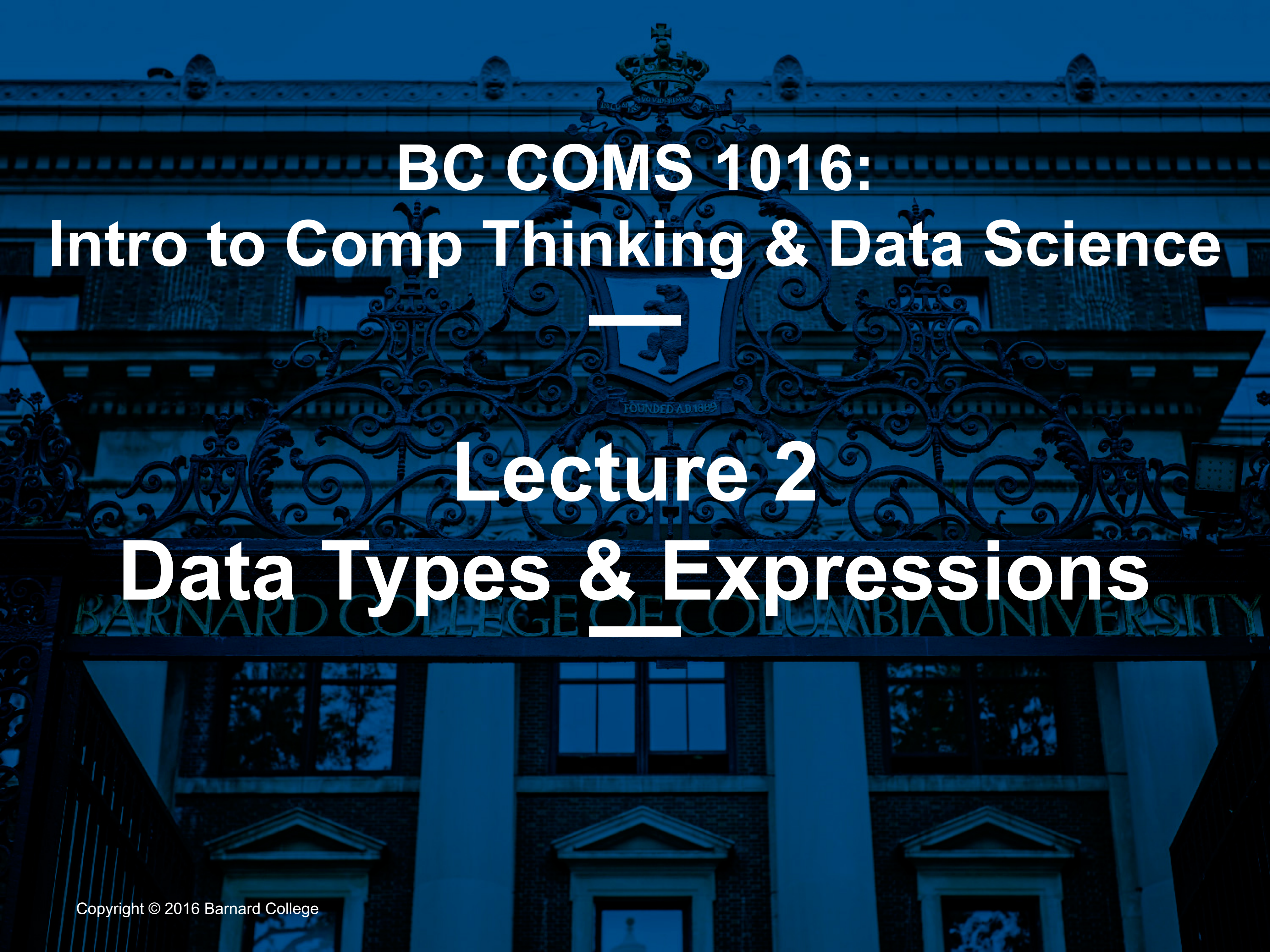
BC COMS 1016: Intro to Comp Thinking & Data Science

