Being Clever at Games, aka Cheating

- When you play solitaire, does the computer cheat?
  - What would this mean?
- When you play chess, who wins?
  - Computer? You?
- When you play Poker?
  - pokerstars.net
  - pokerstars.com
- Hangman???

IBM Watson

Watson was optimized to tackle a specific challenge: competing against the world's best Jeopardy! contestants.

Beyond Jeopardy!, the IBM team is working to deploy this technology across industries such as healthcare, finance and customer service.

Computer is clever at Hangman?

- Cheating/clever NOT OK! : user guesses 't'
  - Computer says 'no occurrence of t'
  - Later secret word is 'chocolate'

- Clever IS OK: user guesses 't' knowing that word is six letters with third letter 'r': _ _ r _ _ _
  - Computer's secret word is 'street'
  - Computer says 'no occurrence of t'
  - Changes secret word to 'person'
  - Why is this ok?

How to program clever game?

- Suppose the possible words are those here:
  [ "OBOE", "NOON", "ODOR", "ROOM", "TRIP", "SOLO", "PICK", "FRAT", "HOOP"]
- What happens if player guesses 'O' as the very first guess?
  - What should computer's secret word be?
- ["OBOE", "ODOR"] is an equivalence class
- ["NOON", "ROOM", "HOOP"] is too
- What about words with no O's?
Aside: Help in debugging programs

- Often very useful to print information
  - Contents of list, set, dictionary, ...
  - After computer winnows possible words?
  - After computer creates dictionary?

- We don't want debugging/print statements in released (final) code

```python
if _DEBUG:
    for key in d:
        print key, d[key]
```

How do we use global _DEBUG?

- If it's a global variable we don't need to declare it when we use it in a function when ...
  - If we write/change global variable must declare
  - If we read/access, don't need to declare! Use this!

- Sometimes useful to create print/debug function

```python
def debug(info):
    if _DEBUG:
        print info

d = {'a': 1, 'b': 2}
d[0] = 'c'
d
debug("%s has len %d" % (key, d[key]))
```

PHP, Rasmus Lerdorf and Others

- Rasmus Lerdorf
  - Qaqortoq, Greenland
  - 1995 started PHP, now part of it

- Personal Home Page
  - No longer an acronym

- “When the world becomes standard, I will start caring about standards.”

  Rasmus Lerdorf

Clever and Python reminders

- Dictionary keys must be immutable
  - Strings are good, lists are bad, tuples are ok
  - When can you write s[i] = 'c'? 

- Write a small amount of code and test it
  - Knowing where your bug is beats trying to find it
  - This is a skill you'll get much better at, but practice*3

- This program combines ... lists, dictionaries, sorting (or max), strings,
  - Plus it's both frustrating and fun