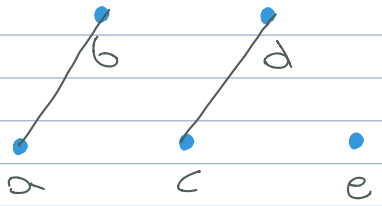
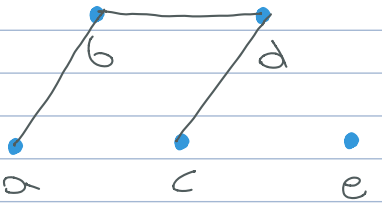
⇒ Can only sort n numbers with $\log_2 n!$

Sorting 5 numbers in 7 comparisons

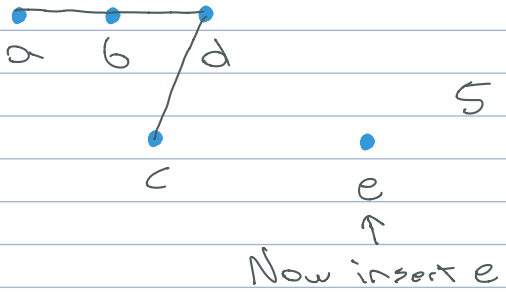
1. a b c d e

2. 

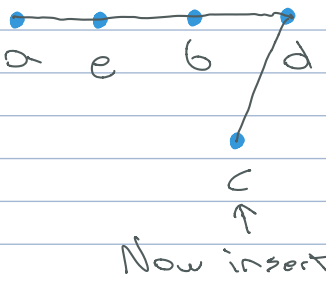
2 comparisons

3. 

3 comparisons

4. 

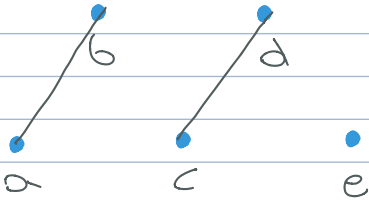
5 comparisons

5. 

7 comparisons

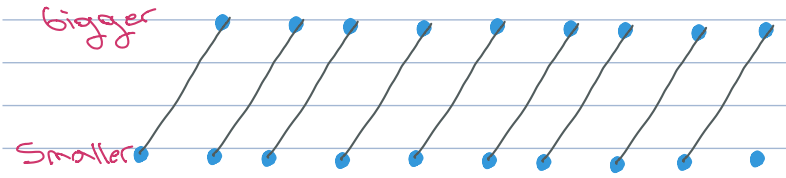
6. It is sorted

Basically, do pairwise sort. Then, from lower half insert into the chain via pairs L to R. Where the rightmost pair inserts first.

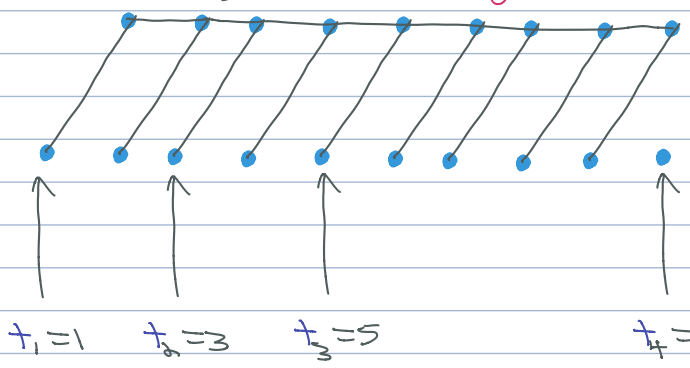


MergeSort $n=21$

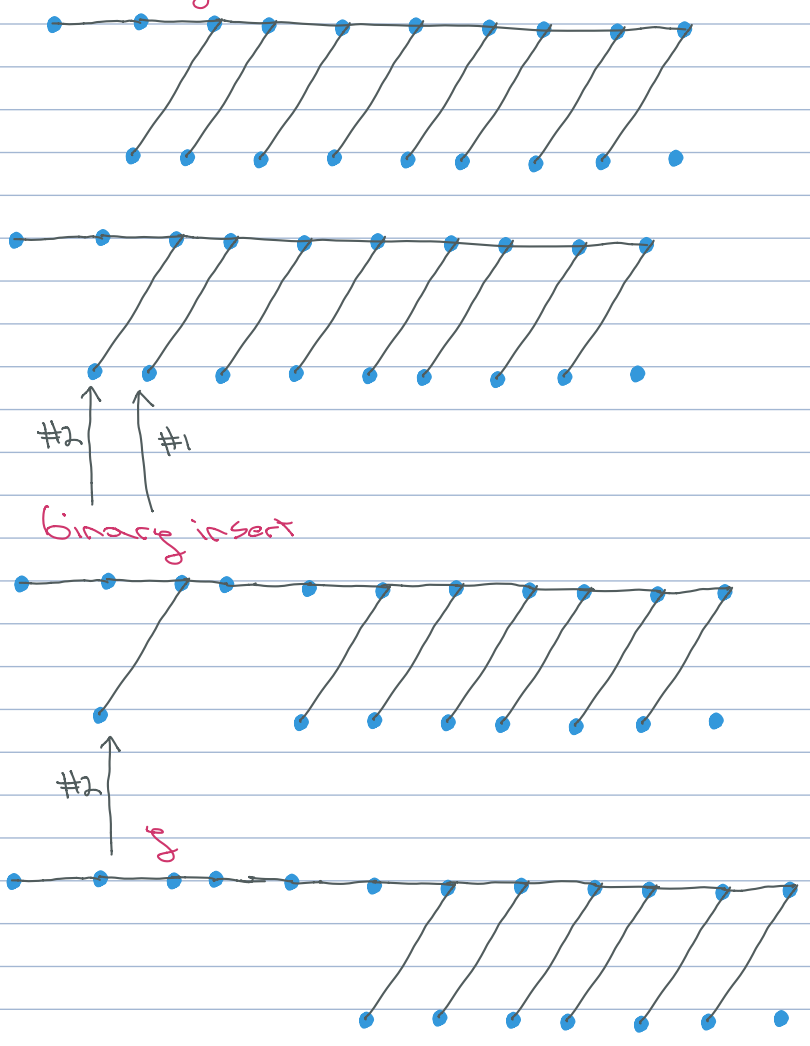
1. Use 10 comparisons to make 10 pairs.



2. Recursively run MergeSort on the upperbound.



3. binary insert lower bound into main chain from L to R



$$t_k + t_{k-1} = 2^k$$

$$t_k = \frac{2^{k+1} + (-1)^k}{3}$$

↑

double-Check that