Lecture 2 Data Types & Expressions



Announcements

- HW 00
  - Due Thursday (11/29)
  - Individual assignment

- Lab 00
  - Due Wednesday (11/28)

Labs

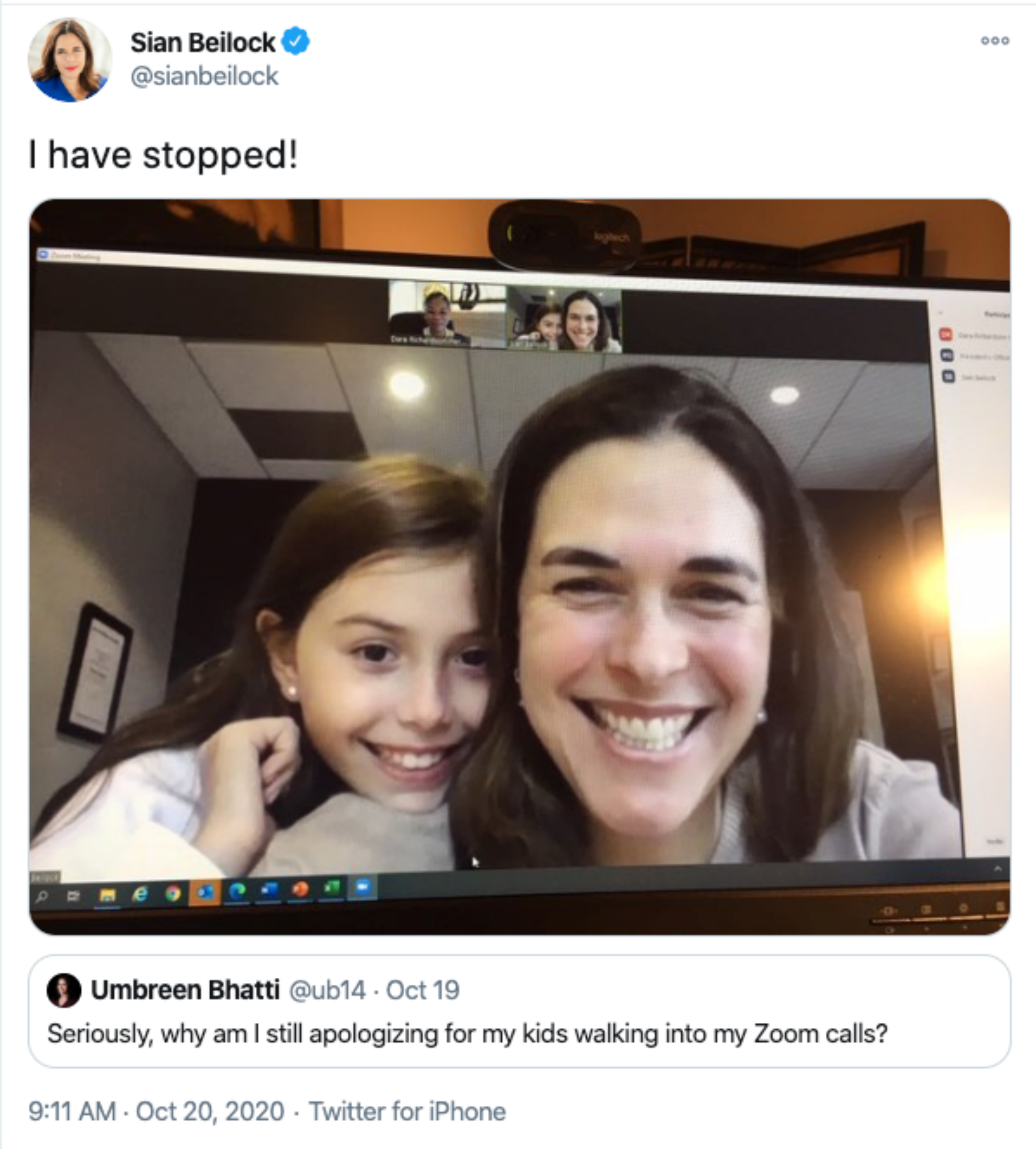
- Labs help solidify the concepts
- Completing labs will help you master the course material
- Grade for labs will be based on Gradescope
- How'd lab00 go?

