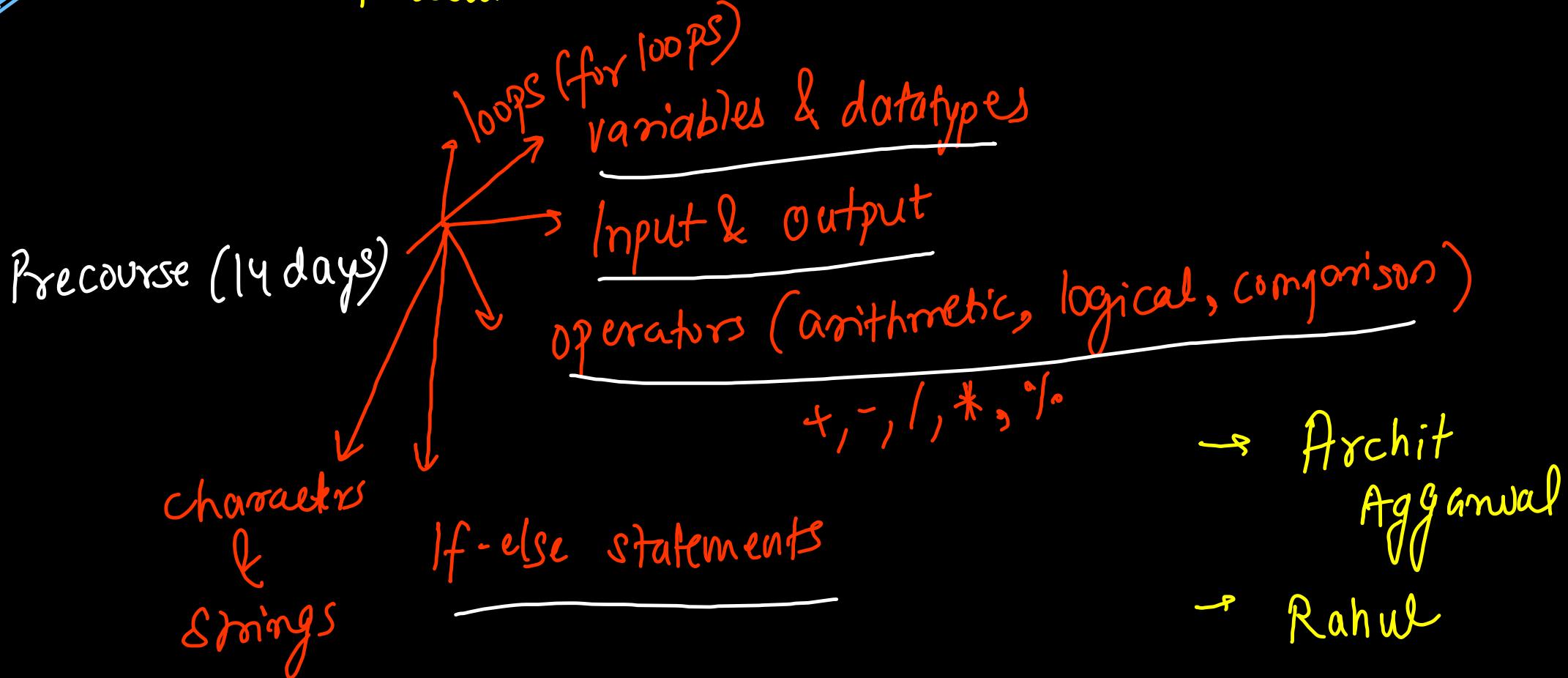


Day 1

FS - 71
Java Basics
Module - 1



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SDE @ Salesforce

Senior @ DTU (CS' Btech)

2000+ Problems on Leetcode, QFG, Hackerrank, Pepcoding

1.5 yrs (10-11 months)

Shop Discount

A shop will give a discount of 10% on the total cost if the cost of the quantity purchased is more than 1000. a. Ask user for the number of units b. Suppose, one unit will cost 100. c. Judge and print total cost for the user in the integer format.

Cost $> 1000 \Rightarrow$ 10% discount

Cost $\leq 1000 \Rightarrow$ 0% discount

price per unit = 100^{rs}

totalcost = units * price

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

public class Solution {

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

        int units = scn.nextInt();
        int totalCost = units * 100;

        if(totalCost > 1000){
            totalCost = totalCost * 90 / 100;
        }

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

$$\text{units} = 5$$

$$\text{totalCost} = 5 \times 100 = 500$$

$$500 > 1000$$

false

$$\text{units} = 20$$

$$\text{totalCost} = 20 \times 100 = 2000$$
$$= 1800$$

$$2000 > 1000$$

true

Print Bonus

The bonus in a company is given by $\text{Bonus} = \text{Salary} * (5 / 100)$. A company decided to give a bonus of 5% to employees if his/her years of service is more than 5 years. Ask user for their salary and year of service and print the net bonus amount. If the years of service is less than or equal to 5, print 0, otherwise print Bonus calculated.

years of service > 5

$$\text{bonus} = \text{Salary} \times 5/100$$

20000

6 > 5

$$\text{bonus} = \frac{20000 \times 5}{100}$$
$$= 1000$$

≤ 5

$$\text{bonus} = 0$$

or
10000

$5 \leq 5$

$$\text{bonus} = 0$$

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
  
    int salary = scn.nextInt();  
    int years = scn.nextInt();  
  
    if(years > 5){  
        int bonus = salary * 5 / 100;  
        System.out.println(bonus);  
    } else {  
        System.out.println("0");  
    }  
}
```

Attendance
minute by minute

$$\begin{aligned} \text{Salary} &= 25 \\ &= 25 + 5 / 100 \\ &= 25 / 100 \\ &= \cancel{1.25} \end{aligned}$$

Print oldest among three

eg1

$$A = 10, \quad B = 20, \quad C = 30 \Rightarrow "C"$$

eg2

$$A = 20, \quad B = 30, \quad C = 10 \Rightarrow "B"$$

eg3

$$A = 30, \quad B = 5, \quad C = 15 \Rightarrow "A"$$

If-else-if ladder

```
if( a>b && a>c )  
{   System.out.println("A"); }  
else if ( b>c )  
{   System.out.println("B"); }  
else  
{   System.out.println("C"); }
```

Given
 $A = 30, B = 5, C = 15$

$A > B$ If $A > C$
true If $30 > 15$
 true
 = true
 "A"

~~eg1~~ $A = 10, B = 20, C = 30$

① $10 > 20 \& \& ?$
False $\& \& ?$
= false

~~eg2~~ $A = 20, B = 30, C = 10$

① $A > B \& \& A > C$
 $20 > 30 \& \& ?$
false $\& \& ?$ = false

② $20 > 30$
= false

② $B > C$
 $30 > 10 \Rightarrow \text{true}$
" \Downarrow "

③ ~~C~~

ladder

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
  
    int a = scn.nextInt();  
    int b = scn.nextInt();  
    int c = scn.nextInt();  
  
    if(a > b && a > c)  
    {  
        System.out.println("A");  
    }  
    else if(b > c)  
    {  
        System.out.println("B");  
    }  
    else  
    {  
        System.out.println("C");  
    }  
}
```

nested if else

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int a = scn.nextInt();  
    int b = scn.nextInt();  
    int c = scn.nextInt();  
  
    if(a > b)  
    {  
        if(a > c)  
            System.out.println("A");  
        else  
            System.out.println("C");  
    }  
    else  
    {  
        if(b > c)  
            System.out.println("B");  
        else  
            System.out.println("C");  
    }  
}
```

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int a = scn.nextInt();  
    int b = scn.nextInt();  
    int c = scn.nextInt();  
  
    1 if(a > b)  
    {  
        2 if(a > c)  
            System.out.println("A");  
        3 else  
            System.out.println("C");  
    }  
    6 else  
    {  
        7 if(b > c)  
        8     System.out.println("B");  
        9 else  
        10    System.out.println("C");  
    }  
}
```

Ques A ~~= 20, B = 30, C = 15~~

1. $20 > 30$

false

2. $b > c$
 $30 > 15$

true

3. "B"

eg(

$$A \cancel{=} 10, \quad B \cancel{=} 20,$$

$$C = 30$$

$$\text{eg} \quad A = 20, \quad B \cancel{=} 5, \quad C \cancel{=} 10$$

1. $A > B$

$$10 > 20$$

false

10 $A > B$

$$20 > 5$$

true

2. $B > C$

$$20 > 30$$

false

2. $A > C$

$$20 > 10$$

true

3. "C"

3. "A"

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int a = scn.nextInt();  
    int b = scn.nextInt();  
    int c = scn.nextInt();  
  
    String res = (a > b) ? ((a > c) ? "A" : "C") : ((b > c) ? "B" : "C");  
    System.out.println(res);  
}
```

using ternary
operator
(not intuitive)

hint final z

x

y

z

Take input three numbers x, y, z as an integer input

Then if the value of x is greater than or equal to 20,

- a. If the value of y is greater than or equal to 100 then add 100 to the value of z.
- b. If the value of y is less than 100 and greater than or equal to 50, then add 50 to the value of z.
- c. Else add 10 to the value of z.

Else if the value of x is less than 20,

- a. If the value of y is greater than or equal to 100 then add 3 to the value of z.
- b. If the value of y is less than 100 and greater than or equal to 50, then add 2 to the value of z.
- c. Else add 1 to the value of z.

Print the final value of z as an integer output in the end.

```

if(x > 20)
{
    if(y > 100) z = z + 100;
    else if(y > 50) z = z + 50;
    else z = z + 10;
}
else {
    if(y > 100) z = z + 3;
    else if(y > 50) z = z + 2;
    else z = z + 1;
}
System.out.println(z);

```

~~x~~
~~y~~
~~z~~
~~yellow~~
~~green~~
~~30 > 20~~
~~120 > 100~~
~~100 + 30 = 130~~

~~x~~
~~y~~
~~z~~
~~yellow~~
~~green~~
~~22 > 20~~
~~55 > 50~~
~~40~~

~~yellow~~
~~green~~
~~22 > 20~~
~~y > 100 \Rightarrow 55 $\not>$ 100~~
~~y > 50 \Rightarrow 55 $>$ 50~~
~~40 + 50 = 90~~

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

    int x = scn.nextInt();
    int y = scn.nextInt();
    int z = scn.nextInt();

    if(x >= 20)
    {
        if(y >= 100) System.out.println(z + 100);
        else if(y >= 50) System.out.println(z + 50);
        else System.out.println(z + 10);
    }
    else
    {
        if(y >= 100) System.out.println(z + 3);
        else if(y >= 50) System.out.println(z + 2);
        else System.out.println(z + 1);
    }
}
```

Tell about x y

Take in two inputs x and y from the user, and then

- If the value of x is greater than or equal to 59 and y is greater than or equal to 10, then print "X is greater than or equal to 59 and y is greater than or equal to 10"
- If the value of x is greater than or equal to 50, and y is less than 10, then print "X is greater than or equal to 50 and y is less than 10"
- Else print "None of the condition matches"

```
if ( x >= 59 && y >= 10 )
```

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

```
else if ( x >= 50 && y < 10 )
```

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

```
else    System.out.println("None");
```

eg
x = 0 y = 100

x >= 59

0 >= 59

false and ?

