

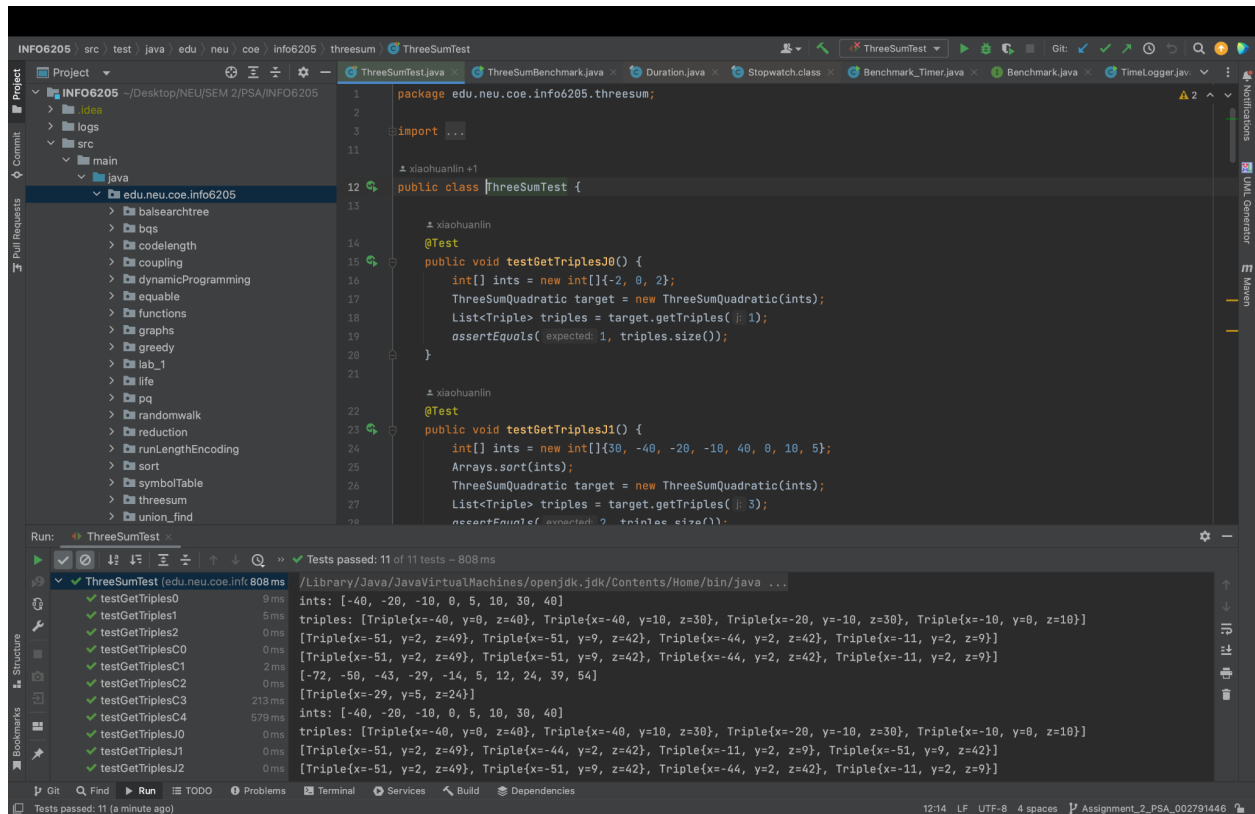
# NUID: 002791446

## Assignment 1: Report

### Explanation of Quadratic Method: Using HashSet

1. We will first Sort array
2. After sorting we move over the pivot element to `nums[i]` and then analyze the numbers to their right.
3. We find all the pairs that are present to its right and add up to `-nums[i]`, using two pointer method, which will eventually add up to 0 (`nums[i] - (num[j]+nums[k])`).
4. Add the corresponding pair and pivot element to the final resultant array.

### Unit Test Case Result:



The screenshot displays an IDE window with the following components:

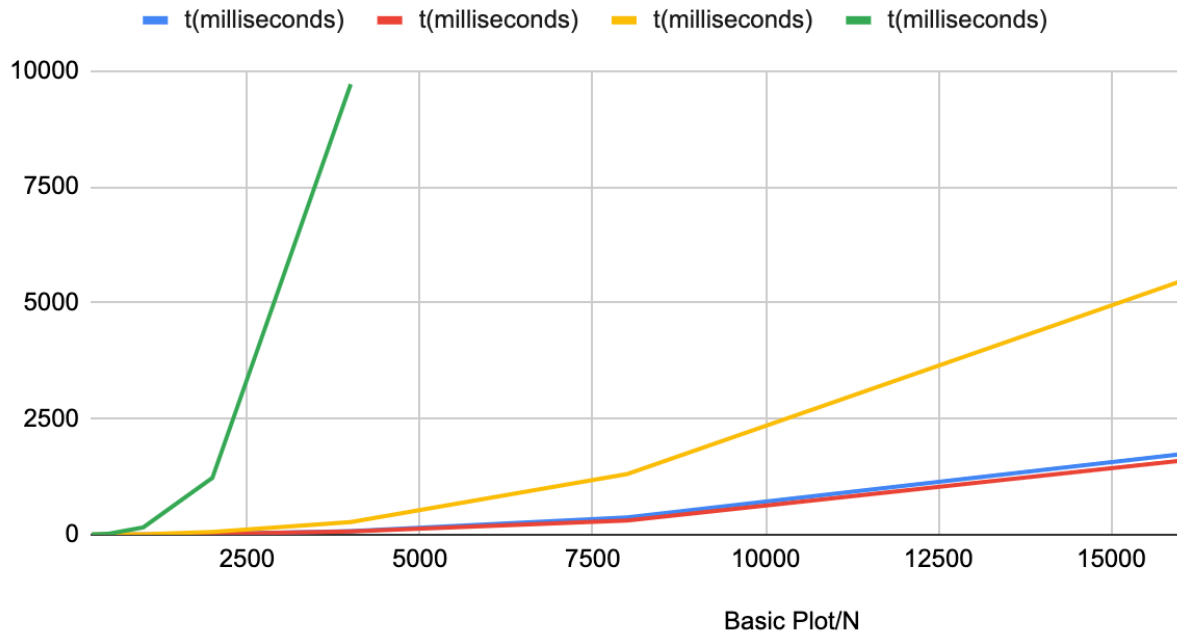
- Project Explorer:** Shows the project structure for `INFO6205`, including `src` and `main` directories, and a `java` package containing various classes like `balsearchtree`, `bqs`, `codeLength`, `coupling`, `dynamicProgramming`, `equale`, `functions`, `graphs`, `greedy`, `lab_1`, `life`, `pq`, `randomwalk`, `reduction`, `runLengthEncoding`, `sort`, `symbolTable`, `threesum`, and `union_find`.
- Code Editor:** Displays the `ThreeSumTest` class. The code includes package declarations, imports, and two test methods: `testGetTriplesJ0` and `testGetTriplesJ1`. Both methods use `ThreeSumQuadratic` to find triplets that sum to a target value.
- Run Console:** Shows the output of the tests. It indicates that 11 of 11 tests passed in 808ms. The output for `testGetTriplesJ0` shows the input array `ints: [-40, -20, -10, 0, 5, 10, 30, 40]` and the resulting list of triplets: `triples: [Triple{x=-40, y=0, z=40}, Triple{x=-40, y=10, z=30}, Triple{x=-20, y=-10, z=30}, Triple{x=-10, y=0, z=10}]`. The output for `testGetTriplesJ1` shows the input array `ints: [-40, -20, -10, 0, 5, 10, 30, 40]` and the resulting list of triplets: `triples: [Triple{x=-40, y=0, z=40}, Triple{x=-40, y=10, z=30}, Triple{x=-20, y=-10, z=30}, Triple{x=-10, y=0, z=10}]`.

Basic Plot					
	Quadratic	Quadratic with Callipers		Quadrithmic	Cubic
N	t(milliseconds)	t(milliseconds)		t(milliseconds)	t(milliseconds)
250	0.79	0.43		0.96	3.12
500	1.32	0.86		2.44	20.66
1000	3.95	2.75		11.3	157.6
2000	15.7	12.3		56.9	1225.4
4000	76.6	73.2		270.4	9713.6
8000	374.33	304.33		1306.33	
16000	1734.5	1592		5463.5	

Logarithmic Plot					
	Quadratic	Quadratic with Callipers		Quadrithmic	Cubic
Log(N)	Log(t)	Log(t)		Log(t)	Log(t)
5.521460918	-0.2357223335	-0.8439700703		-0.0408219945 2	1.137833002
6.214608098	0.2776317366	-0.1508228897		0.8919980393	3.028199464
6.907755279	1.373715579	1.011600912		2.424802726	5.060060177
7.60090246	2.753660712	2.509599262		4.041295341	7.1110226
8.29404964	4.338597077	4.293195421		5.599902344	9.181282244
8.987196821	5.925137761	5.718112639		7.174976958	
9.680344001	7.458474466	7.372746366		8.605844889	

Graphs from Benchmark:

### Input Size/ Run Time : Normal



### On a Logarithmic Scale : Input Size/ Run Time

