Activity 1. [Direct exchange or Bubble algorithm]

|  |  |  |  |
| --- | --- | --- | --- |
| n | T ordered | T reverse | T random |
| 10000 | 333 | 1524 | 1079 |
| 2\*10000 | 1254 | 5976 | 4265 |
| 2^2\*10000 | 4908 | 23844 | 16829 |
| 2^3\*10000 | 19757 | OoT | 67368 |
| 2^4\*10000 | OoT | OoT | OoT |

All three, ordered, reverse and random have a quadratic complexity O(n^2), the times make sense as reverse has to make more changes in the vector than random, and ordered has no changes to do.

Activity 2. [Selection algorithm]

|  |  |  |  |
| --- | --- | --- | --- |
| n | T ordered | T reverse | T random |
| 10000 | 313 | 296 | 320 |
| 2\*10000 | 1260 | 1176 | 1266 |
| 2^2\*10000 | 5045 | 4507 | 5022 |
| 2^3\*10000 | 19450 | 18041 | 20069 |
| 2^4\*10000 | OoT | OoT | OoT |

All three, ordered, reverse and random have a quadratic complexity O(n^2). It makes sense as for this method it is not better if the vector is ordered or if it is not.

Activity 3. [Insertion algorithm]

|  |  |  |  |
| --- | --- | --- | --- |
| n | T ordered | T reverse | T random |
| 10000 | LoR | 299 | 154 |
| 2\*10000 | LoR | 1158 | 584 |
| 2^2\*10000 | LoR | 4683 | 2344 |
| 2^3\*10000 | LoR | 18816 | 9277 |
| 2^4\*10000 | LoR | 74765 | 37072 |
| 2^5\*10000 | LoR | OoT | OoT |
| 2^6\*10000 | LoR | OoT | OoT |
| 2^7\*10000 | LoR | OoT | OoT |
| 2^8\*10000 | LoR | OoT | OoT |
| 2^9\*10000 | 91 | OoT | OoT |
| 2^10\*10000 | 179 | OoT | OoT |
| 2^11\*10000 | 359 | OoT | OoT |
| 2^12\*10000 | 728 | OoT | OoT |
| 2^13\*10000 | 1452 | OoT | OoT |

Yes, as the complexity is linear O(n) for the ordered vectors as it does not have to enter the while loop, and it is quadratic O(n^2) for the reverse and random vectors, as it enters the while loop that iterates n times.

Activity 4. [Quicksort algorithm]

|  |  |  |  |
| --- | --- | --- | --- |
| n | T ordered | T reverse | T random |
| 25000 | LoR | LoR | 93 |
| 2\*25000 | 63 | 72 | 192 |
| 2^2\*25000 | 123 | 140 | 403 |
| 2^3\*25000 | 257 | 289 | 869 |
| 2^4\*25000 | 530 | 599 | 1873 |
| 2^5\*25000 | 1098 | 1249 | 4229 |
| 2^6\*25000 | 2263 | 2523 | 10312 |

Buble: O(n^2) for random

n1 = 10000 -> t1 = 1079 ms , n2=16\*106 -> t2=?

K=(n22/n12)

t2 = k\*t1 = ((16\*106)2/100002)\*1079 ms = (16\*1012/1\*108)\*1079 ms = 16\*104\*1079 ms = 172640000 ms \* (1 s/1000ms)\*(1h/3600s)\*(1 day/24h) = 1,998 days

Selection: O(n^2) for random

n1 = 10000 -> t1 = 320 ms , n2=16\*106 -> t2=?

K=(n22/n12)

t2= k\*t1 = ((16\*106)2/100002)\*320 ms = (16\*1012/1\*108)\*320 ms = 16\*104\*320 ms = 51200000 ms \* (1 s/1000ms)\*(1h/3600s)\*(1 day/24h) = 0,593 days

Selection: O(n^2) for random

n1 = 10000 -> t1 = 154 ms , n2=16\*106 -> t2=?

K=(n22/n12)

t2 = k\*t1 = ((16\*106)2/100002)\*154 ms = (16\*1012/1\*108)\*154 ms = 16\*104\*154 ms = 24640000 ms \* (1 s/1000ms)\*(1h/3600s)\*(1 day/24h) = 0,285 days