Assn_Rules_OMalley.R

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```r
# Association Rules Week 4/5 Assignment
# Sean O'Malley

library(arules)
```

```
## Loading required package: Matrix
##
## Attaching package: 'arules'
##
## The following objects are masked from 'package:base':
##
##     %in%, write
```

```r
library(datasets)
library(graphics)
library(grDevices)
library(Matrix)
library(methods)
library(stats)
library(utils)

# Download Sparse Matrix
bookbaskets <- read.transactions("/Users/SeanOMalley1/Desktop/Week\ 4\ ADM/bookdata.g
z",
                                 format="single",          # specify file and file
format
                                 sep="\t",                 # specify "tab" as colum
n separator
                                 cols=c("userid", "title"), # specify column names
                                 rm.duplicates=T)           # remove duplicate entri
es
```

```
## distribution of transactions with duplicates:
## items
##    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15   16   17   18
##  701  222  106   68   43   39   23   24   18   18   16   10    7    7   13    7    8    5
##   19   20   21   22   23   25   26   27   28   29   30   31   33   34   35   38   39   42
##    3    9    4    4    3    2    2    5    4    5    4    4    1    2    1    1    1    2
##   44   45   47   48   49   52   56   57   59   61   63   71   73   80   84   86   91   93
##    1    1    1    1    1    1    2    1    2    1    2    1    1    1    1    1    1    1
##   95   96   99  103  158  206  260  891
##    1    1    1    1    1    2    1    1
```

```
basketSizes<-size(bookbaskets)

bookFreq<-itemFrequency(bookbaskets)

bookCount <- (bookFreq/sum(bookFreq))*sum(basketSizes)
#    Get the absolute count of book
#    occurrences.

bookbasket_use<-bookbaskets[basketSizes>1]

summary(bookbaskets)
```

```
## transactions as itemMatrix in sparse format with
##  92108 rows (elements/itemsets/transactions) and
##  220447 columns (items) and a density of 5.034811e-05
##
## most frequent items:
##                              Wild Animus
##                                     2502
##             The Lovely Bones: A Novel
##                                     1295
##                        She's Come Undone
##                                      934
##                        The Da Vinci Code
##                                      905
## Harry Potter and the Sorcerer's Stone
##                                      832
##                                  (Other)
##                                  1015847
##
## element (itemset/transaction) length distribution:
## sizes
##      1      2      3      4      5      6      7      8      9     10     11     12
## 51286  10804   5760   3850   2700   2044   1609   1241   1075    901    755    643
```

```
##     13    14    15    16    17    18    19    20    21    22    23    24
##    555   460   464   393   342   332   268   258   237   222   195   179
##     25    26    27    28    29    30    31    32    33    34    35    36
##    182   170   156   154   129   114   120   103   128   101    88    94
##     37    38    39    40    41    42    43    44    45    46    47    48
##     98    82    71    80    60    81    70    65    73    77    79    54
##     49    50    51    52    53    54    55    56    57    58    59    60
##     54    47    43    50    52    43    38    47    43    39    46    44
##     61    62    63    64    65    66    67    68    69    70    71    72
##     36    30    31    24    46    25    27    35    29    28    32    22
##     73    74    75    76    77    78    79    80    81    82    83    84
##     26    24    25    19    22    26    27    21    29    13    29    21
##     85    86    87    88    89    90    91    92    93    94    95    96
##     20    13    15    10    21    26    14    16    23    13    15    19
##     97    98    99   100   101   102   103   104   105   106   107   108
##     14    20    21    12    12    14    17    16    15    12    13    18
##    109   110   111   112   113   114   115   116   117   118   119   120
##     11    11    15    16    14    10    12    14     5     9    17     5
##    121   122   123   124   125   126   127   128   129   130   131   132
##     10    11    11     9    17    16    14    12     6    10    10     8
##    133   134   135   136   137   138   139   140   141   142   143   144
##      8     9    10    11     8     5     7    12     9     6     6     7
##    145   146   147   148   149   150   151   152   153   154   155   156
##      7     9     7     6     6     5     8    10     7    11     6     9
##    157   158   159   160   161   162   163   164   165   166   167   168
##      7     3     8     7     8     6     7     9     4     9     6     6
##    169   170   171   172   173   174   175   176   177   178   179   180
##      1    10     6     6     6     2     7     8     3     9     5     5
##    181   182   183   184   185   186   187   188   189   190   191   192
##      4     9     6     8     3     2     9     5     5     6     7     4
##    193   194   195   196   197   198   199   200   201   202   203   204
##      7     1     6     8     4     2     7     4     9     6     4     2
##    205   206   207   208   209   210   212   213   214   215   216   217
##      4     4     4    10     2     4     1     3     3     4     3     5
##    218   219   220   221   222   223   224   225   226   227   228   229
##      1     5     5     8     2     4     5     3     7     3     2     2
##    230   231   232   233   234   235   236   237   238   239   240   241
##      6     6     5     3     8     5     5     6     4     6     2     4
##    242   243   244   245   246   247   248   249   250   251   252   253
##      5     5     1     2     1     1     4     1     2     1     4     2
##    254   255   256   257   258   259   260   261   262   263   264   265
##      2     2     3     1     3     4     2     4     3     4     1     1
##    266   267   268   269   270   271   272   275   276   277   278   279
##      2     4     5     2     5     4     3     6     4     1     1     2
##    280   281   282   283   284   285   286   287   288   289   290   291
##      1     3     5     2     2     2     3     2     4     1     1     4
##    293   295   296   297   298   300   301   302   304   305   306   307
```
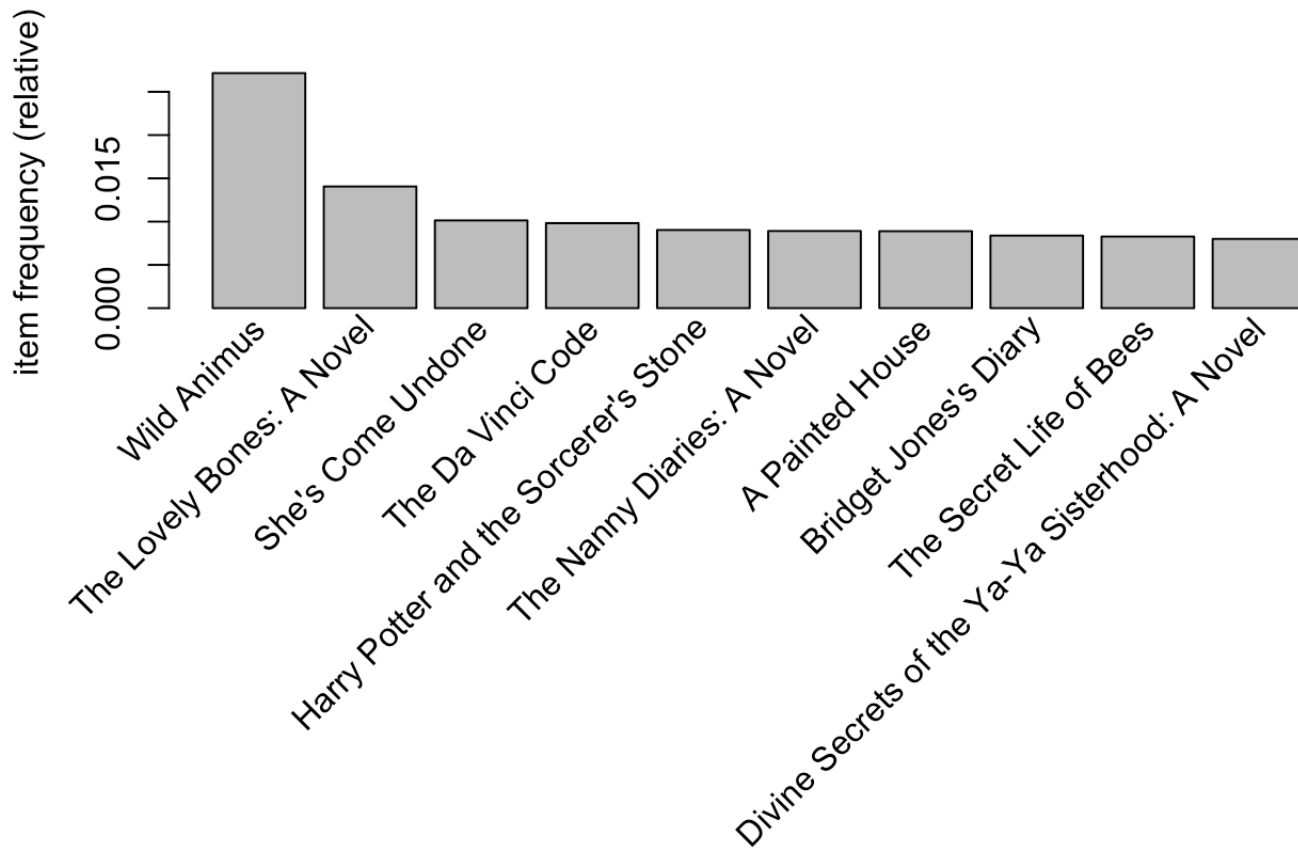
```
##     1    1    2    1    4    1    3    1    1    1    2    1
##   308  309  310  311  313  314  315  316  317  319  320  321
##     3    4    2    1    2    3    1    2    3    3    1    1
##   322  323  324  325  326  327  328  329  330  331  332  333
##     3    4    1    2    2    1    1    6    1    2    2    2
##   334  336  337  338  339  340  341  342  343  344  346  347
##     2    2    1    1    1    1    1    2    2    3    2    2
##   348  349  350  352  354  356  357  358  359  360  363  364
##     1    1    1    2    1    1    1    1    1    1    1    1
##   366  367  368  369  370  372  373  374  375  376  377  378
##     3    1    1    2    1    2    1    2    1    2    2    1
##   379  381  382  383  384  385  386  387  388  389  390  391
##     1    2    2    1    4    2    2    1    3    1    1    2
##   392  393  394  395  396  397  398  399  401  403  406  407
##     4    1    2    1    2    1    4    1    1    3    1    1
##   409  410  412  415  416  417  418  419  420  421  422  425
##     3    1    1    1    3    1    4    1    1    2    2    1
##   427  428  430  435  436  437  438  440  441  442  444  445
##     1    1    1    3    1    1    2    2    4    1    1    1
##   446  447  448  451  453  455  456  457  458  459  460  464
##     1    1    2    1    1    2    2    1    1    2    1    2
##   466  468  472  476  480  481  485  487  489  492  493  494
##     1    2    1    1    1    1    2    4    1    1    1    1
##   496  497  498  507  508  510  512  515  516  517  520  522
##     1    2    1    1    1    1    1    1    1    1    2    2
##   523  524  525  526  527  528  532  534  537  539  540  542
##     1    2    1    1    1    2    2    1    1    1    2    1
##   543  544  547  562  566  570  572  573  575  577  580  590
##     1    1    1    2    1    1    1    1    2    1    2    1
##   591  596  597  599  600  601  602  603  611  613  620  624
##     2    2    2    1    1    1    1    3    2    1    2    1
##   625  626  627  628  629  649  653  656  657  658  661  662
##     1    1    1    2    1    1    1    1    1    1    1    1
##   664  665  666  667  670  673  675  690  692  696  698  705
##     1    1    1    1    1    1    1    1    1    1    1    1
##   707  709  713  721  724  725  727  732  734  736  740  742
##     1    1    1    1    1    1    2    1    1    2    1    2
##   745  746  748  765  767  769  775  781  782  785  790  796
##     2    1    1    1    1    1    2    1    1    1    1    1
##   802  804  805  807  812  814  818  820  829  834  837  849
##     1    1    1    1    1    1    1    1    1    1    1    1
##   855  858  870  878  880  887  894  897  903  917  922  933
##     1    2    1    1    1    1    1    1    1    1    1    3
##   945  948  950  953  961  965  968  971  978  985 1009 1010
##     1    1    1    1    1    1    1    1    1    1    1    1
##  1016 1018 1025 1030 1035 1036 1039 1054 1074 1076 1077 1078
##     1    1    1    1    1    1    1    1    1    2    2    1
```

```
##    1079   1080   1083   1088   1089   1111   1132   1133   1136   1149   1152   1153
##       1      1      1      1      1      1      1      1      1      1      1      1
##    1157   1171   1183   1190   1199   1202   1234   1241   1242   1253   1255   1260
##       1      1      1      1      1      1      1      1      1      1      1      1
##    1264   1270   1275   1285   1293   1308   1312   1317   1320   1326   1340   1351
##       1      1      1      1      1      1      2      1      1      1      1      1
##    1359   1395   1433   1463   1481   1496   1511   1512   1514   1518   1542   1578
##       1      1      1      1      1      1      1      1      1      1      1      1
##    1582   1621   1626   1631   1668   1687   1705   1734   1799   1802   1808   1840
##       1      1      1      1      1      1      1      1      1      1      1      1
##    1966   2040   2060   2124   2190   2197   2202   2215   2270   2272   2291   2295
##       1      1      1      1      1      1      1      1      1      1      1      1
##    2305   2364   2373   2413   2542   2773   2864   2884   2908   3236   3897   4187
##       1      1      1      1      1      1      1      1      1      1      1      1
##    5440   5608   5683   6196  10253
##       1      1      1      1      1
##
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     1.0     1.0     1.0    11.1     4.0 10250.0
##
## includes extended item information - examples:
##
labels
## 1  A Light in the Storm: The Civil War Diary of Amelia Martin, Fenwick Island, Del
aware, 1861
## 2                                                                       Always Hav
e Popsicles
## 3
Apple Magic
##
## includes extended transaction information - examples:
##   transactionID
## 1            10
## 2          1000
## 3        100001
```

```
    # 92,108 transactions and 220,477 items with a very low density at 0.00005

# Most Frequent Items Sold
itemFrequencyPlot(bookbaskets,topN=10)
```

```
      # Most frequent items: #1 Wild Animus        2,502
                             #2 The Lovely Bones   1,295
                             #3 She's Come Undone    934
                             #4 Da Vinci Code        905
                             #5 HP Socerer's Stone   832


# Train Model 1
book_model1 <- apriori(data=bookbaskets,
                    parameter=list(support=0.001,
                                  confidence=0.5))
```

```
##
## Parameter specification:
##  confidence minval smax arem  aval originalSupport support minlen maxlen
##         0.5    0.1    1 none FALSE                 TRUE   0.001      1     10
##  target   ext
##   rules FALSE
##
## Algorithmic control:
##  filter tree heap memopt load sort verbose
##     0.1 TRUE TRUE  FALSE TRUE    2    TRUE
##
## apriori - find association rules with the apriori algorithm
## version 4.21 (2004.05.09)        (c) 1996-2004   Christian Borgelt
## set item appearances ...[0 item(s)] done [0.00s].
## set transactions ...[220447 item(s), 92108 transaction(s)] done [0.50s].
## sorting and recoding items ... [1128 item(s)] done [0.03s].
## creating transaction tree ... done [0.03s].
## checking subsets of size 1 2 3 4 5 done [0.04s].
## writing ... [200 rule(s)] done [0.00s].
## creating S4 object  ... done [0.07s].
```

```
    # Due to high volume of items sold, we had to set support low at 0.001
    # As instructed, confidence was  high at 0.5 with no minimum support established
    # Set of 200 rules established

# Evaluate Model 1
summary(book_model1)
```

```
## set of 200 rules
##
## rule length distribution (lhs + rhs):sizes
##   2   3   4   5
##  60 104  31   5
##
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   2.000   3.000   2.905   3.000   5.000
##
## summary of quality measures:
##     support          confidence         lift
##  Min.   :0.001010  Min.   :0.5000  Min.   : 63.59
##  1st Qu.:0.001083  1st Qu.:0.6038  1st Qu.:138.53
##  Median :0.001194  Median :0.7500  Median :191.71
##  Mean   :0.001375  Mean   :0.7369  Mean   :219.36
##  3rd Qu.:0.001411  3rd Qu.:0.8550  3rd Qu.:292.92
##  Max.   :0.003724  Max.   :0.9669  Max.   :580.51
##
## mining info:
##          data ntransactions support confidence
##   bookbaskets         92108   0.001        0.5
```

```
    # rule length distribution tells us there are:
        #  60 rules with 2 items
        # 104 rules with 3 items
        #  31 rules with 4 items
        #   5 rules with 5 items
    # rule quality measures
        # lift > 1 implies the x amount of items are found together more than chanc
e
        # lift values seem extremely high, need further research

inspect(sort(book_model1, by="lift")[1:50])
```

```
##    lhs                                                    rhs
support confidence     lift
## 1  {Apollyon: The Destroyer Is Unleashed}                => {Soul Harvest
: The World Takes Sides}                               0.001009684  0.7500000 580.5126
## 2  {Soul Harvest: The World Takes Sides}                 => {Apollyon: Th
e Destroyer Is Unleashed}                              0.001009684  0.7815126 580.5126
## 3  {Key of Knowledge}                                    => {Key of Valor
}                                                      0.001031398  0.7723577 564.6058
## 4  {Key of Valor}                                        => {Key of Knowl
edge}                                                  0.001031398  0.7539683 564.6058
## 5  {Key of Knowledge}                                    => {Key of Light
```

