Screenshots

```
jameschoe@Jamess-MBP Lab6 % java Sorting 1Kints.txt 0
                                                   1Kints.txt
Java Default a
                    1.0
                          20230409 153408
                                           hchoe4
Java Default b
                          20230409 153408
                    0.0
                                           hchoe4
                                                   1Kints.txt
Java Default c
                    0.0
                          20230409 153408
                                           hchoe4
                                                   1Kints.txt
Java Default d
                    0.0
                          20230409 153408
                                           hchoe4
                                                   1Kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 1Kints.txt 1
Bubble Sort a
                   7.0
                         20230409 153410
                                          hchoe4
                                                  1Kints.txt
Bubble Sort b
                   3.0
                         20230409 153410
                                          hchoe4
                                                  1Kints.txt
Bubble Sort c
                   1.0
                         20230409 153410
                                          hchoe4
                                                  1Kints.txt
                         20230409 153410
Bubble Sort d
                   1.0
                                          hchoe4
                                                  1Kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 1Kints.txt 2
Selection Sort a
                      5.0
                            20230409_153412
                                             hchoe4
                                                     1Kints.txt
Selection Sort b
                      1.0
                            20230409 153412
                                             hchoe4
                                                     1Kints.txt
Selection Sort c
                      2.0
                            20230409 153412
                                             hchoe4
                                                     1Kints.txt
Selection Sort d
                            20230409 153412
                      1.0
                                             hchoe4 1Kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 1Kints.txt 3
Insertion Sort a
                      7.0
                            20230409_153413
                                             hchoe4 1Kints.txt
Insertion Sort b
                            20230409 153413
                      0.0
                                             hchoe4 1Kints.txt
Insertion Sort c
                     15.0
                            20230409 153414
                                             hchoe4
                                                     1Kints.txt
Insertion Sort d
                      1.0
                            20230409_153414
                                             hchoe4
                                                     1Kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 1Kints.txt 4
                 1.0
                       20230409 153415
                                        hchoe4
Mergesort a
                                                1Kints.txt
Mergesort b
                       20230409 153415
                                        hchoe4
                                                1Kints.txt
                 0.0
Mergesort c
                 1.0
                       20230409 153415
                                        hchoe4
                                                1Kints.txt
Mergesort d
                 0.0
                       20230409 153415
                                        hchoe4
                                                1Kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 1Kints.txt 5
                       20230409 153416
Ouicksort a
                 1.0
                                        hchoe4
                                                1Kints.txt
Quicksort b
                 0.0
                       20230409 153416
                                        hchoe4
                                                1Kints.txt
                       20230409 153416
Quicksort c
                 0.0
                                        hchoe4
                                                1Kints.txt
Quicksort d
                       20230409 153416 hchoe4 1Kints.txt
                 0.0
```

```
jameschoe@Jamess-MBP Lab6 % java Sorting 2Kints.txt 0
Java Default a
                    2.0
                          20230409 153530
                                           hchoe4
                                                   2Kints.txt
Java Default b
                    0.0
                          20230409 153530
                                           hchoe4
                                                   2Kints.txt
Java Default c
                          20230409 153530
                    0.0
                                           hchoe4
                                                   2Kints.txt
Java Default d
                    0.0
                          20230409 153530
                                           hchoe4
                                                   2Kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 2Kints.txt 1
                                                  2Kints.txt
Bubble Sort a
                         20230409 153532
                                          hchoe4
                  16.0
Bubble Sort b
                   2.0
                         20230409 153532
                                                  2Kints.txt
                                          hchoe4
Bubble Sort c
                         20230409 153532
                   3.0
                                          hchoe4
                                                  2Kints.txt
                         20230409 153532
Bubble Sort d
                   6.0
                                          hchoe4 2Kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 2Kints.txt 2
Selection Sort a
                     11.0
                            20230409 153533
                                             hchoe4
                                                     2Kints.txt
Selection Sort b
                      3.0
                            20230409_153533
                                             hchoe4
                                                     2Kints.txt
Selection Sort c
                      2.0
                            20230409 153533
                                             hchoe4
                                                     2Kints.txt
Selection Sort d
                            20230409 153533
                      1.0
                                             hchoe4
                                                     2Kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 2Kints.txt 3
Insertion Sort a
                            20230409 153535
                      7.0
                                             hchoe4
                                                     2Kints.txt
Insertion Sort b
                      1.0
                            20230409 153535
                                             hchoe4
                                                     2Kints.txt
Insertion Sort c
                      1.0
                            20230409 153535
                                                     2Kints.txt
                                             hchoe4
Insertion Sort d
                      0.0
                            20230409 153535
                                             hchoe4 2Kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 2Kints.txt 4
Mergesort a
                 2.0
                       20230409 153536
                                        hchoe4
                                                2Kints.txt
Mergesort b
                 0.0
                       20230409 153536
                                        hchoe4
                                                2Kints.txt
Mergesort c
                 0.0
                       20230409 153536
                                        hchoe4
                                                2Kints.txt
Mergesort d
                 0.0
                       20230409 153536
                                        hchoe4
                                                2Kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 2Kints.txt 5
                 2.0
                       20230409 153537
Quicksort a
                                        hchoe4
                                                2Kints.txt
Quicksort b
                 0.0
                       20230409_153537
                                        hchoe4
                                                2Kints.txt
                       20230409 153537
Quicksort c
                 0.0
                                        hchoe4
