Social Data Science with Python

Session 2: Data Structures, Functions, and Files

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Hello again!

Figure: Source: Reddit r/ProgrammerHumor

What have we covered last lecture?

- Introductions

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What are we learning today?

- Representing Data on A Computer
- More about Variables, Data Types, and Data Objects
- **Structuring Observations and Storing Data in Python**

How do we think about Data?

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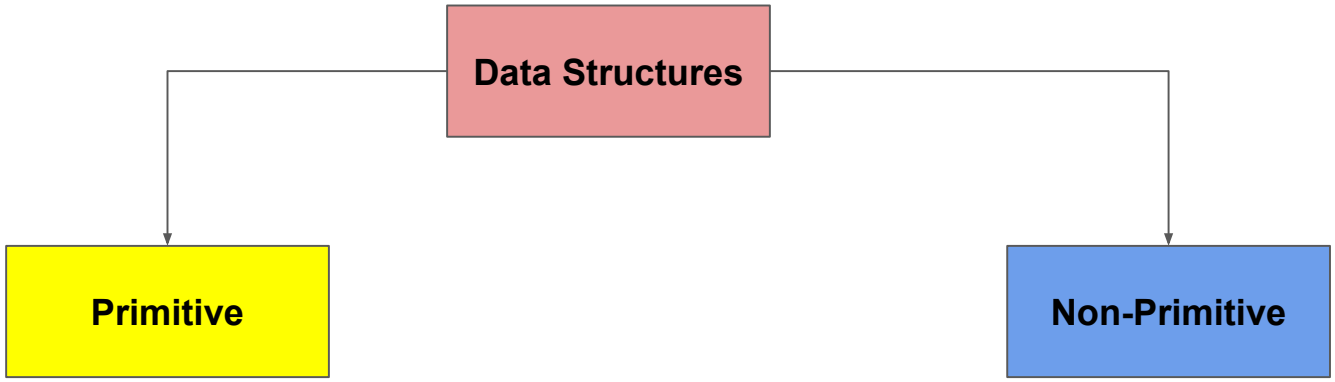
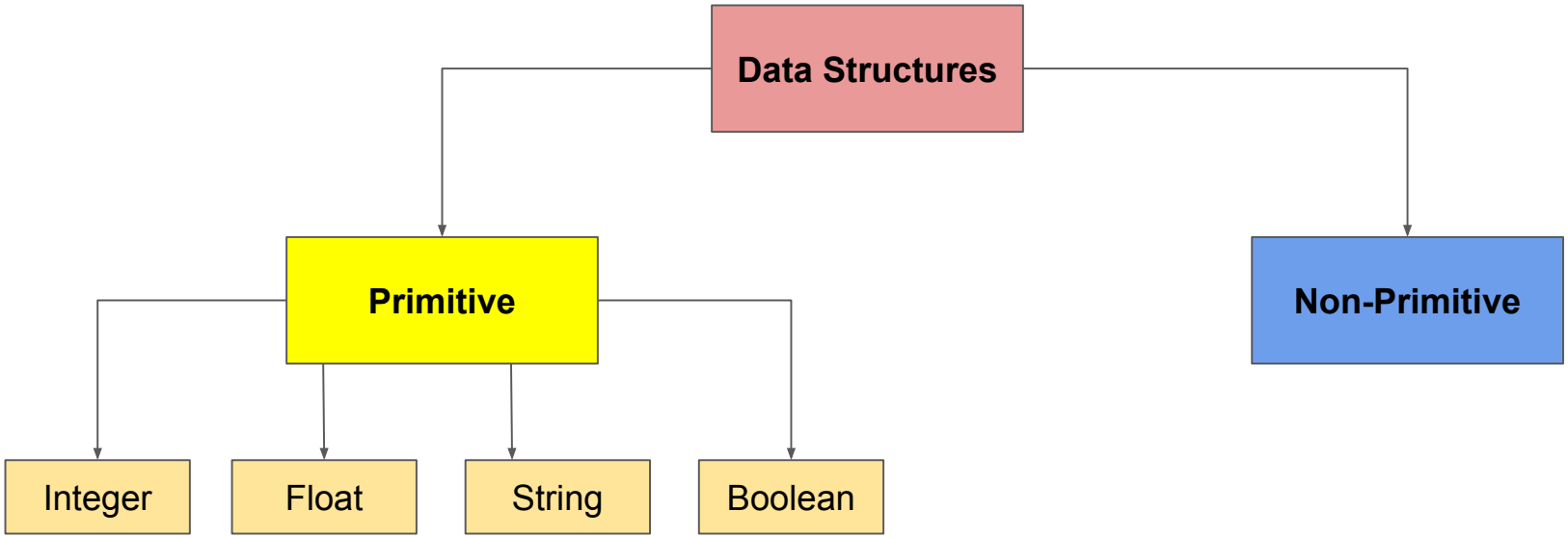
3. Primitive Structures: Simple ways of storing your values.
4. Non-Primitive Structures: More complex and advanced ways of representing data.

