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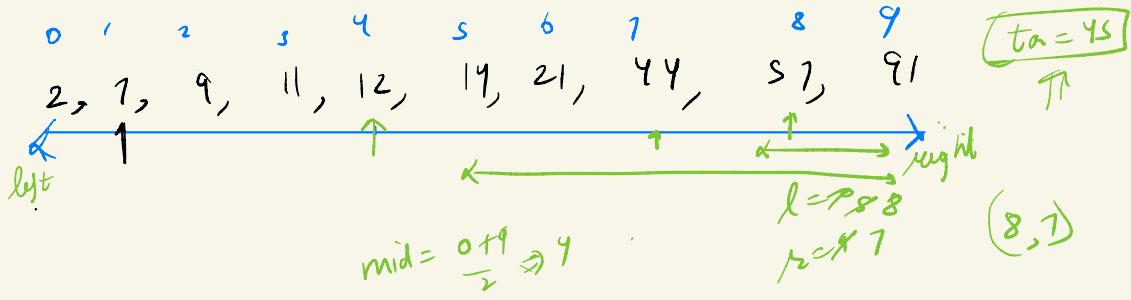
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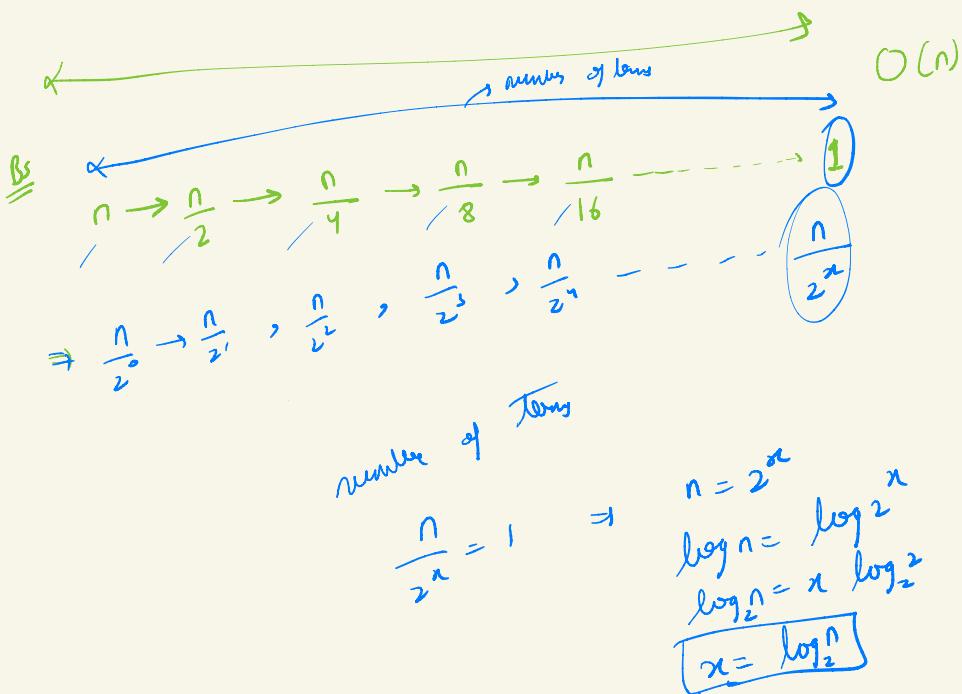
```
public static int binarySearch(int[] arr, int tar){
    int n=arr.length;

    int left=0;
    int right=n-1;

    while(){
        int mid=(left+right)/2;

        if(arr[mid]==tar){
            return mid;
        } else if(arr[mid]<tar){
            left=mid+1;
        } else {
            right=mid-1;
        }
    }

    return -1;
}
```



$\begin{matrix} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 91, 51, 44, 21, 14, 12, 11, & 9, 7, 2 \end{matrix}$

(44)

$\text{tar} = 9$

$\left. \begin{array}{l} \text{if } (\text{tar} < \text{arr}(\text{mid})) \{ \\ \quad \text{left} = \text{mid} + 1; \end{array} \right\}$

$\left. \begin{array}{l} \text{if } (\text{tar} > \text{arr}(\text{mid})) \{ \\ \quad \text{right} = \text{mid} - 1 \end{array} \right\}$

Ans  $\{ 1, 1, 3, 3, 3, 3, 4, 4, 4, 5, 5, 8, 8, 8, 8, 8, 8, 10 \}$

$\text{let } t = 8$        $\text{mid} = 9$        $\text{left} = 7$   
 $\text{right} = 17$

