

CS & IT ENGINEERING



Programming in C
Chapter -2
Control Flow Statements
Lec- 02



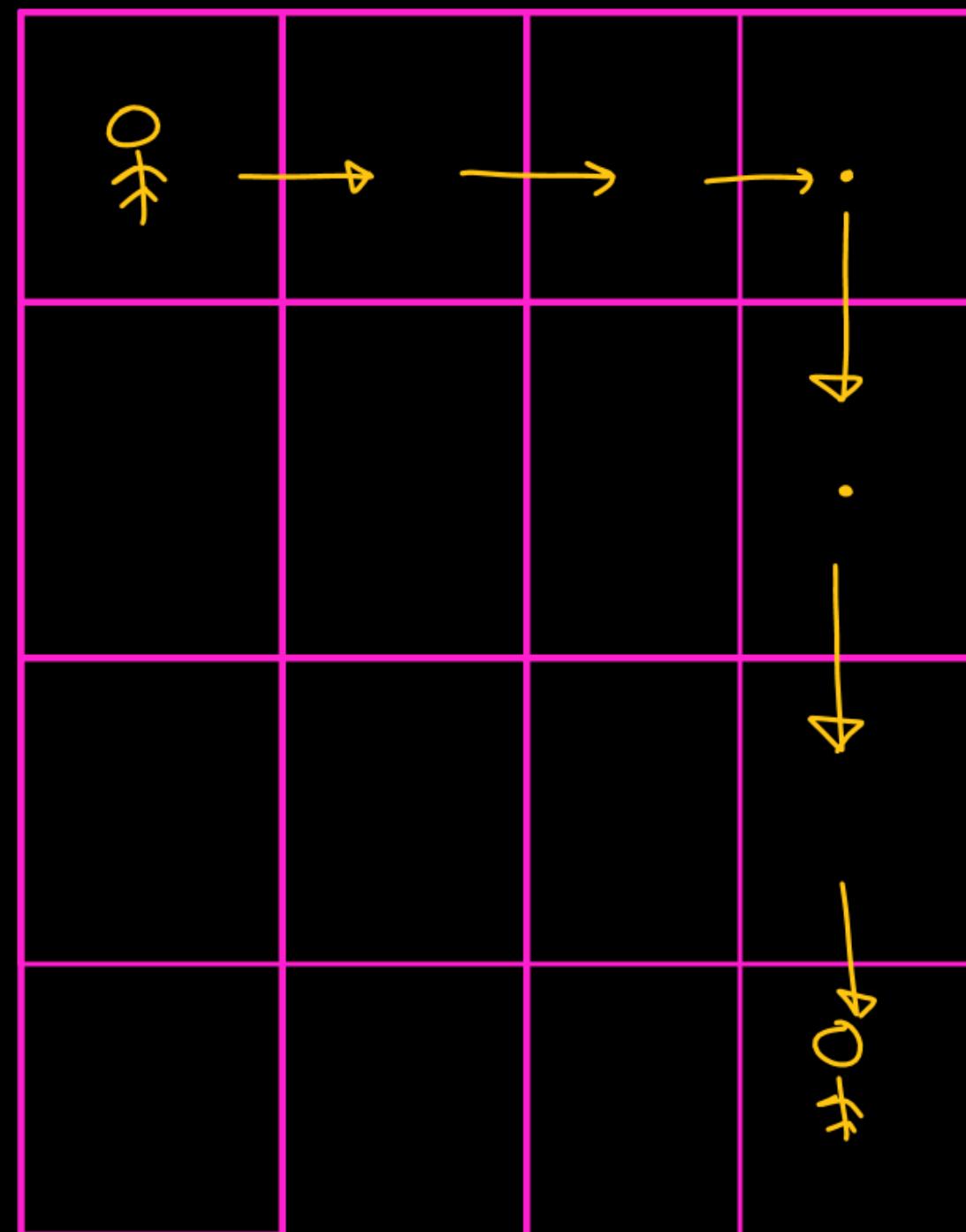
By- Pankaj Sharma sir

TOPICS TO BE COVERED

Iterative Statement-I

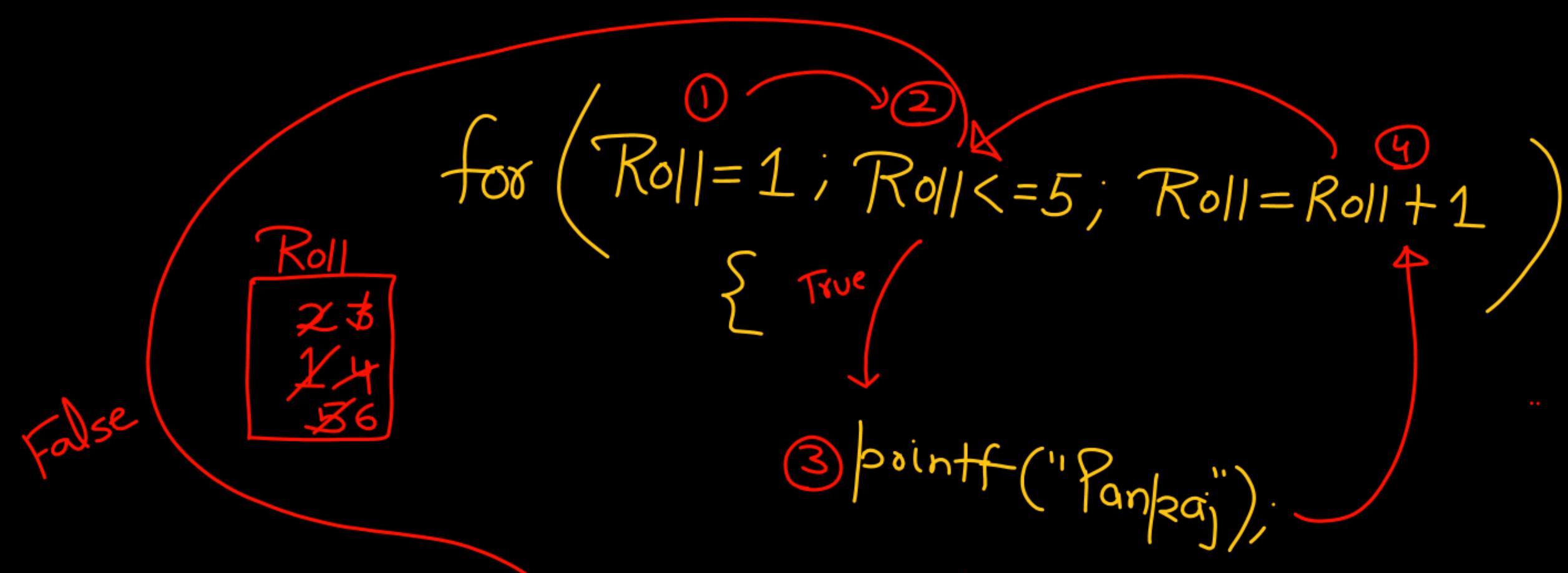
Iterative statements (Repetition)

- (i) Go right
- (ii) Go right
- (iii) Go right
- (iv) Go down
- (v) Go down
- (vi) Go down

