CSSE 120 – Introduction to Software Development (Robotics section)

Concept: *Using Objects*

Objects, Types and Values – and *Classes*

In Python, every "thing" (that is, every item of data) is called an ***object***.

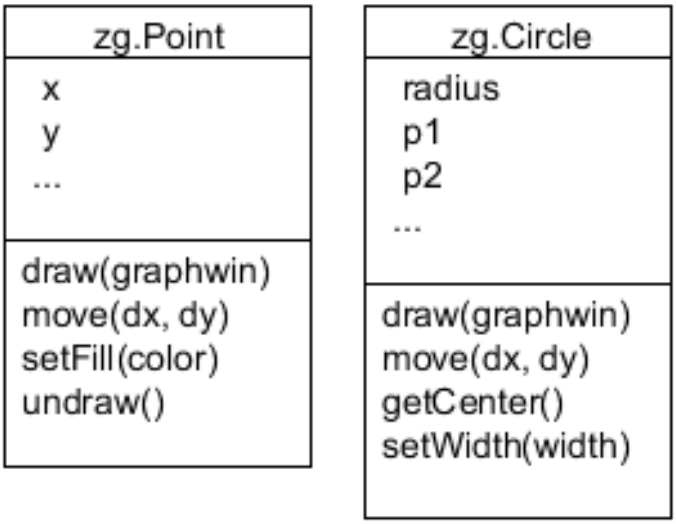
An ***object*** has a ***type*** and a ***value***. For example:

The type of an object determines:

- The ***kind of thing*** the object is
- What ***operations*** the object can do

You can create your own type, by writing a ***class***. We'll see the insides of a class later, but for now all you need to know is that a class has:

- A ***name***
- ***Fields*** (aka ***instance variables***) – the data that instances of the class hold
- ***Methods*** – the operations (functions) that instances of the class can do



We describe these in a ***UML Class Diagram***, where UML stands for Unified Modeling Language. See the examples to the right.

The 3 Key Ideas for Using Objects

- To ***construct*** an object:

```
win = zg.GraphWin()
point1 = zg.Point(500, 450)
line = zg.Line(point1, zg.Point(30, 40))
circle = zg.Circle(point1, 100)
```

Constructor:
- Call it like a function, using the name of the ***class***
- Style: Class names begin with an ***uppercase*** letter
- The constructor ***allocates space*** for the object and does whatever ***initialization*** the class specifies

- To *ask an object to do something*, i.e. to apply its ***methods*** to it:

```
point1.draw(window)
line.move(45, -60)
x = point1.getX()
center = circle.getCenter()
```

Method call:
- Use the ***dot notation:***

`Who.Does_What(With_What)`

Just like a function call, except that the method has access to the object invoking the method.
So the object is an ***implicit argument*** to the method call

- To reference what the object knows (its ***instance variables***, aka ***fields***):

```
point1.x    circle.p1    circle.p2
```

Instance variable (aka *field*) reference:
- Use the ***dot notation*** but ***without parentheses***

`Who.Has_What`