LECTURE 26

OBJECT-ORIENTED PROGRAMMING 2

OPERATOR OVERLOADING

MCS 260 Fall 2021

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REMINDERS

- Homework 9 available, due Tuesday at 10am
- Project 3 will be posted this evening
- Project 3 due 6pm central on Fri Nov 5

REVIEW

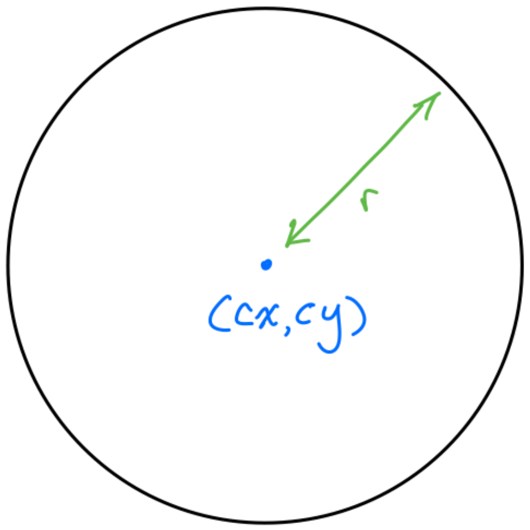
Key concepts from Lecture 25

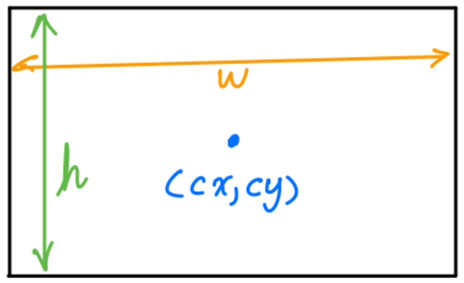
GOALS FOR TODAY

Improve our Rectangle and Circle classes.

Introduce operator overloading.

CIRCLES AND RECTANGLES

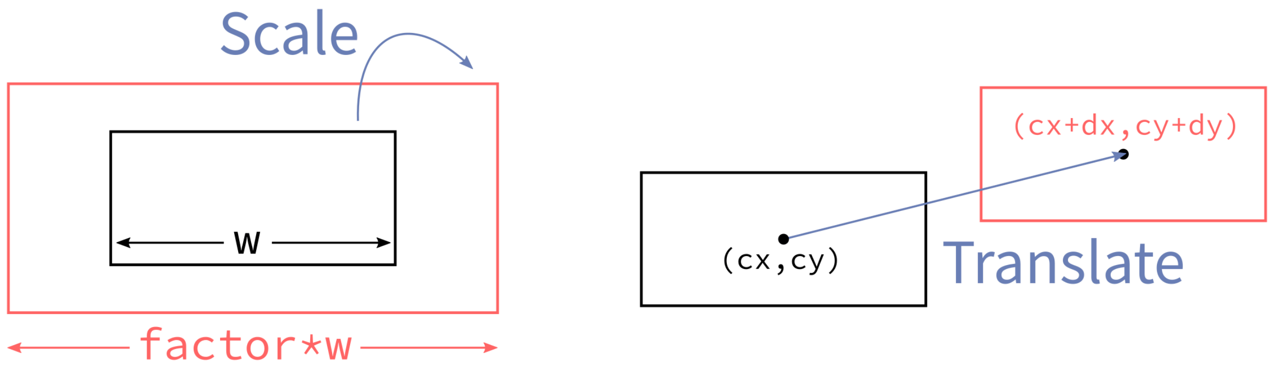




DESIRED METHODS

For both object types:

- Uniform scale about center
- Translation by a vector



__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.

EQUALITY

How is `A==B` evaluated when `A` and `B` are objects?

By default, it checks whether the names refer to the same object in memory. This is often not what you want.

OVERLOADING

Python allows us to specify our own behavior for operators like `==`. This is called **operator overloading**.

If method `A.__eq__` exists, then `A==B` evaluates to the return value of `A.__eq__(B)`.

ISINSTANCE

The built-in function `isinstance(obj,cls)` returns a bool indicating whether `obj` is an instance of the class `cls`, e.g. `isinstance(7,int)`

Using it sparingly. Remember, Python recommends EAFP rather that LBYL in most cases.

EAFP = Easier to Ask Forgiveness than Permission

LBYL = Look Before You Leap

Many operators can be overloaded, including:

Expression	Special method
`A+B`	`A.__add__(B)`
`A-B`	`A.__sub__(B)`
`A*B`	`A.__mul__(B)`
`A/B`	`A.__truediv__(B)`
`A**B`	`A.__pow__(B)`

List of many more in the Python documentation.

OVERLOADING BUILT-IN FUNCTIONS ETC.

Expression	Actually calls
`len(A)`	`A.__len__()`
`bool(A)`	`A.__bool__()`
`A[k]`	`A.__getitem__(k)`
`A[k]=v`	`A.__setitem__(k,v)`

REFERENCES

- In *Downey*:
    - Chapter 17 discusses classes, objects, and methods
- Object-oriented programming is discussed in general terms in Section 6.5 of Brookshear & Brylow.

REVISION HISTORY

- 2021-10-21 Initial publication