Exam: Introduction to Programming, Media Technology Program, LIACS – December 20, 2011

Good luck! Amalia

1- Explain the differences between :
(a) = and ==
(b) + and ++
(c) FIFO and LIFO

2- What is the output of the following piece of code? Show me how you reached your answer.

```
int x = (int) random(10);

if ( ( 2*x >= 0 ) && !( (x == x) || (x == 40) ) ) {
  println("Trick");
}
else {
  println("Treat");
}
```

3- (a) Array `a` is `{1, 6, 2, 12, 8}` and array `b` is `{-7, -3, 11}`. What is the value of

```
b[ a[ a[4] + b[0] ] - a.length ]
```

Show me how you reached your answer.

(b) Array `a` is `{1, 6, 2, 12, 8}`. What is the value of

```
a[  max( abs(a[1]) , int( pow(a[4], 2) ) ) ]
```

Show me how you reached your answer. Note: `int(v)` converts `v` to its integer representation.

4- What is the output of the following piece of code? Show me how you reached your answer.

```
int a = 0;
int b = 1;
for (int x = 0; x < 12 && b < 4; x = x + b) {
  a += x;
  b++;
  println(a);
}
```

5- Write a function that draws vertical lines in the range between (and *inclusive*) two integers `a` and `b`. Your function should receive 2 parameters, i.e. the integers `a` and `b`, and should produce output such as shown in figure *without* using the `rect()` function. Also, your function should work *regardless* of the order of the parameters, e.g. `drawRange(40, 70)` and `drawRange(70, 40)` should produce the same output.

6- (a) Write a function that examines an array of integers `arr` for the occurrence of a number `n`. Your function should receive 2 parameters, i.e. the requested number `n` and the array under examination `arr`, and should return one value, i.e. how many times does `n` appears in `arr`. E.g., for `arr = {2,2,0,2}` and `n = 2`, your function should return the number 3.

(b) Show me with a snippet of code how you could use your function from part (a) to check whether a random integer appears in your array.

7- The following piece of code contains 3 errors. Find the errors and explain them to me.

```
float num = 0.0;

void setup() {
  int x;
  x = 10;
}

void draw() {
  x = x + 1;
  println(x);

  increase(num);
  println(num);

  for (int i=0; i< 10; increase(i)) {
    println(i);
  }
}

void increase(int i) {
  i++;
}
```

8- (a) Explain in your own words what a "class" and what an "object" is. Explain the relation between the two concepts.
(b) Given the following class

```
class Cat {
  int age;
  String name;
}
```

add a constructor that initializes the fields of the class with user provided parameters. Then write down the statements needed to create two instances of this class.

9- Explain in your own words how the "bubble sort" algorithm works. Given `a= {10, 3, 3333, 1, 50, 5}`, apply the "bubble sort" algorithm to sort the array `a`, i.e. write down the state of the array after each swap. Sort in ascending order (from small to big...).

10- (a) Consider the following recursive function:

```
int mysterious(int a, int b) {
  if (0 == b) {
    return 0;
  }
  else {
    return a + mysterious(a, b-1);
  }
}
```

Why is this function called recursive? What is the terminating condition of this recursion?
(b) What is the result of `mysterious(10, 5)`? Write down all the calls involved!