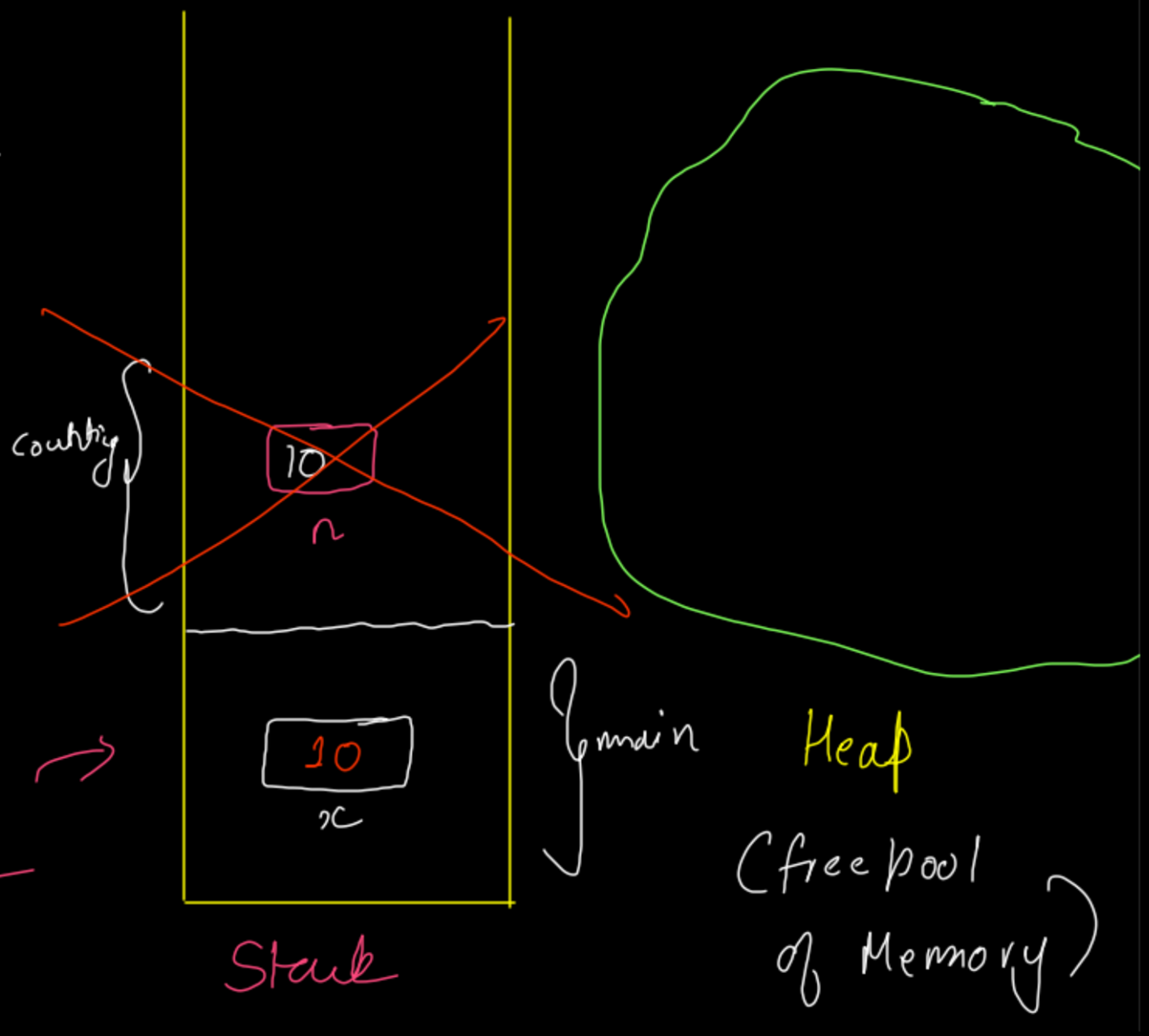
parameter

Pause

argument

1 2 3 4 5 6 7 8 9 10

function call Stack

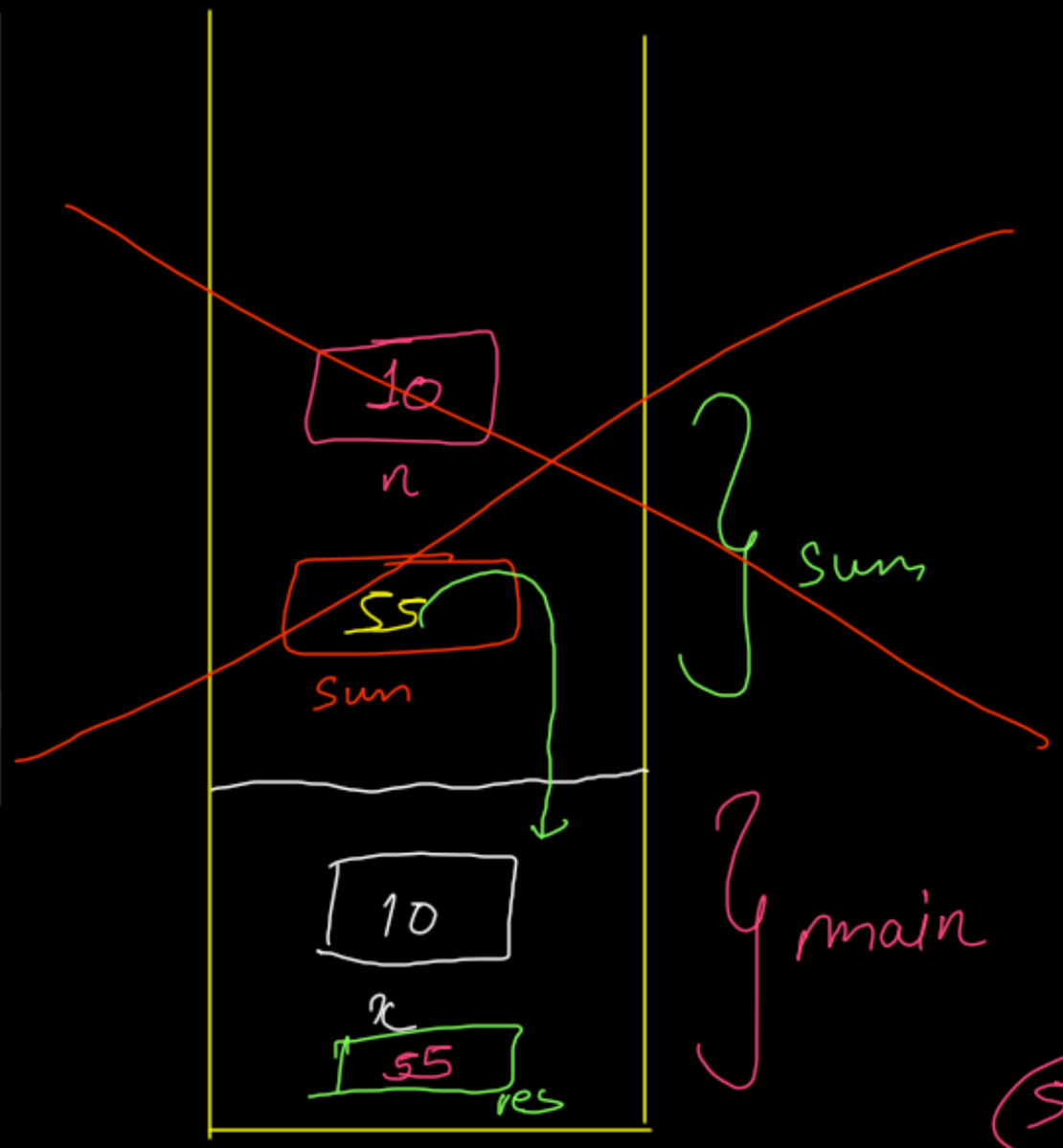


① All primitive datatypes (8) are allocated memory inside the Stack.

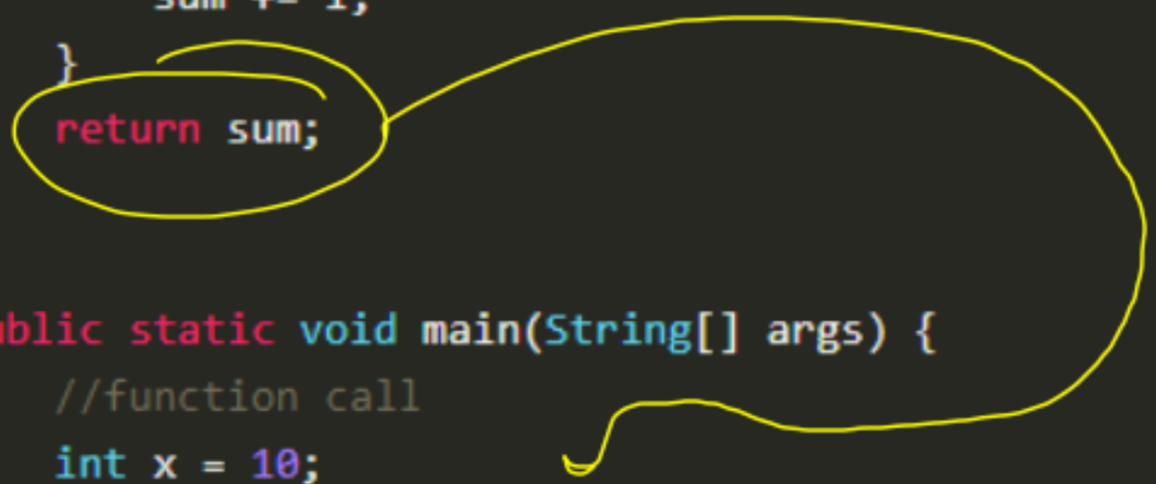
② As soon as all the lines of code of a function are executed, it gets wiped out of the stack.

③ In Java, functions are called Methods because in OOPs any function inside a class is called a Method & in Java everything is inside a class.

```java
import java.util.*;
public class Main {

    public static int sum(int n) {
        //function body
        int sum = 0;
        for(int i=1;i<=n;i++) {
            sum += i;
        }
        return sum;
    }

    public static void main(String[] args) {
        //function call
        int x = 10;
        int res = sum(10);
        System.out.println(res);
    }
}
```



```java
import java.util.*;
public class Main {

    public static int sum(int n) {
        //function body
        int sum = 0;
        for(int i=1;i<=n;i++) {
            sum += i;
        }
        return sum;
    }

    public static void main(String[] args) {
        //function call
        int x = 10;
        System.out.println(sum(10));
    }
}
```



Even Odd

Easy Accuracy: **48.64%** Submissions: **26932** Points: **2**

We've learnt about operators and other basics of CPP. Now, it's time to take another leap and learn to use control structures that helps us choose flow of any code.

Given two integers **a** and **b**. Your task is to print the **even number first and odd number next** in individual lines.
Note: Must print end of the line at the end.

```java
//User function Template for Java

class Solution{
    public void evenOdd(int a, int b){
        // Code here
        if(a % 2 == 0) {
            System.out.println(a);
            System.out.println(b);
        } else {
            System.out.println(b);
            System.out.println(a);
        }
    }
}
```

Even No

N % 2 = 0

odd No

N % 2 != 0
(= 1)

Odd or Even

School Accuracy: **60.31%** Submissions: **13337** Points: **0**

Given a positive integer N, determine whether it is odd or even.

Example 1:

Input:
N = 1
Output:
odd
Explanation:
The output is self-explanatory.

```java
//User function Template for Java
class Solution{
    static String oddEven(int N){
        // code here
        if(N % 2 == 0) {
            return "even";
        } else {
            return "odd";
        }
    }
}
```

System.out.println("|");

This is a

String

Factorial

Basic Accuracy: **53.69%** Submissions: **34040** Points: **1**

Given a positive integer, **N**. Find the factorial of **N**.

Example 1:

Input:
N = 5
Output:
120
Explanation:
5*4*3*2*1 = 120

```java
class Solution{
    static long factorial(int n){
        // code here
        if(n == 0) return 1L;
        long product = 1L;
        for(int i=n;i>=1;i--) {
            product = product * i;
        }

        return product;
    }
}
```

factorial

$N! = N*(N-1)*(N-2)\dots 1$

$= 1*2\times3\dots*(N-1)*(N-2)$

5 4

i

1 2 20 ~~60~~ 120

product

$p = p * i$

(3) * (4)

Problem | Submissions | Solution | New Discuss

Sum or Product

1006 Difficulty: EASY

Avg. time to solve
15 min

Success Rate
80%

Contributed By
Ankush Gupta | Level 1

Problem Statement Suggest Edit

You are given a number 'N' and a query 'Q.' If 'Q' is 1, then you have to return the sum of all integers from 1 to 'N,' else if 'Q' is equal to 2 then you have to return the product of all integers from 1 to 'N.' Since the product can be very large, return it modulo 10 ^ 9 + 7.

For example

```
Given 'N' = 4, 'Q' = 1.
Then the answer is 10 because the sum of all integers between 1 and 4 are 1, 2, 3, and
4. Hence 1 + 2 + 3 + 4 is equal to 10.
```

Sum of 1st N natural No

$N(N+1)/2$

$10^9+7 = (1000000007)$

0 to 10^9+6

$7 \overline{)1}$

0

(1)

$7 \overline{)8}$

1

$=7$

1

$1 \% 7 = 1$

$2 \% 7 = 2$

$3 \% 7 = 3$

$4 \% 7 = 4$

$5 \% 7 = 5$

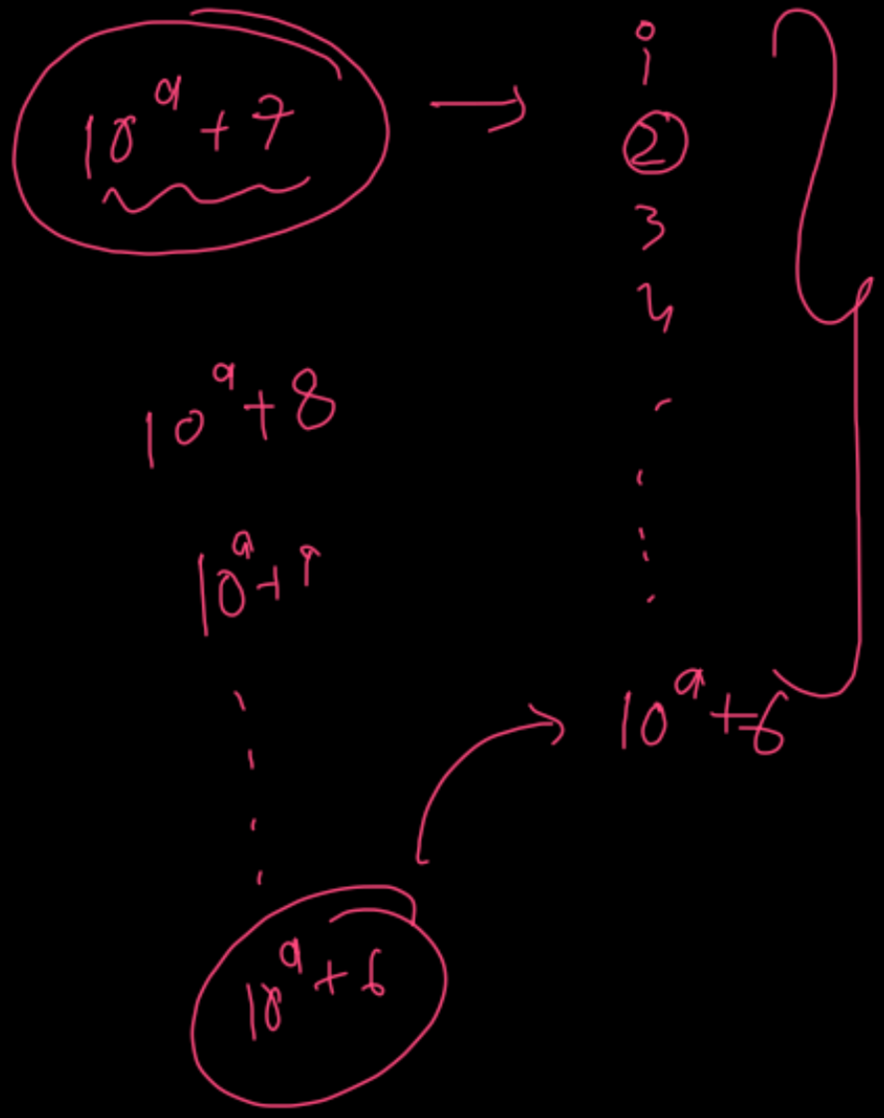
$6 \% 7 = 6$

$7 \% 7 = 0$

$8 \% 7 = 1$

$9 \% 7 = 2$

$\vdots$



INT * INT → Out of Range

(∞) (∞-1)

$N*(N-1)\ldots\ldots 1$

```java
public class Solution {

    public static long sum(int n) {
        return (long)((n*(n+1))/2);
    }

    public static long factorial(int n) {
        if(n == 0) return 1L;
        long product = 1L;
        for(int i=n;i>=1;i--) {
            product = (product * i) % 1000000007;
        }

        return product;
    }
```

```java
    public static long sumOrProduct(int n, int q) {

        if(q == 1) {
            //sum
            return sum(n);
        } else {
            //factorial
            return factorial(n);
        }
    }
```

Getting Started - Lecture 4

Basic Syntax

- → Sum of Even Nos Till N
- → Swap 2 Nos **
  - → 3rd variable
  - → w/o 3rd variable
- → Switch Case

Java is always pass by value

Basic Maths

- → Check Prime
  - → N
  - → N/2
  - → $\sqrt{N}$
- → Prime Nos in Range
- → GCD & LCM
  - → Normal Loop
  - → Euclidean
- → N^{th} fibonacci No
- → Bulb Switcher
- → Power of 2

71

Sum Of Even Numbers Till N

Difficulty: EASY

Avg. time to solve
10 min

Success Rate
90%

Contributed By
Ayush Thakur | Level 1

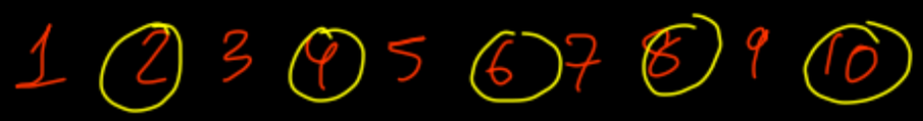
Problem Statement Suggest Edit

You have been given a number 'N'. Your task is to find the sum of all even numbers from 1 to 'N' (both inclusive).

