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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: ⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯⎯

Notes Regarding this Examination

Open Book(s) You may consult any printed textbooks in your immediate possession during the course of this examination.

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No Electronic Devices Permitted You may not use any electronic devices during the course of this examination, including but not limited to calculators, computers, and cellular phones. All electronic devices in the student's possession must be turned off and placed out of sight (for example, in the student's own pocket or backpack) for the duration of the examination.

Violations Copying another's work, or possession of electronic computing or communication devices in the testing area, is cheating and grounds for penalties in accordance with school policies.

Question 1: Recursion (25 points)

Recall that `%` is the Java symbol for modulo arithmetic, which means the remainder left over after doing integer division. So, for example, `7%5` is `2` since five goes into seven one time with two left over. Similarly `5%7` is `5` since seven goes into five zero times with five left over.

Given the following recursive code

```
public static int fcn(int p, int q) {
    if (q == 0) return p;
    return fcn(q, p%q);
}
```

calculate `fcn(650, 125)` recursively.

A. What is the answer returned by the call `fcn(650, 125)`?

B. Show the state of the system after each call (including the initial call and each recursive call). You could do this by drawing the call stack after each call or otherwise showing the values of each variable after each call.

C. Say whether it is possible to convert this code to an iterative version. If it is possible, *explain* how you would do it. (You may write out the code itself or simply explain in words what changes would be necessary to make this conversion.) If it isn't possible, *explain* why it isn't possible.

Question 2: Exceptions (5 points)

Let us imagine that a particular Java application has a main method, which calls method A, which calls method B, which calls method C. Method C does I/O and, rather than handling possible exceptions, simply re-throws them.

A. To which method (main, A, B, or C) with the re-thrown exception go?

B. *Explain* why it makes more sense for the exception to be re-thrown to the method you gave as an answer in part A, than it would to re-throw the exception to any of the other methods mentioned in this question.

Question 3: Assertions (5 points)

Explain why you need to explicitly tell the Java Virtual Machine (JVM) to process assertions. That is, why doesn't the JVM *always* process assertions?

Question 3: Exceptions, Assertions, Preconditions, and Postconditions (15 points)

A common rule of thumb with exceptions, assertions, preconditions, and postconditions is that you should use *exceptions* for *pre*conditions on *public* methods, *assertions* for *pre*conditions on *private* methods, and *assertions* for *post*conditions on *both public and private* methods.

A. *E*xplain why it is better to use *exceptions* (rather than assertions) for *pre*conditions on *public* methods.

B. *E*xplain why it is better to use *assertions* (rather than exceptions) for *pre*conditions on *private* methods.

C. *E*xplain why it is better to use *assertions* (rather than exceptions) for *post*conditions on *both public and private* methods.

Question 4: Applets (15 points)

A. Can you place a frame in an applet? *Explain* your answer.

B. What will happen if the person who writes the html to embed an applet in a web page adds an additional parameter to the html that the creator of the applet did not plan for?

C. *Explain* why Java applets have a `stop()` method but regular Java applications do not.

Question 5: Applets Redux (10 points)

List and *explain* two changes you would need to make to the `LoanApplet.java` code given on page 564 of your textbook if `JApplet` was defined to be an interface, rather than a class.

A. Change one.

B. Change two.

Question 6: Ethics (25 points)

Bill works for the District Attorney (DA) as an IT specialist. At a conference related to IT and law enforcement, Bill sees a demonstration of a piece of software that he thinks would be very useful. The software is called CrimeMap and allows its users (law enforcement personnel) to create maps plotting where crimes of various kinds occurred based on data in the user's database. Bill suggests to Shauna, his boss, that they buy a copy of CrimeMap for their office. Shauna agrees that CrimeMap would be very useful to have but says that the price tag is too high.

Bill keeps thinking about CrimeMap and, when things get a bit slow at work, begins to work on his own crime mapping software, which he calls VisualEyesCrime. Bill bases VisualEyesCrime around the Google Maps API, which allows him to quickly get maps set up and displaying on a web browser, and hooks it into the DA's databases of police reports, investigations, gun registration records, and anything else he can think of that might be useful to the DA and other law enforcement personnel. In order to get feedback to improve the user interface of VisualEyesCrime, Bill emails friends of his in the police department, the sheriff's department, and in private IT jobs, and sends them a URL that they can click on to run VisualEyesCrime through their web browsers.

A. Find at least one ethical principle from a professional code of ethics that is relevant to this scenario. List the principle, give its source, and *explain* why you think it is relevant.

B. Say whether you think Bill abided by (that is, followed) the principle you listed and *explain* how you came to that conclusion.

C. Give one likely motivation for Bill's action and *explain* how you concluded that was a likely motivation.

D. *Explain* a strategy that Bill could use to improve his ethical decision making.

Bonus Question: Model, View, Controller paradigm (20 points)

Sandy has designed a word guessing game using the Model, View, Controller (MVC) paradigm. Her game meets the specifications for your Project 5. Henrik says he likes it but would like to add a "three strikes and you are out" feature. With this feature, each time a user guesses a word that uses one or more letters not in the set of "starting letters," that user gets a "strike." If the user gets three strikes, the game is over and the user loses. Sandy says, "Sounds fun. Here is my code. Feel free to make any changes you want."

A. To add a "three strikes and you are out" feature, will Henrik need to change the model(s) from Sandy's code? *Explain* your answer. In particular, if changes are needed, please specify what they would be. If not, please explain why no changes are needed in this part of the code.

B. To add a "three strikes and you are out" feature, will Henrik need to change the view(s) from Sandy's code? *Explain* your answer. In particular, if changes are needed, please specify what they would be. If not, please explain why no changes are needed in this part of the code.

C. To add a "three strikes and you are out" feature, will Henrik need to change the controller(s) from Sandy's code? *Explain* your answer. In particular, if changes are needed, please specify what they would be. If not, please explain why no changes are needed in this part of the code.

D. While he is modifying Sandy's code, Henrik notices that the model is not listening to the controller. "Hey, Sandy," he says, "you messed up here. If the model doesn't listen to the controller the model will never change!" "No, I didn't," she responds, "the model doesn't need to listen." Based on the version of the MVC we have been using in class, who is right? *Explain* your answer.