Introduction to Programming (IP) – The Processing part

Media Technology, LIACS
Retake No. 2
April 4th, 2013

Instructions

- You have 2 hours to complete the exam. Please note that you can not leave the room during the first 30 minutes as other students may still enter the exam.
- Write all your answers on the answer sheets provided. Feel free to make notes on the exam but these note will not be graded. Please use a (blue or black) pen for your answers.
- At the end of the exam, please hand in both your answer sheets and the exam.

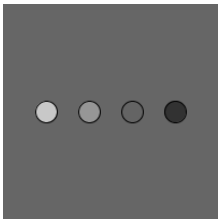
Good luck!
Amalia

1. Explain in your own words the following concepts
   a) an array
   b) `(int)`
   c) /=

2. If integer variable `x` has value 2, what is the output of the following line of code? Show me how you reached your answer; just giving the correct value gives you no points.

```
println( !( ( ( 3 <= (x+1) ) || false) && !(x != x) ) );
```

3. Fill in the missing code to make a program that draws a horizontal row of 4 circles with colours that get darker going from left to right.



```
______(200, 200);
background(102);
int n= ______; int x = 0; int colr = 250;
for (______i = 0; i______ ; i++) {
x += 40;
colr ______ 50;
fill(______);
ellipse(______, 100, 20, 20);
}
//please write your answers on your answer sheet
```

4. Array `a` is `{1, -5, 5, 17, 2, 2}` and array `b` is `{13, 3, 7, 9, 11}`.
   a) What is the value of

```
b[ a[ a[0] + b[1] ]- 2 ]
```

   c) What is the value of

```
b[ max(abs(a[1]) , a[2]) ]
```

   Show me how you reached your answer; just giving the correct value gives you no points.

5. a) What is the output of this program ?

```
int myVariable = 12;

void setup() {
     myVariable = 10;
}

void draw() {
  if (myVariable <= 15) {
    println(myVariable);
    myVariable++;
    }
}
```

   b) What is the new output if we change the statement in `setup()` to

```
int myVariable = 10;
```

   and keep the rest of the program exactly the same ?

6. Write a function `negatives(params)` that returns the number of negative values in an integer array. For example, if array `a` is `{7, 22, -27, 30, 2, -25}`, then a call to `negatives(a)` returns 2.

```
_____ negatives(_________) {
//your solution here...
//please write your answers on your answer sheet
}
```

7. Write a function that calculates the distance between a point (x, y) and the mouse pointer. The calculated distance should be a float number. To calculate the distance, 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.

```
_____ distanceFromCursor(_________) {
//your solution here...
//please write your answers on your answer sheet
}
```

8. a) Explain in your own words what the relation is between the concepts of "class" and "object".
b) Given a class `Cow` with a constructor `Cow(String name)`, show how you can declare and construct a Cow object called `myCow` for a cow called Bella.
c) What does it mean when a function definition starts with the word "`void`", for example "`void obfuscate(int a)`"?

9. 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) {
  for (int i = a.length-1 ; i ______ ; ______ ) {
    for (int j = ______ ; j < i ; ______ ) {
      if ( ______ ) {
        int temp = ______ ; ______ = ______ ; ______ = temp;
      }
    }
  }
  return (a);
}
//please write your answers on your answer sheet
```

10. Below is the definition of a recursive function:

```
int gcd(int n, int r) {
     if (r == 0) {
       return n;
  }
  return gcd(r, n % r);
}
```

What value is returned by `gcd(48, 20);`? Write down all the function calls involved!
Note: `%` is the modulo operator that calculates the remainder of a division, e.g. `5%3` is 2.