Example :

```
Given 'N' : 6
Sum of all even numbers till 'N' will be : 2 + 4 + 6 = 12
```

10



2+4+6+8+10 → ans

```java
public class Solution {
    public static long evenSumTillN(int n) {
        // Write your code here.
        long sum = 0;
        for(int i=1;i<=n;i++) {
            if(i % 2 == 0) sum += i;
        }
        return sum;
    }
}
```

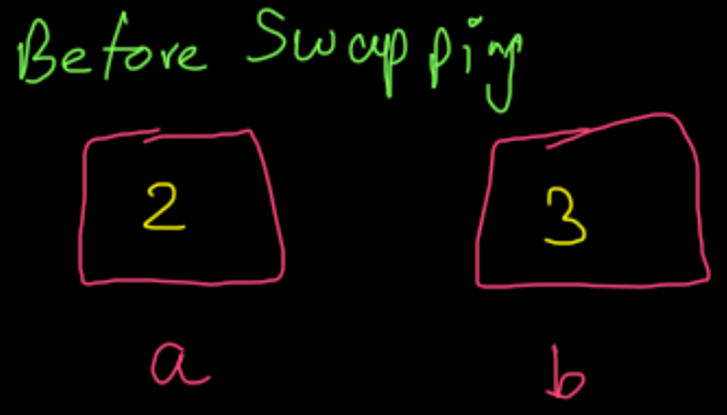
Swap two numbers

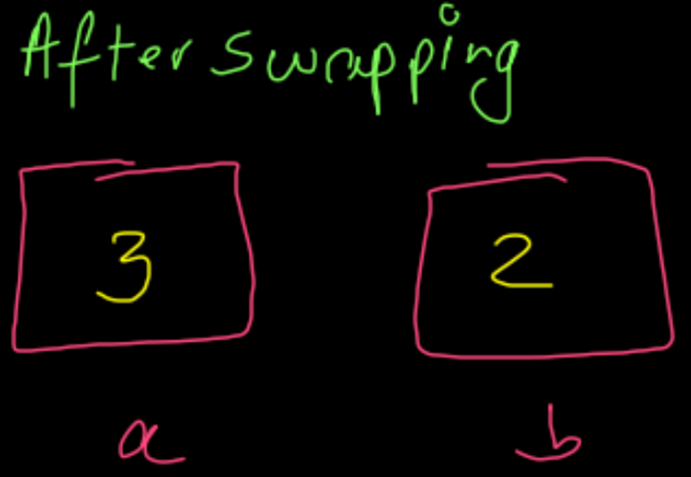
School Accuracy: **69.58%** Submissions: **14283** Points: **0**

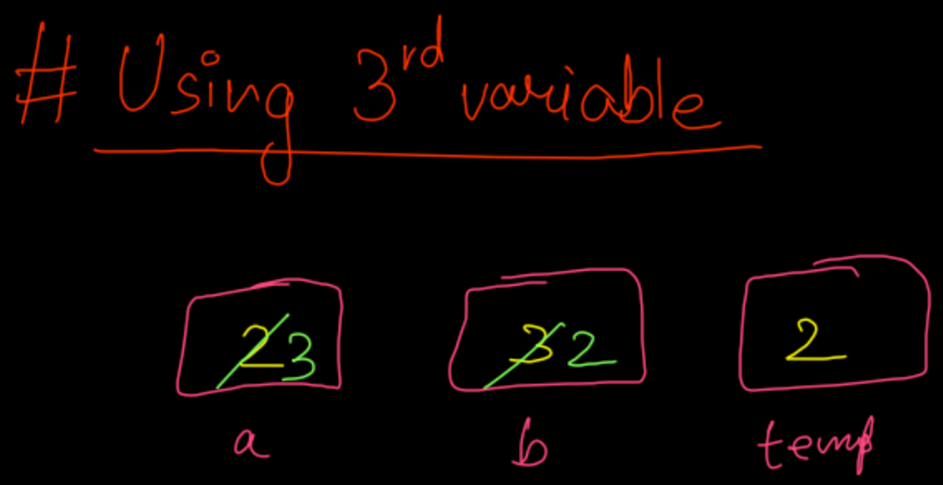
Swap given two numbers and print them. (Try to do it without a temporary variable.) and return it.

Example 1:

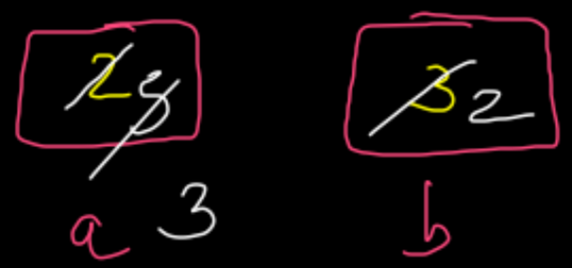
Input: a = 13, b = 9
Output: 9 13
Explanation: after swapping it becomes 9 and 13.

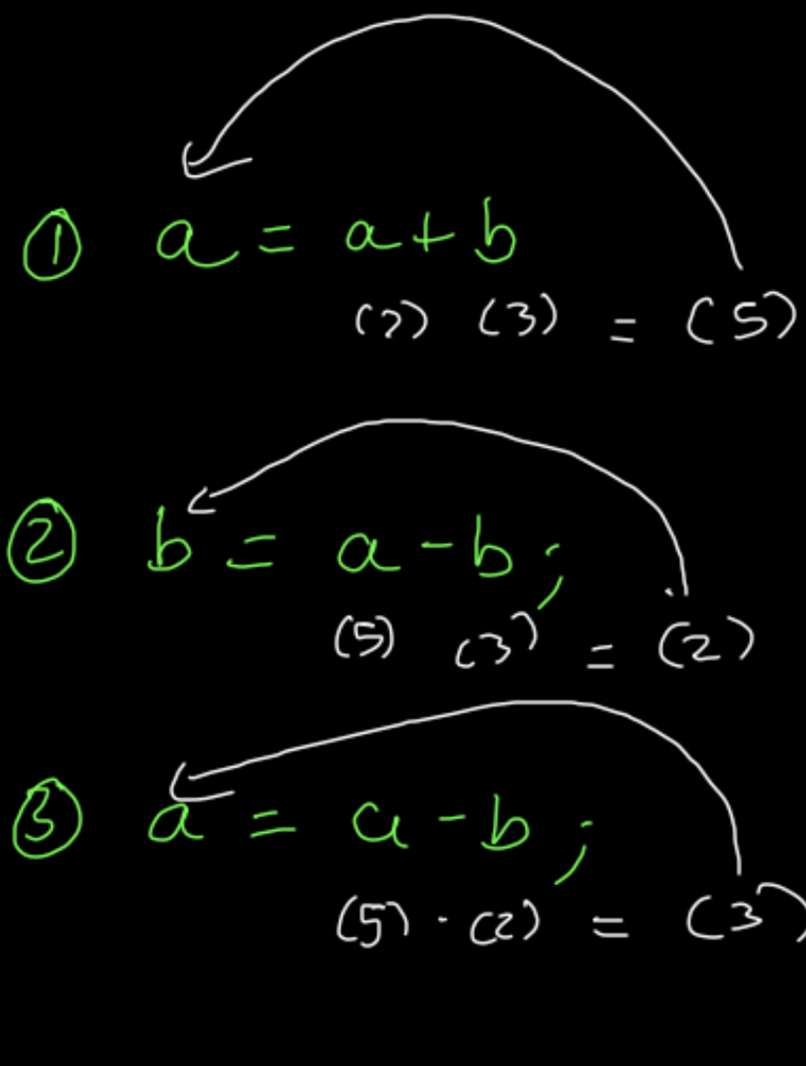






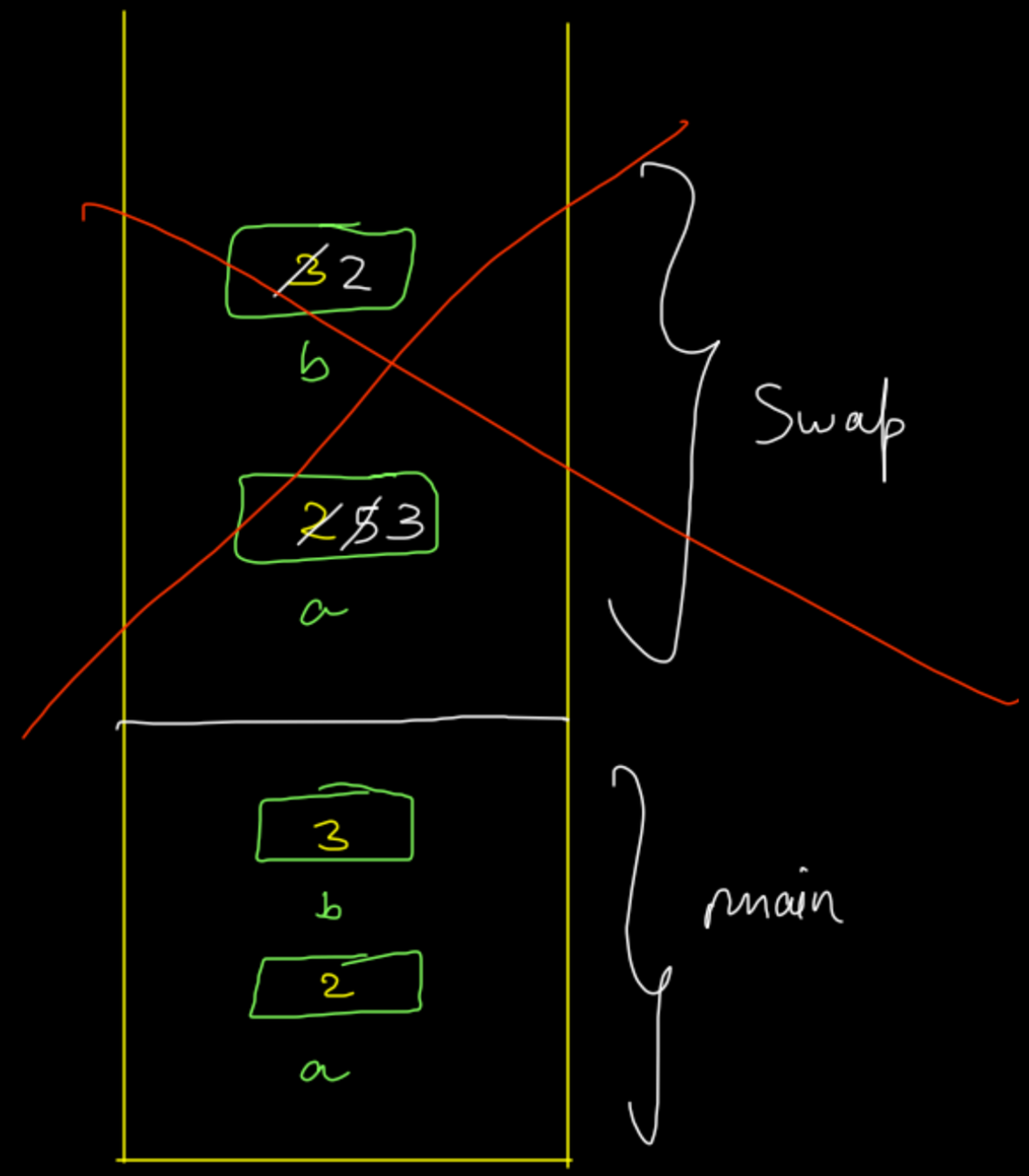
Without 3rd Variable





```java
import java.util.*;
public class Main {

    public static void swap(int a, int b) {
        //swapping
        a = a + b;
        b = a - b;
        a = a - b;
    }

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

        System.out.println("Before swapping a = " + a + " b = " + b);
        swap(a,b);
        System.out.println("After swapping a = " + a + " b = " + b);
    }
}
```

Pass by value



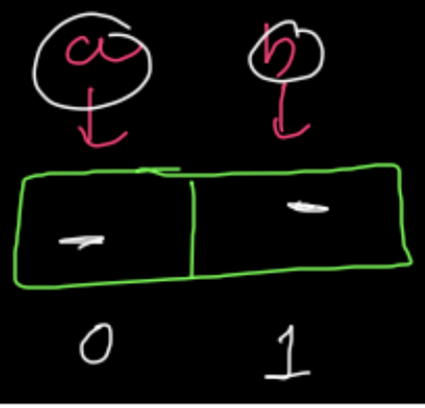
* Java is always pass by value

① Swap with 3rd variable

② W/o 3rd variable

③

④ Put the nos in a data structure (Array, List, LL etc.)



→ list (changes will reflect across function)

```java
class Solution{
    static List<Integer> get(int a,int b)
    {
        // code here
        a = a + b;
        b = a - b;
        a = a - b;

        List<Integer> list = new ArrayList<>();

        list.add(a);
        list.add(b);

        return list;
    }
}
```

Java Switch Case statement

School Accuracy: **66.06%** Submissions: **2535** Points: **0**

Given an integer choice denoting the choice of the user and a list containing the single value R or two values L and B depending on the choice.
If the user's choice is 1, calculate the area of the circle having the given radius(**R**).
Else if choice is 2, calculate the area of the rectangle with given length(**L**) and breadth(**B**).

```java
class Solution{
    static double switchCase(int choice, List<Double> arr){
        // code here

        double r = arr.get(0);
        double l = r;
        double b = (arr.size() == 2) ? arr.get(1) : 0;

        switch(choice) {
            case 1:
                return Math.PI *r *r;
            case 2:
                return l * b;
            default:
            return 0;
        }
    }
}
```

Ternary Operator

```java
import java.util.*;
public class Main {

    public static void swap(int a, int b) {
        //swapping
        a = a + b;
        b = a - b;
        a = a - b;
    }

    public static void main(String[] args) {
        boolean b = true;
        int a = (b == true) ? 1 : 0;
        System.out.println(a);
    }
}
```

Prime Number

Basic Accuracy: **49.19%** Submissions: **56391** Points: **1**

For a given number **N** check if it is prime or not. A prime number is a number which is only **divisible by 1 and itself**.

Example 1:

Input:
N = 5
Output:
1
Explanation:
5 has 2 factors 1 and 5 only.

2 → 2, 1

3 → 3, 1

4 → 2, 4, 1 ✗

5 → 5, 1

6 → 2, 3, 6, 1 ✗

7 → 2, 7

1 2 3 4 . . . . . N-1 N

↓

loop & check

24 1, 24

29 1, 29

```java
class Solution{
    static int isPrime(int N){
        // code here
        if(N == 1) return 0;

        for(int i=2;i<N;i++) {
            if(N % i == 0) return 0;
        }

        return 1;
    }
}
```

→ This code gives TLE.

O(N) solution

27 and 24

27 → 9 less than N/2

24 → 12 equal to N/2

$1 \times 27 = 27$

$3 \times 9 = 27$

1, 3, 9, 27

$1 \times 24 = 24$

$2 \times 12 = 24$

$3 \times 8 = 24$

$4 \times 6 = 24$

1, 2, 3, 4, 6, 8, 12, 24

24 / 2 = 12

smallest * largest → N/2 is the largest factor in case of even Nos

(2) (12)

25

smallest * largest

```java
class Solution{
    static int isPrime(int N){
        // code here
        if(N == 1) return 0;

        for(int i=2;i<N/2;i++) {
            if(N % i == 0) return 0;
        }

        return 1;
    }
}
```

iterations have reduced to half.

#Square Root Solution

36 → 6

1x36 = 36
2x18 = 36
3x12 = 36
4x9 = 36
6x6 = 36

1, 2, 3, 4, 6, 9, 12, 18, 36

24 → 4

1x24 = 24
2x12 = 24
3x8 = 24
4x6 = 24

1, 2, 3, 4, 6, 8, 12, 24

25

1x25 = 25
5x5 = 25

1, 5, 25

29 → 5

$1 \times 29 = 29$

1, 29

5 ↑ → Since there are No factors equal to or before 5 (i.e. $\sqrt{N}$) hence, 29 is a prime No.

Code Conversion

$i \leq \sqrt{N}$

Squaring both sides

$i^2 \leq N$

$\Rightarrow$ $i * i \leq N$

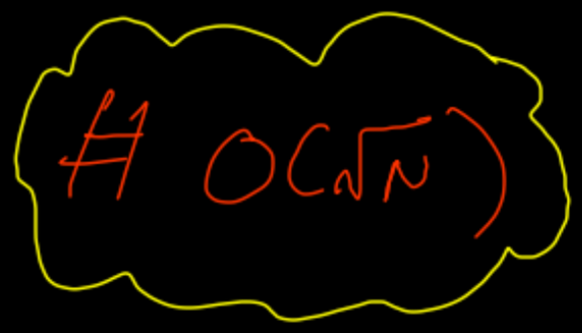
625

2 to 624 1st Method

2 to 317 2nd Method

2 to 25 3rd Method

```java
class Solution{
    static int isPrime(int N){
        // code here
        if(N == 1) return 0;

        for(int i=2;i * i <=N;i++) {
            if(N % i == 0) return 0;
        }

        return 1;
    }
}
```



Find Prime numbers in a range

Medium Accuracy: **63.56%** Submissions: **17866** Points: **4**

Given two integers M and N, generate all primes between M and N including M and N.

```java
boolean isPrime(int n) {

    if(n == 1) return false;

    for(int i=2;i*i<=n;i++) {
        if(n % i == 0) return false;
    }

    return true;
}
```

```java
ArrayList<Integer> primeRange(int lo, int hi) {
    // code here

    ArrayList<Integer> res = new ArrayList<>();

    for(int j=lo;j<=hi;j++) {
       if(isPrime(j) == true) res.add(j);
    }

    return res;
}
```