Python Data Structures



Python Data Structures



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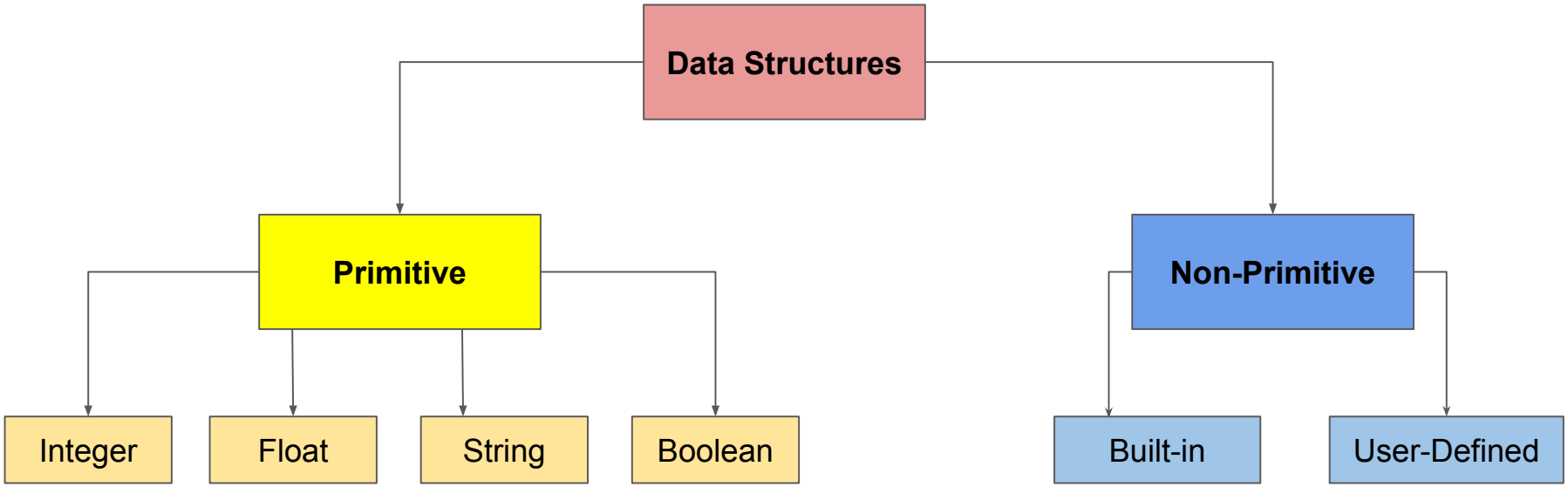

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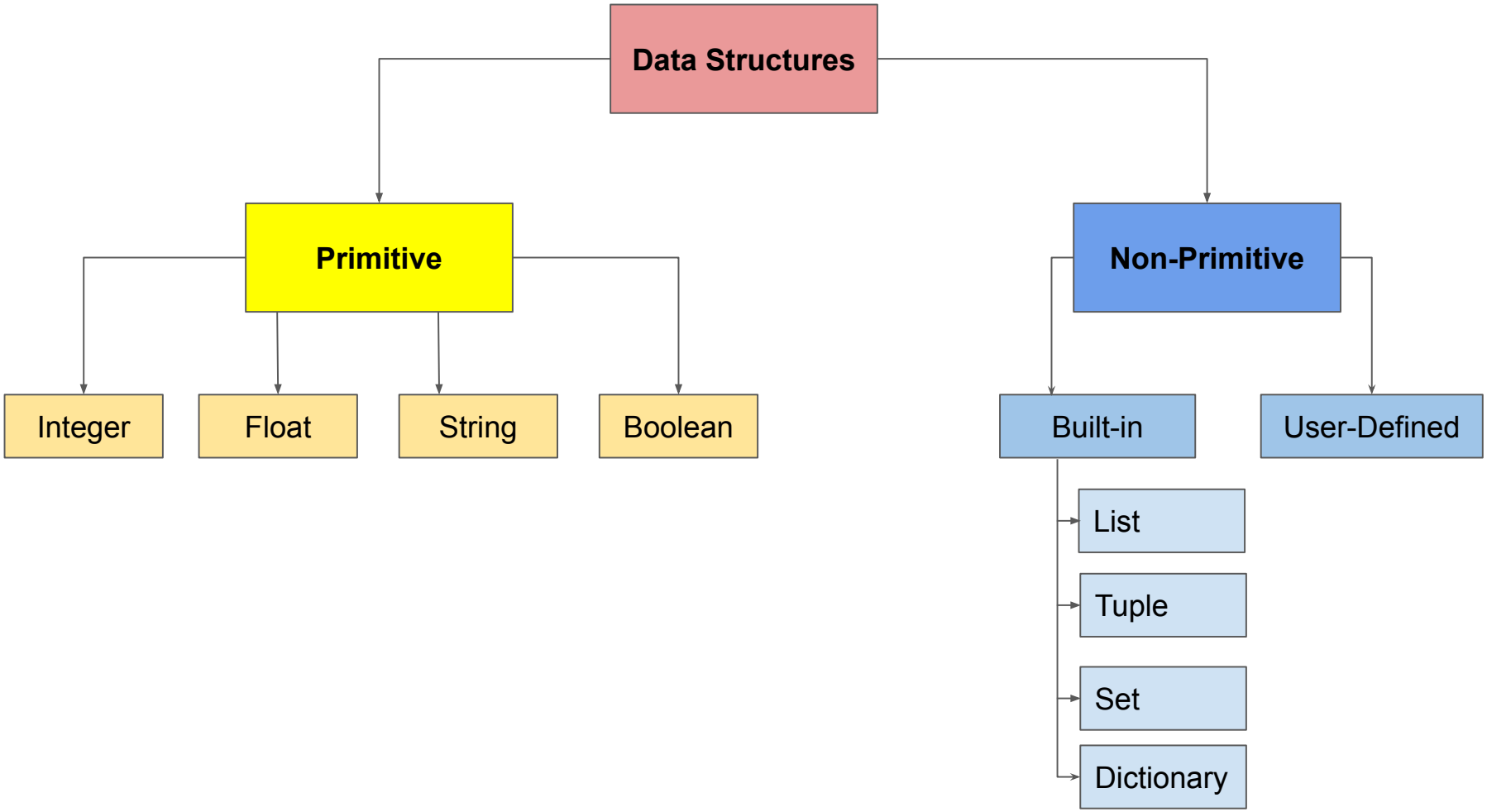

