Name:_____ NetID:_____

Answer all questions in the space provided. Write clearly and legibly, you will not get credit for illegible or incomprehensible answers. This is a closed book exam. However, each student is allowed to bring one page of notes to the exam. Print your name at the top of every page.

Question:	1	2	3	4	5	6	7	8	9	Total
Points:	18	8	6	10	10	18	12	12	6	100
Score:										

1. Multiple choice questions: Select the single correct answer for each.

   (a) Which methods can access the private variables of a class? (2)

   A. Only static methods of the same class.
   B. Only methods defined in the same class.
   C. Only methods defined in the same package.
   D. Only methods within inner classes.

   (b) A member declared with a `protected` access modifier is *not always* visible to: (2)

   A. the class in which it is declared.
   B. classes that extend the class in which it is declared.
   C. parent classes of the class in which it is declared.
   D. classes nested inside the class in which it is declared.

   (c) A static variable with no access modifier could *not* be accessed by: (2)

   A. A static method in the same class.
   B. A non-static method in the same class.
   C. A final method defined within the same package.
   D. A private method defined in a different package.

   (d) Which code could you use to instantiate a new HashMap that associates String keys with Integer values? (2)

   A. `... = <String, Integer>HashMap();`
   B. `... = new HashMap<Integer, String>();`
   C. `... = new HashMap[String, Integer];`
   D. `... = new HashMap<String, Integer>();`
   E. `... = new HashMap<String, int>();`
   F. `... = new HashMap<String, Integer>;`
   G. `... = HashMap<String, Integer>();`
   H. `... = new HashMap<String>(Integer);`

   (e) Which of the following is true of an unchecked exception? (2)

   A. It must be handled at compile time with a try/catch construct.
   B. It is thrown because of unavoidable circumstances, such as a file not being found.
   C. It extends `RuntimeException`.
   D. It cannot be caught at runtime.

(f) Which of the following is *not* a keyword used in exception handling? (2)

A. finally
B. catch
C. final
D. throw
E. try
F. throws

(g) What is the value of the following expression? `"one" + 2 + 3 * 4` (2)

A. `"one234"`
B. `"one212"`
C. `"one14"`
D. `15`
E. This expression would result in a compilation error.

(h) What is displayed when the following code is compiled and executed? (2)

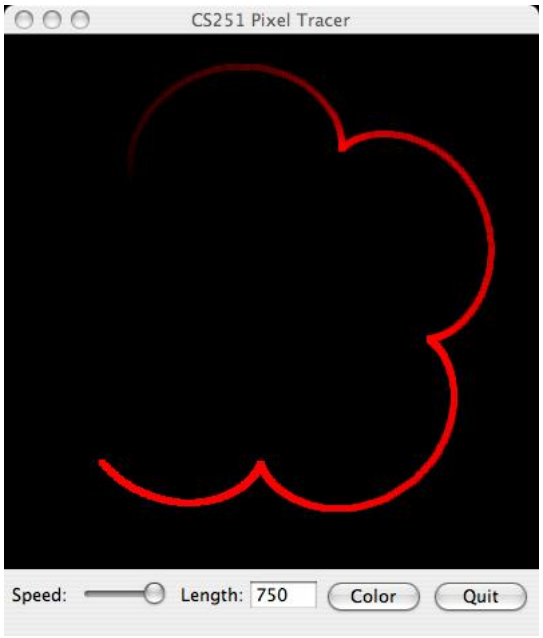
```
public class StringCompare {

    public static void main(String[] args) {
        String s1 = new String("Test");
        String s2 = new String("Test");
        if (s1==s2) System.out.println("Same");
        if (s1.equals(s2)) System.out.println("Equals");
    }
}
```

A. `Same`
   `Equals`
B. `Equals`
C. `Same`
D. The code compiles, but nothing is displayed upon execution.
E. The code fails to compile.

