COMP 110

CL18. Dictionaries

Reminders:

EX05 List Unit Tests - Due Tomorrow

Quiz 02 Friday!

Virtual review session on Thursday @ 7PM
(Zoom link on site's agenda)

Limits of Lists for Collections of Data (1/2)

Using a list, we *could* store everyone in COMP110's PID associated with ONYEN

list[str]	
Index	Value
0	""
1	""
… 710,453,081 items elided …	
710453084	"krisj"
… 9,857,700 items elided …	
720310785	"abyrnes1"
… 9,809,924 items elided …	
730120710	"ihinks"

Warm-up question:
Why does using a **`list[str]`** feel wrong?

Limits of Lists for Collections of Data (2/2)

onyens:

list[str]	
Index	Value
0	"ihinks"
1	"abyrnes1"
2	"sjiang3"
… 296 items elided …	
299	"krisj"

seats:

list[str]	
Index	Value
0	"A1"
1	"A2"
2	"A3"
… 296 items elided …	
299	"N17"

Suppose we model quiz seat assignments with lists. One list has seats, the other has the assigned ONYEN at the same index.

Given the onyen "sjiang3", how do you algorithmically find their assigned seat?

Enter: Dictionaries!

Dictionaries, like lists, are a *data structure* for storing collections of values.

Unlike lists, dictionaries give *you* the ability to decide how what to *index* your data by.

Lists: *always* zero-based, sequential, integer indices!

Dictionaries are indexed by *keys* associated with *values*. *This is a unique, one-way mapping!*

Analogous: A real-world dictionary's *keys* are *words* and associated *values* are *definitions.*

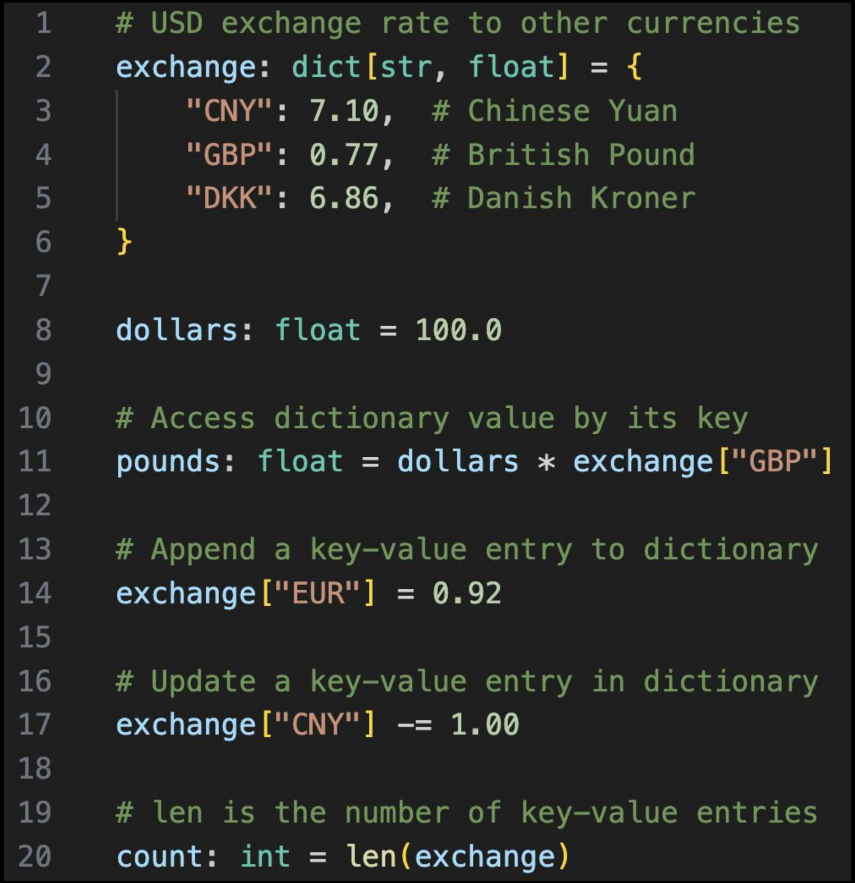
`pid_to_onyen:`

dict[int, str]	
key	value
730120710	"ihinks"
710453084	"krisj"
720310785	"abyrnes1"

`onyen_to_seat:`

dict[str, str]	
key	value
"ihinks"	"A1"
"abyrnes1"	"A2"
"sjiang3"	"A3"
"krisj"	"N17"

Let’s diagram key concepts



```python
# USD exchange rate to other currencies
exchange: dict[str, float] = {
    "CNY": 7.10,  # Chinese Yuan
    "GBP": 0.77,  # British Pound
    "DKK": 6.86,  # Danish Kroner
}

dollars: float = 100.0

# Access dictionary value by its key
pounds: float = dollars * exchange["GBP"]

# Append a key-value entry to dictionary
exchange["EUR"] = 0.92

# Update a key-value entry in dictionary
exchange["CNY"] -= 1.00

# len is the number of key-value entries
count: int = len(exchange)
```

Let’s explore Dictionary syntax in VSCode together…

In your cl directory, add a file named cl18_dictionaries.py with the following starter:

```
"""Examples of dictionary syntax with Ice Cream Shop order tallies."""

ice_cream: dict[str, int] = {
  "chocolate": 12,
  "vanilla": 8,
  "strawberry": 4,
}
```

Save, then open up this file in Trailhead's REPL and we will explore key syntax together.