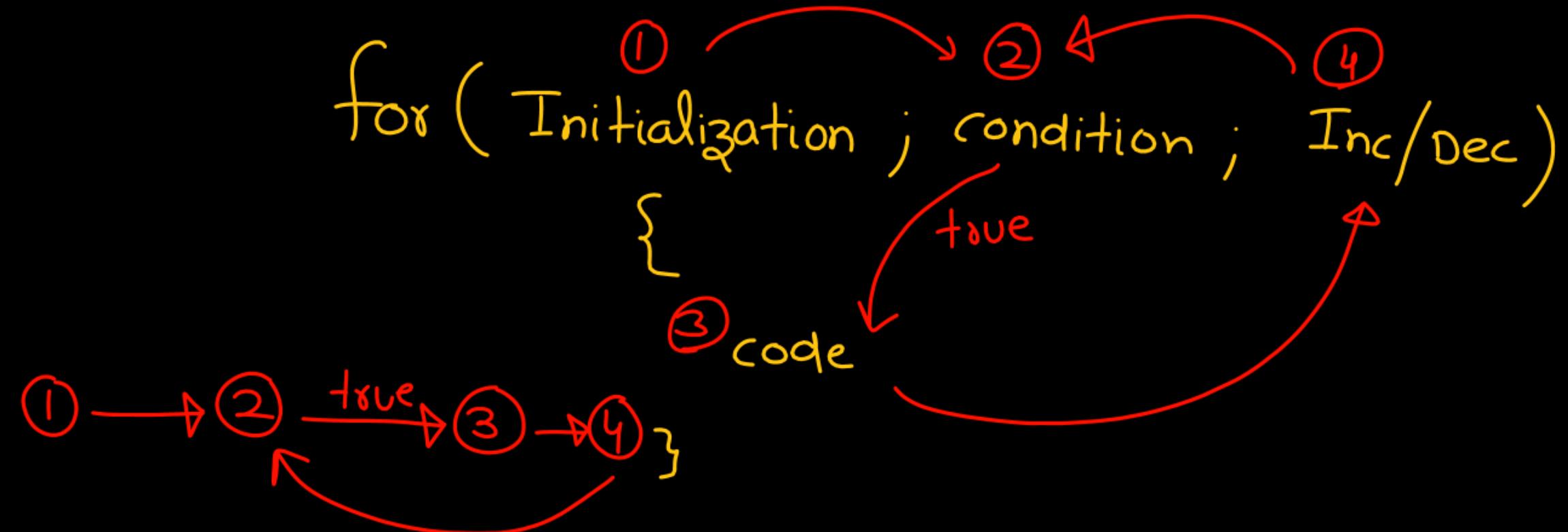


Right
down

- (i) Go right 3 times
- (ii) Go down 3 times



Roll		
1	$1 \leq 5 \rightarrow \text{True}$	Pankaj
2	$2 \leq 5 \rightarrow \text{True}$	Pankaj
3	$3 \leq 5 \rightarrow \text{True}$	Pankaj
4	$4 \leq 5 \rightarrow \text{True}$	Pankaj
5	$5 \leq 5 \rightarrow \text{True}$	Pankaj
6	$6 \leq 5 \rightarrow \text{False}$	PanRaj



