

Activity 3: Types

Python has a wide variety of built-in types for storing anything from numbers and text (e.g., `int`, `float`, `str`) to common data structures (e.g., `list`, `tuple`, `dict`).

Content Learning Objectives

After completing this activity, students should be able to:

- Identify the name and syntax defining basic data types.
- Reference a specific element of a sequence by an index.
- Compare and contrast numeric and sequence data types.

Process Learning Objectives

After completing this activity, students should make progress toward:

- Providing feedback on how well other team members are working. (Teamwork)



Model 1 Numbers

Every value in Python belongs to a **data type** which determines what can be done with the data. Enter the following code, one line at a time, into a Python Shell. Record the output for each line (if any) in the second column.

Python code	Shell Output
<code>integer = 3</code>	
<code>type(integer)</code>	
<code>type("integer")</code>	
<code>pi = 3.1415</code>	
<code>type(pi)</code>	
<code>word = str(pi)</code>	
<code>word</code>	
<code>number = float(word)</code>	
<code>print(word * 2)</code>	
<code>print(number * 2)</code>	
<code>print(word + 2)</code>	
<code>euler = 2.7182</code>	
<code>int(euler)</code>	
<code>round(euler)</code>	

Questions (15 min)

start
time:

1. What is the data type (`int`, `float`, or `str`) of the following values? (Note: if you're



unsure, use the `type` function in a Python Shell.)

- a. `pi`
 - b. `integer`
 - c. `word`
 - d. `number`
2. List the function calls that convert a value to a new data type.
 3. How is a string defined differently than a number?
 4. How does the behavior of the operators (+ and *) depend on the data type?
 5. What is the difference between the `int` function and the `round` function?
 6. What is the value of `3 + 3 + 3`? What is the value of `.3 + .3 + .3`? If you enter these expressions into a Python Shell, what do you notice about the results?
 7. In order to store a number with 100% accuracy (e.g., a bank account balance), what data type is required?
 8. How might you precisely represent a balance of \$123.45?
 9. Try calculating a very large integer in a Python Shell, for example, 123^{123} . Is there a limit to the integers that Python can handle?
 10. Try calculating a very large floating point number in a Python Shell, for example, 123.0^{123} . Is there a limit to the floating point numbers that Python can handle?



Model 2 Lists

A variable can hold multiple values in the form of a *list*. The values are separated by commas and sandwiched between square brackets. For example:

```
primes = [2, 3, 5, 7, 11, 13, 17, 19, 23, 29]
```

Each *element* of the list can be referenced by an *index*, which is the sequential position starting at 0. For example, `primes[4]` is 11.

index	0	1	2	3	4	5	6	7	8	9
value	2	3	5	7	11	13	17	19	23	29

Do not type anything yet! Read the questions first!

Python code	Shell Output
<code>odd = [1, 3, 5, 7]</code>	
<code>odd</code>	
<code>odd[2]</code>	
<code>odd[4]</code>	
<code>len(odd)</code>	
<code>number = odd[1]</code>	
<code>number</code>	
<code>odd[1] = 2</code>	
<code>odd</code>	
<code>number</code>	



Questions (15 min)

start
time:

11. What is the index of the second element of `primes`? What is the value at that index?
12. How does the index number compare to the element number?
13. Type each line of code in a Python Shell and write the corresponding output in the space above. If an error occurs, write what type of error. Place an asterisk (*) next to any output for which you were surprised.
14. How do you reference the value of the 3rd element of `odd`?
15. What does the output of the `len()` function tell you about the list?
16. The output of the **Model 2** displayed an error. Explain the reason for the error.
17. Write a statement that assigns a list of three integers to the variable `run`.
18. Write a statement that assigns the value 100 to the last element of `run`.
19. Write a statement that assigns the first value of `run` to a variable named `first`.