Labs & Late day policies

- **15** late days

- **Can be used for labs**

- Only 2 late days per assignment



Sian Beilock
@sianbeilock

I have stopped!

Umbreen Bhatti @ub14 · Oct 19
Seriously, why am I still apologizing for my kids walking into my Zoom calls?

9:11 AM · Oct 20, 2020 · Twitter for iPhone

Email instructions

- Subject: “BC1016: <few words summary>”

- Intro boiler plate
  - ~~“Dear Prof Poliak,~~
    ~~I hope you are doing ….”~~

- Send screenshot of issue

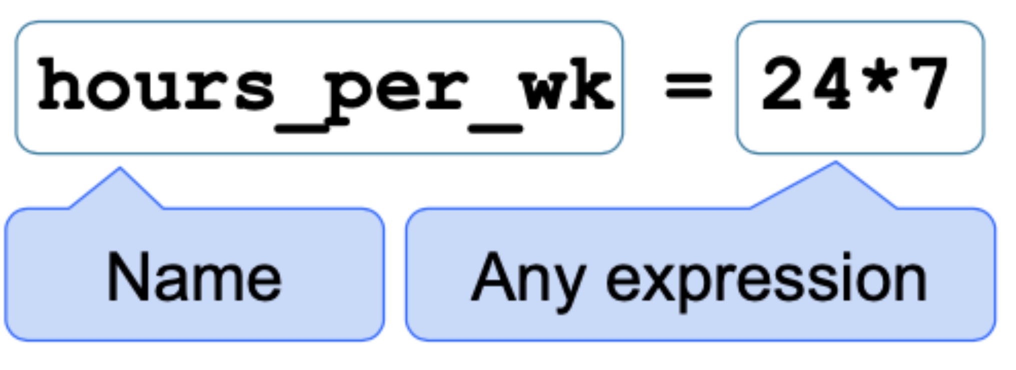
Python

Python

- Popular for data science & software development
- Focus on mastering language fundamentals
- Learn through practice and doing
- Follow along in the demos

