Activity 1. Bubble algorithm

|  |  |  |  |
| --- | --- | --- | --- |
| N(10^4) | t ordered | t reverse | t random |
| 1 | 325 | 1459 | 1018 |
| 2 | 1223 | 5873 | 4112 |
| 4 | 4928 | 23406 | 16538 |
| 8 | 20033 | 94558 | 67298 |
| 16 | 81113 | OoT | OoT |

With a complexity of O(n^2), as we increase the n by 2 and having a O(n^2) complexity it makes sense that the times are multiplied by 4.

Activity 2. Selection algorithm

|  |  |  |  |
| --- | --- | --- | --- |
| N(10^4) | t ordered | t reverse | t random |
| 1 | 326 | 295 | 312 |
| 2 | 1282 | 1178 | 1266 |
| 4 | 5162 | 4656 | 5077 |
| 8 | 20117 | 18424 | 20258 |
| 16 | 79879 | 73450 | 80147 |

Same as before it makes sense that the times are being multiplied by 4 with respect with the previous.

Activity 3. Insertion algorithm

|  |  |  |  |
| --- | --- | --- | --- |
| N(10^4) | t ordered | t reverse | t random |
| 1 | LoR | LoR | LoR |
| 2 | LoR | LoR | LoR |
| 4 | LoR | LoR | LoR |
| 8 | LoR | LoR | LoR |
| 16 | LoR | LoR | 60 |
| 32 | LoR | 50 | 121 |
| 64 | 89 | 102 | 259 |
| 128 | 179 | 211 | 565 |
| 256 | 374 | 432 | 1161 |
| 512 | 781 | 873 | 2568 |
| 1024 | 1620 | 1803 | 5976 |
| 2048 | 3322 | 3661 | 14756 |
| 4096 | 6703 | 7501 | 41121 |
| 8192 | 13795 | 15277 | OoT |

Although it has the same O(n^2) complexity as the previous algorithms we can see that it is much more efficient. Even when we could suppose that the times would be also multiplied by 4 they are only multiplied by 2 except in the largest cases of the random sorted vector.

Activity 4. Quicksort algorithm

|  |  |  |  |
| --- | --- | --- | --- |
| N(10^4) | t ordered | t reverse | t random |
| 25 | LoR | LoR | 101 |
| 50 | 62 | 71 | 192 |
| 100 | 127 | 145 | 436 |
| 200 | 255 | 293 | 929 |
| 400 | 532 | 618 | 1932 |
| 800 | 1099 | 1248 | 4326 |
| 1600 | 2313 | 2546 | 10523 |

With a complexity of O(nlogn) these times make sense even in the random sorted array as the worst case complexity is n^2

Activity 5. Quicksort + Insertion algorithm

|  |  |
| --- | --- |
| n | t random |
| Quicksort | 10523 |
| Quicksort + Insertion (k=5) | 10349 |
| Quicksort + Insertion (k=10) | 10317 |
| Quicksort + Insertion (k=20) | 10275 |
| Quicksort + Insertion (k=30) | 10219 |
| Quicksort + Insertion (k=50) | 9991 |
| Quicksort + Insertion (k=100) | 9218 |
| Quicksort + Insertion (k=200) | 7717 |
| Quicksort + Insertion (k=500) | 10607 |
| Quicksort + Insertion (k=1000) | 18558 |