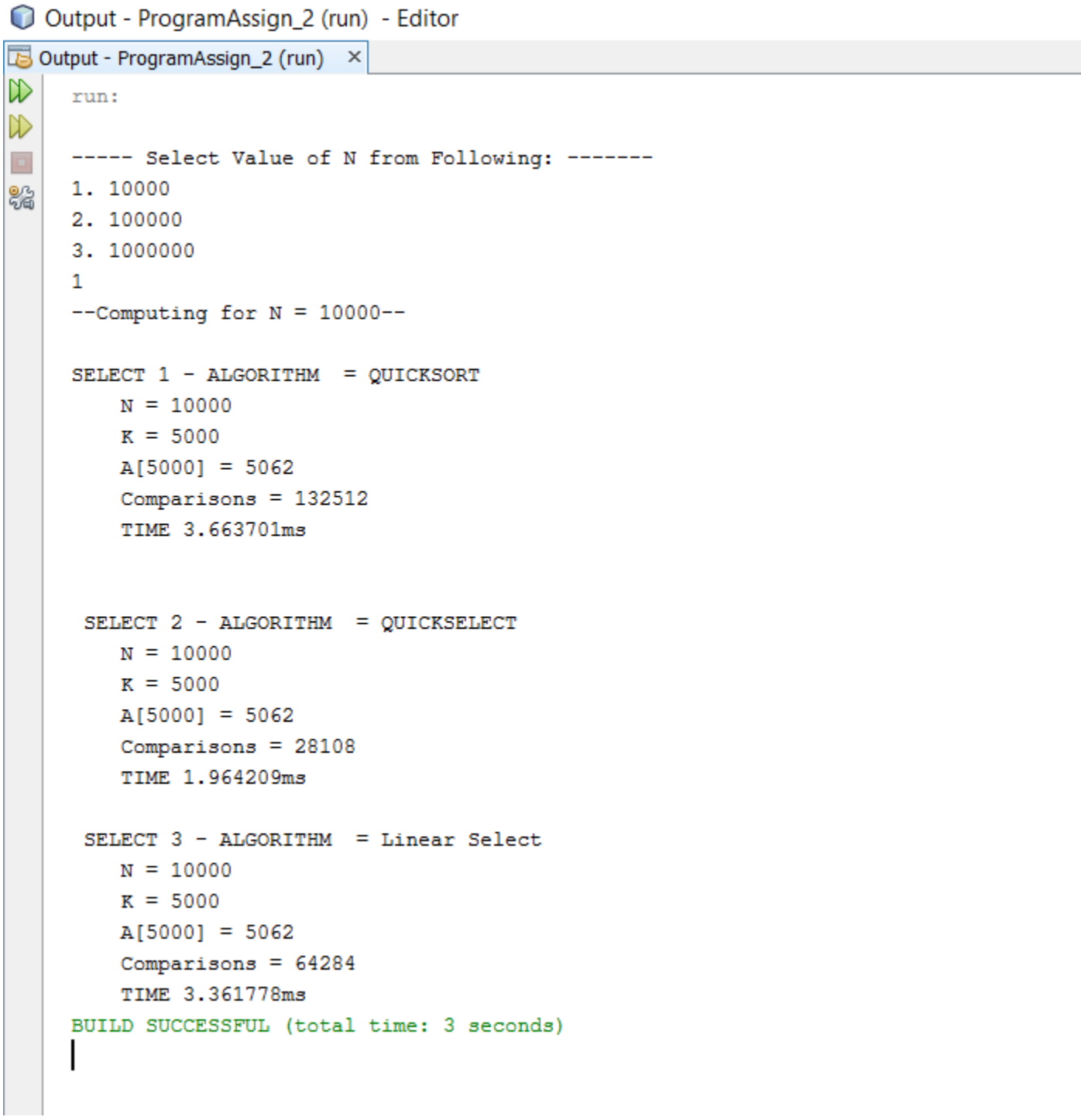
