

Association rules

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```
#Importing the libraries required for association rules and data exploration  
library(dplyr)
```

```
##  
## Attaching package: 'dplyr'  
  
## The following objects are masked from 'package:stats':  
##  
##   filter, lag  
  
## The following objects are masked from 'package:base':  
##  
##   intersect, setdiff, setequal, union
```

```
library(ggplot2)  
library(reshape2)  
library(arules)
```

```
## Loading required package: Matrix  
  
##  
## Attaching package: 'arules'  
  
## The following object is masked from 'package:dplyr':  
##  
##   recode  
  
## The following objects are masked from 'package:base':  
##  
##   abbreviate, write
```

```
library(arulesViz)
```

```
## Loading required package: grid
```

```
library(lubridate)
```

```
##  
## Attaching package: 'lubridate'  
  
## The following object is masked from 'package:base':  
##  
##   date
```

Through this exercise, I want to explore the items that are bought together. For this analysis, I have used the dataset in “Random Shopping Cart” on Kaggle.

Let us first load the data, and inspect it observing basic statistics around the dataset. I have also added a few features based on the Date of shopping. We will slice and dice the data using these features ahead.

##	Date	User	Product	Day
##	Min. :2000-01-01	Min. : 1.0	vegetables: 1702	Friday :3144
##	1st Qu.:2000-05-29	1st Qu.: 292.0	poultry : 640	Monday :2989
##	Median :2001-01-30	Median : 582.0	soda : 597	Saturday :3431

```
## Mean      :2000-12-21   Mean      : 576.4   cereals    : 591   Sunday    :2955
## 3rd Qu.   :2001-06-21   3rd Qu.   : 863.0   ice cream  : 579   Thursday  :3335
## Max.      :2002-02-26   Max.      :1139.0   cheeses    : 578   Tuesday   :3322
##                                     (Other)    :17656   Wednesday :3167
##      Month
## Jan       :3504
## Feb       :3043
## May       :2520
## Mar       :2439
## Sep       :2296
## Aug       :2286
## (Other)   :6255

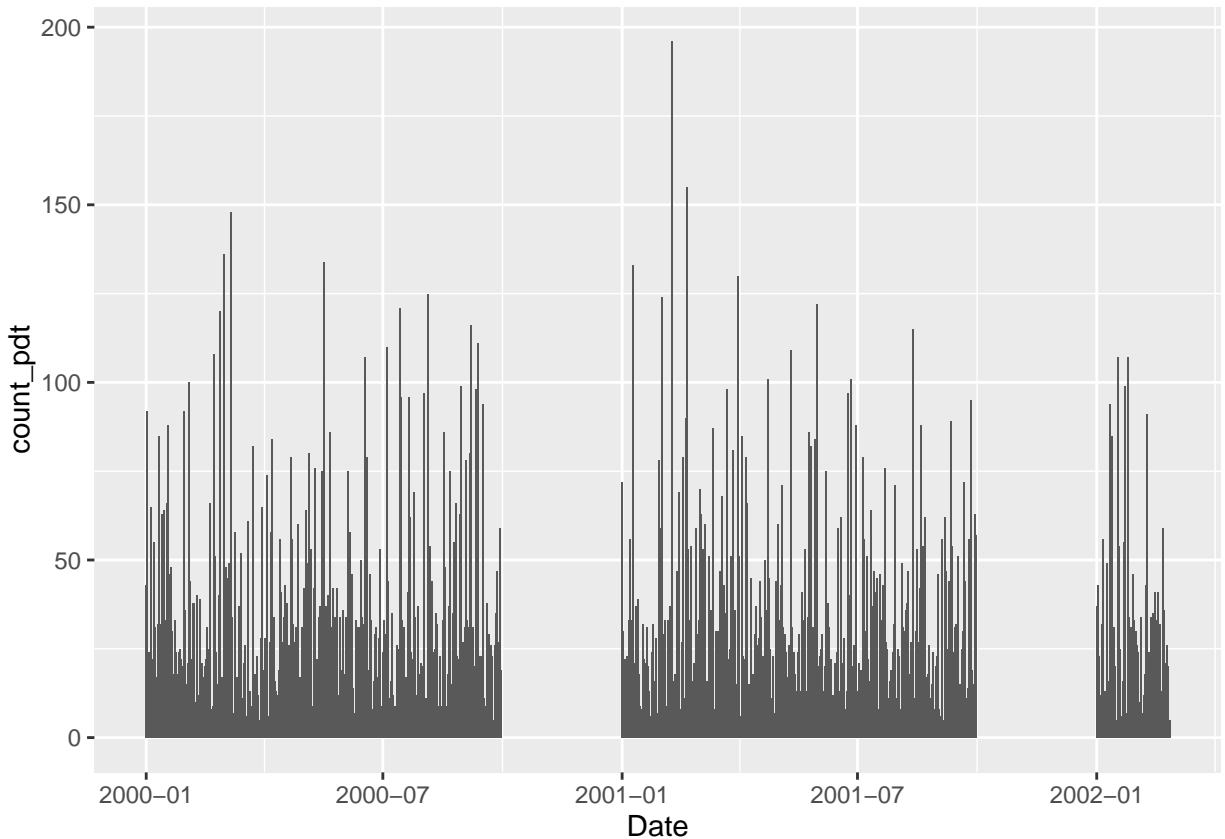
## 'data.frame': 22343 obs. of 5 variables:
## $ Date      : Date, format: "2000-01-01" "2000-01-01" ...
## $ User       : int  1 1 1 1 1 1 1 1 1 1 ...
## $ Product    : Factor w/ 38 levels "all- purpose",...: 38 25 27 20 1 12 31 5 36 4 ...
## $ Day        : Factor w/ 7 levels "Friday","Monday",...: 3 3 3 3 3 3 3 3 3 3 ...
## $ Month      : Ord.factor w/ 12 levels "Jan"<"Feb"<"Mar"<...: 1 1 1 1 1 1 1 1 1 1 ...

## Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
## 3504 3043 2439 2098 2520 1969 2188 2286 2296 0 0 0
```

Observing the summary, we see that there are 38 different Products in our dataset. The count days is more or less uniformly distributed across all days of the week, except for Mondays which have a lower count. I hypothesize that this is due to Monday blues. Whoever shops on Mondays?!? From the summary, what stands out is that the count of records is decreasing as we progress through the year. To inspect further, I summarized the months columns and I found that there is no data for months of October, November and December.

Let us explore the data a bit further by visualizing it!

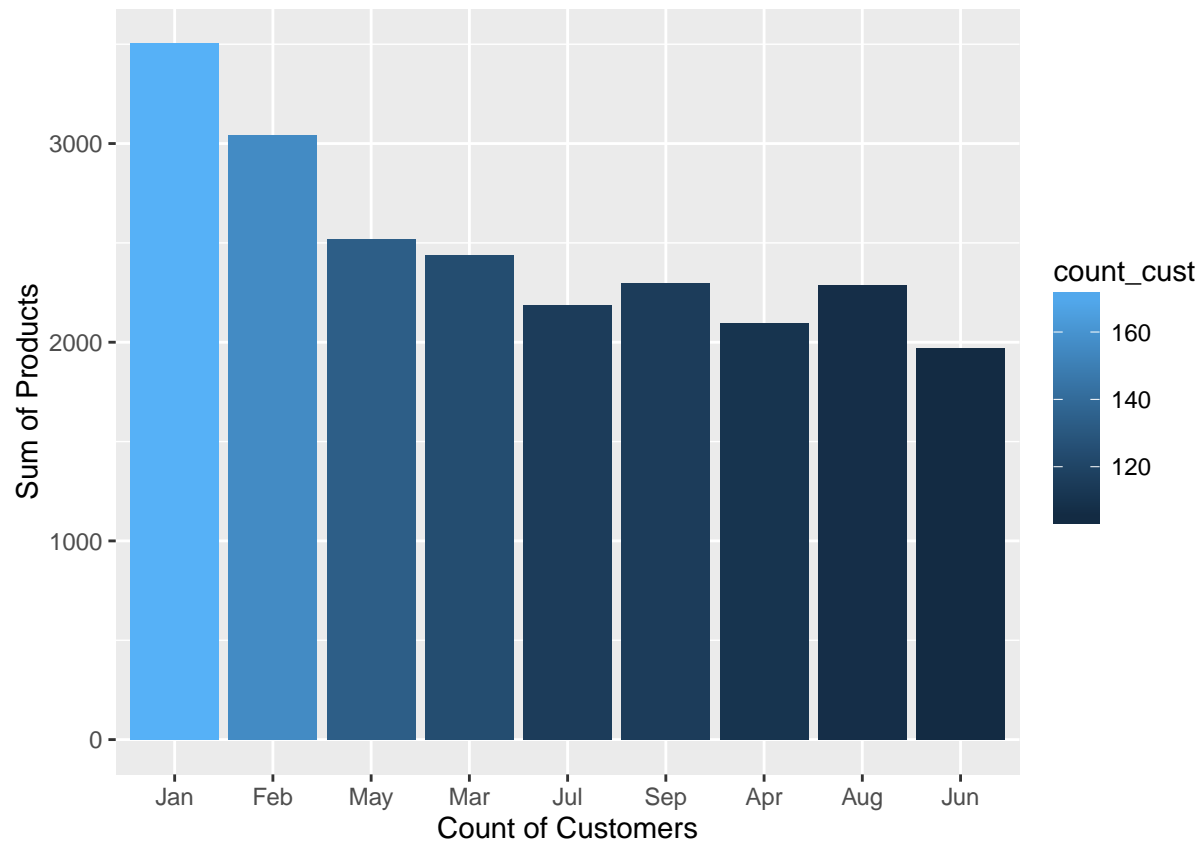
```
a <- basket %>%
  group_by(Date) %>%
  summarize(count_pdt = n(), cust_cnt = n_distinct(User))
ggplot(a) +
  geom_bar(aes(x = Date, y = count_pdt), stat = "identity")
```



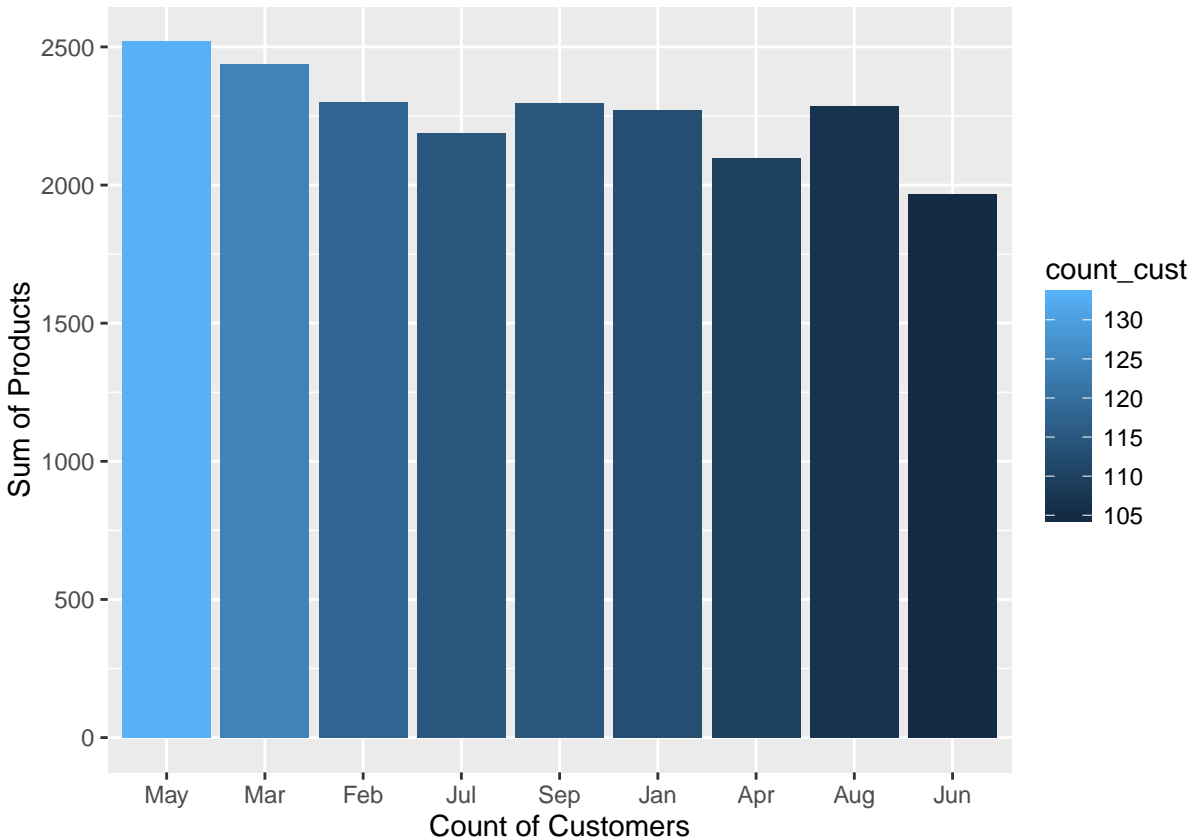
As seen before in the summary, there is no data for 3 months, which is the gap we see in the graph. Other than that, there is nothing we can conclusively say from this graph.

Looking further, I wanted to see if there was a pattern in the customers who visited the store by months, and also plot the total number of products they bought in each month over all the data we have.

