

Rotman

BASIC PROGRAMMING WITH PYTHON

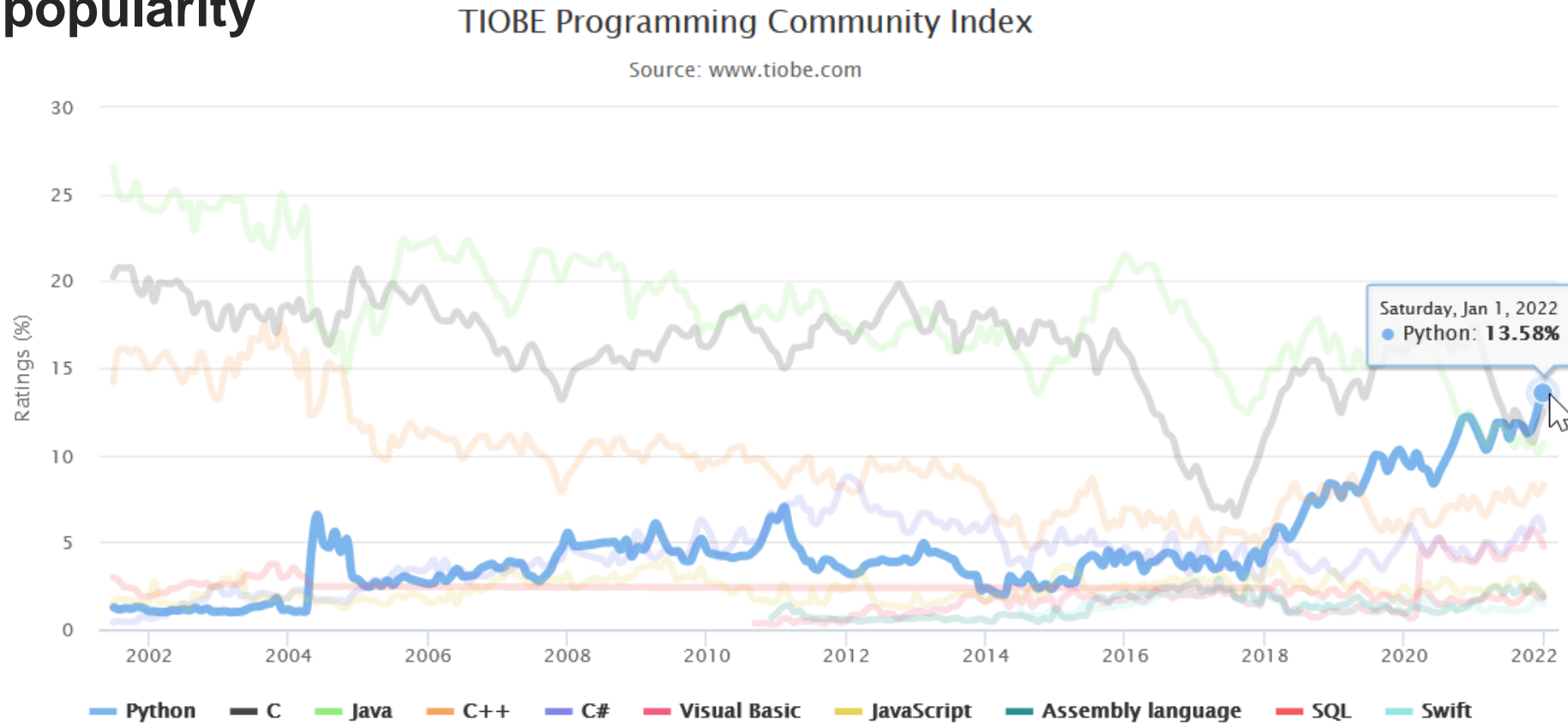
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Python's Popularity

Python gained the highest increase in one year in TIOBE index of programming language popularity



Source: <https://www.tiobe.com/tiobe-index/>

Python's Popularity

1. Statistical analysis
2. Scientific computing
3. Machine learning
4. Data visualization
5. Artificial intelligence
6. Others:
 - i. Scripting & automation
 - ii. Web development
 - iii. Systems testing & prototyping
 - iv. Desktop & mobile applications
 - v. Education!

