# Week 3, Examples 1

# 1.py

# This program teaches you about functions in a very simple way

# Think of program main() as the boss/ head of operations.
# The boss needs to do some work .... and we will use a VERY simple example
# to represent the work

# He wants to add all the odd numbers between 1 and 100 (call this sum s_odd)
# and he also
# wants to add all the even numbers between 101 amd 200 (call this sum s_even)

# So he asks his first helper Larry() to get s_odd, and he asks
# his second helper Moe() to get s_even

# Thus, Larry() is a function, and Moe() is another function
# Both are called by the boss (i.e., main()) to do work

# It turns out that Larry() and Moe() will each call yet another
# function called even() to help them. So there is no restriction on
# how many levels you can go with function calls.

def even(n):  # tells if n is an odd number or an even number
    # n is a "parameter". It comes is an an input that even() can use
    if(n%2 == 0):  # if there is no remainder when dividing by 2
        return(1)  # even() returns the value 1 to caller
    else:
        return(0)  # otherwise even() returns 0

def Larry(low, high):
    # Larry's inputs or parameters are low and high
    # Notice that Larry has get help himself from function even()

        sum = 0
        for i in range(low, high+1, 1):
if (even(i)==0):  # if it's an odd number, increment sum
    sum = sum+i

#Larry returns sum to his caller. He has done his work
return(sum)

def Moe(low,high):

#Moe's inputs or parameters are low and high
#Notice that Moe has to get help too from function even()
    sum = 0
    for i in range(low,high+1,1):
        if (even(i)==1):  # if it's an even number increment sum
            sum = sum + i

#Moe returns sum to his caller. He has done his work.
    return(sum)

def main():

    s_odd = Larry(1,100)

    s_even = Moe(101,200)

    print(" Answer = ",s_even + s_odd)

#__________________________________________________________________________
#2.py

#Curly() tells the boss that he can do both Larry's job and Moe's job
#and he can give the boss both the values that he wants

#So the boss agrees and just uses Curly. Now we know how to make Curly() #do the work, but we want to show how Curly returns both values to the #boss

def even(n):  # tells if n is an odd number or an even number

    # n is a "parameter". It comes is an an input that even() can use
    if(n%2 == 0):  # if there is no remainder when dividing by 2
        return(1)  # even() returns the value 1 to caller
    else:
        return(0)  # otherwise even() returns 0
def Curly(Larry_low,Larry_high,Moe_low,Moe_high):

# Curly needs both Larry's and Moe's inputs since he is doing all the work

    s_odd = 0
    for i in range(Larry_low,Larry_high+1,1):
        if(even(i)==0):  # if it's an odd number, increment sum
            s_odd = s_odd+i
            # You can also say s_odd += i to do this

    s_even = 0
    for i in range(Moe_low,Moe_high+1,1):
        if(even(i)==1):  # if it's an even number increment sum
            s_even = s_even + i
            # You can also say s_even += i to do this

    return(s_odd,s_even)  # IMPORTANT: observe how Curly() returns more than
    # one value to the caller when he is called

def main():

    s_odd,s_even = Curly(1,100,101,200)  # Curly() gives main two values

    print(" Answer = ",s_even + s_odd)

#___________________________________________________________________________

#3.py

# Graphing stock price using candlesticks. We will only do the axes portion
# now so we can see how to draw axes and make labels. Later will read in
# input
# data and actually draw prices in the graph

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

def getwindow(text,sizex,sizey):

    # this is an example of a "function"
    # think of it as a helper you call to do some work for you

    # You'll see that getwindow does not have anything to work with unless
#whoever calls it also gives it something to work with. These are 
"parameters" of the function, or variables that act as placeholders.

```
win = GraphWin(text, sizex, sizey)
```

#win is "local" to this function getwindow(). Whoever called getwindow() 
does not know this variable and is asking for its value, so it can reach 
#the window that getwindow() creates

#So getwindow() gives this value to the caller via the "return" statement 
#It finishes doing its job and RETURNS THE VARIABLE's VALUE

```
return (win)
```

def label_yaxis(w, x, start, stop, step):

#Put little lines and labels next to those lines on the y-axis

```
for i in range(start, stop, step):
    if(i > start):
        lin = Line(Point(x-0.10, i),Point(x+0.10, i))
        lin.draw(w)

        t = Text(Point(x-0.25, i), str(i))  #convert number i to text
            #by asking str() for help
        t.draw(w)
```

#between two labeled points, add a little midpoint line without a label

```
#this if-statement prevents a little mid-point line from printing 
#above the blue y-axis line

    if (i < (stop-25)):
        midpt = Line(Point(x-0.05, i+step/2),Point(x+0.05, i+step/2))
        midpt.draw(w)
```

```
from graphics import *
```

def main():

    #get window()

```
w = getwindow("GOOG price-chart",1600,800)
```

#inside this window our chart has to fit someplace
# let the bottom left corner of the window be at (xl,yl) and the top right corner be at (xh,yh)

# xl (i.e., xlow), xh, yl and yh will be our new coordinate system

xl = -3
xh = 15
yl = 450
yh = 600

# inside this window our chart has to fit someplace, and we need an x-axis and a y-axis

# let the bottom left corner of the x-y graph be at (0,475) and the top right corner be at (11,575). So we will have space for 10 data points on the GOOG graph. We can easily make this much larger later.

w.setCoords(xl,yl,xh,yh)  # remember (x,y) low point, (x,y) high point

# now draw both axes
# the bottom left corner, i.e., (0,0) will be at (xl+3,yl+25)

horz = Line(Point(xl+3,yl+25),Point(xl+14,yl+25))
horz.setOutline("blue3")
horz.setWidth(3)
vert = Line(Point(xl+3,yl+25),Point(xl+3,yh-25))
vert.setOutline("blue3")
vert.setWidth(3)
vert.draw(w)
horz.draw(w)

# remember that (xl+3,yl+25) is the (0,0) on the axes, and at the top right of the axes system is the high value (xl+14,yh-25)

# you don't see the high value, but knowing it's there makes you think about the square inside which you will draw your graph

#----------------------------------------------------------------------
# now put labels for 11 days on the x-axis. We'll print a tiny vertical line at every unit on the x-axis, but use an "if-statement" to skip the origin because we really don't need such a line there

for i in range(0,11,+1):

    if(i > 0):
        lin = Line(Point(xl+3+i,yl+25+1),Point(xl+3+i,yl+25-1))
        lin.draw(w)
t = Text(Point(xl+3+i*0.05,yl+25-6),str(i))  # convert number i to text
help(t.draw(w))

# Now instead of doing the y-axis labeling in main() itself, as for x-axis, why
# don't we ask a function to do this for us? Inside the function will
# be code very much like what we did for the x-axis
# We have to give the function parameters to work with

# We'll give it the window w, the x-axis, and the y-axis values at which
# we want little label lines and label values

# Remember that (xl+3,yl+25) is the (0,0) of our axes
# If you look inside the code for this function you will see what it does

label_yaxis(w, xl+3, yl+25, yh, 25)  # yl+25 because we start label at 475

# Notice how, by calling some function to do a clear piece of work, you
# can farm out such tasks cleanly, and reduce clutter in the main program#

#__________________________________________________________________________
#__________________________________________________________________________
#4.py
#This is the same code from last week's lecture. It shows us a way to
#use random numbers to estimate pi. The only thing different here is that we
#will show what is happening graphically, since we are now learning to use
#the graphics library

# We want n random numbers (integers) from the interval [0,100000]

import random

def rand(n):
    for i in range(n):
        r = random.randrange(1,100000)
        print("random number ",i+1," : ",r)

def nrand():  # this is just rand normalized, result is in (0,1)
    # we'll omit the print statement to avoid clutter
    # and we'll just return one random number instead of n
    r = random.randrange(1,100000)/100000
return(r)

# Let's estimate the value of pi using random numbers
# see http://www.coe.utah.edu/~hodgson/Monte_Carlo.html

# 1. Draw a circle of radius 1, centered at the origin
# 2. Focus only on first quadrant, draw a square of side 1 containing
#    part of circle in quadrant 1
# 3. Area of this part of circle is pi/4
# 4. Area of square is 1

# 5. q = Area of this part of circle / area of square = pi/4

# 5. Throw darts (generate random points) at square
# 6. Estimate r = number of darts falling in circle part / total # of darts
# 7. Because r = pi/4, we get pi = 4*r

import math
import time
from graphics import *

def throw_a_dart(w):
    xpt = nrand()  # x coordinate of dart
    ypt = nrand()  # y coordinate of dart

    if ((xpt**2 + ypt**2) <= 1):
        inside = 1
        c = Circle(Point(xpt, ypt), 0.002)
        c.setFill("blue")
        c.draw(w)
    else:
        inside = 0
        c = Circle(Point(xpt, ypt), 0.003)
        c.setFill("red")
        c.draw(w)

