

Part of speech and n-grams

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```
In [160]: import numpy as np
import pandas as pd
import re
import os
import codecs
from sklearn import feature_extraction
import nltk
from nltk.stem import PorterStemmer
from nltk.tokenize import WordPunctTokenizer
from __future__ import division
import collections
```

Import text file

```
In [161]: file = '/Users/SeanOMalley1/Desktop/MSDS_Text_Analytics/Information_Retrieval/pg25
519.txt'

with codecs.open(file, "r", encoding="utf-8") as f:
    oz = f.read()
```

Remove photo fillers

```
In [162]: oz = oz.replace("[Illustration]", "")
oz = oz.lower()
```

Split text into chapters

```
In [163]: # Chapter 1
ch_1 = oz.split("the cowardly lion and the hungry tiger")[1]
ch_1 = ch_1.split("little dorothy and toto")[0]

# Chapter 2
ch_2 = oz.split("little dorothy and toto")[1]
ch_2 = ch_2.split("tiktok and the nome king")[0]

# Chapter 3
ch_3 = oz.split("tiktok and the nome king")[1]
ch_3 = ch_3.split("ozma and the little wizard")[0]

# Chapter 4
ch_4 = oz.split("ozma and the little wizard")[1]
ch_4 = ch_4.split("jack pumpkinhead and the sawhorse")[0]

# Chapter 5
ch_5 = oz.split("jack pumpkinhead and the sawhorse")[1]
ch_5 = ch_5.split("the scarecrow and the tin woodman")[0]

# Chapter 6
ch_6 = oz.split("the scarecrow and the tin woodman", 1)[1]
```

Put newly split text into a corpus

```
In [164]: oz_doc = (ch_1,ch_2,ch_3,ch_4,ch_5,ch_6)
```

Remove stopwords and lowercase in each chapter

```
In [165]: esw = nltk.corpus.stopwords.words('english')
esw.append("would")
word_pattern = re.compile("^\\w+$")

def get_text(text):
    tokens =
nltk.tokenize.WordPunctTokenizer().tokenize(PorterStemmer().stem(text))
    tokens = list(map(lambda x: x.lower(), tokens))
    tokens = [token for token in tokens if re.match(word_pattern, token) and token
not in esw]
    return (tokens)
```

Now, we need to iterate through all chapters to get all words in the order they happen, with having removed stopwords and upper case. In doing so, we are prepping the data for the ngram process.

```
In [166]: for x in oz_doc:
oz_doc = get_text(x)
```

Begin n-gram process

```
In [167]: from nltk.util import ngrams
```

unigram : assumes no dependency between words

```
In [168]: oz_unigram = list(ngrams(oz_doc, 1, 2))
          oz_unigram
```

```
Out[168]: [('lived',),
            ('land',),
            ('oz',),
            ('two',),
            ('queerly',),
            ('made',),
            ('men',),
            ('best',),
            ('friends',),
            ('much',),
            ('happier',),
            ('together',),
            ('seldom',),
            ('apart',),
            ('yet',),
            ('liked',),
            ('separate',),
            ('might',),
            ('enjoy',),
            ('pleasure',),
            ('meeting',),
            ('one',),
            ('scarecrow',),
            ('means',),
            ('suit',),
            ('blue',),
            ('munchkin',),
            ('clothes',),
            ('stuffed',),
            ('straw',),
            ('top',),
            ('fastened',),
            ('round',),
            ('cloth',),
            ('head',),
            ('filled',),
            ('bran',),
            ('hold',),
            ('shape',),
            ('head',),
            ('painted',),
            ('two',),
            ('eyes',),
            ('two',),
            ('ears',),
            ('nose',),
            ('mouth',),
            ('scarecrow',),
            ('never',),
            ('much',),
            ('success',),
            ('scaring',),
            ('crows',),
            ('prided',),
            ('superior',),
            ('man',),
            ('could',),
            ('feel',),
            ('pain',),
            ('never',),
            ('tired',),
            ('eat',),
            ('drink',),
```

('brains',),
('sharp',),
('wizard',),
('oz',),
('put',),
('pins',),
('needles',),
('scarecrow',),
('brains',),
('man',),
('made',),
('tin',),
('arms',),
('legs',),
('head',),
('cleverly',),
('jointed',),
('could',),
('move',),
('freely',),
('known',),
('tin',),
('woodman',),
('one',),
('time',),
('woodchopper',),
('everyone',),
('loved',),
('wizard',),
('given',),
('excellent',),
('heart',),
('red',),
('plush',),
('tin',),
('woodman',),
('lived',),
('magnificent',),
('tin',),
('castle',),
('built',),
('country',),
('estate',),
('winkie',),
('land',),
('far',),
('emerald',),
('city',),
('oz',),
('pretty',),
('tin',),
('furniture',),
('surrounded',),
('lovely',),
('gardens',),
('many',),
('tin',),
('trees',),
('beds',),
('tin',),
('flowers',),
('palace',),
('scarecrow',),
('far',),

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('banks',),
('river',),
('palace',),
('shape',),
('immense',),
('ear',),
('corn',),
('one',),
('morning',),
('tin',),
('woodman',),
('went',),
('visit',),
('friend',),
('scarecrow',),
('nothing',),
('better',),
('decided',),
('take',),
('boat',),
('ride',),
('river',),
('got',),
('scarecrow',),
('boat',),
('formed',),
('big',),
('corncob',),
('hollowed',),
('pointed',),
('ends',),
('decorated',),
('around',),
('edges',),
('brilliant',),
('jewels',),
('sail',),
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('silk',),
('glittered',),
('gayly',),
('sunshine',),
('good',),
('breeze',),
('day',),
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('swiftly',),
('water',),
('came',),
('smaller',),
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('flowed',),
('deep',),
('forest',),
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('stream',),
('cool',),
('shady',),
('beneath',),

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('much',),
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('jar',),
('made',),
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('fell',),
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('naughty',),
('king',),
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('crotch',),
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('still',),
('clung',),
('fast',),
('iron',),
('anchor',),
('hung',),
('ten',),
('feet',),
('apart',),
('yet',),
('unable',),
('reach',),
('bare',),
('tree',),
('trunk',),
('goodness',),
('sake',),
('drop',),
('anchor',),
('said',),
('tin',),
('woodman',),
('anxiously',),
('inquired',),
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('tumble',),
('ground',),
('tin',),
('badly',),
('dented',),
('fall',),
('also',),
('shoot',),
('air',),
('alight',),

('somewhere',),
('among',),
('tree',),
('tops',),
('said',),
('scarecrow',),
('earnestly',),
('shall',),
('hold',),
('fast',),
('anchor',),
('time',),
('dangled',),
('silence',),
('breeze',),
('swaying',),
('gently',),
('fro',),
('finally',),
('tin',),
('man',),
('said',),
('emergency',),
('friend',),
('brains',),
('help',),
('us',),
('must',),
('think',),
('way',),
('escape',),
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('sharpest',),
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('man',),
('grew',),
('tired',),
('tried',),
('change',),
('position',),
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('joints',),
('already',),
('rusted',),
('badly',),
('could',),
('move',),
('oil',),
('back',),
('boat',),
('suppose',),
('brains',),
('rusted',),
('friend',),
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('ah',),
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('sailed',),
('top',),
('tree',),
('landed',),
('bramble',),
('bush',),
('tin',),
('man',),
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('dry',),
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('joints',),
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('thorns',),
('held',),
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('prisoner',),
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('sound',),
('hoofs',),
('heard',),
('along',),
('forest',),
('path',),
('rode',),
('little',),
('wizard',),
('oz',),
('seated',),

('wooden',),
('sawhorse',),
('smiled',),
('saw',),
('one',),
('eyed',),
('head',),
('scarecrow',),
('sticking',),
('bramble',),
('bush',),
('helped',),
('poor',),
('straw',),
('man',),
('prison',),
('thank',),
('dear',),
('wiz',),
('said',),
('grateful',),
('scarecrow',),
('must',),
('get',),
('oil',),
('rescue',),
('tin',),
('woodman',),
('together',),
('ran',),
('river',),
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('boat',),
('floating',),
('midstream',),
('wizard',),
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('magic',),
('words',),
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('bank',),
('scarecrow',),
('could',),
('get',),
('oil',),
('back',),
('flew',),
('tin',),
('man',),
('scarecrow',),
('carefully',),
('oiled',),
('joint',),
('little',),
('wizard',),
('moved',),
('joints',),
('gently',),
('back',),
('forth',),
('worked',),
('freely',),
('hour',),

