Problem 7: Hamlet Sentence Generator

Who needs Shakespeare when we've got Python? In the following series of exercises, we will create a function that will generate Shakesepearan-sounding phrases. All of the words in our phrase generator come from Act 3, Scene 1 of Shakespeare's Hamlet.

But we won't just be stringing random words together. To make our phrases sound (slightly) coherent, every new word in our phrase will be a word that followed the previous word in the original Shakespearean text.

We will accomplish this in three steps. First, we will tidy the text of the scene, breaking each sentence into an ordered list of the words in that sentence. Second, we will create a dictionary where the keys are words from the text, and the values are lists of the words that immediately follow the key words in the dialogue. Finally, we will create a phrase generator that will use that dictionary by starting with a key word, randomly selecting a word from the list of words that follows it, adding that word to our phrase, and repeating the process.

Here's the text of Hamlet Act 3, Scene 1. Run the next code cell

In [ ]:

```
hamlet_text = """

And can you by no drift of circumstance Get from him why he puts on this confusion
quiet With turbulent and dangerous lunacy? He does confess he feels himself distrac
no means speak. Nor do we find him forward to be sounded But with a crafty madness
him on to some confession Of his true state. Did he receive you well? Most like a g
his disposition. Niggard of question. but of our demands Most free in his reply. Di
Madam it so fell out that certain players We o'er-raught on the way. of these we to
kind of joy To hear of it. they are about the court And as I think they have alread
him. 'Tis most true. And he beseech'd me to entreat your majesties To hear and see
it doth much content me To hear him so inclined. Good gentlemen give him a further
these delights. We shall my lord. Sweet Gertrude leave us too. For we have closely
'twere by accident may here Affront Ophelia. Her father and myself lawful espials W
unseen We may of their encounter frankly judge And gather by him as he is behaved I
or no That thus he suffers for. I shall obey you. And for your part Ophelia I do wi
happy cause Of Hamlet's wildness. so shall I hope your virtues Will bring him to hi
honours. Madam I wish it may. Ophelia walk you here. Gracious so please you We will
book. That show of such an exercise may colour Your loneliness. We are oft to blame
with devotion's visage And pious action we do sugar o'er The devil himself. O 'tis
speech doth give my conscience! The harlot's cheek beautied with plastering art Is
helps it Than is my deed to my most painted word. O heavy burthen! I hear him comin
or not to be. that is the question. Whether 'tis nobler in the mind to suffer The s
fortune Or to take arms against a sea of troubles And by opposing end them? To die.
to say we end The heart-ache and the thousand natural shocks That flesh is heir to
wish'd. To die to sleep. To sleep. perchance to dream. ay there's the rub. For in t
come When we have shuffled off this mortal coil Must give us pause. there's the res
life. For who would bear the whips and scorns of time The oppressor's wrong the pro
despised love the law's delay The insolence of office and the spurns That patient m
himself might his quietus make With a bare bodkin? who would fardels bear To grunt
```

```
that the dread of something after death The undiscover'd country from whose bourn N
will And makes us rather bear those ills we have Than fly to others that we know no
cowards of us all. And thus the native hue of resolution Is sicklied o'er with the
enterprises of great pith and moment With this regard their currents turn awry And
now! The fair Ophelia! Nymph in thy orisons Be all my sins remember'd. Good my lord
many a day? I humbly thank you. well well well. My lord I have remembrances of your
re-deliver. I pray you now receive them. No not I. I never gave you aught. My honou
did. And with them words of so sweet breath composed As made the things more rich.
again. for to the noble mind Rich gifts wax poor when givers prove unkind. There my
lord? Are you fair? What means your lordship? That if you be honest and fair your h
to your beauty. Could beauty my lord have better commerce than with honesty? Ay tru
sooner transform honesty from what it is to a bawd than the force of honesty can tr
this was sometime a paradox but now the time gives it proof. I did love you once. I
so. You should not have believed me. for virtue cannot so inoculate our old stock b
you not. I was the more deceived. Get thee to a nunnery. why wouldst thou be a bree
indifferent honest. but yet I could accuse me of such things that it were better my
very proud revengeful ambitious with more offences at my beck than I have thoughts
them shape or time to act them in. What should such fellows as I do crawling betwee
knaves all. believe none of us. Go thy ways to a nunnery. Where's your father? At h
upon him that he may play the fool no where but in's own house. Farewell. O help hi
marry I'll give thee this plague for thy dowry. be thou as chaste as ice as pure as
calumny. Get thee to a nunnery go. farewell. Or if thou wilt needs marry marry a fo
what monsters you make of them. To a nunnery go and quickly too. Farewell. O heaven
heard of your paintings too well enough. God has given you one face and you make yo
amble and you lisp and nick-name God's creatures and make your wantonness your igno
it hath made me mad. I say we will have no more marriages. those that are married a
rest shall keep as they are. To a nunnery go. O what a noble mind is here o'erthrow
scholar's eye tongue sword. The expectancy and rose of the fair state The glass of
observed of all observers quite quite down! And I of ladies most deject and wretche
music vows Now see that noble and most sovereign reason Like sweet bells jangled ou
unmatch'd form and feature of blown youth Blasted with ecstasy. O woe is me To have
see! Love! his affections do not that way tend. Nor what he spake though it lack'd
There's something in his soul O'er which his melancholy sits on brood. And I do dou
be some danger. which for to prevent I have in quick determination Thus set it down
For the demand of our neglected tribute Haply the seas and countries different With
This something-settled matter in his heart Whereon his brains still beating puts hi
What think you on't? It shall do well. but yet do I believe The origin and commence
neglected love. How now Ophelia! You need not tell us what Lord Hamlet said. We hea
please. But if you hold it fit after the play Let his queen mother all alone entrea
be round with him. And I'll be placed so please you in the ear Of all their confere
send him or confine him where Your wisdom best shall think. It shall be so. Madness
go.

"""
```

