Name: _____
Please also put your name on the back of the last page.

CSCI 111, Fall 2010
Final Exam, December 13th, 2010
110 minutes (8:00 – 9:50 a.m.)
Two 1-sided 8.5" x 11" pages of notes (or one 2-sided)
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There are nine questions in this test on numbered separate pages. It is your responsibility to ensure that you have all of the questions. If you need more space for your answer to a question, use the back of the previous (facing) page.

The time limit will be strictly enforced.

Show your work, or it won't be possible to give partial credit for an incorrect answer.

You don't need to include any comments in any code that you write.

Qn.	Max	Deduct
1	8	
2	9	
3	6	
4	5	
5	9	
6	12	
7	12	
8	3	
9	13	
10	12	
11	11	
TOTAL	100	

1. (8 points)

   a) (1 point) Approximately how many bytes are there in a gigabyte?

   b) (1 point) Approximately how many bits are there in a gigabyte?

   c) (4 points) List each of the eight Java primitive types and specify how much storage in bytes will be used for an element of that type.

   d) (2 points) If you have an array list named `fred` which you want to store `double` values, how do you declare it?

2. (9 points)

(a) (3 points) What will be output by the following code segment? As usual, show spaces with individual underscores.

```
int x = 0;
int[][] q2 = {{1, 3, 5},
              {-2, 4, 6, -2},
              {6, 8, 2, 4, -2, -1},
              {-2, 3, 4}};

for (int i = 0; i < q2.length; i++)
    for (int j = 0; j < q2[i].length; j++)
        if (q2[i][j] < 0)
            x += q2[i][j];

System.out.format("x is%d%n", x);
```

(b) (3 points) If the first for loop in (a) were changed to:

```
for (int i = 0; i < q2[0].length; i++)
```

what would have been the output, or would an exception be thrown?

(c) (3 points) If the second for loop in (a) were changed to

```
for (int j = 0; j < q2[0].length; j++)
```

what would have been the output, or would an exception be thrown?

3. (6 points) What will be output by the following code segment? (Assume that `java.util.*` has been imported.)

```
ArrayList<Integer> qn3 = new ArrayList<Integer>();

qn3.add(1);
qn3.add(3);
qn3.add(5);
for (int i = 0; i < qn3.size(); i++)        // output the array list
    System.out.format("%d,", qn3.get(i));
System.out.println();

qn3.remove(1);
for (int i = 0; i < qn3.size(); i++)
    System.out.format("%d,", qn3.get(i));
System.out.println();

qn3.add(0, 2);
for (int i = 0; i < qn3.size(); i++)
    System.out.format("%d,", qn3.get(i));
System.out.println();
```

4. (5 points) Suppose I have five classes, with headers `public class A`, `public class B extends A`, `public class C extends A`, and `public class D extends B`, and `public class E extends D`.

   `A` contains definitions for the methods `w()` and `x()`, `B` contains a definition for the method `x()`, `C` contains definitions for the methods `x()` and `y()`, `D` contains definitions for the methods `w()` and `z()`, and `E` contains a definition for `y()`.

   Fill in the table below with whether each method can be used in the class and, if so, which definition will be used (i.e., the name of the class in which it is defined)

	w()	x()	y()	z()
A				
B				
C				
D				
E				

5. (9 points) Write a code segment that will display a dialog box with the message `Please enter a double` and will then output twice the value entered to an output dialog box with the message `Twice the value is ?.??` where `?.??` is twice the value entered rounded to two decimal places. For example, if the user enters `1.234` in the input box then the output box will contain `Twice the value is 2.47`

   You don't need to specify imports, but should declare the boxes.

6. (12 points) Consider the following class definitions:

```
public class qn4a
{
    private int y,
                z;

    public qn4a(int in_y, int in_z)
    {
        y = in_y;
        z = in_z;
    }

    public int method1(int n)
    {
        return n * y + z;
    }

    public int method2()
    {
        return y + z;
    }
}

public class qn4b extends qn4a
{
    private int x;

    public qn4b(int in_x, int in_y)
    {
        super(in_y, 2);
        x = in_x;
    }

    public int method1()
    {
        return x * 2;
    }
}
```

What will be output by the following code in a `main()` method?

```
qn4a ann = new qn4a(3, 5);
qn4b jack = new qn4b(2, 4);

System.out.println(ann.method1(2));
System.out.println(ann.method2());
System.out.println(jack.method1());
System.out.println(jack.method2());
```

7. (12 points) Write a class definition for the class `SalesTrip` defined below. A `SalesTrip` object will describe the results of a sales trip to a city, along with the date of the trip.