= false

x >= 50 & 0 >= 10 & ? = f

if $x = 70$, $y = 15$
 $70 > 59$ and $15 > 10$
true and true

= true

①

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
  
    int x = scn.nextInt();  
    int y = scn.nextInt();  
  
    if(x >= 59 && y >= 10)  
        System.out.println("X is greater than or equal to 59 and y is greater than or equal to 10");  
    else if(x >= 50 && y < 10)  
        System.out.println("X is greater than or equal to 50 and y is less than 10");  
    else System.out.println("None of the condition matches");  
}
```

Print Incremented Salary

Take in three inputs age, salary, experience, then

- a. If age is greater than 60 and salary is greater than 20,000 and experience is greater than 20 years, then add 5000 to the salary.
- b. If age is greater than 40 and salary is greater than 15,000 and experience is greater than 10 years, then add 2000 to the salary.
- c. If age is greater than 30 and salary is greater than 10,000 and experience is greater than 5 years, then add 1000 to the salary.
- d. Otherwise add 500 to the salary.

In the end Print the final salary.

$age > 60$ and $salary > 20000$ and $experience > 20$

$Salary + 5000$

$age > 40$ and $salary > 15000$ and $experience > 10$

$Salary + 2000$

\Rightarrow atmost 60 $\rightarrow \leq 60$

\Rightarrow atleast 60 $\rightarrow \geq 60$

\Rightarrow (strictly) more ^(above 60) than 60 $\rightarrow > 60$

\Rightarrow (strictly) less than 60 $\rightarrow < 60$
(below 60)

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
  
    int age = scn.nextInt();  
    int salary = scn.nextInt();  
    int experience = scn.nextInt();  
  
    if(age > 60 && salary > 20000 && experience > 20)  
        System.out.println(salary + 5000);  
    else if(age > 40 && salary > 15000 && experience > 10)  
        System.out.println(salary + 2000);  
    else if(age > 30 && salary > 10000 && experience > 5)  
        System.out.println(salary + 1000);  
    else System.out.println(salary + 500);  
}
```

age = 35

salary = 10000

experience = 9

Salary + 500

10000 + 500

10500

Print final z given xyz

Homework

Problem

Submissions

Leaderboard

Discussions

Take in x, y, z as integer inputs from the user,

- a. If x is greater than or equal to 20 and z is less than 100 then add 200 to the value of z.
- b. If x is greater than or equal to 10, or y is less than 50 Then add 100 to the value of z.

In the end print the final value of z as an integer output.

Characters

Primitive datatypes

- | | |
|-----------|---------|
| → int | → float |
| → boolean | → long |
| → char | → short |
| → double | → byte |

⑧

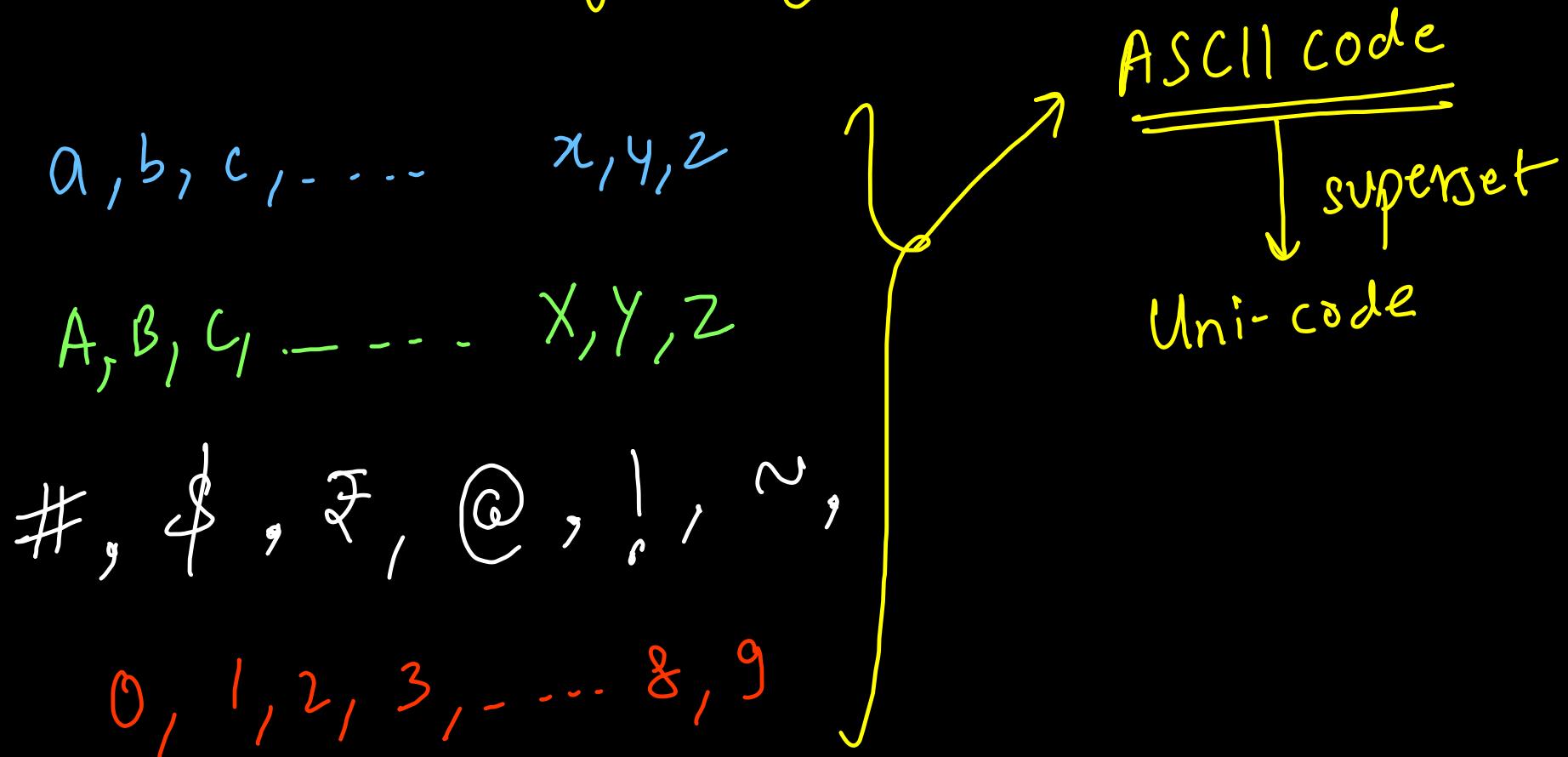
Derived Datatypes
↳ String

"archit"
↓ { } ↘
'a', 'Y', 'c', 'h', 'i', 't'

Arrays

{ 95, 83, 62, ... }

Programming languages



Dec	Char	Dec	Char	Dec	Char	Dec	Char
0	NUL (null)	32	SPACE	64	@	96	`
1	SOH (start of heading)	33	!	65	A	97	a
2	STX (start of text)	34	"	66	B	98	b
3	ETX (end of text)	35	#	67	C	99	c
4	EOT (end of transmission)	36	\$	68	D	100	d
5	ENQ (enquiry)	37	%	69	E	101	e
6	ACK (acknowledge)	38	&	70	F	102	f
7	BEL (bell)	39	'	71	G	103	g
8	BS (backspace)	40	(72	H	104	h
9	TAB (horizontal tab)	41)	73	I	105	i
10	LF (NL line feed, new line)	42	*	74	J	106	j
11	VT (vertical tab)	43	+	75	K	107	k
12	FF (NP form feed, new page)	44	,	76	L	108	l
13	CR (carriage return)	45	-	77	M	109	m
14	SO (shift out)	46	.	78	N	110	n
15	SI (shift in)	47	/	79	O	111	o
16	DLE (data link escape)	48	0	80	P	112	p
17	DC1 (device control 1)	49	1	81	Q	113	q
18	DC2 (device control 2)	50	2	82	R	114	r
19	DC3 (device control 3)	51	3	83	S	115	s
20	DC4 (device control 4)	52	4	84	T	116	t
21	NAK (negative acknowledge)	53	5	85	U	117	u
22	SYN (synchronous idle)	54	6	86	V	118	v
23	ETB (end of trans. block)	55	7	87	W	119	w
24	CAN (cancel)	56	8	88	X	120	x
25	EM (end of medium)	57	9	89	Y	121	y
26	SUB (substitute)	58	:	90	Z	122	z
27	ESC (escape)	59	;	91	[123	{
28	FS (file separator)	60	<	92	\	124	
29	GS (group separator)	61	=	93]	125	}
30	RS (record separator)	62	>	94	^	126	~
31	US (unit separator)	63	?	95	_	127	DEL

character integer

$$'0' \neq 0$$

$$'0' = 48$$

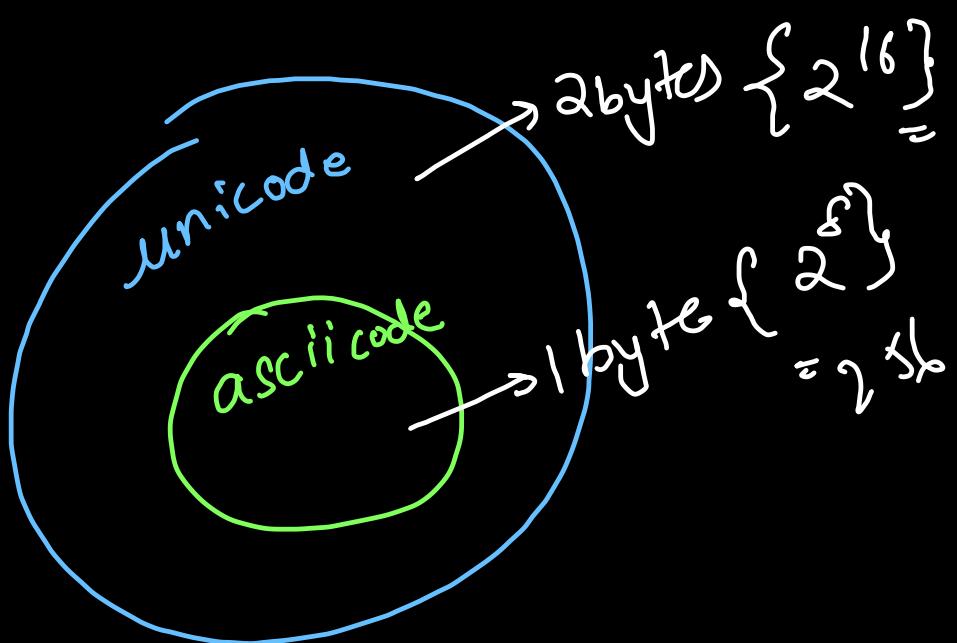
$$'A' - 'Z'$$

$$65 - 90$$

$$'a' - 'z'$$

$$97 - 122$$

```
public static void main(String[] args) {  
    int var1 = 'A'; // 65  
    System.out.println(var1);  
  
    int var2 = '0'; // 48  
    System.out.println(var2);  
  
    int var3 = 'z'; // 122  
    System.out.println(var3);  
  
    int var4 = 'A' - 'a'; // 65 - 97 = -32  
    System.out.println(var4);  
  
    int var5 = '9' - '0'; // 57 - 48 = 9  
    System.out.println(var5);  
  
    int var6 = '5' - 3; // 53 - 3 = 50  
    System.out.println(var6);  
  
    int var7 = 'a' + 'b'; // 97 + 98 = 195  
    System.out.println(var7);  
}
```



Take in a character as an input and then

a. Print "Small case" if it is a small case character.

$$'a' - 'z' \Rightarrow 97 - 122$$

b. Print "Capital case" if it is a capital case character.

$$'A' - 'Z' \Rightarrow 65 - 90$$

c. Print "Digit" if it is a digit.

$$'0' - '9' \Rightarrow 48 - 57$$

d. Print "None" is none of the above conditions follow.