②, ③, ④ repetition

```
for(① Roll=1; Roll<=5; Roll++)  
{  
    ②  
    printf("Pankaj");  
    ③  
}
```

Roll = 1 → ② → ✓

Roll = 2 → 2 <= 5 ✓

Roll = 3 → 3 <= 5 ✓

Roll = 4 → 4 <= 5 ✓

Roll = 5 → 5 <= 5 ✓

Roll = 6 → 6 <= 5 ✗

Roll = 1, 2, 3, 4, 5

2/

```
for (Roll = 6 ; Roll <= 10 ; Roll++)
{
    printf("Pankaj");
}
```

Roll = 6, 7, 8, 9, 10

5 times

3/

```
for (Roll = -1 ; Roll <= 3 ; Roll++)
{
    printf("Pankaj");
}
```

Roll = -1, 0, 1, 2, 3

5 times

for ($i = 1$; $i \leq 10$; $i++$)
 {
 printf ("Hello");
 printf ("Bochhö");
 }

scope
 {
 printf ("Hello");
 printf ("Bochhö");
 }

$i = 1$	printf ("Hello")	printf ("Bochhö")
$i = 2$	✓	
$i = 3$	✓	
$i = 4$	✓	✓
$i = 5$	✓	✓
$i = 6$	✓	
$i = 7$	✓	✓
$i = 8$	✓	
$i = 9$	✓	✓
$i = 10$	✓	
$i = 11$	✗	✗

```
for ( i=1; i<=10; i++ )  
    printf("Hello");  
    printf("Bachho");  
    ↓
```

First
Semi
Colon

```
for( i=1 ; i<=10 ; i++ )  
{  
    printf("Hello");  
}  
printf("Bachho");
```

for (① ; ② ; i++)
{
 printf("%d", i);
}

O/P : No output

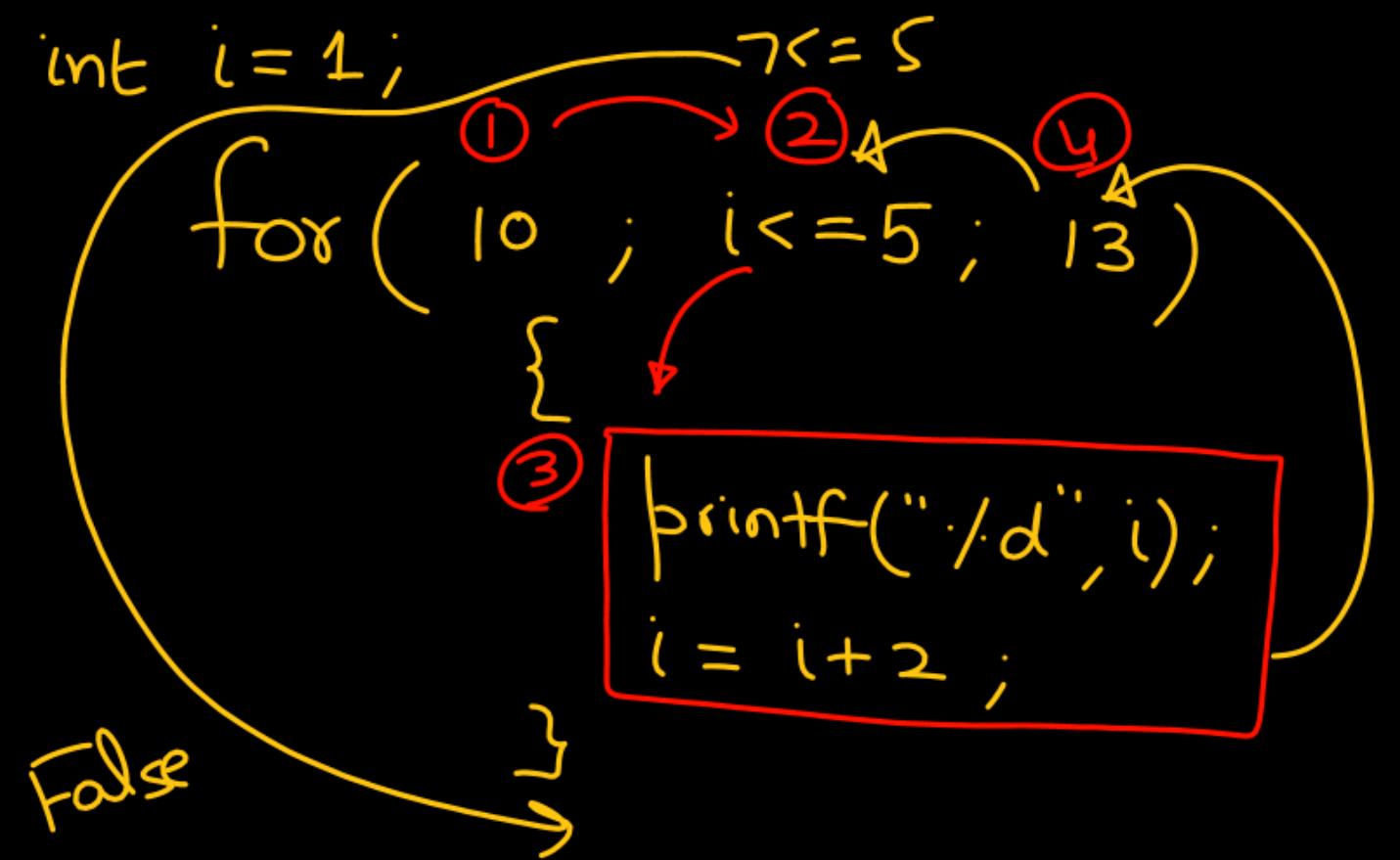
$i = 1$	$i > 10 \rightarrow \text{False}$

```
for(① expression1 ; expression 2 ; ④ expression3)  
{  
    ② true  
    { ③ non-zero  
        code  
    }  
}
```

