

Binary Search



from Striver's SDE Sheet

Problem: N^{th} root of an Integer

$$N=2, m=16$$

Note: Not getting idea how to find. So, taking help of youtube videos.

// Using BS

$$\text{low} = 1, \text{high} = m, \text{mid} = \frac{1 + 16}{2} = 8.5$$

$$[1 \quad 16]$$

$$8.5 \times 8.5 > 16$$

$$[1 \quad 8.5]$$

$$4.75 \times 4.75 > 16$$

$$[1 \quad 4.75]$$

$$2.675 \times 2.675 < 16$$

Remarks

$$[2.875 \quad 4.75]$$

$$[2.875 \quad 3.8125] \rightarrow (\text{high} - \text{low}) < 10^{-6}$$

This will do upto

Notes

Date ___/___/___

Problem: Matrix Median

$A = \begin{bmatrix} [1, 3, 5], [2, 6, 9], [3, 6, 9] \end{bmatrix}$



Output: 5

// create a vector
and push element
in it.

$\begin{bmatrix} 1 & 3 & 5 \\ 2 & 6 & 9 \\ 3 & 6 & 9 \end{bmatrix}$

$[1 | 3 | 5 | 2 | 6 | 9 | 3 | 6 | 9]$

// Now Sort the vector.

by
self //

$[1 | 2 | 3 | 3 | 5 | 6 | 6 | 9 | 9]$

$$\begin{aligned} \text{mid} &= \text{low} + \text{high} / 2 \\ &= \frac{0 + 8}{2} = 4 \end{aligned}$$

median $v[\text{mid}] = 5 //$

but it is brute force

Remarks

TC: $O(N \times M) \log(N \times M) //$

SC: $O(N \times M)$

Date __/__/____



optional

Initialize $low = \text{left INT-min}$
 $high = \text{INT-max}$

~~if~~ while ($low \leq high$) {
 $mid = (low + high) \gg 1$;
 $cnt = 0$;

 for ($int i = 0; i < n; i++$) {
 $cnt += \text{countSmaller}(A[i], mid)$;
 }

 if ($cnt \leq (n+m)/2$) $low = mid + 1$;
 else $high = mid - 1$;

// create fun of smaller

while ($l \leq h$) {
 $mid = (l + h) \gg 1$;
 if ($x[mid] \leq mid$)
 $l = mid + 1$;
 else
 $h = mid - 1$;

return l ;

$T_c: n \log_2(n) \times 4 \times 32 //$

Notes

Remarks