Python for Physicist

Lecture Note - 5

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User defined functions

- Functions can be defined very simple way

```
def my_function(x):
    print 'Passing data: ', x
my_function(5)
```

- Function can return value

```
def my_sum(a, b):
    return a+b
my_sum(5, 6)
```

- Function can return array

```
def my_math(a, b)
    return a+b, a-b
x,y = my_math(5, 6)
```

Example of user defined function

Problem write a function to find the prime factors.

Analysis

- Prime factors of a positive integer are the prime numbers that divide that integer exactly

Code

```
def factors(n):
    factorlist = []
    k = 2
    while k<=n:
     while n%k==0:
     factorlist.append(k)
    n//=k
    k += 1
    return factorlist
```

Exercise on user defined function

Problem write a function to find binomial coefficient

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$

Analysis

$$\binom{n}{k} = \frac{n!}{k!(n-k)!} = \frac{nx(n-1)x(n-2).....(n-k+1)}{1x2x3....k}$$

Recursion

Problem Find the factorial of an integer.

Analysis

$$n! = \begin{cases} 1 & for\ n = 1 \\ nx(n-1)! & for\ n > 1 \end{cases}$$

Code

```
def factorial(n):
    if n==1:
     return 1
    else:
     return n * factorial(n-1)
```

Exercise on Recursion

Problem For the catalan numbers.

Analysis

$$C_n = \begin{cases} 1 & for\ n = 0 \\ \frac{4n-2}{n+1} & for\ n > 0 \end{cases}$$

Code Write the recursion code.

Good Programming Skill

- Include comments in your programs.
- Use meaningful variable names.
- Use the right types of variables.
- Import functions first.
- Give your constants name in standard way.
- Employ user-defined functions, where appropriate.
- Print out partial results and updates throughout your program.
- Layout program clearly.
- Don't make program unnecessarily complicated.