

COMP3506/COMP7505—Algorithms and Data Structures

School of Information Technology and Electrical Engineering

Week 7 Tutorial

Question 1.

Show the result of the following operations on a Map that has been implemented using a hash-table with a list-based map in each bucket-array position. Fill in the table and **also** give a representation of the hash-table.

- a) Show the result of the following operations assuming a hash code of $2i + 7$ and using a mod compression function. The size of the bucket array is 9.

operation	hash code	compression fn	bucket index
put(12, e)	$2 * 12 + 7 = 31$	$31 \bmod 9 = 4$	4
put(44, e)			
put(13, e)			
put(89, e)			
remove(44)			
remove(89)			

- b) Show the result if each entry of the bucket array stored a single entry and collisions were handled by linear probing.

operation	hash code	compression fn	bucket index
put(12, e)	$2 * 12 + 7 = 31$	$31 \bmod 9 = 4$	4
put(44, e)			
put(13, e)			
put(89, e)			
remove(44)			
remove(89)			

- c) Show the result if each entry of the bucket array stored a single entry and collisions were handled by double hashing using the secondary hash code of $7 - (k \bmod 7)$ with the same compression function used before.

operation	hash code	compression fn	bucket index
put(12, e)	$2 * 12 + 7 = 31$	$31 \bmod 9 = 4$	4
put(44, e)			
put(13, e)			
put(89, e)			
remove(44)			
remove(89)			

Question 2

When the load factor ($\alpha = n / N$) of a hash table passes a critical point the hash table is increased in size - increasing N , the size of the array, decreases the load factor.

What needs to happen when the table is resized?

Question 3

Starting with an initially empty skip list, and by flipping a real coin to obtain, i , show the result of each insertion of the following keys into a skip list: 10, 12, 14, 15, 23, 32, and 35.

Indicate the value of i , and show the resulting skip list after each insertion.