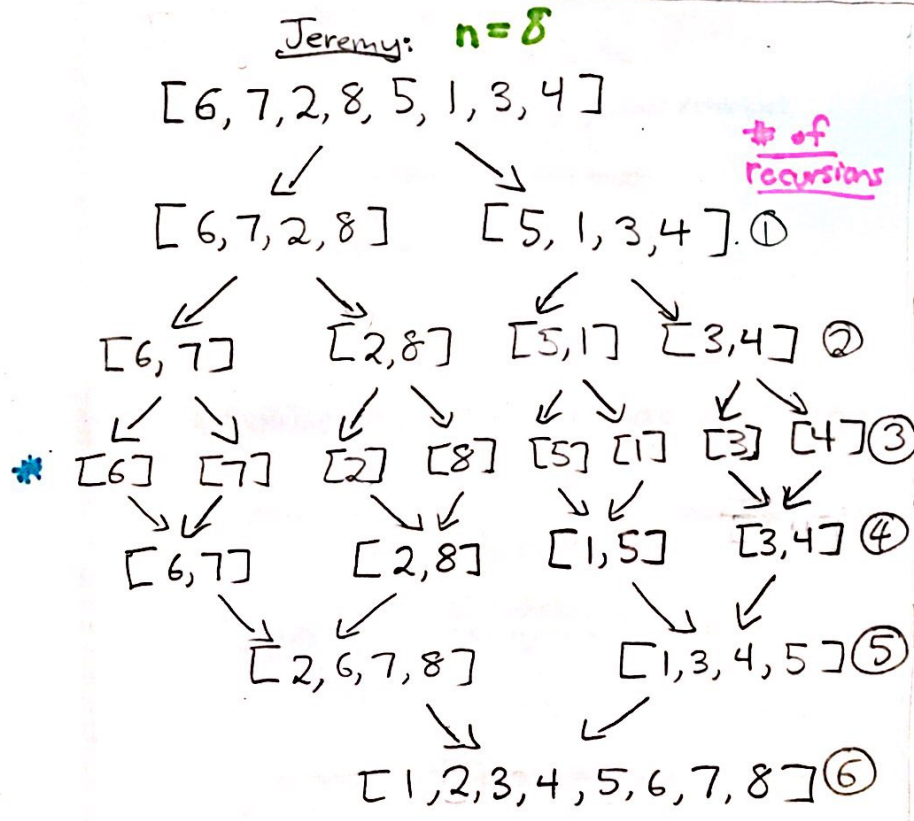Stefan Tan
APCS2 pd 1
HW#06 -- How Fast Are Your Turtles?
2018-02-12

## Win: n=3

[2,1,3]    # of Recursion

[2,1]    [3] ①

[2]  [1]    [3] ② *

[1,2]    [3] ③

[1,2,3] ④

## Tim: n=7

[6,7,2,5,1,3,4]    # of Recursion

[6,7,2,5]    [1,3,4] ①

[6,7]  [2,5]  [1,3]  [4] ②

[6]  [7]  [2]  [5]  [1]  [3]  [4] ③ *

[6,7]  [2,5]  [1,3]  [4] ④

[2,5,6,7]    [1,3,4] ⑤

[1,2,3,4,5,6,7] ⑥

## Jeremy: n=8

[6,7,2,8,5,1,3,4]    # of recursions

[6,7,2,8]    [5,1,3,4] ①

[6,7]  [2,8]  [5,1]  [3,4] ②

* [6]  [7]  [2]  [8]  [5]  [1]  [3]  [4] ③

[6,7]  [2,8]  [1,5]  [3,4] ④

[2,6,7,8]    [1,3,4,5] ⑤

[1,2,3,4,5,6,7,8] ⑥

## Régine: n=9

# of recursions    [9,6,7,2,8,5,1,3,4]

① [9,6,7,2,8]    [5,1,3,4]

② [9,6,7]  [2,8]    [5,1]  [3,4]

