

HEAP

Video-15



(Priority Queue)



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Company :- Pony.ai

You are given a sorted integer array `arr` containing 1 and prime numbers, where all the integers of `arr` are unique. You are also given an integer `k`.

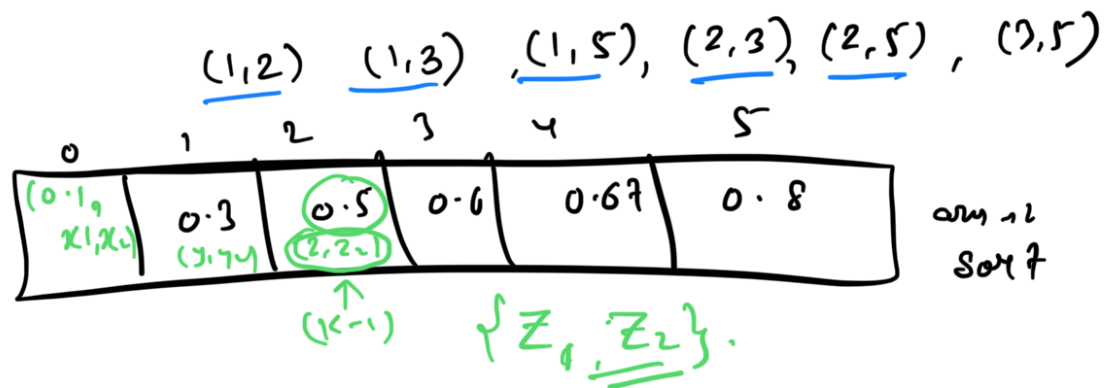
For every i and j where $0 \leq i < j < \text{arr.length}$, we consider the fraction $\text{arr}[i] / \text{arr}[j]$.

Return the k^{th} smallest fraction considered. Return your answer as an array of integers of size 2, where `answer[0] == arr[i]` and `answer[1] == arr[j]`.

$$\frac{1}{2} \quad \frac{1}{3} \quad \frac{1}{5} \quad \frac{2}{3} \quad \frac{2}{5} \quad \frac{4}{5}$$

Example :- $arr = \{1, 2, 3, 5\}$, $K = 3$

$(n^2 + n \log n)$ output = {2, 5}

 n^2 $n \log n$ 

Approach-1

(K^{th} Smallest,
 K^{th} largest ...)

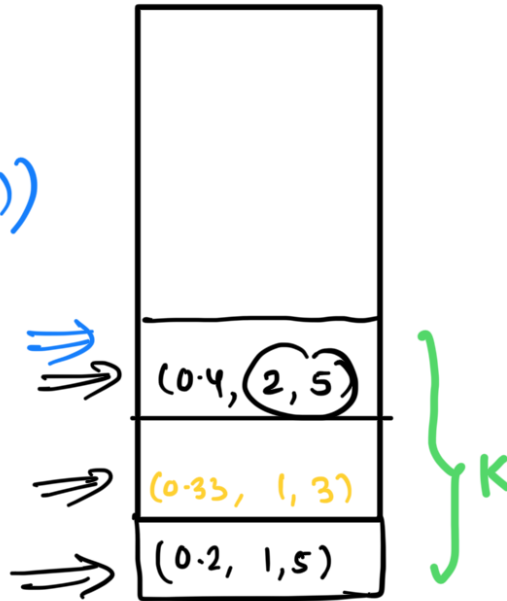


$$arr = \{1, 2, \underline{3}, \underline{5}\}, K=3$$

K^{th} smallest

$$O(n^2 * \log(K))$$

$$\log(K)$$



$$(Heap.size() == K)$$

$$\{2, 5\} \underline{\underline{1}}$$

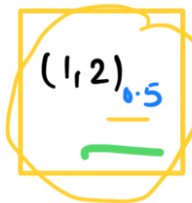
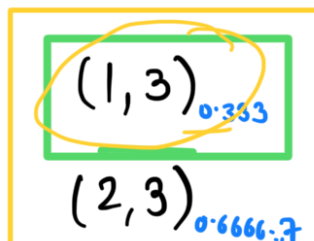
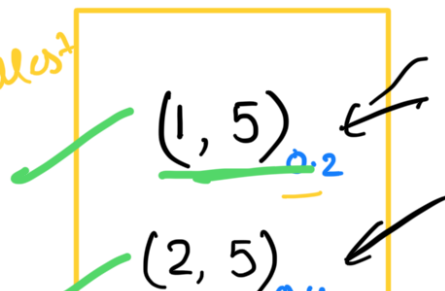
Approach-2

(using min-Heap)

$$arr = \{ \overset{i}{\underset{0}{1}}, \underset{1}{2}, \underset{2}{3}, \overset{j}{\underset{3}{5}} \}, K=3$$

$$O(n \log n)$$

smallest



Heap

✓ (3, 5) 0.6 ✓

2nd Smallest

3rd

1st Smallest = (0.2, 1, 5)

(0.4, 1, 3)
(0.5, 0.1)
(0.6, 2, 3)

1st Smallest

2nd Smallest = (0.3, 0, 2) min-Heap (div, i, j)

(0, 1)

(1, 2)

1/2

3rd Smallest
= 0.4

(1, 3)

$O(K * \log(n))$

{ 2, 5 }

{ a1, a1, a2 }

{ b1, b1, b1 }

{ }

PM
Σ