CSE231 - Lab 09

COVID-19, Exam 2, Nested Dictionaries, Sets

COVID-19, Meeting Changes

I still can’t believe MSU cancelled -- I am both angry and sad. I don’t get to see my professors and you guys anymore 😭

Help-Room for this class will now be the TAs answering questions on Piazza for a set time-slot.

I am no longer on campus if you want to meet up in-person, I’m in Grand Rapids. Unless you’re in Grand Rapids as well, you can contact me to meet through Zoom if you need help on things like projects, Mimir exercises, Exam studying, etc..

I want to give you guys as many resources as possible, so if you need immediate help, contact me via text: 616-334-8085

Exam 2

Exam 2 will be conducted through D2L at 7:00 PM EST on Tuesday, March 17th (3/17)

Students with a VISA will get the specified extra time and will start at 7:00 PM with everyone else. Students who have a conflict will take the makeup on D2L, but at the makeup time arranged.

An Exam 2 review session will be conducted through Zoom on Sunday, March 15th (3/15). It will be first come, first served due to the 300-person meeting limit. More details will be released soon, hopefully.

My notebook on Exam 2 content is now available on the GitHub page in path: Extra/Quirky Things in Python 02.ibynb

Nesting Dictionaries

Like lists and tuples, dictionaries can be nested. You can have a dictionary whose values are *other* dictionaries. Remember that keys in a dictionary have to be immutable, thus keys *cannot* be dictionaries.

Having a nested dictionary can be a bit confusing so hopefully an example might help. We're not going to spend much time on this since it should all be review, might come in handy for the lab today.

Sets

The last Python data structure! We've finally made it. Sets are an idea taken from mathematics, most of you should know them, but if not, we'll briefly go over the essentials.

Sets are a collection of *unique*, *unordered* objects. Meaning that two sets like the following are mathematically ***equivalent***.

$A = \{1, 2, 3, 3, 4, 5\} = \{ x \mid 1 \leq x \leq 5, x \in \mathbb{Z} \}$

$B = \{5, 4, 4, 4, 3, 2, 1, 1\} = \{ x \mid 1 \leq x \leq 5, x \in \mathbb{Z} \}$

"$\{ x \mid 1 \leq x \leq 5, x \in \mathbb{Z} \}$" can be read as: "x such that x is inclusively bounded between 1 and 5, and is within the set of all integers."

Sets (cont.)

How do we translate this to Python? In much the same way, actually.

```
A = {1, 2, 3, 3, 4, 5}

B = {5, 4, 4, 4, 3, 2, 1, 1}

print(A == B)    # True

print(A)    # {1, 2, 3, 4, 5}

print(B)    # {1, 2, 3, 4, 5}

print(len(A))    # 5
```

Set Initialization

```
D = {}    # curly braces with nothing = empty dictionary

S = set()    # correct empty set initialization

S = {20, 5, 10}    # initialization of a set with values

S = set(“abcabbcd”)    # can convert from iterables

print(S)    # {‘b’, ‘d’, ‘a’, ‘c’}

S = {x for x in “abracadabra” if x not in “abc”}

print(S)    # {‘r’, ‘d’}, set comprehension!
```

Adding/Discarding

```
S = set()

S.add(100)    # S = {100, }, adds a given element

S.discard(100)    # S = set(), discards a given element

S.remove(100)    # KeyError

# .remove() removes the object from the set, but raises

# KeyError if the object doesn’t exist
```

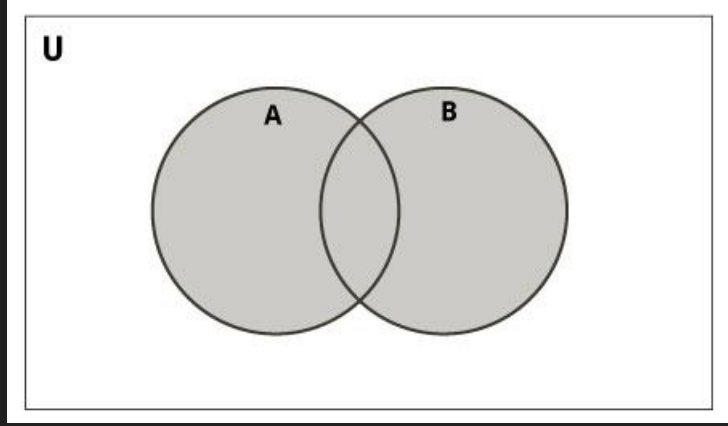
Set Operations

Like in mathematics, sets have a lot of unique operations. If you already know about mathematical sets, you may recognize these guys: ⊆, ⊂, ∪, ∩, etc.. All of these operations have a Python equivalent.

In addition to this, you can of course use `len()` to determine the number of elements within the set (| | in mathematics, also known as the “cardinality” when talking about sets), and use the `` `in` `` keyword to determine if an element exists within your set (∈ in mathematics).

For each of the operators in Python, there is also a corresponding method function as you’ll see.

