

Question 1:

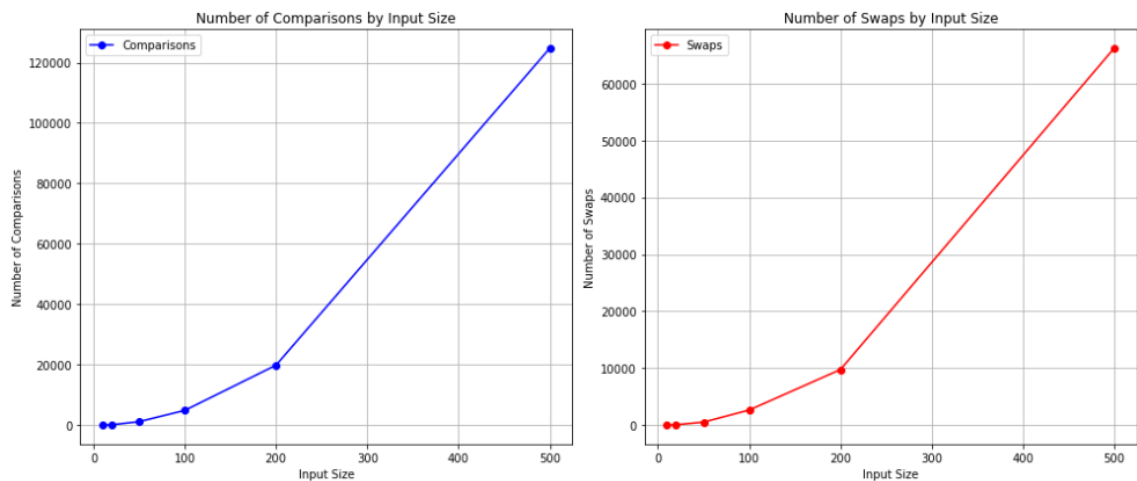
Average-Case Number of Comparisons:

$$C = \frac{n(n-1)}{2}$$

Average-Case Number of Swaps:

$$S = \frac{n(n-1)}{4}$$

Question 4:



The plots of average comparisons and swaps against input sizes both show a linear increase as the input size grows. In bubble sort, each comparison and each swap contribute to the overall time complexity. Since both the number of comparisons and swaps grow linearly with the input size, the combined effect results in quadratic time complexity denoted as $O(n^2)$. Therefore, the linear trends observed in both plots align with the expected quadratic complexity of bubble sort.