```
b <- basket %>%
  group_by(Month) %>%
  summarize(count_pdt = n(), count_cust = n_distinct(User))
ggplot(b) +
  geom_bar(aes(x = reorder(Month, -count_cust), y = count_pdt, fill = count_cust), stat = "identity") +
  xlab("Count of Customers") +
  ylab("Sum of Products")
```



```
b1 <- basket %>%
  filter(Date < "2002-01-01") %>%
  group_by(Month) %>%
  summarize(count_pdt = n(), count_cust = n_distinct(User))
ggplot(b1) +
  geom_bar(aes(x = reorder(Month, -count_cust), y = count_pdt, fill = count_cust), stat = "identity") +
  xlab("Count of Customers") +
  ylab("Sum of Products")
```

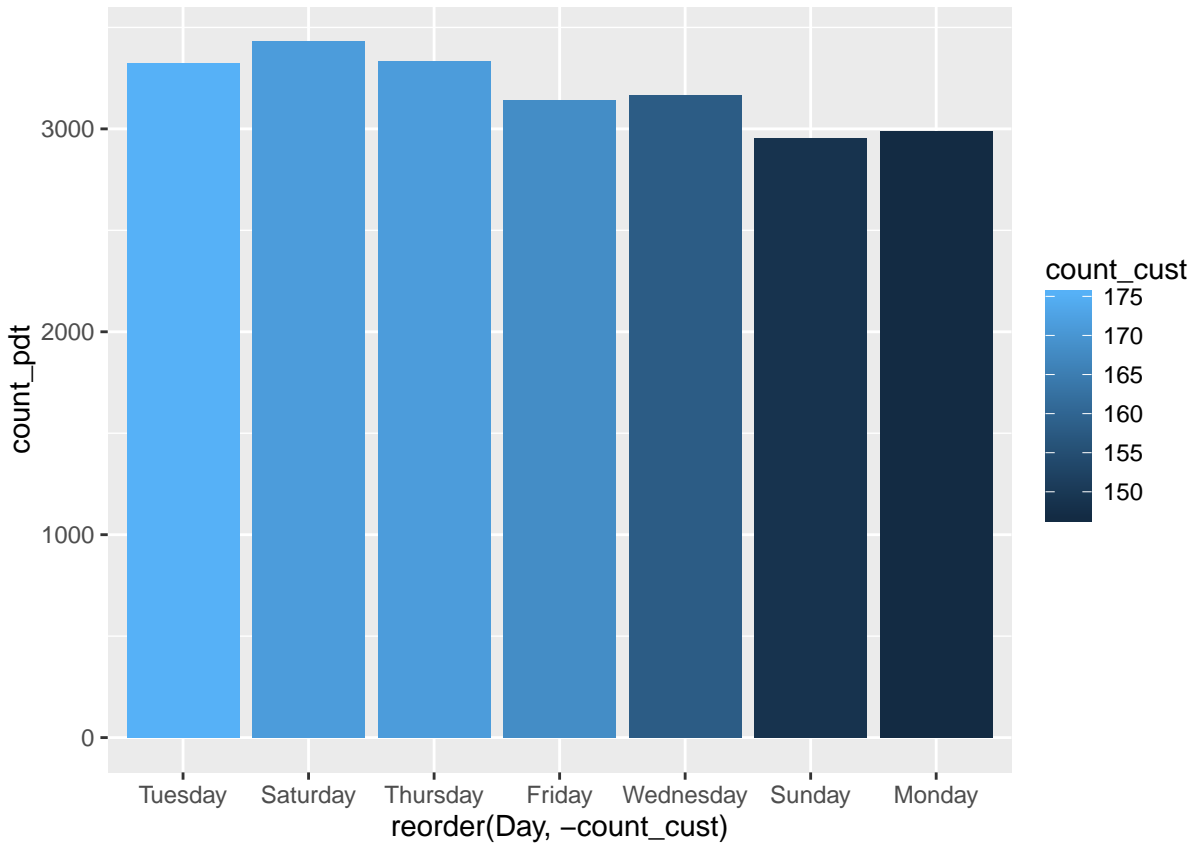


In this graph, I have plotted the sum of all products sold on the Y-Axis, across months on the X-Axis. I have also filled the columns indicating the count of customers, lightest color indicating the maximum number of customers, and darkest color indicating the least number of customers.

Obviously, there is no data for October, November and December, so we see no columns for those months in the data. We also observed that the number of customers are reducing as you go further ahead in the year, which is more or less corroborated by the graph. Also, We have the 2002 data for Jan and Feb, so they end up having more number of customers. To account for this, I subset my data for all dates before January 1, 2002, giving a more distributed graph of the number of products sold by month. Now we see that January and February has moved back in the line, and March reins supreme in both the number of customers and the number of products! Intuitively, makes sense since more the customers, more the products sold.

Getting a bit more granular, lets look at how the customers and products fare across days of the week. Intuitively, I would think people do their grocery shopping on Saturdays and Sundays. Mondays would be the least favourite day for going to the supermarket and getting vegetables.

```
d <- basket %>%
  group_by(Day) %>%
  summarise(count_pdt = n(), count_cust = n_distinct(User))
ggplot(d) +
  geom_bar(aes(x = reorder(Day, -count_cust), y = count_pdt, fill = count_cust), stat = "identity")
```

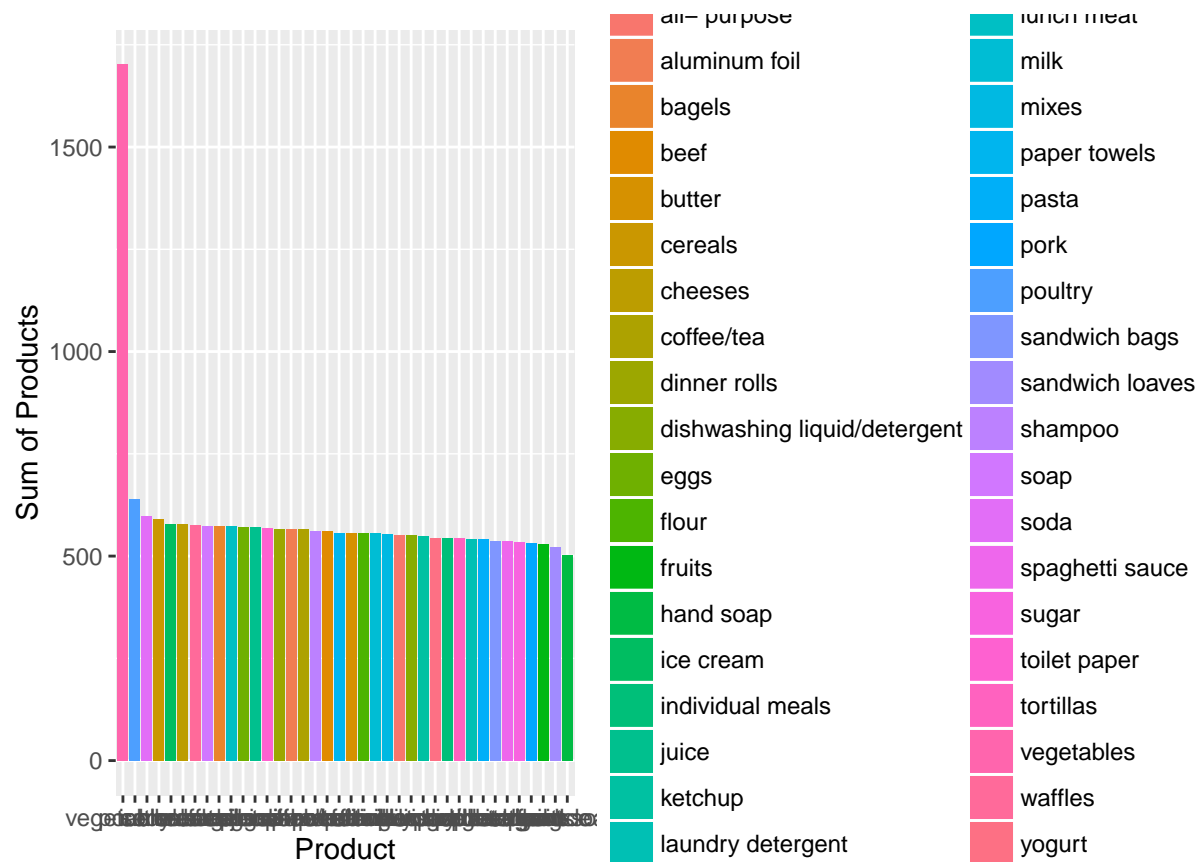


Surprisingly, the reality not so. Tuesdays see the most number of customers in the store, followed by Saturdays. Saturdays also see the most products sold out of all days of the week. Mondays are the worst, in terms of both the number of customers and number of products sold. No surprises there!

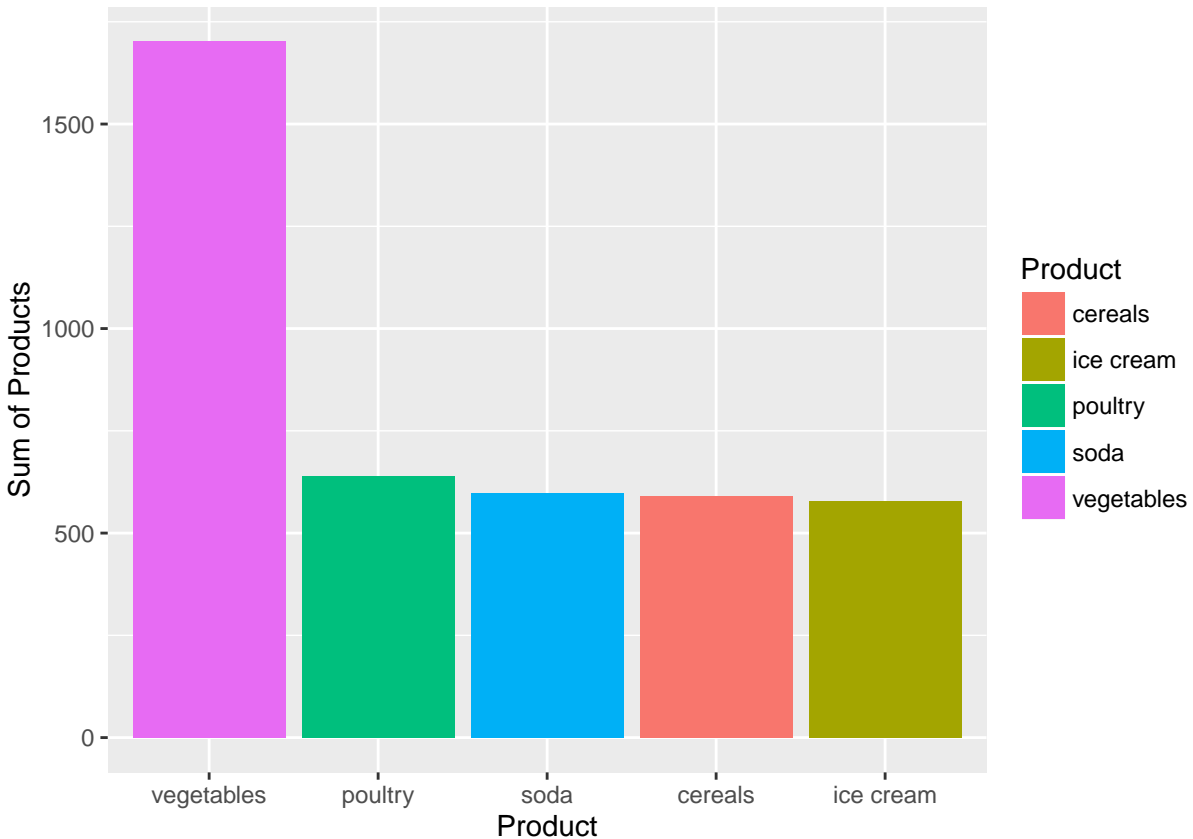
Let us explore how the data looks across products.

```
d <- basket %>%
  group_by(Product) %>%
  summarize(sum_pdt = n()) %>%
  arrange(desc(sum_pdt))

ggplot(d) +
  geom_bar(aes(x = reorder(Product, -sum_pdt), y = sum_pdt, fill = Product), stat = "identity") +
  xlab("Product") +
  ylab("Sum of Products")
```



```
ggplot(d[1:5,]) +
  geom_bar(aes(x = reorder(Product, -sum_pdt), y = sum_pdt, fill = Product), stat = "identity") +
  xlab("Product") +
  ylab("Sum of Products")
```



As you can see in the first graph, it is just cumbersome to see all the products on the graph. So I subset for just the top 5 products. Vegetables is the clear winner, being bought by most customers across all the months.

Applying apriori analysis The Apriori Algorithm is an influential algorithm for mining frequent itemsets for boolean association rules. Apriori uses a “bottom up” approach, where frequent subsets are extended one item at a time (a step known as candidate generation, and groups of candidates are tested against the data).

You can play with the required support and confidence, and sort the rules by decreasing order of lift. Confidence calculates how strong an association is. It is the conditional probability of purchasing RHS if one has purchased LHS. It is calculated by $P(\text{LHS} \cup \text{RHS}) / P(\text{LHS})$. This represents the probability of having RHS in the market basket, given the presence of LHS in the basket already.

The support of an item or item set is the fraction of transactions in our data set that contain that item or item set. It is the probability of finding an itemset in all the transactions. It is calculated using $[\text{count}(\text{itemset}) / \text{total transactions}]$.

The lift value of an association rule is the ratio of the confidence of the rule and the expected confidence of the rule. It is the probability of finding certain itemsets together in a transaction, compared to the probability of finding them individually.

```

basket1 <- dcast(basket, User ~ Product)

## Using Month as value column: use value.var to override.
## Aggregation function missing: defaulting to length
basket1 <- data.matrix(basket1)

basket_txn1 <- as(basket1[, -1], "itemMatrix")

```



```
## Warning in asMethod(object): matrix contains values other than 0 and 1!
## Setting all entries != 0 to 1.
rules1 <- apriori(basket_txn1, parameter = list(support = 0.1, confidence = 0.5))
```

```
## Apriori
##
## Parameter specification:
## confidence minval smax arem aval originalSupport maxtime support minlen
##          0.5   0.1   1 none FALSE             TRUE      5     0.1     1
## maxlen target  ext
##      10  rules FALSE
##
## Algorithmic control:
## filter tree heap memopt load sort verbose
##    0.1 TRUE TRUE  FALSE TRUE    2    TRUE
##
## Absolute minimum support count: 113
##
## set item appearances ...[0 item(s)] done [0.00s].
## set transactions ...[38 item(s), 1139 transaction(s)] done [0.00s].
## sorting and recoding items ... [38 item(s)] done [0.00s].
## creating transaction tree ... done [0.00s].
## checking subsets of size 1 2 3 done [0.00s].
## writing ... [716 rule(s)] done [0.00s].
## creating S4 object ... done [0.00s].
```

```
rules1 <- sort(rules1, by = "lift", decreasing = TRUE)
inspect(rules1)
```

	lhs	rhs	support	confidence	lift
[1]	{soda, vegetables}	=> {eggs}	0.1580334	0.5172414	1.326887
[2]	{dinner rolls, vegetables}	=> {eggs}	0.1562774	0.5071225	1.300929
[3]	{pasta, vegetables}	=> {eggs}	0.1439860	0.5030675	1.290527
[4]	{dishwashing liquid/detergent, vegetables}	=> {eggs}	0.1536435	0.5014327	1.286333
[5]	{lunch meat, vegetables}	=> {waffles}	0.1571554	0.5042254	1.279093
[6]	{individual meals, vegetables}	=> {lunch meat}	0.1431080	0.5015385	1.269450
[7]	{mixes, vegetables}	=> {poultry}	0.1562774	0.5281899	1.253351
[8]	{dinner rolls, vegetables}	=> {poultry}	0.1615452	0.5242165	1.243922
[9]	{dishwashing liquid/detergent, vegetables}	=> {poultry}	0.1597893	0.5214900	1.237452
[10]	{eggs, sandwich loaves}	=> {vegetables}	0.1211589	0.9019608	1.220111
[11]	{eggs, yogurt}	=> {vegetables}	0.1571554	0.8994975	1.216779
[12]	{dinner rolls, eggs}	=> {vegetables}	0.1562774	0.8989899	1.216092

