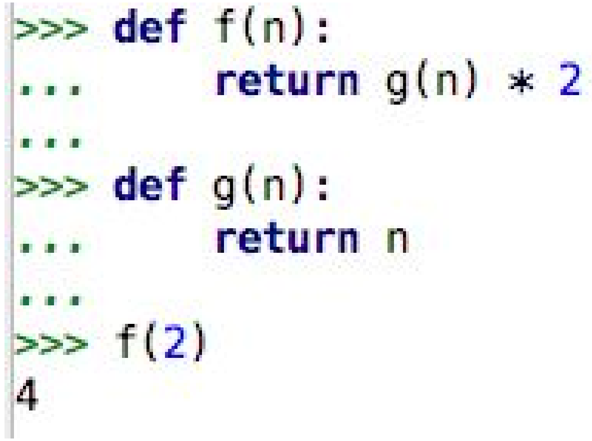
A few more recursion examples

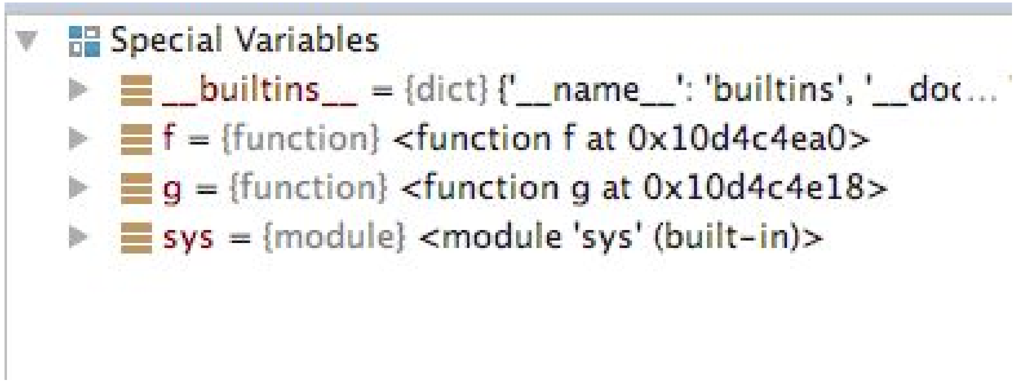
Announcements

1. Lab due tomorrow
    a. Required to write a few recursive functions
    b. How do you identify a recursive function?
    c. Similar to problems shown in class
2. Administrative
    a. QR issue about the test 1 is sorted out and the results will be available soon
    b. I have looked at the first 31, marks are looking good
    c. A1 marks will also be released soon
    d. Demos have been marked already

A word about calling functions from functions

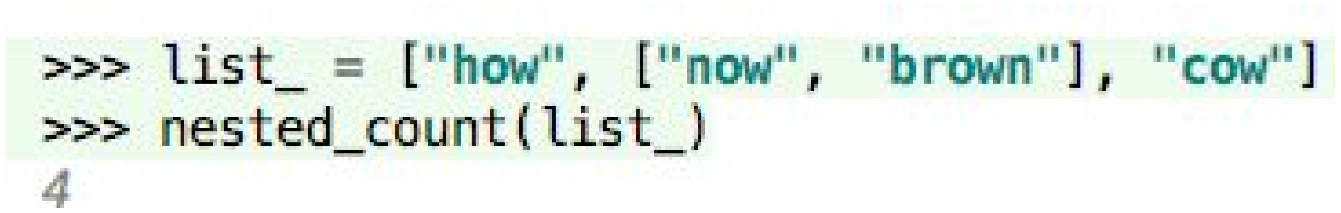


```
>>> def f(n):
...     return g(n) * 2
...
>>> def g(n):
...     return n
...
>>> f(2)
4
```



```
▼ Special Variables
  ▶ __builtins__ = {dict} {'__name__': 'builtins', '__doc...
  ▶ f = {function} <function f at 0x10d4c4ea0>
  ▶ g = {function} <function g at 0x10d4c4e18>
  ▶ sys = {module} <module 'sys' (built-in)>
```

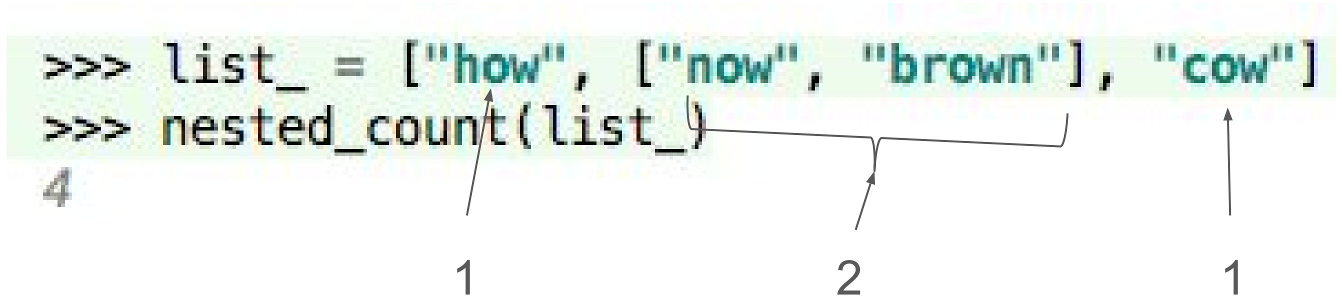
Example 5: Count how many items



```
>>> list_ = ["how", ["now", "brown"], "cow"]
>>> nested_count(list_)
4
```

