

Irfan Khan

q2 From the shopping list, using at least two different methods find the pair of frequent items, create a weighted network for each method, using the support threshold as weight.

```
In [45]: import numpy
import time
numpy.version.version
```

```
Out[45]: '1.16.5'
```

```
In [46]: # https://stackoverflow.com/questions/55188544/pandas-how-to-workaround-error-
tokenizing-data
def tokenize(str):
    idx = [x for x, v in enumerate(str) if v == '\n']
    if len(idx) % 2 != 0:
        idx = idx[:-1]
    memory = {}
    for i in range(0, len(idx), 2):
        val = str[idx[i]:idx[i+1]+1]
        key = "_"*(len(val)-1)+"{0}".format(i)
        memory[key] = val
        str = str.replace(memory[key], key, 1)
    return [memory.get(token, token) for token in str.split(",")]
```

```
In [47]: import numpy as np
import pandas as pd
with open("groceries.csv", encoding='utf-8', mode="r") as fp:
    lines = fp.readlines()

lines = list(map(lambda x: tokenize(x.strip()), lines))
df = pd.DataFrame(lines).replace(np.nan, '')
df
```

Out[47]:

	0	1	2	3	4	5	6	7	8
0	citrus fruit	semi-finished bread	margarine	ready soups					
1	tropical fruit	yogurt	coffee						
2	whole milk								
3	pip fruit	yogurt	cream cheese	meat spreads					
4	other vegetables	whole milk	condensed milk	long life bakery product					
...
9830	sausage	chicken	beef	hamburger meat	citrus fruit	grapes	root vegetables	whole milk	butter
9831	cooking chocolate								
9832	chicken	citrus fruit	other vegetables	butter	yogurt	frozen dessert	domestic eggs	rolls/buns	rum
9833	semi-finished bread	bottled water	soda	bottled beer					
9834	chicken	tropical fruit	other vegetables	vinegar	shopping bags				

9835 rows × 32 columns



```
In [48]: print(type(df), '\n', (df.shape), '\n', type(df[0]))
```

```
<class 'pandas.core.frame.DataFrame'>
(9835, 32)
<class 'pandas.core.series.Series'>
```

Itertools.combinations give all combinations of K items in a list

Frozenset lets us use itemset as a key - order of elements does not matter!

Generate and count itemsets

set `report=True` in `readdata` function to progress report, or wait for a while

```
In [49]: import itertools

def readdata(k, fname="groceries.csv", report=False):
    C_k = []
    b = 0

    with open("groceries.csv", "rt", encoding='utf-8') as f:
        for line in f:
            line = line.replace('\n', '') # remove newline symbol

            if line != "":
                # gather all items in one basket
                C_k.append(line)
            else:
                # end of basket, report all itemsets
                for itemset in itertools.combinations(C_k, k):
                    yield frozenset(itemset)
                C_k = []

            # report progress
            # print every 1000th element to reduce clutter
            if report:
                if b % 1000 == 0:
                    print('processing bin ', b)
                b += 1

    # last basket
    if len(C_k) > 0:
        for itemset in itertools.combinations(C_k, k):
            yield frozenset(itemset)
```

```
In [50]: nitems = 21
for C_k in readdata(k=2):
    print(C_k)

    nitems -= 1
    if nitems == 0:
        break
```

```
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'tropica
l fruit,yogurt,coffee'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'whole m
ilk'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'pip fru
it,yogurt,cream cheese,meat spreads'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'other v
egetables,whole milk,condensed milk,long life bakery product'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'whole m
ilk,butter,yogurt,rice,abrasive cleaner'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'rolls/b
uns'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'other v
egetables,UHT-milk,rolls/buns,bottled beer,liquor (appetizer)'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'potted
plants'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'whole m
ilk,cereals'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'tropica
l fruit,other vegetables,white bread,bottled water,chocolate'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'citrus
fruit,tropical fruit,whole milk,butter,curd,yogurt,flour,bottled water,dish
es'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'beef'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'frankfu
rter,rolls/buns,soda'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'chicke
n,tropical fruit'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'butter,
sugar,fruit/vegetable juice,newspapers'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'fruit/v
egetable juice'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'package
d fruit/vegetables'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'chocola
te'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'special
ty bar'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'other v
egetables'})
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'butter
milk,pastry'})
```

```
In [51]: pd.options.display.max_colwidth=600
```

Count all itemsets - Naive method

```
In [52]: C2 = {}
for key in readdata(k=2):
    if key not in C2:
        C2[key] = 1
    else:
        C2[key] += 1
```

```
In [53]: len(C2)
```

```
Out[53]: 24574018
```

```
In [54]: nitens = 10
for ck,n in C2.items():
    print(ck, n)
    nitens -= 1
    if nitens == 0: break
```

```
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'tropical fruit,yogurt,coffee'}) 1
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'whole milk'}) 121
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'pip fruit,yogurt,cream cheese,meat spreads'}) 1
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'other vegetables,whole milk,condensed milk,long life bakery product'}) 1
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'whole milk,butter,yogurt,rice,abrasive cleaner'}) 1
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'rolls/buns'}) 109
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'other vegetables,UHT-milk,rolls/buns,bottled beer,liquor (appetizer)'}) 1
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'potted plants'}) 10
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'whole milk,cereals'}) 3
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups', 'tropical fruit,other vegetables,white bread,bottled water,chocolate'}) 1
```

s = 10

```
In [55]: %time
start_time_naive10 = time.time()
s = 10 # support threshold
L2s10 = {}
for key, n in C2.items():
    if n >= s:
        L2s10[key] = n
print('{} items with >{} occurrences'.format(len(L2s10), s))
```

```
Wall time: 0 ns
512523 items with >10 occurrences
```

```
In [56]: naive_result_s10=L2s10  
end_time_naive10 = time.time()  
time_naive10 = start_time_naive10-end_time_naive10  
L2s10
```

```

Out[56]: {frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'whole milk'}): 121,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'rolls/buns'}): 109,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'potted plants'}): 10,
          frozenset({'beef',
                    'citrus fruit,semi-finished bread,margarine,ready soups'}): 26,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'fruit/vegetable juice'}): 22,
          frozenset({'chocolate',
                    'citrus fruit,semi-finished bread,margarine,ready soups'}): 35,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'specialty bar'}): 21,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'other vegetables'}): 62,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'yogurt'}): 40,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'pastry,soda'}): 27,
          frozenset({'canned beer',
                    'citrus fruit,semi-finished bread,margarine,ready soups'}): 260,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'coffee'}): 39,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'misc. beverages'}): 31,
          frozenset({'bottled water',
                    'citrus fruit,semi-finished bread,margarine,ready soups'}): 67,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'soda'}): 156,
          frozenset({'berries',
                    'citrus fruit,semi-finished bread,margarine,ready soups'}): 10,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'detergent'}): 10,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'sparkling wine'}): 10,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'newspapers'}): 54,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'frankfurter,rolls/buns'}): 18,
          frozenset({'bottled beer',
                    'citrus fruit,semi-finished bread,margarine,ready soups'}): 120,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'rolls/buns,canned beer'}): 14,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'specialty chocolate'}): 26,
          frozenset({'beverages',
                    'citrus fruit,semi-finished bread,margarine,ready soups'}): 26,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'white wine'}): 19,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'rolls/buns,soda'}): 23,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'ice cream'}): 34,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'liquor'}): 10,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',

```



```

        'pork'}): 27,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'root vegetables'}): 25,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'sausage'}): 24,
frozenset({'candy',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 12,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'sausage,rolls/buns'}): 12,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'photo/film'}): 27,
frozenset({'chicken',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 15,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'shopping bags'}): 48,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'oil'}): 13,
frozenset({'citrus fruit',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 16,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'frozen vegetables'}): 13,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'rolls/buns,bottled beer'}): 11,
frozenset({'bottled beer,liquor',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 11,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'hamburger meat'}): 11,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'pastry'}): 37,
frozenset({'bottled water,soda',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 17,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'salty snack'}): 30,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'yogurt,rolls/buns'}): 10,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'domestic eggs'}): 11,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'frankfurter'}): 11,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'tropical fruit'}): 23,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'whipped/sour cream'}): 26,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'sugar'}): 12,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'sausage,rolls/buns,soda'}): 10,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'soda,bottled beer'}): 10,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'hygiene articles'}): 12,
frozenset({'brown bread',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 20,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'whole milk,pastry'}): 12,
frozenset({'chewing gum',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 15,

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```
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'soda,canned beer'}): 15,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'rolls/buns,brown bread'}): 10,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'pip fruit'}): 28,
frozenset({'UHT-milk',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 10,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'whole milk,rolls/buns'}): 13,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'waffles'}): 21,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'napkins'}): 15,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'long life bakery product'}): 11,
frozenset({'canned beer,shopping bags',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 11,
frozenset({'butter',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 11,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'frozen meals'}): 16,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'dishes'}): 10,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'pet care'}): 10,
frozenset({'tropical fruit,yogurt,coffee', 'whole milk'}): 121,
frozenset({'rolls/buns', 'tropical fruit,yogurt,coffee'}): 109,
frozenset({'potted plants', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'beef', 'tropical fruit,yogurt,coffee'}): 26,
frozenset({'fruit/vegetable juice', 'tropical fruit,yogurt,coffee'}): 22,
frozenset({'chocolate', 'tropical fruit,yogurt,coffee'}): 35,
frozenset({'specialty bar', 'tropical fruit,yogurt,coffee'}): 21,
frozenset({'other vegetables', 'tropical fruit,yogurt,coffee'}): 62,
frozenset({'tropical fruit,yogurt,coffee', 'yogurt'}): 40,
frozenset({'pastry,soda', 'tropical fruit,yogurt,coffee'}): 27,
frozenset({'canned beer', 'tropical fruit,yogurt,coffee'}): 260,
frozenset({'coffee', 'tropical fruit,yogurt,coffee'}): 39,
frozenset({'misc. beverages', 'tropical fruit,yogurt,coffee'}): 31,
frozenset({'bottled water', 'tropical fruit,yogurt,coffee'}): 67,
frozenset({'soda', 'tropical fruit,yogurt,coffee'}): 156,
frozenset({'berries', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'detergent', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'sparkling wine', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'newspapers', 'tropical fruit,yogurt,coffee'}): 54,
frozenset({'frankfurter,rolls/buns', 'tropical fruit,yogurt,coffee'}): 18,
frozenset({'bottled beer', 'tropical fruit,yogurt,coffee'}): 120,
frozenset({'rolls/buns,canned beer', 'tropical fruit,yogurt,coffee'}): 14,
frozenset({'specialty chocolate', 'tropical fruit,yogurt,coffee'}): 26,
frozenset({'beverages', 'tropical fruit,yogurt,coffee'}): 26,
frozenset({'tropical fruit,yogurt,coffee', 'white wine'}): 19,
frozenset({'rolls/buns,soda', 'tropical fruit,yogurt,coffee'}): 23,
frozenset({'ice cream', 'tropical fruit,yogurt,coffee'}): 34,
frozenset({'liquor', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'pork', 'tropical fruit,yogurt,coffee'}): 27,
frozenset({'root vegetables', 'tropical fruit,yogurt,coffee'}): 25,
frozenset({'sausage', 'tropical fruit,yogurt,coffee'}): 24,
```

```

frozenset({'candy', 'tropical fruit,yogurt,coffee'}): 12,
frozenset({'sausage,rolls/buns', 'tropical fruit,yogurt,coffee'}): 12,
frozenset({'photo/film', 'tropical fruit,yogurt,coffee'}): 27,
frozenset({'chicken', 'tropical fruit,yogurt,coffee'}): 15,
frozenset({'shopping bags', 'tropical fruit,yogurt,coffee'}): 48,
frozenset({'oil', 'tropical fruit,yogurt,coffee'}): 13,
frozenset({'citrus fruit', 'tropical fruit,yogurt,coffee'}): 16,
frozenset({'frozen vegetables', 'tropical fruit,yogurt,coffee'}): 13,
frozenset({'rolls/buns,bottled beer', 'tropical fruit,yogurt,coffee'}): 11,
frozenset({'bottled beer,liquor', 'tropical fruit,yogurt,coffee'}): 11,
frozenset({'hamburger meat', 'tropical fruit,yogurt,coffee'}): 11,
frozenset({'pastry', 'tropical fruit,yogurt,coffee'}): 37,
frozenset({'bottled water,soda', 'tropical fruit,yogurt,coffee'}): 17,
frozenset({'salty snack', 'tropical fruit,yogurt,coffee'}): 30,
frozenset({'tropical fruit,yogurt,coffee', 'yogurt,rolls/buns'}): 10,
frozenset({'domestic eggs', 'tropical fruit,yogurt,coffee'}): 11,
frozenset({'frankfurter', 'tropical fruit,yogurt,coffee'}): 11,
frozenset({'tropical fruit', 'tropical fruit,yogurt,coffee'}): 23,
frozenset({'tropical fruit,yogurt,coffee', 'whipped/sour cream'}): 26,
frozenset({'sugar', 'tropical fruit,yogurt,coffee'}): 12,
frozenset({'sausage,rolls/buns,soda', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'soda,bottled beer', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'hygiene articles', 'tropical fruit,yogurt,coffee'}): 12,
frozenset({'brown bread', 'tropical fruit,yogurt,coffee'}): 20,
frozenset({'tropical fruit,yogurt,coffee', 'whole milk,pastry'}): 12,
frozenset({'chewing gum', 'tropical fruit,yogurt,coffee'}): 15,
frozenset({'soda,canned beer', 'tropical fruit,yogurt,coffee'}): 15,
frozenset({'rolls/buns,brown bread', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'pip fruit', 'tropical fruit,yogurt,coffee'}): 28,
frozenset({'UHT-milk', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'tropical fruit,yogurt,coffee', 'whole milk,rolls/buns'}): 13,
frozenset({'tropical fruit,yogurt,coffee', 'waffles'}): 21,
frozenset({'napkins', 'tropical fruit,yogurt,coffee'}): 15,
frozenset({'long life bakery product', 'tropical fruit,yogurt,coffee'}): 11,
frozenset({'canned beer,shopping bags', 'tropical fruit,yogurt,coffee'}): 1
1,
frozenset({'butter', 'tropical fruit,yogurt,coffee'}): 11,
frozenset({'frozen meals', 'tropical fruit,yogurt,coffee'}): 16,
frozenset({'dishes', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'pet care', 'tropical fruit,yogurt,coffee'}): 10,
frozenset({'pip fruit,yogurt,cream cheese,meat spreads', 'whole milk'}): 12
1,
frozenset({'other vegetables,whole milk,condensed milk,long life bakery prod
uct',
          'whole milk'}): 121,
frozenset({'whole milk',
          'whole milk,butter,yogurt,rice,abrasive cleaner'}): 121,
frozenset({'rolls/buns', 'whole milk'}): 13189,
frozenset({'other vegetables,UHT-milk,rolls/buns,bottled beer,liquor (appeti
zer)',
          'whole milk'}): 121,
frozenset({'potted plants', 'whole milk'}): 1210,
frozenset({'whole milk', 'whole milk,cereals'}): 363,
frozenset({'tropical fruit,other vegetables,white bread,bottled water,chocol
ate',
          'whole milk'}): 121,
frozenset({'citrus fruit,tropical fruit,whole milk,butter,curd,yogurt,flour,

```

```

bottled water,dishes',
    'whole milk'}): 121,
frozenset({'beef', 'whole milk'}): 3146,
frozenset({'frankfurter,rolls/buns,soda', 'whole milk'}): 242,
frozenset({'chicken,tropical fruit', 'whole milk'}): 121,
frozenset({'butter,sugar,fruit/vegetable juice,newspapers',
    'whole milk'}): 121,
frozenset({'fruit/vegetable juice', 'whole milk'}): 2662,
frozenset({'packaged fruit/vegetables', 'whole milk'}): 1089,
frozenset({'chocolate', 'whole milk'}): 4235,
frozenset({'specialty bar', 'whole milk'}): 2541,
frozenset({'other vegetables', 'whole milk'}): 7502,
frozenset({'butter milk,pastry', 'whole milk'}): 363,
frozenset({'whole milk'}): 7260,
frozenset({'tropical fruit,cream cheese,processed cheese,detergent,newspaper
s',
    'whole milk'}): 121,
frozenset({'tropical fruit,root vegetables,other vegetables,frozen dessert,r
olls/buns,flour,sweet spreads,salty snack,waffles,candy,bathroom cleaner',
    'whole milk'}): 121,
frozenset({'bottled water,canned beer', 'whole milk'}): 726,
frozenset({'whole milk', 'yogurt'}): 4840,
frozenset({'sausage,rolls/buns,soda,chocolate', 'whole milk'}): 363,
frozenset({'brown bread,soda,fruit/vegetable juice,canned beer,newspapers,sh
opping bags',
    'whole milk'}): 121,
frozenset({'whole milk',
    'yogurt,beverages,bottled water,specialty bar'}): 121,
frozenset({'hamburger meat,other vegetables,rolls/buns,spices,bottled water,
hygiene articles,napkins',
    'whole milk'}): 121,
frozenset({'root vegetables,other vegetables,whole milk,beverages,sugar',
    'whole milk'}): 121,
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es,rolls/buns,bottled water,skin care',
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l products,tea,fruit/vegetable juice',
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c. beverages,waffles,chocolate,candy',
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    'whole milk'}): 121,

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ne articles',
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g life bakery product,shopping bags',
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rt,specialty cheese,frozen vegetables,ice cream,soda,bottled beer',
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ry products,hygiene articles,shopping bags',
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  'whole milk'}): 121,
frozenset({'sausage,rolls/buns,specialty chocolate', 'whole milk'}): 242,
frozenset({'sausage,ham,citrus fruit,tropical fruit,berries,packaged fruit/v
egetables,whole milk,whipped/sour cream,sliced cheese,pastry,sugar,baking pow
der',
  'whole milk'}): 121,
frozenset({'beef,root vegetables,whole milk,cream cheese',
  'whole milk'}): 121,
frozenset({'sugar,hygiene articles', 'whole milk'}): 121,
frozenset({'whole milk', 'yogurt,beverages,coffee'}): 121,
frozenset({'pork,beef', 'whole milk'}): 363,
frozenset({'bottled beer,shopping bags', 'whole milk'}): 847,
frozenset({'curd,butter milk,yogurt,sliced cheese,coffee',
  'whole milk'}): 121,
frozenset({'beef,Instant food products,canned beer', 'whole milk'}): 121,
frozenset({'pork,berries,whipped/sour cream,beverages,flour,oil,soda,chocola
te,newspapers',
  'whole milk'}): 121,
frozenset({'white bread', 'whole milk'}): 847,

```

```

frozenset({'grapes,whole milk,processed cheese,rolls/buns,white bread,fruit/vegetable juice',
          'whole milk'}): 121,
frozenset({'potato products,flower (seeds)', 'whole milk'}): 121,
frozenset({'root vegetables,onions,yogurt,rolls/buns,coffee,bottled water,dishes',
          'whole milk'}): 121,
frozenset({'chicken,hamburger meat,UHT-milk,soda,canned beer,bathroom cleaner,newspapers',
          'whole milk'}): 121,
frozenset({'chicken,other vegetables,salt', 'whole milk'}): 121,
frozenset({'fish,cream cheese,coffee', 'whole milk'}): 121,
frozenset({'other vegetables,whole milk,frozen meals,rolls/buns,brown bread,napkins',
          'whole milk'}): 121,
frozenset({'chicken,pork,whole milk,frozen vegetables,brown bread,vinegar,bottled beer,red/blush wine,newspapers',
          'whole milk'}): 121,
frozenset({'other vegetables,misc. beverages', 'whole milk'}): 121,
frozenset({'whole milk', 'whole milk,cake bar,newspapers'}): 121,
frozenset({'beef,hamburger meat,berries,pastry,hygiene articles',
          'whole milk'}): 121,
frozenset({'sausage,grapes,rolls/buns,soda,salty snack', 'whole milk'}): 121,
frozenset({'whole milk', 'whole milk,rolls/buns,chocolate'}): 121,
frozenset({'citrus fruit,tropical fruit,pip fruit,other vegetables',
          'whole milk'}): 242,
frozenset({'whole milk',
          'whole milk,sliced cheese,domestic eggs,artif. sweetener,bottled water,soda,shopping bags'}): 121,
frozenset({'pastry,soda,bottled beer', 'whole milk'}): 121,
frozenset({'tropical fruit,other vegetables,whole milk,yogurt,soft cheese,hard cheese,spread cheese,curd cheese,frozen vegetables,ice cream,pastry,coffee,fruit/vegetable juice,hygiene articles',
          'whole milk'}): 121,
frozenset({'sliced cheese,pastry,newspapers', 'whole milk'}): 121,
frozenset({'ham,citrus fruit,whole milk,dessert,frozen meals,coffee,popcorn,shopping bags',
          'whole milk'}): 121,
frozenset({'whole milk',
          'whole milk,curd,cream cheese,flour,coffee,bottled water,misc. beverages,newspapers'}): 121,
frozenset({'root vegetables,whipped/sour cream', 'whole milk'}): 242,
frozenset({'soda,canned beer,shopping bags', 'whole milk'}): 121,
frozenset({'curd,roll products,margarine,bottled water,canned beer,white wine,dish cleaner',
          'whole milk'}): 121,
frozenset({'bottled water,soda,fruit/vegetable juice,bottled beer,napkins',
          'whole milk'}): 121,
frozenset({'packaged fruit/vegetables,potted plants', 'whole milk'}): 121,
frozenset({'tropical fruit,root vegetables,frozen vegetables,ice cream,bottled water,cling film/bags',
          'whole milk'}): 121,
frozenset({'ham,beef,grapes,yogurt,whipped/sour cream,domestic eggs,white bread,pastry,bottled water,fruit/vegetable juice,white wine,salty snack,chocolate,newspapers,shopping bags',
          'whole milk'}): 121,

```

```

frozenset({'pork,citrus fruit,UHT-milk,brown bread,soda,bottled beer,canned
beer,long life bakery product',
          'whole milk'}): 121,
frozenset({'beverages,rolls/buns,soda,misc. beverages,liqueur,cake bar',
          'whole milk'}): 121,
frozenset({'sausage,rolls/buns,soda', 'whole milk'}): 1210,
frozenset({'sausage,citrus fruit,whole milk,yogurt,rolls/buns,bottled water,
soda,napkins',
          'whole milk'}): 121,
frozenset({'root vegetables,whole milk,butter,yogurt,cream cheese,frozen fis
h,shopping bags',
          'whole milk'}): 121,
frozenset({'whole milk', 'whole milk,cream cheese'}): 242,
frozenset({'frankfurter,turkey,root vegetables,other vegetables,yogurt,roll
s/buns,pastry,ready soups',
          'whole milk'}): 121,
frozenset({'soda,shopping bags', 'whole milk'}): 242,
frozenset({'soda,bottled beer', 'whole milk'}): 1210,
frozenset({'frankfurter,popcorn', 'whole milk'}): 121,
frozenset({'berries,whole milk,whipped/sour cream,pickled vegetables,deterge
nt,newspapers',
          'whole milk'}): 121,
frozenset({'frankfurter,pork,white bread,canned vegetables,soda',
          'whole milk'}): 121,
frozenset({'frankfurter,hamburger meat,whole milk,butter,curd,flour,rice,oi
l,sugar,mustard,salty snack,chocolate,chocolate marshmallow,dish cleaner,dent
al care',
          'whole milk'}): 121,
frozenset({'berries,root vegetables,whole milk,beverages,sugar,soups,coffee,
shopping bags',
          'whole milk'}): 121,
frozenset({'frozen fish,newspapers', 'whole milk'}): 121,
frozenset({'tropical fruit,newspapers', 'whole milk'}): 242,
frozenset({'beef,grapes,berries,whole milk,yogurt,rolls/buns,newspapers,pott
ed plants',
          'whole milk'}): 121,
frozenset({'rolls/buns,coffee,instant coffee,salty snack,specialty chocolat
e',
          'whole milk'}): 121,
frozenset({'specialty chocolate,potted plants', 'whole milk'}): 121,
frozenset({'sparkling wine,dish cleaner', 'whole milk'}): 121,
frozenset({'citrus fruit,napkins,shopping bags', 'whole milk'}): 121,
frozenset({'onions,herbs,bottled beer', 'whole milk'}): 121,
frozenset({'whole milk', 'whole milk,pastry,detergent,candles'}): 121,
frozenset({'other vegetables,whole milk,white bread,chewing gum',
          'whole milk'}): 121,
frozenset({'whole milk', 'whole milk,rolls/buns,shopping bags'}): 121,
frozenset({'pork,tropical fruit,grapes,hard cheese,soda,napkins,shopping bag
s',
          'whole milk'}): 121,
frozenset({'tropical fruit,grapes,berries,other vegetables,whole milk,butte
r,dessert,yogurt,whipped/sour cream,ice cream,pastry,salt,baking powder,bottl
ed water,misc. beverages,fruit/vegetable juice,canned beer,specialty chocolat
e,potted plants',
          'whole milk'}): 121,
frozenset({'chicken,pork,citrus fruit,other vegetables,whipped/sour cream,wh
ite bread,chewing gum,potted plants',

```

```

        'whole milk'}): 121,
frozenset({'other vegetables,chewing gum', 'whole milk'}): 242,
frozenset({'sausage,bottled water,red/blush wine', 'whole milk'}): 121,
frozenset({'whole milk', 'whole milk,whipped/sour cream,baking powder'}): 12
1,
frozenset({'rolls/buns,coffee', 'whole milk'}): 484,
frozenset({'hygiene articles', 'whole milk'}): 1452,
frozenset({'ice cream,newspapers', 'whole milk'}): 242,
frozenset({'curd,whipped/sour cream,domestic eggs,flour,misc. beverages,news
papers',
        'whole milk'}): 121,
frozenset({'whole milk', 'whole milk,frozen meals,newspapers'}): 121,
frozenset({'onions,whole milk,dessert,domestic eggs,rolls/buns,white bread,c
offee,bottled water',
        'whole milk'}): 121,
frozenset({'finished products,organic sausage,sliced cheese,white bread,frui
t/vegetable juice',
        'whole milk'}): 121,
frozenset({'salt,dog food,long life bakery product', 'whole milk'}): 121,
frozenset({'tropical fruit,root vegetables,other vegetables,domestic eggs,wh
ite bread,brown bread,canned vegetables,soda,fruit/vegetable juice,rum',
        'whole milk'}): 121,
frozenset({'other vegetables,whole milk,yogurt', 'whole milk'}): 242,
frozenset({'tropical fruit,oil,cat food', 'whole milk'}): 121,
frozenset({'frankfurter,citrus fruit,whole milk,yogurt,sliced cheese,special
ty cheese,pastry,fruit/vegetable juice',
        'whole milk'}): 121,
frozenset({'butter,pasta,canned fish,softener,flower (seeds)',
        'whole milk'}): 121,
frozenset({'other vegetables,butter milk,frozen fish,salty snack',
        'whole milk'}): 121,
frozenset({'tropical fruit,pastry,canned beer,chocolate', 'whole milk'}): 12
1,
frozenset({'citrus fruit,root vegetables,packaged fruit/vegetables,yogurt,sl
iced cheese,rolls/buns,white bread,brown bread,zwieback',
        'whole milk'}): 121,
frozenset({'UHT-milk,salt,soda,specialty chocolate,shopping bags',
        'whole milk'}): 121,
frozenset({'curd,yogurt,spread cheese,sugar,canned vegetables',
        'whole milk'}): 121,
frozenset({'citrus fruit,other vegetables,whole milk,dessert,yogurt,frozen v
egetables,fruit/vegetable juice,bottled beer,salty snack',
        'whole milk'}): 121,
frozenset({'whole milk', 'yogurt,brown bread,bottled beer,white wine'}): 12
1,
frozenset({'bottled beer,liquor,red/blush wine', 'whole milk'}): 605,
frozenset({'grapes', 'whole milk'}): 484,
frozenset({'pork,other vegetables,soda', 'whole milk'}): 242,
frozenset({'sausage,citrus fruit,berries,other vegetables,whole milk,yogurt,
whipped/sour cream,cream cheese,frozen vegetables,domestic eggs,pastry,margar
ine,soups,canned fish,chocolate,candy,napkins',
        'whole milk'}): 121,
frozenset({'frankfurter,chicken,pork,tropical fruit,root vegetables,other ve
getables,yogurt,UHT-milk,mayonnaise,brown bread,pastry,flour,mustard,coffee,c
ocoa drinks,fruit/vegetable juice,salty snack,long life bakery product,chocol
ate,seasonal products',
        'whole milk'}): 121,

