CS21: INTRODUCTION TO COMPUTER SCIENCE

Prof. Mathieson

Fall 2017

Swarthmore College

student_computer.py
(find your computer - just this week!)

Amaechi	owl
Sajal	parrot
Matt	pelican
Youssef	pigeon
David	puffin
Ian	quail
Brandon	raven
Andrew	robin
Allan	seagull
Sagnik	sparrow
Nick	lark
Rutger	kestrel
Adi	ibis
Austin	hawk
Maddie	dodo
Mikey	cuckoo
Peem	crane

Shani	cardinal
Patrick	duck
Ari	heron
Yusa	buzzard
Sid	bluejay
Miryam	eagle
Talia	egret
Sophia	falcon
Skylar	finch
Anar	flamingo
Kyle	grouse
Bayliss	ostrich
Shirline	osprey
Eddie	macaw
Claudia	magpie
Chris	loon
Abby	swan

Outline Oct 2:

- Lab 2 examples
- Introduction to object-oriented programming
- Start graphics
- Random circle program (**circles.py**)
- Cat face program (**cat_face.py**)

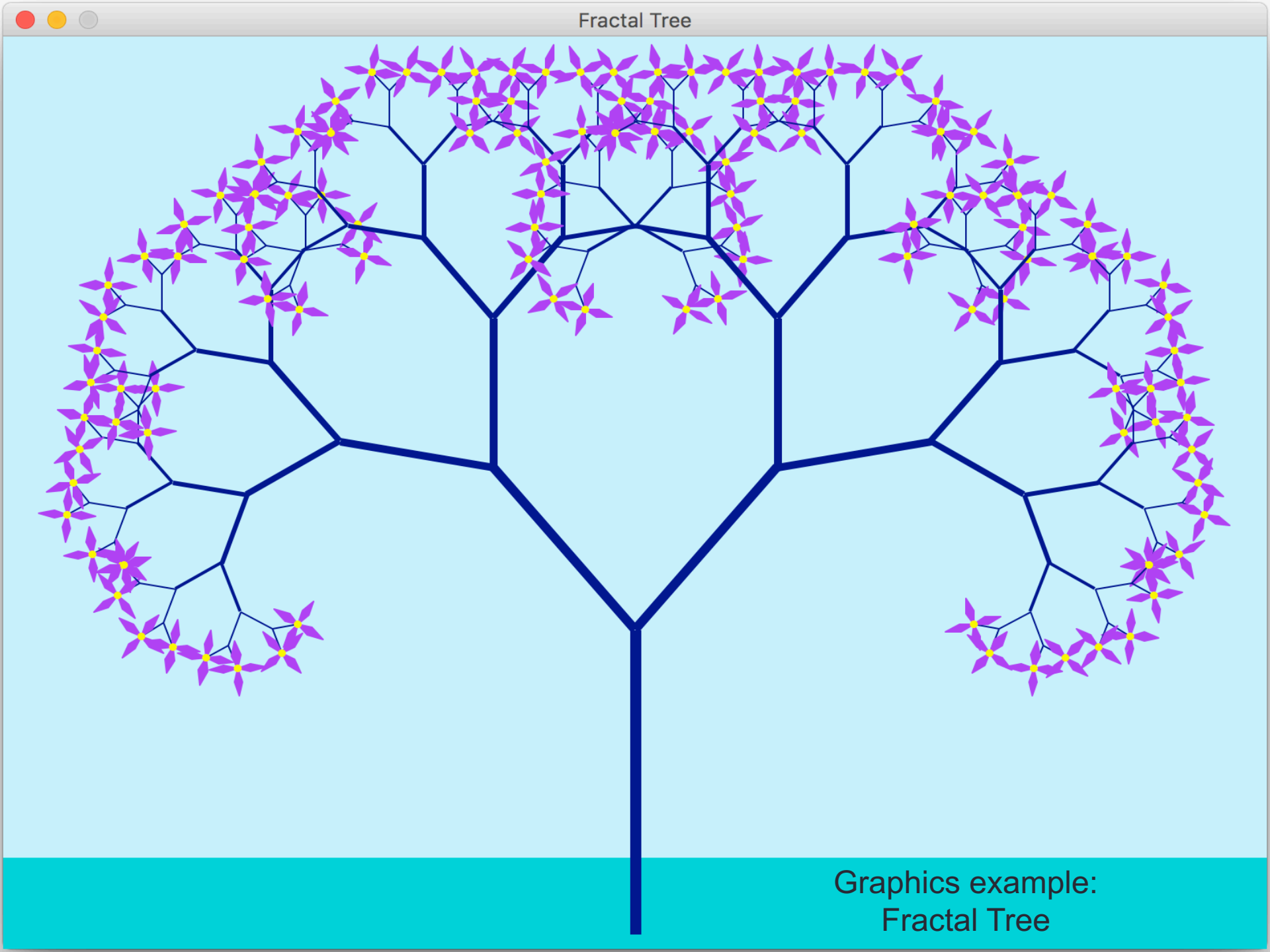
Notes

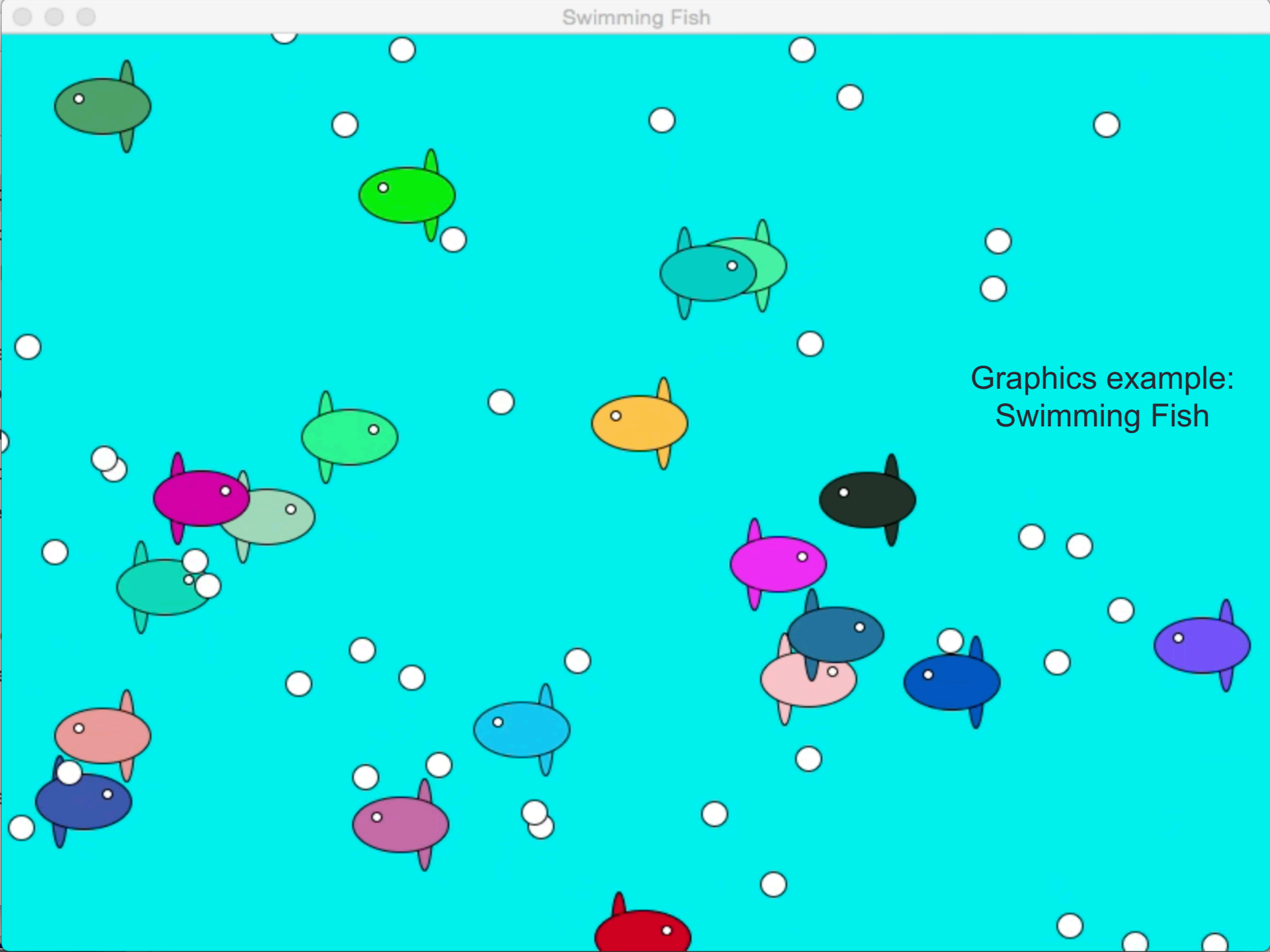
- **Quiz 2** this **Friday** (study guide online)
- **Lab 4** due **Saturday** night
- **Office Hours 3-5pm on Friday (or by appointment)**

