Dictionaries
Lab07: Scrabble

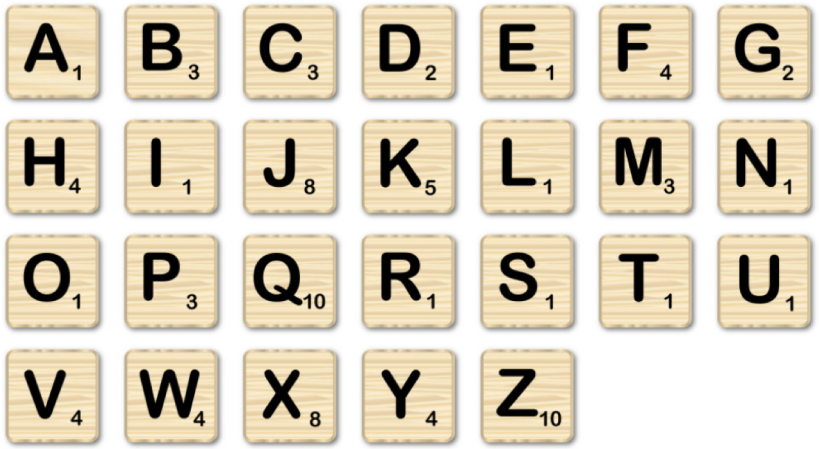
Announcements

- Submit all regrade requests by this Friday (03/05)
- Office hours:

  * 3:30pm – 5pm (Thursday)

  * 2pm – 3:00pm (Friday)

Lab07: Scrabble Word Finder



Point values for each letter of the alphabet

Input: string of letters

Output:

- All valid words that can be made using the input letters and their point values
- Output is printed or written to file.
  (See example on the right)

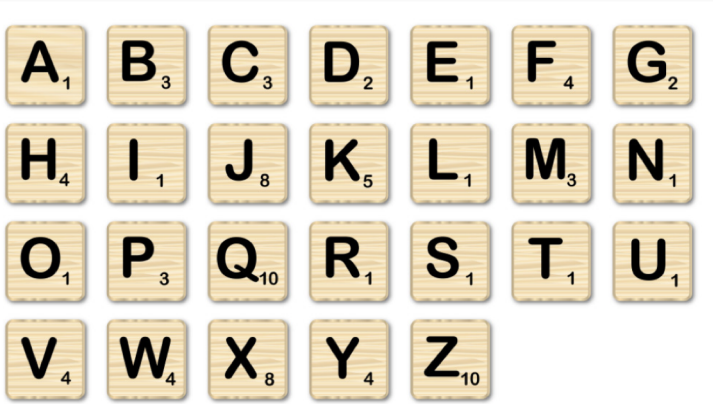
Example run of the program

```
>>> scrabbleWords('buoni')
obi       5
nub       5
nob       5
nib       5
bun       5
bio       5
bin       5
bi        4
uni       3
ion       3
on        2
nu        2
no        2
in        2
u         1
i         1
```

Break down the problem

1. Create a list of **valid** words that can be made with the given letters: **validWordList**
2. Calculate the point value of each word in **validWordList**
3. Print the word and point values in the desired format

```
>>> scrabbleWords('buoni')
obi       5
nub       5
nob       5
nib       5
bun       5
bio       5
bin       5
bi        4
uni       3
ion       3
on        2
nu        2
no        2
in        2
u         1
i         1
```



Sub problem 1: Creating a list of valid words

aah
aal
aalii
aardvark
aardwolf
aasvogel
aba
abac
abaca
aback
.....
.....
.....

bun
bi
bio
bin
i
ion
nub
nob
nib
nu
no
obi
on
in
u
uni

```
L = createWordList('wordlist.txt')

L: ['aah', 'aal', 'aali', 'aardvark',
     …, zymotic, zymurgy, zyzzyva]
```

How can we generate **validWordList** using **L** and **myLetters**? *Discuss with your partner*

wordlist.txt
contains all the valid words in the English Dictionary

validWordList
List of words in wordlist.txt that can be made with the letters myLetters

Sub problem 1:
Create a list of valid words

THIS IS PSEUDO CODE (NOT ALL OF IT IS PYTHON)

Input:
- File containing all valid words (filename)
- string of letters (myLetters)

Output: validWordList

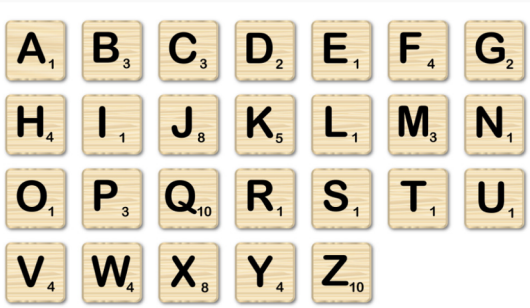
```
L = createWordList(filename)
validWordList = []
for each testWord in L
    if canWeMakeIt(testWord, myLetters)
        append testWord to validWordList
```