```

```

frozenset({'artif. sweetener,soda,photo/film', 'whole milk'}): 121,
frozenset({'frankfurter,onions,butter,processed cheese,rolls/buns,coffee,bottled beer',
          'whole milk'}): 121,
frozenset({'pip fruit,root vegetables,dessert,yogurt,domestic eggs,shopping bags',
          'whole milk'}): 121,
frozenset({'frankfurter,whole milk,coffee,detergent', 'whole milk'}): 121,
frozenset({'whole milk', 'whole milk,newspapers'}): 968,
frozenset({'domestic eggs,hygiene articles,photo/film,flower soil/fertilizer',
          'whole milk'}): 121,
frozenset({'packaged fruit/vegetables,dessert,mayonnaise,oil,soda,waffles,chocolate,flower (seeds),shopping bags',
          'whole milk'}): 121,
frozenset({'chicken,other vegetables,whipped/sour cream,frozen vegetables,bottled water,long life bakery product',
          'whole milk'}): 121,
frozenset({'pork,whole milk,curd,yogurt,whipped/sour cream,cream cheese,domestic eggs,white bread,sugar,baking powder,coffee,cocoa drinks,salty snack,waffles,candy,napkins',
          'whole milk'}): 121,
frozenset({'citrus fruit,other vegetables,whole milk,curd,yogurt,whipped/sour cream,cream cheese,pastry,vinegar,oil,coffee,long life bakery product,detergent,cleaner,napkins,newspapers',
          'whole milk'}): 121,
frozenset({'light bulbs', 'whole milk'}): 484,
frozenset({'cream cheese,margarine,tea', 'whole milk'}): 121,
frozenset({'sausage,curd,frozen meals,domestic eggs,cake bar,seasonal products,detergent,cleaner,house keeping products,potted plants,shopping bags',
          'whole milk'}): 121,
frozenset({'citrus fruit,onions', 'whole milk'}): 121,
frozenset({'other vegetables,whipped/sour cream,roll products',
          'whole milk'}): 121,
frozenset({'chicken,tropical fruit,pip fruit,root vegetables,other vegetables,whole milk,butter,yogurt,whipped/sour cream,hard cheese,frozen vegetables,frozen fish,domestic eggs,white bread,rice,specialty fat,dog food,bottled water,fruit/vegetable juice,long life bakery product,softener,napkins,cling film/bags',
          'whole milk'}): 121,
frozenset({'pork,beef,ice cream,rolls/buns,newspapers', 'whole milk'}): 121,
frozenset({'pork,tropical fruit,other vegetables,yogurt,semi-finished bread,flour,margarine,artif. sweetener,organic products,chocolate marshmallow',
          'whole milk'}): 121,
frozenset({'onions,domestic eggs,soda,hygiene articles', 'whole milk'}): 121,
frozenset({'tropical fruit,pip fruit,grapes,root vegetables,herbs,yogurt,baking powder,seasonal products,potted plants,shopping bags',
          'whole milk'}): 121,
frozenset({'whipped/sour cream,cream cheese,bottled water,canned beer,shopping bags',
          'whole milk'}): 121,
frozenset({'berries,root vegetables,other vegetables,butter,hard cheese,domestic eggs,rolls/buns,fruit/vegetable juice,sparkling wine,hygiene articles',
          'whole milk'}): 121,
frozenset({'berries,dessert,whipped/sour cream,white bread,coffee,shopping bags',
          'whole milk'}): 121,

```

```

        'whole milk'}): 121,
    frozenset({'rolls/buns,long life bakery product', 'whole milk'}): 121,
    frozenset({'ice cream,long life bakery product', 'whole milk'}): 121,
    frozenset({'coffee,fruit/vegetable juice,dishes', 'whole milk'}): 121,
    frozenset({'whole milk', 'whole milk,butter,pasta,misc. beverages'}): 121,
    frozenset({'citrus fruit,berries,butter milk,yogurt', 'whole milk'}): 121,
    frozenset({'beef,grapes,nuts/prunes,root vegetables,onions,other vegetables,
cream,soft cheese,sliced cheese,hard cheese,domestic eggs,rolls/buns,pastry,m
ustard,specialty chocolate,specialty bar,dental care,shopping bags',
        'whole milk'}): 121,
    frozenset({'pork,citrus fruit,grapes,root vegetables,whole milk,ready soups,
potted plants',
        'whole milk'}): 121,
    frozenset({'turkey,tropical fruit,pip fruit,root vegetables,other vegetable
s,curd,butter milk,yogurt,curd cheese,rice,vinegar,margarine',
        'whole milk'}): 121,
    frozenset({'margarine,newspapers', 'whole milk'}): 121,
    frozenset({'beef,tropical fruit,onions,other vegetables,whole milk,butter,cu
rd,butter milk,yogurt,domestic eggs,white bread,pastry,shopping bags',
        'whole milk'}): 121,
    frozenset({'pip fruit,whole milk,domestic eggs,bottled water,long life baker
y product',
        'whole milk'}): 121,
    frozenset({'whole milk', 'whole milk,rice'}): 121,
    frozenset({'frankfurter,chicken,butter milk,margarine,long life bakery produ
ct',
        'whole milk'}): 121,
    frozenset({'whole milk', 'whole milk,white bread'}): 242,
    frozenset({'sausage,root vegetables,domestic eggs,dish cleaner',
        'whole milk'}): 121,
    frozenset({'grapes,zwieback,soda,waffles', 'whole milk'}): 121,
    frozenset({'brown bread', 'whole milk'}): 2420,
    frozenset({'root vegetables,other vegetables,cream cheese,pasta,oil,margarin
e,salty snack,potted plants',
        'whole milk'}): 121,
    frozenset({'UHT-milk,bottled water', 'whole milk'}): 363,
    frozenset({'onions', 'whole milk'}): 726,
    frozenset({'beef,bottled water,misc. beverages,specialty chocolate,shopping
bags',
        'whole milk'}): 121,
    frozenset({'pork,whole milk,rolls/buns,bottled beer', 'whole milk'}): 121,
    frozenset({'canned beer,specialty chocolate,candy,shopping bags',
        'whole milk'}): 121,
    frozenset({'whole milk', 'yogurt,margarine'}): 242,
    frozenset({'whole milk',
        'yogurt,whipped/sour cream,flour,margarine,sugar,baking powder,ca
t food,soda,fruit/vegetable juice,chocolate,hygiene articles,napkins,newspape
rs'}): 121,
    frozenset({'pip fruit,curd,dessert,yogurt,specialty chocolate,specialty bar,
newspapers,shopping bags',
        'whole milk'}): 121,
    frozenset({'meat,chicken,root vegetables,whole milk,oil', 'whole milk'}): 12
1,
    frozenset({'coffee,misc. beverages,bottled beer', 'whole milk'}): 121,
    frozenset({'sausage,whole milk,whipped/sour cream,pasta,pet care,fruit/veget
able juice',
        'whole milk'}): 121,

```



```

frozenset({'pork,herbs,other vegetables,yogurt,domestic eggs,specialty bar,dishes',
          'whole milk'}): 121,
frozenset({'frankfurter,other vegetables,specialty cheese,chewing gum',
          'whole milk'}): 121,
frozenset({'root vegetables,other vegetables,spread cheese,margarine,canned beer',
          'whole milk'}): 121,
frozenset({'sausage,tropical fruit,grapes,other vegetables,processed cheese,frozen meals,domestic eggs,white bread,salty snack,newspapers',
          'whole milk'}): 121,
frozenset({'sausage,citrus fruit,pip fruit,root vegetables,other vegetables,whole milk,yogurt,whipped/sour cream,spread cheese,frozen vegetables,pastry,instant coffee,soda,fruit/vegetable juice,hygiene articles',
          'whole milk'}): 121,
frozenset({'canned vegetables', 'whole milk'}): 363,
frozenset({'tropical fruit,whole milk,white bread,brown bread,misc. beverages,bottled beer',
          'whole milk'}): 121,
frozenset({'grapes,yogurt,UHT-milk,soft cheese,rolls/buns,fruit/vegetable juice,candy,dental care,newspapers,shopping bags',
          'whole milk'}): 121,
frozenset({'whole milk', 'whole milk,pastry'}): 1452,
...}

```

```
In [57]: type(L2s10),type(naive_result_s10),len(L2s10),len(naive_result_s10)
```

```
Out[57]: (dict, dict, 512523, 512523)
```

```
In [58]: !pip install networkx
```

```

Requirement already satisfied: networkx in c:\users\thin_\anaconda3\lib\site-packages (2.3)
Requirement already satisfied: decorator>=4.3.0 in c:\users\thin_\anaconda3\lib\site-packages (from networkx) (4.4.0)

```

```
In [59]: import networkx as nx
import matplotlib.pyplot as plt
import pandas as pd
```

```
In [60]: # create DataFrame using data
dfs10n=pd.DataFrame(naive_result_s10.items(), columns=['basket', 'count'])
dfs10n.head(10)
```

Out[60]:

		basket	count
0	(citrus fruit,semi-finished bread,margarine,ready soups, whole milk)		121
1	(citrus fruit,semi-finished bread,margarine,ready soups, rolls/buns)		109
2	(citrus fruit,semi-finished bread,margarine,ready soups, potted plants)		10
3	(citrus fruit,semi-finished bread,margarine,ready soups, beef)		26
4	(citrus fruit,semi-finished bread,margarine,ready soups, fruit/vegetable juice)		22
5	(citrus fruit,semi-finished bread,margarine,ready soups, chocolate)		35
6	(citrus fruit,semi-finished bread,margarine,ready soups, specialty bar)		21
7	(citrus fruit,semi-finished bread,margarine,ready soups, other vegetables)		62
8	(citrus fruit,semi-finished bread,margarine,ready soups, yogurt)		40
9	(citrus fruit,semi-finished bread,margarine,ready soups, pastry,soda)		27

```
In [61]: MG = nx.MultiGraph()
G_naive_s10=nx.from_pandas_edgelist(dfs10n,source='basket',target='count')

#MG = nx.MultiGraph()
#G_naive_s10=MG.add_weighted_edges_from(dfs10n)
#
```

```
In [62]: type(G_naive_s10)
```

Out[62]: networkx.classes.graph.Graph

```
In [63]: #nx.clustering(G_naive_s10)
```

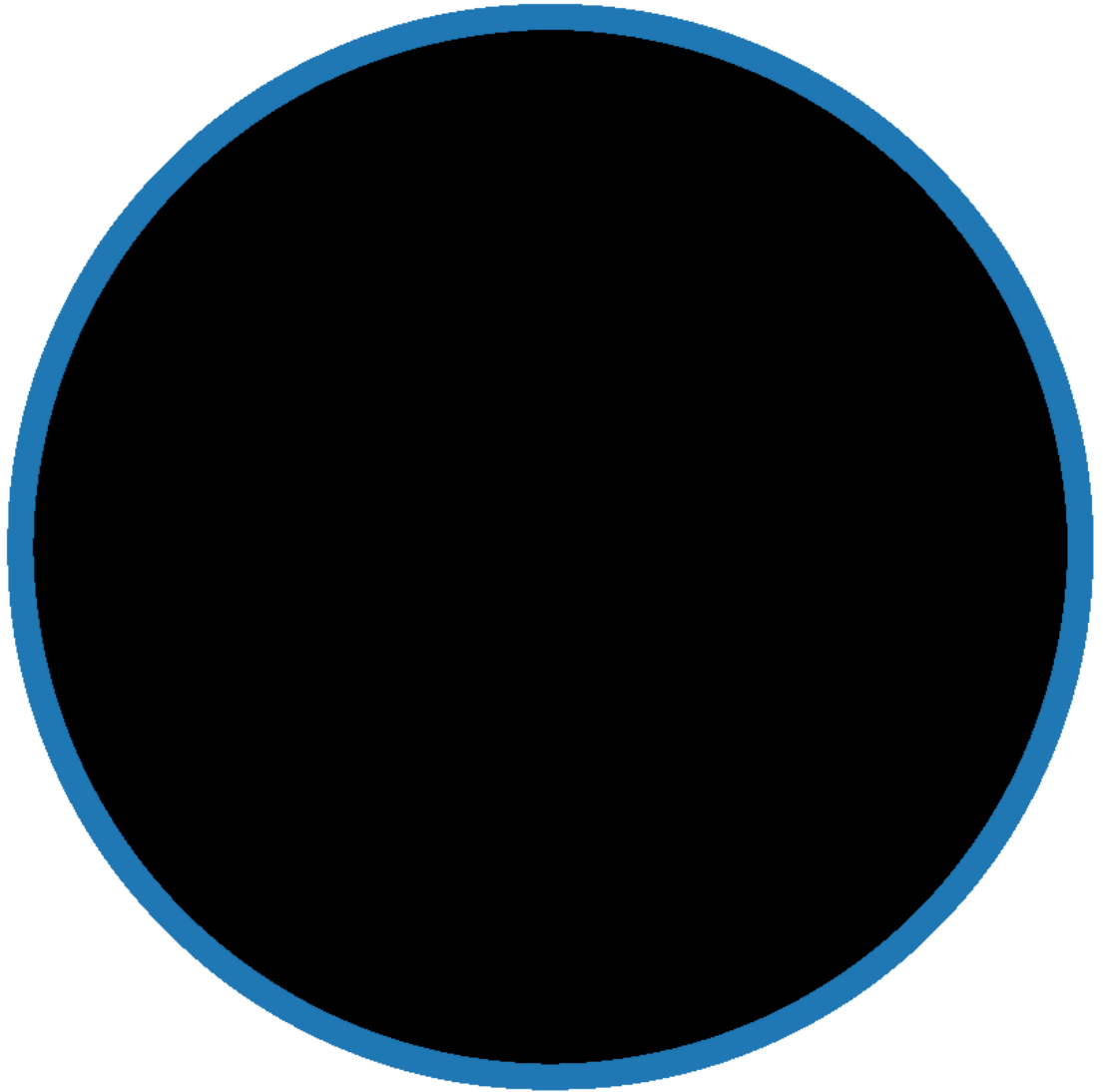
```
In [64]: G_naive_s10.__len__() # number of nodes
```

Out[64]: 513176

```
In [ ]: #G_naive_s10.degree
```

```
In [65]: plt.figure(figsize=(12, 12))
         nx.draw_circular(G_naive_s10)#, with_labels=True, font_weight='bold')
```

C:\Users\thin_\Anaconda3\lib\site-packages\networkx\drawing\nx_pylab.py:579:
MatplotlibDeprecationWarning:
The iterable function was deprecated in Matplotlib 3.1 and will be removed in
3.3. Use np.iterable instead.
if not cb.iterable(width):

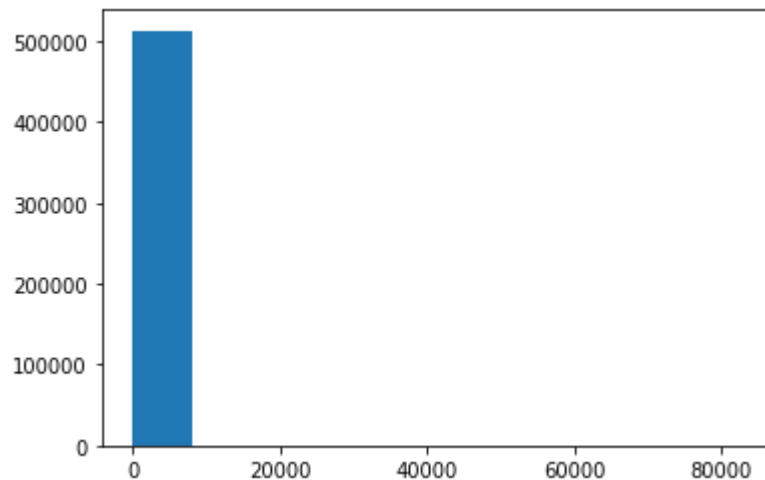


```
In [ ]: #nx.draw(G_naive_s10,pos=nx.spring_layout(G_naive_s10))
         #nx.draw_graphviz(G_naive_s10, 'neato')
```

```
In [ ]: #pos = nx.nx_agraph.graphviz_layout(G_naive_s10)
         #nx.draw(G_naive_s10, pos=pos)
```

```
In [66]: plt.hist([v for k,v in nx.degree(G_naive_s10)])
```

```
Out[66]: (array([5.1316e+05, 9.0000e+00, 2.0000e+00, 2.0000e+00, 1.0000e+00,
        0.0000e+00, 1.0000e+00, 0.0000e+00, 0.0000e+00, 1.0000e+00]),
        array([1.00000e+00, 8.27460e+03, 1.65482e+04, 2.48218e+04, 3.30954e+04,
        4.13690e+04, 4.96426e+04, 5.79162e+04, 6.61898e+04, 7.44634e+04,
        8.27370e+04])),
        <a list of 10 Patch objects>)
```



s = 50

```
In [67]: %time
start_time_naive50 = time.time()
s = 50 # support threshold
L2s50 = {}
for key, n in C2.items():
    if n >= s:
        L2s50[key] = n
print('{} items with >{} occurances'.format(len(L2s50), s))
```

```
Wall time: 0 ns
69002 items with >50 occurances
```

```
In [68]: naive_result_s50=L2s50  
end_time_naive50 = time.time()  
time_naive50 = start_time_naive50-end_time_naive50  
L2s50
```

```

Out[68]: {frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'whole milk'}): 121,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'rolls/buns'}): 109,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'other vegetables'}): 62,
frozenset({'canned beer',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 260,
frozenset({'bottled water',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 67,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'soda'}): 156,
frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
'newspapers'}): 54,
frozenset({'bottled beer',
'citrus fruit,semi-finished bread,margarine,ready soups'}): 120,
frozenset({'tropical fruit,yogurt,coffee', 'whole milk'}): 121,
frozenset({'rolls/buns', 'tropical fruit,yogurt,coffee'}): 109,
frozenset({'other vegetables', 'tropical fruit,yogurt,coffee'}): 62,
frozenset({'canned beer', 'tropical fruit,yogurt,coffee'}): 260,
frozenset({'bottled water', 'tropical fruit,yogurt,coffee'}): 67,
frozenset({'soda', 'tropical fruit,yogurt,coffee'}): 156,
frozenset({'newspapers', 'tropical fruit,yogurt,coffee'}): 54,
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ed bread,artif. sweetener,ready soups,bottled water,hygiene articles,newspape
rs',
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affles,dishes',
'whole milk'}): 121,
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s,packaged fruit/vegetables,butter,rolls/buns,margarine,sugar,rum,long life b
akery product,abrasive cleaner',
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s,fruit/vegetable juice,shopping bags',
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d beer',
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s,other vegetables,whole milk,spread cheese,frozen potato products,brown brea
d,Instant food products,soda,fruit/vegetable juice,shopping bags',
'whole milk'}): 121,
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milk,yogurt,hard cheese,rolls/buns,brown bread,bottled water,bottled beer,sal
ty snack,shopping bags',

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ges,abrasive cleaner',
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hes,newspapers'}): 121,
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frozenset({'root vegetables,whole milk,white bread,brown bread,sweet spread
s,dog food,brandy,shopping bags',
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der',
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vegetable juice',
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shes',
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r,newspapers',
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napkins',
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ttled beer,red/blush wine,newspapers',

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water, soda, shopping bags'}): 121,
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rd cheese, spread cheese, curd cheese, frozen vegetables, ice cream, pastry, coffe
e, fruit/vegetable juice, hygiene articles',
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shopping bags',
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verages, newspapers'}): 121,
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e, dish cleaner',
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        'whole milk'}): 121,
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frozenset({'tropical fruit, root vegetables, frozen vegetables, ice cream, bottl
ed water, cling film/bags',
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ead, pastry, bottled water, fruit/vegetable juice, white wine, salty snack, chocola
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h, shopping bags',
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s/buns, pastry, ready soups',
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l,sugar,mustard,salty snack,chocolate,chocolate marshmallow,dish cleaner,dent
al care',
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shopping bags',
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ed plants',
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frozenset({'rolls/buns,coffee,instant coffee,salty snack,specialty chocola
te',
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s',
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r,dessert,yogurt,whipped/sour cream,ice cream,pastry,salt,baking powder,bottl
ed water,misc. beverages,fruit/vegetable juice,canned beer,specialty chocola
te,potted plants',
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ite bread,chewing gum,potted plants',
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papers',
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t/vegetable juice',

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        'whole milk'}): 121,
    frozenset({'citrus fruit,other vegetables,whole milk,dessert,yogurt,frozen v
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getables,yogurt,UHT-milk,mayonnaise,brown bread,pastry,flour,mustard,coffee,c
ocoa drinks,fruit/vegetable juice,salty snack,long life bakery product,chocol
ate,seasonal products',
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bags',
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r',
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ocolate,flower (seeds),shopping bags',
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ttled water,long life bakery product',

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stic eggs,white bread,sugar,baking powder,coffee,cocoa drinks,salty snack,waf
fles,candy,napkins',
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r cream,cream cheese,pastry,vinegar,oil,coffee,long life bakery product,deter
gent,cleaner,napkins,newspapers',
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s,whole milk,butter,yogurt,whipped/sour cream,hard cheese,frozen vegetables,f
rozen fish,domestic eggs,white bread,rice,specialty fat,dog food,bottled wate
r,fruit/vegetable juice,long life bakery product,softener,napkins,cling film/
bags',
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ing powder,seasonal products,potted plants,shopping bags',
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ng bags',
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stic eggs,rolls/buns,fruit/vegetable juice,sparkling wine,hygiene articles',
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frozenset({'canned beer,specialty chocolate,candy,shopping bags',
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frozenset({'whole milk', 'yogurt,margarine'}): 242,
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s,bottled beer',
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e,fruit/vegetable juice,canned beer,shopping bags',
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ruit/vegetable juice',
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bread,pastry,instant coffee,waffles,dish cleaner',
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HT-milk,sliced cheese,processed cheese,rolls/buns,pastry,chocolate',
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rages,fruit/vegetable juice',
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led beer,long life bakery product',
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s,pastry,long life bakery product,specialty bar,chocolate marshmallow',
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king powder,pickled vegetables,rum',
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t,chewing gum,candy',
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k,yogurt,hard cheese,processed cheese,mayonnaise,frozen vegetables,pastry,rol
l products,rice,margarine,sugar,pickled vegetables,bottled water,fruit/vegeta
ble juice,candy,skin care,napkins',
        'whole milk'}): 121,
frozenset({'chicken,tropical fruit,whole milk,condensed milk,soft cheese,pro
cessed cheese,domestic eggs,white bread,pastry,semi-finished bread,soda,long
life bakery product,waffles,specialty chocolate,napkins,dishes,kitchen towel
s,shopping bags',
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        'whole milk'}): 121,
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d',
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frozenset({'frankfurter,turkey,citrus fruit', 'whole milk'}): 121,
frozenset({'beef,citrus fruit,other vegetables,whole milk,domestic eggs,roll
s/buns,brown bread,coffee,soda,salty snack,shopping bags',
        'whole milk'}): 121,
frozenset({'chicken,other vegetables,white wine,specialty chocolate',
        'whole milk'}): 121,
frozenset({'sausage,finished products,tropical fruit,pip fruit,other vegetab
les,butter,curd,dessert,butter milk,yogurt,whipped/sour cream,soft cheese,fro
zen vegetables,rolls/buns,white bread,brown bread,pastry,pasta,soups,baby foo
d,fruit/vegetable juice,salty snack,waffles,cake bar,chocolate,shopping bag
s',
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frozenset({'citrus fruit,whole milk,butter,dessert,UHT-milk,flower (seeds),s
hopping bags',
        'whole milk'}): 121,
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argarine,bottled water,soda,salty snack,seasonal products,detergent,potted pl
ants',
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frozenset({'UHT-milk,vinegar,waffles,chocolate', 'whole milk'}): 121,
frozenset({'UHT-milk,domestic eggs,brown bread,coffee,soda,canned beer,liquo
r (appetizer),newspapers',
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tter,yogurt,white bread,brown bread,margarine,cat food',
        'whole milk'}): 121,
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s/buns,pastry,soups,Instant food products,bottled water',

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```

        'whole milk'}): 121,
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ping products,shopping bags',
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bottled water,soda,fruit/vegetable juice,popcorn,chewing gum,shopping bags',
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r,napkins',
        'whole milk'}): 121,
    frozenset({'popcorn,candy', 'whole milk'}): 121,
    frozenset({'tropical fruit,pip fruit,other vegetables,cream cheese,soda,bott
led beer',
        'whole milk'}): 121,
    frozenset({'frankfurter,sausage,UHT-milk,frozen meals,frozen dessert,domesti
c eggs,rolls/buns,pastry,mustard,coffee',
        'whole milk'}): 121,
    frozenset({'hamburger meat,citrus fruit,packaged fruit/vegetables,rolls/bun
s,vinegar,cocoa drinks,specialty chocolate',
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    frozenset({'soda,candy', 'whole milk'}): 363,
    frozenset({'sausage,root vegetables,rolls/buns,bottled water,white wine,flow
er (seeds)',
        'whole milk'}): 121,
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        'yogurt,sliced cheese,frozen vegetables,frozen meals,pickled vege
tables,coffee,instant coffee'}): 121,
    frozenset({'meat,other vegetables,whole milk,yogurt,soft cheese,sliced chees
e,domestic eggs,margarine,cat food,pet care,coffee,bottled beer,red/blush win
e,dish cleaner,napkins,kitchen towels',
        'whole milk'}): 121,
    frozenset({'UHT-milk,instant coffee', 'whole milk'}): 121,
    frozenset({'semi-finished bread', 'whole milk'}): 968,
    frozenset({'whole milk',
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er vegetables,whole milk,curd,dessert,whipped/sour cream,UHT-milk,frozen vege
tables,frozen meals,bottled water,fruit/vegetable juice,specialty chocolate,n
apkins',
        'whole milk'}): 121,
    frozenset({'citrus fruit,other vegetables,butter,soda,bottled beer,canned be
er,waffles,chocolate,seasonal products',
        'whole milk'}): 121,
    frozenset({'meat,other vegetables,packaged fruit/vegetables,cream cheese,mar
garine,bottled water,salty snack',
        'whole milk'}): 121,
    frozenset({'root vegetables,whipped/sour cream,salt,fruit/vegetable juice,sa
lty snack',
        'whole milk'}): 121,
    frozenset({'tropical fruit,other vegetables,whole milk,curd,whipped/sour cre
am,bottled beer',
        'whole milk'}): 121,
    frozenset({'brown bread,oil,sugar,soda,bottled beer', 'whole milk'}): 121,
    frozenset({'grapes,brown bread,bottled beer,white wine', 'whole milk'}): 12
1,
    frozenset({'ham,tropical fruit,cream cheese,processed cheese,white bread,can

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dy',
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    frozenset({'root vegetables,skin care', 'whole milk'}): 121,
    frozenset({'ice cream,misc. beverages,canned beer,napkins,shopping bags',
        'whole milk'}): 121,
    frozenset({'tropical fruit,other vegetables,bottled water,bottled beer,napki
ns',
        'whole milk'}): 121,
    frozenset({'finished products,other vegetables,soda,fruit/vegetable juice',
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    frozenset({'other vegetables,nut snack', 'whole milk'}): 121,
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        'whole milk'}): 121,
    frozenset({'frankfurter,tropical fruit,cream cheese,rolls/buns,fruit/vegetab
le juice,kitchen towels,newspapers',
        'whole milk'}): 121,
    frozenset({'sausage,citrus fruit,pip fruit,yogurt,beverages,sliced cheese,su
gar,bottled water,soda,cake bar',
        'whole milk'}): 121,
    frozenset({'meat,citrus fruit,root vegetables,other vegetables,whipped/sour
cream,semi-finished bread,salty snack',
        'whole milk'}): 121,
    frozenset({'sausage,yogurt,pastry,margarine,soda,bottled beer,flower (seed
s)',
        'whole milk'}): 121,
    frozenset({'beef,citrus fruit,onions,herbs,other vegetables,whole milk,yogur
t,whipped/sour cream,specialty cheese,brown bread,canned vegetables,bottled w
ater,dish cleaner,abrasive cleaner,hygiene articles',
        'whole milk'}): 121,
    frozenset({'pip fruit,other vegetables,butter,yogurt,whipped/sour cream,brow
n bread,pastry,fruit/vegetable juice,detergent',
        'whole milk'}): 121,
    frozenset({'ham,hamburger meat,onions,other vegetables,processed cheese,froz
en vegetables,domestic eggs,rolls/buns,white bread,cookware,shopping bags',
        'whole milk'}): 121,
    frozenset({'whole milk', 'yogurt,newspapers'}): 242,
    frozenset({'citrus fruit,grapes,curd,bottled water,waffles',
        'whole milk'}): 121,
    frozenset({'other vegetables,sugar', 'whole milk'}): 121,
    frozenset({'pork,frozen meals,frozen fish,shopping bags', 'whole milk'}): 12
1,
    frozenset({'bathroom cleaner', 'whole milk'}): 363,
    frozenset({'ham,grapes,spread cheese,ice cream,frozen potato products,white
bread,oil,pudding powder',
        'whole milk'}): 121,
    frozenset({'grapes,specialty cheese,pasta,coffee,bottled water,soda,canned b
eer,brandy,white wine',
        'whole milk'}): 121,
    frozenset({'citrus fruit,bottled water,red/blush wine,photo/film',
        'whole milk'}): 121,
    frozenset({'dessert,white bread', 'whole milk'}): 121,
    frozenset({'citrus fruit,tropical fruit,pip fruit,long life bakery product',
        'whole milk'}): 121,
    frozenset({'root vegetables,sliced cheese,soda,bottled beer',
        'whole milk'}): 121,

