CS61A Discussion 3:
Data Abstraction and Sequences

TA: **Jerry Chen**
Email: **jerry.c@berkeley.edu**
TA Website: **jerryjrchen.com/cs61a**

Agenda

1. Week in Review
2. Sequences & Lists
3. Slicing & list comprehension
4. Data abstraction

Week In Review

Hw 2 is due next Tuesday

- How many have **started** hw2?

How was lab 3? (Lambdas/HOFs, Recursion)

Midterm 1 is next Thursday!

- In-lab review survey: **tinyurl.com/jerrymt1labreview**
- Next discussion will be a special review session
- TA sanctioned review session Friday, 5-7pm in 155 Dwinelle

Free one-one-one tutoring sign-ups available! (Check Piazza)

Data

So far, we've been able to store **singular values**

```
x = 10
```

Great. What if we want to store a **bunch of things**?

- For example, a group of temperatures over a week

Enter sequences!

Sequences

Sequences have **length** and **element selection**

Lists are a Python data type that groups together many things

```
x = [10, 20, 30] # all numbers

y = [10, “twenty”, [30]] # num, str, lst
```

Lists

Length

Can easily retrieve the length of a list:

```
>>> x = [1, 2, 3]
>>> len(x)
3
>>> y = [x, 4, 5] # Does nesting matter?
>>> len(y)
3
```

Lists

Element Selection

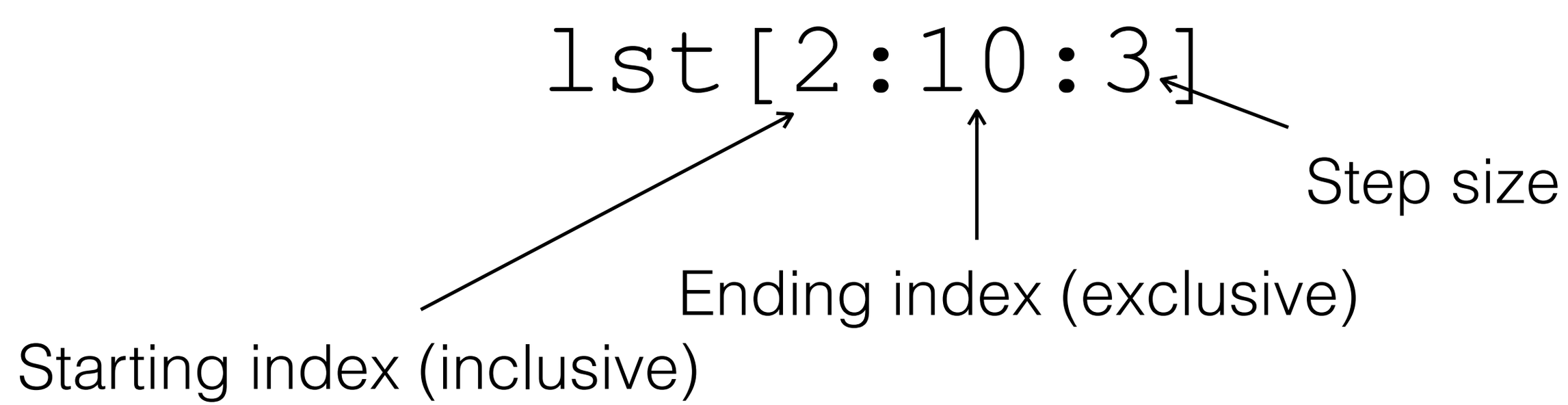
Get an item at an index using bracket notation

```
>>> x = [1, 2, 3]
>>> x[0]
1
>>> x[0] = 10
>>> x
[10, 2, 3]
```

Slicing

Important tool for generating sublists

Anatomy of a slice:



Excluding any part of the slice invokes the default value:
0 for start, len(lst) - 1 for end, 1 for step

Lists

Slicing

```
>>> x = [1, 2, 3]
>>> x[0:2]
[1, 2]
>>> x[0:2] == x[:2]
True
>>> x[0:2:-1]
[]
>>> x[2:0:-1]
[3, 2]
```

Lists

Odds & Ends

Check membership using `in`

```
>>> x = [1, 2, 3]
>>> 1 in x
True
>>> “bananas” in x
False
```

Lists

Odds & Ends

`for` can be used to loop through lists

```
>>> x = [1, 2, 3]
>>> for elem in x: #elem can be any name
...     print(elem)
1
2
3
```

Lists

Odds & Ends

`range` is a useful function that returns a sequence

```
>>> x = range(0, 3) # 0, 1, 2
>>> range(0, 3, 1) == range(3) # Like slicing?
True
>>> for n in x:
...   print(n)
0
1
2
```

Lists

List Comprehension

Quick way of making lists by applying **expressions** to elements in **another sequence**

```
[<map exp> for <name> in <iter> if <filter>]
# filter is optional
>>> [x for x in range(4)]
[0, 1, 2, 3]
>>> [x * 2 for x in range(4) if x % 2 == 1]
[2, 6]
```

Data Abstraction

Focus on **what happens**, not how it happened

- **Abstract data type (ADT)** - represents an object/ thing in code. Abstract since we (as the user) don't need to know how it was built and how it works!

- **Constructor** - creates an ADT

- **Selector** - retrieve information from an ADT

Lists Questions

WWPP - Page 2, Q1

```
>>> a = [1, 5, 4, [2, 3], 3]
>>> print(a[0], a[-1])
1 3
>>> len(a)
5
>>> 2 in a
False
>>> 4 in a
True
>>> a[3][0]
2
```

Lists Questions

WWPP - Page 3, Q1

```
>>> a = [3, 1, 4, 2, 5, 3]
>>> a[1::2]
[1, 2, 3]
>>> a[:]
[3, 1, 4, 2, 5, 3]
>>> a[4:2]
[]
>>> a[1:-2]
[1, 4, 2]
>>> a[::-1]
[3, 5, 2, 4, 1, 3]
```