**323-34 Project 2: Hash Table**                                              **C++**

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**Project Due Date: 2/20/2021**

**<u>Algorithm's Steps:</u>**

1.  First a list node class is created with default constructors of first name and last name. A print node function is also created in the class to display the nodes in the output files.

2.  The class hashtable is created where a hash array is initialized. The method createhashtable allows for each list to have a dummy node of first and last name in the beginning of each bucket.

3.  The doIt function allows us to convert the length of the last names to numbers which allows us to put them into their respective buckets. We can do this by dividing the values of the last names by the bucket length and using the remainder.

4.  The findSpot function looks for the correct bucket that each name can fit in.

5.  HashInsert checks to see if the name the is added is already there. If not, it finds the spot to put in the new name.

6.  HashDelete does the same as hashInsert but instead of adding names, it looks to see if the name is in a bucket and removes it.

7.  HashRetrieval specifically looks for the name and responds with "yes the record is in the database" or "no the record is not in the database".

8.  The method that allows all the previous methods to be called on is informationProcessing. It loops through the entire data file and based on the operation, it calls on hashInsert, hashDelete, or hashRetrieval.

9. Once the correct method is called based on the operation, printList is called to print any updates to the buckets.

10. Lastly, printHashTable prints the entire list of every bucket into the output file.

**Source Code:**

```cpp
#include <iostream>
#include <fstream>
#include <string>

using namespace std;

class listNode {
public:
   string firstName;
   string lastName;
   listNode *next;

   listNode () {
      next = NULL;
   }

   listNode (string firstName, string lastName) {
      this->firstName = firstName;
      this->lastName = lastName;
      next = NULL;
   }

   void printNode(listNode *node, ofstream &outFile) {
      if (node->next == NULL) {
         outFile << "(" << node->firstName << ", " << node->lastName << ") -> NULL." << endl << endl;
      }
      else {
         outFile << "(" << node->firstName << ", " << node->lastName << ", " << node->next->firstName << ") ->";
      }
   }

};
```

```cpp
class hashTable {
public:
    char op;
    int bucketSize;
    listNode* hashArray;

    void createHashTable(int bucketSize) {
        this->bucketSize = bucketSize;
        hashArray = new listNode[bucketSize];

        for (int i = 0; i <= bucketSize; i++) {
            hashArray[i].firstName = "dummyfirst";
            hashArray[i].lastName = "dummylast";
        }
    }

    int doIt(string lastName){
        unsigned int val = 1;
        for (int i = 0; i < lastName.length(); i++) {
            val = val * 32 + (long) lastName[i];
        }
        return val % bucketSize;
    }

    listNode * findSpot (int index, string firstName, string lastName) {
        listNode* spot = &hashArray[index];
        while (spot->next != NULL && spot->next->lastName < lastName) {
            spot = spot->next;
        }
        while (spot->next != NULL && spot->next->lastName == lastName && spot
->next->firstName < firstName) {
            spot = spot->next;
        }
        return spot;
    }

    void hashInsert (int index, string firstName, string lastName, ofstream &outFile2){
        outFile2 << "***Performing hashInsert on " << firstName << " " << lastName << endl;
        listNode* spot = findSpot(index, firstName, lastName);
```

```cpp
        if (spot ->next != NULL && spot->next->lastName == lastName &&
spot->next->firstName == firstName) {
            outFile2 << "***Warning, the record is already in the database!" << endl;
        }

        else {
            listNode* newNode = new listNode(firstName,lastName);
            newNode->next = spot->next;
            spot->next = newNode;
            printList(index, outFile2);
        }
    }

    void hashDelete (int index, string firstName, string lastName, ofstream &outFile2) {
        outFile2 << "***Performing hashDelete on firstName, lastName" << endl;
        listNode* spot = findSpot(index, firstName, lastName);

        if (spot->next != NULL && spot ->next ->lastName == lastName &&
spot->next->firstName == firstName) {
            listNode* junk = spot->next;
            spot->next = spot->next->next;
            junk->next = NULL;
            free(junk);
            printList(index, outFile2);
        }

        else {
            outFile2 << "***Warning, the record is NOT in the database!" << endl;
        }
    }

    void hashRetrieval (int index, string firstName, string lastName, ofstream &outFile2) {
        outFile2 << "***Performing hashRetrieval on firstName, lastName" << endl;
        listNode* spot = findSpot(index, firstName, lastName);
        if (spot-> next != NULL && spot->next->lastName == lastName &&
spot->next->firstName == firstName) {
            outFile2 << "***Yes, the record is in the database!" << endl << endl;
        }
        else {
```

```cpp
            outFile2 << "***No, the record is not in the database!" << endl << endl;
        }
    }

    void informationProcessing(ifstream &inFile, ofstream &outFile2) {
        string firstName, lastName;
        int index;

        while (!inFile.eof()) {
            inFile >> op >> firstName >> lastName;
            outFile2 << "First Name is " << firstName << ". Last name is " << lastName << ".
Operations is " << op << "." << endl;
            index = doIt(lastName);
            outFile2 << "Index: " << index << "." << endl;
            printList(index, outFile2);

            if (op == '+') {
                hashInsert(index, firstName, lastName, outFile2);
            }
            else if (op == '-') {
                hashDelete(index, firstName, lastName, outFile2);
            }
            else if (op == '?') {
                hashRetrieval(index, firstName, lastName, outFile2);
            }
        }
    }

    void printList(int index, ofstream &outFile2) {
        outFile2 << "HashTable [" << index << "]: ";
        listNode* temp = &hashArray[index];

        while (temp != NULL) {
            temp->printNode(temp,outFile2);
            temp = temp->next;
        }
    }
    void printHashTable(ofstream &outFile1) {
        int index = 0;
```

```cpp
        for (int i = 0; i <= bucketSize - 1; i++) {
            index = i;
            outFile1 << "HashTable [" << index << "]: ";
            listNode* temp = &hashArray[index];

            while (temp != NULL) {
                temp->printNode(temp,outFile1);
                temp = temp->next;
            }

        }

    }

};


int main(int argc, const char * argv[]) {

    string inputName = argv[1];
    ifstream input;
    input.open(inputName);

    string inputNum = argv[2];

    string outputName1 = argv[3];
    ofstream output1;
    output1.open(outputName1);

    string outputName2 = argv[4];
    ofstream output2;
    output2.open(outputName2);

    int bucketNum = stoi(inputNum);
    hashTable input1;
    input1.createHashTable(bucketNum);

    input1.informationProcessing(input,output2);
    input1.printHashTable(output1);
```

```
    input.close();
    output1.close();
    output2.close();



    return 0;
}
```

**Program Output:**

**OutFile1 with Bucket Size of 29:**

HashTable [0]: (dummyfirst, dummylast, Jino) ->(Jino, Ellis) -> NULL.

HashTable [1]: (dummyfirst, dummylast, Damian) ->(Damian, Ambia, Bertin) ->(Bertin, Farooqi, Bingming) ->(Bingming, Thakur) -> NULL.

HashTable [2]: (dummyfirst, dummylast, Miroo) ->(Miroo, Jayasundera) -> NULL.

HashTable [3]: (dummyfirst, dummylast, Vincenzo) ->(Vincenzo, Gutierrez, Bakhtiyorjon) ->(Bakhtiyorjon, Manno) -> NULL.

HashTable [4]: (dummyfirst, dummylast) -> NULL.

HashTable [5]: (dummyfirst, dummylast, Alex) ->(Alex, Devereux, Andy) ->(Andy, Lin) -> NULL.

HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Muhammad) ->(Muhammad, Mohamed) -> NULL.

HashTable [7]: (dummyfirst, dummylast, Marvin) ->(Marvin, Karki) -> NULL.

HashTable [8]: (dummyfirst, dummylast, Derek) ->(Derek, Khanal, Kenley) ->(Kenley, Lama, Franklin) ->(Franklin, Meneses) -> NULL.

HashTable [9]: (dummyfirst, dummylast, Kyle) ->(Kyle, Boodoosingh, Dylan) ->(Dylan, Coleman) -> NULL.

HashTable [10]: (dummyfirst, dummylast, Upesh) ->(Upesh, Guira, Gursharn) ->(Gursharn, Pho, George) ->(George, Singh, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

HashTable [11]: (dummyfirst, dummylast, Davron) ->(Davron, Cai, John) ->(John, Cohen, Tenzin) ->(Tenzin, Rodriguez, Wengang) ->(Wengang, Rodriguez) -> NULL.

HashTable [12]: (dummyfirst, dummylast, Chewantha) ->(Chewantha, Chowdhury, David) ->(David, Chowdhury) -> NULL.

HashTable [13]: (dummyfirst, dummylast, Roberto) ->(Roberto, Ehsan, Brian) ->(Brian, Lee) -> NULL.

HashTable [14]: (dummyfirst, dummylast, John) ->(John, Legendre) -> NULL.

HashTable [15]: (dummyfirst, dummylast) -> NULL.

HashTable [16]: (dummyfirst, dummylast, Umair) ->(Umair, Azarpayvand, James) ->(James, Yu) -> NULL.

HashTable [17]: (dummyfirst, dummylast, Dhawa) ->(Dhawa, Farooq, Ben) ->(Ben, Gajda, Fidiana) ->(Fidiana, Lei, Hajab) ->(Hajab, Prykiel) -> NULL.

HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Heteng) ->(Heteng, Zhang, Jonathan) ->(Jonathan, Zhang) -> NULL.

HashTable [19]: (dummyfirst, dummylast, Avenash) ->(Avenash, Luu) -> NULL.

HashTable [20]: (dummyfirst, dummylast, Elyon) ->(Elyon, Aminov, Larry) ->(Larry, Andrade, Wen) ->(Wen, Johnson) -> NULL.

HashTable [21]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Carlos) ->(Carlos, Ochilov, Mahima) ->(Mahima, Qu, Mohab) ->(Mohab, Rasulov, LinBo) ->(LinBo, Tilija) -> NULL.

HashTable [22]: (dummyfirst, dummylast, Pengdwende) ->(Pengdwende, Cesa) -> NULL.

