## Lab 5: Hash (not allow to use library)

**5.1.** Write program using hash algorithm to insert integer numbers and find them. The hash function is mod function (k mod N). In program, we use four ways to resolve collision.

- Chaining Method
- Linear Probing
- Quadratic Probing
- Double hashing

Test with many random numbers.

**5.2.** The Monster family wants to keep a database of all Monsters and their handphone number. You are employed by the Monster Family to implement this phonebook for them. You are to maintain a list of Monster names and phone numbers using a hash table, using Monster names as the keys.

For simplicity, you should resolve collision by linear probing.

To hash a Monster name, implement a hashCode() method to convert a String object to an int. Implement another function h() to hash the values returned by hashCode() to map it to one of the slot in our hash table.

In this problem, you're required to write 4 methods:

-add(), delete(), update() and find().

(1) add(Monster m, int p) -- adds a monster m with phone number p to the phone book.

(2) delete(Monster m) -- deletes monster m and its associated phone number from the phone book. Throws error if monster m is not in the phone book.

(3) updates(Monster m, int p) -- changes the phone number of monster m to p. Throws error if monster m is not in the phone book.

(4) find(Monster m) -- returns the phone number of monster m. Throws error if monster m is not in the phone book.

For example about phonebook.txt:

```
Edward Howard Dudley        1912352460
Mr. Gatema                  2888888888
Clyde Thornton              312345987
Yolanda "Yo-yo" Cribbins    9996669999
```

**5.3.** (Advanced – Not required) Upgrade exercise 5.2 with rehashing

You should also rehash your table by building a larger table when the table is full. Use the given list of prime number stored as array size List in PhoneBook. First, build a table with size sizeList[0]. When the table is full, increase the table size to sizeList[1], and so on. You may assume that you never need to maintain more than 400 monsters.