Algoritmos de ordenamiento QuickSort & HeapSort

1. QuickSort

• Análisis de la Complejidad Temporal

$$T(n) = O(n \log n)$$

• Tabla con los casos de prueba y sus tiempos de ejecución

QuickSort	Mejor de los Casos (Ordenado)	Caso Aleatorio
Casos Pequeños	0.0000 ms	0.0000 ms
Casos Pequeños	0.0000 ms	0.0000 ms
Casos Grandes	1.9951 ms	2.0001 ms
Casos Grandes	1.9971 ms	2.0001 ms

• Análisis del QuickSort:

Después de ejecutar los códigos por ambas partes y visualizar los tiempos de ejecución para este tipo de ordenamiento (QuickSort), podemos concluir que para los "casos pequeños" donde hemos utilizado un arreglo de 10 000 elementos es tan rápido el tiempo en que se ordena que es casi nulo por lo que nos muestra un tiempo de 0 ms, en cambio para los "casos grandes" donde hemos empleado un arreglo de 100 000 elementos si se llega a visualizar un tiempo considerable y mayor a 0 por lo que llegamos a concluir la diferencia entre dichos casos y la cantidad de elementos a ordenar. Así mismo observamos y concluimos que en el "mejor de los casos" donde el arreglo está ordenado es más eficiente que en los "otros casos".

2. HeapSort

• Análisis de la Complejidad Temporal

$$T(n) = O(n \log n)$$

• Tabla con los casos de prueba y sus tiempos de ejecución

HeapSort	Mejor de los casos (Ordenado)	Caso Aleatorio
Casos Pequeños	0.9973 ms	1.0004 ms

Casos Pequeños	0.0000 ms	0.0000 ms
Casos Grandes	13.0016 ms	13.0028 ms
Casos Grandes	12.0043 ms	11.0074 ms

• Análisis del HeapSort:

Después de ejecutar los códigos por ambas partes y visualizar los tiempos de ejecución para este tipo de ordenamiento (HeapSort), podemos concluir que para los "casos pequeños" donde hemos utilizado un arreglo de 10 000 elementos ya se logra visualizar un tiempo considerable y también para los "casos grandes" donde hemos empleado un arreglo de 100 000 elementos observando un mayor tiempo de ejecución.

3. Análisis general de resultados:

Después de varias ejecuciones con múltiples tamaños para los arreglos, logramos obtener los tiempos de ejecución promedio con 10k elementos en los casos pequeños y 100k elementos en los casos grandes:

"Tiempos de Ejecución promedio"		
HeapSort	Mejor de los casos (Ordenado)	Caso Aleatorio
Casos Pequeños	0.4993 ms	0.5002 ms
Casos Grandes	13.016 ms	12.0051 ms

"Tiempos de Ejecución Promedio"		
QuickSort	Mejor de los Casos (Ordenado)	Caso Aleatorio
Casos Pequeños	0.0000 ms	0.0000 ms
Casos Grandes	1.9967 ms	1.9998 ms

Después de analizar ambos ordenamientos y sus tiempos de ejecución se concluye que el ordenamiento Quicksort es el más eficiente porque sus tiempos tanto para los casos pequeños y grandes son menores a comparación del ordenamiento HeapSort.

4. Anexos:

Capturas de los ejecutables:

