YData: Introduction to Data Science

Class 14: writing functions

Overview

Quick review of for loops and conditional statements

Writing functions

If there is time: text manipulation

Announcement: Homework 6

Homework 6 has been posted!

It is due on Gradescope on Sunday March 3rd at 11pm

Also keep thinking about your final projects

Midterm exam

Thursday March 7th in person during regular class time

- Exam is on paper

As part of homework 6, you will post a practice problem to Ed

- Ideally do this soon
- I will take one of these problems and put it on the exam

A practice exam has been posted

Midterm exam “cheat sheet”

You are allowed an exam “cheat sheet”

One page, double sided, that contains **only code**

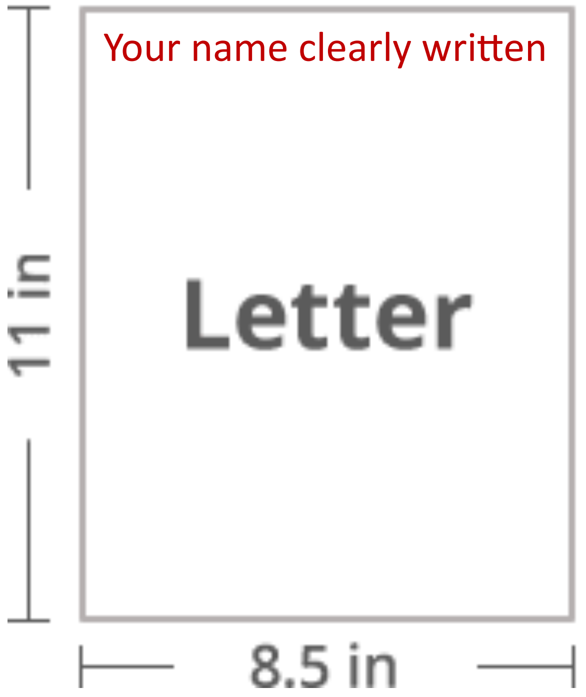
- No code comments allowed
- E.g., sns.catplot(data = , x = , y = , hue = , kind = "strip"/"swarm"})

Cheat sheet must be on a regular 8.5 x 11 piece of paper

- Your name on the upper left of both sides of the paper

You must turn in your cheat sheet with the exam

- Failure to do so will result in a 20 point deduction



Review: for loops

For loops repeat a process many times, iterating over a sequence of items

- Often we are iterating over an array of sequential numbers

```
animals =  ["cat", "dog", "bat”]
for creature in animals:
    print(creature)

for i in range(10):
    print(i**2)
```

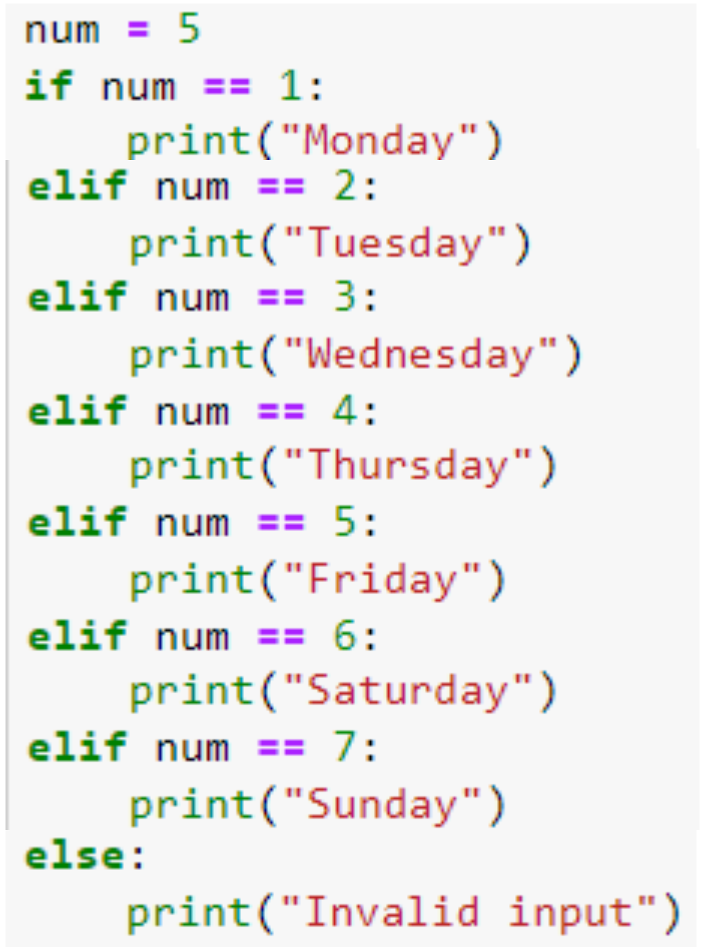
Review: conditional statements

Conditional statements control the sequence of computations that are performed in a program

We use the keyword if to begin a conditional statement to only execute lines of code if a particular condition is met.

