DS 100 – Intro to Data Science

Lecture 3 – Tables, Arrays, & Sequences

01/28/2025

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Announcements

HW 00

- Due Wednesday (01/29)

Lab 01

- Due Friday (01/31)

HW01

- Due Wednesday (02/05)

TAs

Patrick Kelly

- Senior, Political Science Major

Allison Liao

- Junior, CS major

Candy Li

- Senior, Psych major

Office Hours

Adam	Thursday 2:30-3:30 Friday 11:30 – 1	Dalton 300 Park 200C
Allison	Sunday Tuesday	
Patrick	Monday 2 – 4 Wednesday 2-4	
Candy	Wednesday Thursday	

Autograding

Question 1.1. In the next cell, assi

1. the **absolute value** of $2^5 - 2^1$
2. $5 \times 13 \times 31 + 5$.

Try to use just one statement (one l

```
new_year = ...
new_year
```

```
grader.check("q1_1")
```

Error 1

```
---------------------------------------------------------------------------
NameError                                 Traceback (most recent call last)
<ipython-input-1-1ad9a283f073> in <module>()
----> 1 grader.check("q1_1")

NameError: name 'grader' is not defined
```

```
# Initialize Otter
import otter
grader = otter.Notebook()
```

Error 2

```
NameError: name 'new_year' is not defined
```

```
In [ ]: new_year = ...
        new_year
```

```
In [2]: grader.check("q1_1")
```