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    char ch = scn.next().charAt(0);  
  
    if(ch >= 'a' && ch <= 'z') {  
        System.out.println("Small case");  
    }  
    else if(ch >= 'A' && ch <= 'Z') {  
        System.out.println("Capital case");  
    }  
    else if(ch >= '0' && ch <= '9') {  
        System.out.println("Digit");  
    }  
    else {  
        System.out.println("None");  
    }  
}
```

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    char ch = scn.next().charAt(0);  
  
    if(ch >= 97 && ch <= 122){  
        System.out.println("Small case");  
    }  
    else if(ch >= 65 && ch <= 90){  
        System.out.println("Capital case");  
    }  
    else if(ch >= 48 && ch <= 57){  
        System.out.println("Digit");  
    }  
    else {  
        System.out.println("None");  
    }  
}
```

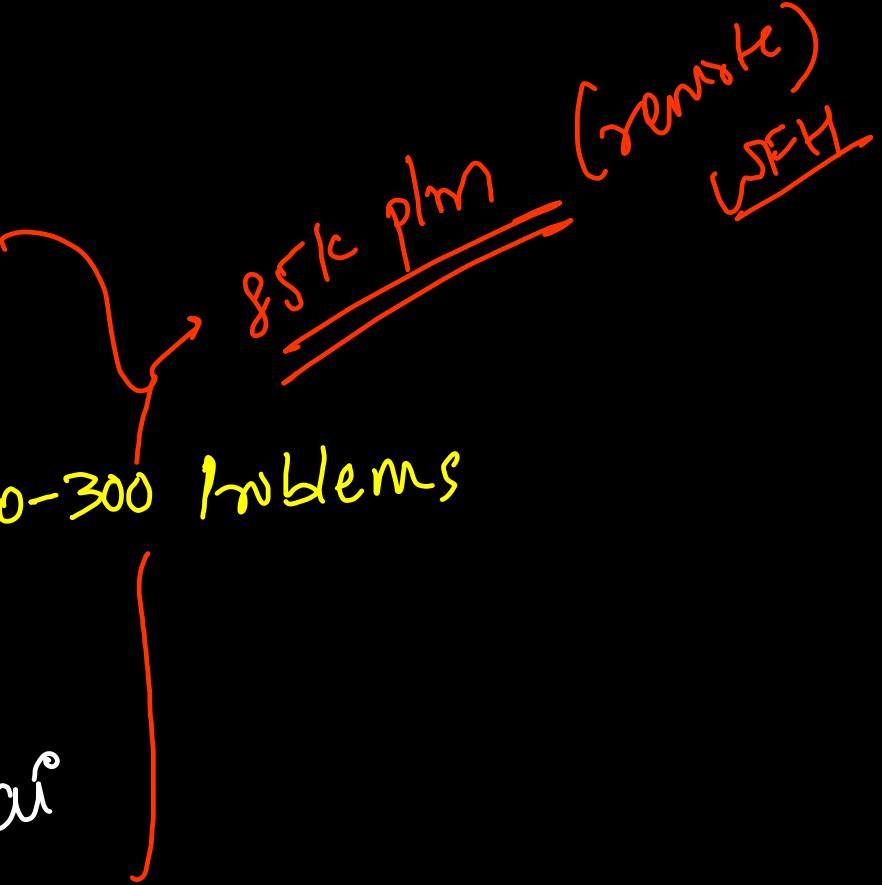
Hindi medium

+

Average Coding → 250-300 problems

+

6th street → dubai



```

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

    char ch = scn.next().charAt(0);

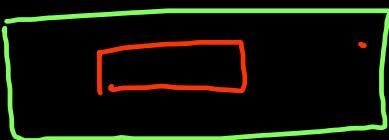
    if(ch >= 'a' && ch <= 'z'){
        // Lowercase to Uppercase : -32
        char ans = (char)(ch - 32);
        System.out.println(ans);
    } else {
        // Uppercase to Lowercase : +32
        char ans = (char)(ch + 32);
        System.out.println(ans);
    }
}

```

(implicitly)
no need of typecasting

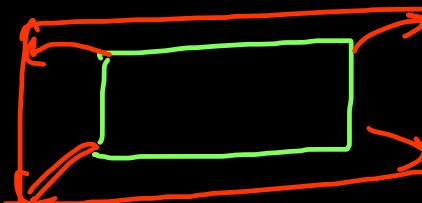
char ↑ → int
2 bytes 4 bytes

int var1 = 'A';



explicit typecasting
int → char
4 bytes 2 bytes

char var2 = (char)65;



Concatenation

"archit" + 10 \Rightarrow archit10

"a" + 10 \Rightarrow a10

integer
addition
(ASCII)

{ "a" + 10 \Rightarrow 107
"g" + 10
"S" + 3 \Rightarrow 56
"S" + 3

Concatenate Two Strings

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
  
    String s1 = scn.next();  
    String s2 = scn.next();  
    System.out.println(s1 + s2);  
}
```

next()
word ↳ space
or
newline
vs
nextline()
sentence (newline)

String concatenate ②

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
  
    String a = scn.next();  
    String b = scn.next();  
  
    if(a.length() < b.length()){  
        System.out.println(a + b + a);  
    }  
    else {  
        System.out.println(b + a + b);  
    }  
}
```

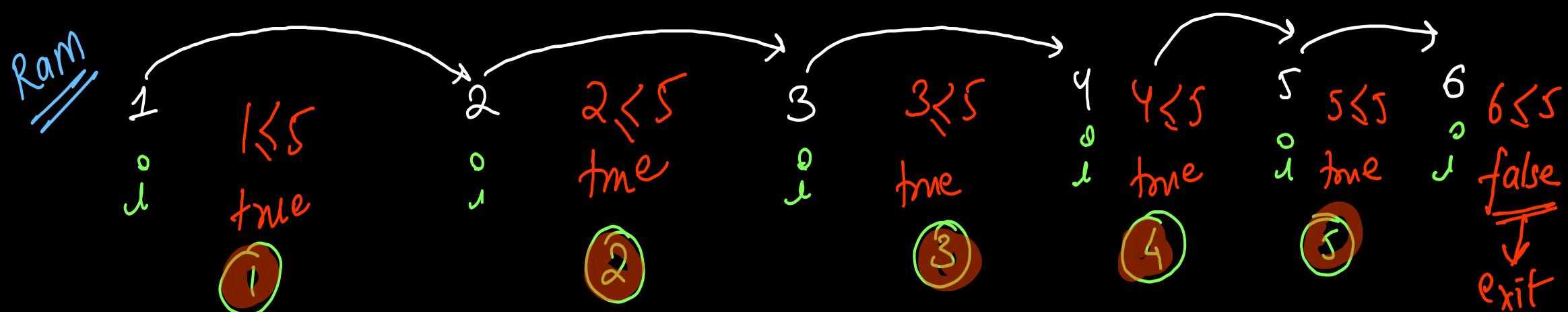
For loop

```
for ( int i=1 ; i<= 5 ; i++ ) { cout << i }
```

↑
initialization
(only once)

↑
terminating
condition
(before entry)

↑
updation
(before reenter)



```

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

    for(int idx = 0; idx <= n; idx++){
        System.out.println(idx);
    }
}

```

Point 0 to n

$n = 3$

idx	$= \emptyset$	\times	\times	\times	4
$0 \leq 3$	$1 \leq 3$	$2 \leq 3$	$3 \leq 3$	$4 \leq 3$	
\checkmark	\checkmark	\checkmark	\checkmark	\times	

$0, 1, 2, 3$

Module 1 → Java Basics

Module 2 → Arrays & Strings + DSA basics

Module 3 → Collection Frameworks + OOPS + Project

Module 4 → Web Basics (HTML + CSS + JS)

Module 5 → Database / React / Springboot

Module 6/7 → NodeJS + ReactJS + Database

Module 8 → Company specific Interview brief

Software
Developer

```

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

    for(int idx = x; idx <= n; idx++){
        System.out.println(idx);
    }
}

```

Point x to n
=====

```

for(int idx = 0; idx >= 5; idx++){
    System.out.println(idx);
}

```

idx
= 0

idx ≥ 5 output
0 ≥ 5 will
false be
empty

n is a tve integer

```

for(int idx = 0; idx <= 5; idx--){
    System.out.println(idx);
}

```

idx
= 0 ✓

$0 \leq 5$

infinite

-1 ✓

$-1 \leq 5$

loop

-2 ✓

$-2 \leq 5$

(runtime

-3 ✓

$-3 \leq 5$

error)

-4, -5, -6, ..., -

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
  
    for(int idx = n; idx > 0; idx--) {  
        System.out.println(idx);  
    }  
}
```

point n to 1

Point table of 4

4x1=4

4x2=8

4x3=12

4x4=16

4x5=20

4x6=24

4x7=28

4x8=32

4x9=36

4x10=40

```
for(int i=1; i<10; i++){
    System.out.println("4X" + i + "=" + (4*i));
}
```

```
for(int i = 1; i <= 10; i++){
    System.out.println("4X" + i + "=" + (4 * i));
}
```

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
  
    // idx = idx + 7 => idx += 7  
    for(int idx = 2; idx <= n; idx += 7){  
        System.out.println(idx);  
    }  
}
```

Print 2,9,16,...

~~App1~~

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

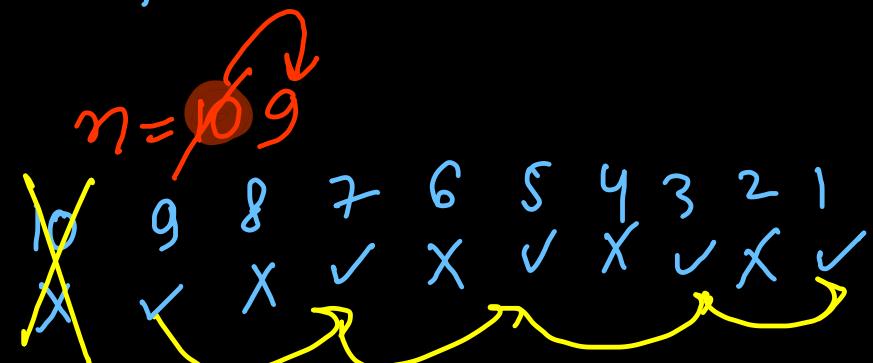
App1 [Efficient/Optimized/Better)

~~App2~~

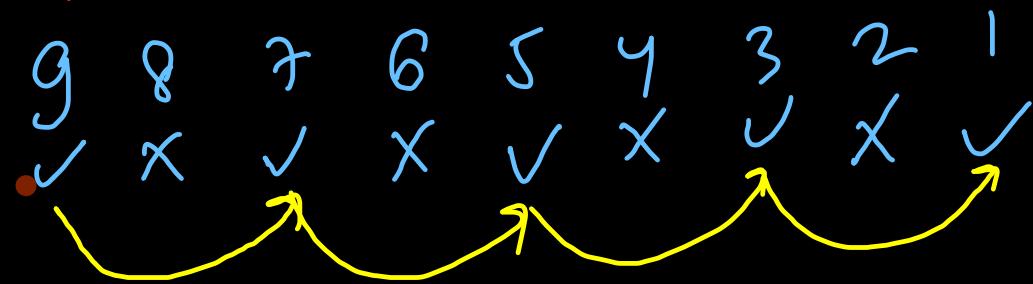
```
public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();
    if(n % 2 == 0) n--;
    for(int idx = n; idx >= 1; idx -= 2){
        System.out.println(idx);
    }
}
```

Print odd

from n1 to 1

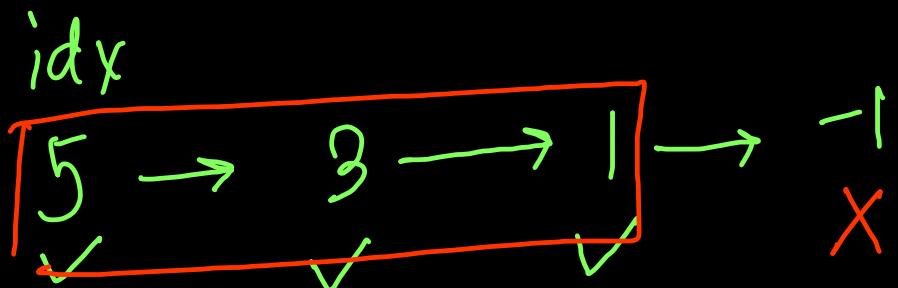


$n=9$



```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
    if(n % 2 == 0) n--; //even  
  
    for(int idx = n; idx >= 1; idx -= 2){  
        System.out.println(idx);  
    }  
}
```

$$n=5$$



$$n= \cancel{6} 5$$

$$5 \rightarrow 3 \rightarrow 1$$

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
  
    for(int idx = n; idx > 0; idx -= 3){  
        System.out.println(idx);  
    }  
}
```

→ print $n, n-3, n-6, n-9, \dots$
 > 0

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
    int k = scn.nextInt();  
  
    for(int idx = n; idx >= 0; idx -= k){  
        System.out.println(idx);  
    }  
}
```