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- Sequenced: Indexed by position, starts counting at 0!

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- Use less space.

3. Sets

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myset1 = {"Python", "at", "DPIR","is","cool}
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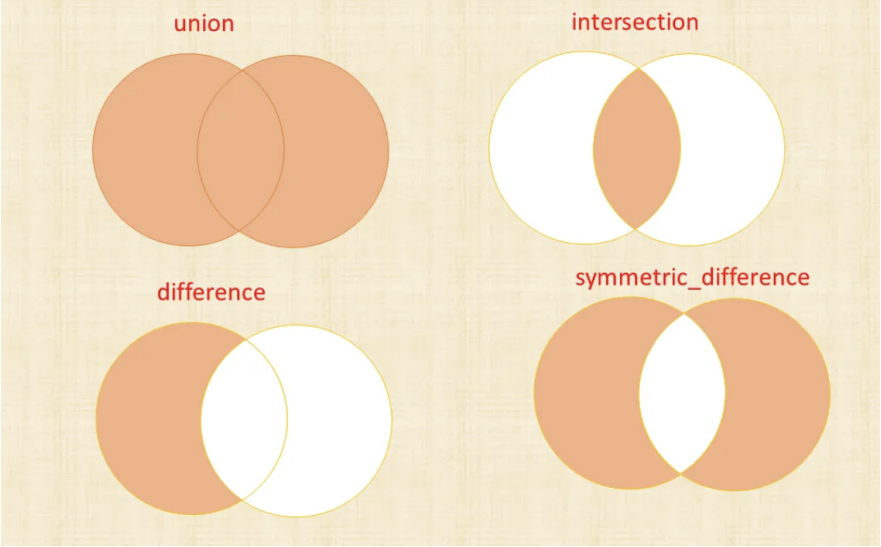
- No duplicate items. Only unique values.
- Mutable.
- No support for slicing or indexing operations.
- Use it: find out if something exists, but nothing else.



Source: Indhumathy Chelliah 2020 Medium

4. Dictionaries

- Key-Value pairs (Address Book).
- Keys must be unique.
- Mutable
- Tuples can be used as dictionary keys or values