Names

Assignment Statements

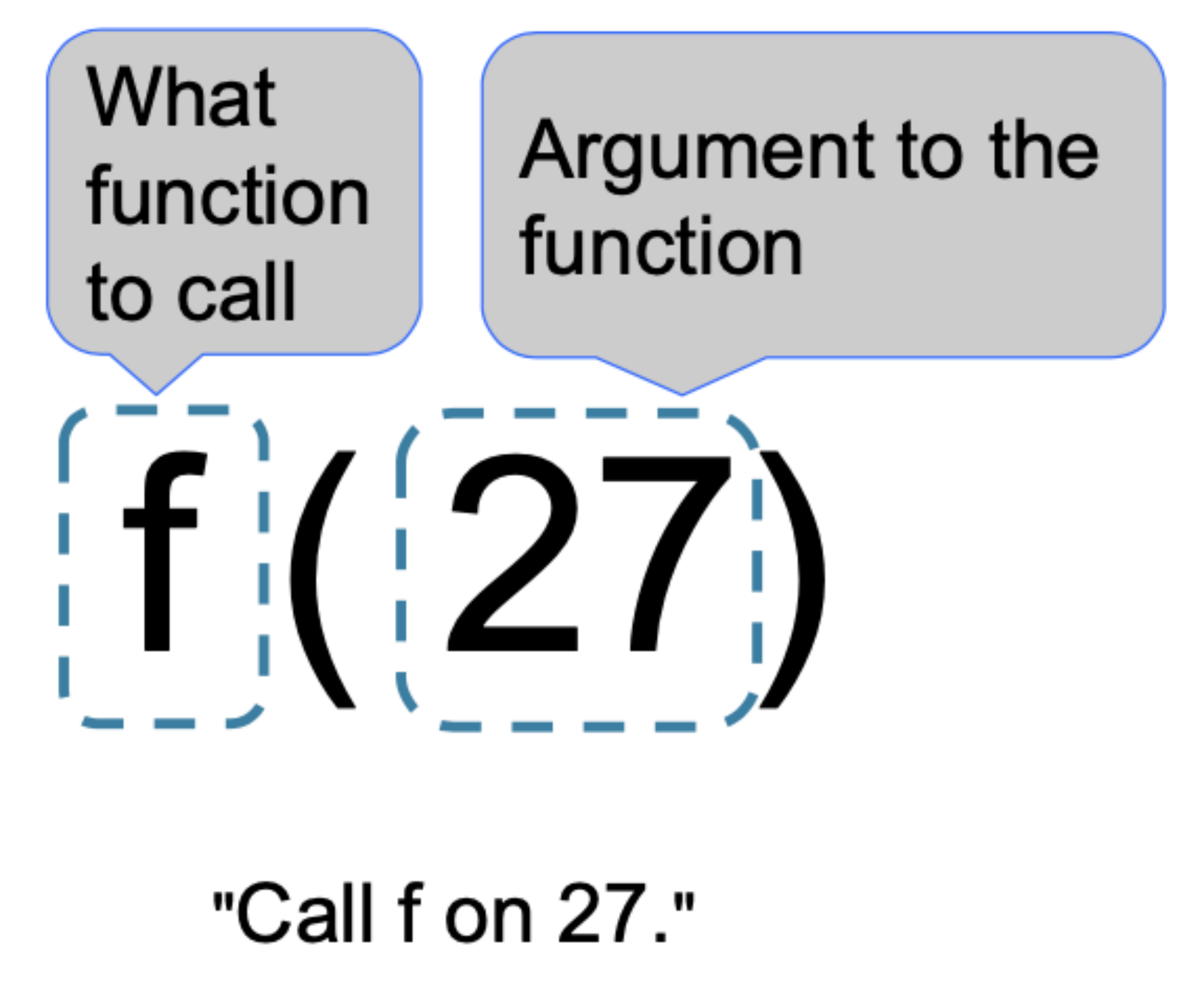


```
hours_per_wk = 24*7
```

- Statements perform an action
  - don’t have a value
- Assignment statement changes the meaning of the name to the left of the = symbol
- The name is bound to a value

