In [1]:
```
#Importing the required libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
```

In [2]:
```
#Read the data from the file and display
data = pd.read_csv("store_data.csv", header=None)
data.head()
```

Out[2]:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | shrimp | almonds | avocado | vegetables mix | green grapes | whole weat flour | yams | cottage cheese | energy drink | tomato juice | low fat yogurt |
| **1** | burgers | meatballs | eggs | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN |
| **2** | chutney | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN |
| **3** | turkey | avocado | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN | NaN |
| **4** | mineral water | milk | energy bar | whole wheat rice | green tea | NaN | NaN | NaN | NaN | NaN | NaN |

In [3]:
```
#Returns the data frame shape(rows,columns)
data.shape
```

Out[3]:
```
(7501, 20)
```

In [4]:
```
#Displaying all information of the data frame
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7501 entries, 0 to 7500
Data columns (total 20 columns):
 #   Column  Non-Null Count  Dtype 
---  ------  --------------  ----- 
 0   0       7501 non-null   object
 1   1       5747 non-null   object
 2   2       4389 non-null   object
 3   3       3345 non-null   object
 4   4       2529 non-null   object
 5   5       1864 non-null   object
 6   6       1369 non-null   object
 7   7       981 non-null    object
 8   8       654 non-null    object
 9   9       395 non-null    object
 10  10      256 non-null    object
 11  11      154 non-null    object
 12  12      87 non-null     object
 13  13      47 non-null     object
 14  14      25 non-null     object
 15  15      8 non-null      object
 16  16      4 non-null      object
 17  17      4 non-null      object
 18  18      3 non-null      object
 19  19      1 non-null      object
dtypes: object(20)
memory usage: 1.1+ MB
```

In [5]:
```
#Mask of bool values for each element in DataFrame
#that indicates whether an element is not an NA value
data.isna()
```

Out[5]:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | False | False | False | False | False | False | False | False | False | False | False | False | False | False | False |
| **1** | False | False | False | True | True | True | True | True | True | True | True | True | True | True | True |
| **2** | False | True | True | True | True | True | True | True | True | True | True | True | True | True | True |
| **3** | False | False | True | True | True | True | True | True | True | True | True | True | True | True | True |
| **4** | False | False | False | False | False | True | True | True | True | True | True | True | True | True | True |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **7496** | False | False | False | True | True | True | True | True | True | True | True | True | True | True | True |
| **7497** | False | False | False | False | False | False | True | True | True | True | True | True | True | True | True |
| **7498** | False | True | True | True | True | True | True | True | True | True | True | True | True | True | True |
| **7499** | False | False | True | True | True | True | True | True | True | True | True | True | True | True | True |
| **7500** | False | False | False | False | True | True | True | True | True | True | True | True | True | True | True |

7501 rows × 20 columns

In [6]:
```
data.isna().sum()
```

Out[6]:
```
0        0
1     1754
2     3112
3     4156
4     4972
5     5637
6     6132
7     6520
8     6847
9     7106
10    7245
11    7347
12    7414
13    7454
14    7476
15    7493
16    7497
17    7497
18    7498
19    7500
dtype: int64
```

In [7]:
```
data.describe()
```

Out[7]:

| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **count** | 7501 | 5747 | 4389 | 3345 | 2529 | 1864 | 1369 | 981 | 654 | 395 | 256 | 154 |
| **unique** | 115 | 117 | 115 | 114 | 110 | 106 | 102 | 98 | 88 | 80 | 66 | 50 |
| **top** | mineral water | mineral water | mineral water | mineral water | green tea | french fries | green tea | green tea | green tea | green tea | low fat yogurt | green tea |
| **freq** | 577 | 484 | 375 | 201 | 153 | 107 | 96 | 67 | 57 | 31 | 22 | 15 |

In [8]:
```
#Data is transformed in the form of list for Apriori Algorithm.
transactions = []

for i in range(0,7501):
    transactions.append([str(data.values[i,j])for j in range(0,20) if not pd.isnull
```

In [9]:
```
# importing the required module
from mlxtend.preprocessing import TransactionEncoder
# initializing the transactionEncoder
te = TransactionEncoder()
te_ary = te.fit(transactions).transform(transactions)
dataset = pd.DataFrame(te_ary, columns=te.columns_)
# dataset after encoded
dataset
```

Out[9]:

| | asparagus | almonds | antioxydant juice | asparagus | avocado | babies food | bacon | barbecue sauce | black tea | blu |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | False | True | True | False | True | False | False | False | False | |
| **1** | False | False | False | False | False | False | False | False | False | |
| **2** | False | False | False | False | False | False | False | False | False | |
| **3** | False | False | False | False | True | False | False | False | False | |
| **4** | False | False | False | False | False | False | False | False | False | |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | |
| **7496** | False | False | False | False | False | False | False | False | False | |
| **7497** | False | False | False | False | False | False | False | False | False | |
| **7498** | False | False | False | False | False | False | False | False | False | |
| **7499** | False | False | False | False | False | False | False | False | False | |
| **7500** | False | False | False | False | False | False | False | False | False | |

7501 rows × 120 columns

In [10]:
```
# Importing the required module
from mlxtend.frequent_patterns import apriori, association_rules

# Extracting the most frequest itemsets via Mlxtend.
# The length column has been added to increase ease of filtering.
frequent_itemsets = apriori(dataset, min_support=0.003, use_colnames=True)
frequent_itemsets['length'] = frequent_itemsets['itemsets'].apply(lambda x: len(x))
```

```
# printing the frequent itemset
frequent_itemsets
```

Out[10]:

| | support | itemsets | length |
|---|---|---|---|
| **0** | 0.020397 | (almonds) | 1 |
| **1** | 0.008932 | (antioxydant juice) | 1 |
| **2** | 0.004666 | (asparagus) | 1 |
| **3** | 0.033329 | (avocado) | 1 |
| **4** | 0.004533 | (babies food) | 1 |
| **...** | ... | ... | ... |
| **1438** | 0.003066 | (spaghetti, mineral water, ground beef, pancakes) | 4 |
| **1439** | 0.003066 | (ground beef, spaghetti, mineral water, tomatoes) | 4 |
| **1440** | 0.003333 | (olive oil, spaghetti, milk, mineral water) | 4 |
| **1441** | 0.003066 | (spaghetti, milk, mineral water, shrimp) | 4 |
| **1442** | 0.003333 | (spaghetti, milk, mineral water, tomatoes) | 4 |