Casos pequeños ordenado:

```
□ D\Users\Sebastian Skytz\Desktop\Labo\Quicky HeapSortexe

- □ X

5, 9506, 9507, 9508, 9509, 9510, 9511, 9512, 9513, 9514, 9515, 9516, 9517, 9518, 9519, 9520, 9521, 9522, 9523, 9524, 952

5, 9526, 9527, 9528, 9529, 9530, 9531, 9532, 9533, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9541, 9542, 9543, 9544, 954

5, 9546, 9547, 9568, 9569, 9570, 9571, 9572, 9573, 9574, 9575, 9576, 9577, 9578, 9559, 9560, 9561, 9662, 9663, 9664, 9665

5, 9566, 9567, 9568, 9569, 9570, 9571, 9572, 9573, 9574, 9575, 9576, 9577, 9578, 9579, 9580, 9599, 9600, 9601, 9602, 9603, 9604, 9601

5, 9606, 9607, 9608, 9609, 9610, 9611, 9612, 9613, 9614, 9615, 9616, 9617, 9618, 9619, 9620, 9621, 9622, 9623, 9624, 962

5, 9626, 9647, 9628, 9629, 9630, 9631, 9632, 9633, 9634, 9635, 9666, 9667, 9668, 9667, 9668, 9669, 9669, 9671, 9672, 9673, 9674, 9675, 9676, 9677, 9678, 9679, 9680, 9611, 9612, 9613, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 9612, 96
```

```
9506, 9507, 9508, 9509, 9510, 9511, 9512, 9513, 9514, 9515, 9516, 9517, 9518, 9519, 9520, 9521, 9522, 9523, 9524, 9526, 9527, 9528, 9529, 9530, 9531, 9532, 9533, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9541, 9542, 9543, 9544, 954
                                               9551, 9552, 9553, 9554, 9555, 9556, 9577, 9588, 9599, 9591, 9592, 9593, 9594, 9595, 9596, 9597, 9598, 9599, 9591, 9592, 9593, 9594, 9595, 9596, 9597, 9598, 9599, 9611, 9612, 9613, 9614, 9615, 9616, 9617, 9618, 9619,
9546, 9547, 9548, 9549, 9550, 9566, 9567, 9568, 9569, 9570,
                                                                                                                                       9560, 9561, 9562,
                                                                                                                                                                    9563, 9564,
9586, 9587, 9588, 9589, 9590,
                                                                                                                                       9600, 9601, 9602, 9603, 9604,
                                                                                                                                                                                        960
9606, 9607, 9608, 9609, 9610,
                                                                                                                                       9620, 9621, 9622, 9623, 9624,
                                               9611, 9612, 9613, 9614, 9613, 9616, 9617, 9611, 9652, 9633, 9654, 9655, 9656, 9657, 9671, 9672, 9673, 9674, 9675, 9676, 9677, 9691, 9692, 9693, 9694, 9695, 9696, 9697,
                  9628, 9629, 9630,
9648, 9649, 9650,
                                                                                                                    9638, 9639,
9658, 9659,
                                                                                                                                       9640, 9641, 9642,
9660, 9661, 9662,
                                                                                                                                                 9641, 9642,
                                                                                                                                                                    9643, 9644,
                                                                                                                                                                    9663, 9664,
9646, 9647,
                                                                                                                    9678, 9679,
9698, 9699,
                                                                                                                                       9680, 9681, 9682, 9683, 9684, 9700, 9701, 9702, 9703, 9704,
9686, 9687,
                   9688, 9689, 9690,
9706,
                                                9711, 9712, 9713, 9714, 9715, 9716, 9717, 9731, 9732, 9733, 9734, 9735, 9736, 9737, 9751, 9752, 9753, 9754, 9755, 9756, 9757,
         9707,
                  9708,
                            9709, 9710,
                                                                                                                                                                    9723, 9724,
9726, 9727, 9728, 9729, 9730, 9746, 9747, 9748, 9749, 9750,
                                                                                                                    9738, 9739,
                                                                                                                                       9740, 9741, 9742, 9743, 9744, 9760, 9761, 9762, 9763, 9764,
                                                                                                                    9758, 9759,
                                                                                                                                       9780,
                                                                                                                                                 9781, 9782, 9783, 9784,
                                                9791, 9792, 9793, 9794, 9795,
9811, 9812, 9813, 9814, 9815,
9831, 9832, 9833, 9834, 9835,
                                                                                                9796, 9797,
9816, 9817,
9786, 9787,
                  9788, 9789,
                                                                                                                    9798, 9799,
                                                                                                                                       9800,
                                                                                                                                                 9801, 9802,
                                                                                                                                                                    9803, 9804,
                                                                                                                    9818, 9819,
                  9808, 9809, 9810,
                                                                                                                                       9820, 9821, 9822, 9823, 9824,
9806, 9807,
                   9828, 9829,
                                                                                                9836, 9837,
                                                                                                                    9838, 9839,
                                                                                                                                       9840, 9841, 9842, 9843, 9844,
                                               9851, 9852, 9853, 9854, 9855, 9856, 9857, 9871, 9872, 9873, 9874, 9875, 9876, 9877, 9891, 9892, 9893, 9894, 9895, 9896, 9897, 9911, 9912, 9913, 9914, 9915, 9916, 9917,
                                                                                                                    9858, 9859,
9878, 9879,
         9847,
                  9848, 9849,
                                      9850,
                                                                                                                                       9860,
                                                                                                                                                 9861, 9862,
                                                                                                                                                                    9863, 9864,
9866,
                                                                                                                                                                    9883, 9884,
                   9868, 9869, 9870,
         9867.
                                                                                                                                       9880.
                                                                                                                                                                                        988
                                                                                                                    9898, 9899,
9918, 9919,
9886, 9887,
                  9888, 9889,
                                      9890,
                                                                                                                                       9900,
                   9908, 9909,
                                                                                                                                                 9921, 9922, 9923, 9924,
9906, 9907,
9926,
                  9928,
                            9929,
                                                9931, 9932, 9933, 9934, 9935, 9936, 9937,
9951, 9952, 9953, 9954, 9955, 9956, 9957,
9971, 9972, 9973, 9974, 9975, 9976, 9977,
                                      9930,
                                                                                                                    9938, 9939,
                                                                                                                                       9940,
                                                                                                                                                 9941, 9942, 9943, 9944,
                                                                                                                                                                                        994
                                                                                                                    9958, 9959,
                   9948, 9949, 9950,
                                                                                                                                                 9961, 9962, 9963, 9964,
                                                                                                                                                                                        996
9946, 9947,
                                                                                                                                       9960,
                                                                                                                                       9980,
10000
                   9968, 9969, 9970,
                                                                                                                    9978, 9979,
                                                                                                                                                 9981, 9982, 9983, 9984, 998
                            9989, 9990,
                                                9991, 9992, 9993,
                                                                             9994, 9995,
                                                                                                                    9998,
Tiempo de ejecución OuickSort: 0 ms.
Tiempo de ejecución HeapSort: 0 ms.
```

