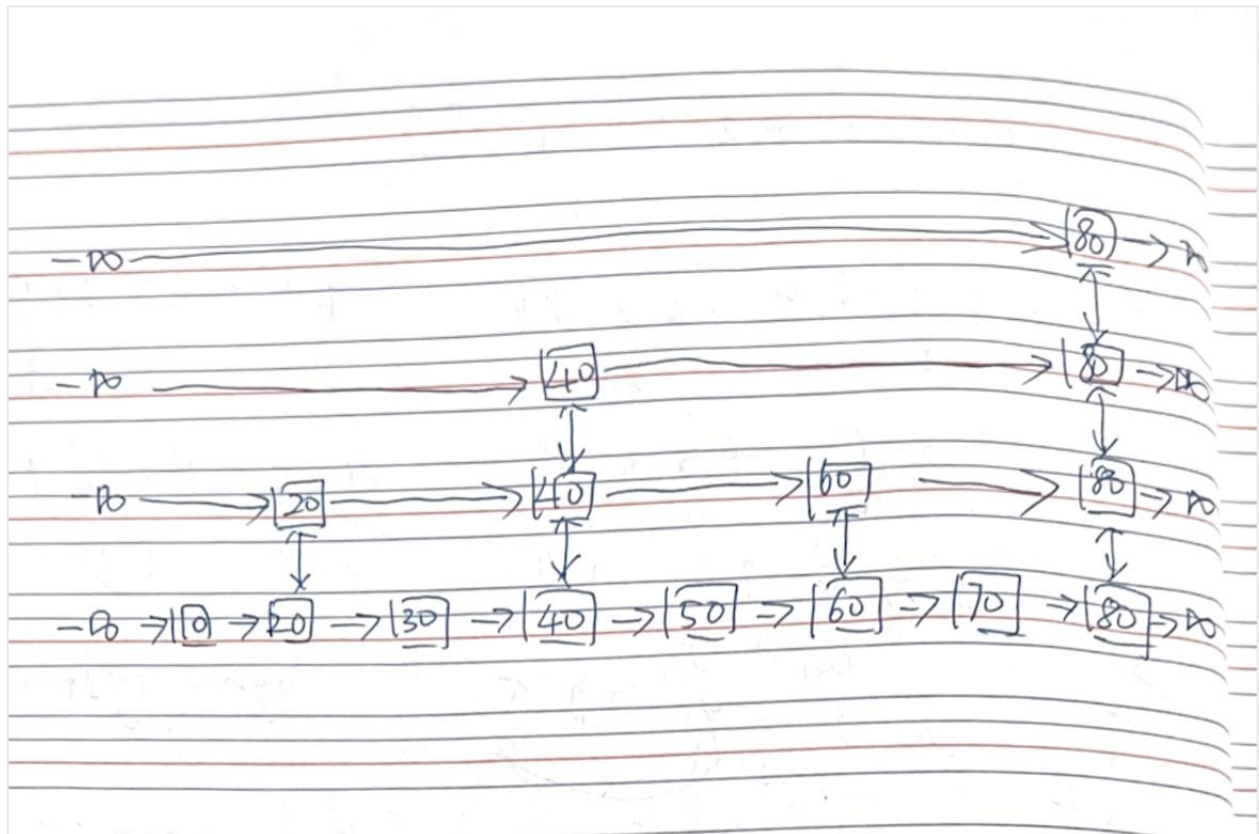


Question1:



Question2:

Suppose we have 4 elements in the array, which are a, b, c, d

First compare, $\text{Max}(a,b)$, $\text{temp1} = \text{Min}(a,b)$

second compare, $\text{Max}(c,d)$, $\text{temp2} = \text{Min}(c,d)$

third compare, $\text{Max}(\text{Max}(a,b), \text{Max}(cd))$, maximum number of 4

forth compare, $\text{Min}(\text{Min}(a,b), \text{Min}(c,d))$, minimum number of 4

fifth compare $\text{Max}(\text{Min}(\text{Max}(a,b), \text{Max}(c,d)), \text{Max}(\text{Min}(a,b), \text{Min}(c,d)))$

2nd max and 3rd max value of 4

Question3:

I can't design an in-place algorithm for this problem, however I'm able to design an algorithm with extra space.

First sort the array.

Place i at the start of the array

Place j at the end of the array

So long as i less than j

Move value in i to the extra array, and move i to the next position toward to end

Move value in j to the extra array, and move j to the next position toward to start

Once i and j crossover, end the loop

$O(n \log n + n)$ is the asymptotic running time of my algorithm

$O(n \log n)$