CSC 172 LAB 3 REPORT
Laurel Tay
LTAY3

Screenshot: 1Kints

```
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Kints.txt 0
Arrays.sort() a 0.0 20230922_130443 LTAY3 1Kints.txt
Arrays.sort() b 0.0 20230922_130443 LTAY3 1Kints.txt
Arrays.sort() c 0.0 20230922_130443 LTAY3 1Kints.txt
Arrays.sort() d 0.0 20230922_130443 LTAY3 1Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Kints.txt 1
Bubble Sort a 7.0 20230922_130501 LTAY3 1Kints.txt
Bubble Sort b 0.0 20230922_130501 LTAY3 1Kints.txt
Bubble Sort c 2.0 20230922_130501 LTAY3 1Kints.txt
Bubble Sort d 0.0 20230922_130501 LTAY3 1Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Kints.txt 2
Selection Sort a 6.0 20230922_130503 LTAY3 1Kints.txt
Selection Sort b 0.0 20230922_130503 LTAY3 1Kints.txt
Selection Sort c 2.0 20230922_130503 LTAY3 1Kints.txt
Selection Sort d 1.0 20230922_130503 LTAY3 1Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Kints.txt 3
Insertion Sort a 5.0 20230922_130505 LTAY3 1Kints.txt
Insertion Sort b 0.0 20230922_130505 LTAY3 1Kints.txt
Insertion Sort c 2.0 20230922_130505 LTAY3 1Kints.txt
Insertion Sort d 0.0 20230922_130505 LTAY3 1Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Kints.txt 4
Mergesort a 1.0 20230922_130507 LTAY3 1Kints.txt
Mergesort b 0.0 20230922_130507 LTAY3 1Kints.txt
Mergesort c 0.0 20230922_130507 LTAY3 1Kints.txt
Mergesort d 1.0 20230922_130507 LTAY3 1Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Kints.txt 5
Quicksort a 0.0 20230922_130510 LTAY3 1Kints.txt
Quicksort b 3.0 20230922_130510 LTAY3 1Kints.txt
Quicksort c 2.0 20230922_130510 LTAY3 1Kints.txt
Quicksort d 0.0 20230922_130510 LTAY3 1Kints.txt
```

Screenshot: 2Kints

```
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 2Kints.txt 1
Bubble Sort a 9.0 20230921_215642 LTAY3 2Kints.txt
Bubble Sort b 0.0 20230921_215642 LTAY3 2Kints.txt
Bubble Sort c 6.0 20230921_215642 LTAY3 2Kints.txt
Bubble Sort d 3.0 20230921_215642 LTAY3 2Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 2Kints.txt 2
Selection Sort a 7.0 20230921_215659 LTAY3 2Kints.txt
Selection Sort b 1.0 20230921_215659 LTAY3 2Kints.txt
Selection Sort c 2.0 20230921_215659 LTAY3 2Kints.txt
Selection Sort d 3.0 20230921_215659 LTAY3 2Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 2Kints.txt 3
Insertion Sort a 7.0 20230921_215717 LTAY3 2Kints.txt
Insertion Sort b 0.0 20230921_215717 LTAY3 2Kints.txt
Insertion Sort c 19.0 20230921_215717 LTAY3 2Kints.txt
Insertion Sort d 0.0 20230921_215717 LTAY3 2Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 2Kints.txt 4
Mergesort a 1.0 20230921_215733 LTAY3 2Kints.txt
Mergesort b 0.0 20230921_215733 LTAY3 2Kints.txt
Mergesort c 0.0 20230921_215733 LTAY3 2Kints.txt
Mergesort d 0.0 20230921_215733 LTAY3 2Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 2Kints.txt 5
Quicksort a 1.0 20230921_215807 LTAY3 2Kints.txt
Quicksort b 2.0 20230921_215807 LTAY3 2Kints.txt
Quicksort c 1.0 20230921_215807 LTAY3 2Kints.txt
Quicksort d 1.0 20230921_215807 LTAY3 2Kints.txt
```