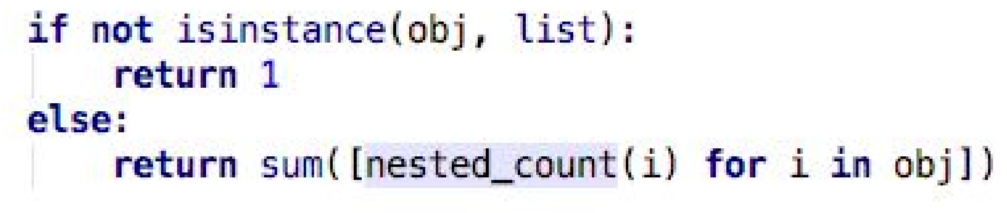
Idea

1. We will use sum() as the combination function
2. We want to add “1” for each non list element to the argument of sum and recursively call the function for all list elements



```
>>> list_ = ["how", ["now", "brown"], "cow"]
>>> nested_count(list_)
4
```

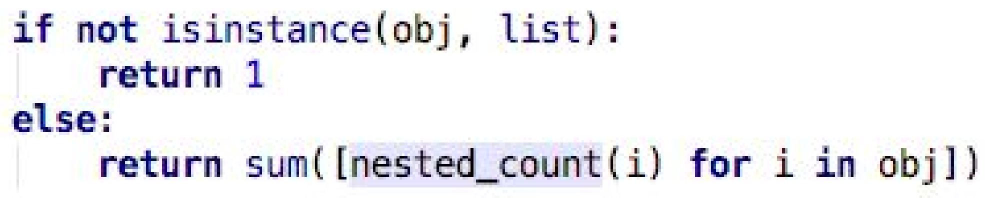
Questions



```
if not isinstance(obj, list):
    return 1
else:
    return sum([nested_count(i) for i in obj])
```

1. What inputs will cause no recursion?

Questions



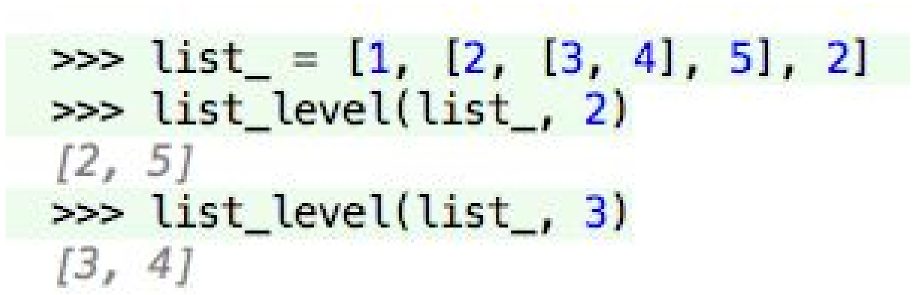
```
if not isinstance(obj, list):
    return 1
else:
    return sum([nested_count(i) for i in obj])
```

2. Will the code work for empty list?

Recursion with history preserved

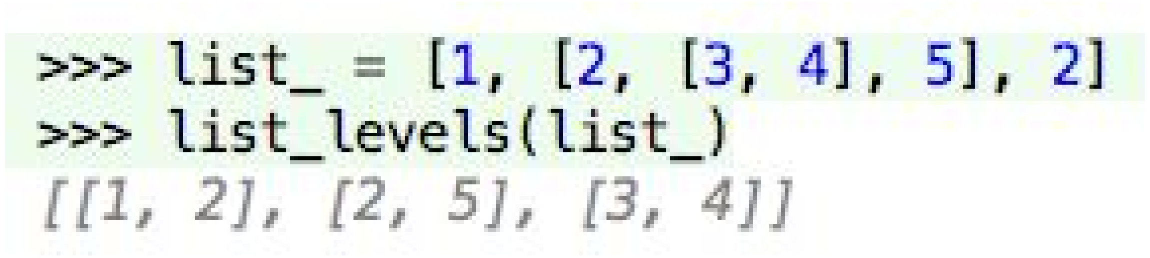
1. So far recursions are **blind**
2. They do not know where in the call level it is
    a. Called on a bigger list or a smaller sublist
3. How do we pass the level information

Example 6: List all non-list elements at a level



```
>>> list_ = [1, [2, [3, 4], 5], 2]
>>> list_level(list_, 2)
[2, 5]
>>> list_level(list_, 3)
[3, 4]
```

Example 7: List all non-list elements at all levels



```
>>> list_ = [1, [2, [3, 4], 5], 2]
>>> list_levels(list_)
[[1, 2], [2, 5], [3, 4]]
```

Play at home

tree burst (recursion using turtles)