1443 rows × 3 columns

In [11]:
```
frequent_itemsets[ (frequent_itemsets['length'] == 1)].head(3)
```

Out[11]:

| | support | itemsets | length |
|---|---|---|---|
| **0** | 0.020397 | (almonds) | 1 |
| **1** | 0.008932 | (antioxydant juice) | 1 |
| **2** | 0.004666 | (asparagus) | 1 |

In [12]:
```
frequent_itemsets[ (frequent_itemsets['length'] == 2)].head(3)
```

Out[12]:

| | support | itemsets | length |
|---|---|---|---|
| **115** | 0.005199 | (burgers, almonds) | 2 |
| **116** | 0.003066 | (almonds, cake) | 2 |
| **117** | 0.005999 | (almonds, chocolate) | 2 |

In [13]:
```
frequent_itemsets[ (frequent_itemsets['length'] == 3)].head(3)
```

Out[13]:

| | support | itemsets | length |
|---|---|---|---|
| **901** | 0.003066 | (chocolate, mineral water, avocado) | 3 |
| **902** | 0.003333 | (milk, mineral water, avocado) | 3 |
| **903** | 0.003333 | (spaghetti, milk, avocado) | 3 |

In [14]:
```
#Applying association rule using apriori algorithm
from apyori import apriori
association_rules = apriori(transactions, min_support = 0.003, min_confidence = 0.2
results = list(association_rules)
print(results)
```

[RelationRecord(items=frozenset({'chicken', 'light cream'}), support=0.004532728969470737, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream'}), items_add=frozenset({'chicken'}), confidence=0.29059829059829057, lift=4.84395061728395)]), RelationRecord(items=frozenset({'mushroom cream sauce', 'escalope'}), support=0.005732568990801226, ordered_statistics=[OrderedStatistic(items_base=frozenset({'mushroom cream sauce'}), items_add=frozenset({'escalope'}), confidence=0.3006993006993007, lift=3.790832696715049)]), RelationRecord(items=frozenset({'escalope', 'pasta'}), support=0.005865884548726837, ordered_statistics=[OrderedStatistic(items_base=frozenset({'pasta'}), items_add=frozenset({'escalope'}), confidence=0.3728813559322034, lift=4.700811850163794)]), RelationRecord(items=frozenset({'fromage blanc', 'honey'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'fromage blanc'}), items_add=frozenset({'honey'}), confidence=0.2450980392156863, lift=5.164270764485569)]), RelationRecord(items=frozenset({'herb & pepper', 'ground beef'}), support=0.015997866951073192, ordered_statistics=[OrderedStatistic(items_base=frozenset({'herb & pepper'}), items_add=frozenset({'ground beef'}), confidence=0.3234501347708895, lift=3.291993841134928 5)]), RelationRecord(items=frozenset({'ground beef', 'tomato sauce'}), support=0.005332622317024397, ordered_statistics=[OrderedStatistic(items_base=frozenset({'tomato sauce'}), items_add=frozenset({'ground beef'}), confidence=0.3773584905660377, lift=3.840659481324083)]), RelationRecord(items=frozenset({'olive oil', 'light cream'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'light cream'}), items_add=frozenset({'olive oil'}), confidence=0.20512820512820515, lift=3.1147098515519573)]), RelationRecord(items=frozenset({'olive oil', 'whole wheat pasta'}), support=0.007998933475536596, ordered_statistics=[OrderedStatistic(items_base=frozenset({'whole wheat pasta'}), items_add=frozenset({'olive oil'}), confidence=0.2714932126696833, lift=4.122410097642296)]), RelationRecord(items=frozenset({'shrimp', 'pasta'}), support=0.005065991201173177, ordered_statistics=[OrderedStatistic(items_base=frozenset({'pasta'}), items_add=frozenset({'shrimp'}), confidence=0.3220338983050847, lift=4.506672147735896)]), RelationRecord(items=frozenset({'spaghetti', 'milk', 'avocado'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'avocado'}), items_add=frozenset({'milk'}), confidence=0.41666666666666663, lift=3.215449245541838)]), RelationRecord(items=frozenset({'burgers', 'milk', 'cake'}), support=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'cake'}), items_add=frozenset({'burgers'}), confidence=0.2799999999999997, lift=3.211437308868501)]), RelationRecord(items=frozenset({'burgers', 'chocolate', 'turkey'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'turkey'}), items_add=frozenset({'burgers'}), confidence=0.27058823529411763, lift=3.1034898363014927)]), RelationRecord(items=frozenset({'burgers', 'milk', 'turkey'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'turkey'}), items_add=frozenset({'burgers'}), confidence=0.2823529411764706, lift=3.2384241770102533)]), RelationRecord(items=frozenset({'frozen vegetables', 'tomatoes', 'cake'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'frozen vegetables', 'cake'}), items_add=frozenset({'tomatoes'}), confidence=0.2987012987012987, lift=4.367560314928736), OrderedStatistic(items_base=frozenset({'tomatoes', 'cake'}), items_add=frozenset({'frozen vegetables'}), confidence=0.36507936507936506, lift=3.8300144300144296)]), RelationRecord(items=frozenset({'cereals', 'spaghetti', 'ground beef'}), support=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=frozenset({'cereals', 'ground beef'}), items_add=frozenset({'spaghetti'}), confidence=0.6764705882352942, lift=3.8853031258445188), OrderedStatistic(items_base=frozenset({'cereals', 'spaghetti'}), items_add=frozenset({'ground beef'}), confidence=0.45999999999999996, lift=4.681763907734057)]), RelationRecord(items=frozenset({'chicken', 'milk', 'ground beef'}), support=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chicken', 'ground beef'}), items_add=frozenset({'milk'}), confidence=0.40845070422535207, lift=3.152046020981858)]), RelationRecord(items=frozenset({'chicken', 'milk', 'olive oil'}), support=0.0035995200639914677, ordered_statistics=[OrderedStatistic(items_base=frozenset({'chicken', 'milk'}), items_add=frozenset({'olive oil'}), confidence=0.24324324324324323, lift=3.693456614509246), OrderedStatistic(items_base=frozenset({'chicken', 'olive oil'}), items_add=frozenset({'milk'}), confidence=0.5, lift=3.858539094650206), OrderedStatistic(items_base=frozenset({'olive oil', 'milk'}), items_add=frozenset({'chicken'}), confidence=0.2109375, lift=3.51609375)]), RelationRecord(items=frozenset({'chicken', 'spaghetti', 'olive oil'}), s

