CSE 8B
Midterm
Winter 2015

Page 1 __________ (20 points)
Page 2 __________ (14 points)
Page 3 __________ (12 points)
Page 4 __________ (12 points)
Page 5 __________ (18 points)
Page 6 __________ (15 points)
Page 7 __________ (11 points)
Total __________ (102 points = 97 base points + 5 points EC [5%])
(97 points = 100%)

This exam is to be taken by yourself with closed books, closed notes, no electronic devices.
You are allowed one side of an 8.5"x11" sheet of paper handwritten by you.
(Partial) Operator Precedence Table

<table>
<thead>
<tr>
<th>Operators</th>
<th>Associativity</th>
</tr>
</thead>
<tbody>
<tr>
<td>! ++ --</td>
<td>(pre &amp; post inc/dec) right to left</td>
</tr>
<tr>
<td>* / %</td>
<td>left to right</td>
</tr>
<tr>
<td>+ -</td>
<td>left to right</td>
</tr>
<tr>
<td>&lt; &lt;= &gt; &gt;=</td>
<td>left to right</td>
</tr>
<tr>
<td>== !=</td>
<td>left to right</td>
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<tr>
<td>&amp;&amp;</td>
<td>left to right</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td>=</td>
<td>right to left</td>
</tr>
</tbody>
</table>

What are the values of the indicated variables after the following code segments are executed?

```
int a = 2, b = 6, d;
boolean c = !(b > 6) && (a >= 3) && (a <= 4) || (b < 6);
if ( a++ >= 4 && --b >= 2 )
   d = ++a + b--;                 
else
   d = a++ + --b;
```

<table>
<thead>
<tr>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

What gets printed?
```
int a = 2;
int b = 4;
int c = 6;
System.out.println( a + b + (c + " = ") + a + (b + c) );
```

What gets printed?
```
public class While {
   public static void main( String[] args ) {
      final int MAX = 11, MIN = 4;
      int i = 8, j = 6;
      while ( i <= MAX ) {
         j = i;
         while ( j > MIN ) {
            System.out.println( i + " " + j ); // Print i and j with
            j -= 2;                          // a space between them
         }
         i += 3;
      }
      System.out.println( i + " " + j ); // Print i and j with
   } // a space between them
}
```

<table>
<thead>
<tr>
<th>Output</th>
</tr>
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<tbody>
<tr>
<td></td>
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</tbody>
</table>
What is the output of this recursive method if it is invoked as `mystery(932)`; Draw Stack Frames to help you answer this question.

```java
public static void mystery(int a) {
    int b = a % 10;
    System.out.println(a);
    if (a >= 10) {
        mystery(a / 10);
    } else {
        System.out.println("Stop");
    }
    System.out.println(b);
}
```

Output

```
x =
in increment x =

Before increment y =
in increment y =
After increment y =
```

The different increment() method definitions have the same name but differ in their formal parameters. This is an example of method ____________________.

What is the output produced by the following program? (Hint: Draw stack frames)

```java
public class Increment {
    public static void main(String[] args) {
        int x = 3;
        System.out.println("x = " + x);
        increment(x);
        System.out.println("x = " + x);
        int[] y = {0,1,2,3,4};
        System.out.println("Before increment y = " + getString(y));
        increment(y);
        System.out.println("After increment y = " + getString(y));
    }
    public static void increment(int x) {
        x++;
        System.out.println("in increment x = " + x);
    }
    public static void increment(int[] y) {
        for(int i = 0; i < y.length; i++) {
            y[i]++;
        }
        System.out.println("in increment y = " + getString(y));
    }
    public static String getString(int[] x) {
        String ret = " ";
        for(int i = 0; i < x.length; i++) {
            ret = ret + x[i] + ", ";
        }
        return ret;
    }
}
```

Output

```
x =
in increment x =
x =
Before increment y =
in increment y =
After increment y =
The different increment() method definitions have the same name but differ in their formal parameters. This is an example of method ____________________.
```
Recall from PA2, class WordPair (right) is defined with a word and a count along with accessor methods getWord() and getCount(). We used an ArrayList of these WordPair objects to maintain information about the number of occurrences of each word in a text file. You can assume there are no duplicate count values - each word has a different count value. You can also assume there is at least one WordPair object in the ArrayList.

