Programming Quiz 9
Due 11:59 PM Wednesday December 1
• One use of a hash table is to implement a set data type. In Quiz 9 you will implement the methods addElement, toString, intersect, difference and the MySetIterator in the class MySet. In quiz 9 you will implement the difference and intersect methods. MySet uses a separate chaining hash table to implement a set of integers. You can use your addElement, toString and MySetIterator from programming quiz 8.
import java.util.*;
import java.io.*;

public class MySet {
    // implements a set using a separate chaining hash table
    private class Node {
        private Integer element;
        private Node next;
        private Node(Integer e, Node n) {
            element = e;
            next = n;
        }
    }

    private Node table[]; // an array of linked list
    private int lastHash; // last hash value used
    private int tableSize; // current number of lists in the table
    private int numElements; // number of elements in the set
private final int primes[] = {7, 23, 59, 131, 271, 563, 1171, 2083, 4441, 8839, 16319, 32467, 65701, 131413, 263983, 528991};

private int primeIndex; //last prime used

private int nextPrime(int p) {
    //finds the next prime from the list above
    //used for resizing and the initial size
    while (primes[primeIndex] <= p)
        primeIndex++;
    return primes[primeIndex];
}

public MySet(int s) {
    //s is a hint for the initial size
    primeIndex = 0;
    tableSize = nextPrime(s);
    table = new Node[tableSize];
    numElements = 0;
}
private void resize() {
  //"double" the table size and reinsert the values stored in the
  //current table. the table size should remain prime
  int oldTableSize = tableSize;
  Node oldTable[] = table;
  tableSize = nextPrime(oldTableSize);
  table = new Node[tableSize];
  for (int i = 0; i < oldTableSize; i++) {
    Node temp = oldTable[i];
    while (temp != null) {
      int h = hash(temp.element);
      Node tempNext = temp.next;
      Node temp1 = table[h];
      table[h] = temp;
      table[h].next = temp1;
      temp = tempNext;
    }
  }
}
private int hash(Integer k) {
    //return the hash function value for k
    return Math.abs(k.hashCode() % tableSize);
}

public boolean find(Integer e) {
    //returns true when e is in the set, otherwise returns false
    lastHash = hash(e); //remember the last hash value used
    //this can be useful in methods that call find
    Node temp = table[lastHash];
    while (temp != null) {
        if (temp.element.equals(e)) return true;
        temp = temp.next;
    }
    return false;
}
public void addElement(Integer e) {
    // if e is not in the set add e to the set otherwise the set does not change
    // if after adding the new element numElements > 2*tableSize then call resize
}

public MySet intersect(MySet s) {
    //return a new set that contains the intersection of the elements in
    //this set and the elements in the set s
}

public MySet difference(MySet s) {
    //return a new set that contains the difference of the elements in
    //this set and the elements in the set s
    //this − s (i.e. all the elements in this that are not in s)
}
public class MySetIterator implements Iterator<Integer> {
    // implements an iterator for the set

    public MySetIterator() {
    }
    public boolean hasNext() {
    }
    public Integer next() {
    }
    public void remove() {
        // not implemented
    }
}

public Iterator<Integer> iterator() {
    // returns an iterator for the set
    return new MySetIterator();
}
public String toString() {
    //returns a string representation for the set
    //the string representation of the set is { followed by a comma delimiter list of set
    //elements followed by a }. The string for the empty set is { }
}

public static void main(String args[]) throws IOException {
    //Create your own test driver. I will use my own test driver to test your programs
}

Programming Quiz 9 Submission

• Upload one zip file to Canvas. The zip file must contain only one file called MySet.java. Do not upload your whole Eclipse project!

• The only comment you need in quiz programs is a comment at the top of the file that includes your name.