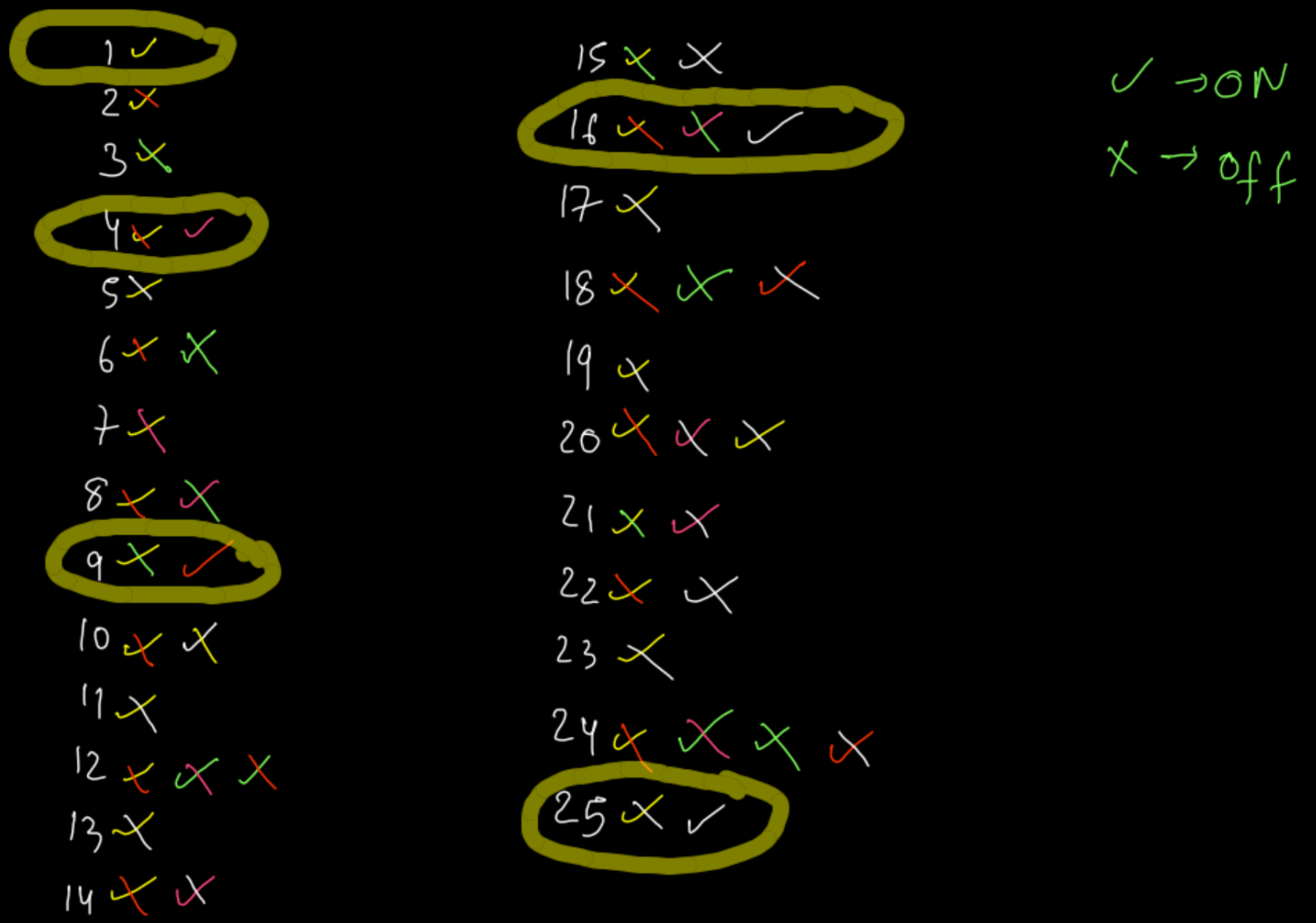
319. Bulb Switcher

Medium 1033 1751 Add to List Share

There are `n` bulbs that are initially off. You first turn on all the bulbs, then you turn off every second bulb.

On the third round, you toggle every third bulb (turning on if it's off or turning off if it's on). For the `i^th` round, you toggle every `i` bulb. For the `n^th` round, you only toggle the last bulb.

Return *the number of bulbs that are on after* `n` *rounds.*



24 → 4

$1 \times 24 = 24$

$2 \times 12 = 24$

$3 \times 8 = 24$

$4 \times 6 = 24$

$6 \times 4 = 24$

$8 \times 3 = 24$

$12 \times 2 = 24$

$24 \times 1 = 24$

36 → 6

$1 \times 36 = 36$

$2 \times 18 = 36$

$3 \times 12 = 36$

$4 \times 9 = 36$

$6 \times 6 = 36$ → This does not mirror.

$9 \times 4 = 36$

$12 \times 3 = 36$

$18 \times 2 = 36$

$36 \times 1 = 36$

Bulb Switcher

```java
class Solution {
    public int bulbSwitch(int n) {

        int count = 0;
        for(int i=1;i<=n;i++) {
            int sqrt = (int)Math.sqrt(i);
            if(sqrt * sqrt == i) count++;
        }

        return count;
    }
}
```

Power of 2

```java
class Solution {
    public boolean isPowerOfTwo(int n) {
        if(n < 0) return false;

        for(int i=0;i<=30;i++) {
            int power = (int)Math.pow(2,i);
            if(power == n) return true;
        }

        return false;
    }
}
```

negative nos cannot be represented as

$n = 2^x$

Nth Fibonacci Number

Easy Accuracy: **41.85%** Submissions: **76409** Points: **2**

Given a positive integer n, find the nth fibonacci number. Since the answer can be very large, return the answer modulo 1000000007.

Example 1:

Input: n = 2
Output: 1
Explanation: 1 is the 2nd number of fibonacci series.

Example 2:

0th 1st 2nd 3rd 4th 5th ...

0 1 1 2 3 5 ...

* Every term is the sum of previous 2

first = 0 (if N==0)

second = 1 (if N==1)

third = 0

```
for(int i=2; i<=N ; i++)
{   third = first + second;
    first = second;
    second = third;
}
```

5th

```
//User function Template for Java
class Solution {
    static long nthFibonacci(long n){
        // code here

        long a = 0L;
        long b = 1L;
        long c = 0L;

        for(int i=2;i<=n;i++) {
            c = (a + b) % 1000000007;
            a = b;
            b = c;
        }

        return c;
    }
}
```

a = 0 1 1 2 3

b = 1 1 2 3 5

c = 0 1 2 3 5 (5)

i = 2 3 4 5

c = a + b

2 + 3 = 5

0 1 1 # This is DP Space Optimized Approach.

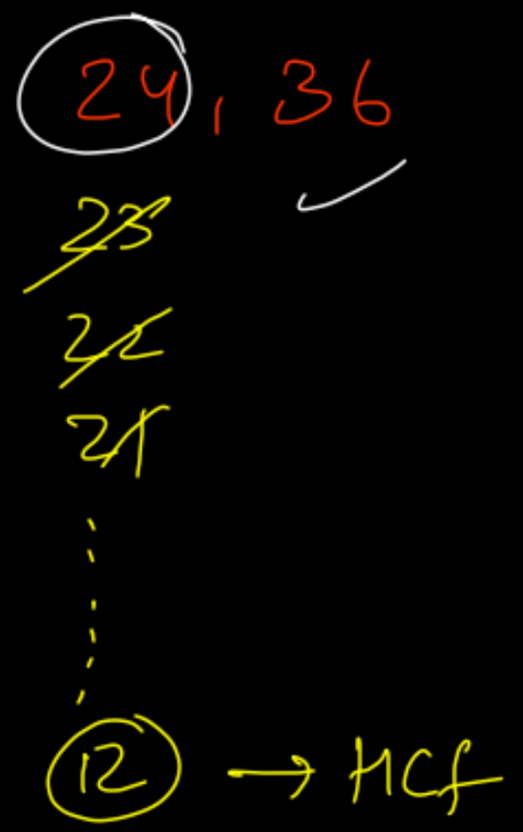
LCM And GCD

Basic Accuracy: **55.13%** Submissions: **14347** Points: **1**

Given two numbers **A** and **B.** The task is to find out their LCM and GCD.

$$A * B = LCM * GCD$$

$$LCM = (A * B) / GCD$$

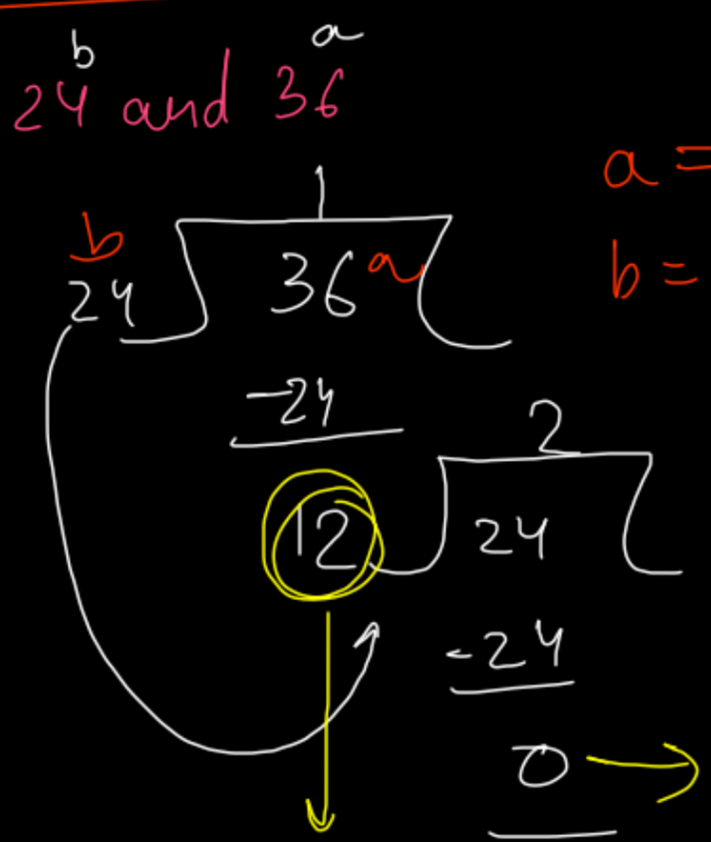


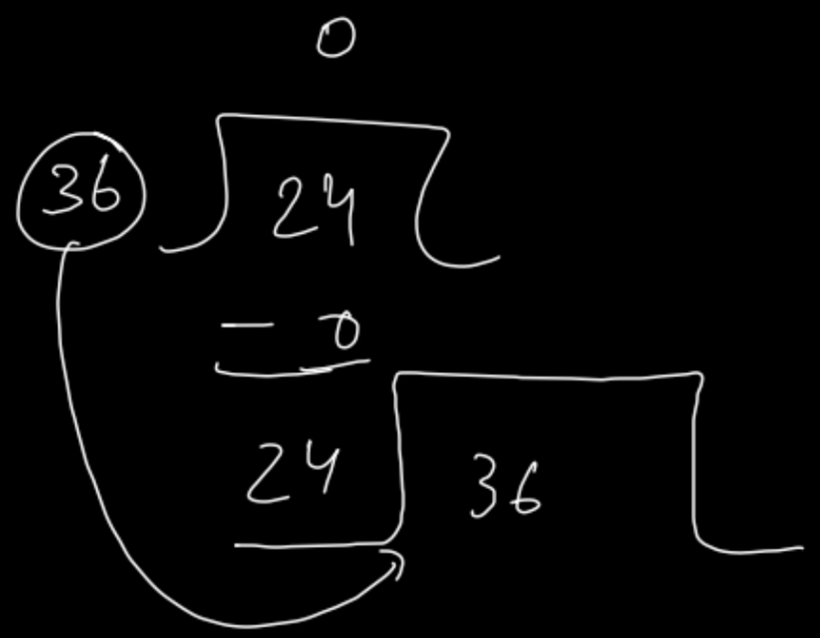
```java
static long gcd(long a,long b) {

    long originalA = a;

    while(a >= 1) {
        if(originalA % a == 0 && b % a == 0) return a;
        a--;
    }

    return 1L;
}
```

→ TLE

```java
static Long[] lcmAndGcd(Long A , Long B) {
    // code here

    long gcd = gcd(A,B);
    long lcm = (A*B)/gcd;

    Long[] res = new Long[2];
    res[0] = lcm;
    res[1] = gcd;
    return res;
}
```

#Euclidean Method






```java
static long divisionMethod(long a, long b) {
    while(a % b != 0) {
        long rem = a%b;
        a = b;
        b = rem;
    }

    return b;
}
```

Getting Started - Lecture 4

Digit Traversal

① Digits of a Number

② Count Digits of a Number (Condition Based)

③ Subtract Product & Sum of Digits

④ Rotate a Number

⑤ Reverse a Number

⑥ Palindrome Number

⑦ Armstrong Number

⑧ Inverse of a Number

Digits of a Number

Reverse A Number

Easy

Prev Next

1. You've to display the digits of a number in reverse.
2. Take as input "n", the number for which digits have to be display in reverse.
3. Print the digits of the number line-wise, but in reverse order.

Input Format

"n" where n is any integer.

Input Format

Output Format

d1
d2
d3
... digits of the number in reverse

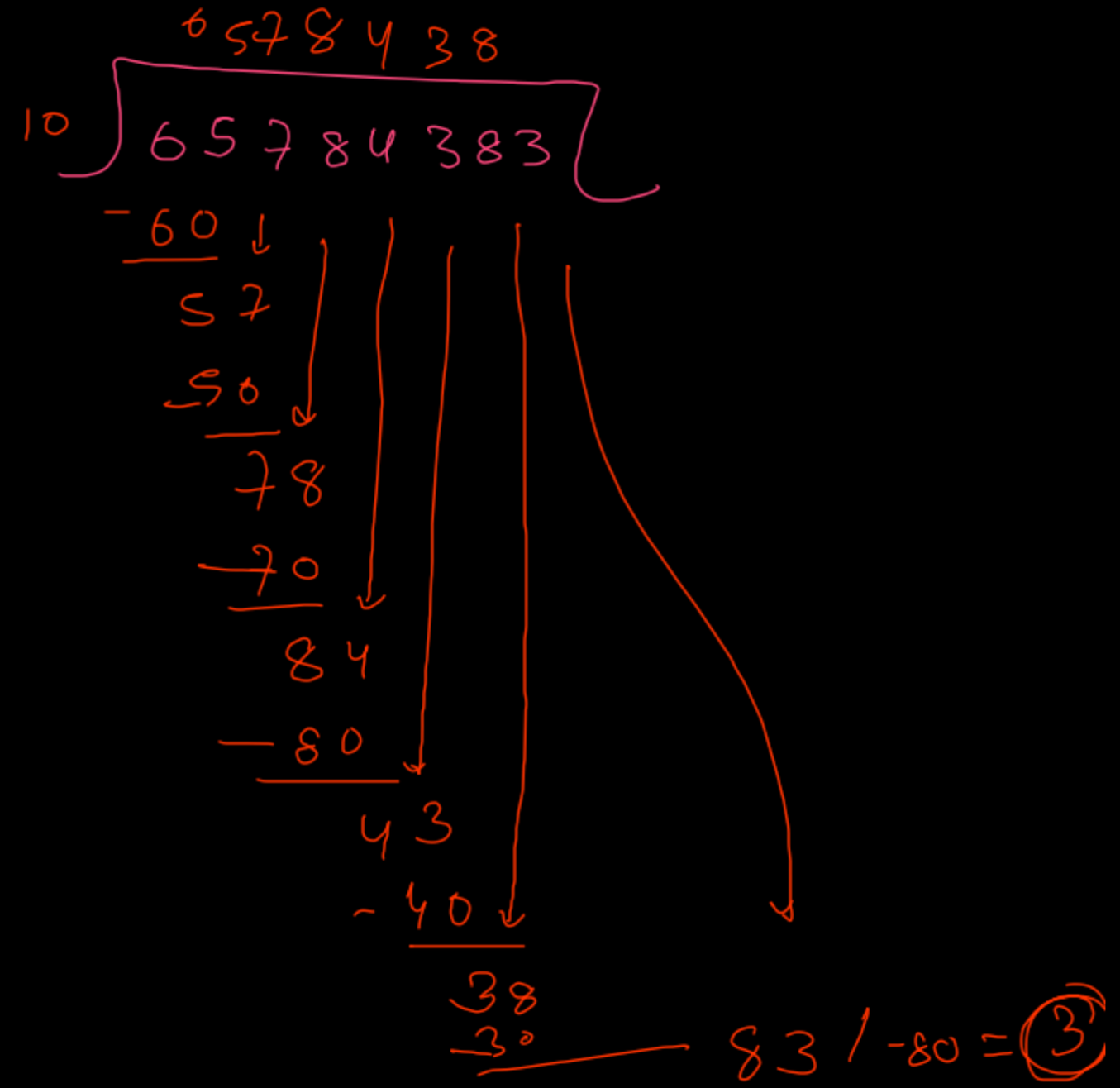
6 5 7 8 4 3 8 3

3
8
3
4
8
7
5
6

65784383 → n

int digit = n % 10;

n = n / 10;

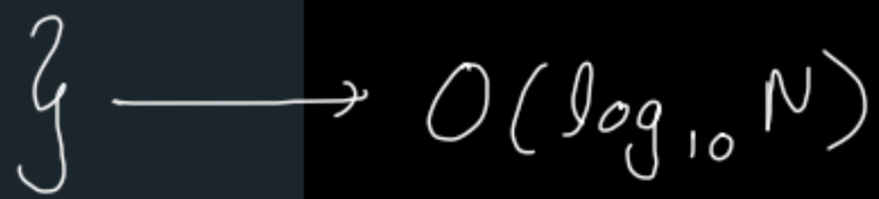


	digit (N % 10)	N / 10
65784383	3	6578438
6578438	8	657843
657843	3	65784
65784	4	6578
6578	8	657
657	7	65
65	5	6
6	6	0

6 / 10 = 0 6

0 → end point


```java
public static void main(String[] args) {
  // write your code here
  Scanner scn = new Scanner(System.in);

  int n = scn.nextInt();

  //digits of a number

  if(n == 0) {
      System.out.println(0);
      return;
  }


  while(n > 0) {
     int digit = n % 10;
     System.out.println(digit);
     n /= 10;
  }

 }
}
```



Count Digits

School Accuracy: **42.91%** Submissions: **9265** Points: **0**

Given a number **N**. Count the number of digits in N which evenly divides N.

Example 1:

Input:
N = 12
Output:
2
Explanation:
1, 2 both divide 12 evenly

N = 124

N	digits	N / 10	original N (124)
124	4	12	count = 1
12	2	1	count = 2
1	1	0	count = 3

9 8 0 2 3 4

↳ 98234 % 0

Arithmetic Exception

↳ / by zero exception

```java
class Solution{
    static int evenlyDivides(int N){
        // code here
        int originalN = N;
        int count = 0;

        while(N > 0) {
            int digit = N % 10;
            if(digit != 0 && originalN % digit == 0) {
                count++;
            }
            N /= 10;
        }

        return count;
    }
}
```

↳ $O(\log_2 N)$

Rotate A Number

Easy

Prev Next

1. You are given two numbers n and k. You are required to rotate n, k times to the right. If k is positive, rotate to the right i.e. remove rightmost digit and make it leftmost. Do the reverse for negative value of k. Also k can have an absolute value larger than number of digits in n.
2. Take as input n and k.
3. Print the rotated number.
4. Note - Assume that the number of rotations will not cause leading 0's in the result. e.g. such an input will not be given

   n = 12340056

   k = 3

   r = 05612340

562984 → N ⟶ mod = (6)

→ k (No of rotations)

k % mod ?

