CS106A Final Review Session

Summer 2022

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Some quick logistics

- August 12th, 8:30am-10:30am
- NVIDIA Auditorium (same room as lecture)
- Open Note (but don’t rely on your notes because of timing)

Let’s Review!

Loops

- for i in range(start, end, increment)
    - “end” is the only mandatory one, and is EXCLUSIVE (up to but not including)
    - Example: for i in range(5)
    - Example: for i in range(5, 2, -1)
- for elem in structure
    - Example: for line in file
    - Example: for ch in str
- while ________
    - Example: while True
    - Example: while count < 10

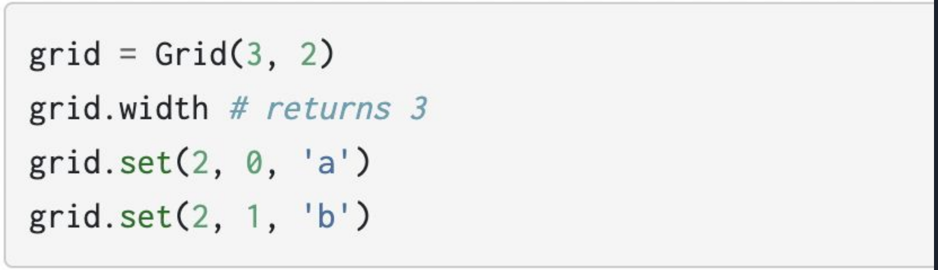
Lists

- LISTS CHEAT SHEET
- A linear collection of any type of Python value
- Declare an empty list like this: things = [ ]
- Use len(things) to get the length (# of items)
- 0-indexed, use things[i] to access the elements
- Lists are MUTABLE—they can be changed
- things.append(item) to add something to a list
- things.index(target) to find the index of the target in a list
    - Only works if target is IN the list! Error otherwise :(

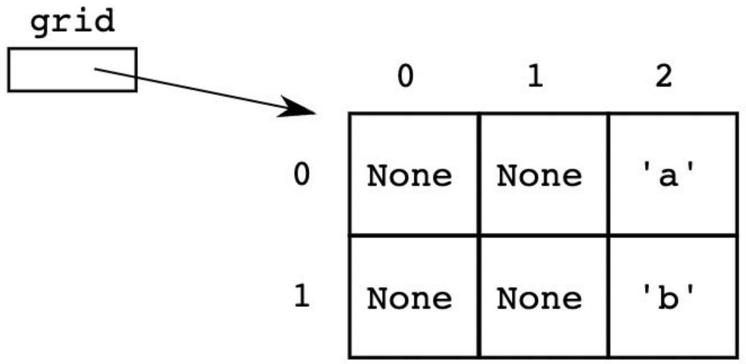
Images

```
image = SimpleImage(filename)
out = SimpleImage.blank( image.width, image.height )
for y in range( image.height ):
    for x in range( image.width ):
        pixel = image.get_pixel(x, y)
        new_pix = out.get_pixel(x, y)
        new_pix.red = pixel.red
        new_pix.green = 0
        new_pix.blue = 0
```

Grids



```
grid = Grid(3, 2)
grid.width # returns 3
grid.set(2, 0, 'a')
grid.set(2, 1, 'b')
```

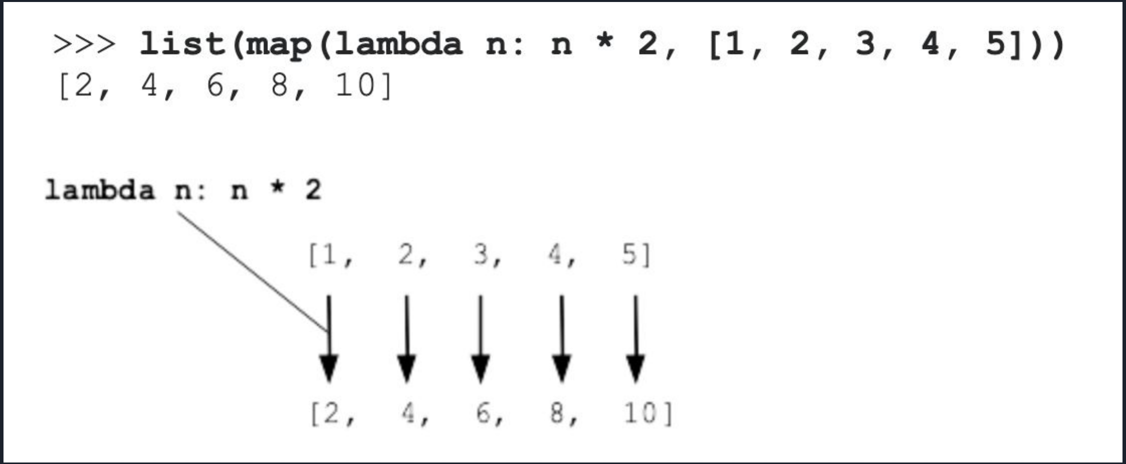


Dictionaries

- DICTIONARIES CHEAT SHEET
- Declare empty dictionary with curly braces { }
- `dict_name[ key ] = value`

