COSC 201 Review Questions
Final
Fall 2009

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?

What is the difference between TreeSet and HashSet?

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 < n; 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.

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

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

Define a comparator for a class Student that will be compared via an integer field id.

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?

What is the issue with the following solution to the Fibonacci problem?

```
public int fib(int a){
        if (a == 0 | a == 1) return 1;

        return (fib(a-1) + fib(a-2));
}
```

What is the solution to the issue above?

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

How can we determine if a number is prime? Write the code for your solution.

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?

Describe two ways to determine if a number is prime. One of those ways should use a randomized algorithm.

What is the basic algorithm for symbol matching? What flaws does it have?

Give the postfix for the following infix notation equation:

$$A + B * C / D \wedge E \wedge F + G - (H + I * J \wedge (K + L) * M)$$

Given the following postfix expression, show how it is evaluated using the stack-based postfix machine that is in your book:

1 2 + 3 * 4 5 6 - ^ -

Describe Dijkstra's algorithm for shortest-path in a non-negative weighted graph.

Describe the Bellman-Ford algorithm for shortest-path in an arbitrary weighted graph.

Apply Dijkstra's algorithm to the following graph from source A to target D. Be sure to show each step:

(undirected)	
AB	1
AC	4
BC	2
CD	2
BE	7
CF	9
EF	3
FG	1
GH	4
GI	6
GJ	3

Given the above table, show what the adjacency matrix of this graph would look like.

What is the runtime complexity of Dijkstra's algorithm?

Show how a binary search tree would order the following sequence of numbers (show the tree): 12, 45, 3, 22, 31, 50, 2, 10, 9, 88