(0) k = 0 562984 ⟷ k = 6 562984 (0)

(1) k = 1 456298 ⟷ k = 7 456298 (1)

k = 2 845629

k = 3 984562

k = 4 298456

k = 5 629845

k = 8

k = 9

k = 10

k = 11

$$6 \overline{)1000} \quad 166$$

$-6\downarrow$

40

-36

40

-36

4 ✓

① k = k % nod (To convert large values of k to small values)

(0 to Nod-1)

Nod = 6

#② if (k < 0)

k = k + nod

k = 0 562984

k = ① 456298 ⟷ k = -5 456298

k = ② 845629 ⟷ k = -4 845629

k = ③ 984562 ⟷ k = -3 984562

k = ④ 298456 ⟷ k = -2 298456

k = ⑤ 629845 ⟷ k = -1 629845

$N = 562984$

$K = 2$

845629

$Last = N \% 10^k \quad (84)$

$N = N / 10^k \quad (5629)$

$Last = Last * 10^{nod-k} \quad (840000)$

$N = Last + N \quad (845629)$

5629

100) 562984

−500 l

629

−600

298

−200

984

−400

84

```java
public static void main(String[] args) {
    // write your code here

    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();
    int k = scn.nextInt();

    int temp = n;
    int nod = 0;
    while(temp > 0) {
        nod++;
        temp /= 10;
    }

    k = k % nod;
    if(k < 0) k = k + nod;

    int last = n % (int)Math.pow(10,k);
    n = n / (int)Math.pow(10,k);
    last = last * (int)Math.pow(10,nod-k);
    n = n + last;

    System.out.println(n);
  }
}
```

-10006

k = k % nod

-(1000 % 6)

k = -4

1281. Subtract the Product and Sum of Digits of an Integer

Easy 1506 196 Add to List Share

Given an integer number `n`, return the difference between the product of its digits and the sum of its digits.

Example 1:

```
Input: n = 234
Output: 15
Explanation:
Product of digits = 2 * 3 * 4 = 24
Sum of digits = 2 + 3 + 4 = 9
Result = 24 - 9 = 15
```

No = 234

N	digits	Sum (0)	Product (1)
234	4	4	4
23	3	7	12
2	2	9	24
0			

24 - 9 = 15

```java
class Solution {
    public int subtractProductAndSum(int n) {
        int sum = 0;
        int product = 1;

        while(n > 0) {
            int digit = n % 10;
            sum += digit;
            product *= digit;
            n /= 10;
        }

        return product - sum;
    }
}
```

Armstrong Numbers

School Accuracy: **53.34%** Submissions: **21079** Points: **0**

For a given **3** digit number, find whether it is armstrong number or not. An **Armstrong number** of three digits is an integer such that the sum of the cubes of its digits is equal to the **number** itself. Return "**Yes**" if it is a armstrong number else return "**No**".

NOTE: 371 is an **Armstrong number** since $3^3 + 7^3 + 1^3 = 371$

on = N

n = 371 ans

N	digit	ans (ans += d*d*d)
371	1	1
37	7	1+(7*7*7) = 344
3	3	344+(3*3*3) = 371
0		

```java
//User function Template for Java
class Solution {
    static String armstrongNumber(int n){
        // code here

        int originalN = n;
        int ans = 0;
        while(n > 0) {
            int d = n % 10;
            n/=10;
            ans += d*d*d;
        }

        if(ans == originalN) return "Yes";
        return "No";
    }
}
```

7. Reverse Integer

Medium 8234 10570 Add to List Share

Given a signed 32-bit integer `x`, return `x` *with its digits reversed.* If reversing `x` causes the value to go outside the signed 32-bit integer range `[-2^31, 2^31 - 1]`, then return `0`.

Assume the environment does not allow you to store 64-bit integers (signed or unsigned).

Example 1:

```
Input: x = 123
Output: 321
```

Example 2:

```
Input: x = -123
Output: -321
```

1234

rev = 0

0

rev = (rev * 10) + digit

No	digit	N/10	Rev
1234	4	123	4
123	3	12	43
12	2	1	432
1	1	0	4321

```java
class Solution {
    public int reverse(int x) {
        int rev = 0;

        while(x != 0) {
            int digit = x % 10;

            rev = (rev * 10) + digit;
            x /= 10;
        }

        return rev;
    }
}
```

Integer
1

$\infty * 10 \rightarrow$ out of Range

$-\infty * 10 \rightarrow$ out of Range

rev * 10 > Integer.MAX value

rev * 10 < Integer.MIN_VALUE

rev < $\frac{\text{Integer.MIN\_VALUE}}{10}$

rev > $\frac{\text{Integer.MAX\_VALUE}}{10}$

```java
class Solution {
    public int reverse(int x) {
        int rev = 0;

        while(x != 0) {
            int digit = x % 10;

            if((rev > Integer.MAX_VALUE/10) || (rev < Integer.MIN_VALUE/10))
                return 0;

            rev = (rev * 10) + digit;
            x /= 10;
        }

        return rev;
    }
}
```

9. Palindrome Number

Easy 7012 2274 Add to List Share

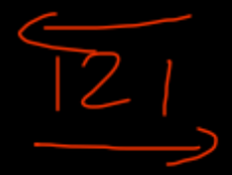
Given an integer `x`, return `true` if `x` is palindrome integer.

An integer is a **palindrome** when it reads the same backward as forward.

- For example, `121` is a palindrome while `123` is not.

Example 1:

```
Input: x = 121
Output: true
Explanation: 121 reads as 121 from left to right and
from right to left.
```



123

```java
class Solution {

    public int reverse(int x) {
        int rev = 0;

        while(x != 0) {
            int digit = x % 10;
            rev = (rev * 10) + digit;
            x /= 10;
        }

        return rev;
    }

    public boolean isPalindrome(int x) {
        if(x < 0) return false;
        int reverse = reverse(x);
        if(reverse == x) return true;
        return false;
    }
}
```

Inverse Of A Number

Easy

Prev Next

1. You are given a number following certain constraints.
2. The key constraint is if the number is 5 digits long, it'll contain all the digits from 1 to 5 without missing any and without repeating any. e.g. 23415 is a 5 digit long number containing all digits from 1 to 5 without missing and repeating any digit from 1 to 5.Take a look at few other valid numbers - 624135, 81456273 etc.Here are a few invalid numbers - 139, 7421357 etc.
3. The inverse of a number is defined as the number created by interchanging the face value and index of digits of number.e.g. for 426135 (reading from right to left, 5 is in place 1, 3 is in place 2, 1 is in place 3, 6 is in place 4, 2 is in place 5 and 4 is in place 6), the inverse will be 416253 (reading from right to left, 3 is in place 1, 5 is in place 2,2 is in place 3, 6 is in place 4, 1 is in place 5 and 4 is in place 6) More examples - inverse of 2134 is 1243 and inverse of 24153 is 24153
4. Take as input number "n", assume that the number will follow constraints.
5. Print it's inverse.

Input Format

"n" where n is any integer, following constraints defined above.

$N \rightarrow 1$ to N digits

8 7 6 5 4 3 2 1

2 8 3 4 6 7 5 1 → place value

1 ← face value

$\sum fv * 10^{pv-1}$ ← Number

8 7 6 5 4 3 2 1

7 3 4 2 5 6 8 1 → Inverse

4 3 2 1

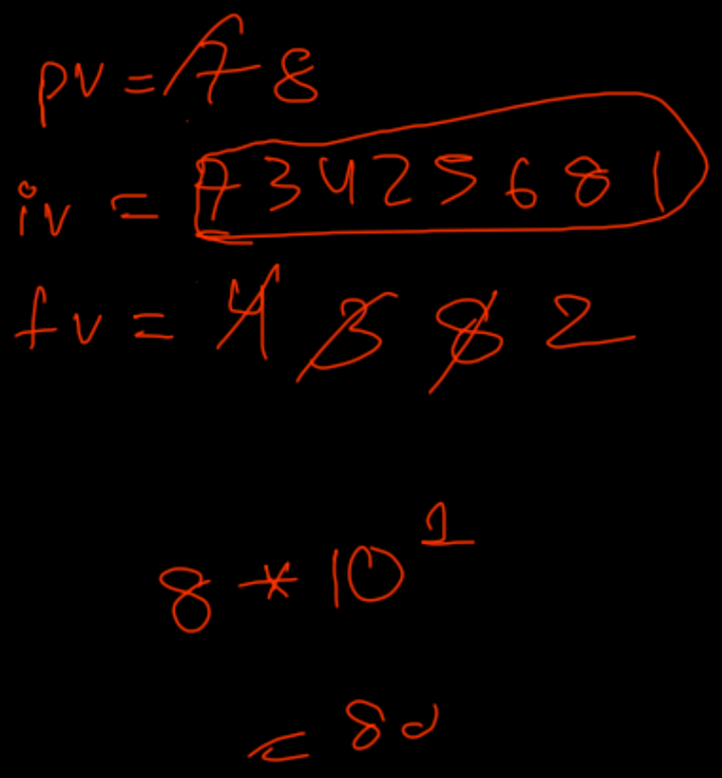
1 2 7 8

$\sum pv * 10^{fv-1}$ → Inverse

$8 * 10^{0}$

$+ 7 * 10^{1}$

$+ 2 * 10^{2} + 1 * 10^{3}$




```java
import java.util.*;

public class Main{

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

  int pv = 1;
  int inverse = 0;

  while(n > 0) {
      int fv = n % 10;
      n /= 10;

      inverse += pv * (int)Math.pow(10,fv-1);
      pv++;
  }

  System.out.println(inverse);
}
}
```

Getting Started - Lecture 6

(Pattern Printing)

Concepts ↓

1. Pattern Printing GfG
2. Right Angled Triangle
3. Patternify
4. Right Angled Triangle - 2
5. Yet Another Pattern
6. Diamond of Stars
7. Void of Diamond
8. Backward Slash
9. forward Slash
10. Cross of Stars

Pattern - Printing (GfG)

Pattern Printing

School Accuracy: **65.5%** Submissions: **2776** Points: **0**

Given a number **N**. The task is to print a series of asterisk(*****) from **1 till N** terms with increasing order and difference being 1.

Example 1:

Input:

N = 3

Output:

* ** ***

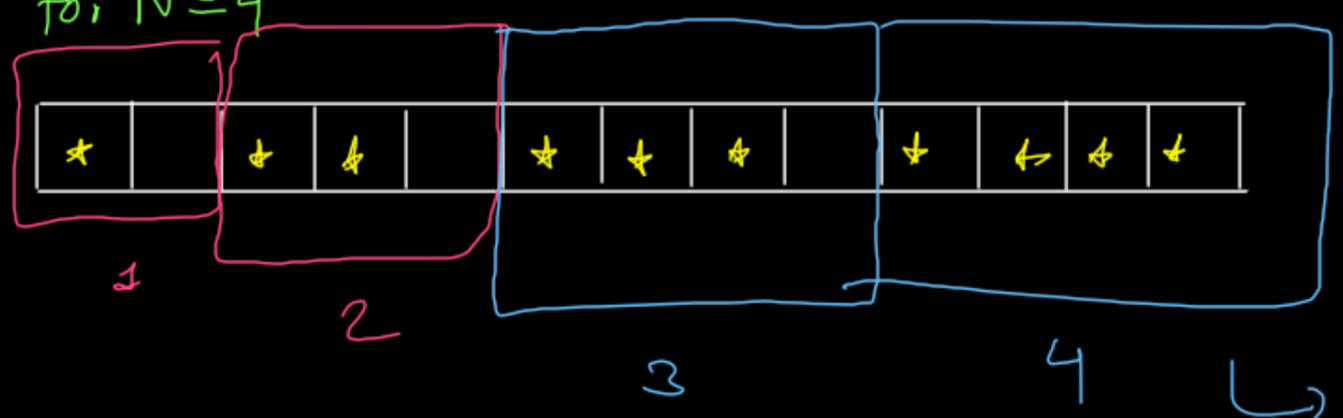
Explanation:

First, print 1 asterisk then space after
that print 2 asterisk and space after that
print 3 asterisk now stop as N is 3.

for N=3

Task → Print *
Print space

for N=4



↳ ith iteration → istars

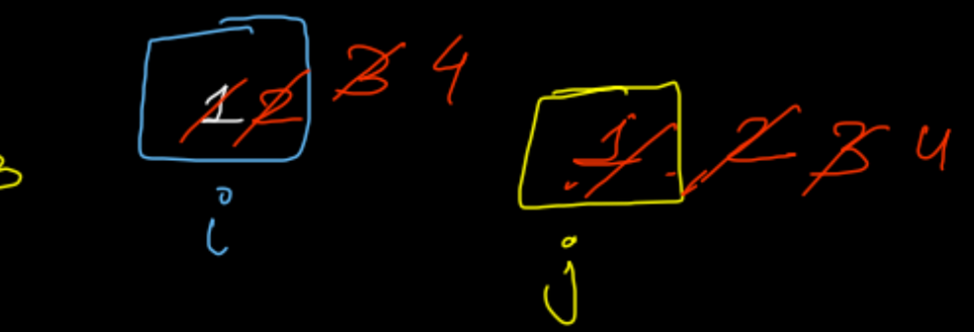
```java
//User function Template for Java
class Solution{
    static void printPattern(int n){
        // code here

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

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

            System.out.print(" ");
        }
    }
}
```

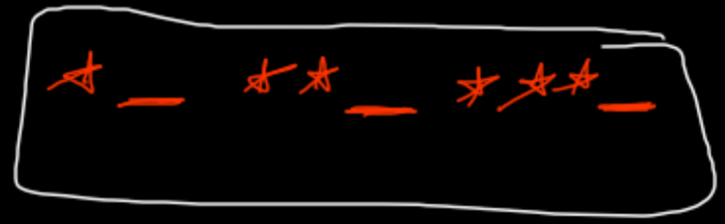
1 3

2

Nested Loop → One or many loops inside another

N = 3





Right Angled Triangle

Pattern 1

Easy

Prev Next

1. You are given a number n.
2. You've to create a pattern of * and separated by tab as shown in output format.

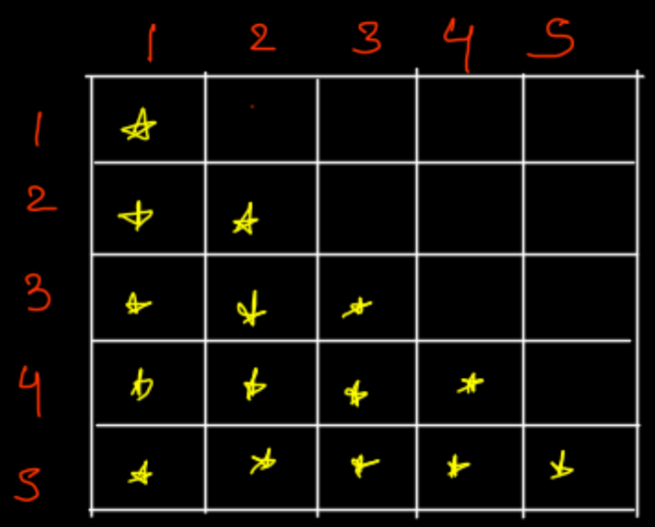
Input Format

A number n

Output Format

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

for N=5



for N=6

for N=3

for N=3

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

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

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

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

        System.out.println();
    }

}
```

#Patternify

Pattern 2

Easy

Prev Next

1. You are given a number n.
2. You've to create a pattern of * and separated by tab as shown in output format.

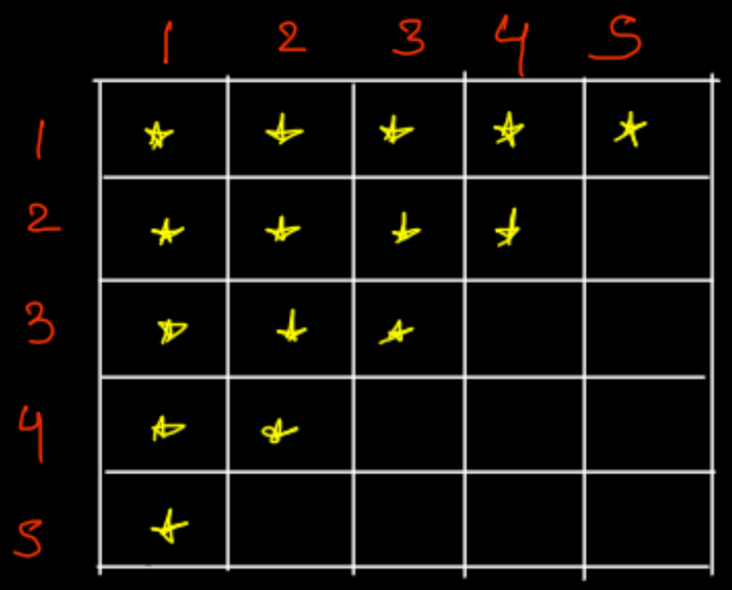
Input Format

A number n

Output Format

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

for N = 5



N to 1 → loop

↓

ith iteration → i stars

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

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

    for(int i=n;i>=1;i--) {

        //stars
        for(int j=1;j<=i;j++) {
            System.out.print("*\t");
        }

        System.out.println();
    }
}
```

1 to N Loop With External Variable

1 to N → Loop

for N=5 Stars

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

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

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

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

        System.out.println();
        stars--;
    }
}
```

#1 to N Loop Without External Variable

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

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

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

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

        System.out.println();
    }
}
```

#Right Angled Triangle -2

Pattern 3

Easy

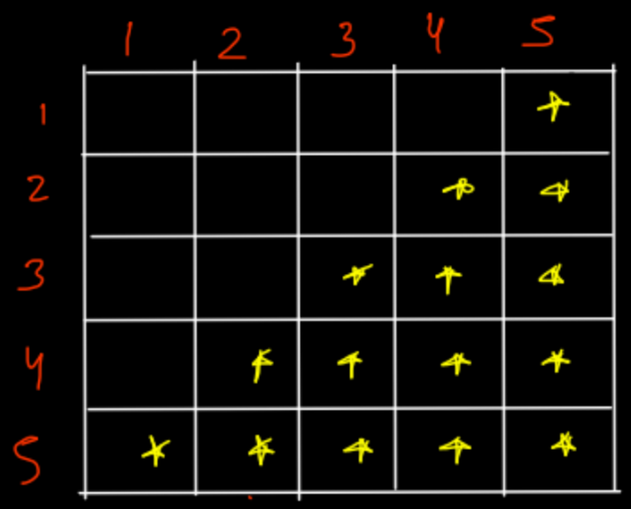
Prev Next

1. You are given a number n.
2. You've to create a pattern of * and separated by tab as shown in output format.

Input Format

A number n

Output Format



(5)

