

Appendices

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Appendix A - QuickSort Pivot Selection Experimentation Data

1. Sorted Array

Pivot Strategy: last
Original Array: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Sorted Array: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Total Swaps: 0
Total Comparisons: 55
Total Pivot Selection Cost: 110.0000
Pivot Strategy: first
Original Array: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Sorted Array: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Total Swaps: 20
Total Comparisons: 55
Total Pivot Selection Cost: 110.0000
Pivot Strategy: random
Original Array: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Sorted Array: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Total Swaps: 12
Total Comparisons: 32
Total Pivot Selection Cost: 52.0000
Pivot Strategy: median
Original Array: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Sorted Array: [0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Total Swaps: 14
Total Comparisons: 22
Total Pivot Selection Cost: 26.0000

2. Unsorted Array:

Pivot Strategy: last
Original Array: [20, 382, 78, 292, 1000, 889, 2, 10, 92, 3, 11]
Sorted Array: [2, 3, 10, 11, 20, 78, 92, 292, 382, 889, 1000]
Total Swaps: 12

Total Comparisons: 23
Total Pivot Selection Cost: 30.0000
Pivot Strategy: first
Original Array: [20, 382, 78, 292, 1000, 889, 2, 10, 92, 3, 11]
Sorted Array: [2, 3, 10, 11, 20, 78, 92, 292, 382, 889, 1000]
Total Swaps: 18
Total Comparisons: 26
Total Pivot Selection Cost: 40.0000
Pivot Strategy: random
Original Array: [20, 382, 78, 292, 1000, 889, 2, 10, 92, 3, 11]
Sorted Array: [2, 3, 10, 11, 20, 78, 92, 292, 382, 889, 1000]
Total Swaps: 14
Total Comparisons: 25
Total Pivot Selection Cost: 38.0000
Pivot Strategy: median
Original Array: [20, 382, 78, 292, 1000, 889, 2, 10, 92, 3, 11]
Sorted Array: [2, 3, 10, 11, 20, 78, 92, 292, 382, 889, 1000]
Total Swaps: 20
Total Comparisons: 23
Total Pivot Selection Cost: 32.0000

3. Array in reverse order:

Pivot Strategy: last
Original Array: [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]
Sorted Array: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Total Swaps: 5
Total Comparisons: 45
Total Pivot Selection Cost: 90.0000
Pivot Strategy: first
Original Array: [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]
Sorted Array: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Total Swaps: 13
Total Comparisons: 45
Total Pivot Selection Cost: 90.0000
Pivot Strategy: random
Original Array: [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]
Sorted Array: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Total Swaps: 15
Total Comparisons: 26
Total Pivot Selection Cost: 42.0000
Pivot Strategy: median
Original Array: [10, 9, 8, 7, 6, 5, 4, 3, 2, 1]
Sorted Array: [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
Total Swaps: 15
Total Comparisons: 19

7. Duplicate Test 3

Pivot Strategy: last

Original Array: [10, 4, 10, 4, 10, 4, 10, 4, 10, 4]

Sorted Array: [4, 4, 4, 4, 4, 10, 10, 10, 10, 10]

Total Swaps: 14

Total Comparisons: 41

Total Pivot Selection Cost: 72.0000

Pivot Strategy: first

Original Array: [10, 4, 10, 4, 10, 4, 10, 4, 10, 4]

Sorted Array: [4, 4, 4, 4, 4, 10, 10, 10, 10, 10]

Total Swaps: 24

Total Comparisons: 36

Total Pivot Selection Cost: 62.0000

Pivot Strategy: random

Original Array: [10, 4, 10, 4, 10, 4, 10, 4, 10, 4]

Sorted Array: [4, 4, 4, 4, 4, 10, 10, 10, 10, 10]

Total Swaps: 22

Total Comparisons: 41

Total Pivot Selection Cost: 72.0000

Pivot Strategy: median

Original Array: [10, 4, 10, 4, 10, 4, 10, 4, 10, 4]

Sorted Array: [4, 4, 4, 4, 4, 10, 10, 10, 10, 10]

