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CSE 2100

Assignment 7

11/27/16

Note: If this error occurs, try running again until it works. Trust me it will, I could not figure out why this error was occurring then randomly not occurring:

```
Problems @ Javadoc Declaration Console Stateminated Main (5) [Java Application] C:\Program Files (x86)\Java\jre1.8.0_91\bin\javaw.exe (Nov 27, 2016, 7:56:48 PM)

Exception in thread "main" java.lang.IllegalArgumentException: Comparison method violates its general contract! at java.util.TimSort.mergeHi (Unknown Source) at java.util.TimSort.mergeAt (Unknown Source) at java.util.TimSort.mergeCollapse (Unknown Source) at java.util.TimSort.sort (Unknown Source) at java.util.Arrays.sort (Unknown Source) at java.util.ArrayList.sort (Unknown Source) at java.util.ArrayList.sort (Unknown Source) at java.util.Collections.sort (Unknown Source) at WordFinder.convertHashAndSort (WordFinder.java:215) at Main.main (Main.java:28)
```

Description:

The purpose of this project was to count the frequency of the words in all of Shakespeare's writings as well as show any words that repeat. To do this, I designed a program that used the implementation of a hashmap, ChainHashMap, given in the book. My program reads the text file of the writings line by line, to save run time and memory, then splits up the words in each line and adds them to a ChainHashMap and changes the value of each string key to match the frequency. Lastly, my program takes the ChainHashMap and puts all the entries into an ArrayList to sort the entries by the amount of times they appear as well as to print the sorted list later.

Tradeoffs:

During the process of making the program I had a few tradeoffs that I considered. First, whether to read the text file line by line or word by word. Word by word could make my life easier and not have to separate each word in a line, but the run time and memory necessary is massive. So, in order to save memory and run time I chose to read line by line, which would make separating and putting into the ChainHashMap slightly more difficult later on, but worth it in the end. Next, I had to decide how to deal with words in the text file that were not formatted correctly, for example 'good' is not the same as good and my program would create two different entries for these cases. I could have gone into the text file and changed every mistake, which I semi did I only corrected a good amount not all, or I could code in specific instances where errors occur and alter them before being put into the ChainHashMap. I compromised on doing both of these things, as seen in the code, but it is still unknown if there are some cases which I missed or didn't think of which can alter the results of the program with incorrect frequency or words that aren't

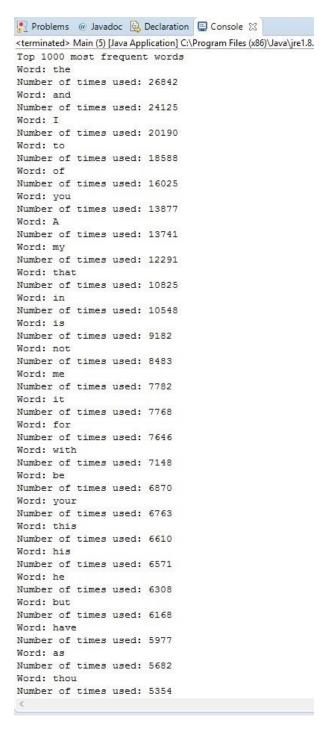
words. Lastly, the last thing I debated was whether to use the specific put, remove, and get bucket methods the ChainHashMap class provided. These used hashcodes, but countless errors happened with space when trying to use them, so I just defaulted to the normal put, get, and remove methods, which are just as effective. This in turn also made it so I didn't have to override the string methods described in the project, equals and hashCode, because hashCode was only needed for the bucket methods, and equals can simply be done using a comparator implementation which I did. This cut down on more code and run time.

Extensions:

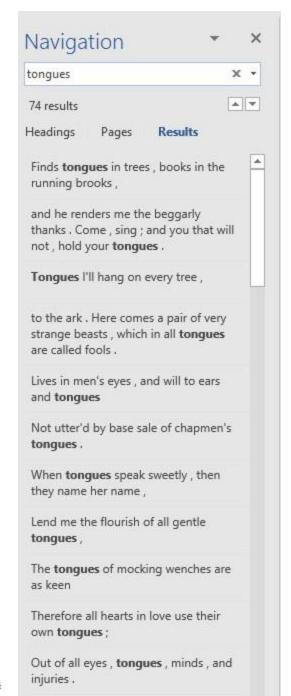
Some possible extensions for my program would include getting a correctly formatted text file, or finding a way to correctly format every case. By having a correctly formatted text file, all the strange cases or misspellings of words, like Caesar being C sar, would have been avoidable and cut down any possible error. Also, having a method to properly fix all the bad formats in the text file would be even more useful, as it fully ensures no mistakes. To achieve this, finding all the mistake cases and coding in special if statements in my code to alter them to be correct formats is the only thing I'd need to do. Lastly, two small extensions that would help would be a possible correct way of using the ChainHashMap bucket methods and fixing the one mysterious error that occurs. This could have made organization, sorting, and printing a bit easier in the end, to achieve this obviously just learn to correctly use the methods, and by eliminating the strange error that occurs it would ensure my program is always working and has no errors which is always necessary in a working program.

Test Cases:

For this project, there weren't really any specific test cases other than my results. There were many ways to reinforce my results though, which count towards the results being the best and only test case for my project. First, here are the top words used in the writings:



As you can see, my end goal was successful in printing the top 1000 words, all words listed later, but how would I check this? The way I went about confirming whether my frequencies were correct was I took the frequency number that was printed and did a word search in a word document to see if the total words found was the same as the frequency. This method doesn't work for words like the, since the is inside many other words, so I took unique nouns, like Neptune and tongues, to check this. Here is the printed frequency for tongues and the word search count in a word document of the same text file:



Word: tongues
Number of times used: 74

As you can see, the frequencies of the word tongues match up completely. This unique noun ensures that all other word count is accurate as well. All cases in the word document are the word tongues, not instances like tongues'. Next, to ensure I had the top 1000 words, I simply took the printed-out frequencies and words and put them into an excel column. Since each word has two lines, the frequency and word, there should be 2001 cells used in the excel column, this includes the top 1000 most frequent words used line:

1980	Word: grows
1981	Number of times used: 75
1982	Word: others
1983	Number of times used: 75
1984	Word: scarce
1985	Number of times used: 74
1986	Word: brain
1987	Number of times used: 74
1988	Word: bor es
1989	Number of times used: 74
1990	Word: tor gues
1991	Number of times used: 74
1992	Word: blind
1993	Number of times used: 74
1994	Word: angelo
1995	Number of times used: 74
1996	Word: blessed
1997	Number of times used: 74
1998	Word: tall ot
1999	Number of times used: 74
2000	Word: woo
2001	Number cl (Ctrl) * ed: 74

As you can see, I have 2001 cells used as predicted, meaning I have the top 1000 most frequent words. Now, a special thing about this program is that there are multiple ties between words for 74 frequency, so the program will never output the same words for the last few of the top 1000. This makes sense as they are the same frequency the program will output the ones that are true as 74 frequency and they won't be the same. These words are still within the top 1000 technically, as they tie for 74, but I didn't include them in the final output. Instead I just took a screenshot as proof:

```
🧝 Problems @ Javadoc 🚇 Declaration 📮 Consc 🌅 Problems @ Javadoc 🚇 Declaration 📮 Console 🛭
<terminated> Main (5) [Java Application] C:\Program F <terminated> Main (5) [Java Application] C:\Program Files (x86)\Java
                                  Word: grows
Word: vow
                                 Number of times used: 75
Number of times used: 76
                                 Word: round
Word: holds
                                Number of times used: 75
Number of times used: 76
Word: paris
                                 Word: know'st
                                 Number of times used: 75
Number of times used: 76
Word: wavs
                                 Word: borne
Word: ways
Number of times used: 75
                                 Number of times used: 75
Word: grows
Number of times used: 75
                                 Word: wits
                                Number of times used: 75
                                Word: until
Number of times used: 75
                                Number of times used: 75
Word: until
                                 Word: wavs
Number of times used: 75
                                 Number of times used: 75
Word: endure
                                  Word: jove
Number of times used: 75
                                 Number of times used: 75
Word: borne
Number of times used: 75
                                 Word: brain
                                Number of times used: 74
Word: others
                                 Word: terms
Number of times used: 75
Number of times used: 75
                                Number of times used: 74
                                 Word: tonques
                                  Number of times used: 74
Word: prisoner
Number of times used: 75
                                 Word: talbot
                                 Number of times used: 74
Word: round
Number of times used: 75
                                Word: blind
Word: know'st
Number of times used: 75
                                Number of times used: 74
                                Word: angelo
                                 Number of times used: 74
Number of times used: 74
                                  Word: blessed
Word: angelo
Number of times used: 74
                                 Number of times used: 74
                                 Word: forgive
Word: talbot
                                 Number of times used: 74
Number of times used: 74
                                Word: yourselves
Word: bones
Word: pones
Number of times used: 74
                                 Number of times used: 74
                                 Word: scarce
Word: woo
                                 Number of times used: 74
Number of times used: 74
                                  Word: bones
Word: brain
Number of times used: 74
                                 Number of times used: 74
                                 Word: although
Word: although
Number of times used: 74 Number of times used: 74
                                 Word: woo
Word: terms
Number of times used: 74
                                 Number of times used: 74
```

As you can see all the words with frequency 74 are there in the second screenshot, but not the first. This is because the top 1000 don't include all the 74 frequency words. I just added this as a notice of this occurring, so if the end output of the 74 frequency is not consistent, you know why. Now, here is the top 1000 words used with their frequencies:

```
Top 1000 most frequent words
Word: the
Number of times used: 26842
Word: and
Number of times used: 24125
Word: I
Number of times used: 20190
Word: to
Number of times used: 18584
Word: of
```

Number of	times	used:	16021
Word: you Number of	times	used:	13877
Word: A			
Number of	times	used:	13741
Word: my Number of	times	used:	12291
Word: that		useu.	12271
Number of		used:	10822
Word: in			
Number of	times	used:	10533
Word: is Number of	times	used:	9182
Word: not	CIMES	useu.	J102
Number of	times	used:	8483
Word: me			
Number of	times	used:	7782
Word: it Number of	timos	usod.	7768
Word: for	CIMES	useu.	7700
	times	used:	7644
Word: with			
Number of	times	used:	7146
Word: be Number of	times	used:	6871
Word: your		useu.	0071
Number of		used:	6763
Word: this			
Number of	times	used:	6610
Word: his Number of	times	used:	6571
Word: he	CIMCS	usca.	0371
Number of	times	used:	6308
Word: but			
Number of		used:	6168
Word: have Number of		used.	5977
Word: as	0211100		03
Number of	times	used:	5682
Word: thou			-0-1
Number of Word: him	times	used:	5354
Number of	times	used:	5142
Word: so	0211100		0 = 1 =
Number of		used:	5011
Word: will		,	F 0 0 1
Number of Word: what		used:	5001
Number of		used:	4490
Word: thy			
Number of	times	used:	3812
Word: her	± 2 ···		2000
Number of Word: do	cimes	usea:	3802
Number of	times	used:	3792
Word: no			
Number of	times	used:	3761

Word: by Number of times used: 3670 Word: all Number of times used: 3645 Word: shall Number of times used: 3597 Word: if Number of times used: 3547 Word: are Number of times used: 3417 Word: we Number of times used: 3386 Word: our Number of times used: 3115 Word: thee Number of times used: 3105 Word: on Number of times used: 2974 Word: good Number of times used: 2809 Word: now Number of times used: 2794 Word: lord Number of times used: 2716 Word: come Number of times used: 2564 Word: from Number of times used: 2555 Word: sir Number of times used: 2539 Word: at Number of times used: 2436 Word: or Number of times used: 2351 Word: they Number of times used: 2330 Word: would Number of times used: 2330 Word: more Number of times used: 2297 Word: was Number of times used: 2272 Word: which Number of times used: 2250 Word: 0 Number of times used: 2238 Word: she Number of times used: 2225 Word: well Number of times used: 2196 Word: how Number of times used: 2176 Word: here Number of times used: 2164 Word: am Number of times used: 2160 Word: then