(i) If you wanted to perform custom painting in a `JPanel`, which method would you override? (2)

A. `draw`
B. `drawComponent`
C. `pack`
D. `paint`
E. `paintComponent`
F. `redraw`
G. `repack`
H. `repaint`
I. `repaintComponent`
J. `refresh`

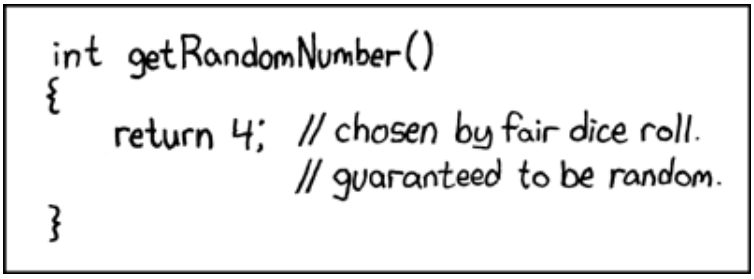
2. Assignment 1 was an implementation of a visualizer for an epicycle. At that point we didn't know much about GUIs but now I think you can make an educated guess as to what components, etc. were necessary to set up that window. What layout managers and components did I use? (8)



3. Write code to create a JButton with text "Click Me" that prints "You clicked me!" to the console when it is pressed. Only create the button, you do not have to add it to a layout, show a window, etc. Use an anonymous class for the action listener. (6)

4. For this problem, you should write a very simple but complete class that represents a counter that counts 0, 1, 2, 3, 4, ... The name of the class should be `Counter`. It has one private instance variable representing the value of the counter. It has two instance methods: `increment()` adds one to the counter value, and `getValue()` returns the current counter value. Write a complete definition for the `Counter` class. (10)

5. Write a method that takes a `Collection` of `String` objects (any type of collection, not a specific implementation) and returns the length of the longest one. If the collection is empty, return -1. (10)



6. Why do the following code snippets not compile? (Explain in one sentence each.)

(a) `Set<int> values;` (3)

(b) `List<String> names = new List<String>();` (3)

(c) (3)

```
public static String myMethod(int x) {
    if( x > 5 ) {
        return "bigger than five!";
    }
}
```

(d) (3)

```
public class Test {
    public void method() {

        for(int i = 0; i < 3; i++) {
            System.out.println(i);
        }

        System.out.println(i);
    }
}
```

(e) (3)

```
public class MyClass {
    private int x = 10;

    public static void main(String[] args) {
        System.out.println(x);
    }
}
```

(f) (3)

```
public class MyClass {
    public static enum MyEnum {
        YES,
        NO,
        MAYBE;
    }

    public MyEnum enumVal = new MyEnum();
}
```

7. Consider the four core interfaces, `Set`, `List`, `Queue`, and `Map`.

   For each of the following parts, specify which of the four core interfaces is best-suited, and explain how to use it to implement the problem. (No need for code, just a sentence will do.)

   (a) Whimsical Toys Inc (WTI) needs to record the names of all its employees. Every month, an employee will be chosen at random from these records to receive a free toy. (3)

   (b) WTI has decided that each new product will be named after an employee – but only first names will be used, and each name will be used only once. Prepare a collection of unique first names. (3)

   (c) WTI decides that it only wants to use the most popular names for its toys. Count up the number of employees who have each first name. (3)

   (d) WTI acquires season tickets for the local lacrosse team, to be shared by employees. Create a waiting list for this popular sport. (3)

8. Consider the following classes. What is the output of this code? (12)

```
public class Foo {
    protected double x;
    protected int y;
    protected String z;

    public Foo() {
        this("Summer");
    }

    public Foo(String x) {
        this(x, x.length());
    }

    public Foo(String x, int y) {
        this.x = y / 2.0;
        this.y = y;
        this.z = x;
    }

    public void print(String x) {
        System.out.println(x);
        System.out.println(y);
        System.out.println(z);
    }

    public void print(double z) {
        System.out.println(x);
        System.out.println(y);
        System.out.println(z);
    }
}
```

```
public class Bar extends Foo {

    public Bar(String y) {
        super("Exam");
        System.out.println(y);
        System.out.println(z);
    }

    public void print(int x) {
        print(x / 3);
    }

    public void print(String x) {
        System.out.println(x);
        print(x.length() / 2.0);
    }

    public static void main(String[] args) {
        Foo test = new Bar("Final");
        test.print("CS" + 251);
    }
}
```

9. Please organize the following objects in a feasible inheritance hierarchy: *Continent, Country, Africa, Indiana, NewYorkCity, State, Albuquerque, County, Boston, SanteFe, NorthAmerica, France, Bernalillo, NewMexico, GeographicArea* (You may add additional objects if it helps your organization.) (6)