CSC148 fall 2013

Introduction to computer science

week 1

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Outline

Introduction

object-oriented design

What's CSC148 about?

- well first, CSC108 was about `if` statements, loops, function definitions and calls, lists, dictionaries, searching, sorting, classes, documentation style. So you've got all that down...

- ...otherwise, sign up for the CSC148 ramp-up session September 14th or 21st, 10–4

  `148rampup@cs.toronto.edu`

But what's CSC148 about?

- how to understand and write a solution for a real-world problem
- abstract data types (ADTs) to represent and manipulate information
- recursion: clever functions that call themselves
- exceptions: how to deal with unexpected situations
- design: how to structure a program

How's this course run?

All answers in course information sheet. Spoiler alert: meaning of life is 42...

python infested by objects

Here are some built-in objects to fool around with:

```
>>> w1 = "words"
>>> w2 = "swords"[1:]
>>> w1 is w2
False
>>> import turtle
>>> t = turtle.Turtle()
>>> t.pos()
(0.00,0.00)
>>> t.forward(100)
```

vandalizing existing classes

this is deeply wrong, except for teaching purposes...

```
>>> from turtle import Turtle
>>> t1 = Turtle()
>>> t1.pos()
(0.00,0.00)
>>> t1.forward(100)
>>> t1.pos()
(100.00,0.00)
>>> t1.neck
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
AttributeError: 'Turtle' object has no attribute 'neck'
>>> Turtle.neck = "very reptilian"
>>> t2 = Turtle()
>>> t2.neck
'very reptilian'
```

Design a new class

Somewhere in the real world there is a description of points in two-dimensional space:

> *In two dimensions, a point is two numbers (coordinates) that are treated collectively as a single object. Points are often written in parentheses with a comma separating the coordinates. For example, (0, 0) represents the origin, and (x, y) represents the point x units to the right and y units up from the origin. Some of the typical operations that one associates with points might be calculating the distance of a point from the origin, or from another point, or finding a midpoint of two points, or asking if a point falls within a given rectangle or circle.*

Find the most important noun (good candidate for a class...), its most important attributes, and operations that sort of noun should support.

build class Point...

in that deeply wrong, but informative, way

```
>>> from math import sqrt
>>> class Point(object):
...     pass
...
>>> def initialize(point, x, y):
...     point.x = x
...     point.y = y
...
>>> def distance(point):
...     return sqrt(point.x**2 + point.y**2)
...
>>> Point.__init__ = initialize
>>> Point.distance = distance
>>> p2 = Point(12, 5)
>>> p2.distance()
13.0
>>>
```

build class Point...

...properly!...

```
from math import sqrt

class Point:
    """Two dimensional point
    """

    def __init__(self: 'Point',
                 x: float,
                 y: float) -> None:
        """Initialize this point
        >>> p = Point(3, 4)
        """
        self.x = x
        self.y = y

# and so on
```