```
}                                                     0.001074825  0.8048780 541.1365
## 6  {Key of Light}                                                  => {Key of Knowl
edge}                                                 0.001074825  0.7226277 541.1365
## 7  {Nicolae: The Rise of Antichrist}                               => {Soul Harvest
: The World Takes Sides}                              0.001020541  0.6619718 512.3773
## 8  {Soul Harvest: The World Takes Sides}                           => {Nicolae: The
Rise of Antichrist}                                   0.001020541  0.7899160 512.3773
## 9  {Key of Valor}                                                  => {Key of Light
}                                                     0.001009684  0.7380952 496.2371
## 10 {Key of Light}                                                  => {Key of Valor
}                                                     0.001009684  0.6788321 496.2371
## 11 {Hot Six : A Stephanie Plum Novel,
##     Three To Get Deadly : A Stephanie Plum Novel}               => {High Five}
0.001042255  0.9320388 383.2510
## 12 {Seven Up,
##     Three To Get Deadly : A Stephanie Plum Novel}               => {High Five}
0.001074825  0.9166667 376.9301
## 13 {Four to Score,
##     Seven Up}                                                   => {High Five}
0.001096539  0.9099099 374.1517
## 14 {Four to Score,
##     Three To Get Deadly : A Stephanie Plum Novel,
##     Two for the Dough}                                          => {High Five}
0.001085682  0.9090909 373.8149
## 15 {Tribulation Force: The Continuing Drama of Those Left Behind} => {Nicolae: The
Rise of Antichrist}                                   0.001194250  0.5759162 373.5668
## 16 {Nicolae: The Rise of Antichrist}                             => {Tribulation
Force: The Continuing Drama of Those Left Behind} 0.001194250  0.7746479 373.5668
## 17 {Four to Score,
##     Hot Six : A Stephanie Plum Novel}                           => {High Five}
0.001074825  0.9000000 370.0768
## 18 {Four to Score,
##     One for the Money,
##     Three To Get Deadly : A Stephanie Plum Novel}               => {High Five}
0.001020541  0.8952381 368.1187
## 19 {Four to Score,
##     High Five,
##     Two for the Dough}                                          => {Three To Get
Deadly : A Stephanie Plum Novel}                      0.001085682  0.9615385 352.8501
## 20 {High Five,
##     One for the Money,
##     Two for the Dough}                                          => {Three To Get
Deadly : A Stephanie Plum Novel}                      0.001009684  0.9489796 348.2415
## 21 {High Five,
##     Three To Get Deadly : A Stephanie Plum Novel,
##     Two for the Dough}                                          => {Four to Scor
e}                                                    0.001085682  0.9174312 347.7480
```

```
## 22 {Four to Score,
##      Two for the Dough}                                      => {High Five}
0.001129109  0.8387097 344.8744
## 23 {Four to Score,
##      Three To Get Deadly : A Stephanie Plum Novel}           => {High Five}
0.001270248  0.8357143 343.6427
## 24 {Hot Six : A Stephanie Plum Novel,
##      Three To Get Deadly : A Stephanie Plum Novel}           => {Four to Scor
e}                                             0.001009684  0.9029126 342.2448
## 25 {Seven Up,
##      Three To Get Deadly : A Stephanie Plum Novel}           => {Four to Scor
e}                                             0.001053112  0.8981481 340.4388
## 26 {High Five,
##      One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel}           => {Four to Scor
e}                                             0.001020541  0.8952381 339.3358
## 27 {Four to Score,
##      One for the Money}                                      => {High Five}
0.001129109  0.8125000 334.0971
## 28 {Four to Score,
##      High Five,
##      One for the Money}                                      => {Three To Get
Deadly : A Stephanie Plum Novel}               0.001020541  0.9038462 331.6791
## 29 {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel}           => {Four to Scor
e}                                             0.001270248  0.8731343 330.9574
## 30 {High Five,
##      Two for the Dough}                                      => {Three To Get
Deadly : A Stephanie Plum Novel}               0.001183393  0.9008264 330.5710
## 31 {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel}           => {Hot Six : A
Stephanie Plum Novel}                          0.001042255  0.7164179 329.9391
## 32 {High Five,
##      Two for the Dough}                                      => {Four to Scor
e}                                             0.001129109  0.8595041 325.7910
## 33 {Four to Score,
##      Two for the Dough}                                      => {Three To Get
Deadly : A Stephanie Plum Novel}               0.001194250  0.8870968 325.5327
## 34 {High Five,
##      Seven Up}                                               => {Four to Scor
e}                                             0.001096539  0.8559322 324.4371
## 35 {Four to Score,
##      High Five}                                              => {Hot Six : A
Stephanie Plum Novel}                          0.001074825  0.7021277 323.3579
## 36 {Four to Score,
##      Seven Up}                                               => {Three To Get
Deadly : A Stephanie Plum Novel}               0.001053112  0.8738739 320.6804
```

```
## 37 {High Five,
##      Hot Six : A Stephanie Plum Novel}                                => {Four to Scor
e}                                                    0.001074825  0.8389831 318.0126
## 38 {High Five,
##      One for the Money}                                               => {Four to Scor
e}                                                    0.001129109  0.8387097 317.9089
## 39 {The Amber Spyglass}                                               => {The Subtle K
nife}                                                 0.001172537  0.7714286 315.7989
## 40 {High Five,
##      One for the Money}                                               => {Three To Get
Deadly : A Stephanie Plum Novel}                      0.001139966  0.8467742 310.7358
## 41 {Four to Score,
##      Hot Six : A Stephanie Plum Novel}                                => {Three To Get
Deadly : A Stephanie Plum Novel}                      0.001009684  0.8454545 310.2515
## 42 {High Five,
##      Seven Up}                                                        => {Three To Get
Deadly : A Stephanie Plum Novel}                      0.001074825  0.8389831 307.8767
## 43 {D Is for Deadbeat}                                                => {E Is for Evi
dence: A Kinsey Millhone Mystery}                     0.001020541  0.5280899 307.8564
## 44 {E Is for Evidence: A Kinsey Millhone Mystery}                     => {D Is for Dea
dbeat}                                                0.001020541  0.5949367 307.8564
## 45 {Seven Up,
##      Two for the Dough}                                               => {Three To Get
Deadly : A Stephanie Plum Novel}                      0.001009684  0.8378378 307.4564
## 46 {Four to Score,
##      Three To Get Deadly : A Stephanie Plum Novel}                    => {Hot Six : A
Stephanie Plum Novel}                                 0.001009684  0.6642857 305.9301
## 47 {One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                                               => {High Five}
0.001009684  0.7440000 305.9301
## 48 {Four to Score,
##      High Five}                                                       => {Three To Get
Deadly : A Stephanie Plum Novel}                      0.001270248  0.8297872 304.5022
## 49 {Four to Score,
##      One for the Money}                                               => {Three To Get
Deadly : A Stephanie Plum Novel}                      0.001139966  0.8203125 301.0253
## 50 {High Five,
##      Hot Six : A Stephanie Plum Novel}                                => {Three To Get
Deadly : A Stephanie Plum Novel}                      0.001042255  0.8135593 298.5471
```

```
    # top 50 associations by lift within model 1
    # skewed lift due to book's that are a part of a series, creating extraordinary
lift outputs
    # notable more obsure lift association: The Amber Spyglass => The Subtle Knife

inspect(sort(book_model1, by="confidence")[1:50])
```

```
##      lhs                                                   rhs
support confidence      lift
## 1  {Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}         => {Harry Potter and the Chamber
of Secrets}        0.001270248  0.9669421 158.47528
## 2  {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}         => {Harry Potter and the Chamber
of Secrets}        0.002095366  0.9650000 158.15698
## 3  {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}         => {Harry Potter and the Chamber
of Secrets}        0.001194250  0.9649123 158.14260
## 4  {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}         => {Harry Potter and the Prisone
r of Azkaban}      0.001194250  0.9649123 197.06461
## 5  {Four to Score,
##      High Five,
##      Two for the Dough}                             => {Three To Get Deadly : A Step
hanie Plum Novel} 0.001085682  0.9615385 352.85014
## 6  {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}         => {Harry Potter and the Prisone
r of Azkaban}      0.001237678  0.9500000 194.01907
## 7  {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}         => {Harry Potter and the Chamber
of Secrets}        0.001237678  0.9500000 155.69858
## 8  {High Five,
##      One for the Money,
##      Two for the Dough}                             => {Three To Get Deadly : A Step
hanie Plum Novel} 0.001009684  0.9489796 348.24148
## 9  {Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}         => {Harry Potter and the Goblet
```

```
of Fire}                  0.001237678  0.9421488 222.51138
## 10 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}        => {Harry Potter and the Goblet
of Fire}                  0.001194250  0.9401709 222.04427
## 11 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix}    => {Harry Potter and the Prisone
r of Azkaban}     0.001302818  0.9375000 191.46619
## 12 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Sorcerer's Stone}        => {Harry Potter and the Prisone
r of Azkaban}     0.002095366  0.9323671 190.41790
## 13 {Hot Six : A Stephanie Plum Novel,
##      Three To Get Deadly : A Stephanie Plum Novel} => {High Five}
0.001042255  0.9320388 383.25104
## 14 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Sorcerer's Stone}        => {Harry Potter and the Chamber
of Secrets}      0.002247362  0.9241071 151.45491
## 15 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}     => {Harry Potter and the Chamber
of Secrets}      0.001302818  0.9230769 151.28607
## 16 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}     => {Harry Potter and the Goblet
of Fire}          0.001302818  0.9230769 218.00710
## 17 {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                            => {Four to Score}
0.001085682  0.9174312 347.74795
## 18 {Seven Up,
##      Three To Get Deadly : A Stephanie Plum Novel} => {High Five}
0.001074825  0.9166667 376.93006
## 19 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}     => {Harry Potter and the Sorcere
r's Stone}        0.001194250  0.9166667 101.48117
## 20 {Four to Score,
##      Seven Up}                                     => {High Five}
0.001096539  0.9099099 374.15171
## 21 {Four to Score,
##      Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                            => {High Five}
0.001085682  0.9090909 373.81494
```

```
## 22 {The Fellowship of the Ring,
##      The Return of the King}                          => {The Two Towers}
0.001585096  0.9068323 285.07341
## 23 {Four to Score,
##      High Five,
##      One for the Money}                               => {Three To Get Deadly : A Step
hanie Plum Novel} 0.001020541  0.9038462 331.67913
## 24 {Hot Six : A Stephanie Plum Novel,
##      Three To Get Deadly : A Stephanie Plum Novel} => {Four to Score}
0.001009684  0.9029126 342.24476
## 25 {High Five,
##      Two for the Dough}                               => {Three To Get Deadly : A Step
hanie Plum Novel} 0.001183393  0.9008264 330.57101
## 26 {Four to Score,
##      Hot Six : A Stephanie Plum Novel}                => {High Five}
0.001074825  0.9000000 370.07679
## 27 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}    => {Harry Potter and the Sorcere
r's Stone}           0.001270248  0.9000000  99.63606
## 28 {Seven Up,
##      Three To Get Deadly : A Stephanie Plum Novel} => {Four to Score}
0.001053112  0.8981481 340.43881
## 29 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire}         => {Harry Potter and the Prisone
r of Azkaban}     0.002388500  0.8979592 183.39074
## 30 {Four to Score,
##      One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel} => {High Five}
0.001020541  0.8952381 368.11871
## 31 {High Five,
##      One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel} => {Four to Score}
0.001020541  0.8952381 339.33576
## 32 {Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}        => {Harry Potter and the Chamber
of Secrets}       0.002583923  0.8947368 146.64132
## 33 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Sorcerer's Stone}        => {Harry Potter and the Prisone
r of Azkaban}     0.002171364  0.8928571 182.34875
## 34 {Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}        => {Harry Potter and the Chamber
of Secrets}       0.001443957  0.8926174 146.29396
## 35 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix}     => {Harry Potter and the Sorcere
r's Stone}           0.001237678  0.8906250  98.59818
```

```
## 36 {Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}    => {Harry Potter and the Goblet
of Fire}            0.001411387  0.8904110 210.29224
## 37 {Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}    => {Harry Potter and the Chamber
of Secrets}         0.001411387  0.8904110 145.93234
## 38 {Four to Score,
##      Two for the Dough}                           => {Three To Get Deadly : A Step
hanie Plum Novel} 0.001194250  0.8870968 325.53271
## 39 {High Five,
##      One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel} => {Two for the Dough}
0.001009684  0.8857143 282.28848
## 40 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban}    => {Harry Potter and the Chamber
of Secrets}         0.002388500  0.8835341 144.80527
## 41 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}       => {Harry Potter and the Prisone
r of Azkaban}       0.001270248  0.8796992 179.66150
## 42 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban}    => {Harry Potter and the Sorcere
r's Stone}          0.002095366  0.8772727  97.12000
## 43 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}    => {Harry Potter and the Sorcere
r's Stone}          0.001237678  0.8769231  97.08129
## 44 {Four to Score,
##      Seven Up}                                    => {Three To Get Deadly : A Step
hanie Plum Novel} 0.001053112  0.8738739 320.68038
## 45 {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel} => {Four to Score}
0.001270248  0.8731343 330.95744
## 46 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix}   => {Harry Potter and the Sorcere
r's Stone}          0.001443957  0.8636364  95.61036
## 47 {Seven Up,
##      Three To Get Deadly : A Stephanie Plum Novel} => {Two for the Dough}
0.001009684  0.8611111 274.44714
## 48 {High Five,
##      Two for the Dough}                           => {Four to Score}
0.001129109  0.8595041 325.79097
## 49 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}       => {Harry Potter and the Goblet
of Fire}            0.001237678  0.8571429 202.43516
```

```
## 50 {High Five,
##      Seven Up}                                       => {Four to Score}
0.001096539   0.8559322 324.43705
```

```
      # top 50 associations by confidence within model 1
      # skewed confidence due to book series', creating associations as high as 96%
      # could find associations within subsets of popular/promoted books to combat the
series issue
      # notable more obsure confidence association: The Amber Spyglass => The Subtle K
nife

# Subsets of Association Rules
lovelybones1 <- subset(book_model1,items %in% "The Lovely Bones: A Novel")
# "items" is saying any assocaition inside (%in%) the rules involving "The Lovely Bon
es: A Novel"

inspect(lovelybones1)
```

```
## NULL
```

```
# Model 1 has too harsh of parameter specifications to find rules for The Lovely Bone
s: A Novel

# Train Model 2
book_model2 <- apriori(data=bookbaskets,
                       parameter=list(support=0.001,
                                      confidence=0.25))
```

```
##
## Parameter specification:
##  confidence minval smax arem  aval originalSupport support minlen maxlen
##        0.25    0.1    1 none FALSE               TRUE   0.001      1     10
##  target    ext
##   rules FALSE
##
## Algorithmic control:
##  filter tree heap memopt load sort verbose
##     0.1 TRUE TRUE  FALSE TRUE    2    TRUE
##
## apriori - find association rules with the apriori algorithm
## version 4.21 (2004.05.09)        (c) 1996-2004   Christian Borgelt
## set item appearances ...[0 item(s)] done [0.00s].
## set transactions ...[220447 item(s), 92108 transaction(s)] done [0.51s].
## sorting and recoding items ... [1128 item(s)] done [0.03s].
## creating transaction tree ... done [0.03s].
## checking subsets of size 1 2 3 4 5 done [0.03s].
## writing ... [384 rule(s)] done [0.00s].
## creating S4 object  ... done [0.06s].
```

```
    # Due to high volume of items sold, we had to set support low at 0.001
    # Confidence was  to 0.25 to increase inclusivity to compensate for high lift of
series books

# Evaluate Model 2
summary(book_model2)
```

```
## set of 384 rules
##
## rule length distribution (lhs + rhs):sizes
##   2   3   4   5
## 236 111  32   5
##
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   2.000   2.000   2.000   2.495   3.000   5.000
##
## summary of quality measures:
##     support           confidence         lift
##  Min.   :0.001010  Min.   :0.2500  Min.   :  9.358
##  1st Qu.:0.001097  1st Qu.:0.3118  1st Qu.: 57.512
##  Median :0.001270  Median :0.5259  Median :133.148
##  Mean   :0.001378  Mean   :0.5451  Mean   :151.543
##  3rd Qu.:0.001455  3rd Qu.:0.7658  3rd Qu.:203.437
##  Max.   :0.003724  Max.   :0.9669  Max.   :580.513
##
## mining info:
##          data ntransactions support confidence
##   bookbaskets         92108   0.001        0.25
```

