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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.

Open Notes You may consult any printed notes in your immediate possession during the course of this examination.

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 (30 points)

Given the following code:

```
public static double compoundInterest(double principle,
    double interestRate, int months) {
  if (months == 0)
    return principle;
  else
    return compoundInterest(principle + principle * interestRate,
          interestRate, months - 1);
}
```

A. What will be the result if `compoundInterest` is called with `100000` for `principle`, `0.01` for `interestRate`, and `0` for months? *Explain* your answer.

B. What will be the result if `compoundInterest` is called with `100000` for `principle`, `0.01` for `interestRate`, and `1` for months? *Explain* your answer.

C. What will be the result if `compoundInterest` is called with `100000` for `principle`, `0.01` for `interestRate`, and `2` for months? *Explain* your answer.

D. In principle, should it be easy to convert this recursive code to iterative code that computes the same value? *Explain* your answer.

E. If you were to convert this code to use iteration instead of recursion, would you expect it to run faster, slower, or exactly the same speed as this recursive version? *Explain* your answer.

F. If you were to convert this code to use iteration instead of recursion, would you expect it to use more, fewer, or exactly the same number of local variables? *Explain* your answer.

Question 2: Preconditions, Assertions, Exceptions, and Object-Oriented Programming (15 points)

A. Given the code from Question 1, what would be a reasonable precondition to add to this function? *Explain* your answer.

B. Would it be better to encode this precondition as an assertion, a conditional with an exception, both, or neither? *Explain* your answer.

C. Where in the code would you place this precondition? *Explain* your answer.

Question 3: Ethics (25 points)

Kelly hates her job. She has hated it almost from the day she took it six months ago. She didn't think it would be like this. She gets to do software development day in and day out. She loves software development and knew that her job would be mostly software development, so she reasoned that she would love this job too. What she hadn't counted on was her work environment. The people there are enough to make her scream! She has a lot of self control, so she manages to wait until she gets in her car before she starts screaming, but she knows this is no way to go through life.

When Kelly confides to Scott just how miserable she is professionally, he says, "Gee, Kelly, that is too bad. Hang in there, though. I may know of a job for you some time in the future. Myrah, this friend of a friend I know, is eager to fund a start-up software company in this part of the country, and she has lines on a lot of other good software developers too. What she needs now is an idea for a killer app to develop."

"Scott, that is perfect!" Kelly elatedly responds, "I have a great idea. It came to me a couple months back and I think of it every night."

One thing leads to another and soon Kelly is the lead software developer of a brand new application based on her idea, in a brand new software company funded by Myrah.

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 Kelly abided by (that is, followed) the principle you listed and *explain* how you came to that conclusion.

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

D. List one ethical-decision-making problem that is likely to have contributed to at least one of Kellys decisions and *explain* how you concluded that was a likely problem.

E. *Explain* a strategy that Kelly could use to improve her ethical decision making.

Question 4: Model, View, Controller (30 points + 15 bonus points)

Consider a prototypical model-view-controller arrangement such as we have been discussing in class and represented in the diagram below (from `http://java.sun.com/blueprints/patterns/MVC-detailed.html`).
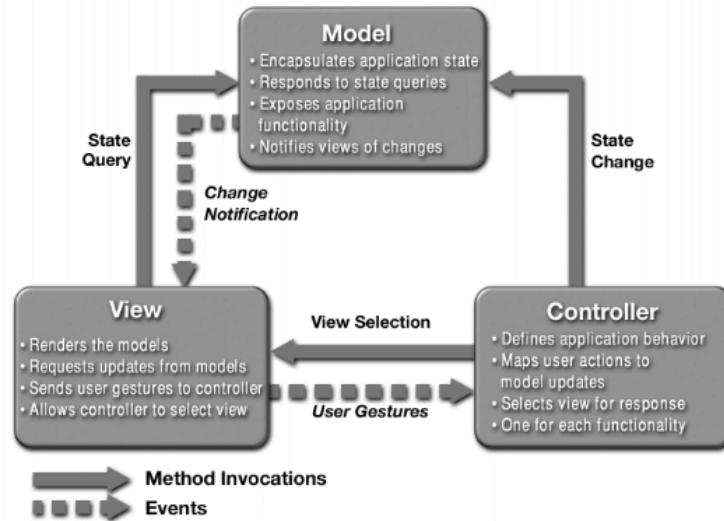
Explain the purpose of each of the following methods. In particular, relate each method to one or more arrows in the diagram above.