Sub problem 2: Calculate point values

INPUTS

```
bun
bi
bio
bin
i
ion
nub
nob
nib
nu
no
obi
on
in
u
uni
```

validWordList



letterPoints

OUTPUT

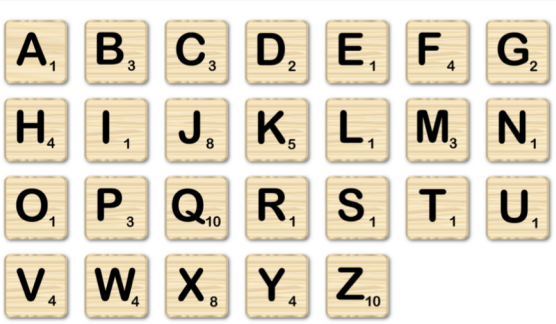
```
[(5, 'bun'),
(4, 'bi'),
(5, 'bio'),
(5, 'bin'),
(1, 'i'),
(3, 'ion'),
(5, 'nub'),
(5, 'nob'),
(5, 'nib'),
(2, 'nu'),
(2, 'no'),
(5, 'obi'),
(2, 'on'),
(2, 'in'),
(1, 'u'),
(3, 'uni')]
```

Write and use the helper function:
getWordPoints(myWord, letterPoints)

Python Dictionaries

- Used to store a collection of KEY: VALUE pairs
- A KEY maps to a VALUE
- Access each VALUE in the dictionary using the KEY as “index”
- Unlike lists there is no ordering of elements

Representing Scrabble Tiles in Python:




```
letterPoints ={'a':1, 'b':3,
'c':3, 'd':2, 'e':1, 'f’:4, …}
```

Concept Test

Which of the following is best suited for a dictionary instead of a list?

A. The order in which people finish a race.
B. The ingredients necessary for a recipe
C. The names of world countries and their capital cities
D. 50 random integers

Another example

- Let's say we're bird-watching, and we want to keep track of the number of each type of bird we've seen

kind	count
`falcon`	1
`owl`	5
`hawk`	2
`eagle`	11

- One approach: parallel lists
- The element `kinds[i]` corresponds with `counts[i]`

```
kinds = ['falcon', 'owl', 'hawk', 'eagle']
counts = [1, 5, 2, 11]
```

Concep Test:

```
def new_sighting(kinds, counts, sighting):
  '''(list of str, list of int, str) -> NoneType
  Add new sighting to parallel lists kinds and counts.
  '''

  if sighting not in kinds:
    kinds.append(sighting)
    ... missing code
  ind = kinds.index(sighting)
  counts[ind] = counts[ind] + 1
```

What code should go in place of the missing code?

A. `counts.append(0)`

B. `counts.append(1)`

C. `counts.append(kind)`

D. No code necessary there

Dictionaries vs. Parallel Lists

```
bird_dict=
{'falcon': 1, 'owl': 5, 'hawk': 2, 'eagle': 11}
```

- Rewrite the new_sighting function
- Compared to parallel lists:
  - Only one dict (not two)
  - No call to index that might search the whole list

Adding to dictionaries

- Keys must be immutable
- Values can be mutable or immutable
- Use d[k] = v to add key k with value v to dictionary d
  - If k is already present, its value is overwritten
- To copy all key/value pairs from another dictionary, use the `update` method

Getting Values from Dictionaries

- Use d[k] to obtain the value associated with key k of dictionary d
- If k does not exist, this causes an error
- The get method is similar, except it returns None instead of giving an error when the key does not exist
- If a second parameter v is provided, get returns v instead of None when the key is not found

Concept Test

What is dictionary `d` created by the following code?

```
d = {3:4}
d[5] = d.get(4, 8)
d[4] = d.get(3, 9)
```

- A. `{3:4, 5:8, 4:9}`
- B. `{3:4, 5:8, 4:4}`
- C. `{3:4, 5:4, 4:3}`
- D. Error caused by `get`

Concept Test

What is dictionary `d` created by the following code?

```
d = {1:5}
d[2] = d.get(1, 6)
d[4] = d.get(3, 7)
```

- A. `{1:5, 2:5, 4:7}`
- B. `{1:5, 2:6, 4:7}`
- C. `{1:5, 2:1, 4:2}`
- D. Error caused by `get`