Lecture 11:

LOOPS

CSC111: Introduction to CS through Programming

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Debrief of first few coding assignments (1/2)

- Overall: really solid!
- Strengths:
  - nicely formatted submissions
  - informative variable names
  - great use of comments (particularly for leaving “notes” and making sections for individual components)
- Still working on:
  - balancing matching specs vs. being creative
  - sketching out a plan **before** you start coding
- Some tips:
  - use blank lines to separate “logical chunks” of code (like paragraphs)
  - Python automatically ignores blank lines! (no need to comment)

Debrief of first few coding assignments (2/2)

- Reminder:

Collaboration and Academic Integrity

Students are strongly encouraged to form study groups and to collaborate on assignments and labs. The following information is required for all submitted work:

1. The names of all collaborating students be listed at the top of the submission. If you worked alone, please state: "*I did not collaborate with anyone on this assignment.*"
2. A "**References**" section, with in-line citations to any resources you used. Citations should include page numbers (if a printed resource) or a direct URL (if an online resource). If you did not use any resources in completing the assignment, please state: "*I did not utilize any external resources in completing this assignment.*"

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Overview

✓Announcements

- Monday: Loops
  - `for…in` (looping through items in a list)
  - the `range()` function (getting a list of numbers)
  - `while` (looping until something happens)
- Lab: Loops
- Wednesday: Life Skill #2/3: Debugging & Documentation
- Friday: Dictionaries and Sets

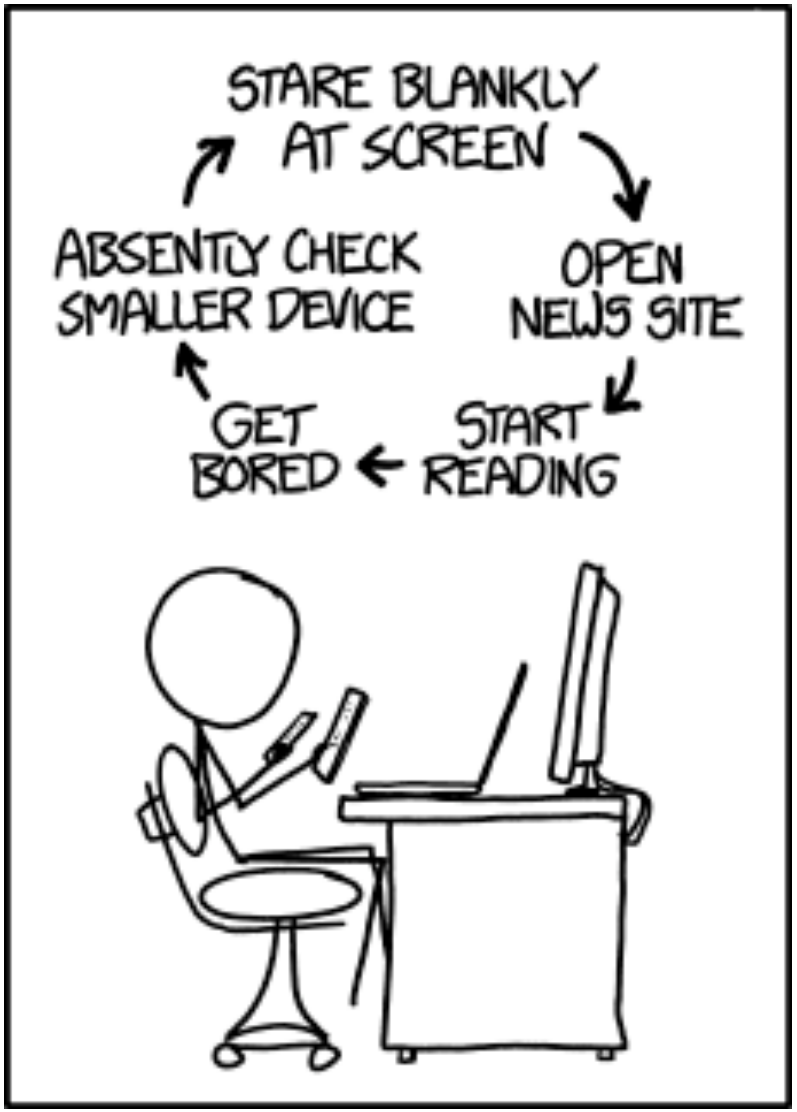
Reality: online classes can be rough

Activity: Beats

Discussion

What kinds of **repetition** did you notice?

