[301] Dictionary Nesting

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Learning Objectives Today

More dictionary operations

- len, in, for loop
- d.keys(), d.values()
- defaults for get and pop, defaultdict

makes coding more convenient

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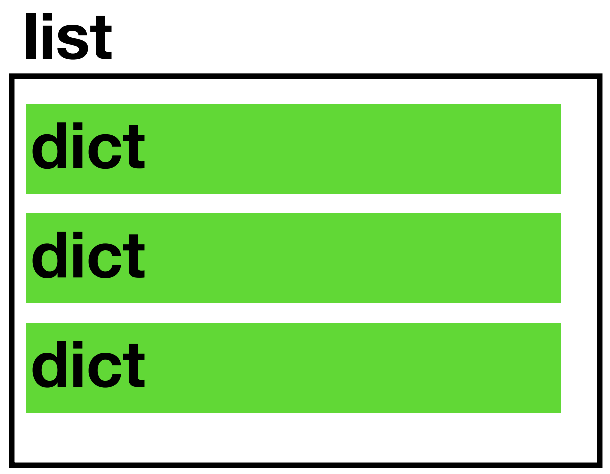
Syntax for nesting (dicts inside dicts, etc)

- indexing/lookup
- step-by-step resolution



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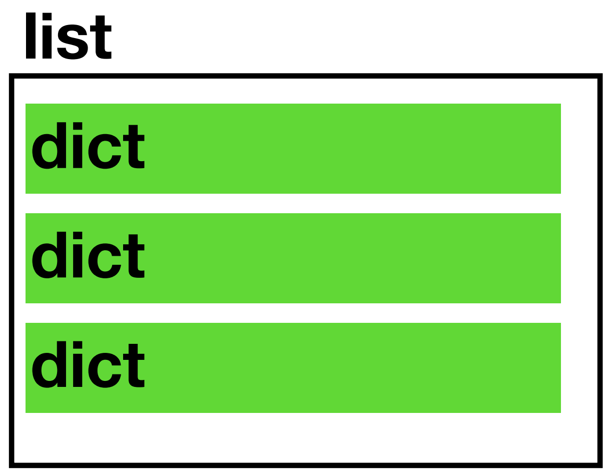

Syntax for nesting (dicts inside dicts, etc)

- indexing/lookup
- step-by-step resolution

Understand common use cases for nesting

- transition probabilities with Markov chains (dict in dict)
- binning/bucketing (list in dict)
- a more convenient table representation (dict in list)

one of the most common data analysis tasks

we'll generate random English-like texts

Today's Outline

More Dictionary Ops

Probabilities Tables

Markov Chains

Default Dictionaries

Binning

Table Representation

Creation of Empty Dict

Non-empty dict:

```
d = {“a”: “alpha”, “b”: “beta”}
```

Empty dict (way 1):

```
d = {}
```

Empty dict (way 2):

```
d = dict()
```

Creation of Empty Dict

Non-empty dict:

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```
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```

Empty dict (way 2):

```
d = dict()
```

Similar for Lists

```
empty_list_1 = []
empty_list_2 = list()
```

len, in, for

```
num_words = {0:“zero”, 1:”one”, 2:”two”, 3:”three”}


print(len(num_words))


print(1 in num_words)


print(“one” in num_words)


for x in num_words:
    print(x)
```

len, in, for

```
num_words = {0:“zero”, 1:”one”, 2:”two”, 3:”three”}

print(len(num_words))  →  4

print(1 in num_words)

print(“one” in num_words)

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num_words = {0:“zero”, 1:”one”, 2:”two”, 3:”three”}
```

```
print(len(num_words))
```

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```
print(1 in num_words)
```

True

```
print(“one” in num_words)
```

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for x in num_words:
    print(x)
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len, in, for

```
num_words = {0:“zero”, 1:”one”, 2:”two”, 3:”three”}
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print(len(num_words))
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print(1 in num_words)
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True

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print(“one” in num_words)
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False

(it is only checking keys, not vals)

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for x in num_words:
    print(x)
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num_words = {0:“zero”, 1:”one”, 2:”two”, 3:”three”}
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```
print(len(num_words))
```

4

```
print(1 in num_words)
```

True

```
print(“one” in num_words)
```

False

(it is only checking keys, not vals)

```
for x in num_words:
    print(x)
```

2
1
0
3

(for iterates over keys, not vals)

(note there is no order here)

len, in, for

```
num_words = {0:“zero”, 1:”one”, 2:”two”, 3:”three”}
```

```
print(len(num_words))
```

4

```
print(1 in num_words)
```

True

```
print(“one” in num_words)
```

False

(it is only checking keys, not vals)

```
for x in num_words:
    print(x, num_words[x])
```

2 two
1 one
0 zero
3 three

you can iterate over values by combining a for loop with lookup

Extracting keys and values

```
num_words = {0:“zero”, 1:”one”, 2:”two”, 3:”three”}


print(type(num_words.keys()))


print(type(num_words.values()))
```

Extracting keys and values

```
num_words = {0:“zero”, 1:”one”, 2:”two”, 3:”three”}
```

```
print(type(num_words.keys()))
```

<class 'dict_keys'>

```
print(type(num_words.values()))
```

<class 'dict_values'>

don’t worry about these new types, because we can force them to be lists

Extracting keys and values

```
num_words = {0:“zero”, 1:”one”, 2:”two”, 3:”three”}
```

```
print(type(num_words.keys()))
```

<class 'dict_keys'>

```
print(type(num_words.values()))
```

<class 'dict_values'>

```
print(list(num_words.keys()))
```

[3, 1, 2, 0]

```
print(list(num_words.values()))
```

[“one”, “two”,
“zero”, “three”]

Defaults with get and pop

```
suffix = {1:“st”, 2:”nd”, 3:”rd”}


suffix.pop(0) # delete fails, because no key 0


suffix[4] # lookup fails because no key 4


suffix.get(4, “th”) # returns “th” because no key 4
```

specify a default if
key cannot be found

Defaults with get and pop

```
suffix = {1:“st”, 2:”nd”, 3:”rd”}
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suffix.pop(0) # delete fails, because no key 0

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Defaults with get and pop

```
suffix = {1:“st”, 2:”nd”, 3:”rd”}
```

specify a default if
key cannot be found

```
suffix.pop(0, “th”) # returns “th” because no key 0

suffix[4] # lookup fails because no key 4

suffix.get(4, “th”) # returns “th” because no key 4
```

specify a default if
key cannot be found

Defaults with get and pop

```
suffix = {1:“st”, 2:”nd”, 3:”rd”}


for num in range(6):
    print(str(num) + suffix.get(num, “th”))
```

Defaults with get and pop

```
suffix = {1:“st”, 2:”nd”, 3:”rd”}


for num in range(6):
    print(str(num) + suffix.get(num, “th”))
```

```
0th
1st
2nd
3rd
4th
5th
```

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Demo 1: Letter Frequency

Goal: if we randomly pick a word in a text, what is the probability that it will be a given letter?

Input:

- Plaintext of book (from Project Gutenberg)
- A letter

Output:

- The portion of letters in the text that are that letter

Example:

```
prompt> python goldbug.py
text: AAAAABBCCC
A: 50%
B: 20%
C: 30%
```

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