COS 126 General Computer Science Spring 2010

Exam 1 Solutions

1. **TOY Programming.**

```
10: 8CFF     R[C] <- mem[FF]
11: 7101     R[1] <- 01
12: 7201     R[2] <- 01
13: 92FF     write R[2] to stdout
14: 5221     R[2] <- R[2] << R[1]
15: 2CC1     R[C] <- R[C] - R[1]
16: DC13     if (R[C] > 0) pc <- 13
17: 0000     halt
```

Alternatively, line 14 could be

```
14: 1222     R[2] <- R[2] + R[2]
```

2. **Scope.** Program prints the three lines:

```
111
2
666
```

3. **Number Systems.**

   (a) -88

   (b) FFBF

   (c) 2^{31} — All positive integers plus one more (for 0).

   (d) 0 — ˆ denotes xor in Java, not exponents.

4. **Java Expressions.**

   (a) All expressions always evaluate to true.

   (b) Type conversion works as follows:

Expression	Type	Value
`11 * 0.2`	`double`	2.2
`(int) 11 * 0.2`	`double`	2.2
`11 * (int) 0.2`	`int`	0
`(int) (11 * 0.2)`	`int`	2

   (c) i, ii, and iii are all equivalent.

5. **Arrays.** The three parts print out the following three lines:

```
0 0 1 1 2 2
0 1 2 3 4 5
5 4 3 2 1 0
```

6. **Recursive Methods.** We will accept either **(d)** the function is fine, or **(e)** with the explanation "call stack will overflow for large enough N" or "integer overflow."

7. **Arrays and I/O.**

   (a) The program outputs the single line:

   ```
   aaa bbb ccc ccc bbb aaa
   ```

   (b) The pipe will consume the output from the first program, but has no effect on the second program because it uses command line arguments and not standard I/O, so the output is the single line:

   ```
   xxx yyy yyy xxx
   ```