Exercise 0 (3 pts): Create a list of lists, named `hamsplits`, such that `hamsplits[i]` is a list of all the words in the `i`-th sentence of the text. The sentences should be stored in the order that they appear, and so should the words within each sentence.

Regarding how to break up the text into sentences and how to store the words, the guidelines are as follows:

- Sentences end with `'.'`, `'?'`, and `'!'`.
- You should convert all letters to lowercase.

- For each word, strip out any punctuation.

For instance, in the text above, the first and last sentences would be:

```
hamsplits[0] == ['and', 'can', 'you', 'by', ..., 'dangerous', 'lunacy']
hamsplits[-1] == ['madness', 'in', 'great', ..., 'not', 'unwatchd', 'go']
```

In [ ]:

```
import re
import string

# Define the punctuation characters you want to keep
keep_punctuation = '.?!'

# Create a set of punctuation characters to remove (all except '.', '?', '!')
remove_punctuation = set(string.punctuation) - set(keep_punctuation)

# Create a translation table that maps each punctuation character to be removed to
translation_table = str.maketrans('', '', ''.join(remove_punctuation))


# Use the translate() method with the translation table to remove unwanted punctuat
stripped_text = hamlet_text.translate(translation_table)

hamsplits = []

###
# Split the text by '.', '?' or '!'
sentences = re.split(r'[.?!]', stripped_text.lower())
###
sentences = [s.strip() for s in sentences]


ham_sentence_split = [s.split() for s in sentences]

ham_sentence_split

hamsplits = [i for i in ham_sentence_split if i]
len(hamsplits)
```

Out[ ]:

```
145
```

In [ ]:

```
#  Hamsplit test Cell

assert type(hamsplits) is list
assert len(hamsplits) == 145, "You found {} sentences instead of 145.".format(len(h
for i, w in [(4, ['did', 'he', 'receive', 'you', 'well']),
             (5, ['most', 'like', 'a', 'gentleman']),
             (21, ['sweet', 'gertrude', 'leave', 'us', 'too'])]:
    print('Sentence {} has the words {}'.format(i, w), "-->", 'Your hamsplits says
    assert hamsplits[i] == w

print("\n(Passed!)")
```

```
Sentence 4 has the words ['did', 'he', 'receive', 'you', 'well'] --> Your hamsplits
says ['did', 'he', 'receive', 'you', 'well']
Sentence 5 has the words ['most', 'like', 'a', 'gentleman'] --> Your hamsplits says
['most', 'like', 'a', 'gentleman']
Sentence 21 has the words ['sweet', 'gertrude', 'leave', 'us', 'too'] --> Your hamsp
lits says ['sweet', 'gertrude', 'leave', 'us', 'too']

(Passed!)
```

Exercise 1 (3 pts): Now create a sequential pairs dictionary, called `hamdict`, with `key` being each word in `hamsplits` and `value` being the list of words that immediately following it. If no words ever follow the given word, then it should not appear as a key in `hamdict`.

