


Recursion

{ Day - 4 }

Ques:-

i/p \rightarrow "abcde" , "babbar"

o/p \rightarrow "cdcba" , "abbab"

\rightarrow Loops = \times

\rightarrow Recursion (using)

0	1	2	3	4
A	B	C	D	E

i j

int $i=0$, $j=s.length()-1$;

while ($i < j$) $(i > j) \rightarrow$ runna

{ swap($s[i]$, $s[j]$):

$i++$;

$j--$;

}

a b c d e

reverse (i , j , s)

{

// base case

if (i > j)
return;

swap (s[i] , s[j])

i++ ;

j-- ;

reverse (i , j , s) ;

}

~~~

main()

name

"babbar"

reverse ( str )

str = "babbar"

++

=

- robbab

cout << name

② ①

abcde

abcde, 0, 4

e~~b~~cda, 1, 3

ed~~c~~ba, 1, 2

ed~~c~~ba, 3, 1

edcba

Base  
Case

Min →  $i \rightarrow$  range →  $n-i-1$

## Ques 2 Palindrome:-

string = abba       $\Rightarrow$  equal  $\rightarrow$  Palindrome

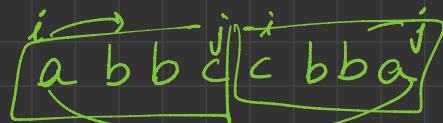
reverse string = abba

↳ Loop  $\Leftarrow$  X

↳ Recursion  $\Leftarrow$

i > j  $\rightarrow$  Palindrome  
 $\Leftarrow$  ==  $\rightarrow$  i++, j--

! =  $\rightarrow$  Not Palindrome



App ① store i, quer  
compa  $\rightarrow$  equal  $\rightarrow$  palindrom  $\rightarrow$   $O(n)$   $\rightarrow$  sc  
 $O(n)$   $\rightarrow$  T.C

App ②

~~str[i]~~

H/w

→ if  $p \rightarrow a = 3$ ,  $b = 2$

$o/p \rightarrow 3^2 = 9$

$ans = 1;$   
for ( $\text{int } i = 0; i < b; i++$ )

↓

$ans = ans * a;$

↓

return  $ans;$  //

$$a^b \rightarrow b \text{ is even} \rightarrow \underline{\underline{a^{b/2} \times a^{b/2}}} \\ \rightarrow b \text{ is odd} \rightarrow \underline{\underline{a \times (a^{b/2} \times a^{b/2})}}$$

$$2^9 = 2 \times (2^4 \times 2^4) = 2 \times \underline{\underline{(2^4)^2}} \\ 2^4 = 2^2 \times 2^2 = \underline{\underline{(2^2)^2}}$$

$\eta =$

$$2^2 = (2 \times 2) = \underline{\underline{(2)^2}}$$

$$2^1 = 2 \times 2^0 \times 2^0 \\ = 2 \times \underline{\underline{(2^0)^2}} \rightarrow \underline{\underline{1}}$$

$$2^9 \rightarrow 9 \text{ item}$$

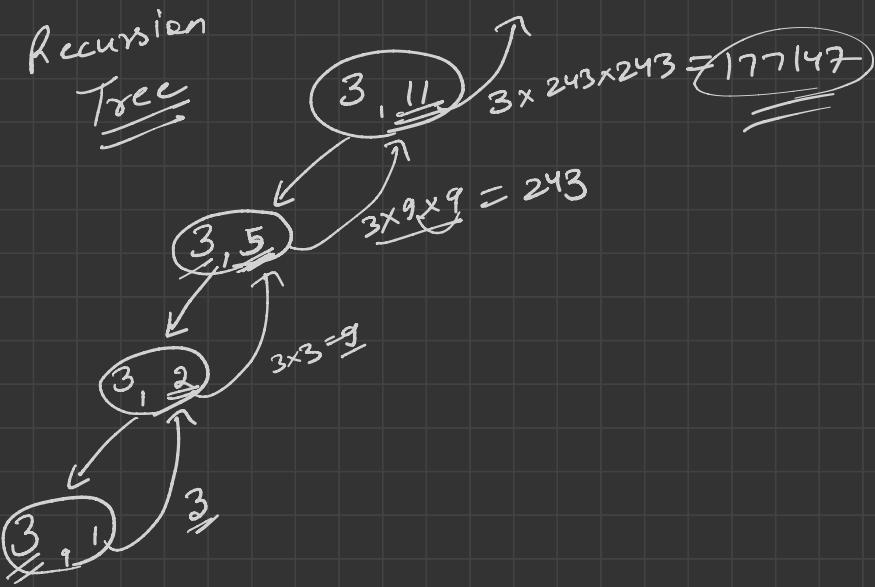
$$2^1 = 2 \\ 3^1 = 3 \\ 4^1 = 4 \\ a^1 = \underline{\underline{a}}$$

1024 item

$$2^{1024} \rightarrow (2^{512})^2 = (2^{256})^2 = (2^{128})^2 = (2^{64})^2$$

11 iterations

$$(2^1)^2 \leftarrow (2^2)^2 \leftarrow (2^4)^2 \leftarrow (2^8)^2 \leftarrow (2^{16})^2 \leftarrow (2^{32})^2$$



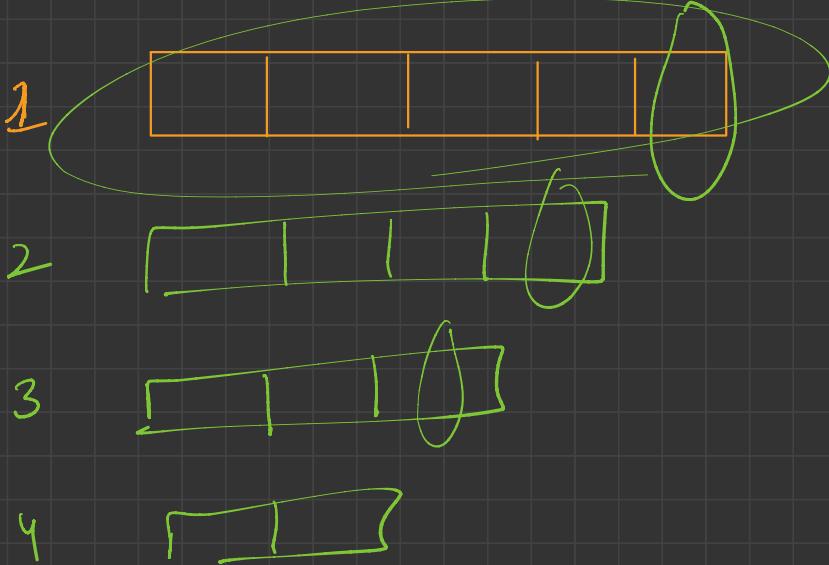
→ Bubble Sort

- Loops  $\equiv \alpha$
- Recursion  $\equiv$

Use-Case: Round  $i^{th}$

$i^{th}$  largest (right place)

round  $i \rightarrow i^{th}$  larg  $\rightarrow n - i^{th}$  index



~~H/w~~ → Selection Sort → ~~H/w~~  
 → Insertion Sort ← using  
 Recursion