Python Programming: Lists

Lesson Objectives

After this lesson, you will be able to…

- Create lists in Python.
- Print out specific elements in a list.
- Perform common list operations.

What is a List?

Variables hold one item.

```
my_color = "red"
my_peer = "Brandi"
```

Lists hold multiple items - and lists can hold anything.

```
# Declaring lists
colors = ["red", "yellow", "green"]
my_class = ["Brandi", "Zoe", "Steve", "Aleksander", "Dasha"]

# Strings
colors = ["red", "yellow", "green"]

# Numbers
my_nums = [4, 7, 9, 1, 4]

# Both!
```

Accessing Elements

List Index means the location of something (an *element*) in the list.

List indexes start counting at 0!

List	**“Brandi”**	**“Zoe”**	**“Steve”**	**“Aleksander”**	**“Dasha”**
Index	0	1	2	3	4

```
my_class = ["Brandi", "Zoe", "Steve", "Aleksander", "Dasha"]
print(my_class[0]) # Prints "Brandi"
print(my_class[1]) # Prints "Zoe"
print(my_class[4]) # Prints "Dasha"
```

We Do: Lists

1. Create a **list** with the names `"Holly"`, `"Juan"`, and `"Ming"`.
2. Print the third name.
3. Create a **list** with the numbers `2`,`4`, `6`, and `8`.
4. Print the first number.

List Operations - Length

`len()`:

- A built in `list` operation.
- How long is the list?

```python
# length_variable = len(your_list)


my_class = ["Brandi", "Zoe", "Steve", "Aleksander", "Dasha"]
num_students = len(my_class)
print("There are", num_students, "students in the class")
# => 5
```

Adding Elements: Append

`.append()`:

- A built in `list` operation.
- Adds to the end of the list.
- Takes any element.

```
# your_list.append(item)


my_class = ["Brandi", "Zoe", "Steve", "Aleksander", "Dasha"]

my_class.append("Sonyl")

print(my_class)

# => ["Brandi", "Zoe", "Steve", "Aleksander", "Dasha", "Sonyl"]
```

Adding Elements: Insert

`.insert()`:

- A built in `list` operation.
- Adds to any point in the list
- Takes any element and an index.

```
# your_list.insert(index, item)


my_class = ["Brandi", "Zoe", "Steve", "Aleksander", "Dasha", "Sonyl"]
my_class.insert(1, "Sanju")
print(my_class)
# => ["Brandi", "Sanju", "Zoe", "Steve", "Aleksander", "Dasha", "Sonyl"]
```

Removing elements - Pop

`.pop()`:

- A built in `list` operation.
- Removes an item from the end of the list.

```
# your_list.pop()


my_class = ["Brandi", "Zoe", "Steve", "Aleksander", "Dasha", "Sonyl"]
student_that_left = my_class.pop()
print("The student", student_that_left, "has left the class.")
# => "Sonyl"
print(my_class)
# => ["Brandi", "Zoe", "Steve", "Aleksander", "Dasha"]
```

Removing elements - Pop(index)

`.pop(index)`:

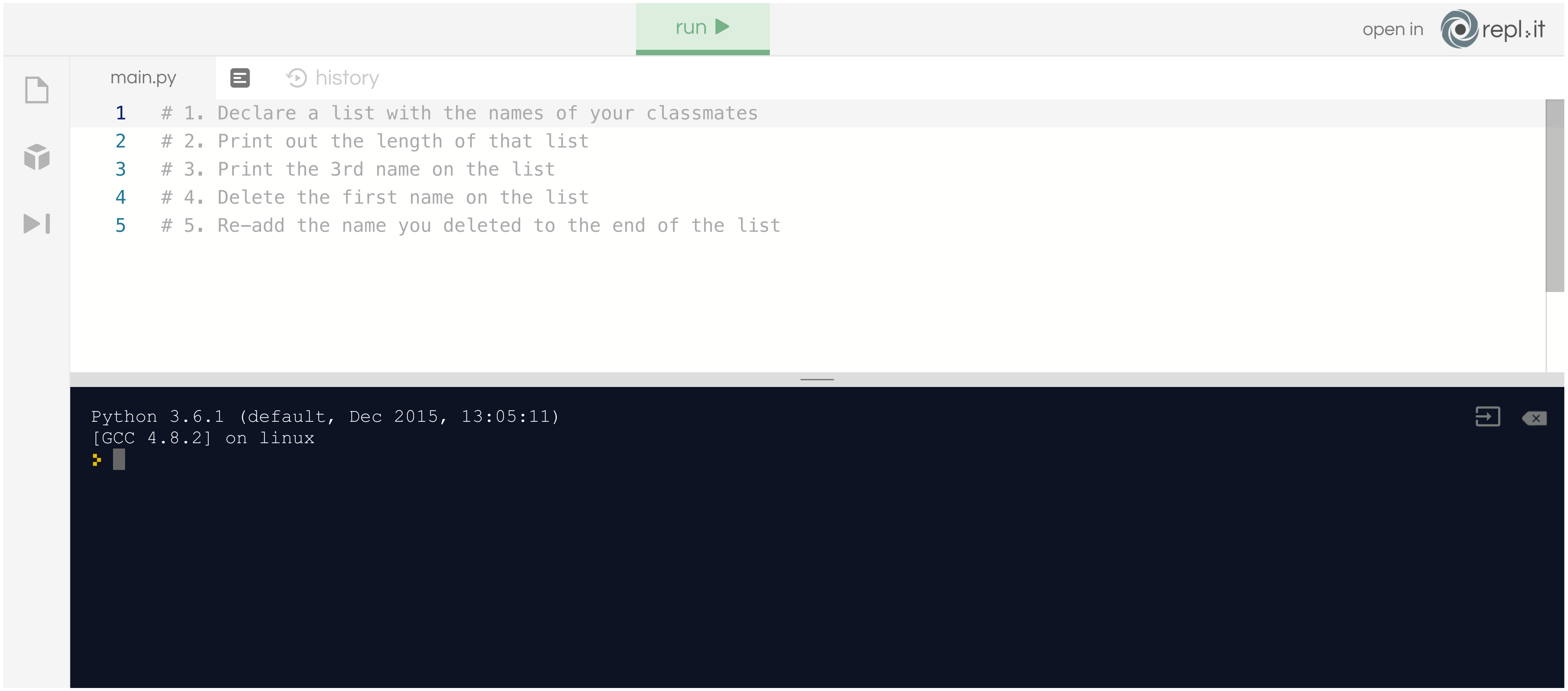
- A built in `list` operation.
- Removes an item from the list.
- Can take an index.

```
# your_list.pop(index)


my_class = ["Brandi", "Zoe", "Steve", "Aleksander", "Dasha", "Sonyl"]
student_that_left = my_class.pop(2) # Remember to count from 0!
print("The student", student_that_left, "has left the class.")
# => "Steve"
print(my_class)
# => ["Brandi", "Zoe", "Aleksander", "Dasha", "Sonyl"]
```