Ready to go? Try evaluating the following expression:

```
ice_cream["vanilla"] += 110
```

Syntax

Data type:

```
name: dict[<key type>, <value type>]
temps: dict[str, float]
```

Construct an empty dict:

```
temps: dict[str, float] = dict() or
temps: dict[str, float] = {}
```

Construct a populated dict:

```
temps: dict[str, float] = {"Florida": 72.5, "Raleigh": 56.0}
```

Let's try it!

Create a dictionary called ice_cream that stores the following orders

Keys	**Values**
chocolate	12
vanilla	8
strawberry	5

Length of dictionary

```
len(<dict name>)

len(temps)
```

Let's try it!

Print out the length of ice_cream.

What exactly is this telling you?

Adding elements

We use subscription notation.

```
<dict name>[<key>] = <value>

temps["DC"] = 52.1
```

Let’s try it!

Add 3 orders of "mint" to your ice_cream dictionary.

Access + Modify

To access a value,
use subscription notation:

```
<dict name>[<key>]
temps["DC"]
```

To modify, also use subscription notation:

```
<dict name>[<key>] = new_value
temps["DC"] = 53.1
```

or

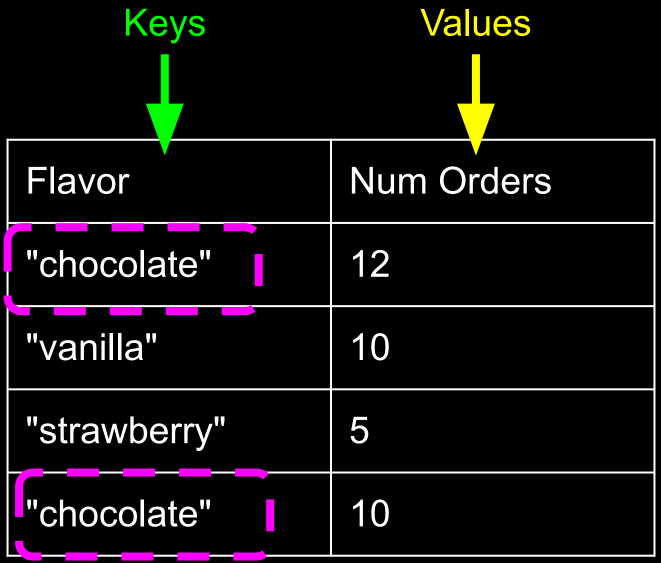
```
temps["DC"] += 1
```

<u>Let's try it!</u>

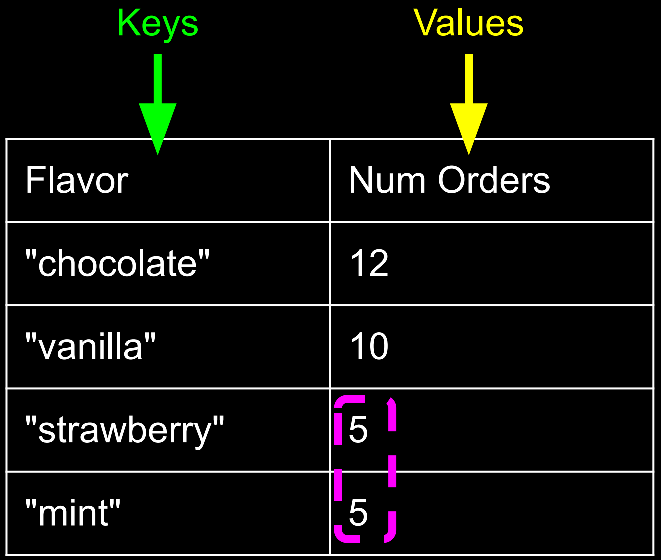
Print out how many orders there are of "chocolate".
Update the number of orders of Vanilla to 10.

Important Note: Can’t Have Multiple of Same ***Key***

(Duplicate *values* are okay.)


Keys
Values

Flavor	Num Orders
"chocolate"	12
"vanilla"	10
"strawberry"	5
"chocolate"	10


Keys
Values

Flavor	Num Orders
"chocolate"	12
"vanilla"	10
"strawberry"	5
"mint"	5

Check if key in dictionary

```
<key> in <dict name>

"DC" in temps

"Florida" in temps
```

<u>Let’s try it!</u>

Check if both the flavors "mint" and "chocolate" are in ice_cream.

