Chapter 6 Review

Tuesday, February 12, 2013
7:34 AM

Computer Science Chapter 6 Review Questions Name: _____

1. Consider the following data field and method.

```
private ArrayList<Integer> nums;

// precondition: nums.size() > 0;
//      nums contains Integer objects
public void numQuest() {
    int k = 0;
    Integer zero = new Integer(0);

    while (k < nums.size()) {
        if (nums.get(k).equals(zero))
            nums.remove(k);

        k++;
    }
}
```

k:0 [0,0,4,2,5,0,3,0]

k:1 [0,4,2,5,0,3,0]

Skips every other zero if there are consecutive zeros.

Assume that `ArrayList<Integer> nums` initially contains the following `Integer` values.

```
[0, 0, 4, 2, 5, 0, 3, 0]
```

What will `ArrayList<Integer> nums` contain as a result of executing `numQuest`?

a) `[0, 0, 4, 2, 5, 0, 3, 0]`
b) `[4, 2, 5, 3]`
c) `[0, 0, 0, 0, 4, 2, 5, 3]`
d) `[3, 5, 2, 4, 0, 0, 0, 0]`
e) `[0, 4, 2, 5, 3]`

2. Consider the following code segment, applied to `list`, which is declared as an `ArrayList<Integer>`.

```
int len = list.size();
for (int i=0; i<len; i++) {
    list.add(i+1, new Integer(i));
    list.set(i, new Integer(i+2));
}
```

(3,2)
(2,4)

[6 1 8]

i: 0 [x 0 1 8]

[2 0 1 8]

i: 1 [2 0 ① 1 8]

[2 ③ 1 1 8]

i: 2 [2 3 1 2 1 8]

[2 3 4 2 1 8]

If `list` is initially 6 1 8, what will it be following execution of the code segment?

a) 2 3 4 2 1 8
b) 2 3 4 6 2 2 0 1 8
c) 2 3 4 0 1 2
d) 2 3 4 6 1 8
e) 2 3 3 2

The next two questions refer to the following information.

Consider the following data field and method `findLongest` with line numbers added for reference. Method `findLongest` is intended to find the longest consecutive block of the value `target` occurring in the array `nums`; however, `findLongest` does not work as intended.

For example, if the array `nums` contains the values
`[7, 10, 10, 15, 15, 15, 15, 10, 10, 10, 15, 10, 10]`,
the call `findLongest(nums, 10)` should return 3, the length of the longest consecutive block of 10's.

```
    private int[] nums;

    public int findLongest(int target) {
        int lenCount = 0;
        int maxLen = 0;

Line 1:     for (int k = 0; k < nums.length; k++) {
Line 2:         if (nums[k] == target) {
Line 3:             lenCount++;
Line 4:         }
Line 5:         else {
Line 6:             if (lenCount > maxLen) {
Line 7:                 maxLen = lenCount;
Line 8:             }
Line 9:         }
Line 10:    }
Line 11:    if (lenCount > maxLen) {
Line 12:        maxLen = lenCount;
Line 13:    }
Line 14:    return maxLen;
    }
```

lenCount++; → keeps going up

needs to get reset when something other than target comes up.

lenCount = 0;

3. The method `findLongest` does not work as intended. Which of the following best describes the value returned by a call to `findLongest`?
   a) It is the length of the shortest consecutive block of the value `target` in `nums`.
   b) It is the length of the array `nums`.
   c) It is the number of occurrences of the value `target` in `nums`.
   d) It is the length of the first consecutive block of the vlue `target` in `nums`.
   e) It is the length of the last consecutive block of the value `target` in `nums`.

4. Which of the following changes should be made so that method `findLongest` will work as intended?

   a) Insert the statement `lenCount = 0;` between lines 1 and 2.

   b) Insert the statement `lenCount = 0;` between lines 5 and 6.

   c) Insert the statement `lenCount = 0;` between lines 6 and 7.

   d) Insert the statement `lenCount = 0;` between lines 7 and 8.

   e) Insert the statement `lenCount = 0;` between lines 8 and 9.

