Assignment 1

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Hardware Details

- Memory: 8 GB 1600 MHz DDR3
- Processor: 1.8 GHz Dual-Core Intel Core i5

Software Details

- Apple clang version 14.0.0 clang-1400.0.29.202
- xcode-select version 2395.

1 Insertion Sort

1.1 Algorithm

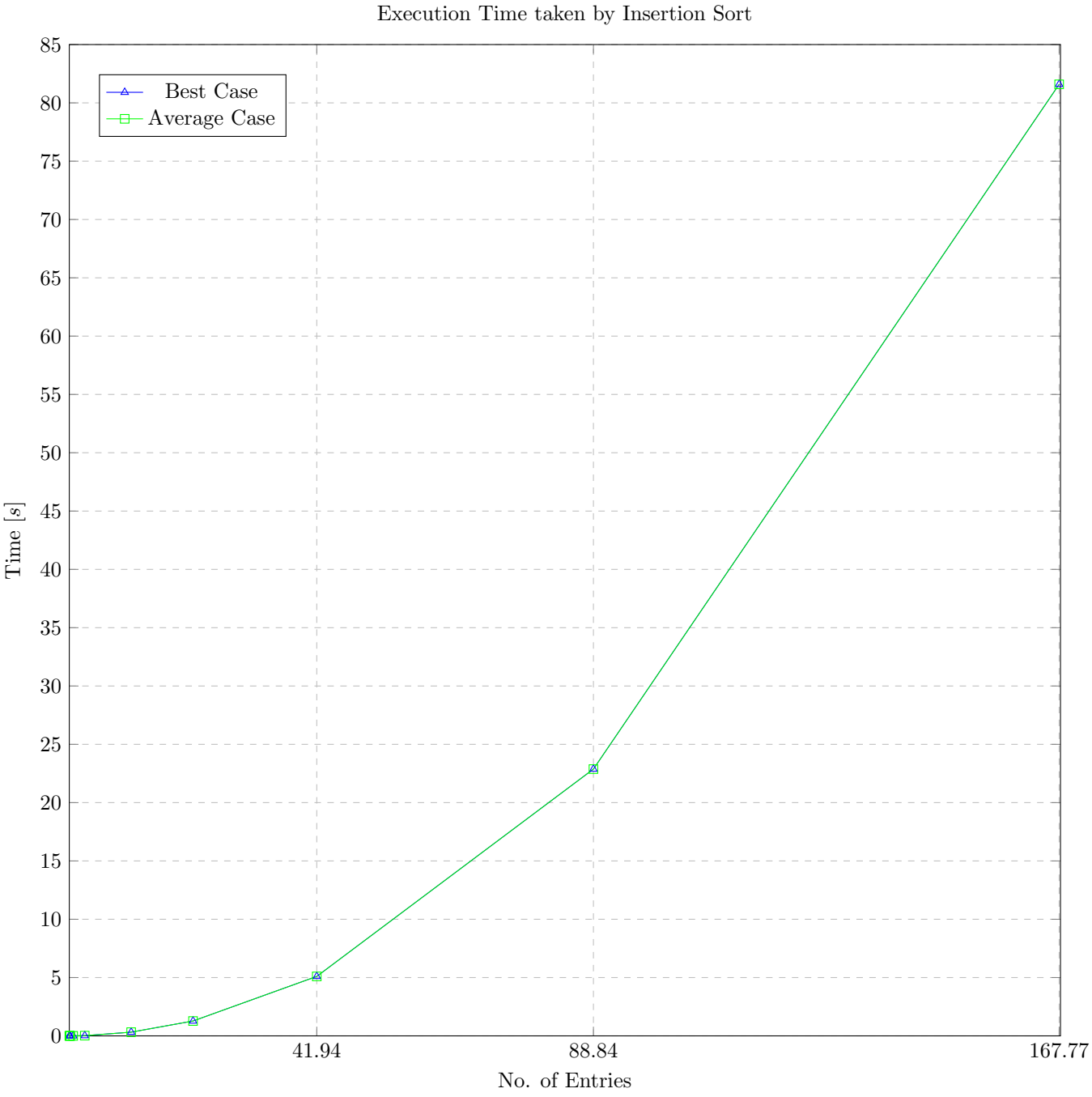
1. Create a file pointer and Open the File
2. Read the number from the file and put it in an array.
3. Start from second element and compare it with previous elements.
4. If found appropriate position, insert at that position.

1.2 Observations

Time Complexity for Insertion Sort		
File Name	No. of Entries	Average Case
File-1	1024	0.003174
File-2	4096	0.048634
File-3	16384	0.777577
File-4	65536	12.446997
File-5	262144	199.183045
File-6	1048576	3187.061125
File-7	2097152	12748.334020
File-8	4194304	50993.515653
File-9	8883608	228757.176227
File-10	16777216	815898.409093

Table 1: Time taken for Insertion Sort

1.3 Graph



1.4 Conclusion

The graph for the worst case is a quadratic. A quadratic curve implies that the change in time taken is quadratically dependent on the change in the no. of elements in the file, as the line is given by $y = 4ax^2$. Therefore, it can be concluded that the time complexity for Insertion Sort is $O(n^2)$. Theoretically also time complexity comes out to be $O(n^2)$. Thus the conclusion matches to the theoretical value of the time complexity.

Time Complexity = $\theta(n)$