Problem sheet 3

COL106 (Data Structures), Semester I, 2018-19, IIT Delhi

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Exercise 1

Exercise 2
Consider a simple open addressing scheme, let's say linear probing with a hash code $f'(x)$. We start with an array of size n, use hash function $f_n(x) = f'(x) \mod n$. When this array gets full we move to an array of size $2n$ with hash function $f_{2n}(x) = f'(x) \mod n$. When this gets full we again double the size and so on. Clearly a single insert could take a long time if rehashing is to be done. Show that the amortized insert time is $\theta(1)$.

Exercise 3
We are given a skip list S with promotion parameter p (the probability with which we promote elements). On this we define the *finger search* operation which is a generalization of the normal find operation. We are given a direct link to a node containing key $x \in S$ and we are asked to find a $y > x$. If x is the ith element and y is the jth element of the base list of S (where $j > i$), explain how to implement finger search so that its expected running time is $O(\log_2(2 + j - i))$. If $y \notin S$ you may assume that y_- is the jth element of the base list of S.

Exercise 4
Recall that we define the height of tree as the maximum depth of any node of the tree (root has depth 0). We are given an AVL tree of height h. Remove all nodes of depth exactly h from this tree. Now prove that the remaining tree is also an AVL tree.