

# Running Time Analysis Report

Empirical vs. Expected Growth:

Input size 20 compared to 10:

- Empirical time growth factor: 0.30
- Expected growth factor ( $O(n \log n)$ ): 1.60

Input size 50 compared to 20:

- Empirical time growth factor: 5.94
- Expected growth factor ( $O(n \log n)$ ): 2.08

Input size 100 compared to 50:

- Empirical time growth factor: 14.61
- Expected growth factor ( $O(n \log n)$ ): 1.71

Input size 200 compared to 100:

- Empirical time growth factor: 0.26
- Expected growth factor ( $O(n \log n)$ ): 1.75

Input size 500 compared to 200:

- Empirical time growth factor: 28.80
- Expected growth factor ( $O(n \log n)$ ): 2.22

Input size 1000 compared to 500:

- Empirical time growth factor: 2.97
- Expected growth factor ( $O(n \log n)$ ): 1.80

Input size 2000 compared to 1000:

- Empirical time growth factor: 2.55
- Expected growth factor ( $O(n \log n)$ ): 1.82

Input size 5000 compared to 2000:

- Empirical time growth factor: 2.23

- Expected growth factor ( $O(n \log n)$ ): 2.12

Input size 10000 compared to 5000:

- Empirical time growth factor: 2.51

- Expected growth factor ( $O(n \log n)$ ): 1.86

Graph of Empirical Running Time vs  $O(n \log n)$ :

