Pranav Vichare

Project 6 Report

1. The Below graphs were generated using Microsoft Power BI. Some changes were made to the boilerplate code and Project6.cpp file to get the .csv file as output with varying value of D and calculating Number of inversions and Chebyshev distance for below N random integers.
   N = 1000
   N = 5000
   N = 10000
   N = 20000
   N = 30000
2. Two parameters are used to determine the efficiency of the Sorting Algorithms, they are Number of Inversions and Chebyshev distance.
   Sorting Algorithm used:
   a. Bubble Sort
   b. Shell Sort
3. Bubble Sort, sorting Algorithm is designed in a way such that it is used to sort the adjacent values of an element. While Shell sort allows sorting of elements which are far apart.
4. As we can see from below graphs, Number of Inversion and Chebyshev distance is compared for Bubble and Shell sort. We can conclude that Shell sort is more efficient than Bubble sort. As the D (Allowed number of inversions) increases the Number of Inversions required to sort the random elements decreases.
5. In case of Bubble sort, it decreases gradually and takes a greater number of inversions as compared to Shell sort. Shell sort requires a smaller number of inversions to sort the elements.
6. Similarly, the displacement of elements or the Chebyshev distance is less for the Shell sort as compared to Bubble Sort, As seen in below graph the Displacement goes to zero for Shell sort very quickly as compared Bubble Sort.
7. Shell sort tries to sort elements that are further away first. If we have a large unsorted array the probability that final sorted position being far from the current position of the element is high. The stack memory used by Shell sort is low.
8. Hence, Shell sort takes a smaller number of inversions and Chebyshev distance to completely sort an array.
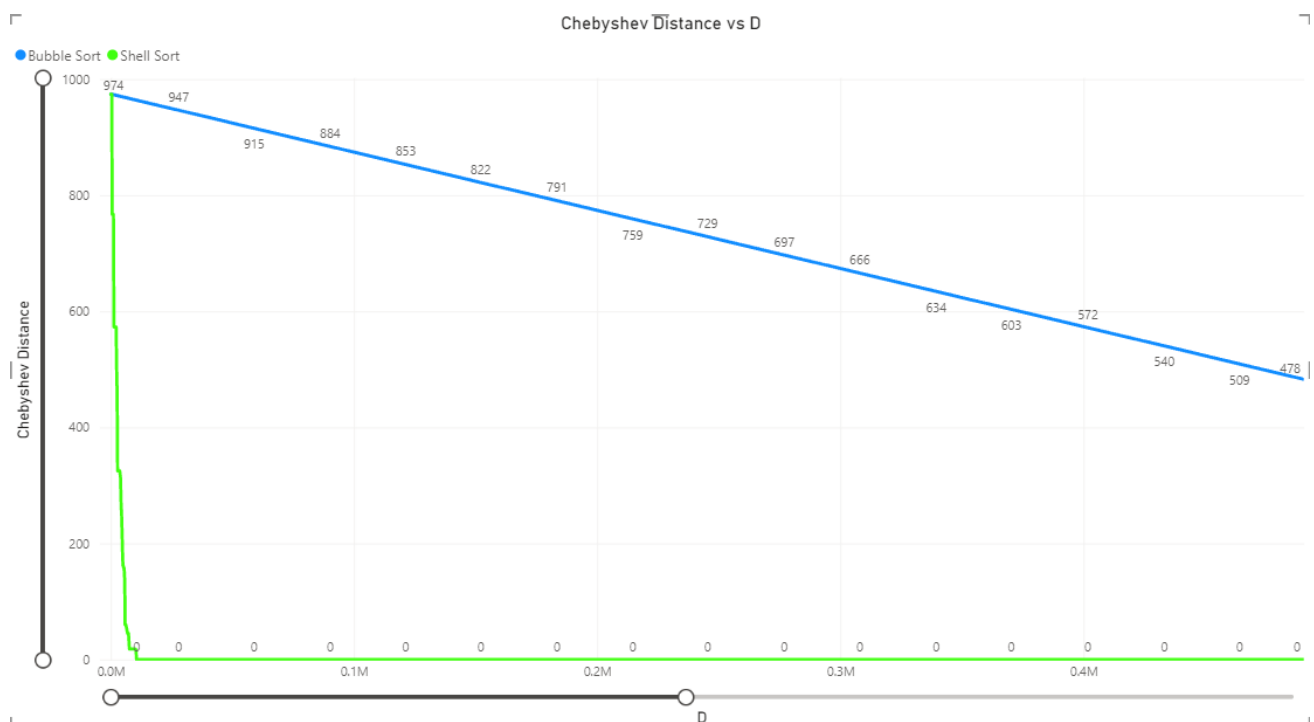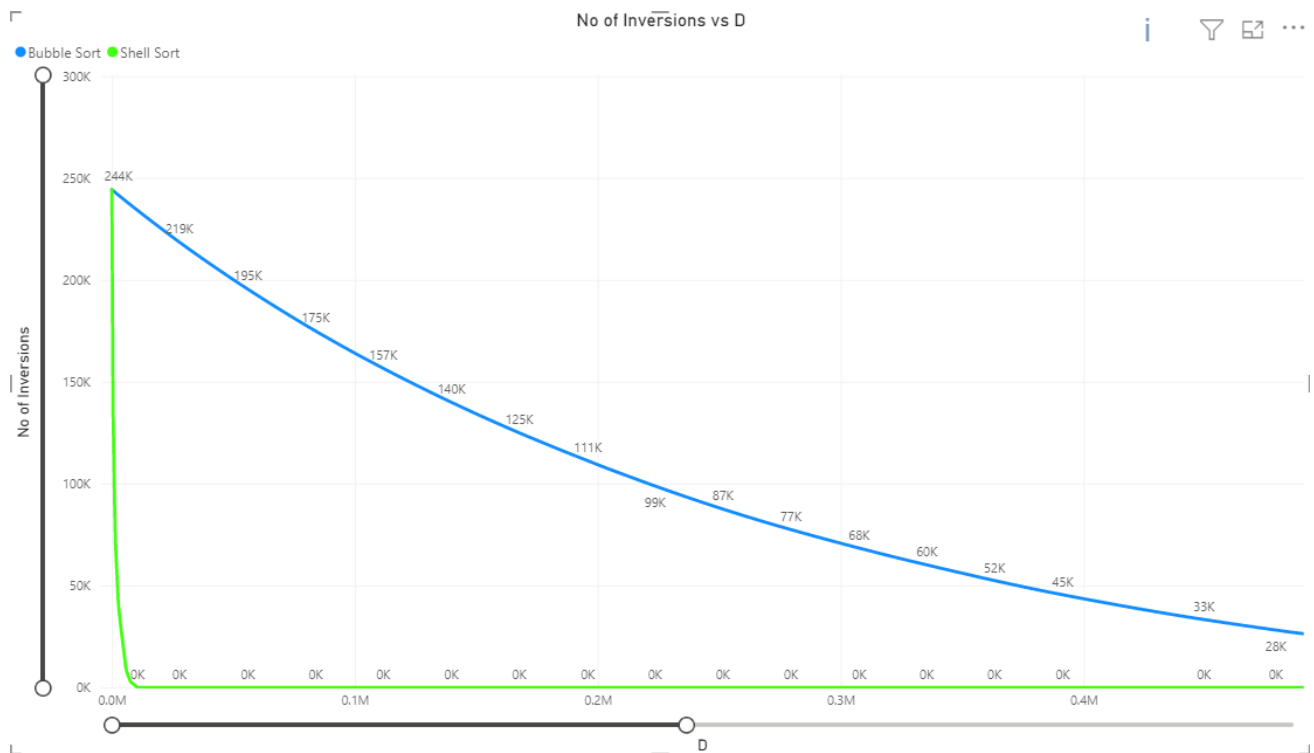
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1. N = 1000

No of Inversions vs D

In above graphs we can see that, No of Inversions and Chebyshev distance required for Bubble Sort is more than Shell sort. D varies from 0 to N*N and increments by 100 for next iteration.
