Hashing

- **Hashing** is a technique or process of mapping keys, values into the **hash** table by using a **hash** function.
- Hashing is designed to solve the problem of needing to efficiently find or store an item in a collection.
- It is done for faster access to elements.
- The efficiency of mapping depends on the efficiency of the **hash** function used.

- A hash table uses a hash function to compute an *index*, also called a *hash code*, into an array of *buckets* or *slots*, from which the desired value can be found.
- During lookup, the key is hashed and the resulting hash indicates where the corresponding value is stored.

- Hashing is a technique which uses less key comparisons and searches the element in
  - **O(n)** time in the **worst case**
  - **O(1)** time in an **average case**

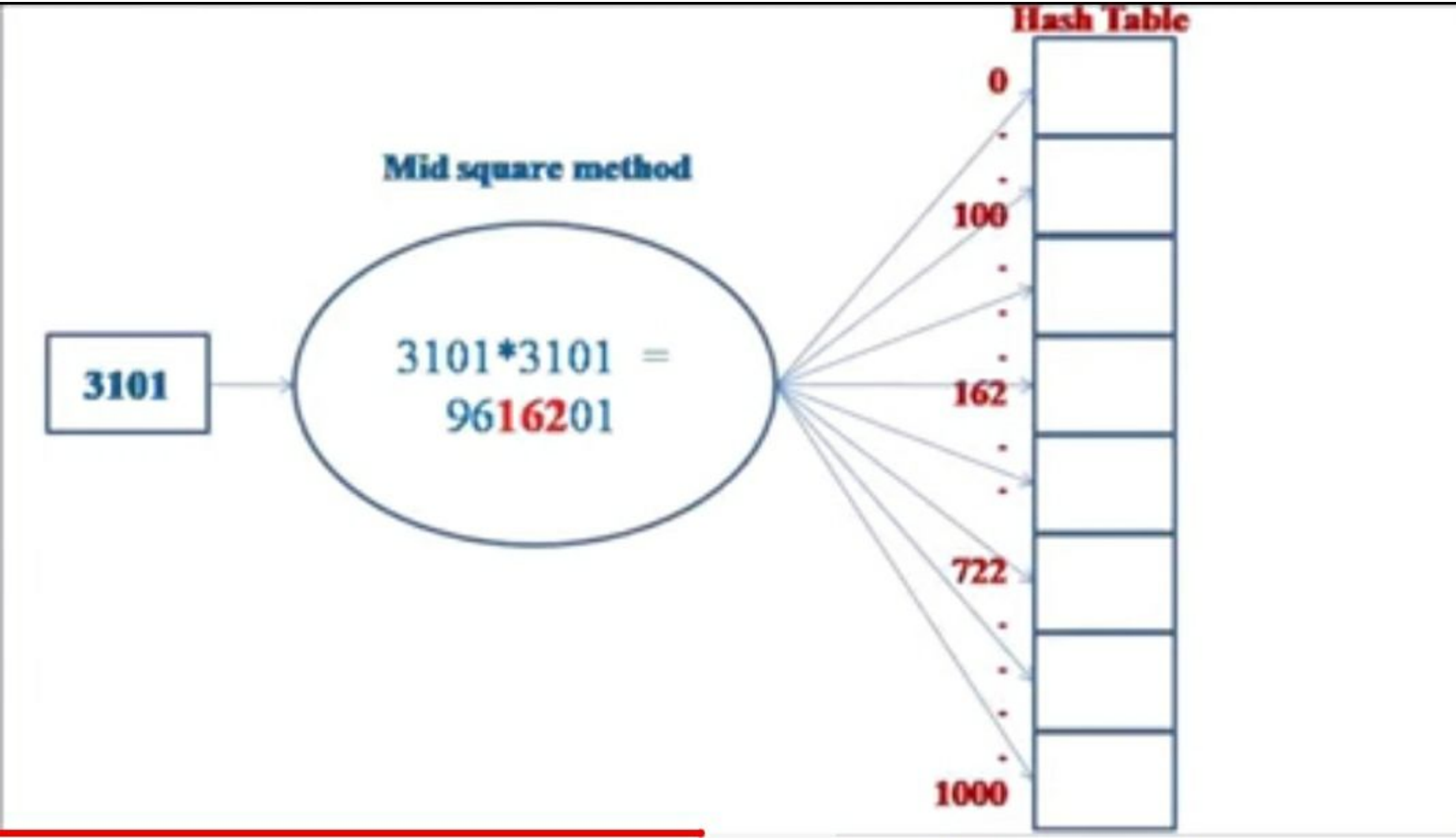
Types of hash function

1. Division method
2. Mid square method
3. Digit folding method

1. Division method

- In this the hash function is dependent upon the remainder of a division.