1st $N-i = 4$

2nd $N-i = 3$

3rd $N-i = 2$

4th $N-i = 1$

5th $N-i = 0$

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

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

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

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

        System.out.println();
    }
```

Yet another Pattern

11 Difficulty: EASY

Avg. time to solve
15 min

Success Rate
85%

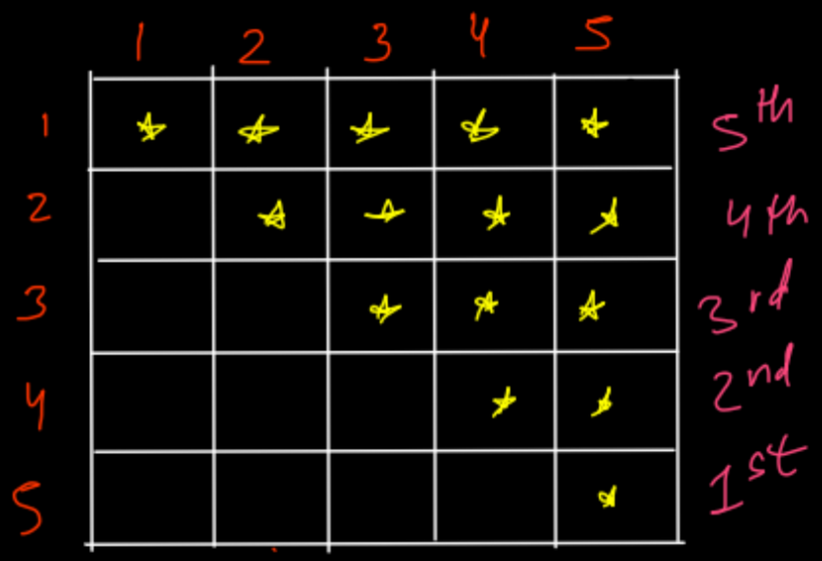
Problem Statement Suggest Edit

Ninja was playing with her sister to solve a puzzle pattern. However, even after taking several hours, they could not solve the problem.

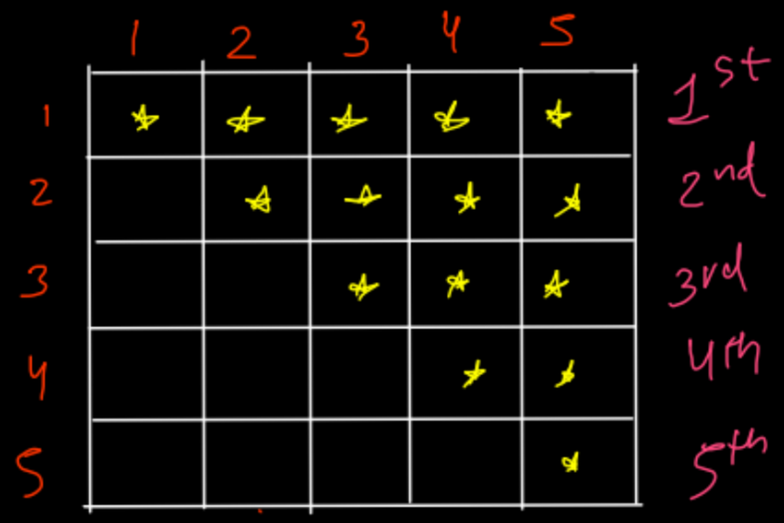
A value of N is given to them, and they are asked to solve the problem. Since they are stuck for a while, they ask you to solve the problem. Can you help solve this problem?

```
Example : Pattern for N = 4

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

N to 1 Loop with external variable for space




```java
// Write your code here.

int space = 0;

for(int i=n;i>=1;i--) {

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

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



(N - i + 1) Stars

Spaces → i - 1

```java
// Write your code here.

for(int i=1;i<=n;i++) {
    //space

    for(int sp=1;sp<=i-1;sp++) {
        System.out.print(" ");
    }

    //stars

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

    System.out.println();
}
}
```

Diamond of Stars

17

Difficulty: EASY

Contributed By
Ankush Gupta | Level 1

Avg. time to solve
10 min

Success Rate
90%

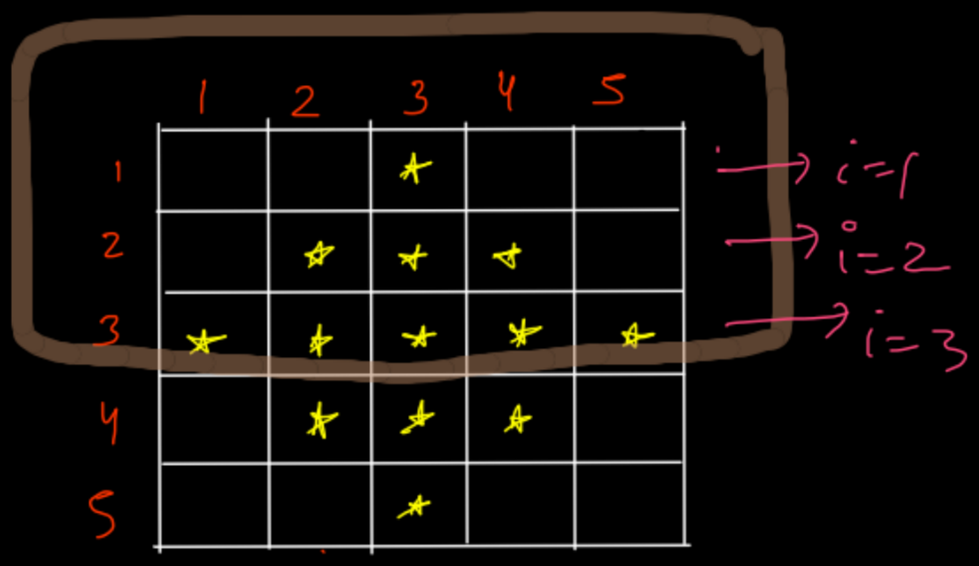
Problem Statement Suggest Edit

You are given an integer 'N'. Your task is to print the following pattern for the 'N' number of rows.

For Example:

```
Pattern for 'N' = 5:
```

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

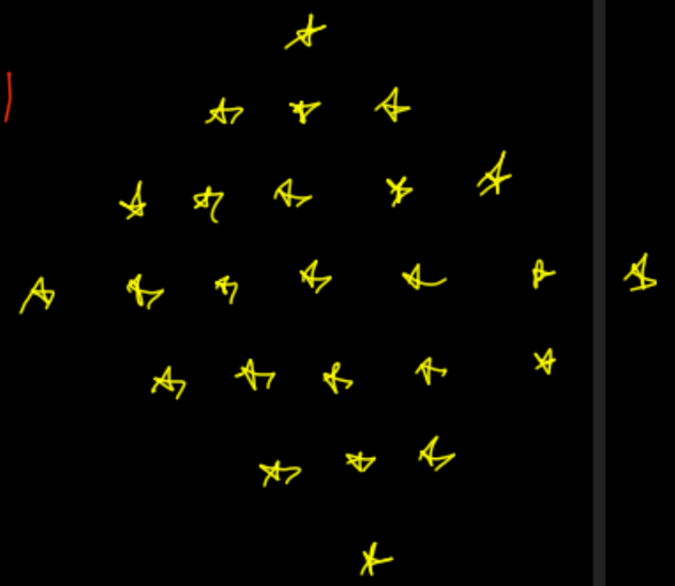


Upper half

let k = n/2+1; → 3

Spaces → k-i

Stars → 2i-1



Second Half

Stars → start from N-2 &
keep decrementing by 2

Spaces = i

```java
int k = n/2 + 1;

//first half
for(int i=1;i<=k;i++) {
    //spaces
    for(int sp=1;sp<=k-i;sp++) {
        System.out.print(" ");
    }

    //stars
    for(int j=1;j<=2*i-1;j++) {
        System.out.print("*");
    }

    System.out.println();
}
```

```java
//second half
int stars = n-2;
for(int i=1;i<=n-k;i++) {

    //spaces
    for(int sp=1;sp<=i;sp++) {
        System.out.print(" ");
    }

    //stars

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

    System.out.println();
    stars -= 2;
}
```

Backward Slash

Pattern 7

Easy

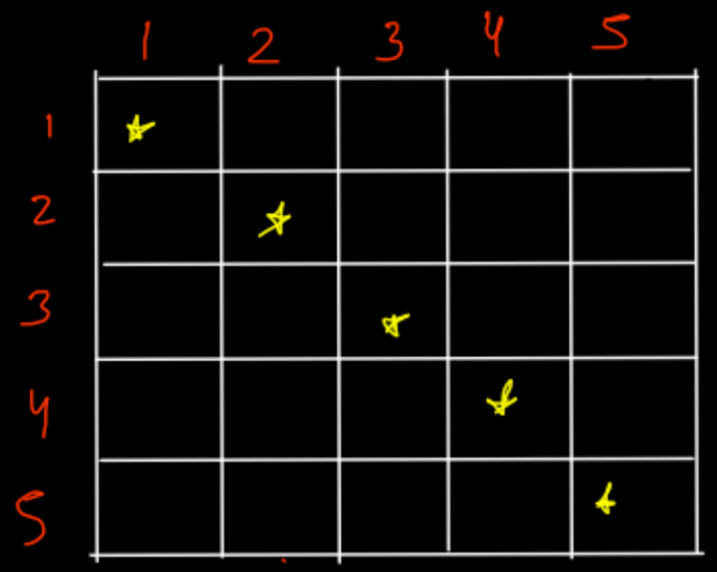
Prev Next

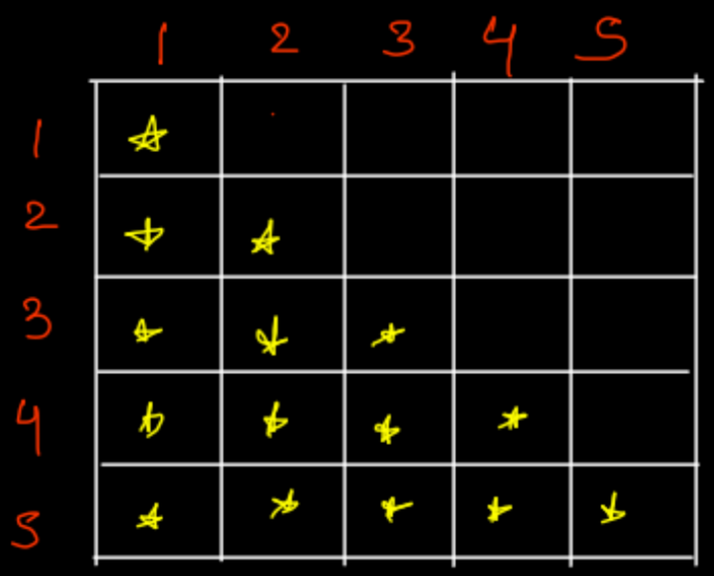
1. You are given a number n.
2. You've to create a pattern of * and separated by tab as shown in output format.

Input Format

A number n

Output Format





Compare them to simplify

1st
2nd
3rd
4th
5th

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

    // write ur code here

    int n = scn.nextInt();

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

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

        System.out.println();
    }

}
```

forward Slash

Pattern 8

Easy

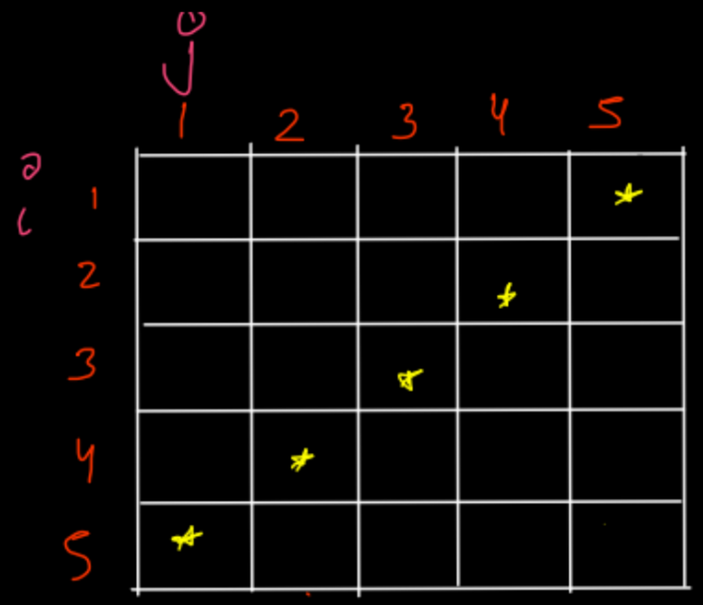
Prev Next

1. You are given a number n.
2. You've to create a pattern of * and separated by tab as shown in output format.

Input Format

A number n

Output Format



$(i+j == N+1) \rightarrow$ * break

else → Space

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

    // write ur code here
    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");
                break;
            } else {
                System.out.print("\t");
            }
        }
        System.out.println();
    }
}
```

Cross of Stars

Pattern 9

Easy

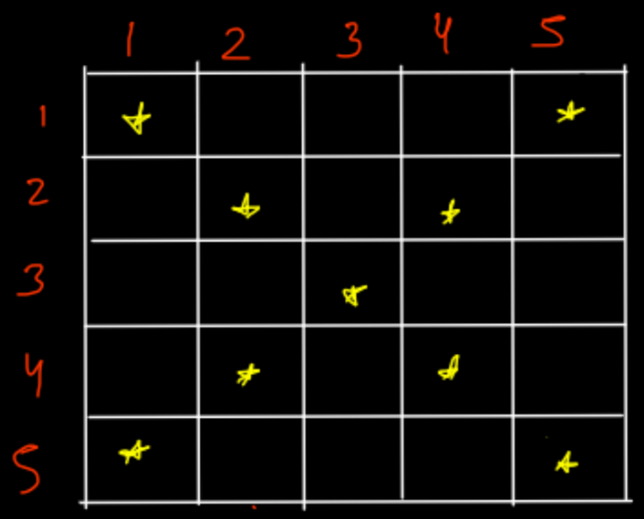
Prev Next

1. You are given a number n.
2. You've to create a pattern of * and separated by tab as shown in output format.

Input Format

A number n

Output Format




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

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

    for(int i=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();
    }

}
```

Void of Diamond

Pattern 6

Easy

Prev Next

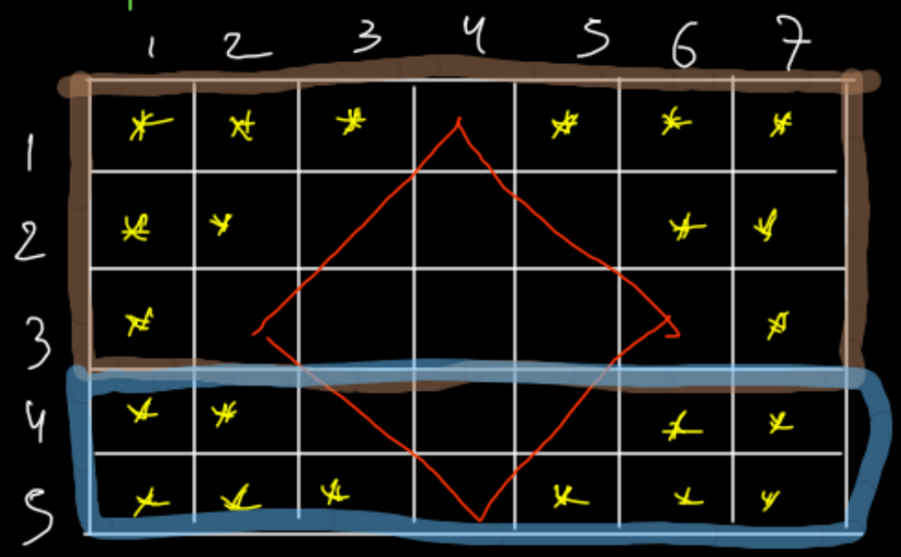
1. You are given a number n.
2. You've to create a pattern of * and separated by tab as shown in output format.