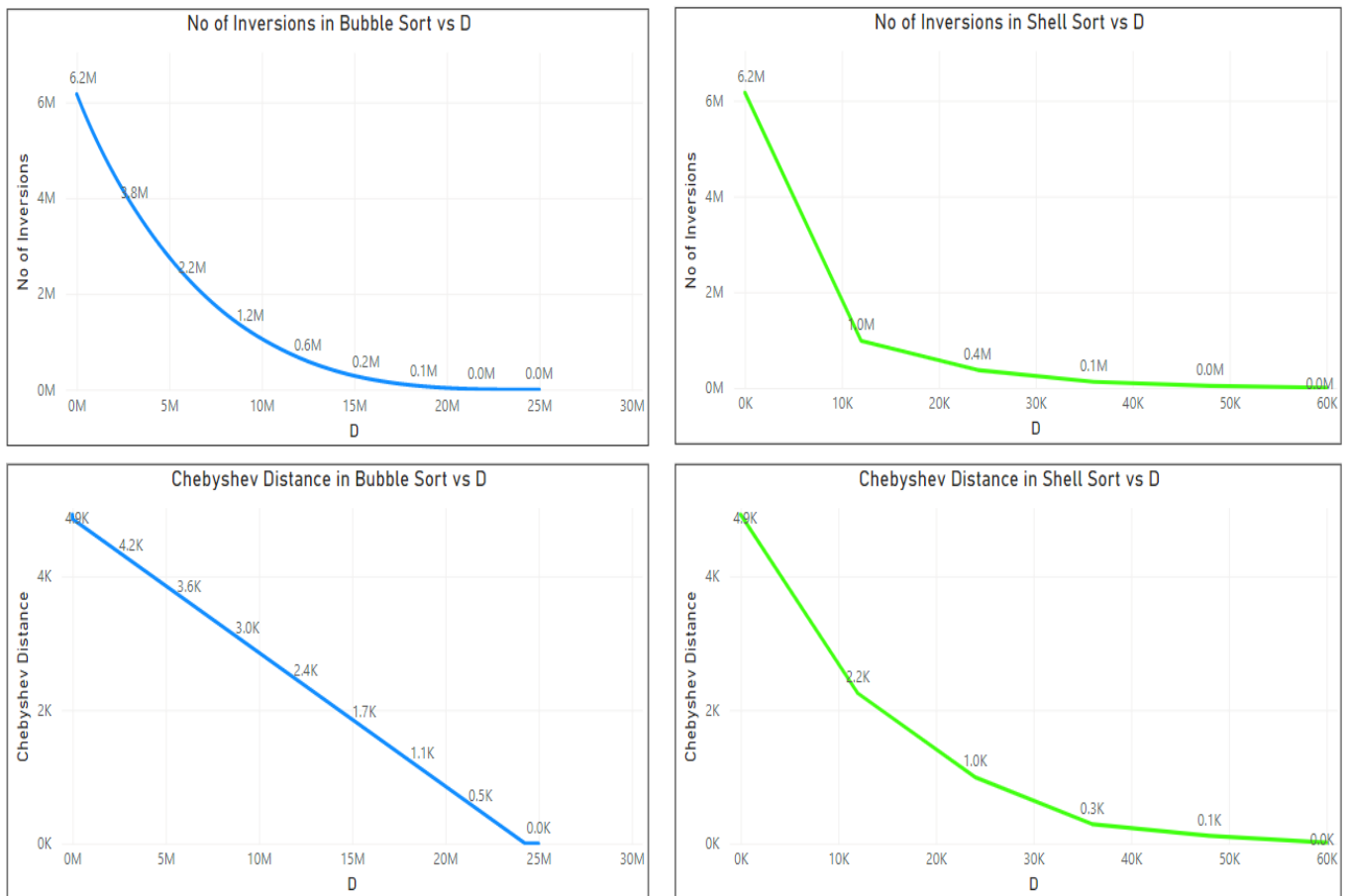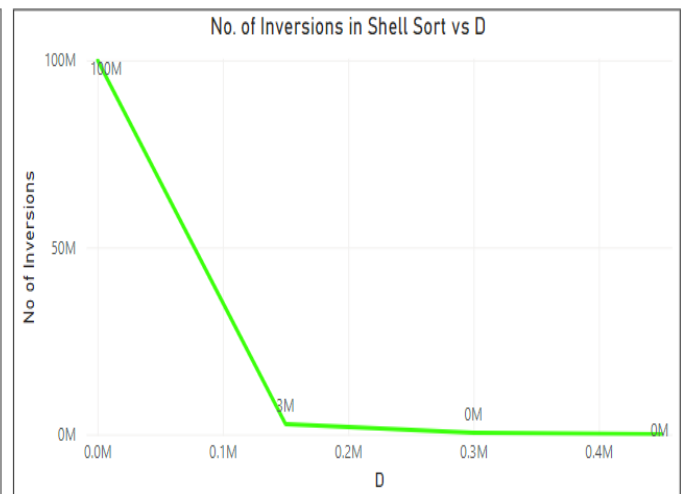
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2. N = 5000
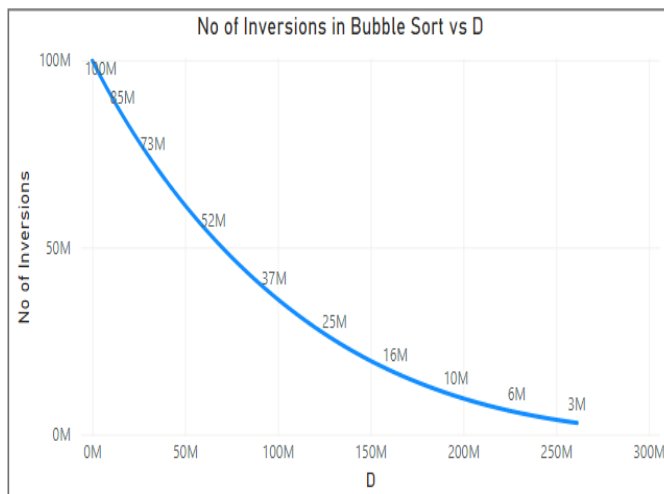

In above graphs we can see that, No of