Prompt

In a separate document, describe the rate of growth that you would expect to see for each type of list. Provide timings from your driver to support your expectations. How do the timings for ComboList compare with ArrayList and LinkedList

Response

I would expect for the ArrayList to operate very quickly, under ten milliseconds, because, while it is doing N operations for the list, it is doing all of the get operations in constant time, meaning very low timings. The times are increasing, but at a number so small that it does not show up.

However, for LinkedList, I would expect it to take the most amount of time since the get operations would be O(N). Since we are using a non-Iterator for-loop, the timing becomes O(N^2). Since the algorithm is O(N^2), we see the timings quadruple and this is because, when the size of an O(N^2) algorithm doubles, the time it takes quadruples.

ComboList should still be O(N) since it follows a similar structure to LinkedList. However, we went through the effort to have the loop skip a node if it knows that the ArrayList's total capacity could not contain our index. However, we are still using a for-loop, which means that the indexing becomes O(N^2), which means that it should quadruple. However, because of the "node-skipping" the times are less than LinkedList

Times:

```
Size for ArrayList: 8000 Time: 1
Size for LinkedList: 8000 Time: 42
Size for ComboList: 8000 Time: 14

Size for ArrayList: 16000 Time: 1
Size for LinkedList: 16000 Time: 173
Size for ComboList: 16000 Time: 71

Size for ArrayList: 32000 Time: 1
Size for LinkedList: 32000 Time: 700
Size for ComboList: 32000 Time: 356

Size for ArrayList: 64000 Time: 0
Size for LinkedList: 64000 Time: 2948
Size for ComboList: 64000 Time: 1364

Size for ArrayList: 128000 Time: 0
Size for LinkedList: 128000 Time: 11801
Size for ComboList: 128000 Time: 5566

Size for ArrayList: 256000 Time: 0
Size for LinkedList: 256000 Time: 55896
Size for ComboList: 256000 Time: 30437

Size for ArrayList: 512000 Time: 0
Size for LinkedList: 512000 Time: 237972
Size for ComboList: 512000 Time: 2439668
```

Size	ArrayList	LinkedList	ComboList
1000	0	1	1
2000	0	4	0
4000	0	11	2
8000	1	42	14
16000	1	173	71
32000	1	700	356
64000	0	2948	1364
128000	0	11801	5566
256000	0	55896	30437
512000	0	237972	2439668