```
( 'labor', ),
( 'tin', ),
( 'woodman', ),
( 'feet', ),
( 'although', ),
( 'still', ),
( 'little', ),
( 'stiff', ),
( 'managed', ),
( 'walk', ),
( 'boat', ),
( 'wizard', ),
( 'sawhorse', ),
( 'also', ),
( 'got', ),
( 'aboard', ),
( 'corncob', ),
( 'craft', ),
( 'together', ),
( 'returned', ),
( 'scarecrow', ),
( 'palace', ),
( 'tin', ),
( 'woodman', ),
( 'careful', ),
( 'stand', ),
( 'boat', )]
```

bigram : two word sequence dependency

```
In [169]: oz_bigram = list(ngrams(oz_doc, 2, 3))
          oz_bigram = oz_bigram[2:]
```

trigram : three word sequence

```
In [170]: oz_trigram = list(ngrams(oz_doc, 3, 3))
          oz_trigram = oz_trigram[2:]
```

Now, given that we have created tri, bi, and uni grams; lets get some statistics on these sequences

bigrams: there are quite a few combinations of 2 word sequences that occur multiple times in the book. Specifically, 'tin woodman' appears the most, many involving the name of characters.

```
In [171]: oz_bigram_count = [(item, oz_bigram.count(item)) for item in
                             sorted(set(oz_bigram))]
```

```
In [172]: oz_bigram_count_sorted = sorted(oz_bigram_count, reverse=True, key=lambda x: x[1])  
list(oz_bigram_count_sorted)
```

```
Out[172]: [ (('tin', 'woodman'), 17),
            (('tin', 'man'), 7),
            (('straw', 'man'), 4),
            (('king', 'crow'), 3),
            (('one', 'eye'), 3),
            (('said', 'scarecrow'), 3),
            (('apart', 'yet'), 2),
            (('around', 'neck'), 2),
            (('around', 'waist'), 2),
            (('black', 'crows'), 2),
            (('bramble', 'bush'), 2),
            (('could', 'move'), 2),
            (('could', 'see'), 2),
            (('end', 'line'), 2),
            (('eye', 'could'), 2),
            (('friend', 'scarecrow'), 2),
            (('get', 'oil'), 2),
            (('line', 'around'), 2),
            (('little', 'wizard'), 2),
            (('made', 'tin'), 2),
            (('man', 'said'), 2),
            (('oil', 'back'), 2),
            (('old', 'crow'), 2),
            (('one', 'eyed'), 2),
            (('replied', 'scarecrow'), 2),
            (('river', 'bank'), 2),
            (('scarecrow', 'brains'), 2),
            (('scarecrow', 'clapped'), 2),
            (('tie', 'string'), 2),
            (('water', 'scarecrow'), 2),
            (('wizard', 'oz'), 2),
            ((' _misfortune_', 'indeed'), 1),
            (('aboard', 'corncob'), 1),
            (('aboard', 'tie'), 1),
            (('adventures', 'met'), 1),
            (('advised', 'crow'), 1),
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```

trigrams: we can see that we return far fewer n-grams with much of a count at all due to the decreased probability of those 3 words occurring one after the other.

```

In [173]: oz_trigram_count = [(item, oz_trigram.count(item)) for item in sorted(set(oz_trigram))]

```

```
In [174]: oz_trigram_count_sorted = sorted(oz_trigram_count, reverse=True, key=lambda x:
x[1])
list(oz_trigram_count_sorted)
```

```
Out[174]: [(['eye', 'could', 'see'], 2),
           (['tin', 'man', 'said'], 2),
           (['_misfortune_', 'indeed', 'replied'], 1),
           (['aboard', 'corncob', 'craft'], 1),
           (['aboard', 'tie', 'around'], 1),
           (['adventures', 'met', 'traveling'], 1),
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           (['among', 'tree', 'tops'], 1),
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(('traveling', 'dorothy', 'little'), 1),
(('tree', 'landed', 'bramble'), 1),
(('tree', 'stood', 'higher'), 1),
(('tree', 'tin', 'woodman'), 1),
(('tree', 'tops', 'said'), 1),
(('tree', 'trunk', 'goodness'), 1),
(('trees', 'beds', 'tin'), 1),
(('trees', 'forest', 'scarecrow'), 1),
(('trees', 'full', 'black'), 1),
(('trees', 'one', 'end'), 1),
(('trees', 'top', 'crotch'), 1),
(('trials', 'wound', 'line'), 1),
(('tried', 'change', 'position'), 1),
(('tried', 'knocked', 'one'), 1),
(('tried', 'one', 'eye'), 1),
(('true', 'agreed', 'scarecrow'), 1),
(('true', 'enough', 'sighed'), 1),
(('trunk', 'goodness', 'sake'), 1),
(('trying', 'get', 'fear'), 1),

(('tumble', 'ground', 'tin'), 1),
(('tumbled', 'ground', 'result'), 1),
(('turned', 'boat', 'stream'), 1),
(('two', 'dead', 'limbs'), 1),
(('two', 'ears', 'nose'), 1),
(('two', 'eyes', 'two'), 1),
(('two', 'friends', 'suspended'), 1),
(('two', 'held', 'captive'), 1),
(('two', 'queerly', 'made'), 1),
(('unable', 'dive', 'water'), 1),
(('unable', 'move', 'thorns'), 1),
(('unable', 'reach', 'bare'), 1),
(('united', 'strength', 'could'), 1),
(('upon', 'branch', 'stuck'), 1),
(('us', 'high', 'land'), 1),
(('us', 'must', 'think'), 1),
(('us', 'river', 'bank'), 1),
(('us', 'united', 'strength'), 1),
(('usually', 'friendly', 'never'), 1),
(('visit', 'friend', 'scarecrow'), 1),
(('voice', 'jaws', 'scarcely'), 1),
(('waist', 'clinging', 'fast'), 1),
(('waist', 'lose', 'fishing'), 1),
(('waist', 'make', 'sink'), 1),
(('walk', 'boat', 'wizard'), 1),
(('warning', 'came', 'late'), 1),
(('watched', 'much', 'interest'), 1),
(('water', 'air', 'next'), 1),
(('water', 'came', 'smaller'), 1),
(('water', 'color', 'instead'), 1),
(('water', 'covered', 'cannot'), 1),
(('water', 'hundreds', 'us'), 1),
(('water', 'instant', 'lay'), 1),
(('water', 'light', 'weight'), 1),
(('water', 'looked', 'friend'), 1),
(('water', 'scarecrow', 'took'), 1),
(('water', 'scarecrow', 'tried'), 1),
(('water', 'soaking', 'joints'), 1),
(('water', 'till', 'touched'), 1),
(('water', 'tried', 'knocked'), 1),
(('way', 'escape', 'thinking'), 1),
(('way', 'get', 'meantime'), 1),
(('weak', 'voice', 'jaws'), 1),
(('weight', 'barely', 'dented'), 1),
(('well', 'however', 'usually'), 1),
(('went', 'visit', 'friend'), 1),
(('wet', 'face', 'handkerchief'), 1),
(('wildly', 'crows', 'flown'), 1),
(('wings', 'birds', 'rose'), 1),
(('winkie', 'land', 'far'), 1),
(('wipe', 'eye', 'could'), 1),
(('wiped', 'one', 'painted'), 1),
(('wiping', 'wet', 'face'), 1),
(('wiz', 'said', 'grateful'), 1),
(('wizard', 'given', 'excellent'), 1),
(('wizard', 'moved', 'joints'), 1),
(('wizard', 'obliged', 'mumble'), 1),
(('wizard', 'oz', 'put'), 1),
(('wizard', 'oz', 'seated'), 1),
(('wizard', 'sawhorse', 'also'), 1),
(('wonderful', 'adventures', 'met'), 1),
(('woodchopper', 'everyone', 'loved'), 1),
(('wooden', 'sawhorse', 'smiled'), 1),
(('woodman', 'anxiously', 'inquired'), 1),

