|  |  |  |
| --- | --- | --- |
| **Selection Sort** | | |
| **List Size** | **Comparisons** | **Time (seconds)** |
| **1,000 (observed)** | 499500 | 0.0839 |
| **2,000 (observed)** | 1999000 | 0.3424 |
| **4,000 (observed)** | 7998000 | 1.4448 |
| **8,000 (observed)** | 31996000 | 5.5538 |
| **16,000 (observed)** | 127992000 | 22.5215 |
| **32,000 (observed)** | 511984000 | 91.7351 |
| **100,000 (estimated)** | 4999950000 | 360 |
| **500,000 (estimated)** | 124999750000 | 1440 |
| **1,000,000 (estimated)** | 499999500000 | 5760 |
| **10,000,000 (estimated)** | 4.9999995e+13 | 23,040 |

|  |  |  |
| --- | --- | --- |
| **Insertion Sort** | | |
| **List Size** | **Comparisons** | **Time (seconds)** |
| **1,000 (observed)** | 247991 | 0.1142 |
| **2,000 (observed)** | 1018723 | 0.4240 |
| **4,000 (observed)** | 3995271 | 1.5246 |
| **8,000 (observed)** | 16112202 | 6.3502 |
| **16,000 (observed)** | 64667457 | 26.5556 |
| **32,000 (observed)** | 25707127 | 120.9697 |
| **100,000 (estimated)** | 2.5e9 | 1000 |
| **500,000 (estimated)** | 6.25e10 | 25000 |
| **1,000,000 (estimated)** | 2.5e11 | 100,000 |
| **10,000,000 (estimated)** | 2.5e13 | 10,000,000 |

1. Which sort do you think is better? Why?

In general, insertion sort is better because uses about half of the comparisons that selection sort does, meaning less work is done. Insertion sort only looks through the part of the unsorted list while selection sort has to look through the entire list each pass.

1. Which sort is better when sorting a list that is already sorted (or mostly sorted)? Why?

When a list is (mostly) sorted, selection sort is better because the majority of the work in selection sort is sorting through the unsorted part of the list, whereas insertion sort iterates through the sorted part of the list to find where to insert the value.

1. You probably found that insertion sort had about half as many comparisons as selection sort. Why? Why are the times for insertion sort not half what they are for selection sort? (For part of the answer, think about what insertion sort has to do more of compared to selection sort.)

Insertion sort has about half as many comparisons as selection sort because it is inserting (shifting the other values in the list) rather than swapping the values like in selection sort. However, the time is not what we would expect because the time it takes for a swap is faster than it is to insert/shift.