HashTable [23]: (dummyfirst, dummylast, Josephine) ->(Josephine, Li, Isakhar) ->(Isakhar, Malla, Preety) ->(Preety, Nazamy) -> NULL.

HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Michael) ->(Michael, Kim, Richard) ->(Richard, Kim, Matin) ->(Matin, Kwon, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

HashTable [25]: (dummyfirst, dummylast, Michael) ->(Michael, Zheng) -> NULL.

HashTable [26]: (dummyfirst, dummylast, James) ->(James, Deciutiis) -> NULL.

HashTable [27]: (dummyfirst, dummylast, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Zilong) ->(Zilong, Kharel, Ryan) ->(Ryan, Kousountidis, Ryan) ->(Ryan, Nicolas) -> NULL.

HashTable [28]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, Junjie) ->(Junjie, Kazi, Chelsea) ->(Chelsea, Mujaj) -> NULL.

## OutFile2 with Bucket Size of 29:

First Name is Isakhar. Last name is Malla. Operations is +.
Index: 23.
HashTable [23]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Isakhar Malla
HashTable [23]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

First Name is Hermun. Last name is Kim. Operations is +.
Index: 24.
HashTable [24]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Hermun Kim
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim) -> NULL.

First Name is Carlos. Last name is Ochilov. Operations is +.
Index: 21.
HashTable [21]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Carlos Ochilov
HashTable [21]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov) -> NULL.

First Name is Isakhar. Last name is Malla. Operations is ?.
Index: 23.
HashTable [23]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

***Performing hashRetrieval on firstName, lastName
***Yes, the record is in the database!

First Name is Michael. Last name is Zheng. Operations is +.
Index: 25.
HashTable [25]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Michael Zheng
HashTable [25]: (dummyfirst, dummylast, Michael) ->(Michael, Zheng) -> NULL.

First Name is Jasmine. Last name is Malla. Operations is +.
Index: 23.
HashTable [23]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

***Performing hashInsert on Jasmine Malla
HashTable [23]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla, Jasmine) ->(Jasmine, Malla) -> NULL.

First Name is Elyon. Last name is Aminov. Operations is +.
Index: 20.
HashTable [20]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Elyon Aminov
HashTable [20]: (dummyfirst, dummylast, Elyon) ->(Elyon, Aminov) -> NULL.

First Name is Hermun. Last name is Kim. Operations is +.
Index: 24.
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim) -> NULL.

***Performing hashInsert on Hermun Kim
***Warning, the record is already in the database!
First Name is Jasmin. Last name is Atwal. Operations is +.
Index: 18.
HashTable [18]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Jasmin Atwal
HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal) -> NULL.

First Name is Sweyaksha. Last name is Webster. Operations is ?.

Index: 10.
HashTable [10]: (dummyfirst, dummylast) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

First Name is Mohammed. Last name is Aucacama. Operations is +.
Index: 28.
HashTable [28]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Mohammed Aucacama
HashTable [28]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama) -> NULL.

First Name is Longcheng. Last name is Ochilov. Operations is +.
Index: 21.
HashTable [21]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov) -> NULL.

***Performing hashInsert on Longcheng Ochilov
HashTable [21]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov, Longcheng)
->(Longcheng, Ochilov) -> NULL.

First Name is Sweyaksha. Last name is Webster. Operations is +.
Index: 10.
HashTable [10]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Sweyaksha Webster
HashTable [10]: (dummyfirst, dummylast, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

First Name is Kyle. Last name is Boodoosingh. Operations is +.
Index: 9.
HashTable [9]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Kyle Boodoosingh
HashTable [9]: (dummyfirst, dummylast, Kyle) ->(Kyle, Boodoosingh) -> NULL.

First Name is Longcheng. Last name is Ochilov. Operations is -.
Index: 21.
HashTable [21]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov, Longcheng)
->(Longcheng, Ochilov) -> NULL.

\*\*\*Performing hashDelete on firstName, lastName
HashTable [21]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov) -> NULL.

First Name is Pengdwende. Last name is Cesa. Operations is +.
Index: 22.
HashTable [22]: (dummyfirst, dummylast) -> NULL.

\*\*\*Performing hashInsert on Pengdwende Cesa
HashTable [22]: (dummyfirst, dummylast, Pengdwende) ->(Pengdwende, Cesa) -> NULL.

First Name is David. Last name is Chowdhury. Operations is ?.
Index: 12.
HashTable [12]: (dummyfirst, dummylast) -> NULL.

\*\*\*Performing hashRetrieval on firstName, lastName
\*\*\*No, the record is not in the database!

First Name is Kushal. Last name is Zheng. Operations is +.
Index: 25.
HashTable [25]: (dummyfirst, dummylast, Michael) ->(Michael, Zheng) -> NULL.

\*\*\*Performing hashInsert on Kushal Zheng
HashTable [25]: (dummyfirst, dummylast, Kushal) ->(Kushal, Zheng, Michael) ->(Michael, Zheng) -> NULL.

First Name is Mohammed. Last name is Aucacama. Operations is +.
Index: 28.
HashTable [28]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama) -> NULL.

\*\*\*Performing hashInsert on Mohammed Aucacama
\*\*\*Warning, the record is already in the database!
First Name is Sweyaksha. Last name is Kim. Operations is -.
Index: 24.
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim) -> NULL.

\*\*\*Performing hashDelete on firstName, lastName
\*\*\*Warning, the record is NOT in the database!
First Name is David. Last name is Chowdhury. Operations is +.
Index: 12.
HashTable [12]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on David Chowdhury
HashTable [12]: (dummyfirst, dummylast, David) ->(David, Chowdhury) -> NULL.

First Name is Chewantha. Last name is Chowdhury. Operations is +.
Index: 12.
HashTable [12]: (dummyfirst, dummylast, David) ->(David, Chowdhury) -> NULL.

***Performing hashInsert on Chewantha Chowdhury
HashTable [12]: (dummyfirst, dummylast, Chewantha) ->(Chewantha, Chowdhury, David) ->(David, Chowdhury) -> NULL.

First Name is Kushal. Last name is Zheng. Operations is ?.
Index: 25.
HashTable [25]: (dummyfirst, dummylast, Kushal) ->(Kushal, Zheng, Michael) ->(Michael, Zheng) -> NULL.

***Performing hashRetrieval on firstName, lastName
***Yes, the record is in the database!

First Name is David. Last name is Chowdhury. Operations is +.
Index: 12.
HashTable [12]: (dummyfirst, dummylast, Chewantha) ->(Chewantha, Chowdhury, David) ->(David, Chowdhury) -> NULL.

***Performing hashInsert on David Chowdhury
***Warning, the record is already in the database!
First Name is Jasmine. Last name is Malla. Operations is -.
Index: 23.
HashTable [23]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla, Jasmine) ->(Jasmine, Malla) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [23]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

First Name is Dylan. Last name is Coleman. Operations is +.
Index: 9.
HashTable [9]: (dummyfirst, dummylast, Kyle) ->(Kyle, Boodoosingh) -> NULL.

***Performing hashInsert on Dylan Coleman

HashTable [9]: (dummyfirst, dummylast, Kyle) ->(Kyle, Boodoosingh, Dylan) ->(Dylan, Coleman) -> NULL.

First Name is Upesh. Last name is Guira. Operations is +.
Index: 10.
HashTable [10]: (dummyfirst, dummylast, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

***Performing hashInsert on Upesh Guira
HashTable [10]: (dummyfirst, dummylast, Upesh) ->(Upesh, Guira, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

First Name is Kushal. Last name is Zheng. Operations is -.
Index: 25.
HashTable [25]: (dummyfirst, dummylast, Kushal) ->(Kushal, Zheng, Michael) ->(Michael, Zheng) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [25]: (dummyfirst, dummylast, Michael) ->(Michael, Zheng) -> NULL.

First Name is Tasif. Last name is Jang. Operations is +.
Index: 21.
HashTable [21]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov) -> NULL.

***Performing hashInsert on Tasif Jang
HashTable [21]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Carlos) ->(Carlos, Ochilov) -> NULL.

First Name is Miroo. Last name is Jayasundera. Operations is +.
Index: 2.
HashTable [2]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Miroo Jayasundera
HashTable [2]: (dummyfirst, dummylast, Miroo) ->(Miroo, Jayasundera) -> NULL.

First Name is Jasmine. Last name is Malla. Operations is -.
Index: 23.
HashTable [23]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!

First Name is Wen. Last name is Johnson. Operations is +.
Index: 20.
HashTable [20]: (dummyfirst, dummylast, Elyon) ->(Elyon, Aminov) -> NULL.

***Performing hashInsert on Wen Johnson
HashTable [20]: (dummyfirst, dummylast, Elyon) ->(Elyon, Aminov, Wen) ->(Wen, Johnson) ->
NULL.

First Name is Marvin. Last name is Karki. Operations is +.
Index: 7.
HashTable [7]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Marvin Karki
HashTable [7]: (dummyfirst, dummylast, Marvin) ->(Marvin, Karki) -> NULL.

First Name is Sweyaksha. Last name is Kim. Operations is -.
Index: 24.
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!
First Name is Junjie. Last name is Kazi. Operations is +.
Index: 28.
HashTable [28]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama) -> NULL.

***Performing hashInsert on Junjie Kazi
HashTable [28]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, Junjie)
->(Junjie, Kazi) -> NULL.

First Name is Richard. Last name is Kim. Operations is +.
Index: 24.
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim) -> NULL.

***Performing hashInsert on Richard Kim
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard,
Kim) -> NULL.

First Name is Davron. Last name is Cai. Operations is -.
Index: 11.
HashTable [11]: (dummyfirst, dummylast) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!
First Name is Brian. Last name is Lee. Operations is +.
Index: 13.
HashTable [13]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Brian Lee
HashTable [13]: (dummyfirst, dummylast, Brian) ->(Brian, Lee) -> NULL.

First Name is Samriddha. Last name is Kim. Operations is +.
Index: 24.
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim) -> NULL.