```
(( 'woodman', 'careful', 'stand'), 1),
(( 'woodman', 'dear', 'friend'), 1),
(( 'woodman', 'feet', 'although'), 1),
(( 'woodman', 'hook', 'joint'), 1),
(( 'woodman', 'hung', 'neck'), 1),
(( 'woodman', 'idea', 'damp'), 1),
(( 'woodman', 'joints', 'rusted'), 1),
(( 'woodman', 'lived', 'magnificent'), 1),
(( 'woodman', 'made', 'attempt'), 1),
(( 'woodman', 'much', 'heavier'), 1),
(( 'woodman', 'one', 'time'), 1),
(( 'woodman', 'outstretched', 'straw'), 1),
(( 'woodman', 'proposed', 'sail'), 1),
(( 'woodman', 'speaking', 'muffled'), 1),
(( 'woodman', 'sprang', 'feet'), 1),
(( 'woodman', 'together', 'ran'), 1),
(( 'woodman', 'went', 'visit'), 1),
(( 'words', 'draw', 'bank'), 1),
(( 'worked', 'freely', 'hour'), 1),
(( 'wound', 'line', 'around'), 1),
(( 'wrong', 'tin', 'woodman'), 1),
(( 'yet', 'liked', 'separate'), 1),
(( 'yet', 'unable', 'reach'), 1)]
```

Word of Interest

Select only the trigrams that contain the word 'one' to see phrases are similar. We certainly see a pattern of 'one eye' occurring throughout

```
In [175]: oz_trigram_count_d = dict(oz_trigram_count_sorted)
filter_string = "one"
oz_trigram_count_d_one = {k:v for k,v in oz_trigram_count_d.items() if filter_string in k}
oz_trigram_count_d_one
```

```
Out[175]: {('air', 'one', 'side'): 1,
('corn', 'one', 'morning'): 1,
('ear', 'corn', 'one'): 1,
('eye', 'one', 'eye'): 1,
('found', 'wiped', 'one'): 1,
('funny', 'replied', 'one'): 1,
('high', 'air', 'one'): 1,
('knocked', 'one', 'eye'): 1,
('man', 'one', 'eyed'): 1,
('meeting', 'one', 'scarecrow'): 1,
('one', 'end', 'line'): 1,
('one', 'eye', 'could'): 1,
('one', 'eye', 'fish'): 1,
('one', 'eye', 'see'): 1,
('one', 'eyed', 'countenance'): 1,
('one', 'eyed', 'head'): 1,
('one', 'morning', 'tin'): 1,
('one', 'old', 'crow'): 1,
('one', 'painted', 'eye'): 1,
('one', 'scarecrow', 'means'): 1,
('one', 'side', 'tree'): 1,
('one', 'time', 'woodchopper'): 1,
('painted', 'eye', 'one'): 1,
('pleasure', 'meeting', 'one'): 1,
('replied', 'one', 'old'): 1,
('saw', 'one', 'eyed'): 1,
('scarecrow', 'tried', 'one'): 1,
('smiled', 'saw', 'one'): 1,
('straight', 'trees', 'one'): 1,
('straw', 'man', 'one'): 1,
('tin', 'woodman', 'one'): 1,
('trees', 'one', 'end'): 1,
('tried', 'knocked', 'one'): 1,
('tried', 'one', 'eye'): 1,
('wiped', 'one', 'painted'): 1,
('woodman', 'one', 'time'): 1}
```

Now, lets do 4 grams to analyze this text futher. We see that occurrences continue to drop at an extremely fast rate given the more n's we have. So much so, that there are no 4grams that occur more than once

```
In [176]: oz_4gram = list(ngrams(oz_doc, 4, 3))
oz_4gram = oz_4gram[3:]
oz_4gram_count = [(item, oz_4gram.count(item)) for item in sorted(set(oz_4gram))]
oz_4gram_count_sorted = sorted(oz_4gram_count, reverse=True, key=lambda x: x[1])
list(oz_4gram_count_sorted)
```

