CIS 122

A Class of One's Own

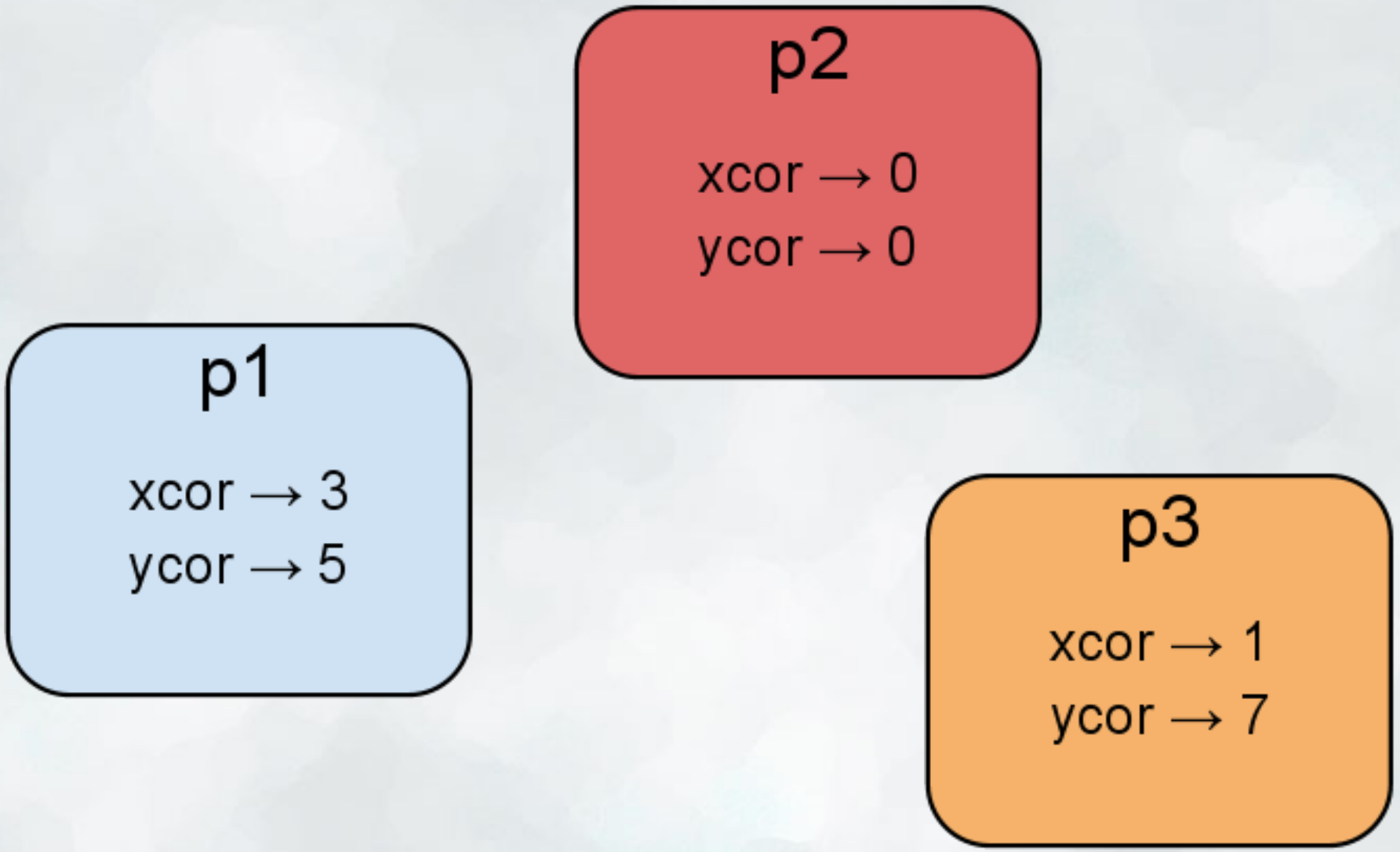
Logistics

- Assignment 4
  - Grades Posted
  - Solutions Posted
- Assignment 4 Grades
  - Forgot to give extra credit for guessing game features
  - I'll fix that tonight
- Assignment 5
  - Do the first part now (feel free to ask for help)
  - We'll work on the second part on Friday

Classes

- Custom objects
  - Composed of properties and methods
- Properties store information
  - Coordinates
  - Names
- Methods tell object how to act
  - __init__
  - __repr__

Classes



Class Methods Under the Surface

- Class methods all start with a special argument
  - Generally named "self"
  - Refers to the object calling the method
- What really happens when we call a class method?
  - What happens to that first argument?

