ASSIGNMENT – 2

Tasks Required:

To Benchmark Insertion sort and draw conclusions for reverse, ordered, partially ordered and random ordered array.

Part 1: To Implement 3 methods in Timer Class.

```
public <T, U> double repeat(int n, Supplier<T> supplier, Function<T, U> function, Una
ryOperator<T> preFunction, Consumer<U> postFunction) {
// TO BE IMPLEMENTED
}

private static long getClock() {
    // TO BE IMPLEMENTED
}

private static double toMillisecs(long ticks) {
    // TO BE IMPLEMENTED
}
```

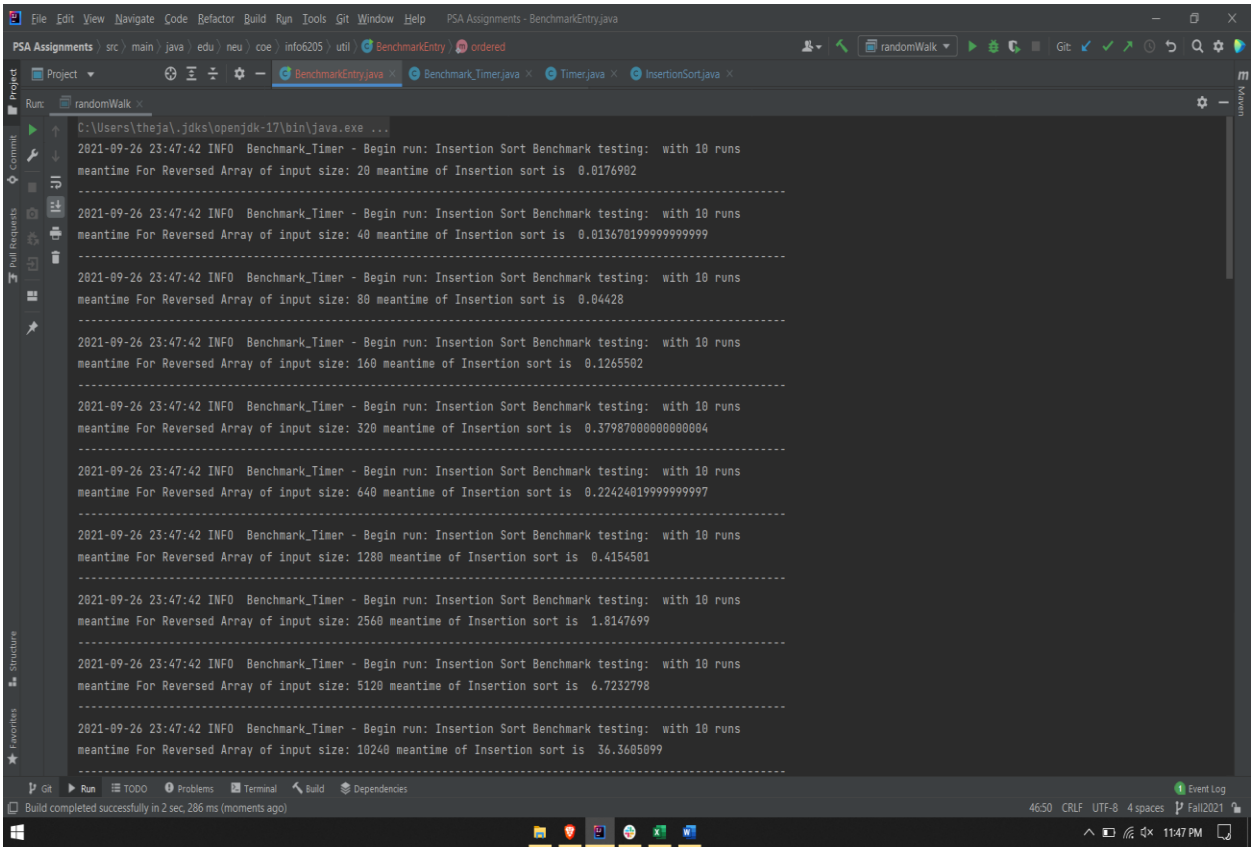
Part 2: Implementation of Insertion sort

Part 3: Implementing a main program as an entry point for the benchmarking process

Output Obtained:

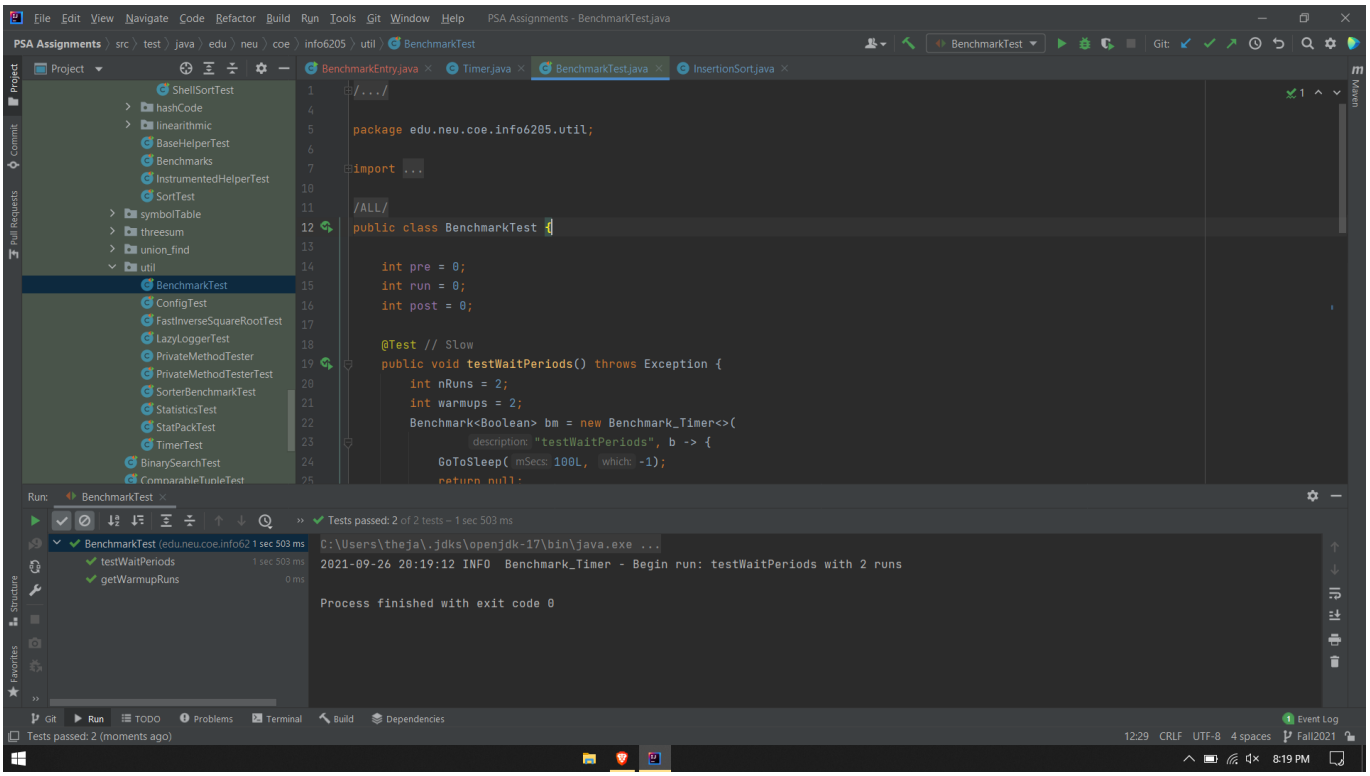
The output obtained is after running the benchmark over 10 times per doubling input starting with 20 for Reversed, Ordered, Partially ordered and Random ordered arrays

Array Length	Reversed order	Ordered	Partially ordered	Random order
20	0.01512	0.00119	0.00721	0.00128
40	0.0112	0.00155	0.00838	0.00187
80	0.03575	0.00175	0.01911	0.00213
160	0.12322	0.00298	0.02135	0.00913
320	0.23651	0.00572	0.06884	0.02863
640	1.41593	0.01008	0.15305	0.05009
1280	0.34849	0.01957	0.27203	0.17958
2560	1.41989	0.03903	0.50182	0.70052
5120	6.15856	0.07075	1.09717	2.63182
10240	23.99875	0.15919	4.54772	12.69387