Lab 2 Examples

(not posted online)

Graphics and Object Oriented Programming (OOP)


Fractal Tree
Graphics example:
Fractal Tree


Swimming Fish
Graphics example:
Swimming Fish

Goals for this week

- Understand the idea of OOP
- Be able to create objects and call methods
- Become comfortable with the vocabulary of OOP
- Be able to use the graphics library documentation to learn new types and methods

Idea of Object Oriented Programming

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* Data
* Methods
* Type

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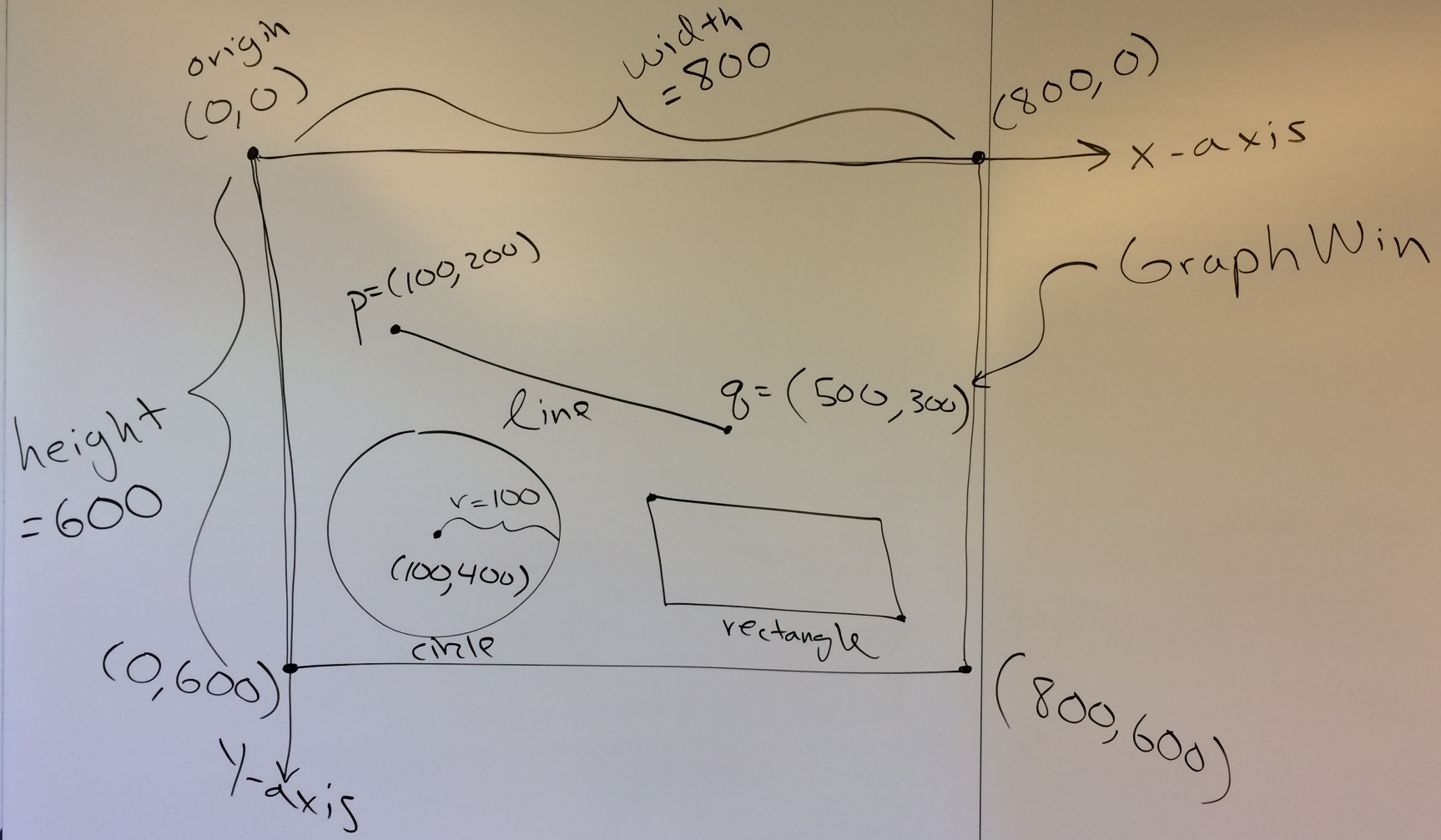
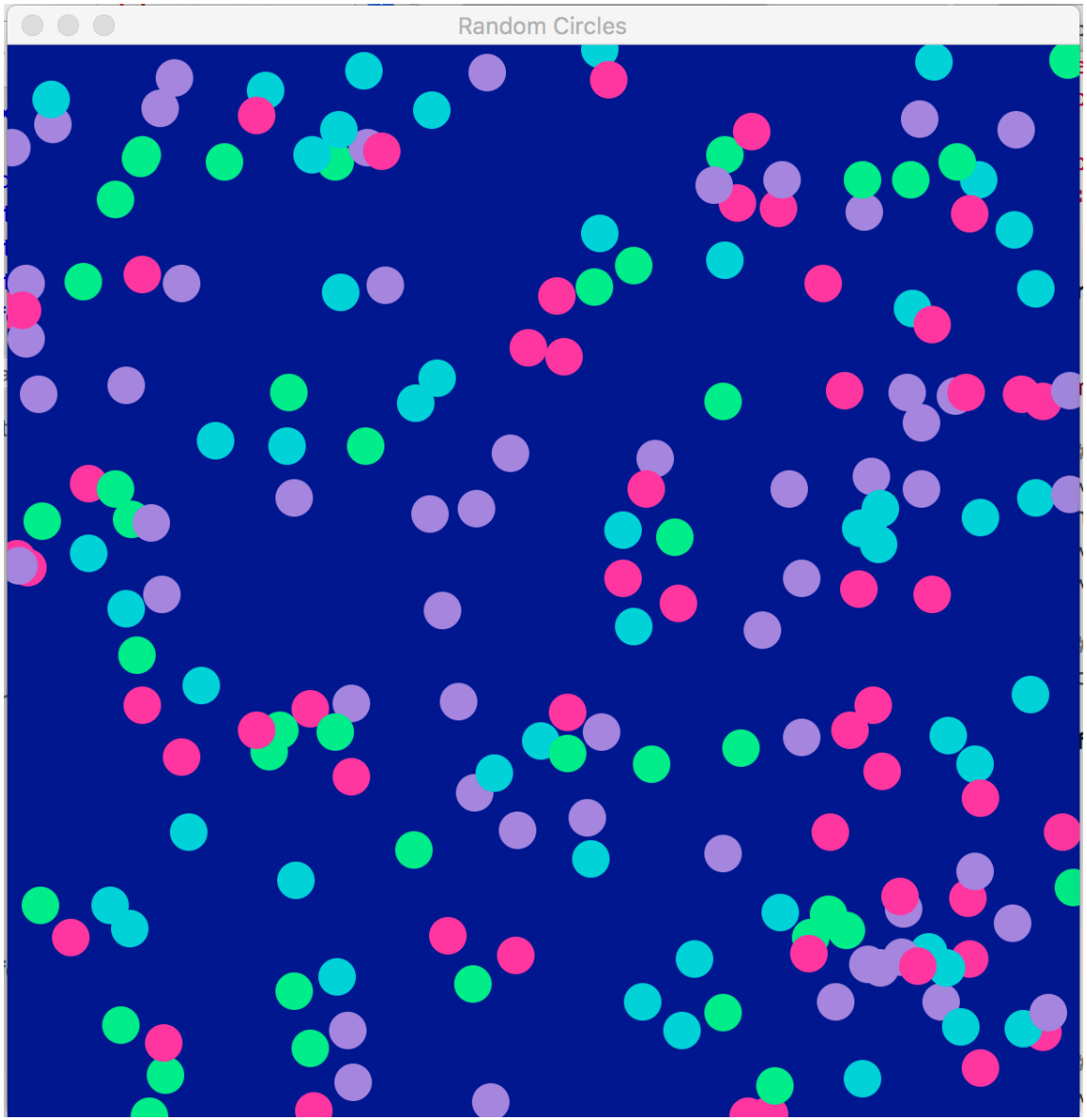
The type of p is Point, p is an *instance* of the Point *class*



