

Recursion with multiple base cases

- Fibonacci numbers
 - Leonardo of Pisa (aka Fibonacci) modeled the following challenge
 - Newborn pair of rabbits (one female, one male) are put in a pen
 - Rabbits mate at age of one month
 - Rabbits have a one month gestation period
 - Assume rabbits never die, that female always produces one new pair (one male, one female) every month from its second month on.
 - How many female rabbits are there at the end of one year?

Fibonacci

- After one month (call it 0) – 1 female
- After second month – still 1 female (now pregnant)
- After third month – two females, one pregnant, one not
- In general, $\text{females}(n) = \text{females}(n-1) + \text{females}(n-2)$
 - Every female alive at month $n-2$ will produce one female in month n ;
 - These can be added those alive in month $n-1$ to get total alive in month n

Month	Females
0	1
1	1
2	2
3	3
4	5
5	8
6	13

Fibonacci

- Base cases:
 - $\text{Females}(0) = 1$
 - $\text{Females}(1) = 1$
- Recursive case
 - $\text{Females}(n) = \text{Females}(n-1) + \text{Females}(n-2)$

```
def fib(x):  
    """assumes x an int >= 0  
        returns Fibonacci of x"""  
    assert type(x) == int and x >= 0  
    if x == 0 or x == 1:  
        return 1  
    else:  
        return fib(x-1) + fib(x-2)
```