**Assignment - 3(Benchmarking)**

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**Task 1:**

**Text

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**Unit Tests:**

**Timer Test:**

Graphical user interface, text

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**Benchmark Test:**

Graphical user interface, text

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Task 2:

**Text

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**InsertionSortTest:**

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**Task 3 :**

Implemented a main program to run the benchmarks and measured the running times of this sort

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| N |  | Ordered |  | Partially |  | Random |  | Reverse |  |
|  |  | (millisec) | lg ratio | (millisec) | lg ratio | (millisec) | lg ratio | (millisec) | lg ratio |
| 250 | Raw Time | 0.06 |  | 0.97 |  | 0.88 |  | 1.34 |  |
| 500 | Raw Time | 0.055 | -0.13 | 0.3 | -1.69 | 0.51 | -0.79 | 3.44 | 1.36 |
| 1000 | Raw Time | 0.01 | -2.46 | 0.73 | 1.28 | 1.25 | 1.29 | 4.59 | 0.42 |
| 2000 | Raw Time | 0.02 | 1 | 1.96 | 1.42 | 2.63 | 1.07 | 8.99 | 0.97 |
| 4000 | Raw Time | 0.01 | -1 | 8.37 | 2.09 | 14.86 | 2.5 | 26.16 | 1.54 |
| 8000 | Raw Time | 0.03 | 1.58 | 34.46 | 2.04 | 64.45 | 2.12 | 64.46 | 1.3 |
| 16000 | Raw Time | 0.07 | 1.22 | 127.226 | 1.88 | 157.29 | 1.29 | 370.87 | 2.52 |
|  |  |  |  |  |  |  |  |  |  |

To avoid negative values, I plotted the graph by multiplying the values obtained in above table by 1000, below table shows the resultant values

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| log(N) | log(T) Ordered | log(T) Partially | log(T) Random | log(T) Reverse |
| 7.965784285 | 5.906890596 | 9.921840937 | 9.781359714 | 10.38801729 |
| 8.965784285 | 5.781359714 | 8.22881869 | 8.994353437 | 11.74819285 |
| 9.965784285 | 3.321928095 | 9.511752654 | 10.28771238 | 12.16427844 |
| 10.96578428 | 4.321928095 | 10.93663794 | 11.36084708 | 13.1341054 |
| 11.96578428 | 3.321928095 | 13.03101191 | 13.8591465 | 14.67507492 |
| 12.96578428 | 4.906890596 | 15.07263508 | 15.97589274 | 15.97611657 |
| 13.96578428 | 6.129283017 | 16.95703401 | 17.26306743 | 18.50055405 |

**A screenshot of a computer

Description automatically generated**

Plotted below graph using the values obtained from above Table:

**Chart, line chart

Description automatically generated**

**Conclusion:**

When the input array is sorted, the order of growth is not significantly affected; however, when the input array is partially sorted, random, or reverse ordered, it increases with the size of the array in all other situations. It is slightly lower for partially sorted and random arrays since they don't require as many swaps as reverse ordered arrays do, and it is always higher for reverse ordered because it requires the most swaps.