Graphics Setup

Random circles (circles.py)



Websites to bookmark

- Graphics library documentation:

http://mcsp.wartburg.edu/zelle/python/graphics/graphics.pdf

- Colors we can use: http://wiki.tcl.tk/37701

GraphWin class

- **GraphWin(title, width, height)** – constructs a new graphics window (default width and height are both 200)
- **setBackground(color)** – set the background color
- **close()** – closes the window
- **getMouse()** – waits for the user to click, returns the click position as a **Point**
- **checkMouse()** – does not wait for the user to click, returns the click position as a **Point,** or None if no position clicked

Methods for all Graphics Objects

- **setFill(color)** – sets the interior color of an object
- **setOutline(color)** – sets the outline color of an object
- **setWidth(pixels)** – sets the outline width (doesn't work for **Point**)
- **draw(window)** – draws the object on the given window
- **undraw()** – removes the object from a graphics window
- **move(dx,dy)** – moves the object dx in the x direction and dy in the y direction
- **clone()** – returns a duplicate (new copy) of the object

Point class

- **Point(x,y)** – constructs a new point at the given position
- **getX()** – returns the current x coordinate
- **getY()** – returns the current y coordinate

Line class

- **Line(point1, point2)** – constructs a line from point1 to point2
- **setArrow(string)** – sets the arrowhead of a line ("first", "last", "both", "none")
- **getCenter()** – returns the midpoint of the line
- **getP1()**, **getP2()** – returns a clone of the corresponding endpoint

Circle class

- **Circle(center, radius)** – constructs a circle at the given position and with the given radius
- **getCenter()** – returns a clone of the center point
- **getRadius()** – returns the radius
- **getP1()**, **getP2()** – returns a clone of the corresponding corner of the circle's bounding box (upper left, lower right)

Rectangle class

- **Rectangle(point1, point2)** – constructs a rectangle with opposite corners at the given points (upper left, lower right)
- **getCenter()** – returns the center point
- **getP1()**, **getP2()** – returns a clone of the corner point