    return(inside)

def pi(w, x, y, n, xin, yin, xout, yout, xtot, ytot):
    in_count = 0  # number of darts falling inside circle part
    out_count = 0
    piflag = 0  # to control undraw() for pi
for i in range(1, n+1, 1):
    success = throw_a_dart(w)

    if (success > 0):
        in_count = in_count + 1
        if (in_count > 1): #if we drew a number before, undraw it
            tin.undraw()
        tin = Text(Point(xin+0.20, yin), str(in_count))
        tin.setSize(36)
        tin.setStyle("bold")
        tin.setTextColor("blue")
        tin.draw(w)
        time.sleep(0.01)

    else:
        out_count = out_count + 1
        if (out_count > 1): #if we drew a number before, undraw it
            tout.undraw()
        tout = Text(Point(xout+0.20, yout), str(out_count))
        tout.setSize(36)
        tout.setStyle("bold")
        tout.setTextColor("red")
        tout.draw(w)
        time.sleep(0.01)

#the total count and print below is part of the loop but
#not part of the if-else statement (notice the indentation)

#the statements begins at the same place that "where" and "if"
#and "else" begin

total = in_count + out_count
    if (total > 1): #if we drew a number before, undraw it
        ttot.undraw()
    ttot = Text(Point(xtot+0.20, ytot), str(total))
    ttot.setSize(36)
    ttot.setStyle("bold")
    ttot.setTextColor("black")
    ttot.draw(w)
    time.sleep(0.01)

    if (piflag == 1): #if we drew a number before, undraw it
        tpi.undraw()

    r = in_count/total

    pi_est = 4*r
    piflag = 1
    tpi = Text(Point(xtot+0.7, ytot), str(pi_est))
tpi.setSize(36)
tpi.setStyle("bold")
tpi.setTextColor("blue")
tpi.draw(w)
time.sleep(0.01)

#Note: Later we will learn how to control how many digits
#of pi are printed after the decimal point. Since we are
#not controlling this, Python prints whatever it computes
#and omits the last string of 0's

return(pi_est)

def draw_dartboard(w,x,y):

center = Point(x,y)
c = Circle(center,1)
c.setOutline("blue")
c.setWidth(3)
c.draw(w)

#Notice that the graphics lib allowed us to draw a circle even though
#much of the circle was drawn outside the graphics window w and thus
#cannot be seen!

xaxis = Line(Point(x,y),Point(x+1,y))
yaxis = Line(Point(x,y),Point(x,y+1))

xaxis.setOutline("red")
xaxis.setWidth(3)
xaxis.draw(w)

yaxis.setOutline("red")
yaxis.setWidth(3)
yaxis.draw(w)

#Now complete the box, so that we have a rectangle (really a square)
#to throw darts at

boxtop = Line(Point(x,y+1),Point(x+1,y+1))
boxrightside = Line(Point(x+1,y+1),Point(x+1,y))

boxtop.setOutline("red")
boxtop.setWidth(3)
boxtop.draw(w)

boxrightside.setOutline("red")
boxrightside.setWidth(3)
def main():

    win = GraphWin(‘Simulation: Estimate pi by throwing darts’, 800, 800)

    # (xl,yl) and (xh,yh) will define our new coordinate system

    xl = -0.2
    xh = 1.2
    yl = -0.2
    yh = 1.2

    win.setCoords(xl, yl, xh, yh)

    # The (0,0) of the (x,y) we will draw is at (xl+0.2,yl+0.2)

    x = xl + 0.2
    y = yl + 0.2

    draw_dartboard(win, x, y)

    # Now we'll modify the original pi program and throw one dart
    # at a time and show where it falls on the dartboard. The dartboard
    # is only the red square

    # Now throw a dart at the dartboard and show where it falls. If it
    # falls inside the circle part, colour it blue
    # or else colour it red

    inlabel = Text(Point(x, y-0.1), “INSIDE = ”)
inlabel.setFont(25)
inlabel.setTextColor(“blue”)
inlabel.draw(win)

    outlabel = Text(Point(x+0.5, y-0.1), “OUTSIDE = ”)
outlabel.setFont(25)
outlabel.setTextColor(“red”)
outlabel.draw(win)

    totlabel = Text(Point(x, yh-0.1), “TOTAL = ”)
totlabel.setFont(25)
totlabel.setTextColor(“black”)
totlabel.draw(win)
n = eval(input("How many darts will you throw? "))

est = pi(win,x,y,n,x,y-0.1,x+0.5,y-0.1,x,yh-0.1)

#Normally, we will not pass the same parameter "x" multiple times, but since we are just focusing on how to print/draw things in specific places in the graphics window, we will overlook this bit of inefficiency

#Our goal here was to give the function pi() places where it needs to put labels and values in the graphics screen

print(" Estimated value of pi: ",est)

#5.py
#Here we show how the graphics window can recognize your mouse clicks and determine where they occur. It can do things once it knows the points.