Class Methods Under the Surface

```
class Point:

    def __init(self, x, y):
        <init code>

    def __repr__(self):
        return "(" + str(self.xcor) + ", " + str(self.ycor) + ")"

    def absValue(self):
        return math.sqrt(self.xcor**2 + self.ycor**2)

print p
```

Class Methods Under the Surface

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print p.__repr__()
```

Class Methods Under the Surface

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class Point:

    def __init(self, x, y):
        <init code>

    def __repr__(self):
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print p.__repr__()
print Point.__repr__(p)
```

Class Methods Under the Surface

- When Python calls a class method
  - The object gets substituted in for the first argument

    p.__repr__() → print Point.__repr__(p)
    p.absVal() → Point.absVal(p)

- The constructor is a little strange
  - But works the same way

Adding up your Points

- How do we add two points?
  - Sum their x coordinates
  - Sum their y coordinates

- For example
  - (1, 3) + (10, 20) = (11, 23)
  - (2, 2) + (-2, -2) = (0, 0)
  - (0, 0) + (0, 0)   = (0, 0)

Adding up your Points

- Let's define addition for our Point class

- __add__ method
  - Defines "+" operator for our class
  - Takes two arguments

```
def __add__(self, other):
```

Adding up your Points

- Let's define addition for our Point class

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```
def __add__(self, other):
    newX = self.xcor + other.xcor
    newY = self.ycor + other.ycor
    newPoint = Point(newX, newY)
    return newPoint
```

Comparing Points

- How does Python compare objects?

- Everything boils down to numbers
  - Ints - compare values
  - Floats - compare values
  - Characters - compare ord values
  - Strings - compare characters

- To compare points, we'll need a basis for comparison
  - How would we like to compare two points?

Comparing Points

- Python has special comparison methods
  - __gt__ → >
  - __ge__ → >=
  - __lt__ → <
  - __le__ → <=
  - __eq__ → ==
  - __ne__ → !=
- That's a lot of methods to define
  - It would be nice if we could define just one

Comparing Points

- Python has one method covering all comparisons
- __cmp__(a,b)
  - Takes two arguments
  - Returns a number
    - Negative if a < b
    - Positive if a > b
    - 0 if a == b
- Let's write a __cmp__ method for our point class

Get the Point

- We now have a functioning Point class
  - Constructor
  - Representation
  - Distance from origin
  - Addition
  - Comparison
- We could add more functionality
  - Depends on what we're using it for

Representing a Student

- Suppose I was writing a grading program
- I might want a student class
  - Keep track of students scores
  - Calculate grades
- What properties should a student have?

Representing a Student

- Student Class
- Properties
  - Name
  - Grades
- Methods
  - Add grade
  - Calculate average grade
  - Get letter grade

Representing a Student

- Let's start at the beginning
- Define a student class
  - With a student constructor
- What information do we need to make a student?
- What information do we want our student to store?

Representing a Student

```
class Student:

    def __init__(self, studentName):
        self.name = studentName
        self.grades = []
```

Representing a Student

- Now let's print out our student
  - What should a student look like?

```
def __repr__(self):
    return self.name
```

Representing a Student

- Now we can make students and display students
- Let's add some functionality
  - addGrade
  - averageGrade
  - letterGrade

Student Class So Far...

```
class Student:

    def __init__(self, studentName):
        self.name = studentName
        self.grades = [ ]

    def __repr__(self):
        return self.name

    def addGrade(self, grade):
        self.grades.append(grade)
```