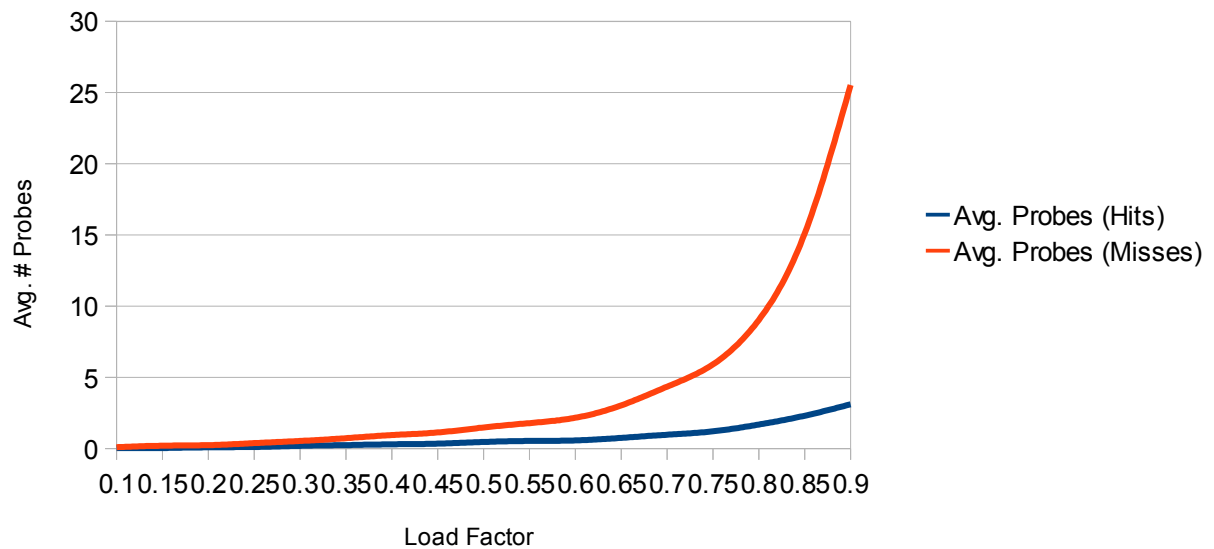


## Set Up

For the experiment, a vector of 1,917 unique, randomized integers from 0 to 10,900 was created. 17 load ratios from .1 to .9 were used. For each load ratio (recorded as Load in the table below), the first N elements of the random number vector were inserted into a hash table of size 1009 with linear probing and without rehashing, in which  $N = \text{Load} * 1009$ . Once complete, the program searched for each number that it had inserted into the hash table, and take the average number of probes necessary to find each one, recorded as Avg. Probes (Hits) in the table below. After that, the program would search for the last N elements of the random number vector, which did not exist in the hash table, and take the average number of probes necessary to determine that each element did not exist in the table, recorded as Avg. Probes (Misses) in the table below.

Load	Elements Inserted	Avg. Probes (Hits)	Avg. Probes (Misses)
0.1	100	0.02	0.09
0.15	151	0.03311	0.1921
0.2	201	0.0796	0.2338
0.25	252	0.1032	0.373
0.3	302	0.1832	0.5265
0.35	353	0.238	0.7195
0.4	403	0.2928	0.9404
0.45	454	0.337	1.121
0.5	504	0.4565	1.476
0.55	554	0.5253	1.778
0.6	605	0.5653	2.155
0.65	655	0.742	3.023
0.7	706	0.9646	4.339
0.75	756	1.202	5.902
0.8	807	1.679	9.024
0.85	857	2.299	15.1
0.9	908	3.101	25.52

## Hashtable Linear Probing Load Test



### Analysis

Both the average number of hits and misses seem to grow exponentially, though the misses increase at a significantly higher rate as the table fills up. This is because as the table fills up (without rehashing), clustering becomes more of a problem, requiring a greater number of linear probes to determine whether or not an element exists in the table. While clustering affects the average number of hits as well, less probes are required to find an existing element.

These results are similar to the ones in the book, though the number of misses in the book increase at a slower rate than those of my experiment. For instance, in the book, the average number of probes for a miss at a load factor of .9 was about 15; in my experiment, that number was 25.