→ print $n, n-k, n-2k, n-3k, \dots \geq 0$

Sample Input 3

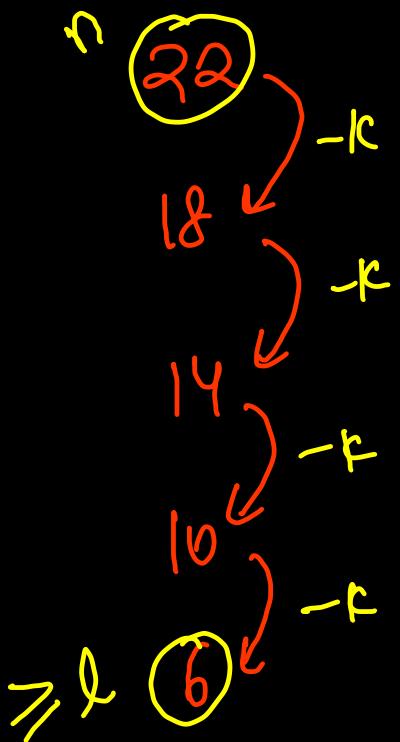
$n=22$
 $k=4$
 $l=6$

Sample Output 3

22
18
14
10
6

Point

$n, n-k, n-2k, n-3k, \dots$ till $>l$



for (? ; ? ; ?)

for (int i = 22; i > 6; i = i - k) {
 SysOut(i);
}

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
  
    int n = scn.nextInt();  
    int k = scn.nextInt();  
    int l = scn.nextInt();  
  
    for(int idx = n; idx >= l; idx -= k){  
        System.out.println(idx);  
    }  
}
```

min r
n, n-k, n-2k...
hill $\geq l$

```
public static void main(String[] args) {  
    for(char ch = 'a'; ch <= 'z'; ch++){  
        System.out.println(ch);  
    }  
  
    for(int idx = 97; idx <= 122; idx++){  
        System.out.println((char)(idx));  
    }  
}
```

Approach 1 } print 'a'
to
'z'
Approach 2 }
Flowercase
letters

chatgpt → openAI → elon musk

linkedin → microsoft

github

youtube → Google

slack → salesforce

lowercase(odd)

97 → a

98 → b

66 → B

99 → c

100 → d

68 → D

101 → e

102 → f

70 → F

103 → g

104 → h

72 → H

,

,

!

}

for (int i = 97; i <= 122; i++) {

if (i % 2 == 1) // lowercase

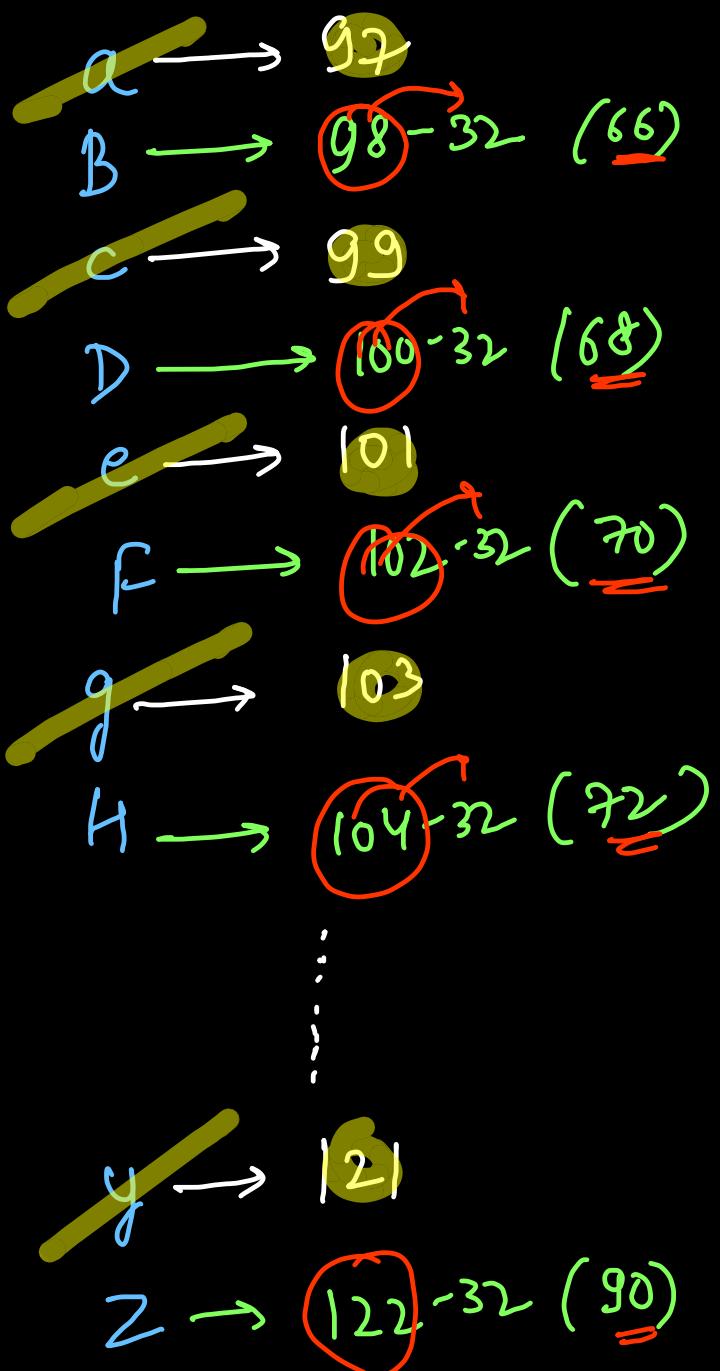
sys0 (char(i));

else

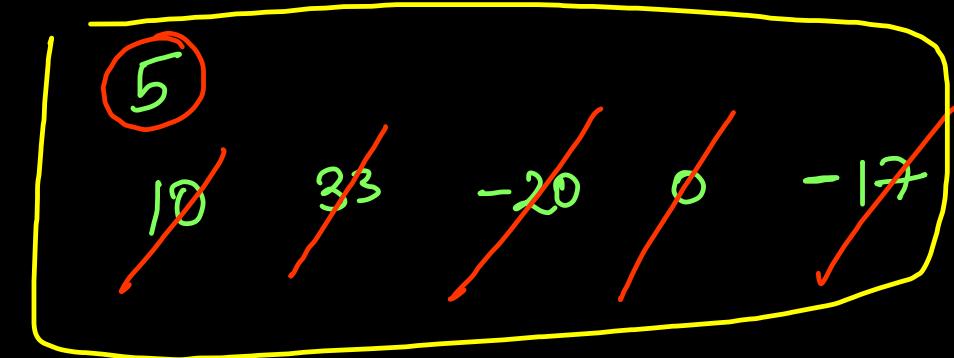
sys0 (char(i - 32))
// uppercase

a
B
C
D
e
F
g
H
i
J
k
L
m
N
O
P
q
R
S
T
u
V
w
X
y
z

```
public static void main(String[] args) {  
    for(int idx = 97; idx <= 122; idx++){  
        if(idx % 2 == 1){  
            // lowercase  
            System.out.println((char)(idx));  
        } else {  
            // uppercase  
            System.out.println((char)(idx - 32));  
        }  
    }  
}
```



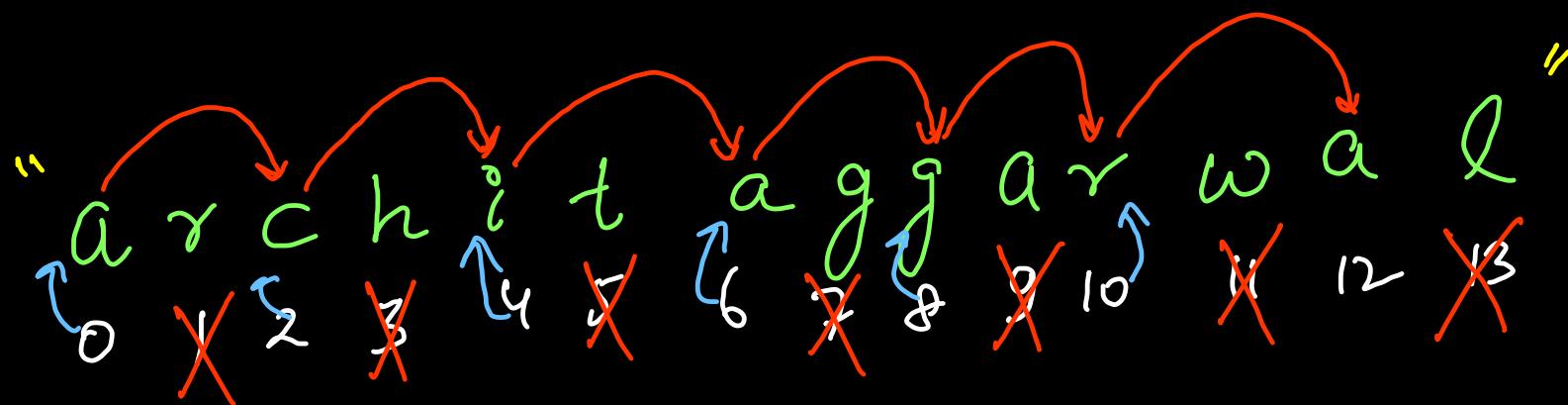
```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
  
    for(int idx = 0; idx < n; idx++){  
        int k = scn.nextInt();  
        if(k % 2 == 0){  
            System.out.println("even");  
        } else {  
            System.out.println("odd");  
        }  
    }  
}
```



$$m=5$$

$idx = 0 \rightarrow k = 10 \rightarrow even$
 $idx = 1 \rightarrow k = 33 \rightarrow odd$
 $idx = 2 \rightarrow k = -20 \rightarrow even$
 $idx = 3 \rightarrow k = 0 \rightarrow even$
 $idx = 4 \rightarrow k = -17 \rightarrow odd$

Print Alternate Characters

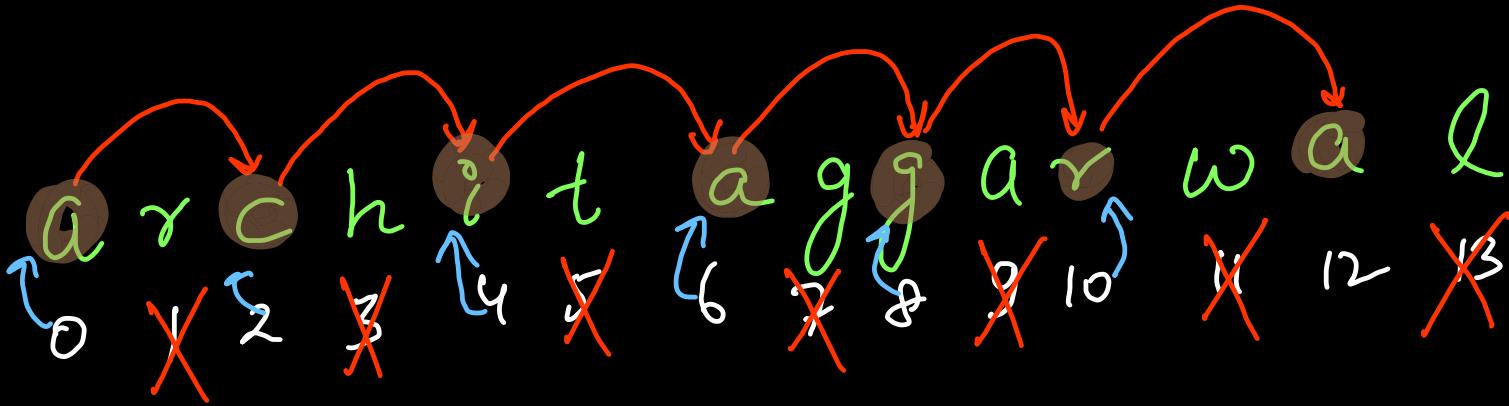


String.length() = 14