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Number of times used: 2134
Word: let
Number of times used: 2099
Word: their
Number of times used: 1985
Word: when
Number of times used: 1967
Word: them
Number of times used: 1966
Word: hath
Number of times used: 1916
Word: love
Number of times used: 1913
Word: than
Number of times used: 1873
Word: there
Number of times used: 1832
Word: man
Number of times used: 1807
Word: one
Number of times used: 1735
Word: go
Number of times used: 1735
Word: upon
Number of times used: 1727
Word: like
Number of times used: 1716
Word: us
Number of times used: 1685
Word: know
Number of times used: 1676
Word: say
Number of times used: 1672
Word: an
Number of times used: 1666
Word: may
Number of times used: 1665
Word: make
Number of times used: 1638
Word: did
Number of times used: 1623
Word: were
Number of times used: 1591
Word: yet
Number of times used: 1562
Word: should
Number of times used: 1555
Word: must
Number of times used: 1508
Word: why
Number of times used: 1480
Word: had
Number of times used: 1446
Word: see
Number of times used: 1439
Word: 'tis
Number of times used: 1407
```

Word: such Number of times used: 1387 Word: king Number of times used: 1362 Word: out Number of times used: 1352 Word: give Number of times used: 1343 Word: these Number of times used: 1323 Word: some Number of times used: 1296 Word: too Number of times used: 1244 Word: where Number of times used: 1232 Word: who Number of times used: 1211 Word: take Number of times used: 1210 Word: can Number of times used: 1201 Word: speak Number of times used: 1193 Word: most Number of times used: 1177 Word: mine Number of times used: 1146 Word: tell Number of times used: 1064 Word: up Number of times used: 1048 Word: think Number of times used: 1036 Word: much Number of times used: 1025 Word: never Number of times used: 1022 Word: time Number of times used: 1007 Word: heart Number of times used: 941 Word: nor Number of times used: 931 Word: hear Number of times used: 897 Word: great Number of times used: 895 Word: art Number of times used: 886 Word: men Number of times used: 864 Word: doth Number of times used: 864 Word: death Number of times used: 860 Word: life

Number of times	used:	842
Word: away Number of times	11eed •	836
Word: father	useu.	030
Number of times	used:	831
Word: look	u20u.	001
Number of times	used:	824
Word: made		
Number of times	used:	819
Word: very		
Number of times	used:	817
Word: hand		
Number of times	used:	808
Word: any		
Number of times	used:	781
Word: ay		
Number of times	used:	779
Word: god		
Number of times	used:	776
Word: master	1	774
Number of times	used:	/ / 4
Word: cannot		7.65
Number of times Word: thus	usea:	705
Number of times	ugod.	762
Word: true	usea.	702
Number of times	11000.	761
Word: again	useu.	701
Number of times	11sed •	745
Word: pray	abca.	7 13
Number of times	used:	745
Word: own		
Number of times	used:	744
Word: sweet		
Number of times	used:	732
Word: fair		
Number of times	used:	725
Word: been		
Number of times		720
Word: before		
Number of times	used:	706
Word: day		
Number of times	used:	702
Word: done	,	6.7.0
Number of times	used:	6/2
Word: leave		CEC
Number of times Word: name	usea:	000
Number of times	ugod.	651
Word: eyes	usea.	034
Number of times	used.	643
Word: being	abca.	0.15
Number of times	used:	642
Word: honour		-
Number of times	used:	642
Word: heaven		
Number of times	used:	636

Word: blood Number of times used: 635 Word: into Number of times used: 634 Word: lady Number of times used: 629 Word: fear Number of times used: 626 Word: nothing Number of times used: 625 Word: noble Number of times used: 624 Word: therefore Number of times used: 621 Word: till Number of times used: 621 Word: could Number of times used: 621 Word: poor Number of times used: 620 Word: old Number of times used: 617 Word: son Number of times used: 614 Word: though Number of times used: 611 Word: world Number of times used: 608 Word: down Number of times used: 607 Word: ever Number of times used: 604 Word: whose Number of times used: 603 Word: comes Number of times used: 602 Word: both Number of times used: 592 Word: nay Number of times used: 590 Word: better Number of times used: 590 Word: hast Number of times used: 590 Word: even Number of times used: 579 Word: myself Number of times used: 575 Word: against Number of times used: 575 Word: other Number of times used: 572 Word: call Number of times used: 572 Word: grace Number of times used: 571 Word: night

Number of Word: to		tim	es	used	: :	564
Number o	of	tim	ies	used	: :	563
Word: was	_	tim	es	used	: !	563
Word: ma			10.5	11504		555
Word: st	tan	d		useu		
Number of Word: pe			es	used	: !	551
Number o	of	tim	es	used	: !	539
Word: fi			ies	used	: :	534
Word: bi						533
Word: de	ead			used		,,,
Number of Word: th			ies	used	: !	531
Number o	of	tim	ies	used	: !	530
Word: be			ies	used	. !	529
Word: ma	ada	m				
Number of Word: fi			es	used	: !	516
Number o	of	tim	ies	used	: :	513
Word: st			es	used	: !	510
Word: 1:				,		-10
Number of Word: ex			ies	used	.: :	510
Number of Word: wo	of	tim	es	used	: :	508
Number			es	used	: !	502
Word: di Number		+ ~~				501
Word: p		CIII	ies	useu	• `	30 I
Number of Word: he			es	used	.: '	493
Number			ies	used	: 4	490
Word: 1:	itt	le				400
Number of Word: ke			ies	usea	.: '	489
Number o			es	used	: '	485
Word: man Number of			ies	used	: 4	483
Word: da				,		470
Number of Word: f:				usea	: '	4/9
Number o	of	tim		used	: '	476
Word: no Number	of	tim	ies	used	: 4	471
Word: go Number o			169	11564	. ,	465
Word: wa	ife					
Number of Word: wh			ies	used	: '	462
Number			ies	used	: 4	461

Word: bring Number of times used: 450 Word: off Number of times used: 450 Word: hold Number of times used: 450 Word: set Number of times used: 447 Word: indeed Number of times used: 444 Word: himself Number of times used: 442 Word: part Number of times used: 441 Word: unto Number of times used: 439 Word: 't Number of times used: 436 Word: long Number of times used: 435 Word: since Number of times used: 435 Word: soul Number of times used: 433 Word: dear Number of times used: 432 Word: queen Number of times used: 431 Word: best Number of times used: 429 Word: young Number of times used: 418 Word: thine Number of times used: 417 Word: stay Number of times used: 415 Word: daughter Number of times used: 415 Word: else Number of times used: 414 Word: full Number of times used: 414 Word: once Number of times used: 413 Word: friend Number of times used: 412 Word: that's Number of times used: 411 Word: words Number of times used: 410 Word: thing Number of times used: 406 Word: house Number of times used: 406 Word: dost Number of times used: 405 Word: face

Number of times	used:	405
Word: faith		
Number of times Word: show	used:	404
