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Week 2, Examples 2

```python
# I.py

# GraphWin is a class. Think of it as code that you can use to create
# GraphWin objects

# What is a GraphWin object? It is a particular instantiation of the class.
# For example if there was a class (i.e., code) to create student objects,
# you can use this class code to instantiate students Bill, Bob, and Tom
# Now Bill, Bob and Tom would be student objects.

# The GraphWin object is a graphics window. You acquire it from the
# graphics.py library, just like you got math.sqrt from math.py

# The Graphwin class has variables, and it uses those variables to give
# you different kinds of windows.

def wait():
    dummyvar = input(" ");

from graphics import *  # instead of just import, in which case you call
# functions using "graphics.GraphWin", like
math.sqrt
    # using this kind of import means no need to say
# "graphics." each time. Just GraphWin will do.

def main():

    wait()
    w1 = GraphWin("Small",200,200)  # (200,200) is default size
    wait()
    w2 = GraphWin("Medium",400,400)
    wait()
    w3 = GraphWin("Large",800,800)
    wait()
    w1.close()  # notice that w1,w2,w3 are objects and they each have
    methods
    w2.close()  # that can work with them. These "methods" are functions
```

Computer Science Courses - http://courses.cs.purdue.edu/
w3.close()  #call from the GraphWin class

wait()
for i in range(1,100,1):
    w = GraphWin("Oops! Yet another graphics window",10*i,10*i)
    # Note that w keeps getting reassigned to point to a new object as
    # the loop index changes
    #and note that we did not call the w.close() function to close windows

    # this was just to show you the windows
    # its bad programming practice to reassign w without closing the old w
    # w = GraphWin("Window 1",10,10)
    # now do a w.close()
    # or else when, without closing, you reassign variable w
    # w = GraphWin("Window 2",20,20)

    # you have lost the way to close the 10x10 window because w now
    # refers to the 20x20 window

    # so always be careful of your variables and losing information

#2.py

#Lets do the window example again, but close each window before
#opening a new one. So you will not see a "cascade" of windows.

from graphics import *  #instead of just import, in which case you call
#functions using "graphics.GraphWin", like
math.sqrt  #using this kind of import means no need to say
#"graphics." each time. Just GraphWin will do.

def main():

    for i in range(1,100,1):
        w = GraphWin("Oops! Yet another graphics window",10*i,10*i)
        w.close()  # close the window before changing w in next loop iteration
#3.py

-grapics.py gives you other classes besides Graphwin

-you can access classes to give you circles, lines, rectangle, polygons etc inside any graphics window

```python
def wait():
    dummy = input(" ")

from graphics import *  #get access to all of graphics.py's functions

import time

def main():
    wait()  #first get a window

    w = GraphWin("Example Window",800,800) #(0,0) is at top left corner
    #(799,799) is at bottom-right corner
    # x is horizontal, y is vertical
    # in (x,y)

    wait()  #draw a circle

    center = Point(100,100)       #place a point at location (100,100)
    c = Circle(center, 90)
    c.draw(w)  #call method to make circle in window w

    wait()

    lec = Point(65,60)       #left eye center

    le = Circle(lec,20)
    le.draw(w)

    wait()

    rec = Point(135,60)       #using symmetry about (100,100) center
    #for right eye

    re = Circle(rec,20)
    re.draw(w)

    wait()

    ##put a horizontal line in middle of right eye
```
```python
# now the right eye looks droopy

droopy = Line(Point(115, 60), Point(155, 60))  # now the right eye looks droopy

droopy.draw(w)

# now you can turn that eye into an ice-cream cone :) by drawing horizontal lines

wait()

for i in range(0, 96, 1):
    droopy.setFill("black")
    droopy.setWidth(1)
    droopy = Line(Point(115+(i/10.0), 60+i), Point(155-(i/10.0), 60+i))
    droopy.draw(w)

wait()

# Now a rectangle

r = Rectangle(Point(250, 250), Point(600, 450))
r.draw(w)

# and some lines

wait()

vert = Line(Point(450, 250), Point(450, 450))
vert.draw(w)

wait()

horz = Line(Point(250, 340), Point(600, 340))
horz.draw(w)

wait()

# Now a triangle, via the polygon class, on the left hand side of page bottom

t1 = Polygon(Point(225, 550), Point(25, 750), Point(425, 750))
t1.draw(w)

# if you say t2 = t1, you simply create a new name t2 for an object that is already called t1, and you can access the object via either name.

# BUT if you wanted to create a duplicate object instead, say another such triangle, then you must CLONE it using the "clone()" method
```
wait()
# How to copy any object, in this case the triangle

t2 = t1.clone()  #now a COPY of t1 is made, and t2 is not pointing to t1

# the copy is ready and sits atop the old object; we need to move t

# lets move it some distance to the right and a bit up

t2.move(350,-75)  # 350 units to right, and 75 units up (hence minus)
t2.draw(w)

#label each triangle, so we can tell from the pic

wait()

t1text = Text(Point(230,650),"t1 is the original")
t1text.setSize(18)
t1text.draw(w)

wait()


t2text = Text(Point(580,625),"t2 is the clone")
t2text.setSize(18)
t2text.draw(w)

#------------------

# You can draw and undraw things; let's try with a line

l = Line(Point(220,150),Point(450,10))
l.draw(w)

for i in range(1,600,+1):
    time.sleep(0.05)  #function from time library; it puts the program to sleep for a bit
    l.undraw()
    l = Line(Point(220+i,150+i),Point(450+i,10+i))  #draw new line, bit lower
    l.setFill("blue")
l.draw(w)

# Because we draw a line, let it stay drawn for 0.05 secs
# and then "undraw" (erase) it and draw the same line a little lower down