Write a conditional that behaves the following way:
If "mint" is in ice_cream, print out how many orders of "mint" there are.
If it’s not, print "no orders of mint".

Removing elements

Similar to lists, we use pop()

```
<dict name>.pop(<key>)
```

```
temps.pop("Florida")
```

Let’s try it!

Remove the orders of "strawberry" from ice_cream.

"for" Loops

"for" loops iterate over the *keys* by default

Let's try it!

Use a for loop to print:
chocolate has 12 orders.
vanilla has 10 orders.
strawberry has 5 orders.

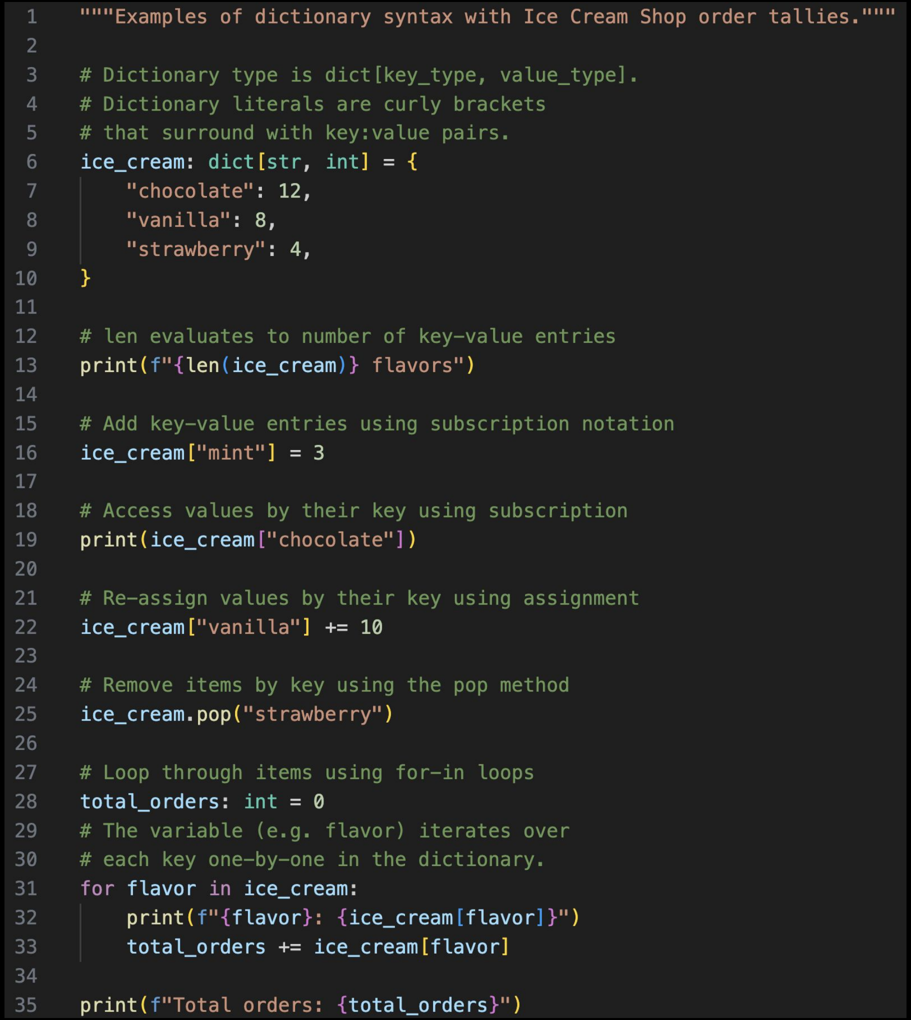
```
for key in ice_cream:
    print(key)
```

```
for key in ice_cream:
    print(ice_cream[key])
```

Flavor	Num Orders
"chocolate"	12
"vanilla"	10
"strawberry"	5

Final Notes

This is the code we worked through together in class, for reference.



```python
"""Examples of dictionary syntax with Ice Cream Shop order tallies."""

# Dictionary type is dict[key_type, value_type].
# Dictionary literals are curly brackets
# that surround with key:value pairs.
ice_cream: dict[str, int] = {
    "chocolate": 12,
    "vanilla": 8,
    "strawberry": 4,
}

# len evaluates to number of key-value entries
print(f"{len(ice_cream)} flavors")

# Add key-value entries using subscription notation
ice_cream["mint"] = 3

# Access values by their key using subscription
print(ice_cream["chocolate"])

# Re-assign values by their key using assignment
ice_cream["vanilla"] += 10

# Remove items by key using the pop method
ice_cream.pop("strawberry")

# Loop through items using for-in loops
total_orders: int = 0
# The variable (e.g. flavor) iterates over
# each key one-by-one in the dictionary.
for flavor in ice_cream:
    print(f"{flavor}: {ice_cream[flavor]}")
    total_orders += ice_cream[flavor]

print(f"Total orders: {total_orders}")
```