                                                2Kints.txt
Quicksort d
                 1.0
                       20230409_153537
                                        hchoe4
                                                2Kints.txt
```

```
jameschoe@Jamess-MBP Lab6 % java Sorting 4kints.txt 0
Java Default a
                    2.0
                          20230409 153634
                                          hchoe4
                                                  4kints.txt
Java Default b
                    0.0
                          20230409 153634
                                           hchoe4
                                                   4kints.txt
Java Default c
                    0.0
                          20230409 153634
                                          hchoe4
                                                   4kints.txt
Java Default d
                    0.0
                          20230409 153634
                                          hchoe4
                                                  4kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 4kints.txt 1
Bubble Sort a
                  29.0
                         20230409 153636
                                         hchoe4
                                                 4kints.txt
Bubble Sort b
                  38.0
                         20230409 153636
                                         hchoe4
                                                 4kints.txt
                  24.0
Bubble Sort c
                         20230409 153636
                                         hchoe4
                                                 4kints.txt
Bubble Sort d
                         20230409 153636
                                         hchoe4
                  10.0
                                                 4kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 4kints.txt 2
                            20230409 153638
Selection Sort a
                     23.0
                                            hchoe4
                                                    4kints.txt
Selection Sort b
                     11.0
                           20230409 153638
                                            hchoe4
                                                    4kints.txt
Selection Sort c
                      9.0
                           20230409_153638
                                            hchoe4
                                                    4kints.txt
Selection Sort d
                      5.0
                            20230409 153638
                                            hchoe4 4kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 4kints.txt 3
                           20230409 153640
Insertion Sort a
                     14.0
                                            hchoe4 4kints.txt
                           20230409_153640
Insertion Sort b
                      0.0
                                            hchoe4
                                                    4kints.txt
Insertion Sort c
                      9.0
                           20230409 153640
                                            hchoe4 4kints.txt
                      1.0
                           20230409 153640
                                            hchoe4 4kints.txt
Insertion Sort d
jameschoe@Jamess-MBP Lab6 % java Sorting 4kints.txt 4
Mergesort a
                 3.0
                       20230409_153642
                                       hchoe4
                                               4kints.txt
Mergesort b
                 1.0
                       20230409_153642
                                       hchoe4
                                               4kints.txt
                 1.0
                       20230409 153642
                                       hchoe4
                                               4kints.txt
Mergesort c
Mergesort d
                 7.0
                       20230409 153642
                                       hchoe4
                                               4kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 4kints.txt 5
                       20230409 153643
                 4.0
                                       hchoe4
                                               4kints.txt
Ouicksort a
Quicksort b
                 0.0
                       20230409_153644
                                       hchoe4
                                               4kints.txt
Ouicksort c
                 0.0
                       20230409 153644
                                       hchoe4
                                               4kints.txt
Quicksort d
                 1.0
                      20230409 153644
                                       hchoe4
                                               4kints.txt
```

```
jameschoe@Jamess-MBP Lab6 % java Sorting 8kints.txt 0
Java Default a
                   7.0
                         20230409 153717
                                                  8kints.txt
                                          hchoe4
Java Default b
                   1.0
                         20230409_153717
                                          hchoe4
                                                  8kints.txt
Java Default c
                   0.0
                         20230409 153717
                                          hchoe4
                                                  8kints.txt
Java Default d
                    1.0
                         20230409 153717
                                          hchoe4
                                                  8kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 8kints.txt 1
                                                 8kints.txt
Bubble Sort a
                 122.0
                        20230409 153719
                                         hchoe4
Bubble Sort b
                  70.0
                        20230409_153719 hchoe4
                                                 8kints.txt
                        20230409 153720
Bubble Sort c
                  47.0
                                         hchoe4
                                                 8kints.txt
                  31.0
Bubble Sort d
                        20230409 153720 hchoe4
                                                 8kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 8kints.txt 2
Selection Sort a
                    66.0
                           20230409 153721
                                            hchoe4
                                                    8kints.txt
Selection Sort b
                    53.0
                           20230409 153721
                                            hchoe4
                                                    8kints.txt
Selection Sort c
                    40.0
                            20230409 153721
                                            hchoe4
                                                    8kints.txt
Selection Sort d
                    26.0
                            20230409 153721
                                            hchoe4
                                                    8kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 8kints.txt 3
Insertion Sort a
                    17.0
                           20230409 153723
                                            hchoe4
                                                    8kints.txt
Insertion Sort b
                     0.0
                           20230409 153723
                                            hchoe4
                                                    8kints.txt
                            20230409 153723
Insertion Sort c
                    37.0
                                            hchoe4
                                                    8kints.txt
                           20230409 153723
Insertion Sort d
                      2.0
                                            hchoe4 8kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 8kints.txt 4
Mergesort a
                 3.0
                       20230409 153725
                                       hchoe4
                                               8kints.txt
Mergesort b
                 2.0
                       20230409 153725
                                       hchoe4
                                               8kints.txt
Mergesort c
                 2.0
                       20230409_153725
                                               8kints.txt
                                       hchoe4
                 3.0
                       20230409 153725
Mergesort d
                                       hchoe4
                                               8kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 8kints.txt 5
Ouicksort a
                 4.0
                       20230409 153726 hchoe4
                                               8kints.txt
                      20230409 153726
                                       hchoe4
Quicksort b
                0.0
                                               8kints.txt
Quicksort c
                0.0
                      20230409 153726
                                       hchoe4