```
Out[176]: [(['_misfortune_', 'indeed', 'replied', 'tin'), 1),
  (('aboard', 'corncob', 'craft', 'together'), 1),
  (('aboard', 'tie', 'around', 'waist'), 1),
  (('adventures', 'met', 'traveling', 'dorothy'), 1),
  (('advised', 'crow', 'perched', 'upon'), 1),
  (('afraid', 'water', 'scarecrow', 'took'), 1),
  (('agreed', 'scarecrow', 'patient', 'friend'), 1),
  (('ah', 'good', 'idea', 'said'), 1),
  (('ah', 'idea', 'last', 'scarecrow'), 1),
  (('ahead', 'look', 'cried', 'warning'), 1),
  (('air', 'alight', 'somewhere', 'among'), 1),
  (('air', 'filled', 'black', 'crows'), 1),
  (('air', 'next', 'moment', 'straw'), 1),
  (('air', 'one', 'side', 'tree'), 1),
  (('air', 'sailed', 'top', 'tree'), 1),
  (('air', 'scarecrow', 'clapped', 'stuffed'), 1),
  (('air', 'stuffed', 'legs', 'kicking'), 1),
  (('alight', 'somewhere', 'among', 'tree'), 1),
  (('along', 'forest', 'path', 'rode'), 1),
  (('already', 'rusted', 'badly', 'could'), 1),
  (('also', 'bottom', 'helpless', 'true'), 1),
  (('also', 'got', 'aboard', 'corncob'), 1),
  (('also', 'shoot', 'air', 'alight'), 1),
  (('although', 'still', 'little', 'stiff'), 1),
  (('among', 'tree', 'tops', 'said'), 1),
  (('amused', 'straw', 'man', 'one'), 1),
  (('anchor', 'aboard', 'tie', 'around'), 1),
  (('anchor', 'also', 'bottom', 'helpless'), 1),
  (('anchor', 'boat', 'seized', 'hoping'), 1),
  (('anchor', 'hold', 'boat', 'place'), 1),
  (('anchor', 'hung', 'ten', 'feet'), 1),
  (('anchor', 'said', 'tin', 'woodman'), 1),
  (('anchor', 'time', 'dangled', 'silence'), 1),
  (('anchor', 'tumbled', 'ground', 'result'), 1),
  (('anxiously', 'inquired', 'scarecrow', 'tumble'), 1),
  (('apart', 'yet', 'liked', 'separate'), 1),
  (('apart', 'yet', 'unable', 'reach'), 1),
  (('arms', 'floated', 'boat', 'climbed'), 1),
  (('arms', 'legs', 'head', 'cleverly'), 1),
  (('around', 'edges', 'brilliant', 'jewels'), 1),
  (('around', 'neck', 'hooked', 'securely'), 1),
  (('around', 'neck', 'tin', 'woodman'), 1),
  (('around', 'waist', 'lose', 'fishing'), 1),
  (('around', 'waist', 'make', 'sink'), 1),
  (('asked', 'crow', 'inquired', 'tin'), 1),
  (('asked', 'weak', 'voice', 'jaws'), 1),
  (('astonishing', 'tin', 'man', 'said'), 1),
  (('astonishment', 'found', 'wiped', 'one'), 1),
  (('attempt', 'found', 'fishline', 'boat'), 1),
  (('attempt', 'several', 'trials', 'wound'), 1),
  (('away', 'chattering', 'laughter', 'left'), 1),
  (('back', 'boat', 'suppose', 'brains'), 1),
  (('back', 'flew', 'tin', 'man'), 1),
  (('back', 'forth', 'worked', 'freely'), 1),
  (('badly', 'could', 'move', 'oil'), 1),
  (('badly', 'dented', 'fall', 'also'), 1),
  (('badly', 'rusted', 'rescued', 'true'), 1),
  (('bait', 'needed', 'scarecrow', 'dropped'), 1),
  (('balance', 'toppled', 'fell', 'overboard'), 1),
  (('balanced', 'nicely', 'straw', 'man'), 1),
  (('bank', 'boat', 'floating', 'midstream'), 1),
  (('bank', 'crows', 'bent', 'mischief'), 1),
  (('bank', 'scarecrow', 'could', 'get'), 1),
```

(('banks', 'river', 'palace', 'shape'), 1),
(('bare', 'tree', 'trunk', 'goodness'), 1),
(('barely', 'dented', 'surface', 'stream'), 1),
(('beak', 'talons', 'scarecrow', 'watched'), 1),
(('became', 'much', 'interested', 'talk'), 1),
(('become', 'badly', 'rusted', 'rescued'), 1),
(('bed', 'dry', 'leaves', 'dented'), 1),
(('beds', 'tin', 'flowers', 'palace'), 1),
(('begged', 'tin', 'woodman', 'idea'), 1),
(('beneath', 'trees', 'forest', 'scarecrow'), 1),
(('bent', 'mischief', 'thought', 'good'), 1),
(('bent', 'water', 'scarecrow', 'tried'), 1),
(('best', 'friends', 'much', 'happier'), 1),
(('better', 'decided', 'take', 'boat'), 1),
(('big', 'corncob', 'hollowed', 'pointed'), 1),
(('big', 'rock', 'ahead', 'look'), 1),
(('birds', 'flew', 'forest', 'tall'), 1),
(('birds', 'rose', 'air', 'scarecrow'), 1),
(('black', 'crows', 'seemed', 'much'), 1),
(('black', 'crows', 'seized', 'cord'), 1),
(('blue', 'munchkin', 'clothes', 'stuffed'), 1),
(('boat', 'bumped', 'rock', 'jar'), 1),
(('boat', 'climbed', 'saying', 'despair'), 1),
(('boat', 'floating', 'midstream', 'wizard'), 1),
(('boat', 'formed', 'big', 'corncob'), 1),
(('boat', 'glided', 'swiftly', 'water'), 1),
(('boat', 'place', 'leaned', 'side'), 1),
(('boat', 'ride', 'river', 'got'), 1),
(('boat', 'sailing', 'forest', 'stream'), 1),
(('boat', 'seized', 'hoping', 'save'), 1),
(('boat', 'stout', 'hook', 'end'), 1),
(('boat', 'stream', 'friends', 'continued'), 1),
(('boat', 'suppose', 'brains', 'rusted'), 1),
(('boat', 'water', 'light', 'weight'), 1),
(('boat', 'wizard', 'sawhorse', 'also'), 1),
(('bother', 'two', 'held', 'captive'), 1),
(('bottom', 'helpless', 'true', 'enough'), 1),
(('bottom', 'river', 'said', 'scarecrow'), 1),
(('bottom', 'water', 'instant', 'lay'), 1),
(('brains', 'help', 'us', 'must'), 1),
(('brains', 'man', 'made', 'tin'), 1),
(('brains', 'rusted', 'friend', 'scarecrow'), 1),
(('brains', 'sharp', 'wizard', 'oz'), 1),
(('brains', 'sharpest', 'thought', 'long'), 1),
(('bramble', 'bush', 'helped', 'poor'), 1),
(('bramble', 'bush', 'tin', 'man'), 1),
(('bran', 'hold', 'shape', 'head'), 1),
(('branch', 'stuck', 'far', 'bent'), 1),
(('breeze', 'day', 'boat', 'glided'), 1),
(('breeze', 'swaying', 'gently', 'fro'), 1),
(('brilliant', 'jewels', 'sail', 'purple'), 1),
(('built', 'country', 'estate', 'winkie'), 1),
(('bumped', 'rock', 'jar', 'made'), 1),
(('bush', 'helped', 'poor', 'straw'), 1),
(('bush', 'tin', 'man', 'fell'), 1),
(('called', 'tin', 'man', 'anchor'), 1),
(('came', 'late', 'tin', 'woodman'), 1),
(('came', 'smaller', 'river', 'flowed'), 1),
(('cannot', 'drown', 'course', 'must'), 1),
(('captive', 'crows', 'scare', 'scarecrow'), 1),
(('careful', 'shouted', 'scarecrow', 'crows'), 1),
(('careful', 'wipe', 'eye', 'could'), 1),
(('carefully', 'oiled', 'joint', 'little'), 1),
(('castle', 'built', 'country', 'estate'), 1),

(('catch', 'line', 'hook', 'around'), 1),
(('caws', 'shrieked', 'king', 'crow'), 1),
(('center', 'line', 'letting', 'go'), 1),
(('change', 'position', 'found', 'joints'), 1),
(('chattering', 'laughter', 'left', 'two'), 1),
(('chuckled', 'naughty', 'king', 'crow'), 1),
(('city', 'oz', 'pretty', 'tin'), 1),
(('clapped', 'hands', 'head', 'forgetting'), 1),
(('clapped', 'stuffed', 'hands', 'glee'), 1),
(('clear', 'water', 'looked', 'friend'), 1),
(('clearly', 'hurry', 'please', 'begged'), 1),
(('cleverly', 'jointed', 'could', 'move'), 1),
(('climbed', 'saying', 'despair', 'friend'), 1),
(('clinging', 'fast', 'spare', 'anchor'), 1),
(('cloth', 'head', 'filled', 'bran'), 1),
(('clothes', 'stuffed', 'straw', 'top'), 1),
(('clung', 'fast', 'iron', 'anchor'), 1),
(('color', 'instead', 'oil', 'must'), 1),
(('command', 'birds', 'flew', 'forest'), 1),
(('companion', 'fallen', 'overboard', 'bottom'), 1),
(('continued', 'talking', 'together', 'old'), 1),
(('cool', 'shady', 'beneath', 'trees'), 1),
(('cord', 'beak', 'talons', 'scarecrow'), 1),
(('corn', 'one', 'morning', 'tin'), 1),
(('corncob', 'craft', 'together', 'returned'), 1),
(('corncob', 'hollowed', 'pointed', 'ends'), 1),
(('could', 'feel', 'pain', 'never'), 1),
(('could', 'get', 'oil', 'back'), 1),
(('could', 'lift', 'much', 'tie'), 1),
(('could', 'move', 'freely', 'known'), 1),
(('could', 'move', 'oil', 'back'), 1),
(('could', 'reach', 'tin', 'woodman'), 1),
(('could', 'see', 'help', 'shriek'), 1),
(('could', 'see', 'joints', 'clearly'), 1),
(('countenance', 'knew', 'crows', 'well'), 1),
(('country', 'estate', 'winkie', 'land'), 1),
(('course', 'must', 'lie', 'find'), 1),
(('covered', 'cannot', 'drown', 'course'), 1),
(('craft', 'together', 'returned', 'scarecrow'), 1),
(('cried', 'king', 'crow', 'mischievous'), 1),
(('cried', 'warning', 'came', 'late'), 1),
(('crooked', 'suddenly', 'scarecrow', 'glanced'), 1),
(('crotch', 'crows', 'dropped', 'center'), 1),
(('crotch', 'formed', 'two', 'dead'), 1),
(('crow', 'command', 'birds', 'flew'), 1),
(('crow', 'great', 'flapping', 'wings'), 1),
