(Re) Exam: Introduction to Programming, Media Technology Program, LIACS – April 7, 2011

Good luck!
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1- Explain what is:
(a) ==
(b) a `boolean`
(c) a stack

2- (a) What is the output of the following piece of code? Show me how you reached your answer (just writing down the correct answer gives you no points...).

```
int x = 50;
if ( !( (x != x) && !(x <= 3+2*20) ) ) {
  println("Apples");
}
else {
  println("Oranges");
}
```

(b) The following piece of code does not compile. Why? Propose a solution.

```
int j=6;
for (int i=0; i<5 && j>0 ; i++) {
  if (i+j>8) {
    i = j; j--;
   }
}
println(i);
```

3- (a) Write a function `answerToTheUltimateQuestionOfLifeTheUniverseAndEverything()` that provides the answer to the Ultimate Question of Life, the Universe and Everything (i.e. 42). Your function does not need any parameters.

(b) Write a function `drawStripes(parameters)` that draws `n` rectangles of alternating colour (black/white) across your screen. Make sure your rectangles spread evenly across the width of your screen and cover the full height of your screen. E.g. `drawStripes(7)` should result in the figure shown on the right.

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

```
int a = 3;
for (int b = a + 4 ; b < 10 && a > 0 ; b += 2) {
  println(b);
  a--;
}
```

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

```
void setup() {
  int j = addOne(0);
  for (int i=addOne(j); i<addOne(j)+2; addOne(i)) {
    println(i);
  }
}
int addOne (int i) {
  return (i+1);
}
```

5- (a) Array `a` is `{3, 9, 6, 0}` and array `b` is `{1, 12, 8, 6, 3}`. What is the value of `b[ b [a.length -1] - a[ a[0] - 1] ]`? Show me how you reached your answer.

(b) Write a function `multiplyArrayValues()` that multiplies the elements of an array `num` by the elements of an array `multiplyBy`. Your function does not need any parameters and does not need to return a value; instead, it should manipulate two global arrays of integers. E.g. if `multiplyBy = {1, 0, 0, 0, 1}`, `num = {8, 2, 7, 4, 5}`, then a call to your function should result in `num = {8, 0, 0, 0, 5}`. Include a solution (in code or in words) in case `multiplyBy` has insufficient elements!

6- (a) Explain in your own words what a "class" is. What is the difference between a "class" and an "object"? Give an example.

(b) The following class declaration contains 4 errors. Find them and correct them.

```
class Monster {

 int numberOfLegs;
 int numberOfEyes;

 Constructor(int eyes) {
   numberOfLegs = (int) random(0,9);
   eyes= numberOfEyes;
 }
 void growALeg() {
  monster.numberOfLegs++;
 }
 void growNLegs(int n) {
  numberOfLegs = new numberOfLegs(n);
 }
}
```

7- (a) Explain in your own words how the "bubblesort" algorithm works. You may provide an example.

(b) Fill in the missing code so that the following function implements the bubblesort algorithm. Make sure the elements end up in ascending order (i.e. going up)

```
int[] bubbleSort(int[] a) {
     int temp;
     for (int i =  a.length-1 ; i ______ ; ______ ) {
       for (int j = ______ ; j < i ; ______ ) {
         if ( ______ ) {
           temp = ______ ; ______ = ______ ; ______ = temp;
         }
       }
     }
     return(a);
}
```

8- (a) Fill in the missing code so that the following function multiplies two positive integers *recursively.*

```
int multiply(int x, int times) { //positive integers only
  if (times == 0) {
    return _____________;
  }
  else {
    return _____________;
  }
}
```

(b) Write down all the calls involved in calculating `multiply(2,4)`. The result of 2 multiplied by 4 is 8.