upport=0.0034662045060658577, ordered_statistics=[OrderedStatistic(items_base=froz
enset({'chicken', 'spaghetti'}), items_add=frozenset({'olive oil'}), confidence=0.
20155038759689922, lift=3.0603835169318647)]), RelationRecord(items=frozenset({'ch
ocolate', 'shrimp', 'frozen vegetables'}), support=0.005332622317024397, ordered_s
tatistics=[OrderedStatistic(items_base=frozenset({'chocolate', 'frozen vegetable
s'}), items_add=frozenset({'shrimp'}), confidence=0.23255813953488375, lift=3.2545
123221103784), OrderedStatistic(items_base=frozenset({'chocolate', 'shrimp'}), ite
ms_add=frozenset({'frozen vegetables'}), confidence=0.29629629629629634, lift=3.10
84175084175087)]), RelationRecord(items=frozenset({'chocolate', 'herb & pepper',
'ground beef'}), support=0.003999466737768298, ordered_statistics=[OrderedStatisti
c(items_base=frozenset({'chocolate', 'herb & pepper'}), items_add=frozenset({'grou
nd beef'}), confidence=0.4411764705882354, lift=4.4901827759597746)]), RelationRec
ord(items=frozenset({'milk', 'soup', 'chocolate'}), support=0.003999466737768298,
ordered_statistics=[OrderedStatistic(items_base=frozenset({'soup', 'chocolate'}),
items_add=frozenset({'milk'}), confidence=0.3947368421052632, lift=3.0462150747238
472)]), RelationRecord(items=frozenset({'spaghetti', 'cooking oil', 'ground bee
f'}), support=0.004799360085321957, ordered_statistics=[OrderedStatistic(items_bas
e=frozenset({'cooking oil', 'ground beef'}), items_add=frozenset({'spaghetti'}), c
onfidence=0.5714285714285714, lift=3.2819951870487856), OrderedStatistic(items_bas
e=frozenset({'spaghetti', 'cooking oil'}), items_add=frozenset({'ground beef'}), c
onfidence=0.3025210084033613, lift=3.0789824749438446)]), RelationRecord(items=fro
zenset({'eggs', 'herb & pepper', 'ground beef'}), support=0.0041327822956939075, o
rdered_statistics=[OrderedStatistic(items_base=frozenset({'eggs', 'ground beef'}),
items_add=frozenset({'herb & pepper'}), confidence=0.2066666666666667, lift=4.1784
54627133872), OrderedStatistic(items_base=frozenset({'eggs', 'herb & pepper'}), it
ems_add=frozenset({'ground beef'}), confidence=0.3297872340425532, lift=3.35649123
81997174)]), RelationRecord(items=frozenset({'eggs', 'spaghetti', 'red wine'}), su
pport=0.0037328356219170776, ordered_statistics=[OrderedStatistic(items_base=froze
nset({'eggs', 'red wine'}), items_add=frozenset({'spaghetti'}), confidence=0.52830
18867924528, lift=3.0342974370828397)]), RelationRecord(items=frozenset({'herb & p
epper', 'ground beef', 'french fries'}), support=0.003199573390214638, ordered_sta
tistics=[OrderedStatistic(items_base=frozenset({'ground beef', 'french fries'}), i
tems_add=frozenset({'herb & pepper'}), confidence=0.23076923076923078, lift=4.6657
68194070081), OrderedStatistic(items_base=frozenset({'herb & pepper', 'french frie
s'}), items_add=frozenset({'ground beef'}), confidence=0.46153846153846156, lift=
4.697421981004071)]), RelationRecord(items=frozenset({'green tea', 'frozen vegetab
les', 'tomatoes'}), support=0.003332888948140248, ordered_statistics=[OrderedStati
stic(items_base=frozenset({'green tea', 'frozen vegetables'}), items_add=frozenset
({'tomatoes'}), confidence=0.2314814814814815, lift=3.38468341635983)]), RelationR
ecord(items=frozenset({'spaghetti', 'frozen vegetables', 'ground beef'}), support=
0.008665511265164644, ordered_statistics=[OrderedStatistic(items_base=frozenset
({'spaghetti', 'frozen vegetables'}), items_add=frozenset({'ground beef'}), confid
ence=0.31100478468899523, lift=3.165328208890303)]), RelationRecord(items=frozense
t({'milk', 'olive oil', 'frozen vegetables'}), support=0.004799360085321957, order
ed_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'frozen vegetable
s'}), items_add=frozenset({'olive oil'}), confidence=0.20338983050847456, lift=3.0
88314005352364), OrderedStatistic(items_base=frozenset({'olive oil', 'frozen veget
ables'}), items_add=frozenset({'milk'}), confidence=0.4235294117647058, lift=3.268
4095860566447)]), RelationRecord(items=frozenset({'milk', 'soup', 'frozen vegetabl
es'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_ba
se=frozenset({'soup', 'frozen vegetables'}), items_add=frozenset({'milk'}), confid
ence=0.5, lift=3.858539094650206)]), RelationRecord(items=frozenset({'milk', 'froz
en vegetables', 'tomatoes'}), support=0.0041327822956939075, ordered_statistics=[O
rderedStatistic(items_base=frozenset({'milk', 'tomatoes'}), items_add=frozenset
({'frozen vegetables'}), confidence=0.29523809523809524, lift=3.097316017316017
2)]), RelationRecord(items=frozenset({'frozen vegetables', 'mineral water', 'shrim
p'}), support=0.007199040127982935, ordered_statistics=[OrderedStatistic(items_bas
e=frozenset({'mineral water', 'shrimp'}), items_add=frozenset({'frozen vegetable
s'}), confidence=0.30508474576271183, lift=3.200616332819722)]), RelationRecord(it
ems=frozenset({'olive oil', 'spaghetti', 'frozen vegetables'}), support=0.00573256
8990801226, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghett
i', 'frozen vegetables'}), items_add=frozenset({'olive oil'}), confidence=0.205741
62679425836, lift=3.1240241752707125)]), RelationRecord(items=frozenset({'spaghett
i', 'frozen vegetables', 'shrimp'}), support=0.005999200106652446, ordered_statist

```
ics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'frozen vegetables'}), it
ems_add=frozenset({'shrimp'}), confidence=0.21531100478468898, lift=3.013148968078
2684)]), RelationRecord(items=frozenset({'frozen vegetables', 'shrimp', 'tomatoe
s'}), support=0.003999466737768298, ordered_statistics=[OrderedStatistic(items_bas
e=frozenset({'frozen vegetables', 'shrimp'}), items_add=frozenset({'tomatoes'}), c
onfidence=0.24000000000000002, lift=3.5092397660818717), OrderedStatistic(items_ba
se=frozenset({'frozen vegetables', 'tomatoes'}), items_add=frozenset({'shrimp'}),
confidence=0.2479338842975207, lift=3.4696866905143704), OrderedStatistic(items_ba
se=frozenset({'shrimp', 'tomatoes'}), items_add=frozenset({'frozen vegetables'}),
confidence=0.35714285714285715, lift=3.7467532467532467)]), RelationRecord(items=f
rozenset({'spaghetti', 'frozen vegetables', 'tomatoes'}), support=0.00666577789628
0496, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghetti', 'fro
zen vegetables'}), items_add=frozenset({'tomatoes'}), confidence=0.239234449760765
58, lift=3.4980460188216425), OrderedStatistic(items_base=frozenset({'spaghetti',
'tomatoes'}), items_add=frozenset({'frozen vegetables'}), confidence=0.31847133757
96179, lift=3.341053850607991)]), RelationRecord(items=frozenset({'spaghetti', 'gr
ound beef', 'grated cheese'}), support=0.005332622317024397, ordered_statistics=[O
rderedStatistic(items_base=frozenset({'spaghetti', 'grated cheese'}), items_add=fr
ozenset({'ground beef'}), confidence=0.3225806451612903, lift=3.28314439532542
6)]), RelationRecord(items=frozenset({'green tea', 'tomatoes', 'ground beef'}), su
pport=0.0030662578322890282, ordered_statistics=[OrderedStatistic(items_base=froze
nset({'green tea', 'ground beef'}), items_add=frozenset({'tomatoes'}), confidence=
0.2072072072072072, lift=3.0297490472929067)]), RelationRecord(items=frozenset({'m
ilk', 'herb & pepper', 'ground beef'}), support=0.0035995200639914677, ordered_sta
tistics=[OrderedStatistic(items_base=frozenset({'milk', 'herb & pepper'}), items_a
dd=frozenset({'ground beef'}), confidence=0.3913043478260869, lift=3.9825968969382
335)]), RelationRecord(items=frozenset({'mineral water', 'herb & pepper', 'ground
beef'}), support=0.006665777896280496, ordered_statistics=[OrderedStatistic(items_
base=frozenset({'mineral water', 'herb & pepper'}), items_add=frozenset({'ground b
eef'}), confidence=0.39062500000000006, lift=3.975682666214383)]), RelationRecord
(items=frozenset({'spaghetti', 'herb & pepper', 'ground beef'}), support=0.0063991
46780429276, ordered_statistics=[OrderedStatistic(items_base=frozenset({'spaghett
i', 'herb & pepper'}), items_add=frozenset({'ground beef'}), confidence=0.39344262
29508197, lift=4.004359721511667)]), RelationRecord(items=frozenset({'olive oil',
'milk', 'ground beef'}), support=0.004932675643247567, ordered_statistics=[Ordered
Statistic(items_base=frozenset({'milk', 'ground beef'}), items_add=frozenset({'oli
ve oil'}), confidence=0.22424242424242427, lift=3.40494417862839)]), RelationRecor
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confidence=0.5750000000000001, lift=3.3025076569678413), OrderedStatistic(items_ba
se=frozenset({'spaghetti', 'tomato sauce'}), items_add=frozenset({'ground beef'}),
confidence=0.4893617021276596, lift=4.980599901844742)]), RelationRecord(items=fro
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lift=3.4345238095238098)]), RelationRecord(items=frozenset({'olive oil', 'milk',
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t({'soup'}), confidence=0.2109375, lift=4.174781497361478), OrderedStatistic(items
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68656, lift=3.1098673300165833)]), RelationRecord(items=frozenset({'olive oil', 's
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istic(items_base=frozenset({'spaghetti', 'milk'}), items_add=frozenset({'olive oi
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54546, lift=3.5077628133183696)]), RelationRecord(items=frozenset({'olive oil', 's
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live oil'}), confidence=0.22543352601156072, lift=3.4230301186492245)]), RelationR
ecord(items=frozenset({'olive oil', 'whole wheat pasta', 'mineral water'}), suppor
t=0.0038661511798426876, ordered_statistics=[OrderedStatistic(items_base=frozenset
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'ground beef'}), support=0.003999466737768298, ordered_statistics=[OrderedStatisti
c(items_base=frozenset({'eggs', 'ground beef'}), items_add=frozenset({'chocolate',
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d=frozenset({'ground beef'}), confidence=0.29702970297029707, lift=3.0230933541115
31)]), RelationRecord(items=frozenset({'chocolate', 'mineral water', 'ground bee
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edStatistic(items_base=frozenset({'chocolate', 'mineral water', 'frozen vegetable
s'}), items_add=frozenset({'ground beef'}), confidence=0.34246575342465757, lift=
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water', 'ground beef'}), items_add=frozenset({'frozen vegetables'}), confidence=0.
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ce=0.5348837209302326, lift=3.0721001460165964), OrderedStatistic(items_base=froze
nset({'spaghetti', 'chocolate', 'frozen vegetables'}), items_add=frozenset({'groun
d beef'}), confidence=0.3898305084745763, lift=3.967596531978015), OrderedStatisti
c(items_base=frozenset({'spaghetti', 'chocolate', 'ground beef'}), items_add=froze
nset({'frozen vegetables'}), confidence=0.33333333333333337, lift=3.49696969696969
75)]), RelationRecord(items=frozenset({'milk', 'chocolate', 'mineral water', 'froz
en vegetables'}), support=0.003999466737768298, ordered_statistics=[OrderedStatist
ic(items_base=frozenset({'chocolate', 'mineral water', 'frozen vegetables'}), item
s_add=frozenset({'milk'}), confidence=0.4109589041095891, lift=3.171401995602909
4)]), RelationRecord(items=frozenset({'milk', 'spaghetti', 'chocolate', 'frozen ve
getables'}), support=0.0034662045060658577, ordered_statistics=[OrderedStatistic(i
tems_base=frozenset({'spaghetti', 'chocolate', 'frozen vegetables'}), items_add=fr