(('crow', 'inquired', 'tin', 'man'), 1),
(('crow', 'king', 'gone', 'wrong'), 1),
(('crow', 'mischievous', 'old', 'fellow'), 1),
(('crow', 'perched', 'upon', 'branch'), 1),
(('crow', 'tie', 'string', 'crows'), 1),
(('crows', 'bent', 'mischief', 'thought'), 1),
(('crows', 'dropped', 'center', 'line'), 1),
(('crows', 'flown', 'straight', 'trees'), 1),
(('crows', 'fly', 'take', 'hold'), 1),
(('crows', 'prided', 'superior', 'man'), 1),
(('crows', 'scare', 'scarecrow', 'chuckled'), 1),
(('crows', 'seemed', 'much', 'amused'), 1),
(('crows', 'seized', 'cord', 'beak'), 1),
(('crows', 'take', 'us', 'high'), 1),
(('crows', 'well', 'however', 'usually'), 1),
(('cry', 'astonishment', 'found', 'wiped'), 1),
(('damaged', 'afraid', 'water', 'scarecrow'), 1),
(('damp', 'help', 'asked', 'crow'), 1),

(('dangled', 'scarecrow', 'hung', 'waist'), 1),
(('dangled', 'silence', 'breeze', 'swaying'), 1),
(('dangled', 'tin', 'woodman', 'hung'), 1),
(('day', 'boat', 'glided', 'swiftly'), 1),
(('day', 'look', 'funny', 'replied'), 1),
(('dead', 'limbs', 'crotch', 'crows'), 1),
(('dead', 'tree', 'stood', 'higher'), 1),
(('dear', 'exclaimed', '_misfortune_', 'indeed'), 1),
(('dear', 'friend', 'companion', 'fallen'), 1),
(('dear', 'wiz', 'said', 'grateful'), 1),
(('deceived', 'thinking', 'meat', 'man'), 1),
(('decided', 'take', 'boat', 'ride'), 1),
(('declared', 'old', 'crow', 'tie'), 1),
(('decorated', 'around', 'edges', 'brilliant'), 1),
(('deep', 'forest', 'tin', 'woodman'), 1),
(('dented', 'fall', 'also', 'shoot'), 1),
(('dented', 'surface', 'stream', 'could'), 1),
(('dented', 'tin', 'woodman', 'joints'), 1),
(('despair', 'friend', 'extra', 'anchor'), 1),
(('distant', 'banks', 'river', 'palace'), 1),
(('dive', 'boat', 'water', 'light'), 1),
(('dive', 'called', 'tin', 'man'), 1),
(('dive', 'get', 'straw', 'rust'), 1),
(('dive', 'water', 'tried', 'knocked'), 1),
(('dorothy', 'little', 'kansas', 'girl'), 1),
(('draw', 'bank', 'scarecrow', 'could'), 1),
(('drawn', 'water', 'air', 'next'), 1),
(('dreadful', 'said', 'poor', 'scarecrow'), 1),
(('drink', 'brains', 'sharp', 'wizard'), 1),
(('drop', 'anchor', 'said', 'tin'), 1),
(('dropped', 'center', 'line', 'letting'), 1),
(('dropped', 'hook', 'water', 'till'), 1),
(('drown', 'course', 'must', 'lie'), 1),
(('dry', 'leaves', 'dented', 'tin'), 1),
(('ear', 'corn', 'one', 'morning'), 1),
(('earnestly', 'shall', 'hold', 'fast'), 1),
(('ears', 'nose', 'mouth', 'scarecrow'), 1),
(('easily', 'replaced', 'damaged', 'afraid'), 1),
(('easy', 'enough', 'declared', 'old'), 1),
(('eat', 'drink', 'brains', 'sharp'), 1),
(('edges', 'brilliant', 'jewels', 'sail'), 1),
(('elfish', 'laughter', 'greeted', 'speech'), 1),
(('emerald', 'city', 'oz', 'pretty'), 1),
(('emergency', 'friend', 'brains', 'help'), 1),
(('end', 'bait', 'needed', 'scarecrow'), 1),
(('end', 'line', 'around', 'waist'), 1),
(('end', 'line', 'dangled', 'tin'), 1),
(('ends', 'decorated', 'around', 'edges'), 1),
(('enjoy', 'pleasure', 'meeting', 'one'), 1),
(('enough', 'declared', 'old', 'crow'), 1),
(('enough', 'sighed', 'scarecrow', 'wiping'), 1),
(('escape', 'thinking', 'replied', 'scarecrow'), 1),
(('estate', 'winkie', 'land', 'far'), 1),
(('everyone', 'loved', 'wizard', 'given'), 1),
(('excellent', 'heart', 'red', 'plush'), 1),
(('exclaimed', '_misfortune_', 'indeed', 'replied'), 1),
(('extra', 'anchor', 'aboard', 'tie'), 1),
(('eye', 'could', 'see', 'help'), 1),
(('eye', 'could', 'see', 'joints'), 1),
(('eye', 'day', 'look', 'funny'), 1),
(('eye', 'fish', 'ah', 'good'), 1),
(('eye', 'must', 'painted', 'water'), 1),
(('eye', 'one', 'eye', 'see'), 1),
(('eye', 'see', 'dreadful', 'said'), 1),

(('eyed', 'countenance', 'knew', 'crows'), 1),
(('eyed', 'head', 'scarecrow', 'sticking'), 1),
(('eyes', 'two', 'ears', 'nose'), 1),
(('face', 'handkerchief', 'gave', 'cry'), 1),
(('face', 'immediately', 'scarecrow', 'threw'), 1),
(('fall', 'also', 'shoot', 'air'), 1),
(('fallen', 'overboard', 'bottom', 'river'), 1),
(('far', 'bent', 'water', 'scarecrow'), 1),
(('far', 'distant', 'banks', 'river'), 1),
(('far', 'emerald', 'city', 'oz'), 1),
(('fast', 'anchor', 'time', 'dangled'), 1),
(('fast', 'iron', 'anchor', 'hung'), 1),
(('fast', 'prisoner', 'sad', 'plight'), 1),
(('fast', 'spare', 'anchor', 'boat'), 1),
(('fastened', 'round', 'cloth', 'head'), 1),
(('fear', 'shall', 'succeed', 'easy'), 1),
(('feared', 'laugh', 'said', 'may'), 1),
(('feel', 'pain', 'never', 'tired'), 1),
(('feet', 'although', 'still', 'little'), 1),
(('feet', 'apart', 'yet', 'unable'), 1),
(('feet', 'boat', 'bumped', 'rock'), 1),
(('fell', 'overboard', 'made', 'tin'), 1),
(('fell', 'plump', 'ground', 'landing'), 1),
(('fellow', 'grab', 'line', 'pull'), 1),
(('filled', 'black', 'crows', 'seized'), 1),
(('filled', 'bran', 'hold', 'shape'), 1),
(('finally', 'tin', 'man', 'said'), 1),
(('find', 'way', 'get', 'meantime'), 1),
(('fish', 'ah', 'good', 'idea'), 1),
(('fishing', 'friend', 'together', 'good'), 1),
(('fishline', 'boat', 'stout', 'hook'), 1),
(('flapping', 'wings', 'birds', 'rose'), 1),
(('flew', 'air', 'sailed', 'top'), 1),
(('flew', 'away', 'chattering', 'laughter'), 1),
(('flew', 'forest', 'tall', 'dead'), 1),
(('flew', 'tin', 'man', 'scarecrow'), 1),
(('floated', 'boat', 'climbed', 'saying'), 1),
(('floating', 'midstream', 'wizard', 'obliged'), 1),
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(('scarecrow', 'watched', 'much', 'interest'), 1),
(('scarecrow', 'wiping', 'wet', 'face'), 1),
(('scaring', 'crows', 'prided', 'superior'), 1),
(('seated', 'wooden', 'sawhorse', 'smiled'), 1),
(('securely', 'good', 'cried', 'king'), 1),
(('see', 'dreadful', 'said', 'poor'), 1),
(('see', 'help', 'shriek', 'elfish'), 1),
(('see', 'joints', 'clearly', 'hurry'), 1),
(('seemed', 'much', 'amused', 'straw'), 1),
(('seized', 'cord', 'beak', 'talons'), 1),
(('seized', 'hoping', 'save', 'hi'), 1),
(('seldom', 'apart', 'yet', 'liked'), 1),
(('separate', 'might', 'enjoy', 'pleasure'), 1),
(('several', 'trials', 'wound', 'line'), 1),
(('shady', 'beneath', 'trees', 'forest'), 1),
(('shall', 'become', 'badly', 'rusted'), 1),
(('shall', 'hold', 'fast', 'anchor'), 1),
(('shall', 'succeed', 'easy', 'enough'), 1),
(('shape', 'head', 'painted', 'two'), 1),
(('shape', 'immense', 'ear', 'corn'), 1),
(('sharp', 'wizard', 'oz', 'put'), 1),
(('sharpest', 'thought', 'long', 'tin'), 1),
(('shoot', 'air', 'alight', 'somewhere'), 1),
(('shouted', 'scarecrow', 'crows', 'take'), 1),
(('shriek', 'elfish', 'laughter', 'greeted'), 1),
(('shrieked', 'king', 'crow', 'great'), 1),
(('side', 'clear', 'water', 'looked'), 1),
(('side', 'tree', 'tin', 'woodman'), 1),
(('sighed', 'scarecrow', 'wiping', 'wet'), 1),
(('silence', 'breeze', 'swaying', 'gently'), 1),
(('silk', 'glittered', 'gayly', 'sunshine'), 1),
(('sink', 'dive', 'called', 'tin'), 1),
(('smaller', 'river', 'flowed', 'deep'), 1),
(('smiled', 'saw', 'one', 'eyed'), 1),
(('soaking', 'joints', 'shall', 'become'), 1),
(('somewhere', 'among', 'tree', 'tops'), 1),
(('sorrowfully', 'dear', 'exclaimed', '_misfortune_'), 1),
(('sort', 'man', 'really', 'feared'), 1),
(('sound', 'hoofs', 'heard', 'along'), 1),
(('spare', 'anchor', 'boat', 'seized'), 1),
(('speaking', 'muffled', 'tones', 'much'), 1),
(('speech', 'looking', 'scarecrow', 'found'), 1),
(('sprang', 'feet', 'boat', 'bumped'), 1),

(('steering', 'turned', 'boat', 'stream'), 1),
(('sticking', 'bramble', 'bush', 'helped'), 1),
(('stiff', 'managed', 'walk', 'boat'), 1),
(('still', 'clung', 'fast', 'iron'), 1),
(('still', 'little', 'stiff', 'managed'), 1),
(('stood', 'higher', 'trees', 'top'), 1),
(('stout', 'hook', 'end', 'bait'), 1),
(('straight', 'trees', 'one', 'end'), 1),
(('straw', 'arms', 'floated', 'boat'), 1),
(('straw', 'light', 'unable', 'dive'), 1),
(('straw', 'man', 'air', 'stuffed'), 1),
(('straw', 'man', 'one', 'eyed'), 1),
(('straw', 'man', 'prison', 'thank'), 1),
(('straw', 'man', 'still', 'clung'), 1),
