

Introduction to Programming Problem Solving

Problem Solving using Python - Week 3

Last Week

Q&A

Lesson Objectives

Convert real-life problems to Python containers

1. Break down problems into smaller questions
2. Understand what questions Python containers can answer
3. Match questions posed by your problem to questions that Python containers can answer

Programming Problem Solving Model

1. Reinterpret the Problem
2. Design a Solution
3. Code
4. Test
5. Debug
6. Evaluate & Reflect

Programming Problem Solving Model

1. Reinterpret the Problem
2. Design a Solution
3. **Code**
4. Test
5. Debug
6. Evaluate & Reflect

Refresher

How did we get this?

```
[  
  ["Then", "he", "climbed", "a", "little", "further"],  
  ["By" "that" "time" "he" "had" "thought" "of" "another" "song"]  
]
```

Step Back to the Problem

How readable is a text?

Step Back to the Problem

How readable is a text?

```
def calculate_flesch_score(text):  
    return (  
        206.835  
        - 84.6 * n_syllables / n_words  
        - 1.015 * n_words / n_sents  
    )
```

Readability Questions

- How many words are in the text?
- How many sentences are in the text?
- How many syllables are in the text?

Authorship Attribution

What about the features in our homework?

- average word length
- type/token ratio
- hapax legomena ratio

Authorship Attribution

What about the features in our homework?

- average word length
- type/token ratio
- hapax legomena ratio

In a mystery Text:

- How many words are there?
- How long is each word?
- How many words occur only once?
- How many unique words?

Open-ended Questions

Approach also valid for questions without an easy answer!

Open-ended Questions

Approach also valid for questions without an easy answer!

How many döner shops are there in Berlin?

Based on a real interview question for StackOverflow programmers

Open-ended Questions

Approach also valid for questions without an easy answer!

How many döner shops are there in Berlin?

Based on a real interview question for StackOverflow programmers

- Is there a registry? An association?
- Is there a bureaucratic category (eg tax type) for such things?
- How many train stations in Berlin?
- How many squares/malls?

Back to Business

Assuming we've generated our questions, what now?

Back to Business

Assuming we've generated our questions, what now?

Readability Questions

- How many words are in the text?
- How many sentences are in the text?
- How many syllables are in the text?

Now in Python

We need some kind of "Python thing" that helps us answer our questions.

Starting Simple

Simple is better than complex.

So let's start simple.

Our text is one big string, what can be simpler...

```
>>> text = (  
...     "Then he climbed a little further. "  
...     "By that time he had thought of another song."  
... )
```

Answering Questions with Data

What kinds of questions can we answer with a `str`?

String Questions

- How many characters in the text?

```
>>> len(text)
```

- How many times is a substring in the text?

```
>>> text.count("This is")
```

- What is the `n`-th character in the text?

```
>>> text[5]
```

Your Turn :)

What kinds of questions can we answer about a text that's a `str`?

Your Turn :)

What kinds of questions can we answer about a text that's a `str`?

- Does the text start with "A" or end with "."?
- Is the text a number?
- Is the text UPPERCASE or lowercase or TitleCase?
- Is a substring in the text?
- Where does a substring occur first in the text?

Matching the Questions

Readability Questions

- How many words are in the text?
- How many sentences are in the text?
- How many syllables are in the text?

String Questions

- How many characters in the text?
- What is the `n`-th character in the text?
- Does the text start with "A" or end with "."?
- Is the text a number?
- Is the text UPPERCASE or lowercase or TitleCase?
- Is a substring in the text?
- How many times is a substring in the text?
- Where does a substring occur first in the text?

No Match this Time

Conclusion: a simple string won't work for us.

List of Word Strings?

Use `str.split` to create a list from the string.

```
>>> text = [  
... "Then", "he", "climbed", "a", "little", "further",  
... "By" "that" "time" "he" "had" "thought" "of" "another" "song"  
... ]
```

What questions can we answer with a list of words?

What questions can we answer with a list of words?

- How many items are in the text?
- Is an item in the text?
- What's the n -th item in the text?
- Where does the item occur first in the text?
- How many times does a item occur in the text?

What questions can we answer with a list of words?

- How many items are in the text?
- Is an item in the text?
- What's the n -th item in the text?
- Where does the item occur first in the text?
- How many times does a item occur in the text?

Important!

For each individual item we have all the questions that strings can answer!!

We could count syllables for each item/word.

Matching the Questions

Readability Questions

- How many words are in the text?
- How many sentences are in the text?
- How many syllables are in the text?

List of Word String Questions

- How many words are in the text?
- Is a word in the text?
- What's the n -th word in the text?
- Where does the word occur first in the text?
- How many times does a word occur in the text?
- How many syllables does each word have?

Matching the Questions

Readability Questions

- How many words are in the text?
- How many sentences are in the text?
- How many syllables are in the text?

List of Word String Questions

- How many words are in the text?
- Is a word in the text?
- What's the n -th word in the text?
- Where does the word occur first in the text?
- How many times does a word occur in the text?
- How many syllables does each word have?

List of Sentence Strings

```
>>> text = [  
...     "Then he climbed a little further. ",  
...     "By that time he had thought of another song."  
... ]
```

What questions can we answer with a list of sentence strings?

What questions can we answer with a list of sentence strings?

- How many words are in the text?
- How many sentences are in the text?
- Is a sentence or word in the text?
- What's the n -th sentence/character in the text?
- Where does the sentence/character occur first in the text?
- How many times does a item occur in the text?

Important!

We lose information about individual words with this structure.

We cannot count syllables per word.

Matching the Questions

Readability Questions

- How many words are in the text?
- How many sentences are in the text?
- How many syllables are in the text?

List of Sentence Strings

- How many words are in the text?
- How many sentences are in the text?
- Is a sentence or word in the text?
- What's the n -th sentence/character in the text?
- Where does the sentence/character occur first in the text?
- How many times does a item occur in the text?

Matching the Questions

Readability Questions

- How many words are in the text?
- How many sentences are in the text?
- How many syllables are in the text?

List of Sentence Strings

- How many words are in the text?
- How many sentences are in the text?
- Is a sentence or word in the text?
- What's the n -th sentence/character in the text?
- Where does the sentence/character occur first in the text?
- How many times does a item occur in the text?

List of Lists (Sentences) of Strings (Words)

Combines the powers of a list of words and of a list of sentences.

The Mighty Dictionary

The Mighty Dictionary

- How many items are in the dictionary?
- Is a key in the dictionary?
- What is the value of a key in a dictionary?

True or False

- `dictionary.keys()` will always return keys in the same order.

Address Book

We need to build an address book where we can look up people by name. Only by name.

Wrap-up + Q&A

Problem Solving using Python - Week 3

Introduction to Programming Problem Solving