Lab10 OO programming (11.4.19) CS103 Fall 2019

author john k johnstone jkj at uab dot edu
course CS103 Fall 2019

version Fall 2019

materials

- *lab10_19fa103.pdf* (this document)
- *lab10_19fa103.py* (stub of the class)
- class examples:
  stack_class.py (lecture19) and compare classless stack.py (lecture17)
  uab_student_class.py (lecture20)

purpose

- explore object-oriented programming

in-class exercises

- 15 minutes in: __init__ method (the constructor);
  (and define a circle using this constructor, as test call)
- 45 minutes in: area method

coding exercises

Today your mission is to build a circle class.
The member variables and methods that you should implement are given below.
As you complete methods, remember to test them. (Always test!)

If you want to try the challenge instead, start with an ellipse class, then build a child circle class by inhering from the ellipse class (see challenge). Only do the challenge if you want a bit more of a challenge (or want to practice inheritance for HW6).

member variables

- c (for center), an int 2-tuple (suppose the center is placed at a pixel, so its coordinates are integer)
- r (for radius), an int

we are using integers to simplify the equality method

methods

- __init__ (constructor from a center and radius)
- area
- perimeter
- collide (do two circles overlap or even touch?)
- get_c (getter for center: retrieve the center)
- get_r (getter for radius)
- set_c (setter for center; set the center)
- set_r (setter for radius)
- __str__ (special method for use by print)
- __eq__
- __lt__ (based on radius)
- draw (with color parameter, filled bool)

challenge

An ellipse is a curve defined by two points F, G and a float α whose points p all satisfy:
dist(p,F) + dist(p,G) = α
The two points are called the foci of the ellipse.
So the sum of distances to the foci is a constant.

Thought exercise: how is a circle a special version of this ellipse?
That is, what are F, G and α for a circle?

- remind yourself about ellipses at **wikipedia page on the ellipse**
- build an ellipse base class, as parent class to the circle class;
  its member variables would be its two foci (both are 2-tuples) and the sum of the distances (a float)
- add more methods (e.g., intersection)

deliverables

A+: A exercises as a child class to an ellipse
A: attendance, first 5 methods of circle class (through get_c)
B: attendance, in-class exercises (init, area)
C: attendance