

1. Let H be a hash-table where collisions are handled by separate chaining and where re-hashing is used each time the load factor (the number of items in the table divided by the size of the table) exceeds $\frac{1}{2}$. We assume that the initial size of H is 2 and that rehashing doubles the size of the table. After inserting 10 items with different keys, what is the size of the hash-table H ?
2. Consider an initially empty hash table of size M and hash function $h(x) = x \bmod M$. In the worst case, what is the time complexity to insert n different keys into the table if separate chaining is used to resolve collisions (without re-hashing)? Suppose that each entry of the table stores an unordered linked list. When adding a new element to an unordered linked list, such an element is inserted at the beginning of the list.
3. What is the answer for question 3 if the linked lists are ordered?
4. Consider the same hash table as above, but assume now that collisions are resolved using linear probing, and $n \leq M/2$. In the worst case, what is the time complexity to insert n keys into the table?