***Performing hashInsert on Samriddha Kim
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim, Samriddha) ->(Samriddha, Kim) -> NULL.

First Name is Fidiana. Last name is Lei. Operations is +.
Index: 17.
HashTable [17]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Fidiana Lei
HashTable [17]: (dummyfirst, dummylast, Fidiana) ->(Fidiana, Lei) -> NULL.

First Name is Josephine. Last name is Li. Operations is +.
Index: 23.
HashTable [23]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

***Performing hashInsert on Josephine Li
HashTable [23]: (dummyfirst, dummylast, Josephine) ->(Josephine, Li, Isakhar) ->(Isakhar, Malla) -> NULL.

First Name is Zilong. Last name is Kharel. Operations is -.
Index: 27.
HashTable [27]: (dummyfirst, dummylast) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!

First Name is Donghee. Last name is Shrestha. Operations is +.
Index: 15.
HashTable [15]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Donghee Shrestha
HashTable [15]: (dummyfirst, dummylast, Donghee) ->(Donghee, Shrestha) -> NULL.

First Name is Andy. Last name is Lin. Operations is +.
Index: 5.
HashTable [5]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Andy Lin
HashTable [5]: (dummyfirst, dummylast, Andy) ->(Andy, Lin) -> NULL.

First Name is Avenash. Last name is Luu. Operations is +.
Index: 19.
HashTable [19]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Avenash Luu
HashTable [19]: (dummyfirst, dummylast, Avenash) ->(Avenash, Luu) -> NULL.

First Name is Brian. Last name is Lee. Operations is ?.
Index: 13.
HashTable [13]: (dummyfirst, dummylast, Brian) ->(Brian, Lee) -> NULL.

***Performing hashRetrieval on firstName, lastName
***Yes, the record is in the database!

First Name is Davron. Last name is Cai. Operations is +.
Index: 11.
HashTable [11]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Davron Cai
HashTable [11]: (dummyfirst, dummylast, Davron) ->(Davron, Cai) -> NULL.

First Name is Chelsea. Last name is Mujaj. Operations is +.
Index: 28.
HashTable [28]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, Junjie)
->(Junjie, Kazi) -> NULL.

***Performing hashInsert on Chelsea Mujaj
HashTable [28]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, Junjie)
->(Junjie, Kazi, Chelsea) ->(Chelsea, Mujaj) -> NULL.

First Name is Gursharn. Last name is Pho. Operations is +.
Index: 10.
HashTable [10]: (dummyfirst, dummylast, Upesh) ->(Upesh, Guira, Sweyaksha) ->(Sweyaksha,
Webster) -> NULL.

***Performing hashInsert on Gursharn Pho
HashTable [10]: (dummyfirst, dummylast, Upesh) ->(Upesh, Guira, Gursharn) ->(Gursharn, Pho,
Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

First Name is Samriddha. Last name is Kim. Operations is -.
Index: 24.
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard,
Kim, Samriddha) ->(Samriddha, Kim) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard,
Kim) -> NULL.

First Name is Donghee. Last name is Shrestha. Operations is -.
Index: 15.
HashTable [15]: (dummyfirst, dummylast, Donghee) ->(Donghee, Shrestha) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [15]: (dummyfirst, dummylast) -> NULL.

First Name is Mahima. Last name is Qu. Operations is +.
Index: 21.
HashTable [21]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Carlos) ->(Carlos, Ochilov) ->
NULL.

***Performing hashInsert on Mahima Qu
HashTable [21]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Carlos) ->(Carlos, Ochilov,
Mahima) ->(Mahima, Qu) -> NULL.

First Name is Zilong. Last name is Kharel. Operations is +.
Index: 27.

HashTable [27]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Zilong Kharel
HashTable [27]: (dummyfirst, dummylast, Zilong) ->(Zilong, Kharel) -> NULL.

First Name is Pravesh. Last name is Ramnarine. Operations is +.
Index: 24.
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim) -> NULL.

***Performing hashInsert on Pravesh Ramnarine
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

First Name is Tenzin. Last name is Rodriguez. Operations is +.
Index: 11.
HashTable [11]: (dummyfirst, dummylast, Davron) ->(Davron, Cai) -> NULL.

***Performing hashInsert on Tenzin Rodriguez
HashTable [11]: (dummyfirst, dummylast, Davron) ->(Davron, Cai, Tenzin) ->(Tenzin, Rodriguez) -> NULL.

First Name is George. Last name is Singh. Operations is +.
Index: 10.
HashTable [10]: (dummyfirst, dummylast, Upesh) ->(Upesh, Guira, Gursharn) ->(Gursharn, Pho, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

***Performing hashInsert on George Singh
HashTable [10]: (dummyfirst, dummylast, Upesh) ->(Upesh, Guira, Gursharn) ->(Gursharn, Pho, George) ->(George, Singh, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

First Name is Bingming. Last name is Thakur. Operations is +.
Index: 1.
HashTable [1]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Bingming Thakur
HashTable [1]: (dummyfirst, dummylast, Bingming) ->(Bingming, Thakur) -> NULL.

First Name is LinBo. Last name is Tilija. Operations is +.
Index: 21.

HashTable [21]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Carlos) ->(Carlos, Ochilov, Mahima) ->(Mahima, Qu) -> NULL.

***Performing hashInsert on LinBo Tilija
HashTable [21]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Carlos) ->(Carlos, Ochilov, Mahima) ->(Mahima, Qu, LinBo) ->(LinBo, Tilija) -> NULL.

First Name is Davron. Last name is Cai. Operations is ?.
Index: 11.
HashTable [11]: (dummyfirst, dummylast, Davron) ->(Davron, Cai, Tenzin) ->(Tenzin, Rodriguez) -> NULL.

***Performing hashRetrieval on firstName, lastName
***Yes, the record is in the database!

First Name is Seratul. Last name is Diaz. Operations is +.
Index: 27.
HashTable [27]: (dummyfirst, dummylast, Zilong) ->(Zilong, Kharel) -> NULL.

***Performing hashInsert on Seratul Diaz
HashTable [27]: (dummyfirst, dummylast, Seratul) ->(Seratul, Diaz, Zilong) ->(Zilong, Kharel) -> NULL.

First Name is Roberto. Last name is Ehsan. Operations is +.
Index: 13.
HashTable [13]: (dummyfirst, dummylast, Brian) ->(Brian, Lee) -> NULL.

***Performing hashInsert on Roberto Ehsan
HashTable [13]: (dummyfirst, dummylast, Roberto) ->(Roberto, Ehsan, Brian) ->(Brian, Lee) -> NULL.

First Name is Derek. Last name is Khanal. Operations is +.
Index: 8.
HashTable [8]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Derek Khanal
HashTable [8]: (dummyfirst, dummylast, Derek) ->(Derek, Khanal) -> NULL.

First Name is Bijaya. Last name is Sajjad. Operations is +.
Index: 18.

HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal) -> NULL.

***Performing hashInsert on Bijaya Sajjad
HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Bijaya) ->(Bijaya, Sajjad) -> NULL.

First Name is Roberto. Last name is Ehsan. Operations is ?.
Index: 13.
HashTable [13]: (dummyfirst, dummylast, Roberto) ->(Roberto, Ehsan, Brian) ->(Brian, Lee) -> NULL.

***Performing hashRetrieval on firstName, lastName
***Yes, the record is in the database!

First Name is Jonathan. Last name is Zhang. Operations is +.
Index: 18.
HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Bijaya) ->(Bijaya, Sajjad) -> NULL.

***Performing hashInsert on Jonathan Zhang
HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Bijaya) ->(Bijaya, Sajjad, Jonathan) ->(Jonathan, Zhang) -> NULL.

First Name is Ben. Last name is Gajda. Operations is +.
Index: 17.
HashTable [17]: (dummyfirst, dummylast, Fidiana) ->(Fidiana, Lei) -> NULL.

***Performing hashInsert on Ben Gajda
HashTable [17]: (dummyfirst, dummylast, Ben) ->(Ben, Gajda, Fidiana) ->(Fidiana, Lei) -> NULL.

First Name is James. Last name is Yu. Operations is +.
Index: 16.
HashTable [16]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on James Yu
HashTable [16]: (dummyfirst, dummylast, James) ->(James, Yu) -> NULL.

First Name is Megan. Last name is Shrestha. Operations is +.
Index: 15.

HashTable [15]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Megan Shrestha
HashTable [15]: (dummyfirst, dummylast, Megan) ->(Megan, Shrestha) -> NULL.

First Name is Alex. Last name is Devereux. Operations is -.
Index: 5.
HashTable [5]: (dummyfirst, dummylast, Andy) ->(Andy, Lin) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!
First Name is Damian. Last name is Ambia. Operations is +.
Index: 1.
HashTable [1]: (dummyfirst, dummylast, Bingming) ->(Bingming, Thakur) -> NULL.

***Performing hashInsert on Damian Ambia
HashTable [1]: (dummyfirst, dummylast, Damian) ->(Damian, Ambia, Bingming) ->(Bingming, Thakur) -> NULL.

First Name is Larry. Last name is Andrade. Operations is +.
Index: 20.
HashTable [20]: (dummyfirst, dummylast, Elyon) ->(Elyon, Aminov, Wen) ->(Wen, Johnson) -> NULL.

***Performing hashInsert on Larry Andrade
HashTable [20]: (dummyfirst, dummylast, Elyon) ->(Elyon, Aminov, Larry) ->(Larry, Andrade, Wen) ->(Wen, Johnson) -> NULL.

First Name is Umair. Last name is Azarpayvand. Operations is +.
Index: 16.
HashTable [16]: (dummyfirst, dummylast, James) ->(James, Yu) -> NULL.

***Performing hashInsert on Umair Azarpayvand
HashTable [16]: (dummyfirst, dummylast, Umair) ->(Umair, Azarpayvand, James) ->(James, Yu) -> NULL.

First Name is Alex. Last name is Devereux. Operations is ?.
Index: 5.
HashTable [5]: (dummyfirst, dummylast, Andy) ->(Andy, Lin) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

First Name is Rashad. Last name is Bernard. Operations is +.
Index: 6.
HashTable [6]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Rashad Bernard
HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard) -> NULL.