Number of times	11sed •	401
Word: please	useu.	40T
Number of times	used:	397
Word: place		
Number of times	used:	397
Word: about		
Number of times	used:	395
Word: there's Number of times	used:	395
Word: tongue	useu.	393
Number of times	used:	390
Word: has		
Number of times	used:	387
Word: said		
Number of times	used:	386
Word: answer		205
Number of times Word: eye	usea:	385
Number of times	used•	382
Word: after	asca.	002
Number of times	used:	381
Word: mistress		
Number of times	used:	377
Word: fool	1	272
Number of times Word: france	used:	373
Number of times	used:	373
Word: welcome	asca.	3 / 3
Number of times	used:	372
Word: marry		
Number of times	used:	370
Word: forth	,	2.60
Number of times Word: prince	usea:	368
Number of times	used.	367
Word: thought	usca.	307
Number of times	used:	361
Word: hence		
Number of times	used:	359
Word: ere		0.50
Number of times Word: farewell	used:	358
Number of times	11sed •	358
Word: hope	usca.	330
Number of times	used:	357
Word: matter		
Number of times	used:	355
Word: lords		0 = =
Number of times Word: gentle	used:	355
Number of times	used.	354
Word: without	asca.	551
Number of times	used:	354

Word: caesar Number of times used: 354 Word: heard Number of times used: 349 Word: boy Number of times used: 347 Word: mind Number of times used: 347 Word: came Number of times used: 345 Word: what's Number of times used: 344 Word: nature Number of times used: 344 Word: makes Number of times used: 342 Word: cause Number of times used: 342 Word: right Number of times used: 336 Word: home Number of times used: 336 Word: rest Number of times used: 335 Word: mother Number of times used: 335 Word: bid Number of times used: 335 Word: does Number of times used: 333 Word: gods Number of times used: 332 Word: power Number of times used: 330 Word: three Number of times used: 330 Word: rather Number of times used: 328 Word: sword Number of times used: 325 Word: we'll Number of times used: 325 Word: fortune Number of times used: 324 Word: another Number of times used: 323 Word: things Number of times used: 323 Word: meet Number of times used: 322 Word: back Number of times used: 322 Word: thousand Number of times used: 320 Word: use Number of times used: 319 Word: woman

Number of times	used:	319
Word: enough		210
Number of times Word: news	usea:	318
Number of times	used:	317
Word: hands		01,
Number of times	used:	315
Word: help		
Number of times	used:	315
Word: only Number of times		210
Word: get	usea:	312
Number of times	used:	311
Word: within		
Number of times	used:	310
Word: truth		
Number of times	used:	309
Word: he's		207
Number of times Word: follow	usea:	307
Number of times	used:	306
Word: fellow		
Number of times	used:	305
Word: lie		
Number of times	used:	303
Word: hither Number of times	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	202
Word: pardon	useu.	303
Number of times	used:	301
Word: wilt		
Number of times	used:	299
Word: thank		
Number of times	used:	298
Word: end Number of times	nsod.	200
Word: sure	useu.	290
Number of times	used:	298
Word: earth		
Number of times	used:	296
Word: fall	,	0.05
Number of times Word: mean	used:	295
Number of times	11900.	292
Word: hour	usca.	2,72
Number of times	used:	292
Word: shame		
Number of times	used:	291
Word: play	,	0.01
Number of times	used:	291
Word: honest Number of times	used•	291
Word: husband	2004.	
Number of times	used:	289
Word: gentleman		
Number of times	used:	287
Word: state	11 G G =1 .	207
Number of times	used:	∠४/

Word: shalt Number of times used: 286 Word: rome Number of times used: 285 Word: tears Number of times used: 284 Word: yourself Number of times used: 282 Word: ye Number of times used: 280 Word: last Number of times used: 278 Word: lay Number of times used: 278 Word: reason Number of times used: 277 Word: turn Number of times used: 271 Word: false Number of times used: 270 Word: far Number of times used: 269 Word: sent Number of times used: 268 Word: kind Number of times used: 267 Word: john Number of times used: 265 Word: under Number of times used: 265 Word: bed Number of times used: 263 Word: saw Number of times used: 263 Word: light Number of times used: 263 Word: means Number of times used: 262 Word: through Number of times used: 261 Word: while Number of times used: 258 Word: majesty Number of times used: 258 Word: lost Number of times used: 258 Word: seen Number of times used: 258 Word: crown Number of times used: 257 Word: let's Number of times used: 257 Word: cousin Number of times used: 256 Word: youth Number of times used: 256 Word: yours

Number of times used: 255 Word: together Number of times used: 255 Word: send Number of times used: 255 Word: fire Number of times used: 255 Word: wit Number of times used: 254 Word: break Number of times used: 252 Word: believe Number of times used: 251 Word: sleep Number of times used: 251 Word: swear Number of times used: 251 Word: left Number of times used: 249 Word: villain Number of times used: 249 Word: arms Number of times used: 247 Word: itself Number of times used: 246 Word: prove Number of times used: 245 Word: war Number of times used: 245 Word: england Number of times used: 244 Word: spirit Number of times used: 244 Word: present Number of times used: 243 Word: strange Number of times used: 243 Word: court Number of times used: 242 Word: fight Number of times used: 239 Word: father's Number of times used: 236 Word: fly Number of times used: 234 Word: further Number of times used: 234 Word: says Number of times used: 234 Word: thoughts Number of times used: 234 Word: business Number of times used: 233 Word: mad Number of times used: 232 Word: wrong Number of times used: 230 Word: alas Number of times used: 229 Word: ne'er Number of times used: 229 Word: beseech Number of times used: 228 Word: seek Number of times used: 228 Word: lies Number of times used: 228 Word: body Number of times used: 228 Word: high Number of times used: 227 Word: less Number of times used: 227 Word: told Number of times used: 227 Word: mark Number of times used: 227 Word: prithee Number of times used: 226 Word: to-morrow Number of times used: 226 Word: child Number of times used: 224 Word: sea Number of times used: 223 Word: found Number of times used: 222 Word: gave Number of times used: 222 Word: between Number of times used: 221 Word: gold Number of times used: 220 Word: worthy Number of times used: 219 Word: service Number of times used: 219 Word: ill Number of times used: 218 Word: bloody Number of times used: 218 Word: horse Number of times used: 218 Word: devil Number of times used: 218 Word: desire Number of times used: 217 Word: wish Number of times used: 217 Word: care Number of times used: 217 Word: royal Number of times used: 216 Word: each