iteration

expression1

⇒ 1st iteration



1 3 5

i	
1	$i <= 5 \rightarrow \text{True}$ \Rightarrow print 1 $i = i + 2 = 3$
3	$3 <= 5 \rightarrow \text{True}$ \Rightarrow print 3 $i = 3 + 2 = 5$
5	$5 <= 5 \rightarrow \text{True}$ \Rightarrow print 5 $i = 5 + 2 = 7$
7	$7 <= 5 \rightarrow \text{False}$

char ch = 1;

by default

Signed for (① → ②
ch = 1 ; ch ; ch++)

→ TTTT

③ printf("Pankaj");
First
Semi
Colon

printf("END");

ch = 1

printf("Pankaj") ↘
" " ↘
" " ↘

ch = 2

ch = 3

ch-1 lect - 2,3

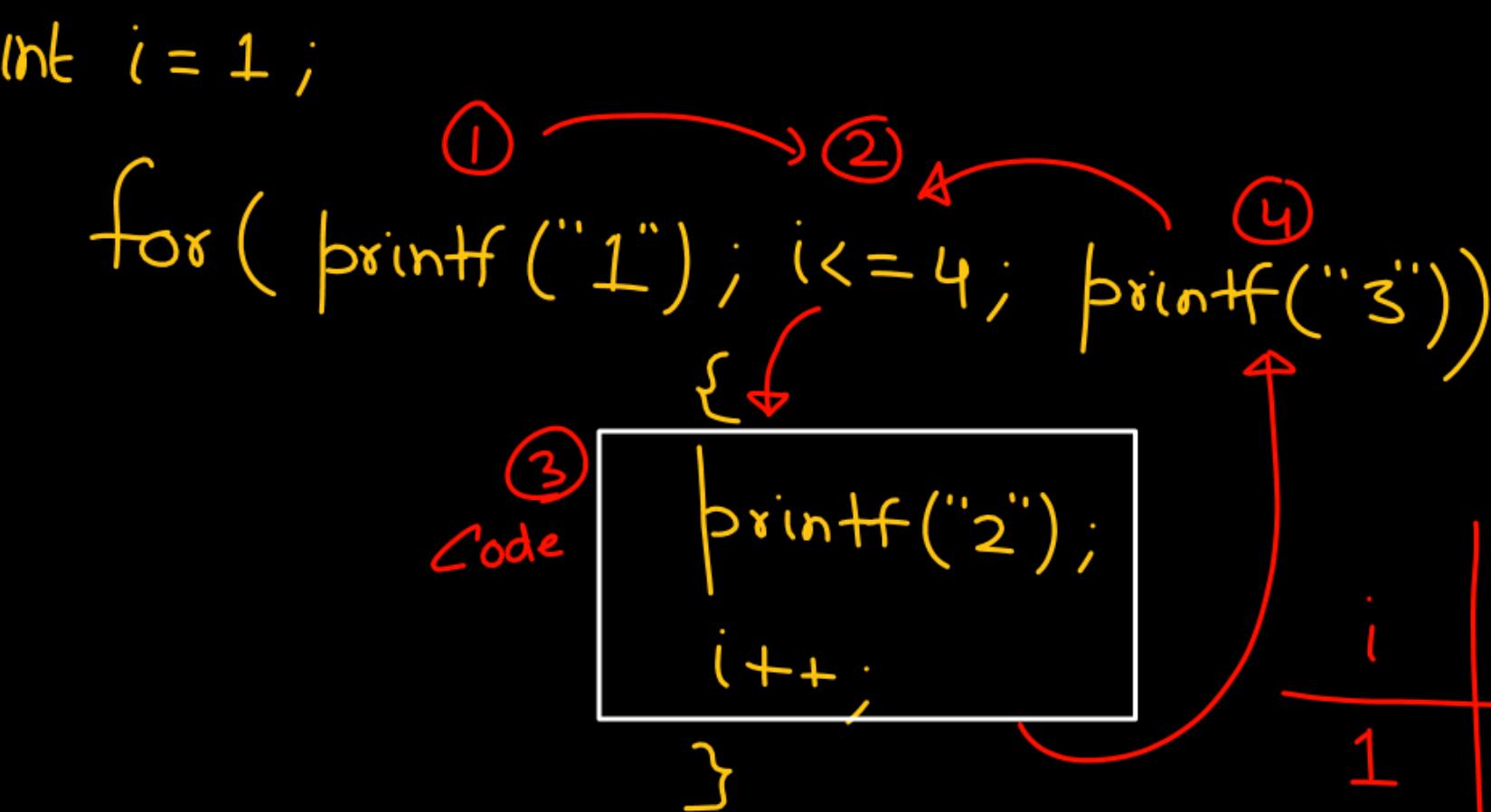
Signed
Char

-126
/ / -128
-127 / | 127 126

ch = 1, 2, 3, ... -127 ⇒ Pankaj
ch = -128, -127, ... -3, -2, -1 ⇒ Pankraj
ch = 0

```
char ch ;  
for (ch=1; ch ; ch= ch+2)  
    printf ("Panraj");
```