#We will open a graphics window and click the mouse inside that window

#Python will capture the point at which you clicked the mouse

#Since it now knows that point, you can ask it to do various things, such as drawing with the help of that point

#So let's draw some strange figures that connect lines

# See if you can use this program to accurately draw some clever or famous person such as a university administrator or politician

from graphics import *

def main():
    w = GraphWin("Fooling around with clicks and lines",800,800)
    w.setCoords(0.0,0.0,10.0,10.0) #changing coordinate system
    n = eval(input("How many points do you want to connect?"))
    msg = Text(Point(2.0,0.5),"Click on one point at a time ")
    msg.setSize(20)
msg.draw(w)

while (n > 0):
    #this is the first time you are seeing a "while-loop"
    #it simply says to repeat execution of all the
    #statements in here as long as n is greater than 0

    p1 = w.getMouse()
    savep1 = p1  #save this first point. We'll need to draw a line from
                #this point
    c = Circle(p1,0.05)
    c.setFill("red")
    c.setOutline("blue")
    c.draw(w)
    
    for i in range(1,n):
        p2 = w.getMouse()
        c = Circle(p2,0.05)
        c.setFill("red")
        c.setOutline("red")
        c.draw(w)

    #now draw a line from p1 to p2 while we have p1 and p2

    lin = Line(p1,p2)
    lin.setWidth(3)
    lin.setFill("blue")
    lin.draw(w)

    p1 = p2  #after drawing p2, rename p2 as p1. Why? Because on
             #the next iteration of the for-loop we'll get a new
             #point
             #and call that p2. This will repeat until the loop is
             #done

# now all the points are drawn and the for-loop is done. All we need
# to do is to connect the last point (now called p1 or p2, since p2 is
# unchanged) to the first point saved, i.e., savep1

lin = Line(p2,savep1)
lin.setWidth(3)
lin.setFill("blue")
lin.draw(w)

# now we have exhausted the n points that were input. Perhaps you want
# to draw another figure in the same window. Why not? We are inside a
# a while loop, and so can continue as long as we want. Let's input another
# value of n and continue. If you input 0 for n's value, we will exit the
# while loop and the program will terminate

```python
n = eval(input("How many points do you want to connect now?"))
```

# the above statement is the last statement in the while loop
# if you enter a value of 0 for n, the while loop condition will
# be checked and the next iteration will not start. Instead the
# while-loop will be exited, and since there is no other code
# below, the while loop will terminate

#_________________________________________________________________________

```python
#6.py

#Earlier to estimate pi, we used the Python prompt to enter the number of
data points to simulate

#Here will show to to open a graphics window which will catch your mouse
#clicks, accept textual input and also return output in the same window.

#We want n random numbers (integers) from the interval [0,100000]

import random

def rand(n):
    for i in range(n):
        r = random.randrange(1,100000)
        print("random number ",i+1,"": ",r)

def nrand(): # this is just rand normalized, result is in (0,1)
    # we'll omit the print statement to avoid clutter
    # and we'll just return one random number instead of n
    r = random.randrange(1,100000)/100000
    return(r)

#_______________________________________________________________________

#Let's estimate the value of pi using random numbers

#see http://www.coe.utah.edu/~hodgson/Monte_Carlo.html

# 1. Draw a circle of radius 1, centered at the origin
# 2. Focus only on first quadrant, draw a square of side 1 containing
#    part of circle in quadrant 1
# 3. Area of this part of circle is pi/4
# 4. Area of square is 1
# 5. q = Area of this part of circle / area of square = pi/4
# 5. Throw darts (generate random points) at square

# 6. Estimate $r = \frac{\text{number of darts falling in circle part}}{\text{total # of darts}}$

# 7. Because $r = \pi/4$, we get $\pi = 4r$