```
ozenset({'milk'}), confidence=0.44067796610169485, lift=3.4007463207086555), Order
edStatistic(items_base=frozenset({'milk', 'spaghetti', 'chocolate'}), items_add=fr
ozenset({'frozen vegetables'}), confidence=0.3170731707317073, lift=3.326385809312
6384)]), RelationRecord(items=frozenset({'chocolate', 'mineral water', 'shrimp',
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items_add=frozenset({'shrimp'}), confidence=0.32876712328767127, lift=4.6008996115
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mp'}), items_add=frozenset({'frozen vegetables'}), confidence=0.4210526315789474,
lift=4.417224880382776)]), RelationRecord(items=frozenset({'olive oil', 'spaghett
i', 'chocolate', 'mineral water'}), support=0.0038661511798426876, ordered_statist
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66, lift=3.700353825740822)]), RelationRecord(items=frozenset({'spaghetti', 'choco
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er'}), items_add=frozenset({'shrimp'}), confidence=0.21848739495798317, lift=3.057
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5)]), RelationRecord(items=frozenset({'spaghetti', 'milk', 'mineral water', 'froze
n smoothie'}), support=0.003199573390214638, ordered_statistics=[OrderedStatistic
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i', 'mineral water'}), confidence=0.22429906542056074, lift=3.7555073431241657), O
rderedStatistic(items_base=frozenset({'spaghetti', 'frozen smoothie'}), items_add=
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k', 'mineral water'}), items_add=frozenset({'frozen smoothie'}), confidence=0.2033
898305084746, lift=3.211846565566459)]), RelationRecord(items=frozenset({'milk',
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k'}), confidence=0.40579710144927533, lift=3.1315679608755294), OrderedStatistic(i
tems_base=frozenset({'milk', 'frozen vegetables', 'mineral water'}), items_add=fro
zenset({'ground beef'}), confidence=0.3373493975903614, lift=3.4334570302921317),
OrderedStatistic(items_base=frozenset({'milk', 'mineral water', 'ground beef'}), i
tems_add=frozenset({'frozen vegetables'}), confidence=0.3373493975903614, lift=3.5
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eredStatistic(items_base=frozenset({'milk', 'frozen vegetables', 'ground beef'}),
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60165964), OrderedStatistic(items_base=frozenset({'milk', 'spaghetti', 'frozen veg
etables'}), items_add=frozenset({'ground beef'}), confidence=0.3709677419354839, l
ift=3.7756160546242397), OrderedStatistic(items_base=frozenset({'spaghetti', 'mil
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({'ground beef'}), confidence=0.3666666666666667, lift=3.7318407960199007)]), Rela
tionRecord(items=frozenset({'milk', 'olive oil', 'frozen vegetables', 'mineral wat
er'}), support=0.003332888948140248, ordered_statistics=[OrderedStatistic(items_ba
se=frozenset({'olive oil', 'frozen vegetables'}), items_add=frozenset({'milk', 'mi
neral water'}), confidence=0.29411764705882354, lift=6.12826797385621), OrderedSta
tistic(items_base=frozenset({'milk', 'frozen vegetables', 'mineral water'}), items
```

