3. Structural Testing

(a) For each of your sorters, determine how much statement coverage and branch coverage is achieved by the test suites that you constructed in Question 2. Justify your answer.

	QuickSorter(%)	HeapSorter(%)
Statement Coverage	100	96.4
Branch Coverage	90	89.3

In QuickSorter class, the method partition () checks whether the selected pivot is empty. If its empty, we can move ahead without any swapping. Since random function is used, it is not possible to guarantee that this condition is occurring always. Thus, on multiple test iterations, the lowest branch coverage was 90 %. Statement coverage was 100 %.

In HeapSorter class, to handle null conditions if largest is null, we need to replace it with left or right. The test cases where not creating a scenario with **largest = null, l = null and r != null**. Thus, the inner block of the if else statement was not getting called resulting in an incomplete branch coverage. The statement inside the block was also not getting executed and resulted in a reduced statement coverage.

The test suite was extended and added new test cases inside the package test3c.

(b) You will find another test suite for sorters in the following repository https://github.ccs.neu.edu/ftip/CS5500-HW4Q3.git. For each of your sorters, determine how much statement coverage and branch coverage is achieved by this test suite. Justify your answer.

	QuickSorter(%)	HeapSorter(%)
Statement Coverage	100	96.4
Branch Coverage	90	82.1

In QuickSorter sorting method, statement coverage was 100%. But it was missing one branch condition in line 48, dealing with null resulting in lower branch coverage. Since quick sort is using random `partition` function, it is better to have more test case to guarantee 100% test coverage always.

The test cases were not covering some branches in the heapSorter(), especially the block written for handling the null conditions. Test cases were not checking for conditions where largest of heapify() method is null, largest and left are null, largest left and right are null resulting in a lower branch coverage. It was not going inside the else if block in line 42 resulting in lower statement coverage.