Polygon class

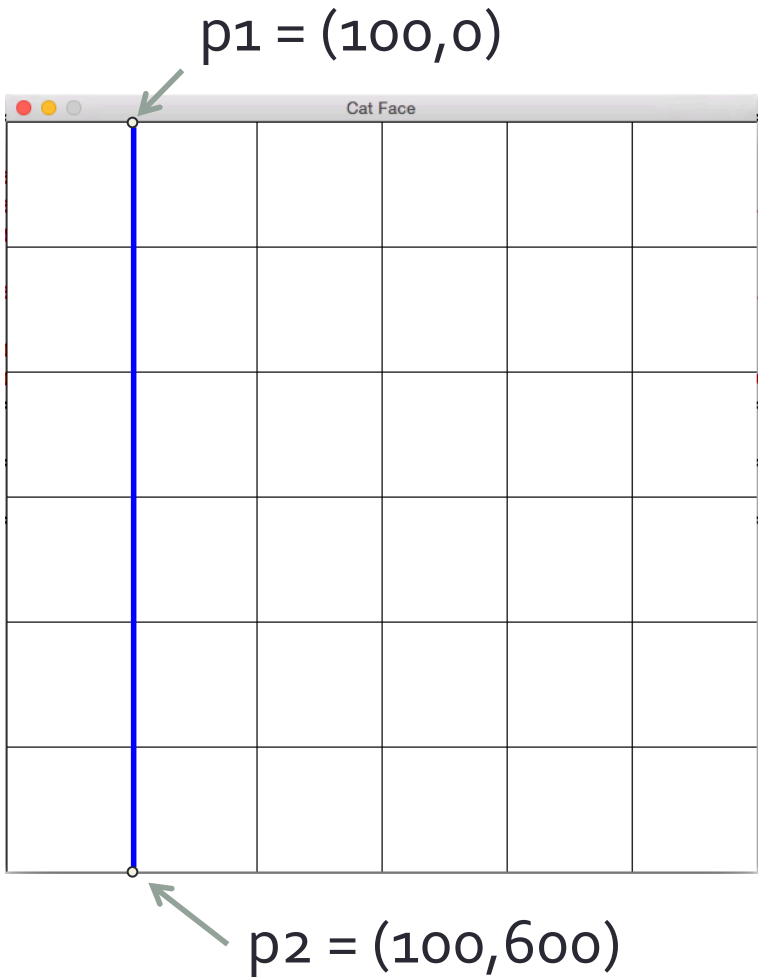
- **Polygon(point1, point2, point3, …)** – constructs a polygon with the given points as vertices (also accepts a list of points)
- **getPoints()** – returns a list of the points in the polygon

Cat Face Exercise

Step 1: (optional) create a grid

- Window 600 x 600
- Grid lines every 100
- Line example:

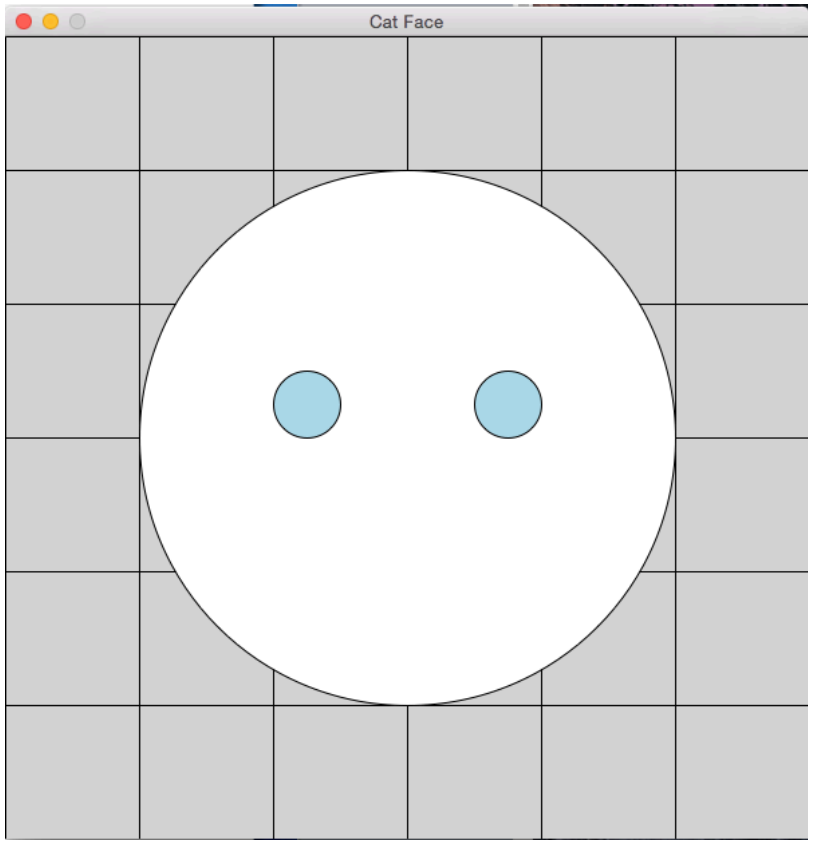
```
# first vertical line
p1 = Point(100,0)
p2 = Point(100,height)
l = Line(p1,p2)
l.draw(win)
```