For example, if `hamsplits == [ ['i', 'love', 'georgia', 'tech'], ['gotta', 'love', 'python'] ]`, then

```
hamdict == {'i': ['love'], 'love': ['georgia', 'python'], 'georgia':
['tech'], 'gotta': ['love']}
```

Notice that no words ever follow `'tech'` nor `'python'`; therefore, they do not appear as keys in `hamdict`.

In [ ]:

```
# We now want to make a sequential pairs dictionary.
hamdict = {}
for word_list in hamsplits:
    for i in range(0, len(word_list)-1):
        key = (word_list[i])
        value = word_list[i+1]
        if key in hamdict:
            if value not in hamdict[key]:
                hamdict[key].append(value)
        else:
            hamdict[key] = [value]
hamdict
```

```
Out[ ]:  {'and': ['can',
           'dangerous',
           'there',
           'as',
           'he',
           'see',
           'it',
           'drive',
           'myself',
           'gather',
           'for',
           'pious',
           'arrows',
           'by',
           'the',
           'scorns',
           'sweat',
           'makes',
           'thus',
           'enterprises',
           'moment',
           'lose',
           'with',
           'fair',
           'heaven',
           'quickly',
           'you',
           'nickname',
           'make',
           'rose',
           'i',
           'wretched',
           'most',
           'harsh',
           'feature',
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           'we',
           'now',
           'aught',
           'know',
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           'not',
           'sweet',
           'make',
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           'jig',
           'amble',
           'lisp',
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           'please',
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           'in'],
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           'that',
           'more',
           'traveller',
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           'quiet',
           'his',
           'question',
           'our',
           'these',
           'joy',
           'it',
           'their',
           'hamlets',
           'such',
           'outrageous',
           'troubles',
           'death',
           'so',
           'time',
           'despised',
           'office',
           'the',
           'something',
           'us',
           'resolution',
           'thought',
           'great',
           'action',
           'yours',
           'beauty',
           'honesty',
           'sinners',
           'them',
           'your',
           'fashion',
           'form',
           'all',
           'ladies',
           'tune',
           'blown',
           'himself'],
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          'get': ['from', 'thee'],
          'from': ['him', 'what', 'whose', 'fashion', 'neglected'],
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           'forward',
           'on',
           'a',
           'so',
           'as',
           'to',
           'coming',
           'that',
           'you',
           'thus',
           'not',
           'or',
           'where'],
          'why': ['he', 'wouldst'],
          'he': ['puts',
           'does',
           'feels',
           'will',
           'receive',
           'beseechd',
           'as',
           'is',
           'suffers',
           'himself',
           'may',
           'spake',
           'shall'],
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          'on': ['this', 'to', 'the', 'brood'],
          'this': ['confusion',
           'night',
           'book',
           'tis',
           'mortal',
           'regard',
           'many',
           'was',
           'plague',
           'somethingsettled'],
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          'grating': ['so'],
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           'fell',
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           'quietus',
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           'brains',
           'grief',
           'queen'],
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           'all',
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           'them',
           'honesty',
           'more',
           'ecstasy',
           'speed',
           'variable',
           'him'],
          'turbulent': ['and'],
          'dangerous': ['lunacy'],
          'does': ['confess', 'make', 'your'],
          'confess': ['he'],
          'feels': ['himself'],
          'himself': ['distracted', 'might'],
          'but': ['from', 'with', 'of', 'that', 'now', 'we', 'yet', 'ins', 'one', 'if'],
          'what': ['cause',
           'dreams',
           'means',
           'it',
           'should',
           'monsters',
           'a',
           'i',
           'he',
           'think',
           'lord'],
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          'will': ['by', 'so', 'bring', 'bestow', 'and', 'sooner', 'have', 'be'],
