Painter Partition Problem: k painters are hired to paint k units of space, all painters start at the same time, & should wait until every worker has finished their work.

Your task is to find & divide the tasks such that the waiting time is minimum.

arr = [3 5 4 2 | 1 2 3 | 8 6 2 7 | 3 | 11]

Person-1 Person-2 Person-3 P-4 P-5

time taken for Person-1 = 3+5+4+2 = 14 units of time

Person-2 = 1+2+3 = 6 units of time

Person-3 = 8+6+2+7 = 23 units of time

Person-4 = 3+11 = 14 units of time

Person-5 = 11 ⇒ 11 units of time

Because all of other workers should wait until every worker finished their job, we need to consider max-time taken out of each person's work.

⇒ max(14, 6, 23, 14, 11) = 23

Divide the task such that the above time is minimum

arr = [2 8 4 2 11 3 8 9 7]

Lets say there are 4 workers assigned to do this job.

what is the time unit that we cannot reduce further?

The highest unit number in the array is the time we cannot reduce further, it means even if there is a worker for every single time unit, others have to wait for that max unit to be finished.

arr = [2 8 4 2 11 3 8 9 7]

↓ maximum time unit

Now, what is the total or highest amount of units where beyond that there is no time exist?

that is total number of time unit present there, for instance if we gave the whole task for a single person, he/she should do all the work in that total amount of time units.

arr = [2 8 4 2 11 3 8 9 7]

sum = 2+8+4+2+11+3+8+9+7 = 19+11+16+7 = 53 units

Linear search

① start with min unit time and look how many workers can fit, if it is more, increase the time until all workers can fit (3).

time (ans)	# workers	number of workers = 3 ;
11	5	[2 8 4 2 11 3 8 9 7] 1 1 1 1 1 = 5
12	5	[2 8 4 2 11 3 8 9 7] 1 1 1 1 1 = 5
13	5	[2 8 4 2 11 3 8 9 7] 1 1 1 1 1 = 5
14	4	[2 8 4 2 11 3 8 9 7] 1 1 1 1 = 4
15	4	[2 8 4 2 11 3 8 9 7] 1 1 1 1 = 4
16	4	[2 8 4 2 11 3 8 9 7] 1 1 1 1 = 4
17	4	[2 8 4 2 11 3 8 9 7] 1 1 1 1 = 4
⋮		
22	3	[2 8 4 2 11 3 8 9 7] 1 1 1 = 3

Time complexity = $O(ans * N)$

↓

For every answer, check #workers correct or not.

② Binary search :