

Compsci 6: PFTW

- **Problem solving and (Python) programming**
 - What are the steps in solving an APT?
 - How do you get better at this?
 - How do you avoid getting frustrated? Cope with it?
- **Practice selection, abstraction, looping**
 - In the context of solving problems
 - El hombre bebe
- **Get ready for first assignment**
 - Difference between assignment and APTs?

Compsci 06/101, Spring 2011

4.1

How to solve an APT

- **Two very, very, very important steps**
 1. How to solve the problem with Paper, Pencil, (Calculator)
 2. How to translate problem-solving to Python
- **Both steps can be hard, vocabulary and language are initially a real barrier**
 - The more experience you have with Python, the easier step 2 will get
 - The more you understand the idioms and power of the language the more you can let step 2 influence step 1
- **Step 1 is key, without it you won't get anywhere**

Compsci 06/101, Spring 2011

4.2

APT Pancake

- **How do you solve this problem?**
 - First steps: are there simple cases that can be solved immediately?
 - What are these for the pancake problem?
 - How will you identify with Python?
 - Sometimes it helps to know if you are on track, use Python to check your paper and pencil work
- **Get specific, solve for 7, not N**
 - Fix one parameter, vary the other
 - Identify the cases and continue

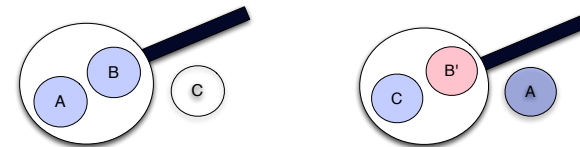


Compsci 06/101, Spring 2011

4.3

Three pancakes in a two-cake pan...

- **Number of cakes in the system**
 - First 5 minutes
- **Number of cakes in the system**
 - Second 5 minutes

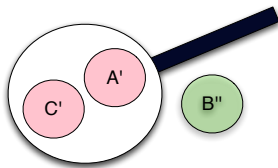


Compsci 06/101, Spring 2011

4.4

Three pancakes in a two-cake pan...

- Number of cakes in the system
 - Third 5 minutes
- How many minutes to cook all three pancakes?



Compsci 06/101, Spring 2011

4.5

How to teach pancake flipping

- http://www.youtube.com/watch?v=W_gxLKSsSIE
 - Is this computer science?
 - For longer, more complex robotic tasks
 - <http://www.youtube.com/watch?v=4usoE981e7I>

Back to specifics:

- Capacity = 7
- Numcakes = 1,2,...7?
- Numcakes = 8,9,10,11,12,13,14?
- Numcakes = 15,16,17,18,19,20?

Is seven special? 6? 5? 3?

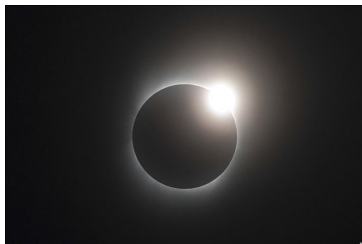


Compsci 06/101, Spring 2011

4.6

Eclipse Interlude

- Finishing the Pancake problem
 - Translating problem-solving ideas to code



Compsci 06/101, Spring 2011

4.7

Lessons: special cases, abstractions

- There are special cases in many, many problems
 - Identifying them is important
 - Abstracting them away when possible is important
 - Example: SilverDistance APT
 - Instead of four quadrants/cases, reducible to two?
 - Instead of (x,y) and (z,w) translate to (0,0) and (z-x,w-y)
- Translating ideas into (Python) code
 - How do we create interesting "heads", "totem poles" ?
 - How do create software for identikit?
 - How do we create Facebook, Foursquare, ...

Compsci 06/101, Spring 2011

4.8

How do you solve a problem like ...?

- **Translating English to Piglatin**
 - Why is this fascinating?
 - <http://www.google.com/webhp?hl=xx-piglatin>
 - Is this like translating English to German?
 - Is it like translating Python to bytecode?
- **"downplay their unique quiet strength"**
 - "ownplayday eirthay uniqueness ietquay engthstray"
 - What are the rules for pig-latin? See APT



Compsci 06/101, Spring 2011

4.9

APT Piglatin

- **How do you solve this problem?**
 - First steps: are there simple cases that can be solved immediately?
 - What are these for the piglatin problem?
 - How will you identify with Python?
 - Words that begin with ...
 - Vowel
 - Foods that begin with the letter 'q' for 200 Alex
- **Translation to Python**
 - First 'q', then vowels



Compsci 06/101, Spring 2011

4.10

Three versions of is_vowel

```
def is_vowel(ch):  
    if ch == 'e':  
        return True  
    if ch == 'a':  
        return True  
    if ch == 'i':  
        return True  
    if ch == 'o':  
        return True  
    if ch == 'u':  
        return True  
    return False
```

```
def is_vowel(ch):  
    c = "aeiou".count(ch)  
    if c > 0:  
        return True  
    else:  
        return False
```

```
def is_vowel(ch):  
    return "aeiou".count(ch) > 0
```

Compsci 06/101, Spring 2011

4.11

Piglatin, age-stay one-way

```
def convert(s):  
    if s[0] == 'q':  
        return s[2:]+"quay"  
    if is_vowel(s[0]):  
        return s+"way"
```

- **Review from last lab: slicing, concatenation, index**
 - Where does string-indexing start?
 - What does slice with a single parameter do?

Compsci 06/101, Spring 2011

4.12

Piglatin, age-stay o-tway

```
def convert(s):  
    if s[0] == 'q':  
        return s[2:]+ "quay"  
    if is_vowel(s[0]):  
        return s+"way"  
  
    if is_vowel(s[1]):  
        return s[1:]+s[0]+"ay"  
    if is_vowel(s[2]):  
        return s[2:]+s[:2]+"ay"  
    if is_vowel(s[3]):  
        return s[3:]+s[:3]+"ay"  
    if is_vowel(s[4]):  
        return s[4:]+s[:4]+"ay"
```

Compsci 06/101, Spring 2011

4.13

Piglatin, age-stay ee-threay

```
def convert(s):  
    if s[0] == 'q':  
        return s[2:]+ "quay"  
    if isvowel(s[0]):  
        return s + "way"  
  
    for index in range(1, len(s)):  
        if isvowel(s[index]):  
            return s[index:]+s[:index]+"ay"
```

- Generalize/parameterize by what varies

- What does a loop do? it repeats!

Compsci 06/101, Spring 2011

4.14

What does this do?

```
def changeup(s):  
    rep = ""  
    for ch in s:  
        rep = rep + ch*2  
    return rep
```

- What's new here, what's similar to what we know?

- What does it mean to loop over a string?
- How do we know it's a string?
- Code experiments to help reason (or just type and run?)
- Look again at Uppity.py?

Compsci 06/101, Spring 2011

4.15

Dawson Engler

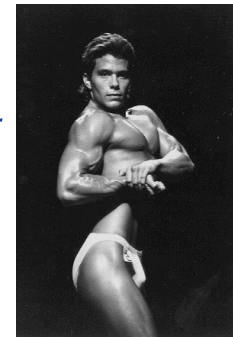
- ACM Hopper Award 2008

"In his papers on automated program checking, Dawson Engler introduces and develops powerful techniques and tools for practical program analysis for finding errors in code."

- Started coverity.com

- Very successful startup to find errors in code

- <http://myvideos.stanford.edu/player/slplayer.aspx?course=CS240&p=true>



Compsci 06/101, Spring 2011

4.16