```

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frozenset({'turkey,whole milk,UHT-milk,fruit/vegetable juice',
'whole milk'}): 121,
frozenset({'tropical fruit,other vegetables,soda,candy,shopping bags',
'whole milk'}): 121,
frozenset({'sausage,other vegetables,pasta,oil,margarine,coffee,syrup,canned
beer,napkins,light bulbs,shopping bags',
'whole milk'}): 121,
frozenset({'sausage,meat,other vegetables,brown bread,canned fish,bottled wa
ter,canned beer,liquor (appetizer),shopping bags',
'whole milk'}): 121,
frozenset({'pork,tropical fruit,other vegetables,dessert,yogurt,roll product
s,flour,rice,coffee,bottled water,soda,fruit/vegetable juice,canned beer,salt
y snack',
'whole milk'}): 121,
frozenset({'sausage,citrus fruit,pip fruit,mayonnaise,brown bread,shopping b
ags',
'whole milk'}): 121,
frozenset({'grapes,chocolate,light bulbs', 'whole milk'}): 121,
frozenset({'grapes,pastry,salty snack,light bulbs,shopping bags',
'whole milk'}): 121,
frozenset({'other vegetables,yogurt,processed cheese,ketchup,bottled water,m
ale cosmetics',
'whole milk'}): 121,
frozenset({'bottled water,potted plants', 'whole milk'}): 121,
frozenset({'prosecco,hygiene articles,potted plants', 'whole milk'}): 121,
frozenset({'UHT-milk,soda,dish cleaner,napkins', 'whole milk'}): 121,
frozenset({'bottled water,soda,chewing gum,specialty chocolate,candy',
'whole milk'}): 121,
frozenset({'beef,other vegetables,butter milk,yogurt,whipped/sour cream,crea
m cheese,white bread,fruit/vegetable juice,bottled beer,chocolate',
'whole milk'}): 121,
frozenset({'tropical fruit,pasta,bottled water', 'whole milk'}): 121,
frozenset({'beef,root vegetables,other vegetables,butter,yogurt,rolls/buns,f
lour',
'whole milk'}): 121,
frozenset({'rolls/buns,white wine', 'whole milk'}): 121,
frozenset({'berries,root vegetables,whipped/sour cream,roll products,bottled
beer',
'whole milk'}): 121,
frozenset({'sausage,hamburger meat,whole milk,rolls/buns,oil,pickled vegetab
les,softener,hygiene articles',
'whole milk'}): 121,
frozenset({'chicken,pork,beef,whole milk,curd,whipped/sour cream',
'whole milk'}): 121,
frozenset({'sausage,citrus fruit,whole milk,cream cheese,processed cheese,fr
ozen vegetables,rolls/buns,pastry,fruit/vegetable juice,chewing gum',
'whole milk'}): 121,
frozenset({'soda,canned beer', 'whole milk'}): 1815,
frozenset({'whole milk', 'yogurt,UHT-milk,rolls/buns'}): 121,
frozenset({'whole milk', 'whole milk,brown bread'}): 847,
frozenset({'citrus fruit,root vegetables,other vegetables,whole milk,curd,yo
gurt,whipped/sour cream,hard cheese,cream cheese,domestic eggs,flour,rice,oi
l,margarine,sugar',
'whole milk'}): 121,
frozenset({'citrus fruit,tropical fruit,grapes,whole milk,brown bread,pastr
y',

```



```

        'whole milk'}): 121,
    frozenset({'brown bread,chocolate', 'whole milk'}): 121,
    frozenset({'tropical fruit,other vegetables,whipped/sour cream,UHT-milk,frozen vegetables,oil,margarine,fruit/vegetable juice,kitchen towels',
        'whole milk'}): 121,
    frozenset({'frankfurter,tropical fruit,butter,whipped/sour cream,frozen vegetables,rolls/buns,sugar,baking powder,bottled water,misc. beverages,long life bakery product,newspapers',
        'whole milk'}): 121,
    frozenset({'ham,rolls/buns,bottled beer,chewing gum', 'whole milk'}): 121,
    frozenset({'other vegetables,curd,yogurt,pickled vegetables,bottled water',
        'whole milk'}): 121,
    frozenset({'sausage,whole milk,curd,butter milk,whipped/sour cream',
        'whole milk'}): 121,
    ...}

```

```

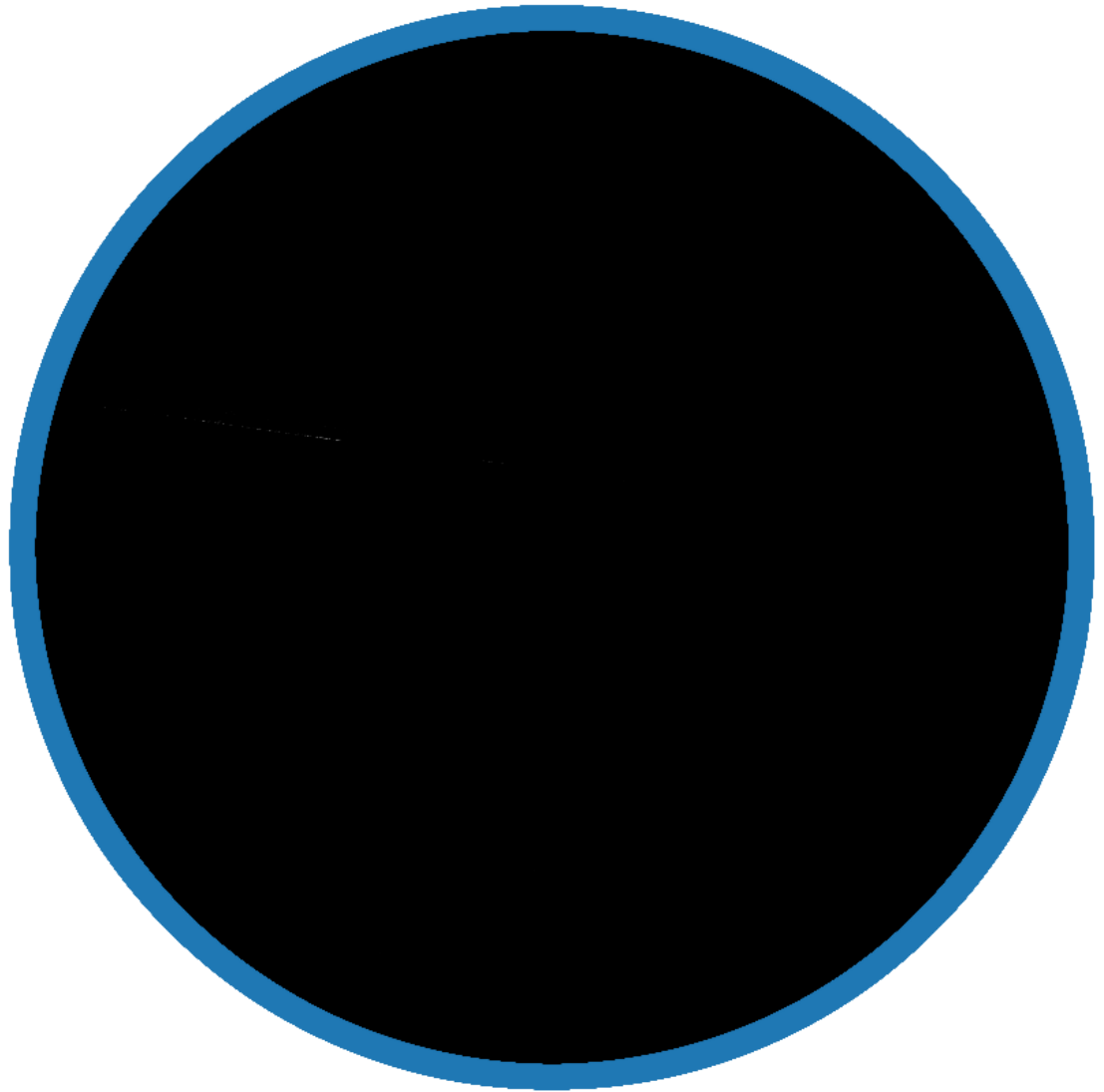
In [69]: # create DataFrame using data
dfs50n=pd.DataFrame(naive_result_s50.items(), columns=['basket', 'count'])
dfs50n.head(10)

```

Out[69]:

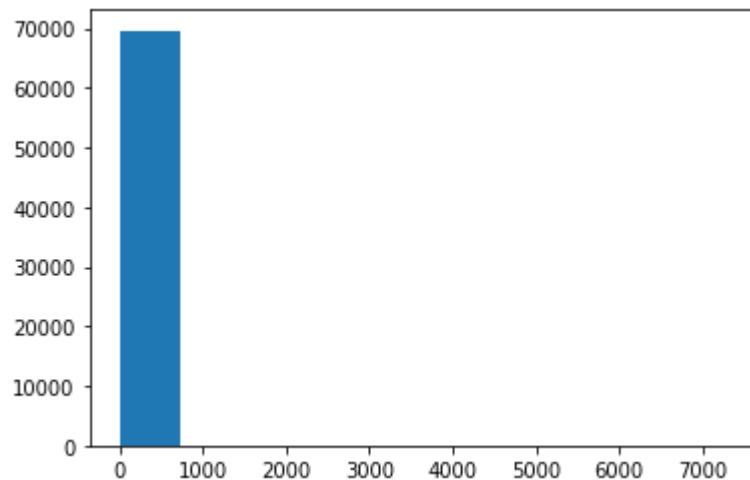
	basket	count
0	(citrus fruit,semi-finished bread,margarine,ready soups, whole milk)	121
1	(citrus fruit,semi-finished bread,margarine,ready soups, rolls/buns)	109
2	(citrus fruit,semi-finished bread,margarine,ready soups, other vegetables)	62
3	(citrus fruit,semi-finished bread,margarine,ready soups, canned beer)	260
4	(citrus fruit,semi-finished bread,margarine,ready soups, bottled water)	67
5	(citrus fruit,semi-finished bread,margarine,ready soups, soda)	156
6	(citrus fruit,semi-finished bread,margarine,ready soups, newspapers)	54
7	(citrus fruit,semi-finished bread,margarine,ready soups, bottled beer)	120
8	(whole milk, tropical fruit,yogurt,coffee)	121
9	(rolls/buns, tropical fruit,yogurt,coffee)	109

```
In [72]: plt.figure(figsize=(12, 12))  
G_naive_s50=nx.from_pandas_edgelist(dfs50n,source='basket',target='count')  
nx.draw_circular(G_naive_s50)
```



```
In [71]: plt.hist([v for k,v in nx.degree(G_naive_s50)])
```

```
Out[71]: (array([6.961e+04, 1.000e+00, 0.000e+00, 0.000e+00, 0.000e+00, 0.000e+00,
        0.000e+00, 0.000e+00, 3.000e+00, 5.000e+00]),
        array([1.0000e+00, 7.3350e+02, 1.4660e+03, 2.1985e+03, 2.9310e+03,
        3.6635e+03, 4.3960e+03, 5.1285e+03, 5.8610e+03, 6.5935e+03,
        7.3260e+03]),
        <a list of 10 Patch objects>)
```



s = 100

```
In [73]: %time
start_time_naive100 = time.time()
s = 100 # support threshold
L2s100 = {}
for key, n in C2.items():
    if n >= s:
        L2s100[key] = n
print('{} items with >{} occurances'.format(len(L2s100), s))
```

```
Wall time: 999 µs
41117 items with >100 occurances
```

```
In [74]: naive_result_s100=L2s100  
end_time_naive100 = time.time()  
time_naive100 = start_time_naive100-end_time_naive100  
L2s100
```

```

Out[74]: {frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'whole milk'}): 121,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'rolls/buns'}): 109,
          frozenset({'canned beer',
                    'citrus fruit,semi-finished bread,margarine,ready soups'}): 260,
          frozenset({'citrus fruit,semi-finished bread,margarine,ready soups',
                    'soda'}): 156,
          frozenset({'bottled beer',
                    'citrus fruit,semi-finished bread,margarine,ready soups'}): 120,
          frozenset({'tropical fruit,yogurt,coffee', 'whole milk'}): 121,
          frozenset({'rolls/buns', 'tropical fruit,yogurt,coffee'}): 109,
          frozenset({'canned beer', 'tropical fruit,yogurt,coffee'}): 260,
          frozenset({'soda', 'tropical fruit,yogurt,coffee'}): 156,
          frozenset({'bottled beer', 'tropical fruit,yogurt,coffee'}): 120,
          frozenset({'pip fruit,yogurt,cream cheese,meat spreads', 'whole milk'}): 12
1,
          frozenset({'other vegetables,whole milk,condensed milk,long life bakery prod
uct',
                    'whole milk'}): 121,
          frozenset({'whole milk',
                    'whole milk,butter,yogurt,rice,abrasive cleaner'}): 121,
          frozenset({'rolls/buns', 'whole milk'}): 13189,
          frozenset({'other vegetables,UHT-milk,rolls/buns,bottled beer,liquor (appeti
zer)',
                    'whole milk'}): 121,
          frozenset({'potted plants', 'whole milk'}): 1210,
          frozenset({'whole milk', 'whole milk,cereals'}): 363,
          frozenset({'tropical fruit,other vegetables,white bread,bottled water,chocol
ate',
                    'whole milk'}): 121,
          frozenset({'citrus fruit,tropical fruit,whole milk,butter,curd,yogurt,flour,
bottled water,dishes',
                    'whole milk'}): 121,
          frozenset({'beef', 'whole milk'}): 3146,
          frozenset({'frankfurter,rolls/buns,soda', 'whole milk'}): 242,
          frozenset({'chicken,tropical fruit', 'whole milk'}): 121,
          frozenset({'butter,sugar,fruit/vegetable juice,newspapers',
                    'whole milk'}): 121,
          frozenset({'fruit/vegetable juice', 'whole milk'}): 2662,
          frozenset({'packaged fruit/vegetables', 'whole milk'}): 1089,
          frozenset({'chocolate', 'whole milk'}): 4235,
          frozenset({'specialty bar', 'whole milk'}): 2541,
          frozenset({'other vegetables', 'whole milk'}): 7502,
          frozenset({'butter milk,pastry', 'whole milk'}): 363,
          frozenset({'whole milk'}): 7260,
          frozenset({'tropical fruit,cream cheese,processed cheese,detergent,newspaper
s',
                    'whole milk'}): 121,
          frozenset({'tropical fruit,root vegetables,other vegetables,frozen dessert,r
olls/buns,flour,sweet spreads,salty snack,waffles,candy,bathroom cleaner',
                    'whole milk'}): 121,
          frozenset({'bottled water,canned beer', 'whole milk'}): 726,
          frozenset({'whole milk', 'yogurt'}): 4840,
          frozenset({'sausage,rolls/buns,soda,chocolate', 'whole milk'}): 363,
          frozenset({'brown bread,soda,fruit/vegetable juice,canned beer,newspapers,sh
opping bags',

```

```

        'whole milk'}): 121,
frozenaset({'whole milk',
            'yogurt,beverages,bottled water,specialty bar'}): 121,
frozenaset({'hamburger meat,other vegetables,rolls/buns,spices,bottled water,
hygiene articles,napkins',
            'whole milk'}): 121,
frozenaset({'root vegetables,other vegetables,whole milk,beverages,sugar',
            'whole milk'}): 121,
frozenaset({'pork,berries,other vegetables,whole milk,whipped/sour cream,arti
f. sweetener,soda,abrasive cleaner',
            'whole milk'}): 121,
frozenaset({'beef,grapes,detergent', 'whole milk'}): 121,
frozenaset({'pastry,soda', 'whole milk'}): 3267,
frozenaset({'canned beer', 'whole milk'}): 31460,
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            'whole milk'}): 121,
frozenaset({'citrus fruit,zwieback,newspapers', 'whole milk'}): 121,
frozenaset({'sausage,rolls/buns,soda,canned beer,specialty bar,shopping bag
s',
            'whole milk'}): 121,
frozenaset({'tropical fruit,root vegetables,whole milk,yogurt,domestic eggs,b
rown bread,pastry,sugar,cereals,coffee,soda,waffles,candy',
            'whole milk'}): 121,
frozenaset({'berries,yogurt', 'whole milk'}): 363,
frozenaset({'butter milk,yogurt,cream cheese,spread cheese,rolls/buns,bottled
water,soda,newspapers',
            'whole milk'}): 121,
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frozenaset({'pastry,bottled water', 'whole milk'}): 242,
frozenaset({'misc. beverages', 'whole milk'}): 3751,
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UHT-milk,hard cheese,rolls/buns,bottled water,long life bakery product',
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frozenaset({'ham,grapes,other vegetables,whole milk', 'whole milk'}): 121,
frozenaset({'turkey,tropical fruit,other vegetables,curd,domestic eggs,brown
bread,semi-finished bread,margarine,baking powder,fruit/vegetable juice',
            'whole milk'}): 121,
frozenaset({'whole milk',
            'whole milk,yogurt,processed cheese,pickled vegetables,soda'}): 1
21,
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frozenaset({'packaged fruit/vegetables,brown bread,canned beer',
            'whole milk'}): 121,
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ygiene articles,napkins',
            'whole milk'}): 121,
frozenaset({'ham,beef,whipped/sour cream,ice cream,rolls/buns,cat food',
            'whole milk'}): 121,
frozenaset({'rolls/buns,pastry,sugar', 'whole milk'}): 242,
frozenaset({'other vegetables,whole milk,frozen vegetables,canned fish,salty
snack,seasonal products,detergent',
            'whole milk'}): 121,
frozenaset({'sausage,pastry', 'whole milk'}): 363,
frozenaset({'sausage,beef,whole milk', 'whole milk'}): 121,
frozenaset({'frankfurter,tropical fruit,rolls/buns,brown bread,sugar',
            'whole milk'}): 121,

```

```

frozenset({'rolls/buns,pastry,soda', 'whole milk'}): 484,
frozenset({'curd cheese,coffee', 'whole milk'}): 121,
frozenset({'red/blush wine,newspapers', 'whole milk'}): 121,
frozenset({'sausage,whole milk,curd', 'whole milk'}): 121,
frozenset({'tropical fruit,pip fruit,berries,whole milk,frozen potato products,rolls/buns,pickled vegetables,chocolate',
'whole milk'}): 121,
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frozenset({'whole milk',
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'whole milk'}): 121,
frozenset({'whole milk', 'whole milk,meat spreads,soda'}): 121,
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'whole milk'}): 121,
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'whole milk'}): 121,
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'whole milk'}): 121,
frozenset({'herbs,condensed milk,frozen vegetables,salt,oil,white wine,candles',
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frozenset({'bottled water', 'whole milk'}): 8107,
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d,candy',
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r,soda,fruit/vegetable juice,napkins',
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d beer',
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l,sugar,mustard,salty snack,chocolate,chocolate marshmallow,dish cleaner,dental care',
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ty cheese,pastry,fruit/vegetable juice',
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gent,cleaner,napkins,newspapers',

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able juice',
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beer',
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k,yogurt,hard cheese,processed cheese,mayonnaise,frozen vegetables,pastry,rol
l products,rice,margarine,sugar,pickled vegetables,bottled water,fruit/vegeta
ble juice,candy,skin care,napkins',
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cessed cheese,domestic eggs,white bread,pastry,semi-finished bread,soda,long
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zen vegetables,rolls/buns,white bread,brown bread,pastry,pasta,soups,baby foo
d,fruit/vegetable juice,salty snack,waffles,cake bar,chocolate,shopping bag
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frozenset({'grapes,specialty cheese,pasta,coffee,bottled water,soda,canned b
eer,brandy,white wine',
'whole milk'}): 121,
frozenset({'citrus fruit,bottled water,red/blush wine,photo/film',
'whole milk'}): 121,
frozenset({'dessert,white bread', 'whole milk'}): 121,
frozenset({'citrus fruit,tropical fruit,pip fruit,long life bakery product',
'whole milk'}): 121,
frozenset({'root vegetables,sliced cheese,soda,bottled beer',
'whole milk'}): 121,
frozenset({'pork,other vegetables', 'whole milk'}): 605,
frozenset({'turkey,whole milk,UHT-milk,fruit/vegetable juice',
'whole milk'}): 121,
frozenset({'tropical fruit,other vegetables,soda,candy,shopping bags',
'whole milk'}): 121,
frozenset({'sausage,other vegetables,pasta,oil,margarine,coffee,syrup,canned
beer,napkins,light bulbs,shopping bags',
'whole milk'}): 121,

```

```

frozenset({'sausage,meat,other vegetables,brown bread,canned fish,bottled wa
ter,canned beer,liquor (appetizer),shopping bags',
          'whole milk'}): 121,
frozenset({'pork,tropical fruit,other vegetables,dessert,yogurt,roll product
s,flour,rice,coffee,bottled water,soda,fruit/vegetable juice,canned beer,salt
y snack',
          'whole milk'}): 121,
frozenset({'sausage,citrus fruit,pip fruit,mayonnaise,brown bread,shopping b
ags',
          'whole milk'}): 121,
frozenset({'grapes,chocolate,light bulbs', 'whole milk'}): 121,
frozenset({'grapes,pastry,salty snack,light bulbs,shopping bags',
          'whole milk'}): 121,
frozenset({'other vegetables,yogurt,processed cheese,ketchup,bottled water,m
ale cosmetics',
          'whole milk'}): 121,
frozenset({'bottled water,potted plants', 'whole milk'}): 121,
frozenset({'prosecco,hygiene articles,potted plants', 'whole milk'}): 121,
frozenset({'UHT-milk,soda,dish cleaner,napkins', 'whole milk'}): 121,
frozenset({'bottled water,soda,chewing gum,specialty chocolate,candy',
          'whole milk'}): 121,
frozenset({'beef,other vegetables,butter milk,yogurt,whipped/sour cream,crea
m cheese,white bread,fruit/vegetable juice,bottled beer,chocolate',
          'whole milk'}): 121,
frozenset({'tropical fruit,pasta,bottled water', 'whole milk'}): 121,
frozenset({'beef,root vegetables,other vegetables,butter,yogurt,rolls/buns,f
lour',
          'whole milk'}): 121,
frozenset({'rolls/buns,white wine', 'whole milk'}): 121,
frozenset({'berries,root vegetables,whipped/sour cream,roll products,bottled
beer',
          'whole milk'}): 121,
frozenset({'sausage,hamburger meat,whole milk,rolls/buns,oil,pickled vegetab
les,softener,hygiene articles',
          'whole milk'}): 121,
frozenset({'chicken,pork,beef,whole milk,curd,whipped/sour cream',
          'whole milk'}): 121,
frozenset({'sausage,citrus fruit,whole milk,cream cheese,processed cheese,fr
ozen vegetables,rolls/buns,pastry,fruit/vegetable juice,chewing gum',
          'whole milk'}): 121,
frozenset({'soda,canned beer', 'whole milk'}): 1815,
frozenset({'whole milk', 'yogurt,UHT-milk,rolls/buns'}): 121,
frozenset({'whole milk', 'whole milk,brown bread'}): 847,
frozenset({'citrus fruit,root vegetables,other vegetables,whole milk,curd,yo
gurt,whipped/sour cream,hard cheese,cream cheese,domestic eggs,flour,rice,oi
l,margarine,sugar',
          'whole milk'}): 121,
frozenset({'citrus fruit,tropical fruit,grapes,whole milk,brown bread,pastr
y',
          'whole milk'}): 121,
frozenset({'brown bread,chocolate', 'whole milk'}): 121,
frozenset({'tropical fruit,other vegetables,whipped/sour cream,UHT-milk,froz
en vegetables,oil,margarine,fruit/vegetable juice,kitchen towels',
          'whole milk'}): 121,
frozenset({'frankfurter,tropical fruit,butter,whipped/sour cream,frozen vege
tables,rolls/buns,sugar,baking powder,bottled water,misc. beverages,long life
bakery product,newspapers',

```

```

        'whole milk'}): 121,
frozenset({'ham,rolls/buns,bottled beer,chewing gum', 'whole milk'}): 121,
frozenset({'other vegetables,curd,yogurt,pickled vegetables,bottled water',
        'whole milk'}): 121,
frozenset({'sausage,whole milk,curd,butter milk,whipped/sour cream',
        'whole milk'}): 121,
frozenset({'pork,whole milk,margarine,soda,canned beer,newspapers',
        'whole milk'}): 121,
frozenset({'citrus fruit,yogurt,whipped/sour cream,soda,cookware',
        'whole milk'}): 121,
frozenset({'tropical fruit,whole milk,domestic eggs,pastry,hygiene article
s',
        'whole milk'}): 121,
frozenset({'other vegetables,yogurt,cream cheese', 'whole milk'}): 121,
frozenset({'pork,whole milk,sugar,soda,long life bakery product,chocolate',
        'whole milk'}): 121,
frozenset({'chicken,pork,pip fruit,other vegetables,whole milk,tidbits,froze
n fish,rolls/buns,margarine,baking powder,soda,bottled beer,white wine,waffle
s,chocolate,candy',
        'whole milk'}): 121,
...}

```

```

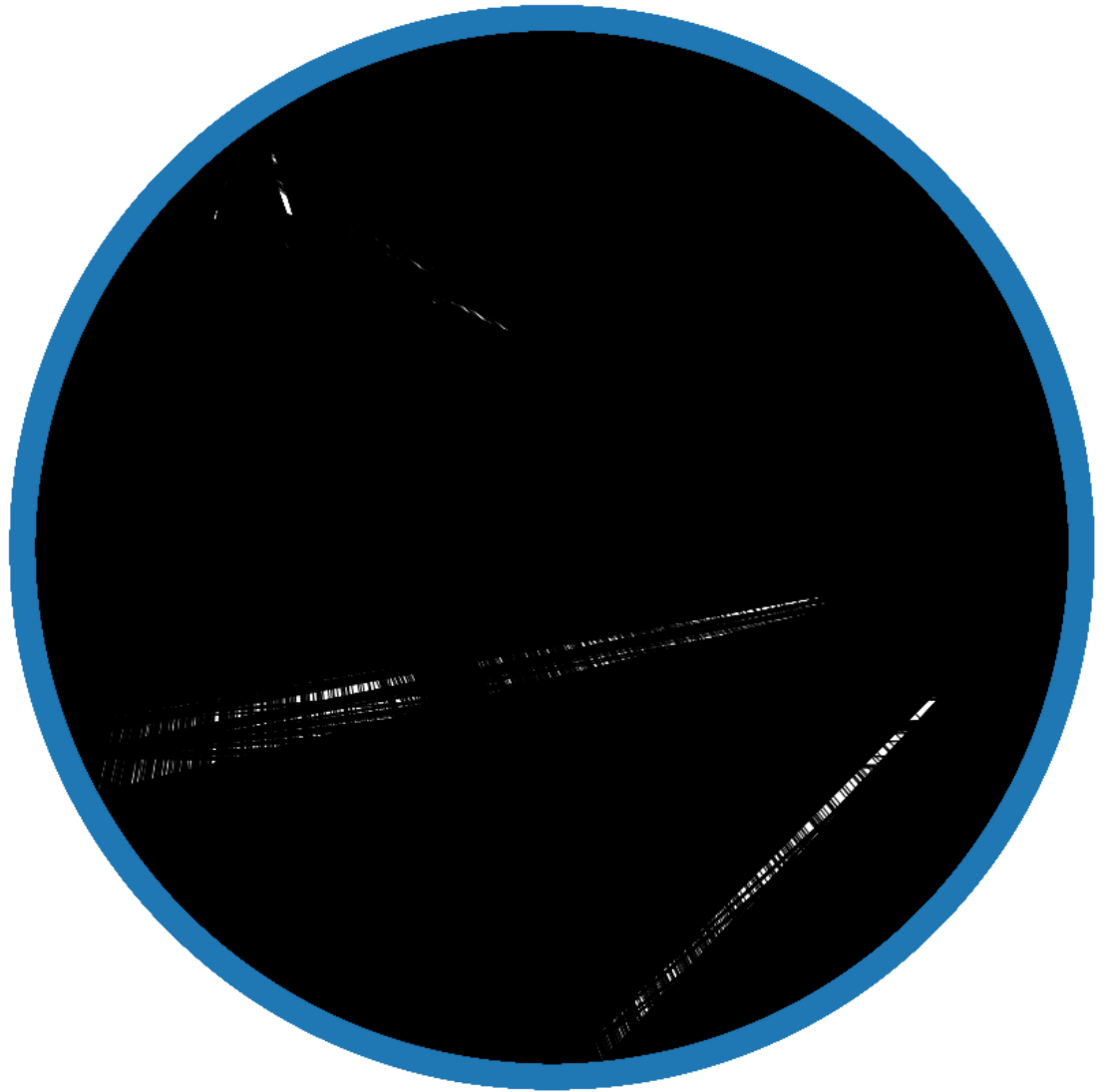
In [75]: # create DataFrame using data
dfs100n=pd.DataFrame(naive_result_s100.items(), columns=['basket', 'count'])
dfs100n.head(10)

```

Out[75]:

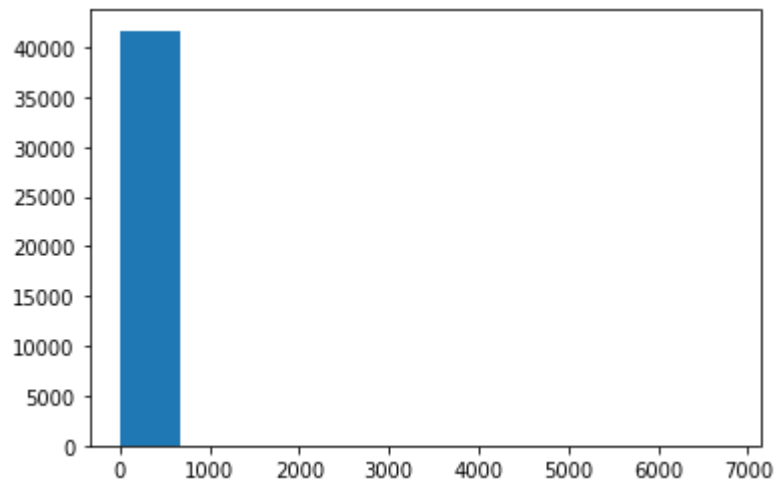
	basket	count
0	(citrus fruit,semi-finished bread,margarine,ready soups, whole milk)	121
1	(citrus fruit,semi-finished bread,margarine,ready soups, rolls/buns)	109
2	(citrus fruit,semi-finished bread,margarine,ready soups, canned beer)	260
3	(citrus fruit,semi-finished bread,margarine,ready soups, soda)	156
4	(citrus fruit,semi-finished bread,margarine,ready soups, bottled beer)	120
5	(whole milk, tropical fruit,yogurt,coffee)	121
6	(rolls/buns, tropical fruit,yogurt,coffee)	109
7	(canned beer, tropical fruit,yogurt,coffee)	260
8	(soda, tropical fruit,yogurt,coffee)	156
9	(bottled beer, tropical fruit,yogurt,coffee)	120


