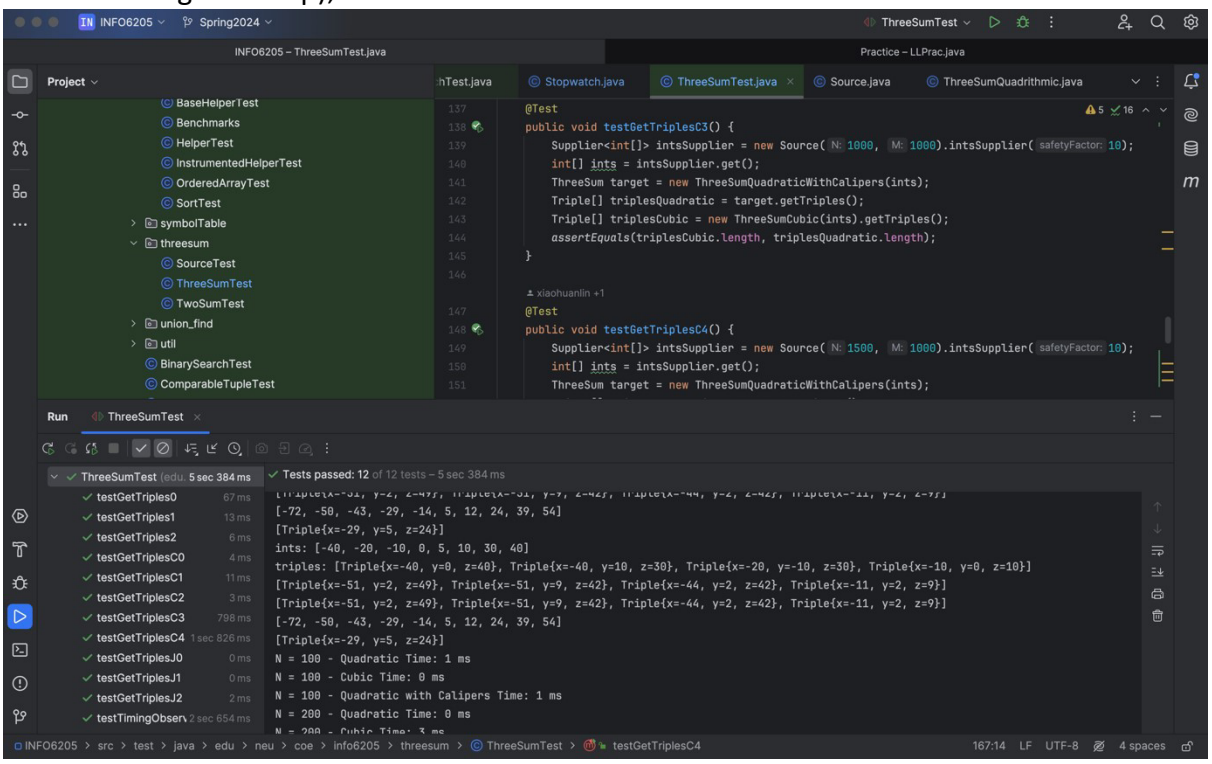
Assignment 2: 3-Sum

(a) evidence (screenshot) of your unit tests running (try to show the actual unit test code as well as the green strip);



(b) a spreadsheet showing your 9ming observa9ons--using the doubling method for at least five values of N--for each of the algorithms (include cubic); Timing should be performed either with an actual stopwatch (e.g. your iPhone) or using the Stopwatch class in the repository.

N = 100 - Quadratic Time: 0 ms
N = 100 - Cubic Time: 1 ms
N = 100 - Quadratic with Calipers Time: 0 ms
N = 100 - Quadrithmic Time: 4 ms
N = 200 - Quadratic Time: 1 ms
N = 200 - Cubic Time: 3 ms
N = 200 - Quadratic with Calipers Time: 0 ms
N = 200 - Quadrithmic Time: 2 ms
N = 400 - Quadratic Time: 0 ms
N = 400 - Cubic Time: 23 ms
N = 400 - Quadratic with Calipers Time: 0 ms
N = 400 - Quadrithmic Time: 7 ms
N = 800 - Quadratic Time: 4 ms
N = 800 - Cubic Time: 181 ms
N = 800 - Quadratic with Calipers Time: 4 ms
N = 800 - Quadrithmic Time: 10 ms

N = 1600 - Quadratic Time: 5 ms
N = 1600 - Cubic Time: 1447 ms
N = 1600 - Quadratic with Calipers Time: 15 ms
N = 1600 - Quadrithmic Time: 43 ms

(c) your brief explana9on of why the quadra9c method(s) work.

The quadra9c method(s) takes advantage of the proper9es of a sorted array. Sor9ng the array allows for a systema9c explora9on of the solu9on space, facilita9ng the iden9fica9on of triples with a sum of zero. The approach involves using two pointers that start at the extremes of the remaining array and move towards each other. The quadra9c method divides the solu9on space into N sub-spaces, where each subspace corresponds to a fixed value for the middle index of the three values in a poten9al triple. By fixing the middle index, the problem is reduced to finding pairs of indices (i, k) that sum to the nega9on of the value at the middle index (j). The quadra9c method has an overall 9me complexity of O(N^2), where N is the size of the input array. This approach results in a 9me complexity that is quadra9c in the size of the input array, making it a prac9cal and efficient solu9on for the ThreeSum problem.