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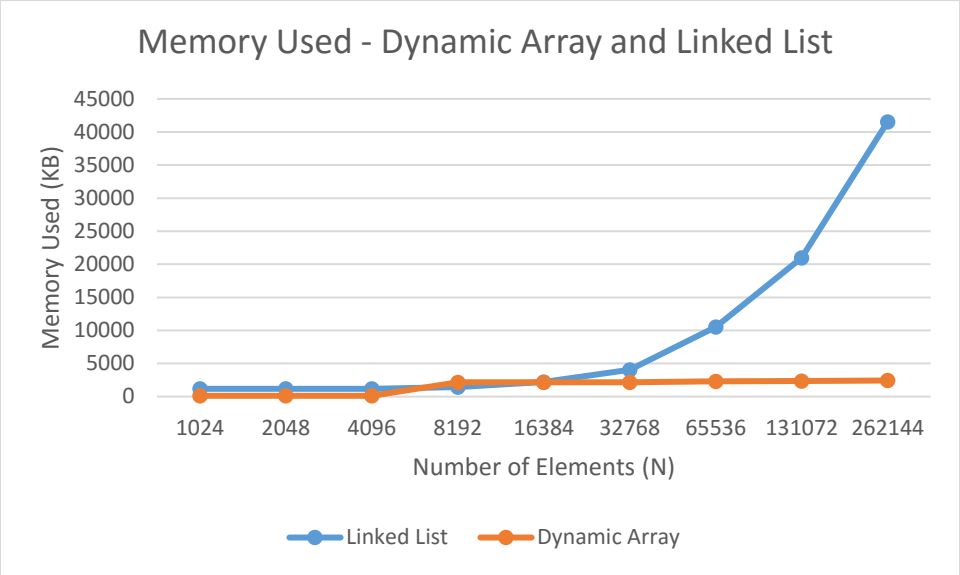
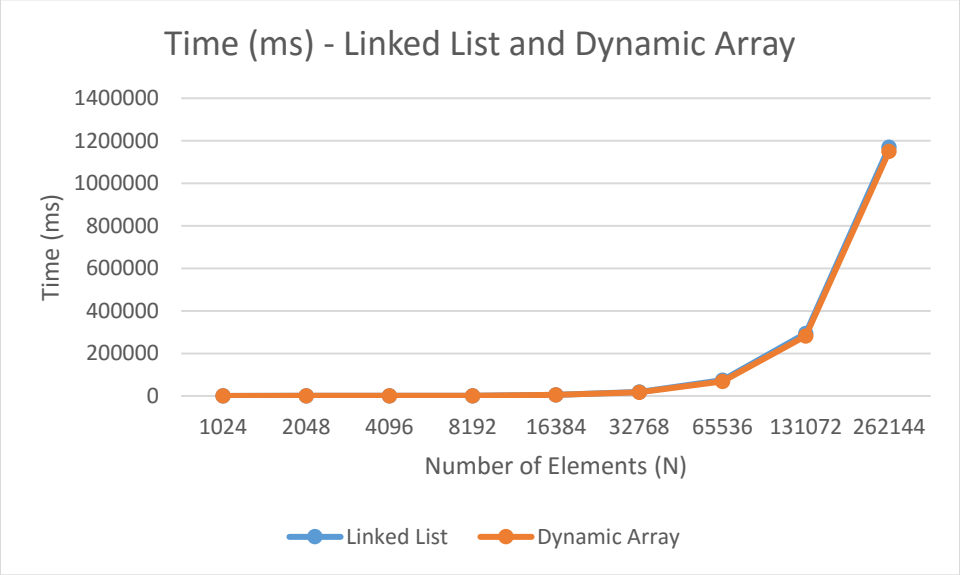
Assignment 3 – Problem 2





Which of the implementations uses more memory? Explain why.

The linked list uses much more memory than the dynamic array, especially at larger N values. This is because each element of the list (link) contains a pointer to the previous and next link, in addition to the value stored in the element. These pointers take up the extra memory that makes up the difference between the linked list and dynamic array.

Which of the implementations is the fastest? Explain why.

Both implementations have similar run times. This is because they each need to iterate through each element individually, and so the Big-OH for both should be O(n).

Would you expect anything to change if the loop performed remove() instead of contains()? If so, why?

I would expect both implementations to have faster run times as their number of elements would decrease incrementally. Of the two, I would expect the Linked List implementation to become faster than the Dynamic Array because the Dynamic Array would require the extra time needed to shift all of the elements to the right of the removed element left one space after that element has been removed.

Linked List

N	Memory used (KB)	Time taken (ms)
1024	1180	30
2048	1180	130
4096	1180	290
8192	1436	1160
16384	2228	4860
32768	4076	17310
65536	10540	69060
131072	20964	282360
262144	41548	1.15x10^6

Dynamic Array

N	Memory used (KB)	Time taken (ms)
1024	124	40
2048	124	140
4096	124	460
8192	2172	1210
16384	2172	5140
32768	2172	18460
65536	2308	73800
131072	2356	294710
262144	2436	1.17x10^6