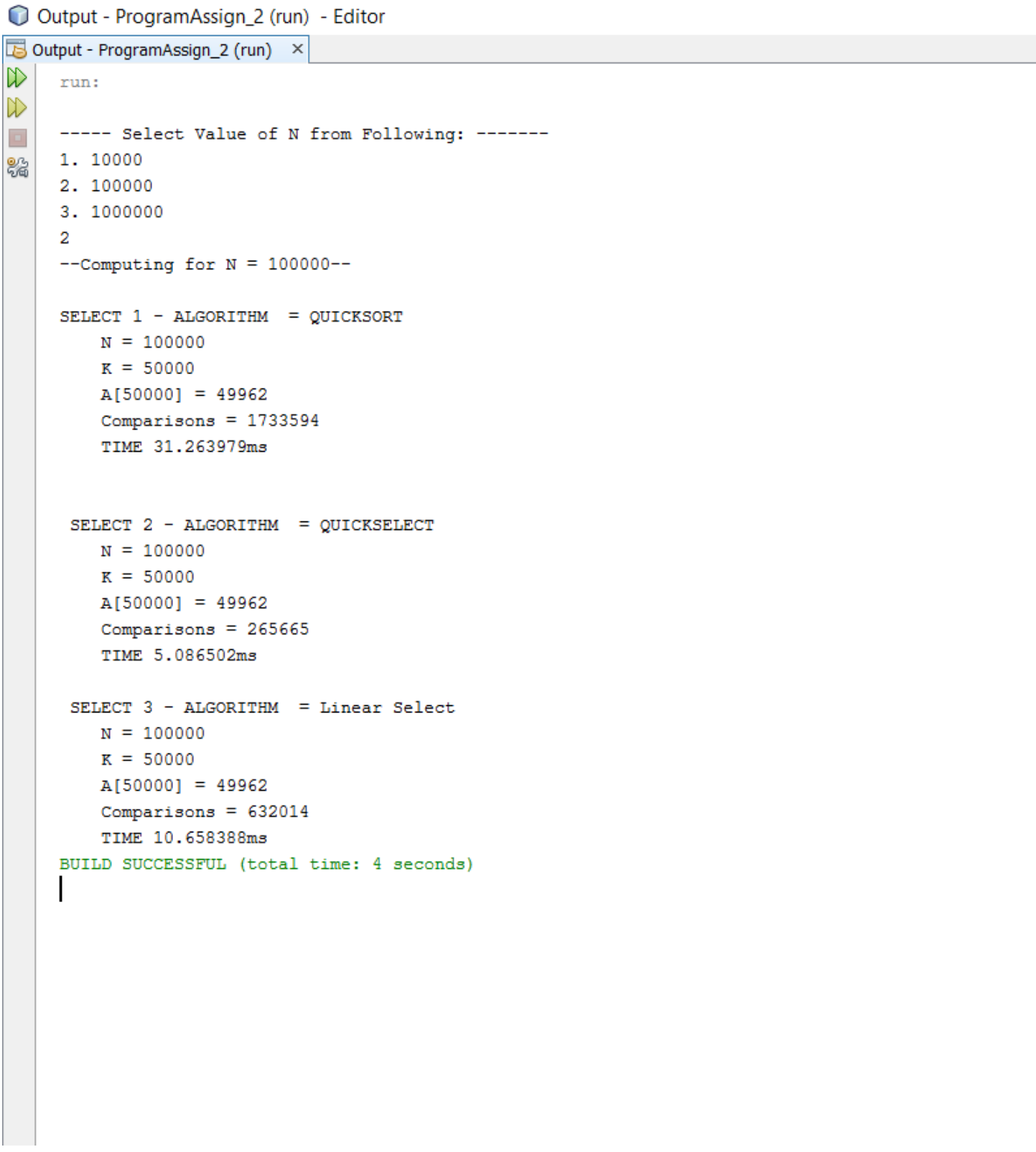
Mithil