h(key) = record % table size


Hash Table
0
100
162
722
1000
Mid square method
3101
3101*3101 =
9616201

Types of hash function

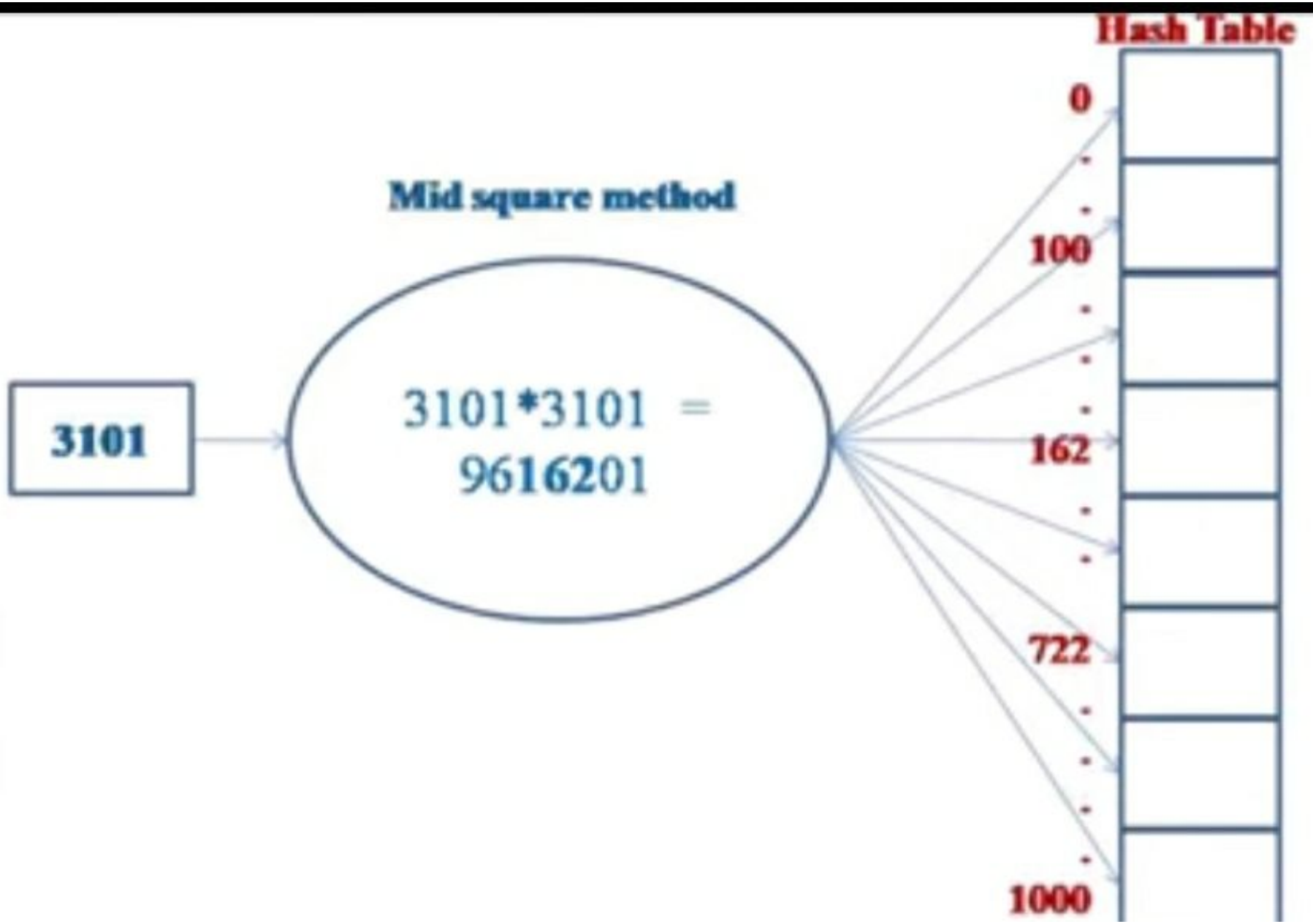
1. Division method
2. Mid square method
3. Digit folding method