```
    # rule length distribution tells us there are:
        # 236 rules with 2 items
        # 111 rules with 3 items
        #  32 rules with 4 items
        #   5 rules with 5 items
# rule quality measures
    # lift > 1 implies the x amount of items are found together more than chance
    # lift values are still very high, but lowering confidence allows more than obsu
re/useful associations

inspect(sort(book_model2, by="lift")[1:350])
```

```
##     lhs                                                   rhs
support confidence       lift
## 1   {Apollyon: The Destroyer Is Unleashed}                    => {Soul Harves
t: The World Takes Sides}                       0.001009684 0.7500000 580.51261
## 2   {Soul Harvest: The World Takes Sides}                     => {Apollyon: T
he Destroyer Is Unleashed}                       0.001009684 0.7815126 580.51261
## 3   {Key of Knowledge}                                        => {Key of Valo
r}                                               0.001031398 0.7723577 564.60576
## 4   {Key of Valor}                                            => {Key of Know
ledge}                                           0.001031398 0.7539683 564.60576
## 5   {Key of Knowledge}                                        => {Key of Ligh
```

```
t}                                                    0.001074825  0.8048780 541.13655
## 6   {Key of Light}                                              => {Key of Know
ledge}                                                0.001074825  0.7226277 541.13655
## 7   {Nicolae: The Rise of Antichrist}                           => {Soul Harves
t: The World Takes Sides}                             0.001020541  0.6619718 512.37732
## 8   {Soul Harvest: The World Takes Sides}                       => {Nicolae: Th
e Rise of Antichrist}                                 0.001020541  0.7899160 512.37732
## 9   {Key of Valor}                                              => {Key of Ligh
t}                                                    0.001009684  0.7380952 496.23705
## 10  {Key of Light}                                              => {Key of Valo
r}                                                    0.001009684  0.6788321 496.23705
## 11  {Hot Six : A Stephanie Plum Novel,
##      Three To Get Deadly : A Stephanie Plum Novel}              => {High Five}
0.001042255  0.9320388 383.25104
## 12  {Seven Up,
##      Three To Get Deadly : A Stephanie Plum Novel}              => {High Five}
0.001074825  0.9166667 376.93006
## 13  {Four to Score,
##      Seven Up}                                                  => {High Five}
0.001096539  0.9099099 374.15171
## 14  {Four to Score,
##      Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                                         => {High Five}
0.001085682  0.9090909 373.81494
## 15  {Tribulation Force: The Continuing Drama of Those Left Behind} => {Nicolae: Th
e Rise of Antichrist}                                 0.001194250  0.5759162 373.56685
## 16  {Nicolae: The Rise of Antichrist}                           => {Tribulation
Force: The Continuing Drama of Those Left Behind} 0.001194250  0.7746479 373.56685
## 17  {Four to Score,
##      Hot Six : A Stephanie Plum Novel}                          => {High Five}
0.001074825  0.9000000 370.07679
## 18  {Four to Score,
##      One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel}              => {High Five}
0.001020541  0.8952381 368.11871
## 19  {Four to Score,
##      High Five,
##      Two for the Dough}                                         => {Three To Ge
t Deadly : A Stephanie Plum Novel}                    0.001085682  0.9615385 352.85014
## 20  {High Five,
##      One for the Money,
##      Two for the Dough}                                         => {Three To Ge
t Deadly : A Stephanie Plum Novel}                    0.001009684  0.9489796 348.24148
## 21  {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                                         => {Four to Sco
re}                                                   0.001085682  0.9174312 347.74795
```

```
## 22  {Four to Score,
##      Two for the Dough}                                       => {High Five}
0.001129109  0.8387097 344.87442
## 23  {Four to Score,
##      Three To Get Deadly : A Stephanie Plum Novel}            => {High Five}
0.001270248  0.8357143 343.64273
## 24  {Hot Six : A Stephanie Plum Novel,
##      Three To Get Deadly : A Stephanie Plum Novel}            => {Four to Sco
re}                                                 0.001009684  0.9029126 342.24476
## 25  {Seven Up,
##      Three To Get Deadly : A Stephanie Plum Novel}            => {Four to Sco
re}                                                 0.001053112  0.8981481 340.43881
## 26  {High Five,
##      One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel}            => {Four to Sco
re}                                                 0.001020541  0.8952381 339.33576
## 27  {Four to Score,
##      One for the Money}                                       => {High Five}
0.001129109  0.8125000 334.09710
## 28  {Four to Score,
##      High Five,
##      One for the Money}                                       => {Three To Ge
t Deadly : A Stephanie Plum Novel}                  0.001020541  0.9038462 331.67913
## 29  {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel}            => {Four to Sco
re}                                                 0.001270248  0.8731343 330.95744
## 30  {High Five,
##      Two for the Dough}                                       => {Three To Ge
t Deadly : A Stephanie Plum Novel}                  0.001183393  0.9008264 330.57101
## 31  {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel}            => {Hot Six : A
Stephanie Plum Novel}                               0.001042255  0.7164179 329.93910
## 32  {High Five,
##      Two for the Dough}                                       => {Four to Sco
re}                                                 0.001129109  0.8595041 325.79097
## 33  {Four to Score,
##      Two for the Dough}                                       => {Three To Ge
t Deadly : A Stephanie Plum Novel}                  0.001194250  0.8870968 325.53271
## 34  {High Five,
##      Seven Up}                                                => {Four to Sco
re}                                                 0.001096539  0.8559322 324.43705
## 35  {Four to Score,
##      High Five}                                               => {Hot Six : A
Stephanie Plum Novel}                               0.001074825  0.7021277 323.35787
## 36  {Four to Score,
##      Seven Up}                                                => {Three To Ge
t Deadly : A Stephanie Plum Novel}                  0.001053112  0.8738739 320.68038
```

```
## 37  {High Five,
##      Hot Six : A Stephanie Plum Novel}                           => {Four to Sco
re}                                              0.001074825  0.8389831 318.01255
## 38  {High Five,
##      One for the Money}                                          => {Four to Sco
re}                                              0.001129109  0.8387097 317.90893
## 39  {The Amber Spyglass}                                         => {The Subtle
Knife}                                           0.001172537  0.7714286 315.79886
## 40  {The Subtle Knife}                                           => {The Amber S
pyglass}                                         0.001172537  0.4800000 315.79886
## 41  {High Five,
##      One for the Money}                                          => {Three To Ge
t Deadly : A Stephanie Plum Novel}               0.001139966  0.8467742 310.73577
## 42  {Four to Score,
##      Hot Six : A Stephanie Plum Novel}                           => {Three To Ge
t Deadly : A Stephanie Plum Novel}               0.001009684  0.8454545 310.25150
## 43  {High Five,
##      Seven Up}                                                   => {Three To Ge
t Deadly : A Stephanie Plum Novel}               0.001074825  0.8389831 307.87670
## 44  {D Is for Deadbeat}                                          => {E Is for Ev
idence: A Kinsey Millhone Mystery}               0.001020541  0.5280899 307.85635
## 45  {E Is for Evidence: A Kinsey Millhone Mystery}               => {D Is for De
adbeat}                                          0.001020541  0.5949367 307.85635
## 46  {Seven Up,
##      Two for the Dough}                                          => {Three To Ge
t Deadly : A Stephanie Plum Novel}               0.001009684  0.8378378 307.45644
## 47  {Four to Score,
##      Three To Get Deadly : A Stephanie Plum Novel}               => {Hot Six : A
Stephanie Plum Novel}                            0.001009684  0.6642857 305.93014
## 48  {One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                                          => {High Five}
0.001009684  0.7440000 305.93014
## 49  {Four to Score,
##      High Five}                                                  => {Three To Ge
t Deadly : A Stephanie Plum Novel}               0.001270248  0.8297872 304.50216
## 50  {Four to Score,
##      One for the Money}                                          => {Three To Ge
t Deadly : A Stephanie Plum Novel}               0.001139966  0.8203125 301.02527
## 51  {High Five,
##      Hot Six : A Stephanie Plum Novel}                           => {Three To Ge
t Deadly : A Stephanie Plum Novel}               0.001042255  0.8135593 298.54710
## 52  {Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                                          => {High Five}
0.001183393  0.7077922 291.04163
## 53  {One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel}               => {High Five}
```

```
0.001139966  0.6953642 285.93129
## 54  {The Fellowship of the Ring,
##      The Return of the King}                                           => {The Two Tow
ers}                                                     0.001585096  0.9068323 285.07341
## 55  {High Five,
##       One for the Money,
##       Three To Get Deadly : A Stephanie Plum Novel}              => {Two for the
Dough}                                                   0.001009684  0.8857143 282.28848
## 56  {The Fellowship of the Ring,
##       The Two Towers}                                            => {The Return
of the King}                                             0.001585096  0.8156425 281.37526
## 57  {Seven Up,
##       Three To Get Deadly : A Stephanie Plum Novel}              => {Two for the
Dough}                                                   0.001009684  0.8611111 274.44714
## 58  {Four to Score,
##        High Five,
##        Three To Get Deadly : A Stephanie Plum Novel}             => {Two for the
Dough}                                                   0.001085682  0.8547009 272.40410
## 59  {Three To Get Deadly : A Stephanie Plum Novel,
##       Two for the Dough}                                         => {Four to Sco
re}                                                      0.001194250  0.7142857 270.74662
## 60  {One for the Money,
##       Three To Get Deadly : A Stephanie Plum Novel}              => {Two for the
Dough}                                                   0.001357103  0.8278146 263.83510
## 61  {One for the Money,
##       Three To Get Deadly : A Stephanie Plum Novel}              => {Four to Sco
re}                                                      0.001139966  0.6953642 263.57452
## 62  {High Five,
##       Three To Get Deadly : A Stephanie Plum Novel}              => {Two for the
Dough}                                                   0.001183393  0.8134328 259.25146
## 63  {One for the Money,
##       Two for the Dough}                                         => {Three To Ge
t Deadly : A Stephanie Plum Novel}                       0.001357103  0.6944444 254.83621
## 64  {Four to Score,
##       One for the Money}                                         => {Two for the
Dough}                                                   0.001107396  0.7968750 253.97426
## 65  {High Five,
##       One for the Money}                                         => {Two for the
Dough}                                                   0.001063968  0.7903226 251.88592
## 66  {Four to Score,
##       Three To Get Deadly : A Stephanie Plum Novel}              => {Two for the
Dough}                                                   0.001194250  0.7857143 250.41720
## 67  {High Five,
##       Three To Get Deadly : A Stephanie Plum Novel}              => {Seven Up}
0.001074825  0.7388060 247.45433
##                                                                  => {Hot Six : A
Stephanie Plum Novel}                                    0.001281105  0.5267857 242.60589
## 68  {High Five}
```

```
## 69   {Hot Six : A Stephanie Plum Novel}                                    => {High Five}
0.001281105   0.5900000 242.60589
## 70   {Four to Score,
##        High Five}                                                          => {Seven Up}
0.001096539   0.7163121 239.92026
## 71   {Shopaholic Ties the Knot}                                            => {Shopaholic
Takes Manhattan}                                  0.001020541   0.5875000 239.44004
## 72   {Shopaholic Takes Manhattan}                                          => {Shopaholic
Ties the Knot}                                    0.001020541   0.4159292 239.44004
## 73   {Four to Score}                                                       => {High Five}
0.001530812   0.5802469 238.59546
## 74   {High Five}                                                           => {Four to Sco
re}                                               0.001530812   0.6294643 238.59546
## 75   {Four to Score,
##        High Five}                                                          => {Two for the
Dough}                                            0.001129109   0.7375887 235.07895
## 76   {Interview With the Vampire,
##        The Queen of the Damned}                                            => {The Vampire
Lestat}                                           0.001129109   0.7819549 232.33645
## 77   {Four to Score,
##        Three To Get Deadly : A Stephanie Plum Novel}                       => {Seven Up}
0.001053112   0.6928571 232.06431
## 78   {One for the Money,
##        Two for the Dough}                                                  => {High Five}
0.001063968   0.5444444 223.87361
## 79   {Harry Potter and the Order of the Phoenix,
##        Harry Potter and the Prisoner of Azkaban,
##        Harry Potter and the Sorcerer's Stone}                              => {Harry Potte
r and the Goblet of Fire}                         0.001237678   0.9421488 222.51138
## 80   {Harry Potter and the Chamber of Secrets,
##        Harry Potter and the Order of the Phoenix,
##        Harry Potter and the Prisoner of Azkaban,
##        Harry Potter and the Sorcerer's Stone}                              => {Harry Potte
r and the Goblet of Fire}                         0.001194250   0.9401709 222.04427
## 81   {B Is for Burglar}                                                    => {C Is for Co
rpse}                                             0.001237678   0.4560000 219.90182
## 82   {C Is for Corpse}                                                     => {B Is for Bu
rglar}                                            0.001237678   0.5968586 219.90182
## 83   {Three To Get Deadly : A Stephanie Plum Novel}                        => {High Five}
0.001454814   0.5338645 219.52319
## 84   {High Five}                                                           => {Three To Ge
t Deadly : A Stephanie Plum Novel}                0.001454814   0.5982143 219.52319
## 85   {Harry Potter and the Chamber of Secrets,
##        Harry Potter and the Order of the Phoenix,
##        Harry Potter and the Prisoner of Azkaban}                           => {Harry Potte
r and the Goblet of Fire}                         0.001302818   0.9230769 218.00710
## 86   {One for the Money,
```

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##      Two for the Dough}                                  => {Four to Sco
re}                                        0.001107396  0.5666667 214.79232
## 87  {The Two Towers}                                     => {The Return
of the King}                               0.001975941  0.6211604 214.28406
## 88  {The Return of the King}                             => {The Two Tow
ers}                                       0.001975941  0.6816479 214.28406
## 89  {Four to Score}                                      => {Three To Ge
t Deadly : A Stephanie Plum Novel}         0.001519955  0.5761317 211.41967
## 90  {Three To Get Deadly : A Stephanie Plum Novel}       => {Four to Sco
re}                                        0.001519955  0.5577689 211.41967
## 91  {Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Prisoner of Azkaban}          => {Harry Potte
r and the Goblet of Fire}                  0.001411387  0.8904110 210.29224
## 92  {Hot Six : A Stephanie Plum Novel}                   => {Four to Sco
re}                                        0.001194250  0.5500000 208.47490
## 93  {Four to Score}                                      => {Hot Six : A
Stephanie Plum Novel}                      0.001194250  0.4526749 208.47490
## 94  {Interview With the Vampire,
##       The Vampire Lestat}                                => {The Queen o
f the Damned}                              0.001129109  0.6153846 206.86805
## 95  {Heaven And Earth}                                   => {Face the Fi
re}                                        0.001270248  0.5391705 205.21453
## 96  {Face the Fire}                                      => {Heaven And
Earth}                                     0.001270248  0.4834711 205.21453
## 97  {B Is for Burglar}                                   => {D Is for De
adbeat}                                    0.001063968  0.3920000 202.84458
## 98  {D Is for Deadbeat}                                  => {B Is for Bu
rglar}                                     0.001063968  0.5505618 202.84458
## 99  {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}            => {Harry Potte
r and the Goblet of Fire}                  0.001237678  0.8571429 202.43516
## 100 {Three To Get Deadly : A Stephanie Plum Novel,
##       Two for the Dough}                                 => {Seven Up}
0.001009684  0.6038961 202.26786
## 101 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}             => {Harry Potte
r and the Prisoner of Azkaban}             0.001194250  0.9649123 197.06461
## 102 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Order of the Phoenix}         => {Harry Potte
r and the Goblet of Fire}                  0.001389673  0.8311688 196.30077
## 103 {Three To Get Deadly : A Stephanie Plum Novel}       => {Two for the
Dough}                                     0.001671950  0.6135458 195.54491
## 104 {Two for the Dough}                                  => {Three To Ge
t Deadly : A Stephanie Plum Novel}         0.001671950  0.5328720 195.54491
```