Inversions and Chebyshev distance required for Bubble Sort is more than Shell sort. D varies from 0 to N*N and increments by 12000 for next iteration.
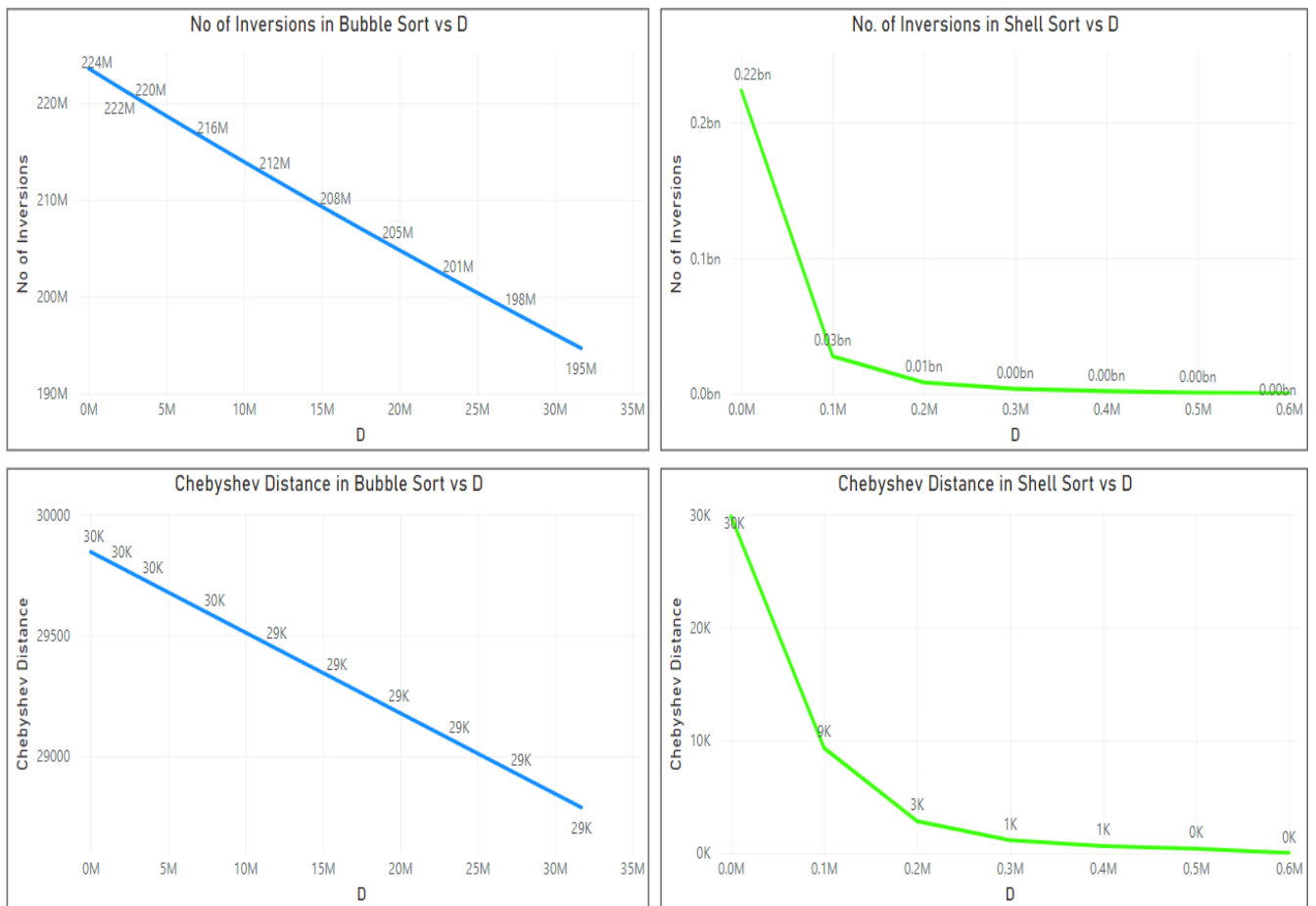
3. N = 10000