First Name is Heteng. Last name is Zhang. Operations is -.
Index: 18.
HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Bijaya) ->(Bijaya, Sajjad, Jonathan) ->(Jonathan, Zhang) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!
First Name is Robert. Last name is Bista. Operations is +.
Index: 15.
HashTable [15]: (dummyfirst, dummylast, Megan) ->(Megan, Shrestha) -> NULL.

***Performing hashInsert on Robert Bista
HashTable [15]: (dummyfirst, dummylast, Robert) ->(Robert, Bista, Megan) ->(Megan, Shrestha) -> NULL.

First Name is John. Last name is Cohen. Operations is +.
Index: 11.
HashTable [11]: (dummyfirst, dummylast, Davron) ->(Davron, Cai, Tenzin) ->(Tenzin, Rodriguez) -> NULL.

***Performing hashInsert on John Cohen
HashTable [11]: (dummyfirst, dummylast, Davron) ->(Davron, Cai, John) ->(John, Cohen, Tenzin) ->(Tenzin, Rodriguez) -> NULL.

First Name is James. Last name is Deciutiis. Operations is +.
Index: 26.
HashTable [26]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on James Deciutiis
HashTable [26]: (dummyfirst, dummylast, James) ->(James, Deciutiis) -> NULL.

First Name is Thomas. Last name is Diaz. Operations is +.

Index: 27.

HashTable [27]: (dummyfirst, dummylast, Seratul) ->(Seratul, Diaz, Zilong) ->(Zilong, Kharel)
-> NULL.

***Performing hashInsert on Thomas Diaz

HashTable [27]: (dummyfirst, dummylast, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz,
Zilong) ->(Zilong, Kharel) -> NULL.

First Name is Shudip. Last name is Taha. Operations is +.

Index: 6.

HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard) -> NULL.

***Performing hashInsert on Shudip Taha

HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Shudip) ->(Shudip, Taha)
-> NULL.

First Name is Jino. Last name is Ellis. Operations is +.

Index: 0.

HashTable [0]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Jino Ellis

HashTable [0]: (dummyfirst, dummylast, Jino) ->(Jino, Ellis) -> NULL.

First Name is Dhawa. Last name is Farooq. Operations is +.

Index: 17.

HashTable [17]: (dummyfirst, dummylast, Ben) ->(Ben, Gajda, Fidiana) ->(Fidiana, Lei) ->
NULL.

***Performing hashInsert on Dhawa Farooq

HashTable [17]: (dummyfirst, dummylast, Dhawa) ->(Dhawa, Farooq, Ben) ->(Ben, Gajda,
Fidiana) ->(Fidiana, Lei) -> NULL.

First Name is Robert. Last name is Bista. Operations is -.

Index: 15.

HashTable [15]: (dummyfirst, dummylast, Robert) ->(Robert, Bista, Megan) ->(Megan,
Shrestha) -> NULL.

***Performing hashDelete on firstName, lastName

HashTable [15]: (dummyfirst, dummylast, Megan) ->(Megan, Shrestha) -> NULL.

First Name is Bertin. Last name is Farooqi. Operations is +.
Index: 1.
HashTable [1]: (dummyfirst, dummylast, Damian) ->(Damian, Ambia, Bingming) ->(Bingming, Thakur) -> NULL.

***Performing hashInsert on Bertin Farooqi
HashTable [1]: (dummyfirst, dummylast, Damian) ->(Damian, Ambia, Bertin) ->(Bertin, Farooqi, Bingming) ->(Bingming, Thakur) -> NULL.

First Name is Vincenzo. Last name is Gutierrez. Operations is +.
Index: 3.
HashTable [3]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Vincenzo Gutierrez
HashTable [3]: (dummyfirst, dummylast, Vincenzo) ->(Vincenzo, Gutierrez) -> NULL.

First Name is Heteng. Last name is Zhang. Operations is +.
Index: 18.
HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Bijaya) ->(Bijaya, Sajjad, Jonathan) ->(Jonathan, Zhang) -> NULL.

***Performing hashInsert on Heteng Zhang
HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Bijaya) ->(Bijaya, Sajjad, Heteng) ->(Heteng, Zhang, Jonathan) ->(Jonathan, Zhang) -> NULL.

First Name is Robert. Last name is Bista. Operations is ?.
Index: 15.
HashTable [15]: (dummyfirst, dummylast, Megan) ->(Megan, Shrestha) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

First Name is Alex. Last name is Devereux. Operations is +.
Index: 5.
HashTable [5]: (dummyfirst, dummylast, Andy) ->(Andy, Lin) -> NULL.

***Performing hashInsert on Alex Devereux

HashTable [5]: (dummyfirst, dummylast, Alex) ->(Alex, Devereux, Andy) ->(Andy, Lin) -> NULL.

First Name is Michael. Last name is Kim. Operations is +.
Index: 24.
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

***Performing hashInsert on Michael Kim
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Michael) ->(Michael, Kim, Richard) ->(Richard, Kim, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

First Name is Ryan. Last name is Kousountidis. Operations is +.
Index: 27.
HashTable [27]: (dummyfirst, dummylast, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Zilong) ->(Zilong, Kharel) -> NULL.

***Performing hashInsert on Ryan Kousountidis
HashTable [27]: (dummyfirst, dummylast, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Zilong) ->(Zilong, Kharel, Ryan) ->(Ryan, Kousountidis) -> NULL.

First Name is Shudip. Last name is Taha. Operations is -.
Index: 6.
HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Shudip) ->(Shudip, Taha) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard) -> NULL.

First Name is Matin. Last name is Kwon. Operations is +.
Index: 24.
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Michael) ->(Michael, Kim, Richard) ->(Richard, Kim, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

***Performing hashInsert on Matin Kwon
HashTable [24]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Michael) ->(Michael, Kim, Richard) ->(Richard, Kim, Matin) ->(Matin, Kwon, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

First Name is Kenley. Last name is Lama. Operations is +.

Index: 8.
HashTable [8]: (dummyfirst, dummylast, Derek) ->(Derek, Khanal) -> NULL.

***Performing hashInsert on Kenley Lama
HashTable [8]: (dummyfirst, dummylast, Derek) ->(Derek, Khanal, Kenley) ->(Kenley, Lama) -> NULL.

First Name is John. Last name is Legendre. Operations is +.
Index: 14.
HashTable [14]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on John Legendre
HashTable [14]: (dummyfirst, dummylast, John) ->(John, Legendre) -> NULL.

First Name is Afm. Last name is Syedan. Operations is +.
Index: 14.
HashTable [14]: (dummyfirst, dummylast, John) ->(John, Legendre) -> NULL.

***Performing hashInsert on Afm Syedan
HashTable [14]: (dummyfirst, dummylast, John) ->(John, Legendre, Afm) ->(Afm, Syedan) -> NULL.

First Name is Bakhtiyorjon. Last name is Manno. Operations is +.
Index: 3.
HashTable [3]: (dummyfirst, dummylast, Vincenzo) ->(Vincenzo, Gutierrez) -> NULL.

***Performing hashInsert on Bakhtiyorjon Manno
HashTable [3]: (dummyfirst, dummylast, Vincenzo) ->(Vincenzo, Gutierrez, Bakhtiyorjon) ->(Bakhtiyorjon, Manno) -> NULL.

First Name is Megan. Last name is Shrestha. Operations is -.
Index: 15.
HashTable [15]: (dummyfirst, dummylast, Megan) ->(Megan, Shrestha) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [15]: (dummyfirst, dummylast) -> NULL.

First Name is Franklin. Last name is Meneses. Operations is +.
Index: 8.

HashTable [8]: (dummyfirst, dummylast, Derek) ->(Derek, Khanal, Kenley) ->(Kenley, Lama) -> NULL.

***Performing hashInsert on Franklin Meneses
HashTable [8]: (dummyfirst, dummylast, Derek) ->(Derek, Khanal, Kenley) ->(Kenley, Lama, Franklin) ->(Franklin, Meneses) -> NULL.

First Name is Muhammad. Last name is Mohamed. Operations is +.
Index: 6.
HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard) -> NULL.

***Performing hashInsert on Muhammad Mohamed
HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Muhammad) ->(Muhammad, Mohamed) -> NULL.

First Name is Afm. Last name is Syedan. Operations is -.
Index: 14.
HashTable [14]: (dummyfirst, dummylast, John) ->(John, Legendre, Afm) ->(Afm, Syedan) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [14]: (dummyfirst, dummylast, John) ->(John, Legendre) -> NULL.

First Name is Megan. Last name is Shrestha. Operations is ?.
Index: 15.
HashTable [15]: (dummyfirst, dummylast) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

First Name is Afm. Last name is Syedan. Operations is ?.
Index: 14.
HashTable [14]: (dummyfirst, dummylast, John) ->(John, Legendre) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

First Name is Preety. Last name is Nazamy. Operations is +.
Index: 23.

HashTable [23]: (dummyfirst, dummylast, Josephine) ->(Josephine, Li, Isakhar) ->(Isakhar, Malla) -> NULL.

***Performing hashInsert on Preety Nazamy
HashTable [23]: (dummyfirst, dummylast, Josephine) ->(Josephine, Li, Isakhar) ->(Isakhar, Malla, Preety) ->(Preety, Nazamy) -> NULL.

First Name is Luis. Last name is Subick. Operations is +.
Index: 5.
HashTable [5]: (dummyfirst, dummylast, Alex) ->(Alex, Devereux, Andy) ->(Andy, Lin) -> NULL.

***Performing hashInsert on Luis Subick
HashTable [5]: (dummyfirst, dummylast, Alex) ->(Alex, Devereux, Andy) ->(Andy, Lin, Luis) ->(Luis, Subick) -> NULL.

First Name is Ryan. Last name is Nicolas. Operations is +.
Index: 27.
HashTable [27]: (dummyfirst, dummylast, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Zilong) ->(Zilong, Kharel, Ryan) ->(Ryan, Kousountidis) -> NULL.

