OBJECTS AND GRAPHICS

CSSE 120 – Rose-Hulman Institute of Technology

Outline

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

Integrated Development Environments (IDEs)

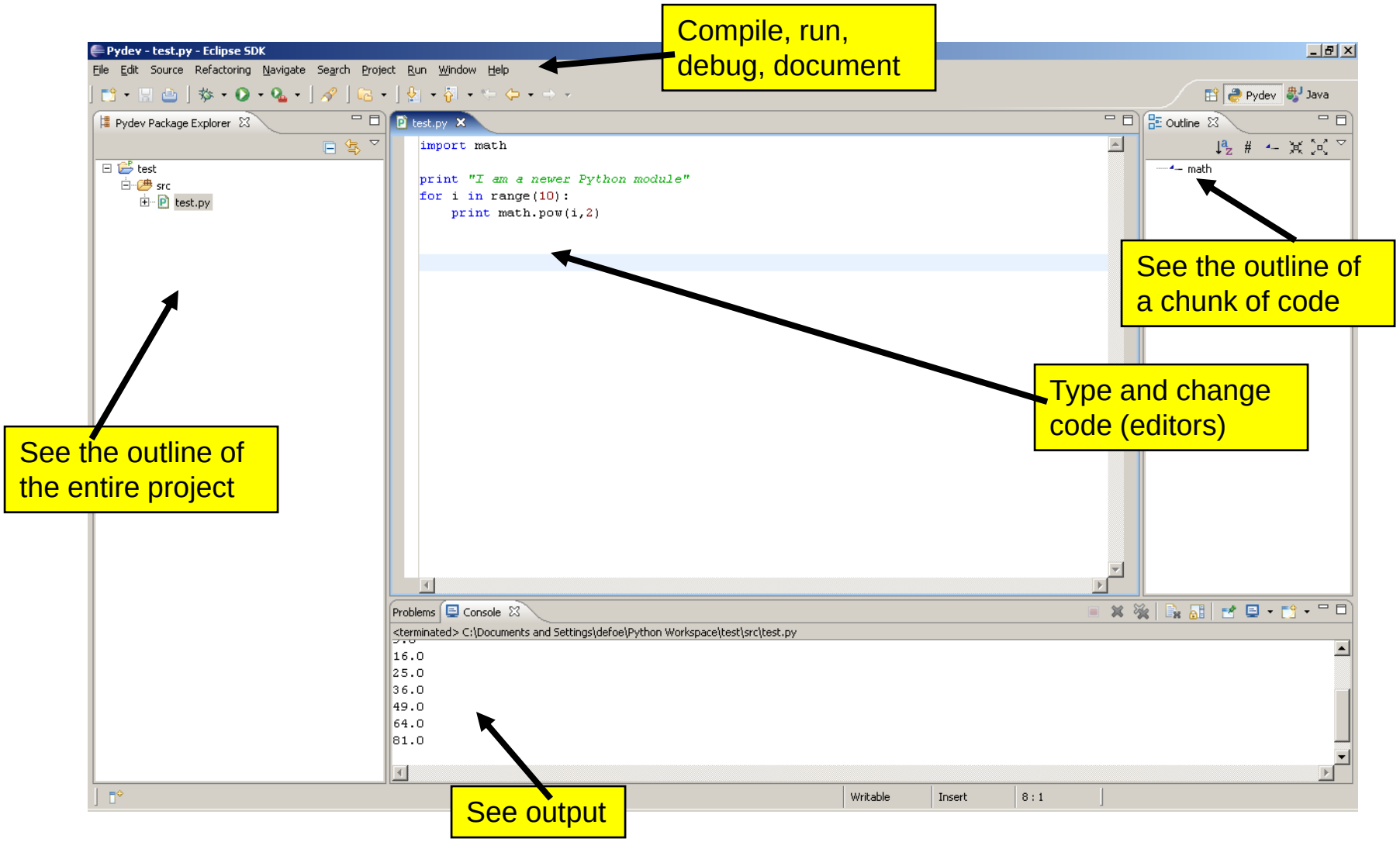
- What are they?
- Why use one?
- Our IDE – Eclipse
  - Why we chose it
  - Basic concepts in Eclipse
    - Workspace, Workbench
    - Files, folders, projects
    - Views, editors, perspectives
    - http://www.rose-hulman.edu/class/csse/resources/Eclipse/installation.htm

The next slides address the listed points

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?