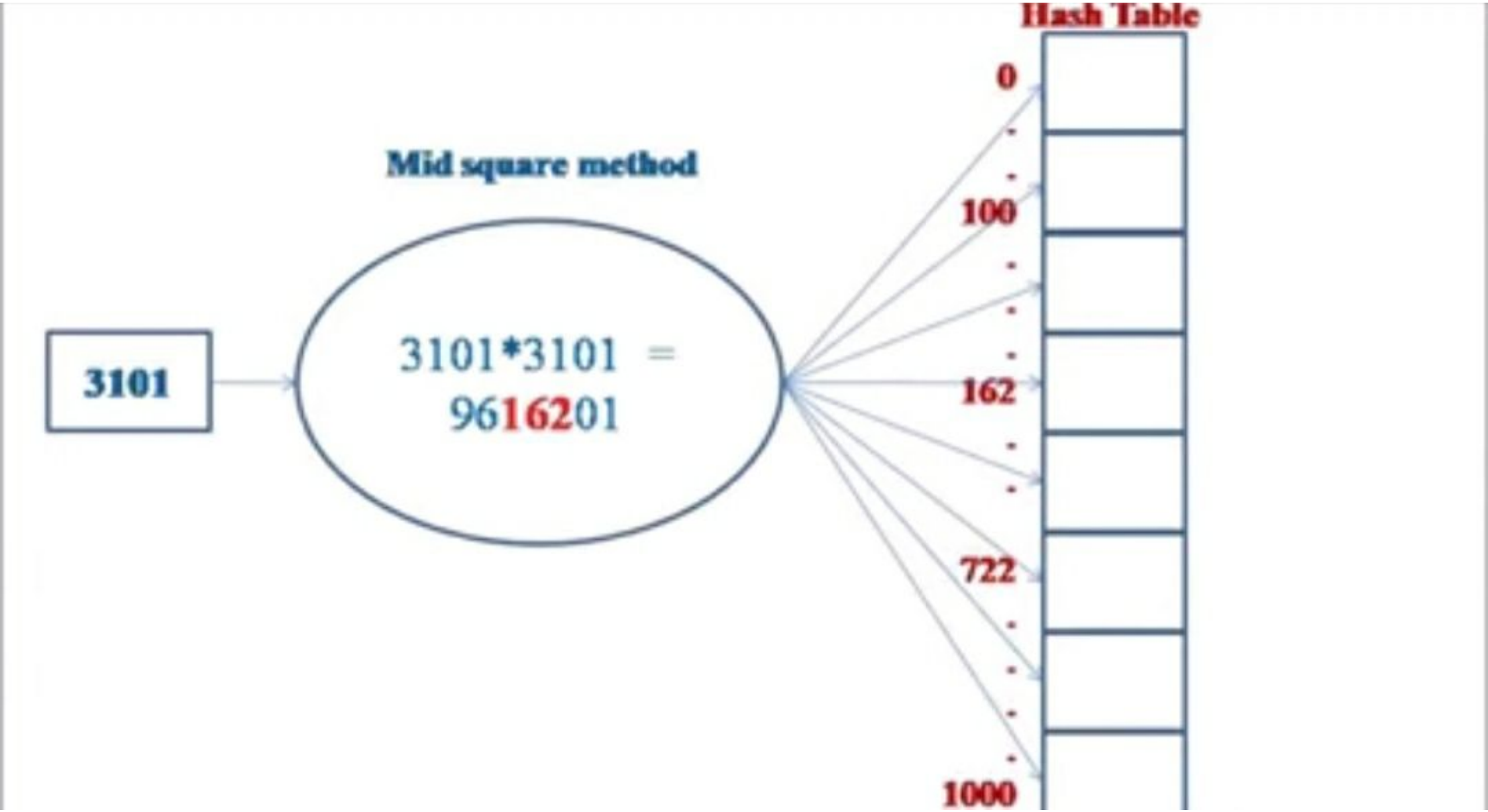
2. Mid square method

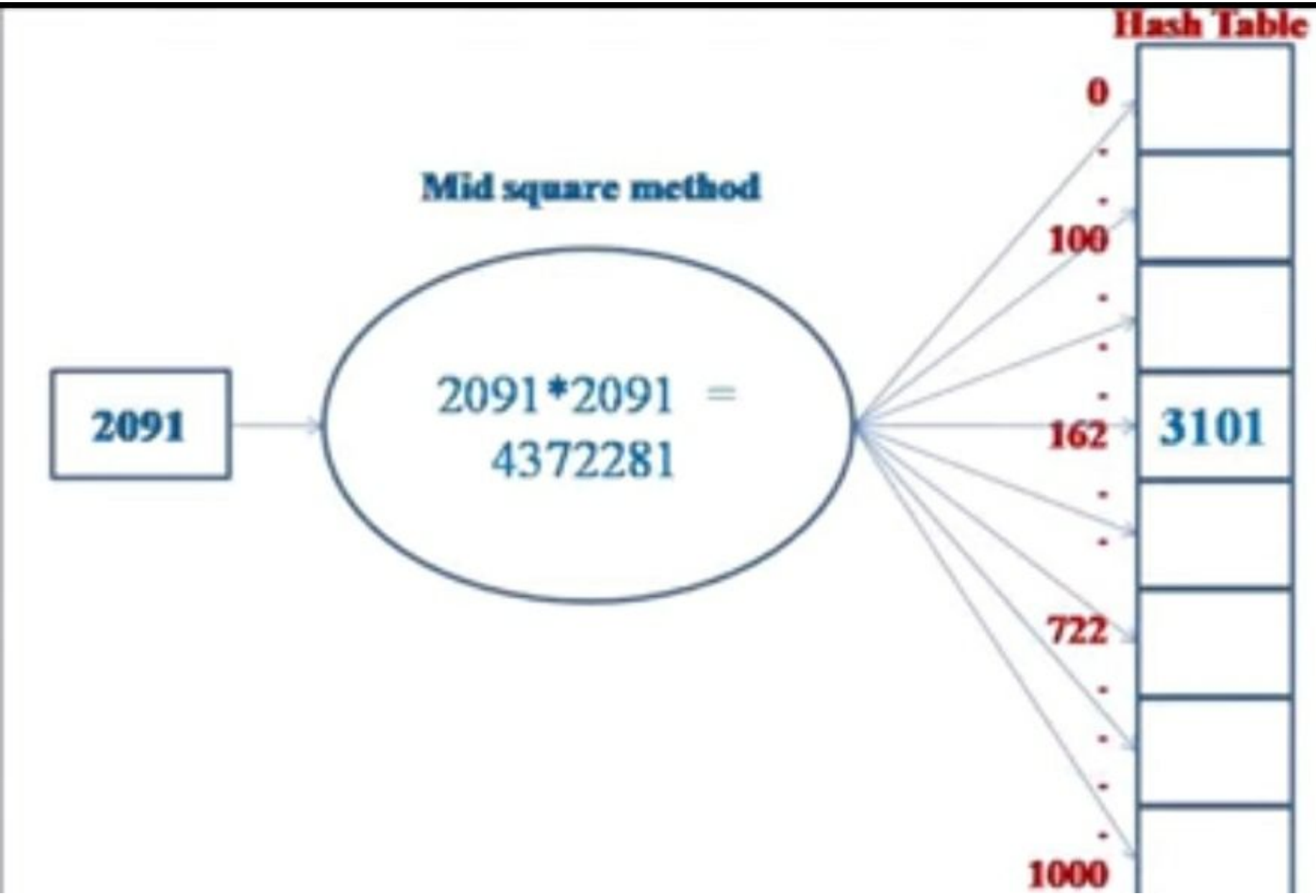
- consider that if we want to place a record of 3101 and the size of table is 1000, Location = **(middle 3 digit)**