Functions

Anatomy of a Call Expression



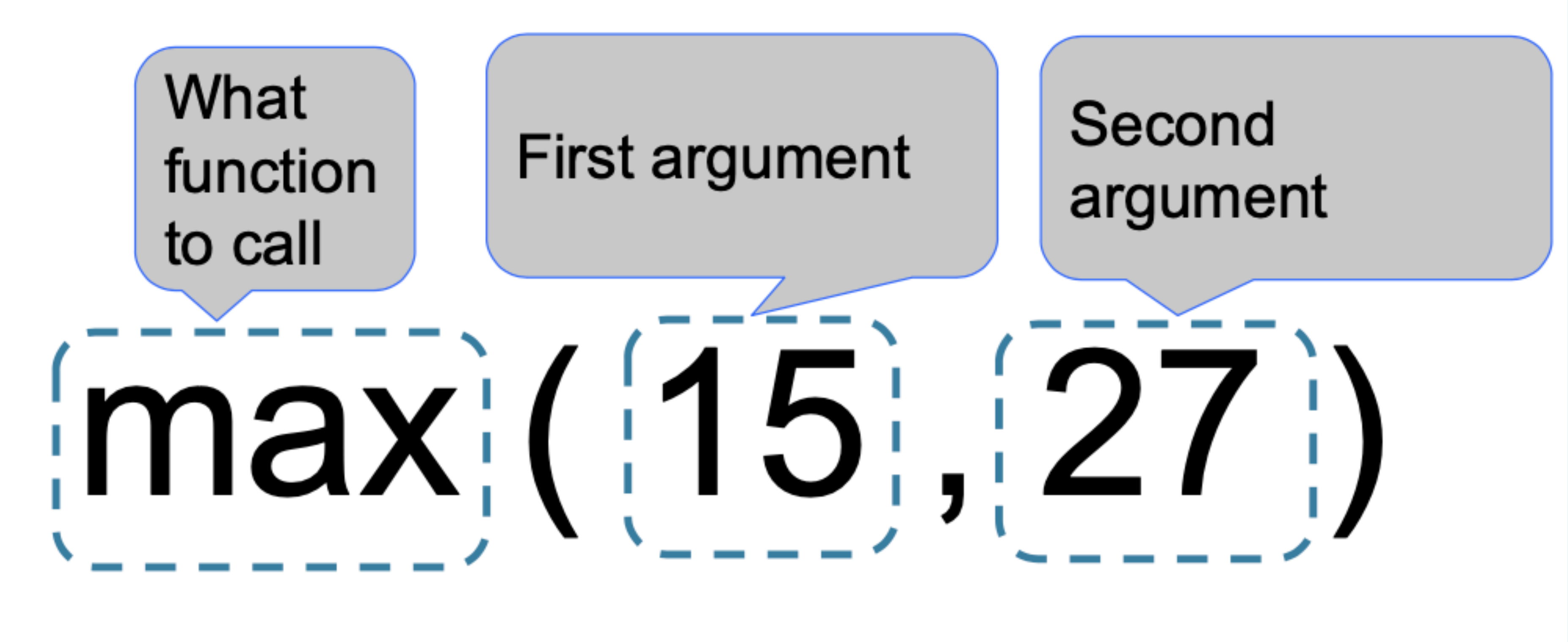
What function to call

Argument to the function

f(27)

"Call f on 27."

Anatomy of a Call Expression



What function to call

First argument

Second argument

```
max(15,27)
```

Numbers

Numbers – Integers and Floats

Two real number types in Python

- int: an integer of any size
- float: a number with an optional fractional part

An int never has a decimal point; a float does

A float might be printed using scientific notation

Limitations on float values

- Floats have limited size (the limit is huge)
- Floats have limited precision of 15-16 decimal places
- After arithmetic, the final few decimal places can be wrong

Strings

Strings

A string value is a snippet of text of any length

- ‘a’
- ‘word’
- “there can be 2 sentences. Here’s the second!”

Strings consisting of numbers can be converted to numbers

- int(‘12’),   float (‘1.2’)

Any value can be converted to a string

- str(5) becomes “5”

Discussion Question

Assume you have run the following statements:

x = 3

y = ‘4’

z = ‘5.6’

What is the source of the error in each example?

A. x + y
B. x + int(y + z)
C. str(x) + int(y)
D. y + float(z)

Types – Every value has a type

We’ve seen 5 types so far:

- int: 2
- float: 2.2
- str: ‘Red fish, blue fish’
- builtin_function_or_method: abs, max, min

Types – Every value has a type

The type function tells you the type of a value

- type(2)
- type(2+2)

An expression's "type" is based on its value

- x = 2
- type(x) = ???

Conversions

Strings that contain numbers can be converted to numbers

- int(“12”)
- float(“1.2”)
- ~~float(“one point two”)~~ # Not a good idea

Conversions

Any value can be converted to a string

- str(6)

Numbers can be converted to other numeric types

- float(1)
- int(2.3).   # DANGER: why is this a bad idea

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

Table methods

- 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