```
_add=frozenset({'olive oil'}), confidence=0.30120481927710846, lift=4.573557387444
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neral water'}), items_add=frozenset({'milk'}), confidence=0.5102040816326531, lift
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3, lift=7.987175925925926), OrderedStatistic(items_base=frozenset({'soup', 'mil
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dStatistic(items_base=frozenset({'soup', 'milk', 'mineral water'}), items_add=froz
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553)]), RelationRecord(items=frozenset({'milk', 'spaghetti', 'frozen vegetables',
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6)]), RelationRecord(items=frozenset({'spaghetti', 'frozen vegetables', 'mineral w
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nd beef'}), items_add=frozenset({'spaghetti', 'mineral water'}), confidence=0.2613
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omatoes', 'mineral water', 'ground beef'}), items_add=frozenset({'spaghetti'}), co
nfidence=0.5609756097560976, lift=3.221958689724723), OrderedStatistic(items_base=
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d beef'}), confidence=0.32857142857142857, lift=3.344117076952898)]), RelationReco
rd(items=frozenset({'olive oil', 'spaghetti', 'milk', 'mineral water'}), support=
```

```
0.003332888948140248, ordered_statistics=[OrderedStatistic(items_base=frozenset
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t({'spaghetti', 'milk', 'mineral water', 'tomatoes'}), support=0.00333288894814024
8, ordered_statistics=[OrderedStatistic(items_base=frozenset({'milk', 'tomatoe
s'}), items_add=frozenset({'spaghetti', 'mineral water'}), confidence=0.2380952380
952381, lift=3.9865008503401365), OrderedStatistic(items_base=frozenset({'spaghett
i', 'milk', 'mineral water'}), items_add=frozenset({'tomatoes'}), confidence=0.211
864406779661, lift=3.0978458387022165)])]
```

In [15]:
```
print("There are {} Relations derived.".format(len(results)))
```

```
There are 80 Relations derived.
```

In [16]:
```
#Generating the rules
for item in results:
    # first index of the inner list
    # Contains base item and add item
    pair = item[0]
    items = [x for x in pair]
    print("Rule: " + items[0] + " -> " + items[1])

