CSE 8B
Final Exam
Fall 2015

You can rip off the last page and use as scratch paper.

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Total
1) Write the output.

```java
int i = 8;
while (i >= 3) {
    if (i % 2 == 0) {
        i++;
    } else {
        i -= 3;
    }
    System.out.println("i = " + i);
}
```

2) Circle the valid Java identifiers.

Ican't     wait4     x-mas   break
8B_final  Integer  st0ck1ng$  MyCSE8B

3) Write the output.

```java
public class Question3 {
    public static void main(String[] args) {
        int[] arr = { 7, 12, 10, 23, 3,
                     23, 19, 7, 14, 3 };
        int x = 15, y = 0;

        for (int i = 0; i < arr.length; i++) {
            int n = arr[i];
            if (n < x) {
                x = n;
                y = i;
            }
        }
        System.out.println(x + "", y + "");
    }
}
```

What is printed if the line if (n < x) was changed to if (n <= x)?  
What is printed if the line if (n < x) was changed to if (n >= x)?  
What is printed if the line if (n < x) was changed to if (n == x)?  
What is printed if the line if (n < x) was changed to if (n != x)?
4) Write the output.

<table>
<thead>
<tr>
<th>Code</th>
<th>Output</th>
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</table>
| ```java
public void recurse(int x) {
    if (x < 1)
        System.out.println("complete");
    else {
        System.out.println(x);
        recurse(x - 1);
    }
}
``` | recurse(6); |

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| ```java
public void recurse(int x) {
    if (x < 1)
        System.out.println("complete");
    else {
        System.out.println(x);
        recurse(x - 1);
    }
}
``` | recurse(0); |

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| ```java
public void recurse(int x) {
    if (x >= 8)
        System.out.println("complete");
    else {
        System.out.println(x);
        recurse(x + 2);
        System.out.println(x);
    }
}
``` | recurse(6); |
recurse(-4, 1);

public void recurse(int x, int y) {
    if (x >= 0)
        System.out.println("complete");
    else {
        System.out.println(x*y);
        if (y >= 1)
            y = -1;
        else
            y++;
        recurse(x+1, y);
    }
}

recurse(1, 4);

public void recurse(int x, int y) {
    if (x >= 5)
        System.out.println("complete");
    else {
        recurse(x, y+1);
    }
}

recurse(0,-1);

public static void recurse(int x, int y) {
    if (x+y > 4)
        System.out.println("complete");
    else {
        if (x<y) {
            System.out.println(x);
            x++;
        } else {
            System.out.println(y);
            y++;
        }
        recurse(x, y);
    }
}
5) You are given two threads, one programmed to continuously print “a” and the other programmed to continuously print “b”, where the second is started before the first. What is the expected output to the terminal?

a. The two threads will run one after the other. “b” will print first, followed by a continuous pattern of “abababab…”.

b. Not enough is known about what is going on behind the scenes. There is no predictable pattern and it is unknown what is printed first.

c. Though the second thread was started first, the process of starting the multithreading process causes it to delay for a single clock cycle. Thus “a” prints first, followed by “bababababa…”.

d. The process of starting the multithreading process causes a delay for the first thread to start, but by an unknown amount of time, depending on the system. “a” prints first, and continues to print for an unknown amount of time, followed by “babababa…”.

e. None of the above

6) When the method start() is called on a thread, e.g. myThread.start(), which method in myThread eventually gets executed?

7) Fill in the blanks to finish the abstract class Abstract, the interface Interface, and the class Final. Read the comments and method calls in Final to figure out whether methods and variables are public or private, as well as method return types.

