**Search Arrays Assignment**

**Part 1 - Linear Search:** Given the following array, *int [ ] nums = { 5, 9, 11, 22, 51, 64, 30, 10, 37, 88},* calculate:

1. What would be returned with *LinearSearch(nums, 64)*?
2. What would be returned with *LinearSearch(nums, 38)*?
3. What would be returned with *LinearSearch(nums, 5)*?

**Part 2 - Binary Search**

**Problem # 1**

Given the array, *int* *[ ] nums = {2, 4, 5, 8, 11, 14, 17, 20, 23, 30, 31, 38, 41, 44, 47, 54, 59}*

1. What is the maximum number of searches required to find any value in this array?
2. What is the pattern to the above numbers? (10 points extra credit spread out between all correct answers)

Fill out the following table based on a binary search of the above array for these values (keys)

BinarySearch(nums, 14) BinarySearch(nums, 54)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Loop** | **Low** | **Mid** | **High** | **Nums[mid]** |  | **Loop** | **Low** | **Mid** | **High** | **Nums[mid]** |
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What is returned? What is returned?

BinarySearch(nums, 38) BinarySearch(nums, 29)

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| **Loop** | **Low** | **Mid** | **High** | **Nums[mid]** |  | **Loop** | **Low** | **Mid** | **High** | **Nums[mid]** |
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What is returned? What is returned?

**Problem # 2**

Now assume you have an array called *numbers* consisting of sorted, sequential, odd numbers from 1 to 9999.

1. How many elements are in this array?
2. What is the maximum number of loops required to find a specific value in this array?

Fill in the following table for these two examples:

BinarySearch(numbers, 3151) BinarySearch(nums, 6933)

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| **Loop** | **Low** | **Mid** | **High** | **Nums[mid]** |  | **Loop** | **Low** | **Mid** | **High** | **Nums[mid]** |
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What value is returned? What value is returned?

How many loops was required? How many loops was required?

**Part 2 - Binary Search Program**

Now build a program called *BinarySearch* that will populate the above array and prompt the user to enter a number (key). The program will call a method which will output the data from the above tables for each loop the search conducts. Here's sample output:

Enter a number to search for:

3749

######## Loop 1 #######

low = 0 mid = 2499 high = 4999 odds[mid] = 4999

3749 is lower than odds[2499].

######## Loop 2 #######

low = 0 mid = 1249 high = 2498 odds[mid] = 2499

3749 is higher than odds[1249].

######## Loop 3 #######

low = 1250 mid = 1874 high = 2499 odds[mid] = 3749

It took 3 loops to find your number.

Your number was found at index # 1874