Dictionaries

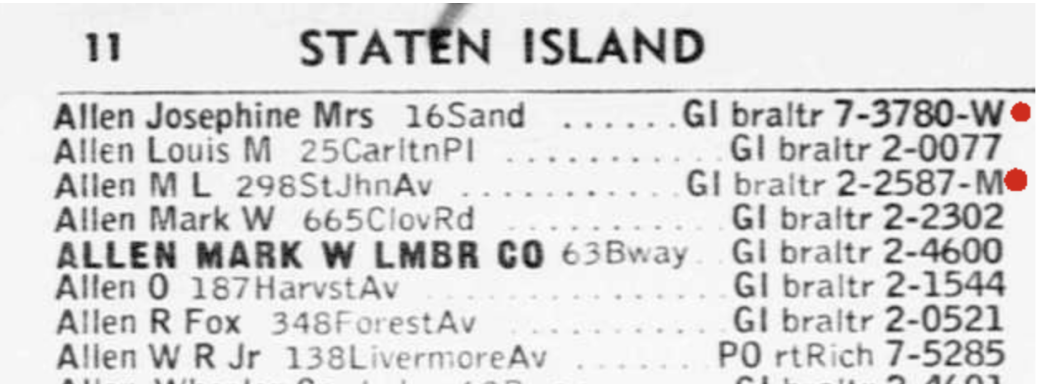

11 STATEN ISLAND

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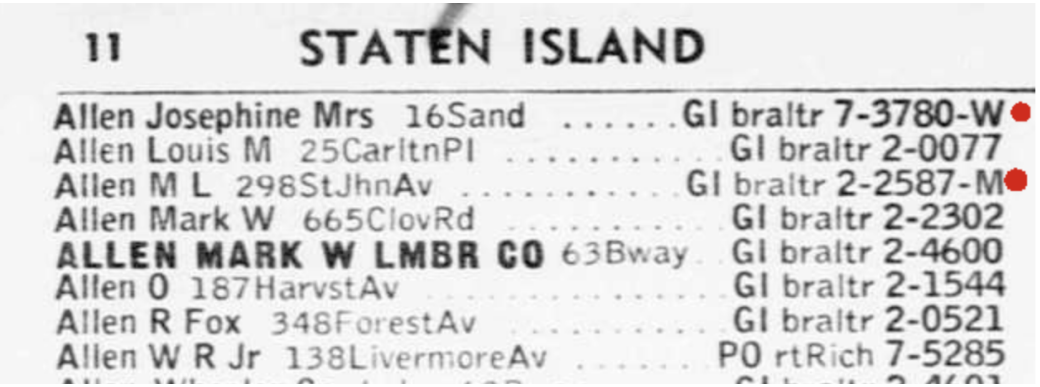
Figure: Source: Internet Archive

Quiz: We want to create a telephone directory that maps from last-name, first-name pairs to telephone numbers. how could write a dictionary assignment statement?

Dictionaries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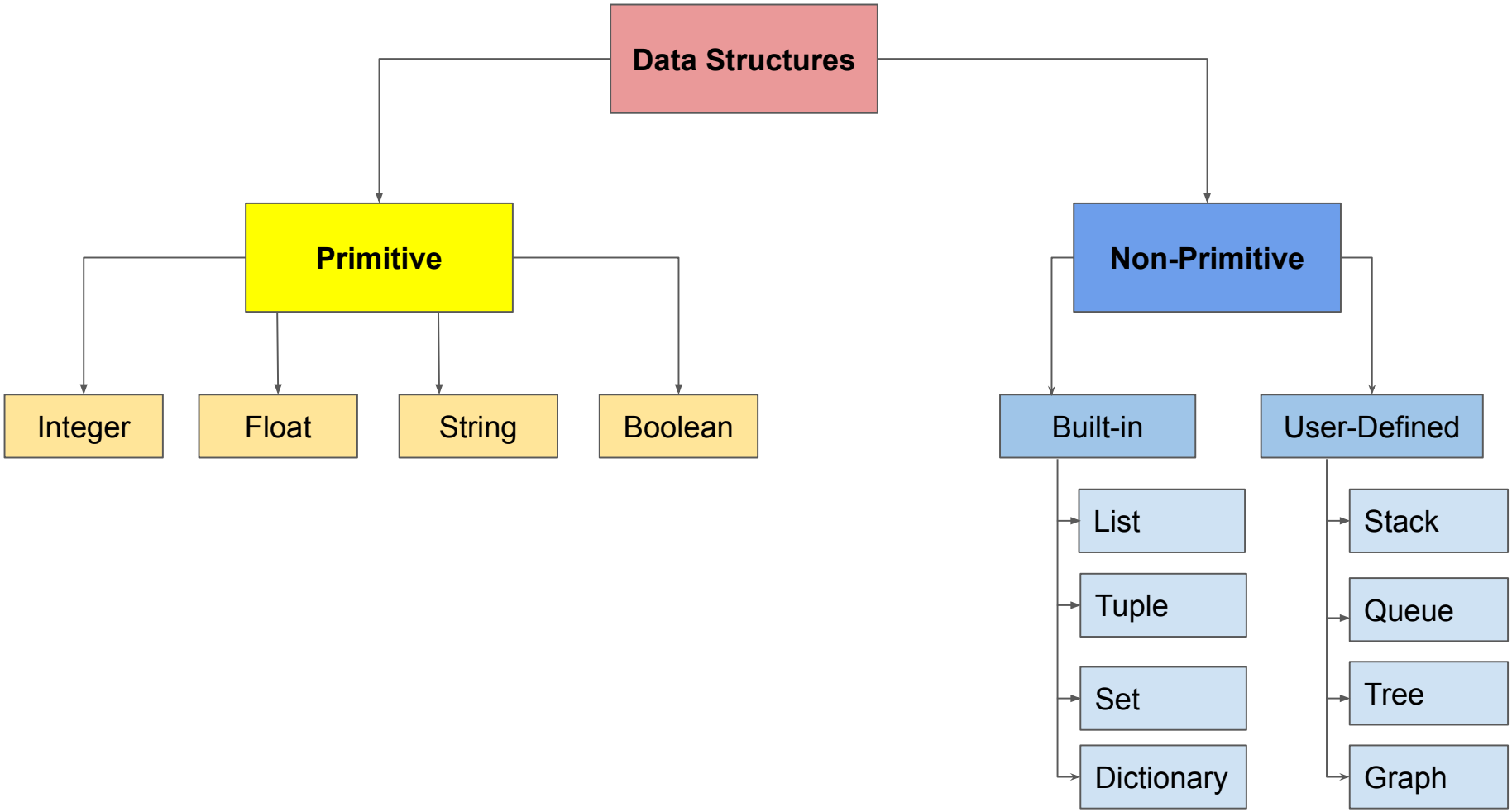
```
my_dict =
        {(FirstName1, LastName1): Number,
        (FirstName2, LastName2): Number}
```

Python Data Structures



Stack

Implementation and deletions restricted to last item (Undo).