***Performing hashInsert on Ryan Nicolas
HashTable [27]: (dummyfirst, dummylast, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Zilong) ->(Zilong, Kharel, Ryan) ->(Ryan, Kousountidis, Ryan) ->(Ryan, Nicolas) -> NULL.

First Name is Bijaya. Last name is Sajjad. Operations is -.
Index: 18.
HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Bijaya) ->(Bijaya, Sajjad, Heteng) ->(Heteng, Zhang, Jonathan) ->(Jonathan, Zhang) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Heteng) ->(Heteng, Zhang, Jonathan) ->(Jonathan, Zhang) -> NULL.

First Name is Hajab. Last name is Prykiel. Operations is +.
Index: 17.
HashTable [17]: (dummyfirst, dummylast, Dhawa) ->(Dhawa, Farooq, Ben) ->(Ben, Gajda, Fidiana) ->(Fidiana, Lei) -> NULL.

***Performing hashInsert on Hajab Prykiel

HashTable [17]: (dummyfirst, dummylast, Dhawa) ->(Dhawa, Farooq, Ben) ->(Ben, Gajda, Fidiana) ->(Fidiana, Lei, Hajab) ->(Hajab, Prykiel) -> NULL.

First Name is Mohab. Last name is Rasulov. Operations is +.
Index: 21.
HashTable [21]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Carlos) ->(Carlos, Ochilov, Mahima) ->(Mahima, Qu, LinBo) ->(LinBo, Tilija) -> NULL.

***Performing hashInsert on Mohab Rasulov
HashTable [21]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Carlos) ->(Carlos, Ochilov, Mahima) ->(Mahima, Qu, Mohab) ->(Mohab, Rasulov, LinBo) ->(LinBo, Tilija) -> NULL.

First Name is Wengang. Last name is Rodriguez. Operations is +.
Index: 11.
HashTable [11]: (dummyfirst, dummylast, Davron) ->(Davron, Cai, John) ->(John, Cohen, Tenzin) ->(Tenzin, Rodriguez) -> NULL.

***Performing hashInsert on Wengang Rodriguez
HashTable [11]: (dummyfirst, dummylast, Davron) ->(Davron, Cai, John) ->(John, Cohen, Tenzin) ->(Tenzin, Rodriguez, Wengang) ->(Wengang, Rodriguez) -> NULL.

First Name is Luis. Last name is Subick. Operations is -.
Index: 5.
HashTable [5]: (dummyfirst, dummylast, Alex) ->(Alex, Devereux, Andy) ->(Andy, Lin, Luis) ->(Luis, Subick) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [5]: (dummyfirst, dummylast, Alex) ->(Alex, Devereux, Andy) ->(Andy, Lin) -> NULL.

First Name is Bijaya. Last name is Sajjad. Operations is ?.
Index: 18.
HashTable [18]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Heteng) ->(Heteng, Zhang, Jonathan) ->(Jonathan, Zhang) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

**OutFile1 with Bucket Size of 43:**

HashTable [0]: (dummyfirst, dummylast, Matin) ->(Matin, Kwon, Franklin) ->(Franklin, Meneses, Preety) ->(Preety, Nazamy, Carlos) ->(Carlos, Ochilov) -> NULL.

HashTable [1]: (dummyfirst, dummylast, Ryan) ->(Ryan, Nicolas) -> NULL.

HashTable [2]: (dummyfirst, dummylast, Miroo) ->(Miroo, Jayasundera) -> NULL.

HashTable [3]: (dummyfirst, dummylast, Jino) ->(Jino, Ellis) -> NULL.

HashTable [4]: (dummyfirst, dummylast) -> NULL.

HashTable [5]: (dummyfirst, dummylast) -> NULL.

HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

HashTable [7]: (dummyfirst, dummylast, Junjie) ->(Junjie, Kazi) -> NULL.

HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, Chewantha) ->(Chewantha, Chowdhury, David) ->(David, Chowdhury, Wen) ->(Wen, Johnson) -> NULL.

HashTable [9]: (dummyfirst, dummylast, Davron) ->(Davron, Cai) -> NULL.

HashTable [10]: (dummyfirst, dummylast) -> NULL.

HashTable [11]: (dummyfirst, dummylast, Kyle) ->(Kyle, Boodoosingh) -> NULL.

HashTable [12]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

HashTable [13]: (dummyfirst, dummylast, Dhawa) ->(Dhawa, Farooq, Upesh) ->(Upesh, Guira) -> NULL.

HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal) -> NULL.

HashTable [15]: (dummyfirst, dummylast, Vincenzo) ->(Vincenzo, Gutierrez, Kenley) ->(Kenley, Lama) -> NULL.

HashTable [16]: (dummyfirst, dummylast) -> NULL.

HashTable [17]: (dummyfirst, dummylast) -> NULL.

HashTable [18]: (dummyfirst, dummylast, Brian) ->(Brian, Lee, John) ->(John, Legendre) -> NULL.

HashTable [19]: (dummyfirst, dummylast, Bertin) ->(Bertin, Farooqi) -> NULL.

HashTable [20]: (dummyfirst, dummylast) -> NULL.

HashTable [21]: (dummyfirst, dummylast) -> NULL.

HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman, Alex) ->(Alex, Devereux, Roberto) ->(Roberto, Ehsan, Fidiana) ->(Fidiana, Lei) -> NULL.

HashTable [23]: (dummyfirst, dummylast, Ryan) ->(Ryan, Kousountidis) -> NULL.

HashTable [24]: (dummyfirst, dummylast) -> NULL.

HashTable [25]: (dummyfirst, dummylast, Mohab) ->(Mohab, Rasulov) -> NULL.

HashTable [26]: (dummyfirst, dummylast, Damian) ->(Damian, Ambia, Andy) ->(Andy, Lin, Chelsea) ->(Chelsea, Mujaj) -> NULL.

HashTable [27]: (dummyfirst, dummylast, Umair) ->(Umair, Azarpayvand, Marvin) ->(Marvin, Karki, Heteng) ->(Heteng, Zhang, Jonathan) ->(Jonathan, Zhang) -> NULL.

HashTable [28]: (dummyfirst, dummylast, Larry) ->(Larry, Andrade, Pengdwende) ->(Pengdwende, Cesa, James) ->(James, Deciutiis, George) ->(George, Singh) -> NULL.

HashTable [29]: (dummyfirst, dummylast) -> NULL.

HashTable [30]: (dummyfirst, dummylast, Avenash) ->(Avenash, Luu) -> NULL.

HashTable [31]: (dummyfirst, dummylast, Derek) ->(Derek, Khanal, Bakhtiyorjon) ->(Bakhtiyorjon, Manno) -> NULL.

HashTable [32]: (dummyfirst, dummylast, LinBo) ->(LinBo, Tilija) -> NULL.

HashTable [33]: (dummyfirst, dummylast, Ben) ->(Ben, Gajda, Hermun) ->(Hermun, Kim, Michael) ->(Michael, Kim, Richard) ->(Richard, Kim, Sweyaksha) ->(Sweyaksha, Webster, James) ->(James, Yu) -> NULL.

HashTable [34]: (dummyfirst, dummylast, Hajab) ->(Hajab, Prykiel) -> NULL.

HashTable [35]: (dummyfirst, dummylast, Josephine) ->(Josephine, Li, Mahima) ->(Mahima, Qu) -> NULL.

HashTable [36]: (dummyfirst, dummylast) -> NULL.

HashTable [37]: (dummyfirst, dummylast) -> NULL.

HashTable [38]: (dummyfirst, dummylast, John) ->(John, Cohen, Tenzin) ->(Tenzin, Rodriguez, Wengang) ->(Wengang, Rodriguez, Michael) ->(Michael, Zheng) -> NULL.

HashTable [39]: (dummyfirst, dummylast, Elyon) ->(Elyon, Aminov) -> NULL.

HashTable [40]: (dummyfirst, dummylast, Muhammad) ->(Muhammad, Mohamed) -> NULL.

HashTable [41]: (dummyfirst, dummylast, Zilong) ->(Zilong, Kharel, Bingming) ->(Bingming, Thakur) -> NULL.

HashTable [42]: (dummyfirst, dummylast) -> NULL.

## OutFile2 with Bucket Size of 43:

First Name is Isakhar. Last name is Malla. Operations is +.
Index: 12.
HashTable [12]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Isakhar Malla
HashTable [12]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

First Name is Hermun. Last name is Kim. Operations is +.
Index: 33.
HashTable [33]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Hermun Kim
HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim) -> NULL.

First Name is Carlos. Last name is Ochilov. Operations is +.
Index: 0.
HashTable [0]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Carlos Ochilov
HashTable [0]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov) -> NULL.

First Name is Isakhar. Last name is Malla. Operations is ?.
Index: 12.
HashTable [12]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

***Performing hashRetrieval on firstName, lastName
***Yes, the record is in the database!

First Name is Michael. Last name is Zheng. Operations is +.
Index: 38.
HashTable [38]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Michael Zheng
HashTable [38]: (dummyfirst, dummylast, Michael) ->(Michael, Zheng) -> NULL.

First Name is Jasmine. Last name is Malla. Operations is +.
Index: 12.
HashTable [12]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

***Performing hashInsert on Jasmine Malla
HashTable [12]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla, Jasmine) ->(Jasmine,
Malla) -> NULL.

First Name is Elyon. Last name is Aminov. Operations is +.
Index: 39.
HashTable [39]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Elyon Aminov
HashTable [39]: (dummyfirst, dummylast, Elyon) ->(Elyon, Aminov) -> NULL.

First Name is Hermun. Last name is Kim. Operations is +.
Index: 33.
HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim) -> NULL.

***Performing hashInsert on Hermun Kim

***Warning, the record is already in the database!

First Name is Jasmin. Last name is Atwal. Operations is +.

Index: 14.

HashTable [14]: (dummyfirst, dummylast) -> NULL.


***Performing hashInsert on Jasmin Atwal

HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal) -> NULL.


First Name is Sweyaksha. Last name is Webster. Operations is ?.

