OBJECTS AND GRAPHICS

CSSE 120 – Rose-Hulman Institute of Technology

Outline

- Eclipse
- The object of objects
- Graphics
- Creating and using objects
- Interactive graphics
- Coordinate systems
- In-class practice time

input() and raw_input() are related through the eval function

- Syntax:
  - eval(<string>)
- Semantics
  - Input: any string
  - Output: result of evaluating the string as if it were a Python expression

- On yesterday's quiz, you investigated the relationship between input and raw_input.
- How does eval relate them?

Eclipse configuration

- If you haven't yet shown me your working Eclipse configuration, show me:
  - The output of either spam.py or greeting.py
  - spam.py **source code** if you have it
    - **Window > Open perspective > Other > SVN Repository Exploring** otherwise
- While I am checking people's code, please do question 1 on the quiz.

Integrated Development Environments (IDEs)

- What are they?
- Why use one?
- Our IDE – Eclipse
  - Why we chose it
  - Basic concepts in Eclipse
    - Workspace, Workbench
    - Files, folders, projects
    - Views, editors, perspectives
    - http://www.rose-hulman.edu/class/csse/resources/Eclipse/installation.htm

The next slides address the listed points

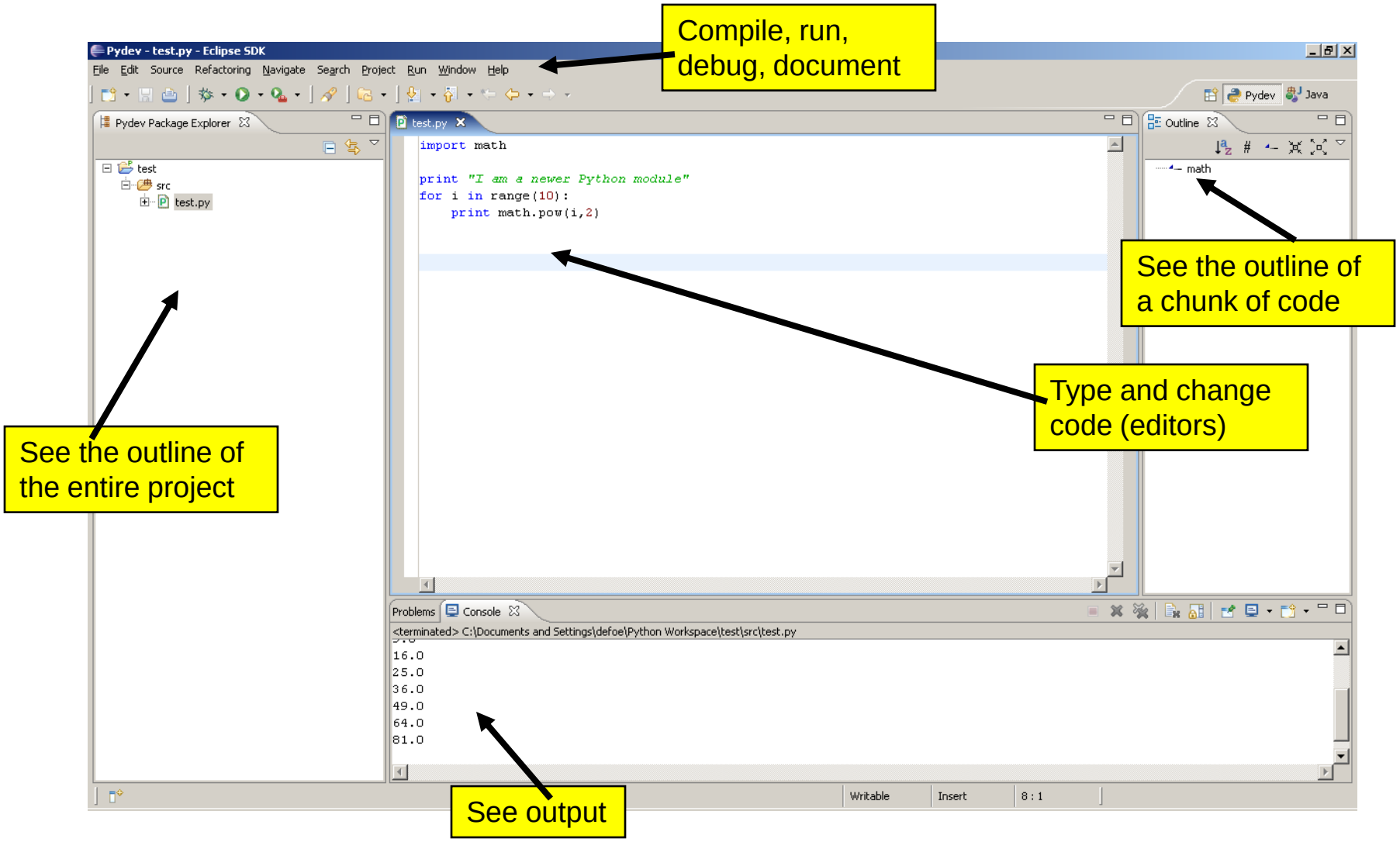
If your Eclipse still doesn't work

- Go to course Angel page:
  Resources → Course Resources section →
  expand CSSE 120 Course Resources →
  click Course Resources Page →
  click Configuring Python on Eclipse in the Software Installation section
- Scroll down to the section:
  Configuring PyDev
- Complete the instructions to the end of the document
- Get help as needed

IDEs – What are they?

An IDE is an application that makes it easier to develop software.

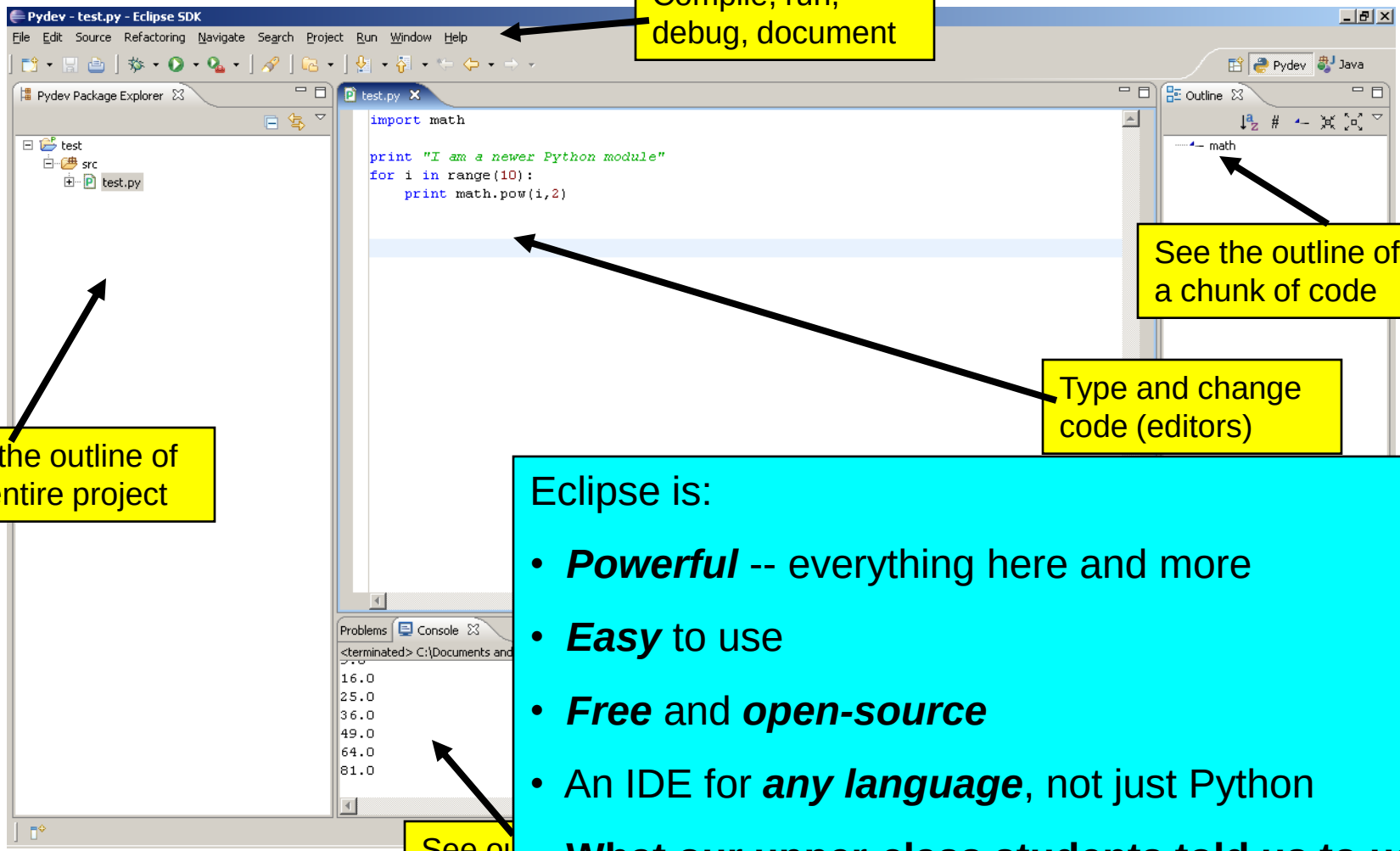
They try to make it easy to:



IDEs – Why use one?

An IDE is an application that makes it easier to develop software.

They try to make it easy to:



Compile, run, debug, document

See the outline of a chunk of code

Type and change code (editors)

See the outline of the entire project

See ou

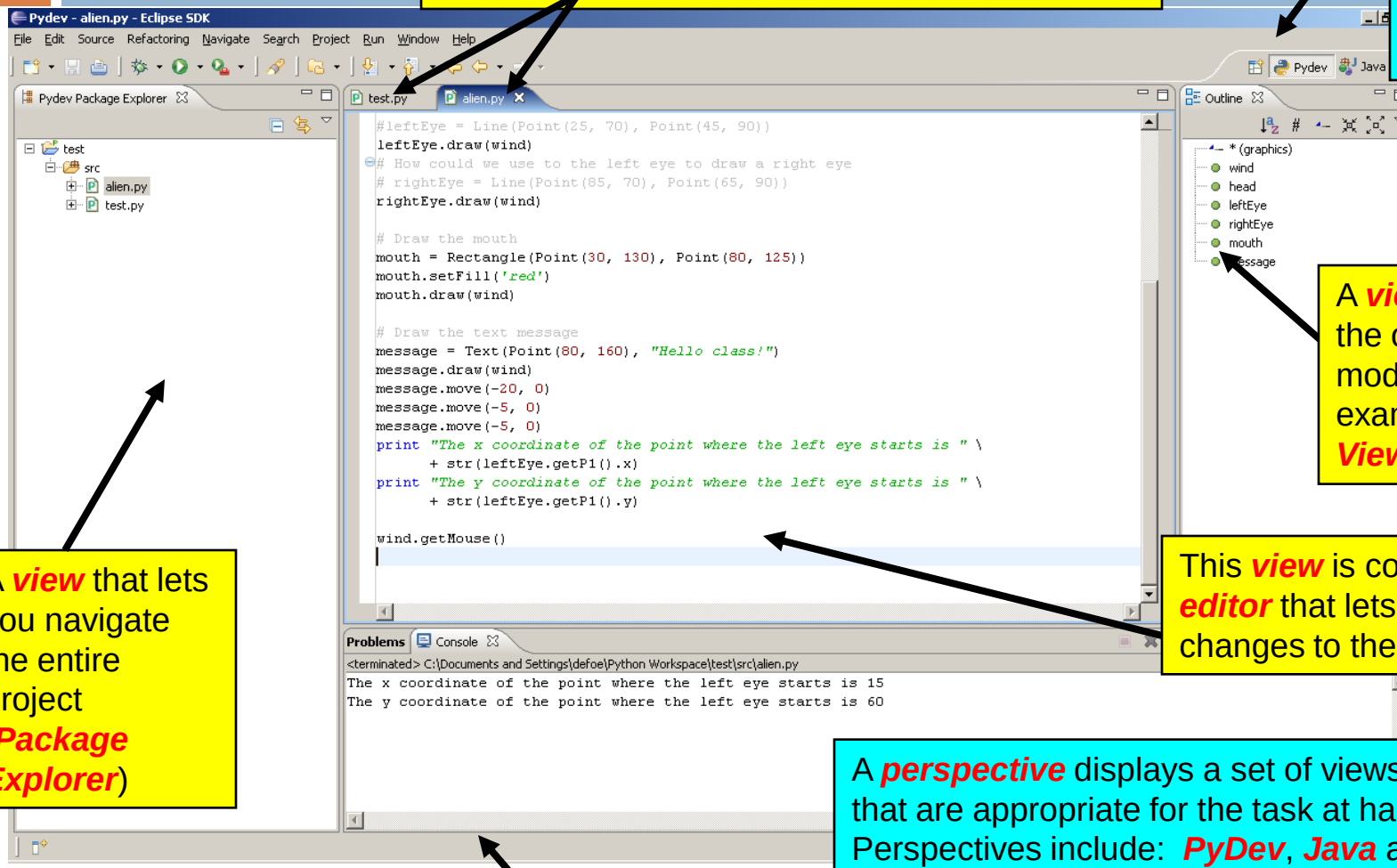
Eclipse is:

- ***Powerful*** -- everything here and more
- ***Easy*** to use
- ***Free*** and ***open-source***
- An IDE for ***any language***, not just Python
- **What our upper-class students told us to use!**

Basic concepts in Eclipse

- ***Workspace*** – where your ***projects*** are stored on your computer
- ***Project*** – a collection of files, organized in folders, that includes:
  - ***Source code*** (the code that you write)
  - ***Compiled code*** (what your source code is translated into, for the machine to run)
  - ***Design documents***
  - ***Documentation***
  - ***Tests***
    - And more that you will learn about over time
- ***Workbench*** – what we saw on the previous slide, that is, the tool in which you do your software development

Views, editors, perspectives



Tabbed ***views*** of the source code of this project

This is the ***PyDev perspective*** but just a button click brings us to another

A ***view*** that shows the outline of the module being examined (***Outline View***)

A ***view*** that lets you navigate the entire project (***Package Explorer***)

This ***view*** is controlled by an ***editor*** that lets you make changes to the file

A ***perspective*** displays a set of views and editors that are appropriate for the task at hand. Perspectives include: ***PyDev***, ***Java*** and lots more

Tabbed ***views*** (***Problems***, ***Console***)

The object of objects

- Data types for strings and numbers are passive
  - Each represents set of values
    - Passive
  - Each has set of operations
    - Active
- Most modern computer programs built using Object-Oriented (OO) approach
  - Objects regarded as active data type
    - Know stuff
    - Can do stuff

The object of objects

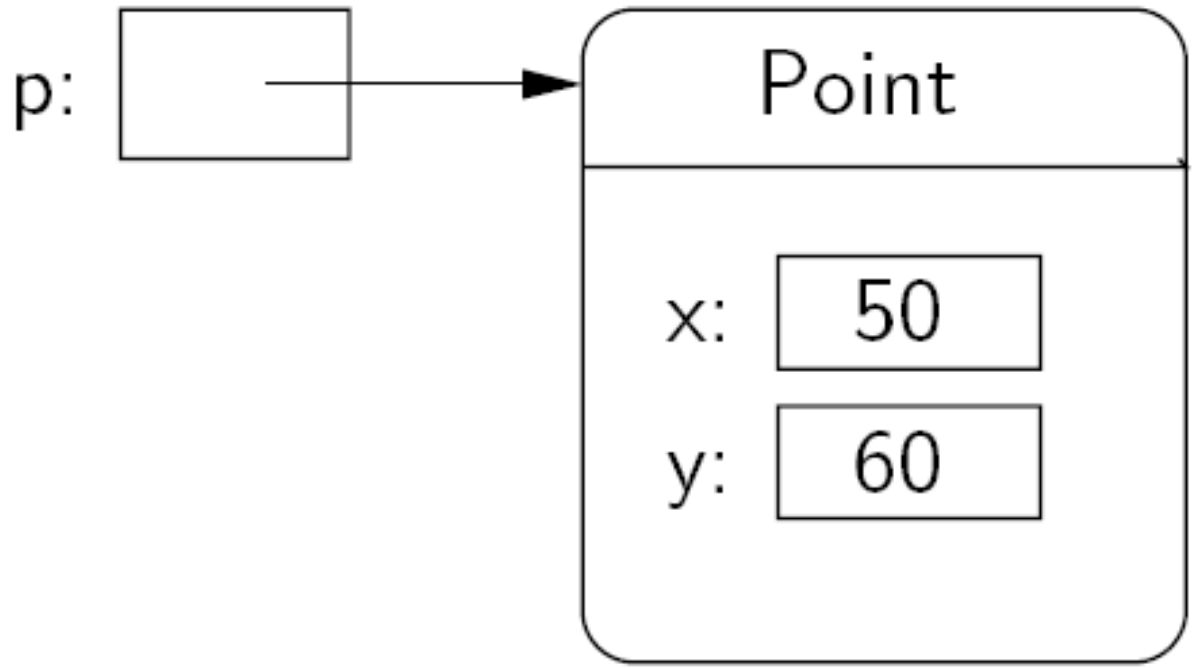
- Basic Idea of OO development
  - View complex system as interaction of simple objects
  - Example: the human body is a complex system

How do objects interact?