Step 2: create a face and eyes

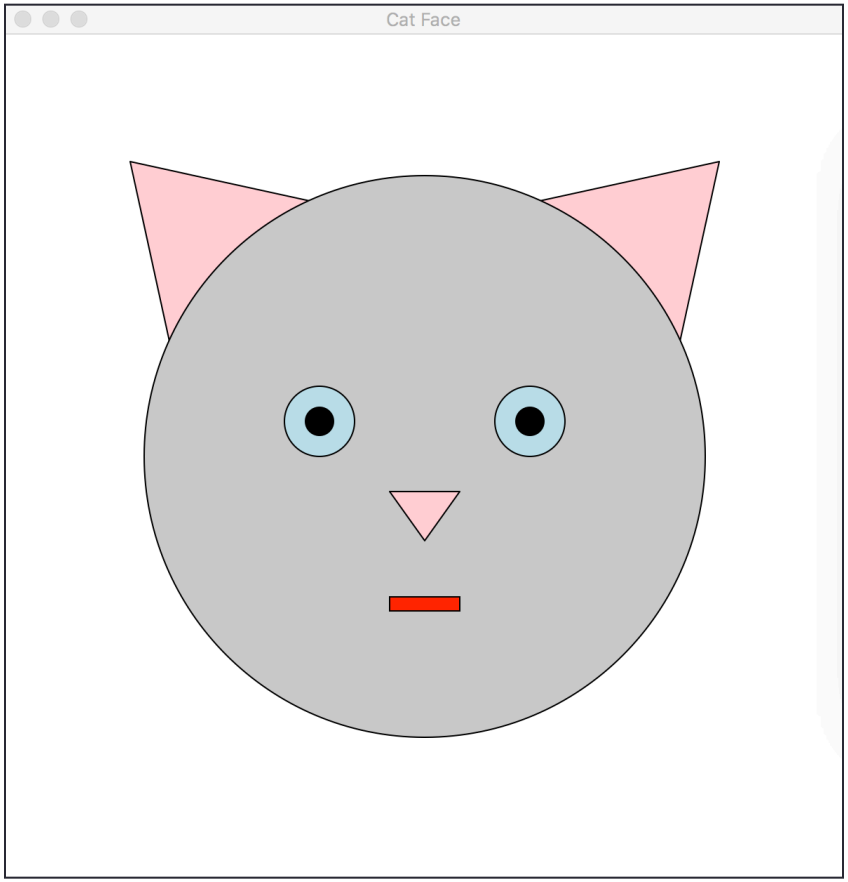
- Create a left eye using a circle
- Clone (copy) the left eye to make the right eye
- Move the right eye over

```
right_eye = left_eye.clone()
right_eye.move(dx,dy)
right_eye.draw(win)
```



Step 3: create nose, ears, mouth

- Create mouth as a rectangle
- Create nose as a polygon
- Create ears as polygons
- Remove background grid
- Change colors!



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