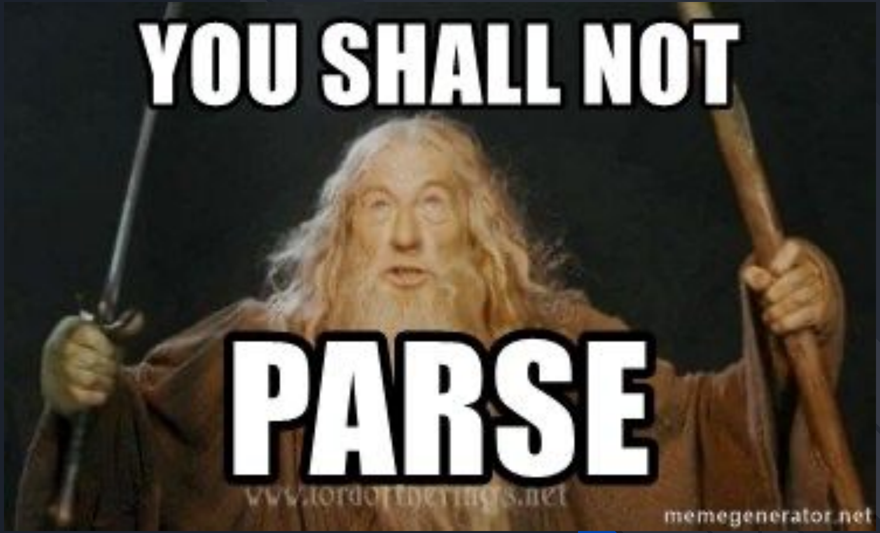
Maps/Lambdas

- [LAMBDAS CHEAT SHEET]
- Runs a lambda function over a list of values



```
>>> list(map(lambda n: n * 2, [1, 2, 3, 4, 5]))
[2, 4, 6, 8, 10]
```

String Parsing
Practice Problem



String Parsing Practice

Given a string s, look for a '(___)' within s.

Look for the first '(' in s, then the first ')' after the '('. If both parens are found, return the chars between them.

So **'xxx(abc)xxx'** returns **'abc'**.

If no such pair of parens is found, return the empty string.

Thinking about this input: **'))(abc)'** → how can we find the ‘)’ without pointing us to the first char?

String Parsing Practice: Solution

```
def parens(s):
    left = s.find('(')
    if left == -1:
        return ''
    right = s.find(')', left + 1)
    if right == -1:
        return ''
     return s[left + 1:right]
```

Nested Structures

Practice Problem

Nested Structures Practice

You’re hosting a huge dinner party, and you need to cook for a bunch of your friends. They’ve all sent you their allergies, but you need a good way to organize this information…

Let’s use a dictionary! The keys will be the names of your friends, and the values will be lists of their respective allergies.

Nested Structures Practice

We’re going to be given a dictionary that looks like this:

```
result = {“Grant”: [ “peanuts”, “kiwis” ],
          “Emily”: [ “grapes”, “chocolate” ],
          “Jonathan”: [ “cheese” ]    }
```

Given this existing dictionary, the name of a person, and an allergy that they have, update the dictionary with the person and their allergy.

Nested Structures Practice

```
def update_allergies( allergy_dict, name, allergy ):
    if name not in allergy_dict:
        allergy_dict[name]= []
    allergy_dict[name].append( allergy )
    return allergy_dict
```

Nested Structures Practice (2)