- Objects interact by sending each other messages
  - Message: request for object to perform one of its operations
  - Example: the brain can ask the feet to walk
  - In Python, messages happen *via* method calls.
- >>> win = GraphWin()
- >>> p = Point(50, 60) # constructor
- >>> p.getX() # *accessor* method
- >>> p.getY()
- >>> p.draw(win)

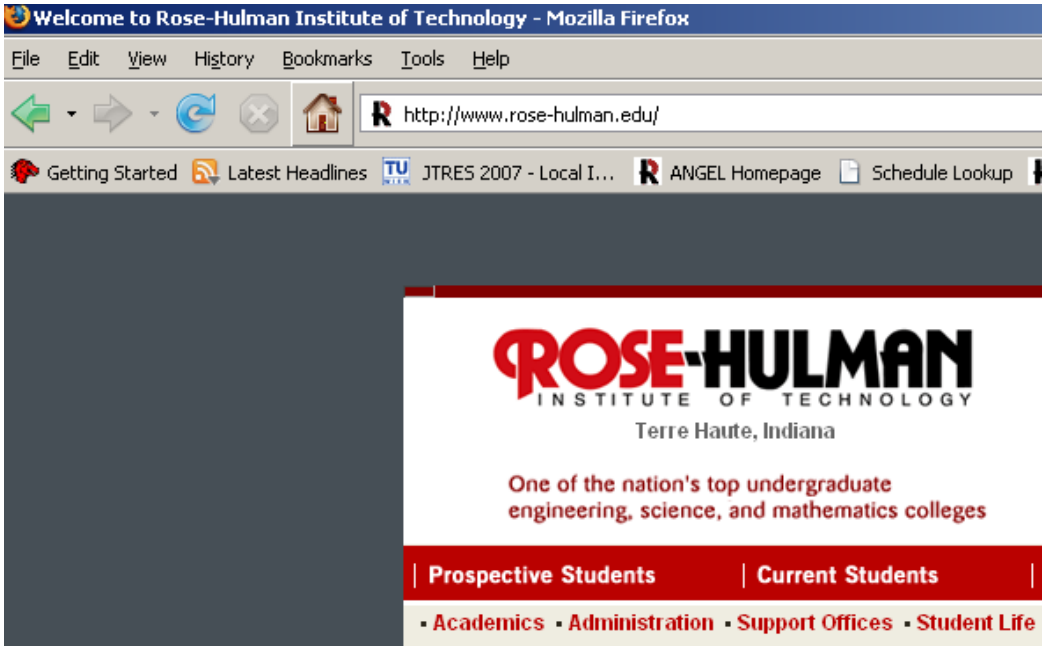
How do objects interact? Point

p = Point(50, 60)



Simple graphics programming

- Graphics is fun and provides a great vehicle for learning about objects
- Computer graphics: study of graphics programming
- Graphical User Interface (GUI)