    # second index of the inner list
    print("Support: " + str(item[1]))

    # third index of the list located at 0th
    # of the third index of the inner list

    print("Confidence: " + str(item[2][0][2]))
    print("Lift: " + str(item[2][0][3]))
    print("=====================================")
```

```
Rule: chicken -> light cream
Support: 0.004532728969470737
Confidence: 0.29059829059829057
Lift: 4.84395061728395
====================================
Rule: mushroom cream sauce -> escalope
Support: 0.005732568990801226
Confidence: 0.3006993006993007
Lift: 3.790832696715049
====================================
Rule: escalope -> pasta
Support: 0.005865884548726837
Confidence: 0.3728813559322034
Lift: 4.700811850163794
====================================
Rule: fromage blanc -> honey
Support: 0.003332888948140248
Confidence: 0.2450980392156863
Lift: 5.164270764485569
====================================
Rule: herb & pepper -> ground beef
Support: 0.015997866951073192
Confidence: 0.3234501347708895
Lift: 3.2919938411349285
====================================
Rule: ground beef -> tomato sauce
Support: 0.005332622317024397
Confidence: 0.3773584905660377
Lift: 3.840659481324083
====================================
Rule: olive oil -> light cream
Support: 0.003199573390214638
Confidence: 0.20512820512820515
Lift: 3.1147098515519573
====================================
Rule: olive oil -> whole wheat pasta
Support: 0.007998933475536596
Confidence: 0.2714932126696833
Lift: 4.122410097642296
====================================
Rule: shrimp -> pasta
Support: 0.005065991201173177
Confidence: 0.3220338983050847
Lift: 4.506672147735896
====================================
Rule: spaghetti -> milk
Support: 0.003332888948140248
Confidence: 0.41666666666666663
Lift: 3.215449245541838
====================================
Rule: burgers -> milk
Support: 0.0037328356219170776
Confidence: 0.27999999999999997
Lift: 3.211437308868501
====================================
Rule: burgers -> chocolate
Support: 0.0030662578322890282
Confidence: 0.27058823529411763
Lift: 3.1034898363014927
====================================
Rule: burgers -> milk
Support: 0.003199573390214638
Confidence: 0.2823529411764706
Lift: 3.2384241770102533
```

```
====================================
Rule: frozen vegetables -> tomatoes
Support: 0.0030662578322890282
Confidence: 0.2987012987012987
Lift: 4.367560314928736
====================================
Rule: cereals -> spaghetti
Support: 0.0030662578322890282
Confidence: 0.6764705882352942
Lift: 3.8853031258445188
====================================
Rule: chicken -> milk
Support: 0.0038661511798426876
Confidence: 0.40845070422535207
Lift: 3.152046020981858
====================================
Rule: chicken -> milk
Support: 0.0035995200639914677
Confidence: 0.24324324324324323
Lift: 3.693456614509246
====================================
Rule: chicken -> spaghetti
Support: 0.0034662045060658577
Confidence: 0.20155038759689922
Lift: 3.0603835169318647
====================================
Rule: chocolate -> shrimp
Support: 0.005332622317024397
Confidence: 0.23255813953488375
Lift: 3.2545123221103784
====================================
Rule: chocolate -> herb & pepper
Support: 0.003999466737768298
Confidence: 0.4411764705882354
Lift: 4.4901827759597746
====================================
Rule: milk -> soup
Support: 0.003999466737768298
Confidence: 0.3947368421052632
Lift: 3.0462150747238472
====================================
Rule: spaghetti -> cooking oil
Support: 0.004799360085321957
Confidence: 0.5714285714285714
Lift: 3.2819951870487856
====================================
Rule: eggs -> herb & pepper
Support: 0.0041327822956939075
Confidence: 0.2066666666666667
Lift: 4.178454627133872
====================================
Rule: eggs -> spaghetti
Support: 0.0037328356219170776
Confidence: 0.5283018867924528
Lift: 3.0342974370828397
====================================
Rule: herb & pepper -> ground beef
Support: 0.003199573390214638
Confidence: 0.23076923076923078
Lift: 4.665768194070081
====================================
Rule: green tea -> frozen vegetables
Support: 0.003332888948140248
Confidence: 0.2314814814814815
```

```
Lift: 3.38468341635983
====================================
Rule: spaghetti -> frozen vegetables
Support: 0.008665511265164644
Confidence: 0.31100478468899523
Lift: 3.165328208890303
====================================
Rule: milk -> olive oil
Support: 0.004799360085321957
Confidence: 0.20338983050847456
Lift: 3.088314005352364
====================================
Rule: milk -> soup
Support: 0.003999466737768298
Confidence: 0.5
Lift: 3.858539094650206
====================================
Rule: milk -> frozen vegetables
Support: 0.0041327822956939075
Confidence: 0.29523809523809524
Lift: 3.0973160173160172
====================================
Rule: frozen vegetables -> mineral water
Support: 0.007199040127982935
Confidence: 0.30508474576271183
Lift: 3.200616332819722
====================================
Rule: olive oil -> spaghetti
Support: 0.005732568990801226
Confidence: 0.20574162679425836
Lift: 3.1240241752707125
====================================
Rule: spaghetti -> frozen vegetables
Support: 0.005999200106652446
Confidence: 0.21531100478468898
Lift: 3.0131489680782684
====================================
Rule: frozen vegetables -> shrimp
Support: 0.003999466737768298
Confidence: 0.24000000000000002
Lift: 3.5092397660818717
====================================
Rule: spaghetti -> frozen vegetables
Support: 0.006665777896280496
Confidence: 0.23923444976076558
Lift: 3.4980460188216425
====================================
Rule: spaghetti -> ground beef
Support: 0.005332622317024397
Confidence: 0.3225806451612903
Lift: 3.283144395325426
====================================
Rule: green tea -> tomatoes
Support: 0.0030662578322890282
Confidence: 0.2072072072072072
Lift: 3.0297490472929067
====================================
Rule: milk -> herb & pepper
Support: 0.0035995200639914677
Confidence: 0.3913043478260869
Lift: 3.9825968969382335
====================================
Rule: mineral water -> herb & pepper
Support: 0.006665777896280496
```

