

CMPT-166: Sample Final Exam Answer Key

Last name *exactly as it appears on your student card*

First name *exactly as it appears on your student card*

Student Number									
SFU Email					Section if you know it!				

This is a **3 hour** test. It is **closed book**: no calculators, computers, notes, books, etc. are allowed.

Short Answer

(10 marks) Write your answer for each question in the corresponding box. Unanswered questions are worth 0.

Question	Answer
(1 mark) What is the type of 3.24?	
(1 mark) What is the type of "3.24"?	
(1 mark) What does this print? <pre>println(2 + 3 * 4);</pre>	
(1 mark) What does this print? <pre>int a; int b; a = 4; b = 5; a -= b; b = a - b; a += b; println(a + b);</pre>	
(1 mark) What does this print? <pre>int x = 3; print("(\" + x + "\")");</pre>	
(1 mark) What does this print? <pre>print(17 % 5);</pre>	
(1 mark) True or false: in Processing, a global variable is any variable defined outside a function or class.	
(1 mark) True or false: in Processing, you cannot define a class inside another class.	
(1 mark) Around which point does the <code>rotate</code> function rotate?	
(1 mark) What are the names of the two functions used to save and restore the coordinate system?	

Boolean Expressions

(10 marks) Write “true” or “false” in the box for each question. Every correct answer is worth **1 mark**, every incorrect answer is worth **-0.5 marks** (guessing is not recommended!), and unanswered questions are worth **0 marks**.

Answer	Question
	<code>!(!(2 == 1))</code>
	<code>!(1 >= 0 false)</code>
	<code>!true</code>
	<code>(8 == 0 && 8 != 0)</code>
	<code>(true) (!true && !true)</code>
	<code>(5 != 5 true) && !(7 == 8)</code>
	<code>(true 1 != 4) && (!false false)</code>
	<code>((!(2 <= 3)) (!false)) (!false)</code>
	<code>(6 <= 5 6 > 1) && (false && false)</code>
	<code>!(0 == 9 !false)</code>

Writing Functions

- a) (5 marks) Write a function called `pointInCircle(a, b, x, y, diam)` that returns `true` just when the point (a, b) is in the circle whose center is (x, y) and whose diameter is `diam`. If (a, b) is not in the circle, then `false` is returned. All the input parameters are of type `float`.
- b) (5 marks) If (r, g, b) is an RGB color triple, then the **inverse color** of (r, g, b) is $(255 - r, 255 - g, 255 - b)$. Write a function called `invertColor(r, g, b)` that returns the inverse color of (r, g, b) as a Processing `color` object. The `r`, `g`, and `b` input parameters are each of type `int`. Also assume that `r`, `g`, and `b` are a valid RGB color.

Classes and Objects

1. (5 marks) Write a complete class called `Particle` that has the following:
 - It stores the (x, y) position of the particle as `float` values.
 - It stores the (dx, dy) velocity of the particle as `float` values.
 - It has a *constructor* that takes the position and velocity of the particle as input parameters, e.g.

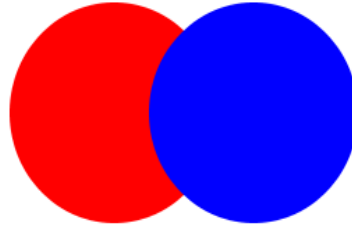
```
Particle p;  
p = new Particle(34, -2.2, 1, 1.5);
```

2. (2 marks) Write the code that creates a variable called `origin` of type `Particle`. Initialize it to be the point $(0, 0)$, and with 0 velocity (in both directions).
3. (1 mark) Write a fragment of code that creates an `ArrayList` variable called `dust` that can hold `Particle` objects. After your code runs `dust` should refer to an empty `ArrayList`.

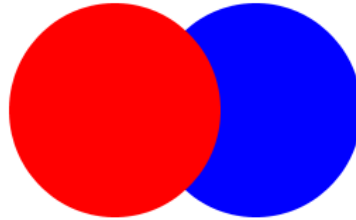
4. (5 marks) Suppose that `dust` is an empty `ArrayList` that can hold `Particle` objects (as in the previous question). Write a fragment of code that uses a while-loop to assign the particles the positions (0, 0), (1, 1), (2, 2), (3, 3), ..., (99, 99). Give `dx` and `dy` for each particle a random value in the range -1.5 to 1.5.

Overlapping Circles

(10 marks) Write a complete program that draws two circles that are initially overlapping like this:



When you click the mouse (anywhere), the red circle is now on top, and the blue circle is on bottom:



Every time you click the mouse, the circle on the bottom is now drawn on the top.

Note that the size and location of the circles stays the same throughout the program. All that changes is the order in which they are drawn.