Input Format

A number n

Output Format

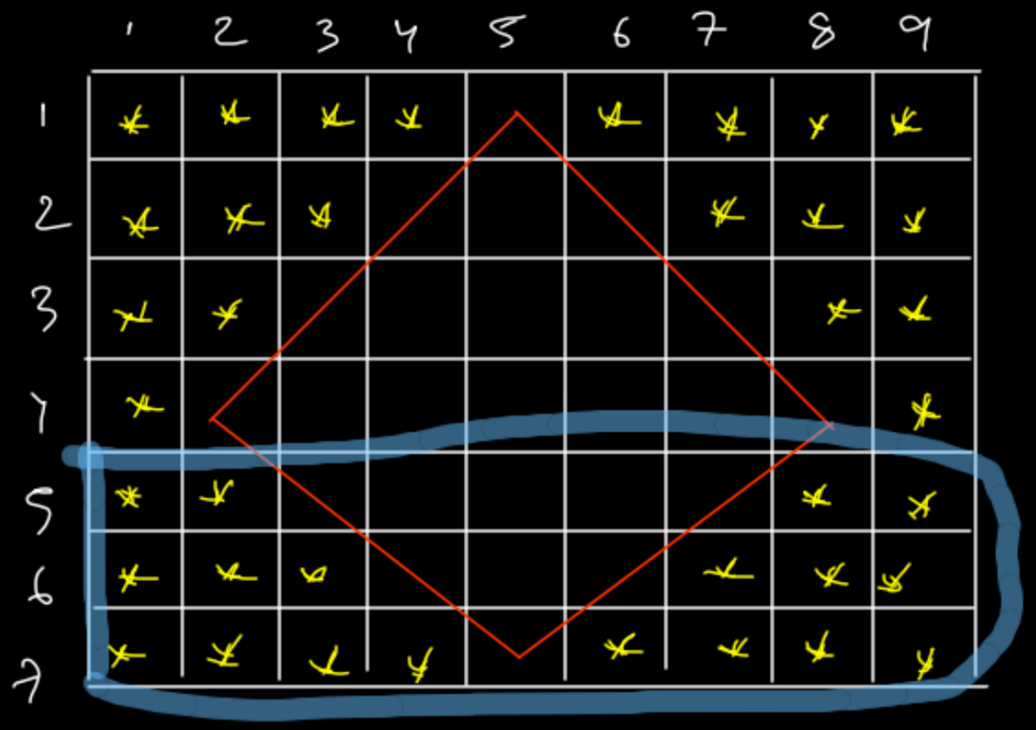
for n=5



$k = n/2 + 1$

$k = 3$

for n=7

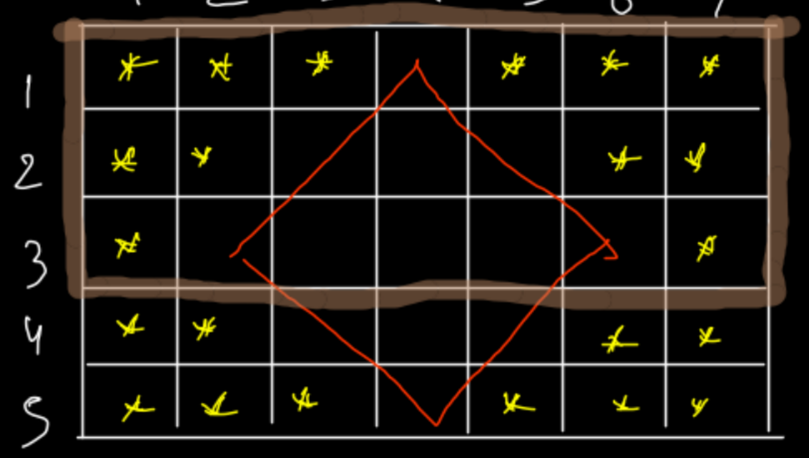


$k = 4$

first Half

→ Stars → Start from k & dec by 1

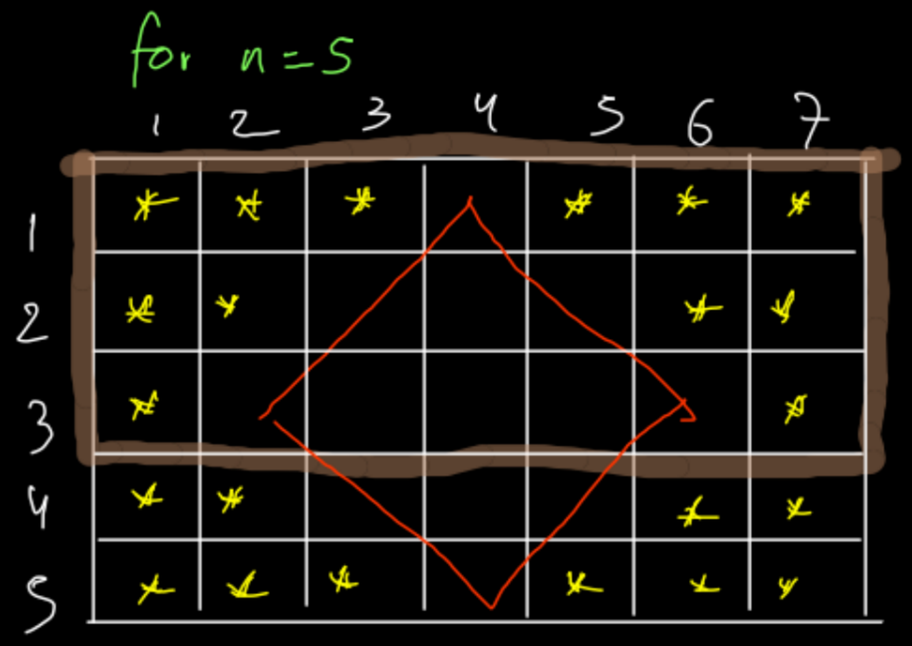
for n=5



Second Half

Stars → start from 2
& inc by 1

Spaces → Start from n-2
& dec by 2



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

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

    int k= n/2 + 1;

    int stars = k;
    for(int i=1;i<=k;i++) {

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

        //spaces

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

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

        System.out.println();
        stars--;
    }
    stars = 2;
    int space = n-2;

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

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


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

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

Getting Started Lecture : 7

① Number Pattern → Pep / CN

② Cross of Numbers

③ Empty Diamond

④ fibonacci Triangle

⑤ Mirror image of Triangle

Number Pattern

Pattern 11

Easy

Prev Next

1. You are given a number n.
2. You've to create a pattern as shown in output format.

Input Format

A number n

Output Format

```
1
2   3
4   5   6
7   8   9   10
..
```

N=5

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

count = 1

→ count Print

count +1

N

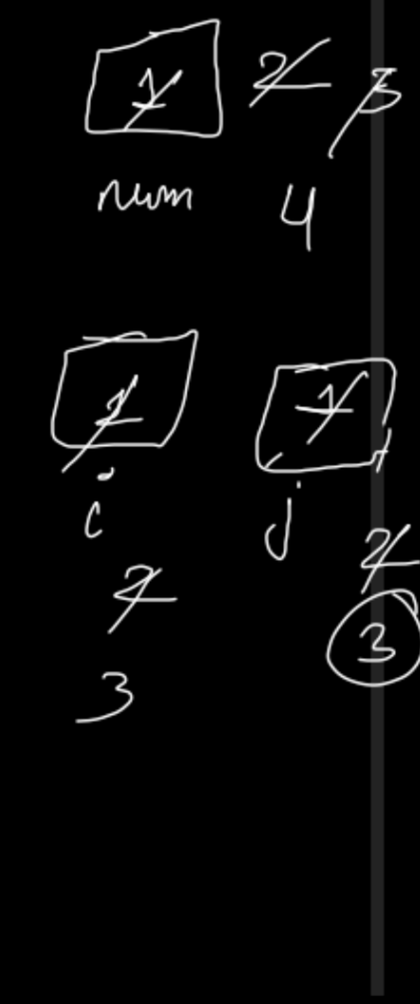
N=5

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

1 → 2 3

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

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

    int num = 1;

    for(int i=1;i<=n;i++) {
        //numbers

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

        //leave line
        System.out.println();
    }

}
```

N=5



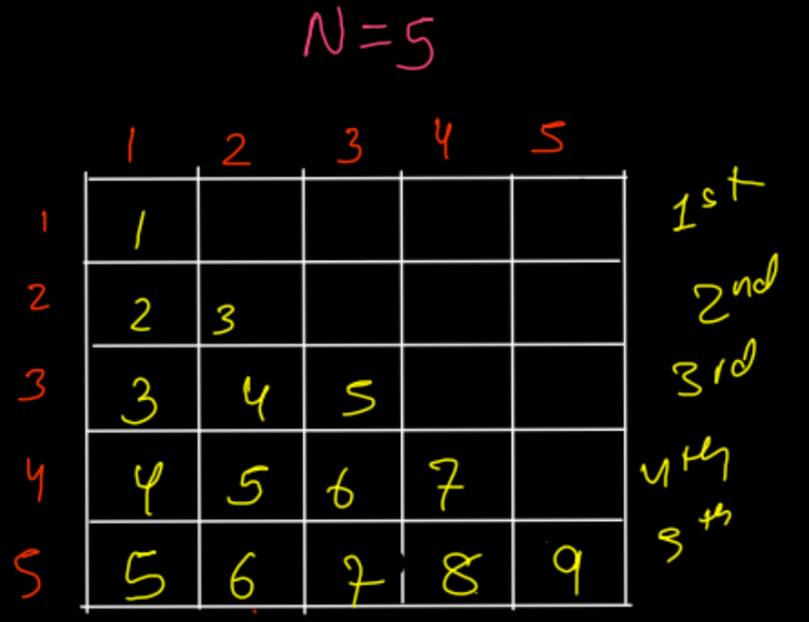
Problem Statement

Ninja wants to build a number pattern for the given integer.

For example, If the given integer ‘N’ is 4

Pattern:

```
1
23
345
4567
```



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

            //leave line
            System.out.println();
        }
    }
}
```

→ This code is for Number Pattern on CN (Print only)

Cross of Numbers

Play with Pattern

7 Difficulty: EASY

Avg. time to solve
20 min

Success Rate
80%

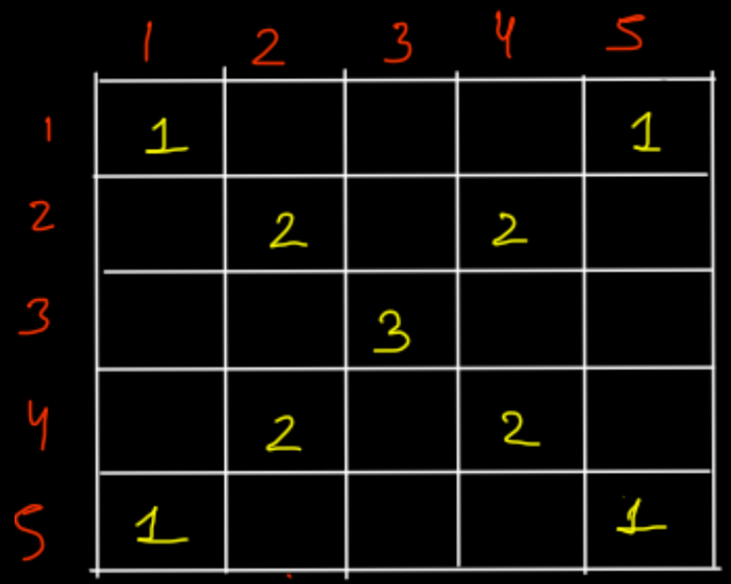
Problem Statement Suggest Edit

Ninja wanted to go to a party along with his friends. However, his mom wanted him to go only if he completes a task assigned by her.

She gave Ninja a value and asked him to print an X-shaped pattern.

Example : Pattern for N = 3 (No. of rows = 5, No. of columns = 5) :

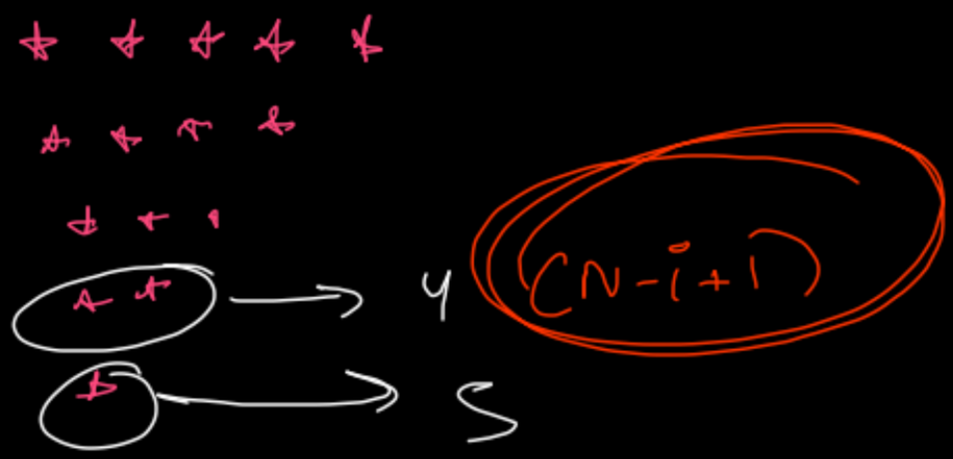
```
1   1
 2 2
  3
 2 2
1   1
```



(5-4+1)=2

(5-5+1)=1

i j N



```java
public static void ninjaPattern(int N) {

    // Write your code here.
    // N= 3
    // n = 2*N-1

    int n = 2*N-1;

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

}
```

Empty Diamond

Pattern 10

Easy

Prev Next

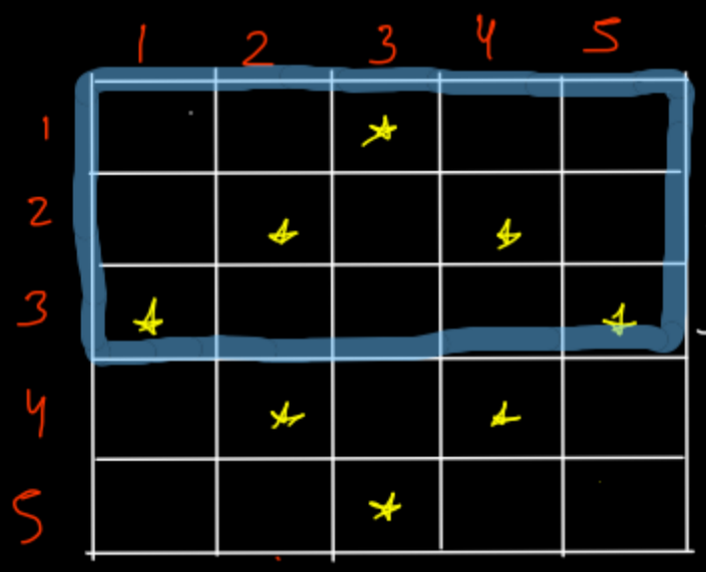
1. You are given a number n.
2. You've to create a pattern of * and separated by tab as shown in output format.

Input Format

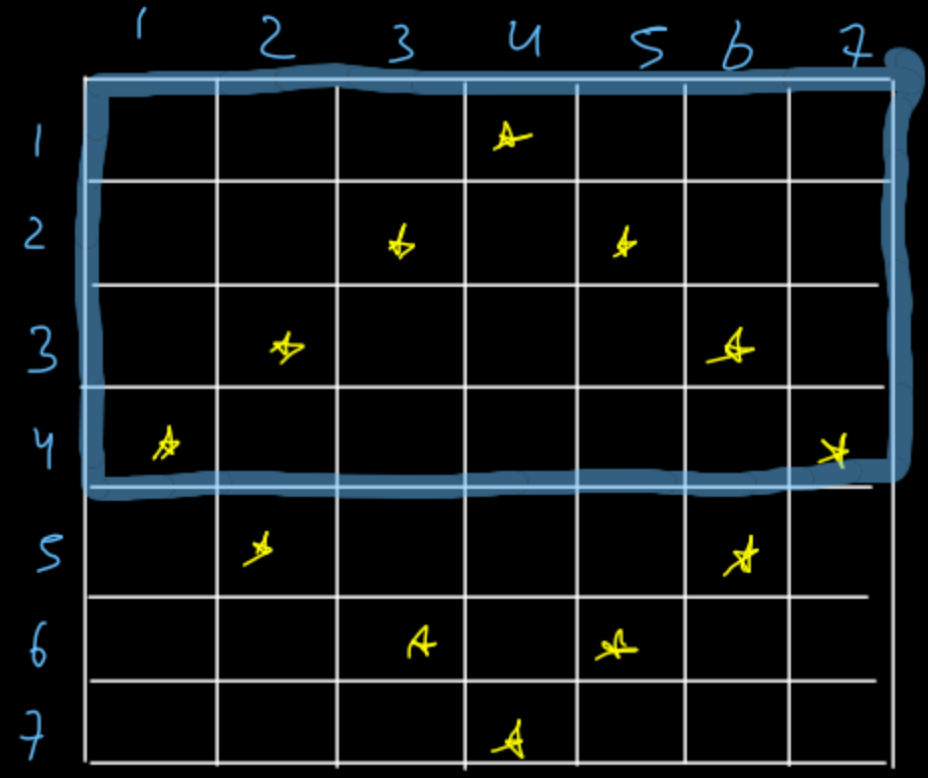
A number n

Output Format

for N = 5



N = 7



first

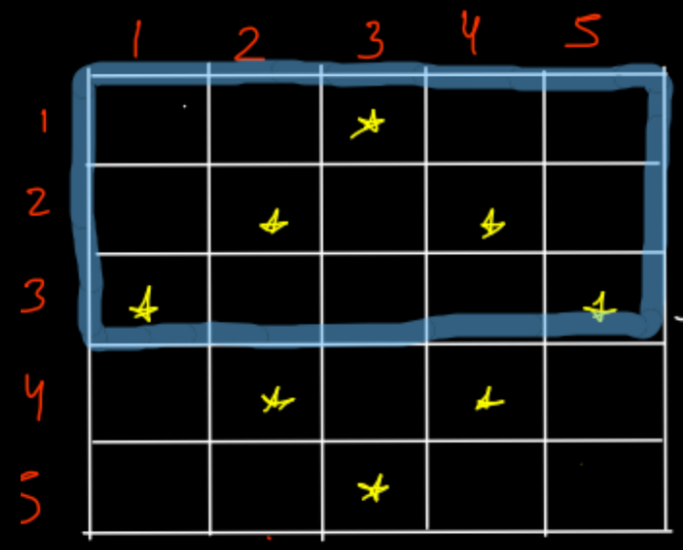
① k-i spaces

② 1 star

③ space starts from 1 & inc by 2 always

④ 1 star

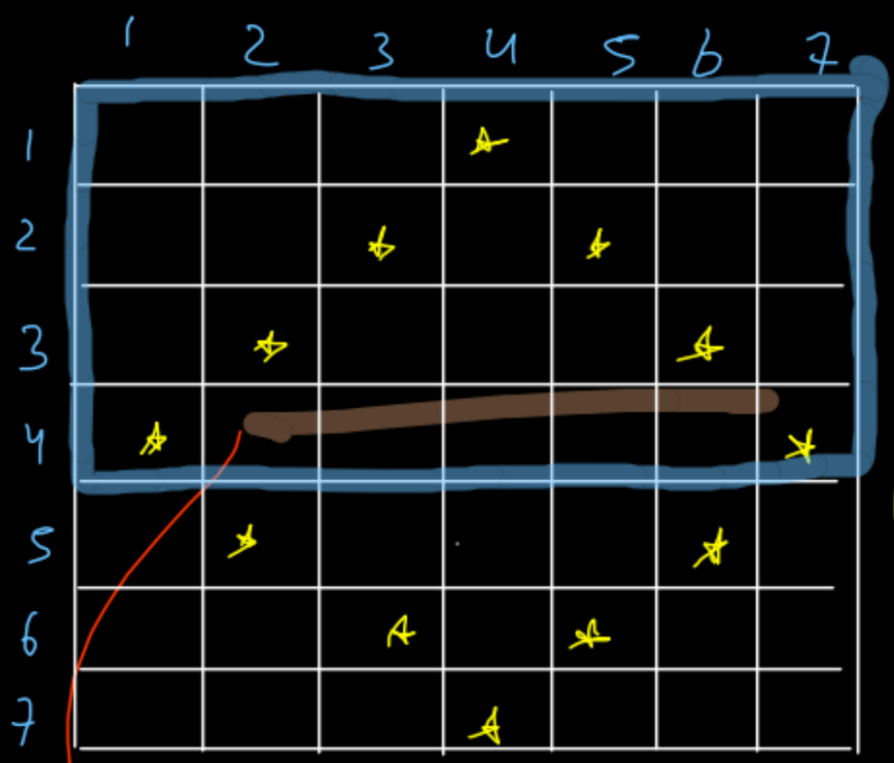
for N=5



n/2+1 (3)

k

N=7



n/2+1 (4)

k

#Second Half

① i spaces
② 1 star

③ space -= 4;
④ 1 star

last_space = space - 2;
sec_half_space = last_space - 2;

sp = 1

```
for(int i=1; i<=3; i++) {
    print(space)
    sp+=2;
}
```

i = 1 2 3 4

space

1 3 5

1 3 5 7

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

    // write ur code here
    int n = scn.nextInt();
   int space = 1;
    int k = n/2 + 1;