Getting Python

• Anaconda

- Anaconda installation is the **recommended** method for getting **Python**.
- Anaconda is a package manager that allows installing many applications at once.
- **Installation Guide - Video** : <https://youtu.be/Z1Yd7upQsXY?t=4m19s> *timestamped to start minutes 19 seconds watch until 5:59*
- **Installation Guide - Text** <https://bit.ly/2FRyakD>

Writing Python Codes

- **Jupyter Notebook**

- Among other applications, Anaconda also installs **Jupyter notebook**,
- Jupyter Notebook is an application where you can easily write and execute Python codes.

- **Google Colab**

- [Google's colaboratory](#), which is a free Jupyter notebook environment that requires no setup and runs entirely on Google's cloud.

- **UofT Jupyter Hub**

- <https://jupyter.utoronto.ca/>

Python Help

- Please contact ***pythonhelp@rotman.utoronto.ca*** if you require additional assistance to install jupyter notebook through Anaconda or for any other Python related inquiries.

Data Structures

Data Structures

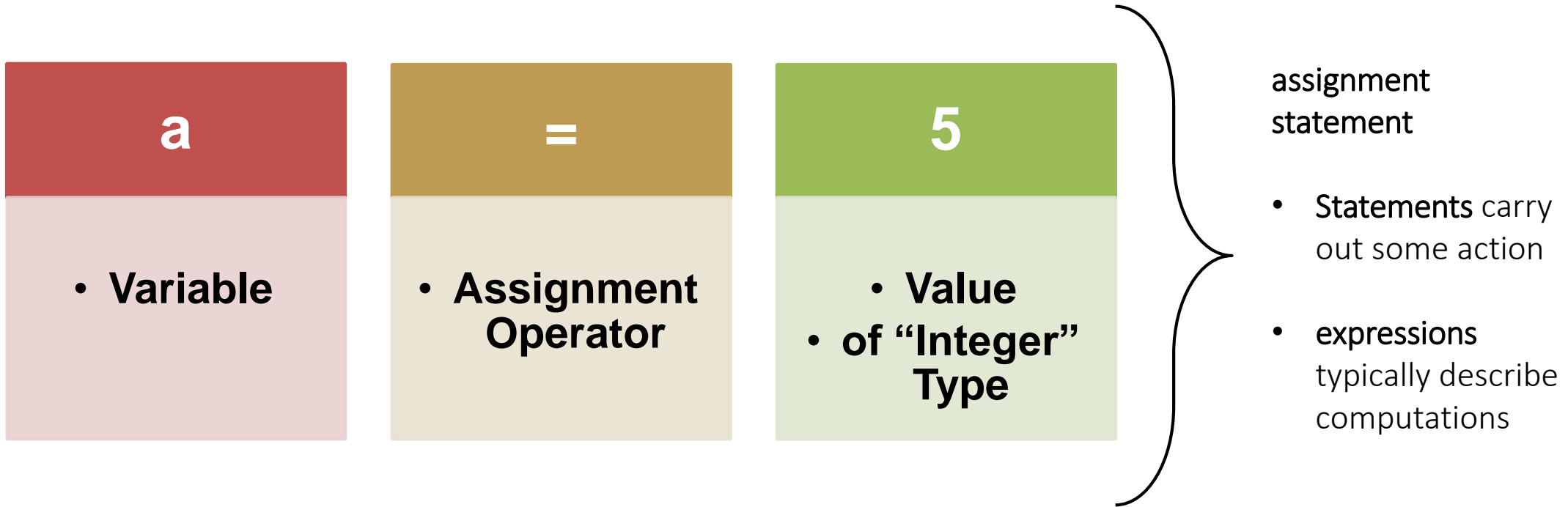
1. Basic

- a) Values
- b) Types
- c) Variables

2. Native to Python

- a) List
- b) Dictionary

Data Structures: Basic



- A program works with values
- Values can be numbers, texts and/or special characters
- Values belong to different [data types](#)