Grading based on autograder

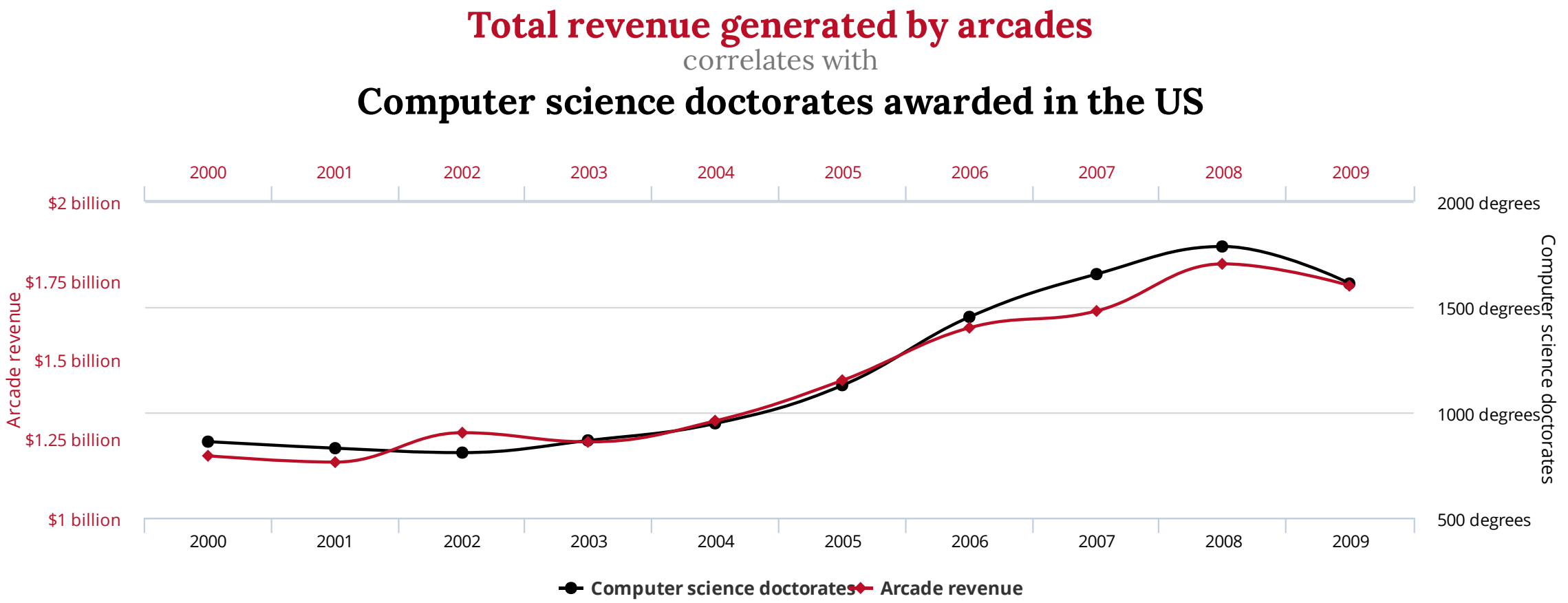
Before we “publish” scores

- Visible:
  - Status of tests (pass/fail)
  - Errors of failing test
- Not visible
  - points associated with the tests

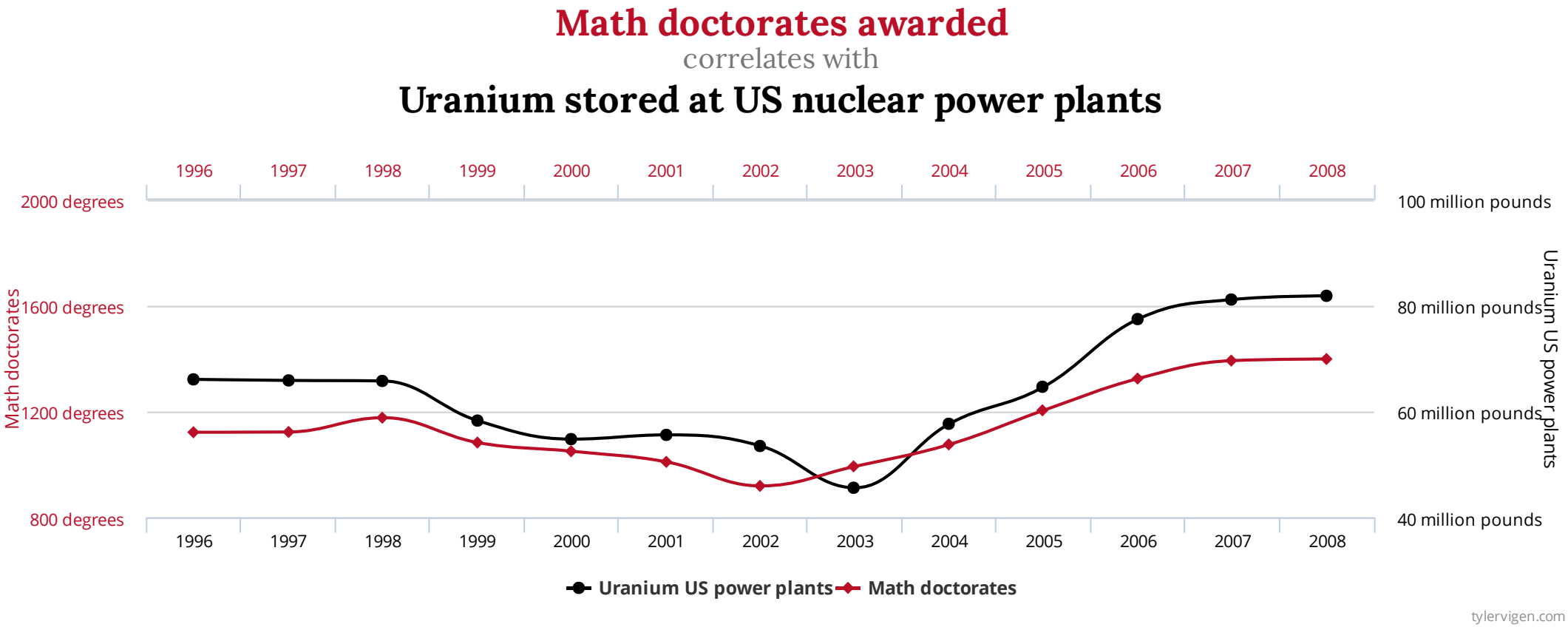
Publish results after the assignment submission is closed