```

## [13] {dishwashing liquid/detergent,
##       eggs} => {vegetables} 0.1536435 0.8974359 1.213990
## [14] {sugar,
##       vegetables} => {poultry} 0.1518876 0.5103245 1.210957
## [15] {cereals,
##       laundry detergent} => {vegetables} 0.1510097 0.8911917 1.205543
## [16] {paper towels,
##       yogurt} => {vegetables} 0.1352063 0.8901734 1.204166
## [17] {lunch meat,
##       vegetables} => {poultry} 0.1580334 0.5070423 1.203169
## [18] {dishwashing liquid/detergent,
##       yogurt} => {vegetables} 0.1404741 0.8888889 1.202428
## [19] {cheeses,
##       eggs} => {vegetables} 0.1501317 0.8860104 1.198534
## [20] {sandwich loaves,
##       sugar} => {vegetables} 0.1211589 0.8846154 1.196647
## [21] {laundry detergent,
##       yogurt} => {vegetables} 0.1404741 0.8839779 1.195785
## [22] {eggs,
##       lunch meat} => {vegetables} 0.1404741 0.8839779 1.195785
## [23] {aluminum foil,
##       sugar} => {vegetables} 0.1255487 0.8827160 1.194078
## [24] {eggs,
##       poultry} => {vegetables} 0.1553995 0.8805970 1.191211
## [25] {eggs,
##       sandwich bags} => {vegetables} 0.1281826 0.8795181 1.189752
## [26] {all- purpose,
##       eggs} => {vegetables} 0.1404741 0.8791209 1.189215
## [27] {dinner rolls} => {poultry} 0.1949078 0.5011287 1.189137
## [28] {dishwashing liquid/detergent,
##       sugar} => {vegetables} 0.1334504 0.8786127 1.188527
## [29] {aluminum foil,
##       eggs} => {vegetables} 0.1378402 0.8770950 1.186474
## [30] {sandwich loaves,
##       vegetables} => {poultry} 0.1413521 0.5000000 1.186458
## [31] {juice,
##       laundry detergent} => {vegetables} 0.1360843 0.8757062 1.184595
## [32] {lunch meat,
##       sugar} => {vegetables} 0.1413521 0.8750000 1.183640
## [33] {lunch meat,
##       yogurt} => {vegetables} 0.1413521 0.8750000 1.183640
## [34] {eggs,
##       individual meals} => {vegetables} 0.1343284 0.8742857 1.182674
## [35] {paper towels,
##       sandwich loaves} => {vegetables} 0.1220369 0.8742138 1.182577
## [36] {eggs,
##       soap} => {vegetables} 0.1457419 0.8736842 1.181860
## [37] {sandwich loaves,
##       yogurt} => {vegetables} 0.1334504 0.8735632 1.181697
## [38] {eggs,
##       fruits} => {vegetables} 0.1325724 0.8728324 1.180708
## [39] {eggs,
##       juice} => {vegetables} 0.1439860 0.8723404 1.180042
## [40] {eggs,

```

##	sugar}	=> {vegetables}	0.1316945	0.8720930	1.179708
## [41]	{dinner rolls,	=> {vegetables}	0.1474978	0.8704663	1.177507
##	waffles}				
## [42]	{sandwich bags,	=> {vegetables}	0.1352063	0.8700565	1.176953
##	yogurt}				
## [43]	{aluminum foil,	=> {vegetables}	0.1466198	0.8697917	1.176595
##	bagels}				
## [44]	{milk,	=> {vegetables}	0.1220369	0.8687500	1.175186
##	sugar}				
## [45]	{laundry detergent,	=> {vegetables}	0.1334504	0.8685714	1.174944
##	shampoo}				
## [46]	{ketchup,	=> {vegetables}	0.1325724	0.8678161	1.173922
##	paper towels}				
## [47]	{coffee/tea,	=> {vegetables}	0.1264267	0.8674699	1.173454
##	sandwich loaves}				
## [48]	{ice cream,	=> {vegetables}	0.1378402	0.8674033	1.173364
##	laundry detergent}				
## [49]	{dinner rolls,	=> {vegetables}	0.1431080	0.8670213	1.172847
##	laundry detergent}				
## [50]	{flour,	=> {vegetables}	0.1246708	0.8658537	1.171268
##	sugar}				
## [51]	{poultry,	=> {vegetables}	0.1413521	0.8655914	1.170913
##	sandwich loaves}				
## [52]	{dinner rolls,	=> {vegetables}	0.1290606	0.8647059	1.169715
##	sandwich loaves}				
## [53]	{hand soap,	=> {vegetables}	0.1176471	0.8645161	1.169458
##	yogurt}				
## [54]	{cereals,	=> {vegetables}	0.1510097	0.8643216	1.169195
##	eggs}				
## [55]	{milk,	=> {vegetables}	0.1448639	0.8638743	1.168590
##	yogurt}				
## [56]	{bagels,	=> {vegetables}	0.1448639	0.8638743	1.168590
##	eggs}				
## [57]	{laundry detergent,	=> {vegetables}	0.1273047	0.8630952	1.167536
##	paper towels}				
## [58]	{eggs,	=> {vegetables}	0.1431080	0.8624339	1.166642
##	paper towels}				
## [59]	{aluminum foil,	=> {vegetables}	0.1369622	0.8618785	1.165890
##	shampoo}				
## [60]	{paper towels,	=> {vegetables}	0.1369622	0.8618785	1.165890
##	poultry}				
## [61]	{fruits,	=> {vegetables}	0.1202809	0.8616352	1.165561
##	sandwich loaves}				
## [62]	{aluminum foil,	=> {vegetables}	0.1527656	0.8613861	1.165224
##	yogurt}				
## [63]	{individual meals,	=> {vegetables}	0.1308165	0.8612717	1.165069
##	laundry detergent}				
## [64]	{spaghetti sauce,	=> {vegetables}	0.1246708	0.8606061	1.164169
##	sugar}				
## [65]	{laundry detergent,	=> {vegetables}	0.1404741	0.8602151	1.163640
##	sandwich bags}				
## [66]	{beef,	=> {vegetables}	0.1404741	0.8602151	1.163640
##	eggs}				
## [67]	{eggs,				

##	laundry detergent}	=> {vegetables}	0.1404741	0.8602151	1.163640
## [68]	{pork,	=> {vegetables}	0.1132572	0.8600000	1.163349
##	sugar}				
## [69]	{sandwich bags,	=> {vegetables}	0.1132572	0.8600000	1.163349
##	sugar}				
## [70]	{mixes,	=> {vegetables}	0.1562774	0.8599034	1.163218
##	poultry}				
## [71]	{individual meals,	=> {vegetables}	0.1237928	0.8597561	1.163019
##	sandwich bags}				
## [72]	{sandwich loaves,	=> {vegetables}	0.1290606	0.8596491	1.162875
##	shampoo}				
## [73]	{dinner rolls,	=> {vegetables}	0.1290606	0.8596491	1.162875
##	toilet paper}				
## [74]	{laundry detergent,	=> {vegetables}	0.1343284	0.8595506	1.162741
##	waffles}				
## [75]	{eggs,	=> {vegetables}	0.1448639	0.8593750	1.162504
##	milk}				
## [76]	{beef,	=> {vegetables}	0.1387182	0.8586957	1.161585
##	yogurt}				
## [77]	{aluminum foil,	=> {vegetables}	0.1387182	0.8586957	1.161585
##	soda}				
## [78]	{soda,	=> {vegetables}	0.1439860	0.8586387	1.161508
##	yogurt}				
## [79]	{cheeses,	=> {vegetables}	0.1378402	0.8579235	1.160540
##	laundry detergent}				
## [80]	{laundry detergent,	=> {vegetables}	0.1106234	0.8571429	1.159484
##	sandwich loaves}				
## [81]	{sandwich loaves,	=> {vegetables}	0.1211589	0.8571429	1.159484
##	soda}				
## [82]	{spaghetti sauce,	=> {vegetables}	0.1369622	0.8571429	1.159484
##	yogurt}				
## [83]	{dinner rolls,	=> {vegetables}	0.1466198	0.8564103	1.158493
##	soda}				
## [84]	{butter,	=> {vegetables}	0.1360843	0.8563536	1.158417
##	eggs}				
## [85]	{coffee/tea,	=> {vegetables}	0.1360843	0.8563536	1.158417
##	eggs}				
## [86]	{tortillas,	=> {vegetables}	0.1308165	0.8563218	1.158374
##	yogurt}				
## [87]	{ketchup,	=> {vegetables}	0.1308165	0.8563218	1.158374
##	yogurt}				
## [88]	{laundry detergent,	=> {vegetables}	0.1308165	0.8563218	1.158374
##	toilet paper}				
## [89]	{eggs,	=> {vegetables}	0.1448639	0.8549223	1.156480
##	waffles}				
## [90]	{dishwashing liquid/detergent,	=> {vegetables}	0.1597893	0.8544601	1.155855
##	poultry}				
## [91]	{hand soap,	=> {vegetables}	0.1185250	0.8544304	1.155815
##	sandwich loaves}				
## [92]	{laundry detergent,	=> {vegetables}	0.1492537	0.8542714	1.155600
##	poultry}				
## [93]	{dinner rolls,	=> {vegetables}	0.1387182	0.8540541	1.155306
##	lunch meat}				
## [94]	{aluminum foil,				

## sandwich loaves}	=> {vegetables}	0.1281826	0.8538012	1.154964
## [95] {shampoo,	=> {vegetables}	0.1281826	0.8538012	1.154964
## soda}				
## [96] {flour,	=> {vegetables}	0.1176471	0.8535032	1.154561
## juice}				
## [97] {mixes,	=> {vegetables}	0.1176471	0.8535032	1.154561
## sugar}				
## [98] {all- purpose,	=> {vegetables}	0.1431080	0.8534031	1.154425
## yogurt}				
## [99] {dishwashing liquid/detergent,	=> {vegetables}	0.1123793	0.8533333	1.154331
## sandwich loaves}				
## [100] {dinner rolls,	=> {vegetables}	0.1422300	0.8526316	1.153382
## yogurt}				
## [101] {soap,	=> {vegetables}	0.1369622	0.8524590	1.153148
## spaghetti sauce}				
## [102] {aluminum foil,	=> {vegetables}	0.1369622	0.8524590	1.153148
## lunch meat}				
## [103] {lunch meat,	=> {vegetables}	0.1571554	0.8523810	1.153043
## waffles}				
## [104] {fruits,	=> {vegetables}	0.1264267	0.8520710	1.152623
## laundry detergent}				
## [105] {sugar,	=> {vegetables}	0.1360843	0.8516484	1.152052
## waffles}				
## [106] {lunch meat,	=> {vegetables}	0.1360843	0.8516484	1.152052
## soda}				
## [107] {mixes,	=> {vegetables}	0.1255487	0.8511905	1.151432
## sandwich loaves}				
## [108] {butter,	=> {vegetables}	0.1255487	0.8511905	1.151432
## juice}				
## [109] {flour,	=> {vegetables}	0.1202809	0.8509317	1.151082
## sandwich loaves}				
## [110] {paper towels,	=> {vegetables}	0.1202809	0.8509317	1.151082
## sugar}				
## [111] {pasta,	=> {vegetables}	0.1352063	0.8508287	1.150943
## yogurt}				
## [112] {lunch meat,	=> {vegetables}	0.1246708	0.8502994	1.150227
## sandwich loaves}				
## [113] {sandwich loaves,	=> {vegetables}	0.1246708	0.8502994	1.150227
## waffles}				
## [114] {ice cream,	=> {vegetables}	0.1343284	0.8500000	1.149822
## sandwich loaves}				
## [115] {cheeses,	=> {vegetables}	0.1439860	0.8497409	1.149471
## sandwich bags}				
## [116] {eggs,	=> {vegetables}	0.1439860	0.8497409	1.149471
## pasta}				
## [117] {eggs,	=> {vegetables}	0.1387182	0.8494624	1.149095
## spaghetti sauce}				
## [118] {flour,	=> {vegetables}	0.1237928	0.8493976	1.149007
## laundry detergent}				
## [119] {lunch meat,	=> {vegetables}	0.1580334	0.8490566	1.148546
## poultry}				
## [120] {eggs,	=> {vegetables}	0.1281826	0.8488372	1.148249
## pork}				
## [121] {eggs,				

```

##      shampoo} => {vegetables} 0.1281826 0.8488372 1.148249
## [122] {all- purpose,
##      paper towels} => {vegetables} 0.1325724 0.8483146 1.147542
## [123] {bagels,
##      dishwashing liquid/detergent} => {vegetables} 0.1422300 0.8481675 1.147343
## [124] {aluminum foil,
##      hand soap} => {vegetables} 0.1176471 0.8481013 1.147253
## [125] {poultry,
##      sugar} => {vegetables} 0.1518876 0.8480392 1.147169
## [126] {eggs,
##      hand soap} => {vegetables} 0.1220369 0.8475610 1.146523
## [127] {dinner rolls,
##      paper towels} => {vegetables} 0.1316945 0.8474576 1.146383
## [128] {bagels,
##      dinner rolls} => {vegetables} 0.1316945 0.8474576 1.146383
## [129] {aluminum foil,
##      mixes} => {vegetables} 0.1457419 0.8469388 1.145681
## [130] {hand soap,
##      lunch meat} => {vegetables} 0.1211589 0.8466258 1.145257
## [131] {paper towels,
##      soap} => {vegetables} 0.1308165 0.8465909 1.145210
## [132] {laundry detergent,
##      soap} => {vegetables} 0.1308165 0.8465909 1.145210
## [133] {eggs,
##      ketchup} => {vegetables} 0.1404741 0.8465608 1.145170
## [134] {pasta,
##      spaghetti sauce} => {vegetables} 0.1352063 0.8461538 1.144619
## [135] {poultry,
##      spaghetti sauce} => {vegetables} 0.1448639 0.8461538 1.144619
## [136] {laundry detergent,
##      pasta} => {vegetables} 0.1299385 0.8457143 1.144024
## [137] {pork,
##      spaghetti sauce} => {vegetables} 0.1202809 0.8456790 1.143977
## [138] {aluminum foil,
##      dishwashing liquid/detergent} => {vegetables} 0.1343284 0.8453039 1.143469
## [139] {aluminum foil,
##      butter} => {vegetables} 0.1246708 0.8452381 1.143380
## [140] {eggs,
##      soda} => {vegetables} 0.1580334 0.8450704 1.143153
## [141] {aluminum foil,
##      poultry} => {vegetables} 0.1483758 0.8450000 1.143058
## [142] {ketchup,
##      sandwich loaves} => {vegetables} 0.1290606 0.8448276 1.142825
## [143] {lunch meat,
##      sandwich bags} => {vegetables} 0.1290606 0.8448276 1.142825
## [144] {poultry,
##      yogurt} => {vegetables} 0.1527656 0.8446602 1.142599
## [145] {butter,
##      laundry detergent} => {vegetables} 0.1334504 0.8444444 1.142307
## [146] {individual meals,
##      yogurt} => {vegetables} 0.1334504 0.8444444 1.142307
## [147] {sugar,
##      toilet paper} => {vegetables} 0.1281826 0.8439306 1.141612
## [148] {laundry detergent,

```

##	pork}	=> {vegetables}	0.1185250	0.8437500	1.141367
## [149]	{butter,	=> {vegetables}	0.1185250	0.8437500	1.141367
##	yogurt}				
## [150]	{flour,	=> {vegetables}	0.1325724	0.8435754	1.141131
##	yogurt}				
## [151]	{ice cream,	=> {vegetables}	0.1325724	0.8435754	1.141131
##	sugar}				
## [152]	{aluminum foil,	=> {vegetables}	0.1325724	0.8435754	1.141131
##	pasta}				
## [153]	{ketchup,	=> {vegetables}	0.1325724	0.8435754	1.141131
##	laundry detergent}				
## [154]	{dinner rolls,	=> {vegetables}	0.1325724	0.8435754	1.141131
##	juice}				
## [155]	{waffles,	=> {vegetables}	0.1466198	0.8434343	1.140940
##	yogurt}				
## [156]	{ice cream,	=> {vegetables}	0.1466198	0.8434343	1.140940
##	lunch meat}				
## [157]	{all- purpose,	=> {vegetables}	0.1369622	0.8432432	1.140682
##	laundry detergent}				
## [158]	{milk,	=> {vegetables}	0.1132572	0.8431373	1.140538
##	sandwich loaves}				
## [159]	{aluminum foil,	=> {vegetables}	0.1273047	0.8430233	1.140384
##	sandwich bags}				
## [160]	{shampoo,	=> {vegetables}	0.1176471	0.8427673	1.140038
##	spaghetti sauce}				
## [161]	{cereals,	=> {vegetables}	0.1316945	0.8426966	1.139942
##	sugar}				
## [162]	{cereals,	=> {vegetables}	0.1360843	0.8423913	1.139529
##	pasta}				
## [163]	{soap,	=> {vegetables}	0.1264267	0.8421053	1.139142
##	yogurt}				
## [164]	{beef,	=> {vegetables}	0.1308165	0.8418079	1.138740
##	sugar}				
## [165]	{hand soap,	=> {vegetables}	0.1167691	0.8417722	1.138692
##	individual meals}				
## [166]	{hand soap,	=> {vegetables}	0.1167691	0.8417722	1.138692
##	ketchup}				
## [167]	{flour,	=> {vegetables}	0.1167691	0.8417722	1.138692
##	paper towels}				
## [168]	{cheeses,	=> {vegetables}	0.1352063	0.8415301	1.138364
##	ketchup}				
## [169]	{cheeses,	=> {vegetables}	0.1352063	0.8415301	1.138364
##	lunch meat}				
## [170]	{aluminum foil,	=> {vegetables}	0.1395961	0.8412698	1.138012
##	dinner rolls}				
## [171]	{mixes,	=> {vegetables}	0.1255487	0.8411765	1.137886
##	toilet paper}				
## [172]	{hand soap,	=> {vegetables}	0.1158911	0.8407643	1.137328
##	sugar}				
## [173]	{cheeses,	=> {vegetables}	0.1343284	0.8406593	1.137186
##	pasta}				
## [174]	{laundry detergent,	=> {vegetables}	0.1343284	0.8406593	1.137186
##	mixes}				
## [175]	{ketchup,				