(('straw', 'rust', 'easily', 'replaced'), 1),
(('straw', 'top', 'fastened', 'round'), 1),
(('stream', 'cool', 'shady', 'beneath'), 1),
(('stream', 'could', 'reach', 'tin'), 1),
(('stream', 'friends', 'continued', 'talking'), 1),
(('stream', 'growing', 'narrow', 'crooked'), 1),
(('strength', 'could', 'lift', 'much'), 1),
(('string', 'crows', 'fly', 'take'), 1),
(('string', 'pull', 'water', 'hundreds'), 1),
(('string', 'replied', 'scarecrow', 'straw'), 1),
(('stuck', 'far', 'bent', 'water'), 1),
(('stuffed', 'hands', 'glee', 'saw'), 1),
(('stuffed', 'legs', 'kicking', 'wildly'), 1),
(('stuffed', 'straw', 'top', 'fastened'), 1),
(('succeed', 'easy', 'enough', 'declared'), 1),
(('success', 'scaring', 'crows', 'prided'), 1),
(('suddenly', 'scarecrow', 'glanced', 'saw'), 1),
(('suit', 'blue', 'munchkin', 'clothes'), 1),
(('sunshine', 'good', 'breeze', 'day'), 1),
(('superior', 'man', 'could', 'feel'), 1),
(('suppose', 'brains', 'rusted', 'friend'), 1),
(('surface', 'stream', 'could', 'reach'), 1),
(('surrounded', 'lovely', 'gardens', 'many'), 1),
(('suspended', 'high', 'air', 'one'), 1),
(('swaying', 'gently', 'fro', 'finally'), 1),
(('swiftly', 'water', 'came', 'smaller'), 1),
(('take', 'boat', 'ride', 'river'), 1),
(('take', 'hold', 'string', 'pull'), 1),
(('take', 'us', 'high', 'land'), 1),
(('talk', 'forgot', 'notice', 'boat'), 1),
(('talking', 'together', 'old', 'times'), 1),
(('tall', 'dead', 'tree', 'stood'), 1),
(('talons', 'scarecrow', 'watched', 'much'), 1),
(('ten', 'feet', 'apart', 'yet'), 1),
(('thank', 'dear', 'wiz', 'said'), 1),
(('think', 'way', 'escape', 'thinking'), 1),
(('thinking', 'meat', 'man', 'sort'), 1),
(('thinking', 'replied', 'scarecrow', 'brains'), 1),
(('thorns', 'held', 'scarecrow', 'fast'), 1),
(('thought', 'good', 'joke', 'bother'), 1),
(('thought', 'long', 'tin', 'man'), 1),
(('threw', 'anchor', 'hold', 'boat'), 1),
(('tie', 'around', 'waist', 'make'), 1),
(('tie', 'string', 'crows', 'fly'), 1),
(('tie', 'string', 'replied', 'scarecrow'), 1),
(('tied', 'end', 'line', 'around'), 1),
(('till', 'touched', 'woodman', 'hook'), 1),
(('time', 'dangled', 'silence', 'breeze'), 1),
(('time', 'woodchopper', 'everyone', 'loved'), 1),
(('times', 'wonderful', 'adventures', 'met'), 1),

(('tin', 'arms', 'legs', 'head'), 1),
(('tin', 'badly', 'dented', 'fall'), 1),
(('tin', 'castle', 'built', 'country'), 1),
(('tin', 'flowers', 'palace', 'scarecrow'), 1),
(('tin', 'furniture', 'surrounded', 'lovely'), 1),
(('tin', 'man', 'anchor', 'also'), 1),
(('tin', 'man', 'catch', 'line'), 1),
(('tin', 'man', 'fell', 'plump'), 1),
(('tin', 'man', 'grew', 'tired'), 1),
(('tin', 'man', 'said', 'emergency'), 1),
(('tin', 'man', 'said', 'light'), 1),
(('tin', 'man', 'scarecrow', 'carefully'), 1),
(('tin', 'sank', 'bottom', 'water'), 1),
(('tin', 'trees', 'beds', 'tin'), 1),
(('tin', 'woodman', 'anxiously', 'inquired'), 1),
(('tin', 'woodman', 'careful', 'stand'), 1),
(('tin', 'woodman', 'dear', 'friend'), 1),
(('tin', 'woodman', 'feet', 'although'), 1),
(('tin', 'woodman', 'hung', 'neck'), 1),
(('tin', 'woodman', 'idea', 'damp'), 1),
(('tin', 'woodman', 'joints', 'rusted'), 1),
(('tin', 'woodman', 'lived', 'magnificent'), 1),
(('tin', 'woodman', 'made', 'attempt'), 1),
(('tin', 'woodman', 'much', 'heavier'), 1),
(('tin', 'woodman', 'one', 'time'), 1),
(('tin', 'woodman', 'outstretched', 'straw'), 1),
(('tin', 'woodman', 'proposed', 'sail'), 1),
(('tin', 'woodman', 'speaking', 'muffled'), 1),
(('tin', 'woodman', 'sprang', 'feet'), 1),
(('tin', 'woodman', 'together', 'ran'), 1),
(('tin', 'woodman', 'went', 'visit'), 1),
(('tired', 'eat', 'drink', 'brains'), 1),
(('tired', 'tried', 'change', 'position'), 1),
(('together', 'good', 'caws', 'shrieked'), 1),
(('together', 'old', 'times', 'wonderful'), 1),
(('together', 'ran', 'river', 'bank'), 1),
(('together', 'returned', 'scarecrow', 'palace'), 1),
(('together', 'seldom', 'apart', 'yet'), 1),
(('tones', 'much', 'water', 'covered'), 1),
(('took', 'hat', 'made', 'dive'), 1),
(('top', 'crotch', 'formed', 'two'), 1),
(('top', 'fastened', 'round', 'cloth'), 1),
(('top', 'tree', 'landed', 'bramble'), 1),
(('toppled', 'fell', 'overboard', 'made'), 1),
(('tops', 'said', 'scarecrow', 'earnestly'), 1),
(('touched', 'woodman', 'hook', 'joint'), 1),
(('traveling', 'dorothy', 'little', 'kansas'), 1),
(('tree', 'landed', 'bramble', 'bush'), 1),
(('tree', 'stood', 'higher', 'trees'), 1),
(('tree', 'tin', 'woodman', 'much'), 1),
(('tree', 'tops', 'said', 'scarecrow'), 1),
(('tree', 'trunk', 'goodness', 'sake'), 1),
(('trees', 'beds', 'tin', 'flowers'), 1),
(('trees', 'forest', 'scarecrow', 'steering'), 1),
(('trees', 'full', 'black', 'crows'), 1),
(('trees', 'one', 'end', 'line'), 1),
(('trees', 'top', 'crotch', 'formed'), 1),
(('trials', 'wound', 'line', 'around'), 1),
(('tried', 'change', 'position', 'found'), 1),
(('tried', 'knocked', 'one', 'eye'), 1),
(('tried', 'one', 'eye', 'could'), 1),
(('true', 'agreed', 'scarecrow', 'patient'), 1),
(('true', 'enough', 'sighed', 'scarecrow'), 1),
(('trunk', 'goodness', 'sake', 'drop'), 1),

(('trying', 'get', 'fear', 'shall'), 1),
(('tumble', 'ground', 'tin', 'badly'), 1),
(('tumbled', 'ground', 'result', 'astonishing'), 1),
(('turned', 'boat', 'stream', 'friends'), 1),
(('two', 'dead', 'limbs', 'crotch'), 1),
(('two', 'ears', 'nose', 'mouth'), 1),
(('two', 'eyes', 'two', 'ears'), 1),
(('two', 'friends', 'suspended', 'high'), 1),
(('two', 'held', 'captive', 'crows'), 1),
(('two', 'queerly', 'made', 'men'), 1),
(('unable', 'dive', 'water', 'tried'), 1),
(('unable', 'move', 'thorns', 'held'), 1),
(('unable', 'reach', 'bare', 'tree'), 1),
(('united', 'strength', 'could', 'lift'), 1),
(('upon', 'branch', 'stuck', 'far'), 1),
(('us', 'high', 'land', 'us'), 1),
(('us', 'must', 'think', 'way'), 1),
(('us', 'river', 'bank', 'crows'), 1),
(('us', 'united', 'strength', 'could'), 1),
(('usually', 'friendly', 'never', 'deceived'), 1),
(('visit', 'friend', 'scarecrow', 'nothing'), 1),
(('voice', 'jaws', 'scarcely', 'move'), 1),
(('waist', 'clinging', 'fast', 'spare'), 1),
(('waist', 'lose', 'fishing', 'friend'), 1),
(('waist', 'make', 'sink', 'dive'), 1),
(('walk', 'boat', 'wizard', 'sawhorse'), 1),
(('warning', 'came', 'late', 'tin'), 1),
(('watched', 'much', 'interest', 'forgot'), 1),
(('water', 'air', 'next', 'moment'), 1),
(('water', 'came', 'smaller', 'river'), 1),
(('water', 'color', 'instead', 'oil'), 1),
(('water', 'covered', 'cannot', 'drown'), 1),
(('water', 'hundreds', 'us', 'united'), 1),
(('water', 'instant', 'lay', 'full'), 1),
(('water', 'light', 'weight', 'barely'), 1),
(('water', 'looked', 'friend', 'sorrowfully'), 1),
(('water', 'scarecrow', 'took', 'hat'), 1),
(('water', 'scarecrow', 'tried', 'one'), 1),
(('water', 'soaking', 'joints', 'shall'), 1),
(('water', 'till', 'touched', 'woodman'), 1),
(('water', 'tried', 'knocked', 'one'), 1),
(('way', 'escape', 'thinking', 'replied'), 1),
(('way', 'get', 'meantime', 'water'), 1),
(('weak', 'voice', 'jaws', 'scarcely'), 1),
(('weight', 'barely', 'dented', 'surface'), 1),
(('well', 'however', 'usually', 'friendly'), 1),
(('went', 'visit', 'friend', 'scarecrow'), 1),
(('wet', 'face', 'handkerchief', 'gave'), 1),
(('wildly', 'crows', 'flown', 'straight'), 1),
(('wings', 'birds', 'rose', 'air'), 1),
(('winkie', 'land', 'far', 'emerald'), 1),
(('wipe', 'eye', 'could', 'see'), 1),
(('wiped', 'one', 'painted', 'eye'), 1),
(('wiping', 'wet', 'face', 'handkerchief'), 1),
(('wiz', 'said', 'grateful', 'scarecrow'), 1),
(('wizard', 'given', 'excellent', 'heart'), 1),
(('wizard', 'moved', 'joints', 'gently'), 1),
(('wizard', 'obliged', 'mumble', 'magic'), 1),
(('wizard', 'oz', 'put', 'pins'), 1),
(('wizard', 'oz', 'seated', 'wooden'), 1),
(('wizard', 'sawhorse', 'also', 'got'), 1),
(('wonderful', 'adventures', 'met', 'traveling'), 1),
(('woodchopper', 'everyone', 'loved', 'wizard'), 1),
(('wooden', 'sawhorse', 'smiled', 'saw'), 1),

