CS 0401 Fall 2016 Quiz 2 Version B

SOLUTIONS

1) Fill in the Blanks (16 points – 2 points each). Provide the MOST appropriate answers. If choices are given in square brackets, select one of the choices.

   a) The __________physical________ size of an ArrayList is the length of the underlying array and the __________logical________ size of an ArrayList is the number of items being stored in the array.

   b) The __________selectionsort________ (give the name) algorithm that we discussed in lecture sorts items by finding the smallest item and putting it into location 0, then finding the next smallest item and putting it into location 1, etc.

   c) Every Java object has a pseudo-instance variable called ______this____ which is a reference back to that same object (i.e. a self-reference).

   d) The Java classes Integer, Float, etc. are called ________wrapper______ classes and are used to allow the primitive types to be accessed as objects.

   e) Composition gives a ________has a________ [is a, has a] relationship between the new and old classes while inheritance gives a ________is a________ [is a, has a] relationship between the new and old classes.

   f) Ad hoc polymorphism utilizes method ________overloading________ [overloading, overriding] whereas subclassing polymorphism utilizes method ________overriding____________ [overloading, overriding]

   g) A subclass inherits ________all________ [all, public and protected only, public only] instance variables from a superclass.

   h) The algorithm used in method doSomething() of Trace1B is ________binary search________________.

2) True / False (12 points – 2 points each). Correct false statements for full credit.

   a) Two-D Java arrays must be rectangular (i.e. each row must have the same number of columns). False – each row may have any number of columns

   b) The binary search algorithm requires the array being searched to be sorted. True

   c) The declaration: String [] A = new String[10]; will create 10 String objects. False – it creates 10 String references which are all null

   d) A new Java class may extend only a single superclass and may implement at most one interface. False – a class may implement any number of interfaces

   e) Consider classes Foo and SubFoo, where SubFoo is a subclass of Foo. The Java statement:

       SubFoo S = new Foo(); is legal False – "is a" is not symmetrical

   f) Consider classes Foo and SubFoo, where SubFoo is a subclass of Foo. The Java statement:

       Foo F = new SubFoo(); is legal True
3) **Trace (12 points).** Give all output, in the correct order and format, produced by execution of the following Java program. Clearly indicate your output by drawing a box around it.

```java
public class Trace1B {
    public static int doSomething(int[] A, int val) {
        boolean done = false;
        int ans = -1;
        int loc1 = 0;
        int loc2 = A.length - 1;
        while (!done && loc1 <= loc2) {
            int loc3 = (loc1 + loc2) / 2;
            System.out.print("Loc1: "+ loc1 + "  Loc2: "+ loc2 + "  Loc3: ");
            System.out.println(loc3 + "  Data: " + A[loc3]);
            if (val == A[loc3]) {
                ans = loc3;
                done = true;
            } else if (val < A[loc3])
                loc2 = loc3 - 1;
            else
                loc1 = loc3 + 1;
        }
        return ans;
    }

    public static void runIt(int[] A, int val) {
        int check = doSomething(A, val);
        if (check >= 0)
            System.out.println("Index " + check + " has " + val);
        else
            System.out.println("Other result for " + val);
    }

    public static void main(String[] args) {
        int[] D = {10, 15, 20, 25, 30, 35, 40, 45, 50, 55};
        runIt(D, 20);
        runIt(D, 38);
    }
}
```

**Answer:**

```
Loc1: 0  Loc2: 9  Loc3: 4  Data: 30
Loc1: 0  Loc2: 3  Loc3: 1  Data: 15
Loc1: 2  Loc2: 3  Loc3: 2  Data: 20
Index 2 has 20
Loc1: 0  Loc2: 9  Loc3: 4  Data: 30
Loc1: 5  Loc2: 9  Loc3: 7  Data: 45
Loc1: 5  Loc2: 6  Loc3: 5  Data: 35
Other result for 38
```
4) **Trace (10 points).** Consider the SomeType class on this page and the Trace2B program on the next page. Give all output, in the correct order and format, produced by execution of the Trace2B program. **Clearly indicate your output by drawing a box around it.**

```java
public class SomeType {
    StringBuilder[] A;
    int N;

    public SomeType(int val) {
        A = new StringBuilder[val];
        N = 0;
    }

    public SomeType(SomeType old) {
        A = new StringBuilder[old.A.length];
        for (int i = 0; i < A.length; i++)
            A[i] = old.A[i];
        N = old.N;
    }

    public boolean add(StringBuilder sb) {
        if (N < A.length) {
            A[N] = sb;
            N++;
            return true;
        }
        else return false;
    }

    public StringBuilder get(int i) {
        if (i >= 0 && i < N)
            return A[i];
        else
            return null;
    }

    public int size() {
        return N;
    }
}
```
public class Trace2B {
    public static String [] info = {"Qui-Gon", "Obi-Wan", "Darth"};

    public static void printIt(SomeType D) {
        System.out.print("Contents: ");
        for (int i = 0; i < D.size(); i++)
            System.out.print(D.get(i).toString() + " ");
        System.out.println();
    }

    public static void main(String [] args) {
        SomeType D1, D2;
        D1 = new SomeType(5);
        for (int i = 0; i < info.length; i++)
            D1.add(new StringBuilder(info[i]));
        printIt(D1);

        D2 = new SomeType(D1);
        D1.get(1).append("Kenobi");
        D1.add(new StringBuilder("Anakin"));
        D2.get(2).append("Maul");
        D2.add(new StringBuilder("Mace"));

        printIt(D1);
        printIt(D2);
    }
}

Answer:
Contents: Qui-Gon Obi-Wan Darth
Contents: Qui-Gon Obi-Wan Kenobi Darth Maul Anakin
Contents: Qui-Gon Obi-Wan Kenobi Darth Maul Mace