We can use elif to test additional conditions

We can use an else statement to run code if none of the if or elif conditions have been met.



```
num = 5
if num == 1:
    print("Monday")
elif num == 2:
    print("Tuesday")
elif num == 3:
    print("Wednesday")
elif num == 4:
    print("Thursday")
elif num == 5:
    print("Friday")
elif num == 6:
    print("Saturday")
elif num == 7:
    print("Sunday")
else:
    print("Invalid input")
```

Let’s do some warm up exercises in Jupyter!

Defining functions

Writing functions

We have already used many functions that are built into Python or are imported from different modules/packages.

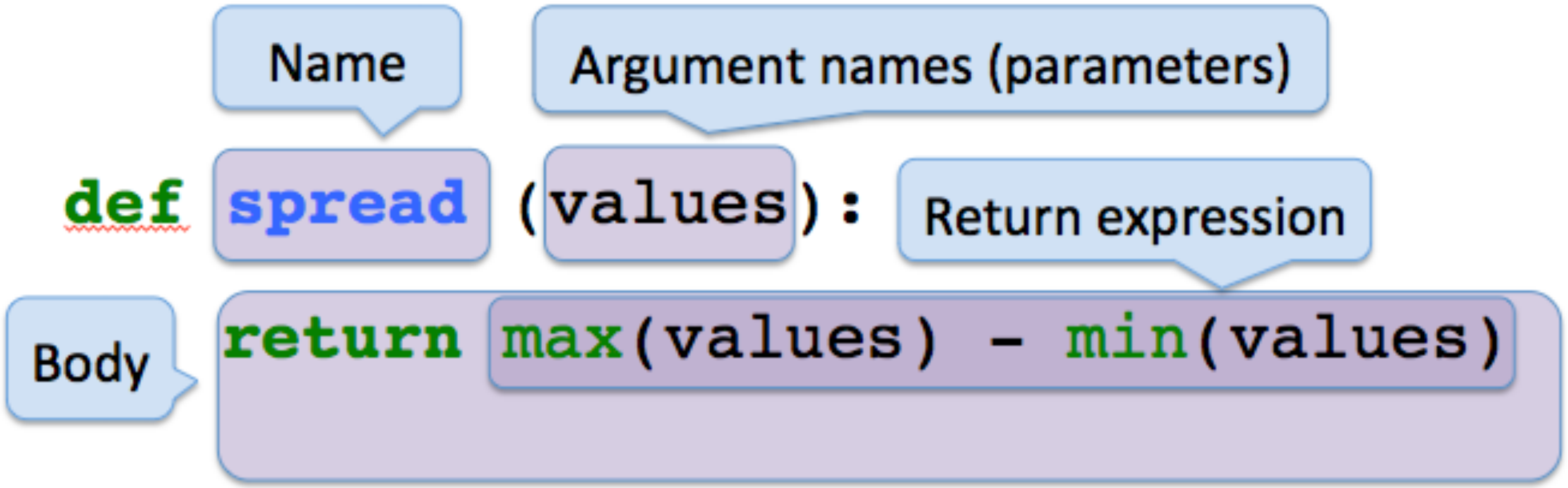
Examples…???

- sum()
- statistics.mean()
- np.diff()
- etc.

Let's now write our own functions!

Def statements

User-defined functions give names to blocks of code



```
def spread(values):
    return max(values) - min(values)
```

Let's explore this in Jupyter!

text

MaNiPuLaTiOn

Text manipulation

80% of a Data Scientists time is cleaning data

- Text manipulation is a big part of cleaning data

20% of a Data Scientists time is complaining about cleaning data

Python has many string methods that are useful for manipulating text and cleaning data!

Text manipulation: capitalization

Some of the simplest string methods involve changing capitalization.

Changing capitalization can be useful when joining DataFrames

- i.e., if they key values are the same, but the values have different capitalization
    - For example, joining different countries, but in one DataFrame the country names are capitalized and in the other they are not

Text manipulation: capitalization

Python strings have a number of methods to change the capitalization of words including:

- .capitalize(): Converts the first character to upper case
- .lower(): Converts a string into lower case
- .upper(): Converts a string into upper case
- .title(): Converts the first character of each word to upper case
- .swapcase(): Swaps cases, lower case becomes upper case and vice versa

Let's explore this in Jupyter!