③ [9,6]  [7]  [2]  [8]  [1]  [5]  [3] [4]

④ [9]  [6]  [7]  [2]  [8]  [1]  [5]  [3] [4]

⑤ [6,9]  [7]  [2,8]  [1,5]  [3,4]

⑥ [6,7,9]  [2,8]    [1,3,4,5]

⑦ [2,6,7,8,9]    [1,3,4,5]

⑧ [1,2,3,4,5,6,7,8,9]
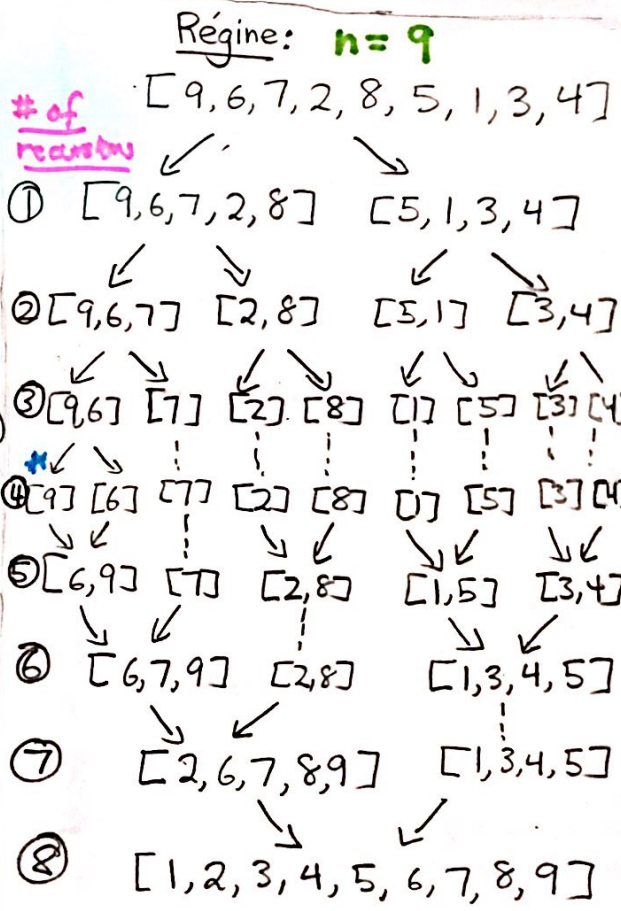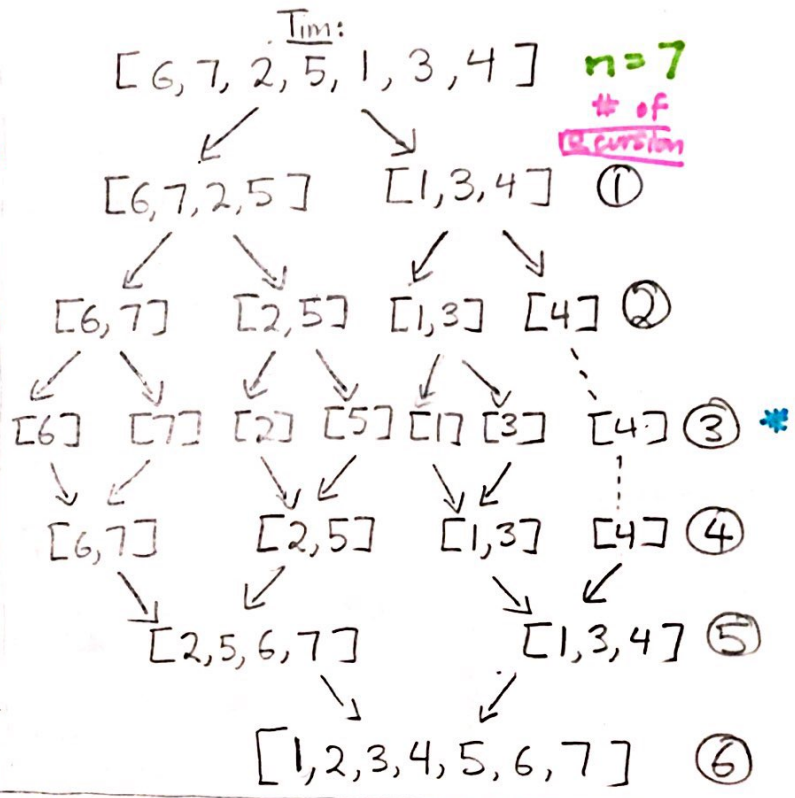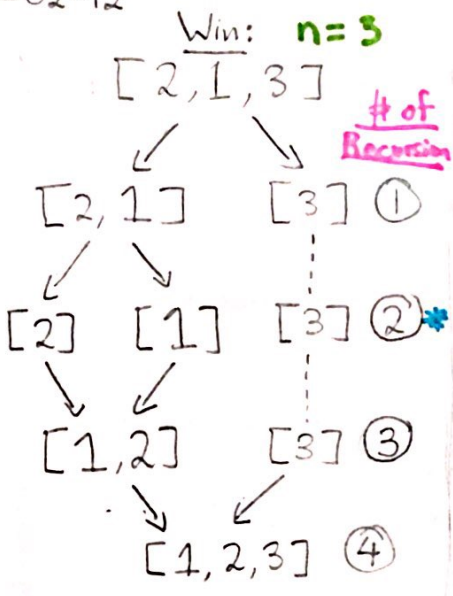
* = pass at which the arrays are
split up into individual arrays.