Loops: a familiar idea



https://xkcd.com/1411/

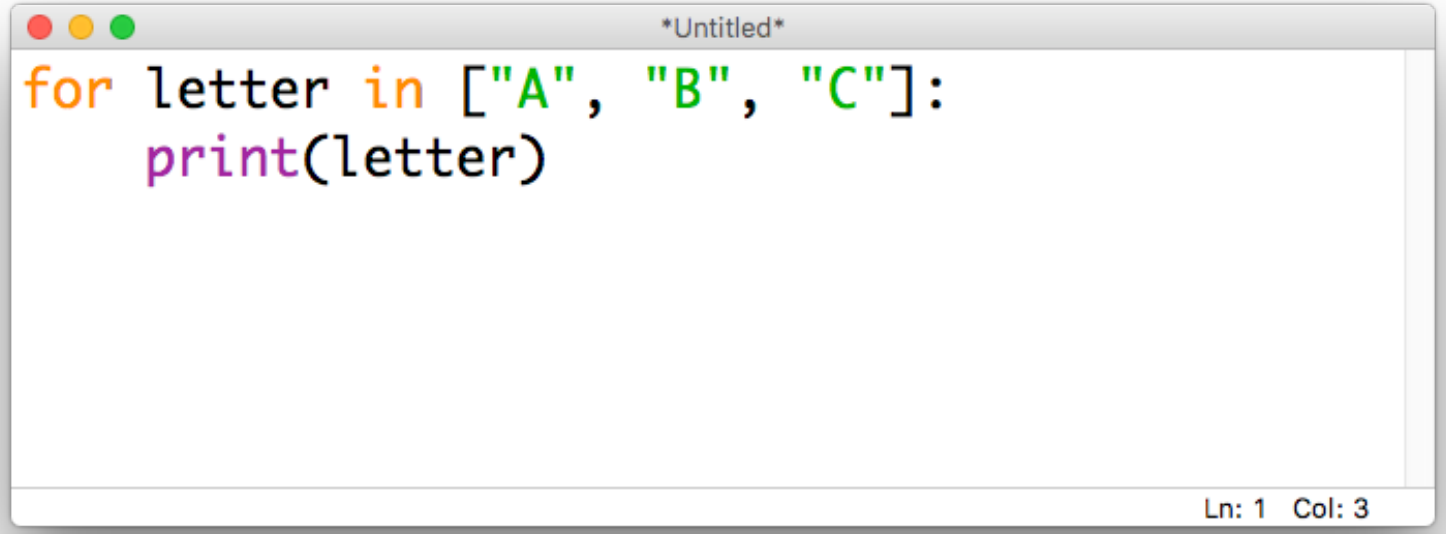
Loops in computer programming

- **Goal**: simplify the description of repeated blocks of code
  (i.e. make it shorter/easier to understand by highlighting **what's being repeated** and **for how long**)

- **Three approaches:**
  - run for **each item** in a list
  - run a specific **number of times**
  - run **until** some condition is met