                                               8kints.txt
Quicksort d
                0.0
                      20230409 153726 hchoe4 8kints.txt
```

```
jameschoe@Jamess-MBP Lab6 % java Sorting 16kints.txt 0
Java Default a
                    3.0
                          20230409 153800
                                                   16kints.txt
                                           hchoe4
Java Default b
                    1.0
                          20230409_153800
                                           hchoe4
                                                   16kints.txt
Java Default c
                    0.0
                          20230409 153800
                                           hchoe4
                                                   16kints.txt
Java Default d
                    2.0
                          20230409 153800
                                           hchoe4
                                                   16kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 16kints.txt 1
                                                  16kints.txt
Bubble Sort a
                 399.0
                         20230409 153802
                                          hchoe4
Bubble Sort b
                 212.0
                         20230409 153803
                                          hchoe4
                                                  16kints.txt
Bubble Sort c
                 290.0
                         20230409 153803
                                          hchoe4
                                                  16kints.txt
Bubble Sort d
                 115.0
                         20230409 153803
                                          hchoe4 16kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 16kints.txt 2
                    159.0
                            20230409 153806
                                             hchoe4
Selection Sort a
                                                     16kints.txt
Selection Sort b
                                                     16kints.txt
                    158.0
                            20230409 153806
                                             hchoe4
Selection Sort c
                    116.0
                            20230409 153806
                                             hchoe4
                                                     16kints.txt
                            20230409 153806
Selection Sort d
                    162.0
                                             hchoe4
                                                     16kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 16kints.txt 3
                            20230409_153809
Insertion Sort a
                     58.0
                                             hchoe4
                                                     16kints.txt
Insertion Sort b
                      0.0
                            20230409 153809
                                             hchoe4
                                                     16kints.txt
Insertion Sort c
                            20230409 153809
                     87.0
                                             hchoe4
                                                     16kints.txt
Insertion Sort d
                     16.0
                            20230409 153809
                                             hchoe4
                                                     16kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 16kints.txt 4
Mergesort a
                14.0
                       20230409 153811
                                        hchoe4 16kints.txt
Mergesort b
                 2.0
                       20230409 153811
                                        hchoe4
                                                16kints.txt
                                                16kints.txt
Mergesort c
                 2.0
                       20230409 153811
                                        hchoe4
Mergesort d
                 3.0
                       20230409 153811 hchoe4
                                                16kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 16kints.txt 5
Ouicksort a
                 4.0
                       20230409 153812 hchoe4
                                                16kints.txt
Ouicksort b
                 0.0
                       20230409 153813
                                        hchoe4
                                                16kints.txt
Ouicksort c
                 0.0
                       20230409 153813
                                        hchoe4
                                                16kints.txt
                       20230409 153813
Ouicksort d
                 0.0
                                        hchoe4
                                                16kints.txt
```

```
jameschoe@Jamess-MBP Lab6 % java Sorting 32kints.txt 0
Java Default a
                    5.0
                         20230409 153905
                                          hchoe4
                                                  32kints.txt
Java Default b
                    1.0
                          20230409 153905
                                          hchoe4
                                                  32kints.txt
Java Default c
                          20230409 153905
                    2.0
                                          hchoe4
                                                  32kints.txt
Java Default d
                    4.0
                          20230409 153905
                                          hchoe4
                                                  32kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 32kints.txt 1
                         20230409 153909
Bubble Sort a
                1826.0
                                         hchoe4
                                                  32kints.txt
Bubble Sort b
                 811.0
                         20230409 153909
                                         hchoe4
                                                 32kints.txt
Bubble Sort c
                 620.0
                         20230409 153910
                                         hchoe4
                                                 32kints.txt
Bubble Sort d
                 490.0
                         20230409 153911
                                         hchoe4 32kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 32kints.txt 2
Selection Sort a
                    539.0
                            20230409 153914
                                                    32kints.txt
                                            hchoe4
Selection Sort b
                    564.0
                            20230409 153914
                                            hchoe4
                                                    32kints.txt
Selection Sort c
                    454.0
                            20230409 153915
                                            hchoe4
                                                    32kints.txt
Selection Sort d
                    288.0
                            20230409 153915
                                            hchoe4
                                                    32kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 32kints.txt 3
                    134.0
                            20230409 153917
                                            hchoe4 32kints.txt
Insertion Sort a
Insertion Sort b
                      1.0
                            20230409 153917
                                            hchoe4
                                                    32kints.txt
Insertion Sort c
                    201.0
                            20230409 153917
                                            hchoe4 32kints.txt
                            20230409 153917
Insertion Sort d
                     29.0
                                            hchoe4 32kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 32kints.txt 4
                 9.0
                       20230409_153920 hchoe4
Mergesort a
                                               32kints.txt
                 3.0
                       20230409 153920
                                       hchoe4 32kints.txt
Mergesort b
Mergesort c
                 2.0
                       20230409 153920
                                       hchoe4
                                               32kints.txt
Mergesort d
                 3.0
                       20230409 153920 hchoe4 32kints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 32kints.txt 5
Quicksort a
                 8.0
                       20230409 153922 hchoe4 32kints.txt
Quicksort b
                 1.0
                       20230409 153922
                                       hchoe4
                                               32kints.txt
                       20230409 153922
Quicksort c
                 1.0
                                       hchoe4
                                               32kints.txt
Quicksort d
                1.0
                      20230409 153922 hchoe4 32kints.txt
```

