# CSE 143 Sample Final Exam #2 Key

1.

| Statement | Output |
|---|---|
| `var1.method2();` | `Ocean 2` |
| `var2.method2();` | `Pond 2` |
| `var3.method2();` | `Pond 2` |
| `var4.method2();` | `error` |
| `var5.method2();` | `Bay 2` |
| `var6.method2();` | `Ocean 2` |
| `var1.method3();` | `Lake 3/Ocean 2` |
| `var2.method3();` | `error` |
| `var3.method3();` | `error` |
| `var4.method3();` | `error` |
| `var5.method3();` | `Lake 3/Bay 2` |
| `var6.method3();` | `Lake 3/Ocean 2` |
| `((Ocean) var5).method1();` | `error` |
| `((Lake) var3).method3();` | `Lake 3/Pond 2` |
| `((Lake) var4).method1();` | `error` |
| `((Ocean) var1).method1();` | `Bay 1/Pond 2` |
| `((Bay) var4).method1();` | `Bay 1/Pond 2` |
| `((Lake) var2).method3();` | `error` |
| `((Ocean) var5).method1();` | `error` |
| `((Pond) var4).method2();` | `Bay 2` |

2.

```
public class CalendarDate extends Date implements Comparable<CalendarDate> {
    private int year;

    public CalendarDate(int year, int month, int day) {
        super(month, day);
        this.year = year;
    }

    public int getYear() {
        return year;
    }

    public void setYear(int year) {
        this.year = year;
    }

    public String toString() {
        return year + "/" + super.toString();
    }

    public void nextDay() {
        super.nextDay();
        if (getMonth() == 1 && getDay() == 1) {
            year++;   // wrap year
        }
    }

    public int compareTo(CalendarDate other) {
        if (year != other.year) {
            return year - other.year;
        } else if (getMonth() != other.getMonth()) {
            return getMonth() - other.getMonth();
        } else {
            return getDay() - other.getDay();
        }
    }
}
```

3. Two possible solutions appear below. The second is shorter because it uses recursion.

```
// precondition: this list and other list are sorted
public void removeAll(LinkedIntList other) {
    if (front != null && other.front != null) {
        ListNode current2 = other.front;
        while (current2 != null && front != null &&
               current2.data <= front.data) {
            if (current2.data < front.data) {
                current2 = current2.next;
            } else {  // current2.data == front.data
                front = front.next;
            }
        }
        if (front != null) {
            ListNode current1 = front;
            while (current1.next != null && current2 != null) {
                if (current1.next.data < current2.data) {
                    current1 = current1.next;
                } else if (current1.next.data == current2.data) {
                    current1.next = current1.next.next;
                } else {  // current1.next.data > current2.data
                    current2 = current2.next;
                }
            }
        }
    }
}

// precondition: this list and other list are sorted
public void removeAll(LinkedIntList other) {
    front = removeAllHelper(front, other.front);
}

private ListNode removeAllHelper(ListNode front1, ListNode front2) {
    if (front1 == null || front2 == null) {
        return front1;
    } else if (front1.data < front2.data) {
        front1.next = removeAllHelper(front1.next, front2);
    } else if (front1.data == front2.data) {
        front1 = removeAllHelper(front1.next, front2);
    } else {  // front1.data > front2.data
        front1 = removeAllHelper(front1, front2.next);
    }
    return front1;
}
```

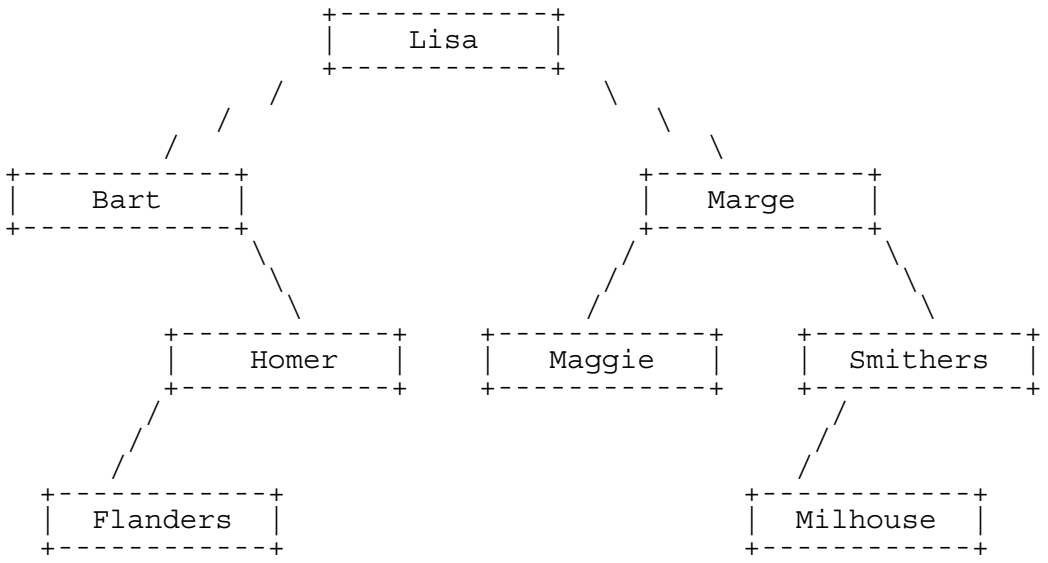
4.

(a) Indexes examined: 7, 11, 13, 12 Value returned: -14

(b)
```
{-9, 5,   8, 14, 0, -1, -7, 3}
{-9, -7,  8, 14, 0, -1,  5, 3}
{-9, -7, -1, 14, 0,  8,  5, 3}
```

(c)
```
{ 8,   5,   -9,  14,    0,  -1,  -7,   3}
{ 8,   5,   -9,  14}  { 0,  -1,  -7,   3}   split
{ 8,   5}  {-9,  14}  { 0,  -1} {-7,   3}   split
{ 8} { 5}  {-9} {14}  { 0} {-1} {-7} { 3}   split
{ 5,   8}  {-9,  14}  {-1,   0} {-7,   3}   merge
{-9,   5,    8,  14}  {-7,  -1,   0,   3}   merge
{-9,  -7,   -1,   0,    3,   5,   8,  14}   merge
```

5. (a)




(b)

Pre-order: Lisa, Bart, Homer, Flanders, Marge, Maggie, Smithers, Milhouse

In-order: Bart, Flanders, Homer, Lisa, Maggie, Marge, Milhouse, Smithers

Post-order: Flanders, Homer, Bart, Maggie, Milhouse, Smithers, Marge, Lisa

6.

```
public int countMultiples(int value) {
    if (value == 0) {
        throw new IllegalArgumentException();
    }
    return countMultiples(overallRoot, value);
}

private int countMultiples(IntTreeNode root, int value) {
    if (root == null) {
        return 0;
    } else {
        int sum = countMultiples(root.left, value) +
                  countMultiples(root.right, value);
        if (root.data % value == 0) {
            return 1 + sum;
        } else {
            return sum;
        }
    }
}
```

7.

```
public int matches(IntTree other) {
    return matches(overallRoot, other.overallRoot);
}

private int matches(IntTreeNode root1, IntTreeNode root2) {
    if (root1 == null || root2 == null) {
        return 0;
    } else {
        int sum = matches(root1.left, root2.left) +
                  matches(root1.right, root2.right);
        if (root1.data == root2.data) {
            return 1 + sum;
        } else {
            return sum;
        }
    }
}
```