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## 105 {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}                        => {Harry Potte
r and the Prisoner of Azkaban}                          0.001237678  0.9500000 194.01907
## 106 {Heaven And Earth}                                              => {Dance upon
the Air}                                                0.001281105  0.5437788 191.90183
## 107 {Dance upon the Air}                                            => {Heaven And
Earth}                                                  0.001281105  0.4521073 191.90183
## 108 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                        => {Harry Potte
r and the Goblet of Fire}                               0.002095366  0.8109244 191.51954
## 109 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix}                    => {Harry Potte
r and the Prisoner of Azkaban}                          0.001302818  0.9375000 191.46619
## 110 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire,
##       Harry Potter and the Sorcerer's Stone}                        => {Harry Potte
r and the Prisoner of Azkaban}                          0.002095366  0.9323671 190.41790
## 111 {Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}                        => {Harry Potte
r and the Goblet of Fire}                               0.001302818  0.8053691 190.20754
## 112 {Hot Six : A Stephanie Plum Novel}                              => {Three To Ge
t Deadly : A Stephanie Plum Novel}                      0.001118252  0.5150000 188.98653
## 113 {Three To Get Deadly : A Stephanie Plum Novel}                  => {Hot Six : A
Stephanie Plum Novel}                                   0.001118252  0.4103586 188.98653
## 114 {The Return of the King,
##       The Two Towers}                                               => {The Fellows
hip of the Ring}                                        0.001585096  0.8021978 186.11797
## 115 {High Five,
##       Three To Get Deadly : A Stephanie Plum Novel,
##       Two for the Dough}                                            => {One for the
Money}                                                  0.001009684  0.8532110 184.91191
## 116 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire}                          => {Harry Potte
r and the Prisoner of Azkaban}                          0.002388500  0.8979592 183.39074
## 117 {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Sorcerer's Stone}                        => {Harry Potte
r and the Prisoner of Azkaban}                          0.002171364  0.8928571 182.34875
## 118 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Prisoner of Azkaban}                     => {Harry Potte
r and the Goblet of Fire}                               0.002388500  0.7719298 182.31003
## 119 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}                        => {Harry Potte
r and the Prisoner of Azkaban}                          0.001270248  0.8796992 179.66150
```

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## 120 {Four to Score,
##      Two for the Dough}                                     => {One for the
Money}                                         0.001107396  0.8225806 178.27355
## 121 {Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}                 => {Harry Potte
r and the Goblet of Fire}                      0.002171364  0.7518797 177.57471
## 122 {Dance upon the Air}                                    => {Face the Fi
re}                                            0.001313675  0.4636015 176.45211
## 123 {Face the Fire}                                         => {Dance upon
the Air}                                       0.001313675  0.5000000 176.45211
## 124 {High Five}                                             => {Seven Up}
0.001281105  0.5267857 176.44065
## 125 {Seven Up}                                              => {High Five}
0.001281105  0.4290909 176.44065
## 126 {Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                                     => {One for the
Money}                                         0.001357103  0.8116883 175.91291
## 127 {Hot Six : A Stephanie Plum Novel}                      => {Seven Up}
0.001139966  0.5250000 175.84255
## 128 {Seven Up}                                              => {Hot Six : A
Stephanie Plum Novel}                          0.001139966  0.3818182 175.84255
## 129 {High Five,
##      Two for the Dough}                                     => {One for the
Money}                                         0.001063968  0.8099174 175.52910
## 130 {Four to Score,
##      High Five,
##      Three To Get Deadly : A Stephanie Plum Novel}          => {One for the
Money}                                         0.001020541  0.8034188 174.12070
## 131 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix}             => {Harry Potte
r and the Prisoner of Azkaban}                 0.001411387  0.8441558 172.40245
## 132 {High Five}                                             => {Two for the
Dough}                                         0.001313675  0.5401786 172.16183
## 133 {Two for the Dough}                                     => {High Five}
0.001313675  0.4186851 172.16183
## 134 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix}             => {Harry Potte
r and the Prisoner of Azkaban}                 0.001411387  0.8333333 170.19217
## 135 {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel}          => {One for the
Money}                                         0.001139966  0.7835821 169.82160
## 136 {Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}                 => {Harry Potte
r and the Prisoner of Azkaban}                 0.001313675  0.8120805 165.85169
## 137 {Hard Eight : A Stephanie Plum Novel}                   => {High Five}
0.001150823  0.4030418 165.72936
## 138 {High Five}                                             => {Hard Eight
```

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: A Stephanie Plum Novel}                                   0.001150823  0.4732143 165.72936
## 139 {Four to Score}                                               => {Two for the
Dough}                                                      0.001346246  0.5102881 162.63534
## 140 {Two for the Dough}                                           => {Four to Sco
re}                                                         0.001346246  0.4290657 162.63534
## 141 {Four to Score,
##      Three To Get Deadly : A Stephanie Plum Novel}                => {One for the
Money}                                                      0.001139966  0.7500000 162.54353
## 142 {The Subtle Knife}                                            => {The Golden
Compass}                                                    0.001357103  0.5555556 160.91544
## 143 {The Golden Compass}                                          => {The Subtle
Knife}                                                      0.001357103  0.3930818 160.91544
## 144 {Four to Score,
##      High Five}                                                   => {One for the
Money}                                                      0.001129109  0.7375887 159.85368
## 145 {Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}                       => {Harry Potte
r and the Chamber of Secrets}                               0.001270248  0.9669421 158.47528
## 146 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}                       => {Harry Potte
r and the Chamber of Secrets}                               0.002095366  0.9650000 158.15698
## 147 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}                       => {Harry Potte
r and the Chamber of Secrets}                               0.001194250  0.9649123 158.14260
## 148 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}                       => {Harry Potte
r and the Chamber of Secrets}                               0.001237678  0.9500000 155.69858
## 149 {C Is for Corpse}                                             => {A Is for Al
ibi}                                                        0.001020541  0.4921466 155.24191
## 150 {A Is for Alibi}                                              => {C Is for Co
rpse}                                                       0.001020541  0.3219178 155.24191
## 151 {B Is for Burglar}                                            => {A Is for Al
ibi}                                                        0.001335389  0.4920000 155.19567
## 152 {A Is for Alibi}                                              => {B Is for Bu
rglar}                                                      0.001335389  0.4212329 155.19567
## 153 {Hard Eight : A Stephanie Plum Novel}                         => {Seven Up}
0.001313675  0.4600760 154.09703
## 154 {Seven Up}                                                    => {Hard Eight
: A Stephanie Plum Novel}                                   0.001313675  0.4400000 154.09703
## 155 {Seven Up}                                                    => {Four to Sco
re}                                                         0.001205107  0.4036364 152.99645
## 156 {Four to Score}                                               => {Seven Up}
```

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0.001205107  0.4567901 152.99645
## 157 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Sorcerer's Stone}                      => {Harry Potte
r and the Chamber of Secrets}                      0.002247362  0.9241071 151.45491
## 158 {Nicolae: The Rise of Antichrist}                           => {Left Behind
: A Novel of the Earth's Last Days}                0.001096539  0.7112676 151.30124
## 159 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}                  => {Harry Potte
r and the Chamber of Secrets}                      0.001302818  0.9230769 151.28607
## 160 {Tribulation Force: The Continuing Drama of Those Left Behind} => {Left Behind
: A Novel of the Earth's Last Days}                0.001465671  0.7068063 150.35222
## 161 {Left Behind: A Novel of the Earth's Last Days}             => {Tribulation
Force: The Continuing Drama of Those Left Behind} 0.001465671  0.3117783 150.35222
## 162 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}                     => {Harry Potte
r and the Order of the Phoenix}                    0.001237678  0.5700000 148.30949
## 163 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}                     => {Harry Potte
r and the Order of the Phoenix}                    0.001194250  0.5699482 148.29601
## 164 {The Queen of the Damned}                                   => {The Vampire
Lestat}                                            0.001476528  0.4963504 147.47690
## 165 {The Vampire Lestat}                                        => {The Queen o
f the Damned}                                      0.001476528  0.4387097 147.47690
## 166 {Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}                     => {Harry Potte
r and the Chamber of Secrets}                      0.002583923  0.8947368 146.64132
## 167 {Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}                     => {Harry Potte
r and the Chamber of Secrets}                      0.001443957  0.8926174 146.29396
## 168 {Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}                  => {Harry Potte
r and the Chamber of Secrets}                      0.001411387  0.8904110 145.93234
## 169 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban}                  => {Harry Potte
r and the Chamber of Secrets}                      0.002388500  0.8835341 144.80527
## 170 {Three To Get Deadly : A Stephanie Plum Novel}              => {Seven Up}
0.001172537  0.4302789 144.11683
## 171 {Seven Up}                                                  => {Three To Ge
t Deadly : A Stephanie Plum Novel}                 0.001172537  0.3927273 144.11683
## 172 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Sorcerer's Stone}                     => {Harry Potte
r and the Order of the Phoenix}                    0.001237678  0.5507246 143.29419
```

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## 173 {Shopaholic Takes Manhattan}                              => {Confessions
of a Shopaholic}                          0.001628523  0.6637168 143.17009
## 174 {Confessions of a Shopaholic}                             => {Shopaholic
Takes Manhattan}                          0.001628523  0.3512881 143.17009
## 175 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Sorcerer's Stone}                 => {Harry Potte
r and the Goblet of Fire}                 0.002247362  0.6034985 142.53088
## 176 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire,
##       Harry Potter and the Prisoner of Azkaban}             => {Harry Potte
r and the Order of the Phoenix}           0.001302818  0.5454545 141.92296
## 177 {The Fellowship of the Ring}                              => {The Two Tow
ers}                                      0.001943371  0.4508816 141.73994
## 178 {The Two Towers}                                          => {The Fellows
hip of the Ring}                          0.001943371  0.6109215 141.73994
## 179 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Sorcerer's Stone}                 => {Harry Potte
r and the Prisoner of Azkaban}            0.002583923  0.6938776 141.71103
## 180 {Four to Score}                                           => {Hard Eight
: A Stephanie Plum Novel}                 0.001063968  0.4032922 141.24120
## 181 {Hard Eight : A Stephanie Plum Novel}                     => {Four to Sco
re}                                       0.001063968  0.3726236 141.24120
## 182 {The Return of the King}                                  => {The Fellows
hip of the Ring}                          0.001747948  0.6029963 139.90121
## 183 {The Fellowship of the Ring}                              => {The Return
of the King}                              0.001747948  0.4055416 139.90121
## 184 {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Sorcerer's Stone}                 => {Harry Potte
r and the Order of the Phoenix}           0.001302818  0.5357143 139.38862
## 185 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire}                   => {Harry Potte
r and the Order of the Phoenix}           0.001389673  0.5224490 135.93709
## 186 {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Prisoner of Azkaban}             => {Harry Potte
r and the Order of the Phoenix}           0.001411387  0.5220884 135.84326
## 187 {The Queen of the Damned,
##       The Vampire Lestat}                                    => {Interview W
ith the Vampire}                          0.001129109  0.7647059 135.19295
## 188 {Two for the Dough}                                       => {One for the
Money}                                    0.001954228  0.6228374 134.98425
## 189 {One for the Money}                                       => {Two for the
Dough}                                    0.001954228  0.4235294 134.98425
## 190 {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix}            => {Harry Potte
r and the Chamber of Secrets}             0.001389673  0.8205128 134.47650
## 191 {Three To Get Deadly : A Stephanie Plum Novel}            => {Hard Eight
: A Stephanie Plum Novel}                 0.001042255  0.3824701 133.94889
```

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## 192 {Hard Eight : A Stephanie Plum Novel}                                    => {Three To Ge
t Deadly : A Stephanie Plum Novel}                    0.001042255  0.3650190 133.94889
## 193 {The Queen of the Damned}                                                => {The Tale of
the Body Thief}                                       0.001085682  0.3649635 132.34669
## 194 {The Tale of the Body Thief}                                             => {The Queen o
f the Damned}                                         0.001085682  0.3937008 132.34669
## 195 {Harry Potter and the Prisoner of Azkaban}                               => {Harry Potte
r and the Goblet of Fire}                             0.002703348  0.5521064 130.39338
## 196 {Harry Potter and the Goblet of Fire}                                    => {Harry Potte
r and the Prisoner of Azkaban}                        0.002703348  0.6384615 130.39338
## 197 {Three To Get Deadly : A Stephanie Plum Novel}                           => {One for the
Money}                                                0.001639380  0.6015936 130.38020
## 198 {One for the Money}                                                      => {Three To Ge
t Deadly : A Stephanie Plum Novel}                    0.001639380  0.3552941 130.38020
## 199 {Seven Up}                                                               => {Two for the
Dough}                                                0.001205107  0.4036364 128.64408
## 200 {Two for the Dough}                                                      => {Seven Up}
0.001205107  0.3840830 128.64408
## 201 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                                 => {Harry Potte
r and the Order of the Phoenix}                       0.001270248  0.4915966 127.90956
## 202 {The Tale of the Body Thief}                                             => {The Vampire
Lestat}                                               0.001150823  0.4173228 123.99604
## 203 {The Vampire Lestat}                                                     => {The Tale of
the Body Thief}                                       0.001150823  0.3419355 123.99604
## 204 {The Pelican Brief,
##       The Rainmaker}                                                         => {The Client}
0.001020541  0.6351351 122.38709
## 205 {High Five}                                                              => {One for the
Money}                                                0.001346246  0.5535714 119.97261
## 206 {One for the Money}                                                      => {High Five}
0.001346246  0.2917647 119.97261
## 207 {Hard Eight : A Stephanie Plum Novel}                                    => {Two for the
Dough}                                                0.001074825  0.3764259 119.97174
## 208 {Two for the Dough}                                                      => {Hard Eight
: A Stephanie Plum Novel}                             0.001074825  0.3425606 119.97174
## 209 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Prisoner of Azkaban}                              => {Harry Potte
r and the Order of the Phoenix}                       0.001411387  0.4561404 118.68411
## 210 {Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                                 => {Harry Potte
r and the Order of the Phoenix}                       0.001313675  0.4548872 118.35806
## 211 {The Chamber,
##       The Pelican Brief}                                                     => {A Time to K
ill}                                                  0.001107396  0.6938776 116.20304
## 212 {Tears of the Giraffe}                                                   => {The No. 1 L
```

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adies' Detective Agency}                                     0.001454814  0.6600985 114.93451
## 213 {The No. 1 Ladies' Detective Agency}                    => {Tears of th
e Giraffe}                                                    0.001454814  0.2533081 114.93451
## 214 {Hot Six : A Stephanie Plum Novel}                      => {One for the
Money}                                                        0.001150823  0.5300000 114.86409
## 215 {Four to Score}                                         => {One for the
Money}                                                        0.001389673  0.5267490 114.15952
## 216 {One for the Money}                                     => {Four to Sco
re}                                                           0.001389673  0.3011765 114.15952
## 217 {The Firm,
##      The Rainmaker}                                         => {The Pelican
Brief}                                                        0.001053112  0.7080292 114.01251
## 218 {A Time to Kill,
##      The Firm}                                              => {The Pelican
Brief}                                                        0.001313675  0.6994220 112.62650
## 219 {The Chamber,
##      The Pelican Brief}                                     => {The Firm}
0.001085682   0.6802721 112.29122
## 220 {The Chamber,
##      The Firm}                                              => {The Pelican
Brief}                                                        0.001085682  0.6896552 111.05377
## 221 {A Time to Kill,
##      The Client}                                            => {The Pelican
Brief}                                                        0.001205107  0.6851852 110.33398
## 222 {The Client,
##      The Firm}                                              => {The Pelican
Brief}                                                        0.001107396  0.6845638 110.23391
## 223 {A Time to Kill,
##      The Chamber}                                           => {The Pelican
Brief}                                                        0.001107396  0.6754967 108.77386
## 224 {The Pelican Brief,
##      The Rainmaker}                                         => {The Firm}
0.001053112   0.6554054 108.18653
## 225 {A Time to Kill,
##      The Pelican Brief}                                     => {The Client}
0.001205107   0.5577889 107.48290
## 226 {The Client,
##      The Pelican Brief}                                     => {A Time to K
ill}                                                          0.001205107  0.6306818 105.61971
## 227 {Harry Potter and the Goblet of Fire}                   => {Harry Potte
r and the Order of the Phoenix}                               0.001693664  0.4000000 104.07684
## 228 {Harry Potter and the Order of the Phoenix}             => {Harry Potte
r and the Goblet of Fire}                                     0.001693664  0.4406780 104.07684
## 229 {Harry Potter and the Prisoner of Azkaban}              => {Harry Potte
r and the Chamber of Secrets}                                 0.003094194  0.6319290 103.56890
## 230 {Harry Potter and the Chamber of Secrets}               => {Harry Potte
r and the Prisoner of Azkaban}                                0.003094194  0.5071174 103.56890
```