```
Number of times used: 216
Word: pity
Number of times used: 216
Word: near
Number of times used: 215
Word: here's
Number of times used: 214
Word: york
Number of times used: 214
Word: sit
Number of times used: 214
Word: grief
Number of times used: 213
Word: sun
Number of times used: 212
Word: foul
Number of times used: 212
Word: yes
Number of times used: 210
Word: land
Number of times used: 209
Word: save
Number of times used: 208
Word: half
Number of times used: 208
Word: purpose
Number of times used: 207
Word: breath
Number of times used: 207
Word: alone
Number of times used: 207
Word: thyself
Number of times used: 206
Word: antony
Number of times used: 206
Word: letter
Number of times used: 204
Word: same
Number of times used: 204
Word: dare
Number of times used: 203
Word: draw
Number of times used: 202
Word: cry
Number of times used: 202
Word: looks
Number of times used: 201
Word: happy
Number of times used: 201
Word: ha
Number of times used: 201
Word: lose
Number of times used: 200
Word: company
Number of times used: 200
Word: charge
Number of times used: 200
```

Word: return Number of times used: 200 Word: knows Number of times used: 199 Word: read Number of times used: 199 Word: talk Number of times used: 198 Word: joy Number of times used: 198 Word: brought Number of times used: 197 Word: ho Number of times used: 197 Word: ear Number of times used: 197 Word: times Number of times used: 197 Word: kill Number of times used: 195 Word: remember Number of times used: 195 Word: lives Number of times used: 195 Word: worth Number of times used: 194 Word: air Number of times used: 193 Word: known Number of times used: 193 Word: wear Number of times used: 193 Word: law Number of times used: 193 Word: holy Number of times used: 193 Word: to-night Number of times used: 192 Word: gracious Number of times used: 191 Word: people Number of times used: 191 Word: patience Number of times used: 191 Word: proud Number of times used: 190 Word: gentlemen Number of times used: 189 Word: loves Number of times used: 189 Word: because Number of times used: 189 Word: comfort Number of times used: 189 Word: general Number of times used: 189 Word: given

Number of times	used:	189
Word: late Number of times	11 G G d •	100
Word: free	usea:	109
Number of times	used:	188
Word: serve		
Number of times	used:	188
Word: run		
Number of times	used:	188
Word: neither		100
Number of times Word: sight	usea:	186
Number of times	used.	185
Word: virtue	abca.	100
Number of times	used:	185
Word: uncle		
Number of times	used:	185
Word: kiss		
Number of times	used:	184
Word: yea		104
Number of times Word: cold	usea:	184
Number of times	used.	183
Word: need	abca.	103
Number of times	used:	182
Word: days		
Number of times	used:	182
Word: years		
Number of times	used:	182
Word: didst		1.00
Number of times Word: work	usea:	182
Number of times	used.	181
Word: new	asca.	101
Number of times	used:	180
Word: age		
Number of times	used:	180
Word: warrant		100
Number of times	used:	180
Word: grave Number of times	11cod •	170
Word: sorrow	useu.	175
Number of times	used:	179
Word: sister		
Number of times	used:	178
Word: something		
Number of times	used:	178
Word: doubt	,	1.00
Number of times Word: money	usea:	1/8
Number of times	11564.	177
Word: wind	abca.	± / /
Number of times	used:	177
Word: maid		
Number of times	used:	177
Word: bound	_	4.5.6
Number of times	used:	T./ 6

Word: strong Number of times used: 176 Word: henry Number of times used: 176 Word: pleasure Number of times used: 175 Word: ah Number of times used: 175 Word: trust Number of times used: 174 Word: command Number of times used: 174 Word: canst Number of times used: 173 Word: seem Number of times used: 173 Word: mercy Number of times used: 173 Word: thanks Number of times used: 173 Word: born Number of times used: 171 Word: cut Number of times used: 170 Word: sound Number of times used: 170 Word: merry Number of times used: 170 Word: weep Number of times used: 168 Word: ask Number of times used: 168 Word: truly Number of times used: 168 Word: hearts Number of times used: 167 Word: goes Number of times used: 167 Word: either Number of times used: 167 Word: knave Number of times used: 167 Word: fit Number of times used: 166 Word: hang Number of times used: 166 Word: sake Number of times used: 166 Word: certain Number of times used: 166 Word: warwick Number of times used: 165 Word: ears Number of times used: 165 Word: 'twas Number of times used: 165 Word: hate

Number of times	used:	164
Word: foot Number of times	used:	164
Word: worse		
Number of times Word: fault	used:	164
Number of times	used:	164
Word: heavy Number of times	used:	163
Word: to-day Number of times	used:	163
Word: next		
Number of times Word: almost	used:	163
Number of times Word:	used:	163
Number of times	used:	162
Word: justice Number of times	used:	161
Word: wise Number of times	used:	161
Word: hard		
Number of times Word: rich		
Number of times Word: ground	used:	160
Number of times	used:	160
Word: base Number of times	used:	159
Word: haste		
Number of times Word: she's	used:	159
Number of times	used:	158
Word: you'll Number of times	used:	158
Word: took Number of times	used:	157
Word: brave		
Number of times Word: enemy	used:	157
Number of times Word: praise	used:	157
Number of times	used:	157
Word: strike Number of times	used:	157
Word: voice		
Number of times Word: having	usea:	156
Number of times Word: music	used:	156
Number of times	used:	156
Word: richard Number of times	used:	156
Word: course Number of times	used:	156
Word: hark		
Number of times	used:	156

Word: content Number of times used: 156 Word: valiant Number of times used: 155 Word: fie Number of times used: 155 Word: deed Number of times used: 155 Word: sin Number of times used: 154 Word: man's Number of times used: 154 Word: drink Number of times used: 154 Word: women Number of times used: 153 Word: field Number of times used: 153 Word: ring Number of times used: 153 Word: revenge Number of times used: 153 Word: behold Number of times used: 153 Word: sad Number of times used: 153 Word: knew Number of times used: 152 Word: french Number of times used: 152 Word: hell Number of times used: 152 Word: beauty Number of times used: 152 Word: unless Number of times used: 152 Word: sick Number of times used: 151 Word: 'em Number of times used: 151 Word: straight Number of times used: 151 Word: side Number of times used: 151 Word: stands Number of times used: 150 Word: over Number of times used: 150 Word: brutus Number of times used: 150 Word: spoke Number of times used: 150 Word: common Number of times used: 150 Word: change Number of times used: 149 Word: methinks

Number of times used: 149 Word: note Number of times used: 148 Word: duty Number of times used: 148 Word: hot Number of times used: 148 Word: themselves Number of times used: 148 Word: already Number of times used: 147 Word: report Number of times used: 147 Word: king's Number of times used: 147 Word: heavens Number of times used: 147 Word: yield Number of times used: 147 Word: ready Number of times used: 147 Word: sirrah Number of times used: 147 Word: withal Number of times used: 146 Word: oath Number of times used: 146 Word: eat Number of times used: 145 Word: highness Number of times used: 145 Word: question Number of times used: 145 Word: soon Number of times used: 144 Word: person Number of times used: 144 Word: lead Number of times used: 144 Word: coming Number of times used: 144 Word: presently Number of times used: 144 Word: become Number of times used: 144 Word: ten Number of times used: 144 Word: english Number of times used: 143 Word: arm Number of times used: 143 Word: sons Number of times used: 143 Word: married Number of times used: 143 Word: past Number of times used: 143

Word: black Number of times used: 143 Word: open Number of times used: 142 Word: dog Number of times used: 142 Word: just Number of times used: 141 Word: lest Number of times used: 141 Word: pay Number of times used: 140 Word: oft Number of times used: 140 Word: wherefore Number of times used: 139 Word: lov'd Number of times used: 139 Word: liege Number of times used: 139 Word: point Number of times used: 139 Word: call'd Number of times used: 138 Word: wars Number of times used: 138 Word: needs Number of times used: 137 Word: edward Number of times used: 137 Word: suit Number of times used: 137 Word: want Number of times used: 137 Word: sing Number of times used: 137 Word: fare Number of times used: 137 Word: country Number of times used: 137 Word: flesh Number of times used: 136 Word: pass Number of times used: 136 Word: met Number of times used: 134 Word: deny Number of times used: 134 Word: soldier Number of times used: 133 Word: knight Number of times used: 133 Word: signior Number of times used: 133 Word: bold Number of times used: 133 Word: grow

Number of times used: 132 Word: lips Number of times used: 131 Word: god's Number of times used: 131 Word: speech Number of times used: 131 Word: sworn Number of times used: 131 Word: glad Number of times used: 131 Word: tender Number of times used: 130 Word: four Number of times used: 130 Word: twenty Number of times used: 130 Word: deep Number of times used: 129 Word: wouldst Number of times used: 129 Word: wherein Number of times used: 129 Word: counsel Number of times used: 129 Word: de Number of times used: 128 Word: favour Number of times used: 128 Word: hector Number of times used: 127 Word: mouth Number of times used: 127 Word: walk Number of times used: 127 Word: traitor Number of times used: 127 Word: fetch Number of times used: 127 Word: anon Number of times used: 126 Word: captain Number of times used: 126 Word: hours Number of times used: 126 Word: appear Number of times used: 126 Word: office Number of times used: 126 Word: pale Number of times used: 125 Word: confess Number of times used: 125 Word: above Number of times used: 124 Word: honourable Number of times used: 124

Word: moon Number of times used: 123 Word: bad Number of times used: 123 Word: fast Number of times used: 123 Word: beat Number of times used: 123 Word: bosom Number of times used: 123 Word: fell Number of times used: 123 Word: water Number of times used: 122 Word: witness Number of times used: 122 Word: conscience Number of times used: 122 Word: act Number of times used: 122 Word: sovereign Number of times used: 122 Word: got Number of times used: 122 Word: whole Number of times used: 122 Word: sport Number of times used: 121 Word: spirits Number of times used: 121 Word: sense Number of times used: 121 Word: letters Number of times used: 121 Word: slain Number of times used: 121 Word: pretty Number of times used: 121 Word: attend Number of times used: 121 Word: page Number of times used: 121 Word: excellent Number of times used: 121 Word: city Number of times used: 121 Word: woe Number of times used: 121 Word: morrow Number of times used: 120 Word: morning Number of times used: 120 Word: dream Number of times used: 120 Word: vile Number of times used: 119 Word: slave

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Number of times used: 119
Word: 'twere
Number of times used: 119
Word: wonder
Number of times used: 119
Word: speaks
Number of times used: 119
Word: is't
Number of times used: 119
Word: loss
Number of times used: 119
Word: living
Number of times used: 118
Word: town
Number of times used: 117
Word: gives
Number of times used: 117
Word: rage
Number of times used: 117
Word: fortunes
Number of times used: 117
Word: strength
Number of times used: 117
Word: win
Number of times used: 117
Word: soft
Number of times used: 117
Word: ourselves
Number of times used: 116
Word: often
Number of times used: 116
Word: romeo
Number of times used: 116
Word: lordship
Number of times used: 116
Word: five
Number of times used: 115
Word: along
Number of times used: 115
Word: kings
Number of times used: 114
Word: entreat
Number of times used: 114
Word: watch
Number of times used: 113
Word: longer
Number of times used: 113
Word: write
Number of times used: 113
Word: action
Number of times used: 113
Word: touch
Number of times used: 113
Word: murder
Number of times used: 113
Word: seems
Number of times used: 113
```

