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| Programming Assignment 3 | |  |  |  |  |  |
| Problem 2: Comparison | |  |  |  |  |  |
|  |  |  |  |  |  |  |
| **Linked List** | |  |  | **Dynamic Array** | |  |
| n | Memory usage KB | time ms |  | n | Memory usage KB | time ms |
| 1000 | 0 | 0 |  | 1000 | 0 | 0 |
| 2000 | 0 | 10 |  | 2000 | 0 | 0 |
| 4000 | 0 | 30 |  | 4000 | 0 | 20 |
| 8000 | 0 | 120 |  | 8000 | 0 | 100 |
| 16000 | 0 | 510 |  | 16000 | 0 | 390 |
| 32000 | 496 | 2050 |  | 32000 | 0 | 1580 |
| 64000 | 1496 | 8340 |  | 64000 | 0 | 6250 |
| 128000 | 3496 | 33440 |  | 128000 | 144 | 24880 |
| 256000 | 7492 | 215440 |  | 256000 | 644 | 99830 |

Which of the implementations uses more memory? Explain why.

**Linked list uses more memory. I think this is due to the fact that linked lists have pointers to**

**the first link, to the last link and to each next link. So it seems that a lot of memory is wasted on those pointers. Dynamic Array needs to store only the value.**

Which of the implementations is the fastest? Explain why.

**Dynamic Array is faster. My guess is that it is faster than liked list because nodes in the linked list are stored incontiguously and this increases the time required to access individual elements within the list. On the other hand, the elements in the dynamic array are stored in contiguous segment of memory, which make is easier, thus faster to transverse.**

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

**I would expect that the dynamic array would have been slower if the remove () function was used instead. The reasoning is that in case an element needs to be removed in the middle of the array, we would need to slide up the elements to fill in the index of the removed element. At the same time, an array from which many elements are removed may also have to be resized in order to avoid wasting too much space. Any time there is an a change in the capacity of an array, we would need to copy and paste all elements from the old array to the new one.**

**As for the memory usage, I do not expect that many if any changes at all, if we perform remove() instead of contains().**