```

##      lunch meat}                => {vegetables} 0.1202809  0.8404908  1.136958
## [176] {dinner rolls,
##      dishwashing liquid/detergent} => {vegetables} 0.1387182  0.8404255  1.136870
## [177] {flour,
##      ketchup}                    => {vegetables} 0.1246708  0.8402367  1.136615
## [178] {sugar,
##      yogurt}                     => {vegetables} 0.1334504  0.8397790  1.135996
## [179] {juice,
##      paper towels}               => {vegetables} 0.1334504  0.8397790  1.135996
## [180] {dinner rolls,
##      sugar}                      => {vegetables} 0.1378402  0.8395722  1.135716
## [181] {spaghetti sauce,
##      waffles}                    => {vegetables} 0.1378402  0.8395722  1.135716
## [182] {sugar,
##      tortillas}                  => {vegetables} 0.1237928  0.8392857  1.135328
## [183] {sandwich bags,
##      spaghetti sauce}             => {vegetables} 0.1237928  0.8392857  1.135328
## [184] {dinner rolls,
##      sandwich bags}               => {vegetables} 0.1281826  0.8390805  1.135051
## [185] {bagels,
##      laundry detergent}           => {vegetables} 0.1281826  0.8390805  1.135051
## [186] {dishwashing liquid/detergent,
##      juice}                       => {vegetables} 0.1281826  0.8390805  1.135051
## [187] {sandwich loaves,
##      soap}                       => {vegetables} 0.1325724  0.8388889  1.134792
## [188] {cheeses,
##      shampoo}                     => {vegetables} 0.1325724  0.8388889  1.134792
## [189] {bagels,
##      lunch meat}                 => {vegetables} 0.1325724  0.8388889  1.134792
## [190] {dishwashing liquid/detergent,
##      laundry detergent}           => {vegetables} 0.1369622  0.8387097  1.134549
## [191] {laundry detergent,
##      soda}                       => {vegetables} 0.1369622  0.8387097  1.134549
## [192] {eggs,
##      toilet paper}                => {vegetables} 0.1369622  0.8387097  1.134549
## [193] {sandwich bags,
##      shampoo}                     => {vegetables} 0.1229148  0.8383234  1.134026
## [194] {eggs}                          => {vegetables} 0.3266023  0.8378378  1.133370
## [195] {soda,
##      sugar}                       => {vegetables} 0.1360843  0.8378378  1.133370
## [196] {bagels,
##      yogurt}                      => {vegetables} 0.1360843  0.8378378  1.133370
## [197] {hand soap,
##      soap}                       => {vegetables} 0.1132572  0.8376623  1.133132
## [198] {cheeses,
##      paper towels}               => {vegetables} 0.1264267  0.8372093  1.132519
## [199] {ice cream,
##      yogurt}                     => {vegetables} 0.1308165  0.8370787  1.132343
## [200] {poultry,
##      waffles}                    => {vegetables} 0.1395961  0.8368421  1.132023
## [201] {aluminum foil,
##      juice}                       => {vegetables} 0.1439860  0.8367347  1.131877
## [202] {cheeses,
##      yogurt}                     => {vegetables} 0.1439860  0.8367347  1.131877

```


## [203] {flour,	=> {vegetables} 0.1255487	0.8362573	1.131232
## mixes}			
## [204] {paper towels,	=> {vegetables} 0.1255487	0.8362573	1.131232
## sandwich bags}			
## [205] {aluminum foil,	=> {vegetables} 0.1343284	0.8360656	1.130972
## laundry detergent}			
## [206] {cereals,	=> {vegetables} 0.1343284	0.8360656	1.130972
## waffles}			
## [207] {poultry,	=> {vegetables} 0.1431080	0.8358974	1.130745
## toilet paper}			
## [208] {lunch meat,	=> {vegetables} 0.1246708	0.8352941	1.129929
## pork}			
## [209] {eggs,	=> {vegetables} 0.1246708	0.8352941	1.129929
## flour}			
## [210] {laundry detergent,	=> {vegetables} 0.1246708	0.8352941	1.129929
## sugar}			
## [211] {aluminum foil,	=> {vegetables} 0.1290606	0.8352273	1.129838
## flour}			
## [212] {dinner rolls,	=> {vegetables} 0.1290606	0.8352273	1.129838
## flour}			
## [213] {individual meals,	=> {vegetables} 0.1334504	0.8351648	1.129754
## sandwich loaves}			
## [214] {aluminum foil,	=> {vegetables} 0.1334504	0.8351648	1.129754
## paper towels}			
## [215] {mixes,	=> {vegetables} 0.1378402	0.8351064	1.129675
## yogurt}			
## [216] {sandwich bags,	=> {vegetables} 0.1150132	0.8343949	1.128712
## sandwich loaves}			
## [217] {cereals,	=> {vegetables} 0.1237928	0.8343195	1.128610
## ketchup}			
## [218] {eggs,	=> {vegetables} 0.1325724	0.8342541	1.128522
## tortillas}			
## [219] {cereals,	=> {vegetables} 0.1325724	0.8342541	1.128522
## shampoo}			
## [220] {sandwich bags,	=> {vegetables} 0.1325724	0.8342541	1.128522
## waffles}			
## [221] {eggs,	=> {vegetables} 0.1325724	0.8342541	1.128522
## mixes}			
## [222] {pasta,	=> {vegetables} 0.1413521	0.8341969	1.128444
## soda}			
## [223] {aluminum foil,	=> {vegetables} 0.1413521	0.8341969	1.128444
## waffles}			
## [224] {all- purpose,	=> {vegetables} 0.1185250	0.8333333	1.127276
## sandwich loaves}			
## [225] {flour,	=> {vegetables} 0.1141352	0.8333333	1.127276
## sandwich bags}			
## [226] {cheeses,	=> {vegetables} 0.1273047	0.8333333	1.127276
## sugar}			
## [227] {fruits,	=> {vegetables} 0.1316945	0.8333333	1.127276
## yogurt}			
## [228] {beef,	=> {vegetables} 0.1316945	0.8333333	1.127276
## lunch meat}			
## [229] {mixes,	=> {vegetables} 0.1229148	0.8333333	1.127276
## soap}			

## [230] {cereals,	=> {vegetables}	0.1404741	0.8333333	1.127276
## lunch meat}				
## [231] {poultry,	=> {vegetables}	0.1439860	0.8324873	1.126132
## soda}				
## [232] {cheeses,	=> {vegetables}	0.1439860	0.8324873	1.126132
## waffles}				
## [233] {all- purpose,	=> {vegetables}	0.1308165	0.8324022	1.126017
## aluminum foil}				
## [234] {beef,	=> {vegetables}	0.1308165	0.8324022	1.126017
## waffles}				
## [235] {pork,	=> {vegetables}	0.1264267	0.8323699	1.125973
## yogurt}				
## [236] {dishwashing liquid/detergent,	=> {vegetables}	0.1220369	0.8323353	1.125926
## spaghetti sauce}				
## [237] {butter,	=> {vegetables}	0.1176471	0.8322981	1.125876
## sandwich loaves}				
## [238] {dinner rolls,	=> {vegetables}	0.1431080	0.8316327	1.124976
## spaghetti sauce}				
## [239] {bagels,	=> {vegetables}	0.1387182	0.8315789	1.124903
## spaghetti sauce}				
## [240] {pasta,	=> {vegetables}	0.1343284	0.8315217	1.124826
## poultry}				
## [241] {laundry detergent,	=> {vegetables}	0.1343284	0.8315217	1.124826
## spaghetti sauce}				
## [242] {juice,	=> {vegetables}	0.1343284	0.8315217	1.124826
## lunch meat}				
## [243] {individual meals,	=> {vegetables}	0.1299385	0.8314607	1.124743
## waffles}				
## [244] {coffee/tea,	=> {vegetables}	0.1299385	0.8314607	1.124743
## juice}				
## [245] {aluminum foil,	=> {vegetables}	0.1299385	0.8314607	1.124743
## spaghetti sauce}				
## [246] {bagels,	=> {vegetables}	0.1255487	0.8313953	1.124655
## sugar}				
## [247] {dishwashing liquid/detergent,	=> {vegetables}	0.1211589	0.8313253	1.124560
## shampoo}				
## [248] {bagels,	=> {vegetables}	0.1211589	0.8313253	1.124560
## soap}	=> {vegetables}	0.3195786	0.8310502	1.124188
## [249] {yogurt}				
## [250] {juice,	=> {vegetables}	0.1466198	0.8308458	1.123911
## yogurt}				
## [251] {juice,	=> {vegetables}	0.1466198	0.8308458	1.123911
## poultry}				
## [252] {poultry,	=> {vegetables}	0.1422300	0.8307692	1.123808
## shampoo}				
## [253] {lunch meat,	=> {vegetables}	0.1378402	0.8306878	1.123698
## soap}				
## [254] {paper towels,	=> {vegetables}	0.1334504	0.8306011	1.123580
## soda}				
## [255] {juice,	=> {vegetables}	0.1334504	0.8306011	1.123580
## ketchup}				
## [256] {juice,	=> {vegetables}	0.1202809	0.8303030	1.123177
## sandwich loaves}				
## [257] {butter,				

##	milk}	=> {vegetables}	0.1158911	0.8301887	1.123022
## [258]	{lunch meat,				
##	shampoo}	=> {vegetables}	0.1325724	0.8296703	1.122321
## [259]	{aluminum foil,				
##	beef}	=> {vegetables}	0.1325724	0.8296703	1.122321
## [260]	{bagels,				
##	waffles}	=> {vegetables}	0.1325724	0.8296703	1.122321
## [261]	{aluminum foil,				
##	cheeses}	=> {vegetables}	0.1404741	0.8290155	1.121436
## [262]	{dinner rolls,				
##	poultry}	=> {vegetables}	0.1615452	0.8288288	1.121183
## [263]	{shampoo,				
##	yogurt}	=> {vegetables}	0.1316945	0.8287293	1.121048
## [264]	{dishwashing liquid/detergent,				
##	paper towels}	=> {vegetables}	0.1316945	0.8287293	1.121048
## [265]	{butter,				
##	sandwich bags}	=> {vegetables}	0.1273047	0.8285714	1.120835
## [266]	{coffee/tea,				
##	paper towels}	=> {vegetables}	0.1273047	0.8285714	1.120835
## [267]	{ice cream,				
##	poultry}	=> {vegetables}	0.1483758	0.8284314	1.120645
## [268]	{hand soap,				
##	pasta}	=> {vegetables}	0.1229148	0.8284024	1.120606
## [269]	{individual meals,				
##	sugar}	=> {vegetables}	0.1229148	0.8284024	1.120606
## [270]	{fruits,				
##	soap}	=> {vegetables}	0.1229148	0.8284024	1.120606
## [271]	{hand soap,				
##	waffles}	=> {vegetables}	0.1185250	0.8282209	1.120361
## [272]	{milk,				
##	waffles}	=> {vegetables}	0.1185250	0.8282209	1.120361
## [273]	{dishwashing liquid/detergent,				
##	toilet paper}	=> {vegetables}	0.1264267	0.8275862	1.119502
## [274]	{shampoo,				
##	sugar}	=> {vegetables}	0.1220369	0.8273810	1.119224
## [275]	{beef,				
##	individual meals}	=> {vegetables}	0.1220369	0.8273810	1.119224
## [276]	{soda,				
##	spaghetti sauce}	=> {vegetables}	0.1387182	0.8272251	1.119014
## [277]	{dinner rolls,				
##	mixes}	=> {vegetables}	0.1343284	0.8270270	1.118746
## [278]	{laundry detergent,				
##	lunch meat}	=> {vegetables}	0.1299385	0.8268156	1.118460
## [279]	{bagels,				
##	hand soap}	=> {vegetables}	0.1088674	0.8266667	1.118258
## [280]	{dishwashing liquid/detergent,				
##	tortillas}	=> {vegetables}	0.1255487	0.8265896	1.118154
## [281]	{cereals,				
##	yogurt}	=> {vegetables}	0.1422300	0.8265306	1.118074
## [282]	{eggs,				
##	ice cream}	=> {vegetables}	0.1378402	0.8263158	1.117783
## [283]	{butter,				
##	fruits}	=> {vegetables}	0.1167691	0.8260870	1.117474
## [284]	{aluminum foil,				

##	ice cream}	=> {vegetables}	0.1457419	0.8258706	1.117181
## [285]	{ice cream,	=> {vegetables}	0.1290606	0.8258427	1.117144
##	sandwich bags}				
## [286]	{paper towels,	=> {vegetables}	0.1290606	0.8258427	1.117144
##	waffles}				
## [287]	{ketchup,	=> {vegetables}	0.1290606	0.8258427	1.117144
##	toilet paper}				
## [288]	{butter,	=> {vegetables}	0.1123793	0.8258065	1.117094
##	flour}				
## [289]	{cereals,	=> {vegetables}	0.1413521	0.8256410	1.116871
##	dinner rolls}				
## [290]	{shampoo,	=> {vegetables}	0.1246708	0.8255814	1.116790
##	soap}				
## [291]	{coffee/tea,	=> {vegetables}	0.1325724	0.8251366	1.116188
##	yogurt}				
## [292]	{cheeses,	=> {vegetables}	0.1281826	0.8248588	1.115812
##	sandwich loaves}				
## [293]	{sugar}	=> {vegetables}	0.2976295	0.8248175	1.115757
## [294]	{aluminum foil,				
##	toilet paper}	=> {vegetables}	0.1316945	0.8241758	1.114889
## [295]	{coffee/tea,	=> {vegetables}	0.1439860	0.8241206	1.114814
##	poultry}				
## [296]	{soap,	=> {vegetables}	0.1273047	0.8238636	1.114466
##	sugar}				
## [297]	{bagels,	=> {vegetables}	0.1273047	0.8238636	1.114466
##	sandwich bags}				
## [298]	{mixes,	=> {vegetables}	0.1273047	0.8238636	1.114466
##	waffles}				
## [299]	{ketchup,	=> {vegetables}	0.1352063	0.8235294	1.114014
##	sandwich bags}				
## [300]	{all- purpose,	=> {vegetables}	0.1229148	0.8235294	1.114014
##	soda}				
## [301]	{cereals,	=> {vegetables}	0.1352063	0.8235294	1.114014
##	paper towels}				
## [302]	{juice,	=> {vegetables}	0.1229148	0.8235294	1.114014
##	pasta}				
## [303]	{ketchup,	=> {vegetables}	0.1352063	0.8235294	1.114014
##	soap}				
## [304]	{dishwashing liquid/detergent,	=> {vegetables}	0.1431080	0.8232323	1.113612
##	lunch meat}				
## [305]	{aluminum foil,	=> {vegetables}	0.1308165	0.8232044	1.113575
##	coffee/tea}				
## [306]	{lunch meat,	=> {vegetables}	0.1387182	0.8229167	1.113185
##	spaghetti sauce}				
## [307]	{cheeses,	=> {vegetables}	0.1387182	0.8229167	1.113185
##	soda}				
## [308]	{dinner rolls,	=> {vegetables}	0.1264267	0.8228571	1.113105
##	hand soap}				
## [309]	{dishwashing liquid/detergent,	=> {vegetables}	0.1264267	0.8228571	1.113105
##	sandwich bags}				
## [310]	{bagels,	=> {vegetables}	0.1264267	0.8228571	1.113105
##	paper towels}				
## [311]	{milk,	=> {vegetables}	0.1466198	0.8226601	1.112838
##	poultry}				

## [312] {flour,				
## soda}	=> {vegetables}	0.1299385	0.8222222	1.112246
## [313] {aluminum foil,				
## fruits}	=> {vegetables}	0.1299385	0.8222222	1.112246
## [314] {aluminum foil,				
## ketchup}	=> {vegetables}	0.1299385	0.8222222	1.112246
## [315] {butter,				
## ketchup}	=> {vegetables}	0.1176471	0.8220859	1.112062
## [316] {butter,				
## coffee/tea}	=> {vegetables}	0.1176471	0.8220859	1.112062
## [317] {juice,				
## sugar}	=> {vegetables}	0.1176471	0.8220859	1.112062
## [318] {dishwashing liquid/detergent,				
## fruits}	=> {vegetables}	0.1378402	0.8219895	1.111931
## [319] {bagels,				
## poultry}	=> {vegetables}	0.1378402	0.8219895	1.111931
## [320] {butter,				
## mixes}	=> {vegetables}	0.1255487	0.8218391	1.111728
## [321] {flour,				
## fruits}	=> {vegetables}	0.1132572	0.8216561	1.111480
## [322] {butter,				
## sugar}	=> {vegetables}	0.1132572	0.8216561	1.111480
## [323] {bagels,				
## juice}	=> {vegetables}	0.1334504	0.8216216	1.111434
## [324] {cheeses,				
## soap}	=> {vegetables}	0.1334504	0.8216216	1.111434
## [325] {juice,				
## spaghetti sauce}	=> {vegetables}	0.1413521	0.8214286	1.111172
## [326] {flour,				
## poultry}	=> {vegetables}	0.1290606	0.8212291	1.110902
## [327] {beef,				
## dishwashing liquid/detergent}	=> {vegetables}	0.1290606	0.8212291	1.110902
## [328] {bagels,				
## soda}	=> {vegetables}	0.1290606	0.8212291	1.110902
## [329] {cereals,				
## spaghetti sauce}	=> {vegetables}	0.1369622	0.8210526	1.110664
## [330] {juice,				
## waffles}	=> {vegetables}	0.1369622	0.8210526	1.110664
## [331] {sandwich loaves,				
## tortillas}	=> {vegetables}	0.1167691	0.8209877	1.110576
## [332] {coffee/tea,				
## sugar}	=> {vegetables}	0.1167691	0.8209877	1.110576
## [333] {lunch meat,				
## pasta}	=> {vegetables}	0.1167691	0.8209877	1.110576
## [334] {butter,				
## dinner rolls}	=> {vegetables}	0.1246708	0.8208092	1.110335
## [335] {beef,				
## ice cream}	=> {vegetables}	0.1325724	0.8206522	1.110122
## [336] {ketchup,				
## waffles}	=> {vegetables}	0.1325724	0.8206522	1.110122
## [337] {cereals,				
## poultry}	=> {vegetables}	0.1483758	0.8203883	1.109765
## [338] {cereals,				
## flour}	=> {vegetables}	0.1202809	0.8203593	1.109726

## [339] {individual meals,				
## pasta}	=> {vegetables}	0.1202809	0.8203593	1.109726
## [340] {paper towels,				
## spaghetti sauce}	=> {vegetables}	0.1281826	0.8202247	1.109544
## [341] {juice,				
## soap}	=> {vegetables}	0.1281826	0.8202247	1.109544
## [342] {dinner rolls,				
## milk}	=> {vegetables}	0.1281826	0.8202247	1.109544
## [343] {dinner rolls,				
## soap}	=> {vegetables}	0.1281826	0.8202247	1.109544