Casos pequeños aleatorio:

```
■ D\Users\Sebastian Sightx\Desktop\Labo\Quicky HeapSort.exe

5, 9506, 9507, 9508, 9509, 9510, 9511, 9512, 9513, 9514, 9515, 9516, 9517, 9518, 9519, 9520, 9521, 9522, 9523, 9524, 952, 9526, 9527, 9528, 9529, 9530, 9531, 9532, 9533, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9541, 9542, 9543, 9544, 9545, 9546, 9547, 9548, 9549, 9550, 9551, 9552, 9553, 9554, 9555, 9556, 9557, 9558, 9559, 9560, 9561, 9562, 9563, 9564, 956

5, 9566, 9567, 9568, 9569, 9579, 9571, 9572, 9573, 9574, 9575, 9576, 9577, 9578, 9579, 9588, 9581, 9582, 9583, 9584, 958

5, 9586, 9587, 9588, 9589, 9590, 9591, 9592, 9593, 9594, 9595, 9596, 9597, 9598, 9599, 9600, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9601, 9602, 9603, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604, 9604
```

```
9506, 9507, 9508, 9509, 9510, 9511, 9512, 9513, 9514, 9515, 9516, 9517, 9518, 9519, 9520, 9521, 9522, 9523, 9524, 952, 9526, 9527, 9528, 9529, 9530, 9531, 9532, 9533, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9541, 9542, 9543, 9544, 954, 9546, 9547, 9548, 9549, 9559, 9550, 9551, 9552, 9553, 9554, 9555, 9556, 9557, 9558, 9559, 9560, 9561, 9562, 9563, 9564, 956, 9567, 9568, 9567, 9568, 9569, 9571, 9572, 9573, 9574, 9575, 9576, 9577, 9578, 9579, 9580, 9581, 9582, 9583, 9584, 958, 9587, 9588, 9589, 9589, 9589, 9591, 9592, 9593, 9594, 9595, 9596, 9597, 9598, 9599, 9600, 9601, 9602, 9603, 9604, 960, 9606, 9607, 9608, 9609, 9610, 9611, 9612, 9613, 9614, 9615, 9616, 9617, 9618, 9619, 9620, 9621, 9622, 9623, 9624, 962, 9622, 9623, 9634, 9631, 9632, 9633, 9634, 9635, 9636, 9637, 9638, 9639, 9640, 9641, 9642, 9643, 9644, 964, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9644, 9645, 9650, 9651, 9652, 9653, 9654, 9655, 9656, 9657, 9658, 9659, 9669, 9660, 9661, 9662, 9663, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9664, 9
          9786, 9787, 9788, 9789, 9790, 9791, 9792, 9793, 9794, 9795, 9796, 9797, 9798, 9799, 9800, 9801, 9802, 9803, 9804, 9806, 9807, 9808, 9809, 9810, 9811, 9812, 9813, 9814, 9815, 9816, 9817, 9818, 9819, 9820, 9821, 9822, 9823, 9824, 9826, 9827, 9828, 9829, 9830, 9831, 9832, 9833, 9834, 9835, 9836, 9837, 9838, 9839, 9840, 9841, 9842, 9843, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 9844, 
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         980
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         982
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         984
              9846, 9847, 9848, 9849,
                                                                                                                                                                                                                                                 9850, 9851, 9852, 9853, 9854, 9855, 9856, 9857, 9858, 9859, 9860, 9861, 9862, 9863, 9864,
        9846, 9867, 9868, 9869, 9870, 9871, 9872, 9873, 9874, 9875, 9876, 9877, 9878, 9899, 9900, 9901, 9902, 9903, 9904, 9866, 9887, 9888, 9889, 9899, 9900, 9911, 9912, 9913, 9914, 9915, 9916, 9917, 9918, 9919, 9920, 9921, 9922, 9923, 9924, 9926, 9927, 9928, 9929, 9930, 9931, 9932, 9933, 9934, 9935, 9936, 9937, 9938, 9939, 9940, 9941, 9942, 9943, 9944, 9926, 9927, 9928, 9929, 9930, 9931, 9932, 9933, 9934, 9935, 9936, 9957, 9958, 9959, 9960, 9961, 9962, 9963, 9964, 9963, 9964, 9963, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 9964, 
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         988
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         990
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         992
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      994
          9966, 9967, 9968, 9969, 9970, 9971, 9972, 9973, 9974, 9975, 9976, 9977, 9978, 9979, 9980, 9981, 9982, 9983, 9984, 998
9986, 9987, 9988, 9989, 9990, 9991, 9992, 9993, 9994, 9995, 9996, 9997, 9998, 9999, 10000.
            9966,
          Tiempo de ejecución OuickSort: 0 ms.
          Tiempo de ejecución HeapSort: 0 ms.
```