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

        System.out.print("*\t");
        if(i == 1) {
            System.out.println();
            continue;
        }

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

        System.out.println("*");
        space += 2;
    }
```

```java
    space -= 4; //this is explained in the class

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

        System.out.print("*\t");
        if(i == n-k) {
            System.out.println();
            continue;
        }

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

        System.out.print("*\t");

        space -=2;
        System.out.println();

    }
```

Fibonacci Triangle

Pattern 12

Easy

Prev Next

1. You are given a number n.
2. You've to create a pattern as shown in output format.

Input Format

A number n

Output Format

```
0
1       1
2       3       5
8       13      21  34
..
```

	1	2	3	4	5
1	0				
2	1	1			
3	2	3	5		
4	8	13	21	34	
5	55	89	144	233	377

1st 2nd 3rd 4th 5th

0 1 1 2 3 ....

$$fib(N) = fib(N-1) + fib(N-2)$$

```java
// write ur code here
int n = scn.nextInt();
int a = 0;
int b = 1;
int c = 0;
for(int i=1;i<=n;i++) {
    for(int j=1;j<=i;j++) {
        if(i == 1) {
            System.out.print("0\t");
        } else if(i == 2 && j==1) {
            System.out.print("1\t");
        } else {
            c = a + b;
            System.out.print(c + "\t");
            a = b;
            b = c;
        }
    }
    System.out.println();
}
```

a = 0 1 1 2 3

b = 1 1 2 3 5

c = 0 1 2 3 5

i = 1 2 3 4

i

0 —

→

1 — 1

→

2 — 3 — 5

Mirror image of triangle

3

Difficulty: EASY

Contributed By
Deepanshu_1780 | Level 1

Avg. time to solve
10 min

Success Rate
90%

Problem Statement Suggest Edit

Ninja's younger sister got a project to print the pattern for the given number of rows, say 'N'. She finds it difficult to write such a pattern for every 'N'.

Ninja decided to help his sister and decided to write a code for this but wasn't able to write the code for the same. Ninja wants help to write a code and asks you for help. Help Ninja.

Example:

```
Pattern for N = 2
    0
   101
  21012
```

for N = 2

	1	2	3	4	5
0			0		
1		1	0	1	
2	2	1	0	1	2

{0 to N} → N+1 times

Spaces → N-i

2i+1 Numbers → Print

[1 to N] → N

1 2 3 4 ... N

[1 - 5]

1 2 3 4 5

[0 to N-1] → N

[0 - 4]

0, 1, 2, 3, 4

```java
public class Solution {
    public static void NumberPattern(int n) {
        // Write your code here

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

            int num = i;

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

            for(int j=1;j<=2*i+1;j++) {
                System.out.print(num);
                if(j < (2*i +1)/2 + 1) {
                    num--;
                } else {
                    num++;
                }
            }

            System.out.println();
        }
    }

}
```

j<=5

for N=2

	1	2	3	4	5
0			0		
1		1	0	1	
2	2	1	0	1	2

num = ~~2~~ ~~1~~ ~~0~~ ~~1~~ 2

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

(2i+1)/2 + 1

= (2*2+1)/2+1

5/2+1

= 2+1 - (3)

2 1 0 1 2

Getting Started lecture - 8

Pattern Printing

- The Arrow Pattern
- The Empty Hour Glass Pattern
- Swastik
- Pascals' Triangle **

Number System

- Decimal to Any Base
- Any base to Decimal
- Any base to Any Base

Arrow Pattern

Pattern 17

Easy

Prev Next

1. You are given a number n.
2. You've to write code to print the pattern given in output format below.

Input Format

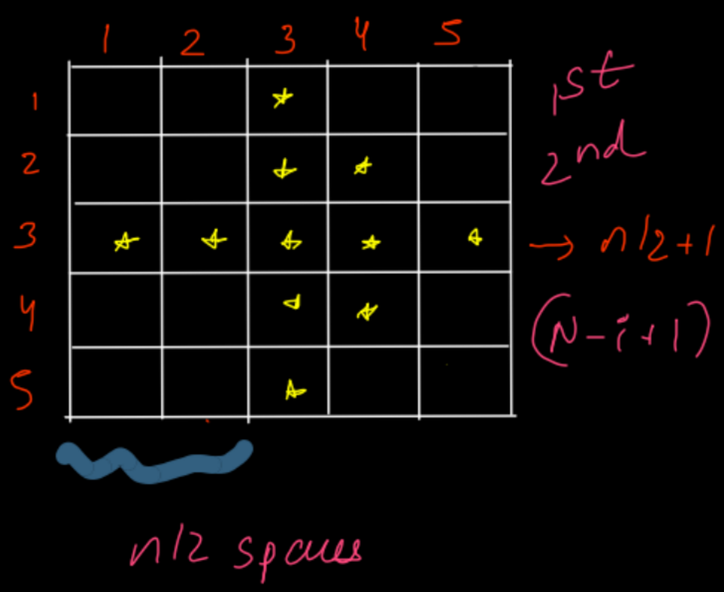
A number n

Output Format

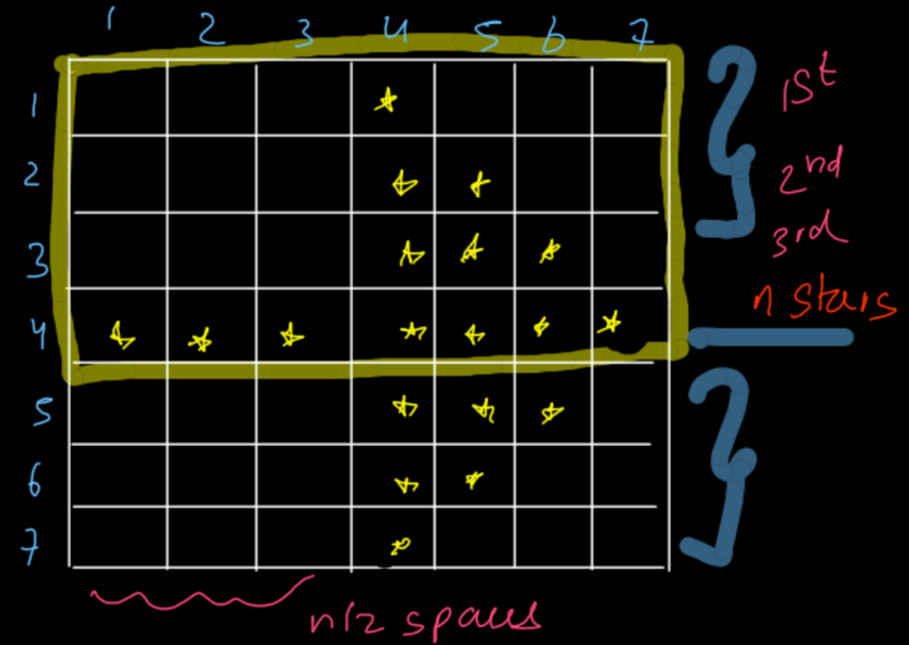
Upper Half → i stars # Spaces → always n/2

Lower Half → N-i+1

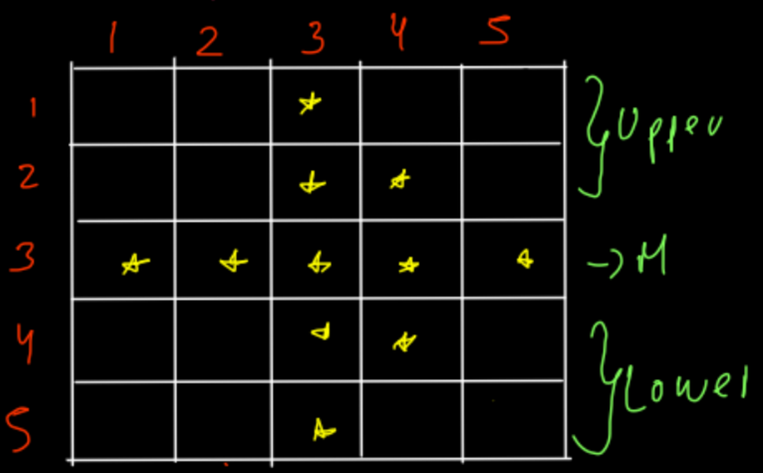
for N=5



for N=7

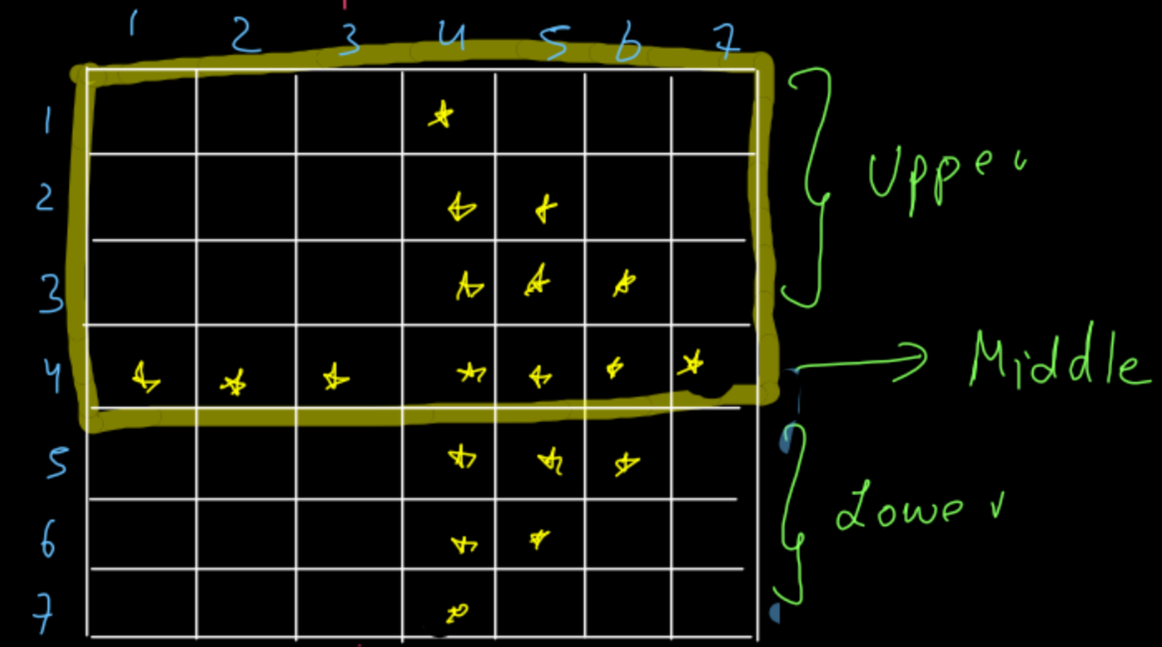


for N=5



Middle (n/2+1) → Print N Stars

for N=7



Upper Half : i stars

Lower Half : N-i+1

Spaces : N/2

```java
import java.util.*;

public class Main {

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

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

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

            } else if(i <= n/2) {
                //upper half

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

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

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

    }
}
```

The Empty Hour Glass Pattern

Pattern 18

Easy

Prev Next

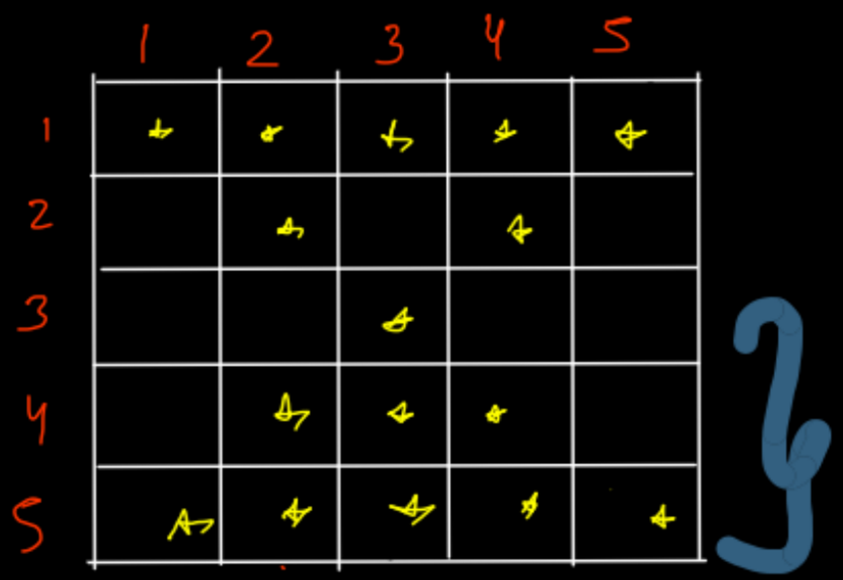
1. You are given a number n.
2. You've to write code to print the pattern given in output format below

Input Format

A number n

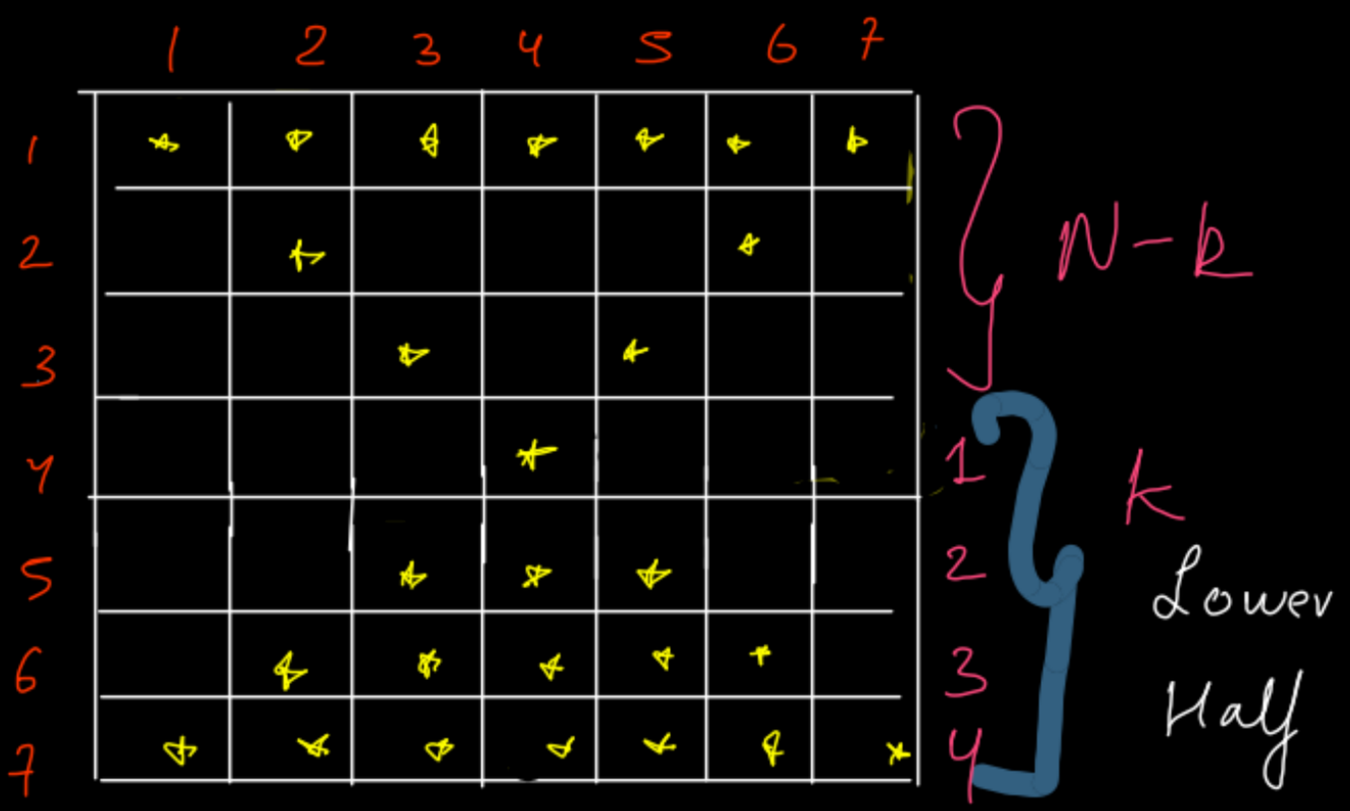
Output Format

for N = 5



$k = n/2 + 1$

for N = 7



Upper Half → k - 1

