

Lab 8

- The following hashtable has size 43; stores integers in the range [0, 999]; and uses the hash function $h(k) = k \% 43$. Collision-handling is accomplished by quadratic probe.

0		12		24	875	36	
1		13	787	25		37	
2	905	14	170	26	714	38	22
3	159	15	144	27	499	39	202
4		16	231	28	930	40	599
5	521	17	963	29	115	41	643
6	607	18		30	460	42	84
7	394	19	664	31	194		
8		20		32	720		
9	783	21	408	33	936		
10	95	22	495	34	550		
11		23	237	35			

- What is the expected number of probes when searching for a number that is not in the table? What would it be if you were doing a linear probe? Write your answer as a fraction.
- Into which slot will the integer 59 be placed? Where would it go if you were doing a linear probe?
- Into which slot will the integer 436 be placed?
- Assume that we were allowed to physically remove the number 783 from the table. After it is removed, what would be the result if we tried to find and retrieve the number 95 from the table?
- How is the delete operation handled in a quadratic probe? Use part (d) to explain why it is done this way.

2. Implement an enhanced stack that supports push, pop, peek, isEmpty and also min, so that worst case running time for any operation is still $O(1)$. Write down your idea and your logic for concluding that operations are in every case $O(1)$. Then implement your idea in a Java class called MinStack.
3. Start with an empty stack of integers. You will attempt to do a sequence of pushes and pops so that the sequence of pops will be a specified permutation of 1, 2, 3, 4, 5, 6. You will be able to do exactly 6 push operations and 6 pop operations. The first push pushes 1 onto the stack; the next pushes 2; and so forth. The sixth push pushes 6 onto the stack.

For this exercise, we will let S denote a push operation and X a pop operation. Example: The sequence SSSSSSXXXXXX outputs 654321.

- a. Describe a sequence of pushes and pops that would produce output 325641 (or explain why it is not possible)
 - b. Describe a sequence of pushes and pops that would produce output 154623 (or explain why it is not possible)
4. Devise an algorithm for reversing the elements in a singly linked list. Implement your solution in code. You can use the singly linked list in the lab folder.