Total Swaps: 23

Total Comparisons: 41

Total Pivot Selection Cost: 72.0000

Appendix B - Simulated Annealing Experimentation Data

1. SA 1st Test Run

Iteration 0, Temperature 10.000, Best Evaluation 22.33582

Iteration 100, Temperature 0.099, Best Evaluation 13.98957

Iteration 200, Temperature 0.050, Best Evaluation 13.97990

Iteration 300, Temperature 0.033, Best Evaluation 13.97983

Iteration 400, Temperature 0.025, Best Evaluation 13.97983

Iteration 500, Temperature 0.020, Best Evaluation 13.97983

Iteration 600, Temperature 0.017, Best Evaluation 13.97983

Iteration 700, Temperature 0.014, Best Evaluation 13.97983

Iteration 800, Temperature 0.012, Best Evaluation 13.97983

Iteration 900, Temperature 0.011, Best Evaluation 13.97983

Best Solution: [-1.9898819672332864, 4.41573127420101]

Best Score: 13.979831371929222

2. SA 2nd Test Run

Iteration 0, Temperature 10.000, Best Evaluation 39.82215

Iteration 100, Temperature 0.099, Best Evaluation 18.95464

Iteration 200, Temperature 0.050, Best Evaluation 18.95464

Iteration 300, Temperature 0.033, Best Evaluation 18.95464

Iteration 400, Temperature 0.025, Best Evaluation 18.95464

Iteration 500, Temperature 0.020, Best Evaluation 18.95464

Iteration 600, Temperature 0.017, Best Evaluation 18.95464

Iteration 700, Temperature 0.014, Best Evaluation 18.95464

Iteration 800, Temperature 0.012, Best Evaluation 18.95464

Iteration 900, Temperature 0.011, Best Evaluation 18.95464

Best Solution: [2.985108632648188, -0.0301710866328396]

Best Score: 18.95461387700815

3. SA 3rd Test Run

Iteration 0, Temperature 10.000, Best Evaluation 11.17406

Iteration 100, Temperature 0.099, Best Evaluation 10.99496

Iteration 200, Temperature 0.050, Best Evaluation 10.99496

Iteration 300, Temperature 0.033, Best Evaluation 10.99496

Iteration 400, Temperature 0.025, Best Evaluation 10.99496

Iteration 500, Temperature 0.020, Best Evaluation 10.99496

Iteration 600, Temperature 0.017, Best Evaluation 10.99496

Iteration 700, Temperature 0.014, Best Evaluation 10.99496

Iteration 800, Temperature 0.012, Best Evaluation 10.99496

Iteration 900, Temperature 0.011, Best Evaluation 10.99496

Best Solution: [0.9948409805553339, -2.7760036686385074]

Best Score: 10.99496180208096

4. SA 4th Test Run

Iteration 0, Temperature 10.000, Best Evaluation 29.50219

Iteration 100, Temperature 0.099, Best Evaluation 7.96064

Iteration 200, Temperature 0.050, Best Evaluation 7.96064

Iteration 300, Temperature 0.033, Best Evaluation 7.96064

Iteration 400, Temperature 0.025, Best Evaluation 7.96064

Iteration 500, Temperature 0.020, Best Evaluation 7.96064

Iteration 600, Temperature 0.017, Best Evaluation 7.96064

Iteration 700, Temperature 0.014, Best Evaluation 7.96064

Iteration 800, Temperature 0.012, Best Evaluation 7.96064

Iteration 900, Temperature 0.011, Best Evaluation 7.96064

Best Solution: [1.9917569855167407, 1.9886703218871031]

Best Score: 7.960641665036977

5. SA 5th Test Run

Iteration 0, Temperature 10.000, Best Evaluation 50.67021

Iteration 100, Temperature 0.099, Best Evaluation 49.74787

2. Unsorted Array

--- Simulated Annealing for Subarray [0:10] ---

Initial Pivot: Index=9, Value=3, Cost=18.0000

Iteration	0	Temp:	10.000	Current:	idx=10, value=11, cost=14.0000	Best:	idx=10, value=11, cost=14.0000
Iteration	10	Temp:	0.909	Current:	idx=2, value=78, cost=10.0000	Best:	idx=2, value=78, cost=10.0000
Iteration	20	Temp:	0.476	Current:	idx=2, value=78, cost=10.0000	Best:	idx=2, value=78, cost=10.0000
Iteration	30	Temp:	0.323	Current:	idx=2, value=78, cost=10.0000	Best:	idx=2, value=78, cost=10.0000
Iteration	40	Temp:	0.244	Current:	idx=2, value=78, cost=10.0000	Best:	idx=2, value=78, cost=10.0000
Iteration	50	Temp:	0.196	Current:	idx=2, value=78, cost=10.0000	Best:	idx=2, value=78, cost=10.0000
Iteration	60	Temp:	0.164	Current:	idx=2, value=78, cost=10.0000	Best:	idx=2, value=78, cost=10.0000

