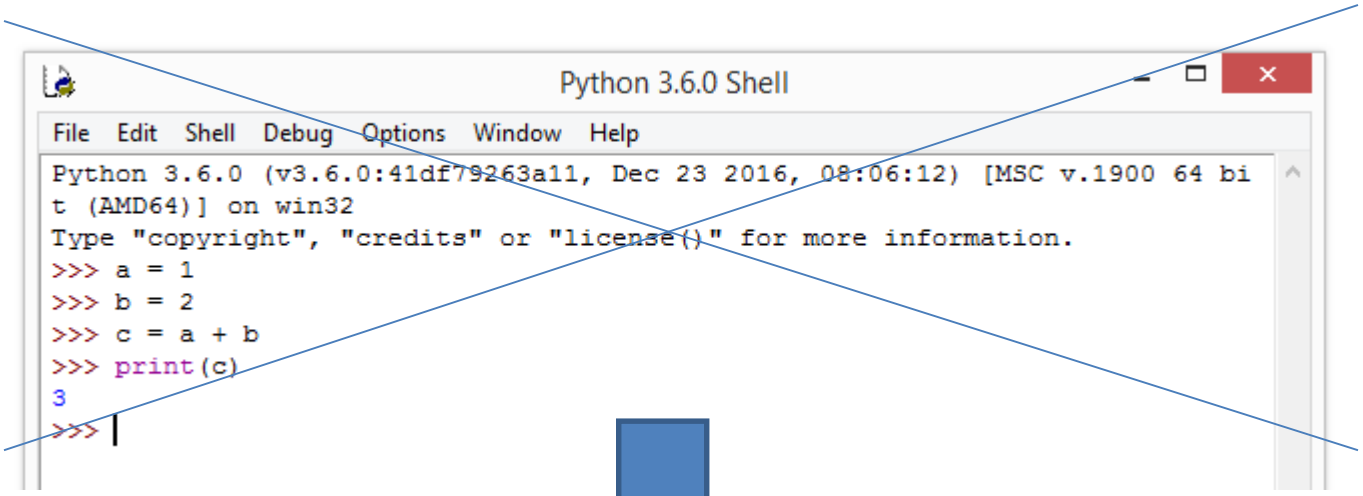
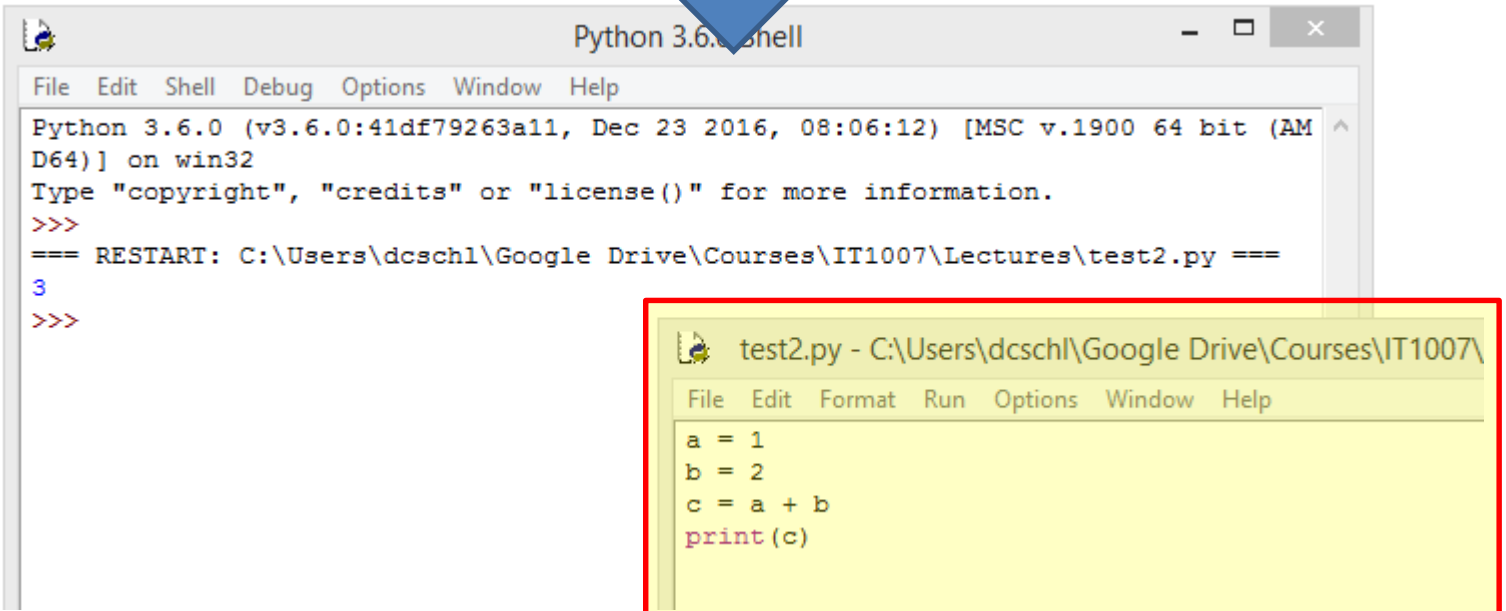