```
(('woodman', 'anxiously', 'inquired', 'scarecrow'), 1),
(('woodman', 'careful', 'stand', 'boat'), 1),
(('woodman', 'dear', 'friend', 'companion'), 1),
(('woodman', 'feet', 'although', 'still'), 1),
(('woodman', 'hook', 'joint', 'advised'), 1),
(('woodman', 'hung', 'neck', 'dangled'), 1),
(('woodman', 'idea', 'damp', 'help'), 1),
(('woodman', 'joints', 'rusted', 'however'), 1),
(('woodman', 'lived', 'magnificent', 'tin'), 1),
(('woodman', 'made', 'attempt', 'several'), 1),
(('woodman', 'much', 'heavier', 'scarecrow'), 1),
(('woodman', 'one', 'time', 'woodchopper'), 1),
(('woodman', 'outstretched', 'straw', 'arms'), 1),
(('woodman', 'proposed', 'sail', 'stream'), 1),
(('woodman', 'speaking', 'muffled', 'tones'), 1),
(('woodman', 'sprang', 'feet', 'boat'), 1),
(('woodman', 'together', 'ran', 'river'), 1),
(('woodman', 'went', 'visit', 'friend'), 1),
(('words', 'draw', 'bank', 'scarecrow'), 1),
(('worked', 'freely', 'hour', 'labor'), 1),
(('wound', 'line', 'around', 'neck'), 1),
(('wrong', 'tin', 'woodman', 'dear'), 1),
(('yet', 'liked', 'separate', 'might'), 1),
(('yet', 'unable', 'reach', 'bare'), 1)]
```

Zipfan distribution

Next, lets create a Zipfan distribution of bigrams, so we can have proper visual of the theory.