How many times Pankaj will be printed ?
~~125~~
∞ times



O/P : 1 2 3 2 3 2 3 2 3

	i	
1	1	$\text{pf("1")} \rightarrow i \leq 4 \rightarrow \text{True}$
2	2	$\text{Code} \rightarrow i = 2$
3	3	$2 \leq 4 \rightarrow \text{True} \rightarrow \text{code}$
4	4	$3 \leq 4 \rightarrow \text{True} \rightarrow \text{code}$
5	5	$4 \leq 4 \rightarrow \text{True} \rightarrow \text{code}$
		$5 \leq 4 \rightarrow \text{False}$

∴

```
for ( ① 1 ; ② 2 ; ③ 3 )  
  {  
    ④ True  
    ③ printf ("Pankaj");  
  }
```

∞ times

2 for (0 ; ^{exp2} 1 ; 0)

printf ("Pankaj");

∞ times

3.

```
for ( ; 0; )  
    printf ("Pankaj");
```

0 times

sat

All 3 expressions in for loop are optional.

```
for(i=1; i<=5; i++)  
{  
    printf("Pankaj");  
}
```

\Rightarrow *i = 1;* *Mandatory*
i ↑

```
for(      ; i<=5; i++)  
{  
    printf("Pankaj");  
}
```

```
for(i=1; i<=5; i++)
{
    printf("Pankaj");
}
```



```
for(i=1; i<=5;
)
{
    printf("Pankaj");
    i++;
}
```

```
i = 1;  
for ( ① ; ② i <= 5 ; ④ )  
{  
    ③ printf("Pankaj");  
}
```

1

$i \leq 5 \rightarrow \text{True} \swarrow$

∞ times

it is treated
as true

for(i=1 ;  ; 12)
{
 printf("Pankaj");
}

```
for( ; ; )  
{  
    printf("Pankaj");  
}
```