Word: begin Number of times used: 113 Word: hair Number of times used: 112 Word: servant Number of times used: 112 Word: mighty Number of times used: 112 Word: cassio Number of times used: 112 Word: white Number of times used: 111 Word: speed Number of times used: 111 Word: marriage Number of times used: 111 Word: he'll Number of times used: 111 Word: quickly Number of times used: 111 Word: offence Number of times used: 110 Word: saint Number of times used: 110 Word: soldiers Number of times used: 110 Word: hundred Number of times used: 110 Word: judgment Number of times used: 109 Word: gloucester Number of times used: 109 Word: issue Number of times used: 109 Word: loving Number of times used: 109 Word: souls Number of times used: 108 Word: besides Number of times used: 108 Word: teach Number of times used: 108 Word: valour Number of times used: 108 Word: grant Number of times used: 107 Word: door Number of times used: 107 Word: children Number of times used: 107 Word: heir Number of times used: 107 Word: kate Number of times used: 107 Word: harry Number of times used: 107 Word: died

Number of times	used:	107
Word: bless Number of times	used.	107
Word: deeds	usca.	107
Number of times	used:	107
Word: presence		
Number of times Word: passion	used:	106
Number of times	used:	106
Word: tale		
Number of times	used:	106
Word: masters		
Number of times	used:	106
Word: princes Number of times	used:	106
Word: bears	abca.	100
Number of times	used:	105
Word: throw		
Number of times	used:	105
Word: respect Number of times	11 G G d •	105
Word: hide	usea.	103
Number of times	used:	104
Word: cast		
Number of times	used:	104
Word: close Number of times	11 G G d •	104
Word: feel	usea.	104
Number of times	used:	104
Word: danger		
Number of times	used:	103
Word: parts		103
Number of times Word: force	used:	103
Number of times	used:	103
Word: dangerous		
Number of times	used:	103
Word: heads Number of times	11 G G d •	1 0 2
Word: case	usea:	103
Number of times	used:	103
Word: hadst		
Number of times	used:	103
Word: pluck Number of times	11 G G d •	103
Word: chance	usea.	103
Number of times	used:	103
Word: wisdom		
Number of times	used:	103
Word: feast Number of times	11924.	103
Word: jest	useu.	100
Number of times	used:	103
Word: whilst		
Number of times	used:	102
Word: health Number of times	used.	102
MANUEL OF CTHIS	useu.	102

