

Reading and In-Class Problem

Reading

- Swaroop, Byte of Python: Ch. 6
- Langtangen, Primer on Scientific Programming with Python: Ch. 2

Problem

- Calculate $\sum_{n=0}^{\infty} \left(\frac{4}{5}\right)^n$
- Make up your own problem and solve using python

Branching: if, elif, else

- 'if, elif', else: goes through series of 'tests'
- colon, indent block structure
- Boolean operations (True/False)
- 'else' always executed

```
#!/usr/bin/python2
#a='y'
a=1
#a=1.00
#a=2
if a==1:
    print 'a is equal to one'
elif type(a)==str:
    print 'oops, you entered a string'
else:
    print 'a is not equal to one'
```

Looping: while

- while: condition based loop
- runs while condition is true
- infinite loops possible
- optional else (always executed)

```
answer=raw_input('do you what to play?\n')
print answer
while (answer=='Y' or answer=='y' or answer=='Yes'
      or answer=='yes'):
    #while answer in ('Yes', 'Y', 'y', 'yes'):
    #while answer==( 'Y' or 'y'): #doesn't work properly
    print 'knock, knock'
    answer=raw_input('Yes to answer door\n')
    print 'hello'
else:
    print 'Bye!'
```

Looping: while

- try different Boolean Ops in ipython
(1 or/and 0) ('Y' or/and 'N') ('N' or/and 'Y') (0 or/and 1) (1 or/and 1) (0 or/and 0)
- compound operations: += -= *= etc.

break,continue,pass

- break
 - breaks out of loop
 - stops executing loop
- continue
 - skips rest of loop
 - continues with next cycle in loop
- pass: do nothing

Looping: while

```
# a fun game you can play forever!
while True:
    print 'knock, knock'
    answer1=raw_input('Yes to answer door\n')
    if answer1 in ('Yes', 'Y', 'y', 'yes',
                  'who\'s there'):
        while 1:#infinite loop
            answer2=raw_input('Meow, Meow?\n')
            if answer2[-3:]=='who':
                print 'I\'m a cat, you @$$@!\n'
                break#break out of loop
            else:
                print 'I\'m still here'
    else:
        print 'Bye!'
        break
```

Looping: for

- for loops
 - loop over sequence
 - assign item in sequence to variable (one after another)
 - colon,indentation for block structure
 - optional 'else'
 - range and xrange

```
a='abcdefghijklmnopqrstuvwxy'
for i in a:
    print i
else:
    print "now I know my abc's"
    print "next time won't you sing with me"
```

Apply what you've learned: Calc. π

π can be calculated in a variety of ways. One method is to calculate the infinite product:

$$\frac{\pi}{2} = \frac{2}{1} \cdot \frac{2}{3} \cdot \frac{4}{3} \cdot \frac{4}{5} \cdot \frac{6}{5} \dots \quad (1)$$

How can this be programmed using python?

Apply what you've learned: Calc. π

```
product=1.
for i in range(40):
    top=(i+1.)*2
    bot1=top-1
    bot2=top+1
    product=product*(top**2)/(bot1*bot2)
print 'first pi= ', 2*product
```

Apply what you've learned: Calc. π

```
product=1.
change=1.
i=-1
while change>1.e-6:
    i+=1
    top=(i+1.)*2
    bot1=top-1
    bot2=top+1
    mult=(top**2)/(bot1*bot2)
    change=mult-1.
    product=product*(top**2)/(bot1*bot2)
print 'second pi = ',2*product
```

Apply what you've learned: Calc. e

The constant e can be calculated using the infinite series:

$$e = \sum_{n=0}^{\infty} \frac{1}{n!} \quad (2)$$

Write a script that calculates the value of e.

Apply what you've learned: Calc. e

```
change=1
eee=0.
i=0
while change>1.e-5:
    if i==0:
        fact=1
    else:
        fact=1
        for i in range(1,i+1):
            fact=fact*i
    change=1./fact
    eee=eee+change
    i+=1
print 'e is ',eee
```