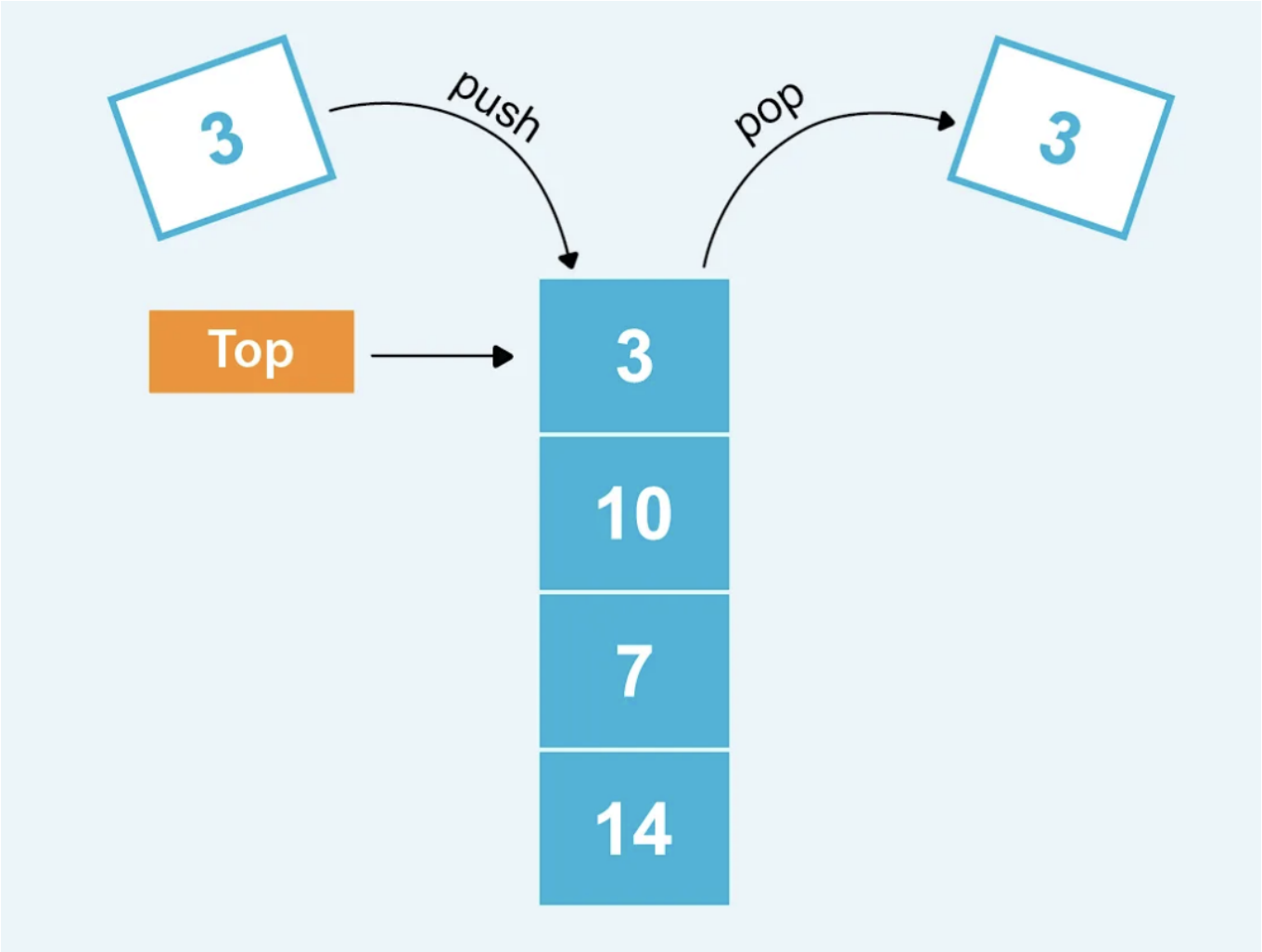


Figure: Source: Nikki Siapno 2022 Medium

Queue

First come, first serve!