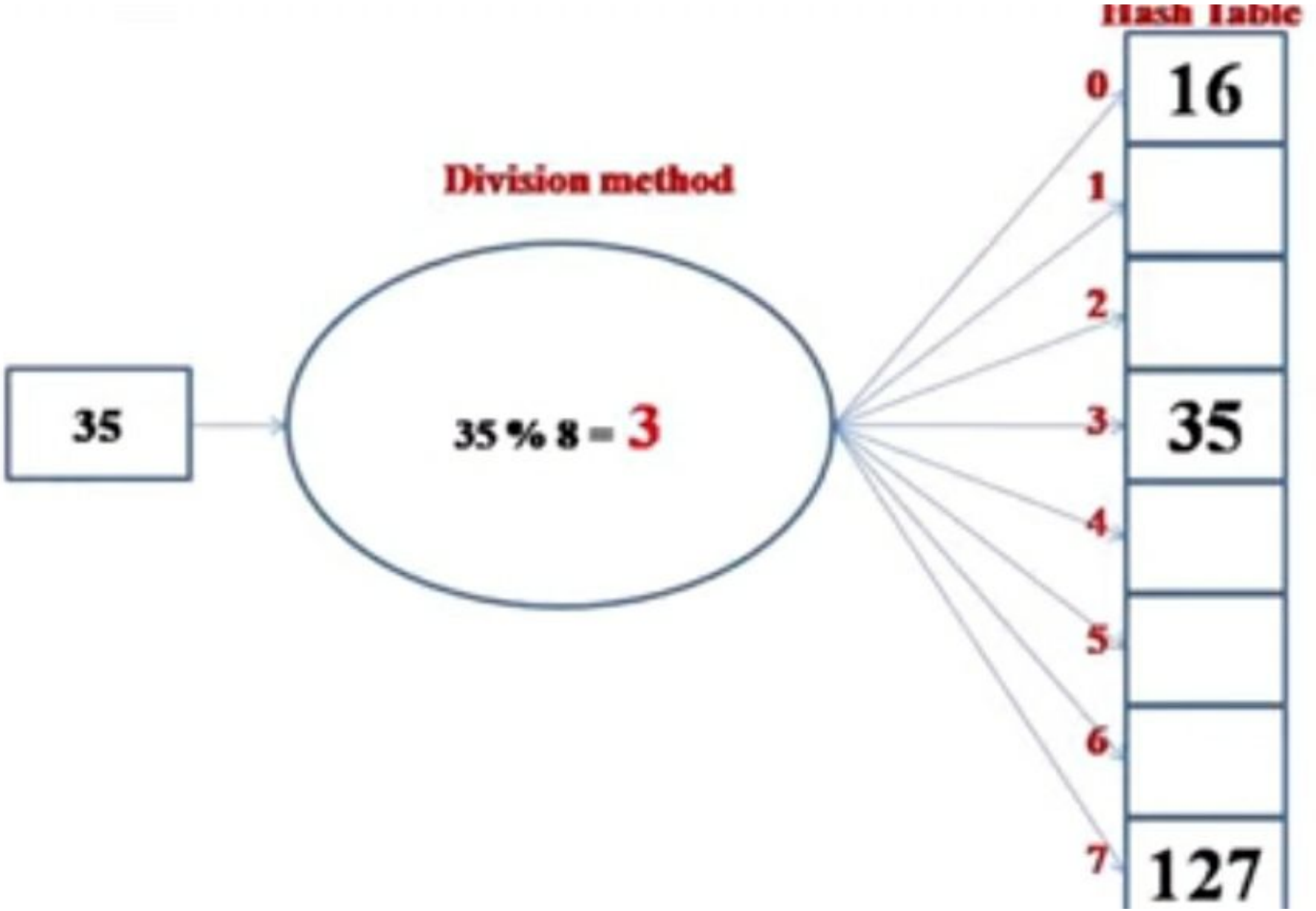
3101*3101 = 96**162**01

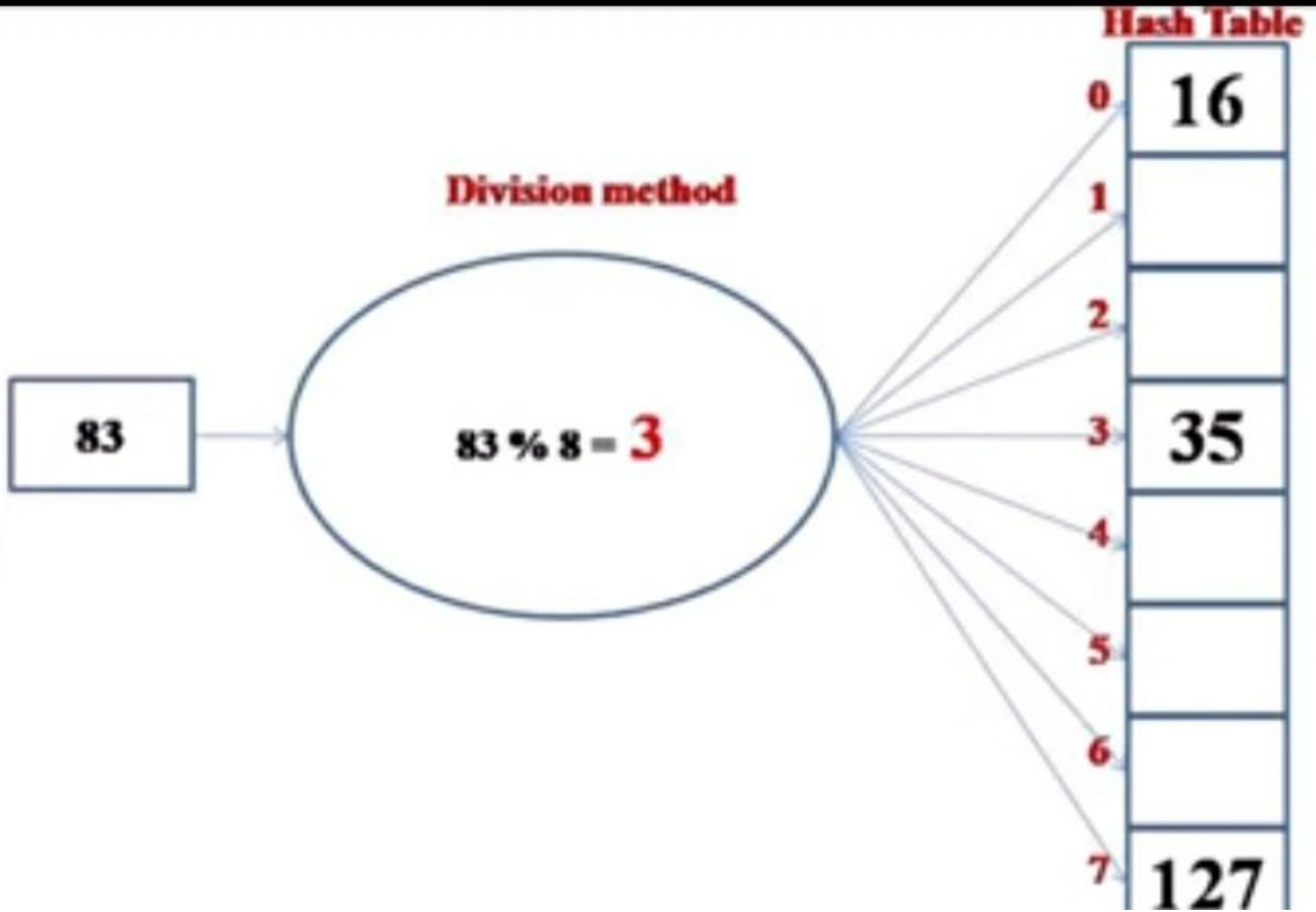
h (3101) = 162


Hash Table
Mid square method
3101
3101*3101 =
9616201
0
100
162
722
1000


Hash Table
Mid square method
3101
3101*3101 =
96162 01
0
100
