DATA 8

Fall 2020

Tutoring Section 3

Expressions, Data Types and Sequences

Introduction

👋 **I'm Kevin Miao. Nice to meet you!**

- Senior in Computer Science
- *Email:* kevinmiao@berkeley.edu
- OH: **Thursday** from **1-3 PM**
- Two truths and a lie:
  - I changed my major 6 times
  - I speak Dutch
  - My dogs are named after food
- **Now it's your turn!**
  - Major, Year, Where you are from, Two truths and a lie!

Logistics

- Weekly one-hour tutoring sections starting at **Berkeley Time**
- Section will consist of mini-lectures, time to work on the tutoring worksheets and exam prep.
- You can't make it? No sweat! Shoot me an email.
- Solutions and slides will be posted on my website: **www.kevin-miao.com**. Solutions will also be available on Piazza
- Questions?

Today

- Expressions and Datatypes
  - Quick Review
  - Question 1.1 and 1.2
  - Question 1.3 and 1.4
- Sequences
  - Quick Review
  - Question 2.1 and 2.2
  - Question 2.3, 2.4 and 2.5
- Old exam question

Expressions and Data Types

Function Calls

A function does something to the arguments that are being passed in and binds it to a value.

min(4,5,6) **evaluates to** *4*
mean(4,5,6) **evaluates to** *5*

Later in the class, we will go more into depth with regards to functions.

Expressions and Data Types

Assignment Status

Python is an *imperative* language. This means that you can simply view python as a series of assignments.

Assignment: Binding a **value** to a **variable** name.

```
our_favorite = 1
our_maximum = max(1,3)
```

Expressions and Data Types

Arithmetic

- +, -, *, /
- % is **remainder**
  - 9%2 *evaluates to* 1
- ** for **exponentiation**
- >, <, ==, !=, >=, <= for **comparing**
  - 9 >= 3 is equal to "Is 9 larger than or equal to 3?"
    - Can only answer with **True** or **False**

Expressions and Data Types

Data Conversion

- str(…)
- int(…)
-float(…)

You will mainly use the latter two to convert between float and ints.
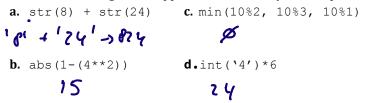
Remember: int(9.9) **rounds** 9.9 **down to** 9.

Worksheet

Link: **https://tinyurl.com/d8tutweek3**

Q1.1 – 1.2

1.1 Evaluate the following code snippets. What would Python output?

a. `str(8) + str(24)`

'8' + '24' → 824

c. `min(10%2, 10%3, 10%1)`

0

b. `abs(1-(4**2))`

15

d. `int('4')*6`

24

1.2 Jaylen Brown challenges you to a modified Three-Point Contest. Jaylen shoots 10 shots and his score is equal to the number of baskets he makes. Assume Jaylen makes a number of shots stored in the variable `jaylen_makes`. On the other hand, you get 3 tries to shoot 10 shots each, and your score comes from whichever of the 3 tries has the most shots made. Whoever has the highest score wins.

Assume the results of your attempts are stored in `try1`, `try2`, and `try3`. Assume there are no ties. Write a line of code which returns whether you won the game. *(Hint: this should be* `True` *or* `False`)

```
if jaylen_makes < max(try1, try2, try3):
    return True
else:
    return False
```

Q1.3 – 1.4

1.3 Assume the variable name `eight` has been assigned to the string `'8'`. Using only this string, the string methods, arithmetic, and any type conversion functions (`int`, `str`, `etc.`), print the square of 88. You may want to use variable assignments so you don't have to reuse code.

eight = '8'
print (int (eight + eight) ** 2)

