

a	1K	2K	4K	8K	16K	32K	1M
Arrays.sort()	17	18	25	25	34	42	212
Bubble	24	31	49	130	372	1714	10m+
Selection	23	26	42	80	244	877	10m+
Insertion	21	26	37	81	242	871	10m+
Merge	18	21	24	26	33	40	189
Quick	18	19	24	31	34	41	241

b	1K	2K	4K	8K	16K	32K	1M
Arrays.sort()	3	1	3	4	6	10	86
Bubble	4	2	7	21	133	802	10m+
Selection	3	4	16	56	217	898	10m+
Insertion	3	5	16	58	215	836	10m+
Merge	3	1	2	26	8	11	153
Quick	5	3	9	32	131	N/A	N/A

c	1K	2K	4K	8K	16K	32K	1M
Arrays.sort()	1	2	3	5	7	10	104
Bubble	1	3	10	53	127	547	10m+
Selection	2	4	15	57	209	923	10m+
Insertion	2	5	7	58	209	878	10m+
Merge	2	2	3	4	6	11	88
Quick	4	2	8	30	80	N/A	N/A

d	1K	2K	4K	8K	16K	32K	1M
Arrays.sort()	1	1	3	3	6	6	51
Bubble	1	3	10	50	127	511	10m+
Selection	2	5	16	58	214	846	10m+
Insertion	2	5	7	58	211	856	10m+
Merge	1	1	2	4	5	5	92
Quick	1	3	8	30	83	N/A	N/A


```

Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 16Kints.txt 0
Arrays.sort() a      31.0    20220410_201228  31830539  16Kints.txt
Arrays.sort() b      6.0    20220410_201228  31830539  16Kints.txt
Arrays.sort() c      5.0    20220410_201228  31830539  16Kints.txt
Arrays.sort() d      5.0    20220410_201228  31830539  16Kints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 16Kints.txt 1
Bubble Sort a      386.0    20220410_201231  31830539  16Kints.txt
Bubble Sort b      69.0    20220410_201231  31830539  16Kints.txt
Bubble Sort c     126.0    20220410_201231  31830539  16Kints.txt
^[[ABubble Sort d     128.0    20220410_201231  31830539  16Kints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 16Kints.txt 2
Selection Sort a     237.0    20220410_201233  31830539  16Kints.txt
Selection Sort b     219.0    20220410_201233  31830539  16Kints.txt
Selection Sort c     209.0    20220410_201233  31830539  16Kints.txt
Selection Sort d     207.0    20220410_201233  31830539  16Kints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 16Kints.txt 3
Insertion Sort a     237.0    20220410_201235  31830539  16Kints.txt
Insertion Sort b     224.0    20220410_201235  31830539  16Kints.txt
Insertion Sort c     210.0    20220410_201235  31830539  16Kints.txt
Insertion Sort d     208.0    20220410_201235  31830539  16Kints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 16Kints.txt 4
Mergesort a      33.0    20220410_201238  31830539  16Kints.txt
Mergesort b      7.0    20220410_201238  31830539  16Kints.txt
Mergesort c      5.0    20220410_201238  31830539  16Kints.txt
Mergesort d      7.0    20220410_201238  31830539  16Kints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 16Kints.txt 5
Quicksort a      34.0    20220410_201240  31830539  16Kints.txt
Quicksort b     131.0    20220410_201240  31830539  16Kints.txt
Quicksort c      80.0    20220410_201240  31830539  16Kints.txt
Quicksort d      83.0    20220410_201240  31830539  16Kints.txt

```

```

Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 32Kints.txt 0
Arrays.sort() a      41.0    20220410_201826  31830539  32Kints.txt
Arrays.sort() b     11.0    20220410_201826  31830539  32Kints.txt
Arrays.sort() c      9.0    20220410_201826  31830539  32Kints.txt
Arrays.sort() d      5.0    20220410_201826  31830539  32Kints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 32Kints.txt 1
Bubble Sort a     1700.0    20220410_201827  31830539  32Kints.txt
Bubble Sort b      713.0    20220410_201827  31830539  32Kints.txt
Bubble Sort c      502.0    20220410_201827  31830539  32Kints.txt
Bubble Sort d      503.0    20220410_201827  31830539  32Kints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 32Kints.txt 2
Selection Sort a     881.0    20220410_201832  31830539  32Kints.txt
Selection Sort b     836.0    20220410_201832  31830539  32Kints.txt
Selection Sort c     831.0    20220410_201832  31830539  32Kints.txt
Selection Sort d     844.0    20220410_201832  31830539  32Kints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 32Kints.txt 3
Insertion Sort a     878.0    20220410_201842  31830539  32Kints.txt
Insertion Sort b     845.0    20220410_201842  31830539  32Kints.txt
Insertion Sort c     833.0    20220410_201842  31830539  32Kints.txt
Insertion Sort d     845.0    20220410_201842  31830539  32Kints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 32Kints.txt 4
Mergesort a      42.0    20220410_201902  31830539  32Kints.txt
Mergesort b     11.0    20220410_201902  31830539  32Kints.txt
Mergesort c     10.0    20220410_201902  31830539  32Kints.txt
Mergesort d      5.0    20220410_201902  31830539  32Kints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 32Kints.txt 5
Quicksort a      40.0    20220410_201909  31830539  32Kints.txt
Exception in thread "main" java.lang.StackOverflowError
        at Sorting.QuickSort(Sorting.java:279)

```

```

Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 1Mints.txt 0
Arrays.sort() a     228.0    20220410_201943  31830539  1Mints.txt
Arrays.sort() b      99.0    20220410_201943  31830539  1Mints.txt
Arrays.sort() c     114.0    20220410_201943  31830539  1Mints.txt
Arrays.sort() d      58.0    20220410_201943  31830539  1Mints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 1Mints.txt 1
^CLees-MacBook-Pro:lab6 joonhyuplee$
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 1Mints.txt 2
^CLees-MacBook-Pro:lab6 joonhyuplee$
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 1Mints.txt 3
^CLees-MacBook-Pro:lab6 joonhyuplee$
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 1Mints.txt 4
Mergesort a     188.0    20220410_202007  31830539  1Mints.txt
Mergesort b     164.0    20220410_202007  31830539  1Mints.txt
Mergesort c      88.0    20220410_202007  31830539  1Mints.txt
Mergesort d      83.0    20220410_202007  31830539  1Mints.txt
Lees-MacBook-Pro:lab6 joonhyuplee$ java Sorting 1Mints.txt 5
Quicksort a     222.0    20220410_202011  31830539  1Mints.txt
Exception in thread "main" java.lang.StackOverflowError
        at Sorting.QuickSort(Sorting.java:279)

```