162
722
1000


Hash Table
Mid square method
2091
2091*2091 =
4372281
0
100
162
722
1000
3101


Hash Table
Division method
35
35 % 8 = 3
0
1
2
3
4
5
6
7
16
35
127


Hash Table
Division method
83
83 % 8 = 3
0
1
2
3
4
5
6
7
16
35
127

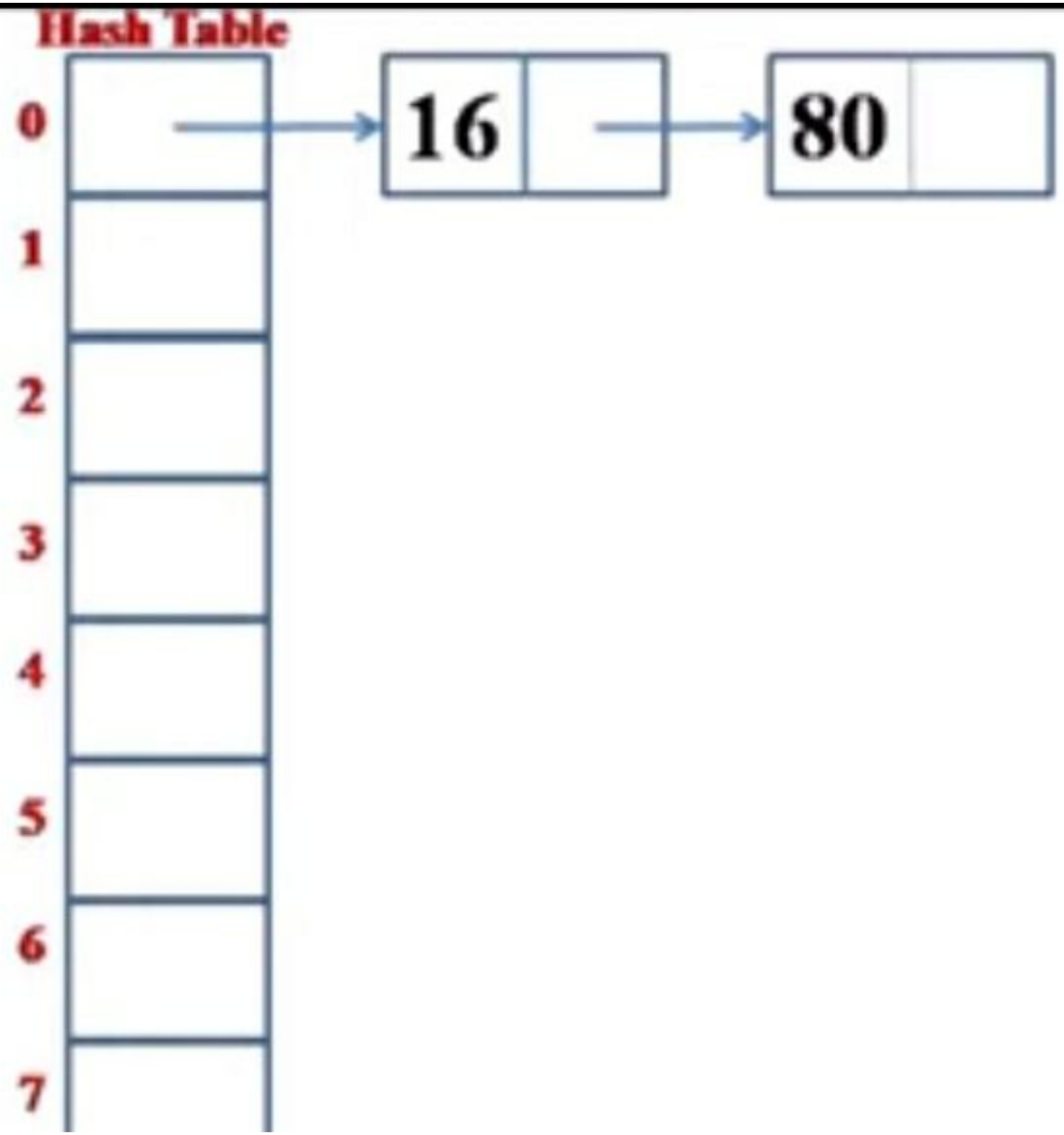
