I, Nathan Gonyo pledge that I did not receive any additional assistance on this exam and that I have read the above statement on Academic Integrity and will adhere to that policy on this exam. I acknowledge that failure to do so will result in a 0 on this exam.

1.One of the concepts we discussed this semester was that of Abstraction. This is one of the fundamental building blocks in Computer Science. What is the concept of Abstraction? Provide a C++ example that demonstrates its power in the language.

1) Abstraction, as we learned in class is essentially what separates the code that we can see in a program and what the computer is actually doing beneath the surface (the black box idea). What we can see in our code may direct the computer what to do, however there is another level of complexity of what is happening which we don't necessarily directly see. An example of this is the use of pointers, which are essentially parts of code which "point" to other values or functions but do not directly hold any values themselves.

2.What is a Base Case when it comes to Recursion? Why is a Base Case essential for writing a successful Recursive function? Use an example to justify your answer and how it relates to a For-Loop.

2) The base case is the condition/situation where recursion is most simple / easy to solve. The base case is what allows us to set up a successful function/"show" the computer what we want it to do. An example of this is in the last assignment where we needed the computer to output a word in reverse using recursion. For this scenario, the base case would be if the word entered is one letter, where the reverse would obviously be the same letter outputted. If a for loop was used in this situation, for the base case the loop would only run once since it is the same thing outputted back, essentially a "default" value.

3.Explain the difference between By-Value and By-Reference semantics. Provide a C++ example of a function that uses both types of Semantics and what impact it has on the function itself.

3) By value means that when a function is called, the variable in your function is essentially copied, rather than directly taken. By Reference, however means that the variable is directly called and stored, not just a copy of the original for use in the function. If you have a function that makes use of by reference semantics, the argument variable is substituted such that any change made to the parameter is also made to the original variable. By value only uses the original value of the parameter.

4) The console would print every other value present in the array (10,15). Value would first be assigned 10 and then 15.
5) Output: 30,21,21,45
   *X value = 3
   * (myArray+index)=10,7,7,15
6) Code trace for Int result: 0 (init) → 1 → 8 → 18 → 33 → 120
   Output: 1,8,18,33,120