```
In [177]: oz_bigram_df = pd.DataFrame(oz_bigram_count_sorted)
```

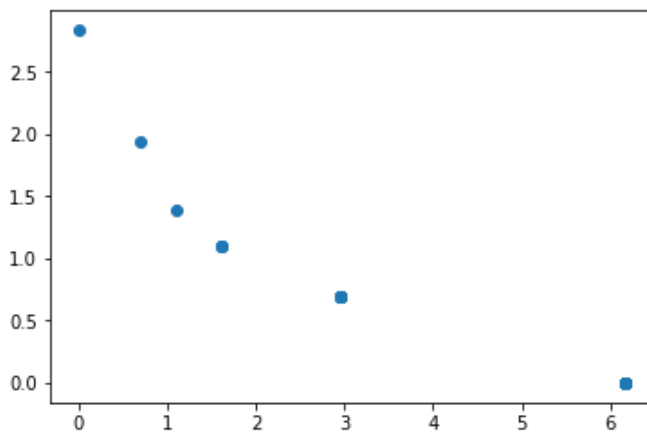
```
In [178]: oz_bigram_df['rank'] = oz_bigram_df.iloc[:,1:].rank(ascending=False)
```

```
In [179]: oz_bigram_df.columns = ['bigrams','total','rank']
```

```
In [180]: y = list(np.log(oz_bigram_df['total']))
          x = list(np.log(oz_bigram_df['rank']))
```

```
In [181]: import matplotlib.pyplot as plt

plt.scatter(x = x, y = y)
plt.show()
```



We can see with the Zipfs plot that the ranks are super low, therefore the number of points are low on the chart. However, given Zipfs theory, this follows the same frequency distribution as predicted.

Next, lets create a word cloud of bigrams using R, because the Anaconda instance has some major bugs with Python 3 and wordcloud packages available.

```
In [182]: x = oz_bigram_df.iloc[:, :2]
dff = pd.DataFrame(x)
dff.to_csv('/Users/SeanOMalley1/Desktop/MSDS_Text_Analytics/Information_Retrieval/
bigram_freq.csv', index=True)
```

Wordcloud in R

```
library(wordcloud)
```

```
FW_DF <- read.csv('/Users/SeanOMalley1/Desktop/MSDS_Text_Analytics/Information_Retrieval/bigram_freq.csv',
stringsAsFactors = FALSE)
```

```
wordcloud(words = FW_DFbigrams, freq = FW_DFtotal, min.freq = 1)
```

Screen Shot 2017-11-13 at 12.48.25 AM
image.png

Part of Speech Tagging

AKA, word classes or lexical categories used to create the tagset seen below

```
In [196]: oz_tagset = nltk.pos_tag(oz_doc)
```

Take a look at the number of words by part of speech

```
In [197]: tag_fd = nltk.FreqDist(tag for (word, tag) in oz_tagset)
tag_fd.most_common()
```

```
Out[197]: [('NN', 336),
            ('JJ', 183),
            ('VBD', 122),
            ('RB', 86),
            ('NNS', 55),
            ('VBN', 38),
            ('VB', 32),
            ('VBG', 30),
            ('VBP', 28),
            ('CD', 18),
            ('MD', 18),
            ('IN', 13),
            ('VBZ', 9),
            ('PRP', 5),
            ('JJR', 5),
            ('JJS', 4),
            ('RBR', 2),
            ('NNP', 1),
            ('WP', 1)]
```

We can see that nouns are the most common parts of speech, followed by adjectives and past tense verbs.