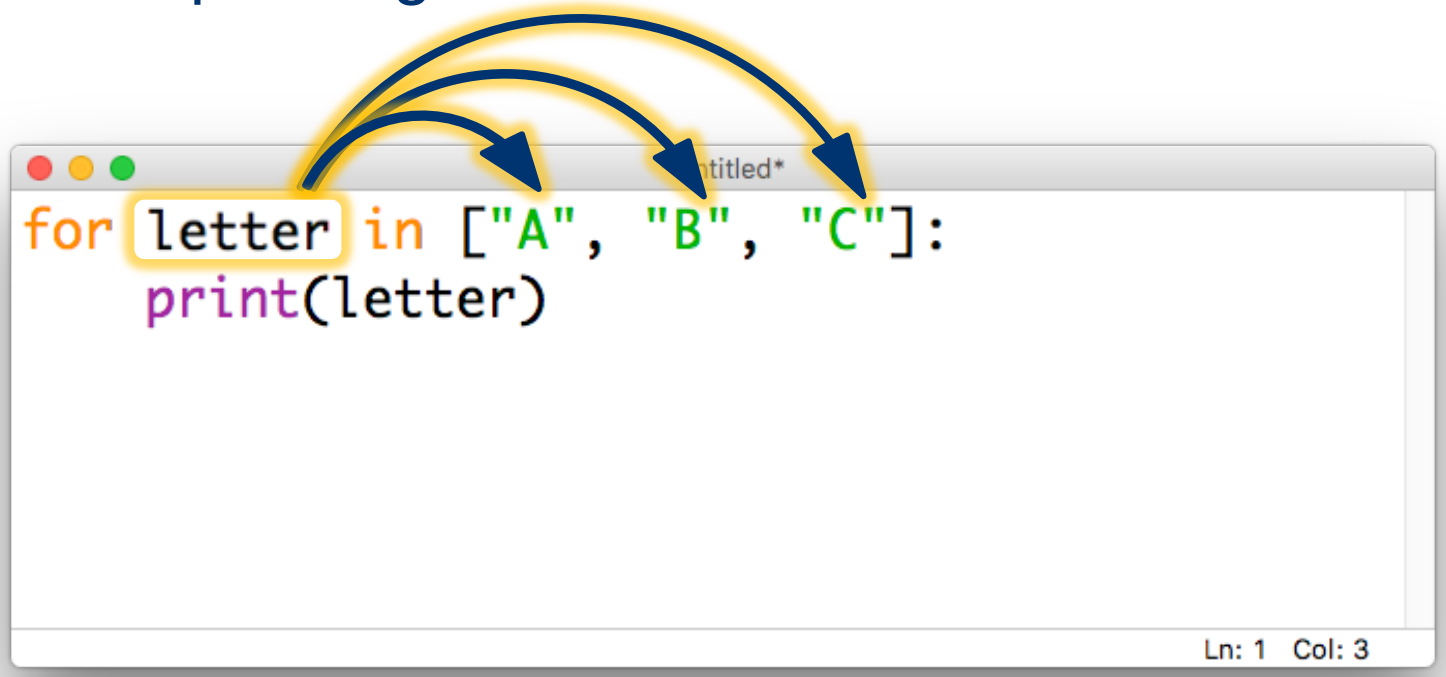
`for...in` loops

- In Python, we use the keywords `for` and `in` to loop through a list



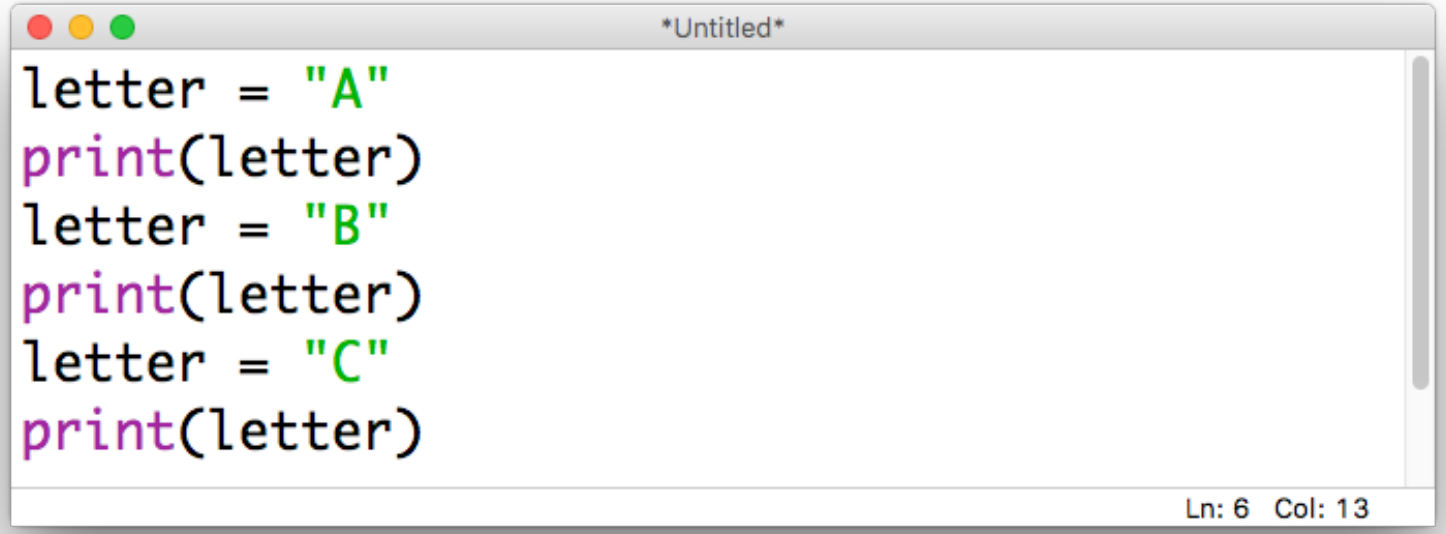
`for...in` loops

- We can think of this in terms of where the variable **`letter`** is pointing:



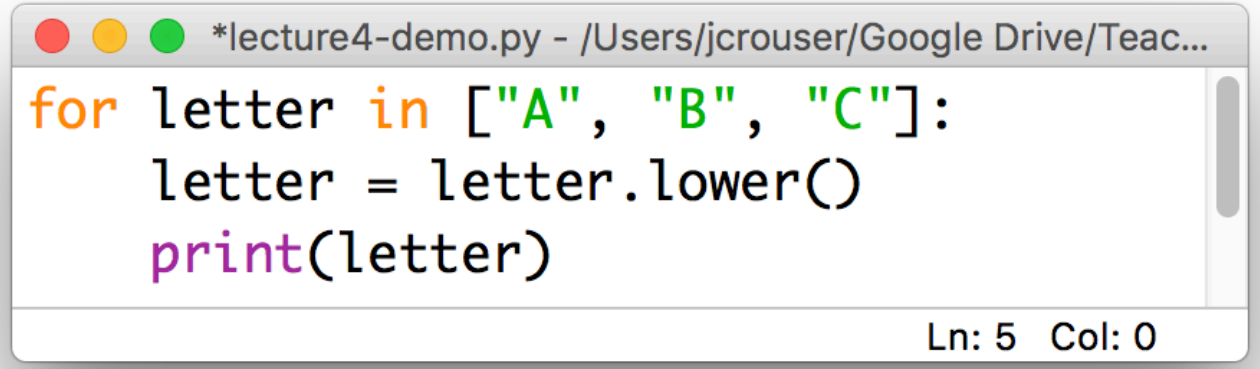
`for...in` loops: unpacked

- We could accomplish the same thing by writing it out as **three separate assignments**:



`for...in` loops: a common "gotcha"

- Python will allow you to **modify a list** while you're looping through it:



- This is generally a **bad idea** (more on why later)
  - it's fine to format the **values**, etc.
  - just don't **overwrite** the originals!

Demo: compute a sum

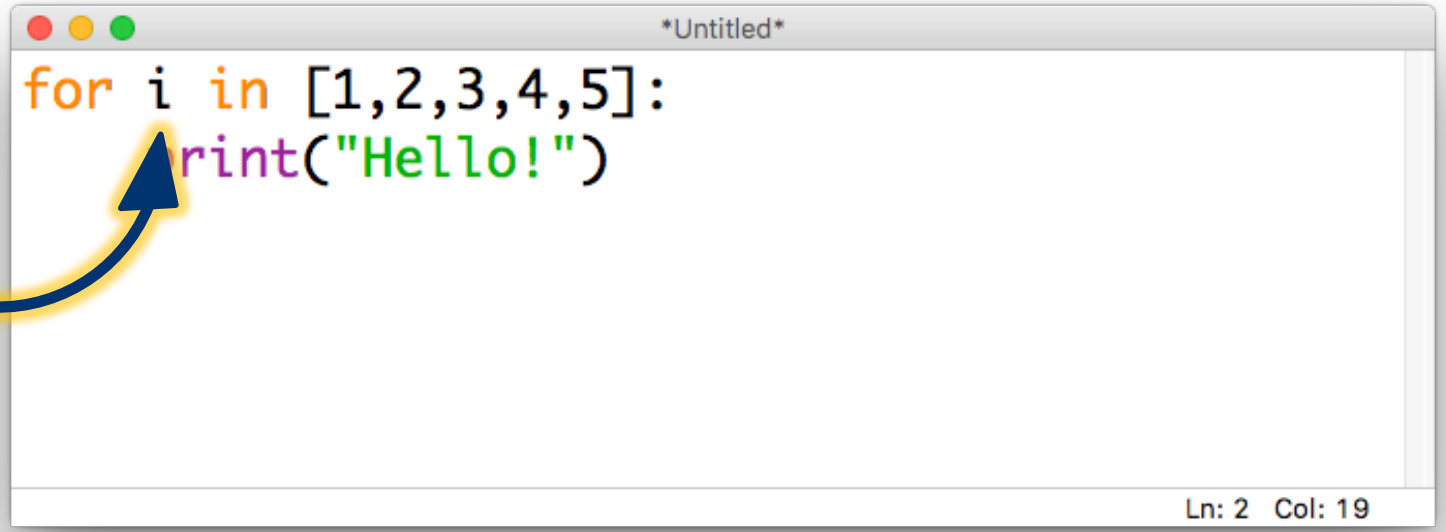
Use a `for` **loop** to compute
the **sum** of a list of numbers