```
In [76]: plt.figure(figsize=(12, 12))  
G_naive_s100=nx.from_pandas_edgelist(dfs100n,source='basket',target='count')  
nx.draw_circular(G_naive_s100)
```



```
In [77]: plt.hist([v for k,v in nx.degree(G_naive_s100)])
```

```
Out[77]: (array([4.1693e+04, 0.0000e+00, 0.0000e+00, 0.0000e+00, 0.0000e+00,
        0.0000e+00, 0.0000e+00, 0.0000e+00, 0.0000e+00, 5.0000e+00]),
        array([1.0000e+00, 6.8070e+02, 1.3604e+03, 2.0401e+03, 2.7198e+03,
        3.3995e+03, 4.0792e+03, 4.7589e+03, 5.4386e+03, 6.1183e+03,
        6.7980e+03])),
        <a list of 10 Patch objects>)
```



A-Priori algorithm

N = 10

```
In [78]: N10 = 10 # frequency threshold
start_time_apriori10=time.time()
```

```
In [79]: %time
# find frequent 1-tuples (individual items)
C1N10 = {}
for key in readdata(k=1, report=False):
    if key not in C1N10:
        C1N10[key] = 1
    else:
        C1N10[key] += 1

print("{} items".format(len(C1N10)))
```

```
Wall time: 0 ns
7011 items
```

```
In [80]: %time
# filter stage
L1N10 = {}
for key, count in C1N10.items():
    if count >= N10:
        L1N10[key] = count
print('{} items with >{} occurances'.format(len(L1N10), N10))
```

Wall time: 0 ns
70 items with >10 occurances

```
In [81]: C2N10_items = set([a.union(b) for a in L1N10.keys() for b in L1N10.keys()])
```

```
In [82]: len(C2N10_items)
```

Out[82]: 2485

```
In [83]: %time
# find frequent 2-tuples
C2N10 = {}
for key in readdata(k=2):
    # filter out non-frequent tuples
    if key not in C2N10_items:
        continue

    # record frequent tuples
    if key not in C2N10:
        C2N10[key] = 1
    else:
        C2N10[key] += 1

print("{} items".format(len(C2N10)))
```

Wall time: 0 ns
2485 items

```
In [84]: %time
# filter stage
L2N10 = {}
for key, count in C2N10.items():
    if count >= N10:
        L2N10[key] = count
print('{} items with > {} occurances'.format(len(L2N10), N10))
end_time_apriori10=time.time()
time_apriori10=start_time_apriori10-end_time_apriori10
```

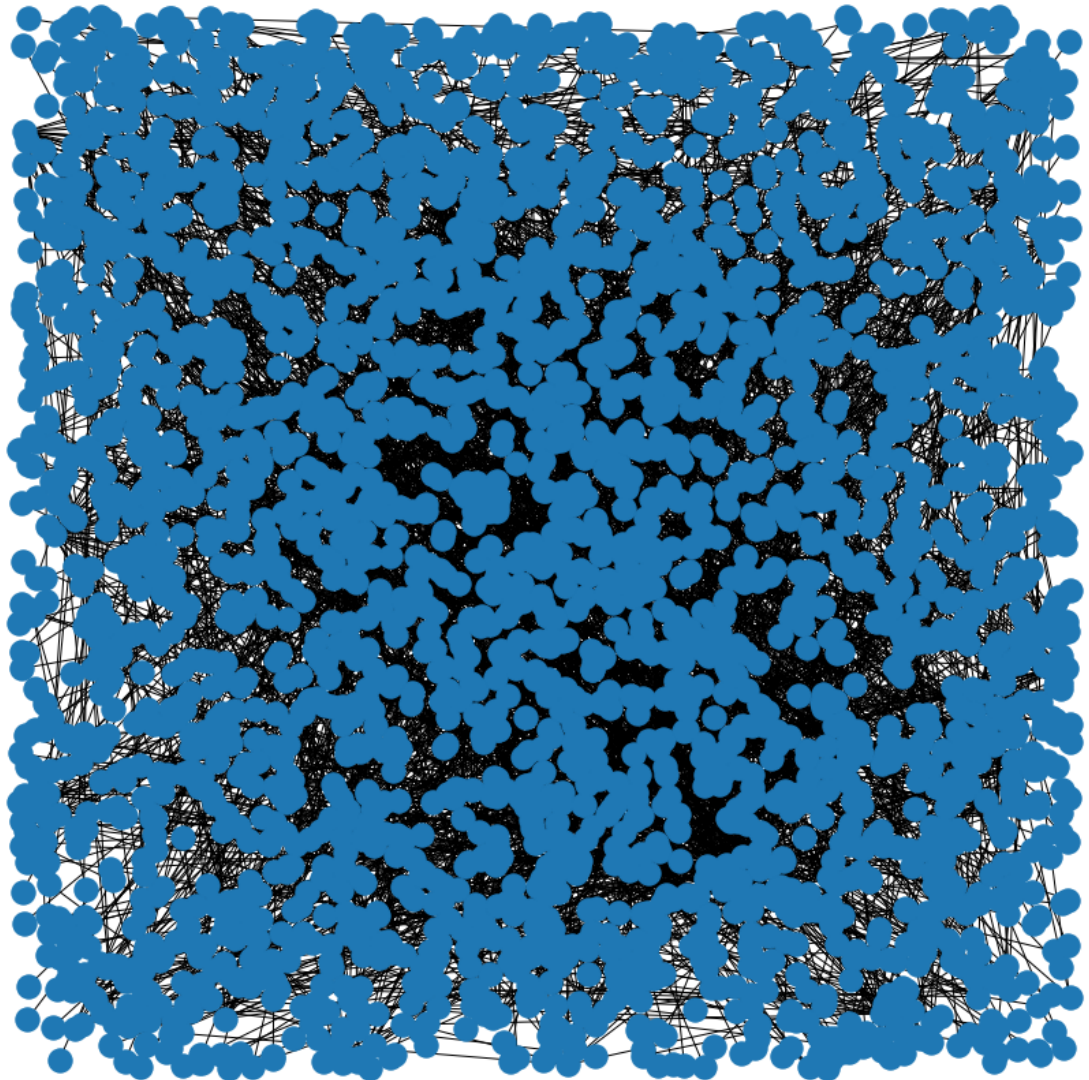
Wall time: 0 ns
2485 items with > 10 occurances

```
In [85]: # create DataFrame using data
dfs10a=pd.DataFrame(L2N10.items(), columns=['basket', 'count'])
dfs10a.head(10)
```

Out[85]:

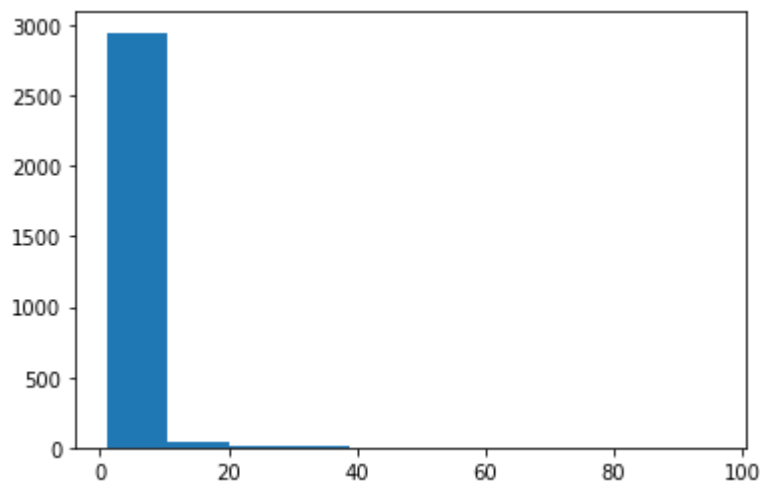
	basket	count
0	(rolls/buns, whole milk)	13189
1	(potted plants, whole milk)	1210
2	(beef, whole milk)	3146
3	(fruit/vegetable juice, whole milk)	2662
4	(chocolate, whole milk)	4235
5	(specialty bar, whole milk)	2541
6	(other vegetables, whole milk)	7502
7	(whole milk)	7260
8	(yogurt, whole milk)	4840
9	(pastry,soda, whole milk)	3267

```
In [100]: plt.figure(figsize=(12, 12))  
G_apriori_n10=nx.from_pandas_edgelist(dfs10a,source='basket',target='count')  
nx.draw_random(G_apriori_n10)
```



```
In [87]: plt.hist([v for k,v in nx.degree(G_apriori_n10)])
```

```
Out[87]: (array([2.947e+03, 3.600e+01, 1.000e+01, 6.000e+00, 3.000e+00, 1.000e+00,
        2.000e+00, 0.000e+00, 0.000e+00, 1.000e+00]),
        array([ 1. , 10.5, 20. , 29.5, 39. , 48.5, 58. , 67.5, 77. , 86.5, 96. ]),
        <a list of 10 Patch objects>)
```



N = 50

```
In [88]: N50 = 50 # frequency threshold
start_time_apriori50=time.time()
```

```
In [89]: %time
# find frequent 1-tuples (individual items)
C1N50 = {}
for key in readdata(k=1, report=False):
    if key not in C1N50:
        C1N50[key] = 1
    else:
        C1N50[key] += 1

print("{} items".format(len(C1N50)))
```

Wall time: 0 ns
7011 items

```
In [90]: %time
# filter stage
L1N50 = {}
for key, count in C1N50.items():
    if count >= N50:
        L1N50[key] = count
print('{} items with >{} occurrences'.format(len(L1N50), N50))
```

Wall time: 0 ns
8 items with >50 occurrences

```
In [91]: C2N50_items = set([a.union(b) for a in L1N50.keys() for b in L1N50.keys()])
```

```
In [92]: len(C2N50_items)
```

```
Out[92]: 36
```

```
In [93]: %time
# find frequent 2-tuples
C2N50 = {}
for key in readdata(k=2):
    # filter out non-frequent tuples
    if key not in C2N50_items:
        continue

    # record frequent tuples
    if key not in C2N50:
        C2N50[key] = 1
    else:
        C2N50[key] += 1

print("{} items".format(len(C2N50)))
```

```
Wall time: 0 ns
36 items
```

```
In [94]: %time
# filter stage
L2N50 = {}
for key, count in C2N50.items():
    if count >= N50:
        L2N50[key] = count
print('{} items with > {} occurrences'.format(len(L2N50), N50))
end_time_apriori50=time.time()
time_apriori50=start_time_apriori50-end_time_apriori50
```

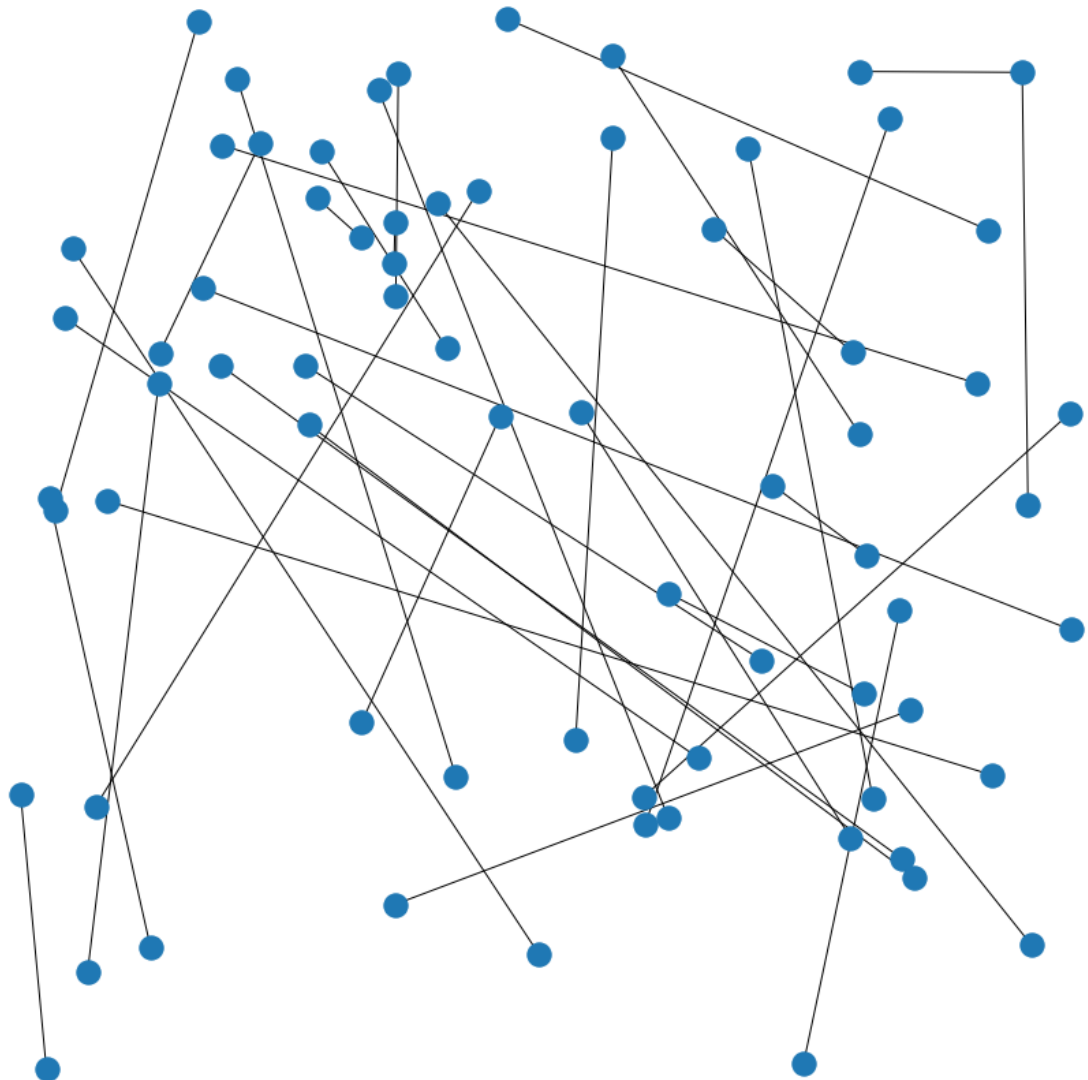
```
Wall time: 0 ns
36 items with > 50 occurrences
```

```
In [95]: # create DataFrame using data
dfs50a=pd.DataFrame(L2N50.items(), columns=['basket', 'count'])
dfs50a.head(10)
```

Out[95]:

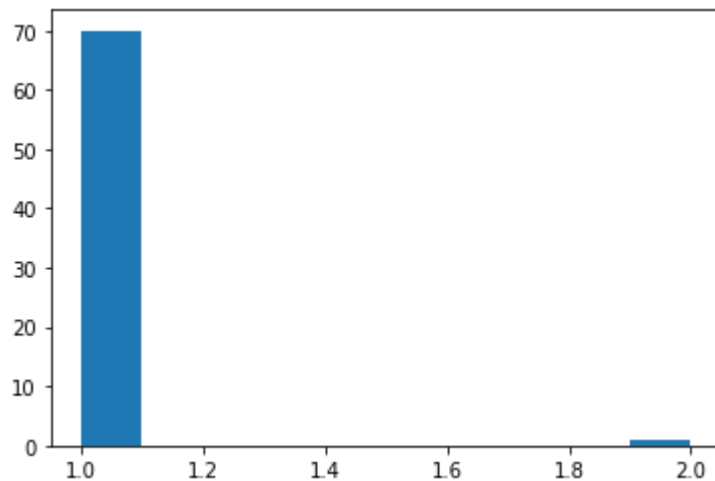
	basket	count
0	(rolls/buns, whole milk)	13189
1	(other vegetables, whole milk)	7502
2	(whole milk)	7260
3	(canned beer, whole milk)	31460
4	(bottled water, whole milk)	8107
5	(soda, whole milk)	18876
6	(newspapers, whole milk)	6534
7	(bottled beer, whole milk)	14520
8	(rolls/buns, other vegetables)	6758
9	(rolls/buns, canned beer)	28340


```
In [101]: plt.figure(figsize=(12, 12))  
G_apriori_n50=nx.from_pandas_edgelist(dfs50a,source='basket',target='count')  
nx.draw_random(G_apriori_n50)
```



```
In [97]: plt.hist([v for k,v in nx.degree(G_apriori_n50)])
```

```
Out[97]: (array([70., 0., 0., 0., 0., 0., 0., 0., 0., 1.]),
array([1. , 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2. ]),
<a list of 10 Patch objects>)
```



N = 100

```
In [102]: N100 = 100 # frequency threshold
start_time_apriori100=time.time()
```

```
In [103]: %time
# find frequent 1-tuples (individual items)
C1N100 = {}
for key in readdata(k=1, report=False):
    if key not in C1N100:
        C1N100[key] = 1
    else:
        C1N100[key] += 1

print("{} items".format(len(C1N100)))
```

Wall time: 0 ns
7011 items

```
In [104]: %time
# filter stage
L1N100 = {}
for key, count in C1N100.items():
    if count >= N100:
        L1N100[key] = count
print('{} items with >{} occurrences'.format(len(L1N100), N100))
```

Wall time: 0 ns
5 items with >100 occurrences

A-Priori filtering, first option: Generate all possible tuples of frequent items

```
In [105]: C2N100_items = set([a.union(b) for a in L1N100.keys() for b in L1N100.keys()])
```

```
In [106]: len(C2N100_items)
```

```
Out[106]: 15
```

```
In [107]: %time
# find frequent 2-tuples
C2N100 = {}
for key in readdata(k=2):
    # filter out non-frequent tuples
    if key not in C2N100_items:
        continue

    # record frequent tuples
    if key not in C2N100:
        C2N100[key] = 1
    else:
        C2N100[key] += 1

print("{} items".format(len(C2N100)))
```

```
Wall time: 0 ns
```

```
15 items
```

```
In [108]: # filter stage
L2N100 = {}
for key, count in C2N100.items():
    if count >= N100:
        L2N100[key] = count
print('{} items with > {} occurrences'.format(len(L2N100), N100))
end_time_apriori100=time.time()
time_apriori100=start_time_apriori100-end_time_apriori100
```

```
15 items with > 100 occurrences
```

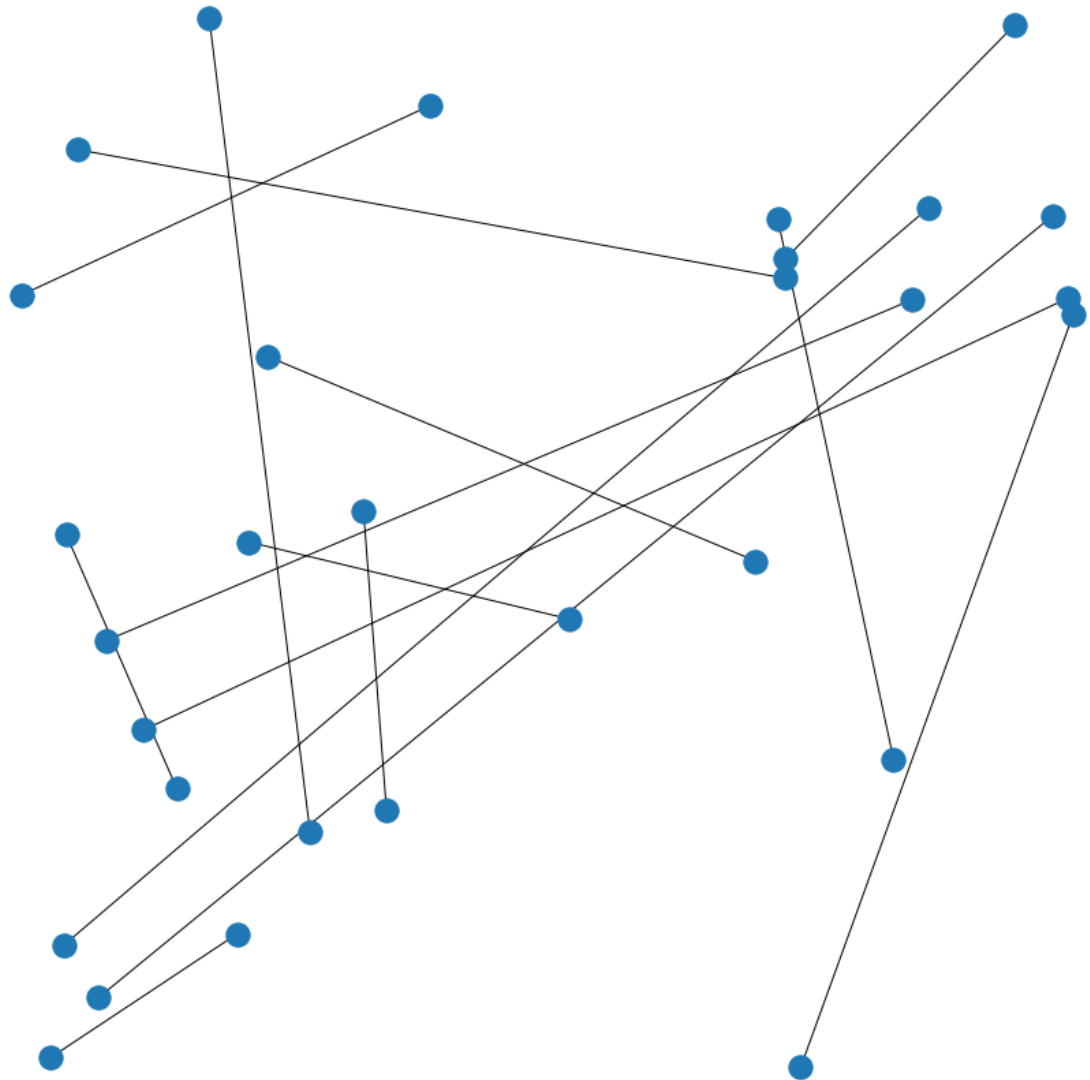
```
In [109]: plt.figure(figsize=(12, 12))  
# create DataFrame using data  
dfs100a=pd.DataFrame(L2N100.items(), columns=['basket', 'count'])  
dfs100a.head(10)
```

Out[109]:

	basket	count
0	(rolls/buns, whole milk)	13189
1	(whole milk)	7260
2	(canned beer, whole milk)	31460
3	(soda, whole milk)	18876
4	(bottled beer, whole milk)	14520
5	(rolls/buns, canned beer)	28340
6	(rolls/buns)	5886
7	(rolls/buns, soda)	17004
8	(rolls/buns, bottled beer)	13080
9	(canned beer)	33670

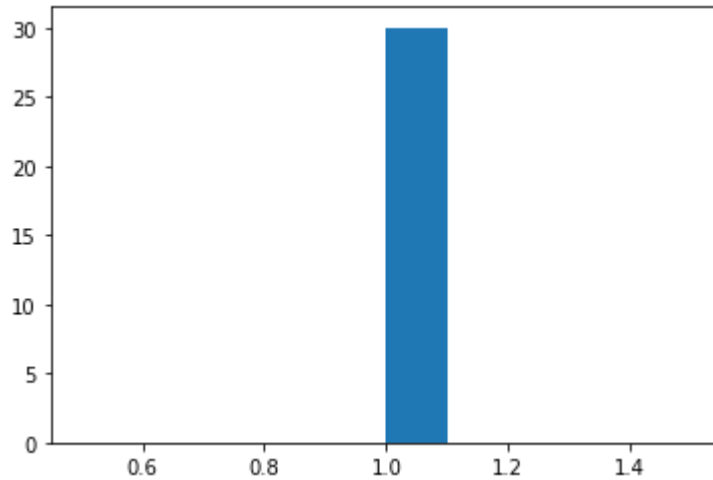
<Figure size 864x864 with 0 Axes>

```
In [112]: plt.figure(figsize=(12, 12))  
G_apriori_n100=nx.from_pandas_edgelist(dfs100a,source='basket',target='count')  
nx.draw_random(G_apriori_n100)
```



```
In [111]: plt.hist([v for k,v in nx.degree(G_apriori_n100)])
```

```
Out[111]: (array([ 0.,  0.,  0.,  0.,  0., 30.,  0.,  0.,  0.,  0.]),
 array([0.5, 0.6, 0.7, 0.8, 0.9, 1. , 1.1, 1.2, 1.3, 1.4, 1.5]),
 <a list of 10 Patch objects>)
```



PCY improvement A-priori

Using one hash table

```
In [113]: N=10
```

```
In [114]: # hash table
max_hash1 = 10*1000000
H1 = np.zeros((max_hash1,), dtype=np.int)
for key in readdata(k=2, report=True):
    hash_cell_1 = hash(key) % max_hash1
    H1[hash_cell_1] += 1
```

```
In [115]: # find frequent 2-tuples
C2 = {}
for key in readdata(k=2):
    # hash-based filtering stage from PCY
    hash_cell_1 = hash(key) % max_hash1
    if H1[hash_cell_1] < N:
        continue

    # filter out non-frequent tuples
    if key not in C2N10_items:
        continue

    # record frequent tuples
    if key not in C2:
        C2[key] = 1
    else:
        C2[key] += 1

print("{} items".format(len(C2)))
```

2485 items

```
In [116]: # filter stage
L2 = {}
for key, count in C2.items():
    if count >= N:
        L2[key] = count
print('{} items with >{} occurrences'.format(len(L2), N))
```

2485 items with >10 occurrences

Using compacted hash table indexes - takes less memory!

