

# Running Time Analysis Report

Empirical vs. Expected Growth:

Input size 20 compared to 10:

- Empirical time growth factor: 2.37
- Expected growth factor ( $O(n \log n)$ ): 1.60

Input size 50 compared to 20:

- Empirical time growth factor: 10.67
- Expected growth factor ( $O(n \log n)$ ): 2.08

Input size 100 compared to 50:

- Empirical time growth factor: 2.41
- Expected growth factor ( $O(n \log n)$ ): 1.71

Input size 200 compared to 100:

- Empirical time growth factor: 2.96
- Expected growth factor ( $O(n \log n)$ ): 1.75

Input size 500 compared to 200:

- Empirical time growth factor: 2.10
- Expected growth factor ( $O(n \log n)$ ): 2.22

Input size 1000 compared to 500:

- Empirical time growth factor: 1.13
- Expected growth factor ( $O(n \log n)$ ): 1.80

Input size 2000 compared to 1000:

- Empirical time growth factor: 2.70
- Expected growth factor ( $O(n \log n)$ ): 1.82

Input size 5000 compared to 2000:

- Empirical time growth factor: 3.77

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

Input size 10000 compared to 5000:

- Empirical time growth factor: 3.75

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

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

