Midterm Review Notes CS 145 Winter 2017

- The midterm will be Wednesday, February 8.
- The exam will consist of short answer questions and will involve writing code.
- Please bring a picture ID with you to the exam.
- The exam will be closed book.
- No use of electronics (calculators, cell phones, music players) without prior permission.

There will be 8 to 12 questions. Questions will be of two kinds: (1) code reading or tracing, and (2) simple code writing.

All code in the exam will compile and execute without error (assuming code fragments are wrapped appropriately.)

Unless otherwise noted in the question, when asked for the output of some code, only the values that are output are important. Formatting (spaces, new lines) is not important.

The midterm will cover content from chapters 1 to 7 and chapter 12 of the textbook, excluding Chapter 3G. The midterm will cover the following topics:

- Java types: `int`, `String`, etc.
- I/O: `System.in` and `System.out`
- functions, parameters, returns
- `if` statement
- `for`, `while` loops
- "Boolean Zen"
- arrays
- recursion

Sample questions:

1. Given the following function:

```
int doSomething(int n) {
   while (n % 2 == 0) {
      n = n / 2;
   }
   return n;
}
```

What is the result of (a) `doSomething(5)`, (b) `doSomething(12)`?

(c) Assuming `n >= 1`, rewrite `doSomething` as a recursive function.

2. Given

```
int[] array = {...};
int sum;
```

(a) Write code that sums (adds up) all the element of `array` and leaves the sum in the variable named `sum`.

(b) What does your code compute for `sum` if `array.length == 0`?

3. Given

```
int a = 5;
int b = -3;
int c = 2;
```

What is

(a) `a + b * c`
(b) `a / c`
(c) `a % c`
(d) `a / (double)c`

4. What is output by the following?

```
public class Test {
   public static void main(String[] args) {
      int x = 1;
      int[] y = new int[10];
      m(x, y);
      System.out.println(x);
      System.out.println(y[0]);
      System.out.println(y[1]);
   }
   public static void m(int number, int[] numbers) {
      number = 1001;
      numbers[0] = 5555;
   }
}
```

5. Rewrite the following code with no `if` statement and a single `return` statement.

```
if (x == 2) {
   return true;
} else {
   return false;
}
```

6. Write code to create and initialize the following array.

	[0]	[1]	[2]
[0]	1	2	3
[1]	4	5	6

7. What is output by the following:

```
public class Test2 {
   static int x = 1;
   static int y = 12;
   public static void main(String[] args) {
      int x = 113;
      m(x);
      m(y);
      m(x);
   }
   public static void m(int y) {
      System.out.println(x);
      System.out.println(y);
      x += 1;
      y += 1;
   }
}
```

8. Consider the following recursive function:

```
static int recursive(int a, int b) {
   if (a == 0)
      return b;
   else
      return recursive(a – 1, b + 1);
}
```

a) What is the result of `recursive(2, 3)`?

b) What is the base case of the recursion?

c) What is the recursive step of the recursion?

d) Write a short description of what the method `recursive` does.

e) What is the number of stack frames for the function recursive that are required by the call `recursive(2, 3)`?

f) What are the values of `a` and `b` for each call of `recursive(2, 3)`?

Answers:

1. (a) 5
   (b) 3
   (c)

```
static int doSomething2(int n) {
   if (n % 2 == 0) {
      return doSomething2(n / 2);
   } else {
      return n;
   }
}
```

2. (a)

```
int sum = 0;
for (int i = 0; i < array.length; i++ ) {
   sum += array[i];
}
```

(b) This code computes `sum = 0`

3. (a) -1
   (b) 2
   (c) 1
   (d) 2.5

4.
```
1
5555
0
```

5.
```
return x == 2;
```

6.
```
int[][] array = {{1, 2, 3},
                 {4, 5, 6}};
```

or (one of a fairly large number of alternatives)

```
int[][] array = new int[2][];
array[0] = new int[] {1, 2, 3};
array[1] = new int[3];
array[1][0] = 4;
array[1][1] = 5;
array[1][2] = 6;
```

7.
```
1
113
2
12
3
113
```

8. (a) `5`

(b) `if (a == 0) return b`

(c) `return recursive(a-1, b+1)`

(d) Adds a and b

(e) `3`

(f)

Call	a	b
1	2	3
2	1	4
3	0	5