```java
        //upper half

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

            System.out.println();
        }

        //lower half

        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();
        }
    }
}
```

#Swastik

Pattern 19

Easy

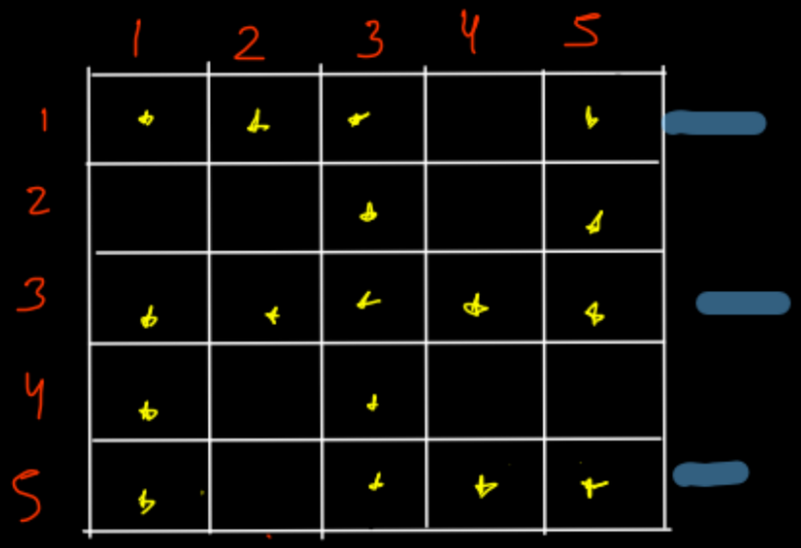
Prev Next

1. You are given a number n.
2. You've to write code to print the pattern given in output format below

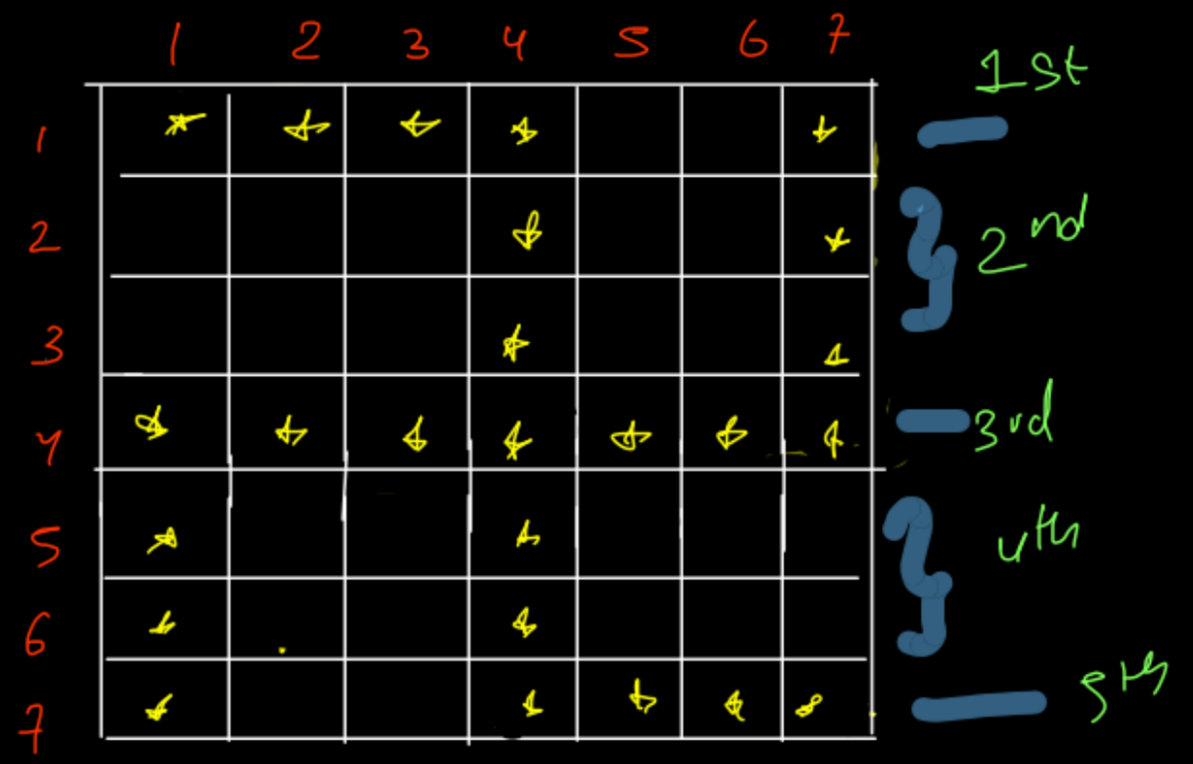
Input Format

A number n

Output Format



for N=5



for N=7

1st part

$(j <= n/2+1) \;||\; j == n \rightarrow$ Star

else Space

2nd

$j == n/2+1 \;||\; j == n \rightarrow$ Star

else → Space

3rd

Print N Stars

4th

j == n/2+1 || j == 1 → Stars

else → Space

5th

j == 1 || j ≥ n/2+1

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

    System.out.println();
}
}
```

Pascals' Triangle

Pattern 13

Easy

Prev Next

1. You are given a number n.
2. You've to create a pattern as shown in output format

Input Format

A number n

Output Format

```
1
1       1
1       2       1
1       3       3       1
1       4       6       4       1
1       5       10      10      5       1
..
```

for N = 5

	0	1	2	3	4
0	1				
1	1	1			
2	1	2	1		
3	1	3	3	1	
4	1	4	6	4	1

$$^nC_k = {}^nC_{N-k}$$

$$^nC_0 = {}^nC_n = 1$$

$$^5C_1 = \frac{5!}{4!\,1!} = \frac{5 \times 4!}{4!\,1!} = 5$$

$$^nC_r = \frac{n!}{(n-r)!\,r!}$$

$^4C_1$

for N = 5

1 to N → N

0 to N-1 → N

	0	1	2	3	4
0	1				
1	1	1			
2	1	2	1		
3	1	3	3	1	
4	1	4	6	4	1

$$^iC_j = {}^4C_1$$

$$^nC_{r+1} = \frac{^nC_r\,(n-r)}{r+1}$$

$N!_0 \rightarrow N*(N-1)!_0$

LHS $\dfrac{n!_0}{(n-(r+1))!_0\,(r+1)!_0} = \dfrac{n!_0}{((n-r)-1)!\,(r+1)!_0}$

RHS $\dfrac{n!_0\,(n-r)}{(n-r)!_0\,r!_0\,(r+1)} = \dfrac{n!_0\,(\cancel{n-r})}{(\cancel{n-r})((n-r)-1)!_0\,(r+1)!_0} = \dfrac{n!_0}{((n-r)-1)!_0\,(r+1)!_0}$

	0	1	2	3	4
0	1				
1	1	1			
2	1	2	1		
3	1	3	3	1	
4	1	4	6	4	1

$4C_0 \rightarrow 1$

$$^nC_{r+1} = \frac{^nC_r\,(n-r)}{r+1}$$

$$^iC_{j+1} = \frac{^iC_j\,(i-j)}{j+1}$$

```java
    //write your code here

    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 + "\t");
            int iCjp1 = iCj * (i-j)/(j+1);
            iCj = iCjp1;
        }
        System.out.println();
    }
}
```

Decimal to Any Base

Decimal To Any Base

Easy

Prev Next

1. You are given a decimal number n.
2. You are given a base b.
3. You are required to convert the number n into its corresponding value in base b.

Decimal Number System → digits from 0 to 9

radix or base → 10

Binary Number System → digits from 0 to 1

radix or base → 2

Hexadecimal NS → digits from 0 to 9

A → 10
B → 11
C → 12
D → 13
E → 14
f → 15

radix or base → 16

N = 25 B = 2

2	25	
2	12	1
2	6	0
2	3	0
2	1	1
	0	1

$(11001)_2$

$1 \quad 1 \quad 0 \quad 0 \quad 1$

$10^4 \quad 10^3 \quad 10^2 \quad 10^1 \quad 10^0$

```
ans = 0;
p = 0
while(n != 0) {
    int rem = n % b;
    n /= b;
    ans += rem * 10^p
    p++;
}
```

N = 25 B = 2

ans = 0 + 1 * 10^0 = 1 + 0 = 1

p = 0 1 2 3 4 5

rem = 1 0 0 1 1 * 10^4

n = 12 6 3 1 0

10,000

1001

11001

```
public static int getValueInBase(int n, int b){
    // write code here

    int ans = 0;
    int p = 0;
    while(n != 0) {
        int rem = n % b;
        n /= b;
        ans += rem * (int)Math.pow(10,p);
        p++;
    }

    return ans;
}
}
```

```java
public static int getValueInBase(int n, int b){
    // write code here

    int ans = 0;
    int p = 0;
    while(n != 0) {
        int rem = n % b;
        n /= b;
        ans += rem * (int)Math.pow(10,p);
        p++;
    }

    return ans;
}
}
```

N = 25

① N = 25 12 p = 0 1

rem = 1 ans = 0 + 1 = 1

$1 * 10^0 = 1 * 1 = 1$

② N = 12 6 p = 1 2

rem = 0 ans = 1

$0 * 10^1 = 0$

③ N = 6 3 p = 2 3

rem = 0 0 ans = 1

$0 * 10^2 = 0$

④ N = 3 p = 3

rem = 1 ans = 1001

Any Base To Decimal

Easy

Prev Next

1. You are given a number n.
2. You are given a base b. n is a number on base b.
3. You are required to convert the number n into its corresponding value in decimal number system.

11001 → N B = 2

9863 4

10^4 10^3 10^2 10^1 10^0

11001

2^4 2^3 2^2 2^1 2^0

= 16 + 8 + 1

11001 = 25

ans += digit * base^p

```java
public static int getValueIndecimal(int n, int b){
    // write your code here

    int ans = 0;
    int pv = 0;
    while(n != 0) {
        int fv = n % 10;
        n /= 10;
        ans += fv * (int)Math.pow(b,pv);
        pv++;
    }

    return ans;
}
}
```

fv = 1

ans = 9 + 16 = 25

pv = 0 1 2 3 4

$1 * 2^4 = 16$

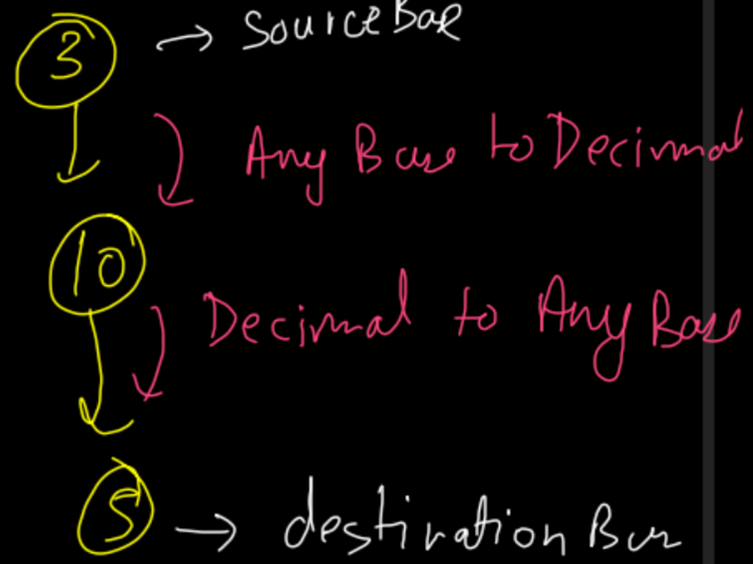
Any Base to Any Base

Any Base To Any Base

Easy

Prev Next

1. You are given a number n.
2. You are given a base b1. n is a number on base b.
3. You are given another base b2.
4. You are required to convert the number n of base b1 to a number in base b2.



```java
public static int anyBaseToAnyBase(int n, int src,int dest) {
    int decimal = anyBaseToDecimal(n,src);
    int ans = decimalToAnyBase(decimal,dest);
    return ans;
}
```

Getting Started - Lecture 9

Number System

→ Any Base Addition

→ Any Base Subtraction

→ Any Base Multiplication

Any Base Addition

Any Base Addition

Easy

1. You are given a base b. 2. You are given two numbers n1 and n2 of base b. 3. You are required to add the two numbes and print their value in base b.

Constraints

`2 <= b <= 10 0 <= n1 <= 256 0 <= n2 <= 256`

Format

Input

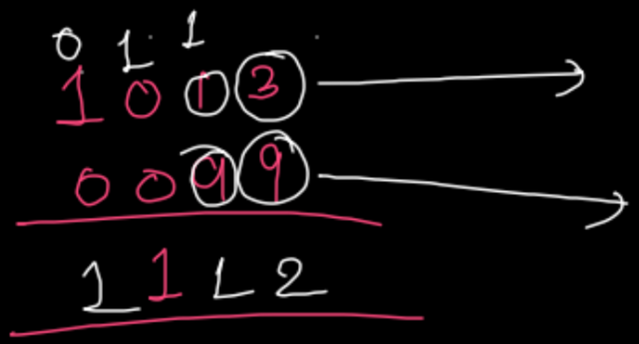
A base b A number n1 A number n2

Output

A number representing the sum of n1 and n2 in base b.

$n_1 \rightarrow 1013$

$n_2 \rightarrow 99$



$d_1 = n_1 \% 10;$ $n_1 /= 10$ (101)

$d_2 = n_2 \% 10;$ $n_2 /= 10$ (9)

$b = 10$

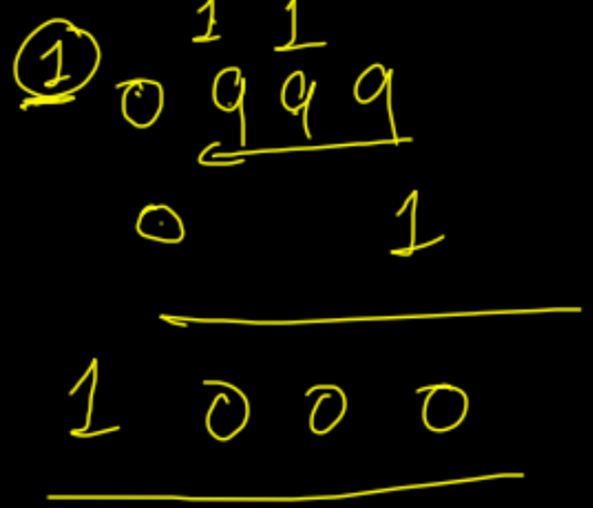
$ca = 0$ $d \rightarrow 1+0+0$ (ca=0)

$ca \rightarrow$

```
if (d1+d2+ca < b) {
    d = d1+d2+ca;
} else {
    d = (d1+d2+ca) % b;
    ca = (d1+d2+ca) / b;
}
```

greater than or equal to base

while(n1>0 || n2>0 || ca>0) → condition for addition



101(3)
99(9)

$d_1 = n_1 \% 10$

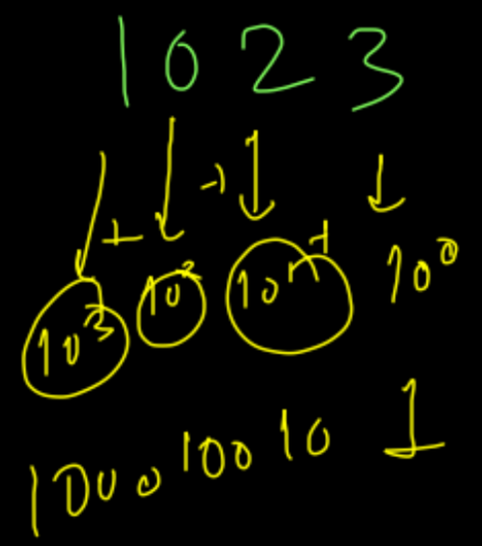
$d_2 = n_2 \% 10$

$n_1 /= 10;$

$n_2 /= 10;$

$d = 2$

$ca = 1$




```java
public static int getSum(int b, int n1, int n2){
    // write ur code here

    int ans = 0;
    int p = 1;
    int ca = 0;

    while(n1 > 0 || n2 > 0 || ca > 0) {
        int d1 = (n1 > 0) ? n1 % 10 : 0;
        int d2 = (n2 > 0) ? n2 % 10 : 0;
        n1 /= 10;
        n2 /= 10;

        int digit = 0;

        if(d1 + d2 + ca >= b) {
            digit = (d1 + d2 + ca) % b;
            ca = (d1 + d2 + ca)/b;
        } else {
             digit = d1 + d2 + ca;
             ca = 0;
        }

       ans += digit * p;
       p *= 10;

    }

    return ans;
}
}
```

Problem | Editorial | Submissions

Any Base Subtraction

Easy

1. You are given a base b.
2. You are given two numbers n1 and n2 of base b.
3. You are required to subtract n1 from n2 and print the value.

Constraints

```
2 <= b <= 10
0 <= n1 <= 256
n1 <= n2 <= 256
```

Format

Input

A base b
A number n1
A number n2

Output

A number of base b equal in value to n2 - n1.

$n_1 \rightarrow 99$

$n_2 \rightarrow 1012$

$1012 \rightarrow d_2$

$-\ 99 \rightarrow d_1$

913

$n_1 \rightarrow 45$

$n_2 \rightarrow 99$

$99 \rightarrow d_2$

$-\ 45 \rightarrow d_1$

54

while(n2>0) → condition for subtraction

$n_1 \rightarrow 99$

$n_2 \rightarrow 1012$

$b_o = 0$

$b = 10$

$1012 \rightarrow n_2$

$0099 \rightarrow n_1$

0913

$d_2 = 1$

$d_1 = 0$

$b_o = -1$

$d_2 - d_1 + b_o$

$1 - 0 + (-1) = 0$

$b_o = 0$

```
if (d2-d1+bo < 0) {
    d = d2-d1+bo+base;
    bo = -1;
} else {
    d = d2-d1+bo;
    bo = 0;
}
```

$10 + 2 - 99 = 13$

```java
public static int getDifference(int b, int n1, int n2){
    // write your code here
    int ans = 0;
    int p = 1;
    int bo = 0;

    while(n2 > 0) {
        int d2 = n2 % 10;
        int d1 = (n1 > 0) ? n1 % 10 : 0;

        n1 /= 10;
        n2 /= 10;

        int digit = 0;

        if(d2 - d1 + bo < 0) {
            digit = d2 - d1 + bo + b;
            bo = -1;
        } else {
            digit = d2 - d1 + bo;
            bo = 0;
        }

        ans += digit *p;
        p *= 10;
    }

    return ans;
}
```

Any Base Multiplication

Easy

1. You are given a base b.
2. You are given two numbers n1 and n2 of base b.
3. You are required to multiply n1 and n2 and print the value.

Constraints

```
2 <= b <= 10
0 <= n1 <= 10000
0 <= n2 <= 10000
```

Format

Input

A base b
A number n1
A number n2

Output

A number of base b equal in value to n2 * n1.

2023 → n1
*15 → n2

Step 1

```
  1 1
  2023
     5
 -----
 10115
 -----
```

Step 2

```
  2023
     1
 -----
  2023   x10
```

```
  10115
  20230
 -------
  30345
 -------
```

Step 3

Multiply No with digit in base B

① 0 1 1
2023 → n
5 → d

10115

ca = 0

$d_1 = 0$

$d = 5$

$0 * 5 + ① = ②$

$d_1 = n \% 10$

```
if (d1 * d + ca >= b) {
    d = (d1 * d + ca) % b;
    ca = (d1 * d + ca) / b;
} else {
    d = d1 * d + ca;
    ca = 0
}
```

Multiplication of Complete Nos in base B

2023
× 15

10115

① Multiply No with Digit

2023
× 5

10115

8

2023
× 1

20230

8

② 10115
20230

```java
public static int multiplyWithDigit(int n, int d,int b) {
    int ans = 0;
    int p = 1;
    int ca = 0;

    while(n > 0 || ca > 0) {
        int d1 = n % 10;
        n /= 10;

        int digit = 0;
        if(d*d1 + ca >= b) {
            digit = (d*d1 + ca) % b;
            ca = (d*d1 + ca)/b;
        } else {
            digit = d*d1 + ca;
            ca = 0;
        }

        ans += digit*p;
        p*=10;
    }

    return ans;
}
```

```java
public static int getProduct(int b, int n1, int n2){
    // write your code here

    int ans = 0;
    int p = 1;

    while(n1 > 0) {
        int d1 = n1 % 10;
        n1 /= 10;

        int smallAns = multiplyWithDigit(n2,d1,b);
        ans  = anyBaseAddition(ans,smallAns * p,b);
        p *= 10;

    }

    return ans;
}
```