MACS 261J
Final Exam
May 5, 2012 **Name:** _____

Question:	1	2	3	4	5	6	7	8	9	Total
Points:	15	5	5	5	10	10	15	25	10	100
Score:										

Question 1 . . . . . (15 points)

What is printed by the following Java statements?

```
int x = 9 / 9 + 3 * 4;
int y = x/4;
int z = x%4;
System.out.println("x="+x+" y="+y+" z="+z);
x = 6; y = 6; z = 6;
--x; ++y; z /= 3;
System.out.println("x="+x+" y="+y+" z="+z);
for (int i=0; i<4; ++i)
  System.out.print(i); // not println!
for (int i=4; i>0; --i)
  System.out.print(i); // not println!
System.out.println();
int n = 5;
while (n!=1) {
  if (n%2==0) {
    n = n/2;
  } else {
    n = 3*n+1;
  }
  System.out.println(n);
}
```

Question 2 . . . . . (5 points)

Complete the following method, which returns the smallest integer that is greater than or equal to the specified value. Ensure that your method works for both negative and non-negative values of `x`.

```
public static int ceiling(double x) {




}
```

Question 3 ..... (5 points)

How many *bits* in a Java `byte`?
How many bytes in a Java `short`?
How many bytes in a Java `int`?
How many bytes in a Java `float`?
How many bytes in a Java `double`?

Question 4 ..... (5 points)

Complete the following method, which returns the number of negative values in the specified array.

```
public static int countNegativeValues(float[] x) {









}
```

Question 5 ..... (10 points)

Complete the following method, which returns a new array containing only the negative values in the specified array.

```
public static float[] getNegativeValues(float[] x) {









}
```

Question 6 . . . . . (10 points)

Complete the following method, which returns a new 1D array with all of the elements copied from the specified 2D array `x`.

```
public static float[] twoToOne(float[][] x) {









}
```

Question 7 . . . . . (15 points)

Complete the following method, which reads a binary file containing a sequence of 500×500 `int`s, pixels of an image that are returned as a 2D array of `float`s. (Hint: do not construct a 2D array of `int`s.)

```
public static float[][] readImage(String fileName) {









}
```

Question 8 ..... (25 points)

(a) [15 points] Implement all methods for the following class:

```
/** A fuel tank has a width, height, and depth. */
public class FuelTank {

  /** Constructs an empty fuel tank with specified dimensions. */
  public FuelTank(double width, double height, double depth) {




  }

  /** Returns the capacity of this tank, the volume of fuel it
   * contains when completely full. */
  public double getCapacity() {


  }

  /** Returns the fraction (a number between zero and one) of tank
   * capacity that is currently consumed by fuel in this tank. */
  public double readFuelGuage() {


  }

  /** Attempts to add the specified volume of fuel to this tank.
   * Less than the specified volume of fuel will be added if the
   * tank becomes full. Returns the actual volume added. */
  public double addFuel(double volume) {









  }
                                                    // declare private
                                                    // fields here


}
```

(b) [10 points] This part of the question is about *using* a class. Specifically, *using the methods of the class* `FuelTank` *defined above*, implement the method `main` for the following class:

```
/**
 * Demonstrates use of the class FuelTank.
 * (1) Constructs a tank with width 0.5 m, height 0.1 m, and depth 0.3 m.
 * (2) Uses the constructed fuel tank to print its capacity.
 * (3) Adds 100 liters (0.1 cubic meters) of fuel to the tank.
 * (4) Prints the actual volume of fuel added.
 */
public class FuelTankDemo {
  public static void main(String[] args) {









  }
}
```

Question 9 ..... (10 points)

Complete the following Java method, which computes and then prints the value of the sum $\frac{1}{2} + \frac{2}{3} \cdots + \frac{n-1}{n}$, for a specified `n`. (Hint: the value is not zero.)

```
public static void printSumOfFractions(int n) {









}
```