A202/A598 & I211 Midterm Exam

Fall Semester 2005
Geology Building Room 126

There are 3 problems for 75 minutes. Each problem is worth 33 points. To this we add 5 points for each of the exam reviews you turned in last Tuesday and today. Please use the blue books provided to develop and write up your code. This is a closed-book and closed-notes exam, and entirely individual work: You are not supposed to exchange any information about the exam with anybody except the proctor(s). Do well!

Problem One. Implement a class Car with the following properties: A car has a certain fuel efficiency (measured in miles/gallon or liters/km—pick one) and a certain amount of fuel in the gas tank. The efficiency is specified in the constructor, and the initial fuel level is 0. Supply a method drive that simulates driving the car for a certain distance, reducing the fuel level in the gas tank. Also supply methods getGas, returning the current fuel level, and addGas to tank up. Sample usage:

```java
Car myHybrid = new Car(49); // 49 miles per gallon
myHybrid.addGas(20); // Tank 20 gallons
myHybrid.drive(100); // Drive 100 miles
System.out.println(myHybrid.getGas()); // Print fuel remaining
```

Note: If a car with a certain efficiency has fuel gallons of fuel in its tank and drives a certain number of miles it will use up miles / efficiency gallons, as expected.

Problem Two. Write a program that translates a number between 0 and 4 into the closest letter grade. For example, the number 2.8 (which might have been the average of several grades would be converted to B–). Break ties in favor of the better grade; for example, 2.85 should be a B.

Let’s work an example to understand this well: C+ is 2.3 and B– is a 2.7 (the numeric values of A, B, C, D, F are 4, 3, 2, 1 and 0. There is no F+ or F–. A plus sign increases the numeric value by 0.3 and a minus sign decreases it by 0.3). Given this, let’s suppose we have to turn 2.4 into a letter grade. Since 2.4 is between 2.3 (C+) and 2.7 (B–) we know that we need to choose between these two. We always choose the closest. In this case: 2.4 is closest to 2.3 and therefore 2.4 must be recorded as a C+. The tie example here is when we are
given 2.5 which is equally apart from 2.3 and 2.7 and the rule says: choose the
better grade (in this case B-).

It’s perfectly acceptable if you assume a variable double number; has the
value that needs to be converted and you just write the relevant code that would
print the letter grade that would correspond to the value in number, without
providing any boilerplate (surrounding classes and a main method).

**Problem Three.** Provide the code for the toString() method in the Triangle
class below. The code (minus the code that you have to write) and its output
are shown below:

```java
sluggo% cat Triangle.java
class Triangle {
    int width;
    Triangle(int width) {
        this.width = width;
    }
    public String toString() {
        // write this method
    }
    public static void main(String[] args) {
        Triangle a = new Triangle(4);
        System.out.println(a.toString());
        a = new Triangle(10);
        System.out.println(a.toString());
    }
}
sluggo% javac Triangle.java
sluggo% java Triangle
```

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