

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?

JUMBLE

Unscramble these four Jumbles, one letter to each square, to form four ordinary words.

SCAMK
□ □ □ □ ○

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CARPH
□ □ □ □ ○

TECTAL
□ ○ □ □ □ □

SLIRGY
□ □ □ ○ □ □

THAT SCRAMBLED WORD GAME
by Mike Argirion and Jeff Knurek



NEW BIBLE Jumble Books Co. To: <http://www.lyndelle.com/jumble/>

Now arrange the circled letters to form the surprise answer, as suggested by the above cartoon.

Print your answer here:

“ □ □ □ □ □ ”

(Answers tomorrow)

Yesterday's | Jumbles: SKUNK TWEAK GAMBOL ADJOIN
Answer: The plastic surgeon sought the clerk's help because she had a — "KNOWS" JOB

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

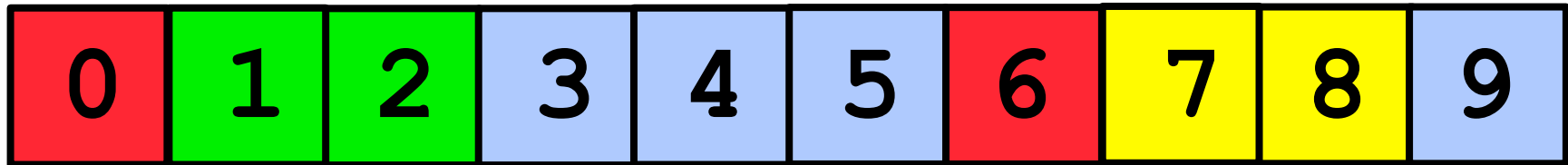
<http://bit.ly/101fall15-oct15-1>

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

ColorfulTiles: Ideas, Algorithm, Code

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

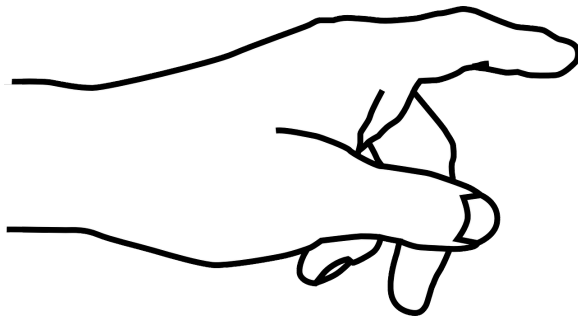
- "RGGBBBRYB" has solution 3, why?



- 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!



STABLE																					
half life more than one trillion years																					
half life in range of billion years																					
half life in range of million years																					
half life in range of thousands of years																					
half life in range of years																					
half life in range of days																					
half life in range of hours																					
half life in range of minutes																					
half life in range of seconds																					
half life in range of milliseconds																					
half life undetermined																					
1 H Hydrogen																	2 He Helium				
3 Li Lithium	4 Be Beryllium															5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon
11 Na Sodium	12 Mg Magnesium															13 Al Aluminum	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton				
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon				
55 Cs Cesium	56 Ba Barium	57 La Lanthanum	72 Hf Hafnium	73 Ta Tantalum	74 W Tungsten	75 Re Rhenium	76 Os Osmium	77 Ir Iridium	78 Pt Platinum	79 Au Gold	80 Hg Mercury	81 Tl Thallium	82 Pb Lead	83 Bi Bismuth	84 Po Polonium	85 At Astatine	86 Rn Radon				
87 Fr Francium	88 Ra Radium	89 Ac Actinium	104 Rf Rutherfordium	105 Db Dubnium	106 Sg Seaborgium	107 Bh Bohrium	108 Hs Hassium	109 Mt Meitnerium	110 Ds Darmstadtium	111 Rg Roentgenium	112 Uub Ununbium	113 Uut Ununtrium	114 Uuq Ununquadium	115 Uup Ununpentium	116 Uuh Ununhexium	117 Uus Ununseptium	118 Uuo Ununoctium				
58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium								
90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium								

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

Bodhi Xerxes
Penelope Cayenne

Approach to solving APT

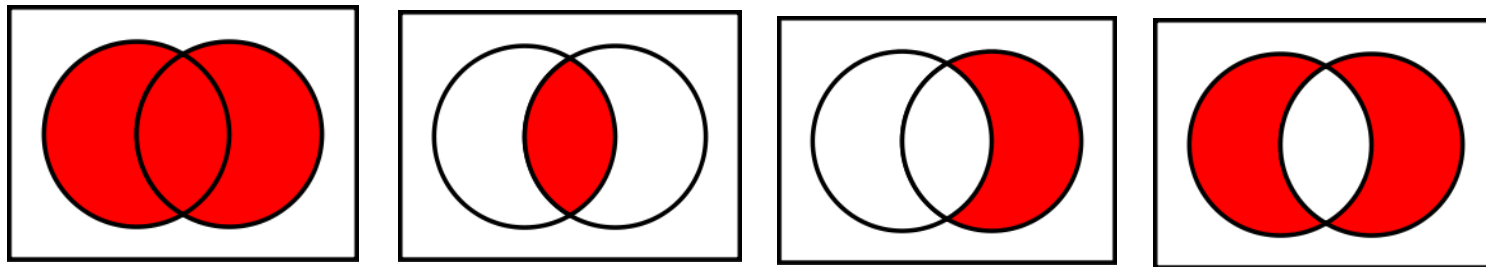
- **Loop over classes, find name/year, repeat**
 - Indexing loop? name/year, name/year, ...
 - Use `range(x,y,2)` for accessing every other entry
- **Add all student names to a list or a set**
 - How to make list contain no duplicates? Set
 - How to sort all the names? Sorted
- **Combine ideas, and done!**

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
- $A \cup B$, set union, $A \cap B$, set intersection
- $B - A$, set difference, $B \Delta A$, 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 ...