# ITP 115

## Lists

# Review

# Recall: Sequences Have Indices!

- Each individual item in a sequence is automatically given an position number
- This number is called an **index** and tells what position the item is in
- The **first index** is **zero (`0`)**
- The **last index** is the **number of items – 1**

# Lists

- New type of variable!
- Are sequences like strings, but lists are **mutable**
- Contain all the same type of elements*
  - i.e. all strings or all ints

**Technically, Python allows lists to hold different types of elements. For our class, though, we will only store "like items"*

# Lists

- Syntax

```
listVariable = [item1, item2, ...]
```

- `item1` could be any type of variable
  - string: `"hello"`
  - int: `7`
  - float: `8.5`
  - another list: `["this is", "another list"]`
  - Any other variable type we will cover

# List Methods

| Method | Description |
|---|---|
| `someList.append(value)` | Adds value to end of a list. |
| `someList.sort()` | Sorts the elements, smallest value first. |
| `someList.reverse()` | Reverses the order of a list. |
| `someList.count(value)` | Returns the number of occurrences of value. |
| `someList.index(value)` | Returns the first position number of where value occurs. |
| `someList.insert(i, value)` | Inserts value at position i. |
| `someList.pop([i])` | Returns value at position i and removes value from the list. Providing the position number i is optional. Without it, the last element in the list is removed and returned. |
| `someList.remove(value)` | Removes the first occurrence of value from the list. |
| `del someList[i]` | Removes the element at the specified index |

# someList.sort()

- Sorts the elements, smallest value first
  - Sorts the actual list—**it does NOT return a new list**
- Example

```
numbers = [3, 5, -12, 40]
```

| 0 | 1 | 2 | 3 |
|---|---|---|---|
| 3 | 5 | -12 | 40 |

# someList.sort()

- Sorts the elements, smallest value first
  - Sorts the actual list—**it does NOT return a new list**
- Example

```
numbers = [3, 5, -12, 40]
numbers.sort()
```

| 0 | 1 | 2 | 3 |
|---|---|---|---|
| -12 | 3 | 5 | 40 |

# someList.sort()

- Sorts the elements, smallest value first
  - Sorts the actual list—**it does NOT return a new list**
- Example

```
drinks = ["coffee", "boba"]
```

| 0 | 1 |
|---|---|
| coffee | boba |

# someList.sort()

- Sorts the elements, smallest value first
  - Sorts the actual list—**it does NOT return a new list**
- Example

```
drinks = ["coffee", "boba"]
drinks.sort()
```

| 0 | 1 |
|---|---|
| boba | coffee |

# someList.reverse()

- Reverses the order of the elements
  - Changes actual list—**it does NOT return a new list**
- Example

```
numbers = [3, 5, -12, 40]
```

| 0 | 1 | 2 | 3 |
|---|---|---|---|
| 3 | 5 | -12 | 40 |

# someList.reverse()

- Reverses the order of the elements
  - Changes actual list—**it does NOT return a new list**
- Example

```
numbers = [3, 5, -12, 40]
numbers.reverse()
```

| 0 | 1 | 2 | 3 |
|---|---|---|---|
| 40 | -12 | 5 | 3 |

# `del someList[index]`

- Removes the element from list at *index*

- Example

```
numbers = [3, 5, -12, 40, 5]
```

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| 3 | 5 | -12 | 40 | 5 |

# `del someList[index]`

- Removes the element from list at *index*

- Example

```
numbers = [3, 5, -12, 40, 5]
del numbers[2]
```

| 0 | 1 | 2 | 3 |
|---|---|---|---|
| 3 | 5 | 40 | 5 |

# `del someList[index]`

- Removes the element from list at *index*

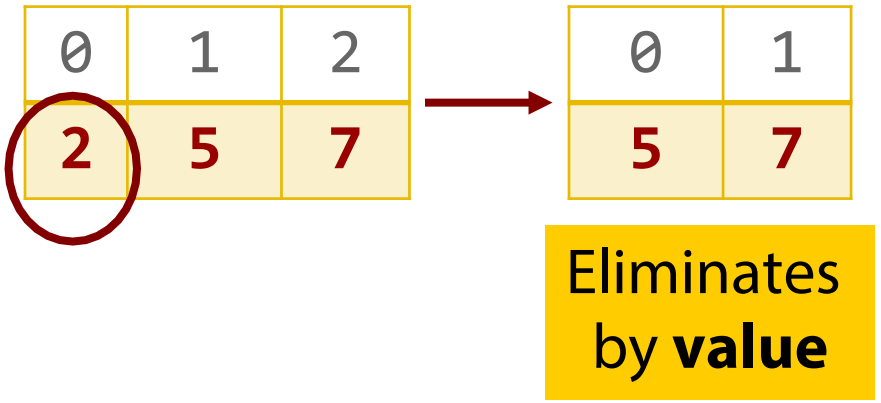
- Example

```
numbers = [3, 5, -12, 40, 5]
del numbers[2]
del numbers[2]
```

