**Project**

|  |  |  |  |
| --- | --- | --- | --- |
| number of loops | bubble sort timing(ns) | insertion sort timing (ns) | merge sort timing (ns) |
| 1 | 3453162000 | 697647000 | 404244000 |
| 2 | 3266348000 | 538986000 | 227747000 |
| 3 | 4335807000 | 537948000 | 261625000 |
| 4 | 2606548000 | 177720000 | 228151000 |
| 5 | 2689905000 | 204332000 | 265455000 |
| 6 | 4307304000 | 185440000 | 276519000 |
| 7 | 2642652000 | 170928000 | 220520000 |
| 8 | 4176661000 | 1498378000 | 1320929000 |
| 9 | 5286461000 | 517756000 | 777968000 |
| 10 | 3736891000 | 201985000 | 222726000 |
| Average | 3650173900 | 473112000 | 420588400 |

**Table shows the time recorded for insertion, bubble and merge sort and its average.**

This is the output in the console :  
  
Time Stamp: 1

Time for Bubble Sort is: 3453162000 Nano's

Time for Insertion Sort is: 697647000 Nano's

Time for Merge Sort is: 404244000 Nano's

Time Stamp: 2

Time for Bubble Sort is: 3266348000 Nano's

Time for Insertion Sort is: 538986000 Nano's

Time for Merge Sort is: 227747000 Nano's

Time Stamp: 3

Time for Bubble Sort is: 4335807000 Nano's

Time for Insertion Sort is: 537948000 Nano's

Time for Merge Sort is: 261625000 Nano's

Time Stamp: 4

Time for Bubble Sort is: 2606548000 Nano's

Time for Insertion Sort is: 177720000 Nano's

Time for Merge Sort is: 228151000 Nano's

Time Stamp: 5

Time for Bubble Sort is: 2689905000 Nano's

Time for Insertion Sort is: 204332000 Nano's

Time for Merge Sort is: 265455000 Nano's

Time Stamp: 6

Time for Bubble Sort is: 4307304000 Nano's

Time for Insertion Sort is: 185440000 Nano's

Time for Merge Sort is: 276519000 Nano's

Time Stamp: 7

Time for Bubble Sort is: 2642652000 Nano's

Time for Insertion Sort is: 170928000 Nano's

Time for Merge Sort is: 220520000 Nano's

Time Stamp: 8

Time for Bubble Sort is: 4176661000 Nano's

Time for Insertion Sort is: 1498378000 Nano's

Time for Merge Sort is: 1320929000 Nano's

Time Stamp: 9

Time for Bubble Sort is: 5286461000 Nano's

Time for Insertion Sort is: 517756000 Nano's

Time for Merge Sort is: 777968000 Nano's

Time Stamp: 10

Time for Bubble Sort is: 3736891000 Nano's

Time for Insertion Sort is: 201985000 Nano's

Time for Merge Sort is: 222726000 Nano's

=== Code Execution Successful ===  
  
  
In this project, I used Bubble Sort, Insertion Sort, and recursive Merge Sort to sort an array of 50,000 random numbers. Each algorithm was run 10 times, recording the sorting time in nanoseconds. I then averaged the times to identify the fastest and slowest sorting methods as shown in the table. The process and results are shown below through code, tables, and images. I will attach the codes in a different file. After analyzing we found out merge sort is taking less time, this proved that merge sort is faster than insertion and bubble sort.