Plan for TDAFB (after fall break)

- Hear via email about plans to catch-up and stay-ahead
  - Profs. Rodger and Astrachan to supply info
- Review APTs due next week
  - Ideas, Code, Algorithms, approaches
  - Review loops and structures
  - How sets can be useful
- Word games to start things off
  - Assignment coming

Succeeding with APTs in Compsci 101

- First do example, solve problem by hand, then Python
  - Capable of doing all examples by hand for APT
    - You don't want to have to do *all* of them by hand!

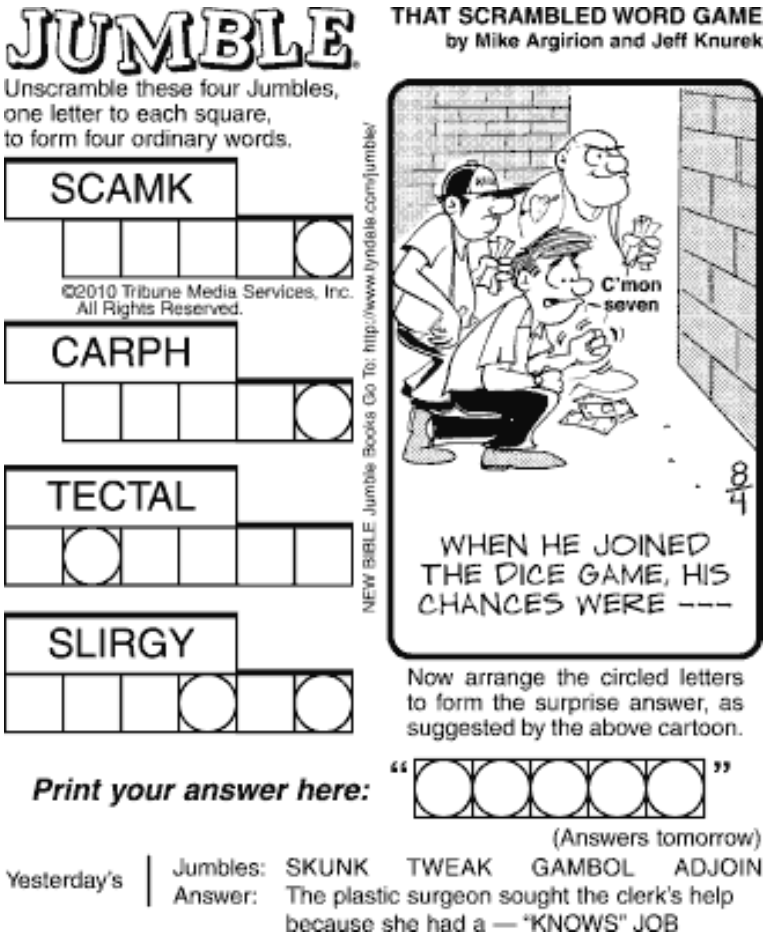
- Using built-in functions:
  - len(x), *sorted(x)*, max(x), ' '.join([…])
  - What is return type of each, which is "it depends"
- Two loops (index/element), Three structures
  - String, list, and now set

Computational Jumble

http://www.jumble.com

Use this problem to think about word games

- **Human approach**
  - What do you do?
- **Computational method?**
  - Cheating or insight?



Eros by any other name would be sore

- See Jumble.py (accessible via snarf)
  - Find standard or canonical form for jumbled
  - "aeprs" is … in alphabetical order!
  - `sorted('spear')` and `sorted([3,1,2,8])`

- Review of list comprehensions,
  - Given a large list of strings named words, what does this comprehension do?

```
[w for w in words if len(w) == len('rose')]
```

How long does this take in Jumble.py?

```
[w for w in words if sorted(w) == sorted(jword)]
```

- Go through each of 354,984 words and ...
  - Sort the word, which returns a list
  - Compare to sorted form of each word

- What if we change boolean filter?
  - Why does this appear to make a difference?

```
if len(w) == len(jw) and sorted(w) == sorted(jw)
```

Jumble programming concepts

- When you run the program it starts in __main__
  - This is how Python works, boilerplate code

- What's the variable words at beginning?
  - Global variable. Accessible in every function in the Python module
  - Used sparingly can be useful in a small module
  - Abused, can lead to hard to maintain code

Answer Questions

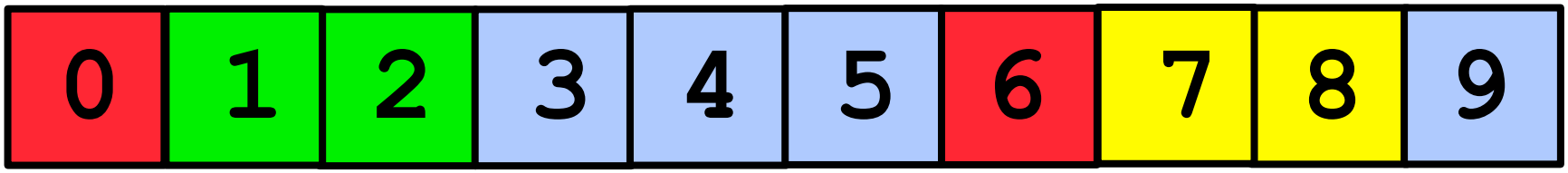
http://bit.ly/101fall15-oct15-1

After questions, solving APTs: ideas and hints for making progress

ColorfulTiles: Ideas, Algorithm, Code

http://www.cs.duke.edu/csed/pythonapt/colorfultiles.html

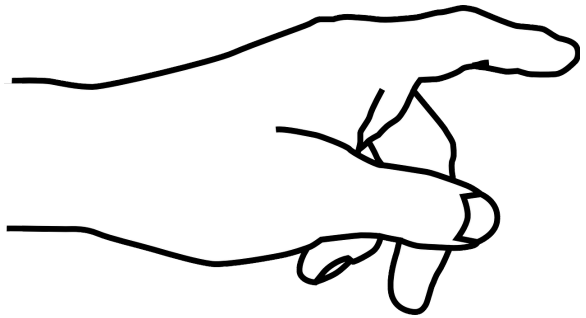
- "RGGBBBRYYB" has solution 3, why?