- 2 days after deadline

Cause & Effect



Cause & Effect



https://www.tylervigen.com/spurious-correlations

Tables

Table Structure

A Table is a sequence of labeled columns

Row: represents one individual

Column: represents one attribute of the individuals

Name	Code	Area (m2)
California	CA	163696
Nevada	NV	110567

Creating a Table

`Table.read_table(filename)` – reads a table from a spreadsheet

`Table()` – an empty table

Table methods

Creating and extending tables:

- Table().with_column and Table.read_table

Finding the size:

- num_rows , num_columns

Referring to columns: labels, relabeling and indices

- labels and relabeled; column indices start at 0

Some Table operations

t.select(label) – constructs a new table with just the specified columns

t.drop(label) – constructs a new table in which the specified columns are omitted

t.sort(label) – constructs a new table with rows sorted by the specified column

t.where(label, condiction) – constructs a new table with just the rows that match the condition

These operations create a new table

Array

Array

An array contains a sequence of values

All elements of an array should have the same type

Arithmetic is applied to each element individually

Adding arrays add elements (**if same length!)**

A column of a table is in an array

Ranges

A range is an array of consecutive numbers

- np.arange(end):
  An array of increasing integers from 0 up to end
- np.arange(start, end):
  An array of increasing integers from start up to end
- np.arrange(start, end, step):
  A range with step between consecutive values

The range always include start but excludes end

Array Functions

Name	Chapter	Description
`max(array)`	3.3	Returns the maximum value of an array
`min(array)`	3.3	Returns the minimum value of an array
`sum(array)`	3.3	Returns the sum of the values in an array
`abs(num), np.abs(array)`	3.3	Take the absolute value of number or each number in an array.
`round(num), np.round(array)`	3.3	Round number or array of numbers to the nearest integer.
`len(array)`	3.3	Returns the length (number of elements) of an array
`make_array(val1, val2, ...)`	5	Makes a numpy array with the values passed in
`np.average(array) np.mean(array)`	5.1	Returns the mean value of an array
`np.std(array)`	14.2	Returns the standard deviation of an array
`np.diff(array)`	5.1	Returns a new array of size `len(arr)-1` with elements equal to the difference between adjacent elements; val_2 - val_1, val_3 - val_2, etc.
`np.sqrt(array)`	5.1	Returns an array with the square root of each element
`np.arange(start, stop, step) np.arange(start, stop) np.arange(stop)`	5.2	An array of numbers starting with `start`, going up in increments of `step`, and going up to but excluding `stop`. When `start` and/or `step` are left out, default values are used in their place. Default step is 1; default start is 0.
`array.item(index)`	5.3	Returns the i-th item in an array (remember Python indices start at 0!)
`np.random.choice(array, n) np.random.choice(array)`	9	Picks one (by default) or some number 'n' of items from an array at random. By default, with replacement.
`np.count_nonzero(array)`	9	Returns the number of non-zero (or `True`) elements in an array.
`np.append(array, item)`	9.2	Returns a copy of the input array with `item` (must be the same type as the other entries in the array) appended to the end.
`percentile(percentile, array)`	13.1	Returns the corresponding percentile of an array.