Screenshot: 4Kints

```
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 4Kints.txt 0
Arrays.sort() a 1.0 20230921_220000 LTAY3 4Kints.txt
Arrays.sort() b 0.0 20230921_220000 LTAY3 4Kints.txt
Arrays.sort() c 0.0 20230921_220000 LTAY3 4Kints.txt
Arrays.sort() d 1.0 20230921_220000 LTAY3 4Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 4Kints.txt  1
Bubble Sort a 19.0 20230921_220013 LTAY3 4Kints.txt
Bubble Sort b 0.0 20230921_220013 LTAY3 4Kints.txt
Bubble Sort c 22.0 20230921_220013 LTAY3 4Kints.txt
Bubble Sort d 10.0 20230921_220013 LTAY3 4Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 4Kints.txt  2
Selection Sort a 14.0 20230921_220033 LTAY3 4Kints.txt
Selection Sort b 5.0 20230921_220033 LTAY3 4Kints.txt
Selection Sort c 6.0 20230921_220033 LTAY3 4Kints.txt
Selection Sort d 5.0 20230921_220033 LTAY3 4Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 4Kints.txt  3
Insertion Sort a 12.0 20230921_220048 LTAY3 4Kints.txt
Insertion Sort b 0.0 20230921_220048 LTAY3 4Kints.txt
Insertion Sort c 8.0 20230921_220048 LTAY3 4Kints.txt
Insertion Sort d 1.0 20230921_220048 LTAY3 4Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 4Kints.txt  4
Mergesort a 2.0 20230921_220110 LTAY3 4Kints.txt
Mergesort b 1.0 20230921_220110 LTAY3 4Kints.txt
Mergesort c 0.0 20230921_220110 LTAY3 4Kints.txt
Mergesort d 1.0 20230921_220110 LTAY3 4Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 4Kints.txt  5
Quicksort a 1.0 20230921_220122 LTAY3 4Kints.txt
Quicksort b 6.0 20230921_220122 LTAY3 4Kints.txt
Quicksort c 6.0 20230921_220122 LTAY3 4Kints.txt
Quicksort d 0.0 20230921_220122 LTAY3 4Kints.txt
```

Screenshot: 8Kints

```
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 8Kints.txt 0
Arrays.sort() a 1.0 20230921_220143 LTAY3 8Kints.txt
Arrays.sort() b 0.0 20230921_220143 LTAY3 8Kints.txt
Arrays.sort() c 1.0 20230921_220143 LTAY3 8Kints.txt
Arrays.sort() d 0.0 20230921_220143 LTAY3 8Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 8Kints.txt 1
Bubble Sort a 56.0 20230921_220154 LTAY3 8Kints.txt
Bubble Sort b 0.0 20230921_220154 LTAY3 8Kints.txt
Bubble Sort c 90.0 20230921_220154 LTAY3 8Kints.txt
Bubble Sort d 43.0 20230921_220154 LTAY3 8Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 8Kints.txt 2
Selection Sort a 42.0 20230921_220215 LTAY3 8Kints.txt
Selection Sort b 20.0 20230921_220215 LTAY3 8Kints.txt
Selection Sort c 25.0 20230921_220215 LTAY3 8Kints.txt
Selection Sort d 21.0 20230921_220215 LTAY3 8Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 8Kints.txt 3
Insertion Sort a 16.0 20230921_220233 LTAY3 8Kints.txt
Insertion Sort b 0.0 20230921_220233 LTAY3 8Kints.txt
Insertion Sort c 17.0 20230921_220233 LTAY3 8Kints.txt
Insertion Sort d 1.0 20230921_220233 LTAY3 8Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 8Kints.txt 4
Mergesort a 3.0 20230921_220556 LTAY3 8Kints.txt
Mergesort b 1.0 20230921_220556 LTAY3 8Kints.txt
Mergesort c 1.0 20230921_220556 LTAY3 8Kints.txt
Mergesort d 1.0 20230921_220556 LTAY3 8Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 8Kints.txt 5
Quicksort a 2.0 20230921_220608 LTAY3 8Kints.txt
Quicksort b 26.0 20230921_220608 LTAY3 8Kints.txt
Quicksort c 22.0 20230921_220608 LTAY3 8Kints.txt
Quicksort d 1.0 20230921_220608 LTAY3 8Kints.txt
```

