INSTRUCTIONS
This is an open book, open notes exam. There is no sharing of materials. Electronic devices, including but not limited to calculators, computers, iPods, headphones, etc. are not allowed. You must show your Student ID to the proctor upon request. You must remain in the exam room for at least half of the exam time. Failure to abide by these terms will result in a score of zero on this examination.

NAME
_________________________________________________________

NET ID
_________________________________________________________
(example: ab111111)

LAB SECTION (circle one)
Mon 12:35pm    Tues 2:45pm    Wed 4:15pm    Tues 1:15pm    Wed 2:45pm
Mon 4:40pm    Wed 1:40pm    Mon 1:40pm    Wed 11:30am    Thu 2:45pm

For scoring use only - do not write below this line

1. ___________ / 12  4. ___________ / 10  7. ___________ / 20

2. ___________ / 15  5. ___________ / 15  E.C. ___________ / 4

3. ___________ / 18  6. ___________ / 10  Total: ___________ / 100
QUESTION 1 (12 points)

A) What is the binary value of the hexadecimal number 21? ____________________

B) Code that handles a thrown exception must go in a ____________________ block.

C) What is the output of the following code?

```java
String message = "abcdefghi";
System.out.println( message + " (" + message.length() + ")" );
```

D) Write one line of code to change the value of 9 in the array given below to 10.

```java
int[][] arr = {{2,3,4},{3,3,3},{1,6,7},{3,6,9}};
```

E) Briefly describe in your own words procedural decomposition:

method based

F) Write a line of code to call the method in Question 2. Use the file “final.txt” as the parameter.

```
Proper parameters to Picture constructors were covered.
```
QUESTION 2  (15 points)  **absolutely clear, precise and accurate**

Add full Javadoc-compliant comments to the following class, describing its function & behavior. For full credit, also add comments within the method to explain each relevant block of code. (You may also add your name as the author).

In Chaiken's words, describe the PURPOSE of EACH LINE OF CODE!

```java
public class PhotoChanger {

    public static void update(Picture pic, Color color){

        for( int h=0; h<pic.getHeight(); h++ ){
            for( int w=0; w<pic.getWidth(); w++ ){

                Pixel p = pic.getPixel(w,h);

                if( p.getColor().colorDistance(color) > 1 )
                    pic.getPixel(w,h).setColor(Color.BLACK);
            }
        }

        pic.show();
    }
}
```
QUESTION 3  (18 points)

The following code outlines a class method called randomTurtle, which takes in an array of Turtle objects as a parameter. This method should randomly choose and return a Turtle object from the given array. Fill in code to make this happen. It must be possible for any Turtle in the array to be chosen.

```java
public static Turtle randomTurtle( Turtle[] turtles )
{

    // We didn't mention random numbers, but this question would be fair if it also said: You may use the static method (of the myTools class) myTools.randInt(int a, int b) to find and return a random int between a and b inclusively.

}
```

In order for your code to compile, would you need to import any classes? If so, list the import statements here:

YES

Write code for testing the above method:

YES
QUESTION 4 (10 points)

Consider the following Java statements:

```java
String a = "Object-Oriented Programming";
String b = "34";
String c = "5";
String d = "p";
String e = "x";
String f = "-";
```

A problem similar to this but with an array, not Strings, would be fair. (We didn't cover String ops other than + and length.

What is the output if each of the following statements is executed after the above code?

A) `System.out.println(a.charAt(5));`  ____________________

B) `System.out.println(c+b+d);`  ____________________

C) `System.out.println(a.substring(16,24));` ____________________

D) `System.out.println(a.indexOf(e));`  ____________________

E) `String[] t = a.split(f);
   System.out.println(t[1]);`  ____________________

```java
```
QUESTION 5 (15 points)

The code below outlines a shell for a method called tail with two parameters: filename and numLines. This method should modify the file specified by filename by removing the first numLines lines. Fill out the method with Java code to make it perform correctly. You must handle file not found and general exceptions. You may assume that any required packages have been imported. Remember, you need to modify the original file, not create a new one.

*Hint: Use an ArrayList.*

```java
public void tail( String filename, int numLines )
{
    Not fair for Spr 2012! We didn't cover Java file access APIs. Instead we did image processing topics including making lines and circles with loops, vignetting, blurring, edge detecting, and copying images.
}
```
QUESTION 6 (10 points)

Create a class method called shiftLeft. This method will take in one character array as a parameter, and will shift all elements in that array one position to the left. The left-most (first) element in the array should be moved to the end of the array. Finally, it should return the shifted character array.

As an example, if the array {'a','b','c'} were passed to your method, it must return {'b','c','a'}. 

int or double or String array
QUESTION 7 (20 points)

A shipping company wants to keep track of the driving habits of its drivers. Create a class called SpeedTracker to track the speed of a truck. The class should have a field for maximum speed and have a way to store multiple speed readings. There should be a constructor that takes one parameter, the maximum speed. There should be three public methods: addSpeedReading adds a new speed reading to the list; getAverageSpeed returns the average of all the speed readings; tooFast returns true if any speed reading is greater than the maximum speed, false otherwise. Remember to import any packages you may need. If you use the back of this page, please indicate.

You may limit the number of speed readings that a SpeedTracker object can track to 100000. Hint: use int (or double) speedArray[ ]; speedArray = new int (or double) [ 100000 ];
EXTRA CREDIT (4 points)

Important! Do NOT work on this question before you have finished the rest of the exam!

$$16578_{10} = \ldots \ldots _{36}$$
$$= \ldots \ldots _{16}$$
$$= \ldots \ldots _{2}$$