[**May use one** 8.5×11 **inch sheet of paper for notes.**] Show all of your work clearly in the space provided or on the additional page at the end of the exam. If the additional page is used, clearly identify to which exam question it is related. Be sure to **read each problem carefully**. Note that the exam is double sided.

1. (10 points) Provide javadoc comments for the following method that you implemented as part of lab 6.

```java
public Fraction add(Fraction fraction) {
  ...
}
```

2. (10 points) Below is the beginnings of a Course class. Add a class constant, with the value 22, that describes the maximum number of students who can enroll in a course.

```java
public class Course {




}
```

3. (10 points) Clearly and concisely describe the object oriented concepts of **objects** and **classes**. Be sure to explain how they are different.

4. (10 points) Clearly and concisely describe the difference between **instance variables** and **local variables**.

5. (10 points) Consider the following line of code:

```
obj1.something(obj2, x, obj3);
```

When in the something method, to what object does the `this` reference point?

6. (10 points) Clearly and concisely explain the purpose of a Java package.

7. (15 points) Write a program that asks the user to enter their name (first and last) and weight (e.g., 158.73283). The program must use System.out.printf to display the person's name and weight where the weight must include two and only two digits after the decimal place. (E.g., **158.73**) You may use a GUI or console interface to get the input from the user.

8. (10 points) Draw the UML class diagram for the Dog class used in the following program:

```java
public static void main(String[] args) {
  Dog d1 = new Dog("Poodle");
  Dog d2 = d1;
  d1.setWeight(30.3);
  d2.setHeight(21.3);

  // Display some stuff
  System.out.println("I like your " + d1.getBreed());
  System.out.println("It looks like it is " + d1.getHeight() + " cm tall");
  System.out.println("and weighs " + d1.getWeight() + " kg.");
  d1.bark();
  System.out.println("Down boy!");
}
```

9. (15 points) Draw the memory diagram for the first three lines of code in the previous problem (all the lines before the "Display some stuff" comment). Be sure to show what local variables, if any, are available within the constructor, setWeight, setHeight, and main.