Figure: Source: Link

Graph

Network Model

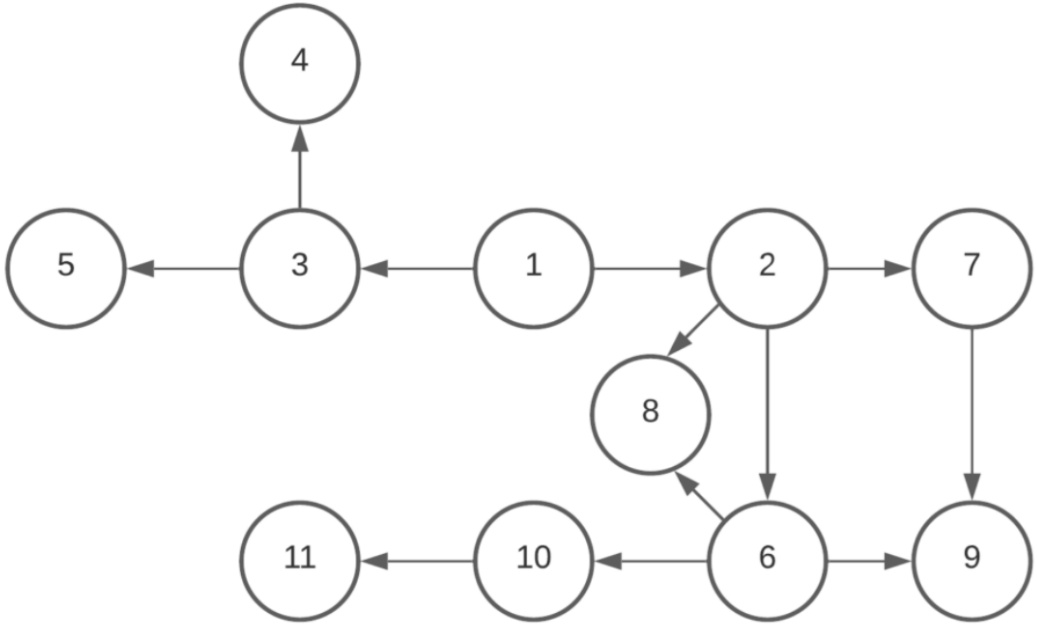


Figure: Source: Baeldung (Link)

Tree

Example: Family Tree

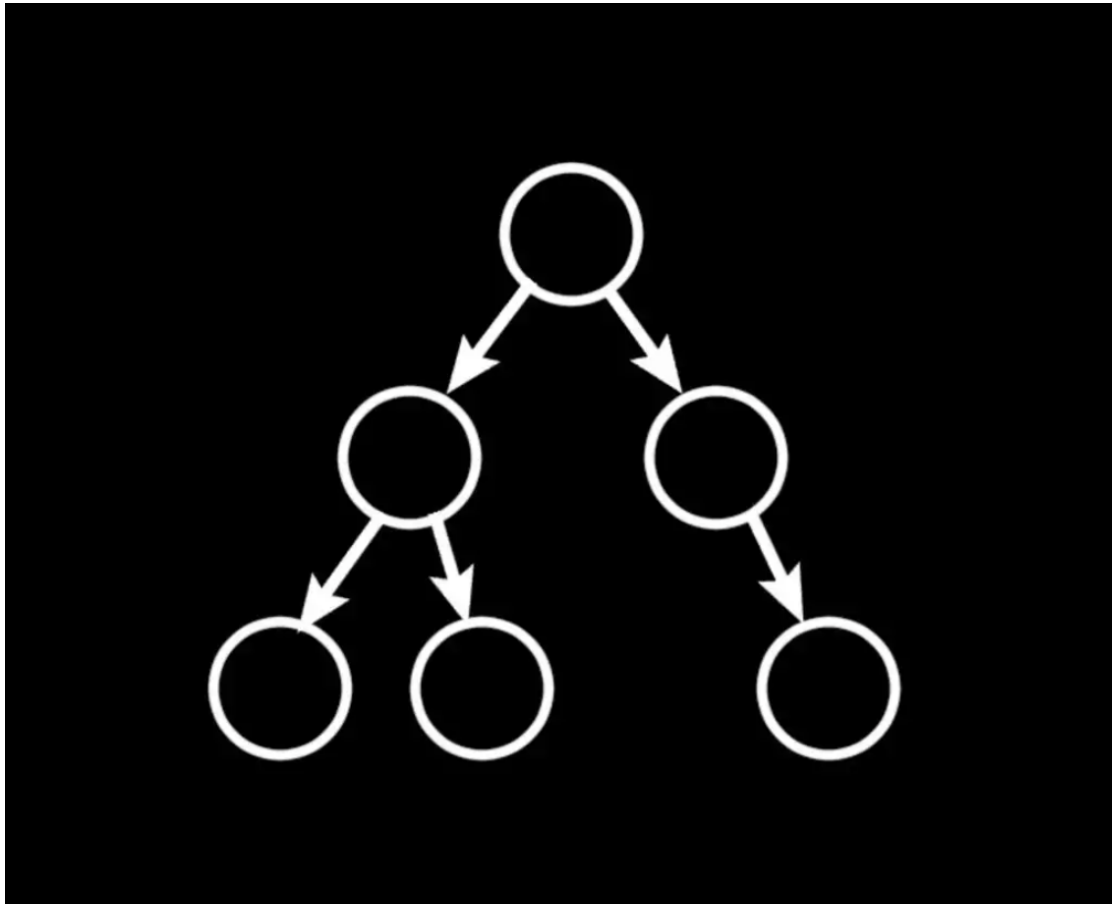


Figure: Source: Keno Leon (Link)

Data Challenge:

How would you structure the information given by this family tree in a tabular data structure? What would be the columns (variables) and rows (observations)? (challenge by Harukawa 2020)