- **Step 1**: pseudocode
- **Step 2**: python

Looping `n` times

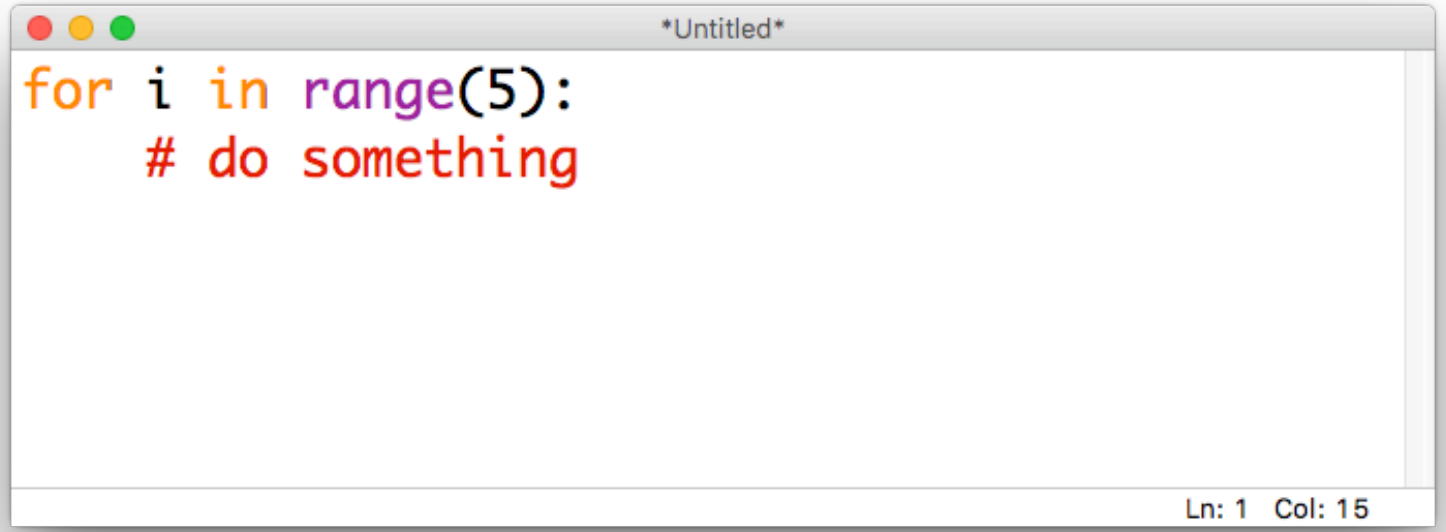
- **Bad news**: there isn't a way to say "run this loop `n` times" in Python – we'll have to find a way around that
- If we want a `for...in` loop to run a specific # of times, can "trick" it using a list of numbers that's the right size

common practice: use the letter `i` to denote the "index"



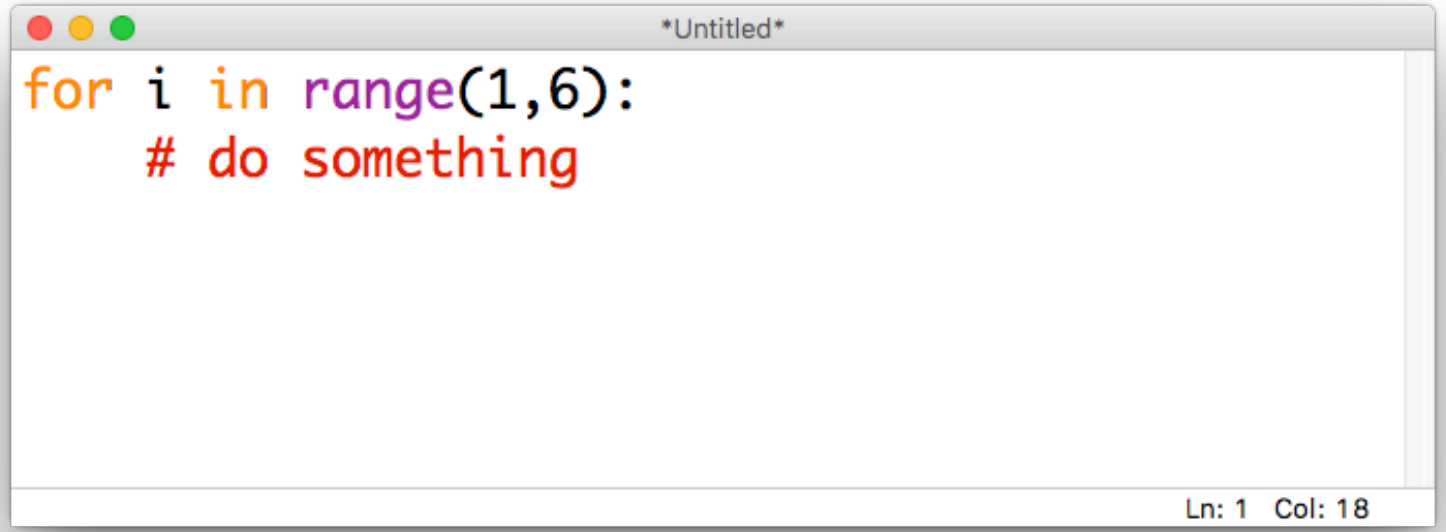
The `range()` function

- The `range()` function lets us generate lists of integers
- Given **one** integer `a`, `range(a)` will generate a list starting at 0 and going up to (but not including) `a`
- For example, if we want a loop to run **5** times:



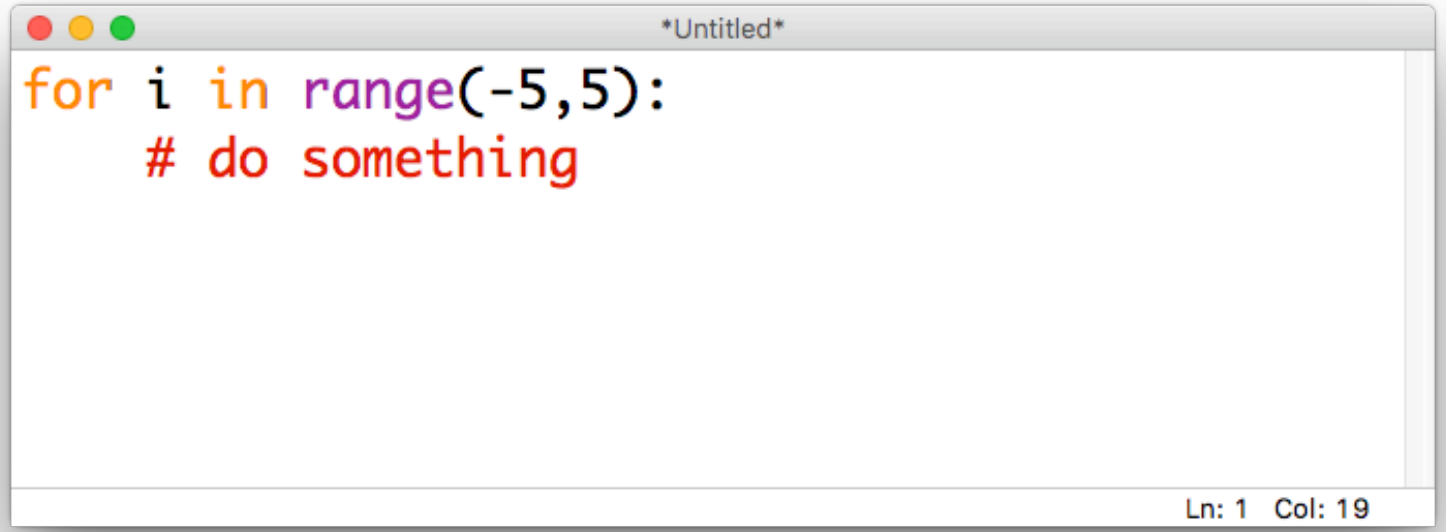
The `range()` function

- Given **two** integers `a,b`, `range(a,b)` will generate a list starting at `a` and going up to (but not including) `b`
- E.g., if we want to loop over the integers from 1 to 5:



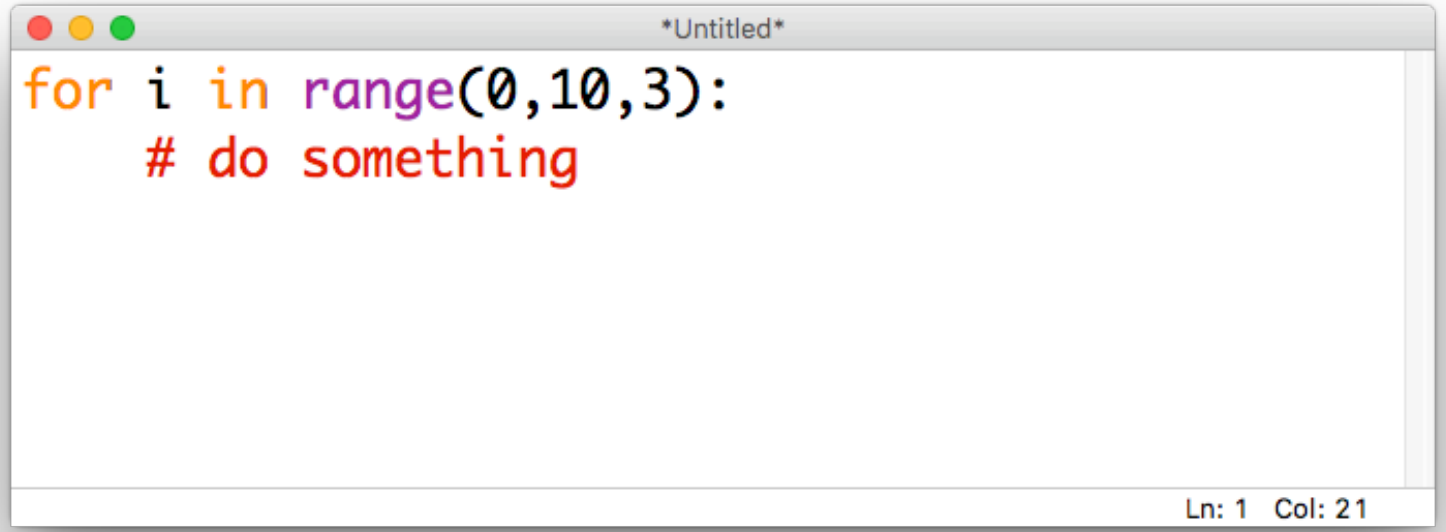
The `range()` function

- These values can be **positive** or **negative** (but for now, the second integer should be **larger** than the first)
- E.g., if we want to loop over the integers from -5 to 5:



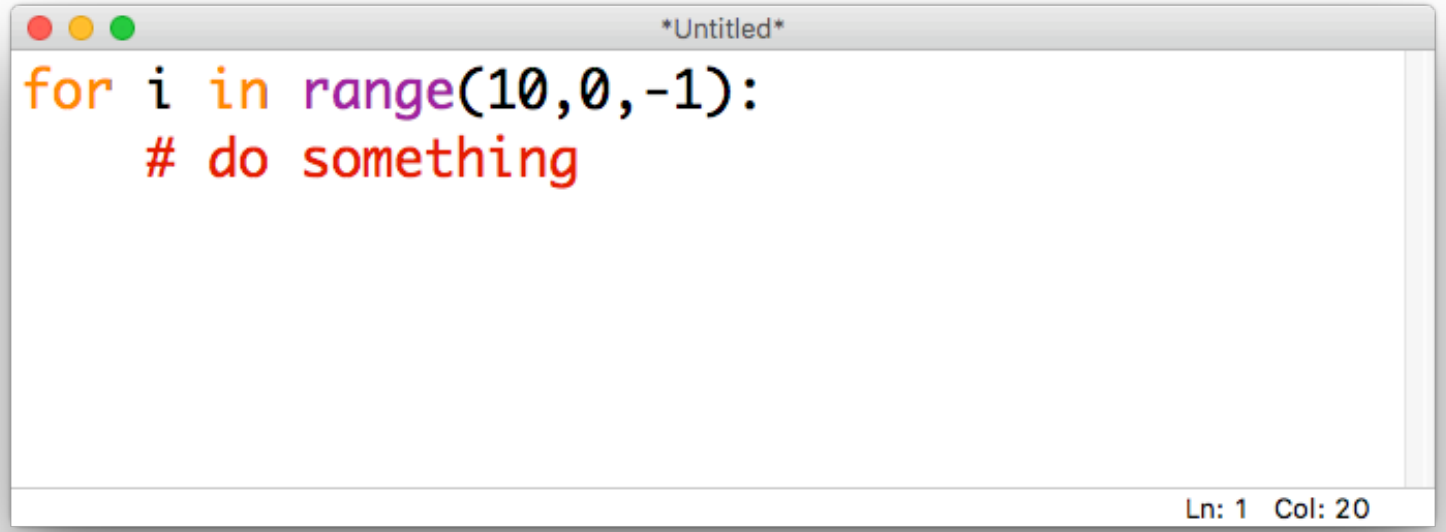
The `range()` function

- Given **three** integers **`a,b,c`**, calling **`range(a,b,c)`** will generate a list starting at **`a`** and going up to (but not including) **`b`** with step size **`c`**
- E.g., if we want the integers from 0 to 9, counting by 3s:



The `range()` function

- If we want to count down instead of up, we can set **`b < a`** and use a negative step size
- E.g., if we want to count down from 10 to 1:



15-Minute Exercise: convert $°F$ to $°C$

Use a `for` **loop** and the `range()` function to generate a **conversion table** of temperatures from $°F$ to $°C$ ranging from $100°F$ to $-30°F$ in increments of $10°F$

Tips:

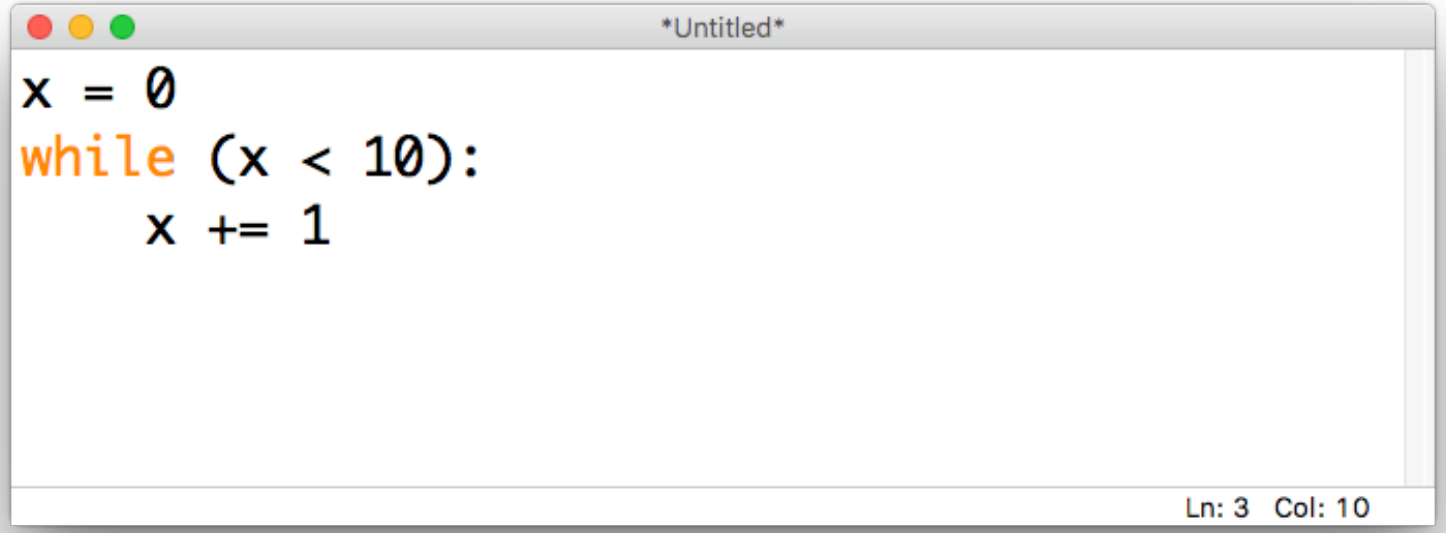
- use the formula $°C = (°F - 32) * 5 / 9$
- `"{0:.1f}".format(c)` will round to 1 decimal place

