

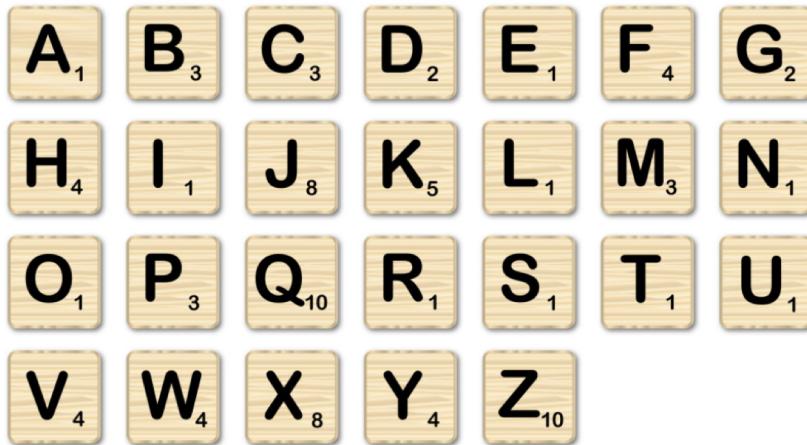
Dictionaries

Lab07: Scrabble

Announcements

- Submit all regrade requests by this Friday (11/30)
- Extra office hours:
 - * 2pm – 4pm today (Tuesday)
 - * 2pm – 5pm (Thursday)
 - * 3:30pm – 5:00pm (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)

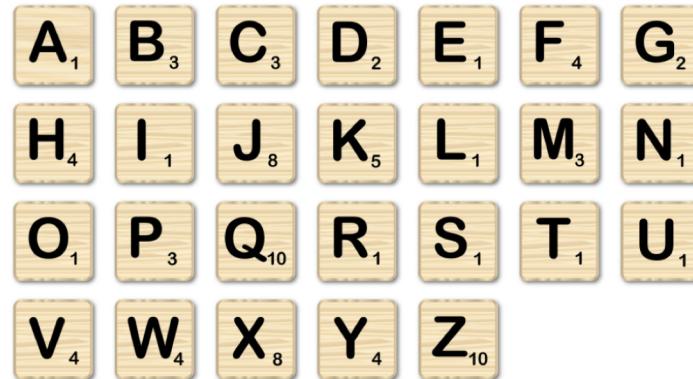
Example run of the program

```
>>> 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  
aali  
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, zyzyva]
```

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)

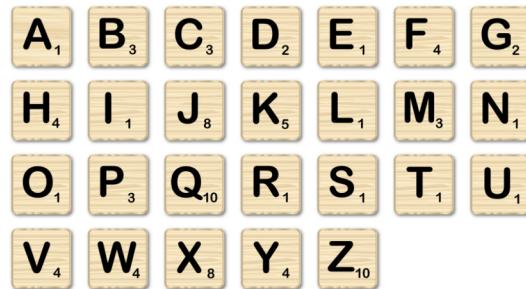
Output: validWordList

```
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