# your brain/eyes fool you into thinking the original line is moving :)

#4.py
# Prof. R had a VERY scary dream where he was attacked by a man with a
# red face and blue nose. The police heard about it and wanted a
description.
# He decided to use the graphics lib with objects and colors to accurately
# describe what he saw :) 

```
from graphics import *  #import all the functions, no need to type x.func
now

def main():

    w = GraphWin("Gregory Peck",800,800)  # 800x800 box

    # Remember the top left corner is (0,0), i.e., x = 0, y = 0, and
    # the bottom right corner is (799,799), i.e., x = 799, y = 799.

    # As x is increased you move to the right
    # As y is increased you move down

    cen = Point(400,400)  # this is the big red circle for face
    cir = Circle(cen,350)
    cir.setFill("red")
    cir.draw(w)

    leye_cen = Point(250,350)  # yellow part of left eye
    leye = Circle(leye_cen,45)
    leye.setFill("yellow")
    leye.draw(w)

    leyeball_cen = Point(250,350)  # left eyeball (black)
    leyeball = Circle(leye_cen,20)
    leyeball.setFill("black")
    leyeball.draw(w)

    reye_cen = Point(550,325)  #big black circle for right eye"
    reye = Circle(reye_cen,100)
    reye.setFill("black")
    reye.draw(w)

    # The next rectangle covers the top of the right eye. By making it red,
    # it blends with face colour and creates a flat eyepatch top. Set line
    # width to 0 so that the rectangle border cannot be seen

    rect = Rectangle(Point(425,225), Point(675,295))
    rect.setFill("red")  # set colour to "blue" to see this rectangle
```
rect.setWidth(0)  # don't want rectangle to show boundary  
rect.draw(w)

lear = Oval(Point(120,75),Point(200,250))  # left ear  
lear.setFill("red")  
lear.setWidth(0)  
lear.draw(w)

rear = Oval(Point(720,85),Point(640,250))  # right ear  
rear.setFill("red")  
rear.setWidth(0)  
rear.draw(w)

line1 = Line(Point(120,175),Point(460,305))  # eye-patch cord to left ear  
line1.setWidth(6)  
line1.draw(w)

line2 = Line(Point(720,175),Point(640,305))  # eye-patch cord to right ear  
line2.setWidth(6)  
line2.draw(w)

nose = Polygon(Point(400,375),Point(340,450),Point(460,450))  # simple nose  
nose.setFill("blue")  
nose.draw(w)

mouth = Oval(Point(190,550),Point(610,565))  # thin oval mouth  
mouth.setFill("black")  
mouth.draw(w)

tooth1 = Rectangle(Point(405,550),Point(440,595))  # left (bigger) tooth  
tooth1.setFill("white")  
tooth1.draw(w)

tooth2 = Rectangle(Point(445,550),Point(470,580))  # right tooth  
tooth2.setFill("white")  
tooth2.draw(w)

#5.py

#IMPORTANT: instead of counting points from the top left corner in a graph window, python makes things easier by letting you define your own coordinate system, as large or as small as you want, inside the graphics window!

#Suppose a mutual-fund manager from Snooty & Co. wants to report his annual profit from his top tech investments to his clients:
# Here is the data

# $5.2M GOOG
# $3.1M YHOO

# $4.5M INTC
# $7.7M AAPL

# $3.8M QCOM
# $1.75 ADBE

# and we want to plot these sizes in a bar chart, in increasing order.

def wait():  # this is only used to pause in class
    dummyvar = input(" ")

from graphics import *

def main():

    wait()
    w = GraphWin("Annual Tech. Investment Profits",800,800)

    w.setCoords(0.0,0.0,14.0,14.0) # IMPORTANT: we redefine the coord. system!

    xmin = 2.0  # this is the (0,0)
    ymin = 3.0  # corner of the graph inside the w window

    xmax = 12.0  # this is the right hand
    ymax = 14.0  # top corner of the graph inside the w window

    wait()

    horzline = Line(Point(xmin,ymin),Point(xmax,ymin))
    horzline.setWidth(3)
    horzline.draw(w)

    wait()

    # First the Heading under the chart

    tag = Text(Point(6.0,1),"Snooty and Co. Annual Tech Profits")
    tag.setStyle("bold")
    tag.setSize(20)
    tag.setTextColor("green")
    tag.draw(w)

    wait()
We have 14-2 = 12 units to work with on the x-axis to place tall bars

skip the first 0.5 units, and then
# repeat this: place a tall bar 1 unit wide and skip 0.5 units
# 6 times

#------ ADBE
x = 0.5 + xmin
y = ymin
adbe = Rectangle(Point(x,ymin),Point(x+1,ymin + 1.75))
adbe.setFill("blue")
adbe.draw(w)
wait()
t1 = Text(Point(x+0.5,ymin-0.5),"ADBE")
t1.setSize(20)
t1.setStyle("bold")
t1.setTextColor("blue")
t1.draw(w)
wait()
tt1 = Text(Point(x+0.5,ymin+1.75+0.5),"$1.75M")
tt1.setSize(15)
tt1.setTextColor("blue")
tt1.draw(w)
wait()

#------ YHOO
x = x + 1.5

yhoo = Rectangle(Point(x,ymin),Point(x+1,ymin + 3.1))
yhoo.setFill("red")
yhoo.draw(w)
wait()
t2 = Text(Point(x+0.5,ymin-0.5),"YHOO")
t2.setSize(20)
t2.setStyle("bold")
t2.setTextColor("red")
t2.draw(w)
wait()
tt1 = Text(Point(x+0.5,ymin+3.10+0.5),"$3.10M")
tt1.setSize(15)
tt1.setTextColor("red")
tt1.draw(w)

# For homework, draw the other 4. Cut and paste from YAHOO, and change
# the numbers and colors accordingly for each