

**Written Exam 1 Solutions****0. Miscellaneous.**

Don't forget to write your name, NetID, precept, and exam room.

**1. Java expressions.**

7 4 ERROR NaN 1.0

**2. Java basics.**

(a) *There are many possible solutions. The following was the most common.*

```
if (b > max) max = b;  
if (c > max) max = c;
```

(b) 

```
a = c;  
c = b;  
b = temp;
```

**3. Loops and debugging.**

J G O

**4. Properties of Java.**

- (a) F T T F F  
(b) Advantage, Not, Not, Advantage

**5. Arrays.**

- (a)  $[4, 17, 45] = [4, 4+13, 4+13+28]$   
*It's best to do part (b) first because each term is the cumulative sum of the terms in (b).*
- (b)  $[4, 13, 28] = [1*4, 1*5 + 2*4, 1*6 + 2*5 + 3*4]$
- (c) compile-time error

## 6. Functions and booleans.

(a) **CLDLEL**

*The letters C, D, and E can be permuted in any order. ELGLIL (and permutations of E, G, and I) are alternative solutions but poorer style.*

```
public static boolean minority(boolean x, boolean y, boolean z) {
    int count = 0;
    if (x) count++;
    if (y) count++;
    if (z) count++;
    return count <= 1;
}
```

(b) **GBIFA**

*The solution is unique.*

```
public static boolean minority(boolean x, boolean y, boolean z) {
    if (x && y) return false;
    else if (x || y) return !z;
    else return true;
}
```

## 7. Functions and arrays.

(a) **4, 8, 12, 16**

*The halve2() function mutates the argument array by dividing each elements by 2. It is called twice.*

(b) **16, 32, 48, 64**

*The halve3() function never modifies an element in the argument array a[].*

## 8. Recursion.

(a)

n	0	1	2	3	4
f(n)	"0"	"1"	"1 2 1"	"1 3 1 2 1"	"1 2 1 4 1 2 1"

(b) **T T F T/F**

- f(8) returns "1 2 1 4 1 2 1 8 1 2 1 4 1 2 1".
- From the previous part, f(8) contains 15 integers. The function call f(16) will consist of two copies of f(8), with the number 16 in the middle, resulting in 31 integers. The function call f(32) will consist of two copies of f(16), with the number 32 in the middle, resulting in 63 integers.
- f(3) returns "1 3 1 2 1", which is not a palindrome. As a result, f(6) is not a palindrome either—it returns "1 3 1 2 1 6 1 3 1 2 1".
- It is *true* if you treat the string as a sequence of integers, but *false* if you treat the string as a sequence of characters. For example, if we let g(n) denote the modified function, then

f(10) = "1 2 1 5 1 3 1 2 1 10 1 2 1 5 1 3 1 2 1"  
g(10) = "1 2 1 3 1 5 1 2 1 10 1 2 1 3 1 5 1 2 1"