cost=6.0000
Iteration 10 Temp: 0.909 Current: idx=9, value=1000, cost=8.0000 Best: idx=6, value=382, cost=4.0000
Iteration 20 Temp: 0.476 Current: idx=10, value=889, cost=6.0000 Best: idx=6, value=382, cost=4.0000
Iteration 30 Temp: 0.323 Current: idx=6, value=382, cost=4.0000 Best: idx=6, value=382, cost=4.0000
Iteration 40 Temp: 0.244 Current: idx=6, value=382, cost=4.0000 Best: idx=6, value=382, cost=4.0000
Iteration 50 Temp: 0.196 Current: idx=6, value=382, cost=4.0000 Best: idx=6, value=382, cost=4.0000
Iteration 60 Temp: 0.164 Current: idx=6, value=382, cost=4.0000 Best: idx=6, value=382, cost=4.0000
Iteration 70 Temp: 0.141 Current: idx=6, value=382, cost=4.0000 Best: idx=6, value=382, cost=4.0000
Iteration 80 Temp: 0.123 Current: idx=6, value=382, cost=4.0000 Best: idx=6, value=382, cost=4.0000
Iteration 90 Temp: 0.110 Current: idx=6, value=382, cost=4.0000 Best: idx=6, value=382, cost=4.0000
Iteration 99 Temp: 0.100 Current: idx=6, value=382, cost=4.0000 Best: idx=6, value=382, cost=4.0000
Selected Pivot: Index=6, Value=382, Cost=4.0000

--- Simulated Annealing for Subarray [0:10] ---

Iteration 0 | Temp: 10.000 | Current: id

Initial Pivot: Index=2, Value=2, Cost=8.0000

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Initial Pivot: Index=1 Value=3 Cost=2.0000

[illegible]

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--- Simulated Annealing for Subarray [5:4] ---
Initial Bit = 1, Initial Max = 3, Initial Min = 3,000,000

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Selected Pivot: Index=5, Value=11, Cost=2.0000

--- Simulated Annealing for Subarray [6:10] ---

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Initial Pivot: Index=6 Value=292 Cost=2.0000

Initial Deposit: £4,000.00, Value: £990.00, Cost: £3,000.00

Iteration 60 | Temp: 0.164 | Current: idx=10, value=889, cost=2.0000 | Best: idx=10, value=889,

Iteration 80 | Temp: 0.123 | Current: idx=9, value=1000, cost=2.0000 | Best: idx=10, value=889, cost=2.0000

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Iteration 99 | Temp: 0.100 | Current: idx=9, value=1000, cost=2.0000 | Best: idx=10, value=889,
cost=2.0000
```

[illegible]

Total Swaps: 18

Total Pivot Selection Cost: 26.0000

--- Simulated Annealing for Subarray [0:9] ---

Iteration 0 | Temp: 10.000 | Current: idx=0, v

Initial Pivot: Index=2, Value=3, Cost=4.0000

Initial Pivot: Index=1, Value=2, Cost=2.0000

Initial Pivot: Index=9, Value=6, Cost=8.0000

Initial Pivot: Index=6, Value=7, Cost=2.0000

Initial Pivot: Index=9, Value=10, Cost=2.0000

Total Swaps: 13

Total Pivot Selection Cost: 24.0000

--- Simulated Annealing for Subarray [0:8] ---

Initial Pivot: Index=1, Value=12, Cost=10.0000

Initial Pivot: Index=1, Value=12, Cost=6.0000

Initial Pivot: Index=0, Value=1, Cost=2.0000

Initial Pivot: Index=5, Value=14, Cost=6.0000

[illegible]

Initial Pivot: Index=5, Value=14, Cost=2.0000

[illegible]

Total Swaps: 13

Total Pivot Selection Cost: 20.0000

--- Simulated Annealing for Subarray [0:30] ---

Iteration 0 | Temp: 10.000 | Current: idx=11, v

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Initial Pivot: Index=16, Value=1, Cost=58.0000

Initial Pivot: Index=10, Value=1, Cost=56.0000

[illegible]

Initial Pivot: Index=21, Value=1, Cost=54.0000

[illegible]

Initial Pivot: Index=12, Value=1, Cost=52.0000

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Initial Pivot: Index=20, Value=1, Cost=50.0000

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Initial Pivot: Index=26, Value=1, Cost=48.0000

Iteration 0 | Temp: 10.000 | Current: idx=28, value=1, cost=30.0000 | Best: idx=25, value=1, cost=30.0000
Iteration 10 | Temp: 0.909 | Current: idx=30, value=1, cost=30.0000 | Best: idx=25, value=1, cost=30.0000
Iteration 20 | Temp: 0.476 | Current: idx=18, value=1, cost=30.0000 | Best: idx=25, value=1, cost=30.0000

Iteration 10 | Temp: 0.909 | Current: idx=25, value=1, cost=12.0000 | Best: idx=24, value=1, cost=12.0000


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Iteration 0 | Temp: 10.000 | Current: idx=6, value=49, cost=6.0000 | Best: idx=7, value=49, cost=6.0000
Iteration 10 | Temp: 0.909 | Current: idx=6, value=49, cost=6.0000 | Best: idx=7, value=49, cost=6.0000
Iteration 20 | Temp: 0.476 | Current: idx=7, value=49, cost=6.0000 | Best: idx=7, value=49, cost=6.0000
Iteration 30 | Temp: 0.323 | Current: idx=7, value=49, cost=6.0000 | Best: idx=7, value=49, cost=6.0000
Iteration 40 | Temp: 0.244 | Current: idx=7, value=49, cost=6.0000 | Best: idx=7, value=49, cost=6.0000
Iteration 50 | Temp: 0.196 | Current: idx=7, value=49, cost=6.0000 | Best: idx=7, value=49, cost=6.0000
Iteration 60 | Temp: 0.161 | Current: idx=7, value=49, cost=6.0000 | Best: idx=7, value=49, cost=6.0000
Iteration 70 | Temp: 0.141 | Current: idx=5, value=49, cost=6.0000 | Best: idx=7, value=49, cost=6.0000
```