```
public abstract class Abstract {
    private int number;
    // returns class variable “number”
    _______ _______ getNumber() {
        return number;
    }
}

public interface Interface {
    public abstract double method();
}

public class Final _________ Abstract __________ Interface {
    public static void main(String[] args) {
        int a = getNumber();
        double b = method();
    }
    _______ _______ method() {...}
}
```
8) Given the following definitions:

```java
public interface Countable {
    public abstract String count(int i);
}

class Counter1 implements Countable {
    private int count;
    
    public Counter1() {
        this.count = 1;
    }
    
    public String count(int i) {
        return this.count + ", " + i;
    }
    
    public String count(String s) {
        return this.count + ", " + s;
    }
}

class Counter2 implements Countable {
    private int count;
    
    public Counter2() {
        this.count = 2;
    }
    
    public String count(int i) {
        return this.count + ", " + i;
    }
    
    public String count() {
        if (count < 2) {
            return "2";
        } else {
            return "two";
        }
    }
}
```

And the following variable definitions:

```java
Counter1 c1 = new Counter1();
Counter2 c2 = new Counter2();
Countable c;
```

What gets printed with the following statements (each statement is executed in the order it appears). If there is a compile time error, write "Error" and assume that line is commented out when run.

```
System.out.println(c1.count());
System.out.println(c1.count(3));
System.out.println(c1.count("three"));
System.out.println(c2.count());
System.out.println(c2.count(3));
System.out.println(c2.count("three"));
c = new Counter1();
System.out.println(c.count());
System.out.println(c.count(3));
System.out.println(c.count("three"));
c = c2;
System.out.println(c.count());
System.out.println(c.count(3));
System.out.println(c.count("three"));
```

_________
_________
_________
_________
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_________
_________
_________
_________
_________
9) Write the Big O complexity, in terms of n.

```java
for (int a = n/2; a > 0; a--) {
    System.out.println(a);
}
```

Complexity

```java
for (int i = 0; i < n; i += 2) {
    System.out.println(i * 2);
}
```

Complexity

```java
for (int i = 0; i < (n - n/2); i++) {
    for (int j = n; j < (n + n/2); j++) {
        System.out.println(i + j);
    }
}
```

Complexity

```java
for (int i = 0; i*2 < n+25; i += 4) {
    for (int j = n; j > 10 + n; j--) {
        System.out.println(j);
    }
}
```

Complexity

```java
for (int i = n; i > n; i--) {
    for (int j = 100; j > 20; j--) {
        System.out.println(i + j);
    }
}
```

Complexity

```java
for (int i = 0; i < n/3) {
    System.out.println("p");
}
```

Complexity
10) Given the following filepaths, answer the following questions.

/home/jundt/cs8b/homework/HW4.java
/home/jundt/cs8b/something.jar

Provided you are in /home/jundt/cs8b, what command do you use to change your working directory to /home/jundt/cs8b/homework?

Once you are in the /home/jundt/cs8b/homework directory, which command would you use to show the contents of the directory?

You see that there is a file named HW4.java. How would you open this file in vim? How would you close it once it is open in vim?

Let’s say you wanted to make a backup of HW4.java. What command would you use to make a copy of HW4.java in /home/jundt/cs8b?

Imagine that HW4.java requires something.jar to be in its classpath during compilation. How would you compile it?

How would you run HW4.java?

11) Write the output.

```java
char[][] array = {{'l', 'g', 'f', 'h'},
                 {'8', 'b', 'g', 'g'}};
alakazam(array[0], array[1][2]);
for (int i = 0; i < array.length; i++)
    for (char j : array[i])
        System.out.println(j);

public void alakazam(char[] array, char mod) {
    for (int i = 0; i < array.length; i--) {
        if (array[i] == mod) {
            char temp = array[i];
            array[i] = array[i-1];
            array[i-1] = temp;
            mod++;
        } // Ex. 'a'++ turns to b
    }
}
```

Output
12) Write the methods that run, in order.

```java
write1(); // throws Exception
try {
    method2();
    method3(); // throws Exception
} catch (Exception e) {
    method4();
    method5();
}
```

13) Select the best data structure for the given situation.

| Saving a fixed amount of integers in a specific order: | ___________________ |
| Matching a bar code number with an item: | ________________________ |
| Storing a large amount of objects, so you can find one in O(1) time later: | ___________________ |
14) Place the following variables under the right location in memory based on where the content is stored. Remember the difference between a pointer that references the content versus the actual content itself.

static int a = 0;  String[] nam = {};  boolean pass = “false”;
static float f = 1.0;  float frac = 2.0;
Integer i = new Integer(42);  double[] array = {1, 2, 3};

ArrayList<int> dynamicList = new ArrayList<int>();

<table>
<thead>
<tr>
<th>Static</th>
<th>Stack</th>
<th>Heap</th>
</tr>
</thead>
</table>

15) Given the following method:

public int find(int n1, int n2) {
    if (n1 < n2)
        return n1;
    else
        return n2;
}

Fill in the blanks with the correct integer that passes the test.