Index: 33.

HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim) -> NULL.


***Performing hashRetrieval on firstName, lastName

***No, the record is not in the database!


First Name is Mohammed. Last name is Aucacama. Operations is +.

Index: 8.

HashTable [8]: (dummyfirst, dummylast) -> NULL.


***Performing hashInsert on Mohammed Aucacama

HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama) -> NULL.


First Name is Longcheng. Last name is Ochilov. Operations is +.

Index: 0.

HashTable [0]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov) -> NULL.


***Performing hashInsert on Longcheng Ochilov

HashTable [0]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov, Longcheng)
->(Longcheng, Ochilov) -> NULL.


First Name is Sweyaksha. Last name is Webster. Operations is +.

Index: 33.

HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim) -> NULL.


***Performing hashInsert on Sweyaksha Webster

HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Sweyaksha)
->(Sweyaksha, Webster) -> NULL.

First Name is Kyle. Last name is Boodoosingh. Operations is +.
Index: 11.
HashTable [11]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Kyle Boodoosingh
HashTable [11]: (dummyfirst, dummylast, Kyle) ->(Kyle, Boodoosingh) -> NULL.

First Name is Longcheng. Last name is Ochilov. Operations is -.
Index: 0.
HashTable [0]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov, Longcheng)
->(Longcheng, Ochilov) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [0]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov) -> NULL.

First Name is Pengdwende. Last name is Cesa. Operations is +.
Index: 28.
HashTable [28]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Pengdwende Cesa
HashTable [28]: (dummyfirst, dummylast, Pengdwende) ->(Pengdwende, Cesa) -> NULL.

First Name is David. Last name is Chowdhury. Operations is ?.
Index: 8.
HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

First Name is Kushal. Last name is Zheng. Operations is +.
Index: 38.
HashTable [38]: (dummyfirst, dummylast, Michael) ->(Michael, Zheng) -> NULL.

***Performing hashInsert on Kushal Zheng
HashTable [38]: (dummyfirst, dummylast, Kushal) ->(Kushal, Zheng, Michael) ->(Michael,
Zheng) -> NULL.

First Name is Mohammed. Last name is Aucacama. Operations is +.
Index: 8.
HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama) -> NULL.

***Performing hashInsert on Mohammed Aucacama

***Warning, the record is already in the database!

First Name is Sweyaksha. Last name is Kim. Operations is -.

Index: 33.

HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.


***Performing hashDelete on firstName, lastName

***Warning, the record is NOT in the database!

First Name is David. Last name is Chowdhury. Operations is +.

Index: 8.

HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama) -> NULL.


***Performing hashInsert on David Chowdhury

HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, David) ->(David, Chowdhury) -> NULL.


First Name is Chewantha. Last name is Chowdhury. Operations is +.

Index: 8.

HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, David) ->(David, Chowdhury) -> NULL.


***Performing hashInsert on Chewantha Chowdhury

HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, Chewantha) ->(Chewantha, Chowdhury, David) ->(David, Chowdhury) -> NULL.


First Name is Kushal. Last name is Zheng. Operations is ?.

Index: 38.

HashTable [38]: (dummyfirst, dummylast, Kushal) ->(Kushal, Zheng, Michael) ->(Michael, Zheng) -> NULL.


***Performing hashRetrieval on firstName, lastName

***Yes, the record is in the database!


First Name is David. Last name is Chowdhury. Operations is +.

Index: 8.

HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, Chewantha) ->(Chewantha, Chowdhury, David) ->(David, Chowdhury) -> NULL.

***Performing hashInsert on David Chowdhury
***Warning, the record is already in the database!
First Name is Jasmine. Last name is Malla. Operations is -.
Index: 12.
HashTable [12]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla, Jasmine) ->(Jasmine, Malla) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [12]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

First Name is Dylan. Last name is Coleman. Operations is +.
Index: 22.
HashTable [22]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Dylan Coleman
HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman) -> NULL.

First Name is Upesh. Last name is Guira. Operations is +.
Index: 13.
HashTable [13]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Upesh Guira
HashTable [13]: (dummyfirst, dummylast, Upesh) ->(Upesh, Guira) -> NULL.

First Name is Kushal. Last name is Zheng. Operations is -.
Index: 38.
HashTable [38]: (dummyfirst, dummylast, Kushal) ->(Kushal, Zheng, Michael) ->(Michael, Zheng) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [38]: (dummyfirst, dummylast, Michael) ->(Michael, Zheng) -> NULL.

First Name is Tasif. Last name is Jang. Operations is +.
Index: 6.
HashTable [6]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Tasif Jang
HashTable [6]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang) -> NULL.

First Name is Miroo. Last name is Jayasundera. Operations is +.

Index: 2.
HashTable [2]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Miroo Jayasundera
HashTable [2]: (dummyfirst, dummylast, Miroo) ->(Miroo, Jayasundera) -> NULL.

First Name is Jasmine. Last name is Malla. Operations is -.
Index: 12.
HashTable [12]: (dummyfirst, dummylast, Isakhar) ->(Isakhar, Malla) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!
First Name is Wen. Last name is Johnson. Operations is +.
Index: 8.
HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, Chewantha)
->(Chewantha, Chowdhury, David) ->(David, Chowdhury) -> NULL.

***Performing hashInsert on Wen Johnson
HashTable [8]: (dummyfirst, dummylast, Mohammed) ->(Mohammed, Aucacama, Chewantha)
->(Chewantha, Chowdhury, David) ->(David, Chowdhury, Wen) ->(Wen, Johnson) -> NULL.

First Name is Marvin. Last name is Karki. Operations is +.
Index: 27.
HashTable [27]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Marvin Karki
HashTable [27]: (dummyfirst, dummylast, Marvin) ->(Marvin, Karki) -> NULL.

First Name is Sweyaksha. Last name is Kim. Operations is -.
Index: 33.
HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Sweyaksha)
->(Sweyaksha, Webster) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!
First Name is Junjie. Last name is Kazi. Operations is +.
Index: 7.
HashTable [7]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Junjie Kazi

HashTable [7]: (dummyfirst, dummylast, Junjie) ->(Junjie, Kazi) -> NULL.

First Name is Richard. Last name is Kim. Operations is +.
Index: 33.
HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Sweyaksha)
->(Sweyaksha, Webster) -> NULL.

***Performing hashInsert on Richard Kim
HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard,
Kim, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

First Name is Davron. Last name is Cai. Operations is -.
Index: 9.
HashTable [9]: (dummyfirst, dummylast) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!
First Name is Brian. Last name is Lee. Operations is +.
Index: 18.
HashTable [18]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Brian Lee
HashTable [18]: (dummyfirst, dummylast, Brian) ->(Brian, Lee) -> NULL.

First Name is Samriddha. Last name is Kim. Operations is +.
Index: 33.
HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard,
Kim, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

***Performing hashInsert on Samriddha Kim
HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard,
Kim, Samriddha) ->(Samriddha, Kim, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

First Name is Fidiana. Last name is Lei. Operations is +.
Index: 22.
HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman) -> NULL.

***Performing hashInsert on Fidiana Lei
HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman, Fidiana) ->(Fidiana, Lei)
-> NULL.

First Name is Josephine. Last name is Li. Operations is +.
Index: 35.
HashTable [35]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Josephine Li
HashTable [35]: (dummyfirst, dummylast, Josephine) ->(Josephine, Li) -> NULL.

First Name is Zilong. Last name is Kharel. Operations is -.
Index: 41.
HashTable [41]: (dummyfirst, dummylast) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!
First Name is Donghee. Last name is Shrestha. Operations is +.
Index: 14.
HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal) -> NULL.

***Performing hashInsert on Donghee Shrestha
HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Donghee) ->(Donghee, Shrestha) -> NULL.

First Name is Andy. Last name is Lin. Operations is +.
Index: 26.
HashTable [26]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Andy Lin
HashTable [26]: (dummyfirst, dummylast, Andy) ->(Andy, Lin) -> NULL.

First Name is Avenash. Last name is Luu. Operations is +.
Index: 30.
HashTable [30]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Avenash Luu
HashTable [30]: (dummyfirst, dummylast, Avenash) ->(Avenash, Luu) -> NULL.

First Name is Brian. Last name is Lee. Operations is ?.
Index: 18.
HashTable [18]: (dummyfirst, dummylast, Brian) ->(Brian, Lee) -> NULL.

***Performing hashRetrieval on firstName, lastName

***Yes, the record is in the database!

First Name is Davron. Last name is Cai. Operations is +.

Index: 9.

HashTable [9]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Davron Cai

HashTable [9]: (dummyfirst, dummylast, Davron) ->(Davron, Cai) -> NULL.

First Name is Chelsea. Last name is Mujaj. Operations is +.

Index: 26.

HashTable [26]: (dummyfirst, dummylast, Andy) ->(Andy, Lin) -> NULL.

***Performing hashInsert on Chelsea Mujaj

HashTable [26]: (dummyfirst, dummylast, Andy) ->(Andy, Lin, Chelsea) ->(Chelsea, Mujaj) -> NULL.

First Name is Gursharn. Last name is Pho. Operations is +.

Index: 6.

HashTable [6]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang) -> NULL.

***Performing hashInsert on Gursharn Pho

HashTable [6]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho) -> NULL.

First Name is Samriddha. Last name is Kim. Operations is -.

Index: 33.

HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim, Samriddha) ->(Samriddha, Kim, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

***Performing hashDelete on firstName, lastName

HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

First Name is Donghee. Last name is Shrestha. Operations is -.

Index: 14.

HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Donghee) ->(Donghee, Shrestha) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal) -> NULL.

First Name is Mahima. Last name is Qu. Operations is +.
Index: 35.
HashTable [35]: (dummyfirst, dummylast, Josephine) ->(Josephine, Li) -> NULL.

***Performing hashInsert on Mahima Qu
HashTable [35]: (dummyfirst, dummylast, Josephine) ->(Josephine, Li, Mahima) ->(Mahima, Qu) -> NULL.

