Python Lesson 5: Dictionaries and JSON

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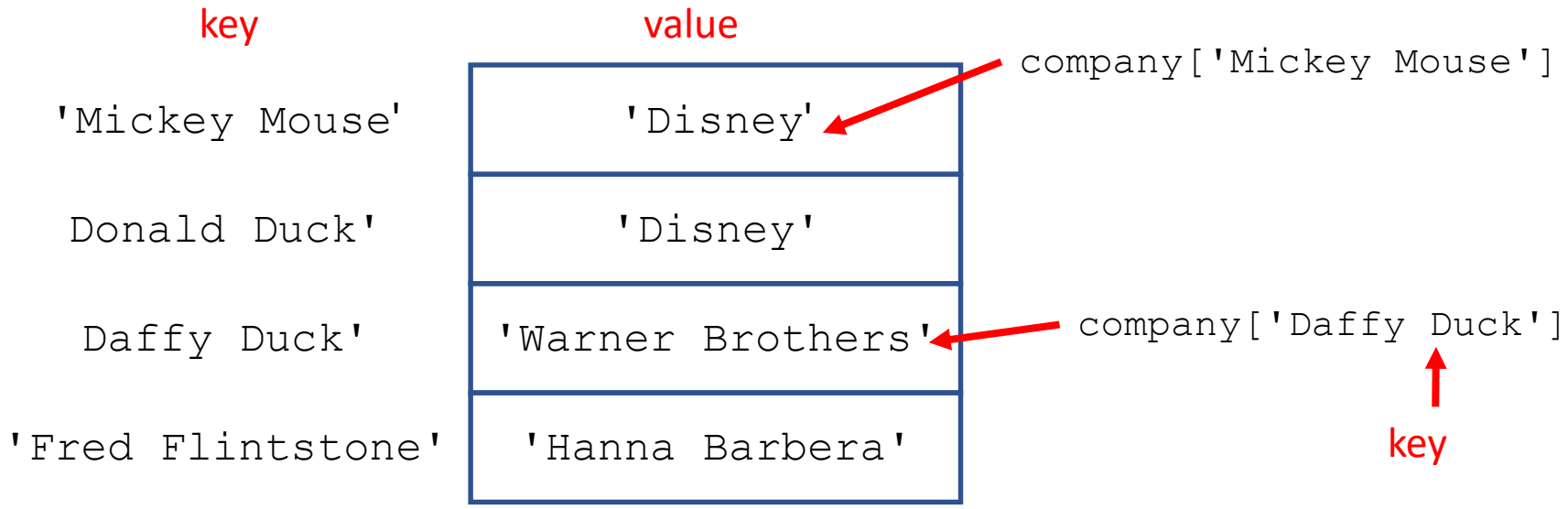
Dictionaries

- Dictionaries are an unordered data structure.
- They're defined using curly brackets: **{ }**
- Values are identified by keys.
- We "look up" values in the dictionary using the keys.

```
company = {'Mickey Mouse':'Disney', 'Donald Duck':'Disney', 'Daffy
Duck':'Warner Brothers', 'Fred Flintstone':'Hanna Barbera'}
```



`try...except...` for error trapping

```
try:
    code that might throw an error goes here
except:
    code to be executed if there's an error goes here
here's where the code execution continues
```

- Error trapping handles problems gracefully instead of having the script crash.
- An error is called an exception.
- Code blocks are identified by indentation (as usual)
- Colons required after **`try`** and **`except`**

`try…except…` for error trapping

- Example:

```
try:
    print('That character works for ' + company[characterName])
except:
    print("I don't know who that character works for.")
print("That's all folks!")
```