          'means': ['speak', 'your'],
          'nor': ['do', 'what'],
          'do': ['we', 'wish', 'sugar', 'crawling', 'not', 'doubt', 'well', 'i', 'as'],
          'we': ['find',
           'would',
           'oerraught',
           'told',
           'shall',
           'have',
           'may',
           'will',
           'are',
           'do',
           'end',
           'know',
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           'my',
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           'sleep',
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           'in'],
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           'lordship',
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           'lord',
           'conscience',
           'deed',
           'most',
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           'honourd',
           'mother',
           'beck'],
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          'drive': ['his'],
          'purpose': ['on'],
          'shall': ['my',
           'obey',
           'i',
           'relish',
           'live',
           'keep',
           'with',
           'expel',
           'do',
           'think',
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          'leave': ['us'],
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           'your',
           'in',
           'who',
           'this',
           'to',
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           'thy',
           'wise'],
          'closely': ['sent'],
          'sent': ['for'],
          'hamlet': ['hither', 'said'],
          'hither': ['that'],
          'twere': ['by'],
          'accident': ['may'],
          'may': ['here', 'of', 'colour', 'come', 'play'],
          'here': ['affront', 'oerthrown'],
          'affront': ['ophelia'],
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          'father': ['and'],
          'myself': ['lawful', 'indifferent'],
          'lawful': ['espials'],
          'espials': ['will'],
          'bestow': ['ourselves'],
          'ourselves': ['that'],
          'seeing': ['unseen'],
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          'their': ['encounter', 'currents', 'perfume', 'conference'],
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          'judge': ['and'],
          'gather': ['by'],
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          'if': ['t', 'you', 'thou', 'she'],
          't': ['be'],
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          'love': ['or', 'the', 'you'],
          'or': ['no', 'not', 'to', 'time', 'if', 'confine'],
          'thus': ['he', 'conscience', 'the', 'set', 'from'],
          'suffers': ['for'],
          'obey': ['you'],
          'part': ['ophelia'],
          'ophelia': ['i', 'walk'],
          'wish': ['that', 'it'],
          'beauties': ['be'],
          'happy': ['cause'],
          'hamlets': ['wildness'],
          'hope': ['your'],
          'virtues': ['will'],
          'wonted': ['way'],
          'way': ['again', 'tend'],
          'again': ['to'],
          'both': ['your'],
          'walk': ['you'],
          'gracious': ['so'],
          'please': ['you'],
          'read': ['on'],
          'show': ['of', 'his'],
          'such': ['an', 'things', 'fellows'],
          'an': ['exercise'],
          'exercise': ['may'],
          'colour': ['your'],
          'oft': ['to'],
          'blame': ['in'],
          'too': ['much', 'true', 'well'],
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          'how': ['smart', 'does', 'now'],
          'smart': ['a'],
          'lash': ['that'],
          'speech': ['doth'],
          'harlots': ['cheek'],
          'cheek': ['beautied'],
          'beautied': ['with'],
          'plastering': ['art'],
          'art': ['is'],
          'not': ['more',
           'to',
           'of',
           'i',
           'have',
           'borne',
           'escape',
           'that',
           'like',
           'tell',
           'unwatchd'],
          'more': ['ugly', 'rich', 'deceived', 'offences', 'ont', 'marriages'],
          'ugly': ['to'],
          'thing': ['that'],
          'helps': ['it'],
          'than': ['is', 'fly', 'with', 'the', 'i'],
          'deed': ['to'],
          'painted': ['word'],
          'heavy': ['burthen'],
          'lets': ['withdraw'],
          'withdraw': ['my'],
          'whether': ['tis'],
          'nobler': ['in'],
          'mind': ['to', 'rich', 'is'],
          'suffer': ['the'],
          'slings': ['and'],
          'arrows': ['of'],
          'outrageous': ['fortune'],
          'fortune': ['or'],
          'take': ['arms', 'these'],
          'arms': ['against'],
          'against': ['a'],
          'sea': ['of'],
          'troubles': ['and'],
          'opposing': ['end'],
          'end': ['them', 'the'],
          'sleep': ['to', 'of'],
          'say': ['we'],
          'heartache': ['and'],
          'thousand': ['natural'],
          'natural': ['shocks'],