Screenshot: 16Kints

```
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 16Kints.txt 0
Arrays.sort() a 1.0 20230921_220853 LTAY3 16Kints.txt
Arrays.sort() b 0.0 20230921_220853 LTAY3 16Kints.txt
Arrays.sort() c 1.0 20230921_220853 LTAY3 16Kints.txt
Arrays.sort() d 1.0 20230921_220853 LTAY3 16Kints.txt
```

```
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 16Kints.txt 1
Bubble Sort a 221.0 20230921_220913 LTAY3 16Kints.txt
Bubble Sort b 0.0 20230921_220913 LTAY3 16Kints.txt
Bubble Sort c 362.0 20230921_220913 LTAY3 16Kints.txt
Bubble Sort d 181.0 20230921_220913 LTAY3 16Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 16Kints.txt 2
Selection Sort a 156.0 20230921_220920 LTAY3 16Kints.txt
Selection Sort b 78.0 20230921_220920 LTAY3 16Kints.txt
Selection Sort c 100.0 20230921_220920 LTAY3 16Kints.txt
Selection Sort d 76.0 20230921_220920 LTAY3 16Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 16Kints.txt 3
Insertion Sort a 32.0 20230921_221007 LTAY3 16Kints.txt
Insertion Sort b 0.0 20230921_221007 LTAY3 16Kints.txt
Insertion Sort c 49.0 20230921_221007 LTAY3 16Kints.txt
Insertion Sort d 4.0 20230921_221007 LTAY3 16Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 16Kints.txt 4
Mergesort a 5.0 20230921_221022 LTAY3 16Kints.txt
Mergesort b 2.0 20230921_221022 LTAY3 16Kints.txt
Mergesort c 2.0 20230921_221022 LTAY3 16Kints.txt
Mergesort d 2.0 20230921_221022 LTAY3 16Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 16Kints.txt 5
Quicksort a 4.0 20230921_221032 LTAY3 16Kints.txt
Quicksort b 114.0 20230921_221032 LTAY3 16Kints.txt
Quicksort c 90.0 20230921_221032 LTAY3 16Kints.txt
Quicksort d 1.0 20230921_221032 LTAY3 16Kints.txt
```

Screenshot: 32Kints

```
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 32Kints.txt 0
Arrays.sort() a 10.0 20230921_221059 LTAY3 32Kints.txt
Arrays.sort() b 0.0 20230921_221059 LTAY3 32Kints.txt
Arrays.sort() c 1.0 20230921_221059 LTAY3 32Kints.txt
Arrays.sort() d 7.0 20230921_221059 LTAY3 32Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 32Kints.txt 1
Bubble Sort a 1460.0 20230921_221114 LTAY3 32Kints.txt
Bubble Sort b 0.0 20230921_221114 LTAY3 32Kints.txt
Bubble Sort c 1455.0 20230921_221114 LTAY3 32Kints.txt
Bubble Sort d 752.0 20230921_221114 LTAY3 32Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 32Kints.txt 2
Selection Sort a 596.0 20230921_221216 LTAY3 32Kints.txt
Selection Sort b 591.0 20230921_221216 LTAY3 32Kints.txt
Selection Sort c 384.0 20230921_221216 LTAY3 32Kints.txt
Selection Sort d 590.0 20230921_221216 LTAY3 32Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 32Kints.txt 3
Insertion Sort a 102.0 20230921_221239 LTAY3 32Kints.txt
Insertion Sort b 0.0 20230921_221239 LTAY3 32Kints.txt
Insertion Sort c 177.0 20230921_221239 LTAY3 32Kints.txt
Insertion Sort d 18.0 20230921_221239 LTAY3 32Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 32Kints.txt 4
Mergesort a 9.0 20230921_221256 LTAY3 32Kints.txt
Mergesort b 4.0 20230921_221256 LTAY3 32Kints.txt
Mergesort c 4.0 20230921_221256 LTAY3 32Kints.txt
Mergesort d 4.0 20230921_221256 LTAY3 32Kints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 32Kints.txt 5
Quicksort a 6.0 20230921_221310 LTAY3 32Kints.txt
Quicksort b 485.0 20230921_221310 LTAY3 32Kints.txt
Quicksort c 335.0 20230921_221310 LTAY3 32Kints.txt
Quicksort d 2.0 20230921_221310 LTAY3 32Kints.txt
```

