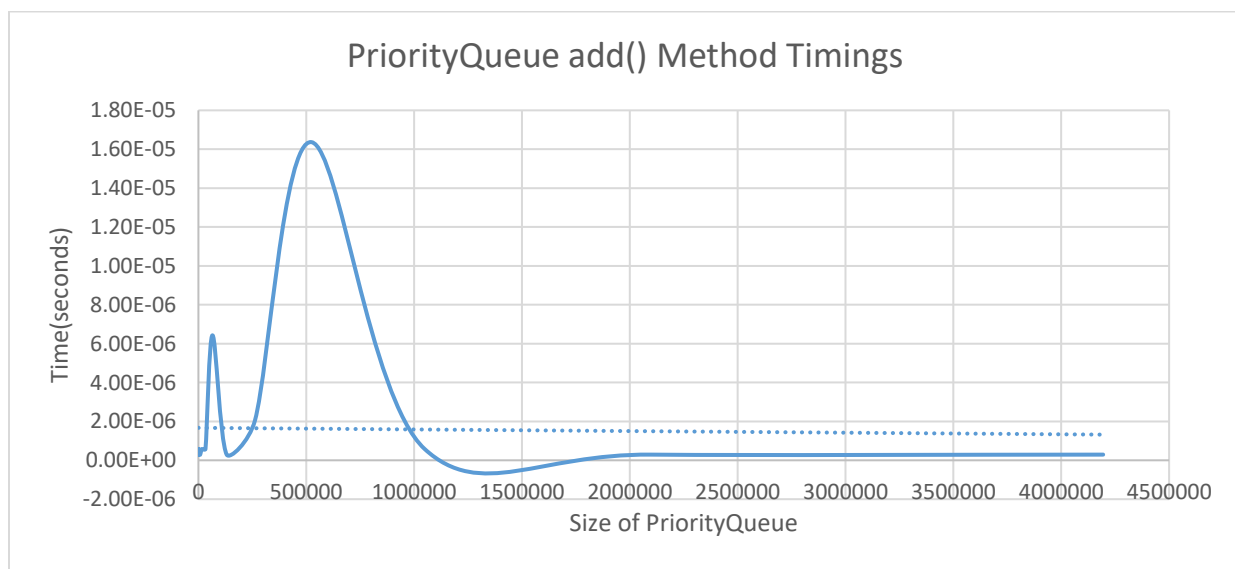
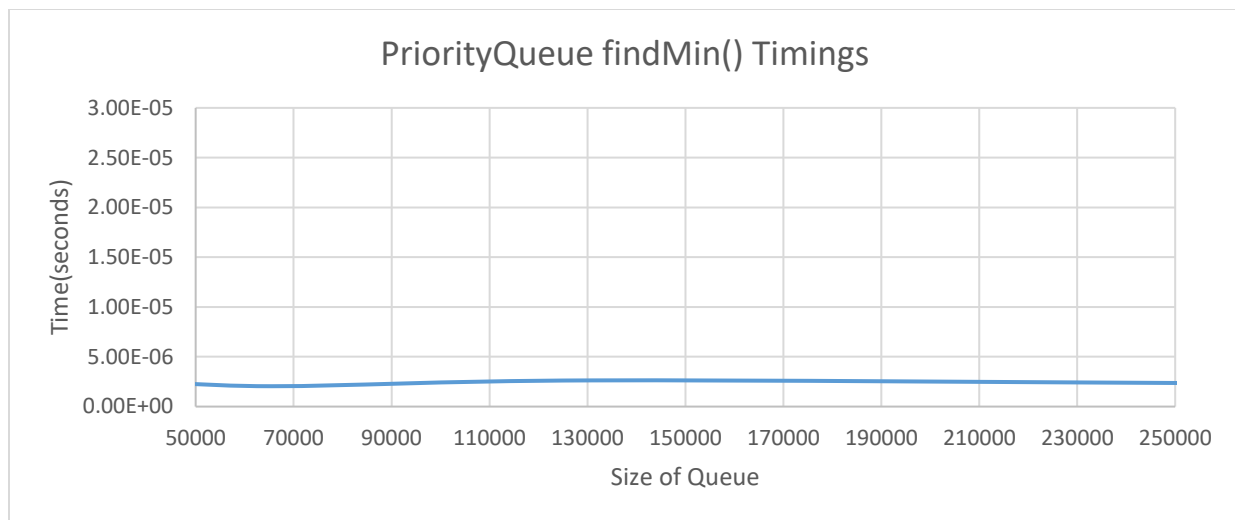
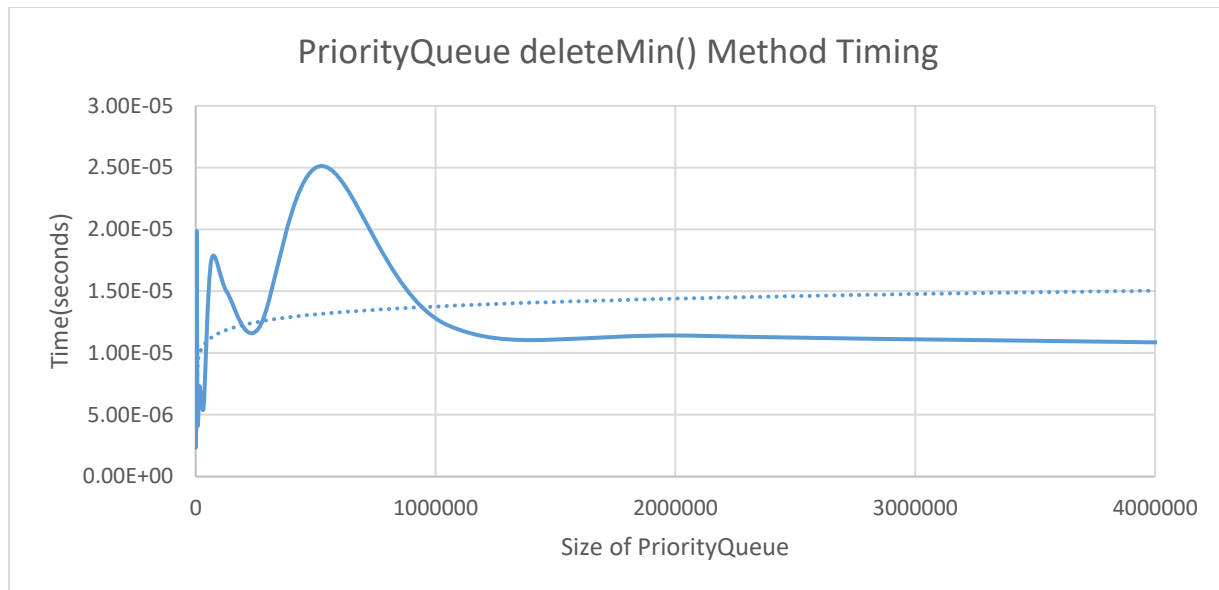