```python
import math
import time
from graphics import *

def throw_a_dart(w):
    xpt = nrand()  # x coordinate of dart
    ypt = nrand()  # y coordinate of dart

    if ((xpt**2 + ypt**2) <= 1):
        inside = 1
        c = Circle(Point(xpt, ypt), 0.002)
        c.setFill("blue")
        c.draw(w)
    else:
        inside = 0
        c = Circle(Point(xpt, ypt), 0.003)
        c.setFill("red")
        c.draw(w)

    return(inside)

def pi(w, x, y, n, xin, yin, xout, yout, xtot, ytot):
    in_count = 0  # number of darts falling inside circle part
    out_count = 0
    piflag = 0  # to control undraw() for pi

    for i in range(1, n+1, 1):
        success = throw_a_dart(w)

        if (success > 0):
            in_count = in_count + 1
            if (in_count > 1):  # if we drew a number before, undraw it
                tin.undraw()
                tin = Text(Point(xin+0.20, yin), str(in_count))
                tin.setSize(36)
                tin.setStyle("bold")
                tin.setTextColor("blue")
                tin.draw(w)
            time.sleep(0.01)
```

else:
    out_count = out_count + 1
    if (out_count > 1): # if we drew a number before, undraw it
        tout.undraw()
        tout = Text(Point(xout+0.20, yout), str(out_count))
        tout.setSize(36)
        tout.setStyle("bold")
        tout.setTextColor("red")
        tout.draw(w)
        time.sleep(0.01)

    # the total count and print below is part of the loop but
    # not part of the if-else statement (notice the indentation)

    total = in_count + out_count
    if (total > 1): # if we drew a number before, undraw it
        ttot.undraw()
        ttot = Text(Point(xtot+0.20, ytot), str(total))
        ttot.setSize(36)
        ttot.setStyle("bold")
        ttot.setTextColor("black")
        ttot.draw(w)
        time.sleep(0.01)

    if (piflag == 1): # if we drew a number before, undraw it
        tpi.undraw()

    r = in_count/total
    pi_est = 4*r
    piflag = 1
    tpi = Text(Point(xtot+0.7, ytot), str(pi_est))
    tpi.setSize(36)
    tpi.setStyle("bold")
    tpi.setTextColor("blue")
    tpi.draw(w)
    time.sleep(0.01)

    # Note: Later we will learn how to control how many digits
    # of pi are printed after the decimal point. Since we are
    # not controlling this, Python prints whatever it computes
    # and omits the last string of 0's

return(pi_est)
def draw_dartboard(w, x, y):
    center = Point(x, y)
    c = Circle(center, 1)
    c.setOutline("blue")
    c.setWidth(3)
    c.draw(w)

    # Notice that the graphics lib allowed us to draw a circle even though
    # much of the circle was drawn outside the graphics window w and thus
    # cannot be seen!

    xaxis = Line(Point(x, y), Point(x+1, y))
    yaxis = Line(Point(x, y), Point(x, y+1))

    xaxis.setOutline("red")
    xaxis.setWidth(3)
    xaxis.draw(w)

    yaxis.setOutline("red")
    yaxis.setWidth(3)
    yaxis.draw(w)

    # Now complete the box, so that we have a rectangle (really a square)
    # to throw darts at

    boxtop = Line(Point(x, y+1), Point(x+1, y+1))
    boxrightside = Line(Point(x+1, y+1), Point(x+1, y))

    boxtop.setOutline("red")
    boxtop.setWidth(3)
    boxtop.draw(w)

    boxrightside.setOutline("red")
    boxrightside.setWidth(3)
    boxrightside.draw(w)

def main():

    # Same as the previous program for pi. Only the code in between the lines
    # is newly added --- for handling textual input

    # New code is between the lines below

    # __________________ handling textual input in a window________________________
w = GraphWin("Input for pi estimator",400,300)
w.setCoords(0,0,3,4)

Text(Point(1,3), "Number of darts: ").draw(w)
Text(Point(1,1),"Estimated value of pi: ").draw(w)

inp = Entry(Point(2,3),5)
inp.setText("0")
inp.draw(w)

outp = Text(Point(2,1),"")
outp.draw(w)

button = Text(Point(1.5,2.0),"Run simulation!")
button.draw(w)
Rectangle(Point(1,1.5),Point(2,2.5)).draw(w)

# wait for a mouse click before user types input in small box
w.getMouse()

# now get the input and then call pi() to do the work
n = eval(inp.getText())