```
for (int idx=0; idx < str.length(); idx+=2){
```

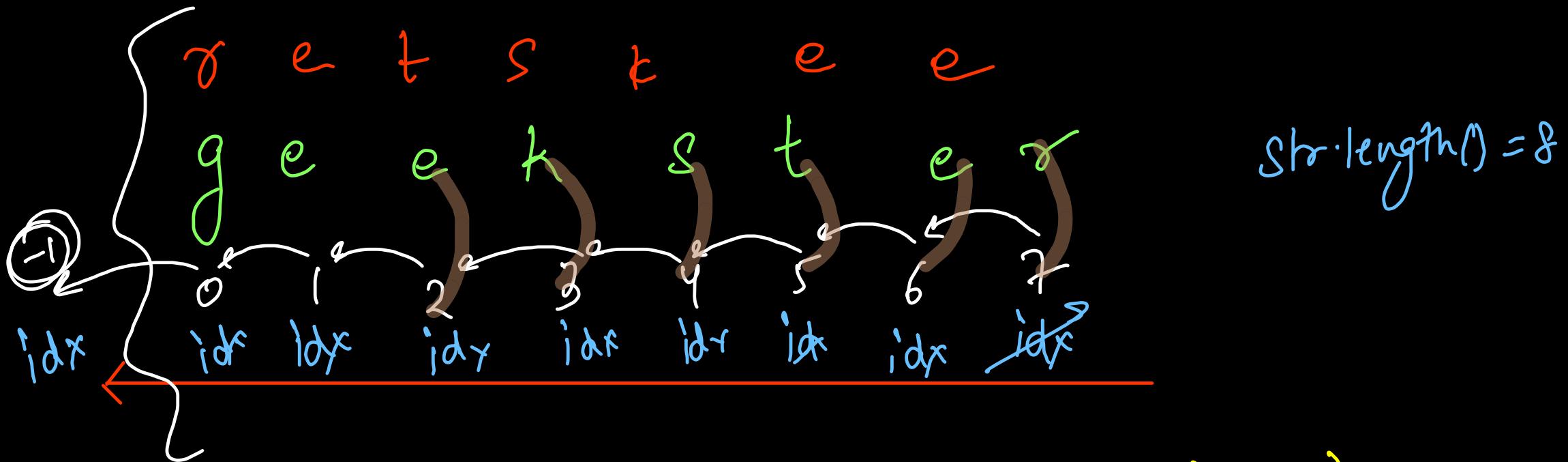
```
System.out.print( str.charAt(idx));
```

}



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

    for(int idx = 0; idx < str.length(); idx += 2){
        System.out.print(str.charAt(idx));
    }
}
```



```

for (int idx = str.length()-1 ; idx >= 0 ; idx--)
  Sys0( str.charAt(idx));
  
```

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    String str = scn.next(); = geelster  
    for(int idx = str.length() - 1; idx >= 0; idx--){  
        System.out.print(str.charAt(idx));  
    }  
} ↳ System.out.println(); ↳ geelster
```

Print String in Reverse Order

nth power of 2

Meet John, a computer science student who is working on a project for his algorithms class. One of the tasks he has been assigned is to write a function that takes in an integer n and returns the nth power of 2. For example, if n is 3, the function should return 8 because 2 to the power of 3 is 8. Can you help John come up with a solution for this problem?

n = 0 -> $2^0 = 1$

n = 1 -> $2^1 = 2$

n = 2 -> $2^2 = 4$

n = 3 -> $2^3 = 8$

n = 4 -> $2^4 = 16$

n = 5 -> $2^5 = 32$

.....

for(int i = 1; i <= n; i *= 2)

n = 5

i = 1: 1 <= 5:

i = 2: 2 <= 5:

i = 4: 4 <= 5:

i = 8: 8 > 5

```
int res = 1;
for(int i = 1; i <= n; i++){
    res *= 2;
}
System.out.println(res);
```

n = 5

res = 1, i = 1 <= 5
res = 2, i = 2 <= 5
res = 4, i = 3 <= 5
res = 8, i = 4 <= 5
res = 16, i = 5 <= 5
res = 32, i = 6 > 5

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

    int res = 1;
    for(int idx = 1; idx <= n; idx++){
        res *= 2;
    }
    System.out.println(res);
}
```

The problem is as follows: Ben needs to write a program that takes in an integer n as input and prints out all the powers of 2 that are less than n. For example, if n is 10, the program should print out 1, 2, 4, and 8.

Sample Input 0

20

Sample Output 0

1 2 4 8 16

```
for(int res = 1; res < n; res *= 2){  
    System.out.print(res + " ");  
}
```

n = 20

res = $2^0 = 1$
res = $2^1 = 2$
res = $2^2 = 4$
res = $2^3 = 8$
res = $2^4 = 16$
res = $2^5 = 32$

res = 1 : 1 < 20: YES
res = 2 : 2 < 20: YES
res = 4 : 4 < 20: YES
res = 8 : 8 < 20: YES
res = 16: 16 < 20: Y
res = 32: 32 < 20: N

```
public class Solution {  
  
    public static void main(String[] args) {  
        Scanner scn = new Scanner(System.in);  
        int n = scn.nextInt();  
  
        for(int res = 1; res < n; res *= 2){  
            System.out.print(res + " ");  
        }  
    }  
}
```

"Write a program that takes an integer input from the user. The program should keep dividing the integer by 3 and printing the resultant value on each iteration until the value is greater than 0. Can you write a solution for this problem?"

Note: Start printing from n, keep on updating n by dividing n by 3 each time, and print the updated value of n each time.

n = 24
n = 24 / 3 = 8
n = 8 / 3 = 2
n = 2 / 3 = 0

n = 100
n = 100 / 3 = 33
n = 33 / 3 = 11
n = 11 / 3 = 3
n = 3 / 3 = 1
n = 1 / 3 = 0

```
for(int i = n; i > 0; i/=3)  
    Syso(i + " ");
```

n = 24

n = 24 / 3 = 8

n = 8 / 3 = 2

n = 2 / 3 = 0

n = 100

n = 100 / 3 = 33

n = 33 / 3 = 11

n = 11 / 3 = 3

n = 3 / 3 = 1

n = 1 / 3 = 0

```
for(int i = n; i > 0; i/=3)  
    Syso(i + " ");
```

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
  
    for(int i = n; i > 0; i /= 3){  
        System.out.print(i + " ");  
    }  
}
```

-> **for(initialization ; termination ; updation)**

Statement) Problem is saying: start from N, if N is even, then subtract by 1, else subtract by 3, till > 0

Eg)

$$N = 10 - 1 = 9$$

$$N = 9 - 3 = 6$$

$$N = 6 - 1 = 5$$

$$N = 5 - 3 = 2$$

$$N = 2 - 1 = 1$$

$$N = 1 - 3 = -2$$

```
// initialization  
while(termination ){  
    // updation will be inside the loop  
}
```

```
// Code  
int n = scn.nextInt();  
while(n > 0){  
    System.out.print(n);  
    if(n % 2 == 0) n -= 1;  
    else n -= 3;  
}
```

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
    while(n > 0){  
        System.out.print(n + " ");  
        n /= 3; updation  
    }  
}
```

n = 100 : > 0 : YES
n = 33: > 0 : YES
n = 11: > 0 : YES
n = 3 : 3 > 0 : YES
n = 1 : 1 > 0 : YES
n = 0 : 0 > 0 FALSE

*n*th power of 10 using while loop

$$10^0 = 1$$

$$10^1 = 10$$

$$10^2 = 100$$

$$10^3 = 1000$$

$$10^4 \approx 10000$$

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

```
int res = 1;  
while( n > 0 ) {
```

```
res *= 10;
```

```
n--;
```

```
}
```

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

$n = 5$ $res = 10^0 = 1$
 \downarrow $n > 0$

$n = 4$ $res = 1 \times 10 = 10$
 \downarrow $n > 0$

$n = 3$ $res = 10 \times 10 = 100$
 \downarrow $n > 0$

$n = 2$ $res = 100 \times 10 = 1000$

$n = 1$ $res = 1000 \times 10 = 10^4$

$n = 0$ $res = 10^4 \times 10 = 10^5$
 \downarrow $n < 0$

$=$

```

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

    int res = 1; // terminate
    while(n > 0){
        res = res * 10;
        n--; // update (inside loop)
    }

    System.out.println(res);
}

```

$$n = 4$$

$$res = 10^0 = 1$$

$$\downarrow \times 10$$

$$10^1 = 10$$

$$\downarrow \times 10$$

$$10^2 = 100$$

$$\downarrow \times 10$$

$$10^3 = 1000$$

$$\downarrow \\ 10^4 = 10000$$

$$n = 4 > 0$$

$$\downarrow$$

$$n = 3 > 0$$

$$\downarrow$$

$$n = 2 > 0$$

$$\downarrow$$

$$n = 1 > 0$$

$$\downarrow$$

$$n = 0 \not> 0$$

Mrinal gautam to You (Direct Message) 8:28 PM

```

int ans = 1;
int i = 0;
while( i<n){
    ans = ans * 10;
    i++;
}

```

// n = 3

// 0 to n - 1 : 0, 1, 2

// 1 to n : 1, 2, 3

// n to 1 : 3, 2, 1

// n - 1 to 0 : 2, 1, 0

Point digits from end

18245

→ 10000 → $1 * 10^4$

+ 8000 → $8 * 10^3$

+ 200 → $2 * 10^2$

+ 40 → $4 * 10^1$

+ 5 → $5 * 10^0$

① Find the last
digit
of integer
 $m \% 10$

② Remove the last
digit from integer
 $m / 10$

$$18245 \% 10 = \cancel{5}$$

$$18245 / 10 = 1824$$

$$1824 \% 10 = \cancel{4}$$

$$1824 / 10 = 182$$

$$182 \% 10 = \cancel{2}$$

$$182 / 10 = 18$$

$$78 \% 10 = \cancel{8}$$

$$78 / 10 = 1$$

$$7 \% 10 = \cancel{1}$$

$$7 / 10 = 0$$

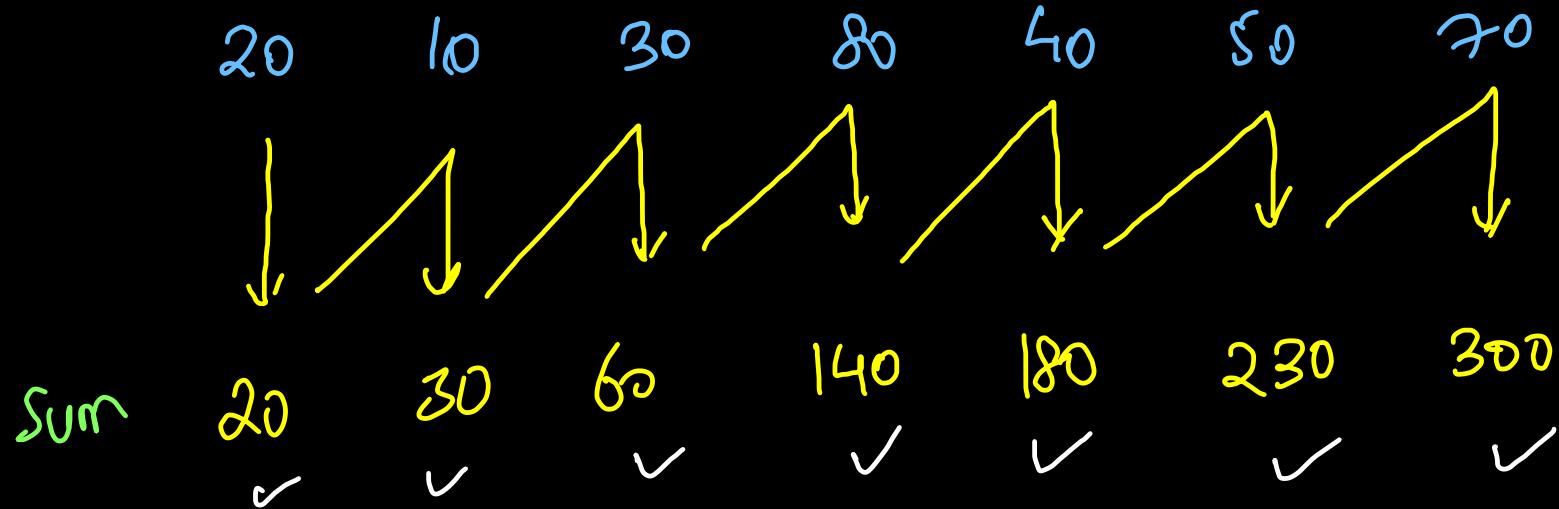
```
while( n>0 ){\n    Sys0( n \% 10 );\n    n = n / 10;\n}
```

