CSCI 261J
Final Exam
May 3, 2014 **Name:** _____

Question:	1	2	3	4	5	6	7	Total
Points:	10	20	15	10	10	20	15	100
Score:								

Question 1 . . . . . (10 points)

(a) Every Java class must have a method `main`.
True or false?

(b) If a Java class declares no constructors, a default constructor is provided.
True or false?

(c) Every Java method returns a value.
True or false?

(d) All Java classes extend (either directly or indirectly) the standard Java class `Object`.
True or false?

(e) Name a standard Java keyword (also called a "reserved" word) that is associated with the object-oriented principle of inheritance.

(f) How many *bits* are in a Java `byte`?

(g) How many bytes are in a Java `short`?

(h) How many bytes are in a Java `int`?

(i) How many bytes are in a Java `float`?

(j) How many bytes are in a Java `double`?

Question 2 ..... (20 points)

What is printed by the following program fragments?

(a)
```
int a = 3, b = 4;
double c = a/b+a%b;
System.out.println(c);
```

(b)
```
int a = 5, b = 4, c = 3, d = 2;
boolean t = a==b || a<b && b<c || c>d;
System.out.println(t);
```

(c)
```
System.out.println(1+1);
System.out.println("1"+1);
```

(d)
```
int[] a = {1,2,3};
int[] b = a;
b[1] = 0; a[1] = 4;
System.out.println(b[1]);
```

(e)
```
for (int i=1; i<=3; ++i)
  System.out.println(i);
```

(f)
```
int n = 0, sum = 0;
while (n<4 && sum<=6) {
  System.out.print(" "+sum);
  sum += n;
  ++n;
}
```

(g)
```
double x = 1.0+(int)Math.PI;
System.out.println(x);
```

(h)
```
double celsius = 10;
double fahrenheit = 32+9/5*celsius;
System.out.println(fahrenheit);
```

(i)
```
int[] a = {1,2,3,4};
for (int i=0; i<2; ++i) {
  double ai = a[i]; a[i] = a[3-i]; a[3-i] = ai;
}
System.out.println(a[0]+" "+a[1]+" "+a[2]+" "+a[3]);
```

(j)
```
int[] a = {1,2,3,4};
for (int i=0; i<4; ++i) {
  double ai = a[i]; a[i] = a[3-i]; a[3-i] = ai;
}
System.out.println(a[0]+" "+a[1]+" "+a[2]+" "+a[3]);
```

Question 3 ..... (15 points)

Complete the following methods.

(a)
```
// Returns a new array with elements copied from the specified
// array, but in reverse order.
public static float[] reverse(float[] a) {









}
```

(b)
```
// Returns true, if array elements are sorted by increasing
// values, so that a[0]<=a[1]<=a[2]<=...; false, otherwise.
public static boolean isSorted(float[] a) {









}
```

(c)
```
// Returns a new 2D image, with pixels copied from the specified
// image a, but flipped upside down. Assume that a[0] contains
// the first column of pixels in the specified image.
public static float[][] flipVertical(float[][] a) {









}
```

Question 4 ..... (10 points)

Complete the following methods. Implement the second method simply, without loops, by calling the first method one or more times.

```
// Returns a new array with elements copied from the array a,
// followed by those from the array b.
public static float[] concatenate(float[] a, float[] b) {









}

// Returns a new array with elements copied from the array a,
// followed by those from the array b, followed by those
// from the array c.
public static float[] concatenate(float[] a, float[] b, float[] c) {




}
```

Question 5 ..... (10 points)

Complete the following method to draw n circles with identical centers $(x, y) = (100 \times n, 100 \times n)$, and radii $100 \times k$, for $k = 1, 2, \ldots, n$. Use the method `drawOval(int x, int y, int width, int height)` in the class `Graphics`.

```
public static void drawCircles(Graphics g, int n) {









}
```

Question 6 . . . . . (20 points)

(a) Complete the following Java class, which represents rational numbers, which are numbers that can be expressed as ratios of integers.

```
public class Rational {

  // Constructs a rational number for specified numerator and denominator.
  public Rational(int num, int den) {




  }

  // Gets the value of this rational number; for example, 0.75 if 3/4.
  public double getValue() {



  }

  // Returns true, if this rational number has the same value as
  // the specified rational number; false, otherwise.
  public boolean equals(Rational that) {



  }

  // Returns a string that represents this rational number as a fraction.
  public String toString() {




  }

  // private fields



}
```

(b) Write a *complete* Java demo program (a class with a method `main`) that uses methods of the class `Rational` to

1. construct a rational number 1/3,
2. construct a rational number 2/6,
3. print the two rational numbers, and
4. determine and print whether or not the two numbers are equal.

Question 7 . . . . . (15 points)

For each of the following questions, circle *all (one or more)* correct answers.

(a) To read binary doubles from a FileInputStream, we should construct a

A. FileDataReader
B. Scanner
C. DataInputStream
D. DataOutputStream

(b) Which of the following properties apply to text files?

A. Contain only alphabetic letters, not numerals.
B. Can be viewed easily using any text editor.
C. Are usually smaller than binary files.
D. Contain bytes that represent characters and digits.

(c) A program writes one int value, two doubles and three floats to a new binary file. How many bytes are in the file?

A. 6
B. 24
C. 28
D. 32

(d) Why is it important to always close an output stream?

A. To ensure that all data are written to the file.
B. To erase all of the data in the file.
C. To enable construction of another output stream.
D. Because the data written might not be in memory.

(e) Which of the following standard Java exceptions must be caught?

A. RuntimeException
B. IOException
C. FileNotFoundException
D. InputMismatchException

(f) Consider a class with a field declared and initialized as follows:

```
private static int count = 3;
```

This field

A. can be modified using methods of this class.
B. can be modified using methods of other classes.
C. is stored in memory with each object of this class.
D. is stored in memory associated only with the class.