$\text{tar} = 8$

$\text{left} = 14, 15, 16, 17$

$\left. \begin{array}{l} \text{if } (\text{arr}(\text{mid}) == \text{target}) \{ \\ \quad \text{left} = \text{mid}; \end{array} \right\}$

$\text{left} = \text{mid}$

$\text{left} = \text{mid} + 1$

$\left. \begin{array}{l} \text{if } (\text{arr}(\text{mid}) < \text{target}) \{ \\ \quad \text{left} = \text{mid} + 1; \end{array} \right\}$

$\text{left} = \text{mid} + 1$

$$0 \rightarrow \underline{0} \quad \underline{0} \quad \underline{0} \quad \underline{0} \rightarrow 2^0$$

$$1 \rightarrow \underline{0} \quad \underline{0} \quad \underline{0} \quad -$$

$$2 \rightarrow \underline{0} \quad \underline{0} \quad \underline{1} \quad \underline{0} \rightarrow 2^1$$

$$3 \rightarrow \underline{0} \quad \underline{0} \quad \underline{1} \quad \underline{1}$$

$$4 \rightarrow \underline{0} \quad \underline{1} \quad \underline{0} \quad \underline{0} \rightarrow 2^2$$

$$5 \rightarrow \underline{0} \quad \underline{1} \quad \underline{0} \quad \underline{1}$$

$$6 \rightarrow \underline{0} \quad \underline{1} \quad \underline{1} \quad \underline{0}$$

$$7 \rightarrow \underline{0} \quad \underline{1} \quad \underline{1} \quad \underline{1}$$

$$8 \rightarrow \underline{1} \quad \underline{0} \quad \underline{0} \quad \underline{0} \rightarrow 2^3$$

$$9 \rightarrow \underline{1} \quad \underline{0} \quad \underline{0} \quad \underline{1}$$

$$10 \rightarrow \underline{1} \quad \underline{0} \quad \underline{1} \quad \underline{0}$$

$$11 \rightarrow \underline{1} \quad \underline{1} \quad \underline{0} \quad \underline{1}$$

$$12 \rightarrow \underline{1} \quad \underline{1} \quad \underline{0} \quad \underline{0}$$

$$13 \rightarrow \underline{1} \quad \underline{1} \quad \underline{0} \quad \underline{1}$$

$$14 \rightarrow \underline{1} \quad \underline{1} \quad \underline{1} \quad \underline{0}$$

$$15 \rightarrow \underline{1} \quad \underline{1} \quad \underline{1} \quad \underline{1}$$

$$16 \rightarrow \underline{1} \quad \underline{0} \quad \underline{0} \quad \underline{0} \rightarrow 2^4$$

Convert a decimal number to binary

Ques

$$17 \div 2$$

↓

$$n=17.$$

$$n=n/2$$

$$\begin{array}{r} 2 | 17 \rightarrow 0 \\ \hline 2 | 8 \checkmark \quad 1 \\ \hline 2 | 4, \quad 0 \\ \hline 2 | 2, \quad 0 \\ \hline 2 | 1, \quad 0 \\ \hline \quad 0 \rightarrow 1 \end{array}$$

$$\text{String binary} = 1$$

$$\begin{aligned} \text{binary} &= '0' + \text{binary} \\ &\Rightarrow 01 \end{aligned}$$

$$\Rightarrow \underline{0} \quad 0 \quad 1$$

$$\underline{\underline{0}} \quad 0 \quad 0 \quad 1$$

$$\underline{\underline{\underline{1}}} \quad 0 \quad 0 \quad 0 \quad 1$$

$$n = \cancel{2^3} + \cancel{8} \times 10 / \text{binary} = "1" \cancel{+} \cancel{1} \cancel{+} \underline{\underline{1011}}$$

$$\text{num} = 1 \cdot 2 = 01$$

$$\begin{array}{r} 2 | 23 \\ 2 | 11 \\ \hline 5, 1 \end{array}$$

```
public static String decimalToBinary(int n){
    String binary="";
    while(n>0){
        int rem=n%2;
        binary= rem + binary;
        n=n/2;
    }
    return binary;
}
```

Ques Given a binary string, change it to decimal number.