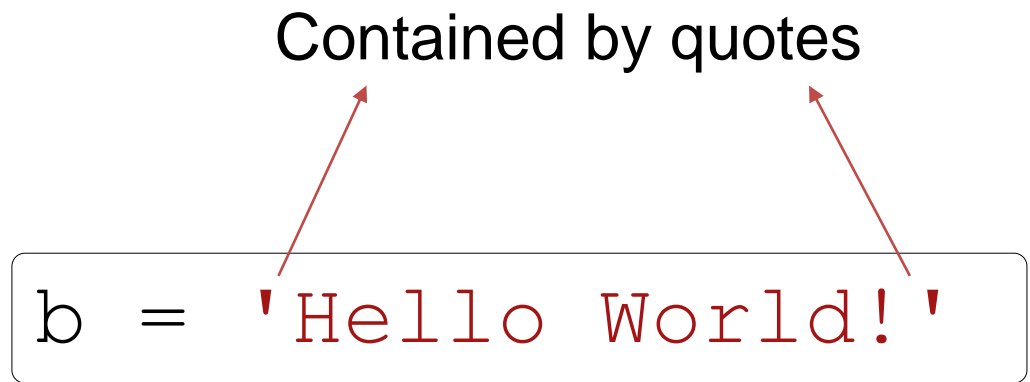
Special Attention to Data Type - String

STRING

- values contained by either single or double quotes
- sequence of character(s)
- can be indexed and sliced by its position
- positions can be indicated by an integer value called index

Contained by quotes

```
b = 'Hello World!'
```

A diagram illustrating string containment. The text "b = 'Hello World!'" is enclosed in a rounded rectangular box. Above the box, the text "Contained by quotes" is written. Two red arrows originate from the words "quotes" and point to the opening single quote (') on the left and the closing single quote (') on the right of the string value.

Data Structures: Native to Python

LIST

- Mutable
- Ordered
- Sequence of items

```
fruits = ['apple', 'orange',  
         'peach']
```

Each element
separated by
comma.

All elements
contained inside
square brackets.

DICTIONARY

- Mutable
- Unordered
- Key-Value Pairs

```
fruits_dict = { 'apple' : 5,  
                'orange' : 2,  
                'peach' : 3 }
```

keys

values

Keys and their values
are separated by colon

All key-value pairs are
contained inside curly
brackets.

Operators

Operators

- Special symbols or keywords used to perform some designated computation:
 - ✓ addition,
 - ✓ subtraction,
 - ✓ assigning value,
 - ✓ comparing values,
 - ✓ combining two or more operations, etc.

Types of Operators

- There are many types of [operators](#) in Python. The most common of them are:

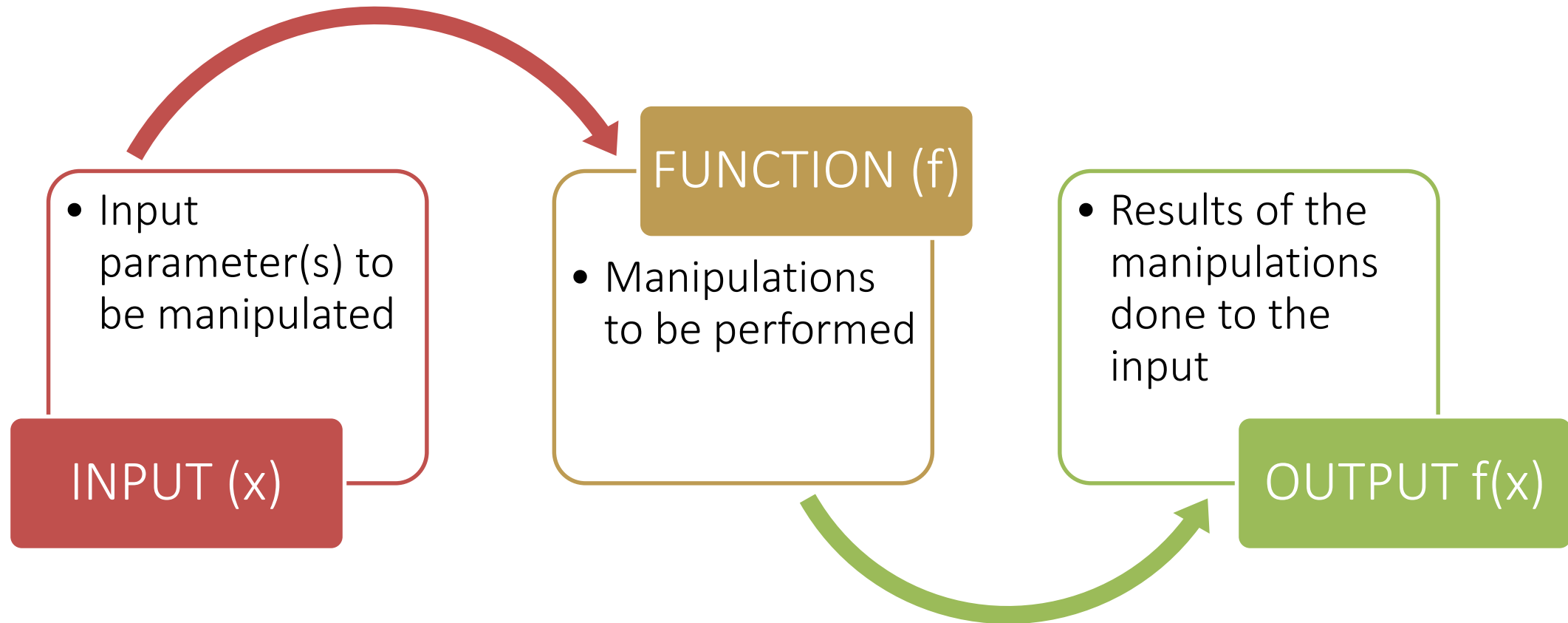
Operator	Function
Assignment	Assign values to variables
Arithmetic	perform arithmetic operation on numeric values (works differently on strings)
Comparison	Compare two values
Logical	test if multiple conditions are satisfied at the same time
Membership	test if a sequence with a specified value is present in another value.

