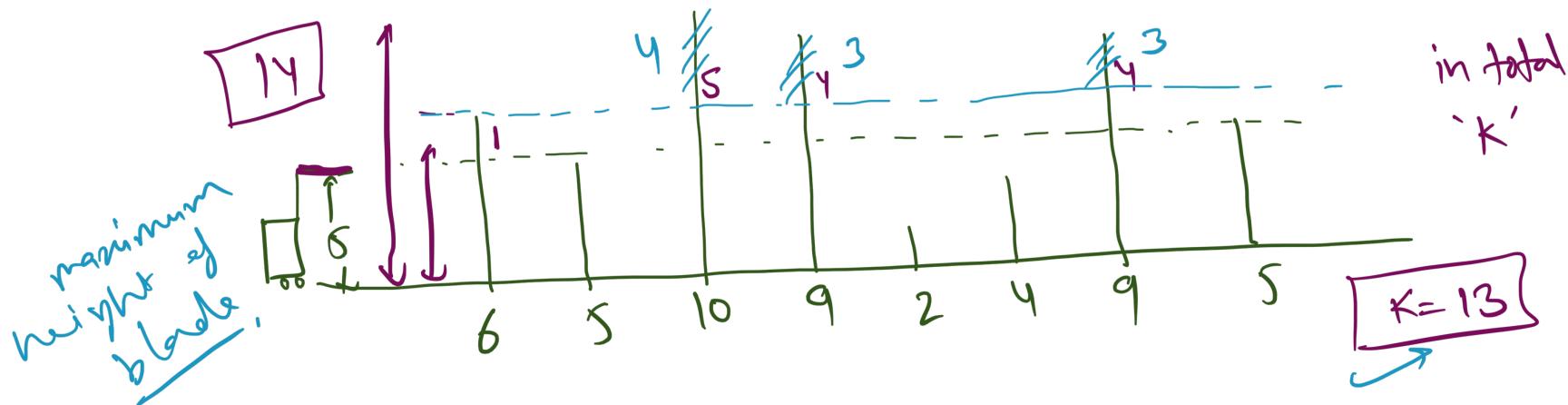


Binary Search Problems - II

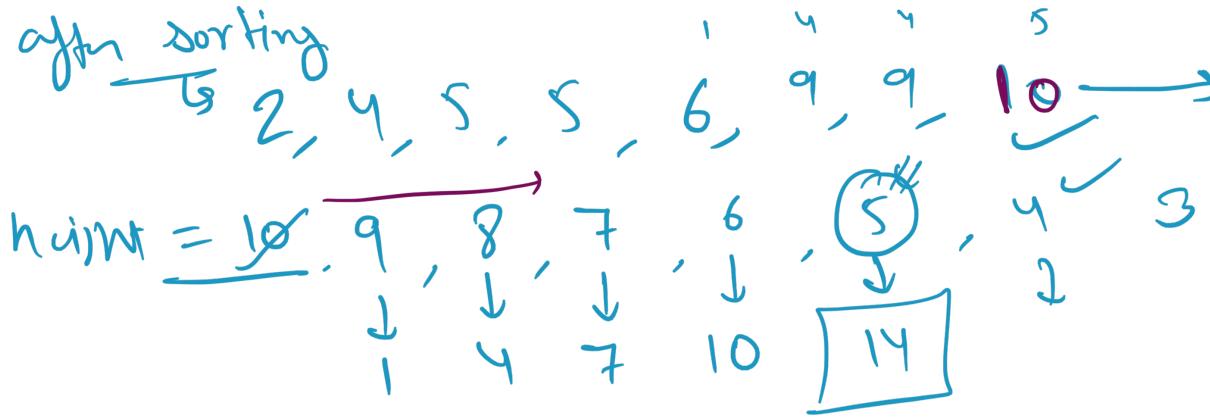


Tree Cutter Problem

Given an array of length 'N' , where each element denotes the height of a tree all placed in one row. Your task is to chop down trees so that you can get at least 'k' length of wood in total. Determine the maximum height at which a blade should be placed so that it can cut the tree above that height to get at least 'k' length of wood in total.