1Mints.txt

```
jameschoe@Jamess-MBP Lab6 % java Sorting 1Mints.txt 0
Java Default a
                  101.0
                         20230409 164105
                                          hchoe4
                                                   1Mints.txt
Java Default b
                   4.0
                          20230409 164105
                                                   1Mints.txt
                                          hchoe4
Java Default c
                   6.0
                         20230409 164106
                                          hchoe4
                                                   1Mints.txt
Java Default d
                          20230409 164106
                  46.0
                                          hchoe4
                                                  1Mints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 1Mints.txt 1
jameschoe@Jamess-MBP Lab6 % java Sorting 1Mints.txt 2
^C<sup>용</sup>
jameschoe@Jamess-MBP Lab6 % java Sorting 1Mints.txt 3
Insertion Sort a 94950.0
                           20230409 164301
                                            hchoe4 1Mints.txt
Insertion Sort b
                      5.0
                           20230409_164301
                                            hchoe4
                                                    1Mints.txt
Insertion Sort c 663709.0
                           20230409 165405
                                            hchoe4
                                                    1Mints.txt
Insertion Sort d 76792.0
                           20230409 165522
                                            hchoe4 1Mints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 1Mints.txt 4
                      20230409_165543 hchoe4
Mergesort a
               180.0
                                               1Mints.txt
Mergesort b
               100.0
                      20230409 165543
                                       hchoe4
                                               1Mints.txt
Mergesort c
               120.0
                      20230409 165544
                                       hchoe4
                                               1Mints.txt
Mergesort d
               82.0
                       20230409 165544
                                       hchoe4 1Mints.txt
jameschoe@Jamess-MBP Lab6 % java Sorting 1Mints.txt 5
               136.0
                      20230409 165547
Ouicksort a
                                       hchoe4 1Mints.txt
Ouicksort b
               34.0
                      20230409 165547
                                       hchoe4
                                               1Mints.txt
                      20230409 165547
Ouicksort c
               18.0
                                       hchoe4
                                               1Mints.txt
                       20230409 165547
Quicksort d
               40.0
                                       hchoe4
                                               1Mints.txt
```