```
## 231 {The Client,
##      The Rainmaker}                                        => {The Pelican
Brief}                                        0.001020541  0.6394558 102.97027
## 232 {Harry Potter and the Goblet of Fire}                 => {Harry Potte
r and the Chamber of Secrets}                 0.002659921  0.6282051 102.95857
## 233 {Harry Potter and the Chamber of Secrets}             => {Harry Potte
r and the Goblet of Fire}                     0.002659921  0.4359431 102.95857
## 234 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Prisoner of Azkaban}           => {Harry Potte
r and the Sorcerer's Stone}                   0.001194250  0.9166667 101.48117
## 235 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Sorcerer's Stone}              => {Harry Potte
r and the Order of the Phoenix}               0.001443957  0.3877551 100.89081
## 236 {The Client,
##      The Pelican Brief}                                   => {The Rainmak
er}                                           0.001020541  0.5340909 100.60132
## 237 {A Time to Kill,
##      The Pelican Brief}                                   => {The Firm}
0.001313675  0.6080402 100.36804
## 238 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Prisoner of Azkaban}           => {Harry Potte
r and the Sorcerer's Stone}                   0.001270248  0.9000000  99.63606
## 239 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix}          => {Harry Potte
r and the Sorcerer's Stone}                   0.001237678  0.8906250  98.59818
## 240 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire,
##       Harry Potter and the Prisoner of Azkaban}           => {Harry Potte
r and the Sorcerer's Stone}                   0.002095366  0.8772727  97.12000
## 241 {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Prisoner of Azkaban}           => {Harry Potte
r and the Sorcerer's Stone}                   0.001237678  0.8769231  97.08129
## 242 {Violets Are Blue}                                    => {Roses Are R
ed}                                           0.001367959  0.3360000  96.41211
## 243 {Roses Are Red}                                       => {Violets Are
Blue}                                         0.001367959  0.3925234  96.41211
## 244 {The Vampire Lestat}                                  => {Interview W
ith the Vampire}                              0.001834803  0.5451613  96.37949
## 245 {Interview With the Vampire}                          => {The Vampire
Lestat}                                       0.001834803  0.3243762  96.37949
## 246 {A Time to Kill,
##      The Pelican Brief}                                   => {The Chamber
```

```
}                                                       0.001107396  0.5125628   95.76295
## 247 {The Client,
##      The Pelican Brief}                                      => {The Firm}
0.001107396  0.5795455   95.66447
## 248 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix}             => {Harry Potte
r and the Sorcerer's Stone}                            0.001443957  0.8636364   95.61036
## 249 {The Firm,
##      The Pelican Brief}                                      => {A Time to K
ill}                                                   0.001313675  0.5627907   94.25005
## 250 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire}                    => {Harry Potte
r and the Sorcerer's Stone}                            0.002247362  0.8448980   93.53589
## 251 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Prisoner of Azkaban}               => {Harry Potte
r and the Sorcerer's Stone}                            0.002583923  0.8350877   92.44983
## 252 {Harry Potter and the Sorcerer's Stone,
##      Wild Animus}                                            => {Harry Potte
r and the Chamber of Secrets}                          0.001009684  0.5602410   91.81971
## 253 {Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}               => {Harry Potte
r and the Sorcerer's Stone}                            0.001313675  0.8287671   91.75010
## 254 {The Firm,
##      The Pelican Brief}                                      => {The Client}
0.001107396  0.4744186   91.41788
## 255 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban}               => {Harry Potte
r and the Sorcerer's Stone}                            0.002171364  0.8032129   88.92107
## 256 {The Firm,
##      The Pelican Brief}                                      => {The Chamber
}                                                      0.001085682  0.4651163   86.89844
## 257 {The Queen of the Damned}                                => {Interview W
ith the Vampire}                                       0.001443957  0.4854015   85.81451
## 258 {Interview With the Vampire}                             => {The Queen o
f the Damned}                                          0.001443957  0.2552783   85.81451
## 259 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix}              => {Harry Potte
r and the Sorcerer's Stone}                            0.001302818  0.7692308   85.15902
## 260 {Seven Up}                                               => {One for the
Money}                                                 0.001172537  0.3927273   85.11370
## 261 {One for the Money}                                      => {Seven Up}
0.001172537  0.2541176   85.11370
## 262 {The Firm,
##      The Pelican Brief}                                      => {The Rainmak
er}                                                    0.001053112  0.4511628   84.98099
## 263 {Harry Potter and the Order of the Phoenix}             => {Harry Potte
r and the Prisoner of Azkaban}                         0.001585096  0.4124294   84.23070
```

```
## 264 {Harry Potter and the Prisoner of Azkaban}                      => {Harry Potte
r and the Order of the Phoenix}                 0.001585096  0.3237251  84.23070
## 265 {Hard Eight : A Stephanie Plum Novel}                           => {One for the
Money}                                          0.001107396  0.3878327  84.05293
## 266 {Harry Potter and the Chamber of Secrets,
##       Wild Animus}                                                  => {Harry Potte
r and the Sorcerer's Stone}                     0.001009684  0.7209302  79.81183
## 267 {The Lost World}                                                => {Jurassic Pa
rk}                                             0.001139966  0.3917910  74.40637
## 268 {The Tale of the Body Thief}                                    => {Interview W
ith the Vampire}                                0.001150823  0.4173228  73.77883
## 269 {1st to Die: A Novel}                                           => {2nd Chance}
0.001476528  0.2730924  72.48989
## 270 {2nd Chance}                                                    => {1st to Die:
A Novel}                                        0.001476528  0.3919308  72.48989
## 271 {Harry Potter and the Order of the Phoenix}                     => {Harry Potte
r and the Chamber of Secrets}                   0.001671950  0.4350282  71.29819
## 272 {Harry Potter and the Chamber of Secrets}                       => {Harry Potte
r and the Order of the Phoenix}                 0.001671950  0.2740214  71.29819
## 273 {Harry Potter and the Chamber of Secrets}                       => {Harry Potte
r and the Sorcerer's Stone}                     0.003723889  0.6103203  67.56656
## 274 {Harry Potter and the Sorcerer's Stone}                         => {Harry Potte
r and the Chamber of Secrets}                   0.003723889  0.4122596  67.56656
## 275 {Harry Potter and the Prisoner of Azkaban}                      => {Harry Potte
r and the Sorcerer's Stone}                     0.002887914  0.5898004  65.29488
## 276 {Harry Potter and the Sorcerer's Stone}                         => {Harry Potte
r and the Prisoner of Azkaban}                  0.002887914  0.3197115  65.29488
## 277 {Harry Potter and the Goblet of Fire}                           => {Harry Potte
r and the Sorcerer's Stone}                     0.002431928  0.5743590  63.58540
## 278 {Harry Potter and the Sorcerer's Stone}                         => {Harry Potte
r and the Goblet of Fire}                       0.002431928  0.2692308  63.58540
## 279 {Roses Are Red}                                                 => {1st to Die:
A Novel}                                        0.001172537  0.3364486  62.22813
## 280 {The Pelican Brief}                                             => {The Firm}
0.002334216  0.3758741  62.04483
## 281 {The Firm}                                                      => {The Pelican
Brief}                                          0.002334216  0.3853047  62.04483
## 282 {The Pelican Brief}                                             => {The Client}
0.001910800  0.3076923  59.29063
## 283 {The Client}                                                    => {The Pelican
Brief}                                          0.001910800  0.3682008  59.29063
## 284 {A Time to Kill}                                                => {The Pelican
Brief}                                          0.002160507  0.3618182  58.26285
## 285 {The Pelican Brief}                                             => {A Time to K
ill}                                            0.002160507  0.3479021  58.26285
## 286 {The Client}                                                    => {The Rainmak
er}                                             0.001595953  0.3075314  57.92659
```

```
## 287 {The Rainmaker}                                   => {The Client}
0.001595953   0.3006135   57.92659
## 288 {Deception Point}                                 => {Angels &amp
; Demons}                                0.001172537   0.4137931   57.66060
## 289 {The Client}                                      => {The Chamber
}                                        0.001585096   0.3054393   57.06573
## 290 {The Chamber}                                     => {The Client}
0.001585096   0.2961460   57.06573
## 291 {A Time to Kill}                                  => {The Client}
0.001758805   0.2945455   56.75731
## 292 {The Client}                                      => {A Time to K
ill}                                     0.001758805   0.3389121   56.75731
## 293 {Digital Fortress : A Thriller}                   => {Angels &amp
; Demons}                                0.001270248   0.4034483   56.21908
## 294 {The Kitchen God's Wife}                          => {The Joy Luc
k Club}                                  0.001194250   0.3459119   55.41088
## 295 {The Firm}                                        => {A Time to K
ill}                                     0.001878230   0.3100358   51.92142
## 296 {A Time to Kill}                                  => {The Firm}
0.001878230   0.3145455   51.92142
## 297 {Red Dragon}                                      => {Hannibal}
0.001139966   0.2579853   51.77017
## 298 {The Client}                                      => {The Firm}
0.001617666   0.3117155   51.45428
## 299 {The Firm}                                        => {The Client}
0.001617666   0.2670251   51.45428
## 300 {The Chamber}                                     => {A Time to K
ill}                                     0.001639380   0.3062880   51.29378
## 301 {A Time to Kill}                                  => {The Chamber
}                                        0.001639380   0.2745455   51.29378
## 302 {The Chamber}                                     => {The Rainmak
er}                                      0.001443957   0.2697769   50.81515
## 303 {The Rainmaker}                                   => {The Chamber
}                                        0.001443957   0.2719836   50.81515
## 304 {Bridget Jones: The Edge of Reason}               => {Bridget Jon
es's Diary}                              0.001020541   0.4215247   50.29248
## 305 {The Partner}                                     => {The Street
Lawyer}                                  0.001454814   0.2869379   49.58588
## 306 {The Street Lawyer}                               => {The Partner
}                                        0.001454814   0.2514071   49.58588
## 307 {The Runaway Jury}                                => {The Client}
0.001433100   0.2573099   49.58223
## 308 {The Client}                                      => {The Runaway
Jury}                                    0.001433100   0.2761506   49.58223
## 309 {The Rainmaker}                                   => {The Runaway
Jury}                                    0.001454814   0.2740286   49.20123
## 310 {The Runaway Jury}                                => {The Rainmak
```

```
er}                                              0.001454814  0.2612086  49.20123
## 311 {The Pelican Brief}                                   => {The Rainmak
er}                                              0.001606809  0.2587413  48.73648
## 312 {The Rainmaker}                                       => {The Pelican
Brief}                                           0.001606809  0.3026585  48.73648
## 313 {The Chamber}                                         => {The Firm}
0.001574239  0.2941176  48.54944
## 314 {The Firm}                                            => {The Chamber
}                                                0.001574239  0.2598566  48.54944
## 315 {The Partner}                                         => {The Rainmak
er}                                              0.001302818  0.2569593  48.40084
## 316 {The Chamber}                                         => {The Pelican
Brief}                                           0.001595953  0.2981744  48.01443
## 317 {The Pelican Brief}                                   => {The Chamber
}                                                0.001595953  0.2569930  48.01443
## 318 {A Walk to Remember}                                  => {Message in
a Bottle}                                        0.001031398  0.2526596  47.68846
## 319 {The Chamber}                                         => {The Runaway
Jury}                                            0.001400530  0.2616633  46.98106
## 320 {The Runaway Jury}                                    => {The Chamber
}                                                0.001400530  0.2514620  46.98106
## 321 {Violets Are Blue}                                    => {1st to Die:
A Novel}                                         0.001031398  0.2533333  46.85548
## 322 {Harry Potter and the Order of the Phoenix}          => {Harry Potte
r and the Sorcerer's Stone}                      0.001617666  0.4209040  46.59690
## 323 {Jewel}                                               => {The Pilot's
Wife : A Novel}                                  0.001053112  0.2869822  46.53761
## 324 {The Rainmaker}                                       => {The Firm}
0.001487384  0.2801636  46.24607
## 325 {The Chamber}                                         => {The Street
Lawyer}                                          0.001422243  0.2657201  45.91922
## 326 {Little Altars Everywhere: A Novel}                   => {Divine Secr
ets of the Ya-Ya Sisterhood: A Novel}            0.001726234  0.3663594  45.78648
## 327 {The Rainmaker}                                       => {A Time to K
ill}                                             0.001443957  0.2719836  45.54885
## 328 {The Hundred Secret Senses}                           => {The Joy Luc
k Club}                                          0.001009684  0.2826748  45.28106
## 329 {A Walk to Remember}                                  => {The Noteboo
k}                                               0.001237678  0.3031915  45.04252
## 330 {Midwives: A Novel}                                   => {The Pilot's
Wife : A Novel}                                  0.001139966  0.2763158  44.80791
## 331 {The Client}                                          => {The Street
Lawyer}                                          0.001324532  0.2552301  44.10645
## 332 {The Runaway Jury}                                    => {A Time to K
ill}                                             0.001411387  0.2534113  42.43856
## 333 {The Runaway Jury}                                    => {The Pelican
Brief}                                           0.001454814  0.2612086  42.06189
```

```
## 334 {Midwives: A Novel}                                          => {Where The H
eart Is}                                       0.001150823  0.2789474  41.10925
## 335 {Jewel}                                                      => {Where The H
eart Is}                                       0.001020541  0.2781065  40.98533
## 336 {The Partner}                                                => {The Testame
nt}                                            0.001346246  0.2655246  40.76157
## 337 {A Bend in the Road}                                         => {The Noteboo
k}                                             0.001009684  0.2735294  40.63588
## 338 {Message in a Bottle}                                        => {The Noteboo
k}                                             0.001443957  0.2725410  40.48904
## 339 {Here On Earth}                                              => {White Olean
der : A Novel}                                 0.001020541  0.2865854  37.02217
## 340 {Midwives: A Novel}                                          => {Snow Fallin
g on Cedars}                                   0.001053112  0.2552632  35.57001
## 341 {Confessions of a Shopaholic}                                => {The Nanny D
iaries: A Novel}                               0.001400530  0.3021077  33.89347
## 342 {Vinegar Hill}                                               => {She's Come
Undone}                                        0.001074825  0.3378840  33.32100
## 343 {Angels &amp; Demons}                                        => {The Da Vinc
i Code}                                        0.002345073  0.3267776  33.25838
## 344 {I Know This Much Is True}                                   => {She's Come
Undone}                                        0.001563382  0.3302752  32.57065
## 345 {Bel Canto: A Novel}                                         => {The Secret
Life of Bees}                                  0.001020541  0.2678063  32.37152
## 346 {Midwives: A Novel}                                          => {White Olean
der : A Novel}                                 0.001031398  0.2500000  32.29593
## 347 {Midwives: A Novel}                                          => {Divine Secr
ets of the Ya-Ya Sisterhood: A Novel}          0.001063968  0.2578947  32.23089
## 348 {Lucky : A Memoir}                                           => {The Lovely
Bones: A Novel}                                0.001454814  0.4451827  31.66401
## 349 {The Deep End of the Ocean}                                  => {She's Come
Undone}                                        0.001150823  0.3063584  30.21205
## 350 {The Brethren}                                               => {A Painted H
ouse}                                          0.001541668  0.2619926  29.46473
```

```
    # top 350 associations by lift within model 2
    # greater variety helps us view associations that are non-series related
    # notable more obsure lift association: Series, artist and genre associations ar
e all present



inspect(sort(book_model2, by="confidence")[1:350])
```

```
##      lhs                                                                rhs
support confidence        lift
## 1   {Harry Potter and the Order of the Phoenix,
```

```
##       Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Chamber of Secrets}                      0.001270248  0.9669421 158.475280
## 2   {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Chamber of Secrets}                      0.002095366  0.9650000 158.156975
## 3   {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Chamber of Secrets}                      0.001194250  0.9649123 158.142598
## 4   {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Prisoner of Azkaban}                     0.001194250  0.9649123 197.064613
## 5   {Four to Score,
##       High Five,
##       Two for the Dough}                                        => {Three To Ge
t Deadly : A Stephanie Plum Novel}                 0.001085682  0.9615385 352.850138
## 6   {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Prisoner of Azkaban}                     0.001237678  0.9500000 194.019069
## 7   {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Chamber of Secrets}                      0.001237678  0.9500000 155.698577
## 8   {High Five,
##       One for the Money,
##       Two for the Dough}                                        => {Three To Ge
t Deadly : A Stephanie Plum Novel}                 0.001009684  0.9489796 348.241483
## 9   {Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Goblet of Fire}                          0.001237678  0.9421488 222.511380
## 10  {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Goblet of Fire}                          0.001194250  0.9401709 222.044269
## 11  {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix}                => {Harry Potte
r and the Prisoner of Azkaban}                     0.001302818  0.9375000 191.466186
## 12  {Harry Potter and the Chamber of Secrets,
```