O/P

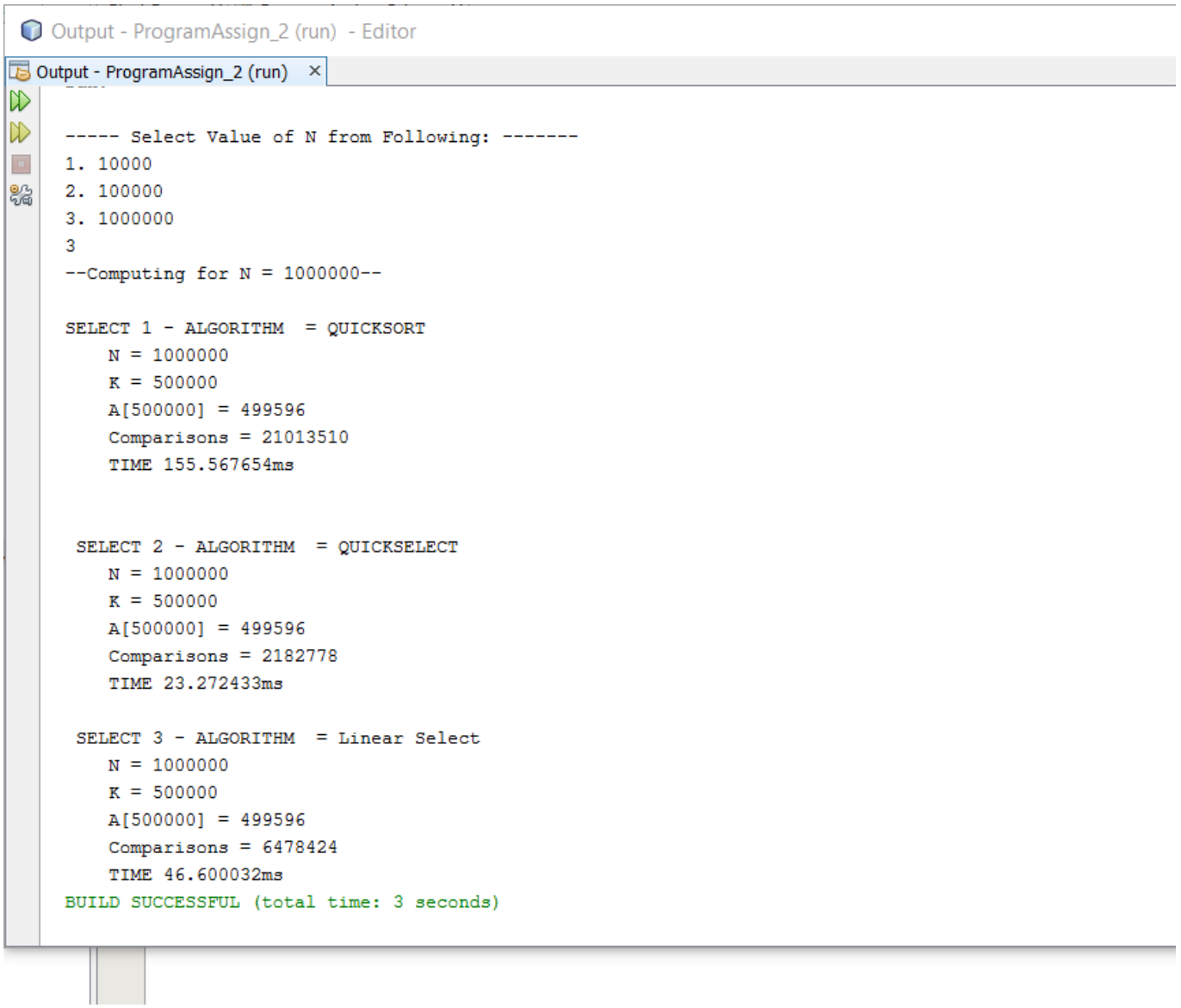
1. For N= 10000



2. For N=100000



3. For N= 100000



RESULTS

Comparisons

	Quick Sort	Quick Select	Linear Search
N=10000	132512	28108	64284
N=100000	1733594	265665	632014
N=1000000	210103510	2182778	6471424

TIME (MS)

	Quick Sort	Quick Select	Linear Search
N=10000	3.663701	1.964209	3.361778
N=100000	31.263979	5.086502	10.658388
N=1000000	155.567654	23.272433	46.600032

Analysis

ANALYSIS.

