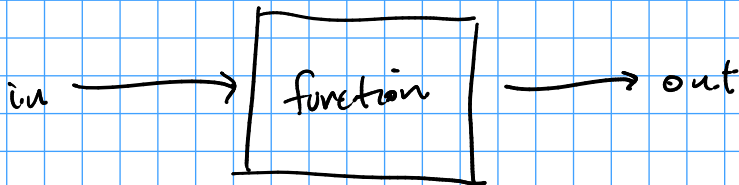


Lecture 4 - Functions

I. Introduction to functions

* A function is a map between an input, output



* Some functions can be written as a formula

$x \mapsto f(x)$
in out

e.g.

$x \mapsto x^2$
 $f(x) = x^2$

$3 \rightarrow \boxed{x} \rightarrow 9$

* Some functions can be thought of as a procedure

'cba' $\rightarrow$ 'abc'

- step through each letter in the list

- compare pairs of letters

- swap pairs to correct order

- cycle through list until sorted

'cba' $\rightarrow$  $\rightarrow$ 'abc'

b c a

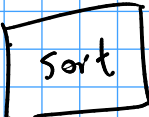
b a c

a b c

} bubble sort

* "Abstraction" $\rightarrow$ a black box to forget about

* Organize, name, re-use code.

write in one part.


execute in another

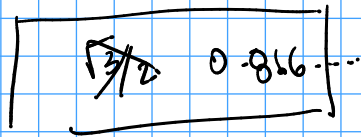
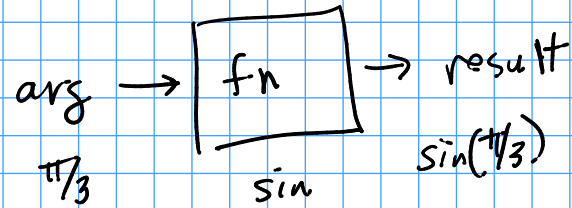
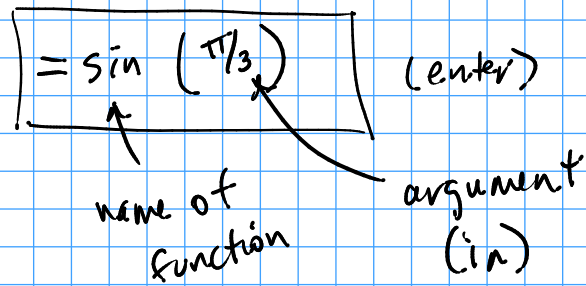
'cba' $\rightarrow$  $\rightarrow$ 'abc'

'fed' $\rightarrow$  $\rightarrow$ 'def'

II. Functions in Excel

- * Has many built in functions → "formulas"
- * You cannot write your own! Ⓢ

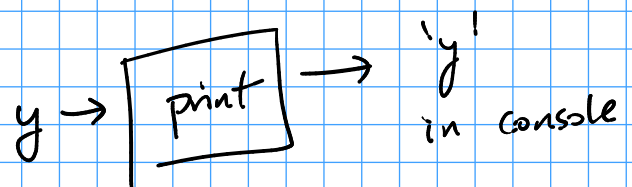
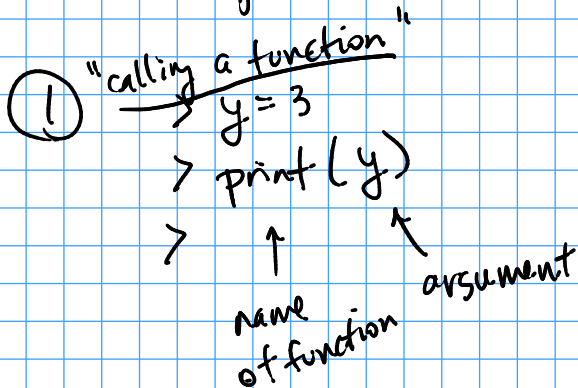
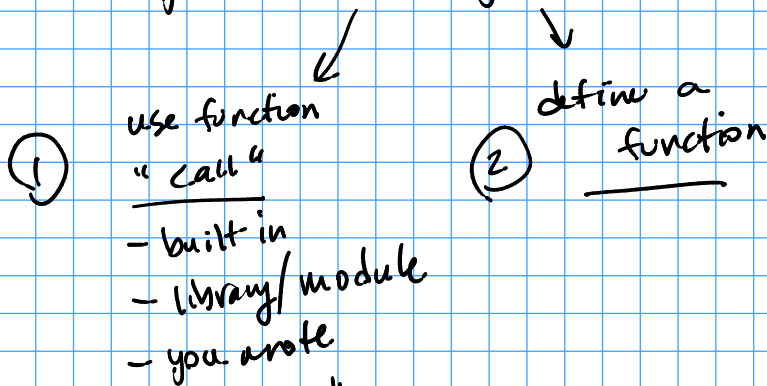
Ⓢ kind of in
see Last day of class



"call" a function
(syn. for use,
cause to be executed)

III. Functions in Python

- * Python has few built in functions
- * Python has many libraries of functions ("modules")
- * You can write your own functions



```

>
> x = sin(pi/3)
>
>

```

~~sin~~ ~~pi~~
import math (math library/module)

← wont work

```

> import math
> x = math.sin(math.pi/3)

```

😊

↑
output

↑
fn name

↑
arg

$\frac{\text{math.pi}}{3}$ → math.
sin → x

* Modules

- math
- Numpy (numerical python) (*)
- Scipy (scientific python) (*)
- matplotlib (plotting library) (*)
- csv (text i/o)

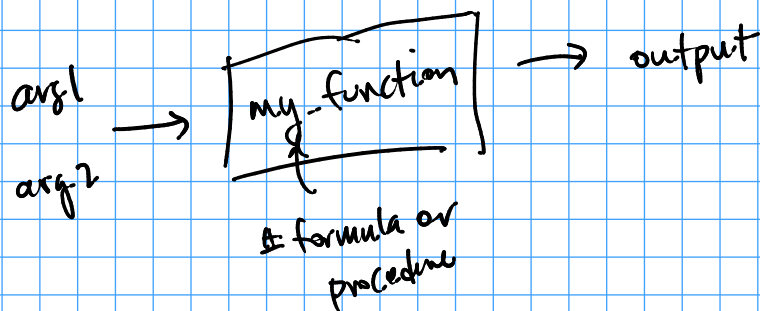
examples ↙

② Define a function

```
def my_function(arg1, arg2):
```

formula or procedure.

return output



```

> def squared(x):
>     y = x**2
>     return y
>
> z = squared(5)
> print(z)
> a = squared(7)
> print(a)

```

function definition

dummy variable

call the function

global

25

49

Local variables / Global variables

only good/known inside a function

known everywhere.

defined inside a function

"Bya Police"

"FBI"