$$\begin{array}{ccccccc}
 & 16 & 8 & 4 & 2 & 1 & 2^0 = 1 \\
 & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \\
 cp=16 & cp=8 & cp=4 & cp=2 & cp=1 & & \\
 2^4 & 2^3 & 2^2 & 2^1 & 2^0 & & \\
 & 1 & 1 & 0 & 1 & & \\
 & \downarrow & \downarrow & \downarrow & \downarrow & & \\
 & 2^0 + 2^1 + 2^2 + 2^4 & & & & & \\
 & 1 + 2 + 4 + 16 = 23 & & & & & 
 \end{array}$$

$$\begin{array}{l}
 cp=\cancel{16} + \cancel{8} + \cancel{4} + \cancel{2} \\
 \text{Any} = \cancel{16} + \cancel{8} + \cancel{4} + 2^3
 \end{array}$$

```
public static int binaryToDecimal(String binary){
    int n=binary.length();
    int curr_pow=1; → power of 2
    int ans=0;

    for(int i=n-1; i>=0; i--){
        char ch=binary.charAt(i);

        if(ch=='1'){
            ans=ans+curr_pow;
        }

        curr_pow=curr_pow*2;
    }

    return ans;
}
```

Ques Given one sorted array, find total number of elements = tar.

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1, 2, 3, 3, 3, 3, 4, 4, 5, 5, 6, 6, 7, 7, 8, 8, 8, 8, 8, 10																			

# tar = 8  
output = 5

$$f_i = 14$$

$$l_i = 18$$

$$B = 14 + 1$$

$$l = \cancel{14} \cancel{5} \leftarrow$$

$$r = 16 - 4$$

Ques

0	1	2	3	4	5	6
1, 2, 4, 5, 6, 8, 10						

$\uparrow \uparrow \uparrow$

$$m = 3 \times 4$$

tar = 6

If ( $arr[mid] <= tar$ )

$$l = mid + 1$$

else  $r = mid - 1$

```
public static int find_index_of_just_greater(int[] arr, int tar) {
    int left=0;
    int right=arr.length-1;

    while(left<=right){
        int mid=(left+right)/2;

        if(arr[mid]<=tar){
            left=mid+1;
        } else {
            right=mid-1;
        }
    }

    return left;
}
```

$\rightarrow s1 = b \ b \ a \ a \ f \ c \ d$  ✓

$\rightarrow s2 = g \ h \ i \ z \ z \ #$

a → x<sup>2</sup>

b → x<sup>2</sup>

f → 1

c → 1

d → 1

```
public static String twoStrings(String s1, String s2) {
    int[] fre=new int[26];

    for(int i=0; i<s1.length(); i++){
        char ch=s1.charAt(i);

        int idx=ch-'a';
        fre[idx]++;
    }

    for(int i=0; i<s2.length(); i++){
        char ch=s2.charAt(i);

        int idx=ch-'a';
        if(fre[idx]>0){
            return "YES";
        }
    }

    return "NO";
}
```

$$\text{area} = \frac{1}{2} \times b \times h$$

$$b=17 \\ \text{area}=100$$

$$h = \sqrt{2 \times \text{area}} \\ b$$

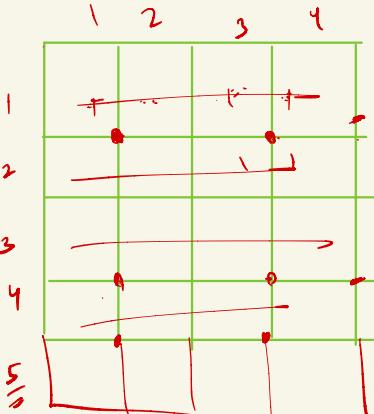
$$\rightarrow \frac{2 \times 100}{17} = \frac{200}{17} = 11.76$$

floor  
11  $\leftarrow 11.76 \rightarrow 12$

$$m = \frac{n+1}{2}$$

$$\frac{n+1}{2}$$

$$\frac{n}{2}$$



$$n=4$$

$$\underline{\underline{m=5}}$$

$$20$$

$$n \neq m$$

$$\frac{n}{2} \times \left( \frac{m+1}{2} \right)$$

$$2 \times 3 = 6$$

$$\left[ \left( \frac{n+1}{2} \right) \times \left( \frac{m+1}{2} \right) \right] \rightarrow$$

$$m=5 \\ \frac{5}{2} \rightarrow 2$$

number of rows to be covered =  $\frac{1}{2}$  even  
 number of columns " " " "  $\Rightarrow \frac{m}{2}$  even

$$\frac{n}{2} = \frac{n+1}{2}$$

$$\frac{n+1}{2}$$

