

This is a closed-book, closed-computer, etc. exam. You may use one 8.5"x11" sheet of notes, which you will turn in with your exam. Review all questions before you get started. Use the page at the end of the exam for extra work. Write your name on the front of each page. The exam is printed double-sided. Show all work.

1. (5 points) **Give an example** of what it means for there to be multiple instances of a class.
  
2. (5 points) Consider the method `void setHeight(int height){this.height=height;}` **Explain** what the keyword `this` means.

3. (15 points) **Write** a program to print out the number of capital A's in the string `str` entered by the user. For example, if the user enters "AN APPLE", the program should print 2.

```
public static void main(String[] ignored) {  
    Scanner in = new Scanner(System.in);  
    System.out.println("Enter any text: ");  
    String str = in.nextLine();
```

```
}
```

4. (15 points) Consider the following program:

```

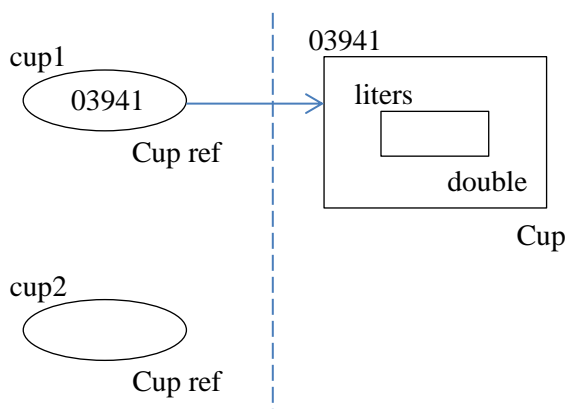
public static void main(String[] ignored) {
    Cup cup = new Cup();
    cup.addLiters(0.15);
    cup.drinkLiters(0.05);
    double liters = cup.getLiters();
    System.out.println("Amount left:"+liters);
}

```

Draw a UML class diagram for the Cup class, including all instance variables and methods needed to run the program above.

5. (10 points)

a. **Complete** the diagram below to illustrate the state of the program after the code on the right has run. The addLiters method increases the amount of water in given the cup by the specified amount. Cups start empty.



```

Cup cup1 = new Cup();
Cup cup2 = cup1;
cup1.addLiters(0.05);
cup2.addLiters(0.10);
System.out.println("c1:"+
    c1.getLiters());
System.out.println("c2:"+
    c2.getLiters())

```

b. **Write** what will print when the program is run.