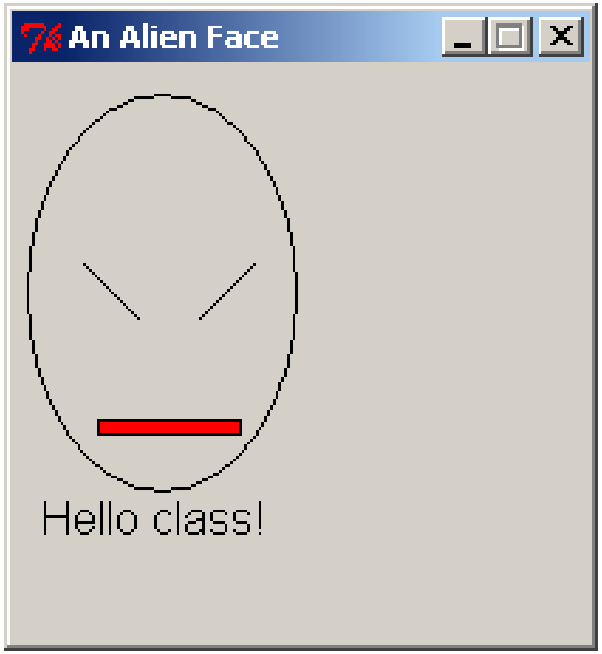


You choose how to import

- Must import graphics library before accessing it
  - >>> import zellegraphics
  - >>> win = zellegraphics.GraphWin()
- Another way to import graphics library
  - >>> from zellegraphics import *
  - win = GraphWin()

Using graphical objects

- Using different types of objects from the graphics library, draw the following alien face and message



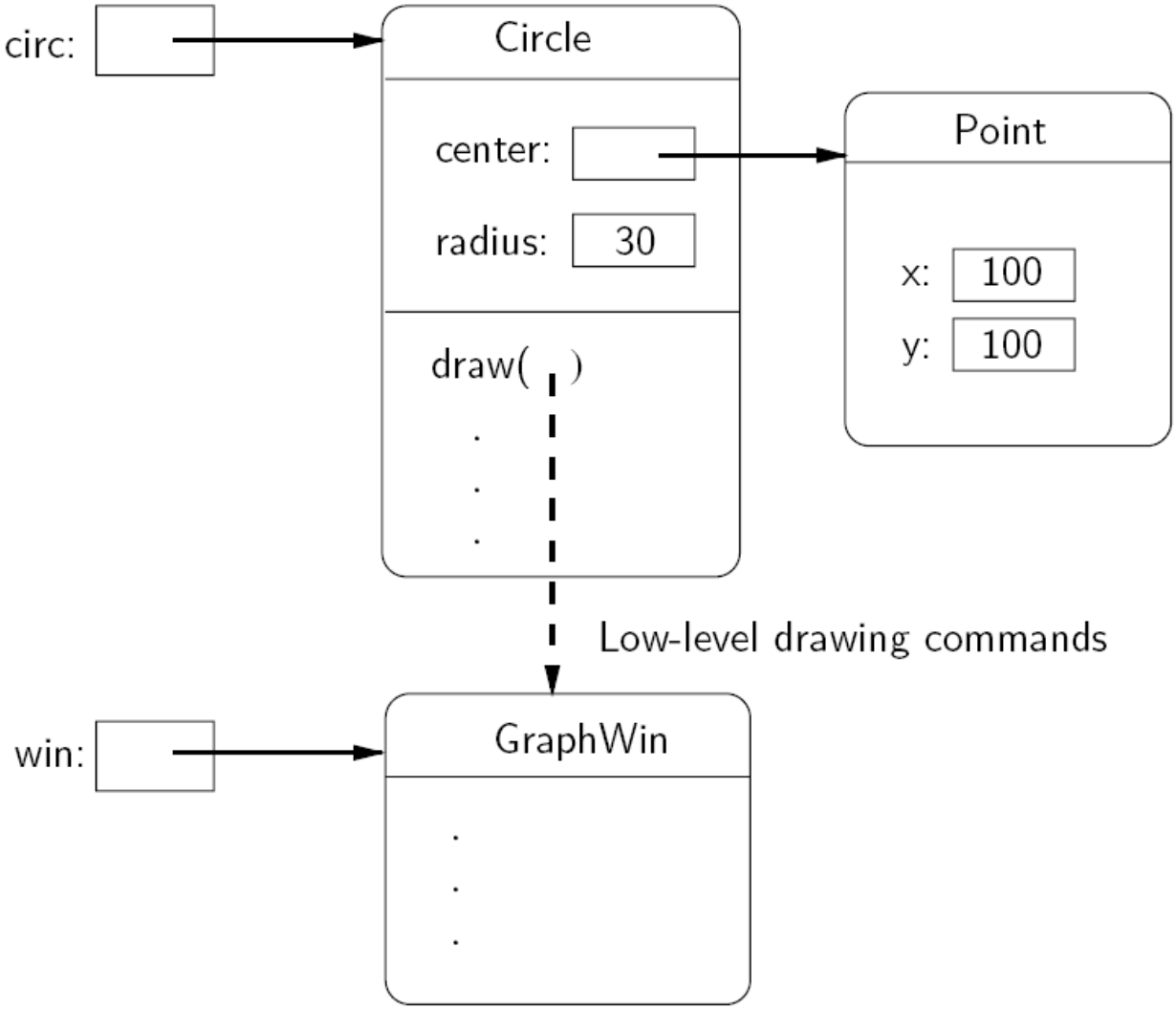
Paige clearly isn't working on homework for CSSE120

- Preview of tonight's homework:
  1. Read in and draw cool plots from the points in the files you generated in HW5
  2. Create a cool slideshow picture viewer!