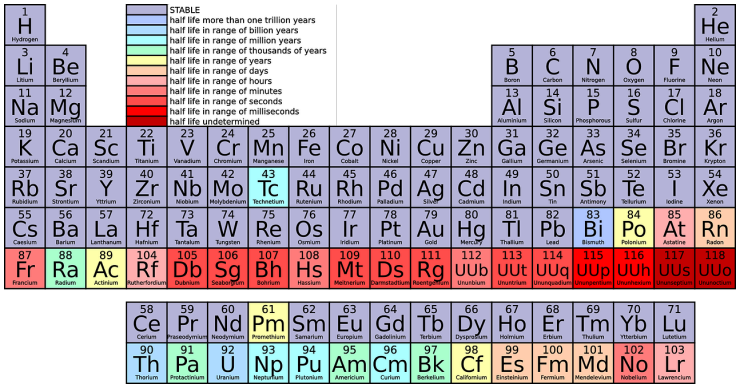


- Indexing can help. Changing a cell's color?
  - What about tile at `i-1` and at `i+1` (from `i`)
  - Change cell 2? Change 3, 4, 5?

Two structures, two types of loop

- **Loop by index or by element?**
  - **What do we do with each element, how to compare to element before? Or After?**
  - **Can do with either loop, much simpler with indexing loop!**





Two structures, two types of a loop

- **What structure to use: string or list?**
  - After examining each element, operations?
  - At green, with green to left, change me to ____ ?
    - Use list to mark with '*', advantage of four colors!
    - Remember strings are immutable

Solving UniqueNames APT

Approach to solving APT

- Loop over classes, find name/year, repeat
  - Indexing loop? name/year, name/year, …
  - Use range(x,y,2) for accessing every other entry

- Add all student names to a list or a set
  - How to make list contain no duplicates? Set
  - How to sort all the names? Sorted

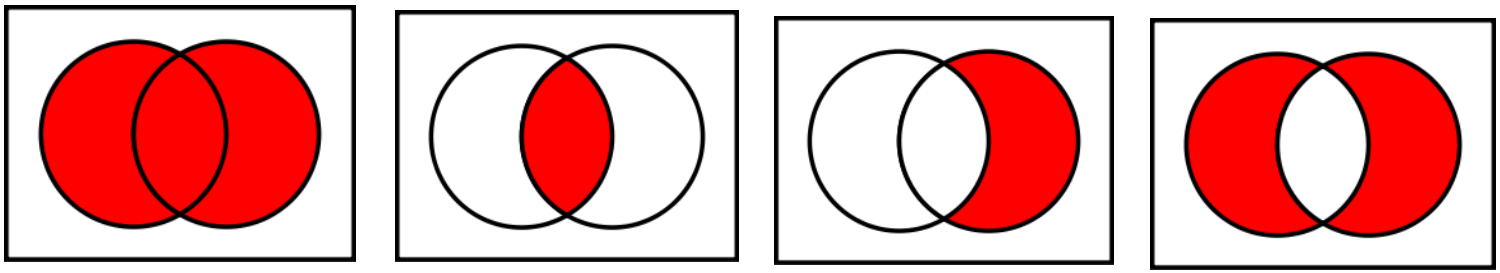
- Combine ideas, and done!

Coding aspects, not algorithmic

- Given list of names…stored in `taken` …
- Add a name to list or set, differences?
  - `taken.append(name)` or `taken.add(name)`
- Create a list of just the unique names?
  - `uniq = list(set(taken))`
- Create a sorted version of taken?
  - `st = sorted(taken)` -- list, string, or set ?
- Create space-separated string with values?
  - `' '.join(joinable)` what type is joinable?

Challenge APT UniqueZoo

- Using sets and set operations can help
  - Set intersection and set union
  - Other set operations
- A | B, set union, A & B, set intersection
- B – A, set difference, B ^ A, symmetric diff



Nested Loops: FortunateNumbers

- How to loop over all characters in each string of a list, e.g., to count all occurrences?
  - Looping over string in loop over list…
  - Think only about inner loop first, …
- Often useful to put inner loop in another function! Did this in Caesar.py

```
for x in ['apple', 'pear', 'orange']:
    for ch in x:
        print ch
        values[alpha.index(ch)] += 1
```

Create "couples" from two lists A, B

- A name is fixed as the inner loop executes
  - See output to reinforce this idea

```
A = ['sam', 'lou', 'chris']
B = ['terry', 'brook',, 'val']
for aname in A:
    for bname in B:
        print aname,",",bname
```

```
sam , terry
sam , brook
sam , val
lou , terry
lou , brook
lou , val
chris , terry
chris , brook
chris , val
```

Answer Questions

http://bit.ly/101fall15-oct15-2

Sets are unique and fast!

- Consider importance of -- `if x in Y:`
  - How long does it take to find x in Y?
  - What does it depend on? See Timings.py

- How can we find if a book is in library?
  - Assume all books shelved properly, then …
  - If we can't assume that, what do we do?

- Look up in set doesn't depend on set size!
  - Cannot add list to set or set to set or …