



DATA TYPES FOR DATA SCIENCE

# Introduction and lists

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# Data types

- Data type system sets the stage for the capabilities of the language
- Understanding data types empowers you as a data scientist



# Container sequences

- Hold other types of data
- Used for aggregation, sorting, and more
- Can be mutable (list, set) or immutable (tuple)
- Iterable



# Lists

- Hold data in order it was added
- Mutable
- Index

```
In [1]: cookies = ['chocolate chip', 'peanut butter', 'oatmeal', 'sugar']
```

```
In [2]: cookies.append('Tirggel')
```

```
In [3]: print(cookies)
['chocolate chip', 'peanut butter', 'oatmeal', 'sugar', 'Tirggel']
```

```
In [4]: print(cookies[2])
oatmeal
```

# Combining Lists

- Using operators, you can combine two lists into a new one

```
In [1]: cakes = ['strawberry', 'vanilla']
```

```
In [2]: desserts = cookies + cakes
```

```
In [3]: print(desserts)
['chocolate chip', 'peanut butter', 'oatmeal', 'sugar', 'Tirggel',
'strawberry', 'vanilla']
```

- `.extend()` method merges a list into another list at the end

# Finding and Removing Elements in a List

- `.index()` method locates the position of a data element in a list

```
In [1]: position = cookies.index('sugar')
```

```
In [2]: print(position)
```

```
3
```

```
In [3]: cookies[3]  
'sugar'
```

- `.pop()` method removes an item from a list and allows you to save it

```
In [1]: name = cookies.pop(position)
```

```
In [2]: print(name)  
sugar
```

```
In [3]: print(cookies)  
['chocolate chip', 'peanut butter', 'oatmeal', 'Tirggel',  
'Biscotti', 'digestive', 'fortune']
```

# Iterating and Sorting

- for loops are the most common way of iterating over a list

```
In [1]: for cookie in cookies:
...:     print(cookie)
chocolate chip
peanut butter
oatmeal
Tirggel
Biscotti
digestive
fortune
```

- sorted() function sorts data in numerical or alphabetical order and returns a new list

```
In [1]: print(cookies)
['chocolate chip', 'oatmeal', 'Tirggel', 'Biscotti', 'digestive', 'fortune']

In [2]: sorted_cookies = sorted(cookies)

In [3]: print(sorted_cookies)
['Biscotti', 'Tirggel', 'chocolate chip', 'digestive', 'fortune', 'oatmeal']
```



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**Let's practice!**





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# Meet the Tuples

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# Tuple, Tuple

- Hold data in order
- Index
- *Immutable*
- Pairing
- Unpackable

# Zippping and Unpacking

- Tuples are commonly created by zipping lists together with `zip()`
- Two lists: `us_cookies`, `in_cookies`

```
In [1]: top_pairs = zip(us_cookies, in_cookies)

In [2]: print(top_pairs)
[('Chocolate Chip', 'Punjabi'), ('Brownies', 'Fruit Cake Rusk'),
 ('Peanut Butter', 'Marble Cookies'), ('Oreos', 'Kaju Pista Cookies'),
 ('Oatmeal Raisin', 'Almond Cookies')]
```

- Unpacking tuples is a very expressive way for working with data

```
In [1]: us_num_1, in_num_1 = top_pairs[0]

In [2]: print(us_num_1)
Chocolate Chip

In [3]: print(in_num_1)
Punjabi
```



# More Unpacking in Loops

- Unpacking is especially powerful in loops

```
In [1]: for us_cookie, in_cookie in top_pairs:
...:     print(in_cookie)
...:     print(us_cookie)
Punjabi
Chocolate Chip
Fruit Cake Rusk
Brownies
# ..etc..
```

# Enumerating positions

- Another useful tuple creation method is the `enumerate()` function
- Enumeration is used in loops to return the position and the data in that position while looping

```
In [1]: for idx, item in enumerate(top_pairs):  
...:     us_cookie, in_cookie = item  
...:     print(idx, us_cookie, in_cookie)  
(0, 'Chocolate Chip', 'Punjabi')  
(1, 'Brownies', 'Fruit Cake Rusk')  
# ..etc..
```

# Be careful when making tuples

- Use `zip()`, `enumerate()`, or `()` to make tuples

```
In [1]: item = ('vanilla', 'chocolate')
```

```
In [2]: print(item)
('vanilla', 'chocolate')
```

- Beware of trailing commas!

```
In [1]: item2 = 'butter',
```

```
In [2]: print(item2)
('butter',)
```



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# Sets for unordered and unique data

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# Set

- Unique
- Unordered
- Mutable
- Python's implementation of Set Theory from Mathematics

# Creating Sets

- Sets are created from a list

```
In [1]: cookies_eaten_today = ['chocolate chip', 'peanut butter',  
    ...: 'chocolate chip', 'oatmeal cream', 'chocolate chip']
```

```
In [2]: types_of_cookies_eaten = set(cookies_eaten_today)
```

```
In [3]: print(types_of_cookies_eaten)  
set(['chocolate chip', 'oatmeal cream', 'peanut butter'])
```

# Modifying Sets

- `.add()` adds single elements
- `.update()` merges in another set or list

```
In [1]: types_of_cookies_eaten.add('biscotti')

In [2]: types_of_cookies_eaten.add('chocolate chip')

In [3]: print(types_of_cookies_eaten)
set(['chocolate chip', 'oatmeal cream', 'peanut butter', 'biscotti'])

In [4]: cookies_hugo_ate = ['chocolate chip', 'anzac']

In [5]: types_of_cookies_eaten.update(cookies_hugo_ate)

In [6]: print(types_of_cookies_eaten)
set(['chocolate chip', 'anzac', 'oatmeal cream', 'peanut butter', 'biscotti'])
```

# Removing data from sets

- `.discard()` safely removes an element from the set by value
- `.pop()` removes and returns an arbitrary element from the set

(`KeyError` when empty)

```
In [1]: types_of_cookies_eaten.discard('biscotti')
```

```
In [2]: print(types_of_cookies_eaten)
set(['chocolate chip', 'anzac', 'oatmeal cream', 'peanut butter',
'biscotti'])
```

```
In [3]: types_of_cookies_eaten.pop()
'chocolate chip'
```

```
In [4]: types_of_cookies_eaten.pop()
'anzac'
```

# Set Operations - Similarities

- `.union()` set method returns a set of all the names (`|`)
- `.intersection()` method identifies overlapping data (`&`)

```
In [1]: cookies_jason_ate = set(['chocolate chip', 'oatmeal cream',  
...: 'peanut butter'])
```

```
In [2]: cookies_hugo_ate = set(['chocolate chip', 'anzac'])
```

```
In [3]: cookies_jason_ate.union(cookies_hugo_ate)  
set(['chocolate chip', 'anzac', 'oatmeal cream', 'peanut butter'])
```

```
In [4]: cookies_jason_ate.intersection(cookies_hugo_ate)  
set(['chocolate chip'])
```

# Set Operations - Differences

- `.difference()` method identifies data present in the set on which the method was used that is not in the arguments (-)
- Target is important!

```
In [1]: cookies_jason_ate.difference(cookies_hugo_ate)
set(['oatmeal cream', 'peanut butter'])
```

```
In [2]: cookies_hugo_ate.difference(cookies_jason_ate)
set(['anzac'])
```



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