5. Consider the following data field and method.

```
private int[] myStuff;

// precondition: myStuff contains integers in no particular order
public int mystery(int num) {
    for (int k = myStuff.length-1; k >= 0; k--) {
        if (myStuff[k] > num) {
            return k;
        }
    }

    return -1;
}
```

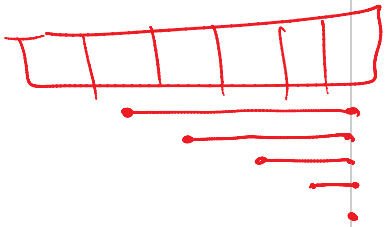
Which of the following best describes the contents of `myStuff` after the following statement has been executed?

```
int m = mystery(n);
```

   a) All values in positions 0 through `m` are less than `n`.
   b) All values in positions `m+1` through `myStuff.length-1` are less than `n`.
   c) All values in positions `m+1` through `myStuff.length-1` are less than or equal to `n`.
   d) The smallest value is at position `m`.
   e) The largest value that is smaller than `n` is at position `m`.

6. Consider the static method `selectSort` shown below. Method `selectSort` is intended to sort an array into increasing order; however, it does not always work as intended.

```
// precondition: numbers.length > 0
// postcondition: numbers is orted in increasing order
public static void selectSort(int[] numbers) {
    int temp;
Line 1:  for (int j = 0; j < numbers.length - 1; j++) {
Line 2:      int pos = 0;
Line 3:      for (int k = j + 1; k < numbers.length; k++) {
Line 4:          if (numbers[k] < numbers[pos]) {
Line 5:              pos = k;
             }
         }
         temp = numbers[j];
         numbers[j] = numbers[pos];
         numbers[pos] = temp;
    }
}
```



Which of the following changes should be made so that `selectSort` will work as intended?

a) Line 1 should be changed to
```
for (int j = 0; j < numbers.length - 2; j++) {
```

b) Line 2 should be changed to
```
int pos = j;
```

c) Line 3 should be changed to
```
for (int k = 0; k < numbers.length; k++) {
```

d) Line 4 should be changed to
```
if (numbers[k] > numbers[pos]) {
```

e) Line 5 should be changed to
```
k = pos;
```

7. The following code fragment is intended to find the smallest value in `arr[0]…arr[n-1]`.

```
//Precondition: arr[0]…arr[n-1] initialized with integers.
//                  arr is an array, arr.length = n
//Postcondition: min = smallest value in arr[0]…arr[n-1]
int min = arr[0];
int i = 1;
while (i < n) {
    i++;
    if (arr[i] < min)
        min = arr[i];
}
```

sets min holder to the 1st item

The first time this executes, i is 2 (the 3rd item)

This code is incorrect. For the segment to work as intended, which of the following modifications could be made?

I Change the line
`int i = 1;`
to
`int i = 0;`

i++ would make i to be equal to n, and that is past the end of the array. Runtime Error

II Change the body of the `while` loop to

```
if (arr[i] < min)
    min = arr[i];
i++
```

III Change the test for the `while` loop as follows:
`while (i <= n)`

i goes too high
Runtime error

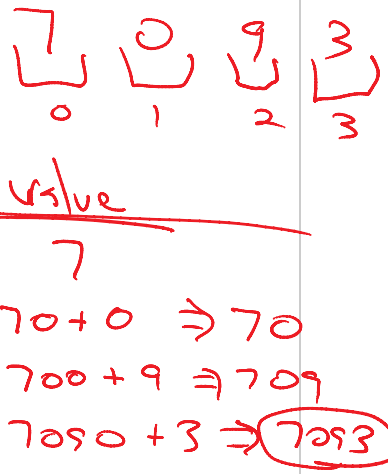
a) I only
b) II only
c) III only
d) I and II only
e) I, II, and III

8. Refer to the following class, containing the `mystery` method.

```
public class SomeClass {
    private int[] arr;

    //Constructor. Initializes arr to contain nonnegative
    //integers K such that 0 <= k <= 9
    public SomeClass() {
        /* Implementation not shown */
    }

    public int mystery() {
        int value = arr[0];
        for (int i=1; i < arr.length; i++) {
            value = value*10 + arr[i];
        }
        return value;
    }
}
```



Which best describes what the `mystery` method does?

a) It sums the elements of `arr`.

b) It sums the products `10*arr[0] + 10*arr[1] + ... + 10*arr[arr.length-1]`.

c) It builds an integer of the form $d_1\ d_2\ d_3 \ldots d_n$, where d_1 = `arr[0]`, d_2 = `arr[1]`, ..., d_n = `arr[arr.length-1]`.

d) It builds an integer of the form $d_1\ d_2\ d_3 \ldots d_n$, where d_1 = `arr[arr.length-1]`, d_2 = `arr[arr.length-2]`, ..., d_n = `arr[0]`.

e) It converts the elements of `arr` to base 10.