Partner Exercise: Pop, Insert, and Append

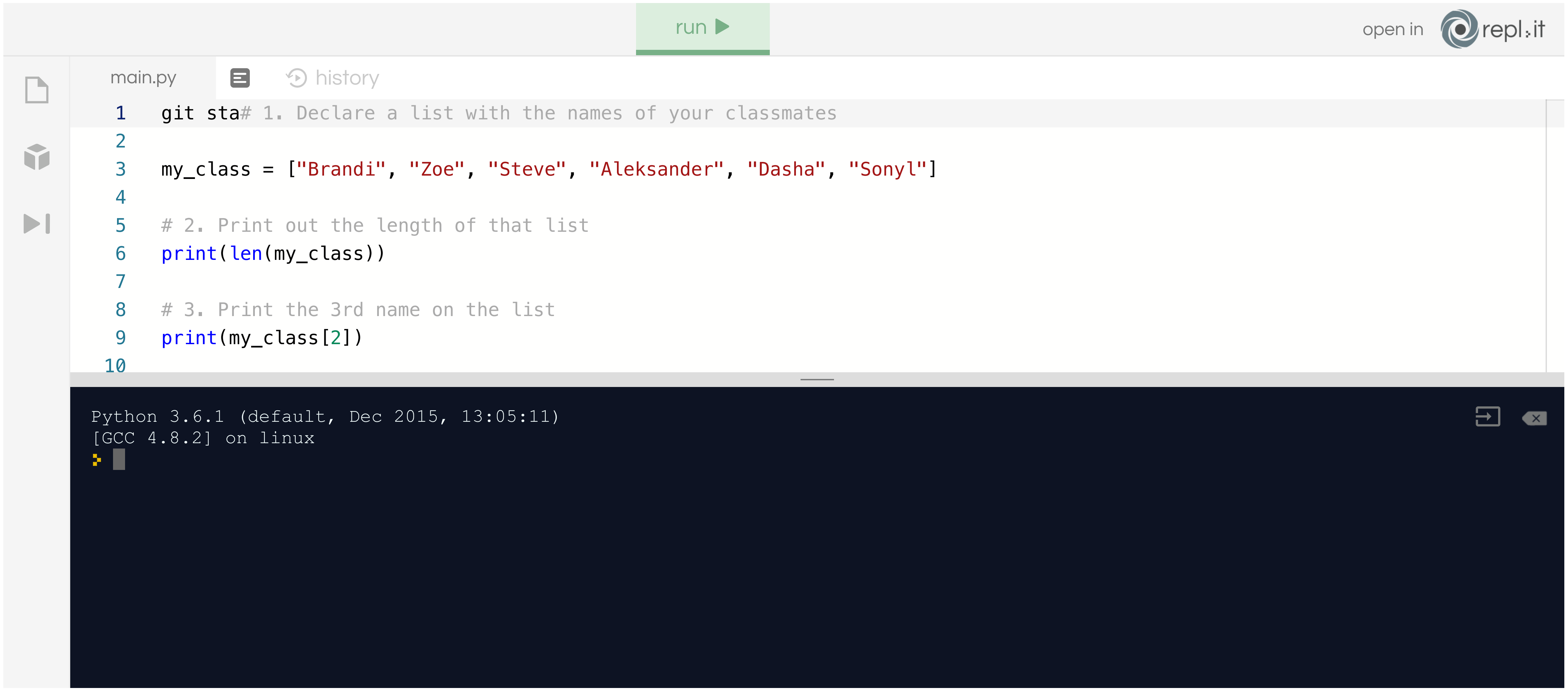
Partner up! Choose one person to be the driver and one to be the navigator, and see if you can do the prompts:



```python
# 1. Declare a list with the names of your classmates
# 2. Print out the length of that list
# 3. Print the 3rd name on the list
# 4. Delete the first name on the list
# 5. Re-add the name you deleted to the end of the list
```

```
Python 3.6.1 (default, Dec 2015, 13:05:11)
[GCC 4.8.2] on linux
›
```

Pop, Insert, Append Solution



```python
git sta# 1. Declare a list with the names of your classmates

my_class = ["Brandi", "Zoe", "Steve", "Aleksander", "Dasha", "Sonyl"]

# 2. Print out the length of that list
print(len(my_class))

# 3. Print the 3rd name on the list
print(my_class[2])

```

```
Python 3.6.1 (default, Dec 2015, 13:05:11)
[GCC 4.8.2] on linux
```

1. DECLARE A LIST WITH THE NAMES OF YOUR CLASSMATES

```
my_class = [“Brandi”, “Zoe”, “Steve”, “Aleksander”, “Dasha”, “Sonyl”]
```

2. PRINT OUT THE LENGTH OF THAT LIST

```
print(len(my_class))
```

3. PRINT THE 3RD NAME ON THE LIST

```
print(my_class[2])
```

4. DELETE THE FIRST NAME ON THE LIST

```
deleted_classmate = my_class.pop(0)
```

5. RE-ADD THE NAME YOU DELETED TO THE END OF THE LIST

my_class.append(deleted_classmate)

print(my_class)

!! List Mutation: Warning !!