Word: enemies Number of times used: 101 Word: weak Number of times used: 101 Word: deliver Number of times used: 101 Word: choose Number of times used: 101 Word: promise Number of times used: 101 Word: where's Number of times used: 101 Word: beg Number of times used: 101 Word: behind Number of times used: 100 Word: quick Number of times used: 100 Word: ladies Number of times used: 100 Word: went Number of times used: 100 Word: curse Number of times used: 100 Word: pride Number of times used: 100 Word: adieu Number of times used: 99 Word: fools Number of times used: 99 Word: understand Number of times used: 99 Word: move Number of times used: 99 Word: claudio Number of times used: 98 Word: shake Number of times used: 98 Word: second Number of times used: 98 Word: toward Number of times used: 97 Word: plain Number of times used: 97 Word: subject Number of times used: 97 Word: stop Number of times used: 97 Word: worst Number of times used: 97 Word: troth Number of times used: 97 Word: awhile Number of times used: 97 Word: humour Number of times used: 97 Word: buy

Number of times	used:	96
Word: form Number of times	used:	96
Word: fashion		
Number of times	used:	96
Word: writ		0.0
Number of times Word: mortal	used:	96
Number of times	used:	96
Word: count	uscu.	50
Number of times	used:	96
Word: battle		
Number of times	used:	96
Word: quarrel		
Number of times	used:	96
Word: going		
Number of times Word: least	used:	96
Number of times	used:	96
Word: virtuous	useu.	90
Number of times	used:	96
Word: receive		
Number of times	used:	96
Word: consent		
Number of times	used:	96
Word: wert		
Number of times	used:	95
Word: angry Number of times	used:	95
Word: title	useu.	93
Number of times	used:	95
Word: roman		
Number of times	used:	95
Word: herself		
Number of times	used:	95
Word: stood	1	0.5
Number of times Word: clarence	used:	95
Number of times	11564.	95
Word: foolish	uscu.	55
Number of times	used:	94
Word: thither		
Number of times Word: judge	used:	94
Word: judge		
Number of times	used:	94
Word: kept Number of times		0.4
Word: blow	usea:	94
Number of times	used:	94
Word: prayers	acca.	J 1
Number of times	used:	94
Word: hurt		
Number of times	used:	94
Word: shows	_	
Number of times	used:	94
Word: kingdom	11504.	93
Number of times	usea:	93

Word: scorn Number of times used: 93 Word: march Number of times used: 93 Word: won Number of times used: 93 Word: worship Number of times used: 93 Word: 'gainst Number of times used: 93 Word: forget Number of times used: 93 Word: plague Number of times used: 92 Word: sorry Number of times used: 92 Word: whither Number of times used: 92 Word: lend Number of times used: 92 Word: treason Number of times used: 92 Word: piece Number of times used: 92 Word: ta'en Number of times used: 92 Word: harm Number of times used: 91 Word: lack Number of times used: 91 Word: faults Number of times used: 91 Word: commend Number of times used: 91 Word: shallow Number of times used: 91 Word: among Number of times used: 91 Word: offer Number of times used: 91 Word: fine Number of times used: 91 Word: taken Number of times used: 91 Word: try Number of times used: 90 Word: pains Number of times used: 90 Word: earl Number of times used: 90 Word: low Number of times used: 90 Word: alive Number of times used: 90 Word: ours Number of times used: 90 Word: measure

Number of times	used:	90
Word: fearful Number of times	used:	89
Word: labour Number of times	used:	89
Word: perceive	useu.	0 9
Number of times	used:	89
Word: brief		0.0
Number of times Word: gates	used:	88
Number of times	used:	88
Word: chamber		
Number of times Word: noise	used:	88
Number of times	used:	88
Word: order		
Number of times	used:	88
Word: guard Number of times	used:	88
Word: ass	usea.	00
Number of times	used:	88
Word: laid Number of times		0.0
Word: calls	usea:	88
Number of times	used:	88
Word: breast		0.0
Number of times Word: hearing	used:	88
Number of times	used:	88
Word: learn		
Number of times Word: kill'd	used:	87
Number of times	used:	87
Word: beard		
Number of times	used:	87
Word: golden Number of times	1156d·	87
Word: men's	usca.	0 7
Number of times	used:	86
Word: forgot Number of times		0.6
Word: patient	usea:	00
Number of times	used:	86
Word: fled		0.5
Number of times Word: awake	used:	86
Number of times	used:	86
Word: honesty		
Number of times	used:	86
Word: troilus Number of times	used:	86
Word: laugh		
Number of times	used:	86
Word: birth Number of times	11964.	85
Word: coward	useu.	0.0
Number of times	used:	85