Tables

Array A

	1Kints.txt	2Kints.txt	4Kints.txt	8Kints.txt	16Kints.txt	32Kints.txt	1Mints.txt
Array a	1	2	4	8	16	32	1000
Java Default	1	2	2	7	3	5	101
Bubble Sort	7	16	29	122	399	1826	N/A
Selection Sort	5	11	23	66	159	539	N/A
Insertion Sort	7	7	14	17	58	134	94950
Mergesort	1	2	3	3	14	9	180
Quicksort	1	2	4	4	4	8	136

Array B

	1Kints.txt	2Kints.txt	4Kints.txt	8Kints.txt	16Kints.txt	32Kints.txt	1Mints.txt
Array b	1	2	4	8	16	32	1000
Java Default	0	0	0	1	1	1	4
Bubble Sort	3	2	38	70	212	811	N/A
Selection Sort	4	3	11	53	158	564	N/A
Insertion Sort	0	1	0	0	0	1	5
Mergesort	0	0	1	2	2	3	100
Quicksort	0	0	0	0	0	1	34

Array C

	1Kints.txt	2Kints.txt	4Kints.txt	8Kints.txt	16Kints.txt	32Kints.txt	1Mints.txt
Array c	1	2	4	8	16	32	1000
Java Default	0	0	0	0	0	2	6
Bubble Sort	1	3	24	47	290	620	N/A
Selection	2	2	9	40	116	454	N/A

Sort							
Insertion Sort	15	1	9	37	87	201	N/A
Mergesort	1	0	1	2	2	2	120
Quicksort	0	0	0	0	0	1	18

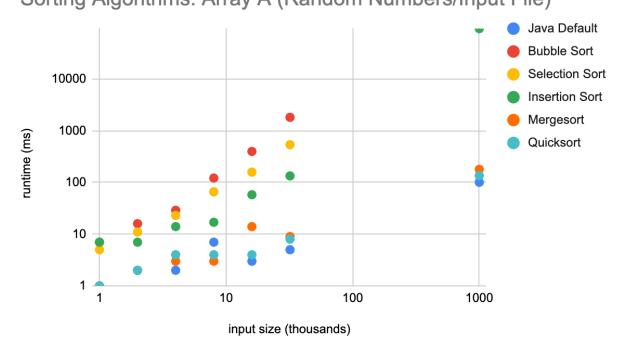
Array D

	1Kints.txt	2Kints.txt	4Kints.txt	8Kints.txt	16Kints.txt	32Kints.txt	1Mints.txt
Array d	1	2	4	8	16	32	1000
Java Default	0	0	0	1	2	4	46
Bubble Sort	1	6	10	31	115	490	N/A
Selection Sort	4	1	5	26	162	288	N/A
Insertion Sort	1	0	1	2	16	29	76792
Mergesort	0	0	7	3	3	3	82
Quicksort	0	1	1	0	0	1	40

Plots

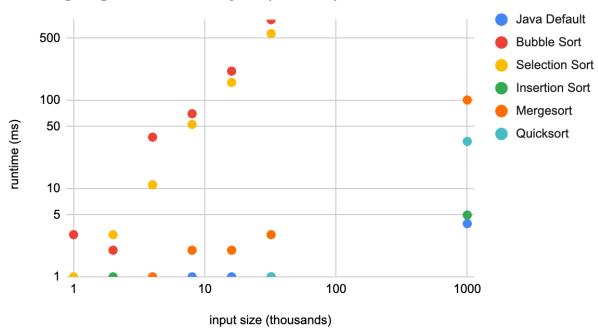
Array A

Sorting Algorithms: Array A (Random Numbers/Input File)



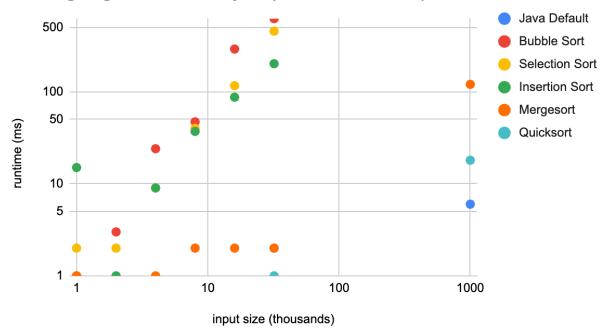
Array B

Sorting Algorithms: Array B (Sorted)



Array C

Sorting Algorithms: Array C (Sorted Reverse)



Array D

Sorting Algorithms: Array D (Almost Sorted)