Text manipulation: string padding

Often we want to remove extra spaces (called "white space") from the front or end of a string.

Conversely, sometimes we want to add extra spaces to make a set of strings the same length

- This is known as "string padding"

Python strings have a number of methods that can pad/trim strings including:

- strip(): Returns a trimmed version of the string (i.e., with no leading or trailing white space).
  - Also, rstrip() and lstrip(): Returns a right/left trim version of the string
- center(num): Returns a centered string (with equal padding on both sides)
  - Also ljust(num) and rjust(num): Returns a right justified version of the string
- zfill(num): Fills the string with a specified number of 0 values at the beginning

Let's explore this in Jupyter!

Text manipulation: checking string properties

There are also many functions to check properties of strings including:

- isalnum(): Returns True if all characters in the string are alphanumeric
- isalpha(): Returns True if all characters in the string are in the alphabet
- isnumeric(): Returns True if all characters in the string are numeric

- isspace(): Returns True if all characters in the string are whitespaces

- islower(): Returns True if all characters in the string are lower case
- isupper(): Returns True if all characters in the string are upper case
- istitle(): Returns True if the string follows the rules of a title

Let's explore this in Jupyter!

Text manipulation: splitting and joining strings

There are several methods that can help us join strings that are contained into a list into a single string, or conversely, parse a single string into a list of strings. These include:

- split(separator_string): Splits the string at the specified separator, and returns a list
- splitlines(): Splits the string at line breaks and returns a list
- join(a_list): Converts the elements of an iterable into a string

Let's explore this in Jupyter!

Text manipulation: finding and replacing substrings

Some methods for locating a substring within a larger string include:

- count(substring): Returns the number of times a specified value occurs in a string
- rfind(substring): Searches the string for a specified value and returns the last position of where it was found.
- startswith(substring): Returns true if the string starts with the specified value
- endswith(substring) : Returns true if the string ends with the specified value
- replace(original_str, replacement_str): Replace a substring with a different string.

Let's explore this in Jupyter!

Text manipulation: filling in strings with values

There are a number of ways to fill in strings parts of a string with particular values.

Perhaps the most useful is to use "f strings", which have the following syntax such as:

- value_to_fill = "my_value"
- f"my string {value_to_fill} will be filled in"

Let's explore this in Jupyter!

Regular expressions!

Regular expressions

Regular expressions are string that allow you find more complex patterns in pieces of text

- They are powerful although can be a bit hard to read

```
[^ ]*?@[^ ]*?\.[^ ]*
```

To use regular expressions in Python we can import the re module

```
import re
```

We can check if a piece of text contains a particular substring by converting the output of re.match() method into a Boolean

```
bool(re.match("regular_expression", "piece_of_text"))
```

Regular expressions

[ ] means match anything in the range inside the braces

- "ch[io]mp" matches "chimp" and "chomp"

Note: if the ^ appears inside square braces it means not

- ^[^aeiou] matches words that don’t start with a lower case vowel

The following are special regular expression characters that are reserved:

. * \ $ { } [ ] ^ ?

Regular expressions

. (period) matches any single character

- bool(re.match("m.ss", "mess"))

* means match 0 or more of the preceding character

- bool(re.match("xy*z", ”xz"))

+ means match 1 or more of the preceding character

- bool(re.match("xy+z", "xz"))

will the following match?

- bool(re.match(".*a.*e", "pineapple"))

Example

```
phone_strings  =  [ "apple",
                    "219 733 8965",
                    "329-293-8753",
                    "Work: 579-499-7527",
                    "Home: 203.867.9305"]
```

The phone number can be matched with the regular expression:

```
".*([2-9][0-9]{2})[- .]([0-9]{3})[- .]([0-9]{4})"
```

Let's explore this in Jupyter!

Escape sequences

In regular expressions a period (.) means any character

- So how can you detect if a period is in a string?

Escape sequences in R start with two slashes \\ and cause the next character to be treated literally rather than as a special character

- To match a period we use \\.
- To match a $ symbol we use \\$

Example

- `bool(re.match(".*\\$100", "Joanna has $100 and Chris has $0"))`

Character classes

Other special characters are also designated by using a double slash first

- \s space
- \n new line or also \r
- \t tab

Let's explore this in Jupyter!