1.4 Write a line of code that evaluates whether 111*43 is even. (Hint: this should be True or False. Consider using %)

111 *43   % 2 == 0

== comparing

= assigning

Arrays

- **Arrays**
  - **Data Type that can hold sequences of data given that they are the same type**
- *Functions*
  - `make_array(...)`
  - `len(array)`
  - `np.arange(start, stop, ~~end~~)` step np.arange (0, 3)
    - [start, end)   ↪ [0, 1, 2]
  - `arr.item(x)`
    - (Indexing starts at 0)
  - `np.cos, np.log, np.sin, np.sqrt, +, - , / , ==`

$$[0,1,2] + [1,1,1] = [1,2,3]$$

- $3*$ [0,1,2] $= [0,3,6]$

Q2.1-2.2

2.1 Using different approaches, write two separate lines of code that evaluate to the first 10 multiples of 3 (starting at 3).

np.arange(3 , 31 , 3) → [3, . . . , 27, 30]

np.arange (1, 11)*3 → [3, . — . . , 30]

2.2 Assume `shopping` is an array of dollar amounts spent in a store (before tax) by 5 different customers. Write a line of code to answer the following questions.

Q2.1-2.2

2.1 Using different approaches, write two separate lines of code that evaluate to the first 10 multiples of 3 (starting at 3).

2.2 Assume `shopping` is an array of dollar amounts spent in a store (before tax) by 5 different customers. Write a line of code to answer the following questions.

a. What is the total amount spent by the customers?

b. What was the largest amount spent by a customer?

c. Did person 2 spend more than person 4? Assume there's no person 0. Your code should evaluate to either `True` or `False`.

d. Assume tax is 10 percent on these items. What did each customer spend after tax?

e. What was the absolute difference between Person 1's expenditure before tax, and Person 5's expenditure after tax?

Q2.2 *continued*

2.2 Assume `shopping` is an array of dollar amounts spent in a store (before tax) by 5 different customers. Write a line of code to answer the following questions.

a. What is the total amount spent by the customers? **sum(shopping)**

b. What was the largest amount spent by a customer? **max(shopping)**

c. Did person 2 spend more than person 4? Assume there's no person 0. Your code should evaluate to either `True` or `False`.
Shopping.item(1) > Shopping.item(3)

d. Assume tax is 10 percent on these items. What did each customer spend after tax?
Shopping * 1.10

e. What was the absolute difference between Person 1's expenditure before tax, and Person 5's expenditure after tax?
abs(Shopping.item(0) − Shopping.item(4) * 1.10)

Q2.3-2.5

2.3 Use one line of code to figure out what every number from <u>1 to 10</u> to the power of 1+ that number is. The first number in your output should be 1^2 = 1, the second number should be 2^3, and the last number should be 10^11.

$\{1,2\} ** \{3,4\}$

$\{1^3, 2^4\}$

• np.arange (1 , 11 , 1) ** np.arange (2 , 12 , 1)

2.4 Assume we have an array of strings called `str_arr`
    a. Find the length of the array.

    b. Find the length of the third string in this array.

2.5 Assume we have arrays `first_arr` and `second_arr`, which are arrays of floats. Use one line of code to answer the following questions: How much larger (or smaller) is the sin of the first element in `first_arr` than the cosine of the last item in `second_arr`.

• Last item of an array : | arr. item (len (arr) - 1) |

Old Exam Question

1. **(10 points) Python Expressions**

For each of the Python expressions below, write the output when the expression is evaluated. If an error occurs, write Error. Here is an example.

Example Expression: `make_array(1, 2, 3, 4, 5) == 3`

Example Answer: `array([False, False, True, False, False])`

(a) **(2 pt)** `make_array(1, 1) * np.arange(1, 10, 5)`

(b) **(2 pt)** `make_array(3, 4, 8) + np.arange(2, 7, 1)`

(c) **(2 pt)** `np.average(np.arange(1, 10, 4))`

(d) **(2 pt)** `make_array(1, 2, 3, 4) + 2`

(e) **(2 pt)** `"I love Data " + 8`

End of Section

- Please complete the anonymous Feedback form so I can improve my teaching:

    - **https://tinyurl.com/feedbackD8Kevin**

- Solutions and notes will be posted at the end of this week!

- For the folks in the bay, stay hydrated 💧!

Always be hydrating!