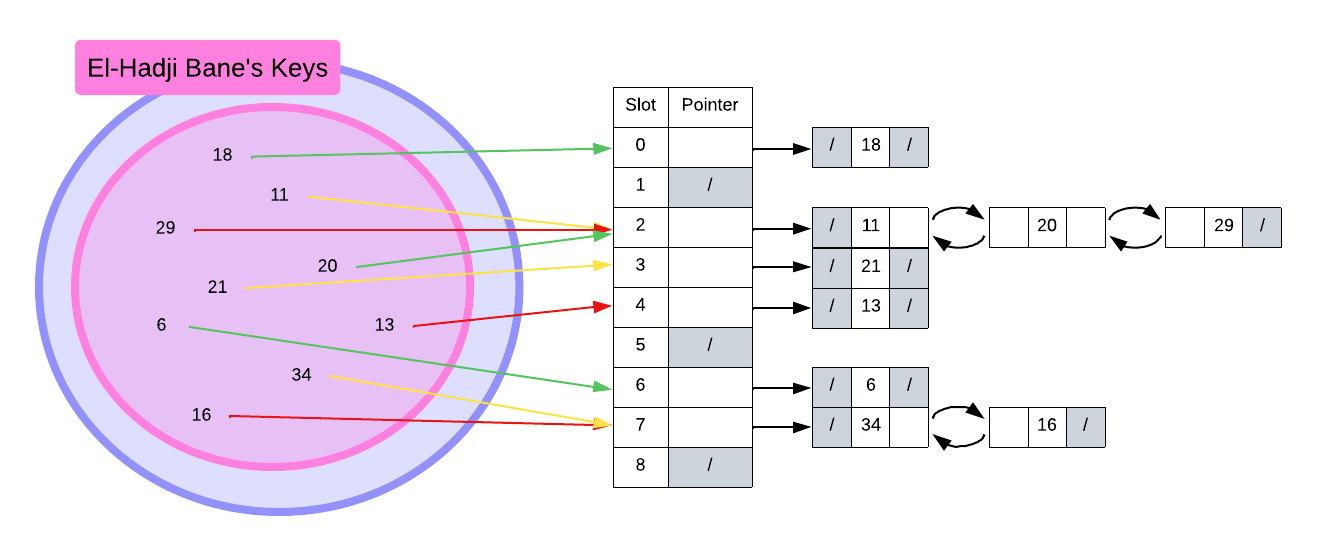
Question 1

[4 pts] Demonstrate what happened when we insert the keys 6, 29, 20, 16, 21, 34, 13, 18, 11 into a hash table with collisions resolved by chaining. Let the table have 9 slots and let the hash function be h(k) = k mod 9. Draw the resulting hash table.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | | 2 | | 3 | | 4 | | 5 | | 6 | | 7 | |
| Slot | keys | Slot | keys | Slot | keys | Slot | keys | Slot | keys | Slot | keys | Slot | keys |
| 0 |  | 0 |  | 0 |  | 0 |  | 0 |  | 0 |  | 0 |  |
| 1 |  | 1 |  | 1 |  | 1 |  | 1 |  | 1 |  | 1 |  |
| 2 |  | 2 | 29 | 2 | 20,29 | 2 | 20,29 | 2 | 20,29 | 2 | 20,29 | 2 | 20,29 |
| 3 |  | 3 |  | 3 |  | 3 |  | 3 | 21 | 3 | 21 | 3 | 21 |
| 4 |  | 4 |  | 4 |  | 4 |  | 4 |  | 4 |  | 4 | 13 |
| 5 |  | 5 |  | 5 |  | 5 |  | 5 |  | 5 |  | 5 |  |
| 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 7 |  | 7 |  | 7 |  | 7 | 16 | 7 | 16 | 7 | 34,16 | 7 | 34,16 |
| 8 |  | 8 |  | 8 |  | 8 |  | 8 |  | 8 |  | 8 |  |

|  |  |  |  |
| --- | --- | --- | --- |
| 8 | | 9 | |
| Slot | keys | Slot | keys |
| 0 | 18 | 0 | 18 |
| 1 |  | 1 |  |
| 2 | 20,29 | 2 | 11,20,29 |
| 3 | 21 | 3 | 21 |
| 4 | 13 | 4 | 13 |
| 5 |  | 5 |  |
| 6 | 6 | 6 | 6 |
| 7 | 34,16 | 7 | 34,16 |
| 8 |  | 8 |  |



Question 2

Suppose you are given a universe of elements U = {85, 46, 65, 34, 39, 98, 17} to be inserted into a hash table and number of slots in the table is 5.

1. [2 pt] What is the load factor?
2. [4 pts] To resolve collision using chaining method draw the final content of the hash table with hash function h(k) = k mod 5. How many computations at the most do you think you’re required to search for any element in the final hash table.

A diagram of a diagram

Description automatically generated

Search computation factors

1. To access the correct slot, the hash value is computed.
2. Traversing up a list takes time.
3. The longest linked-list in the table has 2 nodes.

Conclusion: it takes 2 computations to perform a search at most.