Examples of Operators

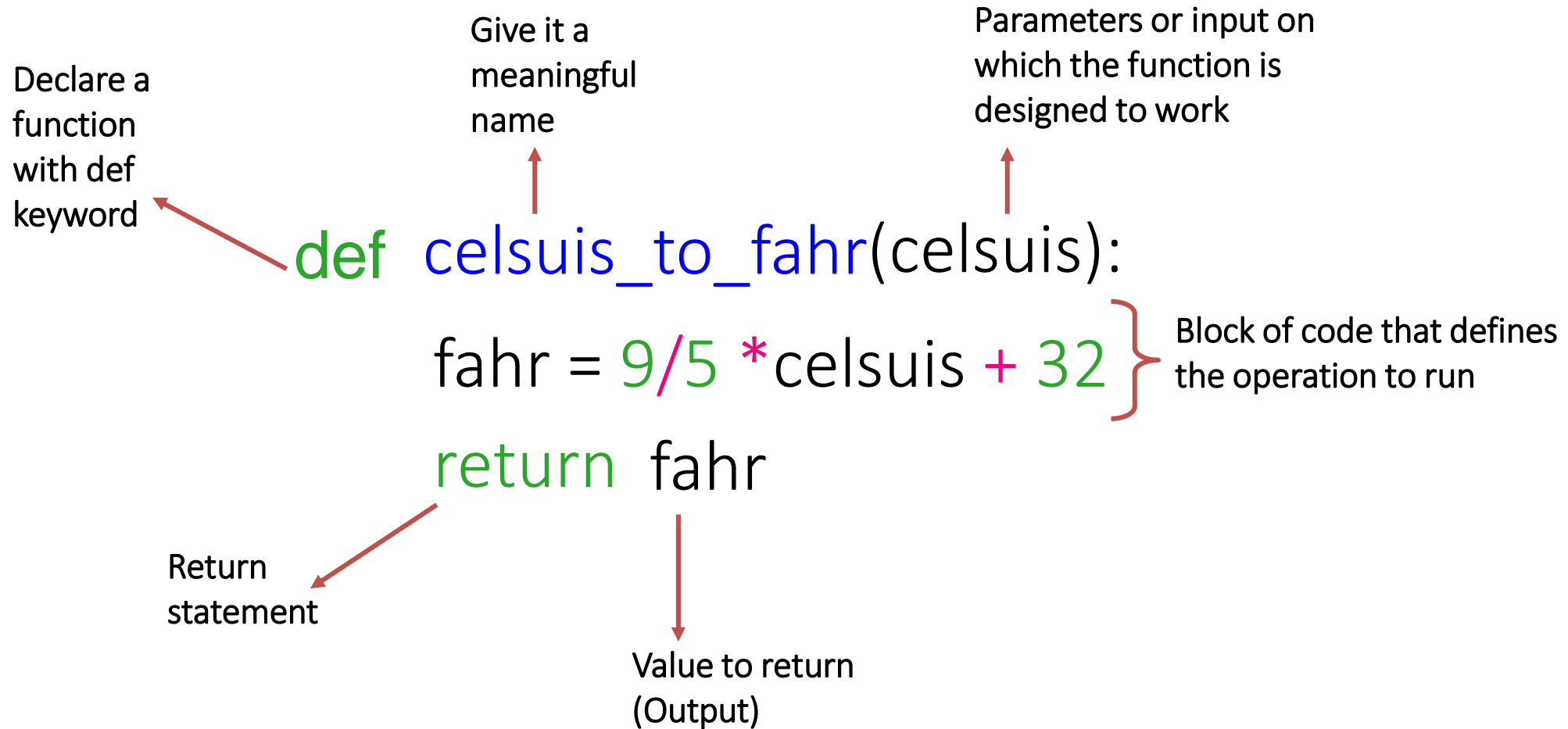
Assignment	Arithmetic	Comparison	Logical	Membership
$X = 5$	+ (Addition)	== (Equal to)	and (Use: $X < 5$ and $X < 10$)	in (Use: x in y)
$X += 5$ (same as $X = X+5$)	- (Subtraction)	!= (Not equal to)	or (Use: $X < 5$ or $X = 10$)	not in (Use: x not in y)
$X *= 5$ (Same as $X = X*5$)	* (Multiplication)	> (is greater than)	not (Use: $\text{not}(x < 5$ and $x = 10)$)	
	** (Exponent)	< (is less than)		

Functions

Functions



Functions: User-defined Functions



Functions: Built-in Functions

- Python interpreter has a number of functions and types built into it that are always available.
- `print()` is an example of built-in function. It prints the given object to the standard output device (screen) or to the text stream file.
- [Here](#) is the list of Python's built-in functions.

```
numlist = [4, 8, 10, 15]
```

```
type(numlist)  
→ list
```

```
len(numlist)  
→ 4
```

```
sum(numlist)  
→ 37
```

Functions: Methods

- Functions that are attached to specific class of objects.
- Methods are accessed using the dot expression.
- Methods available to an object can be viewed using "dir" function.

```
b = 'Hello World!'
```

```
b.upper()  
→ 'HELLO WORLD!'
```

methods available
to string objects
only

```
b.isnumeric()  
→ False
```

```
b.count('l')  
→ 3
```

Functions: Methods

- How are methods supposed to work?
- There are documentations available with information on how a given method is intended to work.
- [Python's official documentation for methods of list object](#)
- [Easy-to-read documentation provided by w3schools.](#)

```
numlist=[4,8,10,15]  
numlist.append(16)  
numlist  
→ [4,8,10,15,16]
```

.append is a method
available to objects of
class list only

Functions: Third Party Packages

- Python has an active supporting community of contributors and users who also make their software available for other Python developers to use under its open source license terms.
- The [SciPy](#) ecosystem is a collection of open source software for scientific computing in Python.