First Name is Zilong. Last name is Kharel. Operations is +.
Index: 41.
HashTable [41]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Zilong Kharel
HashTable [41]: (dummyfirst, dummylast, Zilong) ->(Zilong, Kharel) -> NULL.

First Name is Pravesh. Last name is Ramnarine. Operations is +.
Index: 6.
HashTable [6]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho) -> NULL.

***Performing hashInsert on Pravesh Ramnarine
HashTable [6]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

First Name is Tenzin. Last name is Rodriguez. Operations is +.
Index: 38.
HashTable [38]: (dummyfirst, dummylast, Michael) ->(Michael, Zheng) -> NULL.

***Performing hashInsert on Tenzin Rodriguez
HashTable [38]: (dummyfirst, dummylast, Tenzin) ->(Tenzin, Rodriguez, Michael) ->(Michael, Zheng) -> NULL.

First Name is George. Last name is Singh. Operations is +.
Index: 28.
HashTable [28]: (dummyfirst, dummylast, Pengdwende) ->(Pengdwende, Cesa) -> NULL.

***Performing hashInsert on George Singh

HashTable [28]: (dummyfirst, dummylast, Pengdwende) ->(Pengdwende, Cesa, George) ->(George, Singh) -> NULL.

First Name is Bingming. Last name is Thakur. Operations is +.
Index: 41.
HashTable [41]: (dummyfirst, dummylast, Zilong) ->(Zilong, Kharel) -> NULL.

***Performing hashInsert on Bingming Thakur
HashTable [41]: (dummyfirst, dummylast, Zilong) ->(Zilong, Kharel, Bingming) ->(Bingming, Thakur) -> NULL.

First Name is LinBo. Last name is Tilija. Operations is +.
Index: 32.
HashTable [32]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on LinBo Tilija
HashTable [32]: (dummyfirst, dummylast, LinBo) ->(LinBo, Tilija) -> NULL.

First Name is Davron. Last name is Cai. Operations is ?.
Index: 9.
HashTable [9]: (dummyfirst, dummylast, Davron) ->(Davron, Cai) -> NULL.

***Performing hashRetrieval on firstName, lastName
***Yes, the record is in the database!

First Name is Seratul. Last name is Diaz. Operations is +.
Index: 6.
HashTable [6]: (dummyfirst, dummylast, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

***Performing hashInsert on Seratul Diaz
HashTable [6]: (dummyfirst, dummylast, Seratul) ->(Seratul, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

First Name is Roberto. Last name is Ehsan. Operations is +.
Index: 22.
HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman, Fidiana) ->(Fidiana, Lei) -> NULL.

***Performing hashInsert on Roberto Ehsan

HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman, Roberto) ->(Roberto, Ehsan, Fidiana) ->(Fidiana, Lei) -> NULL.

First Name is Derek. Last name is Khanal. Operations is +.
Index: 31.
HashTable [31]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Derek Khanal
HashTable [31]: (dummyfirst, dummylast, Derek) ->(Derek, Khanal) -> NULL.

First Name is Bijaya. Last name is Sajjad. Operations is +.
Index: 13.
HashTable [13]: (dummyfirst, dummylast, Upesh) ->(Upesh, Guira) -> NULL.

***Performing hashInsert on Bijaya Sajjad
HashTable [13]: (dummyfirst, dummylast, Upesh) ->(Upesh, Guira, Bijaya) ->(Bijaya, Sajjad) -> NULL.

First Name is Roberto. Last name is Ehsan. Operations is ?.
Index: 22.
HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman, Roberto) ->(Roberto, Ehsan, Fidiana) ->(Fidiana, Lei) -> NULL.

***Performing hashRetrieval on firstName, lastName
***Yes, the record is in the database!

First Name is Jonathan. Last name is Zhang. Operations is +.
Index: 27.
HashTable [27]: (dummyfirst, dummylast, Marvin) ->(Marvin, Karki) -> NULL.

***Performing hashInsert on Jonathan Zhang
HashTable [27]: (dummyfirst, dummylast, Marvin) ->(Marvin, Karki, Jonathan) ->(Jonathan, Zhang) -> NULL.

First Name is Ben. Last name is Gajda. Operations is +.
Index: 33.
HashTable [33]: (dummyfirst, dummylast, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

***Performing hashInsert on Ben Gajda

HashTable [33]: (dummyfirst, dummylast, Ben) ->(Ben, Gajda, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

First Name is James. Last name is Yu. Operations is +.
Index: 33.
HashTable [33]: (dummyfirst, dummylast, Ben) ->(Ben, Gajda, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim, Sweyaksha) ->(Sweyaksha, Webster) -> NULL.

***Performing hashInsert on James Yu
HashTable [33]: (dummyfirst, dummylast, Ben) ->(Ben, Gajda, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim, Sweyaksha) ->(Sweyaksha, Webster, James) ->(James, Yu) -> NULL.

First Name is Megan. Last name is Shrestha. Operations is +.
Index: 14.
HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal) -> NULL.

***Performing hashInsert on Megan Shrestha
HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Megan) ->(Megan, Shrestha) -> NULL.

First Name is Alex. Last name is Devereux. Operations is -.
Index: 22.
HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman, Roberto) ->(Roberto, Ehsan, Fidiana) ->(Fidiana, Lei) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!
First Name is Damian. Last name is Ambia. Operations is +.
Index: 26.
HashTable [26]: (dummyfirst, dummylast, Andy) ->(Andy, Lin, Chelsea) ->(Chelsea, Mujaj) -> NULL.

***Performing hashInsert on Damian Ambia
HashTable [26]: (dummyfirst, dummylast, Damian) ->(Damian, Ambia, Andy) ->(Andy, Lin, Chelsea) ->(Chelsea, Mujaj) -> NULL.

First Name is Larry. Last name is Andrade. Operations is +.
Index: 28.

HashTable [28]: (dummyfirst, dummylast, Pengdwende) ->(Pengdwende, Cesa, George) ->(George, Singh) -> NULL.

***Performing hashInsert on Larry Andrade
HashTable [28]: (dummyfirst, dummylast, Larry) ->(Larry, Andrade, Pengdwende) ->(Pengdwende, Cesa, George) ->(George, Singh) -> NULL.

First Name is Umair. Last name is Azarpayvand. Operations is +.
Index: 27.
HashTable [27]: (dummyfirst, dummylast, Marvin) ->(Marvin, Karki, Jonathan) ->(Jonathan, Zhang) -> NULL.

***Performing hashInsert on Umair Azarpayvand
HashTable [27]: (dummyfirst, dummylast, Umair) ->(Umair, Azarpayvand, Marvin) ->(Marvin, Karki, Jonathan) ->(Jonathan, Zhang) -> NULL.

First Name is Alex. Last name is Devereux. Operations is ?.
Index: 22.
HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman, Roberto) ->(Roberto, Ehsan, Fidiana) ->(Fidiana, Lei) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

First Name is Rashad. Last name is Bernard. Operations is +.
Index: 6.
HashTable [6]: (dummyfirst, dummylast, Seratul) ->(Seratul, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

***Performing hashInsert on Rashad Bernard
HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Seratul) ->(Seratul, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

First Name is Heteng. Last name is Zhang. Operations is -.
Index: 27.
HashTable [27]: (dummyfirst, dummylast, Umair) ->(Umair, Azarpayvand, Marvin) ->(Marvin, Karki, Jonathan) ->(Jonathan, Zhang) -> NULL.

***Performing hashDelete on firstName, lastName
***Warning, the record is NOT in the database!

First Name is Robert. Last name is Bista. Operations is +.

Index: 40.

HashTable [40]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Robert Bista

HashTable [40]: (dummyfirst, dummylast, Robert) ->(Robert, Bista) -> NULL.

First Name is John. Last name is Cohen. Operations is +.

Index: 38.

HashTable [38]: (dummyfirst, dummylast, Tenzin) ->(Tenzin, Rodriguez, Michael) ->(Michael, Zheng) -> NULL.

***Performing hashInsert on John Cohen

HashTable [38]: (dummyfirst, dummylast, John) ->(John, Cohen, Tenzin) ->(Tenzin, Rodriguez, Michael) ->(Michael, Zheng) -> NULL.

First Name is James. Last name is Deciutiis. Operations is +.

Index: 28.

HashTable [28]: (dummyfirst, dummylast, Larry) ->(Larry, Andrade, Pengdwende) ->(Pengdwende, Cesa, George) ->(George, Singh) -> NULL.

***Performing hashInsert on James Deciutiis

HashTable [28]: (dummyfirst, dummylast, Larry) ->(Larry, Andrade, Pengdwende) ->(Pengdwende, Cesa, James) ->(James, Deciutiis, George) ->(George, Singh) -> NULL.

First Name is Thomas. Last name is Diaz. Operations is +.

Index: 6.

HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Seratul) ->(Seratul, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

***Performing hashInsert on Thomas Diaz

HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

First Name is Shudip. Last name is Taha. Operations is +.

Index: 0.

HashTable [0]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov) -> NULL.

***Performing hashInsert on Shudip Taha

HashTable [0]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov, Shudip) ->(Shudip, Taha) -> NULL.

First Name is Jino. Last name is Ellis. Operations is +.
Index: 3.
HashTable [3]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Jino Ellis
HashTable [3]: (dummyfirst, dummylast, Jino) ->(Jino, Ellis) -> NULL.

First Name is Dhawa. Last name is Farooq. Operations is +.
Index: 13.
HashTable [13]: (dummyfirst, dummylast, Upesh) ->(Upesh, Guira, Bijaya) ->(Bijaya, Sajjad) -> NULL.

***Performing hashInsert on Dhawa Farooq
HashTable [13]: (dummyfirst, dummylast, Dhawa) ->(Dhawa, Farooq, Upesh) ->(Upesh, Guira, Bijaya) ->(Bijaya, Sajjad) -> NULL.

First Name is Robert. Last name is Bista. Operations is -.
Index: 40.
HashTable [40]: (dummyfirst, dummylast, Robert) ->(Robert, Bista) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [40]: (dummyfirst, dummylast) -> NULL.