          'shocks': ['that'],
          'flesh': ['is'],
          'heir': ['to'],
          'consummation': ['devoutly'],
          'devoutly': ['to'],
          'die': ['to'],
          'perchance': ['to'],
          'ay': ['theres', 'truly'],
          'theres': ['the', 'something'],
          'death': ['what', 'the'],
          'dreams': ['may'],
          'come': ['when'],
          'shuffled': ['off'],
          'off': ['this'],
          'mortal': ['coil'],
          'coil': ['must'],
          'must': ['give', 'not'],
          'respect': ['that'],
          'makes': ['calamity', 'us'],
          'calamity': ['of'],
          'long': ['life', 'to'],
          'who': ['would'],
          'bear': ['the', 'to', 'those'],
          'whips': ['and'],
          'scorns': ['of'],
          'time': ['the', 'gives', 'to'],
          'oppressors': ['wrong'],
          'wrong': ['the'],
          'proud': ['mans', 'revengeful'],
          'mans': ['contumely'],
          'contumely': ['the'],
          'pangs': ['of'],
          'despised': ['love'],
          'laws': ['delay'],
          'delay': ['the'],
          'insolence': ['of'],
          'office': ['and'],
          'spurns': ['that'],
          'patient': ['merit'],
          'merit': ['of'],
          'unworthy': ['takes'],
          'takes': ['when'],
          'might': ['his'],
          'quietus': ['make'],
          'make': ['with', 'cowards', 'of', 'yourselves', 'your'],
          'bare': ['bodkin'],
          'fardels': ['bear'],
          'grunt': ['and'],
          'sweat': ['under'],
          'under': ['a'],
          'weary': ['life'],
          'life': ['but'],
          'dread': ['of'],
          'something': ['after', 'in'],
          'after': ['death', 'the'],
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          'country': ['from'],
          'whose': ['bourn'],
          'bourn': ['no'],
          'traveller': ['returns'],
          'returns': ['puzzles'],
          'puzzles': ['the'],
          'rather': ['bear'],
          'those': ['ills', 'that'],
          'ills': ['we'],
          'fly': ['to'],
          'others': ['that'],
          'know': ['not', 'right', 'well'],
          'conscience': ['does'],
          'cowards': ['of'],
          'native': ['hue'],
          'hue': ['of'],
          'resolution': ['is'],
          'sicklied': ['oer'],
          'pale': ['cast'],
          'cast': ['of'],
          'thought': ['and'],
          'enterprises': ['of'],
          'great': ['pith', 'ones'],
          'pith': ['and'],
          'moment': ['with'],
          'regard': ['their'],
          'currents': ['turn'],
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          'awry': ['and'],
          'lose': ['the'],
          'name': ['of'],
          'soft': ['you'],
          'fair': ['ophelia', 'your', 'state'],
          'nymph': ['in'],
          'thy': ['orisons', 'ways', 'dowry'],
          'orisons': ['be'],
          'sins': ['rememberd'],
          'lord': ['how', 'i', 'you', 'have', 'hamlet', 'do'],
          'honour': ['for'],
          'many': ['a'],
          'humbly': ['thank'],
          'thank': ['you'],
          'well': ['well', 'you', 'enough'],
          'remembrances': ['of'],
          'yours': ['that'],
          'longed': ['long'],
          'pray': ['you'],
          'now': ['receive', 'the', 'see', 'ophelia'],
          'never': ['gave'],
          'gave': ['you'],
          'honourd': ['lord'],
          'right': ['well'],
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          'words': ['of'],
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          'things': ['more', 'that'],
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          'lost': ['take'],
          'noble': ['mind', 'and'],
          'rich': ['gifts'],
          'gifts': ['wax'],
          'wax': ['poor'],
          'poor': ['when'],
          'givers': ['prove'],
          'prove': ['unkind'],
          'ha': ['ha'],
          'honest': ['and'],
          'honesty': ['should', 'from', 'can'],
          'should': ['admit', 'not', 'such'],
          'admit': ['no'],
          'discourse': ['to'],
          'could': ['beauty', 'accuse'],
          'beauty': ['my', 'will', 'into'],
          'better': ['commerce', 'my'],
          'commerce': ['than'],
          'power': ['of'],
          'sooner': ['transform'],
          'transform': ['honesty'],
          'bawd': ['than'],
          'force': ['of'],
          'translate': ['beauty'],
          'into': ['his'],
          'was': ['sometime', 'the', 'not'],
          'sometime': ['a'],
          'paradox': ['but'],
          'gives': ['it'],
          'indeed': ['my'],
          'believe': ['so', 'none', 'the'],
          'believed': ['me'],
          'virtue': ['cannot'],
          'cannot': ['so'],
          'inoculate': ['our'],
          'old': ['stock'],
          'stock': ['but'],
          'relish': ['of'],
          'loved': ['you'],
          'thee': ['to', 'this'],
          'wouldst': ['thou'],
          'thou': ['be', 'dost', 'as', 'shalt', 'wilt'],
          'breeder': ['of'],
