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Assignment 1 - Arrays, Loops and Functions

Problem 1: Unsorted arrays

Function myAdd()
- References: ZyBook: Section 5.2 - Arrays
- Error conditions: Array index out of bound: When size of array is past maximum size or when the addition is unsuccessful, the program will return code -1.
- Brief algorithm: The new element is added to the end of the current array as the last element.
- Running time of the function (algorithm): O (1)
- Brief explanation of the running time: Program is executing an if and else statement. If the size of array is smaller then the maximum size, integer is added to the array as last element. Otherwise, program returns code -1. Since there is only the storing of element, the running time is O (1).

Function myRemove()
- References: https://stackoverflow.com/questions/15821123/removing-elements-from-an-array-in-c
- https://stackoverflow.com/questions/44130392/how-do-i-print-the-last-element-of-an-array-in-c
- Error conditions: Array index out of bound: When the number is searched for in the array and isn't found, the program will return code -1;
- Brief algorithm: The number is searched in the array. If the number isn't found, it will be a negative number and will return code -1. If the number is found, the number will be replaced by the last element of the array.
- Running time of the function (algorithm): O(n)
- Brief explanation of the running time: The program is executing an if and else statement. If the number is found, the number will be replaced by the last element in the array otherwise, it will return code -1 for not finding the number. Before the if and else, there is a call function to search () and its running time is O(n) since it's a iteration to find the number in array.

Function search()
- References: ZyBook, Section 5.4 – Iterating through arrays
- Error conditions: Array index out of bound: If the number is not found in array, the program will return code -1.
- Brief algorithm: Each element in the array is searched for the number one by one from the beginning. If the number is found, it will return the index location of the element. If number is not found in the array, it will return code -1.
- Running time of the function (algorithm): O(n)
- Brief explanation of the running time: The function executes a for loop to iterate through the array to find the number. Since its searching for a value in the array and the time grows as input size increases, its running time is O(n).

Problem 2: Sorted arrays

Function myAdd()
- References: https://www.geeksforgeeks.org/search-insert-and-delete-in-a-sorted-array/
- https://stackoverflow.com/questions/7970857/java-shifting-elements-in-an-array
- Error conditions: Array out of bound: If size of array is bigger than maximum size of array, addition is unsuccessful and will return code -1.
- Brief algorithm: If array has space to add number, array is searched for a location that respects the conditions in order to sort the array in a non decreasing order. Then, when the location is found, number will take that location. If the addition is unsuccessful, it will return code -1.
- Running time of the function (algorithm): O(n)
- Brief explanation of the running time: A for loop is iterated in order to find a location respecting the conditions. As the loop is searching for an index, the time is growing as the input size increases. Therefore, the running time is O(n).

Function myRemove()
- References: https://stackoverflow.com/questions/15821123/removing-elements-from-an-array-in-c
- Error conditions: Array out of bound: If the number is not found, it will return code -1.
- Brief algorithm: Number is searched in the array. If the number is negative, it will return code -1 otherwise, it will go through the loop and shift all the elements in the array to the left and remove number.
- Running time of the function (algorithm): O(n)
- Brief explanation of the running time: The function is executing a for loop which is iterating through an array to find the number and remove it. Since it is only one iteration, the running time is O(n).

Function search()
- References: ZyBook, Section 5.4 – Iterating through arrays
- Error conditions: Array out of bound: If the number is not found in the array, it will return code -1.
- Brief algorithm: Array is searched for the number. If the number is found, it will return the index location otherwise, it will return code -1.
- Running time of the function (algorithm): O(n)
- Brief explanation of the running time: The function is iterating once to find a value in the array. Since this is the case, the running time is O(n).