```
Confidence: 0.39062500000000006
Lift: 3.975682666214383
====================================
Rule: spaghetti -> herb & pepper
Support: 0.006399146780429276
Confidence: 0.3934426229508197
Lift: 4.004359721511667
====================================
Rule: olive oil -> milk
Support: 0.004932675643247567
Confidence: 0.22424242424242427
Lift: 3.40494417862839
====================================
Rule: soup -> milk
Support: 0.003999466737768298
Confidence: 0.4109589041095891
Lift: 3.1714019956029094
====================================
Rule: spaghetti -> ground beef
Support: 0.003332888948140248
Confidence: 0.33783783783783783
Lift: 3.4384282518610876
====================================
Rule: spaghetti -> shrimp
Support: 0.005999200106652446
Confidence: 0.5232558139534884
Lift: 3.005315360233627
====================================
Rule: spaghetti -> ground beef
Support: 0.0030662578322890282
Confidence: 0.2169811320754717
Lift: 5.535970992170453
====================================
Rule: light cream -> mineral water
Support: 0.003199573390214638
Confidence: 0.20512820512820515
Lift: 3.4345238095238098
====================================
Rule: olive oil -> milk
Support: 0.003199573390214638
Confidence: 0.3934426229508197
Lift: 3.0362274843149164
====================================
Rule: olive oil -> soup
Support: 0.0035995200639914677
Confidence: 0.2109375
Lift: 4.174781497361478
====================================
Rule: olive oil -> spaghetti
Support: 0.007199040127982935
Confidence: 0.20300751879699247
Lift: 3.0825089038385434
====================================
Rule: soup -> milk
Support: 0.0030662578322890282
Confidence: 0.21904761904761905
Lift: 4.335293378565146
====================================
Rule: whole wheat pasta -> spaghetti
Support: 0.003999466737768298
Confidence: 0.4545454545454546
Lift: 3.5077628133183696
====================================
Rule: olive oil -> soup
```

```
Support: 0.005199306759098787
Confidence: 0.22543352601156072
Lift: 3.4230301186492245
====================================
Rule: olive oil -> whole wheat pasta
Support: 0.0038661511798426876
Confidence: 0.4027777777777778
Lift: 6.115862573099416
====================================
Rule: olive oil -> spaghetti
Support: 0.005065991201173177
Confidence: 0.20105820105820105
Lift: 3.0529100529100526
====================================
Rule: olive oil -> spaghetti
Support: 0.004399413411545127
Confidence: 0.6111111111111112
Lift: 3.5099115194827295
====================================
Rule: spaghetti -> whole wheat rice
Support: 0.0030662578322890282
Confidence: 0.2169811320754717
Lift: 3.1726617382029496
====================================
Rule: eggs -> chocolate
Support: 0.003999466737768298
Confidence: 0.20000000000000004
Lift: 3.7979746835443047
====================================
Rule: chocolate -> mineral water
Support: 0.003332888948140248
Confidence: 0.34246575342465757
Lift: 3.4855300087358976
====================================
Rule: spaghetti -> chocolate
Support: 0.0030662578322890282
Confidence: 0.5348837209302326
Lift: 3.0721001460165964
====================================
Rule: milk -> chocolate
Support: 0.003999466737768298
Confidence: 0.4109589041095891
Lift: 3.1714019956029094
====================================
Rule: milk -> spaghetti
Support: 0.0034662045060658577
Confidence: 0.44067796610169485
Lift: 3.4007463207086555
====================================
Rule: chocolate -> mineral water
Support: 0.003199573390214638
Confidence: 0.32876712328767127
Lift: 4.600899611531385
====================================
Rule: olive oil -> spaghetti
Support: 0.0038661511798426876
Confidence: 0.23577235772357724
Lift: 3.947608159117306
====================================
Rule: spaghetti -> chocolate
Support: 0.0034662045060658577
Confidence: 0.21848739495798317
Lift: 3.0576006522011783
====================================
```

```
Rule: milk -> eggs
Support: 0.0037328356219170776
Confidence: 0.411764705882353
Lift: 3.177620430888405
====================================
Rule: spaghetti -> milk
Support: 0.003199573390214638
Confidence: 0.22429906542056074
Lift: 3.7555073431241657
====================================
Rule: milk -> frozen vegetables
Support: 0.0037328356219170776
Confidence: 0.22047244094488186
Lift: 4.593788276465442
====================================
Rule: milk -> spaghetti
Support: 0.0030662578322890282
Confidence: 0.5348837209302326
Lift: 3.0721001460165964
====================================
Rule: spaghetti -> frozen vegetables
Support: 0.004399413411545127
Confidence: 0.25984251968503935
Lift: 4.350622187851519
====================================
Rule: milk -> olive oil
Support: 0.003332888948140248
Confidence: 0.29411764705882354
Lift: 6.12826797385621
====================================
Rule: milk -> soup
Support: 0.0030662578322890282
Confidence: 0.3833333333333333
Lift: 7.987175925925926
====================================
Rule: milk -> spaghetti
Support: 0.004532728969470737
Confidence: 0.28813559322033894
Lift: 3.0228043143297376
====================================
Rule: spaghetti -> frozen vegetables
Support: 0.003332888948140248
Confidence: 0.2
Lift: 3.3486607142857148
====================================
Rule: spaghetti -> frozen vegetables
Support: 0.0030662578322890282
Confidence: 0.2555555555555556
Lift: 3.7366904916612524
====================================
Rule: spaghetti -> milk
Support: 0.004399413411545127
Confidence: 0.2
Lift: 3.3486607142857148
====================================
Rule: olive oil -> spaghetti
Support: 0.0030662578322890282
Confidence: 0.2169811320754717
Lift: 3.63298096361186
====================================
Rule: spaghetti -> mineral water
Support: 0.0030662578322890282
Confidence: 0.21100917431192662
Lift: 3.532990661861075
```