```
In [117]: start_time_pcy10 = time.time()
# hash table
max_hash1 = 10*1000000
H1 = np.zeros((max_hash1,), dtype=np.int)
for key in readdata(k=2, report=True):
    hash_cell_1 = hash(key) % max_hash1
    H1[hash_cell_1] += 1
```

```
In [118]: # compact hash table
H_good_1 = set(np.where(H1 >= N10)[0])

del H1
```

```
In [119]: # find frequent 2-tuples
C2 = {}
for key in readdata(k=2):
    # hash-based filtering stage from PCY
    hash_cell_1 = hash(key) % max_hash1
    if hash_cell_1 not in H_good_1:
        continue

    # filter out non-frequent tuples
    if key not in C2N10_items:
        continue

    # record frequent tuples
    if key not in C2:
        C2[key] = 1
    else:
        C2[key] += 1

print("{} items".format(len(C2)))
```

2485 items

```
In [120]: # filter stage
L2_PCY_N10 = {}
for key, count in C2.items():
    if count >= N10:
        L2_PCY_N10[key] = count
print('{} items with >{} occurrences'.format(len(L2_PCY_N10), N10))
end_time_pcy10=time.time()
time_pcy10=start_time_pcy10-end_time_pcy10
```

2485 items with >10 occurrences

Generate rules A -> B


```
In [121]: L2_PCY_N10 = [ elem for elem in list(L2_PCY_N10) if len(elem)>1] # clean our list a bit.

for i in range(len(L2_PCY_N10)):

    A, B = list(L2_PCY_N10[i])
    support_AB = C2[frozenset([A, B])]
    support_A = C1N10[frozenset([A])]
    conf_A_leads_to_B = support_AB / support_A