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Iteration: 50 | Temp.: 0.525 | Current: Max: 12, Value: 50, Cost: 14.0000 | Best: Max: 15, Value: 50,
cost=14.0000
```

```
-- Simulated Annealing for Subarray [11:17] --
Initial Pivot: Index=15, Value=90, Cost=12.0000

Iteration 0 | Temp: 10.000 | Current: idx=16, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000
Iteration 10 | Temp: 0.909 | Current: idx=13, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000
Iteration 20 | Temp: 0.476 | Current: idx=13, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000
Iteration 30 | Temp: 0.323 | Current: idx=11, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000
Iteration 40 | Temp: 0.244 | Current: idx=17, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000
Iteration 50 | Temp: 0.196 | Current: idx=14, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000
Iteration 60 | Temp: 0.164 | Current: idx=14, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000
Iteration 70 | Temp: 0.141 | Current: idx=14, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000
Iteration 80 | Temp: 0.123 | Current: idx=12, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000
Iteration 90 | Temp: 0.110 | Current: idx=11, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000
Iteration 99 | Temp: 0.100 | Current: idx=11, value=90, cost=12.0000 | Best: idx=15, value=90, cost=12.0000

Selected Pivot: Index=15, Value=90, Cost=12.0000
```

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--- Simulated Annealing for Subarray [13:17] ---
Initial Pivot: Index=14, Value=90, Cost=8.0000
Iteration 0 | Temp: 10.000 | Current: idx=14, value=90, cost=8.0000 | Best: idx=14, value=90, cost=8.0000
Iteration 10 | Temp: 0.909 | Current: idx=16, value=90, cost=8.0000 | Best: idx=14, value=90, cost=8.0000
Iteration 20 | Temp: 0.476 | Current: idx=17, value=90, cost=8.0000 | Best: idx=14, value=90, cost=8.0000
Iteration 30 | Temp: 0.323 | Current: idx=15, value=90, cost=8.0000 | Best: idx=14, value=90, cost=8.0000
Iteration 40 | Temp: 0.244 | Current: idx=14, value=90, cost=8.0000 | Best: idx=14, value=90, cost=8.0000
Iteration 50 | Temp: 0.196 | Current: idx=13, value=90, cost=8.0000 | Best: idx=14, value=90, cost=8.0000

