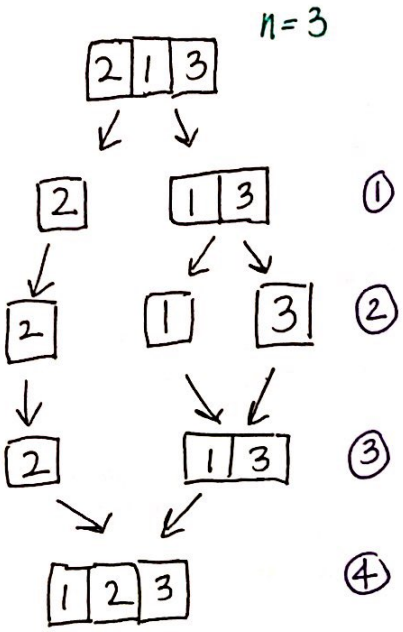
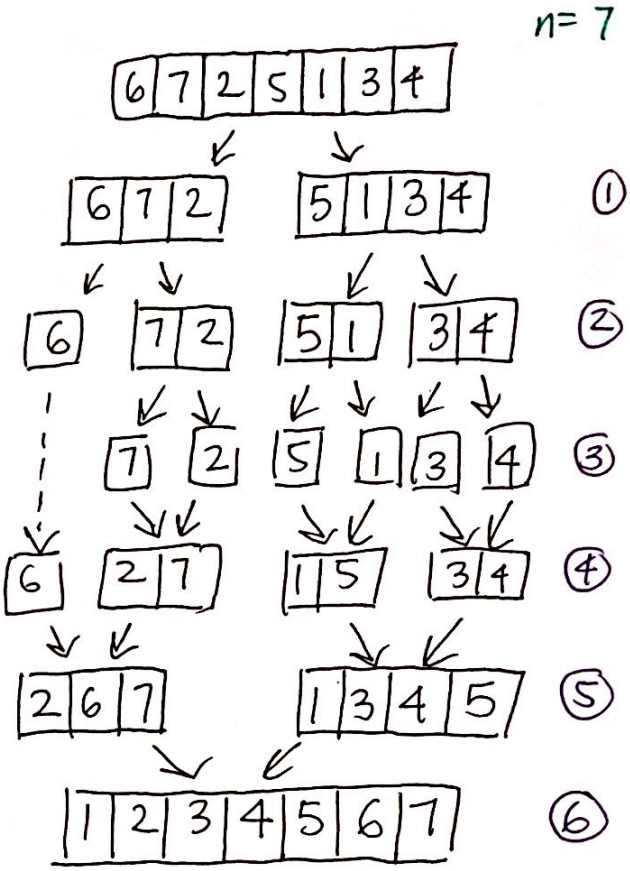
Wenting Li
APCS2 pd 1
HW06 -- How Fast are your Turtles?
2018-02-13

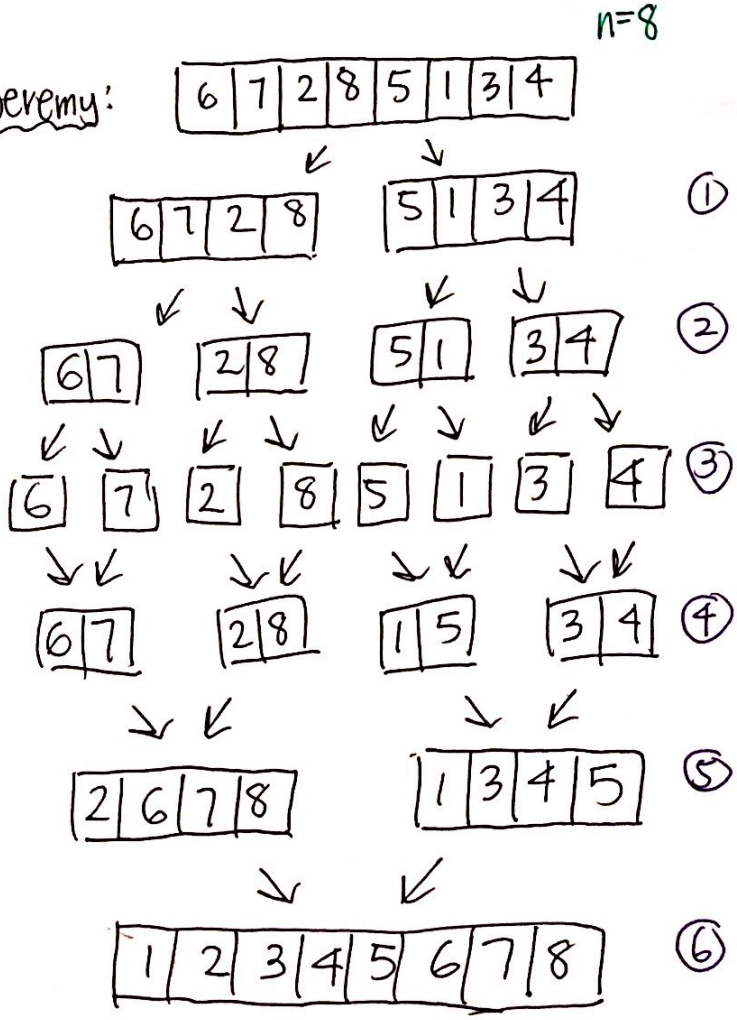
Win:



Tim:

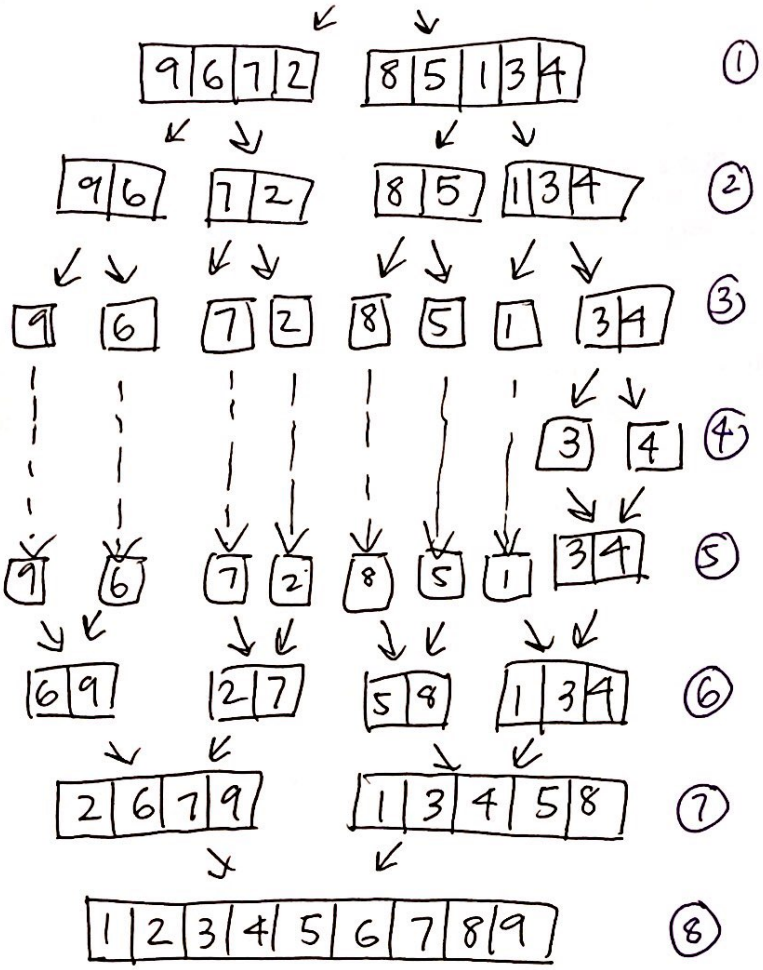


Jeremy:

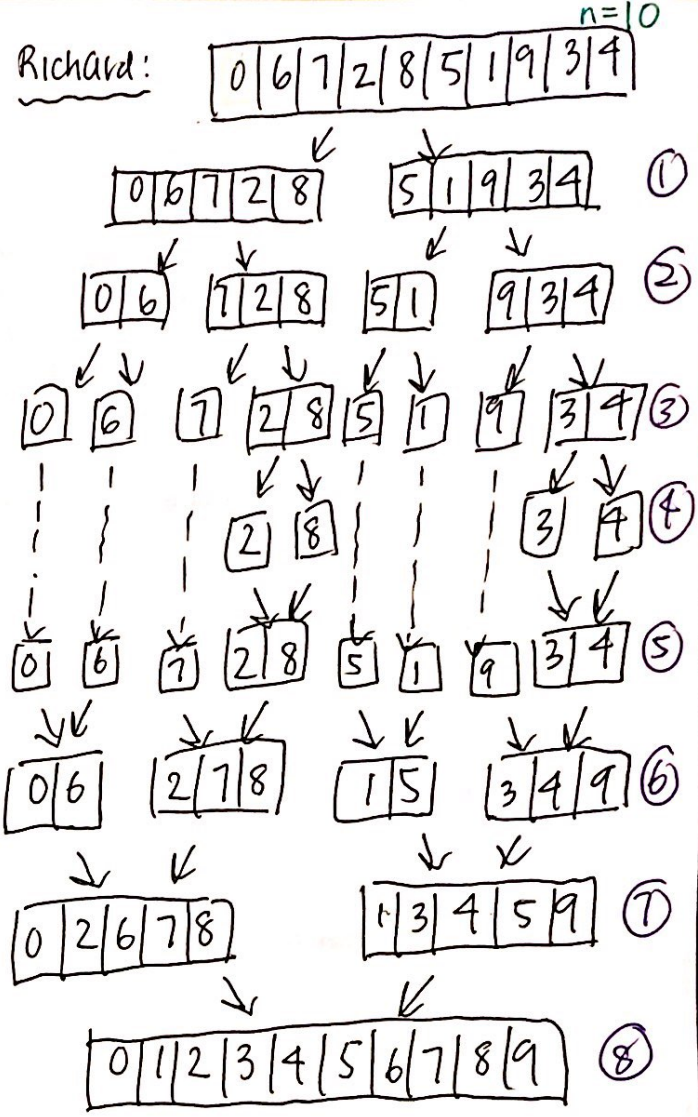


n=1	1	n=9	8
n=2	2	n=10	8
n=3	4	n=11	8
n=4	4	n=12	8
n=5	6	n=13	8
n=6	6	n=14	8
n=7	6	n=15	8
n=8	6	n=16	8