```
##        Harry Potter and the Goblet of Fire,
##        Harry Potter and the Sorcerer's Stone}                      => {Harry Potte
r and the Prisoner of Azkaban}                        0.002095366  0.9323671 190.417901
## 13   {Hot Six : A Stephanie Plum Novel,
##        Three To Get Deadly : A Stephanie Plum Novel}               => {High Five}
0.001042255  0.9320388 383.251040
## 14   {Harry Potter and the Goblet of Fire,
##        Harry Potter and the Sorcerer's Stone}                      => {Harry Potte
r and the Chamber of Secrets}                         0.002247362  0.9241071 151.454912
## 15   {Harry Potter and the Goblet of Fire,
##        Harry Potter and the Order of the Phoenix,
##        Harry Potter and the Prisoner of Azkaban}                   => {Harry Potte
r and the Chamber of Secrets}                         0.001302818  0.9230769 151.286066
## 16   {Harry Potter and the Chamber of Secrets,
##        Harry Potter and the Order of the Phoenix,
##        Harry Potter and the Prisoner of Azkaban}                   => {Harry Potte
r and the Goblet of Fire}                             0.001302818  0.9230769 218.007101
## 17   {High Five,
##        Three To Get Deadly : A Stephanie Plum Novel,
##        Two for the Dough}                                          => {Four to Sco
re}                                                   0.001085682  0.9174312 347.747952
## 18   {Seven Up,
##        Three To Get Deadly : A Stephanie Plum Novel}               => {High Five}
0.001074825  0.9166667 376.930060
## 19   {Harry Potter and the Chamber of Secrets,
##        Harry Potter and the Goblet of Fire,
##        Harry Potter and the Order of the Phoenix,
##        Harry Potter and the Prisoner of Azkaban}                   => {Harry Potte
r and the Sorcerer's Stone}                           0.001194250  0.9166667 101.481170
## 20   {Four to Score,
##        Seven Up}                                                   => {High Five}
0.001096539  0.9099099 374.151705
## 21   {Four to Score,
##        Three To Get Deadly : A Stephanie Plum Novel,
##        Two for the Dough}                                          => {High Five}
0.001085682  0.9090909 373.814935
## 22   {The Fellowship of the Ring,
##        The Return of the King}                                     => {The Two Tow
ers}                                                  0.001585096  0.9068323 285.073411
## 23   {Four to Score,
##        High Five,
##        One for the Money}                                          => {Three To Ge
t Deadly : A Stephanie Plum Novel}                    0.001020541  0.9038462 331.679130
## 24   {Hot Six : A Stephanie Plum Novel,
##        Three To Get Deadly : A Stephanie Plum Novel}               => {Four to Sco
re}                                                   0.001009684  0.9029126 342.244756
## 25   {High Five,
```

```
##       Two for the Dough}                                    => {Three To Ge
t Deadly : A Stephanie Plum Novel}                     0.001183393 0.9008264 330.571005
## 26  {Four to Score,
##       Hot Six : A Stephanie Plum Novel}                              => {High Five}
0.001074825  0.9000000 370.076786
## 27  {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Prisoner of Azkaban}                 => {Harry Potte
r and the Sorcerer's Stone}                            0.001270248 0.9000000  99.636058
## 28  {Seven Up,
##       Three To Get Deadly : A Stephanie Plum Novel}              => {Four to Sco
re}                                                    0.001053112 0.8981481 340.438805
## 29  {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire}                      => {Harry Potte
r and the Prisoner of Azkaban}                         0.002388500 0.8979592 183.390742
## 30  {Four to Score,
##       One for the Money,
##       Three To Get Deadly : A Stephanie Plum Novel}         => {High Five}
0.001020541  0.8952381 368.118707
## 31  {High Five,
##       One for the Money,
##       Three To Get Deadly : A Stephanie Plum Novel}              => {Four to Sco
re}                                                    0.001020541 0.8952381 339.335763
## 32  {Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Chamber of Secrets}                          0.002583923 0.8947368 146.641319
## 33  {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Prisoner of Azkaban}                         0.002171364 0.8928571 182.348749
## 34  {Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Chamber of Secrets}                          0.001443957 0.8926174 146.293965
## 35  {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix}               => {Harry Potte
r and the Sorcerer's Stone}                            0.001237678 0.8906250  98.598182
## 36  {Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Prisoner of Azkaban}                 => {Harry Potte
r and the Goblet of Fire}                              0.001411387 0.8904110 210.292237
## 37  {Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Prisoner of Azkaban}                 => {Harry Potte
r and the Chamber of Secrets}                          0.001411387 0.8904110 145.932336
## 38  {Four to Score,
##       Two for the Dough}                                        => {Three To Ge
t Deadly : A Stephanie Plum Novel}                     0.001194250 0.8870968 325.532708
## 39  {High Five,
##       One for the Money,
```

```
##       Three To Get Deadly : A Stephanie Plum Novel}              => {Two for the
## Dough}                                              0.001009684  0.8857143 282.288482
## 40  {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban}                   => {Harry Potte
## r and the Chamber of Secrets}                       0.002388500  0.8835341 144.805271
## 41  {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}                      => {Harry Potte
## r and the Prisoner of Azkaban}                      0.001270248  0.8796992 179.661504
## 42  {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban}                   => {Harry Potte
## r and the Sorcerer's Stone}                         0.002095366  0.8772727  97.119996
## 43  {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Prisoner of Azkaban}                   => {Harry Potte
## r and the Sorcerer's Stone}                         0.001237678  0.8769231  97.081287
## 44  {Four to Score,
##      Seven Up}                                                   => {Three To Ge
## t Deadly : A Stephanie Plum Novel}                  0.001053112  0.8738739 320.680378
## 45  {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel}               => {Four to Sco
## re}                                                 0.001270248  0.8731343 330.957435
## 46  {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix}                  => {Harry Potte
## r and the Sorcerer's Stone}                         0.001443957  0.8636364  95.610358
## 47  {Seven Up,
##      Three To Get Deadly : A Stephanie Plum Novel}               => {Two for the
## Dough}                                              0.001009684  0.8611111 274.447136
## 48  {High Five,
##      Two for the Dough}                                          => {Four to Sco
## re}                                                 0.001129109  0.8595041 325.790974
## 49  {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Order of the Phoenix,
##      Harry Potter and the Sorcerer's Stone}                      => {Harry Potte
## r and the Goblet of Fire}                           0.001237678  0.8571429 202.435165
## 50  {High Five,
##      Seven Up}                                                   => {Four to Sco
## re}                                                 0.001096539  0.8559322 324.437051
## 51  {Four to Score,
##      High Five,
##      Three To Get Deadly : A Stephanie Plum Novel}               => {Two for the
## Dough}                                              0.001085682  0.8547009 272.404105
## 52  {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                                          => {One for the
## Money}                                              0.001009684  0.8532110 184.911905
```

```
## 53  {High Five,
##         One for the Money}                                      => {Three To Ge
t Deadly : A Stephanie Plum Novel}                 0.001139966 0.8467742 310.735767
## 54  {Four to Score,
##         Hot Six : A Stephanie Plum Novel}                       => {Three To Ge
t Deadly : A Stephanie Plum Novel}                 0.001009684 0.8454545 310.251503
## 55  {Harry Potter and the Chamber of Secrets,
##         Harry Potter and the Goblet of Fire}                    => {Harry Potte
r and the Sorcerer's Stone}                        0.002247362 0.8448980  93.535891
## 56  {Harry Potter and the Chamber of Secrets,
##         Harry Potter and the Order of the Phoenix}              => {Harry Potte
r and the Prisoner of Azkaban}                     0.001411387 0.8441558 172.402453
## 57  {High Five,
##         Hot Six : A Stephanie Plum Novel}                       => {Four to Sco
re}                                                0.001074825 0.8389831 318.012555
## 58  {High Five,
##         Seven Up}                                               => {Three To Ge
t Deadly : A Stephanie Plum Novel}                 0.001074825 0.8389831 307.876697
## 59  {Four to Score,
##         Two for the Dough}                                      => {High Five}
0.001129109  0.8387097 344.874424
## 60  {High Five,
##         One for the Money}                                      => {Four to Sco
re}                                                0.001129109 0.8387097 317.908934
## 61  {Seven Up,
##         Two for the Dough}                                      => {Three To Ge
t Deadly : A Stephanie Plum Novel}                 0.001009684 0.8378378 307.456444
## 62  {Four to Score,
##         Three To Get Deadly : A Stephanie Plum Novel}           => {High Five}
0.001270248  0.8357143 343.642730
## 63  {Harry Potter and the Chamber of Secrets,
##         Harry Potter and the Prisoner of Azkaban}               => {Harry Potte
r and the Sorcerer's Stone}                        0.002583923 0.8350877  92.449831
## 64  {Harry Potter and the Goblet of Fire,
##         Harry Potter and the Order of the Phoenix}              => {Harry Potte
r and the Prisoner of Azkaban}                     0.001411387 0.8333333 170.192166
## 65  {Harry Potter and the Chamber of Secrets,
##         Harry Potter and the Order of the Phoenix}              => {Harry Potte
r and the Goblet of Fire}                          0.001389673 0.8311688 196.300766
## 66  {Four to Score,
##         High Five}                                              => {Three To Ge
t Deadly : A Stephanie Plum Novel}                 0.001270248 0.8297872 304.502162
## 67  {Harry Potter and the Order of the Phoenix,
##         Harry Potter and the Prisoner of Azkaban}               => {Harry Potte
r and the Sorcerer's Stone}                        0.001313675 0.8287671  91.750099
## 68  {One for the Money,
##         Three To Get Deadly : A Stephanie Plum Novel}           => {Two for the
```

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Dough}                                                 0.001357103  0.8278146 263.835102
## 69  {Four to Score,
##       Two for the Dough}                                           => {One for the
Money}                                                 0.001107396  0.8225806 178.273548
## 70  {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix}                   => {Harry Potte
r and the Chamber of Secrets}                          0.001389673  0.8205128 134.476503
## 71  {Four to Score,
##       One for the Money}                                           => {Three To Ge
t Deadly : A Stephanie Plum Novel}                     0.001139966  0.8203125 301.025274
## 72  {The Fellowship of the Ring,
##       The Two Towers}                                              => {The Return
of the King}                                           0.001585096  0.8156425 281.375264
## 73  {High Five,
##       Hot Six : A Stephanie Plum Novel}                            => {Three To Ge
t Deadly : A Stephanie Plum Novel}                     0.001042255  0.8135593 298.547100
## 74  {High Five,
##       Three To Get Deadly : A Stephanie Plum Novel}                => {Two for the
Dough}                                                 0.001183393  0.8134328 259.251459
## 75  {Four to Score,
##       One for the Money}                                           => {High Five}
0.001129109   0.8125000 334.097098
## 76  {Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}                       => {Harry Potte
r and the Prisoner of Azkaban}                         0.001313675  0.8120805 165.851694
## 77  {Three To Get Deadly : A Stephanie Plum Novel,
##       Two for the Dough}                                           => {One for the
Money}                                                 0.001357103  0.8116883 175.912911
## 78  {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                       => {Harry Potte
r and the Goblet of Fire}                              0.002095366  0.8109244 191.519543
## 79  {High Five,
##       Two for the Dough}                                           => {One for the
Money}                                                 0.001063968  0.8099174 175.529101
## 80  {Harry Potter and the Order of the Phoenix,
##       Harry Potter and the Sorcerer's Stone}                       => {Harry Potte
r and the Goblet of Fire}                              0.001302818  0.8053691 190.207537
## 81  {Key of Knowledge}                                             => {Key of Ligh
t}                                                     0.001074825  0.8048780 541.136550
## 82  {Four to Score,
##       High Five,
##       Three To Get Deadly : A Stephanie Plum Novel}                => {One for the
Money}                                                 0.001020541  0.8034188 174.120704
## 83  {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Prisoner of Azkaban}                    => {Harry Potte
r and the Sorcerer's Stone}                            0.002171364  0.8032129  88.921069
```

```
## 84  {The Return of the King,
##       The Two Towers}                                         => {The Fellows
hip of the Ring}                          0.001585096  0.8021978 186.117973
## 85  {Four to Score,
##       One for the Money}                                      => {Two for the
Dough}                                    0.001107396  0.7968750 253.974265
## 86  {High Five,
##       One for the Money}                                      => {Two for the
Dough}                                    0.001063968  0.7903226 251.885925
## 87  {Soul Harvest: The World Takes Sides}                     => {Nicolae: Th
e Rise of Antichrist}                     0.001020541  0.7899160 512.377323
## 88  {Four to Score,
##       Three To Get Deadly : A Stephanie Plum Novel}           => {Two for the
Dough}                                    0.001194250  0.7857143 250.417202
## 89  {High Five,
##       Three To Get Deadly : A Stephanie Plum Novel}           => {One for the
Money}                                    0.001139966  0.7835821 169.821598
## 90  {Interview With the Vampire,
##       The Queen of the Damned}                                => {The Vampire
Lestat}                                   0.001129109  0.7819549 232.336454
## 91  {Soul Harvest: The World Takes Sides}                     => {Apollyon: T
he Destroyer Is Unleashed}                0.001009684  0.7815126 580.512605
## 92  {Nicolae: The Rise of Antichrist}                         => {Tribulation
Force: The Continuing Drama of Those Left Behind} 0.001194250  0.7746479 373.566846
## 93  {Key of Knowledge}                                        => {Key of Valo
r}                                        0.001031398  0.7723577 564.605756
## 94  {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Prisoner of Azkaban}               => {Harry Potte
r and the Goblet of Fire}                 0.002388500  0.7719298 182.310031
## 95  {The Amber Spyglass}                                      => {The Subtle
Knife}                                    0.001172537  0.7714286 315.798857
## 96  {Harry Potter and the Goblet of Fire,
##       Harry Potter and the Order of the Phoenix}              => {Harry Potte
r and the Sorcerer's Stone}               0.001302818  0.7692308  85.159024
## 97  {The Queen of the Damned,
##       The Vampire Lestat}                                     => {Interview W
ith the Vampire}                          0.001129109  0.7647059 135.192955
## 98  {Key of Valor}                                            => {Key of Know
ledge}                                    0.001031398  0.7539683 564.605756
## 99  {Harry Potter and the Prisoner of Azkaban,
##       Harry Potter and the Sorcerer's Stone}                  => {Harry Potte
r and the Goblet of Fire}                 0.002171364  0.7518797 177.574706
## 100 {Apollyon: The Destroyer Is Unleashed}                    => {Soul Harves
t: The World Takes Sides}                 0.001009684  0.7500000 580.512605
## 101 {Four to Score,
##       Three To Get Deadly : A Stephanie Plum Novel}           => {One for the
Money}                                    0.001139966  0.7500000 162.543529
```