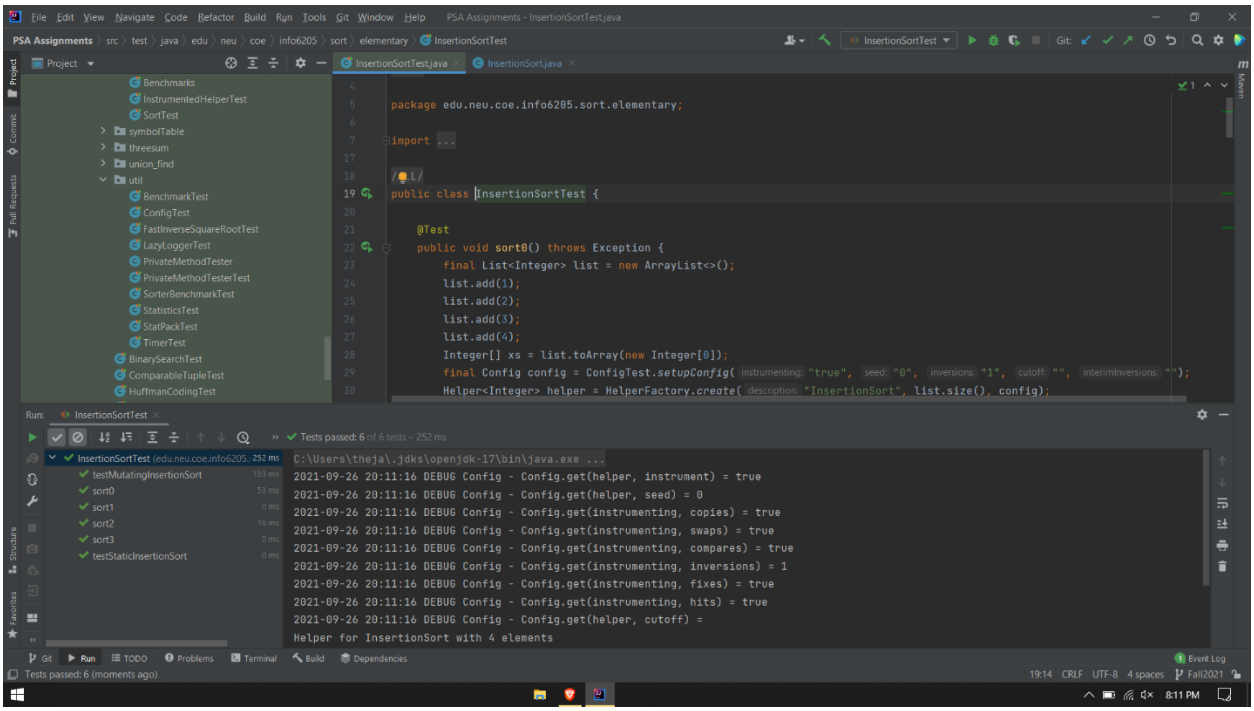


Test case Results:

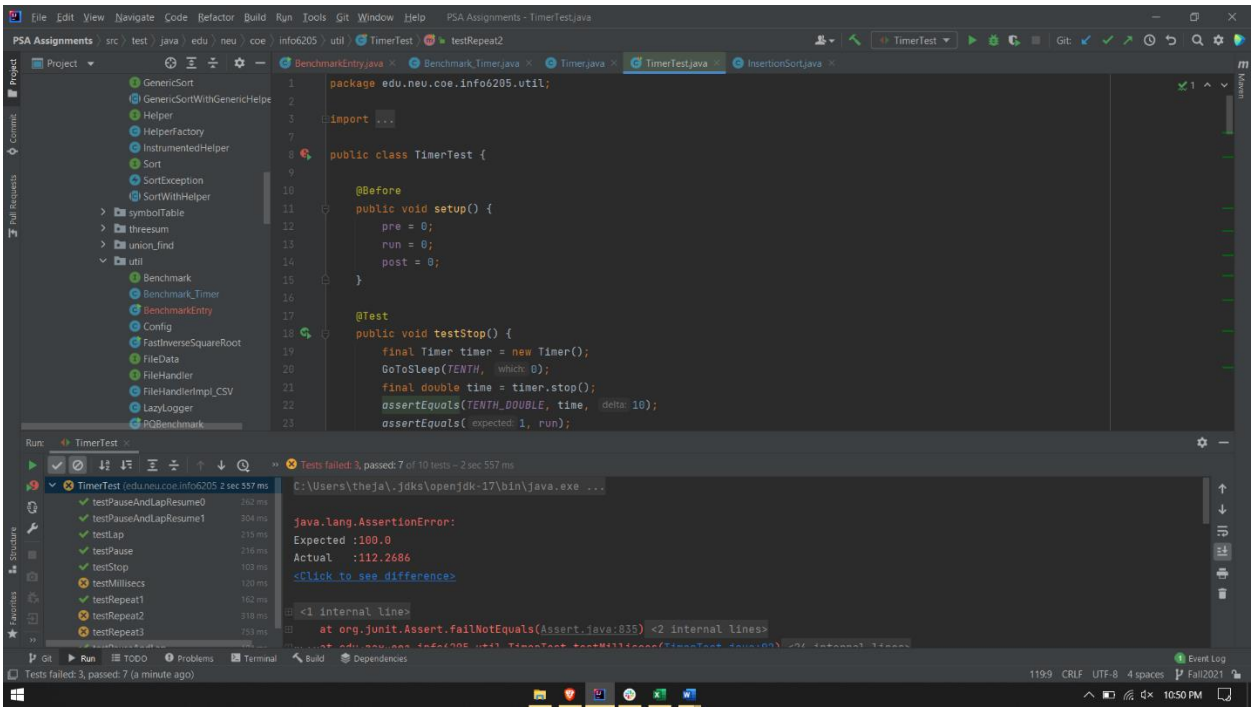
Benchmark Test Result:



InsertionSort Test Result:

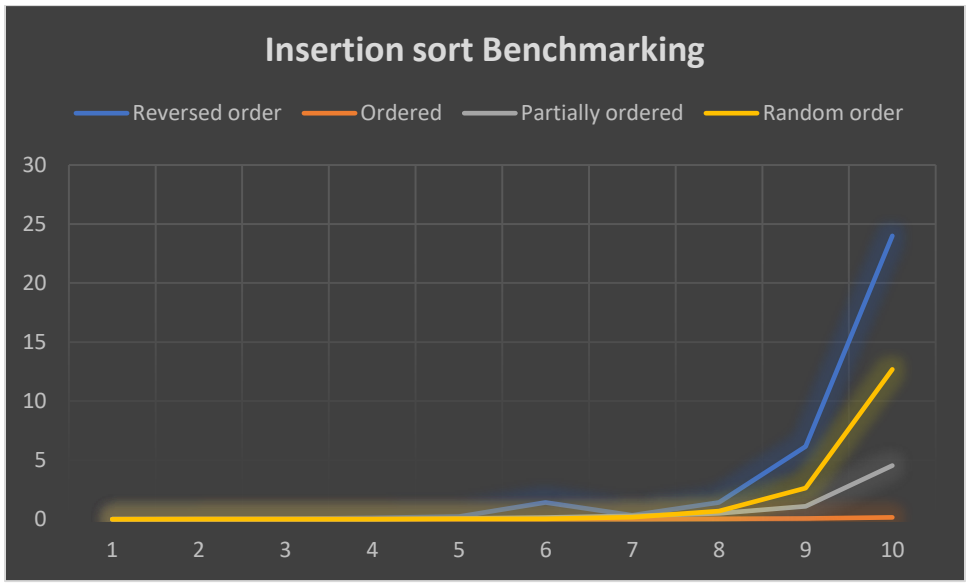


Timer Test Results:



Observations and Conclusions:

Plotting a line graph from the obtained outputs for the differently sorted inputs with mean sorting times on the y-axis and array length on the x-axis.



- We observe that with increase in array length the mean time taken to sort also increases, irrespective of the sorting of the input.

  Meantime to sort is proportional to array length.

- From the same graph we can also observe that the sorting of the input array affects the meantime to sort in the below way.
  Meantime for sorting of
  Reverse ordered array > Random ordered > Partially ordered > Ordered array

- We can also observe that the time complexity for sorting varies from
  O (n^2) for the worst case i.e. reverse ordered input to **O(n)** which is the best case scenario i.e. ordered input with partially ordered and random lying in between these two limits.