What does the following method do (use letters to the right)?

(3 pts) Write the letter corresponding to your answer here _______

```
public static int mystery( ArrayList<WordPair> list ) {
    int var1 = list.get(0).getCount();
    String var2 = list.get(0).getWord();
    for ( int i = 1; i < list.size(); ++i ) {
        if ( list.get(i).getCount() < var1 ) {
            var1 = list.get(i).getCount();
            var2 = list.get(i).getWord();
        }
    }
    return var1;
}
```

A) Finds the max count of any word
B) Finds the min count of any word
C) Finds the word with the max count
D) Finds the word with the min count
E) Finds the word with the specified count
F) Finds the count of the specified word
G) Finds the index of the specified word
H) Finds the index with the specified count

What does the following method do (use letters to the right)?

(3 pts) Write the letter corresponding to your answer here _______

```
public static String mystery( ArrayList<WordPair> list, int x ) {
    int var1 = 0;
    String var2 = null;
    for ( int i = 0; i < list.size(); ++i ) {
        if ( list.get(i).getCount() == x ) {
            var1 = list.get(i).getCount();
            var2 = list.get(i).getWord();
        }
    }
    return var2;
}
```

You type `java Foo2` at the command line and you get the following:

Exception in thread "main" java.langNumberFormatException: For input string: "123b5"
    at java.lang.NumberFormatException.forInputString(NumberFormatException.java:63)
    at java.lang.Integer.parseInt(Integer.java:490)
    at java.lang.Integer.parseInt(Integer.java:531)
    at FooBar.foo2(BarNone.java:69)
    at Foo2.main(Foo2.java:28)

Is this a compile time or a run time error? _______________________

What is the value of the string we were trying to convert to an int? _____________________

What method in what class in what file and line number in your code did this occur?

Method _______________________________
Class _______________________________
File _______________________________
Line # ________________________________
public class Animal {
    private String name;

    public Animal() {
        this.name = "Animal";
    }

    public Animal( String name ) {
        this.name = name;
    }

    public String getName() {
        return this.name;
    }

    public String speak() {
        return "???";
    }
}

public class Bird extends Animal {
    public Bird() {
        super( "Bird" );
    }

    public Bird( String name ) {
        super( name );
    }

    public String speak() {
        return "Chirp";
    }
}

public class Duck extends Bird {
    public Duck() {
        super( "Duck" );
    }

    public Duck( String name ) {
        super( name + " Duck" );
    }

    public String speak() {
        return "Quack";
    }
}

public class Cat extends Animal {
    public Cat() {
        super( "Cat" );
    }

    public Cat( String name ) {
        super( name );
    }

    public String speak() {
        return "Meow";
    }
}

public class Lion extends Cat {
    public Lion() {
        super( "Lion" );
    }

    public Lion( String name ) {
        super( name + " Lion" );
    }

    public String speak() {
        return "Roar";
    }
}

public class Tiger extends Cat {
    public Tiger() {
        super( "Tiger" );
    }

    public Tiger( String name ) {
        super( name + " Tiger" );
    }

    public String speak() {
        return "Grrrrr";
    }
}

What is printed when the program to the left is run?