Tables & Arrays

brynmawr.edu

Some Table operations

Accessing data in a column

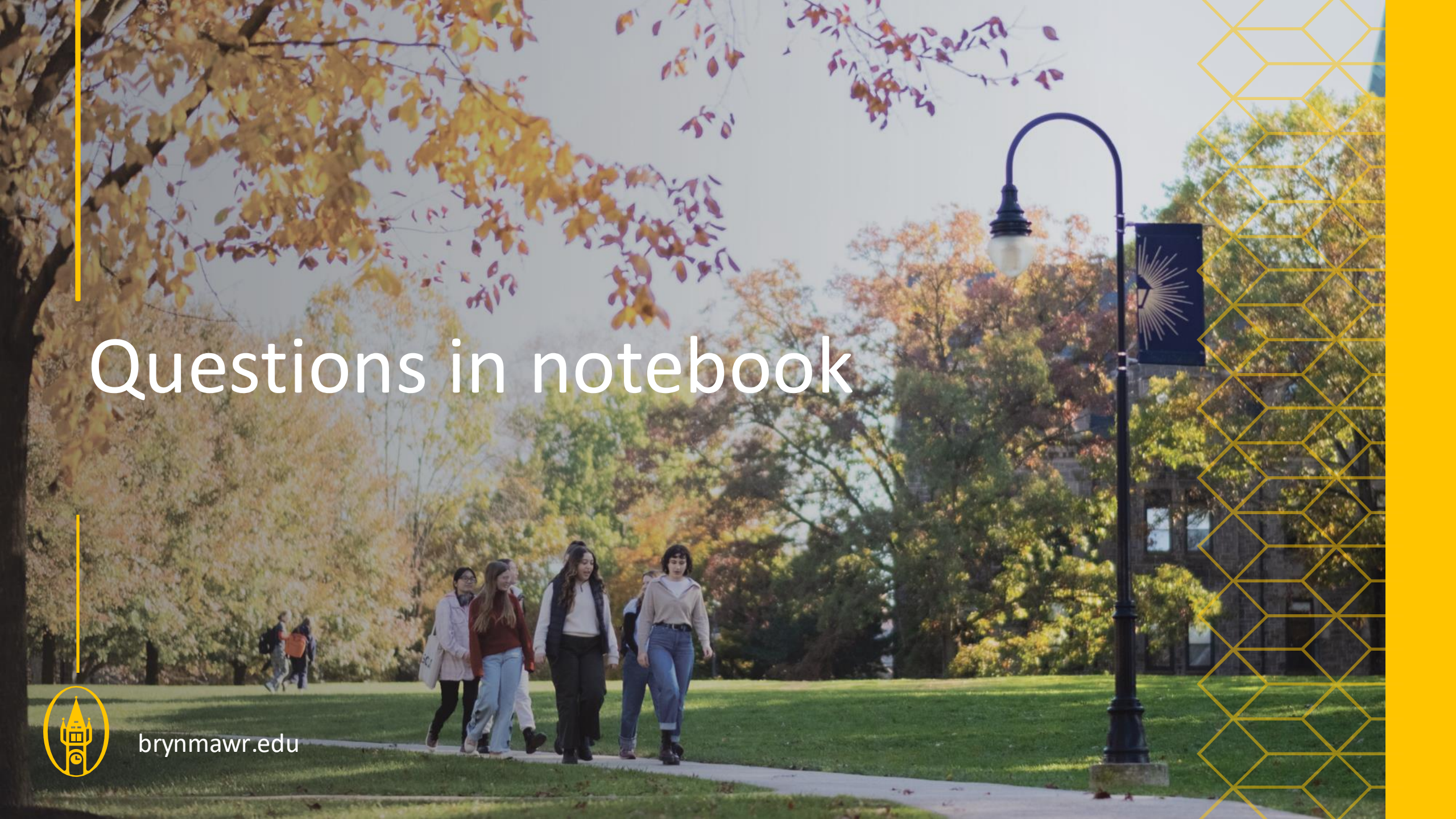
- `Column` takes a label or index and returns an array

Using array methods to work with data in columns

- `item`, `sum`, `min`, `max`, and so on

Creating new tables containing some of the original columns

- `select`, `drop`



Questions in notebook

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Questions

The table nba has columns

PLAYER, POSITION, and SALARY

```
table = Table.read_table('https://www.inferentialthinking.com/data/nba_salaries.csv')
```

1. Create an array containing the names of all centers (C) who make more than $15M/year

```
centers = table.where('POSITION', 'C')
centers.where('\'15-\'16 SALARY', are.above(15)).column('PLAYER')
```

Answer:

'Dwight Howard', 'Roy Hibbert', 'Marc Gasol', 'Enes Kanter', 'DeMarcus Cousins'