9. Consider the method `doTask` defined below.

```
public static int doTask(int[] a) {
    int index = 0;
    int soFar = 1;
    int count = 1;
    for (int k = 1; k < a.length; k++) {
        if (a[k] == a[k - 1]) {
            count++;
            if (count > soFar) {
                soFar = count;
                index = k;
            }
        }
        else {
            count = 1;
        }
    }
    return a[index];
}
```

the number in the list where the maximum run occured.

soFar → 7 → the maximum run of a number

index → position where the maximum run of a number occured.

When the following code segment is executed,

```
int[] arr = {1,2,3,3,3,3,4,2,2,2,2,2,2,5,6,6,6,6,6,6,4,7,8};
System.out.println(doTask(arr));
```

What is printed to the screen?

a) 1
b) 2
c) 6
d) 7
e) 24

10. Refer to the following declarations:

```
String[] colors = {"red", "green", "black"};
ArrayList<String> colorList = new ArrayList<String>();
```

Which of the following correctly adds the elements of the `colors` array to `colorList`? The final ordering of colors in `colorList` should be the same as in the `colors` array.

I.
```
for (int i=0; i<colors.length; i++)
    colorList.add(i, colors.get(i));
```
→ can't do .get( ) on a standard array.

II.
```
for (int i=0; i<colors.length; i++)
    colorList.add(colors[i]);
```

III.
```
for (int i=colors.length-1; i>=0; i--)
    colorList.add(i, colors[i]);
```

i = 2
i = 1
i = 0

colorList.add(2, "black")
Can't add to position 2 of an empty ArrayList

a) I only
b) II only
c) III only
d) II and III only
e) I, II, and III

11. Suppose an `ArrayList<Integer>` called `list` is initialized with `Integer` values. Which of the following will *not* cause an `IndexOutOfBoundsException` runtime error?

a)
```
for (int i=0; i<=list.size(); i++)
    list.set(i, 0);
```
→ too far

b)
```
list.add(list.size(),0);
```

c)
```
int i = list.get(list.size());
```
→ too far

d)
```
int i = list.remove(list.size());
```
→ too far

e)
```
list.add(-1, 0);
```
→ not valid

12. The following program segment is intended to find the index of the first negative integer in `arr[0]...arr[n-1]`, where `arr` is an array of `n` integers.

```
int i = 0;
while (arr[i] >= 0) {
    i++;
}
location = i;
```

what happens all numbers are >=0 ? out-of-bounds!

This segment will work in intended

a) Always.
b) Never.
c) Whenever `arr` contains at least one negative integer.
d) Whenever `arr` contains at least one nonnegative integer.
e) Whenever `arr` contains no negative integers.

13. Below is the code for the Binary Search algorithm.

```
// precondition: list is an instantiated array, and sorted in ascending order
// postcondition: the index of the key is returned. If not found -1 is returned
public static int binarySearch(int[] numbers, int key) {
  int low = 0;
  int high = numbers.length-1;
  int middle = (low + high) / 2;

  while (numbers[middle] != key && low <= high) {
    if (key < numbers[middle])
      high = middle - 1;
    else
      low = middle + 1;
    middle = (low + high) / 2;
  }

  if (numbers[middle] == key)
    return middle;
  else
    return -1;
}
```

Given this array, how many iterations through the while loop does it take to determine that `18` is not in the list?

Value:	3	13	17	20	35	43	51	54	55	55	61	63	68	68	72	72	80	81	85	97
Index:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19

L m H

Pass 1: L M H

Pass 2: L M H

Pass 3: L H (M)

Pass 4: L H (M)

Pass 5: H L High and low flip — not found!