Exam: Introduction to Programming, Media Technology Program, LIACS – December 14, 2010

Good luck!
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1- Explain what is:
(a) +=
(b) a `void` function
(c) a FIFO data structure

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 = 8;
if ( ! ( (x+10 == 2*9) || !(x >= 6) && (x != x) ) ) {
  println("Bye bye love");
}
else {
  println("Bye bye happiness");
}
```

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

```
int j = 2;
for (int i = j + 7 ; i > 0 ; i = i - j) {
  println(i);
  j++;
}
```

3- (a) Write a function `circleChain(parameters)` that draws `n` circles of size `diameter` next to each other, using a for loop. The y position of the chain should be in the middle of your screen.

(b) Write a function `distanceFromCursor(parameters)` that calculates the distance between a given point (x, y) and the mouse pointer. The calculated distance should be a float number. To calculate the distance, just use the formula

$$distance = \sqrt{(x1-x2)^2+(y1-y2)^2}$$

and the Processing built-in function `sqrt()` that calculates the square root of a number.

4- (a) The following piece of code does not compile. Why is that? Propose a solution.

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

void draw() {
}

void fancyCalculation() {
  x= (x+2*40)%2;
}
```

(b) What is the value of x after the following piece of code? Explain your answer.

```
int x = 20;
```

```
void setup() {
  increase(x);
}

void draw() {
}

void increase(int x) {
  x = x+1;
}
```

5- (a) Array `a` is `{1, 8, 15, 14, 2}` and array `b` is `{13, 2, 7, 3, 11}`. What is the value of `b[a[a[0]+b[3]]+1]`? Show me how you reached your answer.

(b) Write a function `replaceNegativeValues()` that replaces all negative elements in an array with 0s. Your function does not need any parameters and does not need to return a value. Instead, you should manipulate a global array of integers. For example, if `a = {1, -5, 200, 1,-3}`, then a call to your function should change array `a` to `{1, 0, 200, 1, 0}`.

6- (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 Point {
  int x;
  int y;
}
```

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

7- Given `a= {50, 4820605, 42, 2, 11, 68}`, apply the "bubble sort" algorithm to sort the array in ascending order, that is, write down the state of the array after each swap required by the sorting algorithm (no coding needed!).

8- (a) The following function calculates the power of i to the j, for positive values of j. Why is this function called recursive? What is the terminating condition of this recursion?

```
int power(int i, int j) {
  if (j == 0) {
     return(1);
  } else {
    return(i * power(i, j - 1));
  }
}
```

(b) Write down all the calls involved when calculating `power(2,4)`. The result of 2 to the power of 4 is 16.

(c) Write a function that implements a non-recursive solution for the same problem and without using the Processing built-in function `pow()`.