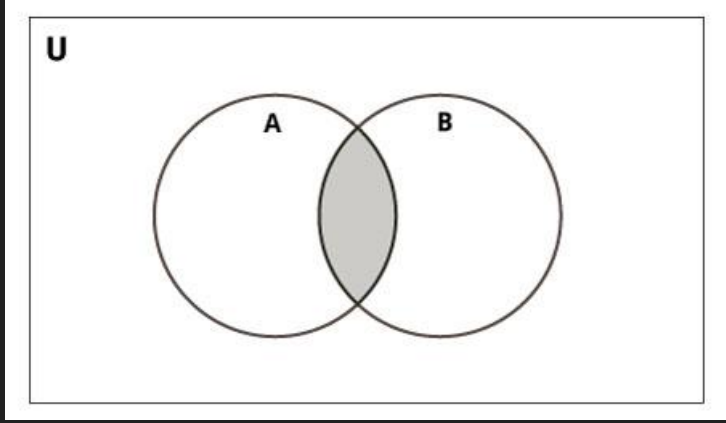
Union




```
A = {1, 2}

B = {3, 4}

print(A | B)    # {1, 2, 3, 4}

print(A.union(B))    # {1, 2, 3, 4}
```

All elements, within both sets. Equivalent to `U` in mathematics.

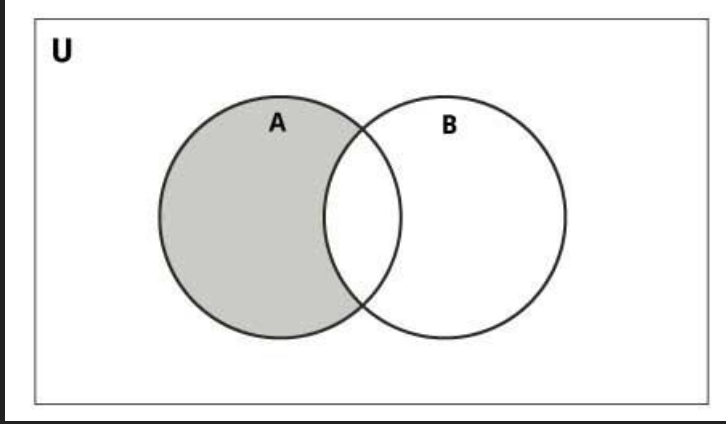
Intersection




```
A = {1, 2, 3}

B = {2, 3, 4}

print(A & B)    # {2, 3}

print(A.intersection(B))    # {2, 3}
```

All elements ***shared*** between both sets. Equivalent to ∩ in mathematics.

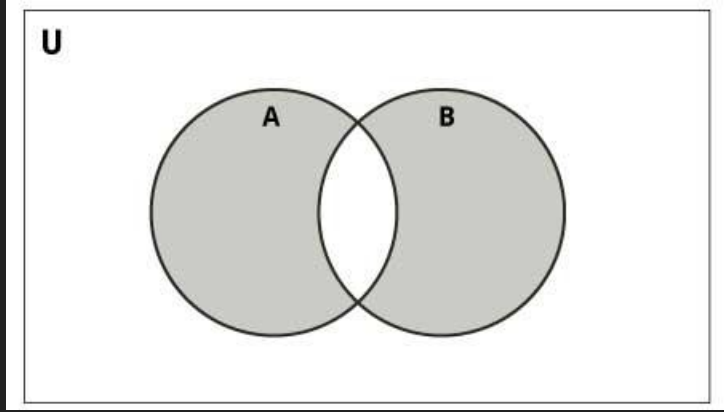
Difference




```
A = {1, 2, 3}

B = {2, 3, 4}

print(A - B)    # {1}

print(A.difference(B))    # {1}
```

Elements ***in A but not in B***. Equivalent to − in mathematics.

Symmetric Difference




```
A = {1, 2, 3}

B = {2, 3, 4}

print(A ^ B)    # {1, 4}

print(A.symmetric_difference(B))    # {1, 4}
```

All elements ***unique*** to both sets. Equivalent to ⊖ in mathematics.

Lab Stuff

Like I said in my email, I'll be moving to the "CSE231-020-SS20 General" channel where you can come in and request my help if you need it.

I created group channels for the course, "CSE231-020-SS20 Group X", where you can splinter off into groups, or you can chill in the general channel with me and work there, that way you can just ask me questions whenever -- I'll have my screen shared to do demonstrations and such.

If you get finished early, tell me in some way through Zoom. I can check your Mimir submission from my computer.

Today's Lab: tinyurl.com/vnv3mmq

Today's lab is a hot mess.

Dr. Enbody made some whoopsies on the original starter code. The code was also very badly formatted in my opinion, so use my stuff instead. I cleaned and reworked some of the code to make it clearer as to what you're supposed to do.

The PDF of today's lab also says to rename your part a file. DON'T DO THIS. Mimir wants BOTH parts submitted. Make a copy of your part a file, and then rename it to be part b. Part b works off of the assumption that you did part a.

Have fuuuuuuuuuuuuunnnnnnn