PA5 Part 1

# Insertion Sort

Yellow hightlight = temp number

Red = Sorted

|  |  |
| --- | --- |
| Random |  |
| Iteration 0 | [4, 7, 1, 2, 8, 3, 9] |
| Iteration 1 | (7 < 4❌) - [4, 7, 1, 2, 8, 3, 9] |
| Iteration 2 | (1<7✔️) – (1<4✔️) – [1, 4, 7, 2, 8, 3, 9] |
| Iteration 3 | (2<7✔️) – (2<4✔️) – (1<2❌) – [1, 2, 4, 7, 8, 3, 9] |
| Iteration 4 | (8<7❌) – [1, 2, 4, 7, 8, 3, 9] |
| Iteration 5 | (3<8✔️) – (3<7✔️) – (3<4✔️) – (3<2❌) – [1, 2, 3,4, 7, 8, 9] |
| Iteration 6 | (9<8❌) – – [1, 2, 3, 4, 7, 8, 9] |
| Sorted |  |
| Iteration 0 | [1, 2, 3, 4, 7, 8, 9] |
| Iteration 1 | (2<1❌) [1, 2, 3, 4, 7, 8, 9] |
| Iteration 2 | (3<2❌) [1, 2, 3, 4, 7, 8, 9] |
| Iteration 3 | (4<3❌) [1, 2, 3, 4, 7, 8, 9] |
| Iteration 4 | (7<4❌) [1, 2, 3, 4, 7, 8, 9] |
| Iteration 5 | (8<7❌) [1, 2, 3, 4, 7, 8, 9] |
| Iteration 6 | (9<8❌) [1, 2, 3, 4, 7, 8, 9] |
| Reversed |  |
| Iteration 0 | [9, 8, 7, 4, 3, 2, 1] |
| Iteration 1 | (8<9✔️) [8, 9, 7, 4, 3, 2, 1] |
| Iteration 2 | (7<9✔️) - (7<8✔️) – [7, 8, 9, 4, 3, 2, 1] |
| Iteration 3 | (4<9✔️) – (4<8✔️) – (4<7✔️) – [4, 7, 8, 9, 3, 2, 1] |
| Iteration 4 | (3<9✔️) – (3<8✔️) – (3<7✔️) – (3<4✔️) – [3, 4, 7, 8, 9, 2, 1] |
| Iteration 5 | (2<9✔️) – (2<8✔️) – (2<7✔️) – (2<4✔️) – (2<3✔️) – [2, 3, 4, 7, 8, 9, 1] |
| Iteration 6 | (1<9✔️) – (1<8✔️) – (1<7✔️) – (1<4✔️) – (1<3✔️) – (1<2✔️) [ 1, 2, 3, 4, 7, 8, 9] |