Collision

- It is a situation in which the hash function returns the same hash key for more than one record

Collision resolution technique

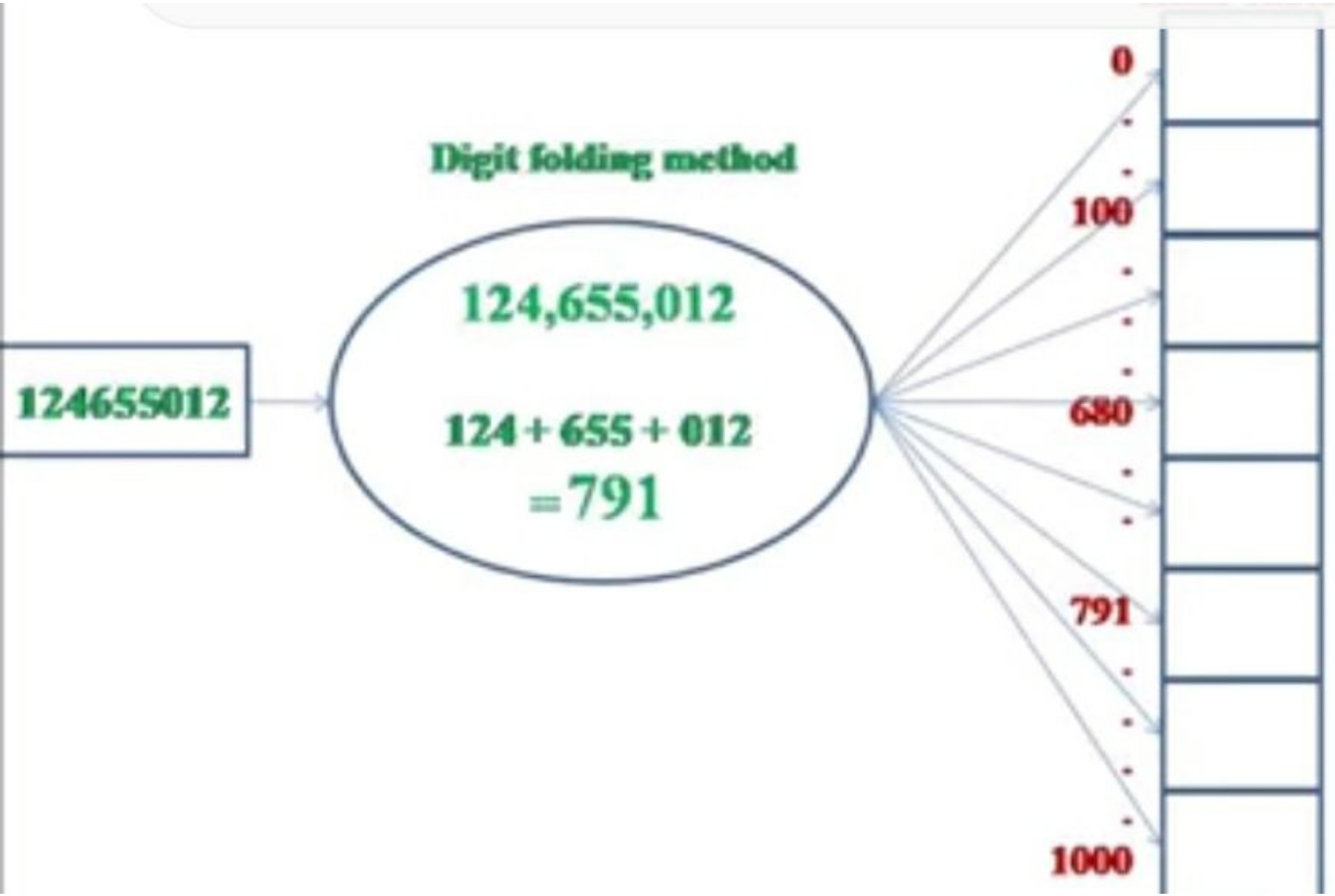
1) Chaining
2) Double hashing
3) Linear probing
4) Quadratic probing

