

Practice Final Examination

CMSC 10200, University of Chicago, Summer 2005

revision 1, 7/19, 9:40 AM: equals method in Point changed to consume an Object

Abbreviations. In your responses, feel free to use `pr` to mean `System.out.println` and IAE to mean `throw new IllegalArgumentException`.

An Object-Oriented Design

You will need to refer to this section in later questions.

```
public interface Point {
    public double x();
    public double y();
    public double dist(Point that);
    public String toString();
    public boolean equals(Object o);
}

public class APoint implements Point {
    /* body of class omitted */
}

public interface Triangle {
    public double perimeter();
    public double area();
    public Point[] corners();
    public Point lowestCorner();
}

public class ATriangle implements Triangle {
    /* body of class omitted */
}
```

General Knowledge of Java

1. Assume the class `APoint` includes two private instance variables, doubles `x` and `y`. Write the `equals` method for `APoint`.
2. Suggest private instance variable(s) for an implementation of the `Triangle` interface.
3. Write the `perimeter` method for `ATriangle`.
4. Write the `corners` method for `ATriangle`.

Look Closely

Explain the errors, if any, in the following code fragments.

1. `Point Q = (8.1, -1.2);`

2. `Point P = new APoint(1.0,2.1);`
 `System.out.println(A.toString);`

3. `Point C1 = new APoint(0.0,0.0);`
 `Point C2 = new APoint(1.1,2.2);`
 `Point C3 = new APoint(2.5,0.2);`
 `Triangle T = new Triangle(C1,C2,C3);`
 `System.out.println(T);`

Object-Oriented Programming

Assume in the following questions that you have been given the task of writing a program to simulate the game of Scrabble. Your design will include **ScrabbleTile** and **ScrabbleBoard** classes. (The **ScrabbleBoard** need only include information about the tiles on the board, not about the players, their scores or anything else.)

1. For the **ScrabbleTile** class, give the names and types of appropriate private instance variables.
2. For the **ScrabbleBoard** class, give the names and types of appropriate private instance variables.
3. Assume you are asked to create a “stateful” JSP webapp. If you were to use hidden fields to maintain the state of the Scrabble game, you would need to “marshal” the board at each step. Describe what a marshalled board might look like.
4. What elements of the game besides the board would you need to store in hidden fields in the progress of your webapp?

SQL Queries

Assume you are working with a database that holds information about the history of the kingdom of Zembla. At any point in history, Zembla is reigned over by a king or a queen. The database also stores information about castles in the kingdom, and each king or queen had a favorite castle.

The database consists of the following tables. Table names are listed in bold; fields are plain text, but primary keys are underlined and foreign keys are italicized. (Note that *FavoriteCastle* links to *CastleID* despite having a different name.)

RoyalPersons: RoyalPersonID, FirstName, Gender, BirthDate, DeathDate, *FavoriteCastle*

Castles: CastleID, Name, ConstructionStartDate, ConstructionEndDate, Latitude, Longitude

Reigns: ReignID, *RoyalPersonID*, StartDate, EndDate

Write queries to extract information from this database as follows.

1. Select all kings.
2. Select all monarchs who ruled for more than twenty-five years.
3. Select all queens who reigned in the twelfth century.
4. Select all queens whose favorite castle was completed during their reign.
5. Select all monarchs whose favorite castles were built at least 200 years before they began their reign.

Database JSPs

Assume you are making a website to allow users access to the Zembla database from the previous question. You would like to enable your users to choose monarchs by first initial.

Assume the page where users enter the initial has a text input with name `initial`. This page will pass its parameters to a JSP page that provides the user with a set of radio buttons for all monarchs with that initial.

1. Sketch the code where the appropriate SQL query is stitched together into a String `q`.

2. Assume your jsp page creates a `ResultSet` from your query with

```
ResultSet rs = stmt.executeQuery(q);
```

Sketch the code where the contents of this `ResultSet` are used to produce a set of radio buttons.

Database Design

You have been asked to build an air travel website that allows users to search flights and purchase tickets online. You will build this site using MySQL and JSP.

Sketch the design of the database for this project in the space below. Include the relationships between tables and any simplifying assumptions you made in characterizing those relationships.

Big Picture Question

Consider the various technologies you've seen in this course: Java programming, object-oriented design, Java server pages, SQL databases, and (briefly) graphical user interfaces. You can fit these pieces together to tackle a huge variety of software problems you might face in the real world.

Assume that you have been asked to manage a large software project: you will be building software to manage the Chicago Symphony Orchestra. The software must handle payroll for the orchestra as well as scheduling and ticket sales to customers. Briefly outline some of the software components that you would create in the course of this project.