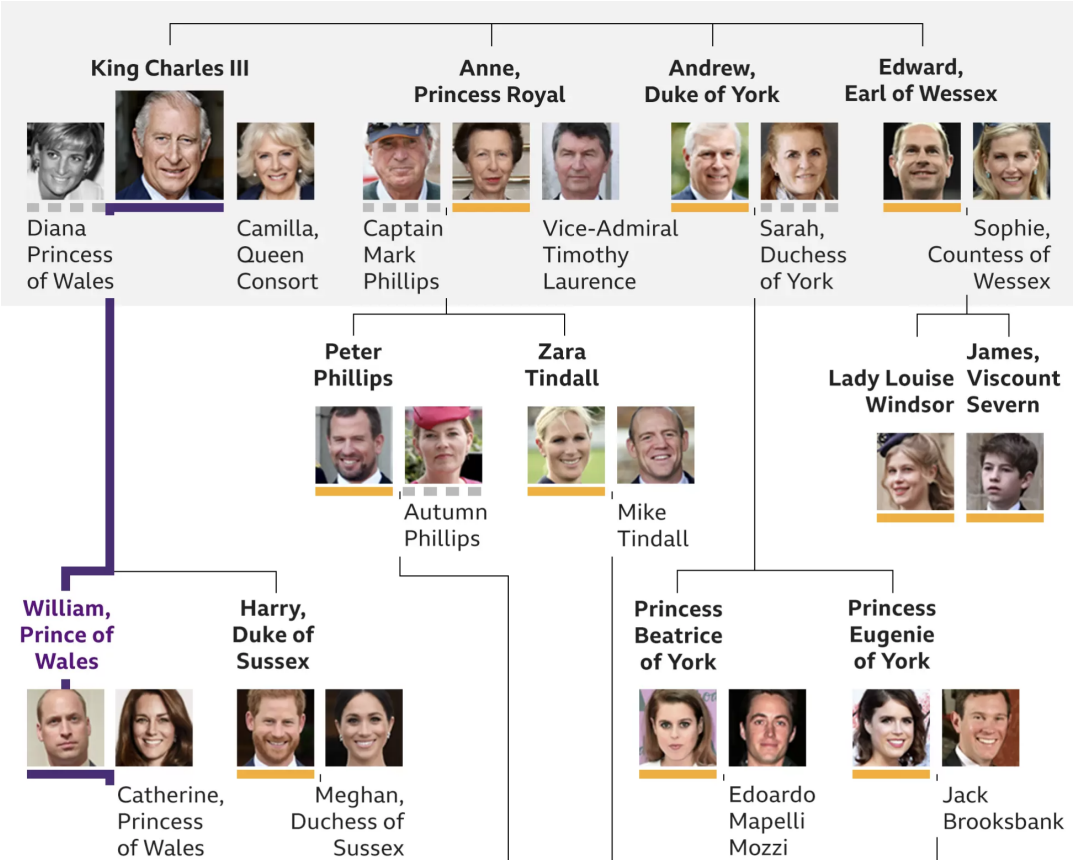


Figure: Source: BBC UK News 1.2.23

From Data Points to Data Frame: Tabular Data

More about this next time!

Creating Pandas DataFrames from Python Lists and Dictionaries

Dictionary

Row Oriented

```
sales = [{'account': 'Jones LLC', 'Jan': 150, 'Feb': 200, 'Mar': 140},
         {'account': 'Alpha Co', 'Jan': 200, 'Feb': 210, 'Mar': 215},
         {'account': 'Blue Inc', 'Jan': 50, 'Feb': 90, 'Mar': 95 }]
df = pd.DataFrame(sales)
```

default

List

```
sales = [('Jones LLC', 150, 200, 50),
         ('Alpha Co', 200, 210, 90),
         ('Blue Inc', 140, 215, 95)]
labels = ['account', 'Jan', 'Feb', 'Mar']
df = pd.DataFrame.from_records(sales, columns=labels)
```

from_records

	account	Jan	Feb	Mar
0	Jones LLC	150	200	140
1	Alpha Co	200	210	215
2	Blue Inc	50	90	95

Column Oriented

```
sales = {'account': ['Jones LLC', 'Alpha Co', 'Blue Inc'],
         'Jan': [150, 200, 50],
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df = pd.DataFrame.from_dict(sales)
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from_dict

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sales = [('account', ['Jones LLC', 'Alpha Co', 'Blue Inc']),
         ('Jan', [150, 200, 50]),
         ('Feb', [200, 210, 90]),
         ('Mar', [140, 215, 95]) ]
df = pd.DataFrame.from_items(sales)
```

from_items

When using a dictionary, column order is not preserved.
Explicitly order them:
`df = df[['account', 'Jan', 'Feb', 'Mar']]`

Practical Business Python - pbpython.com

Figure: Source: Chris Moffitt 2016

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- Control Structures: Learn to iterate through data structures

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If-Else Statement

```
if expression :
    statement 1
    statement 2
    ...
    statement n
```