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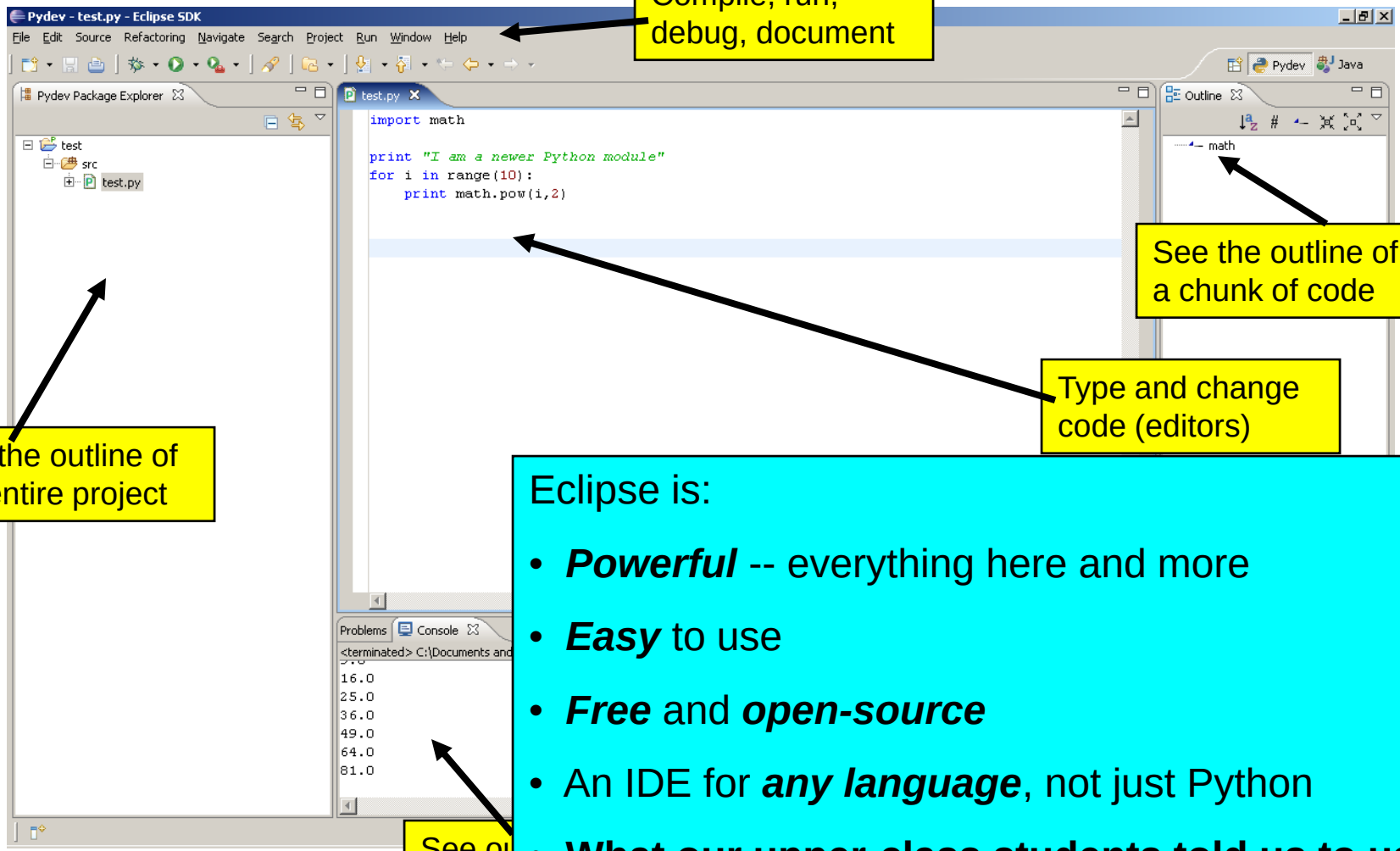