I: N = 10,000

(a) Quick Sort.

According to the result produced. n = 10,000

No. of comparisions = 132512

Avg. case complexity is given by = $T(n) <= O(n * \log n) <= A * (n * \log n)$.

here

A is some constant

Avg case analysis for QuickSort $O(n \log n)$.

$n \log n = 10000 \log_2 10000 = 132877$.

~~$T(n) =$~~ ~~$\leq A(n \log n)$~~

$\therefore A =$

$\therefore T(n) = 132512 \leq A \cdot (n \log n)$

$132512 \leq A(132877)$

$\therefore \boxed{A = 0.99725}$.

(b) Quick select.

according to the result produced = n = 10,000.

Avg case Analysis for Quick sort is $O(n)$.

$\therefore O(n) = 10,000$.

No. of comparision = 28108.

Avg Case complexity is given by $T(n) \leq O(n) \leq A(n)$ (for some constant A).

$\therefore T(n) \leq O(n) \leq A(n)$.

$28108 \leq A(10000)$.

$\therefore \boxed{A = 2.8108}$.

(c) Linear Select

according to the result produced n = 10,000 $\therefore O(n) = 10,000$.

Avg cas Analysis for linear select is $O(n)$.

Avg case complexity is given by $T(n) \leq O(n) \leq A(n)$ {A is constant}

$\therefore O(n) = 10,000$.

$\therefore T(n) \leq O(n) \leq A(n)$ i.e, $64284 = A(10000)$.

$\therefore \boxed{A = 6.4284}$.

II.) N = 100,000.

(a) Quick Sort.

N = 100000.
no. of comparision: 1733594
Avg case Analysis for QuickSort = O(nlogn).
∴ nlogn = 1660964.
T(n) ≤ O(nlogn) ≤ B(nlogn)

1733594 ≤ B(1660964).

∴ B = 1.04372.

(b) Quick Select

N = 100000.
no. of comparision:
Avg case Analysis for Quick Selet = O(n).
n = 100,000
T(n) ≤ O(n) ≤ B(n).

265665 ≤ B(100,000).

∴ B = 2.65665

(c) Linear Selet

N = 100,000
no. of comparision: 632014.
Avg case Analysis for Linear Search = O(n).
n = 100,000
T(n) ≤ O(n) ≤ B(n).

∴ 632014 ≤ B(100000)

∴ B = 6.32014.

N = 1000,000

(a) Quick Sort.

N = 1000,000

No. of comparision: 21013510

Avg case Analysis = O(nlogn)

nlogn = ≈ 19931568

$T(n) = O(n\log n) \leq C(n\log n)$.

$\therefore \Rightarrow 21013510 \leq C(19931568)$.

$C = 1.054288$

(b) Quick Select

N = 1000,000.

no. of comparision: 2182778

Avg case analysis = O(n).

n = 1000,000.

$T(n) = O(n) \leq C(n)$.

$= 2182778 \leq C(1000,000)$

$C = 2.182778$.

(c) Linear select.

N = 1000,000.

no. of comparision: 6478424.

Avg. case analysis = O(n).

n = 1000,000.

$T(n) = O(n) = C(n)$.

$\therefore 6478424 = C(1000000)$

$C = 6.478424$.

Conclusion:

- From above results it simply that algorithms have an average case complexity.
- In comparison of the algorithms, we see that, Quick sort first sorts the integers and then finds the Kth smallest and hence it takes more time than other algorithms. Hence it has higher complexity.
- The Quick select algorithm will randomly select a pivot and place that pivot at its correct position and as soon as it finds the required Kth smallest element it returns. Since its randomized algorithm it finds the Kth smallest in the average time and is the fastest amongst others.
- The Linear select algorithm finds the Kth smallest element in the average time of O(n) but it has the highest coefficient. Hence it takes much more time than Quick select algorithm.