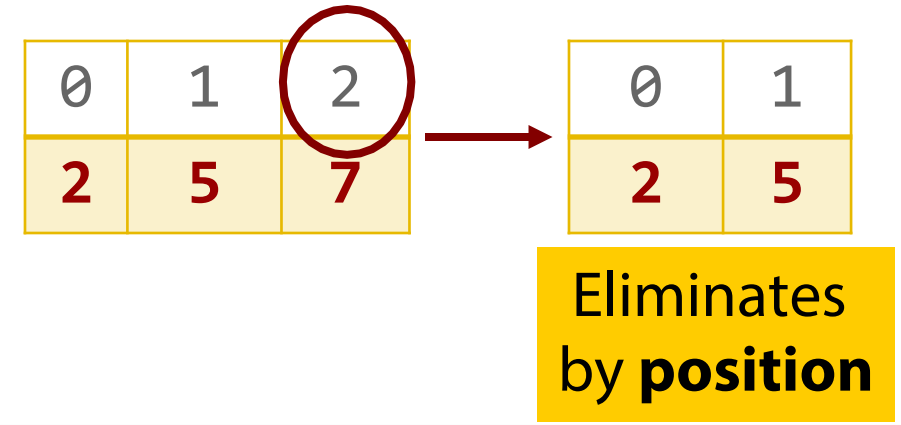
| 0 | 1 | 2 |
|---|---|---|
| 3 | 5 | 5 |

# remove vs. del

```
numbers = [2, 5, 7]
numbers.remove(2)
```




```
numbers = [2, 5, 7]
del numbers[2]
```



# someList.index(someValue)

- Returns the first position number where value occurs

- Example

```
numbers = [3, 5, -12]
```

| 0 | 1 | 2 |
|---|---|---|
| 3 | 5 | -12 |

# someList.index(someValue)

- Returns the first position number where value occurs

- Example

```
numbers = [3, 5, -12]
found = numbers.index(5)

print(found)
```

```
1
```

| 0 | 1 | 2 |
|---|---|---|
| 3 | 5 | -12 |

# someList.index(someValue)

- Returns the first position number where value occurs

- Example

```
numbers = [3, 5, -12]
found = numbers.index(5)

print(found)
```

| 0 | 1 | 2 |
|---|---|---|
| 3 | 5 | -12 |

```
1
```

```
found = numbers.index(100)
```

```
Error
```

# Slicing Lists

- We can slice a list just we did with strings

- We can use **slicing** to get multiple items from a sequence

# Slicing Lists

- Syntax

```
someList[startPosition:endPosition]
```

# Accessing Lists by Slicing

animals

| 0 | 1 | 2 | 3 |
|---|---|---|---|
| dog | cat | emu | bird |

```
slice = animals[1:3]
```

slice

| 0 | 1 |
|---|---|
| cat | emu |

```
slice = animals[0:1]
```

slice

| 0 |
|---|
| dog |

*Slice gives you a list*

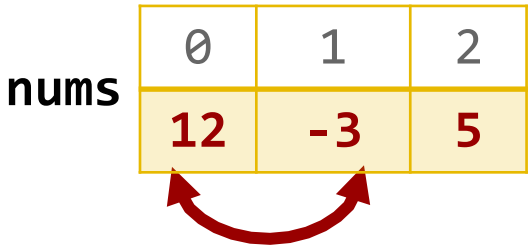
```
item  = animals[0]
```

item dog

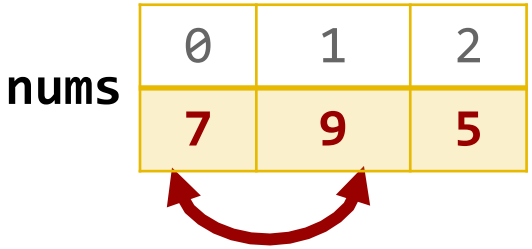
*Index gives you one item*

# Changing Lists by Slicing

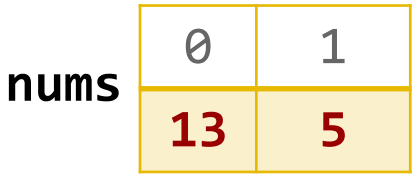
```
nums        = [12, -3, 5]
```




```
nums[0:2] = [7,9]
```




```
nums[0:2] = [13]
```




*Slice assignment requires value on right to be a list*

# Useful Slicing Tricks

| 0 | 1 | 2 | 3 |
|---|---|---|---|
| dog | cat | emu | bird |

- Start at beginning

```
print(animals[:2])
```

```
[dog, cat]
```

- Go to end

```
print(animals[1:])
```

```
[cat, emu, bird]
```

- Entire list

```
print(animals[:])
```

```
[dog, cat, emu, bird]
```

# Note about Slicing Lists

- What is the difference between `a` and `b`?

```
drinks = ["tea", "coffee"]

a = drinks

b = drinks[:]

print(a)
```

```
["tea", "coffee"]
```

```
print(b)
```

```
["tea", "coffee"]
```

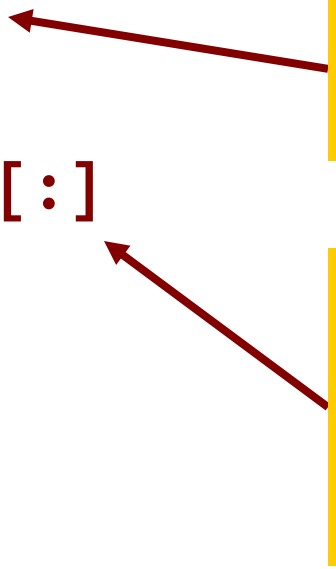
# Note about Slicing

- What is the difference between `a` and `b`?

```
drinks = ["tea", "coffee"]

a = drinks

b = drinks[:]
```



- *This means* `a` *is linked to* `drinks`

- *This means* `b` *is NOT linked to* `drinks`
- *This means* `b` *is a copy of* `drinks`

*We will revisit this later*