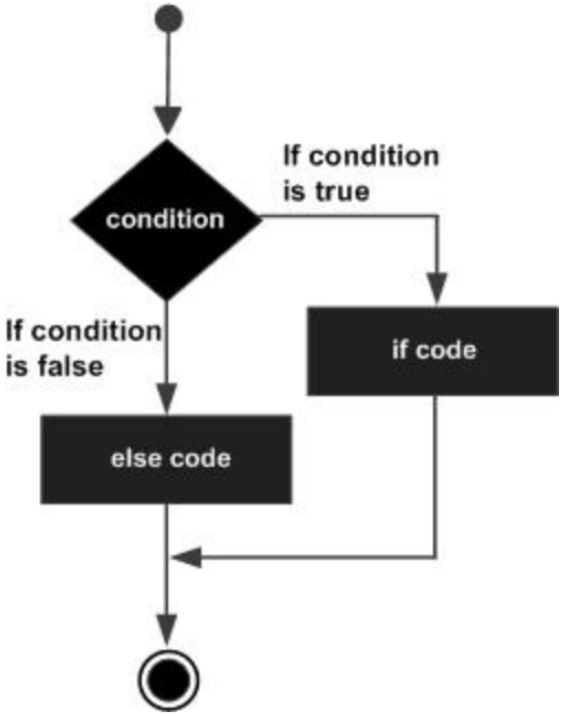

Figure: Source: Tutorials Point

List Comprehension

- Simple, compact, fast.

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- Simple, compact, fast.
- More Pythonic than loops:
  - map + filter + list generation
  - no new strategy for each situation

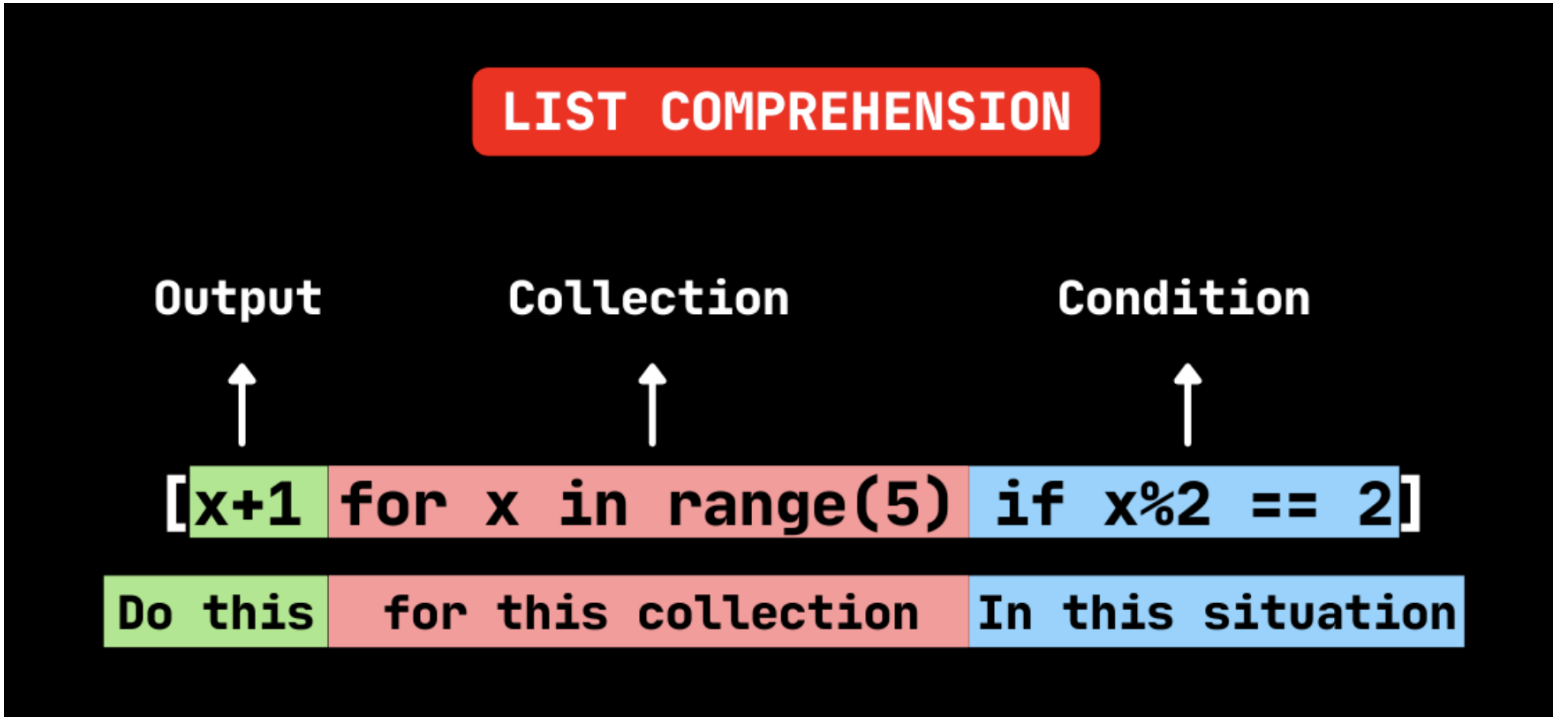

Figure: Source: Buggy Programmer