A. A `setModel()` method in a view class.

B. A `setModel()` method in a controller class.

C. An `addActionListener()` method in a view class.

D. An `addActionListener()` method in a model class.

E. A `processEvent()` method in a model class.
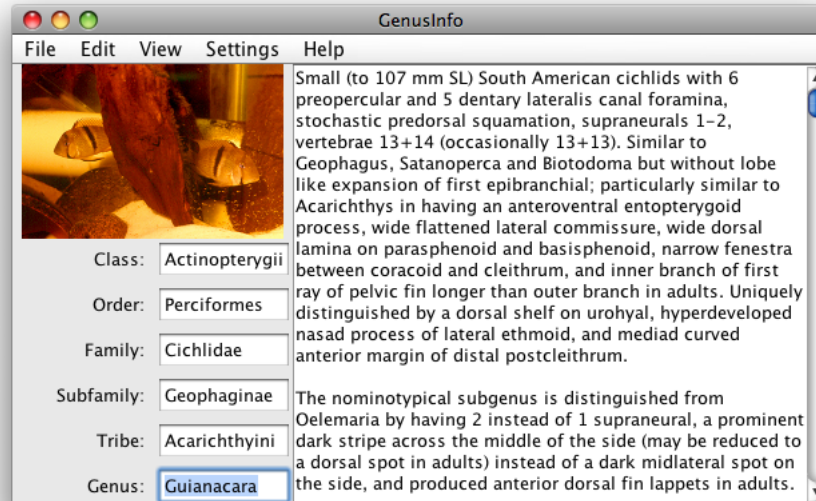
F. A `processEvent()` method in a view class.

G. An `actionPerformed()` method in a view class.

H. An `actionPerformed()` method in a controller class.

I. A `paintComponent()` method in a view class.

Question 5: Graphical User Interfaces (20 bonus points)

Juan Miguel wishes to create a GUI with the following view.

A. List five of the components he could use to create this view and **explain** the purpose of each in the GUI.
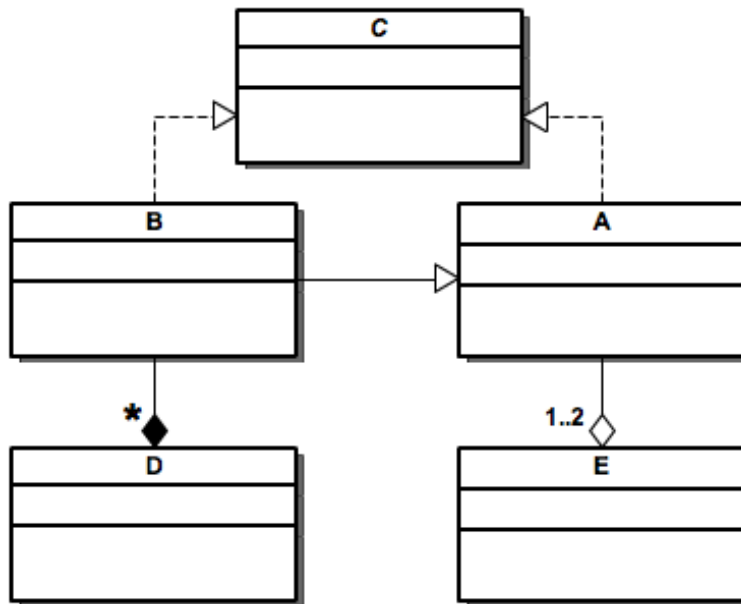
Here is the same GUI but the window shape has been adjusted by the end user to be taller and narrower. Note which elements resize and in which ways they resize.
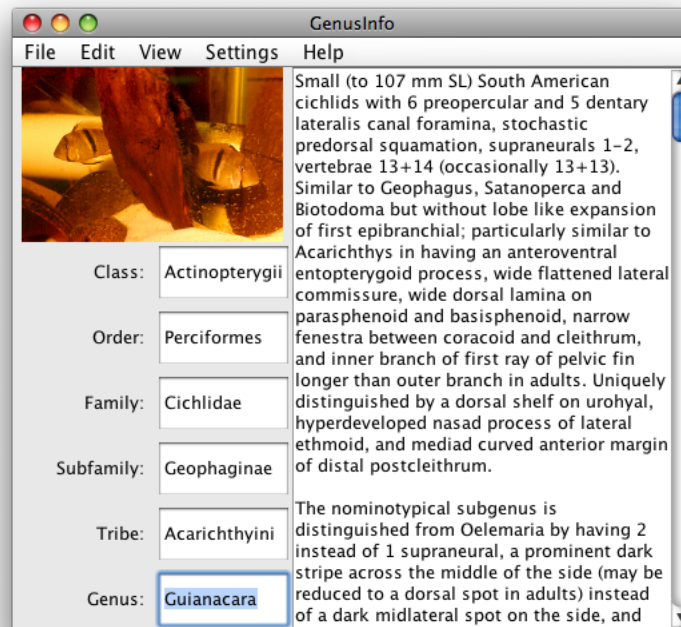
B. **Explain** which layout manager(s) he could use to create a view that behaves in this way.

Question 6: OOP and GUI in Java (10 bonus points)

Explain the following UML class diagram.

Question 7: Engineering and the Law (10 bonus points)

A. According to John Kenny speaking at the Centennial Symposium panel discussion on engineering and the law, there were 474 US patents awarded to people or companies located in Oklahoma in 2008. Also according to Kenny, this was closer to which percent of the total US patents awarded that year to people or companies within the US? 10%, 1%, 0.5%, or 0.25%. *Explain* how you reached that conclusion.

B. According to Kenny, was this percent higher than he would like to see, lower than he would like to see, or just the percent he would like to see? *Explain* why he might hold that opinion.

C. Given your answer regarding Kenny's opinion in part B, and given the patent reform mentioned by Anil Gollahalli during the Centennial Symposium panel discussion, do you think Kenny believes that it will be more urgent, less urgent, or equally as urgent that Oklahoma changes its patent numbers in the future? *Explain* why he might hold that belief.