### Lecture 10: Tabular Data

Wednesday, September 28, 2022

10:20 PM

# CSC110 Lecture 10: Tabular Data



## Exercise 1: Working with tabular data

1. Here is the sample list data we saw in lecture. (You can copy and paste this directly into the Python console.)

```
import datetime

marriage_data = [
    [1657, 'ET', 80, datetime.date(2011, 1, 1)],
    [1658, 'NY', 136, datetime.date(2011, 1, 1)],
    [1659, 'SC', 159, datetime.date(2011, 1, 1)],
    [1660, 'TO', 367, datetime.date(2011, 1, 1)],
    [1661, 'ET', 109, datetime.date(2011, 2, 1)],
    [1662, 'NY', 150, datetime.date(2011, 2, 1)],
    [1663, 'SC', 154, datetime.date(2011, 2, 1)],
    [1664, 'TO', 383, datetime.date(2011, 2, 1)]
]
```

For each of the following expressions, write down what it would evaluate to.

```
>>> len(marriage_data)
                                                                                Ê
>>> marriage_data[5]
  [ 1662, 'NY',...
>>> marriage_data[0][0]
>>> marriage_data[6][2]
>>> len(marriage_data[3])
>>> max([row[2] for row in marriage_data])
```

2. Using the same data from the previous question, write Python expressions for each of the following descriptions:

```
>>> # Number of marriages in 'ET' in February 2011
                                                                           Ê
>>> # (use list indexing to access the correct row)
»» marriage-data [4][2]
109
>>> # The date corresponding to ID 166
>>> # (use list indexing to access the correct row)
>>>
datetime.date(2011, 2, 1)
>>> # The minimum number of marriage Licenses issued in a month
>>>
80
>>> # The rows where more than 300 licenses were issued
>>> # (use a filtering list comprehension!)
    [ row for rowin morage-date if row 23 > 30
[[1660, 'TO', 367, datetime.date(2011, 1, 1)], [1664, 'TO', 383,
        datetime.date(2011, 2, 1)]]
```

# Exercise 2: Constraining the "marriage license" data representation

Suppose we have a variable marriage\_data that is a nested list representing the marriage license data we've been working with in lecture. We have listed below several statements that are *constraints* on the rows in this list. Your task is to translate each of these constraints into an equivalent Python expression (similar to how you translated English preconditions into Python on this week's prep).

Use the variable marriage\_data to refer to the nested list containing all rows; each of the constraints except the last can be expressed as an expression of the form all({\_\_\_\_ for row in marriage\_data}).

<ol> <li>Every r</li> </ol>	w has	length 4.
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all lencrows == 4 for	row	in	marriage dis)
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2. Every row's first element (representing the "row id") is an integer greater than o. (Hint: use isinstance(\_\_\_, int) to return whether a value is an int.)

all { for row in marriage day)

3. Every row's second element (representing the civic centre) is one of 'TO', 'ET', 'NY', or 'SC'.

all { for row in marriage day)

4. Every row's third element (representing the number of marriage licenses) is an integer greater than or equal to o.

all { for row in marriage day)

5. Every row's fourth element is a datetime.date value. (You can use isinstance here as well.)

all [{ is instance (row[3], ") for row in marriage dis)

6. At least one row has 'TO' as its civic centre.

### Exercise 3: Implementing functions on tabular data

Your task here is to implement the following functions that operate on our marriage license data set.

```
def civic_centres(data: list[list]) -> set[str]:

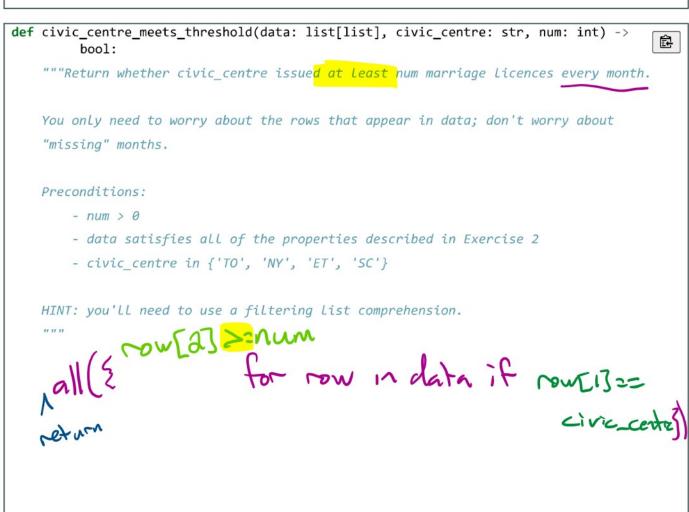
"""Return a set of all the civic centres found in data.

Preconditions:

- data satisfies all of the properties described in Exercise 2

"""

The formal in data.
```





def summarize\_licences\_by\_centre(data: list[list]) -> dict[str, int]:

"""Return the total number of licences issued by each civic centre in <data>.

Returns a dictionary where keys are civic centre names and values are the total number of licences issued by that civic centre.

#### Preconditions:

- data satisfies all of the properties described in Exercise 2

HINT: you will find it useful to write a function that calculates the total number of licences issued for a given civic centre as a parameter, e.g. total\_licenses\_for\_centre(data, civic\_centre).

(similar to augst per civic centre)

### Additional exercises

```
def average_licenses_by_centre(marriage_data: list[list]) -> dict[str, float]:
    """Return a mapping of the average number of marriage licenses issued at
each civic centre.
    In the returned mapping:
      - Each key is the name of a civic centre
      - Each corresponding value is the average number of marriage licenses
issued at
       that centre.
    Preconditions:
    - marriage data satisfies all of the conditions from Exercise 2
   # 1. Compute the civic centres in marriage_data.
    civic_centres = ...
   # 2. For each civic centre, find its average number of licenses.
   {cc : get_avg_licenses(marriage_data, cc) for cc in civic_centres }
def get_avg_licenses(marriage_data, cc):
Return the avg # licenses for cc.
   # find the right numbers
    right = [row[2]]
                               for row in marriage_data if row[1] ==
      ]
CC
   # average
    sum(right) / len(right)
```