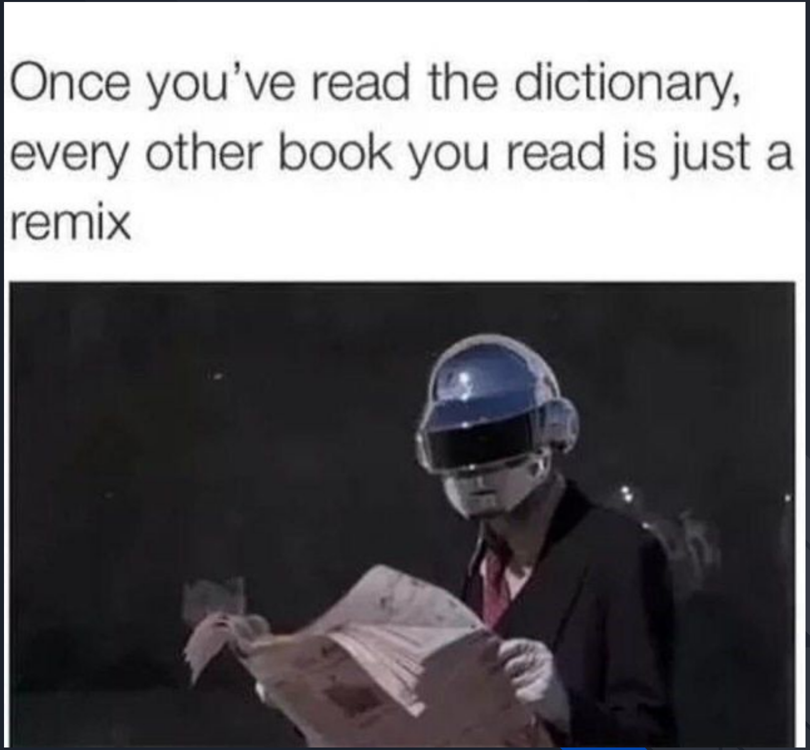
Now that we have our dictionary built, let's put it to use!

Let's say we want to know how many allergies a given person has.

Task: given a dictionary *allergies* and a string *name* return the number of allergies the given person has

```
def num_allergies(allergies, name):
    allergies_list = allergies[name]
    return len(allergies_list)
```

Nested Dictionaries
Practice Problem


Once you've read the dictionary, every other book you read is just a remix

Avatar the Last Airbender Characters

Let’s say we are given a text file containing information about each character of the ATLA universe.

The information includes each character’s name, their age, and the nation they belong to. See below for an example of the inputted file:

```
Katara-14-Water
Sokka-15-Water
Toph-12-Earth
Bumi-112-Earth
Zuko-16-Fire
Iroh-40-Fire
Azula-14-Fire
Aang-112-Air
```

ATLA Problem: Our Task

Our task is to read (parse) through the inputted file and return a nested dictionary that sorts each character along with their age into their appropriate nation.

```
result = {Nation: {Name: Age}}
```

ATLA Problem: Our Task

```
Katara-14-Water
Sokka-15-Water
Toph-12-Earth
Bumi-112-Earth
Zuko-16-Fire
Iroh-40-Fire
Azula-14-Fire
Aang-112-Air
```

$\nearrow$

```
parse_characters('character_info.txt')
```

$\downarrow$

```
{  'Water': {'Katara': 14, 'Sokka': 15},
   'Earth': {'Toph': 12, 'Bumi': 112},
   'Fire': {'Zuko': 16, 'Iroh': 40, 'Azula': 14},
    'Air': {'Aang': 112}  }
```

ATLA Problem: Solution?

We can break down our task into three steps:

1. Opening/Reading the file
2. Parsing the information from each line
3. Adding to our result dictionary

Opening Files in Python

```
filename = 'character_info.txt'
with open(filename) as f:
        # CODE HERE
        # In this case we want to deal with each line from our file,
        # so we can say for line in f: to iterate over each line of the file
```

FILE READING CHEAT SHEET

Parsing Information From Each Line

```
filename = 'character_info.txt'
with open(filename) as f:
    for line in f:
        line = line.strip() # strips any whitespace and newline character
        parts = line.split('-') # separates line into a list (called parts) by the ‘-’ delimiter
        name = parts[0] # parts = [‘Katara’, ‘14’, ‘Water’], we can grab each part by indexing into the list
        age = parts[1]
        nation = parts[2]
```

Time to Nest the Dictionaries!

```
filename = 'character_info.txt'
with open(filename) as f:
    result = {} # We need to first declare our result dictionary that we will be returning!
    for line in f:
        line = line.strip()
        parts = line.split('-')
        name = parts[0]
        age = parts[1]
        nation = parts[2]
        if nation not in result: # We first must check if the key is in our outer dictionary or not
            result[nation] = {} # So we add the nation as a new key with a default value (another dictionary!)
        inner_dict = result[nation] # Let’s pull the inner dictionary from our outer one so we can better access it
        inner_dict[name] = int(age) # Add the age (as a number!) to our inner dictionary
```

Time to Nest the Dictionaries!

```
filename = 'character_info.txt'
with open(filename) as f:
    result = {} # We need to first declare our result dictionary that we will be returning!
    for line in f:
        line = line.strip()
        parts = line.split('-')
        name = parts[0]
        age = parts[1]
        nation = parts[2]
        if nation not in result: # We first must check if the key is in our outer dictionary or not
            result[nation] = {} # So we add the nation as a new key with a default value (another dictionary!)
        result[nation][name] =  int(age) # This also works!! We grab the nested dict with result[nation] first
return result
```

And that’s all!

Congrats! You are now the next Mark Zuckerberg!

Questions?