CS61B Lecture #3

- **Reading:** Please read Chapter 4 of the reader *A Java Reference* for Friday (on Values, Types, and Containers).

- **Labs:** We are forgiving during the first week, but try to get your lab1 submitted properly by Friday night. *DBC: Let us know if you can’t get something to work!*

- **Homework:** Please see Homework #1 on the lab page.
More Iteration: Sort an Array

Problem. Print out the command-line arguments in order:

```
% java sort the quick brown fox jumped over the lazy dog
brown dog fox jumped lazy over quick the the
```

Plan.

class Sort {
   /** Sort and print WORDS lexicographically. */
   public static void main (String[] words) {
      sort (words, 0, words.length-1);
      print (words);
   }

   /** Sort items A[L..U], with all others unchanged. */
   static void sort (String[] A, int L, int U) { /* TOMORROW */ }

   /** Print A on one line, separated by blanks. */
   static void print (String[] A) { /* TOMORROW */ }
}
/** Sort items A[L..U], with all others unchanged. */
static void sort (String[] A, int L, int U) {
    if (L < U) {
        int k = /*( Index s.t. A[k] is largest in A[L],...,A[U] )*/;
        /*{ Sort items L to U-1 of A. }*/;
    }
}

Selection Sort
Selection Sort

/** Sort items A[L..U], with all others unchanged. */
static void sort (String[] A, int L, int U) {
    if (L < U) {
        int k = indexOfLargest (A, L, U);
        /*{ Sort items L to U-1 of A. }*/;
    }
}

Selection Sort

/** Sort items A[L..U], with all others unchanged. */
static void sort (String[] A, int L, int U) {
    if (L < U) {
        int k = indexOfLargest (A, L, U);
        sort (A, L, U-1); // Sort items L to U-1 of A
    }
}

Selection Sort

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static void sort (String[] A, int L, int U) {
    if (L < U) {
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Selection Sort

/** Sort items A[L..U], with all others unchanged. */
static void sort (String[] A, int L, int U) {
    if (L < U) {
        int k = indexOfLargest (A, L, U);
        sort (A, L, U-1);    // Sort items L to U-1 of A
    }
}

Iterative version:

    while (L < U) {
        int k = indexOfLargest (A, L, U);
        U -= 1;
    }

And we're done! Well, OK, not quite.
Really Find Largest

/** Value k, I0<=k<=I1, such that V[k] is largest element among
* V[I0], ... V[I1]. Requires I0<=I1. */
static int indexOfLargest (String[] V, int i0, int i1) {
    if (i0 >= i1)
        return i1;
    else /* if (i0 < i1) */ {
        int k = indexOfLargest (V, i0+1, i1);
        return (V[i0].compareTo (V[k]) > 0) ? i0 : k;
    }
}

Iterative:

int i, k;
k = i1;    // Deepest iteration
for (i = i1-1; i >= i0; i -= 1)
    k = (V[i].compareTo (V[k]) > 0) ? i : k;
return k;
Finally, Printing

/** Print A on one line, separated by blanks. */
static void print (String[] A) {
    for (int i = 0; i < A.length; i += 1)
        System.out.print (A[i] + " ");
    System.out.println();
}

/* Looking ahead: There’s a brand-new syntax for the for
 * loop here (as of J2SE 5): */
for (String s : A)
    System.out.print (s + " ");
/* Use it if you like, but let’s not stress over it yet! */
Another Problem

Given an array of integers, A, move its last element, A[A.length-1], to just after nearest previous item that is ≤ to it (shoving other elements to the right). For example, if A starts out as

{ 1, 9, 4, 3, 0, 12, 11, 9, 15, 22, 12 }

then it ends up as

{ 1, 9, 4, 3, 0, 12, 11, 9, 12, 15, 22 }

If there is no such previous item, move A[A.length-1] to the beginning of A (i.e., to A[0]). So

{ 1, 9, 4, 3, 0, 12, 11, 9, 15, 22, -2 }

would become

{ -2, 1, 9, 4, 3, 0, 12, 11, 9, 15, 22 }

(Preliminary question: How can I state this without making this last case special?)
A Solution (from class)

class Shove {
    /** Move A[A.length-1] so that all items after it are greater than
     * it is, displacing those items to the right (towards
     * higher indices). */
    static void moveOver(int[] A) {
        for (int i = A.length - 2; i >= 0; i -= 1) {
            if (A[i] <= A[i+1])
                break;
        }
    }
}