Discussion

What did you come up with?

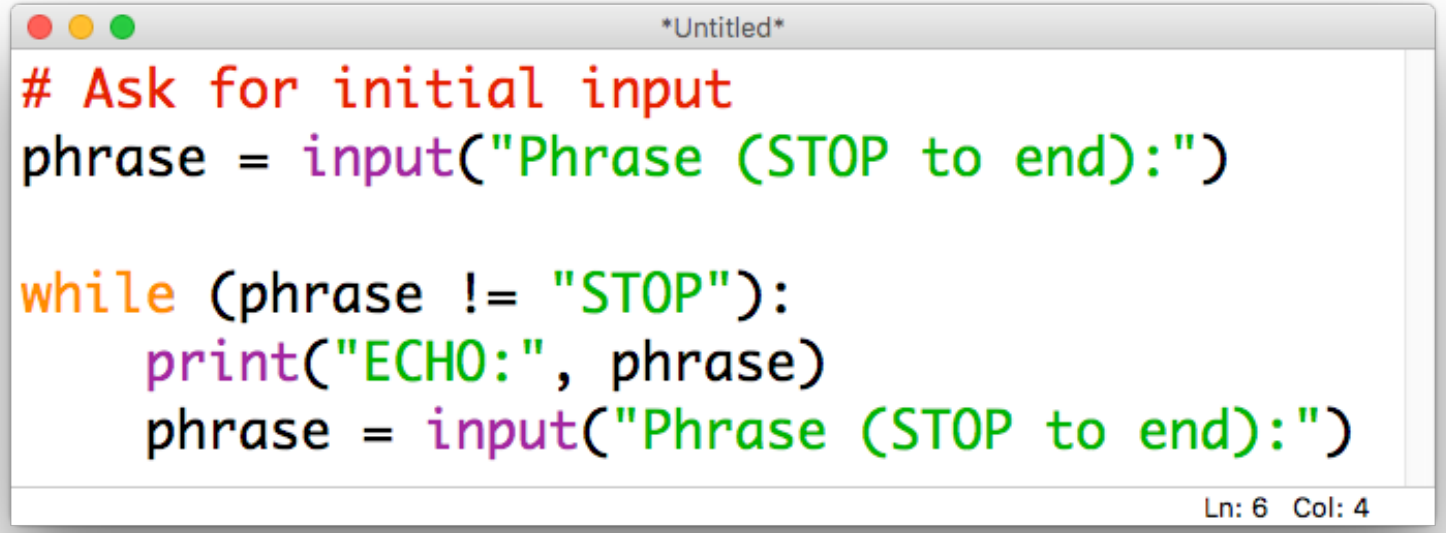
`while` loops

- We may sometimes want a program to continue doing the same thing **until something happens**
- In Python we can do this with a `while` loop, which is paired with a conditional (`True/False`) statement



`while` loops

- `while` loops can be especially useful when combined with the `input()` function
- For example, we may want to continue asking for input until the user tells us they are done:



Demo: compute a sum pt.2

Modify our previous demo program to
use a `while` **loop** to compute
the **sum** of a series of numbers
entered by the user

(continue until the user enters a blank)

Checking in

What's **one thing** you learned

in today's class?

Assignment #3: Magic 8 Ball

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- In this assignment, you will write a python program that **simulates a Magic 8 Ball**
- Your program should:
  - Take in a question from the user
  - Print a randomly-selected response
  - Determine if the user wants to ask another question
  - If so, repeat!
- Submit your repl on Moodle by **11:55pm on Thursday**

Up next

- ✓Monday: Loops
  - ✓`for…in` (looping through items in a list)
  - ✓the `range()` function (getting a list of numbers)
  - ✓`while` (looping until something happens)
- Lab: Loops
- Wednesday: Life Skill #2/3: Debugging & Documentation
- A3 due Thursday at 11:55pm
- Friday: Dictionaries and Sets