

## ***Homework 3***

*100 Points*

### ***Pointers and Dynamic Allocation of Memory***

[22B\\_H3A\\_InsertSort.cpp](#) (pointers, arrays, and sorting)

[22B\\_H3B\\_Errors.cpp](#) (find and fix errors: dynamic memory allocation)

[22B\\_H3C\\_Movie.cpp](#) Project: **Movie Statistics** (see next pages)

#### **Grading**

Program 3A	– 10
Program 3B	– 20
Program 3C	
1. Get data from file (including dynamically allocating the array)	– 15
2. Insertion sort	– 10 // reuse code: 3A
3. Write sorted array to file	– 10 // reuse code: 3A (add the output file)
4. Average	– 10
5. Median	– 10
6. Display statistics	– 5
7. main()	– 5
8. Self Assessment Report	– 5

Run each program as required and save the output at the end of the source file as a comment. Compress the source file, input and output files (if any), and the report, and upload the compressed file: [22B\\_LastName\\_FirstName\\_H3.zip](#)

**Note:** Three ways to display an array:

```
// A. Use an index
for( i = 0; i < size; i++ )
{
    cout << ary[i] << " ";
}

// B. Use an index and pointer arithmetic: NEVER USE THIS STYLE!
for( i = 0; i < size; i++ )
{
    cout << *(ary + i) << " ";
}

// C. Use a pointer // ← This is the required style for Project C
for( pW = ary, pLast = ary + size - 1; pW <= pLast; pW++ )
{
    cout << *pw << " ";
}
```

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Programming Assignments

## Project: Movie Statistics

Students at De Anza College were surveyed about the number of movies they watch per month. Write a program that reads the survey results, sorts them, writes the sorted data to a file, calculates and displays the average and the median.

The first number in an input file, **n**, represents the number of students that were surveyed. On the next **n** lines, there is an integer representing the number of movies each student watched in a month. Here is an example:

```
5
8
11
5
7
5
```

The program should perform the following steps:

1. Read the number of students from the input file. An array of integers with this many elements should then be dynamically allocated.
2. Read the rest of the numbers from the file into the dynamically allocated array.
3. Sort the array in ascending order using the insertion sort algorithm:  
5 5 7 8 11
4. Write the sorted array to a file, one number per line, including the number of students on the first line (same format as the input file).
5. Calculate the average of the numbers in the array.  
(5 + 5 + 7 + 8 + 11) / 5 = 7.2
6. Calculate the median of the numbers in the array. The median is the number in the middle of the sorted array if the array has an odd number of elements. If the array has an even number of elements the median is the average of the two numbers in the middle of the sorted array: 7
7. Display statistics in a readable format of your choice.
8. Finally, release the memory and terminate the program.

Here is another example:

```
6
9
10
7
8
7
7
```

sorted array: 7 7 7 8 9 10  
average: ( 7 + 7 + 7 + 8 + 9 + 10 ) / 6  
median: ( 7 + 8 ) / 2 = 7.5

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Run the program using the following input files:

1. Input file name: **moviesurvey.txt**
2. Input file name: **moviestats.txt**
3. Input file name: **survey.txt**

**moviesurvey.txt**

5  
8  
11  
5  
7  
5

**moviestats.txt**

6  
9  
10  
7  
8  
7  
7

**survey.txt**, with the following data:

26  
12  
8  
12  
23  
12  
8  
8  
3  
23  
2  
9  
2  
25  
3  
21  
8  
21  
23  
21  
8  
8  
13  
11  
19  
8  
2