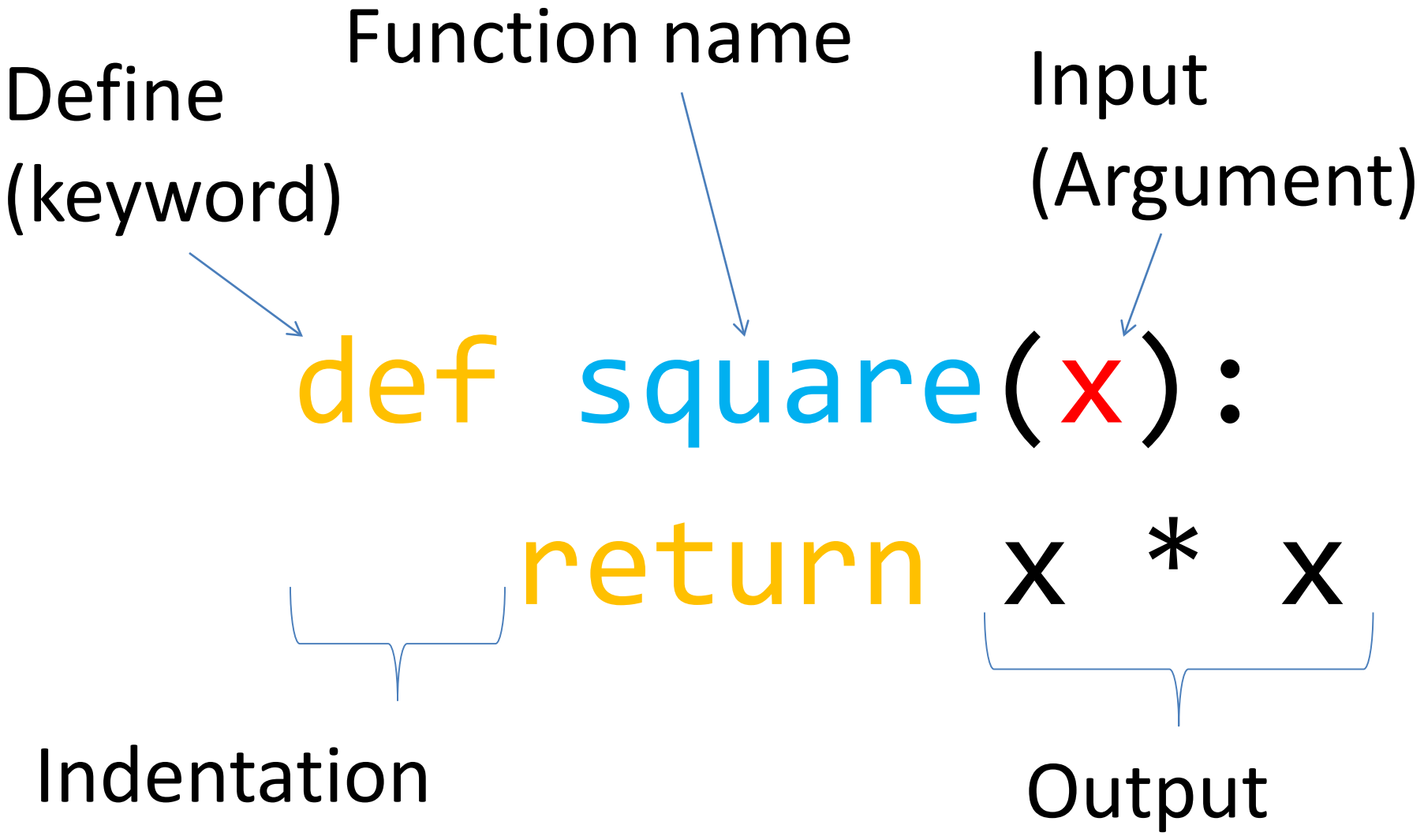
Let's Move Out of the Console