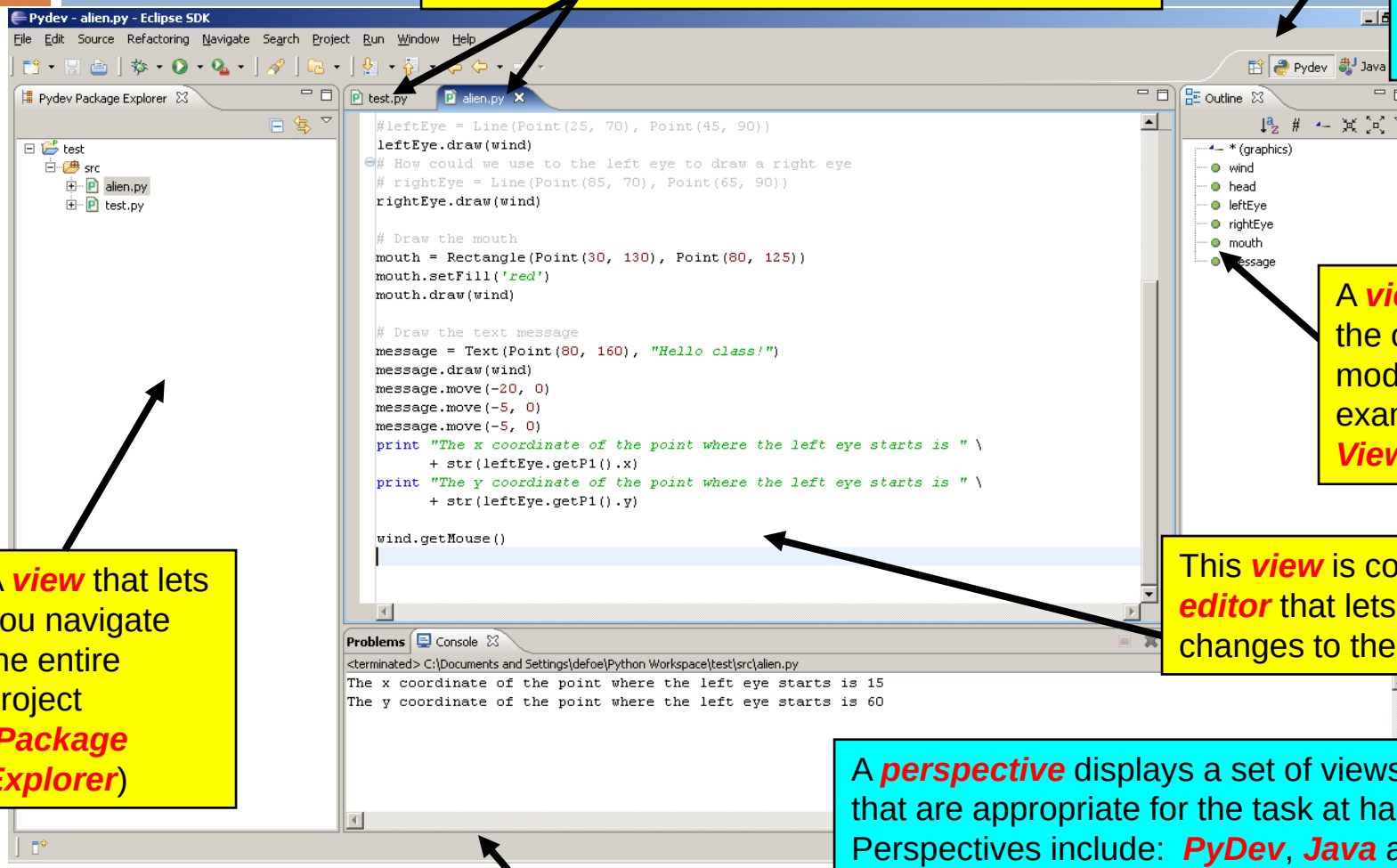
Eclipse is:

- ***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***)

Eclipse in a Nutshell

- ***Workspace*** – where your ***projects*** are stored on your computer
- ***Project*** – a collection of files, organized in folders, that includes:
  - ***Source code*** and ***Compiled code*** and more
- ***Workbench*** – the tool in which to work
  - It has ***perspectives*** which organize the ***views*** and ***editors*** that you use

Verify that Eclipse Works for You

- Go to course Angel page:
  Resources → Course Resources section →
  Software Installation links →
  Configuring Python on Eclipse
- Scroll down to the section:
  Writing Your First Python Program
- Complete the instructions from there to the end of the document
- Get help as needed