# Quicksort

Yellow highlight = Left pointer

Blue Highlight = right pointer

Green = pivot

Red = sorted

|  |  |
| --- | --- |
| Random |  |
| Start | [4, 7, 1, 2, 8, 3, 9] |
| First recursive call | [4, 7, 1, 2, 8, 3, 9] - [4, 7, 1, 2, 8, 3, 9] – (Swap) - [4, 3, 1, 2, 8, 7, 9] – (Move pivot) – [3, 1, 2, 4, 8, 7, 9] |
| Second Recursive call | [3, 1, 2, 4, 8, 7, 9] – [3, 1, 2] & [8, 7, 9] – [3, 1, 2.] & [8 ,7, 9] – (Move pivot) – [1, 2, 3] & [7, 8, 9]  [1, 2, 3, 4, 7, 8, 9] |
| Third Recursive call | [1, 2, 3, 4, 7, 8, 9] – [1, 2] & [7] & [9] – [1, 2] & [7] & [9]  [1, 2, 3, 4, 7, 8, 9] |
| Fourth Recursive call | [1, 2, 3, 4, 7, 8, 9] – [2] – [2]  [1, 2, 3, 4, 7, 8, 9] |
| Sorted |  |
| Start | [1, 2, 3, 4, 7, 8, 9] |
| First Recursive call | [1, 2, 3, 4, 7, 8, 9] – [1, 2, 3, 4, 7, 8, 9]  [1, 2, 3, 4, 7, 8, 9] |
| Second Recursive call | [1, 2, 3, 4, 7, 8, 9] - [2, 3, 4, 7, 8, 9]  [1, 2, 3, 4, 7, 8, 9] |
| Third Recursive call | [1, 2, 3, 4, 7, 8, 9] – [3, 4, 7, 8, 9]  [1, 2, 3, 4, 7, 8, 9] |
| Fourth Recursive call | [1, 2, 3, 4, 7, 8, 9] – [4, 7, 8, 9]  [1, 2, 3, 4, 7, 8, 9] |
| Fifth recursive call | [1, 2, 3, 4, 7, 8, 9] – [7, 8, 9]  [1, 2, 3, 4, 7, 8, 9] |
| Sixth recursive call | [1, 2, 3, 4, 7, 8, 9.] – [8, 9]  [1, 2, 3, 4, 7, 8, 9] |
| Seventh Recursive call | [1, 2, 3, 4, 7, 8, 9] – [9]  [1, 2, 3, 4, 7, 8, 9] |
| Reversed |  |
| Start | [9, 8, 7, 4, 3, 2, 1] |
| First Recursive Call | [9, 8, 7, 4, 3, 2, 1] – [9, 8, 7, 4, 3, 2, 1.]  [8, 7, 4, 3, 2, 1, 9] |
| Second Recursive Call | [8, 7, 4, 3, 2, 1, 9] – [8, 7, 4, 3, 2, 1.]  [7, 4, 3, 2, 1, 8, 9] |
| Third Recursive call | [7, 4, 3, 2, 1, 8, 9] – [7, 4, 3, 2, 1.]  [4, 3, 2, 1, 7, 8, 9] |
| Fourth Recursive Call | [4, 3, 2, 1, 7, 8, 9] – [4, 3, 2, 1.]  [3, 2, 1, 4, 7, 8, 9] |
| Fifth Recursive call | [3, 2, 1, 4, 7, 8, 9] – [3, 2, 1.]  [2, 1, 3, 4, 7, 8, 9] |
| Sixth Recursive call | [2, 1, 3, 4, 7, 8, 9] – [2, 1.]  [1, 2, 3, 4, 7, 8, 9] |
| Seventh Recursive call | [1, 2, 3, 4, 7, 8, 9] – [1]  [1, 2, 3, 4, 7, 8, 9] |

# Cocktail Sort

|  |  |
| --- | --- |
| Random |  |
| Start | [4, 7, 1, 2, 8, 3, 9] |
| First Iteration | [4, 1, 2, 7, 3, 8, 9] – 3 swaps |
| Second Iteration | [1, 4, 2, 3, 7, 8, 9] – 2 swaps |
| Third Iteration | [1, 2, 3, 4, 7, 8, 9] – 2 swaps |
| Forth Iteration | [1, 2, 3, 4, 7, 8, 9] – No swaps so end |
| Sorted |  |
| Start | [1, 2, 3, 4, 7, 8, 9] |
| First Iteration | [1, 2, 3, 4, 7, 8, 9] – No swaps so end |
| Reversed |  |
| Start | [9, 8, 7, 4, 3, 2, 1] |
| First iteration | [8, 7, 4, 3, 2, 1, 9] – 6 Swaps |
| Second Iteration | [1, 8, 7, 4, 3, 2, 9] – 5 Swaps |
| Third Iteration | [1, 7, 4, 3, 2, 8, 9] – 4 Swaps |
| Fourth Iteration | [1, 2, 7, 4, 3, 8, 9] – 3 Swaps |
| Fifth Iteration | [1, 2, 4, 3, 7, 8, 9] – 2 Swaps |
| Sixth Iteration | [1, 2, 3, 4, 7, 8, 9] – 1 Swap |
| Seventh Iteration | [1, 2, 3, 4, 7, 8, 9] – No swaps so end |