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## 102 {One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                                    => {High Five}
0.001009684  0.7440000 305.930143
## 103 {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel}         => {Seven Up}
0.001074825  0.7388060 247.454328
## 104 {Key of Valor}                                         => {Key of Ligh
t}                                          0.001009684  0.7380952 496.237052
## 105 {Four to Score,
##      High Five}                                            => {Two for the
Dough}                                      0.001129109  0.7375887 235.078947
## 106 {Four to Score,
##      High Five}                                            => {One for the
Money}                                      0.001129109  0.7375887 159.853684
## 107 {Key of Light}                                         => {Key of Know
ledge}                                      0.001074825  0.7226277 541.136550
## 108 {Harry Potter and the Chamber of Secrets,
##      Wild Animus}                                          => {Harry Potte
r and the Sorcerer's Stone}                 0.001009684  0.7209302  79.811829
## 109 {High Five,
##      Three To Get Deadly : A Stephanie Plum Novel}         => {Hot Six : A
Stephanie Plum Novel}                       0.001042255  0.7164179 329.939104
## 110 {Four to Score,
##      High Five}                                            => {Seven Up}
0.001096539  0.7163121 239.920258
## 111 {Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                                    => {Four to Sco
re}                                         0.001194250  0.7142857 270.746620
## 112 {Nicolae: The Rise of Antichrist}                      => {Left Behind
: A Novel of the Earth's Last Days}         0.001096539  0.7112676 151.301239
## 113 {The Firm,
##      The Rainmaker}                                        => {The Pelican
Brief}                                      0.001053112  0.7080292 114.012506
## 114 {Three To Get Deadly : A Stephanie Plum Novel,
##      Two for the Dough}                                    => {High Five}
0.001183393  0.7077922 291.041628
## 115 {Tribulation Force: The Continuing Drama of Those Left Behind} => {Left Behind
: A Novel of the Earth's Last Days}         0.001465671  0.7068063 150.352224
## 116 {Four to Score,
##      High Five}                                            => {Hot Six : A
Stephanie Plum Novel}                       0.001074825  0.7021277 323.357872
## 117 {A Time to Kill,
##      The Firm}                                             => {The Pelican
Brief}                                      0.001313675  0.6994220 112.626501
## 118 {One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel}         => {Four to Sco
```

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re}                                              0.001139966  0.6953642 263.574524
## 119 {One for the Money,
##      Three To Get Deadly : A Stephanie Plum Novel}          => {High Five}
0.001139966  0.6953642 285.931291
## 120 {One for the Money,
##      Two for the Dough}                                     => {Three To Ge
t Deadly : A Stephanie Plum Novel}               0.001357103  0.6944444 254.836211
## 121 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Sorcerer's Stone}                => {Harry Potte
r and the Prisoner of Azkaban}                   0.002583923  0.6938776 141.711028
## 122 {The Chamber,
##      The Pelican Brief}                                     => {A Time to K
ill}                                             0.001107396  0.6938776 116.203043
## 123 {Four to Score,
##      Three To Get Deadly : A Stephanie Plum Novel}          => {Seven Up}
0.001053112  0.6928571 232.064312
## 124 {The Chamber,
##      The Firm}                                              => {The Pelican
Brief}                                           0.001085682  0.6896552 111.053774
## 125 {A Time to Kill,
##      The Client}                                           => {The Pelican
Brief}                                           0.001205107  0.6851852 110.333981
## 126 {The Client,
##      The Firm}                                              => {The Pelican
Brief}                                           0.001107396  0.6845638 110.233914
## 127 {The Return of the King}                               => {The Two Tow
ers}                                             0.001975941  0.6816479 214.284056
## 128 {The Chamber,
##      The Pelican Brief}                                     => {The Firm}
0.001085682  0.6802721 112.291225
## 129 {Key of Light}                                         => {Key of Valo
r}                                               0.001009684  0.6788321 496.237052
## 130 {A Time to Kill,
##      The Chamber}                                           => {The Pelican
Brief}                                           0.001107396  0.6754967 108.773862
## 131 {Four to Score,
##      Three To Get Deadly : A Stephanie Plum Novel}          => {Hot Six : A
Stephanie Plum Novel}                            0.001009684  0.6642857 305.930143
## 132 {Shopaholic Takes Manhattan}                           => {Confessions
of a Shopaholic}                                 0.001628523  0.6637168 143.170090
## 133 {Nicolae: The Rise of Antichrist}                      => {Soul Harves
t: The World Takes Sides}                        0.001020541  0.6619718 512.377323
## 134 {Tears of the Giraffe}                                 => {The No. 1 L
adies' Detective Agency}                         0.001454814  0.6600985 114.934508
## 135 {The Pelican Brief,
##      The Rainmaker}                                         => {The Firm}
0.001053112  0.6554054 108.186525
```

```
## 136 {The Client,
##       The Rainmaker}                                           => {The Pelican
Brief}                                              0.001020541   0.6394558 102.970268
## 137 {Harry Potter and the Goblet of Fire}                      => {Harry Potte
r and the Prisoner of Azkaban}                      0.002703348   0.6384615 130.393382
## 138 {The Pelican Brief,
##       The Rainmaker}                                           => {The Client}
0.001020541   0.6351351 122.387086
## 139 {Harry Potter and the Prisoner of Azkaban}                 => {Harry Potte
r and the Chamber of Secrets}                       0.003094194   0.6319290 103.568898
## 140 {The Client,
##       The Pelican Brief}                                       => {A Time to K
ill}                                                0.001205107   0.6306818 105.619711
## 141 {High Five}                                                => {Four to Sco
re}                                                 0.001530812   0.6294643 238.595459
## 142 {Harry Potter and the Goblet of Fire}                      => {Harry Potte
r and the Chamber of Secrets}                       0.002659921   0.6282051 102.958573
## 143 {Two for the Dough}                                        => {One for the
Money}                                              0.001954228   0.6228374 134.984246
## 144 {The Two Towers}                                           => {The Return
of the King}                                        0.001975941   0.6211604 214.284056
## 145 {Interview With the Vampire,
##       The Vampire Lestat}                                      => {The Queen o
f the Damned}                                       0.001129109   0.6153846 206.868052
## 146 {Three To Get Deadly : A Stephanie Plum Novel}             => {Two for the
Dough}                                              0.001671950   0.6135458 195.544907
## 147 {The Two Towers}                                           => {The Fellows
hip of the Ring}                                    0.001943371   0.6109215 141.739944
## 148 {Harry Potter and the Chamber of Secrets}                  => {Harry Potte
r and the Sorcerer's Stone}                         0.003723889   0.6103203  67.566563
## 149 {A Time to Kill,
##       The Pelican Brief}                                       => {The Firm}
0.001313675   0.6080402 100.368041
## 150 {Three To Get Deadly : A Stephanie Plum Novel,
##       Two for the Dough}                                       => {Seven Up}
0.001009684   0.6038961 202.267863
## 151 {Harry Potter and the Chamber of Secrets,
##       Harry Potter and the Sorcerer's Stone}                   => {Harry Potte
r and the Goblet of Fire}                           0.002247362   0.6034985 142.530881
## 152 {The Return of the King}                                   => {The Fellows
hip of the Ring}                                    0.001747948   0.6029963 139.901207
## 153 {Three To Get Deadly : A Stephanie Plum Novel}             => {One for the
Money}                                              0.001639380   0.6015936 130.380202
## 154 {High Five}                                                => {Three To Ge
t Deadly : A Stephanie Plum Novel}                  0.001454814   0.5982143 219.523193
## 155 {C Is for Corpse}                                          => {B Is for Bu
rglar}                                              0.001237678   0.5968586 219.901822
```

