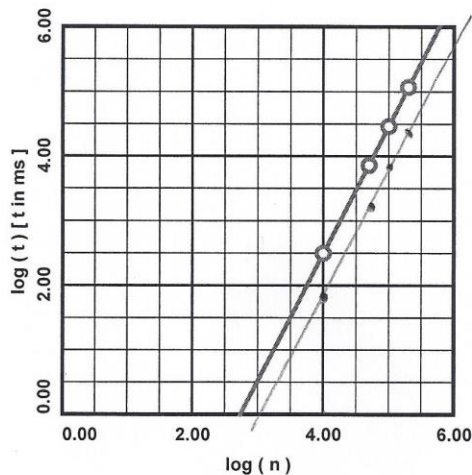


AP COMPUTER SCIENCE A

- 1) Download the files `is_10000.txt`, `is_50000.txt`, `is_100000.txt` and `is_200000.txt` from `canvas.instructure.com`. These files contain randomly ordered lists of integers, e.g., `is_10000.txt` contains 10,000 integers.
- 2) Download the program `InsertionSort.java` from `canvas.instructure.com`, which program performs an insertion sort. `InsertionSort.java` needs the files `FileInput.java` and `FileOutput.java`.
- 3) Compile and run `InsertionSort.java` and fill out the table below.

n	t (in ms)	$\log n$	$\log t$
10,000	63	4.00	1.80
50,000	1551	4.70	3.19
100,000	6928	5.00	3.84
200,000	27,283	5.30	4.44

- 4) Graph the points $\log n$ versus $\log t$ from the above table on the axes provided below.



As was discussed in lecture, the time it takes to perform an insertion sort is $t \sim O(n^2)$, or $t \approx n^2$. Taking the common logarithm of both sides then gives $\log t \approx 2 \log n$. Thus the plotted points should follow $\log t = a \log n + b$ closely, where $a \approx 2$.

INSERTION SORT CLASS WORK

- 5) Perform a linear regression on the values in the table to obtain the line of best fit $\log t = a \log n + b$ and graph the line on the axes at lower left.

$$a = ? \quad 2.035$$

$$b = ? \quad -6.348$$

- 6) The points and line of best fit that were already on the graph are what were obtained previously for a selection sort, which also takes time $t \sim O(n^2)$. Which sorting algorithm is faster, the selection sort or the insertion sort?

Insertion sort is a little faster -