```
====================================
Rule: tomatoes -> spaghetti
Support: 0.0030662578322890282
Confidence: 0.26136363636363635
Lift: 4.3760907061688314
====================================
Rule: olive oil -> spaghetti
Support: 0.003332888948140248
Confidence: 0.211864406779661
Lift: 3.216993755575379
====================================
Rule: spaghetti -> milk
Support: 0.003332888948140248
Confidence: 0.2380952380952381
Lift: 3.9865008503401365
====================================
```

In [17]:
```
#Display the result in the tabular form as a dataframe
def inspect(results):
    lhs         = [tuple(result[2][0][0])[0] for result in results]
    rhs         = [tuple(result[2][0][1])[0] for result in results]
    supports    = [result[1] for result in results]
    confidences = [result[2][0][2] for result in results]
    lifts       = [result[2][0][3] for result in results]
    return list(zip(lhs, rhs, supports, confidences, lifts))
resultsinDataFrame  = pd.DataFrame(inspect(results), columns = ['Antecedents', 'Cor
```

In [18]:
```
print(resultsinDataFrame)
```

```
             Antecedents  Consequents   Support  Confidence      Lift
0            light cream      chicken  0.004533    0.290598  4.843951
1   mushroom cream sauce     escalope  0.005733    0.300699  3.790833
2                  pasta     escalope  0.005866    0.372881  4.700812
3          fromage blanc        honey  0.003333    0.245098  5.164271
4          herb & pepper  ground beef  0.015998    0.323450  3.291994
..                   ...          ...       ...         ...       ...
75            olive oil    spaghetti  0.003066    0.216981  3.632981
76             pancakes    spaghetti  0.003066    0.211009  3.532991
77             tomatoes    spaghetti  0.003066    0.261364  4.376091
78            spaghetti    olive oil  0.003333    0.211864  3.216994
79                 milk    spaghetti  0.003333    0.238095  3.986501

[80 rows x 5 columns]
```

In [19]:
```
#Sorting the data by confidence value
sorted_df = resultsinDataFrame.sort_values(by=['Confidence'], ascending=False)
print(sorted_df)
```

```
          Antecedents Consequents   Support  Confidence      Lift
14            cereals   spaghetti  0.003066    0.676471  3.885303
54          olive oil   spaghetti  0.004399    0.611111  3.509912
21        cooking oil   spaghetti  0.004799    0.571429  3.281995
67               milk   spaghetti  0.003066    0.534884  3.072100
58          chocolate   spaghetti  0.003066    0.534884  3.072100
..                ...         ...       ...         ...       ...
17            chicken   olive oil  0.003466    0.201550  3.060384
53          spaghetti   olive oil  0.005066    0.201058  3.052910
56               eggs   chocolate  0.003999    0.200000  3.797975
74               milk   spaghetti  0.004399    0.200000  3.348661
72  frozen vegetables   spaghetti  0.003333    0.200000  3.348661

[80 rows x 5 columns]
```

In [20]:
```
#Sorting the data by lift value
sorted_df = resultsinDataFrame.sort_values(by=['Lift'], ascending=False)
print(sorted_df)
```

```
          Antecedents        Consequents   Support  Confidence      Lift
70               soup               milk  0.003066    0.383333  7.987176
69          olive oil               milk  0.003333    0.294118  6.128268
52  whole wheat pasta          olive oil  0.003866    0.402778  6.115863
44       tomato sauce          spaghetti  0.003066    0.216981  5.535971
3       fromage blanc              honey  0.003333    0.245098  5.164271
..                ...                ...       ...         ...       ...
23               eggs          spaghetti  0.003733    0.528302  3.034297
36          green tea           tomatoes  0.003066    0.207207  3.029749
71          spaghetti  frozen vegetables  0.004533    0.288136  3.022804
32          spaghetti             shrimp  0.005999    0.215311  3.013149
43             shrimp          spaghetti  0.005999    0.523256  3.005315

[80 rows x 5 columns]
```

In [21]:
```
#  We set our metric as "Lift" to define whether antecedents & consequents are depe
from mlxtend.frequent_patterns import apriori, association_rules
rules = association_rules(frequent_itemsets, metric="lift", min_threshold=1.2)
rules["antecedents_length"] = rules["antecedents"].apply(lambda x: len(x))
rules["consequents_length"] = rules["consequents"].apply(lambda x: len(x))
rules.sort_values("lift",ascending=False)
```

Out[21]:

| | antecedents | consequents | antecedent support | consequent support | support | confidence | lift | leverag |
|---|---|---|---|---|---|---|---|---|
| **4336** | (milk, mineral water) | (soup, frozen vegetables) | 0.047994 | 0.007999 | 0.003066 | 0.063889 | 7.987176 | 0.00268 |
| **4337** | (soup, frozen vegetables) | (milk, mineral water) | 0.007999 | 0.047994 | 0.003066 | 0.383333 | 7.987176 | 0.00268 |
| **4323** | (olive oil, frozen vegetables) | (milk, mineral water) | 0.011332 | 0.047994 | 0.003333 | 0.294118 | 6.128268 | 0.00278 |
| **4322** | (milk, mineral water) | (olive oil, frozen vegetables) | 0.047994 | 0.011332 | 0.003333 | 0.069444 | 6.128268 | 0.00278 |
| **3810** | (whole wheat pasta, mineral water) | (olive oil) | 0.009599 | 0.065858 | 0.003866 | 0.402778 | 6.115863 | 0.00323 |
| **...** | ... | ... | ... | ... | ... | ... | ... | . |
| **1969** | (escalope) | (milk, chocolate) | 0.079323 | 0.032129 | 0.003066 | 0.038655 | 1.203131 | 0.00051 |
| **2405** | (green tea) | (mineral water, cooking oil) | 0.132116 | 0.020131 | 0.003200 | 0.024218 | 1.203039 | 0.00054 |
| **2404** | (mineral water, cooking oil) | (green tea) | 0.020131 | 0.132116 | 0.003200 | 0.158940 | 1.203039 | 0.00054 |
| **2583** | (eggs) | (green tea, spaghetti) | 0.179709 | 0.026530 | 0.005733 | 0.031899 | 1.202388 | 0.00096 |
| **2580** | (green tea, spaghetti) | (eggs) | 0.026530 | 0.179709 | 0.005733 | 0.216080 | 1.202388 | 0.00096 |

4484 rows × 12 columns