Assignment 11 Analysis Document

1. Design and conduct an experiment to assess the running-time efficiency of your priority queue.

For this experiment I started by making an outer loop that controls how many times an inner loop is run and how big the queue will be for each inner loop. Before the inner loop is run, a new PriorityQueue is created for new items to be added to. The inner loop controls the adding of items to the queue. I used Integers for this experiment, so each iteration of the inner loop adds a random number to the queue. Once the queue is built, I tested how long it took for each of the findMin, deleteMin, and add methods to do their work and then displayed those times in the console so I could easily add the data to Excel for graph creation.





2. What is the cost of each priority queue operation (in Big-O notation)? Does your implementation perform as you expected?

The cost for `findMin` is $O(c)$ and my implementation does work as expected. The average cost of `add` is also $O(c)$ because as mentioned in class, it takes an average of 1.6 comparisons for any N and can terminate early for the average cost of $O(c)$. Our implementation of `add` will double the size of the array when it needs to make room and that is where the spikes in my graph come from. Other than those spikes, it does seem to be very close to constant.

For `deleteMin`, the cost should be $O(\log N)$. With my testing, the `deleteMin` method seems to work correctly so I'm not sure what is causing the spikes that are seen on the graph, but the trend line does make it look logarithmic.

3. Briefly describe at least one important application for a priority queue.

The first example that comes to mind is using Dijkstra's algorithm to find the shortest path to a node. In that case, it is important to keep the queue updated with the "cost so far" so we can be sure we are finding the shortest path.

Another example is from our Pacman assignment where we needed to navigate through a maze. Although I never updated a "cost so far" as the path moved along, we were only able to access the first item in the queue.

4. How many hours did you spend on this assignment?

I spent about 4.5 hours on this assignment.