TA: Sherdil Niyaz

CS61B Extra Problems 3 Solutions

First, a Note:

This worksheet was stolen from Evan Ye, TA for CS 61B in Spring 2014. Thank him if you have the chance! All I've done is adapt it a bit for Spring 2017.

The class definitions are also a bit different for this worksheet than what you saw in class. Here they are. Note the **lack** of a sentinel node!!

```
public class SListNode {
  public Object item;
  public SListNode next;
}
```

```
public class SList {
  private SListNode head;              // First node in list.
  private int size;                    // Number of items in list.

  public SList() {                     // Here's how to represent an empty list.
    head = null;
    size = 0;
  }

  public void insertFront(Object item) {
    head = new SListNode(item, head);
    size++;
  }
}
```

Good luck on the next few problems. This is a very hard, dense worksheet, so don't be discouraged if you get stuck!

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Linked Lists vs Arrays

List the characteristics of Arrays and Linked Lists. How are they the same? How are they different?

Answer:

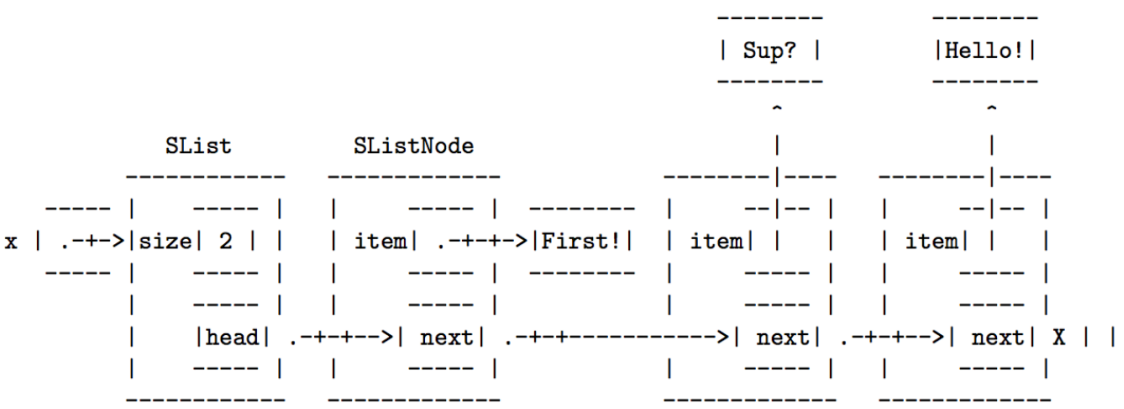
SList	DList	Array
Insertion is constant(if we have the node)	Same as SList	Insertion is not constant (must shift elements)
Removal is not constant	Removal is constant(ifhave node)	Removal is not constant
Accessing elements not constant	Same as SList	Accessing elements constant
Size can be arbitrary	Size can be arbitrary	Size is fixed

Box and Pointer

Draw a box and pointer diagram for the following SList:

```
SList list = new SList();
list.insertFront("Hello!");
list.insertFront("Sup?");
list.insertFront("First!");
```

Solution:



Head Spinning a la Hilfinger

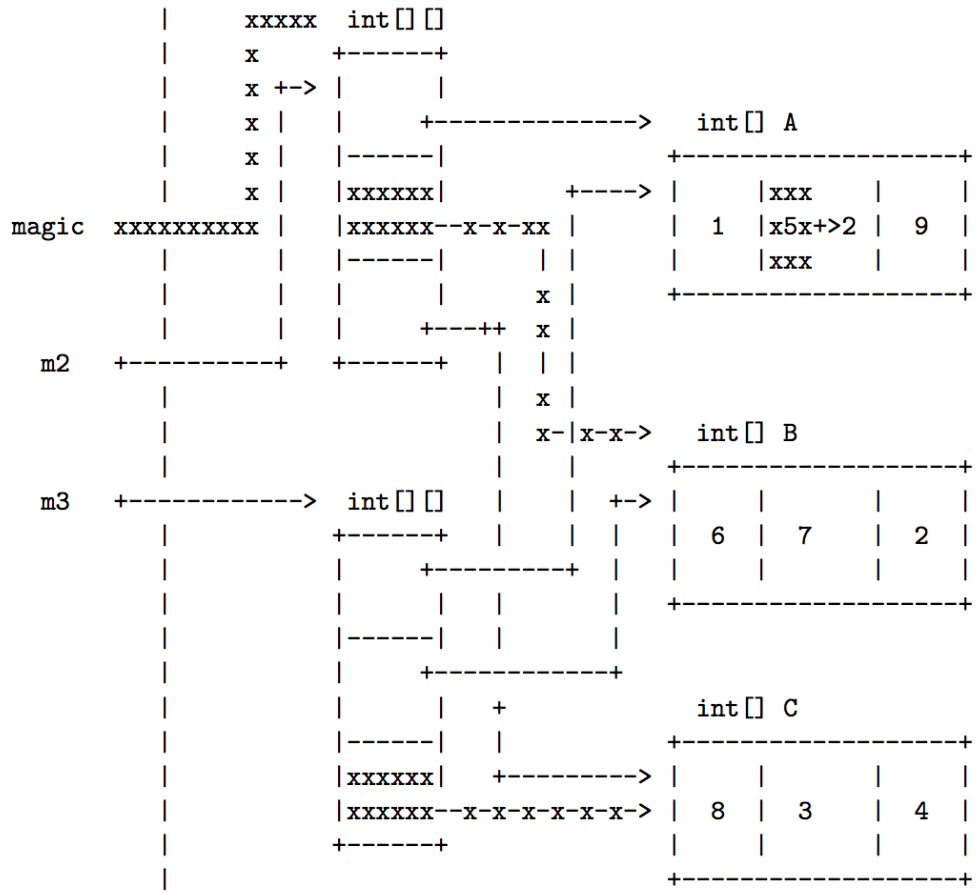
```
int[][] magic = { { 1, 5, 9 }, { 6, 7, 2 }, { 8, 3, 4 } };
int[][] m2 = magic;
int[][] m3 = new int[3][];
for (int i = 0; i < 3; i += 1) m3[i] = magic[i];
m3[2] = null; m2[1] = null; magic[0][1] = 2;
```

What are magic[2], magic[1], m2[2], m3[1], m2[0][1], m3[0][1] equal to?

After, I set magic = null. Now what is m2[0][1] ?

Hint: Draw a box and pointer if you can't figure it out.

Solution:



magic[2] = C, magic[1] = null,m2[2] = C, m3[1] = B
m2[0][1] = 2, m3[0][1] = 2
m2[0][1] = 2

Mystery

What does the following code segment do?

```
void mystery(int[] arr) {
  if (arr.length == 0)
    return;
  int tmp = arr[arr.length-1];
  for (int i = arr.length-2; i >= 0; i -= 1)  // Why backwards?
    arr[i+1] = arr[i];
  arr[0] = tmp;
}
```

Answer: Rotate the array elements by 1!

Even more Linked Lists!

Write a removeFront method for an SList. Maintain the invariant that the head and size are correct.

Answer:

```
public Object removeFront() {
  if(head == null) {
   return null;
  } else {
   SListNode temp = head;
   head = head.next;
   size--;
   return temp.item;
  }
}
```

Spring 2009 MT1 Question 3a

Write a method called removeNode for the SList class. removeNode takes an SListNode node which you know is in this list, and removes it. (Do not worry if the node does not happen to be in the list.)

Answer:

```
public class SList {
  public SListNode head;
  public void removeNode(SListNode node) {
    if (head == node) {
      head = head.next;
    } else {
      SListNode n = head;
      while (n.next != node) {
        n = n.next;
      }
      n.next = n.next.next;
    }
  }
}
```

```
public class SListNode {
  public Object item;
  public SListNode next; }
```