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

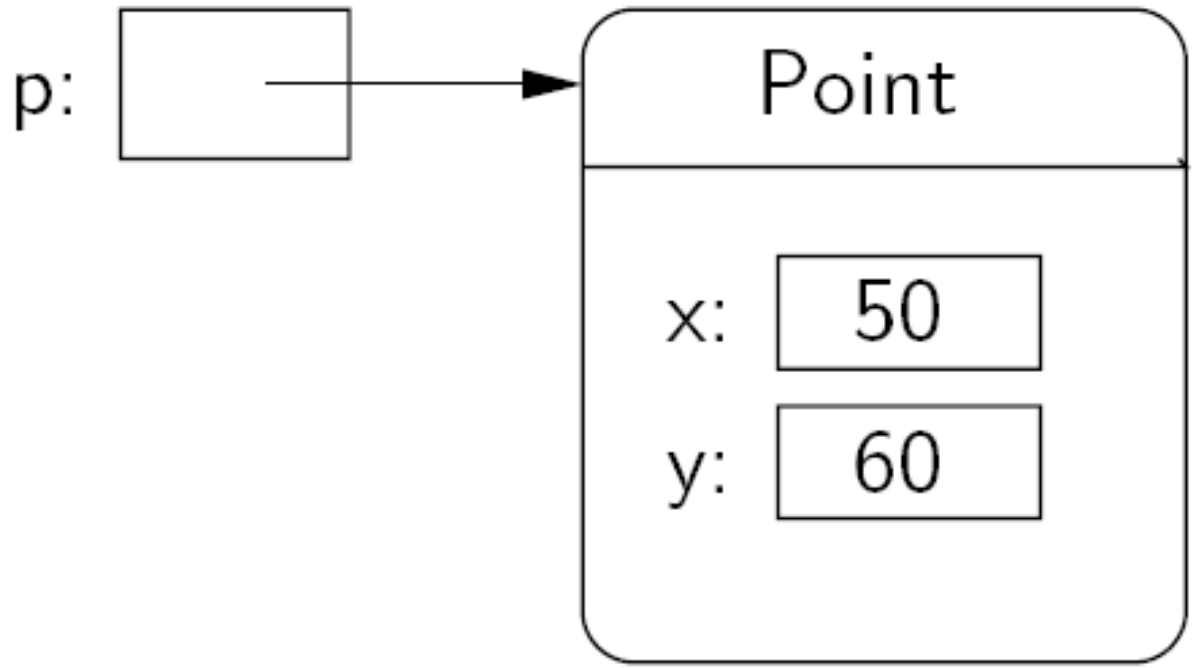
- Basic Idea of OO development
  - View complex system as interaction of simple objects
  - Example: the human body is a complex system

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
- >>> win = graphics.GraphWin()
- >>> p = Point(50, 60)
- >>> p.getX() # accessor method
- >>> p.getY()
- >>> p.draw(win)