Casos grandes ordenado:

D:\Users\Sebastian Skyhz\Desktop\Labo\Quick y HeapSort.exe

□ D\Users\Sebastian Skyhz\Desktop\Labo\Quicky HeapSort.exe

□ 576, 99577, 99578, 99579, 99580, 99581, 99582, 99583, 99584, 99585, 99586, 99587, 99588, 99589, 99591, 99592, 99593, 99594, 99595, 99596, 99597, 99598, 99599, 99600, 99601, 99601, 99601, 99612, 99613, 99614, 99612, 99613, 99614, 99612, 99613, 99614, 99613, 99614, 99612, 99633, 99624, 99624, 99625, 99626, 99667, 99688, 99630, 99631, 99631, 99631, 99631, 99631, 99631, 99631, 99631, 99632, 99633, 99634, 99639, 99644, 99645, 99646, 99647, 99648, 99649, 99658, 99658, 99658, 99658, 99658, 99658, 99658, 99658, 99657, 99688, 99669, 99669, 99669, 99669, 99669, 99669, 99669, 99669, 99679, 99680, 99681, 99682, 99683, 99684, 99685, 99686, 99687, 99688, 99689, 99694, 99694, 99695, 996969, 99691, 99692, 99694, 99694, 99695, 996969, 99694, 99691, 99692, 99694, 99695, 996969, 99698, 99694, 99691, 99692, 99694, 99695, 99696, 99697, 99688, 99698, 99694, 99701, 99712, 99723, 99724, 99723, 99724, 99725, 99726, 99727, 99728, 99729, 99733, 99734, 99731, 99732, 99733, 99734, 99734, 99734, 99744, 99745, 99746, 99747, 99788, 99799, 99744, 99745, 99746, 99746, 99746, 99746, 99746, 99746, 99746, 99746, 99746, 99746, 99746, 99746, 99746, 99746, 99769, 99751, 99752, 99753, 99754, 99755, 99756, 99756, 99756, 99766, 99766, 99767, 99768, 99766, 99767, 99768, 99766, 99767, 99768, 99766, 99767, 99768, 99766, 99767, 99788, 99784, 9

- > Tiempo de ejecución QuickSort: 1.9951 ms.
- Tiempo de ejecución HeapSort: 13.016 ms.

