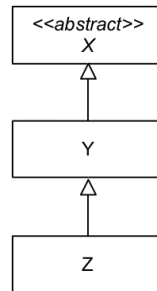


Labtest 2E Non-Programming Questions — March 19, 2014

Total marks: 30.

There are 3 multi-part questions. You should be able to answer each question part with between 1 and 3 *short* sentences.

1. [10 marks total] For this question, consider the classes X, Y, and Z that are related to one another as shown in the following UML diagram:



Assume that all of the classes have a default constructor.

- a)** (2 marks) A student correctly states: “A client cannot create an object of type X by writing `new X()` ;” The student then states: “Therefore, the constructors of X are useless.” Explain why you agree or disagree with the second statement.
- b)** (2 marks) (Continued from part a) The first statement in part a) is true: clients cannot instantiate X objects. When are X objects created?
- c)** (3 marks) Suppose X has the following method:

```
/**
 * Precondition:  aIn > 0
 */
public double calculate(int aIn)
```

Suppose that Y overrides `calculate`. State a different, acceptable precondition for the Y version of the method (but do not say that there is no precondition).

- d)** (3 marks) Suppose Y has the following method:

```
/**
 * Postcondition:  returns a value greater than aIn
 */
public double compute(int aIn)
```

Suppose that Z overrides `compute`. State a different, acceptable postcondition for the Z version of the method.

2. [10 marks total, 2 marks each] Consider the following three lines of code:

```
List<Date> t = new ArrayList<Date> ();  
t.add(new Date());  
t.add(new Date());
```

Running the code causes:

1 ArrayList object to be created, and
2 Date objects to be created.

- a) How many ArrayList objects will be created if you make an alias for t?
How many Date objects will be created if you make an alias for t?

- b) How many ArrayList objects will be created if you make a shallow copy of t?
How many Date objects will be created if you make a shallow copy of t?

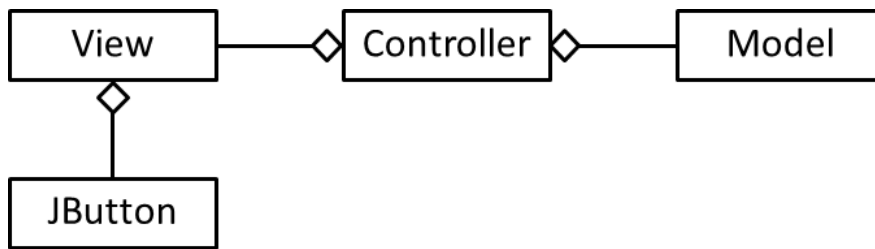
- c) How many ArrayList objects will be created if you make a deep copy of t?
How many Date objects will be created if you make a deep copy of t?

- d) What kind of copy of t is created by the following line of code?

```
List<Date> u = new ArrayList<Date>(t);
```

- e) Using three sentences or less, explain what you must do to make a deep copy of a HashMap<String, Date> object.

3. [10 marks] Suppose that you have a GUI application where the user can interact only with one button. The UML class diagram for such an application is shown below:



- a) (3 marks) Explain why the controller has a reference to the view.
- b) (3 marks) Explain why the controller has a reference to the model.
- c) (1 mark) Explain why the view has a reference to the button.
- d) (3 marks) There is a missing relationship between the button and the controller. Does the button have a reference to the controller, or does the controller have a reference to the button? You must explain your answer to receive any marks.