          'am': ['myself', 'very'],
          'indifferent': ['honest'],
          'yet': ['i', 'do'],
          'accuse': ['me'],
          'were': ['better'],
          'mother': ['had', 'all'],
          'had': ['not'],
          'borne': ['me'],
          'very': ['proud'],
          'revengeful': ['ambitious'],
          'ambitious': ['with'],
          'offences': ['at'],
          'at': ['my', 'home'],
          'beck': ['than'],
          'thoughts': ['to'],
          'put': ['them'],
          'imagination': ['to'],
          'shape': ['or'],
          'act': ['them'],
          'fellows': ['as'],
          'crawling': ['between'],
          'between': ['earth'],
          'earth': ['and'],
          'arrant': ['knaves'],
          'knaves': ['all'],
          'none': ['of'],
          'go': ['thy', 'and', 'to'],
          'ways': ['to'],
          'wheres': ['your'],
          'home': ['my'],
          'let': ['the', 'his', 'her'],
          'doors': ['be'],
          'shut': ['upon'],
          'upon': ['him'],
          'fool': ['no'],
          'where': ['but', 'your'],
          'ins': ['own'],
          'own': ['house'],
          'help': ['him'],
          'dost': ['marry'],
          'marry': ['ill', 'marry', 'a'],
          'ill': ['give', 'no', 'be'],
          'plague': ['for'],
          'chaste': ['as'],
          'ice': ['as'],
          'pure': ['as'],
          'snow': ['thou'],
          'shalt': ['not'],
          'escape': ['calumny'],
          'nunnery': ['go'],
          'wilt': ['needs'],
          'needs': ['marry'],
          'wise': ['men'],
          'men': ['know'],
          'enough': ['what'],
          'monsters': ['you'],
          'quickly': ['too'],
          'heavenly': ['powers'],
          'powers': ['restore'],
          'restore': ['him'],
          'heard': ['of', 'it'],
          'paintings': ['too'],
          'god': ['has'],
          'has': ['given'],
          'given': ['you'],
          'one': ['face', 'shall'],
          'face': ['and'],
          'yourselves': ['another'],
          'jig': ['you'],
          'amble': ['and'],
          'lisp': ['and'],
          'nickname': ['gods'],
          'gods': ['creatures'],
          'creatures': ['and'],
          'wantonness': ['your'],
          'hath': ['made'],
          'married': ['already'],
          'rest': ['shall'],
          'keep': ['as'],
          'courtiers': ['soldiers'],
          'soldiers': ['scholars'],
          'scholars': ['eye'],
          'eye': ['tongue'],
          'tongue': ['sword'],
          'expectancy': ['and'],
          'rose': ['of'],
          'state': ['the'],
          'glass': ['of'],
          'fashion': ['and', 'of'],
          'mould': ['of'],
          'form': ['the', 'and', 'a'],
          'observed': ['of'],
          'observers': ['quite'],
          'quite': ['quite', 'down'],
          'ladies': ['most'],
          'deject': ['and'],
          'wretched': ['that'],
          'suckd': ['the'],
          'honey': ['of'],
          'music': ['vows'],
          'vows': ['now'],
          'sovereign': ['reason'],
          'reason': ['like'],
          'bells': ['jangled'],
          'jangled': ['out'],
          'tune': ['and'],
          'unmatchd': ['form'],
          'feature': ['of'],
          'blown': ['youth'],
          'youth': ['blasted'],
          'blasted': ['with'],
          'woe': ['is'],
          'seen': ['what', 'see'],
          'affections': ['do'],
          'spake': ['though'],
          'though': ['it'],
          'lackd': ['form'],
          'little': ['was'],
          'soul': ['oer'],
          'which': ['his', 'for'],
          'melancholy': ['sits'],
          'sits': ['on'],
          'doubt': ['the'],
          'hatch': ['and'],
          'disclose': ['will'],
          'prevent': ['i'],
          'quick': ['determination'],
          'determination': ['thus'],
          'set': ['it'],
          'speed': ['to'],
          'england': ['for', 'send'],
          'demand': ['of'],
          'neglected': ['tribute', 'love'],
          'tribute': ['haply'],
          'haply': ['the'],
          'seas': ['and'],
          'countries': ['different'],
          'different': ['with'],
          'variable': ['objects'],
          'objects': ['shall'],
          'expel': ['this'],
          'somethingsettled': ['matter'],
          'matter': ['in'],
          'heart': ['whereon'],
          'whereon': ['his'],
          'brains': ['still'],
          'still': ['beating'],
          'beating': ['puts'],
          'origin': ['and'],
          'commencement': ['of'],
          'grief': ['sprung'],
          'sprung': ['from'],
          'need': ['not'],
          'tell': ['us'],
          'hold': ['it'],
          'fit': ['after'],
          'queen': ['mother'],
          'alone': ['entreat'],
          'round': ['with'],
          'placed': ['so'],
          'ear': ['of'],
          'she': ['find'],
          'send': ['him'],
          'confine': ['him'],
          'wisdom': ['best'],
          'best': ['shall'],
          'ones': ['must'],
          'unwatchd': ['go']}
```

