**LAB 8: HASHING**

1. Write a hashing program that prompts the user to enter 5 key values that is in the range of 1000 and 9,999, and **truncate them to the first 2 digits** to produce the index values. If user entered a value that is out of range, system should display error message.

**Sample output:**

|  |
| --- |
| Enter key 1: 1212  Enter key 2: 3325  Enter key 3: 1245  Enter key 4: 78767  Input out of range:  Enter key 4: 998  Input out of range:  Enter key 4: 7898  Enter key 5: 5647  Key: 1212 Hash Index: 12  Key: 3325 Hash Index: 33  Key: 1245 Hash Index: 12  Key: 7898 Hash Index: 78  Key: 5647 Hash Index: 56 |

1. Write a hashing program that prompts a student to enter his/her ID number of 9-digits long (key value). The system must calculate the hash value (value) by dividing the ID into three portions. The three separated number must then be sum up and then applies the mod function with 100.

For example, student id 100136548

Hash value = (100 + 136 + 548) %100 = 784 % 100 = 84

**Sample output:**

|  |
| --- |
| Enter id: 100136548  Hash Value = 84 |

**Submission Questions**

1. Based on the following truncation, write the hash function for the key: **5247613**
   1. Truncate the last two digits

**5247613 / 100 = 52476.13**

**Last 2 Digits**

**13**

**ANS : 52476**

* 1. Truncate the first three digits

**5247613 / 1000 = 5247.613**

**First 3 Digits**

**524**

**ANS : 7.613**

* 1. Truncate the first two digits and the last two digits

**5247613 / 100 = 52476.13**

**First 2 digits**

**52**

**Last 2 digits**

**13**

**ANS : 476**

1. Assume a hash table with 6 locations and the hashing function ***h(x) = x%6***. Show the index for each key and the result of the hash table when the following integers are inserted in the order given.

**22, 47, 53, 69, 73, 85**

* 1. linear probing

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 | 4 | 5 |
| Key | **53** | **73** | **85** | **69** | **22** | **47** |

* 22-22 / 6\*6 = 4
* 47-47 /6\*6 = 5
* 53-53 /6\*6 = 5 (HIT) - GO to Index 0 as next available slot
* 69-69 /6\*6 = 3
* 73-73/6\*6 = 1
* 85-85/6\*6 = 1 (HIT) – GO to index 2 as next available slot
  1. quadratic probing

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 | 4 | 5 |
| Key | **53** | **73** | **85** | **69** | **22** | **47** |

* 22-22 / 6\*6 = 4
* 47-47 /6\*6 = 5
* 69-69 /6\*6 = 3
* 73-73/6\*6 = 1
* 53-53 /6\*6 = 5 (HIT)

Since hit, quadratic probing

0^2 = (5+0) / 6

5-5 / 6\*6 = 5 (HIT)

1^2 = (5+1) / 6

6-6 / 6\*6 = 0

85-85/6\*6 = 1 (HIT)

0^2 = (1+0)/6

1-1 / 6\*6 = 1 (HIT)

1^2 = (1+1) / 6

2-2 / 6 \*6 = 2

* 1. Chaining

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Index | 0 | 1 | 2 | 3 | 4 | 5 |
| Key | **53** | **73** | **85** | **69** | **22** | **47** |
| Chain |  | **85** |  |  |  | **53** |

* 22-22 / 6\*6 = 4
* 47-47 /6\*6 = 5
* 53-53 /6\*6 = 5 (HIT)
* 69-69 /6\*6 = 3
* 73-73/6\*6 = 1
* 85-85/6\*6 = 1 (HIT)