LECTURE 23

OBJECT-ORIENTED PROGRAMMING

MCS 260 Fall 2020

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REMINDERS

- Worksheet 8, Quiz 8 available
- Project 3 description release today
- Project 2 grades Saturday

CUSTOM TYPES IN PYTHON

In Python, **classes** are the way to define your own types. A value of that type is an **object** or **instance**.

Analogy: class "Cat", instance "Mr. Mittens".

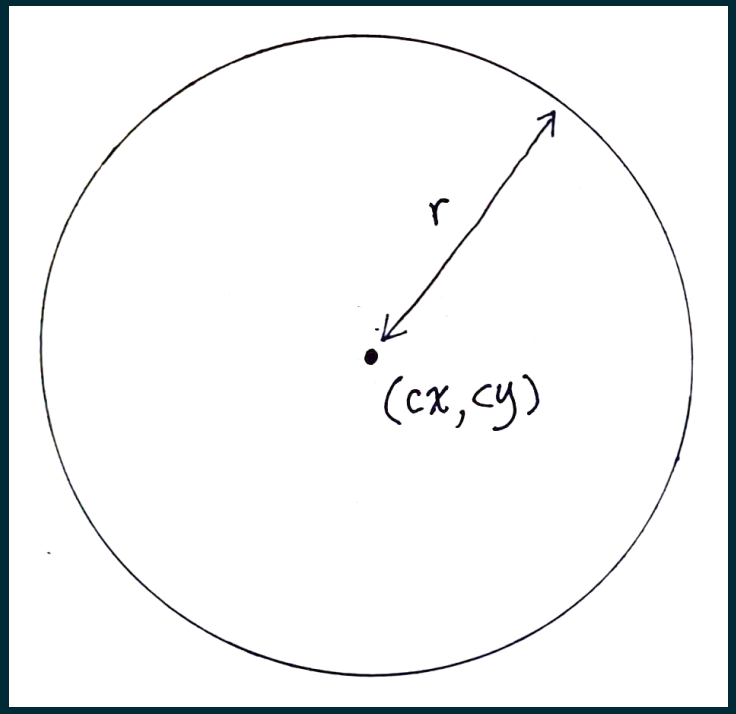
Objects bundle together **data** and **behavior** (things you can do with a specific sort of data).

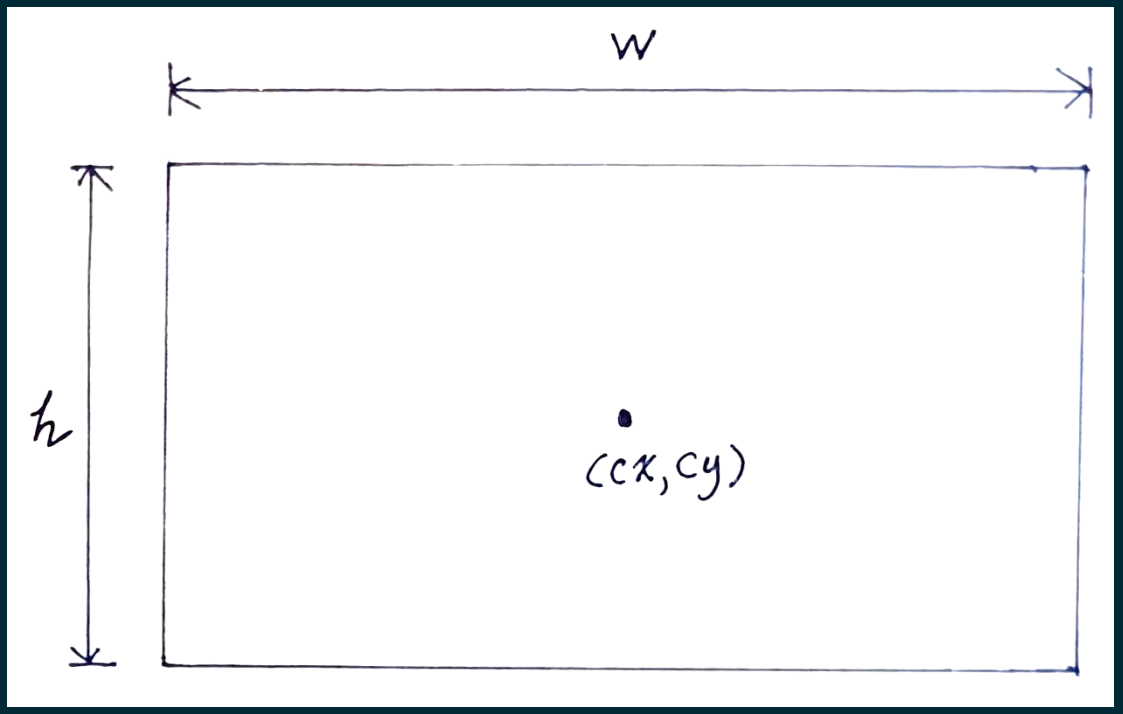
SAMPLE PROBLEM

Suppose we are writing programs that will work with geometric objects in the plane, such as circles and rectangles.

How should we represent these objects as numeric data?

REPRESENTATION





But what type should we use? `list`, `tuple`, `dict`?

CLASSES

We can create our own type called **Circle**, using a **class** definition.

By convention class names LookLikeThis (capitalized words with no separator).

Classes are mutable and can contain named **attributes**, which are like variables.

`Circle()` will create a new object of type `Circle`.

ACTING ON OBJECTS

Now imagine that moving geometric objects right and left (x-translation) is important in our program. How would we do it?

We could create functions that modify the objects:

```
circle_translate_x(circle,delta_x)
rectangle_translate_x(rectangle,delta_x)
```

METHODS

Notice the functions we just defined take an object as the first argument and modify it in some way?

This is so common that there is a language feature just for this purpose.

A **method** is a function that is defined inside a class, and which then exists in each object of that type using syntax like `C.translate_x(dx)` if `C` is an object of type `Circle`.

IMPORTANT NOTE

A method is called like this: `C.translate_x(dx)`

But it receives argument list: `(C, dx)`

Methods always receive the object as their first argument!

`__init__`

For a class `Circle`, when we call `Circle()` we are actually running a special method called the **constructor**. It sets up a new object for us.

If we define a method `__init__(self,...)` in a class, it becomes the constructor.

__STR__

When Python needs to convert an object to a string, it calls the `__str__(self)` method, if it exists.

Define this and return a string that is a human-readable representation of what the object is.

REFERENCES

- In *Downey*:
  - Chapter 17 discusses classes, objects, and methods

REVISION HISTORY

- 2020-10-15 Initial publication