For this lab, I decided to separate it into three different programs. The First is implementing the leftist heap, the second is the skew heap, and third is testing these structures and producing times. When testing the structures, the program will run all the tests and store the values into a 2D array corresponding to the heap type and testing topic. Once all the data was collected, a method was called to print the results and their averages of the five seeds. It was grouped into printing Build Results and Operation Results. Further grouping was heap type, and inside of that, the five times and their averages pertaining to the number of elements it held.

As you can see in the page below, all values and averages are recorded. These are from which the two graphs derived. Following the guidelines of the lab, build tested how long it took to populate each heap with the four values, n, which represents the size of the heap. On the other hand, operations took that populated heap and randomly deletes the minimum value or inserts a random value while timing how long it took to do so. Only 0.1n, where n is one of the four the sizes of the heap, operations were called on the heap.

Perusing the results of the testing program, none of the times ever went above 0.2 seconds. Obviously, in relation to the n values, 50,000 was the fastest, since it added the least elements and ran the least number of operations. On the other side of that scale, 400,000 took the longest, since it added the most elements and ran the most operations. In both cases, building the heap and running operations, the min Leftist heap took longer than the min Skew heap.

In conclusion, the min Skew heap performed better than the min Leftist heap. As we can see in the graphs, both heaps were close when n was smaller, but as n grew the gap between their performances grew as well. If we were to continue to increase the value of n, the min Leftist heap would continue to veer away from the min Skew heap and take longer and longer.

n = 50000

	Leftist Build	Leftist Operations	Skew Build	Skew Operations
1	0.034796	0.004432	0.017368	0.0031
2	0.024422	0.004756	0.018892	0.00288
3	0.018759	0.004493	0.017178	0.003209
4	0.022079	0.005325	0.021804	0.007939
5	0.02408	0.006133	0.020394	0.003178
Average	0.0248272	0.0050278	0.0191272	0.0040612

n = 100000

	Leftist Build	Leftist Operations	Skew Build	Skew Operations
1	0.040843	0.009659	0.035982	0.006855
2	0.04196	0.010236	0.034981	0.008121
3	0.041985	0.009346	0.039509	0.00727
4	0.042238	0.010385	0.035565	0.007125
5	0.042055	0.009425	0.042486	0.006976
Average	0.0418162	0.0098102	0.0377046	0.0072694

n = 200000

	Leftist Build	Leftist Operations	Skew Build	Skew Operations
1	0.085464	0.02097	0.080079	0.018025
2	0.094107	0.023	0.077337	0.017763
3	0.091392	0.021358	0.082268	0.015976
4	0.095578	0.021055	0.084517	0.015875
5	0.089804	0.027514	0.079605	0.016277
Average	0.091269	0.0227794	0.0807612	0.0167832

n = 400000

	Leftist Build	Leftist Operations	Skew Build	Skew Operations
1	0.183537	0.049057	0.177385	0.037101
2	0.204623	0.049572	0.181464	0.039533
3	0.193471	0.049753	0.199998	0.040772
4	0.18758	0.049018	0.174464	0.037353
5	0.205075	0.048988	0.173646	0.040588
Average	0.194857	0.0492776	0.181391	0.0390694

Average Times

		Leftist Build	Leftist Operations	Skew Build	Skew Operations
	50000	0.0248272	0.0050278	0.0191272	0.0040612
n Value	100000	0.0418162	0.0098102	0.0377046	0.0072694
	200000	0.091269	0.0227794	0.0807612	0.0167832
	400000	0.194857	0.0492776	0.181391	0.0390694

Average Build Times

Average Operation Times