

I broke my testing down into three phases. The first part was just normal testing of the insert element and remove element. This part was not very complicated as I only tested trees that did not require rotations. I checked to make sure the height of the trees was correct along with the in order, pre order, and post order traversal methods. This also inherently partially checks to make sure the tree is not getting rotated when it doesn't need to be, as an unnecessary rotation would likely produce a difference in one of the traversal methods.

The second phase was the testing of the balancing, rotate, and double rotate functions when the insert element and remove element cause the tree or a subtree to have a balance of 2 or -2. This was by far the most complicated part of the testing. I tried to be as thorough as possible by checking as many different tree shapes as I could with sizes of three, four, five and six. When I refer to the shape of a tree, I merely mean the way it subtrees and leaf node are configured. I chose these sizes for a variety of reasons. First, a tree of with one or two elements could never be imbalanced. Second, a tree larger than these would simply be a larger version of these rotations or would include rotations of subtrees of these sizes. I checked a lot of different shapes of each of these sizes, I found multiple errors for shapes that I had not considered, which required new conditionals to handle them. I checked to make sure the trees were correct by checking the different traversal methods for each tree along with the height of the tree. The most important, and difficult part of this testing was checking the trees after the removal of the root, as this may change the height as well as the traversals drastically.

The last part of my testing was testing the to list method. This was not overly complicated as I just tested the same cases as I did for the two above section, but instead of checking the different traversal methods I check to make sure the to list method was correct. I made sure to test the base cases. I also made sure to check for empty lists, lists after rotating, double rotating, and removing the root, which are the stress cases.