∞ times

`int i = -1;`

`for (i → 0 → false`

`i++; i++; i++)`

{

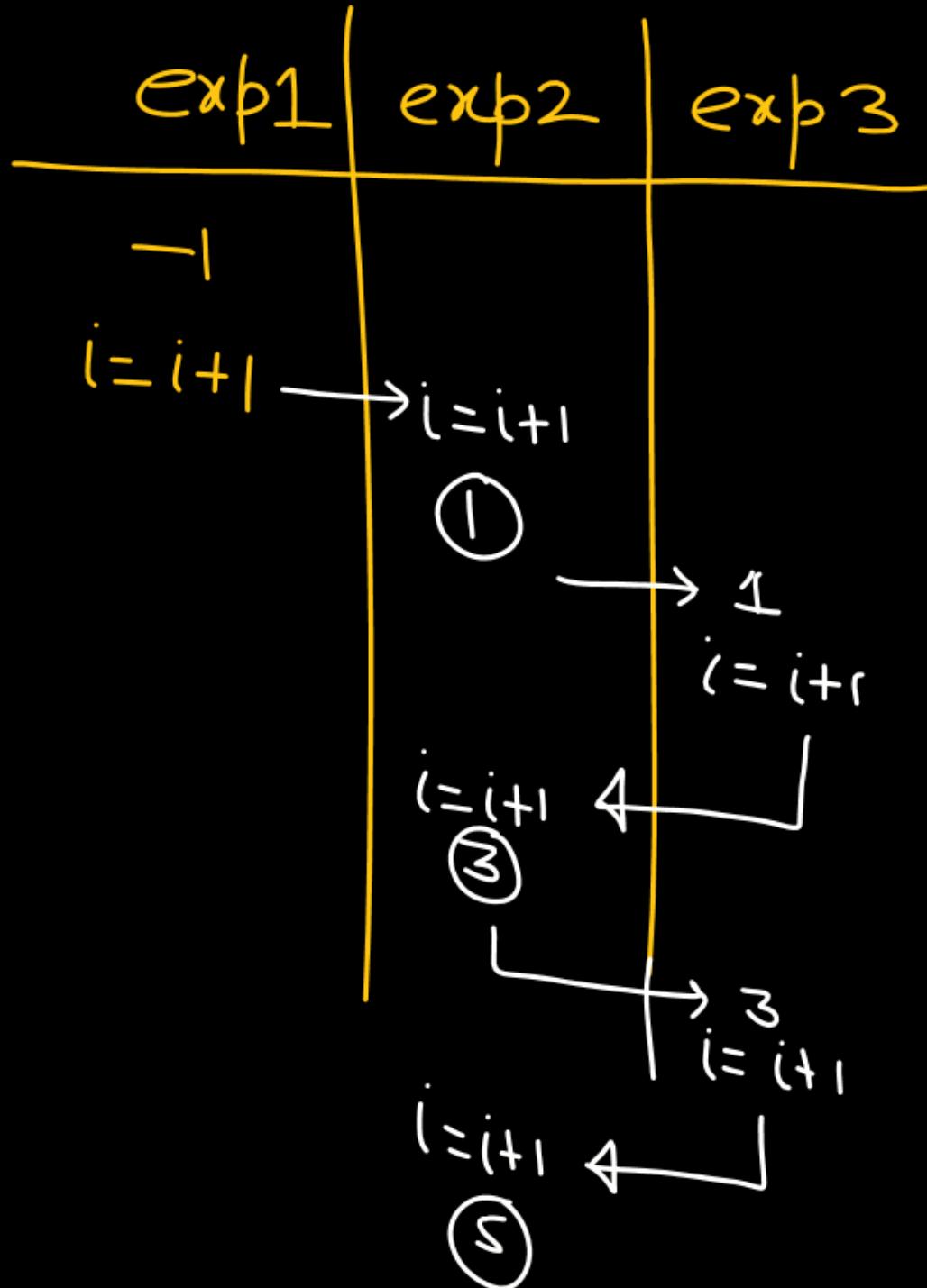
`printf("Pankaj");`

}

0 times

exp1	exp2	exp3
-1	0	.

i 12345



```
int i = -1;  
for(i++; ++i; i++)  
{  
    printf("Pankaj");  
}
```

∞ times

1 ✓
3 ✓
5 ✓

(it freeb on repeating odd values)

int i = 1

for (; ++i < 6 ;)

{
 printf("%d", i);
}

i	exp2	
1	$i = i + 1$ $i < 6$	$i = 2$ $2 < 6 \checkmark \Rightarrow \text{bf}(2)$
2	$i = i + 1$ $i < 6$	$i = 3$ $3 < 6 \checkmark \Rightarrow \text{bf}(3)$
3	$i = i + 1$ $i < 6$	$i = 4$ $4 < 6 \Rightarrow \text{bf}(4)$
4	$i = i + 1$ $i < 6$	$i = 5$ $5 < 6 \checkmark \Rightarrow \text{bf}(5)$
5	$i = i + 1$ $i < 6$	$i = 6$ $6 < 6 \checkmark \text{False}$

2345

i 123456

int i = 1

for(; i++ < 6 ;)

① $1 < 6 \Rightarrow \text{True} \rightarrow i = i + 1$

pf(2)

{

printf("%d", i);

}

② $2 < 6 \Rightarrow \text{True} \Rightarrow i = i + 1$

pf(3)

③ $3 < 6 \Rightarrow \text{True} \stackrel{i=i+1}{\Rightarrow}$

pf(4)

23456

④ $4 < 6 \Rightarrow \text{True} \stackrel{i=i+1}{\Rightarrow}$

pf(5)

⑤ $5 < 6 \Rightarrow \text{True} \stackrel{i=i+1}{\Rightarrow}$

pf(6)

⑥ $6 < 6 \Rightarrow \text{False}$

Loop Analysis

↳

```
for (i=1; i<=10; i++)  
{  
    printf("Pankaj");  
}
```

Ans : $i = 1, 2, 3, \dots, 10$

1 to 10

$\Rightarrow 10 - 1 + 1 = \boxed{10 \text{ times}}$

$n \geq 1$

2.

```
for ( i=1; i<=n; i++)
{
    printf("Pankaj");
}
```

$i = 1, 2, 3, \dots, n$
 n times

$n \geq 1$

3.

for ($i = 1; i \leq n; i = i + 2$)

{

 printf("Panraj");

}

$\lceil \frac{n}{2} \rceil$ times

$n = 10$

$i = 1, 3, 5, 7, 9, \cancel{11}$

5

$n = 20$

$i = \underline{1, 3, 5, 7, 9, 11, 13, 15, 17, 19}$

10

$n = 11$

$i = 1, 3, 5, 7, 9, 11$

$6 \Rightarrow \frac{11}{2}$

5.5

$$n = 10 \Rightarrow \left\lceil \frac{10}{2} \right\rceil = \lceil 5 \rceil = 5 \quad \left\lceil \frac{n}{2} \right\rceil$$

$$n = 11 \Rightarrow \left\lceil \frac{11}{2} \right\rceil = \lceil 5.5 \rceil = 6$$

