

Computer Science 2334
Programming Structures and Abstractions

Final Exam

Fall 2006

Name: _____

Sooner ID #: _____

UOSA Statement of Academic Integrity:

On my honor I affirm that I have neither given nor received inappropriate aid in the completion of this exercise.

Signature: _____

Date: _____

➡ Read ALL questions carefully before answering! ⬅

- ***You may only have a writing implement and an eraser at your seat. Any cell phones, pagers, and all other electronic devices must be placed with the rest of your belongings at the front of the room.***
- Show all work in the space provided. You may write on the back side of the pages if you need more space (if you use the back side of a page, be sure to clearly indicate in the space provided for the question that the answer is on the back).
- Write clearly and be concise.
- Partial credit will only be given if all work is clearly shown and written legibly.
- You must work all problems with the requested techniques, methods, classes, and interfaces to receive credit. For example, a question requesting a List solution will receive no credit for an array solution.
- You may include (but are not required to include) comments explaining your ideas/intentions behind any code that you write.

Make sure your test has all 7 questions before beginning.

A Java API Specification Supplement is included.

Do not open the test until you are told to do so.

Q1. Welcome to the final installment of “This is your Java”. We have some Java programming related concepts and programming constructs here that are going to describe their characteristics. It is up to you to determine who they are and write their name below each description. Some of our guests are more specific, some are less specific. *(9 points, 3 each)*

- a) I allow methods and objects to have multiple behaviors. When I am used the behavior of the method or object is determined by its context based on the type of the object or the type of the data being used.

- b) I manage a collection of data that have a set of unique properties. Furthermore, I provide an implementation of all of the operations that can be performed on the data that I manage.

- c) I determine how components are arranged inside of a container that is part of the GUI of a program.

Q2. Select the ADT from the list below that is the best choice for solving the given problem. While it is possible that multiple ADTs could work in a situation, choose the most appropriate one. (10 points, 2 each)

Set **Queue** **List** **Stack** **Map** **Priority Queue**

- a) Your boss wants a program to store employee information. Each employee has an ID, which is used to look up their information. The program must be able to efficiently add and remove employees, and perform fast searches to retrieve data.

- b) You are developing a new software system to manage service calls for the local phone company. When a customer reports an outage or problem with their phone service they call the phone company's service center and their problem is placed into the system. Their problem will be handled by a technician that will come to their location to check the phone equipment. Problems with phone service are handled by the technicians in the order they are received.

- c) You are going to develop a simple video player. The video is stored as a collection of frames (each represented as an object). The player will be able to play the video in both forward and reverse directions, pause the video, and skip forwards or backwards to another position in the video. The player will not support editing of the video, therefore you will not have to support adding or removing any frames from the video.

- d) You are writing a program for a calculator that will evaluate mathematical expressions entered into the calculator. The calculator will store the expressions in a postfix format. You are working on writing the program code that will take user input and store the expression as well as the program code that evaluates an expression when the user presses the '=' button.

- e) You are asked to write a program that manages orders coming into a deli market. These orders are filled as they are received, except that some orders will be party trays. Since party trays are somewhat time consuming, they will not be filled until all normal orders have been completed.

Q3. The following code uses various ADTs to perform some operations. Show the contents of each ADT and the temp variables *after* the completion of all of the operations. You may assume that the Student class has two class variables (name and grade) and has a standard set of Accessors and Mutators. (10 points)

```

HashMap<Integer, Student> db = new HashMap<Integer, Student>();
Stack<Student> cs101 = new Stack<Student>();
db.put( 0012, new Student( "Fred", 96.5 ) );
db.put( 0101, new Student( "Jon", 86.9 ) );
db.put( 1023, new Student( "Mary", 99.9 ) );
cs101.push( db.get( 0101 ) );
cs101.push( db.get( 1023 ) );
Student s1 = cs101.peek();
s1.setGrade( 100.0 );
cs101.push( s1 );
Student s2 = db.get( 0012 );
s2.setName( "Jane" );
s2 = cs101.pop();

```

	Name	Grade
s1 =		
s2 =		

HashMap

Key	Value	
	Name	Grade

Name	Grade
Value	
Bottom of Stack	

Q6. Explain why the following scenario would or would not be fair use of copyrighted material: You rent a copy of the movie 'Lord of the Rings: Return of the King' on DVD from your local video store. Before you return the DVD you decide to make a copy so that you can watch it again in the future. (5 points)

Q7. As an engineer at SAVS you have developed a new software package for the detection and blocking of computer worms before they have a chance to infect a computer. Should SAVS, keep the details of this new software as a trade secret, patent the software, or copyright the software? Explain the reasons behind your choice. (5 points)

Bonus Question (5 points)

Briefly explain why Binary Search requires fewer comparisons in the worst case than Linear Search. You may include a diagram to help motivate your explanation.