In [ ]:

```
# Hamdict test cell
assert type(hamdict) is dict
assert len(hamdict) == 552

ans_key = {'some': ['confession', 'danger'],
           'thou': ['be', 'dost', 'as', 'shalt', 'wilt'],
           'should': ['admit', 'not', 'such']}

for k, v in ans_key.items():
    assert len(hamdict[k]) == len(v)
    assert set(hamdict[k]) == set(v)

print ("\n(Passed!)")
```

```
(Passed!)
```

Exercise 2 (4 pts): Now it's time to build your folio!

Below, write a function, `hambot`, that takes a starter word from your dictionary and builds a Shakespearean-sounding phrase, returning it as a string.

Your function should randomly select one of the words that follows your starter word, add it to your phrase, and then repeat the process with this new word. This process should continue until either your function reaches a word that is not a key in your dictionary, or the phrase reaches the specified length. Your function should then return this phrase as a string (all lowercase, with no punctuation).

The function takes two optional parameters, `length` and `starter`. `length` is an integer which is the number of words long your output phrase should be. If the `length` parameter is not supplied, your function should default to attempting to produce a 5-word phrase.

`starter` is the first word to start your phrase. If `starter` is not supplied, your function should choose a word at random from among the keys in your dictionary.

As an example, if your function starts with the word "some," the second word in your phrase would be either "confession" or "danger," the two words that follow "some." If it selected "confession," the third word would be "of," which is the only word that follows "confession." The fourth word would be randomly chosen from the 38 words that follow "of." In other words,

```
hambot(4, "some")
```

.... should return a string like, `"some confession of circumstance"`.

> Note: A useful Python function for choosing a random element of a list is `random.choice()`.

In [ ]:

```
import random

def hambot(length = 5, starter = False):
    ### START SOLUTION
    #randomly select a word out of the values of the starter word.
    #check if length of string matches the length, if not repeat the process
    #if key not in hamdict, then return the string
    newstr=""
    keys=list(hamdict.keys())
    # print(keys)
    if starter==False:
        starter=random.choice(keys)
    newstr=newstr+starter+" "
    numwords=len(newstr.split())
    print(numwords)
    while numwords<length:
        print("starter",starter)
        #print(hamdict[starter])
        if starter not in keys:
            print("enter if")
            print(newstr)
            return newstr.strip()
        else:
            pick_from=hamdict[starter]
            word=random.choice(pick_from)
            newstr=newstr+word+" "
            numwords=len(newstr.split())
            starter=word
            print(newstr)
    return(newstr.strip())
    ### END SOLUTION

hambot(4, "some")
```

```
1
starter some
some danger
starter danger
enter if
some danger
```