## [344] {laundry detergent,				
## milk}	=> {vegetables}	0.1360843	0.8201058	1.109383
## [345] {dishwashing liquid/detergent,				
## waffles}	=> {vegetables}	0.1439860	0.8200000	1.109240
## [346] {pasta,				
## sandwich loaves}	=> {vegetables}	0.1158911	0.8198758	1.109072
## [347] {pasta,				
## sugar}	=> {vegetables}	0.1237928	0.8197674	1.108925
## [348] {cheeses,				
## individual meals}	=> {vegetables}	0.1316945	0.8196721	1.108796
## [349] {aluminum foil,				
## milk}	=> {vegetables}	0.1316945	0.8196721	1.108796
## [350] {lunch meat,				
## milk}	=> {vegetables}	0.1316945	0.8196721	1.108796
## [351] {all- purpose,				
## sugar}	=> {vegetables}	0.1194030	0.8192771	1.108262
## [352] {coffee/tea,				
## laundry detergent}	=> {vegetables}	0.1194030	0.8192771	1.108262
## [353] {paper towels,				
## shampoo}	=> {vegetables}	0.1273047	0.8192090	1.108170
## [354] {shampoo,				
## waffles}	=> {vegetables}	0.1273047	0.8192090	1.108170
## [355] {beef,				
## ketchup}	=> {vegetables}	0.1273047	0.8192090	1.108170
## [356] {lunch meat,				
## paper towels}	=> {vegetables}	0.1352063	0.8191489	1.108089
## [357] {sandwich loaves,				
## spaghetti sauce}	=> {vegetables}	0.1229148	0.8187135	1.107500
## [358] {butter,				
## spaghetti sauce}	=> {vegetables}	0.1229148	0.8187135	1.107500
## [359] {fruits,				
## paper towels}	=> {vegetables}	0.1229148	0.8187135	1.107500
## [360] {individual meals,				
## soap}	=> {vegetables}	0.1308165	0.8186813	1.107456
## [361] {beef,				
## soap}	=> {vegetables}	0.1308165	0.8186813	1.107456
## [362] {cereals,				
## dishwashing liquid/detergent}	=> {vegetables}	0.1387182	0.8186528	1.107418
## [363] {bagels,				
## sandwich loaves}	=> {vegetables}	0.1185250	0.8181818	1.106780
## [364] {sandwich bags,				
## soap}	=> {vegetables}	0.1299385	0.8176796	1.106101
## [365] {milk,				
## shampoo}	=> {vegetables}	0.1220369	0.8176471	1.106057

## [366] {dinner rolls, ## individual meals}	=> {vegetables} 0.1220369 0.8176471 1.106057
## [367] {dinner rolls, ## pasta}	=> {vegetables} 0.1413521 0.8172589 1.105532
## [368] {cheeses, ## mixes}	=> {vegetables} 0.1334504 0.8172043 1.105458
## [369] {juice, ## milk}	=> {vegetables} 0.1255487 0.8171429 1.105375
## [370] {cheeses, ## dinner rolls}	=> {vegetables} 0.1369622 0.8167539 1.104849
## [371] {laundry detergent}	=> {vegetables} 0.3090430 0.8167053 1.104783
## [372] {flour, ## pasta}	=> {vegetables} 0.1211589 0.8165680 1.104597
## [373] {ketchup, ## sugar}	=> {vegetables} 0.1132572 0.8164557 1.104445
## [374] {dishwashing liquid/detergent, ## pork}	=> {vegetables} 0.1246708 0.8160920 1.103953
## [375] {flour, ## shampoo}	=> {vegetables} 0.1167691 0.8159509 1.103763
## [376] {juice, ## tortillas}	=> {vegetables} 0.1167691 0.8159509 1.103763
## [377] {coffee/tea, ## lunch meat}	=> {vegetables} 0.1360843 0.8157895 1.103544
## [378] {all- purpose, ## ice cream}	=> {vegetables} 0.1281826 0.8156425 1.103345
## [379] {fruits, ## ketchup}	=> {vegetables} 0.1202809 0.8154762 1.103120
## [380] {juice, ## mixes}	=> {vegetables} 0.1202809 0.8154762 1.103120
## [381] {hand soap, ## shampoo}	=> {vegetables} 0.1123793 0.8152866 1.102864
## [382] {hand soap, ## juice}	=> {vegetables} 0.1123793 0.8152866 1.102864
## [383] {paper towels, ## toilet paper}	=> {vegetables} 0.1316945 0.8152174 1.102770
## [384] {bagels, ## pasta}	=> {vegetables} 0.1237928 0.8150289 1.102515
## [385] {beef, ## sandwich loaves}	=> {vegetables} 0.1158911 0.8148148 1.102226
## [386] {flour, ## lunch meat}	=> {vegetables} 0.1273047 0.8146067 1.101944
## [387] {ketchup, ## milk}	=> {vegetables} 0.1273047 0.8146067 1.101944
## [388] {individual meals, ## poultry}	=> {vegetables} 0.1387182 0.8144330 1.101709
## [389] {fruits, ## milk}	=> {vegetables} 0.1194030 0.8143713 1.101626
## [390] {all- purpose, ## cereals}	=> {vegetables} 0.1229148 0.8139535 1.101061
## [391] {bagels, ## individual meals}	=> {vegetables} 0.1343284 0.8138298 1.100893
## [392] {ketchup, ## mixes}	=> {vegetables} 0.1343284 0.8138298 1.100893
## [393] {cheeses,	

## spaghetti sauce}	=> {vegetables}	0.1343284	0.8138298	1.100893
## [394] {mixes,	=> {vegetables}	0.1264267	0.8135593	1.100527
## sandwich bags}				
## [395] {all- purpose,	=> {vegetables}	0.1264267	0.8135593	1.100527
## dinner rolls}				
## [396] {beef,	=> {vegetables}	0.1264267	0.8135593	1.100527
## juice}				
## [397] {beef,	=> {vegetables}	0.1264267	0.8135593	1.100527
## soda}				
## [398] {dishwashing liquid/detergent,	=> {vegetables}	0.1264267	0.8135593	1.100527
## ketchup}				
## [399] {laundry detergent,	=> {vegetables}	0.1185250	0.8132530	1.100113
## tortillas}				
## [400] {aluminum foil,	=> {vegetables}	0.1185250	0.8132530	1.100113
## tortillas}				
## [401] {beef,	=> {vegetables}	0.1299385	0.8131868	1.100023
## cheeses}				
## [402] {dishwashing liquid/detergent,	=> {vegetables}	0.1299385	0.8131868	1.100023
## soap}				
## [403] {cereals,	=> {vegetables}	0.1413521	0.8131313	1.099948
## mixes}				
## [404] {bagels,	=> {vegetables}	0.1106234	0.8129032	1.099640
## flour}				
## [405] {butter,	=> {vegetables}	0.1220369	0.8128655	1.099589
## cereals}				
## [406] {ice cream,	=> {vegetables}	0.1220369	0.8128655	1.099589
## shampoo}				
## [407] {all- purpose,	=> {vegetables}	0.1220369	0.8128655	1.099589
## bagels}				
## [408] {cheeses,	=> {vegetables}	0.1220369	0.8128655	1.099589
## juice}				
## [409] {coffee/tea,	=> {vegetables}	0.1334504	0.8128342	1.099547
## ketchup}				
## [410] {soap,	=> {vegetables}	0.1404741	0.8121827	1.098665
## waffles}				
## [411] {coffee/tea,	=> {vegetables}	0.1176471	0.8121212	1.098582
## spaghetti sauce}				
## [412] {fruits,	=> {vegetables}	0.1325724	0.8118280	1.098185
## lunch meat}				
## [413] {cheeses,	=> {vegetables}	0.1325724	0.8118280	1.098185
## fruits}				
## [414] {bagels,	=> {vegetables}	0.1325724	0.8118280	1.098185
## toilet paper}				
## [415] {cheeses,	=> {vegetables}	0.1325724	0.8118280	1.098185
## dishwashing liquid/detergent}				
## [416] {cereals,	=> {vegetables}	0.1211589	0.8117647	1.098100
## sandwich loaves}				
## [417] {tortillas,	=> {vegetables}	0.1211589	0.8117647	1.098100
## waffles}				
## [418] {all- purpose,	=> {vegetables}	0.1211589	0.8117647	1.098100
## spaghetti sauce}				
## [419] {beef,	=> {vegetables}	0.1246708	0.8114286	1.097645
## shampoo}				
## [420] {beef,				

## spaghetti sauce}	=> {vegetables}	0.1281826	0.8111111	1.097216
## [421] {dinner rolls,				
## ketchup}	=> {vegetables}	0.1281826	0.8111111	1.097216
## [422] {mixes,				
## spaghetti sauce}	=> {vegetables}	0.1281826	0.8111111	1.097216
## [423] {fruits,				
## pasta}	=> {vegetables}	0.1167691	0.8109756	1.097032
## [424] {all- purpose,				
## cheeses}	=> {vegetables}	0.1202809	0.8106509	1.096593
## [425] {coffee/tea,				
## shampoo}	=> {vegetables}	0.1237928	0.8103448	1.096179
## [426] {hand soap,				
## toilet paper}	=> {vegetables}	0.1123793	0.8101266	1.095884
## [427] {hand soap,				
## laundry detergent}	=> {vegetables}	0.1158911	0.8098160	1.095464
## [428] {milk,				
## paper towels}	=> {vegetables}	0.1308165	0.8097826	1.095419
## [429] {dinner rolls,				
## ice cream}	=> {vegetables}	0.1308165	0.8097826	1.095419
## [430] {cereals,				
## toilet paper}	=> {vegetables}	0.1343284	0.8095238	1.095068
## [431] {juice,				
## shampoo}	=> {vegetables}	0.1378402	0.8092784	1.094736
## [432] {ice cream,				
## paper towels}	=> {vegetables}	0.1378402	0.8092784	1.094736
## [433] {dishwashing liquid/detergent,				
## milk}	=> {vegetables}	0.1378402	0.8092784	1.094736
## [434] {butter,				
## waffles}	=> {vegetables}	0.1229148	0.8092486	1.094696
## [435] {individual meals,				
## shampoo}	=> {vegetables}	0.1229148	0.8092486	1.094696
## [436] {all- purpose,				
## milk}	=> {vegetables}	0.1229148	0.8092486	1.094696
## [437] {hand soap,				
## paper towels}	=> {vegetables}	0.1079895	0.8092105	1.094645
## [438] {sandwich loaves}	=> {vegetables}	0.2827041	0.8090452	1.094421
## [439] {soap,				
## soda}	=> {vegetables}	0.1413521	0.8090452	1.094421
## [440] {mixes,				
## shampoo}	=> {vegetables}	0.1264267	0.8089888	1.094345
## [441] {ice cream,				
## ketchup}	=> {vegetables}	0.1264267	0.8089888	1.094345
## [442] {cheeses,				
## ice cream}	=> {vegetables}	0.1448639	0.8088235	1.094121
## [443] {sandwich loaves,				
## toilet paper}	=> {vegetables}	0.1150132	0.8086420	1.093876
## [444] {dishwashing liquid/detergent,				
## ice cream}	=> {vegetables}	0.1334504	0.8085106	1.093698
## [445] {dinner rolls,				
## shampoo}	=> {vegetables}	0.1369622	0.8082902	1.093400
## [446] {aluminum foil}	=> {vegetables}	0.3107989	0.8082192	1.093304
## [447] {flour,				
## soap}	=> {vegetables}	0.1220369	0.8081395	1.093196
## [448] {milk,				

##	pasta}	=> {vegetables}	0.1220369	0.8081395	1.093196
## [449]	{fruits,	=> {vegetables}	0.1255487	0.8079096	1.092885
##	spaghetti sauce}				
## [450]	{beef,	=> {vegetables}	0.1255487	0.8079096	1.092885
##	paper towels}				
## [451]	{pasta,	=> {vegetables}	0.1290606	0.8076923	1.092591
##	soap}				
## [452]	{beef,	=> {vegetables}	0.1141352	0.8074534	1.092268
##	coffee/tea}				
## [453]	{beef,	=> {vegetables}	0.1141352	0.8074534	1.092268
##	laundry detergent}				
## [454]	{fruits,	=> {vegetables}	0.1176471	0.8072289	1.091964
##	sugar}				
## [455]	{ice cream,	=> {vegetables}	0.1395961	0.8071066	1.091799
##	waffles}				
## [456]	{individual meals,	=> {vegetables}	0.1431080	0.8069307	1.091561
##	lunch meat}				
## [457]	{ketchup,	=> {vegetables}	0.1246708	0.8068182	1.091408
##	spaghetti sauce}				
## [458]	{pork,	=> {vegetables}	0.1062335	0.8066667	1.091203
##	sandwich loaves}				
## [459]	{ice cream,	=> {vegetables}	0.1281826	0.8066298	1.091154
##	spaghetti sauce}				
## [460]	{milk,	=> {vegetables}	0.1281826	0.8066298	1.091154
##	mixes}				
## [461]	{lunch meat,	=> {vegetables}	0.1316945	0.8064516	1.090913
##	tortillas}				
## [462]	{bagels,	=> {vegetables}	0.1352063	0.8062827	1.090684
##	fruits}				
## [463]	{poultry,	=> {vegetables}	0.1387182	0.8061224	1.090467
##	sandwich bags}				
## [464]	{flour,	=> {vegetables}	0.1167691	0.8060606	1.090384
##	waffles}				
## [465]	{fruits,	=> {vegetables}	0.1237928	0.8057143	1.089915
##	sandwich bags}				
## [466]	{lunch meat,	=> {vegetables}	0.1237928	0.8057143	1.089915
##	mixes}				
## [467]	{dinner rolls,	=> {vegetables}	0.1273047	0.8055556	1.089700
##	tortillas}				
## [468]	{cereals,	=> {vegetables}	0.1273047	0.8055556	1.089700
##	sandwich bags}				
## [469]	{individual meals,	=> {vegetables}	0.1273047	0.8055556	1.089700
##	spaghetti sauce}				
## [470]	{bagels,	=> {vegetables}	0.1273047	0.8055556	1.089700
##	ketchup}				
## [471]	{ketchup,	=> {vegetables}	0.1273047	0.8055556	1.089700
##	soda}				
## [472]	{milk,	=> {vegetables}	0.1273047	0.8055556	1.089700
##	spaghetti sauce}				
## [473]	{toilet paper,	=> {vegetables}	0.1308165	0.8054054	1.089497
##	yogurt}				
## [474]	{bagels,	=> {vegetables}	0.1308165	0.8054054	1.089497
##	cereals}				
## [475]	{cereals,				

##	soap}	=> {vegetables}	0.1308165	0.8054054	1.089497
## [476]	{ice cream,				
##	soap}	=> {vegetables}	0.1343284	0.8052632	1.089305
## [477]	{dishwashing liquid/detergent,				
##	soda}	=> {vegetables}	0.1343284	0.8052632	1.089305
## [478]	{butter,				
##	paper towels}	=> {vegetables}	0.1158911	0.8048780	1.088784
## [479]	{butter,				
##	soap}	=> {vegetables}	0.1194030	0.8047337	1.088589
## [480]	{individual meals,				
##	tortillas}	=> {vegetables}	0.1229148	0.8045977	1.088405
## [481]	{aluminum foil,				
##	soap}	=> {vegetables}	0.1264267	0.8044693	1.088231
## [482]	{pasta,				
##	waffles}	=> {vegetables}	0.1299385	0.8043478	1.088067
## [483]	{bagels,				
##	milk}	=> {vegetables}	0.1299385	0.8043478	1.088067
## [484]	{butter,				
##	poultry}	=> {vegetables}	0.1334504	0.8042328	1.087911
## [485]	{aluminum foil,				
##	cereals}	=> {vegetables}	0.1334504	0.8042328	1.087911
## [486]	{hand soap,				
##	pork}	=> {vegetables}	0.1044776	0.8040541	1.087669
## [487]	{cereals,				
##	hand soap}	=> {vegetables}	0.1115013	0.8037975	1.087322
## [488]	{dishwashing liquid/detergent,				
##	hand soap}	=> {vegetables}	0.1150132	0.8036810	1.087165
## [489]	{dinner rolls,				
##	pork}	=> {vegetables}	0.1150132	0.8036810	1.087165
## [490]	{all- purpose,				
##	sandwich bags}	=> {vegetables}	0.1150132	0.8036810	1.087165
## [491]	{coffee/tea,				
##	flour}	=> {vegetables}	0.1220369	0.8034682	1.086877
## [492]	{coffee/tea,				
##	milk}	=> {vegetables}	0.1220369	0.8034682	1.086877
## [493]	{bagels,				
##	beef}	=> {vegetables}	0.1255487	0.8033708	1.086745
## [494]	{cereals,				
##	soda}	=> {vegetables}	0.1255487	0.8033708	1.086745
## [495]	{fruits,				
##	ice cream}	=> {vegetables}	0.1325724	0.8031915	1.086503
## [496]	{ketchup,				
##	poultry}	=> {vegetables}	0.1325724	0.8031915	1.086503
## [497]	{cereals,				
##	coffee/tea}	=> {vegetables}	0.1360843	0.8031088	1.086391
## [498]	{fruits,				
##	hand soap}	=> {vegetables}	0.1106234	0.8025478	1.085632
## [499]	{paper towels,				
##	tortillas}	=> {vegetables}	0.1141352	0.8024691	1.085525
## [500]	{juice,				
##	sandwich bags}	=> {vegetables}	0.1176471	0.8023952	1.085425
## [501]	{all- purpose,				
##	coffee/tea}	=> {vegetables}	0.1176471	0.8023952	1.085425
## [502]	{pasta,				

##	shampoo}	=> {vegetables}	0.1211589	0.8023256	1.085331
## [503]	{bagels,	=> {vegetables}	0.1281826	0.8021978	1.085158
##	ice cream}				
## [504]	{paper towels,	=> {vegetables}	0.1316945	0.8021390	1.085079
##	pasta}				
## [505]	{bagels,	=> {vegetables}	0.1316945	0.8021390	1.085079
##	mixes}				
## [506]	{soda,	=> {vegetables}	0.1422300	0.8019802	1.084864
##	waffles}				
## [507]	{flour,	=> {vegetables}	0.1062335	0.8013245	1.083977
##	hand soap}				
## [508]	{flour,	=> {vegetables}	0.1062335	0.8013245	1.083977
##	spaghetti sauce}				
## [509]	{flour,	=> {vegetables}	0.1167691	0.8012048	1.083815
##	milk}				
## [510]	{all- purpose,	=> {vegetables}	0.1202809	0.8011696	1.083767
##	fruits}				
## [511]	{mixes,	=> {vegetables}	0.1202809	0.8011696	1.083767
##	soda}				
## [512]	{all- purpose,	=> {vegetables}	0.1237928	0.8011364	1.083722
##	ketchup}				
## [513]	{fruits,	=> {vegetables}	0.1308165	0.8010753	1.083640
##	waffles}				
## [514]	{hand soap,	=> {vegetables}	0.1158911	0.8000000	1.082185
##	spaghetti sauce}				
## [515]	{flour,	=> {vegetables}	0.1158911	0.8000000	1.082185
##	pork}				
## [516]	{butter,	=> {vegetables}	0.1088674	0.8000000	1.082185
##	pork}				
## [517]	{paper towels,	=> {vegetables}	0.1088674	0.8000000	1.082185
##	pork}				
## [518]	{flour,	=> {vegetables}	0.1158911	0.8000000	1.082185
##	ice cream}				
## [519]	{poultry,	=> {vegetables}	0.1369622	0.8000000	1.082185
##	tortillas}				
## [520]	{fruits,	=> {vegetables}	0.1123793	0.8000000	1.082185
##	shampoo}				
## [521]	{fruits,	=> {vegetables}	0.1194030	0.8000000	