n>1
4.

```
for (i=1; i<=n; i=i*2)  
{
```

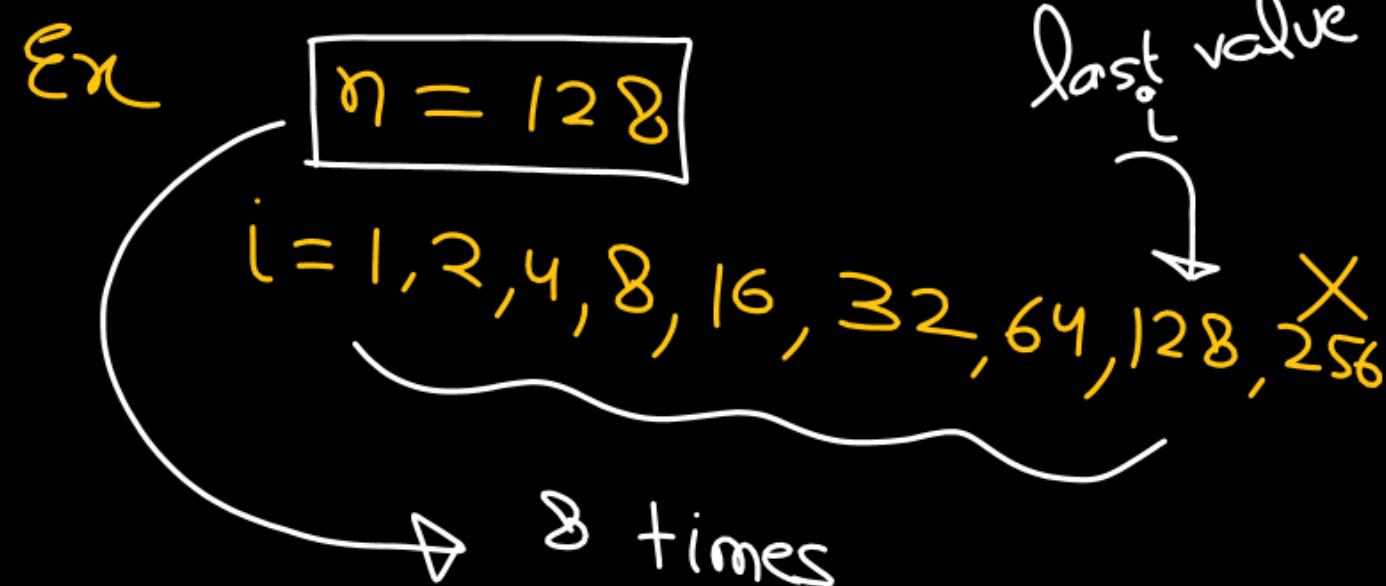
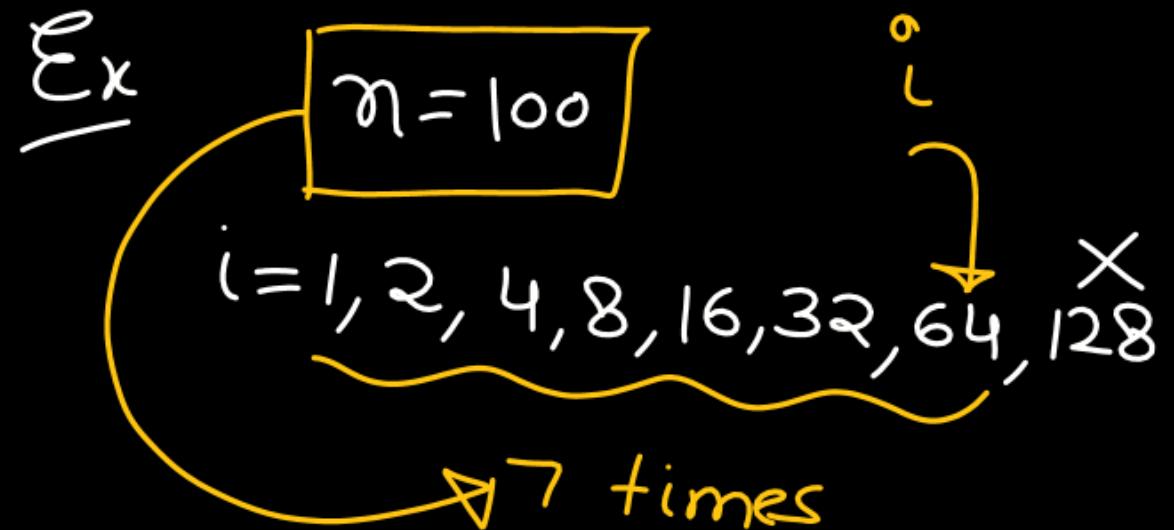
```
    printf ("Pankaj");
```

```
}
```