Recap: Simple Functions



Parameters of Functions

= input

= arguments

Input Parameters

```
def add2things(a,b)
    return a + b
```

Must be the same number of items

```
>>> add2things(1,2)
3
>>> add2things(1)
Traceback (most recent call last):
  File "<pyshell#94>", line 1, in <module>
    add2things(1)
TypeError: add2things() missing 1 required positional argument: 'b'
>>> add2things()
Traceback (most recent call last):
  File "<pyshell#95>", line 1, in <module>
    add2things()
TypeError: add2things() missing 2 required positional arguments: 'a' and
>>> add2things(1,2,3)
Traceback (most recent call last):
  File "<pyshell#96>", line 1, in <module>
    add2things(1,2,3)
TypeError: add2things() takes 2 positional arguments but 3 were given
>>>
```

Parameter Types

- In Python, parameters have no declared types. We can pass any kind of variable to the function….

```
>>> add2things(3.14, 2.71)
5.85
>>> add2things('Hello ', 'world!')
'Hello world!'
>>> add2things(True, True)
2
>>>
```

…. as far as the function works

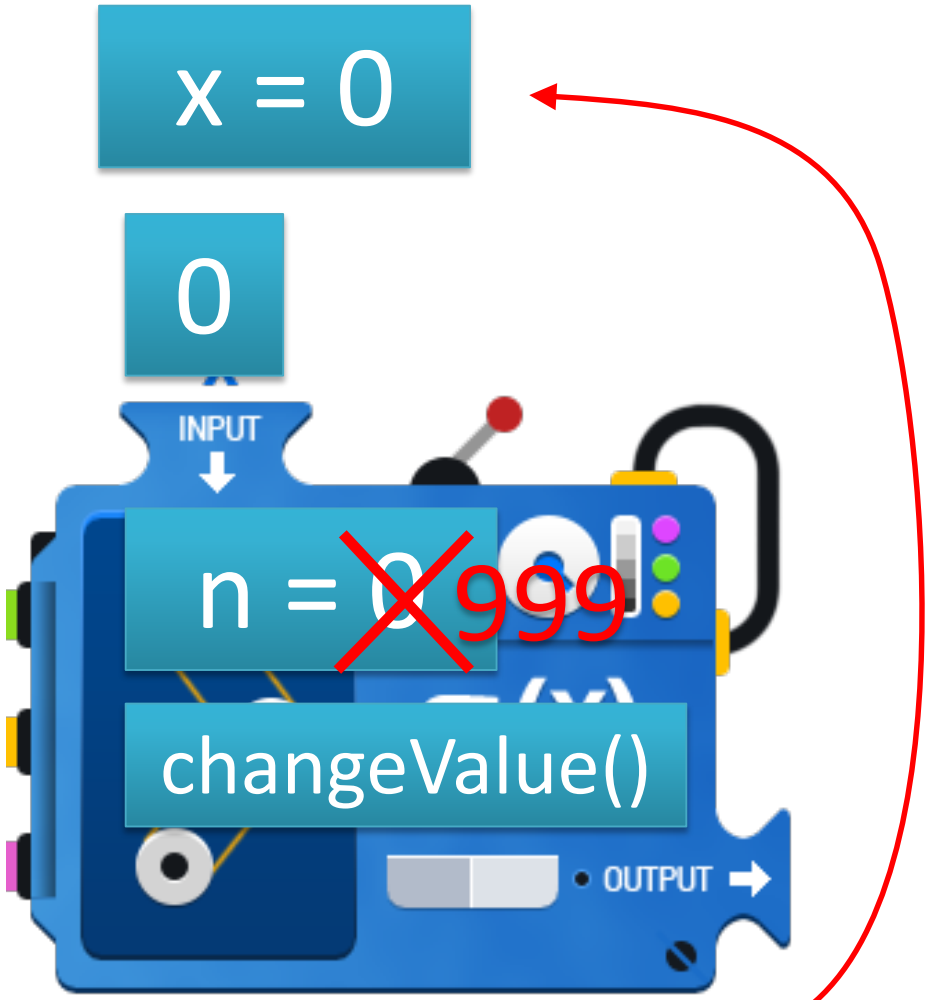
Pass by Values

```
x = 0

def changeValue(n):
    n = 999
    print(n)

changeValue(x)
print(x)
```

- The `print` () in "`changeValue`" will print 999
- But how about the last `print(x)`?
  - Will x becomes 999?
- (So actually this function will NOT change the value of x)

Function

- "changeValue()" is a function
  - x = 0
  - Input x into the function
  - Another n inside the function copied that value
  - And you changed that n, it doesn't affect x