This won't work as expected - don't do this!

```
colors = ["red", "yellow", "green"]
print colors.append("blue")
#   => None
```

This will work - do this!

```
colors = ["red", "yellow", "green"]
colors.append("blue")
print colors
#   => ["red", "yellow", "green", "blue"]
```

5. RE-ADD THE NAME YOU DELETED TO THE END OF THE LIST

my_class.append(deleted_classmate)

print(my_class)

Quick Review: Basic List Operations

```
# List Creation
my_list = ["red", 7, "yellow", 1]

# List Length
list_length = len(my_list) # 4

# List Index
print(my_list[0]) # red

# List Append
my_list.append("Yi") # ["red", 7, "yellow", 1, "Yi"]

# List Insert at Index
my_list.insert(1, "Sanju") # ["red", "Sanju", 7, "yellow", 1, "Yi"]

# List Delete
student_that_left = my_list.pop() # "Yi"; ["red", "Sanju", 7, "yellow", 1]

# List Delete at Index
student_that_left = my_list.pop(2) # 7; ["red", "Sanju", "yellow", 1]
```

5. RE-ADD THE NAME YOU DELETED TO THE END OF THE LIST

my_class.append(deleted_classmate)

print(my_class)

Numerical List Operations - Sum

Some actions can only be performed on lists with numbers.

`sum()`:

- A built in `list` operation.
- Adds the list together.
- Only works on lists with numbers!

```
# sum(your_numeric_list)

team_batting_avgs = [.328, .299, .208, .301, .275, .226, .253, .232, .287]
sum_avgs = sum(team_batting_avgs)
print("The total of all the batting averages is", sum_avgs)
# => 2.409
```

5. RE-ADD THE NAME YOU DELETED TO THE END OF THE LIST

my_class.append(deleted_classmate)

print(my_class)

List Operations - Max/Min

`max()` or `min()`:

- Built in `list` operations.
- Finds highest, or lowest, in the list.
- Only works on lists with numbers!

```
# max(your_numeric_list)
# min(your_numeric_list)

team_batting_avgs = [.328, .299, .208, .301, .275, .226, .253, .232, .287]
print("The highest batting average is", max(team_batting_avgs))
# => 0.328
print("The lowest batting average is", min(team_batting_avgs))
# => 0.208
```

5. RE-ADD THE NAME YOU DELETED TO THE END OF THE LIST

my_class.append(deleted_classmate)

print(my_class)

You Do: Lists

On your local computer, create a `.py` file named `list_practice.py`. In it:

1. Save a list with the numbers `2`, `4`, `6`, and `8` into a variable called `numbers`.
2. Print the max of `numbers`.
3. Pop the last element in `numbers` off; re-insert it at index `2`.
4. Pop the second number in `numbers` off.
5. Append `3` to `numbers`.
6. Print out the average number (divide the sum of `numbers` by the length).
7. Print `numbers`.

5. RE-ADD THE NAME YOU DELETED TO THE END OF THE LIST

my_class.append(deleted_classmate)

print(my_class)

Summary and Q&A

We accomplished quite a bit!

```
# List Creation
my_list = ["red", 7, "yellow", 1]
# List Length
list_length = len(my_list) # 4
# List Index
print(my_list[0]) # red
# List Append
my_list.append("Yi") # ["red", 7, "yellow", 1, "Yi"]
# List Insert at Index
my_list.insert(1, "Sanju") # ["red", "Sanju", 7, "yellow", 1, "Yi"]
# List Delete
student_that_left = my_list.pop() # "Yi"; ["red", "Sanju", 7, "yellow", 1]
# List Delete at Index
student_that_left = my_list.pop(2) # 7; ["red", "Sanju", "yellow", 1]
```

5. RE-ADD THE NAME YOU DELETED TO THE END OF THE LIST

my_class.append(deleted_classmate)

print(my_class)

Summary and Q&A

And for numerical lists only…

```
# Sum all numbers in list
sum_avgs = sum(team_batting_avgs)
# Find minimum value of list
min(team_batting_avgs)
# Find maximum value of list
max(team_batting_avgs)
```

5. RE-ADD THE NAME YOU DELETED TO THE END OF THE LIST

```
my_class.append(deleted_classmate)

print(my_class)
```

Additional Resources

- Python Lists - Khan Academy Video
- Google For Education: Python Lists
- Python-Lists