   `SalesTrip` has four instance fields that must be declared as private:

   - `int income`
   - `int cost`
   - `String city`
   - `String date`, which will have the form "`mm/dd/yyyy`". For example, for today `date` would be the string "`12/13/2010`".

   The constructor will have the header `public SalesTrip(int in_income, int in_cost, String in_city, String in_date)` and will provide the values for the four instance fields.

   There will also be one class field, `numTrips`, which will keep track of the number of sales trips. So it will initially be `0` and will then increase by `1` as each new `SalesTrip` object is defined.

   There will be three public methods:
   - `public int profitOrLoss()` will return the value of `income - cost`.
   - `public static int getNumTrips()` will return the value of `numTrips`.
   - `public void describeTrip()` will output one of three messages depending on the value of `profitOrLoss()`. If it is positive then if, for example, it were a trip to Chicago on 12/19/1979 with `profitOrLoss()` of `123`, then the output would be:
     ```
     The trip to Chicago on 12/19/1979 had a profit of $123.
     ```
     The same trip with a `profitOrLoss()` of `-123` would have output
     ```
     The trip to Chicago on 12/19/1979 had a loss of $123.
     ```
     The same trip with a zero `profitOrLoss()` would give
     ```
     The trip to Chicago on 12/19/1979 broke even.
     ```

   If you need more space use the back of the previous (facing) page. You don't need to include any comments.

8. (3 points) In the program in question 7, why did I need to declare `getNumTrips()` as `static`, or would it have worked if I had omitted the `static` keyword in the method header?

9. (13 points) Write a class definition for the class `TripRecord` defined below:

   `TripRecord` has a single instance field which is a private array list of `TripReport` objects called `allTrips`, where `TripReport` was the class defined in Question 7.

   `TripRecord`'s constructor does nothing.

   `TripRecord` has three methods, two of which use methods defined in `TripReport`.

   - `public void addTrip(TripReport x)` adds the trip report x to the array list.
   - `public int cityProfit(String city)` returns the total profit for all trips to the specified city.
   - `public void describeAllTrips()` uses the format given in the `TripReport` class definition to output information on all of the trips in the array list.

   For example, if a `main()` method to test `TripRecord` and `TripReport` contains:

```
TripRecord myTrips = new TripRecord();
myTrips.addTrip(new SalesTrip(5000, 3000, "Chicago", "02/05/2000"));
myTrips.addTrip(new SalesTrip(200, 200, "Bozeman", "11/11/2000"));
myTrips.addTrip(new SalesTrip(3000, 3050, "Chicago", "09/10/2001"));
System.out.format("Total profit for Chicago is %d%n",
                  myTrips.cityProfit("Chicago"));
myTrips.describeAllTrips();
```

   The output would be:

```
Total profit for Chicago is $1950
The trip to Chicago on 02/05/2000 had a profit of $2000.
The trip to Bozeman on 11/11/2000 broke even.
The trip to Chicago on 09/10/2001 had a loss of $50.
```

   If you need more space use the back of the previous (facing) page. You don't need to include any comments.

10. (12 points) Write a method `public static int[] first2(int[] myArr)` which returns a two-element array containing the first two elements of the 1D array `myArr`. If `myArr` only contains one element, return a two-element array with that element as the first value and `-1` as the second value. For example, if we run the code segment below

```
int[] arr1 = {1, 3, 5, 7, 9},
      arr2 = {6},
      res1 = first2(arr1),
      res2 = first2(arr2);
System.out.format("%d %d%n%d %d%n",
                  res1[0], res1[1], res2[0], res2[1]);
```

in a calling method then the output will be

```
1 3
6 -1
```

11. (11 points) You want to run the code

```
int x = in.nextInt();
```

but you expect your user to mess up and so `InputMismatchException` will be thrown. Assume that the `Scanner` object `in` has already been declared. Protect the code, and if the user does enter a value that raises this exception output the message

```
You've entered ??? for an int
```

where `???` is the invalid entry that they made, and then just set `x` to zero and continue.

For example, if the user enters `5` then that will be the value of `x` used by the rest of the program, but if the user enters `-1.23` you will output the message

```
You've entered -1.23 for an int
```

in a `catch` block and will then use `0` as the value for `x` for the rest of the program.

Name: _____