CS102 – Review for exam over Chapter 6

Vocabulary to know
Array
Elements of an array
Subscript, index
Bounds error

General facts to know about arrays
An array is a group of variables that all
- Have the same name
- Have the same type
- Are accessed by their positions
- Store similar data

An array has a definite size that cannot be changed
The first index in an array is location is 0, the next is 1, etc.
If an array is not full, you have to keep track of the effective length
An array is a data structure (a way to store data)
When an array is passed to a function, it is passed by reference
A function cannot return an array (A function cannot be of type array.)

Coding specifics
Know how to declare an array

Know how to use an array. Specifically,
- Be able to print and/or calculate with an element of an array
- Be able to initialize an array using a for loop
- Be able to calculate the sum, average of the elements in an array
- Be able to find the maximum, minimum element in an array
- Be able to search an array linearly
- Be able to copy one array to another array
  - You have to do this element by element
- Be able to list the elements in an array
  - This requires a separator

Sorting
Sorting takes a long time
Know the selection sort
Know how to swap two data items
Know that the quicksort is the fastest sort

Deleting elements from and inserting elements into an array
You cannot actually delete or insert; this size of an array cannot be changed
There are two ways to delete element i from an array containing n elements
1. You can copy element $n-1$ to location i
2. You copy element $i+1$ to index i, element $i+2$ to index $i+1$, …, element $n-1$ to index $n-2$
In either case, you have to decrement n

Similarly, there are two ways to insert a new element into an array containing n elements
1. You can copy the new element to location n
2. Suppose you want to insert it at index i. You copy element $n-1$ to index n, element $n-2$ to index $n-1$, …, element i to index $i+1$. Then insert the element at index i.
Again, in either case, you have to increment n

Know that Option 2 (in both cases) can be very slow if you have a big array
The delete operation assumes the item you are trying to delete is actually in the array
The insert operation assumes that there is room in the array to insert a new element

The Binary Search
The linear search is the slowest search
A much faster search is the binary search
It only works if the data is sorted
The binary search works recursively
    It breaks the data into halves
    It determines the correct half and searches that half recursively

Two-Dimensional Arrays
A two-dimensional array has rows and columns
Know how to declare a two-dimensional array
Know how to use a two-dimensional array (It requires two subscripts.)

Vectors
A vector is similar to an array, but it can grow and shrink dynamically
You can add an element to the end of the array using push_back
You can delete an element from the end of the array using pop_back
To use a vector, you need to #include <vector>
Know how to declare a vector of a specified type and size
Know that it's common to create an empty vector and add elements to it using push_back(). Also know how to do this
Know how to use the size member function
If you pass a vector into a function, it is passed by value
A function can return a vector (It can be of type vector.)
You can copy one vector to another like you copy two ints