Out[ ]: 'some danger'

In [ ]:

```
randomham1 = hambot().split()[0]
randomham2 = hambot().split()[0]

print("Starter word 1:", randomham1)
print("Starter word 2:", randomham2)
```

```
1
starter say
say we
starter we
say we shall
starter shall
say we shall with
starter with
say we shall with all
1
starter o
o heavenly
starter heavenly
o heavenly powers
starter powers
o heavenly powers restore
starter restore
o heavenly powers restore him
Starter word 1: say
Starter word 2: o
```

In [ ]:

```
## hambot0 test Cell

print("\nFirst let's see if your function is getting random starter words:")

randomham1 = hambot().split()[0]
randomham2 = hambot().split()[0]

print("Starter word 1:", randomham1)
print("Starter word 2:", randomham2)

if randomham1 == randomham2:
    randomham1 = hambot().split()[0]
    randomham2 = hambot().split()[0]

    assert randomham1 != randomham2, "Alas, it doesn't appear your function is prod

print("\nForsooth, your function looks to be correctly choosing random words. Now l

hambot_test1 = hambot(4, "harlots")
hambot_test2 = hambot(4, "encounter")
hambot_test3 = hambot(4, "thousand")
hambot_test4 = hambot(starter = "rich")

hamanswer1 = 'harlots cheek beautied with'
hamanswer2 = 'encounter frankly judge and'
hamanswer3 = 'thousand natural shocks that'
hamanswer4 = 'rich gifts wax poor when'

assert hambot_test1 == hamanswer1, "Fie, hambot(4, 'harlots') should have produced
assert hambot_test2 == hamanswer2, "Fie, hambot(4, 'encounter') should have produce
assert hambot_test3 == hamanswer3, "Fie, hambot(4, 'thousand') should have produced
assert hambot_test4 == hamanswer4, "Fie, hambot(5, 'rich') should have produced '"

print('\nHuzzah, your function correctly assembled the test phrases.')
```

```
First let's see if your function is getting random starter words:
1
starter sea
sea of
starter of
sea of office
starter office
sea of office and
starter and
sea of office and nickname
1
starter after
after the
starter the
after the origin
starter origin
after the origin and
starter and
after the origin and the
Starter word 1: sea
Starter word 2: after

Forsooth, your function looks to be correctly choosing random words. Now let's test
a few non-random phrases....
1
starter harlots
harlots cheek
starter cheek
harlots cheek beautied
starter beautied
harlots cheek beautied with
1
starter encounter
encounter frankly
starter frankly
encounter frankly judge
starter judge
encounter frankly judge and
1
starter thousand
thousand natural
starter natural
thousand natural shocks
starter shocks
thousand natural shocks that
1
starter rich
rich gifts
starter gifts
rich gifts wax
starter wax
rich gifts wax poor
starter poor
rich gifts wax poor when

Huzzah, your function correctly assembled the test phrases.
```

In [ ]:

```
## hambot1 test Cell

rand_ham = hambot(50)

print('\nAs Shakespeare once said, \n\n"' + rand_ham +'."')

rand_ham_words = rand_ham.split()

assert len(rand_ham_words) <= 50, "Alas! Your verbosity doth be too much. (You gene
if len(rand_ham_words) < 50:
    last_word = rand_ham_words[-1]
    assert last_word not in hamdict, "Your sentence be too short! Valid words, be t

if len(rand_ham_words) >= 2:
    for word0, word1 in zip(rand_ham_words[:-1], rand_ham_words[1:]):
        valid = hamdict[word0]
        assert word1 in valid, "Zounds! {} mustn't follow {}; only these be allowed

print("\n(Thou has't most verily passed!)")
```

```
1
starter be
be so
starter so
be so inclined
starter inclined
enter if
be so inclined

As Shakespeare once said,

"be so inclined."

(Thou has't most verily passed!)
```

** Fin ** You've reached the end of this problem. Don't forget to restart the kernel and run the entire notebook from top-to-bottom to make sure you did everything correctly. If that is working, try submitting this problem. (Recall that you *must* submit and pass the autograder to get credit for your work.)