    support_B = C1N10[frozenset([B])]
    prob_B = support_B / 2750.0

    interest_A_leads_to_B = conf_A_leads_to_B - prob_B

    if interest_A_leads_to_B > 0.7:
        print("{} --> {} with interest {:.3f}".format(A, B, interest_A_leads_to_B))
```

rolls/buns --> whole milk with interest 120.956000
potted plants --> whole milk with interest 120.956000
beef --> whole milk with interest 120.956000
fruit/vegetable juice --> whole milk with interest 120.956000
chocolate --> whole milk with interest 120.956000
specialty bar --> whole milk with interest 120.956000
other vegetables --> whole milk with interest 120.956000
yogurt --> whole milk with interest 120.956000
pastry,soda --> whole milk with interest 120.956000
canned beer --> whole milk with interest 120.956000
coffee --> whole milk with interest 120.956000
misc. beverages --> whole milk with interest 120.956000
bottled water --> whole milk with interest 120.956000
soda --> whole milk with interest 120.956000
berries --> whole milk with interest 120.956000
detergent --> whole milk with interest 120.956000
sparkling wine --> whole milk with interest 120.956000
newspapers --> whole milk with interest 120.956000
frankfurter,rolls/buns --> whole milk with interest 120.956000
bottled beer --> whole milk with interest 120.956000
rolls/buns,canned beer --> whole milk with interest 120.956000
specialty chocolate --> whole milk with interest 120.956000
beverages --> whole milk with interest 120.956000
white wine --> whole milk with interest 120.956000
rolls/buns,soda --> whole milk with interest 120.956000
ice cream --> whole milk with interest 120.956000
liquor --> whole milk with interest 120.956000
pork --> whole milk with interest 120.956000
root vegetables --> whole milk with interest 120.956000
sausage --> whole milk with interest 120.956000
candy --> whole milk with interest 120.956000
sausage,rolls/buns --> whole milk with interest 120.956000
photo/film --> whole milk with interest 120.956000
chicken --> whole milk with interest 120.956000
shopping bags --> whole milk with interest 120.956000
oil --> whole milk with interest 120.956000
citrus fruit --> whole milk with interest 120.956000
frozen vegetables --> whole milk with interest 120.956000
rolls/buns,bottled beer --> whole milk with interest 120.956000
bottled beer,liquor --> whole milk with interest 120.956000
hamburger meat --> whole milk with interest 120.956000
pastry --> whole milk with interest 120.956000
bottled water,soda --> whole milk with interest 120.956000
salty snack --> whole milk with interest 120.956000
yogurt,rolls/buns --> whole milk with interest 120.956000
domestic eggs --> whole milk with interest 120.956000
frankfurter --> whole milk with interest 120.956000
tropical fruit --> whole milk with interest 120.956000
whipped/sour cream --> whole milk with interest 120.956000
sugar --> whole milk with interest 120.956000
sausage,rolls/buns,soda --> whole milk with interest 120.956000
soda,bottled beer --> whole milk with interest 120.956000
hygiene articles --> whole milk with interest 120.956000
brown bread --> whole milk with interest 120.956000
whole milk,pastry --> whole milk with interest 120.956000
chewing gum --> whole milk with interest 120.956000
soda,canned beer --> whole milk with interest 120.956000

rolls/buns,brown bread --> whole milk with interest 120.956000
pip fruit --> whole milk with interest 120.956000
UHT-milk --> whole milk with interest 120.956000
whole milk,rolls/buns --> whole milk with interest 120.956000
waffles --> whole milk with interest 120.956000
napkins --> whole milk with interest 120.956000
long life bakery product --> whole milk with interest 120.956000
canned beer,shopping bags --> whole milk with interest 120.956000
butter --> whole milk with interest 120.956000
frozen meals --> whole milk with interest 120.956000
dishes --> whole milk with interest 120.956000
pet care --> whole milk with interest 120.956000
rolls/buns --> potted plants with interest 9.996364
rolls/buns --> beef with interest 25.990545
rolls/buns --> fruit/vegetable juice with interest 21.992000
rolls/buns --> chocolate with interest 34.987273
rolls/buns --> specialty bar with interest 20.992364
rolls/buns --> other vegetables with interest 61.977455
rolls/buns --> yogurt with interest 39.985455
rolls/buns --> pastry,soda with interest 26.990182
rolls/buns --> canned beer with interest 259.905455
rolls/buns --> coffee with interest 38.985818
rolls/buns --> misc. beverages with interest 30.988727
rolls/buns --> bottled water with interest 66.975636
rolls/buns --> soda with interest 155.943273
rolls/buns --> berries with interest 9.996364
rolls/buns --> detergent with interest 9.996364
rolls/buns --> sparkling wine with interest 9.996364
rolls/buns --> newspapers with interest 53.980364
rolls/buns --> frankfurter,rolls/buns with interest 17.993455
rolls/buns --> bottled beer with interest 119.956364
rolls/buns --> rolls/buns,canned beer with interest 13.994909
rolls/buns --> specialty chocolate with interest 25.990545
rolls/buns --> beverages with interest 25.990545
rolls/buns --> white wine with interest 18.993091
rolls/buns --> rolls/buns,soda with interest 22.991636
rolls/buns --> ice cream with interest 33.987636
rolls/buns --> liquor with interest 9.996364
rolls/buns --> pork with interest 26.990182
rolls/buns --> root vegetables with interest 24.990909
rolls/buns --> sausage with interest 23.991273
rolls/buns --> candy with interest 11.995636
rolls/buns --> sausage,rolls/buns with interest 11.995636
rolls/buns --> photo/film with interest 26.990182
rolls/buns --> chicken with interest 14.994545
rolls/buns --> shopping bags with interest 47.982545
rolls/buns --> oil with interest 12.995273
rolls/buns --> citrus fruit with interest 15.994182
rolls/buns --> frozen vegetables with interest 12.995273
rolls/buns --> rolls/buns,bottled beer with interest 10.996000
rolls/buns --> bottled beer,liquor with interest 10.996000
rolls/buns --> hamburger meat with interest 10.996000
rolls/buns --> pastry with interest 36.986545
rolls/buns --> bottled water,soda with interest 16.993818
rolls/buns --> salty snack with interest 29.989091
rolls/buns --> yogurt,rolls/buns with interest 9.996364
rolls/buns --> domestic eggs with interest 10.996000

rolls/buns --> frankfurter with interest 10.996000
rolls/buns --> tropical fruit with interest 22.991636
rolls/buns --> whipped/sour cream with interest 25.990545
rolls/buns --> sugar with interest 11.995636
rolls/buns --> sausage,rolls/buns,soda with interest 9.996364
rolls/buns --> soda,bottled beer with interest 9.996364
rolls/buns --> hygiene articles with interest 11.995636
rolls/buns --> brown bread with interest 19.992727
rolls/buns --> whole milk,pastry with interest 11.995636
rolls/buns --> chewing gum with interest 14.994545
rolls/buns --> soda,canned beer with interest 14.994545
rolls/buns --> rolls/buns,brown bread with interest 9.996364
rolls/buns --> pip fruit with interest 27.989818
rolls/buns --> UHT-milk with interest 9.996364
rolls/buns --> whole milk,rolls/buns with interest 12.995273
rolls/buns --> waffles with interest 20.992364
rolls/buns --> napkins with interest 14.994545
rolls/buns --> long life bakery product with interest 10.996000
rolls/buns --> canned beer,shopping bags with interest 10.996000
rolls/buns --> butter with interest 10.996000
rolls/buns --> frozen meals with interest 15.994182
rolls/buns --> dishes with interest 9.996364
rolls/buns --> pet care with interest 9.996364
beef --> potted plants with interest 9.996364
fruit/vegetable juice --> potted plants with interest 9.996364
chocolate --> potted plants with interest 9.996364
specialty bar --> potted plants with interest 9.996364
other vegetables --> potted plants with interest 9.996364
yogurt --> potted plants with interest 9.996364
potted plants --> pastry,soda with interest 26.990182
canned beer --> potted plants with interest 9.996364
potted plants --> coffee with interest 38.985818
potted plants --> misc. beverages with interest 30.988727
bottled water --> potted plants with interest 9.996364
soda --> potted plants with interest 9.996364
berries --> potted plants with interest 9.996364
detergent --> potted plants with interest 9.996364
potted plants --> sparkling wine with interest 9.996364
newspapers --> potted plants with interest 9.996364
frankfurter,rolls/buns --> potted plants with interest 9.996364
bottled beer --> potted plants with interest 9.996364
rolls/buns,canned beer --> potted plants with interest 9.996364
specialty chocolate --> potted plants with interest 9.996364
beverages --> potted plants with interest 9.996364
white wine --> potted plants with interest 9.996364
rolls/buns,soda --> potted plants with interest 9.996364
ice cream --> potted plants with interest 9.996364
liquor --> potted plants with interest 9.996364
potted plants --> pork with interest 26.990182
root vegetables --> potted plants with interest 9.996364
sausage --> potted plants with interest 9.996364
candy --> potted plants with interest 9.996364
potted plants --> sausage,rolls/buns with interest 11.995636
photo/film --> potted plants with interest 9.996364
chicken --> potted plants with interest 9.996364
shopping bags --> potted plants with interest 9.996364
potted plants --> oil with interest 12.995273

citrus fruit --> potted plants with interest 9.996364
frozen vegetables --> potted plants with interest 9.996364
rolls/buns,bottled beer --> potted plants with interest 9.996364
potted plants --> bottled beer,liquor with interest 10.996000
hamburger meat --> potted plants with interest 9.996364
pastry --> potted plants with interest 9.996364
bottled water,soda --> potted plants with interest 9.996364
salty snack --> potted plants with interest 9.996364
yogurt,rolls/buns --> potted plants with interest 9.996364
domestic eggs --> potted plants with interest 9.996364
frankfurter --> potted plants with interest 9.996364
tropical fruit --> potted plants with interest 9.996364
whipped/sour cream --> potted plants with interest 9.996364
sugar --> potted plants with interest 9.996364
sausage,rolls/buns,soda --> potted plants with interest 9.996364
soda,bottled beer --> potted plants with interest 9.996364
hygiene articles --> potted plants with interest 9.996364
brown bread --> potted plants with interest 9.996364
whole milk,pastry --> potted plants with interest 9.996364
chewing gum --> potted plants with interest 9.996364
soda,canned beer --> potted plants with interest 9.996364
rolls/buns,brown bread --> potted plants with interest 9.996364
potted plants --> pip fruit with interest 27.989818
UHT-milk --> potted plants with interest 9.996364
whole milk,rolls/buns --> potted plants with interest 9.996364
potted plants --> waffles with interest 20.992364
napkins --> potted plants with interest 9.996364
long life bakery product --> potted plants with interest 9.996364
canned beer,shopping bags --> potted plants with interest 9.996364
butter --> potted plants with interest 9.996364
frozen meals --> potted plants with interest 9.996364
potted plants --> dishes with interest 9.996364
potted plants --> pet care with interest 9.996364
fruit/vegetable juice --> beef with interest 25.990545
chocolate --> beef with interest 25.990545
specialty bar --> beef with interest 25.990545
other vegetables --> beef with interest 25.990545
yogurt --> beef with interest 25.990545
beef --> pastry,soda with interest 26.990182
canned beer --> beef with interest 25.990545
beef --> coffee with interest 38.985818
beef --> misc. beverages with interest 30.988727
bottled water --> beef with interest 25.990545
soda --> beef with interest 25.990545
berries --> beef with interest 25.990545
detergent --> beef with interest 25.990545
beef --> sparkling wine with interest 9.996364
newspapers --> beef with interest 25.990545
frankfurter,rolls/buns --> beef with interest 25.990545
bottled beer --> beef with interest 25.990545
rolls/buns,canned beer --> beef with interest 25.990545
specialty chocolate --> beef with interest 25.990545
beverages --> beef with interest 25.990545
white wine --> beef with interest 25.990545
rolls/buns,soda --> beef with interest 25.990545
ice cream --> beef with interest 25.990545
liquor --> beef with interest 25.990545

beef --> pork with interest 26.990182
root vegetables --> beef with interest 25.990545
sausage --> beef with interest 25.990545
candy --> beef with interest 25.990545
beef --> sausage,rolls/buns with interest 11.995636
photo/film --> beef with interest 25.990545
chicken --> beef with interest 25.990545
shopping bags --> beef with interest 25.990545
beef --> oil with interest 12.995273
citrus fruit --> beef with interest 25.990545
frozen vegetables --> beef with interest 25.990545
rolls/buns,bottled beer --> beef with interest 25.990545
beef --> bottled beer,liquor with interest 10.996000
hamburger meat --> beef with interest 25.990545
pastry --> beef with interest 25.990545
bottled water,soda --> beef with interest 25.990545
salty snack --> beef with interest 25.990545
yogurt,rolls/buns --> beef with interest 25.990545
domestic eggs --> beef with interest 25.990545
frankfurter --> beef with interest 25.990545
tropical fruit --> beef with interest 25.990545
whipped/sour cream --> beef with interest 25.990545
sugar --> beef with interest 25.990545
sausage,rolls/buns,soda --> beef with interest 25.990545
soda,bottled beer --> beef with interest 25.990545
hygiene articles --> beef with interest 25.990545
brown bread --> beef with interest 25.990545
whole milk,pastry --> beef with interest 25.990545
chewing gum --> beef with interest 25.990545
soda,canned beer --> beef with interest 25.990545
rolls/buns,brown bread --> beef with interest 25.990545
beef --> pip fruit with interest 27.989818
UHT-milk --> beef with interest 25.990545
whole milk,rolls/buns --> beef with interest 25.990545
beef --> waffles with interest 20.992364
napkins --> beef with interest 25.990545
long life bakery product --> beef with interest 25.990545
canned beer,shopping bags --> beef with interest 25.990545
butter --> beef with interest 25.990545
frozen meals --> beef with interest 25.990545
beef --> dishes with interest 9.996364
beef --> pet care with interest 9.996364
fruit/vegetable juice --> chocolate with interest 34.987273
fruit/vegetable juice --> specialty bar with interest 20.992364
fruit/vegetable juice --> other vegetables with interest 61.977455
fruit/vegetable juice --> yogurt with interest 39.985455
fruit/vegetable juice --> pastry,soda with interest 26.990182
fruit/vegetable juice --> canned beer with interest 259.905455
fruit/vegetable juice --> coffee with interest 38.985818
fruit/vegetable juice --> misc. beverages with interest 30.988727
fruit/vegetable juice --> bottled water with interest 66.975636
fruit/vegetable juice --> soda with interest 155.943273
fruit/vegetable juice --> berries with interest 9.996364
fruit/vegetable juice --> detergent with interest 9.996364
fruit/vegetable juice --> sparkling wine with interest 9.996364
fruit/vegetable juice --> newspapers with interest 53.980364
fruit/vegetable juice --> frankfurter,rolls/buns with interest 17.993455

bottled beer --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> rolls/buns,canned beer with interest 13.994909
fruit/vegetable juice --> specialty chocolate with interest 25.990545
fruit/vegetable juice --> beverages with interest 25.990545
white wine --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> rolls/buns,soda with interest 22.991636
fruit/vegetable juice --> ice cream with interest 33.987636
liquor --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> pork with interest 26.990182
fruit/vegetable juice --> root vegetables with interest 24.990909
fruit/vegetable juice --> sausage with interest 23.991273
fruit/vegetable juice --> candy with interest 11.995636
fruit/vegetable juice --> sausage,rolls/buns with interest 11.995636
fruit/vegetable juice --> photo/film with interest 26.990182
chicken --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> shopping bags with interest 47.982545
fruit/vegetable juice --> oil with interest 12.995273
citrus fruit --> fruit/vegetable juice with interest 21.992000
frozen vegetables --> fruit/vegetable juice with interest 21.992000
rolls/buns,bottled beer --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> bottled beer,liquor with interest 10.996000
fruit/vegetable juice --> hamburger meat with interest 10.996000
fruit/vegetable juice --> pastry with interest 36.986545
bottled water,soda --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> salty snack with interest 29.989091
fruit/vegetable juice --> yogurt,rolls/buns with interest 9.996364
fruit/vegetable juice --> domestic eggs with interest 10.996000
fruit/vegetable juice --> frankfurter with interest 10.996000
tropical fruit --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> whipped/sour cream with interest 25.990545
sugar --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> sausage,rolls/buns,soda with interest 9.996364
fruit/vegetable juice --> soda,bottled beer with interest 9.996364
hygiene articles --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> brown bread with interest 19.992727
fruit/vegetable juice --> whole milk,pastry with interest 11.995636
fruit/vegetable juice --> chewing gum with interest 14.994545
fruit/vegetable juice --> soda,canned beer with interest 14.994545
fruit/vegetable juice --> rolls/buns,brown bread with interest 9.996364
fruit/vegetable juice --> pip fruit with interest 27.989818
fruit/vegetable juice --> UHT-milk with interest 9.996364
fruit/vegetable juice --> whole milk,rolls/buns with interest 12.995273
fruit/vegetable juice --> waffles with interest 20.992364
napkins --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> long life bakery product with interest 10.996000
canned beer,shopping bags --> fruit/vegetable juice with interest 21.992000
fruit/vegetable juice --> butter with interest 10.996000
fruit/vegetable juice --> frozen meals with interest 15.994182
fruit/vegetable juice --> dishes with interest 9.996364
fruit/vegetable juice --> pet care with interest 9.996364
specialty bar --> chocolate with interest 34.987273
other vegetables --> chocolate with interest 34.987273
yogurt --> chocolate with interest 34.987273
chocolate --> pastry,soda with interest 26.990182
canned beer --> chocolate with interest 34.987273
chocolate --> coffee with interest 38.985818
chocolate --> misc. beverages with interest 30.988727

bottled water --> chocolate with interest 34.987273
soda --> chocolate with interest 34.987273
berries --> chocolate with interest 34.987273
detergent --> chocolate with interest 34.987273
chocolate --> sparkling wine with interest 9.996364
newspapers --> chocolate with interest 34.987273
frankfurter,rolls/buns --> chocolate with interest 34.987273
bottled beer --> chocolate with interest 34.987273
rolls/buns,canned beer --> chocolate with interest 34.987273
specialty chocolate --> chocolate with interest 34.987273
beverages --> chocolate with interest 34.987273
white wine --> chocolate with interest 34.987273
rolls/buns,soda --> chocolate with interest 34.987273
ice cream --> chocolate with interest 34.987273
liquor --> chocolate with interest 34.987273
chocolate --> pork with interest 26.990182
root vegetables --> chocolate with interest 34.987273
sausage --> chocolate with interest 34.987273
candy --> chocolate with interest 34.987273
chocolate --> sausage,rolls/buns with interest 11.995636
photo/film --> chocolate with interest 34.987273
chicken --> chocolate with interest 34.987273
shopping bags --> chocolate with interest 34.987273
chocolate --> oil with interest 12.995273
citrus fruit --> chocolate with interest 34.987273
frozen vegetables --> chocolate with interest 34.987273
rolls/buns,bottled beer --> chocolate with interest 34.987273
chocolate --> bottled beer,liquor with interest 10.996000
hamburger meat --> chocolate with interest 34.987273
pastry --> chocolate with interest 34.987273
bottled water,soda --> chocolate with interest 34.987273
salty snack --> chocolate with interest 34.987273
yogurt,rolls/buns --> chocolate with interest 34.987273
domestic eggs --> chocolate with interest 34.987273
frankfurter --> chocolate with interest 34.987273
tropical fruit --> chocolate with interest 34.987273
whipped/sour cream --> chocolate with interest 34.987273
sugar --> chocolate with interest 34.987273
sausage,rolls/buns,soda --> chocolate with interest 34.987273
soda,bottled beer --> chocolate with interest 34.987273
hygiene articles --> chocolate with interest 34.987273
brown bread --> chocolate with interest 34.987273
whole milk,pastry --> chocolate with interest 34.987273
chewing gum --> chocolate with interest 34.987273
soda,canned beer --> chocolate with interest 34.987273
rolls/buns,brown bread --> chocolate with interest 34.987273
chocolate --> pip fruit with interest 27.989818
UHT-milk --> chocolate with interest 34.987273
whole milk,rolls/buns --> chocolate with interest 34.987273
chocolate --> waffles with interest 20.992364
napkins --> chocolate with interest 34.987273
long life bakery product --> chocolate with interest 34.987273
canned beer,shopping bags --> chocolate with interest 34.987273
butter --> chocolate with interest 34.987273
frozen meals --> chocolate with interest 34.987273
chocolate --> dishes with interest 9.996364
chocolate --> pet care with interest 9.996364

other vegetables --> specialty bar with interest 20.992364
yogurt --> specialty bar with interest 20.992364
specialty bar --> pastry,soda with interest 26.990182
specialty bar --> canned beer with interest 259.905455
specialty bar --> coffee with interest 38.985818
specialty bar --> misc. beverages with interest 30.988727
specialty bar --> bottled water with interest 66.975636
specialty bar --> soda with interest 155.943273
berries --> specialty bar with interest 20.992364
detergent --> specialty bar with interest 20.992364
specialty bar --> sparkling wine with interest 9.996364
specialty bar --> newspapers with interest 53.980364
frankfurter,rolls/buns --> specialty bar with interest 20.992364
bottled beer --> specialty bar with interest 20.992364
specialty bar --> rolls/buns,canned beer with interest 13.994909
specialty chocolate --> specialty bar with interest 20.992364
specialty bar --> beverages with interest 25.990545
white wine --> specialty bar with interest 20.992364
specialty bar --> rolls/buns,soda with interest 22.991636
ice cream --> specialty bar with interest 20.992364
liquor --> specialty bar with interest 20.992364
specialty bar --> pork with interest 26.990182
root vegetables --> specialty bar with interest 20.992364
sausage --> specialty bar with interest 20.992364
specialty bar --> candy with interest 11.995636
specialty bar --> sausage,rolls/buns with interest 11.995636
specialty bar --> photo/film with interest 26.990182
chicken --> specialty bar with interest 20.992364
specialty bar --> shopping bags with interest 47.982545
specialty bar --> oil with interest 12.995273
citrus fruit --> specialty bar with interest 20.992364
frozen vegetables --> specialty bar with interest 20.992364
rolls/buns,bottled beer --> specialty bar with interest 20.992364
specialty bar --> bottled beer,liquor with interest 10.996000
specialty bar --> hamburger meat with interest 10.996000
pastry --> specialty bar with interest 20.992364
bottled water,soda --> specialty bar with interest 20.992364
specialty bar --> salty snack with interest 29.989091
yogurt,rolls/buns --> specialty bar with interest 20.992364
domestic eggs --> specialty bar with interest 20.992364
specialty bar --> frankfurter with interest 10.996000
tropical fruit --> specialty bar with interest 20.992364
specialty bar --> whipped/sour cream with interest 25.990545
sugar --> specialty bar with interest 20.992364
specialty bar --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> specialty bar with interest 20.992364
hygiene articles --> specialty bar with interest 20.992364
specialty bar --> brown bread with interest 19.992727
specialty bar --> whole milk,pastry with interest 11.995636
chewing gum --> specialty bar with interest 20.992364
specialty bar --> soda,canned beer with interest 14.994545
rolls/buns,brown bread --> specialty bar with interest 20.992364
specialty bar --> pip fruit with interest 27.989818
UHT-milk --> specialty bar with interest 20.992364
whole milk,rolls/buns --> specialty bar with interest 20.992364
specialty bar --> waffles with interest 20.992364
napkins --> specialty bar with interest 20.992364

specialty bar --> long life bakery product with interest 10.996000
canned beer,shopping bags --> specialty bar with interest 20.992364
specialty bar --> butter with interest 10.996000
frozen meals --> specialty bar with interest 20.992364
specialty bar --> dishes with interest 9.996364
specialty bar --> pet care with interest 9.996364
other vegetables --> yogurt with interest 39.985455
other vegetables --> pastry,soda with interest 26.990182
other vegetables --> canned beer with interest 259.905455
other vegetables --> coffee with interest 38.985818
other vegetables --> misc. beverages with interest 30.988727
other vegetables --> bottled water with interest 66.975636
other vegetables --> soda with interest 155.943273
other vegetables --> berries with interest 9.996364
other vegetables --> detergent with interest 9.996364
other vegetables --> sparkling wine with interest 9.996364
other vegetables --> newspapers with interest 53.980364
frankfurter,rolls/buns --> other vegetables with interest 61.977455
bottled beer --> other vegetables with interest 61.977455
other vegetables --> rolls/buns,canned beer with interest 13.994909
specialty chocolate --> other vegetables with interest 61.977455
other vegetables --> beverages with interest 25.990545
white wine --> other vegetables with interest 61.977455
other vegetables --> rolls/buns,soda with interest 22.991636
other vegetables --> ice cream with interest 33.987636
liquor --> other vegetables with interest 61.977455
other vegetables --> pork with interest 26.990182
other vegetables --> root vegetables with interest 24.990909
other vegetables --> sausage with interest 23.991273
other vegetables --> candy with interest 11.995636
other vegetables --> sausage,rolls/buns with interest 11.995636
other vegetables --> photo/film with interest 26.990182
chicken --> other vegetables with interest 61.977455
other vegetables --> shopping bags with interest 47.982545
other vegetables --> oil with interest 12.995273
citrus fruit --> other vegetables with interest 61.977455
frozen vegetables --> other vegetables with interest 61.977455
rolls/buns,bottled beer --> other vegetables with interest 61.977455
other vegetables --> bottled beer,liquor with interest 10.996000
other vegetables --> hamburger meat with interest 10.996000
other vegetables --> pastry with interest 36.986545
bottled water,soda --> other vegetables with interest 61.977455
other vegetables --> salty snack with interest 29.989091
yogurt,rolls/buns --> other vegetables with interest 61.977455
domestic eggs --> other vegetables with interest 61.977455
other vegetables --> frankfurter with interest 10.996000
tropical fruit --> other vegetables with interest 61.977455
other vegetables --> whipped/sour cream with interest 25.990545
sugar --> other vegetables with interest 61.977455
other vegetables --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> other vegetables with interest 61.977455
hygiene articles --> other vegetables with interest 61.977455
other vegetables --> brown bread with interest 19.992727
other vegetables --> whole milk,pastry with interest 11.995636
chewing gum --> other vegetables with interest 61.977455
other vegetables --> soda,canned beer with interest 14.994545
other vegetables --> rolls/buns,brown bread with interest 9.996364

other vegetables --> pip fruit with interest 27.989818
UHT-milk --> other vegetables with interest 61.977455
whole milk,rolls/buns --> other vegetables with interest 61.977455
other vegetables --> waffles with interest 20.992364
napkins --> other vegetables with interest 61.977455
other vegetables --> long life bakery product with interest 10.996000
canned beer,shopping bags --> other vegetables with interest 61.977455
other vegetables --> butter with interest 10.996000
frozen meals --> other vegetables with interest 61.977455
other vegetables --> dishes with interest 9.996364
other vegetables --> pet care with interest 9.996364
yogurt --> pastry,soda with interest 26.990182
yogurt --> canned beer with interest 259.905455
yogurt --> coffee with interest 38.985818
yogurt --> misc. beverages with interest 30.988727
yogurt --> bottled water with interest 66.975636
yogurt --> soda with interest 155.943273
berries --> yogurt with interest 39.985455
detergent --> yogurt with interest 39.985455
yogurt --> sparkling wine with interest 9.996364
yogurt --> newspapers with interest 53.980364
frankfurter,rolls/buns --> yogurt with interest 39.985455
bottled beer --> yogurt with interest 39.985455
yogurt --> rolls/buns,canned beer with interest 13.994909
specialty chocolate --> yogurt with interest 39.985455
yogurt --> beverages with interest 25.990545
white wine --> yogurt with interest 39.985455
yogurt --> rolls/buns,soda with interest 22.991636
ice cream --> yogurt with interest 39.985455
liquor --> yogurt with interest 39.985455
yogurt --> pork with interest 26.990182
root vegetables --> yogurt with interest 39.985455
sausage --> yogurt with interest 39.985455
yogurt --> candy with interest 11.995636
yogurt --> sausage,rolls/buns with interest 11.995636
yogurt --> photo/film with interest 26.990182
chicken --> yogurt with interest 39.985455
yogurt --> shopping bags with interest 47.982545
yogurt --> oil with interest 12.995273
citrus fruit --> yogurt with interest 39.985455
frozen vegetables --> yogurt with interest 39.985455
rolls/buns,bottled beer --> yogurt with interest 39.985455
yogurt --> bottled beer,liquor with interest 10.996000
yogurt --> hamburger meat with interest 10.996000
pastry --> yogurt with interest 39.985455
bottled water,soda --> yogurt with interest 39.985455
yogurt --> salty snack with interest 29.989091
yogurt,rolls/buns --> yogurt with interest 39.985455
domestic eggs --> yogurt with interest 39.985455
yogurt --> frankfurter with interest 10.996000
tropical fruit --> yogurt with interest 39.985455
yogurt --> whipped/sour cream with interest 25.990545
sugar --> yogurt with interest 39.985455
yogurt --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> yogurt with interest 39.985455
hygiene articles --> yogurt with interest 39.985455
yogurt --> brown bread with interest 19.992727

yogurt --> whole milk,pastry with interest 11.995636
chewing gum --> yogurt with interest 39.985455
yogurt --> soda,canned beer with interest 14.994545
rolls/buns,brown bread --> yogurt with interest 39.985455
yogurt --> pip fruit with interest 27.989818
UHT-milk --> yogurt with interest 39.985455
whole milk,rolls/buns --> yogurt with interest 39.985455
yogurt --> waffles with interest 20.992364
napkins --> yogurt with interest 39.985455
yogurt --> long life bakery product with interest 10.996000
canned beer,shopping bags --> yogurt with interest 39.985455
yogurt --> butter with interest 10.996000
frozen meals --> yogurt with interest 39.985455
yogurt --> dishes with interest 9.996364
yogurt --> pet care with interest 9.996364
canned beer --> pastry,soda with interest 26.990182
coffee --> pastry,soda with interest 26.990182
misc. beverages --> pastry,soda with interest 26.990182
bottled water --> pastry,soda with interest 26.990182
soda --> pastry,soda with interest 26.990182
berries --> pastry,soda with interest 26.990182
detergent --> pastry,soda with interest 26.990182
sparkling wine --> pastry,soda with interest 26.990182
newspapers --> pastry,soda with interest 26.990182
frankfurter,rolls/buns --> pastry,soda with interest 26.990182
bottled beer --> pastry,soda with interest 26.990182
rolls/buns,canned beer --> pastry,soda with interest 26.990182
specialty chocolate --> pastry,soda with interest 26.990182
beverages --> pastry,soda with interest 26.990182
white wine --> pastry,soda with interest 26.990182
rolls/buns,soda --> pastry,soda with interest 26.990182
ice cream --> pastry,soda with interest 26.990182
liquor --> pastry,soda with interest 26.990182
pork --> pastry,soda with interest 26.990182
root vegetables --> pastry,soda with interest 26.990182
sausage --> pastry,soda with interest 26.990182
candy --> pastry,soda with interest 26.990182
sausage,rolls/buns --> pastry,soda with interest 26.990182
photo/film --> pastry,soda with interest 26.990182
chicken --> pastry,soda with interest 26.990182
shopping bags --> pastry,soda with interest 26.990182
oil --> pastry,soda with interest 26.990182
citrus fruit --> pastry,soda with interest 26.990182
frozen vegetables --> pastry,soda with interest 26.990182
rolls/buns,bottled beer --> pastry,soda with interest 26.990182
bottled beer,liquor --> pastry,soda with interest 26.990182
hamburger meat --> pastry,soda with interest 26.990182
pastry --> pastry,soda with interest 26.990182
bottled water,soda --> pastry,soda with interest 26.990182
salty snack --> pastry,soda with interest 26.990182
yogurt,rolls/buns --> pastry,soda with interest 26.990182
domestic eggs --> pastry,soda with interest 26.990182
frankfurter --> pastry,soda with interest 26.990182
tropical fruit --> pastry,soda with interest 26.990182
whipped/sour cream --> pastry,soda with interest 26.990182
sugar --> pastry,soda with interest 26.990182
sausage,rolls/buns,soda --> pastry,soda with interest 26.990182

soda,bottled beer --> pastry,soda with interest 26.990182
hygiene articles --> pastry,soda with interest 26.990182
brown bread --> pastry,soda with interest 26.990182
whole milk,pastry --> pastry,soda with interest 26.990182
chewing gum --> pastry,soda with interest 26.990182
soda,canned beer --> pastry,soda with interest 26.990182
rolls/buns,brown bread --> pastry,soda with interest 26.990182
pip fruit --> pastry,soda with interest 26.990182
UHT-milk --> pastry,soda with interest 26.990182
whole milk,rolls/buns --> pastry,soda with interest 26.990182
waffles --> pastry,soda with interest 26.990182
napkins --> pastry,soda with interest 26.990182
long life bakery product --> pastry,soda with interest 26.990182
canned beer,shopping bags --> pastry,soda with interest 26.990182
butter --> pastry,soda with interest 26.990182
frozen meals --> pastry,soda with interest 26.990182
dishes --> pastry,soda with interest 26.990182
pet care --> pastry,soda with interest 26.990182
canned beer --> coffee with interest 38.985818
canned beer --> misc. beverages with interest 30.988727
bottled water --> canned beer with interest 259.905455
canned beer --> soda with interest 155.943273
berries --> canned beer with interest 259.905455
detergent --> canned beer with interest 259.905455
canned beer --> sparkling wine with interest 9.996364
canned beer --> newspapers with interest 53.980364
frankfurter,rolls/buns --> canned beer with interest 259.905455
bottled beer --> canned beer with interest 259.905455
rolls/buns,canned beer --> canned beer with interest 259.905455
specialty chocolate --> canned beer with interest 259.905455
canned beer --> beverages with interest 25.990545
white wine --> canned beer with interest 259.905455
rolls/buns,soda --> canned beer with interest 259.905455
ice cream --> canned beer with interest 259.905455
liquor --> canned beer with interest 259.905455
canned beer --> pork with interest 26.990182
root vegetables --> canned beer with interest 259.905455
sausage --> canned beer with interest 259.905455
candy --> canned beer with interest 259.905455
canned beer --> sausage,rolls/buns with interest 11.995636
canned beer --> photo/film with interest 26.990182
chicken --> canned beer with interest 259.905455
shopping bags --> canned beer with interest 259.905455
canned beer --> oil with interest 12.995273
citrus fruit --> canned beer with interest 259.905455
frozen vegetables --> canned beer with interest 259.905455
rolls/buns,bottled beer --> canned beer with interest 259.905455
canned beer --> bottled beer,liquor with interest 10.996000
hamburger meat --> canned beer with interest 259.905455
pastry --> canned beer with interest 259.905455
bottled water,soda --> canned beer with interest 259.905455
canned beer --> salty snack with interest 29.989091
yogurt,rolls/buns --> canned beer with interest 259.905455
domestic eggs --> canned beer with interest 259.905455
frankfurter --> canned beer with interest 259.905455
tropical fruit --> canned beer with interest 259.905455
whipped/sour cream --> canned beer with interest 259.905455

sugar --> canned beer with interest 259.905455
canned beer --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> canned beer with interest 259.905455
hygiene articles --> canned beer with interest 259.905455
canned beer --> brown bread with interest 19.992727
canned beer --> whole milk,pastry with interest 11.995636
chewing gum --> canned beer with interest 259.905455
soda,canned beer --> canned beer with interest 259.905455
rolls/buns,brown bread --> canned beer with interest 259.905455
canned beer --> pip fruit with interest 27.989818
UHT-milk --> canned beer with interest 259.905455
whole milk,rolls/buns --> canned beer with interest 259.905455
canned beer --> waffles with interest 20.992364
napkins --> canned beer with interest 259.905455
canned beer --> long life bakery product with interest 10.996000
canned beer,shopping bags --> canned beer with interest 259.905455
canned beer --> butter with interest 10.996000
frozen meals --> canned beer with interest 259.905455
canned beer --> dishes with interest 9.996364
canned beer --> pet care with interest 9.996364
misc. beverages --> coffee with interest 38.985818
bottled water --> coffee with interest 38.985818
soda --> coffee with interest 38.985818
berries --> coffee with interest 38.985818
detergent --> coffee with interest 38.985818
sparkling wine --> coffee with interest 38.985818
newspapers --> coffee with interest 38.985818
frankfurter,rolls/buns --> coffee with interest 38.985818
bottled beer --> coffee with interest 38.985818
rolls/buns,canned beer --> coffee with interest 38.985818
specialty chocolate --> coffee with interest 38.985818
beverages --> coffee with interest 38.985818
white wine --> coffee with interest 38.985818
rolls/buns,soda --> coffee with interest 38.985818
ice cream --> coffee with interest 38.985818
liquor --> coffee with interest 38.985818
pork --> coffee with interest 38.985818
root vegetables --> coffee with interest 38.985818
sausage --> coffee with interest 38.985818
candy --> coffee with interest 38.985818
sausage,rolls/buns --> coffee with interest 38.985818
photo/film --> coffee with interest 38.985818
chicken --> coffee with interest 38.985818
shopping bags --> coffee with interest 38.985818
oil --> coffee with interest 38.985818
citrus fruit --> coffee with interest 38.985818
frozen vegetables --> coffee with interest 38.985818
rolls/buns,bottled beer --> coffee with interest 38.985818
bottled beer,liquor --> coffee with interest 38.985818
hamburger meat --> coffee with interest 38.985818
pastry --> coffee with interest 38.985818
bottled water,soda --> coffee with interest 38.985818
salty snack --> coffee with interest 38.985818
yogurt,rolls/buns --> coffee with interest 38.985818
domestic eggs --> coffee with interest 38.985818
frankfurter --> coffee with interest 38.985818
tropical fruit --> coffee with interest 38.985818

whipped/sour cream --> coffee with interest 38.985818
sugar --> coffee with interest 38.985818
sausage,rolls/buns,soda --> coffee with interest 38.985818
soda,bottled beer --> coffee with interest 38.985818
hygiene articles --> coffee with interest 38.985818
brown bread --> coffee with interest 38.985818
whole milk,pastry --> coffee with interest 38.985818
chewing gum --> coffee with interest 38.985818
soda,canned beer --> coffee with interest 38.985818
rolls/buns,brown bread --> coffee with interest 38.985818
pip fruit --> coffee with interest 38.985818
UHT-milk --> coffee with interest 38.985818
whole milk,rolls/buns --> coffee with interest 38.985818