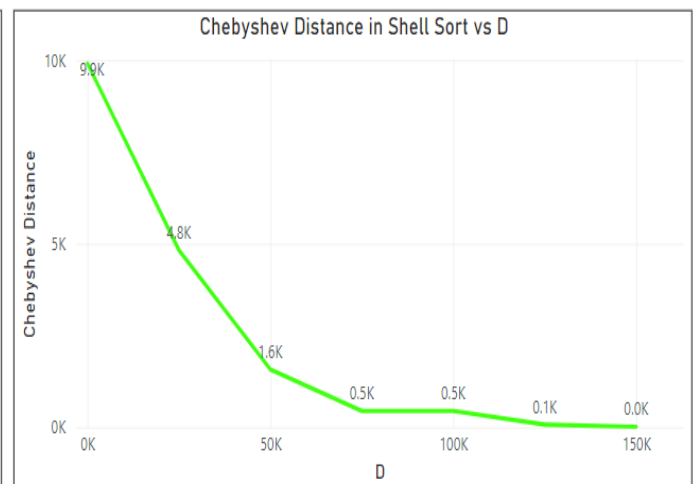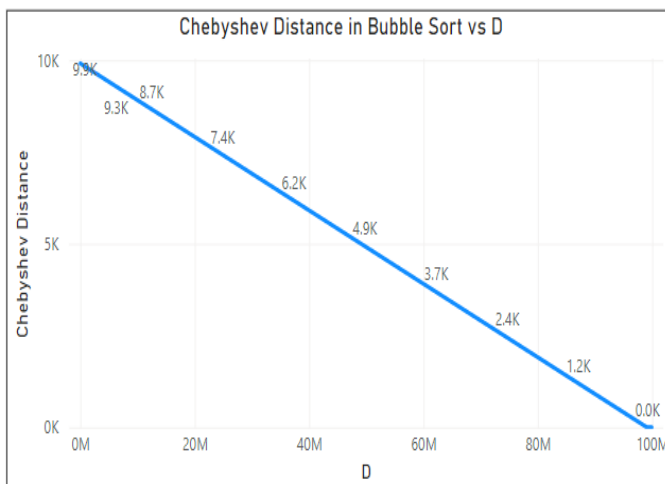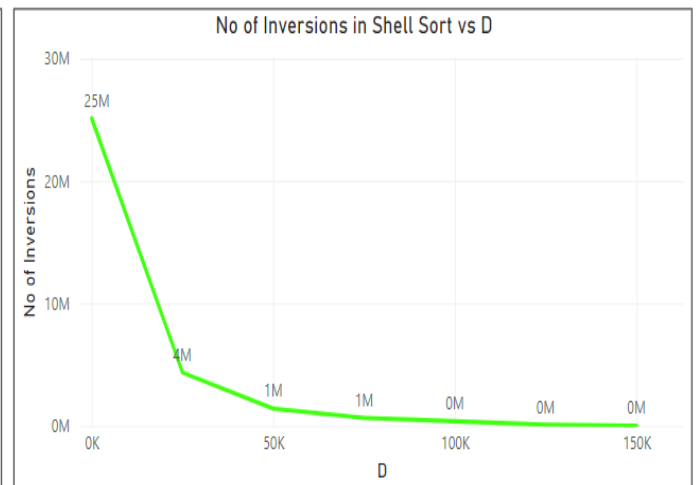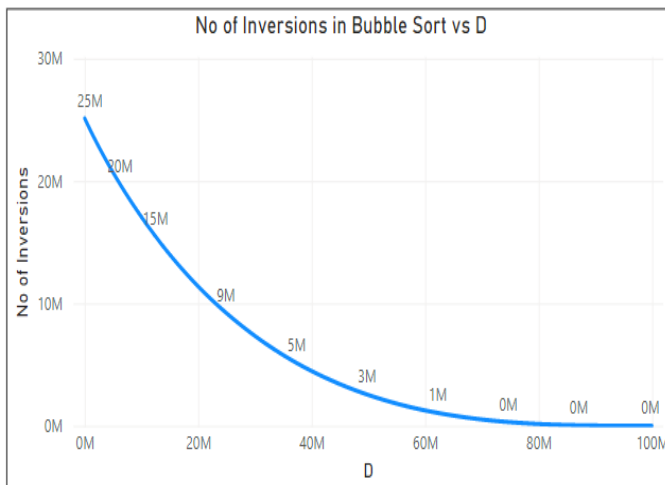
D varies from 0 to N*N and increments by 25000 for the next iteration.

4. N = 20000