Screenshot: 1Mints

```
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Mints.txt 0
Arrays.sort() a 92.0 20230921_221348 LTAY3 1Mints.txt
Arrays.sort() b 4.0 20230921_221348 LTAY3 1Mints.txt
Arrays.sort() c 6.0 20230921_221348 LTAY3 1Mints.txt
Arrays.sort() d 69.0 20230921_221348 LTAY3 1Mints.txt

laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Mints.txt 5
Quicksort a 110.0 20230922_133556 LTAY3 1Mints.txt
Quicksort b 419063.0 20230922_133556 LTAY3 1Mints.txt
Quicksort c 2064872.0 20230922_133556 LTAY3 1Mints.txt
Quicksort d 94.0 20230922_133556 LTAY3 1Mints.txt

laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Mints.txt 4
Mergesort a 246.0 20230921_222623 LTAY3 1Mints.txt
Mergesort b 57.0 20230921_222623 LTAY3 1Mints.txt
Mergesort c 61.0 20230921_222623 LTAY3 1Mints.txt
Mergesort d 88.0 20230921_222623 LTAY3 1Mints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Mints.txt 3
Insertion Sort a 92361.0 20230921_222637 LTAY3 1Mints.txt
Insertion Sort b 11.0 20230921_222637 LTAY3 1Mints.txt
Insertion Sort c 171631.0 20230921_222637 LTAY3 1Mints.txt
Insertion Sort d 18033.0 20230921_222637 LTAY3 1Mints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Mints.txt 2
Selection Sort a 580768.0 20230921_223343 LTAY3 1Mints.txt
Selection Sort b 317092.0 20230921_223343 LTAY3 1Mints.txt
Selection Sort c 612032.0 20230921_223343 LTAY3 1Mints.txt
Selection Sort d 303888.0 20230921_223343 LTAY3 1Mints.txt
laureltay9@dhcp-10-5-212-83 Lab7 % java Sorting 1Mints.txt 1
Bubble Sort a 2169130.0 20230921_230754 LTAY3 1Mints.txt
Bubble Sort b 7.0 20230921_230754 LTAY3 1Mints.txt
Bubble Sort c 1435968.0 20230921_230754 LTAY3 1Mints.txt
Bubble Sort d 34763980.0 20230921_230754 LTAY3 1Mints.txt
```

Data Tables

Array: a	Arrays.sort	bubbleSort	selectionSort	insertionSort	mergeSort	quickSort
1Kints.txt	0.0	7.0	6.0	5.0	1.0	0.0
2Kints.txt	1.0	9.0	7.0	7.0	1.0	1.0
4Kints.txt	1.0	19.0	14.0	12.0	2.0	1.0
8Kiints.txt	1.0	56.0	42.0	16.0	3.0	2.0
16Kints.txt	1.0	222.0	156.0	32.0	5.0	4.0
32Kints.txt	10.0	1460.0	596.0	102.0	9.0	6.0
1Mints.txt	92.0	2169130.0	92361.0	92361.0	234.0	109.0

Array: b	Arrays.sort	bubbleSort	selectionSort	insertionSort	mergeSort	quickSort
1Kints.txt	0.0	0.0	0.0	0.0	0.0	3.0
2Kints.txt	0.0	0.0	1.0	0.0	0.0	2.0
4Kints.txt	0.0	0.0	5.0	0.0	1.0	6.0
8Kiints.txt	0.0	0.0	20.0	0.0	1.0	26.0
16Kints.txt	0.0	0.0	78.0	0.0	2.0	114.0
32Kints.txt	0.0	0.0	591.0	0.0	4.0	485.0
1Mints.txt	4.0	7.0	11.0	11.0	59.0	419063.0

Array: c	Arrays.sort	bubbleSort	selectionSort	insertionSort	mergeSort	quickSort
1Kints.txt	0.0	2.0	2.0	2.0	0.0	2.0
2Kints.txt	0.0	6.0	2.0	19.0	0.0	1.0
4Kints.txt	0.0	22.0	6.0	9.0	0.0	6.0
8Kiints.txt	1.0	90.0	25.0	17.0	1.0	22.0
16Kints.txt	1.0	362.0	100.0	49.0	2.0	90.0
32Kints.txt	1.0	1455.0	384.0	177.0	4.0	335.0
1Mints.txt	6.0	1435968.0	171631.0	171631.0	62.0	2064872.0