```

```
-- Simulated Annealing for Subarray [16:17] --  
Initial Pivot: Index=16, Value=90, Cost=2.0000  
  
Iteration 0 | Temp: 10.000 | Current: idx=16, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Iteration 10 | Temp: 0.909 | Current: idx=17, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Iteration 20 | Temp: 0.476 | Current: idx=17, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Iteration 30 | Temp: 0.323 | Current: idx=16, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Iteration 40 | Temp: 0.244 | Current: idx=17, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Iteration 50 | Temp: 0.196 | Current: idx=17, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Iteration 60 | Temp: 0.164 | Current: idx=16, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Iteration 70 | Temp: 0.141 | Current: idx=17, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Iteration 80 | Temp: 0.123 | Current: idx=16, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Iteration 90 | Temp: 0.110 | Current: idx=17, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Iteration 99 | Temp: 0.100 | Current: idx=17, value=90, cost=2.0000 | Best: idx=16, value=90, cost=2.0000  
Selected Pivot: Index=16, Value=90, Cost=2.0000
```

```

--- Simulated Annealing for Subarray [19:26] ---
Initial Pivot: Index=19, Value=100, Cost=14.0000

Iteration 0 | Temp: 10.000 | Current: idx=19, value=100, cost=14.0000 | Best: idx=19, value=100, cost=14.0000
Iteration 10 | Temp: 0.909 | Current: idx=20, value=100, cost=14.0000 | Best: idx=19, value=100, cost=14.0000
Iteration 20 | Temp: 0.476 | Current: idx=26, value=100, cost=14.0000 | Best: idx=19, value=100, cost=14.0000
Iteration 30 | Temp: 0.323 | Current: idx=23, value=100, cost=14.0000 | Best: idx=19, value=100, cost=14.0000
Iteration 40 | Temp: 0.244 | Current: idx=21, value=100, cost=14.0000 | Best: idx=19, value=100, cost=14.0000
Iteration 50 | Temp: 0.196 | Current: idx=22, value=100, cost=14.0000 | Best: idx=19, value=100, cost=14.0000
Iteration 60 | Temp: 0.164 | Current: idx=25, value=100, cost=14.0000 | Best: idx=19, value=100, cost=14.0000
Iteration 70 | Temp: 0.141 | Current: idx=25, value=100, cost=14.0000 | Best: idx=19, value=100, cost=14.0000

```


Total Pivot Selection Cost: 234,0000

```
Iteration 00 | Temp: 0.100 | Current idx=0, value=10, cost=6.0000 | Best idx=0, value=10, cost=6.0000
```

Selected Pivot: Index=11, Value=10, Cost=6.0000

--- Simulated Annealing for Subarray [9:11] ---

Initial Pivot: Index=11, Value=10, Cost=4.0000

Iteration 0 | Temp: 10.000 | Current: idx=10, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Iteration 10 | Temp: 0.909 | Current: idx=11, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Iteration 20 | Temp: 0.476 | Current: idx=9, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Iteration 30 | Temp: 0.323 | Current: idx=9, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Iteration 40 | Temp: 0.244 | Current: idx=10, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Iteration 50 | Temp: 0.196 | Current: idx=9, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Iteration 60 | Temp: 0.164 | Current: idx=10, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Iteration 70 | Temp: 0.141 | Current: idx=10, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Iteration 80 | Temp: 0.123 | Current: idx=9, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Iteration 90 | Temp: 0.110 | Current: idx=10, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Iteration 99 | Temp: 0.100 | Current: idx=11, value=10, cost=4.0000 | Best: idx=11, value=10, cost=4.0000
Selected Pivot: Index=11, Value=10, Cost=4.0000

--- Simulated Annealing for Subarray [10:11] ---

Initial Pivot: Index=11, Value=10, Cost=2.0000

Iteration 0 | Temp: 10.000 | Current: idx=11, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Iteration 10 | Temp: 0.909 | Current: idx=11, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Iteration 20 | Temp: 0.476 | Current: idx=10, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Iteration 30 | Temp: 0.323 | Current: idx=11, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Iteration 40 | Temp: 0.244 | Current: idx=11, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Iteration 50 | Temp: 0.196 | Current: idx=11, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Iteration 60 | Temp: 0.164 | Current: idx=10, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Iteration 70 | Temp: 0.141 | Current: idx=11, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Iteration 80 | Temp: 0.123 | Current: idx=11, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Iteration 90 | Temp: 0.110 | Current: idx=10, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Iteration 99 | Temp: 0.100 | Current: idx=10, value=10, cost=2.0000 | Best: idx=11, value=10, cost=2.0000
Selected Pivot: Index=11, Value=10, Cost=2.0000

Sorted Array: [4, 4, 4, 4, 4, 10, 10, 10, 10, 10, 10]

Total Swaps: 20

Total Comparisons: 36

Total Pivot Selection Cost: 62.0000