Review: Class and object terminology

- Different types of objects
  - Point, Line, Rectangle, Oval, Text
  - These are examples of *classes*
- Different objects
  - head, leftEye, rightEye, mouth, message
  - Each is an *instance* of a class
  - Created using a *constructor*
  - Objects have *instance variables*
  - Objects use *methods* to operate on instance variables

Object interaction to draw a circle



Interactive graphics

- *GUI*—Graphical User Interface
  - Accepts input
    - Keyboard, mouse clicks, menu, text box
  - Displays output
    - In graphical format
    - On-the-fly
- Developed using *Event-Driven Programming*
  - Program draws interface elements (*widgets*) and waits
  - Program responds when user does something

getMouse

- win.getMouse()
  - Causes the program to halt, waiting for the user to click with the mouse somewhere in the window
  - To find out where it was clicked, assign it to a variable:
    - p = win.getMouse()

Mouse Event Exercise

Together, lets' solve the following problem:

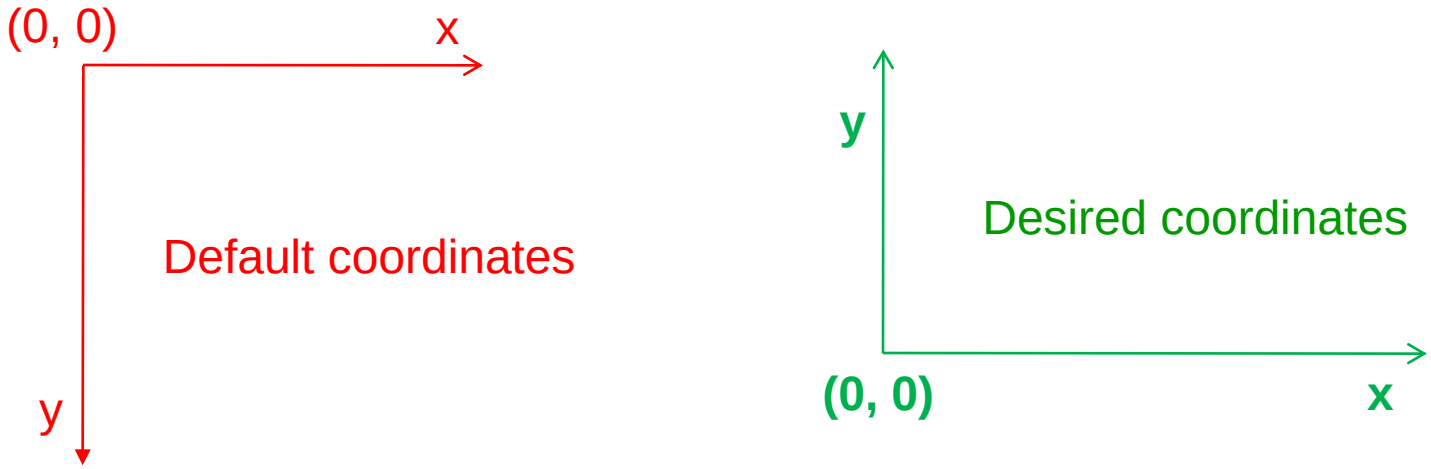
Create a program, clickme.py, with a window labeled "Click Me!" that displays the message *You clicked (x, y)* the first 5 times the user clicks in the window.

The program also draws a red-filled circle, with blue outline, for each of these first 5 clicks.

The program closes the window on the 6th click

Coordinate systems

- An important use of graphics is to represent **data** visually
  - Example: a bar chart
- We really want (0,0) to be in the lower-left corner



Desired coordinate system

- setCoords(x1, y1, x2, y2) method from GraphWin class
  - Sets the coordinates to run from (x1,y1) in the lower-left corner to (x2,y2) in the upper-right corner.