Hash table exercise:

Given input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function h(x) = x mod 10, show the tables for a hash table size 10:

a. Separate chaining hash table.

b. Hash table using linear probing.

c. Hash table using quadratic probing.

d. Hash table with second hash function h2(x) = 7 − (x mod 7).

e. Show the result of rehashing the hash tables to new tables size 19

4371 mod 10 = 1

1323 mod 10 = 3

6173 mod 10 = 3

4199 mod 10 = 9

4344 mod 10 = 4

9679 mod 10 = 9

1989 mod 10 = 9

a. Separate chaining hash table.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|  | 4371 |  | 1323 | 4344 |  |  |  |  | 4199 |
|  |  |  | 6173 |  |  |  |  |  | 9679 |
|  |  |  |  |  |  |  |  |  | 1989 |

b. Hash table using linear probing.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 9679 | 4371 | 1989 | 1323 | 9173 | 4344 |  |  |  | 4199 |

c. Hash table using quadratic probing.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 9679 | 4371 |  | 1323 | 6173 | 4344 |  |  | 1989 | 4199 |

d. Hash table with second hash function h2(x) = 7 − (x mod 7).

h2(6173) = 7 – (6173 mod 7) = 1

h2(4344) = 7 – (4344 mod 7) = 3

h2(9679) = 7 – (9679 mod 7) = 2

h2(9679) = 7 – (9679 mod 7) = 2

h2(1989) = 7 – (1989 mod 7) = 6 – BROKEN VALUE – always points to index with conflict

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|  | 4371 |  | 1323 | 6173 | 9679 |  | 4344 |  | 4199 |

e. Show the result of rehashing the hash tables to new tables size 19

a. Separate chaining hash table.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|  | 4371 |  | 1323 | 4344 |  |  |  |  | 4199 |
|  |  |  | 6173 |  |  |  |  |  | 9679 |
|  |  |  |  |  |  |  |  |  | 1989 |

↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓↓

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 4199 | 4371 |  |  | 4344 |  |  |  |  | 6173 |  |  | 1323 | 1989 |  |  |  | 9679 |  |