Pass by Values

```
x = 0

def changeValue(n):
    n = 999
    print(n)

changeValue(x)
print(x)
```

- n is another copy of x
- You can deem it as

```
def changeValue(x):
    n = x
    n = 999
    print(n)
```

For Parameters that are Primitives

- Primitive data:
  - int, float, bool, etc.
- Parameters are passed by values
- But NOT for *some* parameters
  - E.g. sequences
  - Will discuss about this in later lectures

Return Values

Vs “`print()`”

Print vs Return

```
def foo_print3():
    print(3)
    print(3)

def foo_return3():
    return 3
    return 3
```

```
>>> foo_print3()
3
3
>>> foo_return3()
3
>>>
```

- “return” will end the function immediately

Print vs Return

```
def foo_print3():
    print(3)

def foo_return3():
    return 3
```

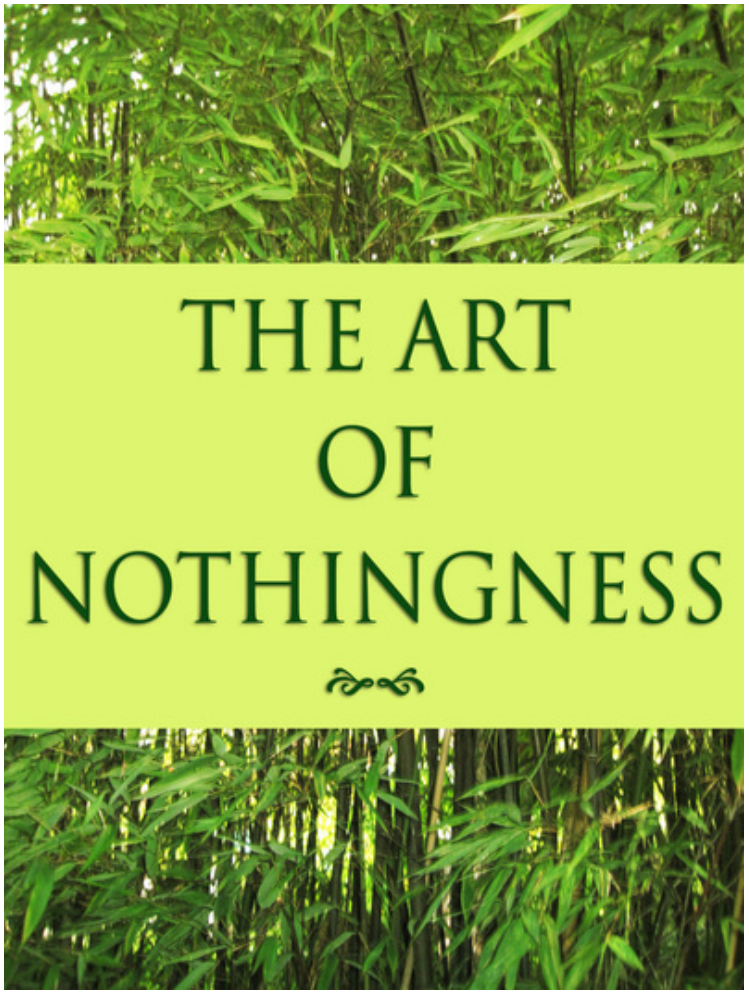
```
>>> foo_print3()
3
>>> foo_return3()
3
>>>
```

Wait…

```
>>> x = foo_print3()
3
>>> y = foo_return3()
>>>
```

Nothing?

```
>>> type(x)
<class 'NoneType'>
>>> type(y)
<class 'int'>
>>>
```



Print vs Return

```
def foo_print3():
    print(3)

def foo_return3():
    return 3
```

By the print function

```
>>> foo_print3()
3
>>> foo_return3()
3
>>>
```

IDLE's **echo**

Print vs Return

```
def foo_print3():
    print(3)

def foo_return3():
    return 3
```

- foo_print3() does not "return" a value

```
>>> x = foo_print3()
3
>>> y = foo_return3()
>>>
```

