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**Program Structures & Algorithms**

**Fall 2021**

**Assignment No. 2**

* **Task**

**Question:**

**There are three parts of overall tasks:**

1. **Implement three methods of a class called Timer.**
2. **Implement InsertionSort by simply looking up the insertion code used by Arrays.sort.**
3. **Implement a main program to actually run the following benchmarks: measure the running times of this sort, using four different initial array ordering situations: random, ordered, partially-ordered and reverse-ordered. Use the doubling method for choosing n and test for at least five values of n. Draw any conclusions from your observations regarding the order of growth.**

* **Relationship Conclusion:**

1. **Running time: Reverse-Ordered > Random > Partially-Ordered > Ordered**
2. **For Ordered array, the relationship among N and Time is almost linear.**
3. **Increasing rate of Time with larger N: Reverse-Ordered > Random > Partially-Ordered > Ordered**

* **Evidence to support the conclusion:**

1. **Output**

**图形用户界面, 文本, 应用程序

描述已自动生成图形用户界面, 文本, 应用程序

描述已自动生成Here are times for four different types of arrays:**

**图形用户界面, 文本, 应用程序

描述已自动生成**

**图形用户界面, 文本, 应用程序

描述已自动生成**

1. **Graphical Representation**

**The graph observed:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| N | random | ordered | partially -ordered | reverse-ordered |
| 500 | 0.106355 | 0.005419 | 0.035781 | 0.057449 |
| 1000 | 0.376302 | 0.00893 | 0.138268 | 0.224512 |
| 2000 | 0.857376 | 0.017642 | 0.48578 | 0.956718 |
| 4000 | 1.747063 | 0.019762 | 1.762057 | 3.541571 |
| 8000 | 7.152535 | 0.038781 | 4.77068 | 24.63061 |
| 16000 | 27.74747 | 0.075862 | 7.99329 | 60.42497 |
| 32000 | 116.6566 | 0.14062 | 30.31337 | 261.6932 |
| 64000 | 490.2033 | 0.279758 | 114.9185 | 987.3597 |

* **Unit tests result:**

1. 图形用户界面, 应用程序

   描述已自动生成**TimerTest unit tests are pass and none of code is modified:**

图形用户界面, 文本, 应用程序

描述已自动生成

图形用户界面, 应用程序

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1. **BenchMarkTest unit tests are pass and none of code is modified:**

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1. **InsertionSortTest unit tests are pass and none of code is modified:**

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