

## Outline for October 31, 2012

**Reading:** *None*

**Assignment due:** Friday, November 9, 2012 at 5:00 PM

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1. How to solve problem #2 of Homework #2
2. Recursion
  - a.  $n$  factorial [*nfact.py*]
  - b. Fibonacci numbers [*rfib.py*]
  - c. Sum of digits [*sumdigits.py*]
3. Speed: compare iterative and recursive Fibonacci programs [*timefibs.py*]

### Problem #2, Homework #2

Write a function `gcd(m, n)` that calculates the greatest common divisor of  $m$  and  $n$ . The greatest divisor of  $m$  and  $n$  is the largest *positive* integer  $k$  that evenly divides  $m$  and  $n$  (that is, divides both of them giving a remainder of 0). Use Euclid's algorithm to calculate this. Here is one very succinct way to describe the algorithm (as usual in Python,  $m \% n$  is the remainder of  $m$  when divided by  $n$ ):

Repeatedly replace  $m$  with  $n$ , and  $n$  with  $m \% n$ , until  $n$  is 0

When  $n$  is 0, the value  $m$  is the greatest common divisor of  $m$  and  $n$ . Then write a program that calls your function repeatedly, until the user enters 0 for  $n$ . Here is an example run of such a program. What the user types is in *italics* and the symbol “`j`” means to type a return or enter. Please do not try to make the input in italics and show the return symbol in your output, of course!

```
First number (0 to stop): 113,  
Second number: 293,  
The greatest common divisor of 293 and 113 is 1  
First number (0 to stop): 14,  
Second number: 18,  
The greatest common divisor of 18 and 14 is 2  
First number (0 to stop): -30,  
Second number: -66,  
The greatest common divisor of -66 and -30 is 6  
First number (0 to stop): 7,  
Second number: 0,  
The greatest common divisor of 0 and 7 is 7  
First number (0 to stop): 0,
```

Please call your program “gcd.py”.