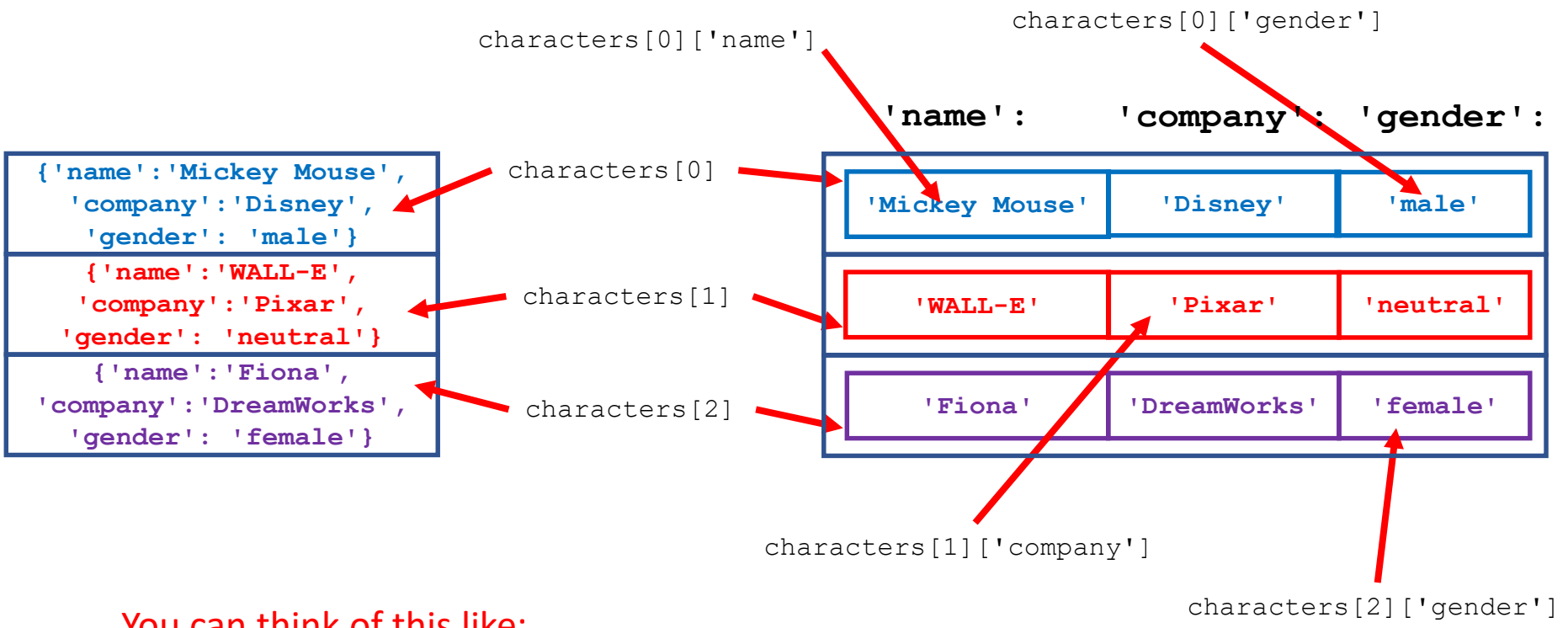
- It's a good idea to error trap any error that can be predicted to happen sometime (e.g. file not found)

Try this

- Note: the keys in a dictionary should be unique
- It is typical for keys to either:
  - be some kind of identifier for a thing (this example)
  - be some kind of characteristic of the thing (next example)

Lists of dictionaries

```
characters = [{'name':'Mickey Mouse', 'company':'Disney', 'gender': 'male'}, {'name':'WALL-E', 'company':'Pixar', 'gender': 'neutral'}, {'name':'Fiona', 'company':'DreamWorks', 'gender': 'female'}]
```



You can think of this like:

`data[row][key]`

Since the keys aren't ordered, there is no significance to the location of the columns.

Lists of dictionaries (cont.)

- Lists are iterable. Dictionaries aren't (they are unordered).
- It's common for each item on the list to represent an individual of some category of thing and each key:value pair in that individual's dictionary to represent a property of that individual.
- Stepping through the list processes each individual.

Examples

What is JSON?