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
  
    while(n > 0){  
        int digit = n % 10;  
        System.out.println(digit);  
        n = n / 10;  
    }  
}
```

```
for(int i = n; i > 0; i /= 10) {  
    System.out.println(i % 10);  
}
```

running sum for loop
or prefix sum

$$n = 7$$



```

public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();
    int sum = 0;

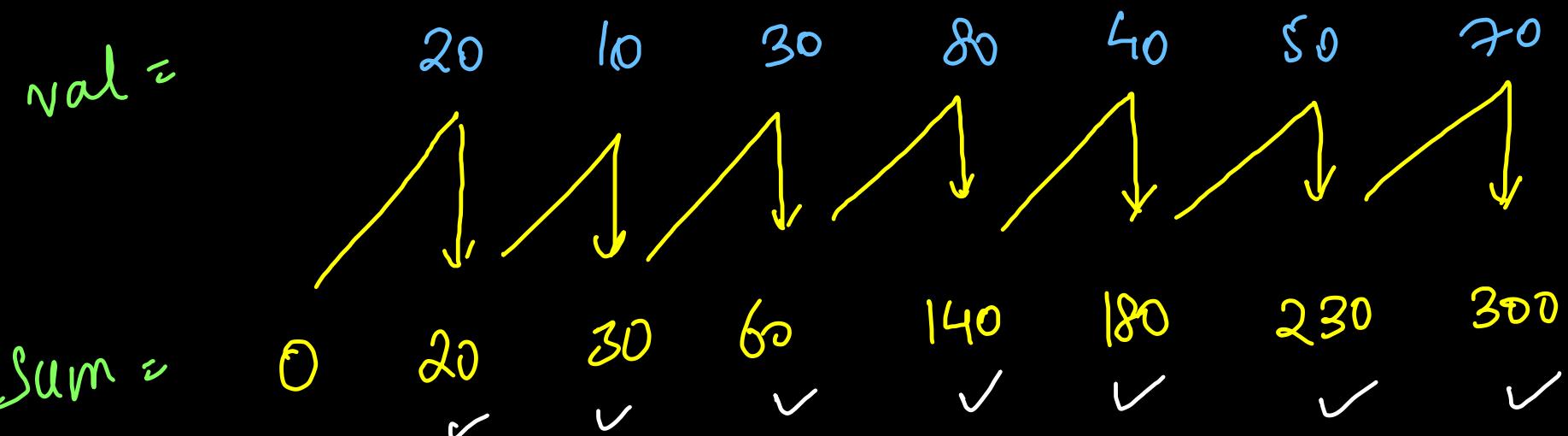
    // n times
    for(int idx = 0; idx < n; idx++){
        int val = scn.nextInt();
        sum += val;  $\Rightarrow$  sum = sum + val;
        System.out.print(sum + " ");
    }
}

```

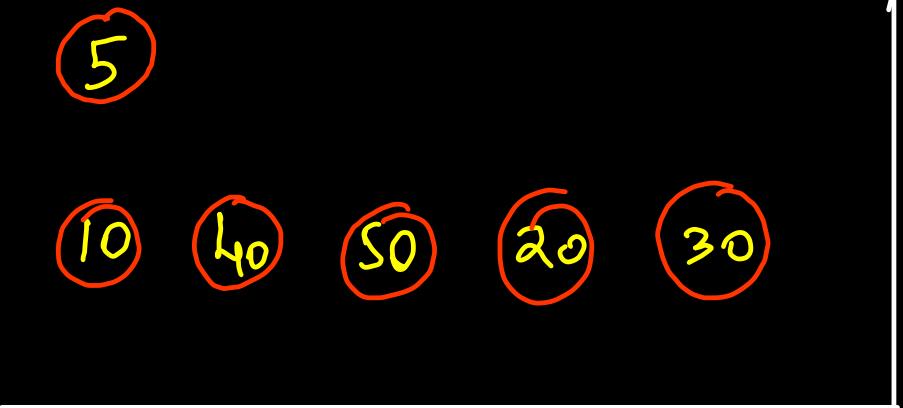
$0 \text{ to } n-1$
 $\uparrow \text{ to } n$
 $n \text{ to } 1$
 $n-1 \text{ to } 0$

\rightarrow n times

g:32



Input



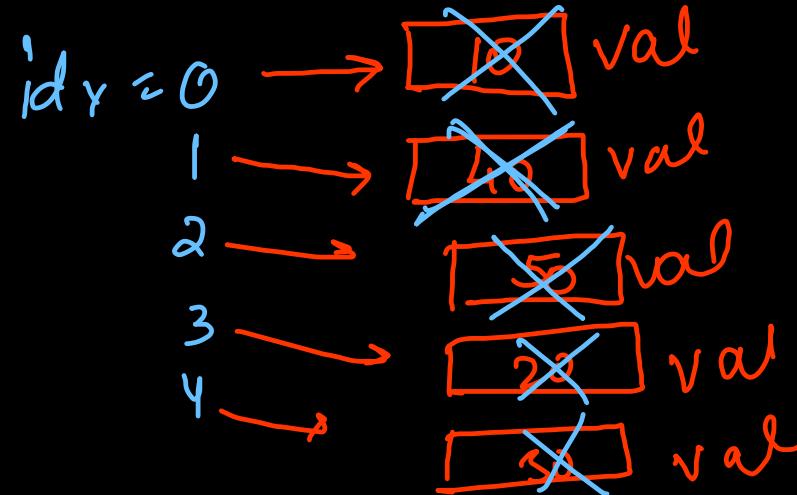
Output

10 50 100 120 150

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt(); }  
    int sum = 0;  
  
    // n times  
    for(int idx = 0; idx < n; idx++){  
        int val = scn.nextInt();  
        sum += val;  
        System.out.print(sum + " ");  
    }  
}
```

$$n = 5$$

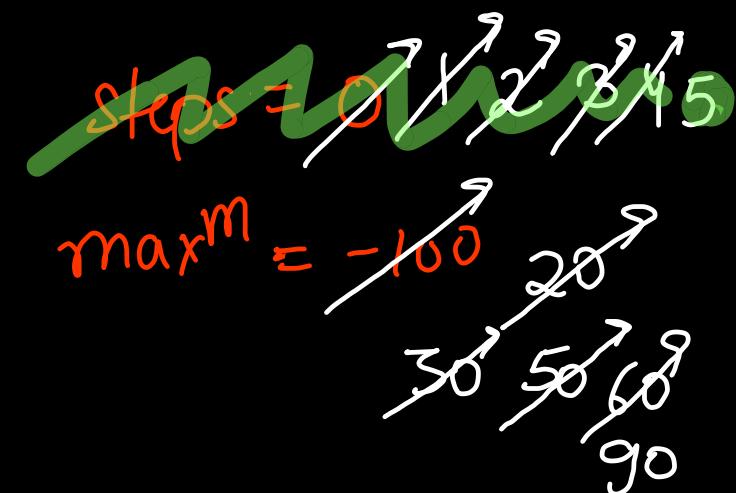
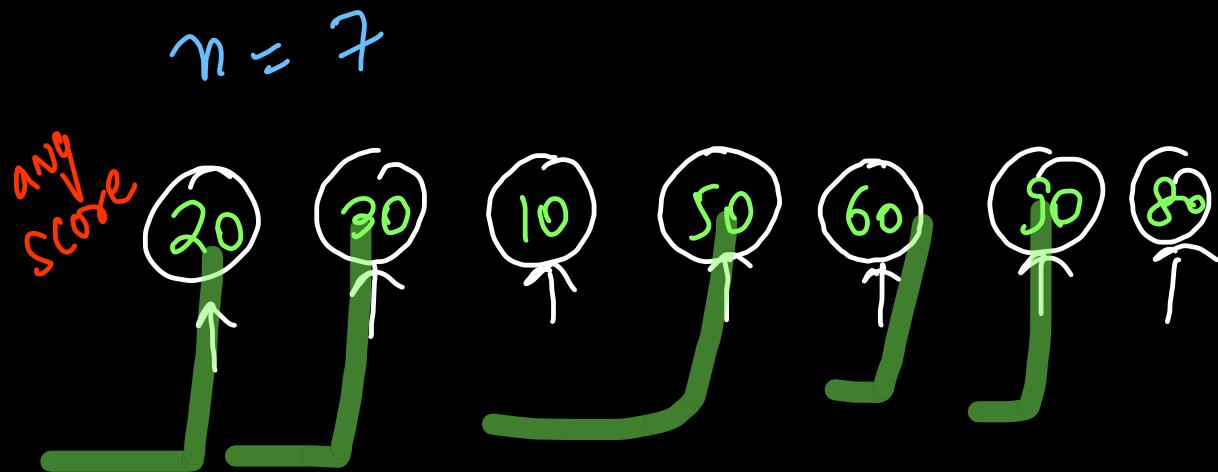
sum = ~~0~~ → 10 → 50 → 100 → 120 → 150



Take n as input from the user. Then you will be given a list of n positive integers, each time you find a new maximum value, you have to increment the steps by 1.

Take steps as 0 initially and maximum value as -100 in the starting.

In the end print the number of steps performed.