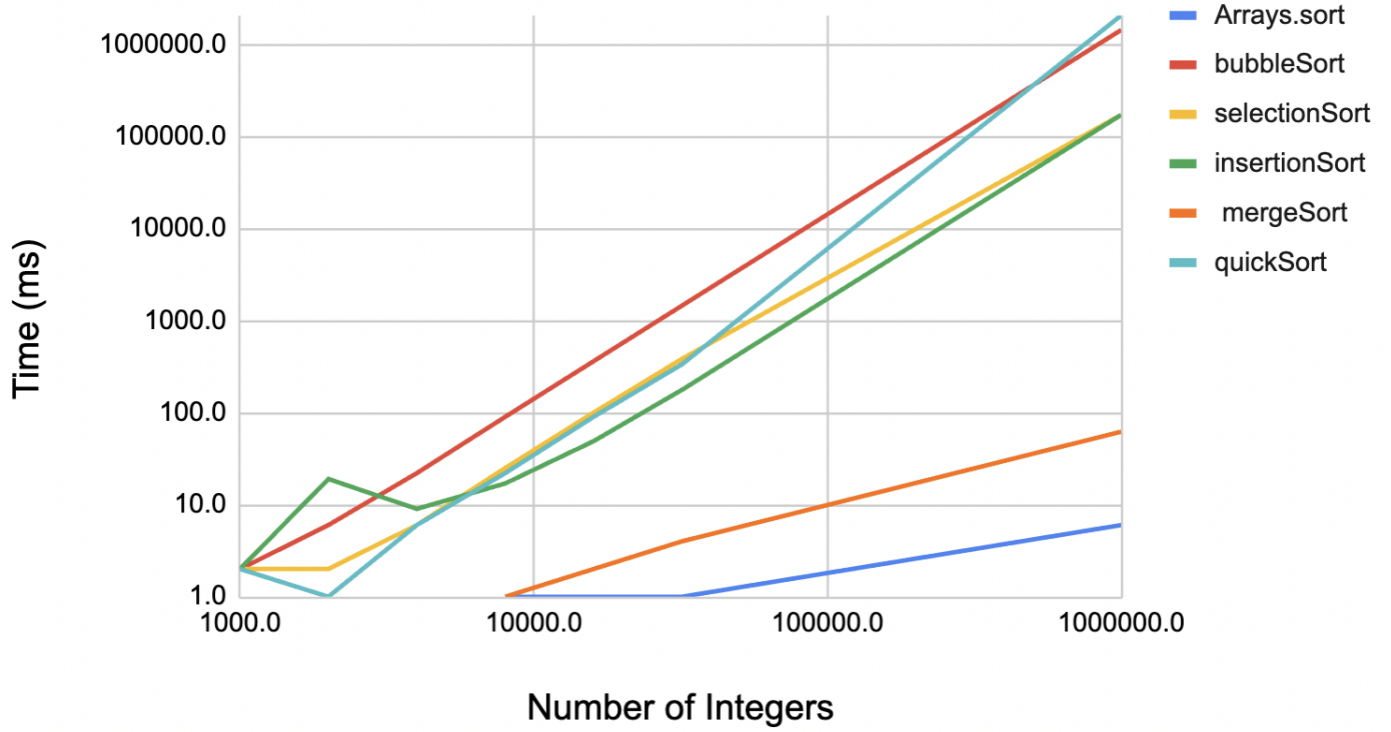| Array: d	Arrays.sort	bubbleSort	selectionSort	insertionSort	mergeSort	quickSort
1Kints.txt	0.0	0.0	1.0	0.0	1.0	0.0
2Kints.txt	0.0	3.0	3.0	0.0	0.0	1.0
4Kints.txt	1.0	10.0	5.0	1.0	1.0	0.0
8Kiints.txt	0.0	43.0	21.0	1.0	1.0	1.0
16Kints.txt	1.0	189.0	76.0	4.0	2.0	1.0
32Kints.txt	7.0	752.0	590.0	18.0	4.0	2.0
1Mints.txt	69.0	34763980.0	18033.0	18033.0	96.0	94.0