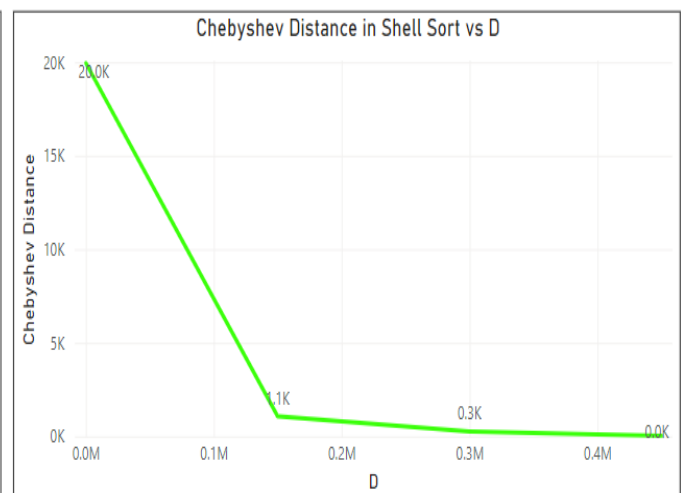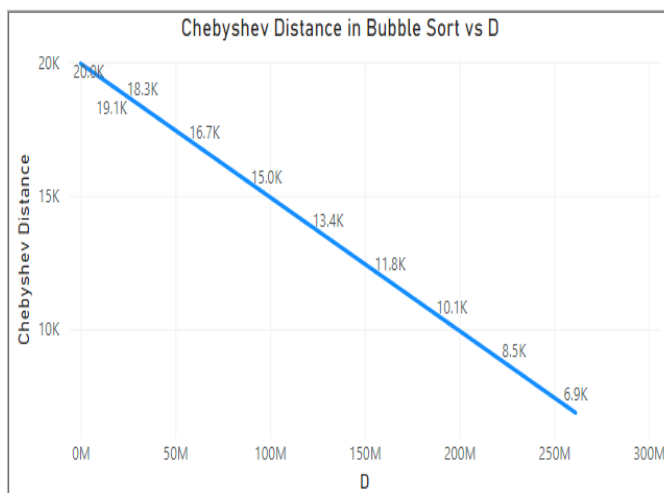
D varies from 0 to N*N and increments by 150000 for next iteration.

5. N = 30000

D varies from 0 to N*N and increments by 100000 for next iteration.