# now we got the value of n through the graphics window instead
# of through a Python prompt.

# Create the output window and let pi() do the estimation work

#____________________ new code is done

win = GraphWin("Simulation: Estimate pi by throwing darts",800,800)

# (xl,yl) and (xh,yh) will define our new coordinate system

xl = -0.2
xh = 1.2
yl = -0.2
yh = 1.2

win.setCoords(xl,yl,xh,yh)

# The (0,0) of the (x,y) we will draw is at (xl+0.2,yl+0.2)

x = xl + 0.2
y = yl + 0.2
draw_dartboard(win,x,y)

# Now we'll modify the original pi program and throw one dart
# at a time and show where it falls on the dartboard. The dartboard
# is only the red square

# Now throw a dart at the dartboard and show where it falls. If it
# falls inside the circle part, colour it blue
# or else colour it red

inlabel = Text(Point(x,y-0.1),"INSIDE = ")
inlabel.setSize(25)
inlabel.setTextColor("blue")
inlabel.draw(win)

outlabel = Text(Point(x+0.5,y-0.1),"OUTSIDE = ")
outlabel.setSize(25)
outlabel.setTextColor("red")
outlabel.draw(win)

totlabel = Text(Point(x,yh-0.1),"TOTAL = ")
totlabel.setSize(25)
totlabel.setTextColor("black")
totlabel.draw(win)

est = pi(win,x,y,n,x,y-0.1,x+0.5,y-0.1,x,yh-0.1)

#Normally, we will not pass the same parameter "x" multiple
#times, but since we are just focusing on how to print/draw
#things in specific places in the graphics window, we will
#overlook this bit of inefficiency

#Our goal here was to give the function pi() places where
#it needs to put labels and values in the graphics screen,
#apart from simply estimating the value of pi

print(" Estimated value of pi: ",est)

# __________ the rest of the change is
#below______________________________

# display the output (estimated value) and change the button to
# give the user a chance to exit

# if we do not want to exit, we can put all of the code in a loop
# as we shall see later
outp.setText(est)

button.setText("Quit")

# wait for click and then quit
w.getMouse()
w.close()

#7.py

# Simple Animation

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

def clark(w,x):
    # draw a circle
    center = Point(x,9)   # place a point at location (100,100)
c = Circle(center,0.1)
c.draw(w)           # call method to make circle in window w

    # draw small triangle for nose
n = Polygon(Point(x+0.1,9+0.02),Point(x+0.1,9-0.01),Point(x+0.15,9))
n.draw(w)

    # draw body
bcenter = Point(x,9-0.3)
b = Circle(bcenter,0.2)
b.draw(w)

    return(c,n,b)

def rightlegforward(w,x):
    rthigh = Line(Point(x,9-0.4),Point(x+0.2,9-0.6))
rthigh.draw(w)
rleg = Line(Point(x+0.2,9-0.6),Point(x+0.2,9-0.8))
rleg.draw(w)

    lback = Line(Point(x-0.1,9-0.5),Point(x-0.25,9-0.8))
lback.draw(w)

    return(rthigh,rleg,lback)
def leftlegforward(w,x):
    lthigh = Line(Point(x+.17,9-.4),Point(x+0.3,9-0.6))
    lthigh.draw(w)
    lleg = Line(Point(x+0.3,9-0.6),Point(x+0.3,9-0.8))
    lleg.draw(w)

rback = Line(Point(x,9-.4),Point(x-0.25,9-.8))
rback.draw(w)

return(lthigh,lleg,rback)

def clearbody(f,n,b):
    n.undraw()
    f.undraw()
    b.undraw()

def clearleftforward(lthigh,lleg,rback):
    lthigh.undraw()
    lleg.undraw()
    rback.undraw()

def clearrightforward(rthigh,rleg,lback):
    rthigh.undraw()
    rleg.undraw()
    lback.undraw()

#IMPORTANT: The functions used here return multiple values at the same time

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

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

w = GraphWin("Clark Gable practices a stylish walk",1000,1000)

w.setCoords(0.0,0.0,10.0,10.0)  # new coord system
    # (0,0) is left bottom of window
    # (10,10) is right top of window

wait()

delay = 1

while(1):  #since the condition in the while-loop is always true
#this loop will run forever, and Clark Gable will walk in circles forever

```python
for x in range(1,12,2):
    if (x>1):
        clearrightforward(rthigh,rleg,lback)
    face,nose,body = clark(w,x)  # face is more correctly his head
    lthigh,lleg,rback = leftlegforward(w,x)
    time.sleep(delay)
    clearbody(face,nose,body)
    clearleftforward(lthigh,lleg,rback)
    rthigh,rleg,lback = rightlegforward(w,x+1)
    face,nose,body = clark(w,x+1)
    time.sleep(delay)
    clearbody(face,nose,body)
```