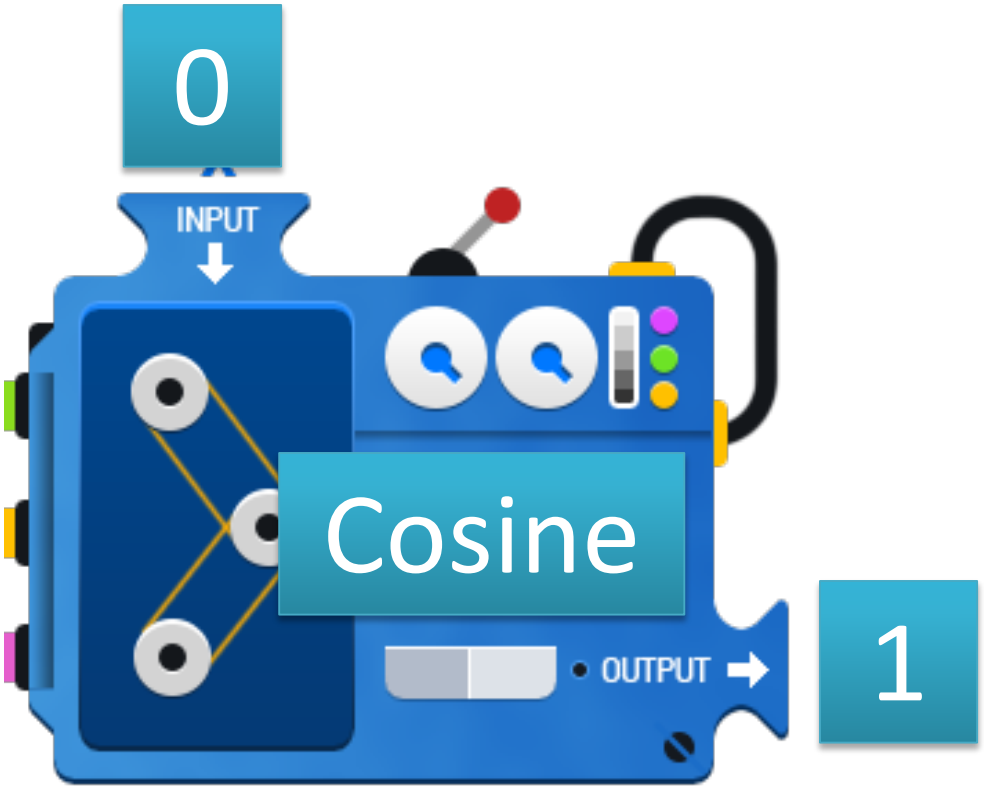
IDEL echoes "nothing"

Function

- "Cosine" is a function
  - Input 0
  - Output/return 1
  - x = cos(0)

return

  - That' why x = 1

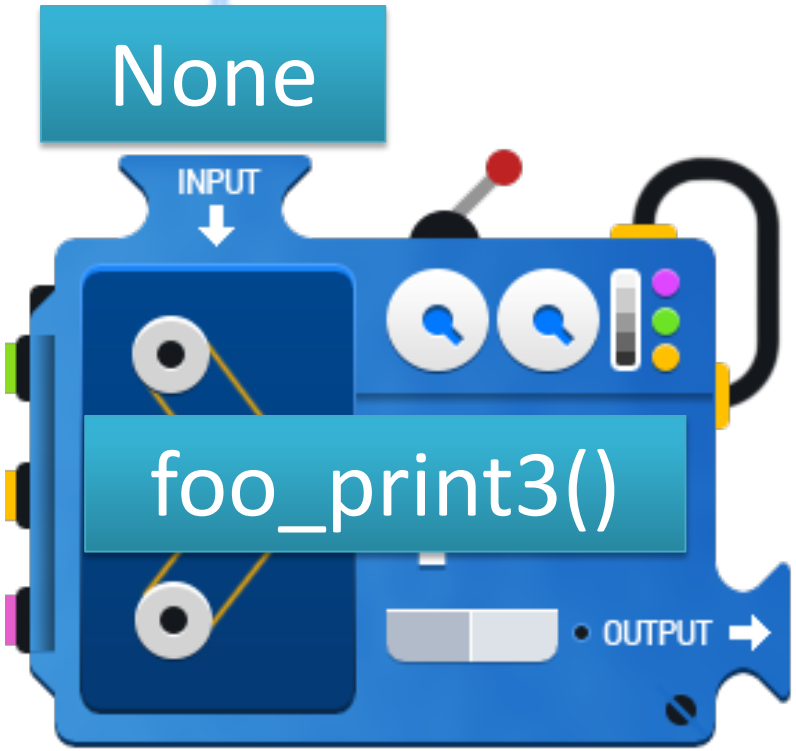


Function

- "`foo_print3()`" is a function
  - Input nothing
  - No output

```
y = foo_print3()
```

return "None"



In general, we called all these "functions"

But for a function that "returns" nothing. Sometime we call it a "procedure"

Return Values

- All functions returns “something”
- `foo_return3()` return the integer 3
- `foo_print3()`
  - Do not have any return statement
  - So it returns “None”

Question: Can we assume that a function always return something of the same TYPE?