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## 156 {E Is for Evidence: A Kinsey Millhone Mystery}              => {D Is for De
adbeat}                                            0.001020541  0.5949367 307.856350
## 157 {Hot Six : A Stephanie Plum Novel}                          => {High Five}
0.001281105   0.5900000 242.605893
## 158 {Harry Potter and the Prisoner of Azkaban}                  => {Harry Potte
r and the Sorcerer's Stone}                        0.002887914  0.5898004  65.294879
## 159 {Shopaholic Ties the Knot}                                  => {Shopaholic
Takes Manhattan}                                   0.001020541  0.5875000 239.440044
## 160 {Four to Score}                                             => {High Five}
0.001530812   0.5802469 238.595459
## 161 {The Client,
##      The Pelican Brief}                                         => {The Firm}
0.001107396   0.5795455  95.664467
## 162 {Four to Score}                                             => {Three To Ge
t Deadly : A Stephanie Plum Novel}                 0.001519955  0.5761317 211.419671
## 163 {Tribulation Force: The Continuing Drama of Those Left Behind} => {Nicolae: Th
e Rise of Antichrist}                              0.001194250  0.5759162 373.566846
## 164 {Harry Potter and the Goblet of Fire}                      => {Harry Potte
r and the Sorcerer's Stone}                        0.002431928  0.5743590  63.585404
## 165 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Order of the Phoenix}                    0.001237678  0.5700000 148.309492
## 166 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Order of the Phoenix}                    0.001194250  0.5699482 148.296010
## 167 {One for the Money,
##      Two for the Dough}                                         => {Four to Sco
re}                                                0.001107396  0.5666667 214.792318
## 168 {The Firm,
##      The Pelican Brief}                                         => {A Time to K
ill}                                               0.001313675  0.5627907  94.250047
## 169 {Harry Potter and the Sorcerer's Stone,
##      Wild Animus}                                               => {Harry Potte
r and the Chamber of Secrets}                      0.001009684  0.5602410  91.819706
## 170 {A Time to Kill,
##      The Pelican Brief}                                         => {The Client}
0.001205107   0.5577889 107.482896
## 171 {Three To Get Deadly : A Stephanie Plum Novel}             => {Four to Sco
re}                                                0.001519955  0.5577689 211.419671
## 172 {The Subtle Knife}                                          => {The Golden
Compass}                                           0.001357103  0.5555556 160.915444
## 173 {High Five}                                                 => {One for the
Money}                                             0.001346246  0.5535714 119.972605
## 174 {Harry Potter and the Prisoner of Azkaban}                 => {Harry Potte
```

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r and the Goblet of Fire}                              0.002703348  0.5521064 130.393382
## 175 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Sorcerer's Stone}                     => {Harry Potte
r and the Order of the Phoenix}                        0.001237678  0.5507246 143.294195
## 176 {D Is for Deadbeat}                                         => {B Is for Bu
rglar}                                                 0.001063968  0.5505618 202.844584
## 177 {Hot Six : A Stephanie Plum Novel}                          => {Four to Sco
re}                                                    0.001194250  0.5500000 208.474897
## 178 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban}                  => {Harry Potte
r and the Order of the Phoenix}                        0.001302818  0.5454545 141.922958
## 179 {The Vampire Lestat}                                        => {Interview W
ith the Vampire}                                       0.001834803  0.5451613  96.379494
## 180 {One for the Money,
##      Two for the Dough}                                         => {High Five}
0.001063968  0.5444444 223.873611
## 181 {Heaven And Earth}                                          => {Dance upon
the Air}                                               0.001281105  0.5437788 191.901831
## 182 {High Five}                                                 => {Two for the
Dough}                                                 0.001313675  0.5401786 172.161826
## 183 {Heaven And Earth}                                          => {Face the Fi
re}                                                    0.001270248  0.5391705 205.214533
## 184 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Sorcerer's Stone}                     => {Harry Potte
r and the Order of the Phoenix}                        0.001302818  0.5357143 139.388620
## 185 {The Client,
##      The Pelican Brief}                                         => {The Rainmak
er}                                                    0.001020541  0.5340909 100.601320
## 186 {Three To Get Deadly : A Stephanie Plum Novel}              => {High Five}
0.001454814  0.5338645 219.523193
## 187 {Two for the Dough}                                         => {Three To Ge
t Deadly : A Stephanie Plum Novel}                     0.001671950  0.5328720 195.544907
## 188 {Hot Six : A Stephanie Plum Novel}                          => {One for the
Money}                                                 0.001150823  0.5300000 114.864094
## 189 {D Is for Deadbeat}                                         => {E Is for Ev
idence: A Kinsey Millhone Mystery}                     0.001020541  0.5280899 307.856350
## 190 {High Five}                                                 => {Hot Six : A
Stephanie Plum Novel}                                  0.001281105  0.5267857 242.605893
## 191 {High Five}                                                 => {Seven Up}
0.001281105  0.5267857 176.440649
## 192 {Four to Score}                                             => {One for the
Money}                                                 0.001389673  0.5267490 114.159516
## 193 {Hot Six : A Stephanie Plum Novel}                          => {Seven Up}
0.001139966  0.5250000 175.842545
## 194 {Harry Potter and the Chamber of Secrets,
```

```
##      Harry Potter and the Goblet of Fire}                    => {Harry Potte
r and the Order of the Phoenix}             0.001389673  0.5224490 135.937092
## 195 {Harry Potter and the Goblet of Fire,
##      Harry Potter and the Prisoner of Azkaban}               => {Harry Potte
r and the Order of the Phoenix}             0.001411387  0.5220884 135.843260
## 196 {Hot Six : A Stephanie Plum Novel}                      => {Three To Ge
t Deadly : A Stephanie Plum Novel}          0.001118252  0.5150000 188.986534
## 197 {A Time to Kill,
##      The Pelican Brief}                                     => {The Chamber
}                                           0.001107396  0.5125628  95.762953
## 198 {Four to Score}                                          => {Two for the
Dough}                                      0.001346246  0.5102881 162.635340
## 199 {Harry Potter and the Chamber of Secrets}               => {Harry Potte
r and the Prisoner of Azkaban}              0.003094194  0.5071174 103.568898
## 200 {Face the Fire}                                         => {Dance upon
the Air}                                    0.001313675  0.5000000 176.452107
## 201 {The Queen of the Damned}                               => {The Vampire
Lestat}                                     0.001476528  0.4963504 147.476901
## 202 {C Is for Corpse}                                       => {A Is for Al
ibi}                                        0.001020541  0.4921466 155.241914
## 203 {B Is for Burglar}                                      => {A Is for Al
ibi}                                        0.001335389  0.4920000 155.195671
## 204 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Prisoner of Azkaban,
##      Harry Potter and the Sorcerer's Stone}                 => {Harry Potte
r and the Order of the Phoenix}             0.001270248  0.4915966 127.909557
## 205 {The Queen of the Damned}                               => {Interview W
ith the Vampire}                            0.001443957  0.4854015  85.814506
## 206 {Face the Fire}                                         => {Heaven And
Earth}                                      0.001270248  0.4834711 205.214533
## 207 {The Subtle Knife}                                      => {The Amber S
pyglass}                                    0.001172537  0.4800000 315.798857
## 208 {The Firm,
##      The Pelican Brief}                                     => {The Client}
0.001107396  0.4744186  91.417885
## 209 {High Five}                                             => {Hard Eight
: A Stephanie Plum Novel}                   0.001150823  0.4732143 165.729359
## 210 {The Firm,
##      The Pelican Brief}                                     => {The Chamber
}                                           0.001085682  0.4651163  86.898439
## 211 {Dance upon the Air}                                    => {Face the Fi
re}                                         0.001313675  0.4636015 176.452107
## 212 {Hard Eight : A Stephanie Plum Novel}                   => {Seven Up}
0.001313675  0.4600760 154.097034
## 213 {Four to Score}                                         => {Seven Up}
0.001205107  0.4567901 152.996453
## 214 {Harry Potter and the Chamber of Secrets,
```

```
##        Harry Potter and the Prisoner of Azkaban}                        => {Harry Potte
r and the Order of the Phoenix}                      0.001411387  0.4561404 118.684111
## 215 {B Is for Burglar}                                               => {C Is for Co
rpse}                                                0.001237678  0.4560000 219.901822
## 216 {Harry Potter and the Prisoner of Azkaban,
##        Harry Potter and the Sorcerer's Stone}                          => {Harry Potte
r and the Order of the Phoenix}                      0.001313675  0.4548872 118.358056
## 217 {Four to Score}                                                  => {Hot Six : A
Stephanie Plum Novel}                                0.001194250  0.4526749 208.474897
## 218 {Dance upon the Air}                                             => {Heaven And
Earth}                                               0.001281105  0.4521073 191.901831
## 219 {The Firm,
##       The Pelican Brief}                                             => {The Rainmak
er}                                                  0.001053112  0.4511628  84.980986
## 220 {The Fellowship of the Ring}                                     => {The Two Tow
ers}                                                 0.001943371  0.4508816 141.739944
## 221 {Lucky : A Memoir}                                               => {The Lovely
Bones: A Novel}                                      0.001454814  0.4451827  31.664008
## 222 {Harry Potter and the Order of the Phoenix}                      => {Harry Potte
r and the Goblet of Fire}                            0.001693664  0.4406780 104.076836
## 223 {Seven Up}                                                       => {Hard Eight
: A Stephanie Plum Novel}                            0.001313675  0.4400000 154.097034
## 224 {The Vampire Lestat}                                             => {The Queen o
f the Damned}                                        0.001476528  0.4387097 147.476901
## 225 {Harry Potter and the Chamber of Secrets}                        => {Harry Potte
r and the Goblet of Fire}                            0.002659921  0.4359431 102.958573
## 226 {Harry Potter and the Order of the Phoenix}                      => {Harry Potte
r and the Chamber of Secrets}                        0.001671950  0.4350282  71.298188
## 227 {Three To Get Deadly : A Stephanie Plum Novel}                   => {Seven Up}
0.001172537  0.4302789 144.116827
## 228 {Seven Up}                                                       => {High Five}
0.001281105  0.4290909 176.440649
## 229 {Two for the Dough}                                              => {Four to Sco
re}                                                  0.001346246  0.4290657 162.635340
## 230 {One for the Money}                                              => {Two for the
Dough}                                               0.001954228  0.4235294 134.984246
## 231 {Bridget Jones: The Edge of Reason}                              => {Bridget Jon
es's Diary}                                          0.001020541  0.4215247  50.292479
## 232 {A Is for Alibi}                                                 => {B Is for Bu
rglar}                                               0.001335389  0.4212329 155.195671
## 233 {Harry Potter and the Order of the Phoenix}                      => {Harry Potte
r and the Sorcerer's Stone}                          0.001617666  0.4209040  46.596901
## 234 {Two for the Dough}                                              => {High Five}
0.001313675  0.4186851 172.161826
## 235 {The Tale of the Body Thief}                                     => {The Vampire
Lestat}                                              0.001150823  0.4173228 123.996038
## 236 {The Tale of the Body Thief}                                     => {Interview W
```

```
ith the Vampire}                                        0.001150823  0.4173228  73.778832
## 237 {Shopaholic Takes Manhattan}                                 => {Shopaholic
Ties the Knot}                                          0.001020541  0.4159292 239.440044
## 238 {Deception Point}                                            => {Angels &amp
; Demons}                                               0.001172537  0.4137931  57.660598
## 239 {Harry Potter and the Order of the Phoenix}                  => {Harry Potte
r and the Prisoner of Azkaban}                          0.001585096  0.4124294  84.230699
## 240 {Harry Potter and the Sorcerer's Stone}                      => {Harry Potte
r and the Chamber of Secrets}                           0.003723889  0.4122596  67.566563
## 241 {Three To Get Deadly : A Stephanie Plum Novel}               => {Hot Six : A
Stephanie Plum Novel}                                   0.001118252  0.4103586 188.986534
## 242 {The Fellowship of the Ring}                                 => {The Return
of the King}                                            0.001747948  0.4055416 139.901207
## 243 {Seven Up}                                                   => {Four to Sco
re}                                                     0.001205107  0.4036364 152.996453
## 244 {Seven Up}                                                   => {Two for the
Dough}                                                  0.001205107  0.4036364 128.644077
## 245 {Digital Fortress : A Thriller}                              => {Angels &amp
; Demons}                                               0.001270248  0.4034483  56.219083
## 246 {Four to Score}                                              => {Hard Eight
: A Stephanie Plum Novel}                               0.001063968  0.4032922 141.241202
## 247 {Hard Eight : A Stephanie Plum Novel}                        => {High Five}
0.001150823   0.4030418 165.729359
## 248 {Harry Potter and the Goblet of Fire}                        => {Harry Potte
r and the Order of the Phoenix}                         0.001693664  0.4000000 104.076836
## 249 {The Tale of the Body Thief}                                 => {The Queen o
f the Damned}                                           0.001085682  0.3937008 132.346687
## 250 {The Golden Compass}                                         => {The Subtle
Knife}                                                  0.001357103  0.3930818 160.915444
## 251 {Seven Up}                                                   => {Three To Ge
t Deadly : A Stephanie Plum Novel}                      0.001172537  0.3927273 144.116827
## 252 {Seven Up}                                                   => {One for the
Money}                                                  0.001172537  0.3927273  85.113703
## 253 {Roses Are Red}                                              => {Violets Are
Blue}                                                   0.001367959  0.3925234  96.412112
## 254 {B Is for Burglar}                                           => {D Is for De
adbeat}                                                 0.001063968  0.3920000 202.844584
## 255 {2nd Chance}                                                 => {1st to Die:
A Novel}                                                0.001476528  0.3919308  72.489890
## 256 {The Lost World}                                             => {Jurassic Pa
rk}                                                     0.001139966  0.3917910  74.406370
## 257 {Hard Eight : A Stephanie Plum Novel}                        => {One for the
Money}                                                  0.001107396  0.3878327  84.052928
## 258 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Sorcerer's Stone}                      => {Harry Potte
r and the Order of the Phoenix}                         0.001443957  0.3877551 100.890811
## 259 {The Firm}                                                   => {The Pelican
```

```
Brief}                                            0.002334216  0.3853047  62.044828
## 260 {Two for the Dough}                                  => {Seven Up}
0.001205107   0.3840830 128.644077
## 261 {Three To Get Deadly : A Stephanie Plum Novel}        => {Hard Eight
: A Stephanie Plum Novel}                        0.001042255  0.3824701 133.948889
## 262 {Seven Up}                                           => {Hot Six : A
Stephanie Plum Novel}                            0.001139966  0.3818182 175.842545
## 263 {Hard Eight : A Stephanie Plum Novel}                 => {Two for the
Dough}                                           0.001074825  0.3764259 119.971739
## 264 {The Pelican Brief}                                  => {The Firm}
0.002334216   0.3758741  62.044828
## 265 {Hard Eight : A Stephanie Plum Novel}                 => {Four to Sco
re}                                              0.001063968  0.3726236 141.241202
## 266 {The Client}                                         => {The Pelican
Brief}                                           0.001910800  0.3682008  59.290634
## 267 {Little Altars Everywhere: A Novel}                   => {Divine Secr
ets of the Ya-Ya Sisterhood: A Novel}            0.001726234  0.3663594  45.786480
## 268 {Hard Eight : A Stephanie Plum Novel}                 => {Three To Ge
t Deadly : A Stephanie Plum Novel}               0.001042255  0.3650190 133.948889
## 269 {The Queen of the Damned}                            => {The Tale of
the Body Thief}                                  0.001085682  0.3649635 132.346687
## 270 {A Time to Kill}                                     => {The Pelican
Brief}                                           0.002160507  0.3618182  58.262848
## 271 {One for the Money}                                  => {Three To Ge
t Deadly : A Stephanie Plum Novel}               0.001639380  0.3552941 130.380202
## 272 {Confessions of a Shopaholic}                        => {Shopaholic
Takes Manhattan}                                 0.001628523  0.3512881 143.170090
## 273 {The Pelican Brief}                                  => {A Time to K
ill}                                             0.002160507  0.3479021  58.262848
## 274 {The Kitchen God's Wife}                             => {The Joy Luc
k Club}                                          0.001194250  0.3459119  55.410883
## 275 {Two for the Dough}                                  => {Hard Eight
: A Stephanie Plum Novel}                        0.001074825  0.3425606 119.971739
## 276 {The Vampire Lestat}                                 => {The Tale of
the Body Thief}                                  0.001150823  0.3419355 123.996038
## 277 {The Client}                                         => {A Time to K
ill}                                             0.001758805  0.3389121  56.757307
## 278 {Vinegar Hill}                                       => {She's Come
Undone}                                          0.001074825  0.3378840  33.321002
## 279 {Roses Are Red}                                      => {1st to Die:
A Novel}                                         0.001172537  0.3364486  62.228127
## 280 {Violets Are Blue}                                   => {Roses Are R
ed}                                              0.001367959  0.3360000  96.412112
## 281 {I Know This Much Is True}                           => {She's Come
Undone}                                          0.001563382  0.3302752  32.570654
## 282 {Angels &amp; Demons}                                => {The Da Vinc
i Code}                                          0.002345073  0.3267776  33.258378
```

```
## 283 {Interview With the Vampire}                               => {The Vampire
Lestat}                                              0.001834803  0.3243762  96.379494
## 284 {Harry Potter and the Prisoner of Azkaban}                 => {Harry Potte
r and the Order of the Phoenix}                      0.001585096  0.3237251  84.230699
## 285 {A Is for Alibi}                                           => {C Is for Co
rpse}                                                0.001020541  0.3219178 155.241914
## 286 {Harry Potter and the Sorcerer's Stone}                    => {Harry Potte
r and the Prisoner of Azkaban}                       0.002887914  0.3197115  65.294879
## 287 {A Time to Kill}                                           => {The Firm}
0.001878230  0.3145455  51.921421
## 288 {Left Behind: A Novel of the Earth's Last Days}            => {Tribulation
Force: The Continuing Drama of Those Left Behind}    0.001465671  0.3117783 150.352224
## 289 {The Client}                                               => {The Firm}
0.001617666  0.3117155  51.454282
## 290 {The Firm}                                                 => {A Time to K
ill}                                                 0.001878230  0.3100358  51.921421
## 291 {Midwives: A Novel}                                        => {The Lovely
Bones: A Novel}                                      0.001270248  0.3078947  21.899281
## 292 {The Pelican Brief}                                        => {The Client}
0.001910800  0.3076923  59.290634
## 293 {The Client}                                               => {The Rainmak
er}                                                  0.001595953  0.3075314  57.926586
## 294 {The Deep End of the Ocean}                                => {She's Come
Undone}                                              0.001150823  0.3063584  30.212053
## 295 {The Chamber}                                              => {A Time to K
ill}                                                 0.001639380  0.3062880  51.293778
## 296 {The Client}                                               => {The Chamber
}                                                    0.001585096  0.3054393  57.065732
## 297 {A Walk to Remember}                                       => {The Noteboo
k}                                                   0.001237678  0.3031915  45.042519
## 298 {The Rainmaker}                                            => {The Pelican
Brief}                                               0.001606809  0.3026585  48.736482
## 299 {Confessions of a Shopaholic}                              => {The Nanny D
iaries: A Novel}                                     0.001400530  0.3021077  33.893470
## 300 {One for the Money}                                        => {Four to Sco
re}                                                  0.001389673  0.3011765 114.159516
## 301 {The Rainmaker}                                            => {The Client}
0.001595953  0.3006135  57.926586
## 302 {We Were the Mulvaneys}                                    => {She's Come
Undone}                                              0.001107396  0.2982456  29.411999
## 303 {The Chamber}                                              => {The Pelican
Brief}                                               0.001595953  0.2981744  48.014426
## 304 {The Chamber}                                              => {The Client}
0.001585096  0.2961460  57.065732
## 305 {Jewel}                                                    => {She's Come
Undone}                                              0.001085682  0.2958580  29.176539
## 306 {Here On Earth}                                            => {She's Come
```

```
Undone}                                            0.001053112  0.2957317  29.164086
## 307 {Here On Earth}                                  => {The Lovely
Bones: A Novel}                                    0.001053112  0.2957317  21.034175
## 308 {The Book of Ruth}                               => {She's Come
Undone}                                            0.001129109  0.2954545  29.136753
## 309 {Drowning Ruth}                                  => {She's Come
Undone}                                            0.001107396  0.2947977  29.071976
## 310 {A Time to Kill}                                 => {The Client}
0.001758805  0.2945455  56.757307
## 311 {The Chamber}                                    => {The Firm}
0.001574239  0.2941176  48.549441
## 312 {One for the Money}                              => {High Five}
0.001346246  0.2917647 119.972605
## 313 {Midwives: A Novel}                              => {She's Come
Undone}                                            0.001194250  0.2894737  28.546940
## 314 {The Deep End of the Ocean}                      => {Wild Animus
}                                                  0.001085682  0.2890173  10.639812
## 315 {Stones From the River}                          => {She's Come
Undone}                                            0.001172537  0.2880000  28.401610
## 316 {Jewel}                                          => {The Pilot's
Wife : A Novel}                                    0.001053112  0.2869822  46.537607
## 317 {The Partner}                                    => {The Street
Lawyer}                                            0.001454814  0.2869379  49.585884
## 318 {Here On Earth}                                  => {White Olean
der : A Novel}                                     0.001020541  0.2865854  37.022167
## 319 {While I Was Gone}                               => {The Lovely
Bones: A Novel}                                    0.001346246  0.2850575  20.274960
## 320 {Fried Green Tomatoes at the Whistle Stop Cafe}  => {Wild Animus
}                                                  0.001020541  0.2831325  10.423170
## 321 {The Hundred Secret Senses}                      => {The Joy Luc
k Club}                                            0.001009684  0.2826748  45.281057
## 322 {The Rainmaker}                                  => {The Firm}
0.001487384  0.2801636  46.246073
## 323 {Midwives: A Novel}                              => {Where The H
eart Is}                                           0.001150823  0.2789474  41.109255
## 324 {Mystic River}                                   => {Wild Animus
}                                                  0.001074825  0.2788732  10.266369
## 325 {Jewel}                                          => {Where The H
eart Is}                                           0.001020541  0.2781065  40.985335
## 326 {Midwives: A Novel}                              => {The Pilot's
Wife : A Novel}                                    0.001139966  0.2763158  44.807913
## 327 {The Client}                                     => {The Runaway
Jury}                                              0.001433100  0.2761506  49.582226
## 328 {A Time to Kill}                                 => {The Chamber
}                                                  0.001639380  0.2745455  51.293778
## 329 {The Rainmaker}                                  => {The Runaway
Jury}                                              0.001454814  0.2740286  49.201226
```

```
## 330 {Harry Potter and the Chamber of Secrets}              => {Harry Potte
r and the Order of the Phoenix}              0.001671950  0.2740214  71.298188
## 331 {A Bend in the Road}                                    => {The Noteboo
k}                                           0.001009684  0.2735294  40.635882
## 332 {1st to Die: A Novel}                                   => {2nd Chance}
0.001476528  0.2730924  72.489890
## 333 {The Book of Ruth}                                      => {The Lovely
Bones: A Novel}                              0.001042255  0.2727273  19.397964
## 334 {Message in a Bottle}                                   => {The Noteboo
k}                                           0.001443957  0.2725410  40.489040
## 335 {The Rainmaker}                                         => {The Chamber
}                                            0.001443957  0.2719836  50.815150
## 336 {The Rainmaker}                                         => {A Time to K
ill}                                         0.001443957  0.2719836  45.548853
## 337 {We Were the Mulvaneys}                                 => {The Lovely
Bones: A Novel}                              0.001009684  0.2719298  19.341245
## 338 {While I Was Gone}                                      => {She's Come
Undone}                                      0.001281105  0.2712644  26.751197
## 339 {The Bridges of Madison County}                         => {Wild Animus
}                                            0.001281105  0.2712644   9.986258
## 340 {Harry Potter and the Chamber of Secrets,
##      Harry Potter and the Sorcerer's Stone}                 => {Wild Animus
}                                            0.001009684  0.2711370   9.981570
## 341 {When the Wind Blows}                                   => {Wild Animus
}                                            0.001096539  0.2700535   9.941681
## 342 {The Chamber}                                           => {The Rainmak
er}                                          0.001443957  0.2697769  50.815150
## 343 {Harry Potter and the Sorcerer's Stone}                 => {Harry Potte
r and the Goblet of Fire}                    0.002431928  0.2692308  63.585404
## 344 {Good in Bed}                                           => {The Lovely
Bones: A Novel}                              0.001433100  0.2688391  19.121415
## 345 {A Walk to Remember}                                    => {The Lovely
Bones: A Novel}                              0.001096539  0.2686170  19.105619
## 346 {Bel Canto: A Novel}                                    => {The Secret
Life of Bees}                                0.001020541  0.2678063  32.371522
## 347 {The Firm}                                              => {The Client}
0.001617666  0.2670251  51.454282
## 348 {The Chamber}                                           => {The Street
Lawyer}                                      0.001422243  0.2657201  45.919222
## 349 {The Partner}                                           => {The Testame
nt}                                          0.001346246  0.2655246  40.761570
## 350 {Me Talk Pretty One Day}                                => {The Lovely
Bones: A Novel}                              0.001291962  0.2632743  18.725616
```

```
    # top 350 associations by confidence within model 2
    # arranging by confidence allows us to see more obscure associations that we wou
ldn't otherwise see
    # could find associations within subsets of popular/promoted books to combat the
series issue
    # notable more obsure confidence association: If you buy Harry Potter, you also
bought Wild Animus
    # notable more obsure confidence association: We were the Mulvaneys => Lovely Bo
nes: A Novel

# Subsets of Association Rules
lovelybones2 <- subset(book_model2,items %in% "The Lovely Bones: A Novel")
    # "items" is saying any assocaition inside (%in%) the rules involving "The Lovel
y Bones: A Novel"

inspect(lovelybones2)
```

```
##     lhs                            rhs                            support confid
ence     lift
## 1  {Lucky : A Memoir}          => {The Lovely Bones: A Novel} 0.001454814  0.445
1827 31.66401
## 2  {Me Talk Pretty One Day}    => {The Lovely Bones: A Novel} 0.001291962  0.263
2743 18.72562
## 3  {We Were the Mulvaneys}     => {The Lovely Bones: A Novel} 0.001009684  0.271
9298 19.34125
## 4  {Here On Earth}             => {The Lovely Bones: A Novel} 0.001053112  0.295
7317 21.03417
## 5  {Confessions of a Shopaholic} => {The Lovely Bones: A Novel} 0.001215964  0.262
2951 18.65597
## 6  {The Bonesetter's Daughter} => {The Lovely Bones: A Novel} 0.001096539  0.255
6962 18.18661
## 7  {A Walk to Remember}        => {The Lovely Bones: A Novel} 0.001096539  0.268
6170 19.10562
## 8  {The Book of Ruth}          => {The Lovely Bones: A Novel} 0.001042255  0.272
7273 19.39796
## 9  {While I Was Gone}          => {The Lovely Bones: A Novel} 0.001346246  0.285
0575 20.27496
## 10 {Midwives: A Novel}         => {The Lovely Bones: A Novel} 0.001270248  0.307
8947 21.89928
## 11 {Good in Bed}               => {The Lovely Bones: A Novel} 0.001433100  0.268
8391 19.12141
## 12 {Message in a Bottle}       => {The Lovely Bones: A Novel} 0.001335389  0.252
0492 17.92722
```

```
    # Model 2 shows that "The Lovely Bones: A Novel" is a great suggestion (rhs) to
up to 12 books that people buy
    # EG: If you bought"Lucky: A Memoir" then you also bought "The Lovely Bones: A N
ovel" 44% of the time
    # this association alone has 31% lift, which is impressive.


# Book Subset of my choice
notebook2 <- subset(book_model2,items %in% "The Notebook")

inspect(notebook2)
```

```
##   lhs                    rhs               support confidence     lift
## 1 {A Bend in the Road}  => {The Notebook} 0.001009684  0.2735294 40.63588
## 2 {A Walk to Remember}  => {The Notebook} 0.001237678  0.3031915 45.04252
## 3 {Message in a Bottle} => {The Notebook} 0.001443957  0.2725410 40.48904
```

```
    # Model 2 tells us that "The Notebook" is a great suggestion for those who buy a
ny other Nickolas Sparks books
    # Knowing that if you bought "A Bend in the Road" then you might buy "The Notebo
ok" gives an impressive lift of 40.43
    # If you bought "A Walk to Remember" then you also bought "The Notebook" 31% of
the time

#################################################
```