1.082185
##	mixes}				
## [522]	{sandwich bags,	=> {vegetables}	0.1158911	0.8000000	1.082185
##	toilet paper}				
## [523]	{all- purpose,	=> {vegetables}	0.1229148	0.8000000	1.082185
##	toilet paper}				
## [524]	{individual meals,	=> {vegetables}	0.1194030	0.8000000	1.082185
##	mixes}				
## [525]	{mixes,	=> {vegetables}	0.1264267	0.8000000	1.082185
##	paper towels}				
## [526]	{dishwashing liquid/detergent,	=> {vegetables}	0.1439860	0.8000000	1.082185
##	mixes}	=> {vegetables}	0.3151888	0.7995546	1.081583
## [527]	{waffles}				
## [528]	{poultry,	=> {vegetables}	0.1466198	0.7990431	1.080891
##	soap}	=> {vegetables}	0.2897278	0.7990315	1.080875
## [529]	{paper towels}				
## [530]	{beef,				

##	fruits}	=> {vegetables}	0.1325724	0.7989418	1.080754
##	[531] {individual meals,				
##	soda}	=> {vegetables}	0.1325724	0.7989418	1.080754
##	[532] {spaghetti sauce,				
##	tortillas}	=> {vegetables}	0.1185250	0.7988166	1.080584
##	[533] {coffee/tea,				
##	hand soap}	=> {vegetables}	0.1115013	0.7987421	1.080484
##	[534] {ice cream,				
##	milk}	=> {vegetables}	0.1316945	0.7978723	1.079307
##	[535] {all- purpose,				
##	dishwashing liquid/detergent}	=> {vegetables}	0.1281826	0.7978142	1.079228
##	[536] {beef,				
##	milk}	=> {vegetables}	0.1281826	0.7978142	1.079228
##	[537] {toilet paper,				
##	tortillas}	=> {vegetables}	0.1246708	0.7977528	1.079145
##	[538] {cereals,				
##	juice}	=> {vegetables}	0.1246708	0.7977528	1.079145
##	[539] {hand soap,				
##	mixes}	=> {vegetables}	0.1211589	0.7976879	1.079058
##	[540] {dishwashing liquid/detergent,				
##	flour}	=> {vegetables}	0.1211589	0.7976879	1.079058
##	[541] {bagels,				
##	butter}	=> {vegetables}	0.1211589	0.7976879	1.079058
##	[542] {spaghetti sauce,				
##	toilet paper}	=> {vegetables}	0.1211589	0.7976879	1.079058
##	[543] {dinner rolls,				
##	fruits}	=> {vegetables}	0.1176471	0.7976190	1.078964
##	[544] {sandwich bags}	=> {vegetables}	0.2932397	0.7971360	1.078311
##	[545] {soap,				
##	toilet paper}	=> {vegetables}	0.1308165	0.7967914	1.077845
##	[546] {cheeses,				
##	flour}	=> {vegetables}	0.1273047	0.7967033	1.077726
##	[547] {coffee/tea,				
##	pasta}	=> {vegetables}	0.1237928	0.7966102	1.077600
##	[548] {beef,				
##	pasta}	=> {vegetables}	0.1167691	0.7964072	1.077325
##	[549] {all- purpose,				
##	flour}	=> {vegetables}	0.1132572	0.7962963	1.077175
##	[550] {individual meals,				
##	ketchup}	=> {vegetables}	0.1132572	0.7962963	1.077175
##	[551] {hand soap,				
##	tortillas}	=> {vegetables}	0.1097454	0.7961783	1.077016
##	[552] {pork,				
##	toilet paper}	=> {vegetables}	0.1097454	0.7961783	1.077016
##	[553] {cheeses,				
##	poultry}	=> {vegetables}	0.1439860	0.7961165	1.076932
##	[554] {coffee/tea,				
##	waffles}	=> {vegetables}	0.1369622	0.7959184	1.076664
##	[555] {ice cream,				
##	pasta}	=> {vegetables}	0.1334504	0.7958115	1.076519
##	[556] {cheeses,				
##	coffee/tea}	=> {vegetables}	0.1334504	0.7958115	1.076519
##	[557] {all- purpose,				
##	soap}	=> {vegetables}	0.1299385	0.7956989	1.076367

## [558] {milk,			
## toilet paper}	=> {vegetables}	0.1299385	0.7956989 1.076367
## [559] {coffee/tea,			
## soap}	=> {vegetables}	0.1264267	0.7955801 1.076206
## [560] {coffee/tea,			
## dinner rolls}	=> {vegetables}	0.1264267	0.7955801 1.076206
## [561] {butter,			
## soda}	=> {vegetables}	0.1229148	0.7954545 1.076036
## [562] {spaghetti sauce}	=> {vegetables}	0.2967515	0.7952941 1.075819
## [563] {sandwich bags,			
## soda}	=> {vegetables}	0.1290606	0.7945946 1.074873
## [564] {ice cream,			
## individual meals}	=> {vegetables}	0.1290606	0.7945946 1.074873
## [565] {milk,			
## sandwich bags}	=> {vegetables}	0.1255487	0.7944444 1.074670
## [566] {butter,			
## ice cream}	=> {vegetables}	0.1220369	0.7942857 1.074455
## [567] {all- purpose,			
## juice}	=> {vegetables}	0.1220369	0.7942857 1.074455
## [568] {coffee/tea,			
## dishwashing liquid/detergent}	=> {vegetables}	0.1220369	0.7942857 1.074455
## [569] {pork,			
## soap}	=> {vegetables}	0.1150132	0.7939394 1.073987
## [570] {beef,			
## poultry}	=> {vegetables}	0.1352063	0.7938144 1.073818
## [571] {cereals,			
## ice cream}	=> {vegetables}	0.1316945	0.7936508 1.073597
## [572] {cereals,			
## fruits}	=> {vegetables}	0.1281826	0.7934783 1.073363
## [573] {dishwashing liquid/detergent,			
## pasta}	=> {vegetables}	0.1281826	0.7934783 1.073363
## [574] {beef,			
## toilet paper}	=> {vegetables}	0.1246708	0.7932961 1.073117
## [575] {coffee/tea,			
## mixes}	=> {vegetables}	0.1176471	0.7928994 1.072580
## [576] {beef,			
## hand soap}	=> {vegetables}	0.1141352	0.7926829 1.072287
## [577] {all- purpose,			
## individual meals}	=> {vegetables}	0.1106234	0.7924528 1.071976
## [578] {dinner rolls}	=> {vegetables}	0.3081651	0.7923251 1.071803
## [579] {beef,			
## flour}	=> {vegetables}	0.1071115	0.7922078 1.071645
## [580] {cheeses,			
## milk}	=> {vegetables}	0.1237928	0.7921348 1.071546
## [581] {pork,			
## waffles}	=> {vegetables}	0.1202809	0.7919075 1.071238
## [582] {all- purpose,			
## mixes}	=> {vegetables}	0.1202809	0.7919075 1.071238
## [583] {bagels,			
## coffee/tea}	=> {vegetables}	0.1202809	0.7919075 1.071238
## [584] {milk,			
## soda}	=> {vegetables}	0.1369622	0.7918782 1.071199
## [585] {pasta,			
## sandwich bags}	=> {vegetables}	0.1167691	0.7916667 1.070913

## [586] {beef,	=> {vegetables}	0.1334504	0.7916667	1.070913
## cereals}				
## [587] {ice cream,	=> {vegetables}	0.1334504	0.7916667	1.070913
## soda}				
## [588] {milk,	=> {vegetables}	0.1132572	0.7914110	1.070567
## pork}				
## [589] {all- purpose,	=> {vegetables}	0.1264267	0.7912088	1.070293
## lunch meat}				
## [590] {cereals,	=> {vegetables}	0.1264267	0.7912088	1.070293
## individual meals}				
## [591] {hand soap,	=> {vegetables}	0.1097454	0.7911392	1.070199
## soda}				
## [592] {cheeses,	=> {vegetables}	0.1097454	0.7911392	1.070199
## hand soap}				
## [593] {cheeses}	=> {vegetables}	0.3090430	0.7910112	1.070026
## [594] {mixes,	=> {vegetables}	0.1229148	0.7909605	1.069957
## pork}				
## [595] {bagels,	=> {vegetables}	0.1229148	0.7909605	1.069957
## pork}				
## [596] {shampoo,	=> {vegetables}	0.1062335	0.7908497	1.069807
## tortillas}				
## [597] {juice,	=> {vegetables}	0.1360843	0.7908163	1.069762
## toilet paper}				
## [598] {all- purpose,	=> {vegetables}	0.1325724	0.7905759	1.069437
## waffles}				
## [599] {aluminum foil,	=> {vegetables}	0.1158911	0.7904192	1.069225
## pork}				
## [600] {butter,	=> {vegetables}	0.1158911	0.7904192	1.069225
## tortillas}				
## [601] {pork,	=> {vegetables}	0.1123793	0.7901235	1.068825
## shampoo}				
## [602] {flour,	=> {vegetables}	0.1123793	0.7901235	1.068825
## tortillas}				
## [603] {cereals,	=> {vegetables}	0.1255487	0.7900552	1.068733
## tortillas}				
## [604] {dishwashing liquid/detergent,	=> {vegetables}	0.1255487	0.7900552	1.068733
## individual meals}				
## [605] {coffee/tea,	=> {vegetables}	0.1255487	0.7900552	1.068733
## soda}				
## [606] {all- purpose,	=> {vegetables}	0.1387182	0.7900000	1.068658
## poultry}				
## [607] {hand soap,	=> {vegetables}	0.1220369	0.7897727	1.068351
## poultry}				
## [608] {individual meals,	=> {vegetables}	0.1220369	0.7897727	1.068351
## paper towels}				
## [609] {dishwashing liquid/detergent}	=> {vegetables}	0.3064091	0.7895928	1.068107
## [610] {ice cream,	=> {vegetables}	0.1316945	0.7894737	1.067946
## juice}				
## [611] {butter,	=> {vegetables}	0.1150132	0.7891566	1.067517
## shampoo}				
## [612] {cereals,	=> {vegetables}	0.1378402	0.7889447	1.067230
## cheeses}				
## [613] {lunch meat}	=> {vegetables}	0.3116769	0.7888889	1.067155
## [614] {fruits,				

##	tortillas}	=> {vegetables}	0.1115013	0.7888199	1.067062
## [615]	{ketchup,	=> {vegetables}	0.1211589	0.7885714	1.066725
##	pork}				
## [616]	{milk,	=> {vegetables}	0.1273047	0.7880435	1.066011
##	soap}				
## [617]	{fruits,	=> {vegetables}	0.1141352	0.7878788	1.065789
##	individual meals}				
## [618]	{all- purpose,	=> {vegetables}	0.1141352	0.7878788	1.065789
##	beef}				
## [619]	{juice,	=> {vegetables}	0.1237928	0.7877095	1.065560
##	soda}				
## [620]	{fruits,	=> {vegetables}	0.1009658	0.7876712	1.065508
##	pork}				
## [621]	{beef,	=> {vegetables}	0.1009658	0.7876712	1.065508
##	butter}	=> {vegetables}	0.3318701	0.7875000	1.065276
## [622]	{poultry}				
## [623]	{butter,	=> {vegetables}	0.1106234	0.7875000	1.065276
##	pasta}	=> {vegetables}	0.2958736	0.7873832	1.065118
## [624]	{mixes}				
## [625]	{coffee/tea,	=> {vegetables}	0.1202809	0.7873563	1.065082
##	sandwich bags}				
## [626]	{coffee/tea,	=> {vegetables}	0.1202809	0.7873563	1.065082
##	individual meals}				
## [627]	{individual meals,	=> {vegetables}	0.1202809	0.7873563	1.065082
##	toilet paper}				
## [628]	{all- purpose,	=> {vegetables}	0.1071115	0.7870968	1.064731
##	hand soap}				
## [629]	{hand soap,	=> {vegetables}	0.1167691	0.7869822	1.064576
##	milk}				
## [630]	{coffee/tea,	=> {vegetables}	0.1167691	0.7869822	1.064576
##	pork}				
## [631]	{coffee/tea,	=> {vegetables}	0.1132572	0.7865854	1.064039
##	fruits}				
## [632]	{beef,	=> {vegetables}	0.1229148	0.7865169	1.063946
##	sandwich bags}				
## [633]	{all- purpose,	=> {vegetables}	0.1255487	0.7857143	1.062861
##	pasta}				
## [634]	{fruits,	=> {vegetables}	0.1316945	0.7853403	1.062355
##	poultry}				
## [635]	{cheeses,	=> {vegetables}	0.1316945	0.7853403	1.062355
##	toilet paper}	=> {vegetables}	0.3107989	0.7849224	1.061789
## [636]	{cereals}				
## [637]	{ketchup,	=> {vegetables}	0.1185250	0.7848837	1.061737
##	shampoo}	=> {vegetables}	0.2914838	0.7848700	1.061718
## [638]	{ketchup}				
## [639]	{hand soap,	=> {vegetables}	0.1088674	0.7848101	1.061637
##	sandwich bags}				
## [640]	{fruits,	=> {vegetables}	0.1088674	0.7848101	1.061637
##	toilet paper}	=> {vegetables}	0.2906058	0.7843602	1.061029
## [641]	{fruits}				
## [642]	{flour,	=> {vegetables}	0.1115013	0.7839506	1.060475
##	individual meals}				
## [643]	{fruits,	=> {vegetables}	0.1176471	0.7836257	1.060035
##	soda}				

## [644] {flour}	=> {vegetables}	0.2765584	0.7835821	1.059976
## [645] {bagels,				
## shampoo}	=> {vegetables}	0.1237928	0.7833333	1.059640
## [646] {all- purpose,				
## pork}	=> {vegetables}	0.1202809	0.7828571	1.058996
## [647] {individual meals,				
## pork}	=> {vegetables}	0.1106234	0.7826087	1.058660
## [648] {butter,				
## dishwashing liquid/detergent}	=> {vegetables}	0.1167691	0.7823529	1.058314
## [649] {shampoo,				
## toilet paper}	=> {vegetables}	0.1229148	0.7821229	1.058002
## [650] {soda}	=> {vegetables}	0.3055312	0.7820225	1.057867
## [651] {individual meals,				
## milk}	=> {vegetables}	0.1132572	0.7818182	1.057590
## [652] {hand soap}	=> {vegetables}	0.2704126	0.7817259	1.057465
## [653] {toilet paper,				
## waffles}	=> {vegetables}	0.1352063	0.7817259	1.057465
## [654] {soap,				
## tortillas}	=> {vegetables}	0.1158911	0.7810651	1.056571
## [655] {shampoo}	=> {vegetables}	0.2879719	0.7809524	1.056419
## [656] {juice}	=> {vegetables}	0.2941176	0.7808858	1.056329
## [657] {pork,				
## poultry}	=> {vegetables}	0.1281826	0.7807487	1.056143
## [658] {lunch meat,				
## toilet paper}	=> {vegetables}	0.1281826	0.7807487	1.056143
## [659] {butter,				
## lunch meat}	=> {vegetables}	0.1246708	0.7802198	1.055428
## [660] {butter,				
## cheeses}	=> {vegetables}	0.1246708	0.7802198	1.055428
## [661] {ice cream,				
## toilet paper}	=> {vegetables}	0.1246708	0.7802198	1.055428
## [662] {bagels,				
## cheeses}	=> {vegetables}	0.1308165	0.7801047	1.055272
## [663] {butter,				
## hand soap}	=> {vegetables}	0.1027217	0.7800000	1.055131
## [664] {bagels}	=> {vegetables}	0.3002634	0.7790433	1.053836
## [665] {aluminum foil,				
## individual meals}	=> {vegetables}	0.1264267	0.7783784	1.052937
## [666] {milk}	=> {vegetables}	0.2958736	0.7782910	1.052819
## [667] {soap}	=> {vegetables}	0.2949956	0.7777778	1.052125
## [668] {pork,				
## sandwich bags}	=> {vegetables}	0.1167691	0.7777778	1.052125
## [669] {cheeses,				
## pork}	=> {vegetables}	0.1167691	0.7777778	1.052125
## [670] {flour,				
## toilet paper}	=> {vegetables}	0.1106234	0.7777778	1.052125
## [671] {cereals,				
## milk}	=> {vegetables}	0.1352063	0.7777778	1.052125
## [672] {beef}	=> {vegetables}	0.2914838	0.7775176	1.051773
## [673] {beef,				
## tortillas}	=> {vegetables}	0.1097454	0.7763975	1.050257
## [674] {cheeses,				
## tortillas}	=> {vegetables}	0.1123793	0.7757576	1.049392
## [675] {ketchup,				

##	pasta}	=> {vegetables}	0.1211589	0.7752809	1.048747
## [676]	{coffee/tea,	=> {vegetables}	0.1211589	0.7752809	1.048747
##	toilet paper}				
## [677]	{milk,	=> {vegetables}	0.1176471	0.7745665	1.047781
##	tortillas}				
## [678]	{fruits,	=> {vegetables}	0.1053556	0.7741935	1.047276
##	juice}				
## [679]	{individual meals,	=> {vegetables}	0.1202809	0.7740113	1.047030
##	juice}				
## [680]	{ice cream,	=> {vegetables}	0.1141352	0.7738095	1.046757
##	tortillas}				
## [681]	{hand soap,	=> {vegetables}	0.1106234	0.7730061	1.045670
##	ice cream}				
## [682]	{bagels,	=> {vegetables}	0.1255487	0.7729730	1.045625
##	tortillas}				
## [683]	{soda,	=> {vegetables}	0.1255487	0.7729730	1.045625
##	toilet paper}	=> {vegetables}	0.2897278	0.7728337	1.045437
## [684]	{all- purpose}				
## [685]	{coffee/tea,	=> {vegetables}	0.1194030	0.7727273	1.045293
##	tortillas}				
## [686]	{beef,	=> {vegetables}	0.1194030	0.7727273	1.045293
##	dinner rolls}				
## [687]	{mixes,	=> {vegetables}	0.1132572	0.7724551	1.044924
##	pasta}				
## [688]	{beef,	=> {vegetables}	0.1158911	0.7719298	1.044214
##	pork}				
## [689]	{all- purpose,	=> {vegetables}	0.1123793	0.7710843	1.043070
##	tortillas}				
## [690]	{ketchup,	=> {vegetables}	0.1123793	0.7710843	1.043070
##	tortillas}	=> {vegetables}	0.2835821	0.7708831	1.042798
## [691]	{butter}				
## [692]	{pasta}	=> {vegetables}	0.2862160	0.7706856	1.042531
## [693]	{pasta,				
##	toilet paper}	=> {vegetables}	0.1150132	0.7705882	1.042399
## [694]	{beef,				
##	mixes}	=> {vegetables}	0.1115013	0.7696970	1.041193
## [695]	{juice,				
##	pork}	=> {vegetables}	0.1202809	0.7696629	1.041147
## [696]	{pork,				
##	soda}	=> {vegetables}	0.1141352	0.7692308	1.040563
## [697]	{all- purpose,				
##	shampoo}	=> {vegetables}	0.1167691	0.7687861	1.039961
## [698]	{all- purpose,				
##	butter}	=> {vegetables}	0.1132572	0.7678571	1.038705
## [699]	{tortillas}	=> {vegetables}	0.2835821	0.7672209	1.037844
## [700]	{cereals,				
##	pork}	=> {vegetables}	0.1150132	0.7660819	1.036303
## [701]	{coffee/tea,				
##	ice cream}	=> {vegetables}	0.1264267	0.7659574	1.036135
## [702]	{ice cream,				
##	mixes}	=> {vegetables}	0.1176471	0.7657143	1.035806
## [703]	{toilet paper}	=> {vegetables}	0.2897278	0.7656613	1.035734
## [704]	{sandwich bags,				
##	tortillas}	=> {vegetables}	0.1229148	0.7650273	1.034877