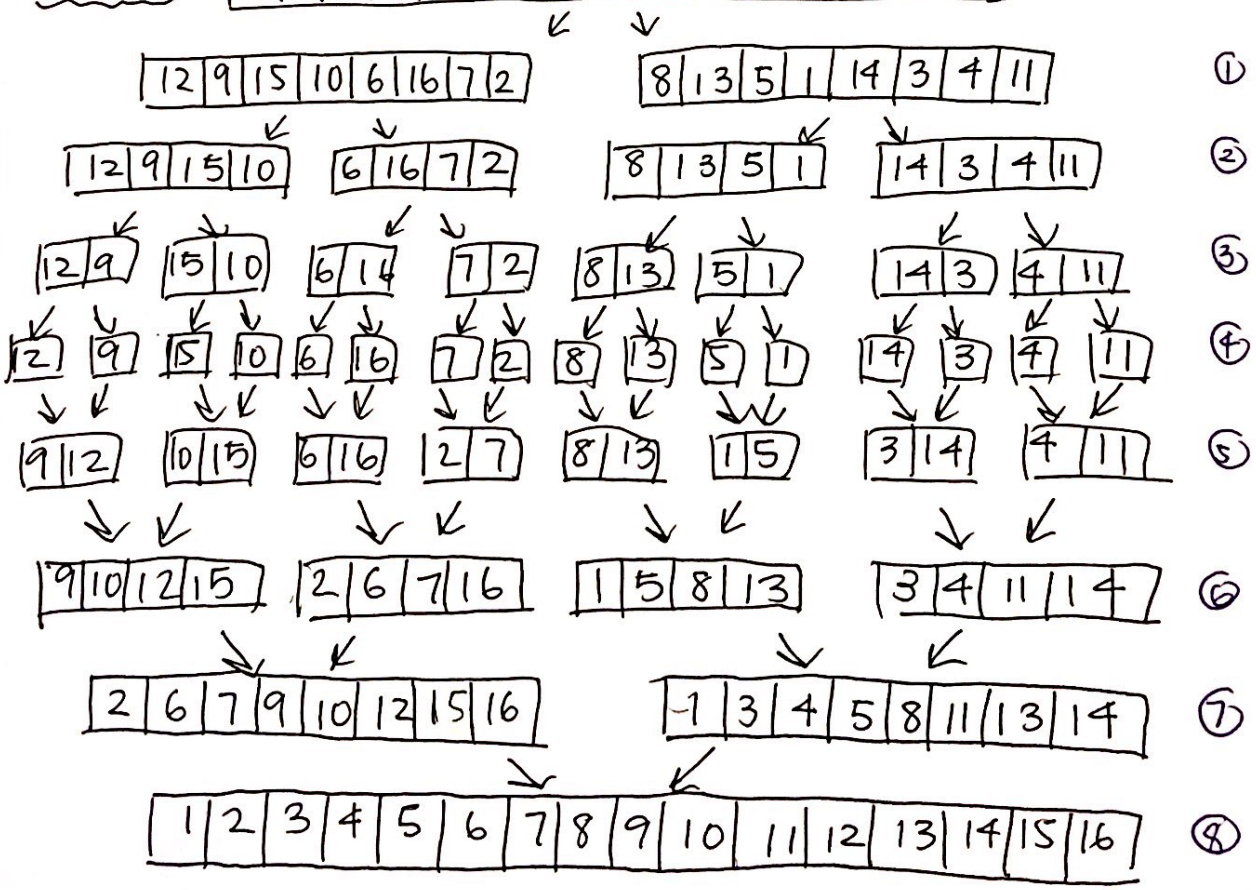
Regine: 9 6 7 2 8 5 1 3 4 n=9



Richard: 0 6 7 2 8 5 1 9 3 4 n=10



William: 12 9 15 10 6 16 7 2 8 13 5 1 14 3 4 11 n=16



Explanation:

The number of layers is $2(\text{floor}(\log_2 n))$, because $\text{floor}(\log_2 n)$ gives us the number of layers it takes to split the array into single-element array parts, so twice that gives us the number of layers it takes to split and then merge all the split array parts. In each layer, you are either merging or splitting, which both just has a runtime of $O(n)$. Therefore, if you have $2\log_2 n$ layers and each layer is n, you have an overall runtime of $O(n\,2\log_2 n)$, which is $\boxed{O(n \log n)}$.