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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