_____________ says ______________
_____________ says ______________
_____________ says ______________
_____________ says ______________
_____________ says ______________
_____________ says ______________

import java.util.ArrayList;

public class Speak {
    public static void main( String[] args ) {
        ArrayList<Animal> list = new ArrayList<Animal>();

        list.add( new Cat() );
        list.add( new Bird( "Tweety" ) );
        list.add( new Duck( "Daisy" ) );
        list.add( new Tiger( "Tony" ) );
        list.add( new Animal() );

        for ( Animal a : list ) {
            System.out.println( a.getName() + " says " + a.speak() );
        }
    }
} // end class Speak
Trace the following program and specify its output.

```java
public class Trace {
    public static void main( String[] args ) {
        System.out.println( "main1" );
        foo1();
        System.out.println( "main2" );
        foo2();
        System.out.println( "main3" );
        foo3();
    }

    public static void foo1() {
        System.out.println( "A" );
        foo3();
        System.out.println( "B" );
    }

    public static void foo2() {
        System.out.println( "C" );
    }

    public static void foo3() {
        System.out.println( "D" );
        foo2();
        System.out.println( "E" );
    }
}
```

What is printed when the program to the left is run?

---

(3 pts) If `b` is a boolean variable, then the statement

```
b = ( b == false );
```

has what effect? _____

1) It always changes the value of b.
2) It causes a compile-time error message.
3) It causes a run-time error message.
4) It causes b to have the value false regardless of its value just before the statement was executed.
5) It changes the value of b if and only if b had value true just before the statement was executed.

---

(3 pts) Which of the following is equivalent to and has the same effect as

```
b = ( b == false );
```

b = ( b == false ); ? ______

1) `b = ( b != b );`
2) `b = ( b == true );`
3) `b = ( b != false );`
4) `b = ( b != true );`
5) `b = ( b == b );`
6) More than one of the above statements is equivalent
What is the default initial value of an instance variable that is defined as a boolean? __________
What is the default initial value of an instance variable that is defined as an object reference? __________
What is the default initial value of an instance variable that is defined as a double? __________
What is the default initial value of a local variable that is defined as an int? __________

Using the letters on the right, regarding the Animal, Bird, Duck, Cat, Lion, Tiger program on page 4:

class Duck is ______ speak() from class Bird
class Cat is ______ getName() from class Animal
class Tiger is ______ its constructors

Given the following class definitions for class Foo, class Fubar, and class FubarTest:

```java
public class Foo
{
    public Foo()
    {
        System.out.println( "Foo ctor #1" );
    }

    public Foo( int x, int y )
    {
        this();
        System.out.println( "Foo ctor #2" );
    }

    public String toString()
    {
        System.out.println( "Foo.toString" );
        return "Foo";
    }
}

public class Fubar extends Foo
{
    public Fubar( int x, int y, int z )
    {
        super( x, y );
        System.out.println( "Fubar ctor #1" );
    }

    public Fubar()
    {
        this( 4, 2, 15 );
        System.out.println( "Fubar ctor #2" );
    }

    public String toString()
    {
        String s = super.toString() + " + " + "Fubar";
        System.out.println( s );
        return "Fubar.toString";
    }
}

public class FubarTest
{
    public static void main( String[] args )
    {
        Foo ref = new Fubar();
        System.out.println( "*****" );
        System.out.println( ref.toString() );
    }
}
```

What is the output when we run FubarTest as in `java FubarTest`
If any two numbers in an array of integers, not necessarily consecutive numbers in the array, are out of order (i.e. the number that occurs first in the array is larger than the number that occurs second), then that is called an inversion. For example, consider an array “x” that contains the following numbers:

Example 1:
4 5 6 2 1 3
There are 10 inversions in that array, as:
x[0]=4 > x[3]=2
x[0]=4 > x[4]=1
x[0]=4 > x[5]=3
x[1]=5 > x[3]=2
x[1]=5 > x[4]=1

Example 2:
1 2 3 6 4 5 7 8
There are 2 inversions in that array, as:

[7pts total] Write a method which takes an integer array as a parameter and returns the number of inversions. You may only use “for” loops which iterate in ascending order (HINT – think nested loops). You will be graded on readability (1 point).

```java
public int inversions(int[] array) {
}
```

Complete the following method which is intended to return the largest integer in the array numbers.

```java
public static int findMax(int[] numbers) { // Assume number of elements in array numbers > 0
    int positionOfMax = 0;
    for (int index = 1; __________________________________________; index++) {
        if (________________________) {
            ___________________________________;
        }
    }
    return numbers[positionOfMax];
}
```