Word: wild Number of times used: 85 Word: short Number of times used: 85 Word: opinion Number of times used: 85 Word: carry Number of times used: 85 Word: small Number of times used: 85 Word: stir Number of times used: 85 Word: silence Number of times used: 84 Word: whence Number of times used: 84 Word: mock Number of times used: 84 Word: broke Number of times used: 84 Word: dull Number of times used: 83 Word: amen Number of times used: 83 Word: book Number of times used: 83 Word: dinner Number of times used: 83 Word: greater Number of times used: 83 Word: emperor Number of times used: 83 Word: year Number of times used: 82 Word: glory Number of times used: 82 Word: whether Number of times used: 82 Word: lion Number of times used: 82 Word: green Number of times used: 82 Word: held Number of times used: 82 Word: who's Number of times used: 82 Word: thence Number of times used: 82 Word: shape Number of times used: 82 Word: feed Number of times used: 82 Word: match Number of times used: 82 Word: takes Number of times used: 81 Word: safe

Number			used:	81
Word: w				
Number			used:	81
Word: e				0.1
Number Word: p			used:	81
Number			used:	81
Word: q			usca.	ΟŢ
Number			used:	81
Word: p				
Number			used:	81
Word: q	quie	t		
Number	of	times	used:	80
Word: p				
Number			used:	80
Word: p			_	
Number Word: c			used:	80
wora: c Number				0.0
Word: f			used:	80
Number			used:	80
Word: k			abca.	00
Number			used:	80
Word: n				
Number			used:	80
Word: p	ris	on		
Number			used:	80
Word: c			,	
Number Word: 1			used:	79
Number			used:	79
Word: t			usca.	13
Number			used:	79
Word: b				
Number			used:	79
Word: k	rot	her's		
Number			used:	79
Word: f				
Number			used:	79
Word: w			,	7.0
Number Word: h			usea:	79
Number			11000.	79
Word: s			usca.	1)
Number			used:	79
	ogu			
Number			used:	79
Word: w	_			
Number			used:	79
Word: t				
Number			used:	79
Word: b	_		11000	70
Number Word: p			used:	79
Number			used.	79
Word: v			abca.	, ,
Number			used:	79

Word: goodly Number of times	neod.	70
Word: desires	usea:	19
Number of times	used.	78
Word: honours	abca.	7 0
Number of times	used:	78
Word: greatness	asca.	, 0
Number of times	used:	78
Word: ancient		
Number of times	used:	78
Word: smile		
Number of times	used:	78
Word: trouble		
Number of times	used:	78
Word: sudden		
Number of times	used:	78
Word: folly		
Number of times	used:	78
Word: timon		
Number of times	used:	78
Word: struck		
Number of times		77
Word: knowledge		
Number of times	used:	77
Word: rise		
Number of times	used:	77
Word: double		
Number of times	used:	7.7
Word: alack		77
Number of times	usea:	/ /
Word: tent Number of times		77
Word: tear	usea:	/ /
Number of times	11000.	77
Word: banish'd	useu.	7 7
Number of times	used.	77
Word: steal	abca.	, ,
Number of times	used:	77
Word: drawn	asca.	, ,
Number of times	used:	77
Word: marcius		
Number of times	used:	77
Word: aught		
Number of times	used:	77
Word: jack		
Number of times	used:	77
Word: moor		
Number of times	used:	77
Word: wounds		
Number of times	used:	77
Word: burn		
Number of times	used:	77
Word: holds		
Number of times	used:	76
Word: paris	_	T. C.
Number of times	used:	76
Word: vow		

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Number of times used: 76
Word: paper
Number of times used: 76
Word: manner
Number of times used: 76
Word: mother's
Number of times used: 76
Word: wast
Number of times used: 76
Word: motion
Number of times used: 76
Word: colour
Number of times used: 76
Word: wits
Number of times used: 75
Word: grows
Number of times used: 75
Word: endure
Number of times used: 75
Word: round
Number of times used: 75
Word: borne
Number of times used: 75
Word: until
Number of times used: 75
Word: jove
Number of times used: 75
Word: prisoner
Number of times used: 75
Word: ways
Number of times used: 75
Word: know'st
Number of times used: 75
Word: others
Number of times used: 75
Word: woo
Number of times used: 74
Word: tongues
Number of times used: 74
Word: bones
Number of times used: 74
Word: angelo
Number of times used: 74
Word: scarce
Number of times used: 74
Word: blind
Number of times used: 74
Word: although
Number of times used: 74
Word: brain
Number of times used: 74
Word: talbot
Number of times used: 74
```

Lastly, the other goal was to print out all the words that had collisions, aka more frequently occurring than 1. There are far too many of them to display them all, but here are some instances

(Note: the total collisions is one less than the frequency, since the first instance of a word isn't a collision):

```
Problems @ Javadoc ☑ Declaration ☑ Console ♡
<terminated> Main (5) [Java Application] C:\Program Files (x86)\Java\jre1.8.0_91\bin\java\
Word: therewith
Number of times used: 2
Word: toothpick
Number of times used: 2
Word: prolong
Number of times used: 2
Word: inkhorn
Number of times used: 2
Word: folds
Number of times used: 2
Word: footboy
Number of times used: 2
Word: clients
Number of times used: 2
Word: gagged
Number of times used: 2
Word: usurper's
Number of times used: 2
Word: faintness
Number of times used: 2
Number of times used: 2
Word: novices
Number of times used: 2
Word: augmenting
Number of times used: 2
Word: paintings
Number of times used: 2
Word: hooks
Number of times used: 2
Word: perge
Number of times used: 2
Word: turkey-cock
Number of times used: 2
Word: variation
Number of times used: 2
Word: victual
Number of times used: 2
Word: suffic'd
Number of times used: 2
Word: uncouth
Number of times used: 2
Word: armenia
Number of times used: 2
Word: clouts
Number of times used: 2
Word: politicly
Number of times used: 2
Word: daffodils
Number of times used: 2
Word: barking
```

Based off the accuracy of my results, I'm pretty confident in my project, although I can never be certain given the amount of formatting errors in the text file which can alter the frequency of many words and the actual words themselves.