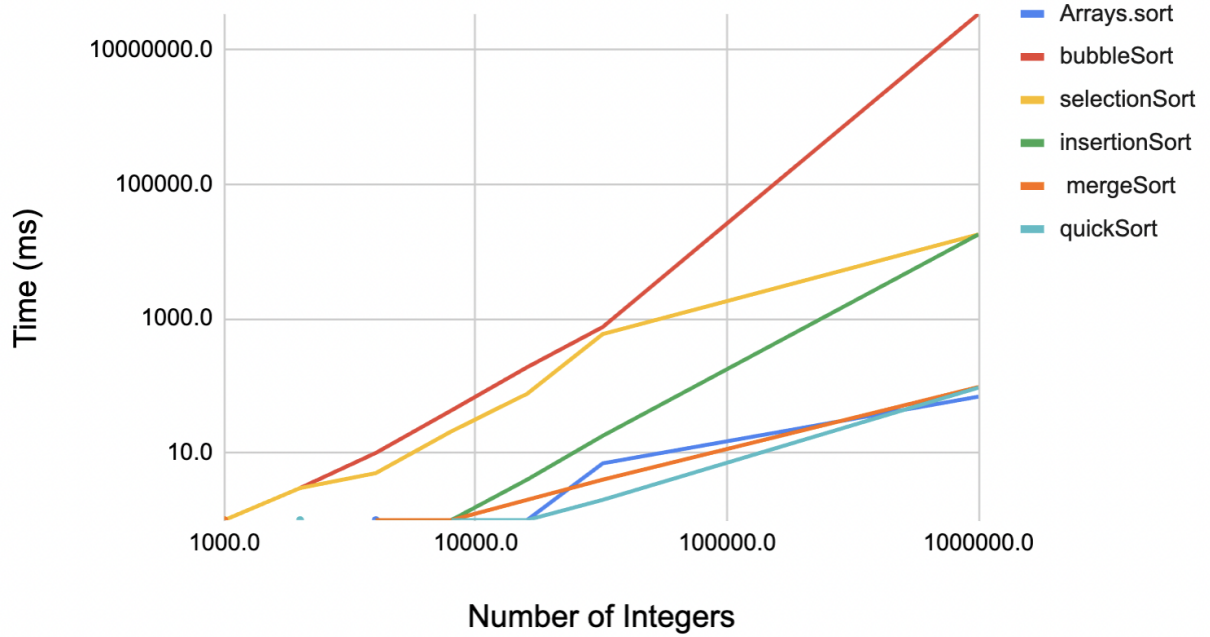# Graphs

Array a
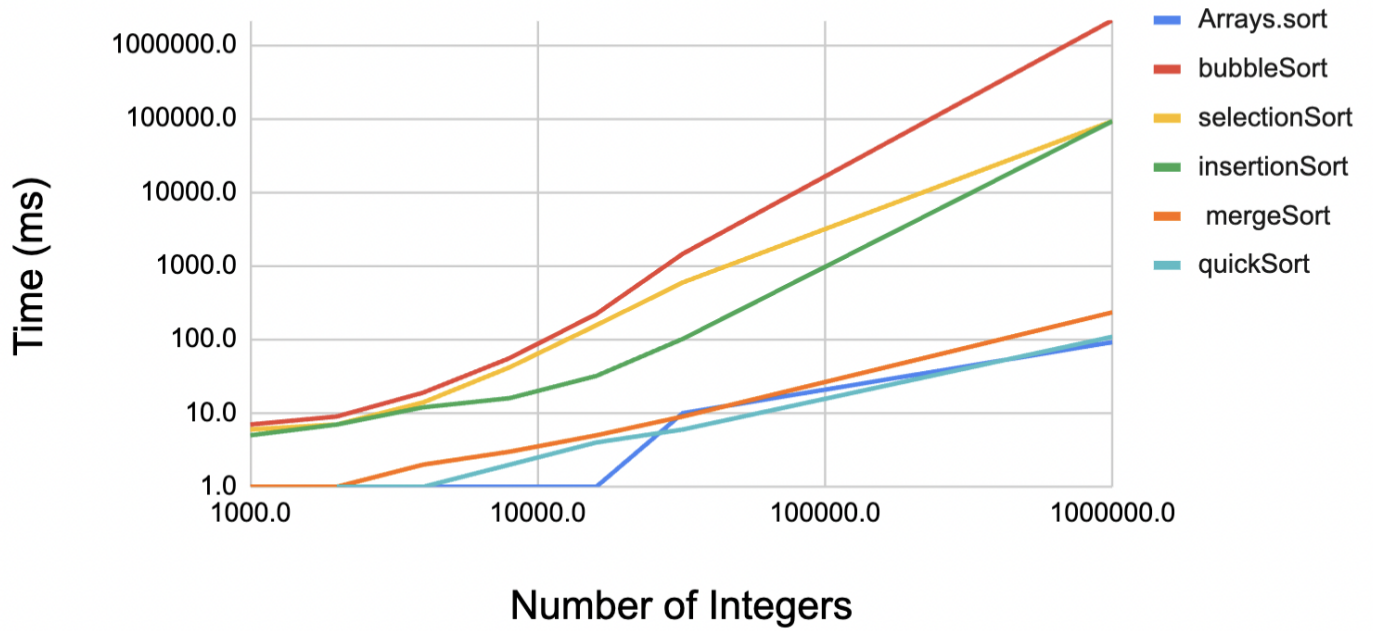
Array b
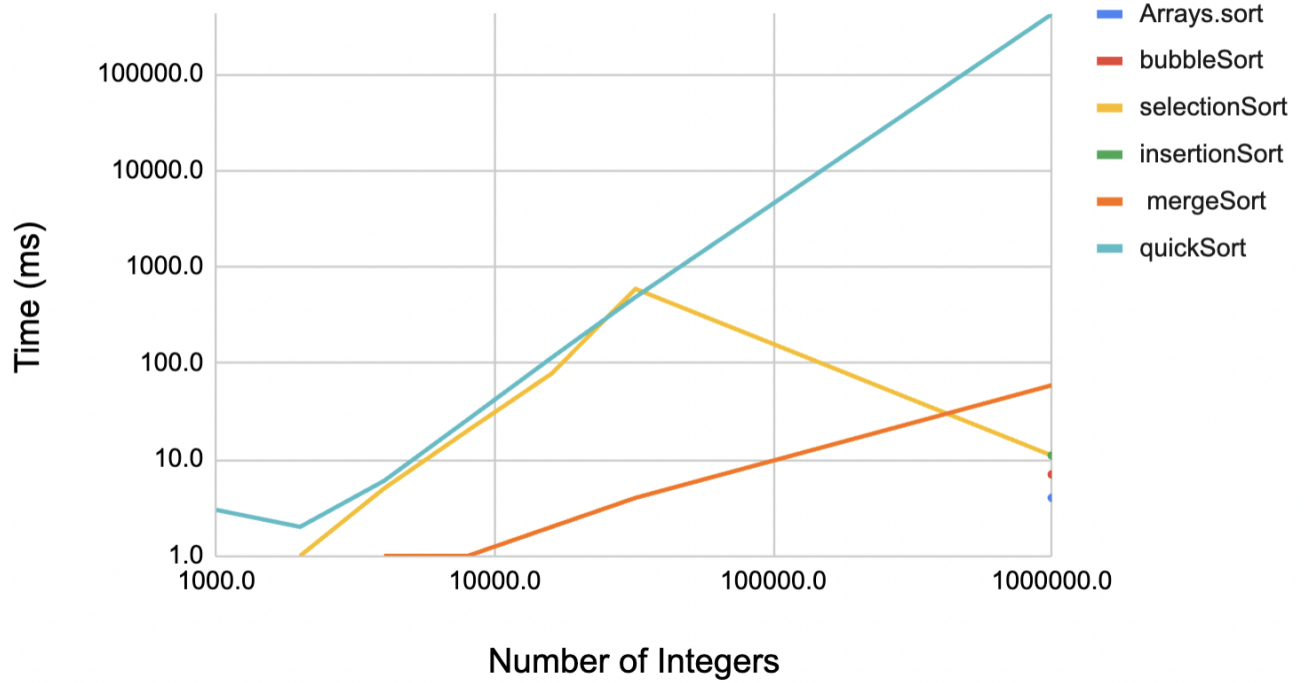
Array c

Array d

Findings:

From looking at the data points that were obtained, it can be seen that array b had much faster runtimes than the other arrays, especially for the first 5 sorting techniques. Array a had the most consistent pattern among the different sorting techniques. Regarding sorting algorithms, mergeSort was rather consistent, having quite consistent trends across arrays. Arrays.sort turned out to be the fastest out of the sorting techniques overall with the fastest runtimes. Array sort and merge sort tended to have faster runtimes while bubble sort, selection sort and insertion sort tended to have slower runtimes. Overall it seems bubble sort took the longest.