**Richard:** n=10

[0, 6, 7, 2, 8, 5, 1, 9, 3, 4]

# of recursions

[0, 6, 7, 2, 8]   [5, 1, 9, 3, 4] ①

[0, 6, 7]  [2, 8]   [5, 1, 9]  [3, 4] ②

[0, 6]  [7]  [2]  [8]   [5, 1]  [9]  [3]  [4] ③

[0]  [6]  [7]  [2]  [8]   [5]  [1]  [9]  [3]  [4] ④ *

[0, 6]  [7]   [2, 8]   [1, 5]  [9]   [3, 4] ⑤

[0, 6, 7]   [2, 8]   [1, 5, 9]   [3, 4] ⑥

[0, 2, 6, 7, 8]   [1, 3, 4, 5, 9] ⑦

[0, 1, 2, 3, 4, 5, 6, 7, 8, 9] ⑧

**William:** n=16

[12, 9, 15, 10, 6, 16, 7, 2, 8, 13, 5, 1, 14, 3, 4, 11]

# of recursions

[12, 9, 15, 10, 6, 16, 7, 2]   [8, 13, 5, 1, 14, 3, 4, 11] ①

[12, 9, 15, 10]  [6, 16, 7, 2]   [8, 13, 5, 1]  [14, 3, 4, 11] ②

[12, 9]  [15, 10]   [6, 16]  [7, 2]   [8, 13]  [5, 1]   [14, 3]  [4, 11] ③

[12]  [9]  [15]  [10]   [6]  [16]  [7]  [2]   [8]  [13]  [5]  [1]   [14]  [3]  [4]  [11] ④ *

[9, 12]   [10, 15]   [6, 16]  [2, 7]   [8, 13]  [1, 5]   [3, 14]  [4, 11] ⑤

[9, 10, 12, 15]   [2, 6, 7, 16]   [1, 5, 8, 13]   [3, 4, 11, 14] ⑥

[2, 6, 7, 9, 10, 12, 15, 16]   [1, 3, 4, 5, 8, 11, 13, 14] ⑦

[1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16] ⑧

Explanation:

The efficiency of merge sort seems to increase as the data size gets larger.

For example array Richard and array William have a difference of 6 elements in the array yet they require the same number of passes.

This means that it is more faster than O(n) runtime so it has to be O(log n).