```java
@Test
public void test1() {
    int n1 = 99, n2 = 66;
    assertEquals(find(n1, n2), ___);
}
```

```java
@Test
public void test2() {
    int n1 = 50, n2 = 50;
    assertEquals(find(n1, n2), ___);
}
```

Circle the correct answer.

a. Unit tests are designed to test the functionality of the entire project. ( TRUE / FALSE )

b. In test-driven development, when should unit tests be written in relation to the actual code? ( BEFORE / AFTER )
16) Given the following UML diagrams, reconstruct the classes in code. If a method is not abstract, put ellipses in the method body. (Ex. public void method() {...})

<table>
<thead>
<tr>
<th>Tears</th>
</tr>
</thead>
<tbody>
<tr>
<td>- amount: int</td>
</tr>
<tr>
<td># defeat: boolean</td>
</tr>
<tr>
<td>+ crying(): String</td>
</tr>
<tr>
<td>+ admitDefeat(): void</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SaltyTears</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ saltiness: double</td>
</tr>
<tr>
<td>- outOfTears(): boolean</td>
</tr>
<tr>
<td>+ crying(): String</td>
</tr>
<tr>
<td>+ admitDefeat(): void</td>
</tr>
</tbody>
</table>
Given the following class definitions, write the output.

class ClassA {
    public void method1() {
        System.out.println("ClassA 1");
    }

    public void method2() {
        System.out.println("ClassA 2");
    }
}

class ClassB extends ClassA {
    public void method1() {
        super.method1();
        System.out.println("ClassB 1");
    }

    public void method3() {
        super.method2();
        System.out.println("ClassB 3");
        method1();
    }
}

class ClassC extends ClassA {
    public void method1() {
        super.method2();
        System.out.println("ClassC 1");
    }

    public void method2() {
        System.out.println("ClassC 2");
    }
}

class ClassD extends ClassC {
    public void method2() {
        System.out.println("ClassD 2");
    }

    public void method3() {
        super.method1();
        System.out.println("ClassD 3");
    }
}
```java
public class Question18B {
    public static void main(String[] args) {
        ClassA ref1;

        ref1 = new ClassD();
        ref1.method1();
        System.out.println("------");
        ref1.method2();
        System.out.println("------");
        ( (ClassD)ref1).method3();
    }
}
```

```java
public class Question18B {
    public static void main(String[] args) {
        ClassA ref1;

        ref1 = new ClassB();
        ref1.method1();
        System.out.println("------");
        ref1.method2();
        System.out.println("------");
        ( (ClassB) ref1).method3();
    }
}
```

18) Select the valid constructors for the following classes.

   a) BufferedReader
      1. BufferedReader(RandomAccessFile ram)
      2. BufferedReader(FileInputStream fis)
      3. BufferedReader(FileOutputStream fos)

   b) PrintWriter
      1. PrintWriter(File source)
      2. PrintWriter(OutputStream fos)
      3. PrintWriter(Scanner scnr)
19) Fill in the blanks with one of the following words.

- implements, compilation, default, extends, runtime, package, stream, abstract, text editor, IDE, GUI, UML, data structure, thread, polymorphism

- A compiler error occurs when you try to compile it. The programmer is notified of the error during at/during _________.
- While both are useful tools for programmers, a(n) ________ will usually have more features than a(n) ________, such as debug mode.
- If a program is expected to take a long time, it can be useful to distribute the workload onto more than one _________.
- Buttons, file choosers, and text fields are some components that a(n) ________ typically carries.
- After you are done opening a File object, you should remember to close the file _________.
- Common ________ (s) include arrays, lists, hashmaps, and sets.
- The Java keyword which denotes inheritance of interface is ________, the Java keyword which denotes inheritance of abstract classes is _________.