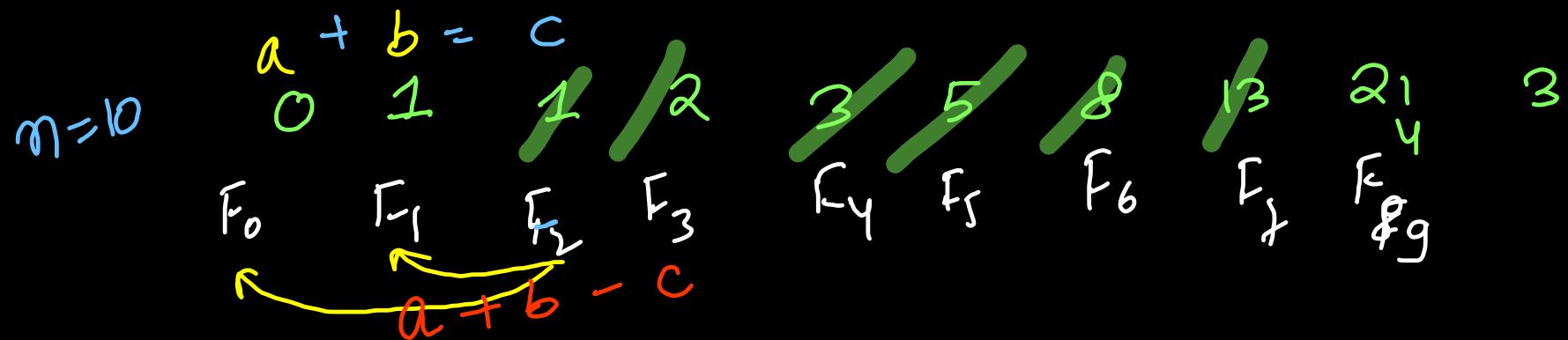


```
public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();
    int max = -100, steps = 0;

    for(int idx = 0; idx < n; idx++)
    {
        int val = scn.nextInt();
        if(val > max)
        {
            max = val;
            steps++;
        }
    }

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

Fibonacci Series



$$F_0 = 0$$

$$F_1 = 1$$

$$F_i = F_{i-1} + F_{i-2}$$

$i \geq 2$

$n = 6$

✓	✓	✓	✓	✓	✓			
0	1	1	2	3	5	8	13	
f_0	f_1	f_2	f_3	f_4	f_5	\uparrow	\uparrow	\uparrow

a b c

$\text{int } a = 0, b = 1;$

```
for( int i=0; i<n; i++ ) {  
    System.out.print(a + " ");
```

```
    int c = a+b;  
    a=b; b=c;  
}
```

```

public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();
    int a = 0, b = 1;

    for(int idx = 0; idx < n; idx++){
        System.out.print(a + " ");
        int c = a + b;
        a = b;
        b = c;
    }
}

```

output

0 1 1 2 3 5

Two Pointer
Algorithm

Dynamic
Programming

$$n = 6$$

	f_{idx}	f_{idx+1}	f_{idx+2}	
$idx=0$	f_0	$\cancel{f_1}$	f_2	$0+1=1 f_2$
$idx=1$	f_1	$\cancel{f_2}$	$\cancel{f_3}$	$1+1=2 f_3$
$idx=2$	f_2	$\cancel{f_3}$	$\cancel{f_4}$	$1+2=3 f_4$
$idx=3$	f_3	$\cancel{f_4}$	$\cancel{f_5}$	$2+3=5 f_5$
$idx=4$	f_4	$\cancel{f_5}$	$\cancel{f_6}$	$3+5=8 f_6$
$idx=5$	f_5	$\cancel{f_6}$	$\cancel{f_7}$	$5+8=13 f_7$
	f_6	$\cancel{f_7}$	f_8	

$F(0)$	$F(1)$	$F(2)$	$F(3)$	$F(4)$	$F(5)$	$F(6)$	a	$b \times$	$F(7)$
0	1	1	2	3	5	8			
✓	✓	✓	✓	✓	✓				13

```

public static void main(String[] args) {
    Scanner scn = new Scanner(System.in);
    int n = scn.nextInt();
    int a = 0, b = 1, c = 1;

    for(int idx = 0; idx < n; idx++){
        c = a + b;
        a = b;
        b = c;
    }

    System.out.println(a);
}

```

$$F(n) = F(n-1) + F(n-2), \\ \text{Where, } F(1) = F(2) = 1$$

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
    int a = 0, b = 1, c = 0;  
  
    for(int idx = 0; idx < n; idx++){  
        c = a + b;  
        a = b;  
        b = c;  
    }  
  
    System.out.println(a);  
}
```

$$x = \cancel{5} \nearrow 10$$

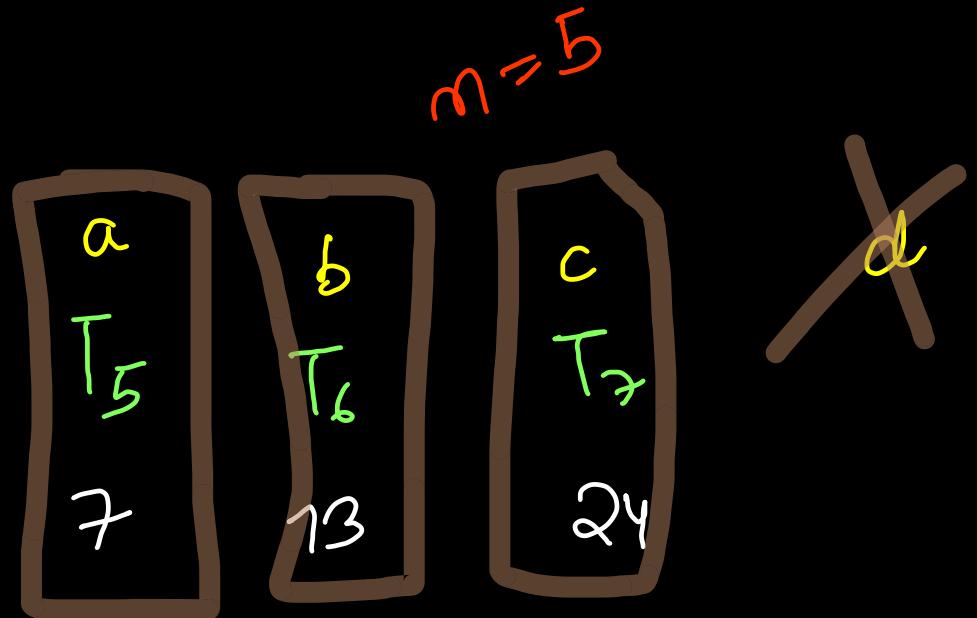
$$y = 10$$

$$\textcolor{red}{y} \ x = \cancel{y};$$

assignment → assign right side value
to left side
variable

n th fibonacc^o number

✓ ✓ ✓ ✓ ✓
 T_0 T_1 T_2 T_3 T_4
0 1 1 2 4



```
int a = 0, b = 1, c = 1;  
for (int idx = 0; idx < n; idx++) {  
    int d = a + b + c;  
    a = b; b = c; c = d;
```

}
SysO(a);

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

    int a = 0, b = 1, c = 1;
    for(int idx = 0; idx < n; idx++){
        int d = a + b + c;
        a = b; b = c; c = d;
    }
    System.out.println(a);
}
```

integer
78354 → ⑤

number of digits

n 18354 > 0 digits
/ 1

int digits = 0;

n 1835 > 0 / 2

while(n>0){

n 183 > 0 / 3

n /= 10;

n 18 > 0 / 4

digits ++;

45

}

System.out.println(digits)

n 0 ≤ 0

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
    int digits = 0;  
    while(n > 0){  
        digits++;  
        n /= 10; -  
    }  
    System.out.println(digits);  
}
```

for(int i=n; i>0; i/=10){
 digits++
}

Pattern - I Horizontal Stars

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
  
    for(int col = 0; col < n; col++){  
        System.out.print("*");  
    }  
}
```

$$n=5$$

" $c=0$ $c=1$ $c=2$ $c=3$ $c=4$ "
 * x * x x x

Grid / Matrix / Rectangle

	c_1	c_2	c_3	c_4	c_5	c_6
r_1	11	12	13	14	15	16
r_2	21	22	23	24	25	26
r_3	31	32	33	34	35	36
r_4	41	42	43	44	45	46
r_5	51	52	53	54	55	56

5×6

columns → vertical
rows → horizontal

top to bottom

left to right

for (rows)

for (cols)

```
for(int row = 1; row <= 5; row++){
    for(int col = 1; col <= 6; col++){
        System.out.println(row + " " + col);
    }
}
```

row
1

col
1, 2, 3, 4, 5, 6, 7

2

1, 2, 3, 4, 5, 6, 7

3

1, 2, 3, 4, 5, 6, 7

4

1, 2, 3, 4, 5, 6, 7

5

1, 2, 3, 4, 5, 6, 7

11 12 13 14 15 16
21 22 23 24 25 26
31 32 33 34 35 36
41 42 43 44 45 46
51 52 53 54 55 56

```

for(int row = 1; row <= 4; row++){
    $1 System.out.print(row + " -> ");
    $2 for(int col = 1; col <= 3; col++){
        System.out.print(col + " ");
    }
    $3 System.out.println();
}

```

row col
 1 $1 \leq 4$ $\cancel{1} \cancel{2} \cancel{3} \cancel{4}$
 2 $2 \leq 4$ $\cancel{1} \cancel{2} \cancel{3} \cancel{4}$
 3 $3 \leq 4$ $\cancel{1} \cancel{2} \cancel{3} \cancel{4}$
 4 $4 \leq 4$ $\cancel{1} \cancel{2} \cancel{3} \cancel{4}$
 5 $5 > 4$

Judge Output ?
Output

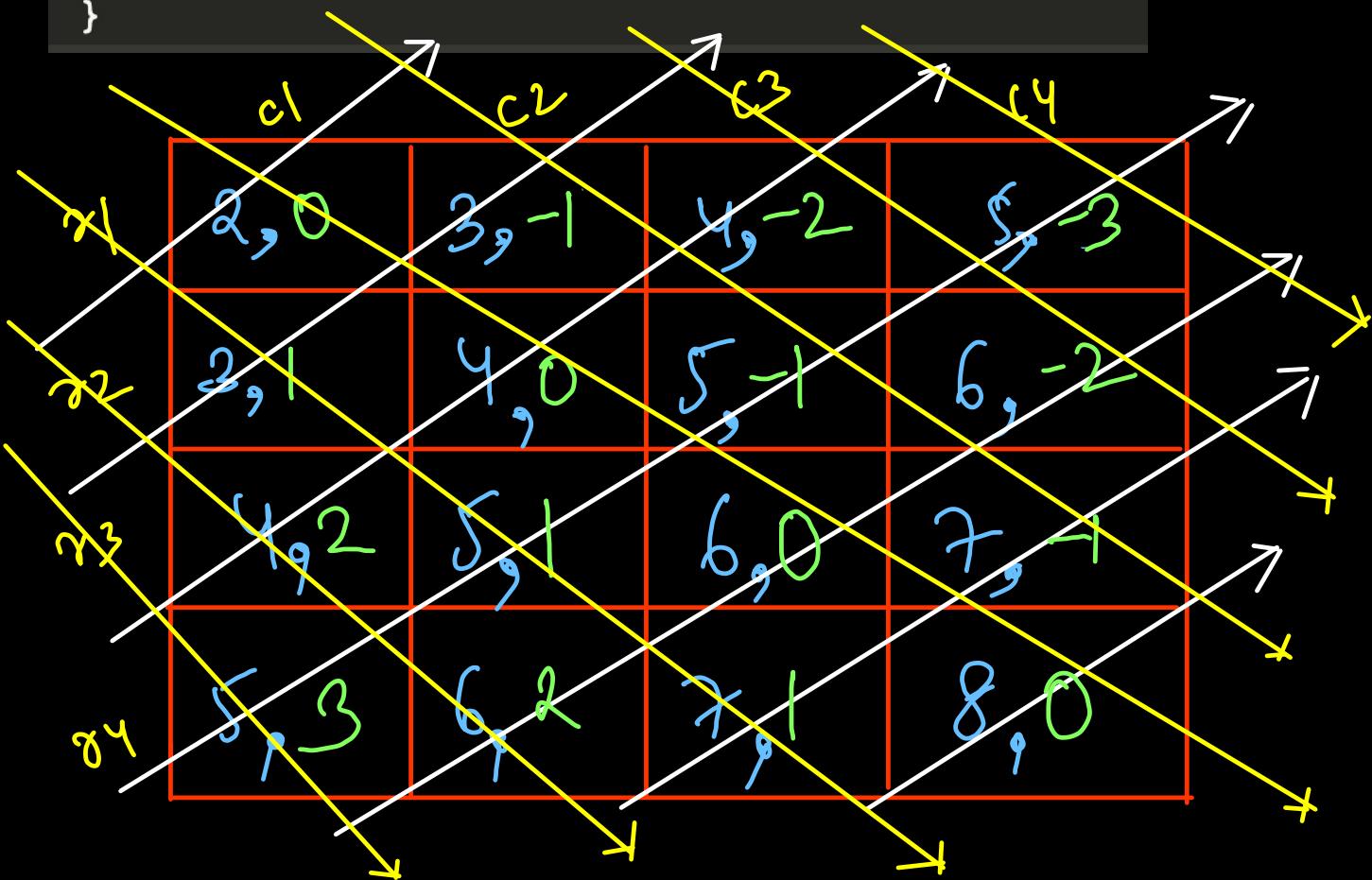
$1 \rightarrow$	1	2	3
$2 \rightarrow$	1	2	3
$3 \rightarrow$	1	2	3
$4 \rightarrow$	1	2	3