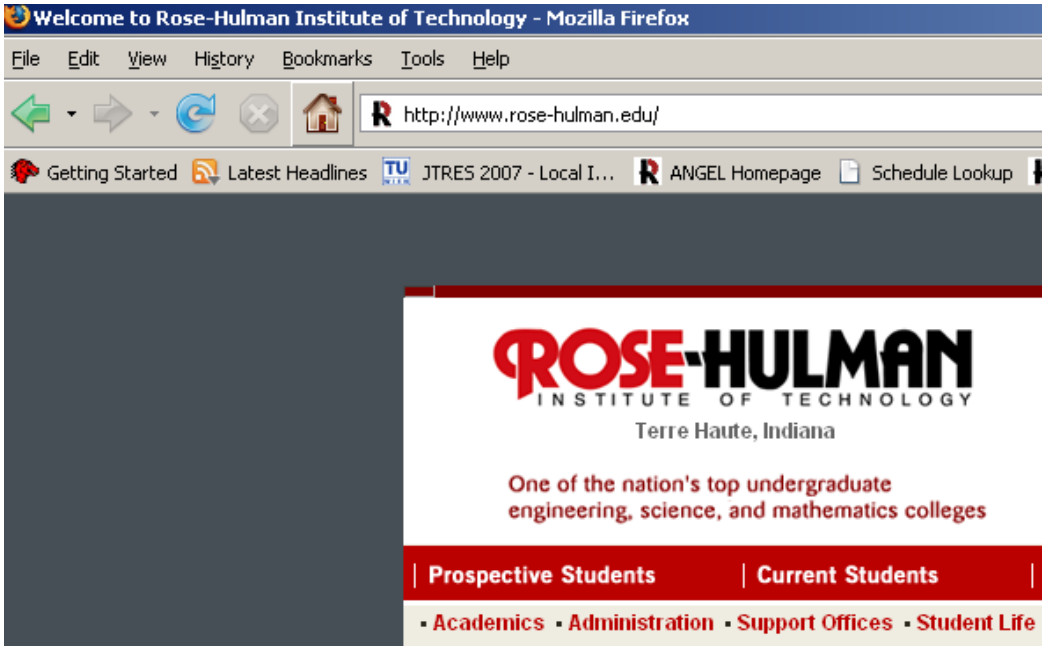
How do objects interact -- Point

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)



Simple graphics programming

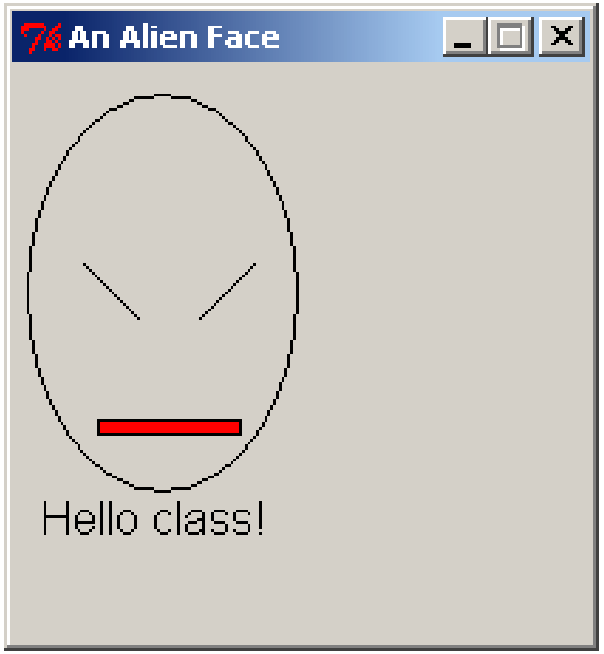
- Must import graphics library before accessing it
  - >>> import graphics
  - >>> win = graphics.GraphWin()
- Another way to import graphics library
  - >>> from graphics import *
  - win = GraphWin()
- What is the difference between these two approaches?

Graphics window

- Collection of tiny points called pixel
  - Pixel: picture element
  - Has a title, length, and width
  - E.g. height = 200 pixels, width = 200 pixels
    - How many pixels?
- Computer monitor
  - # pixels wide
  - # pixels tall

