Python: Functions*

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1 Functions in Python

- A collection of statements that you can execute anywhere in your program.
- Functions create smaller "units" of codes.
- Functions make codes easier to read or debug.

Example: A mathematical function as a python function

```
def my_function(x1, x2, x3):
    product = x1 * x2 * x3
    return product
```

Warning Python functions are not restricted to be "mathematical functions". Any set of statements that we want to repeatedly execute can be a Python function.

*References: (1) Langtangen, Hans Petter. A primer on scientific programming with Python, Fourth Edition. Springer, 2014. (2) https://docs.python.org/2/reference/

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2 Example of a function

```
def slope(x1, y1):
    """
    Computes the slope of the line passing through (x1, y1)
    and the origin (0,0)

    Example
    _______
    >>> a= slope(3,4)
    >>> print(a)
        1.333333333
    """

    a = y1/x1

    return a
```

3 Local/Global Variables

Variable created inside a function (called local variables) are invisible outside functions.

```
x1, y1 = 3, 4
b = slope(x1,y1)
print(a)

#Python output
```

```
NameError          Traceback (most recent call last)
<ipython-input-3-c5a4f3535135> in <module>()
----> 1 print(a)

NameError: name 'a' is not defined
```

4 Positional and Keyword Arguments

Positional arguments have no default values and must be assigned values when the function is called. Keyword arguments, on the other hand, have default values, so we may leave out theses arguments in the call.

```
def some_function(arg1, arg2, kwarg1 = 10, kwarg2 = 0.5)
"""
arg1 and arg2 are positional arguments,
whereas kwarg1 and kwarg2 are keyword arguments
"""
```

All keyword arguments must come after the positional arguments.

```
def slope(x1, y1, x2 = 0, y2 = 0):
        """
        Slope of the line passing through (x1, y1)  and (x2,y2).
        If (x2,y2) is not provided, the function assumes (x2,y2) = (0,0)

        Example:
        ________
        >>> a = slope(3,4)
        >>> print(a)
                            1.333333333


        >>> a = slope(3,4,2,1)
        >>> print(a)
                            3
        """

        a = (y2-y1)/(x2-x1)
        return a
```

Examples of usage:

```
        a = slope(3,5,2) # y2 is zero

        a = slope(3,5,x2 =0,y2 =10)
```