```
## [705] {coffee/tea}          => {vegetables} 0.2897278 0.7638889 1.033337
## [706] {soda,
##      tortillas}             => {vegetables} 0.1185250 0.7627119 1.031744
## [707] {mixes,
##      tortillas}             => {vegetables} 0.1237928 0.7621622 1.031001
## [708] {butter,
##      toilet paper}          => {vegetables} 0.1176471 0.7613636 1.029921
## [709] {pork}                   => {vegetables} 0.2704126 0.7604938 1.028744
## [710] {ice cream}               => {vegetables} 0.3028973 0.7599119 1.027957
## [711] {individual meals}       => {vegetables} 0.2853380 0.7593458 1.027191
## [712] {ice cream,
##      pork}                   => {vegetables} 0.1062335 0.7562500 1.023003
## [713] {pork,
##      tortillas}             => {vegetables} 0.1115013 0.7559524 1.022601
## [714] {pasta,
##      tortillas}             => {vegetables} 0.1150132 0.7528736 1.018436
## [715] {butter,
##      individual meals}       => {vegetables} 0.1106234 0.7500000 1.014549
## [716] {}                        => {vegetables} 0.7392450 0.7392450 1.000000
```

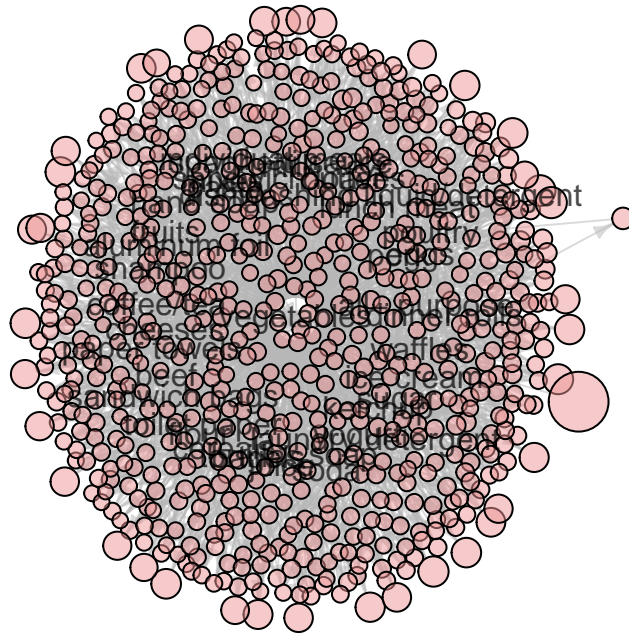
```
rules1_1 <- subset(rules1, !(rhs %in% "vegetables"))
inspect(rules1_1)
```

	lhs	rhs	support	confidence	lift
## [1]	{soda, vegetables}	=> {eggs}	0.1580334	0.5172414	1.326887
## [2]	{dinner rolls, vegetables}	=> {eggs}	0.1562774	0.5071225	1.300929
## [3]	{pasta, vegetables}	=> {eggs}	0.1439860	0.5030675	1.290527
## [4]	{dishwashing liquid/detergent, vegetables}	=> {eggs}	0.1536435	0.5014327	1.286333
## [5]	{lunch meat, vegetables}	=> {waffles}	0.1571554	0.5042254	1.279093
## [6]	{individual meals, vegetables}	=> {lunch meat}	0.1431080	0.5015385	1.269450
## [7]	{mixes, vegetables}	=> {poultry}	0.1562774	0.5281899	1.253351
## [8]	{dinner rolls, vegetables}	=> {poultry}	0.1615452	0.5242165	1.243922
## [9]	{dishwashing liquid/detergent, vegetables}	=> {poultry}	0.1597893	0.5214900	1.237452
## [10]	{sugar, vegetables}	=> {poultry}	0.1518876	0.5103245	1.210957
## [11]	{lunch meat, vegetables}	=> {poultry}	0.1580334	0.5070423	1.203169
## [12]	{dinner rolls}	=> {poultry}	0.1949078	0.5011287	1.189137
## [13]	{sandwich loaves, vegetables}	=> {poultry}	0.1413521	0.5000000	1.186458