- A basic unit of JSON is a **key:value pair**. For example:

  `"name":"Steve"` (strings must be in quotes)

  `"fingers":10` (numbers don't need quotes)

- A **JSON object** is a list of key:value pairs inside curly brackets.

```
{"name":"Steve", "fingers":10,
"street":"Penny Lane"}
```

- Multiple values can be put in an **array** inside square brackets.

```
["Steve","Steven","Esteban"]
```

Nesting in JSON

- Arrays can be nested inside objects

```
{
  "name":
         [
         "Steve",
         "Steven",
         "Esteban"
         ],
  "fingers":10,
  "street":"Penny Lane"
}
```

- We use this when there are **multiple options** for a **value**
- In this example, the array holds multiple name values.

Whitespace

- Whitespace is not important – it can be used to make the JSON structure clearer. The following mean exactly the same thing:

```
{"name":["Steve","Steven","Esteban"], "fingers":10, "street":"Penny Lane"}
```

```
{"name":["Steve","Steven","Esteban"],
 "fingers":10,
 "street":"Penny Lane"}
```

```
{
  "name":
         [
         "Steve",
         "Steven",
         "Esteban"
         ],
  "fingers":10,
  "street":"Penny Lane"
}
```

Nesting in JSON

- Objects can be nested inside arrays


```
[
    {
        "created_at":"Wed Sep 18 19:50:41 +0000 2019",
        "text":"The \u201cdigital downloads\u201d tax makes an appearance!",
        "lang":"en"
    },
    {
        "created_at":"Wed Sep 18 19:28:44 +0000 2019",
        "text":"I couldn't feel my fingertips this morning it was so cold!",
        "lang":"en"
    },
    {
        "created_at":"Wed Sep 18 14:08:54 +0000 2019",
        "text":"RT @wnprwheelhouse: @wnprharriet giving shoutout to @wnpr !",
        "lang":"en"
    }
]
```


- Use this to assign properties and values to **multiple items**
- In this example, each item is a described tweet

Nesting in JSON

- Objects can be nested inside objects

```
{
    "in_reply_to_screen_name": null,
    "user":
            {
            "id": 6253282,
            "id_str": "6253282",
            "name": "Carmen Baskauf",
            "screen_name": "cbaskauf",
            "location": "Hartford, CT"
            }
        ,
    "geo": null,
    "coordinates": null
}
```

- We use this when a value needs to be **further described** using additional properties.
- In this example, the inner object describes the user

JSON converted to Python objects

- The json.loads() function turns a JSON string into a Python data object.
- Example: lists nested inside dictionaries

```
data = json.loads('''
{
  "name":
          [
          "Steve",
          "Steven",
          "Esteban"
          ],
  "fingers":10,
  "street":"Penny Lane"
}
''')
```

```
>>> print( data['name'][1] )
Steven
```

JSON converted to Python objects

- Example: dictionaries nested inside arrays

```
data = json.loads('''
[
    {
        "created_at":"Wed Sep 18 19:50:41 +0000 2019",
        "text":"The \u201cdigital downloads\u201d tax makes an appearance!",
        "lang":"en"
    },
    {
        "created_at":"Wed Sep 18 19:28:44 +0000 2019",
        "text":"¡No podía sentir las yemas de mis dedos esta mañana, hacía tanto
frío",
        "lang":"es"
    },
    {
        "created_at":"Wed Sep 18 14:08:54 +0000 2019",
        "text":"RT @wnprwheelhouse: @wnprharriet кричать @wnpr !",
        "lang":"ru"
    }
]
''')
```

```
>>> print( data[1]['lang'] )
es
```

JSON converted to Python objects

- Example: dictionaries nested inside dictionaries

```
data = json.loads('''
{
    "in_reply_to_screen_name": null,
    "user":
            {
            "id": 6253282,
            "id_str": "6253282",
            "name": "Carmen Baskauf",
            "screen_name": "cbaskauf",
            "location": "Hartford, CT"
            }
        ,
    "geo": null,
    "coordinates": null
}
''')
```

```
>>> print( data['user']['location'] )
Hartford, CT
```

General pattern

- In complex JSON structures, inner structures can be nested inside outer structures – potentially many times.
- In a variable, we describe the path from outer to inner structures through a series of square brackets.
- If the next structure is a JSON array (Python list), we use an index number.
- If the next structure is an JSON object (Python dictionary), we use a key string.

Try this