last-value of i
 $i = 1, 2, 2^2, 2^3, \dots, 2^k$

How many values of i

$\hookrightarrow (k+1)$ times



$n \geq 1$

4.

```
for (i=1; i<=n; i=i*2)
{
```

```
    printf ("Pankaj");
```

}

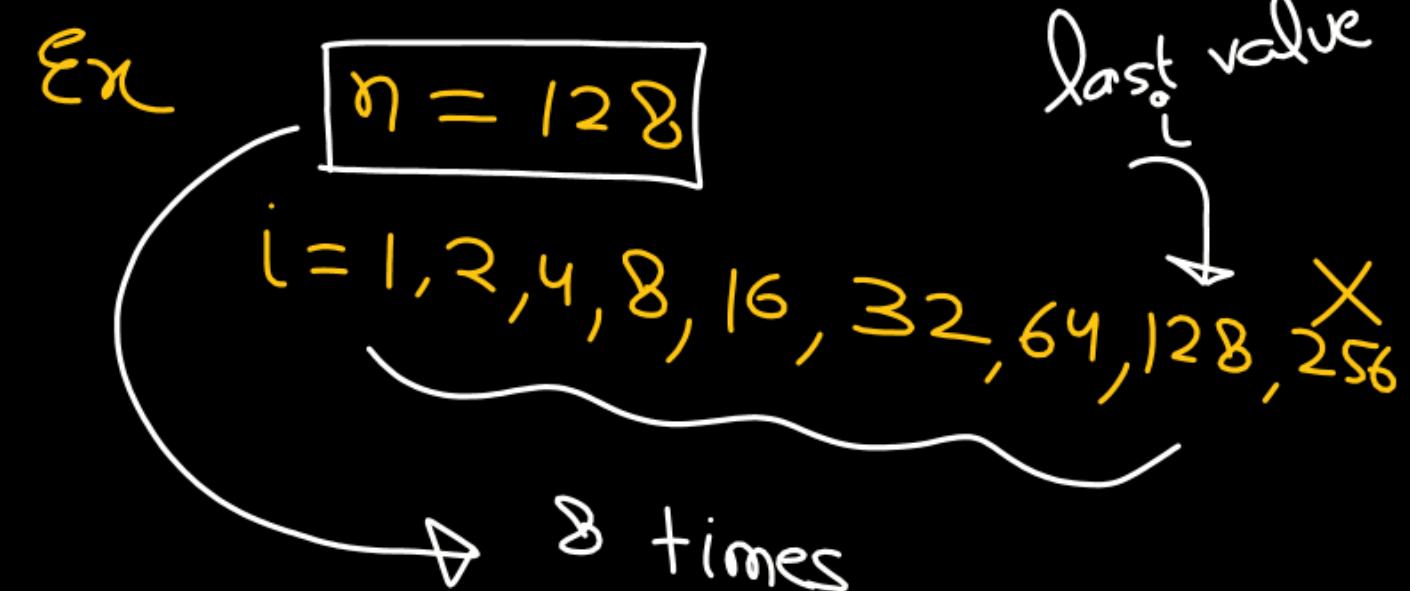
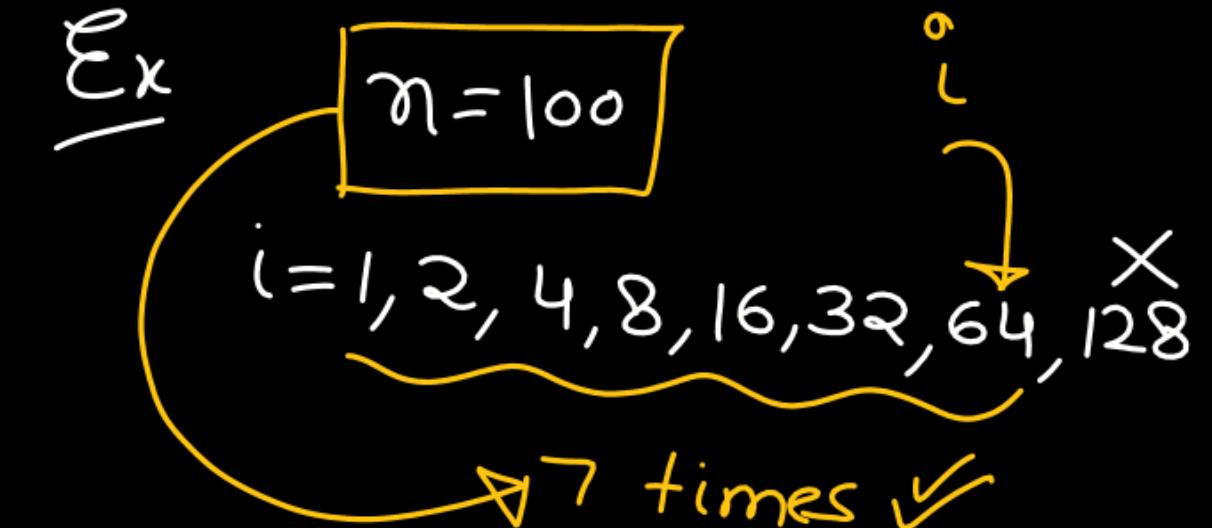
$(k+1)$ times

$$2^k \leq n$$

$$\log(2^k) \leq \log n$$

$$k \log 2 \leq \log n$$

$$k \leq \frac{\log n}{\log 2}$$



$$k \leq \log_2 n$$

$$K \leq \log_2 n$$

$$K = \lfloor \log_2 n \rfloor$$

$$n = 9$$

$$\log_2 9$$

$(K+1)$ times

$$\Rightarrow \lfloor 3 \cdot x \rfloor$$

$$\Rightarrow \lfloor \log_2 n \rfloor + 1$$

$$\boxed{K = 3}$$

$$n = 100$$

$$\Rightarrow \lfloor \log_2 100 \rfloor + 1$$

$$\begin{aligned} &\Rightarrow \lfloor 6 \cdot x \rfloor + 1 \\ &= 6 + 1 = 7 \end{aligned}$$

1, 2, 4,

1 → 2 → 2² → 2³ - - - n

$\lfloor \log_2 n \rfloor + 1$

```
for( i=1; i<=n; i = i * 3 )
```

```
    printf("Hello");
```

Ans :

$$\lfloor \log_3 n \rfloor + 1$$

1 byte

Java

2 byte

Unicode

$$ch = 1 \text{ to } 127 \Rightarrow last - first + 1 = 127 - 1 + 1 = 127$$

$$ch: -128 \text{ to } -1 \Rightarrow 1 - (-128) = 128$$

255 Pankaj

\Rightarrow END