①


 $O(\underbrace{\max \text{height}}_{\log(h)} * n)$
 $\boxed{\log(h) * n}$
 $\boxed{n \log n}$
 $h = 10^6 \text{ owl}$

$a[] = \{3, 1, 4, 7, 2, 5, 2, 9\}$

$k = 7$

0 0 0 0 0 0 2

2 0

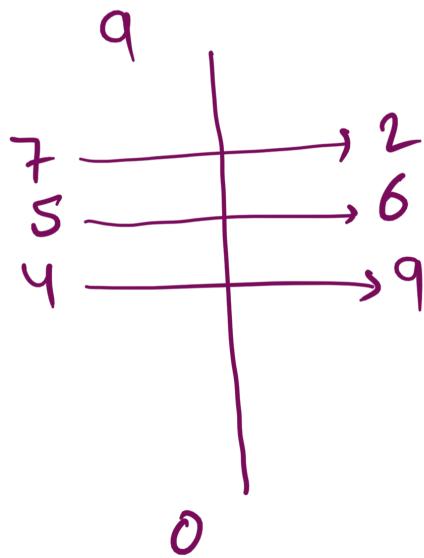
2

4

ans = 4

$$\begin{cases} l = 5 \\ r = 4 \end{cases}$$

$$m = 5$$



Books Allocation Problem

Given an array of integers A of size N and an integer B.

College library has ~~N~~^{books} books, the ith book has A[i] number of pages.

You have to allocate books to B number of students so that maximum number of pages allotted to a student is minimum.

A book will be allocated to exactly one student.

Each student has to be allocated at least one book.

Allotment should be in contiguous order, for example: A student cannot be allocated book 1 and book 3, skipping book 2.

Calculate and return that minimum possible number.

NOTE: Return -1 if a valid assignment is not possible.

$a[] = \{ 7, 9, 3, 6, 5, 2 \} \Rightarrow 29$

$K = 3$

$a[i] \leq 10$
 $n = 10^5$

$J = 0$
 $\gamma = 29$
 $m = 14$

Pages, mid = 12

$sum = 12 \times 2 = 24$
 $curr = 2$

$ans = 14 + 13$

while ($J \leq \gamma$)

$J = 0$

$\gamma = 13$

$m = 6$

$J = 7$

$\gamma = 13$

$m = 10$

$J = 11$
 $\gamma = 13$
 $m = 12$

$J = 13$
 $\gamma = 13$
 $m = 13$

break.

$J = 13$
 $\gamma = 12$

Time \rightarrow $O(\log(\text{sum}) * n)$

$$\log(10^{10}) \rightarrow \frac{10 \log 10}{\log 10} \rightarrow \boxed{30 \dots * n}$$
$$\approx \boxed{O(n)}$$

Aggressive Cows Problem

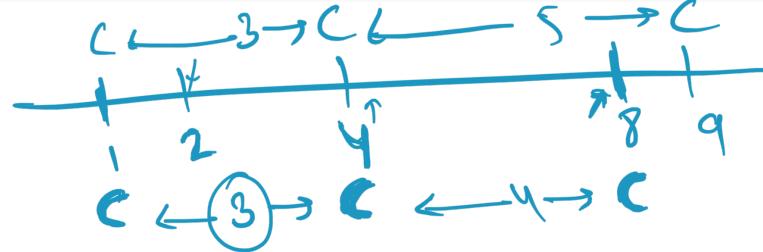
Given an array of length ‘N’ , where each element denotes the position of a stall. Now you have ‘N’ stalls and an integer ‘K’ which denotes the number of cows that are aggressive. To prevent the cows from hurting each other, you need to assign the cows to the stalls, such that the minimum distance between any two of them is as large as possible. Return the largest minimum distance.

Eg

array: 1,2,4,8,9 & k=3

O/P: 3

Explanation: 1st cow at stall 1 , 2nd cow at stall 4 and 3rd cow at stall 8



$$\lambda = 0$$

$$\gamma = 9$$



$$\begin{array}{c} \uparrow \\ m = 4 \end{array}$$

$$\lambda = 0$$

$$\gamma = 3$$

$$\rightarrow m = 1$$

Practice Problems

1. Given a matrix of integers A of size $N \times M$ in which each row is sorted. Find and return the overall median of the matrix A.
2. Painter's partition Problem.
3. <https://www.interviewbit.com/courses/programming/binary-search>