```
plot(rules1, method="graph", shading = NA)
```

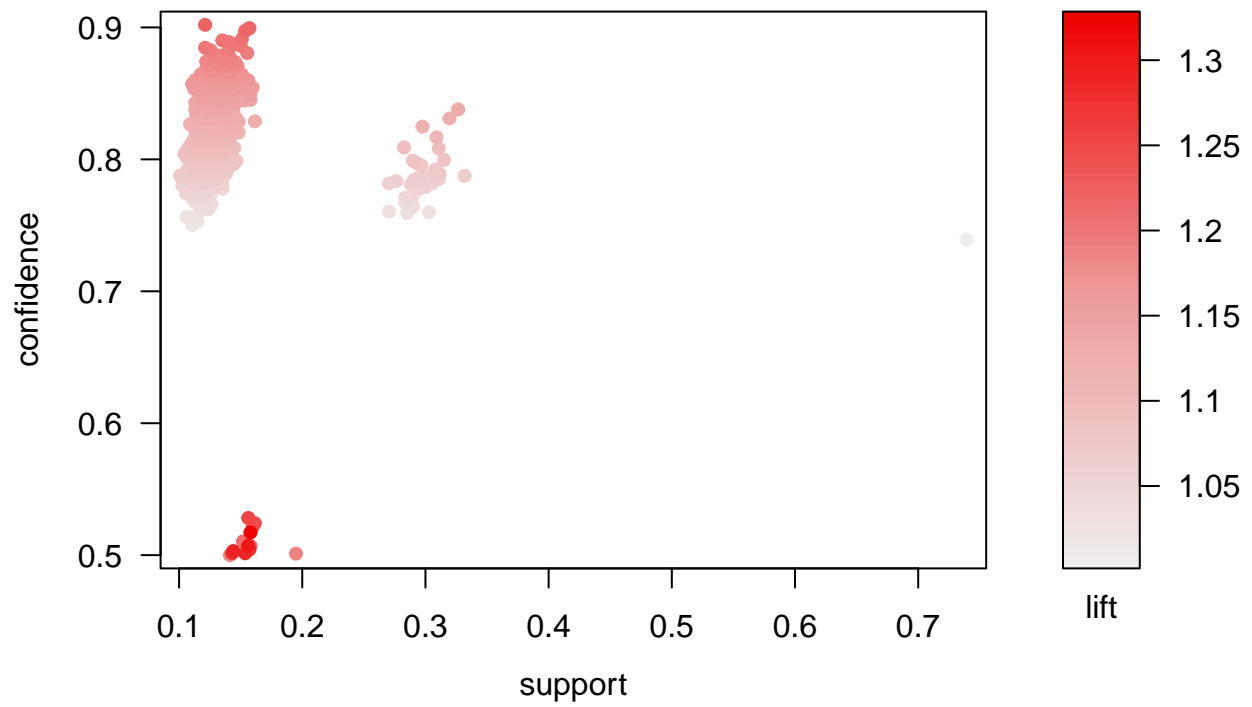
Graph for 716 rules

size: support (0.101 – 0.739)



```
plot(rules1, method="scatter", shading = "lift")
```

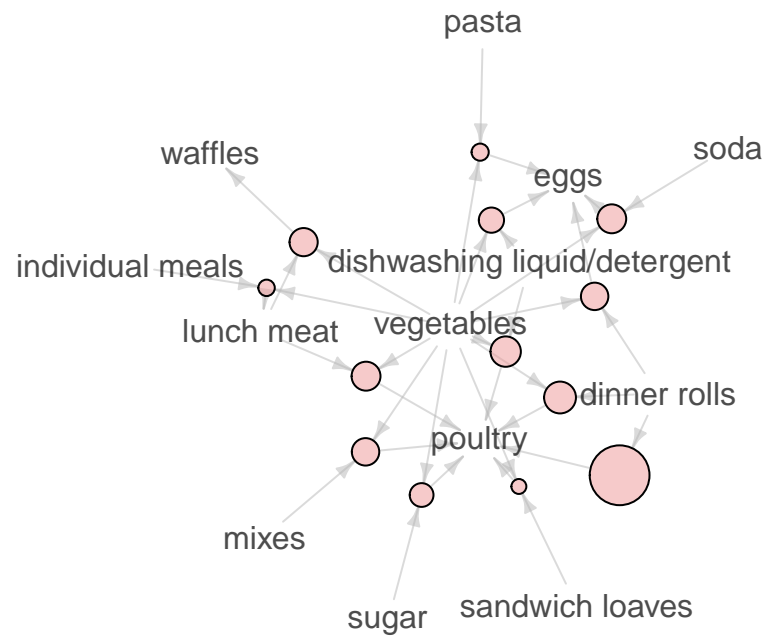
Scatter plot for 716 rules



```
plot(rules1_1, method="graph", shading = NA)
```

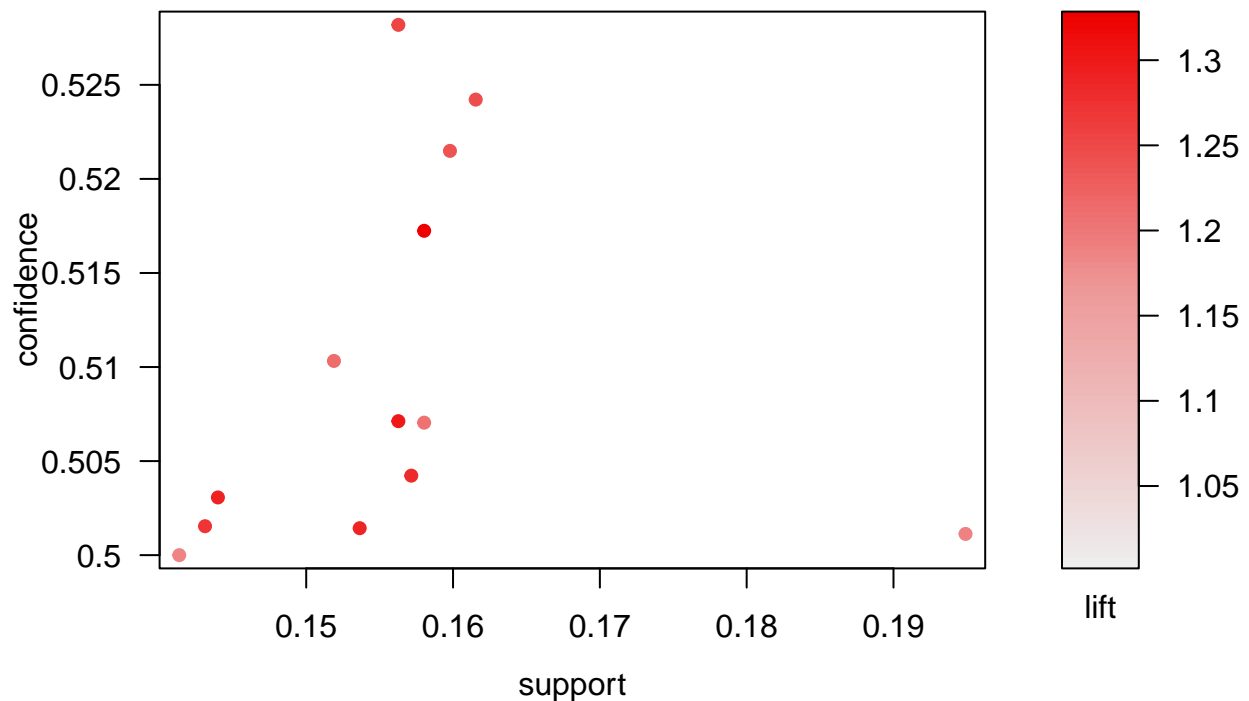
Graph for 13 rules

size: support (0.141 – 0.195)



```
plot(rules1_1, method="scatter", shading = "lift")
```

Scatter plot for 13 rules



Vegetables seems to be present in too many baskets, and seems to be messing with my analysis. So, I will subset my data and remove vegetables from it to see what else I can find.

```
basket2 <- dcast(basket, User ~ Product)
```

```
## Using Month as value column: use value.var to override.
```

```
## Aggregation function missing: defaulting to length
```

```
basket2 <- basket2 %>% select(-c(User,vegetables))
```

```
basket2 <- data.matrix(basket2)
```

```
basket_txn2 <- as(basket2, "itemMatrix")
```

```
## Warning in asMethod(object): matrix contains values other than 0 and 1!
```

```
## Setting all entries != 0 to 1.
```

```
rules2 <- apriori(basket_txn2, parameter = list(support = 0.1, confidence = 0.5))
```

```
## Apriori
```

```
##
```

```
## Parameter specification:
```

```
## confidence minval smax arem aval originalSupport maxtime support minlen
```

```
##          0.5    0.1    1 none FALSE                TRUE     5     0.1    1
```

```
## maxlen target  ext
```

```
##          10 rules FALSE
```

```
##
```

```
## Algorithmic control:
```

```
## filter tree heap memopt load sort verbose
```

```
##      0.1 TRUE TRUE  FALSE TRUE      2      TRUE
##
## Absolute minimum support count: 113
##
## set item appearances ...[0 item(s)] done [0.00s].
## set transactions ...[37 item(s), 1139 transaction(s)] done [0.00s].
## sorting and recoding items ... [37 item(s)] done [0.00s].
## creating transaction tree ... done [0.00s].
## checking subsets of size 1 2 3 done [0.00s].
## writing ... [1 rule(s)] done [0.00s].
## creating S4 object ... done [0.00s].
```

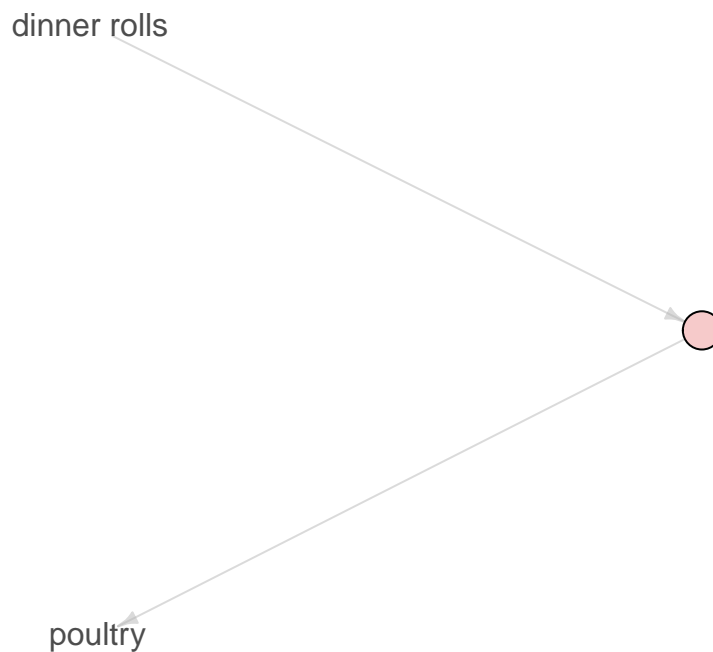
```
rules2 <- sort(rules2, by = "lift", decreasing = TRUE)
inspect(rules2)
```

```
##      lhs              rhs      support  confidence lift
## [1] {dinner rolls} => {poultry} 0.1949078 0.5011287 1.189137
```

```
plot(rules2, method = "graph", shading = NA)
```

Graph for 1 rules

size: support (0.195 – 0.195)



Not much it seems!