

# All Sorts of Sorting Algorithms

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## 1 Introduction

In this assignment, we were tasked with implementing 4 sorting algorithms. The sorting algorithms we designed include: Quicksort, Heapsort, Shell Sort, and Batchers's Odd-Even Merge Sort. Furthermore We were also tasked with gathering statistics from those sorting methods, including data on the number of compares and moves required by each algorithm. Lastly, we implemented a small set creation and manipulation program for keeping track of command line options and other use in the future. We utilized all these functions and programs in our test harness "sorting.c", where we ran each of the sorts on an array with randomly generated numbers.

## 2 The Sorts

Not all sorts are created equal. Different sorts can have different situations in which they perform well. Of the 4 sorts we created, 3 of them (quick, heap, and batcher sorts) have an average time complexity of  $O(n \log n)$ . On the other hand, our Shell Sort implementation using the Pratt sequence has a time complexity of  $O(n^{\frac{5}{3}})$ . The following graph exemplifies these differences by showing the number of moves required to sort based on the size of the graph:

