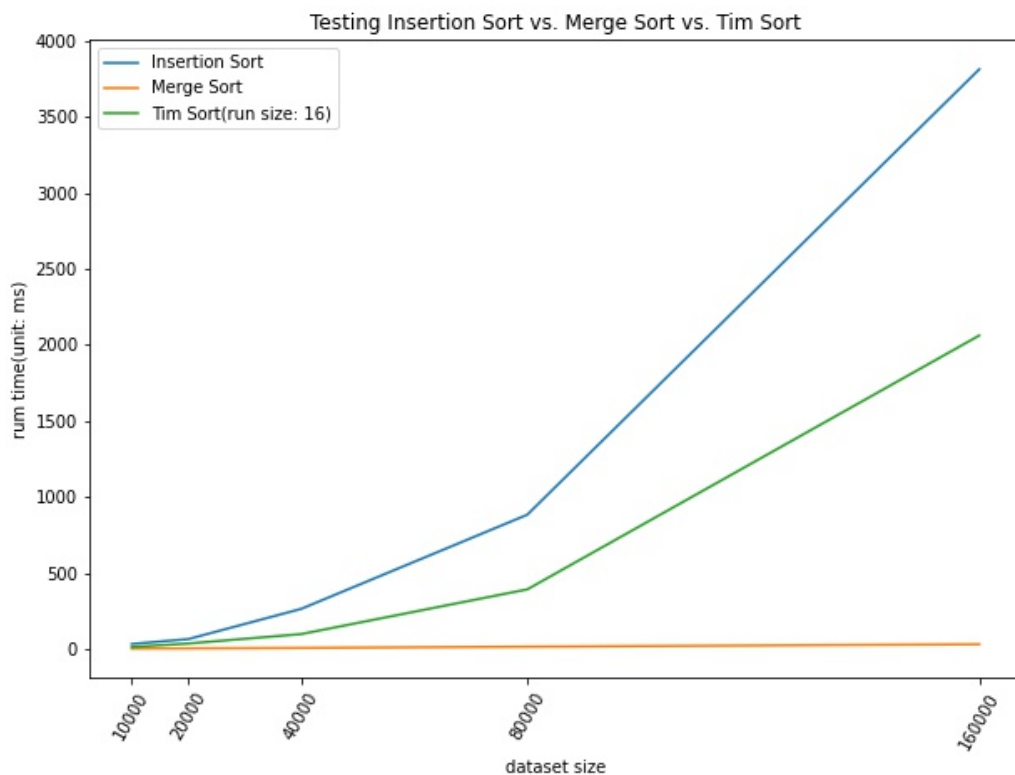# Runtime Analysis

Task 1. Testing Insertion Sort vs. Merge Sort vs. Tim Sort

- Dataset sizes = {10000, 20000, 40000, 80000, 160000}
- time unit: millisecond

Dataset Size	Insertion Sort	Merge Sort	Tim Sort (run size: 16)
10000	33	3	13
20000	65	4	36
40000	264	7	98
80000	883	15	392
160000	3813	31	2062

As the picture depicts above, when dataset sizes doubles, these three sort algorithms' performance varies from each other.

Insertion sort takes O(n) time complexity

Testing Tim Sort Cutoff Values

- Dataset size = 200,000

- Cutoff Values for Run Size = {4, 8, 16, 32, 64, 128}

Run Size	Time (unit: ms)
4	2886
8	1263
16	630
32	318
64	165
128	85

Testing Tim Sort Cutoff Values