First Name is Bertin. Last name is Farooqi. Operations is +.
Index: 19.
HashTable [19]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Bertin Farooqi
HashTable [19]: (dummyfirst, dummylast, Bertin) ->(Bertin, Farooqi) -> NULL.

First Name is Vincenzo. Last name is Gutierrez. Operations is +.
Index: 15.
HashTable [15]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Vincenzo Gutierrez
HashTable [15]: (dummyfirst, dummylast, Vincenzo) ->(Vincenzo, Gutierrez) -> NULL.

First Name is Heteng. Last name is Zhang. Operations is +.
Index: 27.
HashTable [27]: (dummyfirst, dummylast, Umair) ->(Umair, Azarpayvand, Marvin) ->(Marvin, Karki, Jonathan) ->(Jonathan, Zhang) -> NULL.

***Performing hashInsert on Heteng Zhang
HashTable [27]: (dummyfirst, dummylast, Umair) ->(Umair, Azarpayvand, Marvin) ->(Marvin, Karki, Heteng) ->(Heteng, Zhang, Jonathan) ->(Jonathan, Zhang) -> NULL.

First Name is Robert. Last name is Bista. Operations is ?.
Index: 40.
HashTable [40]: (dummyfirst, dummylast) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

First Name is Alex. Last name is Devereux. Operations is +.
Index: 22.
HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman, Roberto) ->(Roberto, Ehsan, Fidiana) ->(Fidiana, Lei) -> NULL.

***Performing hashInsert on Alex Devereux
HashTable [22]: (dummyfirst, dummylast, Dylan) ->(Dylan, Coleman, Alex) ->(Alex, Devereux, Roberto) ->(Roberto, Ehsan, Fidiana) ->(Fidiana, Lei) -> NULL.

First Name is Michael. Last name is Kim. Operations is +.
Index: 33.
HashTable [33]: (dummyfirst, dummylast, Ben) ->(Ben, Gajda, Hermun) ->(Hermun, Kim, Richard) ->(Richard, Kim, Sweyaksha) ->(Sweyaksha, Webster, James) ->(James, Yu) -> NULL.

***Performing hashInsert on Michael Kim
HashTable [33]: (dummyfirst, dummylast, Ben) ->(Ben, Gajda, Hermun) ->(Hermun, Kim, Michael) ->(Michael, Kim, Richard) ->(Richard, Kim, Sweyaksha) ->(Sweyaksha, Webster, James) ->(James, Yu) -> NULL.

First Name is Ryan. Last name is Kousountidis. Operations is +.
Index: 23.
HashTable [23]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Ryan Kousountidis
HashTable [23]: (dummyfirst, dummylast, Ryan) ->(Ryan, Kousountidis) -> NULL.

First Name is Shudip. Last name is Taha. Operations is -.
Index: 0.
HashTable [0]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov, Shudip) ->(Shudip, Taha)
-> NULL.

***Performing hashDelete on firstName, lastName
HashTable [0]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov) -> NULL.

First Name is Matin. Last name is Kwon. Operations is +.
Index: 0.
HashTable [0]: (dummyfirst, dummylast, Carlos) ->(Carlos, Ochilov) -> NULL.

***Performing hashInsert on Matin Kwon
HashTable [0]: (dummyfirst, dummylast, Matin) ->(Matin, Kwon, Carlos) ->(Carlos, Ochilov) ->
NULL.

First Name is Kenley. Last name is Lama. Operations is +.
Index: 15.
HashTable [15]: (dummyfirst, dummylast, Vincenzo) ->(Vincenzo, Gutierrez) -> NULL.

***Performing hashInsert on Kenley Lama
HashTable [15]: (dummyfirst, dummylast, Vincenzo) ->(Vincenzo, Gutierrez, Kenley)
->(Kenley, Lama) -> NULL.

First Name is John. Last name is Legendre. Operations is +.
Index: 18.
HashTable [18]: (dummyfirst, dummylast, Brian) ->(Brian, Lee) -> NULL.

***Performing hashInsert on John Legendre
HashTable [18]: (dummyfirst, dummylast, Brian) ->(Brian, Lee, John) ->(John, Legendre) ->
NULL.

First Name is Afm. Last name is Syedan. Operations is +.
Index: 6.
HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Seratul) ->(Seratul, Diaz,
Thomas) ->(Thomas, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh)
->(Pravesh, Ramnarine) -> NULL.

***Performing hashInsert on Afm Syedan

HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine, Afm) ->(Afm, Syedan) -> NULL.

First Name is Bakhtiyorjon. Last name is Manno. Operations is +.
Index: 31.
HashTable [31]: (dummyfirst, dummylast, Derek) ->(Derek, Khanal) -> NULL.

***Performing hashInsert on Bakhtiyorjon Manno

HashTable [31]: (dummyfirst, dummylast, Derek) ->(Derek, Khanal, Bakhtiyorjon) ->(Bakhtiyorjon, Manno) -> NULL.

First Name is Megan. Last name is Shrestha. Operations is -.
Index: 14.
HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal, Megan) ->(Megan, Shrestha) -> NULL.

***Performing hashDelete on firstName, lastName

HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal) -> NULL.

First Name is Franklin. Last name is Meneses. Operations is +.
Index: 0.
HashTable [0]: (dummyfirst, dummylast, Matin) ->(Matin, Kwon, Carlos) ->(Carlos, Ochilov) -> NULL.

***Performing hashInsert on Franklin Meneses

HashTable [0]: (dummyfirst, dummylast, Matin) ->(Matin, Kwon, Franklin) ->(Franklin, Meneses, Carlos) ->(Carlos, Ochilov) -> NULL.

First Name is Muhammad. Last name is Mohamed. Operations is +.
Index: 40.
HashTable [40]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Muhammad Mohamed

HashTable [40]: (dummyfirst, dummylast, Muhammad) ->(Muhammad, Mohamed) -> NULL.

First Name is Afm. Last name is Syedan. Operations is -.
Index: 6.

HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine, Afm) ->(Afm, Syedan) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

First Name is Megan. Last name is Shrestha. Operations is ?.
Index: 14.
HashTable [14]: (dummyfirst, dummylast, Jasmin) ->(Jasmin, Atwal) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

First Name is Afm. Last name is Syedan. Operations is ?.
Index: 6.
HashTable [6]: (dummyfirst, dummylast, Rashad) ->(Rashad, Bernard, Seratul) ->(Seratul, Diaz, Thomas) ->(Thomas, Diaz, Tasif) ->(Tasif, Jang, Gursharn) ->(Gursharn, Pho, Pravesh) ->(Pravesh, Ramnarine) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!

First Name is Preety. Last name is Nazamy. Operations is +.
Index: 0.
HashTable [0]: (dummyfirst, dummylast, Matin) ->(Matin, Kwon, Franklin) ->(Franklin, Meneses, Carlos) ->(Carlos, Ochilov) -> NULL.

***Performing hashInsert on Preety Nazamy
HashTable [0]: (dummyfirst, dummylast, Matin) ->(Matin, Kwon, Franklin) ->(Franklin, Meneses, Preety) ->(Preety, Nazamy, Carlos) ->(Carlos, Ochilov) -> NULL.

First Name is Luis. Last name is Subick. Operations is +.
Index: 23.
HashTable [23]: (dummyfirst, dummylast, Ryan) ->(Ryan, Kousountidis) -> NULL.

***Performing hashInsert on Luis Subick

HashTable [23]: (dummyfirst, dummylast, Ryan) ->(Ryan, Kousountidis, Luis) ->(Luis, Subick) -> NULL.

First Name is Ryan. Last name is Nicolas. Operations is +.
Index: 1.
HashTable [1]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Ryan Nicolas
HashTable [1]: (dummyfirst, dummylast, Ryan) ->(Ryan, Nicolas) -> NULL.

First Name is Bijaya. Last name is Sajjad. Operations is -.
Index: 13.
HashTable [13]: (dummyfirst, dummylast, Dhawa) ->(Dhawa, Farooq, Upesh) ->(Upesh, Guira, Bijaya) ->(Bijaya, Sajjad) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [13]: (dummyfirst, dummylast, Dhawa) ->(Dhawa, Farooq, Upesh) ->(Upesh, Guira) -> NULL.

First Name is Hajab. Last name is Prykiel. Operations is +.
Index: 34.
HashTable [34]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Hajab Prykiel
HashTable [34]: (dummyfirst, dummylast, Hajab) ->(Hajab, Prykiel) -> NULL.

First Name is Mohab. Last name is Rasulov. Operations is +.
Index: 25.
HashTable [25]: (dummyfirst, dummylast) -> NULL.

***Performing hashInsert on Mohab Rasulov
HashTable [25]: (dummyfirst, dummylast, Mohab) ->(Mohab, Rasulov) -> NULL.

First Name is Wengang. Last name is Rodriguez. Operations is +.
Index: 38.
HashTable [38]: (dummyfirst, dummylast, John) ->(John, Cohen, Tenzin) ->(Tenzin, Rodriguez, Michael) ->(Michael, Zheng) -> NULL.

***Performing hashInsert on Wengang Rodriguez

HashTable [38]: (dummyfirst, dummylast, John) ->(John, Cohen, Tenzin) ->(Tenzin, Rodriguez, Wengang) ->(Wengang, Rodriguez, Michael) ->(Michael, Zheng) -> NULL.

First Name is Luis. Last name is Subick. Operations is -.
Index: 23.
HashTable [23]: (dummyfirst, dummylast, Ryan) ->(Ryan, Kousountidis, Luis) ->(Luis, Subick) -> NULL.

***Performing hashDelete on firstName, lastName
HashTable [23]: (dummyfirst, dummylast, Ryan) ->(Ryan, Kousountidis) -> NULL.

First Name is Bijaya. Last name is Sajjad. Operations is ?.
Index: 13.
HashTable [13]: (dummyfirst, dummylast, Dhawa) ->(Dhawa, Farooq, Upesh) ->(Upesh, Guira) -> NULL.

***Performing hashRetrieval on firstName, lastName
***No, the record is not in the database!