**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

For each of the below questions, write a short sentence or two to express (in your own words) your answer. Keep the answers short, but use complete, correct, English sentences.

If it helps to clarify the questions, feel free to mentally prefix all the questions with the phrase "According to the video…"

1. After you’ve watched all the videos, please answer this question:  
   Of all the videos that you watched, if you could pick one video to be re-recorded by the instructor outside of class which would you choose? Why?  
   (Keep in mind the recording outside of class will omit any pauses from the instructor answering student questions, have less hemming and hawing, etc, and generally be more concise)

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| < Write your answer here > |

**VIDEO: Linear/Binary Search**

1. Let’s say that you want to determine if a particular value is present in an array.  
   Briefly and intuitively, describe how a linear search operates.

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| < Write your answer here > |

1. In the video, what does the variable **N** represent?

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| < Etc. > |

1. Why is this search method called “linear” search?

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1. What sort of arrays can you use a linear search on?

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1. In addition to the properties needed for a linear search, what must also be true of an array in order to use a binary search on it?

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1. How does a binary search begin?

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1. If that array element is not the target value, then what will the binary search do next?

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1. Briefly describe how the binary search continues searching (after the initial check)

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1. What is an important test case to check when testing a search algorithm (such as binary search)?

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**VIDEO: Binary Search on paper: Example Solution**Notice that in this lesson in the In-Class Exercises portion of the web page there are a number of documents linked to by **“Linear Search By Hand”** or **“Binary Search By Hand”** or “**Bubble Sort By Hand”**. This video explains how to do the “**Binary Search By Hand**” on-paper exercise.   
  
It is recommended that you try to do the exercise on your own before you watch this video, then check your work against the explanation in the video.

1. During Iteration 0, what values are tracked, and what does each value mean?

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1. At the end of Iteration 0, why does max change to 6?  
   (Also - why does it not change to 7?)

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1. At the end of Iteration 1, what value is changed to 4, and why?

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Make sure that you check your work against the remainder of the video

1. Given how awesomely efficient binary search is, why don’t we always use binary search on every array that we want to search?

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**VIDEO: Bubble Sort**

1. About a minute into the video BubbleSort is quickly summarized. According to that summary, how does BubbleSort (basically) operate?

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1. For BubbleSort, how are numbers swapped inside the computer?  
   In contrast, how will we represent numbers being swapped when doing the paper exercise?

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1. (Roughly) how many elements does Pass #1 compare?

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1. In Pass #1, what happens if you find the largest element somewhere in the beginning/middle of the array?

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1. After one pass through the array, what is true about the values in the array?

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1. In the pseudocode, what is the outer loop used for?  
   Because of this, why is it ok that you never actually use the outer loop’s counter inside the inner loop?

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1. Briefly, intuitively explain one (or more) optimization(s) there were briefly mentioned in the video.

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**VIDEO: Bubble Sort on paper: Example solution**

Notice that in this lesson in the In-Class Exercises portion of the web page there are a number of documents linked to by **“Linear Search By Hand”** or **“Binary Search By Hand”** or “**Bubble Sort By Hand”**.

This video explains how to do the “**BubbleSort By Hand**” on-paper exercise.   
It is recommended that you try to do the exercise on your own before you watch this video, then check your work against the explanation in the video.

1. When do you copy the current array into a “fresh” (blank) array?  
   (Remember that you do NOT copy the array over every time that you do a comparison! You’ll get a hand cramp AND run out of paper trying to finish the exercise! ☺ )

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1. Between the “Starting Point” row and “Swap 0”, which two elements are swapped? Why?

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1. Between “Swap 0” and “Swap 1”, which two elements are swapped?

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1. Between “Swap 1” and “Swap 2”, which two elements are swapped?

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1. Between “Swap 2” and “Swap 3”, why do we “rewind, and go back to the beginning of the array”?

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1. After which rows does Pass #2 end?

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**VIDEO: Bubble Sort: Warning about the Null Reference test case in this week's tests**

1. The BubbleSort method is public; what does this imply about the possible values of the parameters?

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1. Give one example of a line of C# code that would cause the program to crash if your BubbleSort method was given null as a parameter; make sure to explain why it causes the crash.

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1. Give an example of C# code that will check if BubbleSort’s parameter is null or not:

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1. Give the example from the video that checks if the array parameter is null or else if the length of the array is zero. Also explain why that line will not crash when the parameter is null.

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1. Is it possible to create an array that is not null yet has a length of zero?  
   If so, then give an example of C# code that does this.

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**VIDEO: Big "Oh" notation**

1. What can Big Oh notation be used to measure?

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| < Write your answer here > |

1. Overall, what is the goal of using Big Oh notation? What can we use it to do?

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1. When in the software development lifecycle would you use Big Oh notation?

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1. For the 'simple example' of printing out everything in array, what will control how many times the body of the loop runs?

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1. Is Big Oh notation good for analyzing small arrays? Why or why not?  
   What sized arrays is Big Oh notation good for analyzing

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1. Why/how do we ignore any coefficients on the leading term of the formula that exactly describes how much time the algorithm will need?

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1. If we say that an algorithm takes O( N ) time (where N is the length of the array), what are we actually saying about the exact time that it takes to run the algorithm.

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1. Is Big Oh notation an upper or lower bound on the amount of time that the algorithm will take?

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**VIDEO: Big "Oh" notation & linear search**

1. What is one complication that arises when analyzing the run-time of linear search?

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1. In analyzing the run-time of any algorithm (say, linear search), what assumption are we going to make about the values contained in the array?

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1. For linear search, on average, how far do we expect to go through the array before finding the target value (or determining that the value is not present)

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1. When writing out the running time of linear search, why is it that we do not see the coefficient listed in the video?

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1. When examining the Excel spreadsheet in the video, what do the values in the “Array Size” column mean?

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1. When examining the Excel spreadsheet in the video, what do the values in the “Found” column mean?

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1. When examining the Excel spreadsheet in the video, what do the values in the “Not Found” column mean?

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1. **What is the running time of the linear search algorithm, in the Big Oh notation?  
   (Make sure that you (briefly) note what N is!)**

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**VIDEO: Big "Oh" notation & binary search**

1. Why is it good to compare algorithms based on looking at the ‘Found’ column?

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1. Why is it good to compare algorithms based on looking at the ‘Not Found’ column?

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1. Why don’t we use binary search for every single search we want to do on every single array we want to search?

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1. **What is the running time of the binary search algorithm, in the Big Oh notation?  
   (Make sure that you (briefly) note what N is!)**

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**VIDEO: Big "Oh" notation & bubble sort**

1. In the video we examine the behavior of the BubbleSort algorithm. Is the implementation that we’re examining optimized in any way?  
   (Although it was not covered in this video, make sure that you remember what some possible optimizations are)

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1. When examining the Excel spreadsheet in the video, what do the values in the “Sorting Swaps” column mean?

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1. If you were to graph the linear search on the same graph as BubbleSort, how would the linear search appear?

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1. Given a 20,000 element array that you want to find a single, specific value in would it be better to do a BubbleSort followed by a Binary Search, or would it be better to skip the sorting and go straight to a linear search?   
   Explain (briefly and intuitively) your reasoning.  
   Note: There is a correct answer to this question, but because the video does not say it you will not lose points for failing to list it here. You should think about the question, reason your way to a conclusion, then concisely explain your answer (your reasoning) here.

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1. **What is the running time of the bubble sort algorithm, in the Big Oh notation?**(You may need to look this up online)

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