***C\Users\ROSMER\\Downloads\Quicky HeapSort.exe**

2576, 99577, 99578, 99579, 99580, 99581, 99582, 99583, 99584, 99585, 99586, 99587, 99588, 99589, 99590, 99591, 99592, 99

263, 99594, 99595, 99596, 99597, 99598, 99599, 99600, 99601, 99602, 99603, 99604, 99605, 99606, 99607, 99608, 99601, 99611, 99612, 99613, 99614, 99615, 99616, 99617, 99618, 99619, 99620, 99621, 99623, 99624, 99625, 99626, 9962

264, 99612, 99630, 99631, 99613, 99613, 99631, 99651, 99653, 99654, 99657, 99638, 99639, 99640, 99641, 99642, 99643, 99644, 99645, 99664, 99664, 99665, 99666, 99667, 99668, 99667, 99668, 99667, 99668, 99669, 99670, 99671, 99672, 99673, 99674, 99675, 99676, 99677, 99678, 99678, 99680, 99681, 99682, 99683, 99684, 99685, 99686, 99687, 99688, 99689, 99690, 99691, 99692, 99633, 99694, 99695, 99696, 99677, 99678, 99676, 99677, 99678, 99676, 99677, 99678, 99676, 99677, 99678, 99678, 99674, 99677, 99678, 99676, 99677, 99678, 99674, 99678, 99674, 99678, 99674, 99678, 99674, 99678, 99674, 99678, 99674, 99678, 99674, 99678, 99774, 99718, 99714, 99715, 99716, 99717, 99718, 99719, 99720, 99721, 99722, 99723, 99724, 99725, 99726, 99727, 99728, 99729, 99784, 99734, 99744, 99745, 99746, 99766, 99767, 99688, 99699, 99699, 99699, 99699, 99699, 99699, 99699, 99699, 99699, 99699, 99769, 99774, 99778, 99778, 99778, 99779, 99788, 99789, 99766, 99767, 99688, 99699, 99769, 99779, 99778, 99778, 99778, 99778, 99778, 99779, 99788, 99789, 99780, 99781, 99782, 99788, 99789, 99766, 99767, 99688, 99699, 99699, 99699, 99799, 99799, 99794, 99794, 99781, 99782, 99783, 99784, 99785, 99786, 99787, 99788, 99789, 99789, 99799, 99791, 99794, 99798, 99798, 99799, 99809, 99804, 99904, 99904, 9

- Tiempo de ejecución QuickSort: 1.9971 ms.
- Tiempo de ejecución HeapSort: 12.0015 ms.

Casos grandes aleatorio:

■ D\Users\Sebastian Skytz\Desktop\Labo\Quicky HeapSort.exe

- □ ×
9576, 99577, 99578, 99579, 99580, 99581, 99582, 99583, 99584, 99585, 99586, 99587, 99588, 99589, 99590, 99591, 99592, 99
583, 99594, 99595, 99596, 99597, 99598, 99599, 99600, 99601, 99602, 99603, 99604, 99605, 99607, 99608, 99607, 99608, 99607,
10, 99611, 99612, 99613, 99614, 99615, 99616, 99617, 99618, 99619, 99620, 99621, 99622, 99623, 99624, 99625, 99626, 9962
7, 99628, 99629, 99630, 99631, 99632, 99633, 99634, 99635, 99637, 99638, 99639, 99644, 99642, 99644, 99645, 99666, 99667, 99668, 99667, 99668, 99667, 99668, 99667, 99668, 99667, 99668, 99667, 99668, 99667, 99668, 99667, 99678, 99677, 99678, 99677, 99678, 99678, 99680, 99681, 99682, 99683, 99684, 99685, 99689, 99690, 99611, 99672, 99673, 99674, 99677, 99678, 99676, 99677, 99678,
99679, 99680, 99681, 99682, 99683, 99684, 99685, 99689, 99670, 99671, 99672, 99673, 99674, 99675, 99676, 99677, 99688,
99699, 99690, 99700, 99701, 99712, 99703, 99704, 99705, 99706, 99707, 99708, 99704, 99714, 99714, 99712, 997
30, 99731, 99732, 99733, 99734, 99735, 99739, 99724, 99722, 99723, 99724, 99725, 99727, 99772, 99772, 997729, 9977
7, 99748, 99749, 99750, 99751, 99752, 99753, 99754, 99755, 99756, 99757, 99758, 99756, 99767, 99768, 99769, 99770, 99781,
99782, 99783, 99784, 99785, 99786, 99787, 99783, 99784, 99785, 99786, 99777, 99778, 99779, 99788, 99799,
99799, 99800, 99001, 99802, 99803, 99804, 99805, 99806, 99807, 99808, 99804, 99812, 99812, 99813, 99814, 99815, 99816, 99817, 99813, 99814, 99815, 99816, 99817, 99818, 99819, 99820, 99801, 99811, 99812, 9983, 99830, 99804, 99804, 99805, 99806, 99807, 99808, 99804, 99807, 99808, 99809, 99801, 99811, 99812, 9983, 99889, 99899, 99804, 99819, 9981, 9991, 999

- > Tiempo de ejecución QuickSort: 2.0001 ms.
- Tiempo de ejecución HeapSort: 13.0028 ms.

C:\Users\ROSMERI\Downloads\Ouick v HeapSort.ex

\$\text{Colsers\RosMER\Downloads\Quicky\HeapSort.exe}\$

9576, 99577, 99578, 99579, 99580, 99581, 99582, 99583, 99584, 99585, 99586, 99587, 99588, 99589, 99590, 99591, 99592, 99

503, 99594, 99595, 99596, 99596, 99597, 99598, 99599, 99600, 99601, 99602, 99603, 99604, 99605, 99606, 99607, 99608, 99609, 996

10, 99611, 99612, 99613, 99614, 99615, 99616, 99617, 99618, 99619, 99620, 99621, 99623, 99624, 99625, 99626, 9962

7, 99628, 99629, 99630, 99631, 99632, 99633, 99634, 99635, 99637, 99638, 99639, 99640, 99641, 99642, 99643, 99644

99645, 99646, 99647, 99648, 99664, 99666, 99667, 99668, 99669, 99670, 99671, 99672, 99673, 99674, 99675, 99676, 99677, 99678,

99679, 99680, 99681, 99682, 99683, 99684, 99685, 99686, 99687, 99688, 99689, 99690, 99691, 99692, 99694, 99695, 9

6969, 99697, 99688, 99699, 99700, 99701, 99702, 99703, 99704, 99702, 99703, 99704, 99707, 99708, 99709, 99710, 99711, 99712, 99

713, 99714, 99715, 99716, 99717, 99718, 99719, 99720, 99721, 99722, 99723, 99724, 99725, 99726, 99727, 99728, 99729

30, 99731, 99732, 99733, 99734, 99735, 99736, 99737, 99738, 99739, 99740, 99741, 99744, 99745, 99746, 99746, 99746, 99767, 99768, 99769, 99769, 99776, 99776, 99777, 99778, 99778, 99778, 99789, 99780, 99781, 99782, 99783, 99784, 99785, 99786, 99787, 99788, 99789, 99780, 99781, 99782, 99783, 99784, 99785, 99786, 99787, 99788, 99789, 99780, 99781, 99782, 99783, 99784, 99785, 99786, 99787, 99788, 99789, 99780, 99781, 99782, 99783, 99784, 99785, 99786, 99787, 99788, 99789, 99780, 99781, 99782, 99783, 99884, 99885, 99886, 99887, 99888, 99889, 99810, 99811, 99812, 99831, 99814, 99815, 99818, 99818, 99881, 99891, 99991, 99991, 99991, 99991, 99991, 99991, 999

- Tiempo de ejecución QuickSort: 2.0001 ms.
- Tiempo de ejecución HeapSort: 11.0074 ms.