waffles --> coffee with interest 38.985818
napkins --> coffee with interest 38.985818
long life bakery product --> coffee with interest 38.985818
canned beer,shopping bags --> coffee with interest 38.985818
butter --> coffee with interest 38.985818
frozen meals --> coffee with interest 38.985818
dishes --> coffee with interest 38.985818
pet care --> coffee with interest 38.985818
bottled water --> misc. beverages with interest 30.988727
soda --> misc. beverages with interest 30.988727
berries --> misc. beverages with interest 30.988727
detergent --> misc. beverages with interest 30.988727
sparkling wine --> misc. beverages with interest 30.988727
newspapers --> misc. beverages with interest 30.988727
frankfurter,rolls/buns --> misc. beverages with interest 30.988727
bottled beer --> misc. beverages with interest 30.988727
rolls/buns,canned beer --> misc. beverages with interest 30.988727
specialty chocolate --> misc. beverages with interest 30.988727
beverages --> misc. beverages with interest 30.988727
white wine --> misc. beverages with interest 30.988727
rolls/buns,soda --> misc. beverages with interest 30.988727
ice cream --> misc. beverages with interest 30.988727
liquor --> misc. beverages with interest 30.988727
pork --> misc. beverages with interest 30.988727
root vegetables --> misc. beverages with interest 30.988727
sausage --> misc. beverages with interest 30.988727
candy --> misc. beverages with interest 30.988727
sausage,rolls/buns --> misc. beverages with interest 30.988727
photo/film --> misc. beverages with interest 30.988727
chicken --> misc. beverages with interest 30.988727
shopping bags --> misc. beverages with interest 30.988727
oil --> misc. beverages with interest 30.988727
citrus fruit --> misc. beverages with interest 30.988727
frozen vegetables --> misc. beverages with interest 30.988727
rolls/buns,bottled beer --> misc. beverages with interest 30.988727
bottled beer,liquor --> misc. beverages with interest 30.988727
hamburger meat --> misc. beverages with interest 30.988727
pastry --> misc. beverages with interest 30.988727
bottled water,soda --> misc. beverages with interest 30.988727
salty snack --> misc. beverages with interest 30.988727
yogurt,rolls/buns --> misc. beverages with interest 30.988727
domestic eggs --> misc. beverages with interest 30.988727
frankfurter --> misc. beverages with interest 30.988727
tropical fruit --> misc. beverages with interest 30.988727

whipped/sour cream --> misc. beverages with interest 30.988727
sugar --> misc. beverages with interest 30.988727
sausage,rolls/buns,soda --> misc. beverages with interest 30.988727
soda,bottled beer --> misc. beverages with interest 30.988727
hygiene articles --> misc. beverages with interest 30.988727
brown bread --> misc. beverages with interest 30.988727
whole milk,pastry --> misc. beverages with interest 30.988727
chewing gum --> misc. beverages with interest 30.988727
soda,canned beer --> misc. beverages with interest 30.988727
rolls/buns,brown bread --> misc. beverages with interest 30.988727
pip fruit --> misc. beverages with interest 30.988727
UHT-milk --> misc. beverages with interest 30.988727
whole milk,rolls/buns --> misc. beverages with interest 30.988727
waffles --> misc. beverages with interest 30.988727
napkins --> misc. beverages with interest 30.988727
long life bakery product --> misc. beverages with interest 30.988727
canned beer,shopping bags --> misc. beverages with interest 30.988727
butter --> misc. beverages with interest 30.988727
frozen meals --> misc. beverages with interest 30.988727
dishes --> misc. beverages with interest 30.988727
pet care --> misc. beverages with interest 30.988727
bottled water --> soda with interest 155.943273
berries --> bottled water with interest 66.975636
detergent --> bottled water with interest 66.975636
bottled water --> sparkling wine with interest 9.996364
bottled water --> newspapers with interest 53.980364
frankfurter,rolls/buns --> bottled water with interest 66.975636
bottled beer --> bottled water with interest 66.975636
rolls/buns,canned beer --> bottled water with interest 66.975636
specialty chocolate --> bottled water with interest 66.975636
bottled water --> beverages with interest 25.990545
white wine --> bottled water with interest 66.975636
rolls/buns,soda --> bottled water with interest 66.975636
ice cream --> bottled water with interest 66.975636
liquor --> bottled water with interest 66.975636
bottled water --> pork with interest 26.990182
root vegetables --> bottled water with interest 66.975636
sausage --> bottled water with interest 66.975636
candy --> bottled water with interest 66.975636
bottled water --> sausage,rolls/buns with interest 11.995636
bottled water --> photo/film with interest 26.990182
chicken --> bottled water with interest 66.975636
shopping bags --> bottled water with interest 66.975636
bottled water --> oil with interest 12.995273
citrus fruit --> bottled water with interest 66.975636
frozen vegetables --> bottled water with interest 66.975636
rolls/buns,bottled beer --> bottled water with interest 66.975636
bottled water --> bottled beer,liquor with interest 10.996000
hamburger meat --> bottled water with interest 66.975636
pastry --> bottled water with interest 66.975636
bottled water,soda --> bottled water with interest 66.975636
bottled water --> salty snack with interest 29.989091
yogurt,rolls/buns --> bottled water with interest 66.975636
domestic eggs --> bottled water with interest 66.975636
frankfurter --> bottled water with interest 66.975636
tropical fruit --> bottled water with interest 66.975636
whipped/sour cream --> bottled water with interest 66.975636

sugar --> bottled water with interest 66.975636
bottled water --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> bottled water with interest 66.975636
hygiene articles --> bottled water with interest 66.975636
bottled water --> brown bread with interest 19.992727
bottled water --> whole milk,pastry with interest 11.995636
chewing gum --> bottled water with interest 66.975636
soda,canned beer --> bottled water with interest 66.975636
rolls/buns,brown bread --> bottled water with interest 66.975636
bottled water --> pip fruit with interest 27.989818
UHT-milk --> bottled water with interest 66.975636
whole milk,rolls/buns --> bottled water with interest 66.975636
bottled water --> waffles with interest 20.992364
napkins --> bottled water with interest 66.975636
bottled water --> long life bakery product with interest 10.996000
canned beer,shopping bags --> bottled water with interest 66.975636
bottled water --> butter with interest 10.996000
frozen meals --> bottled water with interest 66.975636
bottled water --> dishes with interest 9.996364
bottled water --> pet care with interest 9.996364
berries --> soda with interest 155.943273
detergent --> soda with interest 155.943273
soda --> sparkling wine with interest 9.996364
soda --> newspapers with interest 53.980364
frankfurter,rolls/buns --> soda with interest 155.943273
bottled beer --> soda with interest 155.943273
rolls/buns,canned beer --> soda with interest 155.943273
specialty chocolate --> soda with interest 155.943273
soda --> beverages with interest 25.990545
white wine --> soda with interest 155.943273
rolls/buns,soda --> soda with interest 155.943273
ice cream --> soda with interest 155.943273
liquor --> soda with interest 155.943273
soda --> pork with interest 26.990182
root vegetables --> soda with interest 155.943273
sausage --> soda with interest 155.943273
candy --> soda with interest 155.943273
soda --> sausage,rolls/buns with interest 11.995636
soda --> photo/film with interest 26.990182
chicken --> soda with interest 155.943273
shopping bags --> soda with interest 155.943273
soda --> oil with interest 12.995273
citrus fruit --> soda with interest 155.943273
frozen vegetables --> soda with interest 155.943273
rolls/buns,bottled beer --> soda with interest 155.943273
soda --> bottled beer,liquor with interest 10.996000
hamburger meat --> soda with interest 155.943273
pastry --> soda with interest 155.943273
bottled water,soda --> soda with interest 155.943273
soda --> salty snack with interest 29.989091
yogurt,rolls/buns --> soda with interest 155.943273
domestic eggs --> soda with interest 155.943273
frankfurter --> soda with interest 155.943273
tropical fruit --> soda with interest 155.943273
whipped/sour cream --> soda with interest 155.943273
sugar --> soda with interest 155.943273
soda --> sausage,rolls/buns,soda with interest 9.996364

soda,bottled beer --> soda with interest 155.943273
hygiene articles --> soda with interest 155.943273
soda --> brown bread with interest 19.992727
soda --> whole milk,pastry with interest 11.995636
chewing gum --> soda with interest 155.943273
soda,canned beer --> soda with interest 155.943273
rolls/buns,brown bread --> soda with interest 155.943273
soda --> pip fruit with interest 27.989818
UHT-milk --> soda with interest 155.943273
whole milk,rolls/buns --> soda with interest 155.943273
soda --> waffles with interest 20.992364
napkins --> soda with interest 155.943273
soda --> long life bakery product with interest 10.996000
canned beer,shopping bags --> soda with interest 155.943273
soda --> butter with interest 10.996000
frozen meals --> soda with interest 155.943273
soda --> dishes with interest 9.996364
soda --> pet care with interest 9.996364
detergent --> berries with interest 9.996364
berries --> sparkling wine with interest 9.996364
berries --> newspapers with interest 53.980364
frankfurter,rolls/buns --> berries with interest 9.996364
bottled beer --> berries with interest 9.996364
berries --> rolls/buns,canned beer with interest 13.994909
specialty chocolate --> berries with interest 9.996364
berries --> beverages with interest 25.990545
white wine --> berries with interest 9.996364
berries --> rolls/buns,soda with interest 22.991636
ice cream --> berries with interest 9.996364
liquor --> berries with interest 9.996364
berries --> pork with interest 26.990182
root vegetables --> berries with interest 9.996364
sausage --> berries with interest 9.996364
berries --> candy with interest 11.995636
berries --> sausage,rolls/buns with interest 11.995636
berries --> photo/film with interest 26.990182
chicken --> berries with interest 9.996364
berries --> shopping bags with interest 47.982545
berries --> oil with interest 12.995273
citrus fruit --> berries with interest 9.996364
frozen vegetables --> berries with interest 9.996364
rolls/buns,bottled beer --> berries with interest 9.996364
berries --> bottled beer,liquor with interest 10.996000
berries --> hamburger meat with interest 10.996000
pastry --> berries with interest 9.996364
bottled water,soda --> berries with interest 9.996364
berries --> salty snack with interest 29.989091
yogurt,rolls/buns --> berries with interest 9.996364
domestic eggs --> berries with interest 9.996364
berries --> frankfurter with interest 10.996000
tropical fruit --> berries with interest 9.996364
berries --> whipped/sour cream with interest 25.990545
sugar --> berries with interest 9.996364
berries --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> berries with interest 9.996364
hygiene articles --> berries with interest 9.996364
berries --> brown bread with interest 19.992727

berries --> whole milk,pastry with interest 11.995636
chewing gum --> berries with interest 9.996364
berries --> soda,canned beer with interest 14.994545
rolls/buns,brown bread --> berries with interest 9.996364
berries --> pip fruit with interest 27.989818
UHT-milk --> berries with interest 9.996364
whole milk,rolls/buns --> berries with interest 9.996364
berries --> waffles with interest 20.992364
napkins --> berries with interest 9.996364
berries --> long life bakery product with interest 10.996000
canned beer,shopping bags --> berries with interest 9.996364
berries --> butter with interest 10.996000
frozen meals --> berries with interest 9.996364
berries --> dishes with interest 9.996364
berries --> pet care with interest 9.996364
detergent --> sparkling wine with interest 9.996364
detergent --> newspapers with interest 53.980364
frankfurter,rolls/buns --> detergent with interest 9.996364
bottled beer --> detergent with interest 9.996364
detergent --> rolls/buns,canned beer with interest 13.994909
specialty chocolate --> detergent with interest 9.996364
detergent --> beverages with interest 25.990545
white wine --> detergent with interest 9.996364
detergent --> rolls/buns,soda with interest 22.991636
detergent --> ice cream with interest 33.987636
liquor --> detergent with interest 9.996364
detergent --> pork with interest 26.990182
detergent --> root vegetables with interest 24.990909
detergent --> sausage with interest 23.991273
detergent --> candy with interest 11.995636
detergent --> sausage,rolls/buns with interest 11.995636
detergent --> photo/film with interest 26.990182
chicken --> detergent with interest 9.996364
detergent --> shopping bags with interest 47.982545
detergent --> oil with interest 12.995273
citrus fruit --> detergent with interest 9.996364
frozen vegetables --> detergent with interest 9.996364
rolls/buns,bottled beer --> detergent with interest 9.996364
detergent --> bottled beer,liquor with interest 10.996000
detergent --> hamburger meat with interest 10.996000
detergent --> pastry with interest 36.986545
bottled water,soda --> detergent with interest 9.996364
detergent --> salty snack with interest 29.989091
yogurt,rolls/buns --> detergent with interest 9.996364
domestic eggs --> detergent with interest 9.996364
detergent --> frankfurter with interest 10.996000
tropical fruit --> detergent with interest 9.996364
detergent --> whipped/sour cream with interest 25.990545
sugar --> detergent with interest 9.996364
detergent --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> detergent with interest 9.996364
hygiene articles --> detergent with interest 9.996364
detergent --> brown bread with interest 19.992727
detergent --> whole milk,pastry with interest 11.995636
chewing gum --> detergent with interest 9.996364
detergent --> soda,canned beer with interest 14.994545
detergent --> rolls/buns,brown bread with interest 9.996364

detergent --> pip fruit with interest 27.989818
UHT-milk --> detergent with interest 9.996364
whole milk,rolls/buns --> detergent with interest 9.996364
detergent --> waffles with interest 20.992364
napkins --> detergent with interest 9.996364
detergent --> long life bakery product with interest 10.996000
canned beer,shopping bags --> detergent with interest 9.996364
detergent --> butter with interest 10.996000
frozen meals --> detergent with interest 9.996364
detergent --> dishes with interest 9.996364
detergent --> pet care with interest 9.996364
newspapers --> sparkling wine with interest 9.996364
frankfurter,rolls/buns --> sparkling wine with interest 9.996364
bottled beer --> sparkling wine with interest 9.996364
rolls/buns,canned beer --> sparkling wine with interest 9.996364
specialty chocolate --> sparkling wine with interest 9.996364
beverages --> sparkling wine with interest 9.996364
white wine --> sparkling wine with interest 9.996364
rolls/buns,soda --> sparkling wine with interest 9.996364
ice cream --> sparkling wine with interest 9.996364
liquor --> sparkling wine with interest 9.996364
pork --> sparkling wine with interest 9.996364
root vegetables --> sparkling wine with interest 9.996364
sausage --> sparkling wine with interest 9.996364
candy --> sparkling wine with interest 9.996364
sausage,rolls/buns --> sparkling wine with interest 9.996364
photo/film --> sparkling wine with interest 9.996364
chicken --> sparkling wine with interest 9.996364
shopping bags --> sparkling wine with interest 9.996364
oil --> sparkling wine with interest 9.996364
citrus fruit --> sparkling wine with interest 9.996364
frozen vegetables --> sparkling wine with interest 9.996364
rolls/buns,bottled beer --> sparkling wine with interest 9.996364
bottled beer,liquor --> sparkling wine with interest 9.996364
hamburger meat --> sparkling wine with interest 9.996364
pastry --> sparkling wine with interest 9.996364
bottled water,soda --> sparkling wine with interest 9.996364
salty snack --> sparkling wine with interest 9.996364
yogurt,rolls/buns --> sparkling wine with interest 9.996364
domestic eggs --> sparkling wine with interest 9.996364
frankfurter --> sparkling wine with interest 9.996364
tropical fruit --> sparkling wine with interest 9.996364
whipped/sour cream --> sparkling wine with interest 9.996364
sugar --> sparkling wine with interest 9.996364
sausage,rolls/buns,soda --> sparkling wine with interest 9.996364
soda,bottled beer --> sparkling wine with interest 9.996364
hygiene articles --> sparkling wine with interest 9.996364
brown bread --> sparkling wine with interest 9.996364
whole milk,pastry --> sparkling wine with interest 9.996364
chewing gum --> sparkling wine with interest 9.996364
soda,canned beer --> sparkling wine with interest 9.996364
rolls/buns,brown bread --> sparkling wine with interest 9.996364
pip fruit --> sparkling wine with interest 9.996364
UHT-milk --> sparkling wine with interest 9.996364
whole milk,rolls/buns --> sparkling wine with interest 9.996364
waffles --> sparkling wine with interest 9.996364
napkins --> sparkling wine with interest 9.996364

long life bakery product --> sparkling wine with interest 9.996364
canned beer,shopping bags --> sparkling wine with interest 9.996364
butter --> sparkling wine with interest 9.996364
frozen meals --> sparkling wine with interest 9.996364
dishes --> sparkling wine with interest 9.996364
pet care --> sparkling wine with interest 9.996364
frankfurter,rolls/buns --> newspapers with interest 53.980364
bottled beer --> newspapers with interest 53.980364
rolls/buns,canned beer --> newspapers with interest 53.980364
specialty chocolate --> newspapers with interest 53.980364
beverages --> newspapers with interest 53.980364
white wine --> newspapers with interest 53.980364
rolls/buns,soda --> newspapers with interest 53.980364
ice cream --> newspapers with interest 53.980364
liquor --> newspapers with interest 53.980364
newspapers --> pork with interest 26.990182
root vegetables --> newspapers with interest 53.980364
sausage --> newspapers with interest 53.980364
candy --> newspapers with interest 53.980364
newspapers --> sausage,rolls/buns with interest 11.995636
photo/film --> newspapers with interest 53.980364
chicken --> newspapers with interest 53.980364
shopping bags --> newspapers with interest 53.980364
newspapers --> oil with interest 12.995273
citrus fruit --> newspapers with interest 53.980364
frozen vegetables --> newspapers with interest 53.980364
rolls/buns,bottled beer --> newspapers with interest 53.980364
newspapers --> bottled beer,liquor with interest 10.996000
hamburger meat --> newspapers with interest 53.980364
pastry --> newspapers with interest 53.980364
bottled water,soda --> newspapers with interest 53.980364
salty snack --> newspapers with interest 53.980364
yogurt,rolls/buns --> newspapers with interest 53.980364
domestic eggs --> newspapers with interest 53.980364
frankfurter --> newspapers with interest 53.980364
tropical fruit --> newspapers with interest 53.980364
whipped/sour cream --> newspapers with interest 53.980364
sugar --> newspapers with interest 53.980364
sausage,rolls/buns,soda --> newspapers with interest 53.980364
soda,bottled beer --> newspapers with interest 53.980364
hygiene articles --> newspapers with interest 53.980364
brown bread --> newspapers with interest 53.980364
whole milk,pastry --> newspapers with interest 53.980364
chewing gum --> newspapers with interest 53.980364
soda,canned beer --> newspapers with interest 53.980364
rolls/buns,brown bread --> newspapers with interest 53.980364
newspapers --> pip fruit with interest 27.989818
UHT-milk --> newspapers with interest 53.980364
whole milk,rolls/buns --> newspapers with interest 53.980364
newspapers --> waffles with interest 20.992364
napkins --> newspapers with interest 53.980364
long life bakery product --> newspapers with interest 53.980364
canned beer,shopping bags --> newspapers with interest 53.980364
butter --> newspapers with interest 53.980364
frozen meals --> newspapers with interest 53.980364
newspapers --> dishes with interest 9.996364
newspapers --> pet care with interest 9.996364

bottled beer --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> rolls/buns,canned beer with interest 13.994909
frankfurter,rolls/buns --> specialty chocolate with interest 25.990545
frankfurter,rolls/buns --> beverages with interest 25.990545
white wine --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> rolls/buns,soda with interest 22.991636
frankfurter,rolls/buns --> ice cream with interest 33.987636
liquor --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> pork with interest 26.990182
frankfurter,rolls/buns --> root vegetables with interest 24.990909
frankfurter,rolls/buns --> sausage with interest 23.991273
frankfurter,rolls/buns --> candy with interest 11.995636
frankfurter,rolls/buns --> sausage,rolls/buns with interest 11.995636
frankfurter,rolls/buns --> photo/film with interest 26.990182
chicken --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> shopping bags with interest 47.982545
frankfurter,rolls/buns --> oil with interest 12.995273
citrus fruit --> frankfurter,rolls/buns with interest 17.993455
frozen vegetables --> frankfurter,rolls/buns with interest 17.993455
rolls/buns,bottled beer --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> bottled beer,liquor with interest 10.996000
frankfurter,rolls/buns --> hamburger meat with interest 10.996000
frankfurter,rolls/buns --> pastry with interest 36.986545
bottled water,soda --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> salty snack with interest 29.989091
frankfurter,rolls/buns --> yogurt,rolls/buns with interest 9.996364
frankfurter,rolls/buns --> domestic eggs with interest 10.996000
frankfurter,rolls/buns --> frankfurter with interest 10.996000
tropical fruit --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> whipped/sour cream with interest 25.990545
sugar --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> sausage,rolls/buns,soda with interest 9.996364
frankfurter,rolls/buns --> soda,bottled beer with interest 9.996364
hygiene articles --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> brown bread with interest 19.992727
frankfurter,rolls/buns --> whole milk,pastry with interest 11.995636
frankfurter,rolls/buns --> chewing gum with interest 14.994545
frankfurter,rolls/buns --> soda,canned beer with interest 14.994545
frankfurter,rolls/buns --> rolls/buns,brown bread with interest 9.996364
frankfurter,rolls/buns --> pip fruit with interest 27.989818
frankfurter,rolls/buns --> UHT-milk with interest 9.996364
frankfurter,rolls/buns --> whole milk,rolls/buns with interest 12.995273
frankfurter,rolls/buns --> waffles with interest 20.992364
napkins --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> long life bakery product with interest 10.996000
canned beer,shopping bags --> frankfurter,rolls/buns with interest 17.993455
frankfurter,rolls/buns --> butter with interest 10.996000
frankfurter,rolls/buns --> frozen meals with interest 15.994182
frankfurter,rolls/buns --> dishes with interest 9.996364
frankfurter,rolls/buns --> pet care with interest 9.996364
bottled beer --> rolls/buns,canned beer with interest 13.994909
bottled beer --> specialty chocolate with interest 25.990545
bottled beer --> beverages with interest 25.990545
bottled beer --> white wine with interest 18.993091
bottled beer --> rolls/buns,soda with interest 22.991636
bottled beer --> ice cream with interest 33.987636
bottled beer --> liquor with interest 9.996364

bottled beer --> pork with interest 26.990182
bottled beer --> root vegetables with interest 24.990909
bottled beer --> sausage with interest 23.991273
bottled beer --> candy with interest 11.995636
bottled beer --> sausage,rolls/buns with interest 11.995636
bottled beer --> photo/film with interest 26.990182
bottled beer --> chicken with interest 14.994545
bottled beer --> shopping bags with interest 47.982545
bottled beer --> oil with interest 12.995273
bottled beer --> citrus fruit with interest 15.994182
bottled beer --> frozen vegetables with interest 12.995273
bottled beer --> rolls/buns,bottled beer with interest 10.996000
bottled beer --> bottled beer,liquor with interest 10.996000
bottled beer --> hamburger meat with interest 10.996000
bottled beer --> pastry with interest 36.986545
bottled beer --> bottled water,soda with interest 16.993818
bottled beer --> salty snack with interest 29.989091
bottled beer --> yogurt,rolls/buns with interest 9.996364
bottled beer --> domestic eggs with interest 10.996000
bottled beer --> frankfurter with interest 10.996000
bottled beer --> tropical fruit with interest 22.991636
bottled beer --> whipped/sour cream with interest 25.990545
bottled beer --> sugar with interest 11.995636
bottled beer --> sausage,rolls/buns,soda with interest 9.996364
bottled beer --> soda,bottled beer with interest 9.996364
bottled beer --> hygiene articles with interest 11.995636
bottled beer --> brown bread with interest 19.992727
bottled beer --> whole milk,pastry with interest 11.995636
bottled beer --> chewing gum with interest 14.994545
bottled beer --> soda,canned beer with interest 14.994545
bottled beer --> rolls/buns,brown bread with interest 9.996364
bottled beer --> pip fruit with interest 27.989818
bottled beer --> UHT-milk with interest 9.996364
bottled beer --> whole milk,rolls/buns with interest 12.995273
bottled beer --> waffles with interest 20.992364
bottled beer --> napkins with interest 14.994545
bottled beer --> long life bakery product with interest 10.996000
bottled beer --> canned beer,shopping bags with interest 10.996000
bottled beer --> butter with interest 10.996000
bottled beer --> frozen meals with interest 15.994182
bottled beer --> dishes with interest 9.996364
bottled beer --> pet care with interest 9.996364
specialty chocolate --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> beverages with interest 25.990545
white wine --> rolls/buns,canned beer with interest 13.994909
rolls/buns,soda --> rolls/buns,canned beer with interest 13.994909
ice cream --> rolls/buns,canned beer with interest 13.994909
liquor --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> pork with interest 26.990182
root vegetables --> rolls/buns,canned beer with interest 13.994909
sausage --> rolls/buns,canned beer with interest 13.994909
candy --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> sausage,rolls/buns with interest 11.995636
rolls/buns,canned beer --> photo/film with interest 26.990182
chicken --> rolls/buns,canned beer with interest 13.994909
shopping bags --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> oil with interest 12.995273

citrus fruit --> rolls/buns,canned beer with interest 13.994909
frozen vegetables --> rolls/buns,canned beer with interest 13.994909
rolls/buns,bottled beer --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> bottled beer,liquor with interest 10.996000
hamburger meat --> rolls/buns,canned beer with interest 13.994909
pastry --> rolls/buns,canned beer with interest 13.994909
bottled water,soda --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> salty snack with interest 29.989091
yogurt,rolls/buns --> rolls/buns,canned beer with interest 13.994909
domestic eggs --> rolls/buns,canned beer with interest 13.994909
frankfurter --> rolls/buns,canned beer with interest 13.994909
tropical fruit --> rolls/buns,canned beer with interest 13.994909
whipped/sour cream --> rolls/buns,canned beer with interest 13.994909
sugar --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> rolls/buns,canned beer with interest 13.994909
hygiene articles --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> brown bread with interest 19.992727
rolls/buns,canned beer --> whole milk,pastry with interest 11.995636
chewing gum --> rolls/buns,canned beer with interest 13.994909
soda,canned beer --> rolls/buns,canned beer with interest 13.994909
rolls/buns,brown bread --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> pip fruit with interest 27.989818
UHT-milk --> rolls/buns,canned beer with interest 13.994909
whole milk,rolls/buns --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> waffles with interest 20.992364
napkins --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> long life bakery product with interest 10.996000
canned beer,shopping bags --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> butter with interest 10.996000
frozen meals --> rolls/buns,canned beer with interest 13.994909
rolls/buns,canned beer --> dishes with interest 9.996364
rolls/buns,canned beer --> pet care with interest 9.996364
specialty chocolate --> beverages with interest 25.990545
white wine --> specialty chocolate with interest 25.990545
specialty chocolate --> rolls/buns,soda with interest 22.991636
specialty chocolate --> ice cream with interest 33.987636
liquor --> specialty chocolate with interest 25.990545
specialty chocolate --> pork with interest 26.990182
specialty chocolate --> root vegetables with interest 24.990909
specialty chocolate --> sausage with interest 23.991273
specialty chocolate --> candy with interest 11.995636
specialty chocolate --> sausage,rolls/buns with interest 11.995636
specialty chocolate --> photo/film with interest 26.990182
chicken --> specialty chocolate with interest 25.990545
specialty chocolate --> shopping bags with interest 47.982545
specialty chocolate --> oil with interest 12.995273
citrus fruit --> specialty chocolate with interest 25.990545
frozen vegetables --> specialty chocolate with interest 25.990545
rolls/buns,bottled beer --> specialty chocolate with interest 25.990545
specialty chocolate --> bottled beer,liquor with interest 10.996000
specialty chocolate --> hamburger meat with interest 10.996000
specialty chocolate --> pastry with interest 36.986545
bottled water,soda --> specialty chocolate with interest 25.990545
specialty chocolate --> salty snack with interest 29.989091
specialty chocolate --> yogurt,rolls/buns with interest 9.996364
specialty chocolate --> domestic eggs with interest 10.996000

specialty chocolate --> frankfurter with interest 10.996000
tropical fruit --> specialty chocolate with interest 25.990545
specialty chocolate --> whipped/sour cream with interest 25.990545
sugar --> specialty chocolate with interest 25.990545
specialty chocolate --> sausage,rolls/buns,soda with interest 9.996364
specialty chocolate --> soda,bottled beer with interest 9.996364
hygiene articles --> specialty chocolate with interest 25.990545
specialty chocolate --> brown bread with interest 19.992727
specialty chocolate --> whole milk,pastry with interest 11.995636
specialty chocolate --> chewing gum with interest 14.994545
specialty chocolate --> soda,canned beer with interest 14.994545
specialty chocolate --> rolls/buns,brown bread with interest 9.996364
specialty chocolate --> pip fruit with interest 27.989818
specialty chocolate --> UHT-milk with interest 9.996364
specialty chocolate --> whole milk,rolls/buns with interest 12.995273
specialty chocolate --> waffles with interest 20.992364
napkins --> specialty chocolate with interest 25.990545
specialty chocolate --> long life bakery product with interest 10.996000
canned beer,shopping bags --> specialty chocolate with interest 25.990545
specialty chocolate --> butter with interest 10.996000
specialty chocolate --> frozen meals with interest 15.994182
specialty chocolate --> dishes with interest 9.996364
specialty chocolate --> pet care with interest 9.996364
white wine --> beverages with interest 25.990545
rolls/buns,soda --> beverages with interest 25.990545
ice cream --> beverages with interest 25.990545
liquor --> beverages with interest 25.990545
beverages --> pork with interest 26.990182
root vegetables --> beverages with interest 25.990545
sausage --> beverages with interest 25.990545
candy --> beverages with interest 25.990545
beverages --> sausage,rolls/buns with interest 11.995636
photo/film --> beverages with interest 25.990545
chicken --> beverages with interest 25.990545
shopping bags --> beverages with interest 25.990545
beverages --> oil with interest 12.995273
citrus fruit --> beverages with interest 25.990545
frozen vegetables --> beverages with interest 25.990545
rolls/buns,bottled beer --> beverages with interest 25.990545
beverages --> bottled beer,liquor with interest 10.996000
hamburger meat --> beverages with interest 25.990545
pastry --> beverages with interest 25.990545
bottled water,soda --> beverages with interest 25.990545
salty snack --> beverages with interest 25.990545
yogurt,rolls/buns --> beverages with interest 25.990545
domestic eggs --> beverages with interest 25.990545
frankfurter --> beverages with interest 25.990545
tropical fruit --> beverages with interest 25.990545
whipped/sour cream --> beverages with interest 25.990545
sugar --> beverages with interest 25.990545
sausage,rolls/buns,soda --> beverages with interest 25.990545
soda,bottled beer --> beverages with interest 25.990545
hygiene articles --> beverages with interest 25.990545
brown bread --> beverages with interest 25.990545
whole milk,pastry --> beverages with interest 25.990545
chewing gum --> beverages with interest 25.990545
soda,canned beer --> beverages with interest 25.990545

rolls/buns,brown bread --> beverages with interest 25.990545
beverages --> pip fruit with interest 27.989818
UHT-milk --> beverages with interest 25.990545
whole milk,rolls/buns --> beverages with interest 25.990545
beverages --> waffles with interest 20.992364
napkins --> beverages with interest 25.990545
long life bakery product --> beverages with interest 25.990545
canned beer,shopping bags --> beverages with interest 25.990545
butter --> beverages with interest 25.990545
frozen meals --> beverages with interest 25.990545
beverages --> dishes with interest 9.996364
beverages --> pet care with interest 9.996364
white wine --> rolls/buns,soda with interest 22.991636
white wine --> ice cream with interest 33.987636
white wine --> liquor with interest 9.996364
white wine --> pork with interest 26.990182
white wine --> root vegetables with interest 24.990909
white wine --> sausage with interest 23.991273
white wine --> candy with interest 11.995636
white wine --> sausage,rolls/buns with interest 11.995636
white wine --> photo/film with interest 26.990182
white wine --> chicken with interest 14.994545
white wine --> shopping bags with interest 47.982545
white wine --> oil with interest 12.995273
white wine --> citrus fruit with interest 15.994182
white wine --> frozen vegetables with interest 12.995273
white wine --> rolls/buns,bottled beer with interest 10.996000
white wine --> bottled beer,liquor with interest 10.996000
white wine --> hamburger meat with interest 10.996000
white wine --> pastry with interest 36.986545
white wine --> bottled water,soda with interest 16.993818
white wine --> salty snack with interest 29.989091
white wine --> yogurt,rolls/buns with interest 9.996364
white wine --> domestic eggs with interest 10.996000
white wine --> frankfurter with interest 10.996000
white wine --> tropical fruit with interest 22.991636
white wine --> whipped/sour cream with interest 25.990545
white wine --> sugar with interest 11.995636
white wine --> sausage,rolls/buns,soda with interest 9.996364
white wine --> soda,bottled beer with interest 9.996364
white wine --> hygiene articles with interest 11.995636
white wine --> brown bread with interest 19.992727
white wine --> whole milk,pastry with interest 11.995636
white wine --> chewing gum with interest 14.994545
white wine --> soda,canned beer with interest 14.994545
white wine --> rolls/buns,brown bread with interest 9.996364
white wine --> pip fruit with interest 27.989818
white wine --> UHT-milk with interest 9.996364
white wine --> whole milk,rolls/buns with interest 12.995273
white wine --> waffles with interest 20.992364
white wine --> napkins with interest 14.994545
white wine --> long life bakery product with interest 10.996000
white wine --> canned beer,shopping bags with interest 10.996000
white wine --> butter with interest 10.996000
white wine --> frozen meals with interest 15.994182
white wine --> dishes with interest 9.996364
white wine --> pet care with interest 9.996364

ice cream --> rolls/buns,soda with interest 22.991636
liquor --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> pork with interest 26.990182
root vegetables --> rolls/buns,soda with interest 22.991636
sausage --> rolls/buns,soda with interest 22.991636
candy --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> sausage,rolls/buns with interest 11.995636
rolls/buns,soda --> photo/film with interest 26.990182
chicken --> rolls/buns,soda with interest 22.991636
shopping bags --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> oil with interest 12.995273
citrus fruit --> rolls/buns,soda with interest 22.991636
frozen vegetables --> rolls/buns,soda with interest 22.991636
rolls/buns,bottled beer --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> bottled beer,liquor with interest 10.996000
hamburger meat --> rolls/buns,soda with interest 22.991636
pastry --> rolls/buns,soda with interest 22.991636
bottled water,soda --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> salty snack with interest 29.989091
yogurt,rolls/buns --> rolls/buns,soda with interest 22.991636
domestic eggs --> rolls/buns,soda with interest 22.991636
frankfurter --> rolls/buns,soda with interest 22.991636
tropical fruit --> rolls/buns,soda with interest 22.991636
whipped/sour cream --> rolls/buns,soda with interest 22.991636
sugar --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> rolls/buns,soda with interest 22.991636
hygiene articles --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> brown bread with interest 19.992727
rolls/buns,soda --> whole milk,pastry with interest 11.995636
chewing gum --> rolls/buns,soda with interest 22.991636
soda,canned beer --> rolls/buns,soda with interest 22.991636
rolls/buns,brown bread --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> pip fruit with interest 27.989818
UHT-milk --> rolls/buns,soda with interest 22.991636
whole milk,rolls/buns --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> waffles with interest 20.992364
napkins --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> long life bakery product with interest 10.996000
canned beer,shopping bags --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> butter with interest 10.996000
frozen meals --> rolls/buns,soda with interest 22.991636
rolls/buns,soda --> dishes with interest 9.996364
rolls/buns,soda --> pet care with interest 9.996364
liquor --> ice cream with interest 33.987636
ice cream --> pork with interest 26.990182
root vegetables --> ice cream with interest 33.987636
sausage --> ice cream with interest 33.987636
ice cream --> candy with interest 11.995636
ice cream --> sausage,rolls/buns with interest 11.995636
ice cream --> photo/film with interest 26.990182
chicken --> ice cream with interest 33.987636
ice cream --> shopping bags with interest 47.982545
ice cream --> oil with interest 12.995273
citrus fruit --> ice cream with interest 33.987636
frozen vegetables --> ice cream with interest 33.987636
rolls/buns,bottled beer --> ice cream with interest 33.987636

ice cream --> bottled beer,liquor with interest 10.996000
ice cream --> hamburger meat with interest 10.996000
pastry --> ice cream with interest 33.987636
bottled water,soda --> ice cream with interest 33.987636
ice cream --> salty snack with interest 29.989091
yogurt,rolls/buns --> ice cream with interest 33.987636
domestic eggs --> ice cream with interest 33.987636
ice cream --> frankfurter with interest 10.996000
tropical fruit --> ice cream with interest 33.987636
ice cream --> whipped/sour cream with interest 25.990545
sugar --> ice cream with interest 33.987636
ice cream --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> ice cream with interest 33.987636
hygiene articles --> ice cream with interest 33.987636
ice cream --> brown bread with interest 19.992727
