

AP COMPUTER SCIENCE A

- Download the files `s_10000.txt`, `s_50000.txt`, `s_100000.txt`, `s_500000.txt` and `s_1000000.txt` from `canvas.instructure.com`. These files contain lists of random numbers. For example, the first few lines of `s_10000.txt` are:

```
10000
/**/
1055
294
593
.
.
.
```

The first two lines just tell the reading program that `s_10000.txt` contains a list of 10,000 numbers (the numbers between 0 and 9999, inclusive) ordered randomly. The third and subsequent lines are the random numbers.

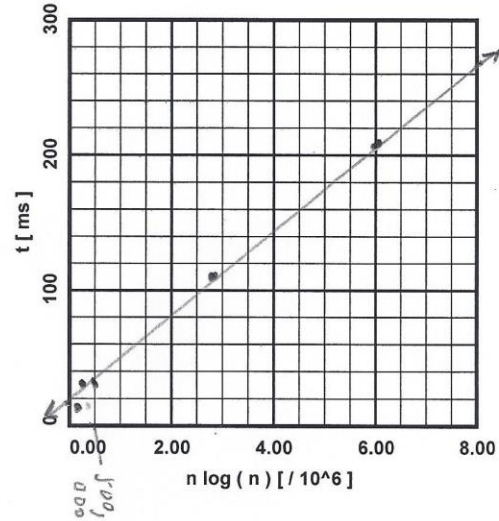
- Download the file `RecursiveMergeSort.java` from `canvas.instructure.com`, which performs a merge sort on a list of integers using a recursive algorithm. The program `RecursiveMergeSort.java` also needs the files `FileInput.java` and `FileOutput.java`. Compile and run `RecursiveMergeSort` and fill out the table below. The program will print out the time, in milliseconds, that it took to perform the sort.

n	t (ms)	$n \log n$
10 000	15	40,000
50 000	31	234,949
100 000	32	500,000
500 000	110	2,849,485
1 000 000	203	6,000,000

As was discussed in lecture, the speed of a merge sort is $t \sim O(n \log n)$. Thus, the points in the above table, when plotted, should follow $t = a \cdot n \log n + b$.

RECURSIVE MERGE SORT CLASS WORK

- Graph the points in the table at lower left on the axes provided below.



- Perform a linear regression on the plotted points to obtain the equation of best fit $t = a \cdot n \log n + b$ and graph the best-fit line on the axes above.

$$a = ? \quad 3.099 \times 10^{-5}$$

$$b = ? \quad 18,545$$