

Solution to Section #9

Parts of this handout by Eric Roberts and Patrick Young

1. Data structure design

```
/*
 * File: ExpandableArray.java
 * -----
 * This class provides methods for working with an array that expands
 * to include any positive index value supplied by the caller.
 */

public class ExpandableArray {

/**
 * Creates a new expandable array with no elements.
 */
    public ExpandableArray() {
        array = new Object[0]; // Allows us to check length of array
                               // even when no elements exist
    }

/**
 * Sets the element at the given index position to the specified.
 * value. If the internal array is not large enough to contain that
 * element, the implementation expands the array to make room.
 */
    public void set(int index, Object value) {
        if (index >= array.length) {

            // Create a new array that is large enough
            Object[] newArray = new Object[index + 1];

            // Copy all the existing elements into new array
            for (int i = 0; i < array.length; i++) {
                newArray[i] = array[i];
            }

            // Keep track of the new array in place of the old array
            array = newArray;
        }
        array[index] = value;
    }

/**
 * Returns the element at the specified index position, or null if
 * no such element exists. Note that this method never throws an
 * out-of-bounds exception; if the index is outside the bounds of
 * the array, the return value is simply null.
 */
    public Object get(int index) {
        if (index >= array.length) return null;
        return array[index];
    }
}
```

```
    }  
  
    /* Private instance variable */  
    private Object[] array;  
  
}
```

2. Program Tracing with Objects

```
Snap is ( y: 5 )  
Pop1 is ( str: Bah, snap: ( y: 5 ) )  
Pop2 is ( str: Bah, snap: ( y: 5 ) )  
Str is ( Bah )  
Snap is ( y: 6 )  
Pop1 is ( str: Bah, snap: ( y: 6 ) )  
Pop2 is ( str: Humbug, snap: ( y: 6 ) )  
Str is ( Bah )  
Snap is ( y: 7 )  
Pop1 is ( str: Humbug, snap: ( y: 8 ) )  
Pop2 is ( str: Humbug, snap: ( y: 7 ) )  
Str is ( Bah )
```