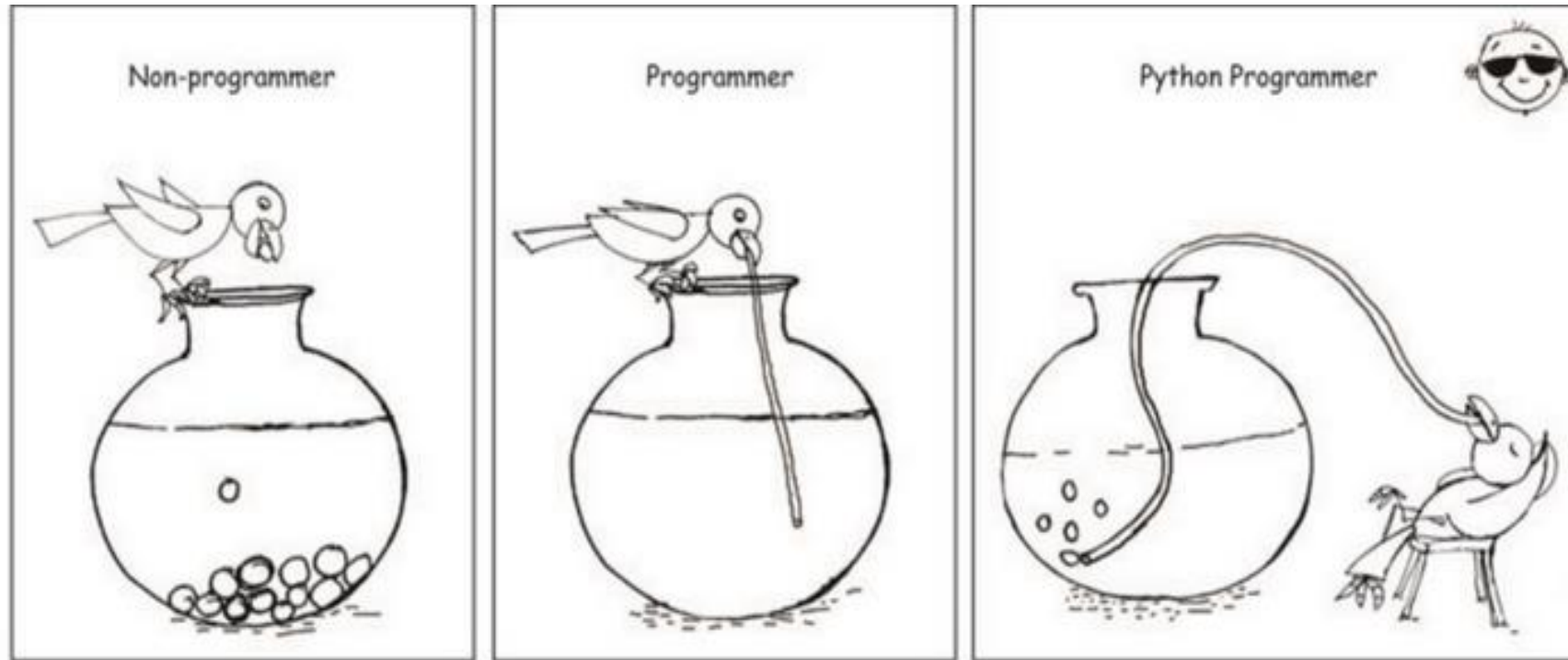


pandas
 $y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$



matplotlib

Questions?



Who wants to become a Python Programmer?

Thank you