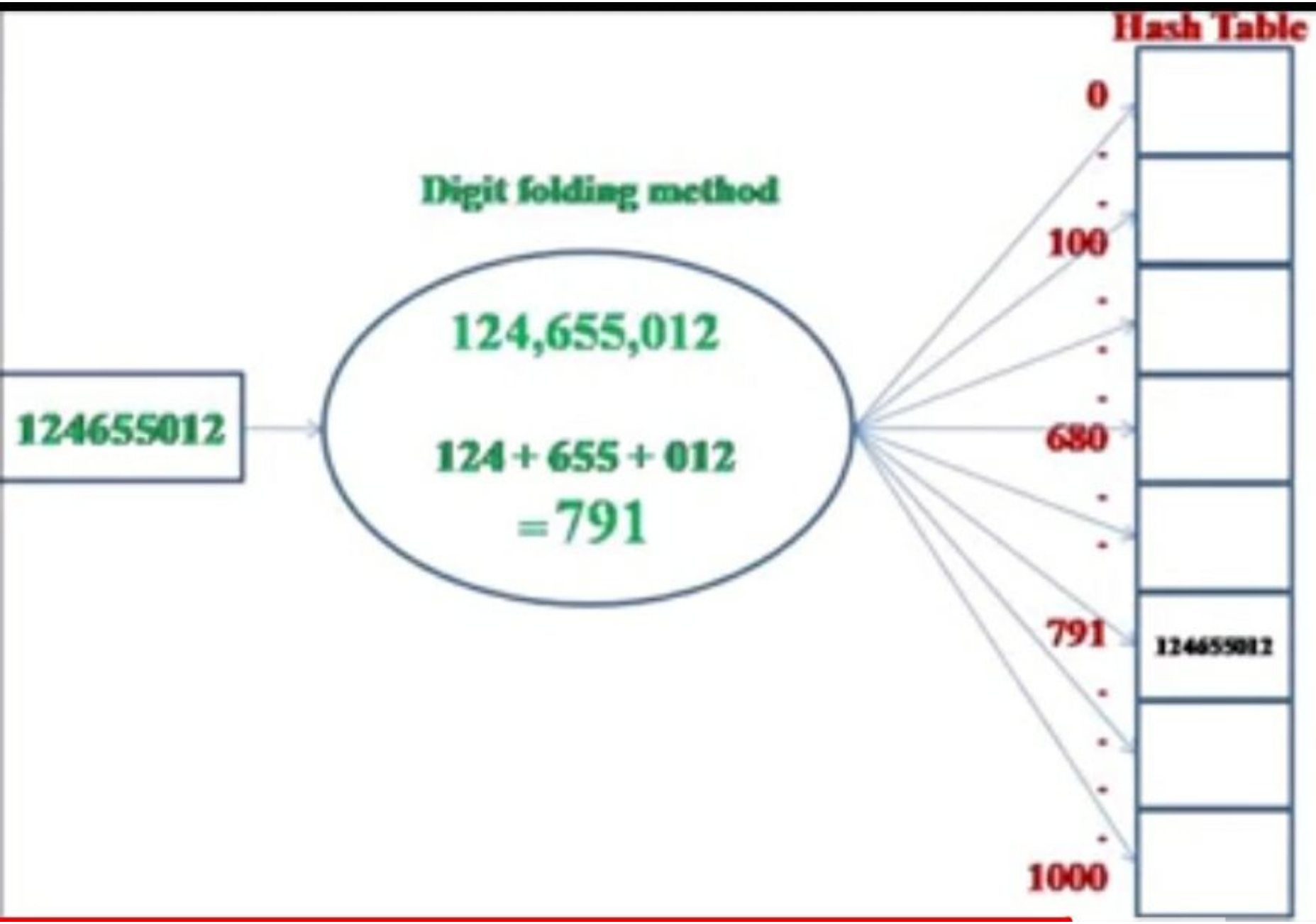
Chaining



3. Digit folding method

- In this method the key is divided into separate parts and by using some simple operations these parts are combined to produce a hash key.


Digit folding method
124655012
124,655,012
124 + 655 + 012
=791
0
100
680
791
1000


Hash Table
0
100
680
791
1000
124655012
Digit folding method
124,655,012
124 + 655 + 012
= 791
124655012

Collision resolution technique

1) Chaining
2) Double hashing
3) Linear probing
4) Quadratic probing