COSC 201 Review Questions

Final

Fall 2013

Write the code to create an enhanced for loop that will go through every member of an ArrayList <String> myArray and print it out to the console.

Give the code to create an array of strings of size 10 called myStrings.

What is the difference between Object and Class?

Give an algorithm to solve the maximum subsequence sum problem in less than O(n^3) time.

Define static.

Give the code to create a class called Student that IS-A Person. The class Student should have one field a double called gpa. Be sure to create the constructor, toString, accessors and mutators for Student. The constructor will take in 5 parameters: String n, int ag, String ad, String p, double g and assume that the constructor for Person is formatted: Person(String n, int ag, String ad, String p).

What is an IS-A relationship?

Give the code to create an interface called myInterface. The interface should have two methods, add and remove. Add has two parameters, int a and int b. Remove has one paramter, int idx.

Give the code to implement an interface called Whee. Whee's interface defintion:

```
public interface Whee{
        public int add2ints(int a, int b);
}
```

Your implementation of this interface should include simply the methods needed.

Define algorithm analysis.

What is the time complexity of this snippet of code:

```
for (i = 0; i < n; i++)
        for (j = 0; j < 1; j++)
                for (k = 0; k < n; k++)
                        System.out.println(k*i*j);
```

Give the code to create an Iterator for the ArrayList myArray. Use that Iterator to print out the elements in myArray.

What is the interface for Iterator?

Name 5 of the 8 methods in the Collection interface.

Name the three implementations of List in the Java API.

Give the code to add a ListNode element called k between ListNode i and ListNode j in a LinkedList. You can assume that the node has already been created for the element.

Is the LinkedList implemented by the Java API a singly-linked list or a doubly-linked list?

Give the code to declare and instantiate a Stack of strings called myStack. Then add the elements “This” “is” “COSC” “201”, and then print out those elements.

How do you implement a Stack with a Linked List?

What is recursion?

Give the recursive method for the summation of integers from 1 to N.

Create a class Student with two private fields id (an integer) and name (a String). Include a useful constructor as well as methods to allow Student to be put into a HashSet and sorted with Collections.sort. Students should be compared by name.

Create an abstract class called Person. The class should include name, age and address. Include the usual methods (constructors, getters, setters) and an abstract method toString.

Give the code to determine if a variable **myvar** is of type Integer.

Give the code to print out the first command line argument in a main method. Be sure to include any error checking you may need.

What is polymorphism?

Will the following code snippet work?

```
Student s = new Student(…);
Person p = s;
p.getName();
p.getGPA();
```

Assume that Person has an implementation of getName, but not an implementation of getGPA. If this does not work, how can I use **p** to call getGPA?

If I wanted to create a class that is generic, but restricted to include only types that extend Person, what would the class signature look like?

Give the recursive method to find the Fibonacci sequence number at a given index i (i.e. the ith number in the sequence). Be sure to use the correct implementation.

Given the following set of number {1, -4, 3, 2, 12, -8, -9, 18}, what is the maximum contiguous subsequence sum for said set?

What are the four problems that need to be solved for the RSA encryption scheme?

Give me an algorithm to solve for the greatest common divisor between two ints.

Give three examples of what sorting would be useful for.

Given the sequence 45, 33, 12, 2, 19, 10, 8, 1, 9 … show me how an insertion sort would sort this sequence.

Using the same sequence, show how shell sort, merge sort and quick sort would sort that sequence.

Give me three different ways to pick the pivot for quick sort and what are the advantages and disadvantages to each.

Explain the partitioning strategy used in the quicksort algorithm from the book.

What is the average running time complexity of the insertion sort, shell sort, merge sort and quick sort algorithms in the book?

Give a recursive method to print all permutations of a String s.

Declare and instantiate an Integer Queue in Java. Add the following numbers to the Queue: 1, 4, 22, -4, 3, 1. If we printed the Queue out in order, what would print?

Create a PriorityQueue of Strings. Add the following Strings to the queue: “Alan”, “COSC 201”, “Computer”, “Science”, “Schaefer”, “SMCM”. If we printed out this queue in order, what would print?

What is the equation that drives the linear congruential generator? What is a good number for M?

Give the postfix for the following infix notation equation and then evaluate (show all work):

A + B * C / D ^ E ^ F + G – (H + I * J ^ (K + L) * M)

Create a Comparator that will order Integers from largest to smallest (instead of natural ordering) and use that in a PriorityQueue of Integers.

Convert 234 from base 10 to base 13.

Write the pseudocode for Dijkstra’s shortest-path algorithm on a positive-weighted graph from source S to destination D.

Draw the graph represented by the following array (0 denotes no edge): What is the equivalent adjacency list?

```
int bigValid[][] = {{0, 0, 4, 0, 0, 0, 6, 3, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0},
                      {2, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0},
                      {0, 1, 0, 3, 0, 0, 0, 6, 1, 0, 0, 0, 0, 7, 0, 0, 0, 0, 0, 0},
                      {0, 0, 3, 0, 0, 0, 0, 0, 0, 4, 0, 0, 0, 0, 3, 0, 0, 0, 0, 0},
                      {0, 0, 0, 0, 0, 6, 0, 0, 0, 0, 4, 0, 0, 0, 0, 0, 0, 0, 0, 0},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 6},
                      {0, 0, 2, 0, 0, 0, 0, 4, 0, 0, 0, 20, 0, 0, 0, 0, 0, 0, 0, 0},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 3, 0, 0, 0, 0, 0, 0, 0},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 6, 0, 0, 0, 0, 9, 0},
                      {0, 0, 0, 0, -1, 0, 0, 0, 5, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 3, -2},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 4, 0, 0, 10, 0, 0, 0, 0},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 4, 0, 12, 0, 0, 13, 0, 0, 0},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 3, 0, 3, 0, 0, 0},
                      {0, 0, 0, 0, 5, 0, 0, 0, 0, -2, 5, 0, 0, 0, 0, 0, 0, 0, 4, 0},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 3, 0, 0, 0, 5, 0, 0, 0},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 7, -3, 0},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 3, 0, 5},
                      {0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0}};
```

What is the equivalent adjacency list?