```

for(int row = 1; row <= 4; row++){
    for(int col = 1; col <= 4; col++){
        System.out.print(row + col + ",");
        System.out.print(row - col + " ");
    }
    System.out.println();
}

```

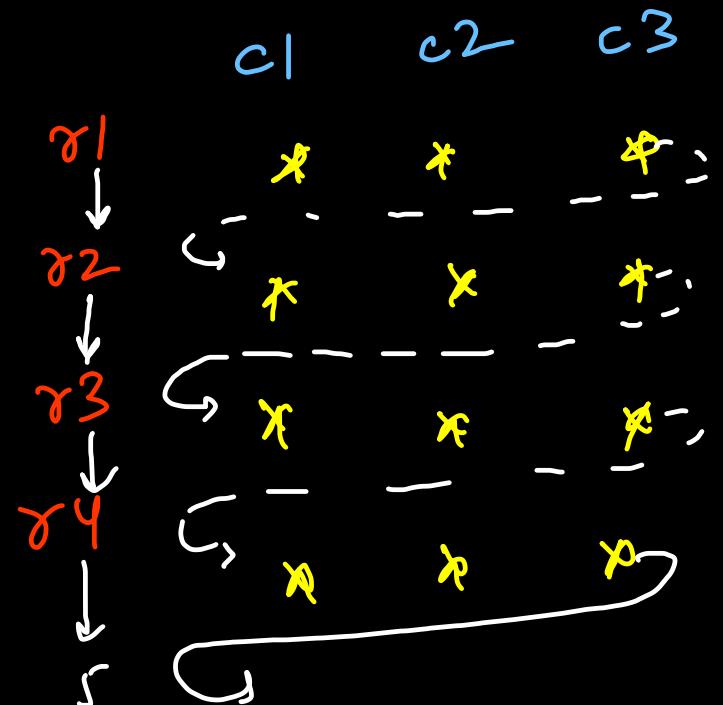
Judge == Output ?



Pattern -2 R x N Box

rows = 4
cols = 3

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int rows = 12, cols = scn.nextInt();  
  
    for(int row = 1; row <= rows; row++){  
        for(int col = 1; col <= cols; col++){  
            System.out.print("*");  
        }  
        System.out.println();  
    }  
}
```



Sample Input 0

$n=5$

Sample Output 0

```
for (int row=1; row<=n; row++) {
    for (int col=1; col<=row; col++) {
        System.out.print("*");
    }
    System.out.println();
}
```

Print Pattern - 4

"Lower Left Triangle"

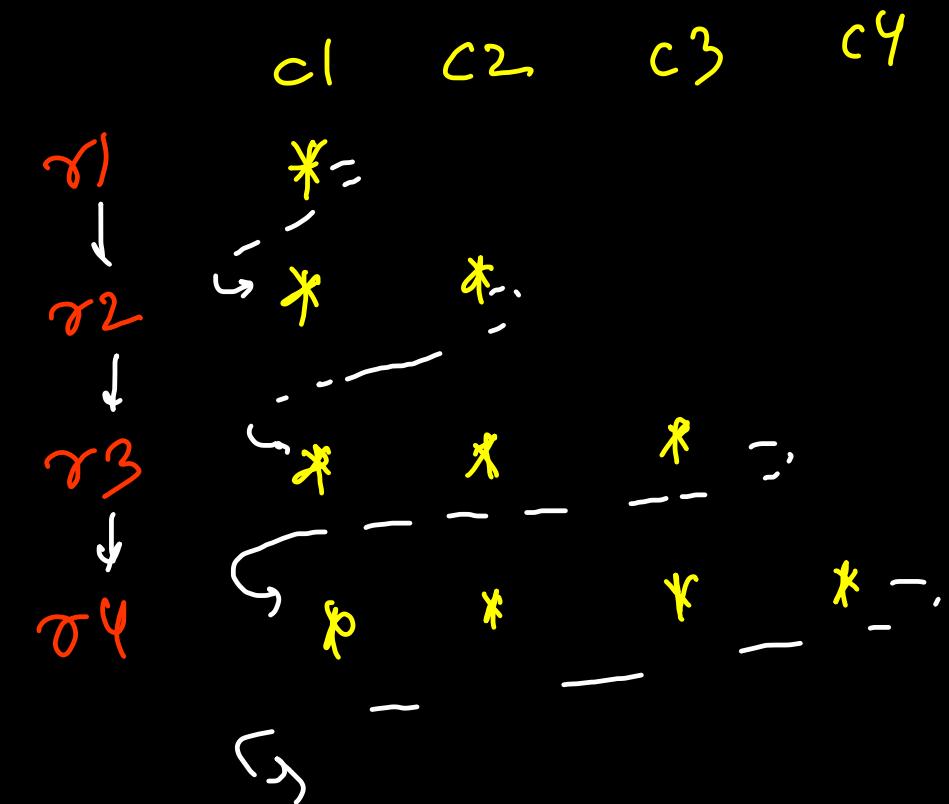
```
for (int row=1; row<=n; row++)
{
    for (int col=1; col<=row; col++)
    {
        System.out.print("*");
    }
    System.out.println();
}
```

“Testimonials”



$n=4$

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
  
    for(int row = 1; row <= n; row++){  
        for(int col = 1; col <= row; col++){  
            System.out.print("* ");  
        }  
        System.out.println();  
    }  
}
```



backlog ≤ 3 days

	c1	c2	c3	c4	c5
r1	*				
r2	x	x			
r3	x	x	*		
r4	x	*	*	*	
r5	*	*	*	*	*

lower-left triangle

	c1	c2	c3	c4	c5
r5	*	x	*	*	x
r4	x	x	x	x	
r3	x	x	*		
r2	x	*			
r1	*				

upper Left triangle

```
for(int r=1; r<=n; r++)
    for(int c=1; c<=r; c++)
        cout<< "* ";
    cout<< endl;
```

```
for(int r=n; r>=1; r--)
    for(int c=1; c<=r; c++)
        cout<< "* ";
    cout<< endl;
```

$n=5$

	c1	c2	c3	c4	c5
r1	- - - -		*		
r2	- - -	*	*		
r3	- - *	*	*	*	
r4	- *	*	*	*	*
r5	*	*	*	*	*

$r+c$

2	3	4	5	6
3	4	5	6	7
4	5	6	7	8
5	6	7	8	9
6	7	8	9	10

(Pattern 5) Lower Right Triangle

```

for(int r=1; r<=n; r++){
    for(int c=1; c<=n; c++){
        if(r+c<=n) System.out.print("-");
        else System.out.print("*");
    }
    System.out.println();
}
    
```

$m=5$

	c_1	c_2	c_3	c_4	c_5
r_1	1×1	1×2	1×3	1×4	$1 \times 5 *$
r_2	2×1	2×2	2×3	$2 \times 4 *$	$2 \times 5 *$
r_3	3×1	3×2	$3 \times 3 *$	$3 \times 4 *$	$3 \times 5 *$
r_4	4×1	$4 \times 2 *$	$4 \times 3 *$	$4 \times 4 *$	$4 \times 5 *$
r_5	5×1	$5 \times 2 *$	$5 \times 3 *$	$5 \times 4 *$	$5 \times 5 *$

~~Grid based~~

for($\text{int } r=1; r \leq n; r++$)

 for($\text{int } c=1; c \leq m; c++$)

 if($r+c \leq n$) System.out.print(" ")

 else System.out.print("*");

 System.out.println();

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

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

Upper-right Triangle

~~n=5~~

	c1	c2	c3	c4	c5
r1	x _{1,1}	x _{1,2}	x _{1,3}	x _{1,4}	x _{1,5}
r2	x _{2,1}	x _{2,2}	x _{2,3}	x _{2,4}	x _{2,5}
r3	x _{3,1}	x _{3,2}	x _{3,3}	x _{3,4}	x _{3,5}
r4	x _{4,1}	x _{4,2}	x _{4,3}	x _{4,4}	x _{4,5}
r5	x _{5,1}	x _{5,2}	x _{5,3}	x _{5,4}	x _{5,5}

~~Grid based~~

```
for(int r=1; r<=n; r++)
```

```
    for(int c=1; c<=n; c++)
```

```
        if(r>c) System.out.print("-");  
        else System.out.print("#);
```

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

c₁ c₂ c₃ c₄ c₅

r₁ 1
r₂ 1 2
r₃ 1 2 3
r₄ 1 2 3 4
r₅ 1 2 3 4 5

Hwo Pattern-2

Lower-Left Triangle

for(int row=1 ; row<=n ; row++)

for(int col=1 ; col<=row ; col++)

System.out.print(col+");

System.out.println();

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int n = scn.nextInt();  
  
    for(int row = 1; row <= n; row++){  
        for(int col = 1; col <= row; col++){  
            System.out.print(col + " ");  
        }  
        System.out.println();  
    }  
}
```

HW-Pattern 3

$n=5$

	c1	c2	c3	c4	c5
r1	1	-	-	-	-
r2	2	2	-	-	-
r3	3	3	3	-	-
r4	4	4	4	4	-
r5	5	5	5	5	5

```
for( int row=1 ; row<=n ; row++ )  
    for( int col=1 ; col<=row ; col++ )  
        System.out.print(row+col);  
    System.out.println();
```

Sample Input 0

$n=6$

Sample Output 0

	c1	c2	c3	c4	c5	c6
r1	5 1					
r2	5 1	10 2				
r3	5 1	10 2	15 3			
r4	5 1	10 2	15 3	20 4		
r5	5 1	10 2	15 3	20 4	25 5	
r6	5 1	10 2	15 3	20 4	25 5	30 6

Pattern - 6

Homework

```
for( int row=1 ; row<=n ; row++ )
```

```
    for( int col=1 ; col<=row ; col++ )
```

```
        System.out.print( 5*col + " " );
```

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

Pattern 7) Hollow Rectangle

cols=4; rows=6

	c1	c2	c3	c4
r1	*	*	*	*
r2	*	-	-	*
r3	*	-	-	*
r4	*	-	-	*
r5	*	-	-	*
r6	*	*	*	*

Grid Based

```

for (int row = 1; row <= rows; row++) {
    for (int col = 1; col <= cols; col++) {
        if (row == 1 || row == rows || col == 1 || col == cols)
            System.out.print("*");
        else System.out.print(" ");
    }
    System.out.println();
}

```

rows = 6, cols = 4

	c1	c2	c3	c4
r1	*	*	*	*
r2	*	-	-	*
r3	*	-	-	*
r4	*	-	-	*
r5	*	-	-	*
r6	*	*	*	*

for (int row = 1; row <= rows; row++)

for (int col = 1; col <= cols; col++)

if (row == 1 || row == 6 ||
col == 1 || col == 4)

 SysOut(" * ");

else SysOut(" - ");

SysOut();

```
public static void main(String[] args) {  
    Scanner scn = new Scanner(System.in);  
    int cols = scn.nextInt();  
    int rows = scn.nextInt();  
  
    for(int row = 1; row <= rows; row++) {  
        for(int col = 1; col <= cols; col++) {  
            if(row == 1 || row == rows || col == 1 || col == cols)  
                System.out.print("*");  
            else System.out.print(" ");  
        }  
        System.out.println();  
    }  
}
```