Using graphical objects

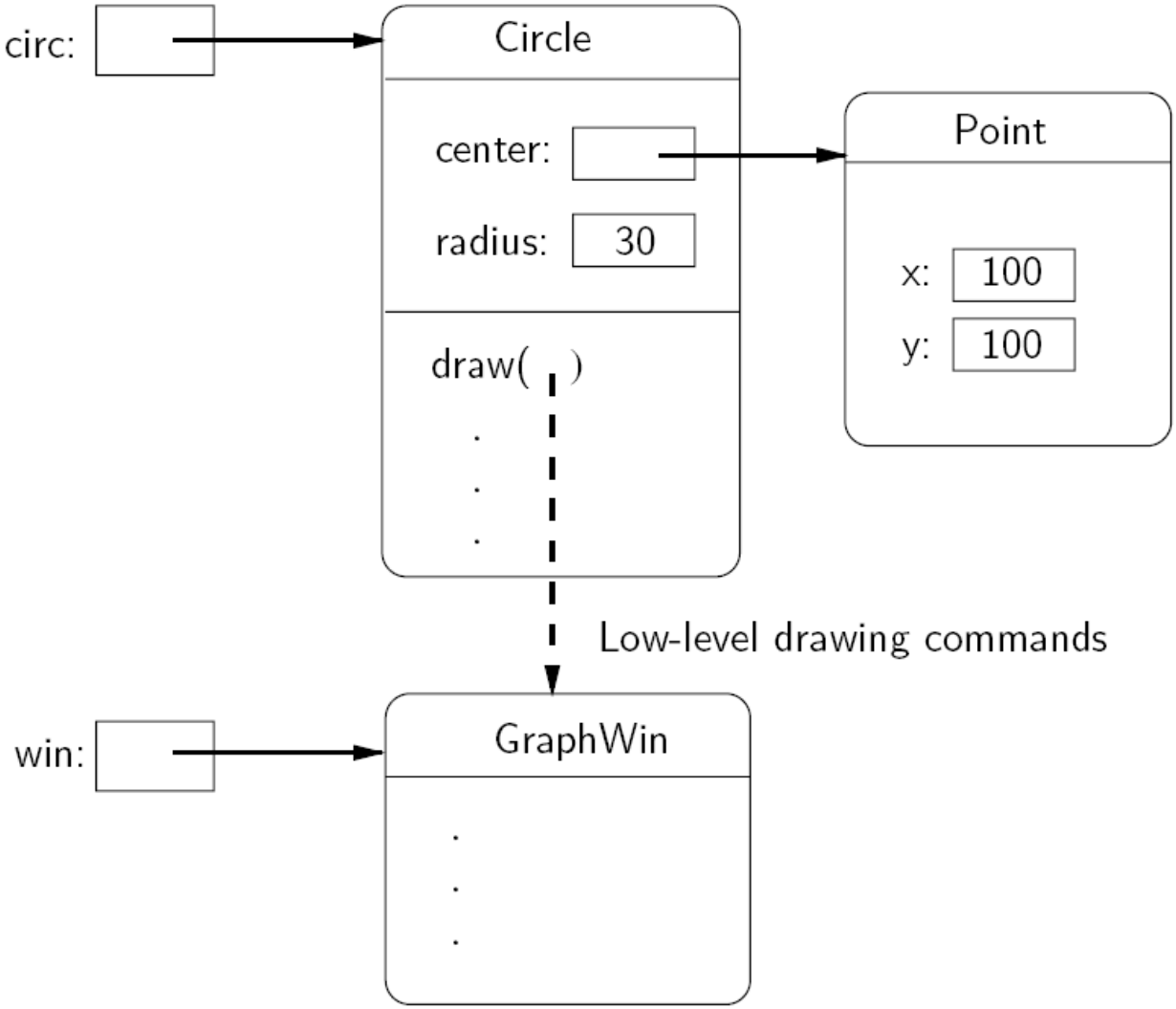
- Using different types of objects from the graphics library draw the following alien face and message



Classes and objects

- 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

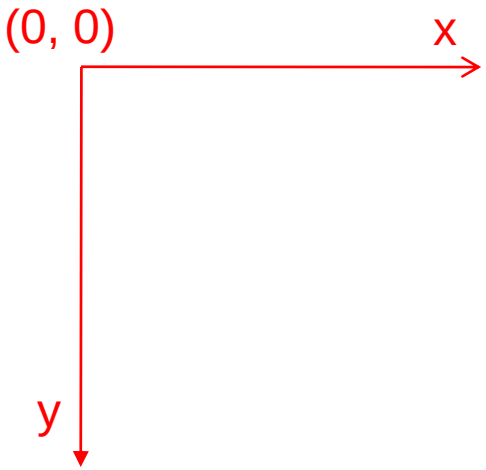


Producing a copy of an object

- What if the left eye was a circle and we wanted to use it to generate the right eye?
- What if we redefine leftEye and rightEye as follows?
  - leftEye = Circle(Point(25, 70), 10)
    leftEye .setFill('yellow')
    leftEye.setOutline('red')
  - rightEye = leftEye *# aliasing*
    rightEye.move(55, 0)

Coordinate systems

- Very important use of graphics is to visually represent data
- What if we want to plot a bar chart?
  - Graphwin



Desired coordinate system

- Use setCoords(x1, y1, x2, y2) method from GraphWin class.

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

Mouse Event Exercise

Together with class 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 10 times the user clicks in the window.

The program draws a red-filled circle, with blue outline for each of the first 10 clicks.

The program closes the window on the 11th click

Bar chart problem – in class

- Suppose the number of CSSE majors at Rose increases by 5 % every year starting from 180 majors in the current year.
- Using an appropriate coordinate system, write a program called majors.py that draws a bar graph to represent the number of CSSE majors for each year over the next 8 years
- Label the axes appropriately

Turn-in for Majors Exercise

- In the In-class Exercise Drop Boxes folder on ANGEL, there is a drop box called Majors Drop Box.
- Place your Python code file majors.py in this drop boxes before the beginning of your section's Session 7 class meeting (before next class).