ice cream --> whole milk,pastry with interest 11.995636
chewing gum --> ice cream with interest 33.987636
ice cream --> soda,canned beer with interest 14.994545
rolls/buns,brown bread --> ice cream with interest 33.987636
ice cream --> pip fruit with interest 27.989818
UHT-milk --> ice cream with interest 33.987636
whole milk,rolls/buns --> ice cream with interest 33.987636
ice cream --> waffles with interest 20.992364
napkins --> ice cream with interest 33.987636
ice cream --> long life bakery product with interest 10.996000
canned beer,shopping bags --> ice cream with interest 33.987636
ice cream --> butter with interest 10.996000
frozen meals --> ice cream with interest 33.987636
ice cream --> dishes with interest 9.996364
ice cream --> pet care with interest 9.996364
liquor --> pork with interest 26.990182
liquor --> root vegetables with interest 24.990909
liquor --> sausage with interest 23.991273
liquor --> candy with interest 11.995636
liquor --> sausage,rolls/buns with interest 11.995636
liquor --> photo/film with interest 26.990182
liquor --> chicken with interest 14.994545
liquor --> shopping bags with interest 47.982545
liquor --> oil with interest 12.995273
liquor --> citrus fruit with interest 15.994182
liquor --> frozen vegetables with interest 12.995273
liquor --> rolls/buns,bottled beer with interest 10.996000
liquor --> bottled beer,liquor with interest 10.996000
liquor --> hamburger meat with interest 10.996000
liquor --> pastry with interest 36.986545
liquor --> bottled water,soda with interest 16.993818
liquor --> salty snack with interest 29.989091
liquor --> yogurt,rolls/buns with interest 9.996364
liquor --> domestic eggs with interest 10.996000
liquor --> frankfurter with interest 10.996000
liquor --> tropical fruit with interest 22.991636
liquor --> whipped/sour cream with interest 25.990545
liquor --> sugar with interest 11.995636
liquor --> sausage,rolls/buns,soda with interest 9.996364
liquor --> soda,bottled beer with interest 9.996364
liquor --> hygiene articles with interest 11.995636
liquor --> brown bread with interest 19.992727

liquor --> whole milk,pastry with interest 11.995636
liquor --> chewing gum with interest 14.994545
liquor --> soda,canned beer with interest 14.994545
liquor --> rolls/buns,brown bread with interest 9.996364
liquor --> pip fruit with interest 27.989818
liquor --> UHT-milk with interest 9.996364
liquor --> whole milk,rolls/buns with interest 12.995273
liquor --> waffles with interest 20.992364
liquor --> napkins with interest 14.994545
liquor --> long life bakery product with interest 10.996000
liquor --> canned beer,shopping bags with interest 10.996000
liquor --> butter with interest 10.996000
liquor --> frozen meals with interest 15.994182
liquor --> dishes with interest 9.996364
liquor --> pet care with interest 9.996364
root vegetables --> pork with interest 26.990182
sausage --> pork with interest 26.990182
candy --> pork with interest 26.990182
sausage,rolls/buns --> pork with interest 26.990182
photo/film --> pork with interest 26.990182
chicken --> pork with interest 26.990182
shopping bags --> pork with interest 26.990182
oil --> pork with interest 26.990182
citrus fruit --> pork with interest 26.990182
frozen vegetables --> pork with interest 26.990182
rolls/buns,bottled beer --> pork with interest 26.990182
bottled beer,liquor --> pork with interest 26.990182
hamburger meat --> pork with interest 26.990182
pastry --> pork with interest 26.990182
bottled water,soda --> pork with interest 26.990182
salty snack --> pork with interest 26.990182
yogurt,rolls/buns --> pork with interest 26.990182
domestic eggs --> pork with interest 26.990182
frankfurter --> pork with interest 26.990182
tropical fruit --> pork with interest 26.990182
whipped/sour cream --> pork with interest 26.990182
sugar --> pork with interest 26.990182
sausage,rolls/buns,soda --> pork with interest 26.990182
soda,bottled beer --> pork with interest 26.990182
hygiene articles --> pork with interest 26.990182
brown bread --> pork with interest 26.990182
whole milk,pastry --> pork with interest 26.990182
chewing gum --> pork with interest 26.990182
soda,canned beer --> pork with interest 26.990182
rolls/buns,brown bread --> pork with interest 26.990182
pip fruit --> pork with interest 26.990182
UHT-milk --> pork with interest 26.990182
whole milk,rolls/buns --> pork with interest 26.990182
waffles --> pork with interest 26.990182
napkins --> pork with interest 26.990182
long life bakery product --> pork with interest 26.990182
canned beer,shopping bags --> pork with interest 26.990182
butter --> pork with interest 26.990182
frozen meals --> pork with interest 26.990182
dishes --> pork with interest 26.990182
pet care --> pork with interest 26.990182
root vegetables --> sausage with interest 23.991273

root vegetables --> candy with interest 11.995636
root vegetables --> sausage,rolls/buns with interest 11.995636
root vegetables --> photo/film with interest 26.990182
chicken --> root vegetables with interest 24.990909
root vegetables --> shopping bags with interest 47.982545
root vegetables --> oil with interest 12.995273
citrus fruit --> root vegetables with interest 24.990909
frozen vegetables --> root vegetables with interest 24.990909
rolls/buns,bottled beer --> root vegetables with interest 24.990909
root vegetables --> bottled beer,liquor with interest 10.996000
root vegetables --> hamburger meat with interest 10.996000
root vegetables --> pastry with interest 36.986545
bottled water,soda --> root vegetables with interest 24.990909
root vegetables --> salty snack with interest 29.989091
yogurt,rolls/buns --> root vegetables with interest 24.990909
domestic eggs --> root vegetables with interest 24.990909
root vegetables --> frankfurter with interest 10.996000
tropical fruit --> root vegetables with interest 24.990909
root vegetables --> whipped/sour cream with interest 25.990545
sugar --> root vegetables with interest 24.990909
root vegetables --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> root vegetables with interest 24.990909
hygiene articles --> root vegetables with interest 24.990909
root vegetables --> brown bread with interest 19.992727
root vegetables --> whole milk,pastry with interest 11.995636
chewing gum --> root vegetables with interest 24.990909
root vegetables --> soda,canned beer with interest 14.994545
root vegetables --> rolls/buns,brown bread with interest 9.996364
root vegetables --> pip fruit with interest 27.989818
UHT-milk --> root vegetables with interest 24.990909
whole milk,rolls/buns --> root vegetables with interest 24.990909
root vegetables --> waffles with interest 20.992364
napkins --> root vegetables with interest 24.990909
root vegetables --> long life bakery product with interest 10.996000
canned beer,shopping bags --> root vegetables with interest 24.990909
root vegetables --> butter with interest 10.996000
frozen meals --> root vegetables with interest 24.990909
root vegetables --> dishes with interest 9.996364
root vegetables --> pet care with interest 9.996364
sausage --> candy with interest 11.995636
sausage --> sausage,rolls/buns with interest 11.995636
sausage --> photo/film with interest 26.990182
chicken --> sausage with interest 23.991273
sausage --> shopping bags with interest 47.982545
sausage --> oil with interest 12.995273
citrus fruit --> sausage with interest 23.991273
frozen vegetables --> sausage with interest 23.991273
rolls/buns,bottled beer --> sausage with interest 23.991273
sausage --> bottled beer,liquor with interest 10.996000
sausage --> hamburger meat with interest 10.996000
pastry --> sausage with interest 23.991273
bottled water,soda --> sausage with interest 23.991273
sausage --> salty snack with interest 29.989091
yogurt,rolls/buns --> sausage with interest 23.991273
domestic eggs --> sausage with interest 23.991273
sausage --> frankfurter with interest 10.996000
tropical fruit --> sausage with interest 23.991273

sausage --> whipped/sour cream with interest 25.990545
sugar --> sausage with interest 23.991273
sausage --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> sausage with interest 23.991273
hygiene articles --> sausage with interest 23.991273
sausage --> brown bread with interest 19.992727
sausage --> whole milk,pastry with interest 11.995636
chewing gum --> sausage with interest 23.991273
sausage --> soda,canned beer with interest 14.994545
rolls/buns,brown bread --> sausage with interest 23.991273
sausage --> pip fruit with interest 27.989818
UHT-milk --> sausage with interest 23.991273
whole milk,rolls/buns --> sausage with interest 23.991273
sausage --> waffles with interest 20.992364
napkins --> sausage with interest 23.991273
sausage --> long life bakery product with interest 10.996000
canned beer,shopping bags --> sausage with interest 23.991273
sausage --> butter with interest 10.996000
frozen meals --> sausage with interest 23.991273
sausage --> dishes with interest 9.996364
sausage --> pet care with interest 9.996364
candy --> sausage,rolls/buns with interest 11.995636
candy --> photo/film with interest 26.990182
chicken --> candy with interest 11.995636
shopping bags --> candy with interest 11.995636
candy --> oil with interest 12.995273
citrus fruit --> candy with interest 11.995636
frozen vegetables --> candy with interest 11.995636
rolls/buns,bottled beer --> candy with interest 11.995636
candy --> bottled beer,liquor with interest 10.996000
hamburger meat --> candy with interest 11.995636
pastry --> candy with interest 11.995636
bottled water,soda --> candy with interest 11.995636
candy --> salty snack with interest 29.989091
yogurt,rolls/buns --> candy with interest 11.995636
domestic eggs --> candy with interest 11.995636
frankfurter --> candy with interest 11.995636
tropical fruit --> candy with interest 11.995636
whipped/sour cream --> candy with interest 11.995636
sugar --> candy with interest 11.995636
candy --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> candy with interest 11.995636
hygiene articles --> candy with interest 11.995636
candy --> brown bread with interest 19.992727
candy --> whole milk,pastry with interest 11.995636
chewing gum --> candy with interest 11.995636
soda,canned beer --> candy with interest 11.995636
rolls/buns,brown bread --> candy with interest 11.995636
candy --> pip fruit with interest 27.989818
UHT-milk --> candy with interest 11.995636
whole milk,rolls/buns --> candy with interest 11.995636
candy --> waffles with interest 20.992364
napkins --> candy with interest 11.995636
candy --> long life bakery product with interest 10.996000
canned beer,shopping bags --> candy with interest 11.995636
candy --> butter with interest 10.996000
frozen meals --> candy with interest 11.995636

candy --> dishes with interest 9.996364
candy --> pet care with interest 9.996364
photo/film --> sausage,rolls/buns with interest 11.995636
chicken --> sausage,rolls/buns with interest 11.995636
shopping bags --> sausage,rolls/buns with interest 11.995636
oil --> sausage,rolls/buns with interest 11.995636
citrus fruit --> sausage,rolls/buns with interest 11.995636
frozen vegetables --> sausage,rolls/buns with interest 11.995636
rolls/buns,bottled beer --> sausage,rolls/buns with interest 11.995636
bottled beer,liquor --> sausage,rolls/buns with interest 11.995636
hamburger meat --> sausage,rolls/buns with interest 11.995636
pastry --> sausage,rolls/buns with interest 11.995636
bottled water,soda --> sausage,rolls/buns with interest 11.995636
salty snack --> sausage,rolls/buns with interest 11.995636
yogurt,rolls/buns --> sausage,rolls/buns with interest 11.995636
domestic eggs --> sausage,rolls/buns with interest 11.995636
frankfurter --> sausage,rolls/buns with interest 11.995636
tropical fruit --> sausage,rolls/buns with interest 11.995636
whipped/sour cream --> sausage,rolls/buns with interest 11.995636
sugar --> sausage,rolls/buns with interest 11.995636
sausage,rolls/buns,soda --> sausage,rolls/buns with interest 11.995636
soda,bottled beer --> sausage,rolls/buns with interest 11.995636
hygiene articles --> sausage,rolls/buns with interest 11.995636
brown bread --> sausage,rolls/buns with interest 11.995636
whole milk,pastry --> sausage,rolls/buns with interest 11.995636
chewing gum --> sausage,rolls/buns with interest 11.995636
soda,canned beer --> sausage,rolls/buns with interest 11.995636
rolls/buns,brown bread --> sausage,rolls/buns with interest 11.995636
pip fruit --> sausage,rolls/buns with interest 11.995636
UHT-milk --> sausage,rolls/buns with interest 11.995636
whole milk,rolls/buns --> sausage,rolls/buns with interest 11.995636
waffles --> sausage,rolls/buns with interest 11.995636
napkins --> sausage,rolls/buns with interest 11.995636
long life bakery product --> sausage,rolls/buns with interest 11.995636
canned beer,shopping bags --> sausage,rolls/buns with interest 11.995636
butter --> sausage,rolls/buns with interest 11.995636
frozen meals --> sausage,rolls/buns with interest 11.995636
dishes --> sausage,rolls/buns with interest 11.995636
pet care --> sausage,rolls/buns with interest 11.995636
chicken --> photo/film with interest 26.990182
shopping bags --> photo/film with interest 26.990182
photo/film --> oil with interest 12.995273
citrus fruit --> photo/film with interest 26.990182
frozen vegetables --> photo/film with interest 26.990182
rolls/buns,bottled beer --> photo/film with interest 26.990182
photo/film --> bottled beer,liquor with interest 10.996000
hamburger meat --> photo/film with interest 26.990182
pastry --> photo/film with interest 26.990182
bottled water,soda --> photo/film with interest 26.990182
salty snack --> photo/film with interest 26.990182
yogurt,rolls/buns --> photo/film with interest 26.990182
domestic eggs --> photo/film with interest 26.990182
frankfurter --> photo/film with interest 26.990182
tropical fruit --> photo/film with interest 26.990182
whipped/sour cream --> photo/film with interest 26.990182
sugar --> photo/film with interest 26.990182
sausage,rolls/buns,soda --> photo/film with interest 26.990182

soda,bottled beer --> photo/film with interest 26.990182
hygiene articles --> photo/film with interest 26.990182
brown bread --> photo/film with interest 26.990182
whole milk,pastry --> photo/film with interest 26.990182
chewing gum --> photo/film with interest 26.990182
soda,canned beer --> photo/film with interest 26.990182
rolls/buns,brown bread --> photo/film with interest 26.990182
photo/film --> pip fruit with interest 27.989818
UHT-milk --> photo/film with interest 26.990182
whole milk,rolls/buns --> photo/film with interest 26.990182
photo/film --> waffles with interest 20.992364
napkins --> photo/film with interest 26.990182
long life bakery product --> photo/film with interest 26.990182
canned beer,shopping bags --> photo/film with interest 26.990182
butter --> photo/film with interest 26.990182
frozen meals --> photo/film with interest 26.990182
photo/film --> dishes with interest 9.996364
photo/film --> pet care with interest 9.996364
chicken --> shopping bags with interest 47.982545
chicken --> oil with interest 12.995273
chicken --> citrus fruit with interest 15.994182
chicken --> frozen vegetables with interest 12.995273
chicken --> rolls/buns,bottled beer with interest 10.996000
chicken --> bottled beer,liquor with interest 10.996000
chicken --> hamburger meat with interest 10.996000
chicken --> pastry with interest 36.986545
bottled water,soda --> chicken with interest 14.994545
chicken --> salty snack with interest 29.989091
chicken --> yogurt,rolls/buns with interest 9.996364
chicken --> domestic eggs with interest 10.996000
chicken --> frankfurter with interest 10.996000
chicken --> tropical fruit with interest 22.991636
chicken --> whipped/sour cream with interest 25.990545
chicken --> sugar with interest 11.995636
chicken --> sausage,rolls/buns,soda with interest 9.996364
chicken --> soda,bottled beer with interest 9.996364
hygiene articles --> chicken with interest 14.994545
chicken --> brown bread with interest 19.992727
chicken --> whole milk,pastry with interest 11.995636
chicken --> chewing gum with interest 14.994545
chicken --> soda,canned beer with interest 14.994545
chicken --> rolls/buns,brown bread with interest 9.996364
chicken --> pip fruit with interest 27.989818
chicken --> UHT-milk with interest 9.996364
chicken --> whole milk,rolls/buns with interest 12.995273
chicken --> waffles with interest 20.992364
napkins --> chicken with interest 14.994545
chicken --> long life bakery product with interest 10.996000
canned beer,shopping bags --> chicken with interest 14.994545
chicken --> butter with interest 10.996000
chicken --> frozen meals with interest 15.994182
chicken --> dishes with interest 9.996364
chicken --> pet care with interest 9.996364
shopping bags --> oil with interest 12.995273
citrus fruit --> shopping bags with interest 47.982545
frozen vegetables --> shopping bags with interest 47.982545
rolls/buns,bottled beer --> shopping bags with interest 47.982545

shopping bags --> bottled beer,liquor with interest 10.996000
hamburger meat --> shopping bags with interest 47.982545
pastry --> shopping bags with interest 47.982545
bottled water,soda --> shopping bags with interest 47.982545
shopping bags --> salty snack with interest 29.989091
yogurt,rolls/buns --> shopping bags with interest 47.982545
domestic eggs --> shopping bags with interest 47.982545
frankfurter --> shopping bags with interest 47.982545
tropical fruit --> shopping bags with interest 47.982545
whipped/sour cream --> shopping bags with interest 47.982545
sugar --> shopping bags with interest 47.982545
shopping bags --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> shopping bags with interest 47.982545
hygiene articles --> shopping bags with interest 47.982545
shopping bags --> brown bread with interest 19.992727
shopping bags --> whole milk,pastry with interest 11.995636
chewing gum --> shopping bags with interest 47.982545
soda,canned beer --> shopping bags with interest 47.982545
rolls/buns,brown bread --> shopping bags with interest 47.982545
shopping bags --> pip fruit with interest 27.989818
UHT-milk --> shopping bags with interest 47.982545
whole milk,rolls/buns --> shopping bags with interest 47.982545
shopping bags --> waffles with interest 20.992364
napkins --> shopping bags with interest 47.982545
shopping bags --> long life bakery product with interest 10.996000
canned beer,shopping bags --> shopping bags with interest 47.982545
shopping bags --> butter with interest 10.996000
frozen meals --> shopping bags with interest 47.982545
shopping bags --> dishes with interest 9.996364
shopping bags --> pet care with interest 9.996364
citrus fruit --> oil with interest 12.995273
frozen vegetables --> oil with interest 12.995273
rolls/buns,bottled beer --> oil with interest 12.995273
oil --> bottled beer,liquor with interest 10.996000
hamburger meat --> oil with interest 12.995273
pastry --> oil with interest 12.995273
bottled water,soda --> oil with interest 12.995273
salty snack --> oil with interest 12.995273
yogurt,rolls/buns --> oil with interest 12.995273
domestic eggs --> oil with interest 12.995273
frankfurter --> oil with interest 12.995273
tropical fruit --> oil with interest 12.995273
whipped/sour cream --> oil with interest 12.995273
sugar --> oil with interest 12.995273
sausage,rolls/buns,soda --> oil with interest 12.995273
soda,bottled beer --> oil with interest 12.995273
hygiene articles --> oil with interest 12.995273
brown bread --> oil with interest 12.995273
whole milk,pastry --> oil with interest 12.995273
chewing gum --> oil with interest 12.995273
soda,canned beer --> oil with interest 12.995273
rolls/buns,brown bread --> oil with interest 12.995273
oil --> pip fruit with interest 27.989818
UHT-milk --> oil with interest 12.995273
whole milk,rolls/buns --> oil with interest 12.995273
oil --> waffles with interest 20.992364
napkins --> oil with interest 12.995273

long life bakery product --> oil with interest 12.995273
canned beer,shopping bags --> oil with interest 12.995273
butter --> oil with interest 12.995273
frozen meals --> oil with interest 12.995273
oil --> dishes with interest 9.996364
oil --> pet care with interest 9.996364
citrus fruit --> frozen vegetables with interest 12.995273
citrus fruit --> rolls/buns,bottled beer with interest 10.996000
citrus fruit --> bottled beer,liquor with interest 10.996000
citrus fruit --> hamburger meat with interest 10.996000
citrus fruit --> pastry with interest 36.986545
bottled water,soda --> citrus fruit with interest 15.994182
citrus fruit --> salty snack with interest 29.989091
citrus fruit --> yogurt,rolls/buns with interest 9.996364
citrus fruit --> domestic eggs with interest 10.996000
citrus fruit --> frankfurter with interest 10.996000
citrus fruit --> tropical fruit with interest 22.991636
citrus fruit --> whipped/sour cream with interest 25.990545
citrus fruit --> sugar with interest 11.995636
citrus fruit --> sausage,rolls/buns,soda with interest 9.996364
citrus fruit --> soda,bottled beer with interest 9.996364
hygiene articles --> citrus fruit with interest 15.994182
citrus fruit --> brown bread with interest 19.992727
citrus fruit --> whole milk,pastry with interest 11.995636
citrus fruit --> chewing gum with interest 14.994545
citrus fruit --> soda,canned beer with interest 14.994545
citrus fruit --> rolls/buns,brown bread with interest 9.996364
citrus fruit --> pip fruit with interest 27.989818
citrus fruit --> UHT-milk with interest 9.996364
citrus fruit --> whole milk,rolls/buns with interest 12.995273
citrus fruit --> waffles with interest 20.992364
napkins --> citrus fruit with interest 15.994182
citrus fruit --> long life bakery product with interest 10.996000
canned beer,shopping bags --> citrus fruit with interest 15.994182
citrus fruit --> butter with interest 10.996000
citrus fruit --> frozen meals with interest 15.994182
citrus fruit --> dishes with interest 9.996364
citrus fruit --> pet care with interest 9.996364
rolls/buns,bottled beer --> frozen vegetables with interest 12.995273
frozen vegetables --> bottled beer,liquor with interest 10.996000
frozen vegetables --> hamburger meat with interest 10.996000
frozen vegetables --> pastry with interest 36.986545
bottled water,soda --> frozen vegetables with interest 12.995273
frozen vegetables --> salty snack with interest 29.989091
frozen vegetables --> yogurt,rolls/buns with interest 9.996364
frozen vegetables --> domestic eggs with interest 10.996000
frozen vegetables --> frankfurter with interest 10.996000
tropical fruit --> frozen vegetables with interest 12.995273
frozen vegetables --> whipped/sour cream with interest 25.990545
sugar --> frozen vegetables with interest 12.995273
frozen vegetables --> sausage,rolls/buns,soda with interest 9.996364
frozen vegetables --> soda,bottled beer with interest 9.996364
hygiene articles --> frozen vegetables with interest 12.995273
frozen vegetables --> brown bread with interest 19.992727
frozen vegetables --> whole milk,pastry with interest 11.995636
frozen vegetables --> chewing gum with interest 14.994545
frozen vegetables --> soda,canned beer with interest 14.994545

frozen vegetables --> rolls/buns,brown bread with interest 9.996364
frozen vegetables --> pip fruit with interest 27.989818
frozen vegetables --> UHT-milk with interest 9.996364
frozen vegetables --> whole milk,rolls/buns with interest 12.995273
frozen vegetables --> waffles with interest 20.992364
napkins --> frozen vegetables with interest 12.995273
frozen vegetables --> long life bakery product with interest 10.996000
canned beer,shopping bags --> frozen vegetables with interest 12.995273
frozen vegetables --> butter with interest 10.996000
frozen vegetables --> frozen meals with interest 15.994182
frozen vegetables --> dishes with interest 9.996364
frozen vegetables --> pet care with interest 9.996364
rolls/buns,bottled beer --> bottled beer,liquor with interest 10.996000
rolls/buns,bottled beer --> hamburger meat with interest 10.996000
rolls/buns,bottled beer --> pastry with interest 36.986545
bottled water,soda --> rolls/buns,bottled beer with interest 10.996000
rolls/buns,bottled beer --> salty snack with interest 29.989091
rolls/buns,bottled beer --> yogurt,rolls/buns with interest 9.996364
rolls/buns,bottled beer --> domestic eggs with interest 10.996000
rolls/buns,bottled beer --> frankfurter with interest 10.996000
tropical fruit --> rolls/buns,bottled beer with interest 10.996000
rolls/buns,bottled beer --> whipped/sour cream with interest 25.990545
sugar --> rolls/buns,bottled beer with interest 10.996000
rolls/buns,bottled beer --> sausage,rolls/buns,soda with interest 9.996364
rolls/buns,bottled beer --> soda,bottled beer with interest 9.996364
hygiene articles --> rolls/buns,bottled beer with interest 10.996000
rolls/buns,bottled beer --> brown bread with interest 19.992727
rolls/buns,bottled beer --> whole milk,pastry with interest 11.995636
rolls/buns,bottled beer --> chewing gum with interest 14.994545
rolls/buns,bottled beer --> soda,canned beer with interest 14.994545
rolls/buns,bottled beer --> rolls/buns,brown bread with interest 9.996364
rolls/buns,bottled beer --> pip fruit with interest 27.989818
rolls/buns,bottled beer --> UHT-milk with interest 9.996364
rolls/buns,bottled beer --> whole milk,rolls/buns with interest 12.995273
rolls/buns,bottled beer --> waffles with interest 20.992364
napkins --> rolls/buns,bottled beer with interest 10.996000
rolls/buns,bottled beer --> long life bakery product with interest 10.996000
canned beer,shopping bags --> rolls/buns,bottled beer with interest 10.996000
rolls/buns,bottled beer --> butter with interest 10.996000
rolls/buns,bottled beer --> frozen meals with interest 15.994182
rolls/buns,bottled beer --> dishes with interest 9.996364
rolls/buns,bottled beer --> pet care with interest 9.996364
hamburger meat --> bottled beer,liquor with interest 10.996000
pastry --> bottled beer,liquor with interest 10.996000
bottled water,soda --> bottled beer,liquor with interest 10.996000
salty snack --> bottled beer,liquor with interest 10.996000
yogurt,rolls/buns --> bottled beer,liquor with interest 10.996000
domestic eggs --> bottled beer,liquor with interest 10.996000
frankfurter --> bottled beer,liquor with interest 10.996000
tropical fruit --> bottled beer,liquor with interest 10.996000
whipped/sour cream --> bottled beer,liquor with interest 10.996000
sugar --> bottled beer,liquor with interest 10.996000
sausage,rolls/buns,soda --> bottled beer,liquor with interest 10.996000
soda,bottled beer --> bottled beer,liquor with interest 10.996000
hygiene articles --> bottled beer,liquor with interest 10.996000
brown bread --> bottled beer,liquor with interest 10.996000
whole milk,pastry --> bottled beer,liquor with interest 10.996000

chewing gum --> bottled beer,liquor with interest 10.996000
soda,canned beer --> bottled beer,liquor with interest 10.996000
rolls/buns,brown bread --> bottled beer,liquor with interest 10.996000
pip fruit --> bottled beer,liquor with interest 10.996000
UHT-milk --> bottled beer,liquor with interest 10.996000
whole milk,rolls/buns --> bottled beer,liquor with interest 10.996000
waffles --> bottled beer,liquor with interest 10.996000
napkins --> bottled beer,liquor with interest 10.996000
long life bakery product --> bottled beer,liquor with interest 10.996000
canned beer,shopping bags --> bottled beer,liquor with interest 10.996000
butter --> bottled beer,liquor with interest 10.996000
frozen meals --> bottled beer,liquor with interest 10.996000
dishes --> bottled beer,liquor with interest 10.996000
pet care --> bottled beer,liquor with interest 10.996000
pastry --> hamburger meat with interest 10.996000
bottled water,soda --> hamburger meat with interest 10.996000
hamburger meat --> salty snack with interest 29.989091
yogurt,rolls/buns --> hamburger meat with interest 10.996000
domestic eggs --> hamburger meat with interest 10.996000
frankfurter --> hamburger meat with interest 10.996000
tropical fruit --> hamburger meat with interest 10.996000
whipped/sour cream --> hamburger meat with interest 10.996000
sugar --> hamburger meat with interest 10.996000
hamburger meat --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> hamburger meat with interest 10.996000
hygiene articles --> hamburger meat with interest 10.996000
hamburger meat --> brown bread with interest 19.992727
hamburger meat --> whole milk,pastry with interest 11.995636
chewing gum --> hamburger meat with interest 10.996000
soda,canned beer --> hamburger meat with interest 10.996000
rolls/buns,brown bread --> hamburger meat with interest 10.996000
hamburger meat --> pip fruit with interest 27.989818
UHT-milk --> hamburger meat with interest 10.996000
whole milk,rolls/buns --> hamburger meat with interest 10.996000
hamburger meat --> waffles with interest 20.992364
napkins --> hamburger meat with interest 10.996000
hamburger meat --> long life bakery product with interest 10.996000
canned beer,shopping bags --> hamburger meat with interest 10.996000
hamburger meat --> butter with interest 10.996000
frozen meals --> hamburger meat with interest 10.996000
hamburger meat --> dishes with interest 9.996364
hamburger meat --> pet care with interest 9.996364
bottled water,soda --> pastry with interest 36.986545
pastry --> salty snack with interest 29.989091
yogurt,rolls/buns --> pastry with interest 36.986545
domestic eggs --> pastry with interest 36.986545
pastry --> frankfurter with interest 10.996000
tropical fruit --> pastry with interest 36.986545
pastry --> whipped/sour cream with interest 25.990545
sugar --> pastry with interest 36.986545
pastry --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> pastry with interest 36.986545
hygiene articles --> pastry with interest 36.986545
pastry --> brown bread with interest 19.992727
pastry --> whole milk,pastry with interest 11.995636
chewing gum --> pastry with interest 36.986545
pastry --> soda,canned beer with interest 14.994545

rolls/buns,brown bread --> pastry with interest 36.986545
pastry --> pip fruit with interest 27.989818
UHT-milk --> pastry with interest 36.986545
whole milk,rolls/buns --> pastry with interest 36.986545
pastry --> waffles with interest 20.992364
napkins --> pastry with interest 36.986545
pastry --> long life bakery product with interest 10.996000
canned beer,shopping bags --> pastry with interest 36.986545
pastry --> butter with interest 10.996000
frozen meals --> pastry with interest 36.986545
pastry --> dishes with interest 9.996364
pastry --> pet care with interest 9.996364
bottled water,soda --> salty snack with interest 29.989091
bottled water,soda --> yogurt,rolls/buns with interest 9.996364
bottled water,soda --> domestic eggs with interest 10.996000
bottled water,soda --> frankfurter with interest 10.996000
bottled water,soda --> tropical fruit with interest 22.991636
bottled water,soda --> whipped/sour cream with interest 25.990545
bottled water,soda --> sugar with interest 11.995636
bottled water,soda --> sausage,rolls/buns,soda with interest 9.996364
bottled water,soda --> soda,bottled beer with interest 9.996364
bottled water,soda --> hygiene articles with interest 11.995636
bottled water,soda --> brown bread with interest 19.992727
bottled water,soda --> whole milk,pastry with interest 11.995636
bottled water,soda --> chewing gum with interest 14.994545
bottled water,soda --> soda,canned beer with interest 14.994545
bottled water,soda --> rolls/buns,brown bread with interest 9.996364
bottled water,soda --> pip fruit with interest 27.989818
bottled water,soda --> UHT-milk with interest 9.996364
bottled water,soda --> whole milk,rolls/buns with interest 12.995273
bottled water,soda --> waffles with interest 20.992364
bottled water,soda --> napkins with interest 14.994545
bottled water,soda --> long life bakery product with interest 10.996000
bottled water,soda --> canned beer,shopping bags with interest 10.996000
bottled water,soda --> butter with interest 10.996000
bottled water,soda --> frozen meals with interest 15.994182
bottled water,soda --> dishes with interest 9.996364
bottled water,soda --> pet care with interest 9.996364
yogurt,rolls/buns --> salty snack with interest 29.989091
domestic eggs --> salty snack with interest 29.989091
frankfurter --> salty snack with interest 29.989091
tropical fruit --> salty snack with interest 29.989091
whipped/sour cream --> salty snack with interest 29.989091
sugar --> salty snack with interest 29.989091
sausage,rolls/buns,soda --> salty snack with interest 29.989091
soda,bottled beer --> salty snack with interest 29.989091
hygiene articles --> salty snack with interest 29.989091
brown bread --> salty snack with interest 29.989091
whole milk,pastry --> salty snack with interest 29.989091
chewing gum --> salty snack with interest 29.989091
soda,canned beer --> salty snack with interest 29.989091
rolls/buns,brown bread --> salty snack with interest 29.989091
salty snack --> pip fruit with interest 27.989818
UHT-milk --> salty snack with interest 29.989091
whole milk,rolls/buns --> salty snack with interest 29.989091
salty snack --> waffles with interest 20.992364
napkins --> salty snack with interest 29.989091

long life bakery product --> salty snack with interest 29.989091
canned beer,shopping bags --> salty snack with interest 29.989091
butter --> salty snack with interest 29.989091
frozen meals --> salty snack with interest 29.989091
salty snack --> dishes with interest 9.996364
salty snack --> pet care with interest 9.996364
domestic eggs --> yogurt,rolls/buns with interest 9.996364
yogurt,rolls/buns --> frankfurter with interest 10.996000
tropical fruit --> yogurt,rolls/buns with interest 9.996364
yogurt,rolls/buns --> whipped/sour cream with interest 25.990545
sugar --> yogurt,rolls/buns with interest 9.996364
yogurt,rolls/buns --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> yogurt,rolls/buns with interest 9.996364
hygiene articles --> yogurt,rolls/buns with interest 9.996364
yogurt,rolls/buns --> brown bread with interest 19.992727
yogurt,rolls/buns --> whole milk,pastry with interest 11.995636
chewing gum --> yogurt,rolls/buns with interest 9.996364
yogurt,rolls/buns --> soda,canned beer with interest 14.994545
yogurt,rolls/buns --> rolls/buns,brown bread with interest 9.996364
yogurt,rolls/buns --> pip fruit with interest 27.989818
UHT-milk --> yogurt,rolls/buns with interest 9.996364
whole milk,rolls/buns --> yogurt,rolls/buns with interest 9.996364
yogurt,rolls/buns --> waffles with interest 20.992364
napkins --> yogurt,rolls/buns with interest 9.996364
yogurt,rolls/buns --> long life bakery product with interest 10.996000
canned beer,shopping bags --> yogurt,rolls/buns with interest 9.996364
yogurt,rolls/buns --> butter with interest 10.996000
frozen meals --> yogurt,rolls/buns with interest 9.996364
yogurt,rolls/buns --> dishes with interest 9.996364
yogurt,rolls/buns --> pet care with interest 9.996364
domestic eggs --> frankfurter with interest 10.996000
tropical fruit --> domestic eggs with interest 10.996000
domestic eggs --> whipped/sour cream with interest 25.990545
sugar --> domestic eggs with interest 10.996000
domestic eggs --> sausage,rolls/buns,soda with interest 9.996364
domestic eggs --> soda,bottled beer with interest 9.996364
hygiene articles --> domestic eggs with interest 10.996000
domestic eggs --> brown bread with interest 19.992727
domestic eggs --> whole milk,pastry with interest 11.995636
domestic eggs --> chewing gum with interest 14.994545
domestic eggs --> soda,canned beer with interest 14.994545
domestic eggs --> rolls/buns,brown bread with interest 9.996364
domestic eggs --> pip fruit with interest 27.989818
domestic eggs --> UHT-milk with interest 9.996364
domestic eggs --> whole milk,rolls/buns with interest 12.995273
domestic eggs --> waffles with interest 20.992364
napkins --> domestic eggs with interest 10.996000
domestic eggs --> long life bakery product with interest 10.996000
canned beer,shopping bags --> domestic eggs with interest 10.996000
domestic eggs --> butter with interest 10.996000
domestic eggs --> frozen meals with interest 15.994182
domestic eggs --> dishes with interest 9.996364
domestic eggs --> pet care with interest 9.996364
tropical fruit --> frankfurter with interest 10.996000
whipped/sour cream --> frankfurter with interest 10.996000
sugar --> frankfurter with interest 10.996000
frankfurter --> sausage,rolls/buns,soda with interest 9.996364

soda,bottled beer --> frankfurter with interest 10.996000
hygiene articles --> frankfurter with interest 10.996000
frankfurter --> brown bread with interest 19.992727
frankfurter --> whole milk,pastry with interest 11.995636
chewing gum --> frankfurter with interest 10.996000
soda,canned beer --> frankfurter with interest 10.996000
rolls/buns,brown bread --> frankfurter with interest 10.996000
frankfurter --> pip fruit with interest 27.989818
UHT-milk --> frankfurter with interest 10.996000
whole milk,rolls/buns --> frankfurter with interest 10.996000
frankfurter --> waffles with interest 20.992364
napkins --> frankfurter with interest 10.996000
frankfurter --> long life bakery product with interest 10.996000
canned beer,shopping bags --> frankfurter with interest 10.996000
frankfurter --> butter with interest 10.996000
frozen meals --> frankfurter with interest 10.996000
frankfurter --> dishes with interest 9.996364
frankfurter --> pet care with interest 9.996364
tropical fruit --> whipped/sour cream with interest 25.990545
sugar --> tropical fruit with interest 22.991636
tropical fruit --> sausage,rolls/buns,soda with interest 9.996364
tropical fruit --> soda,bottled beer with interest 9.996364
hygiene articles --> tropical fruit with interest 22.991636
tropical fruit --> brown bread with interest 19.992727
tropical fruit --> whole milk,pastry with interest 11.995636
tropical fruit --> chewing gum with interest 14.994545
tropical fruit --> soda,canned beer with interest 14.994545
tropical fruit --> rolls/buns,brown bread with interest 9.996364
tropical fruit --> pip fruit with interest 27.989818
tropical fruit --> UHT-milk with interest 9.996364
tropical fruit --> whole milk,rolls/buns with interest 12.995273
tropical fruit --> waffles with interest 20.992364
napkins --> tropical fruit with interest 22.991636
tropical fruit --> long life bakery product with interest 10.996000
canned beer,shopping bags --> tropical fruit with interest 22.991636
tropical fruit --> butter with interest 10.996000
tropical fruit --> frozen meals with interest 15.994182
tropical fruit --> dishes with interest 9.996364
tropical fruit --> pet care with interest 9.996364
sugar --> whipped/sour cream with interest 25.990545
whipped/sour cream --> sausage,rolls/buns,soda with interest 9.996364
soda,bottled beer --> whipped/sour cream with interest 25.990545
hygiene articles --> whipped/sour cream with interest 25.990545
whipped/sour cream --> brown bread with interest 19.992727
whipped/sour cream --> whole milk,pastry with interest 11.995636
chewing gum --> whipped/sour cream with interest 25.990545
soda,canned beer --> whipped/sour cream with interest 25.990545
rolls/buns,brown bread --> whipped/sour cream with interest 25.990545
whipped/sour cream --> pip fruit with interest 27.989818
UHT-milk --> whipped/sour cream with interest 25.990545
whole milk,rolls/buns --> whipped/sour cream with interest 25.990545
whipped/sour cream --> waffles with interest 20.992364
napkins --> whipped/sour cream with interest 25.990545
whipped/sour cream --> long life bakery product with interest 10.996000
canned beer,shopping bags --> whipped/sour cream with interest 25.990545
whipped/sour cream --> butter with interest 10.996000
frozen meals --> whipped/sour cream with interest 25.990545

whipped/sour cream --> dishes with interest 9.996364
whipped/sour cream --> pet care with interest 9.996364
sugar --> sausage,rolls/buns,soda with interest 9.996364
sugar --> soda,bottled beer with interest 9.996364
hygiene articles --> sugar with interest 11.995636
sugar --> brown bread with interest 19.992727
sugar --> whole milk,pastry with interest 11.995636
sugar --> chewing gum with interest 14.994545
sugar --> soda,canned beer with interest 14.994545
sugar --> rolls/buns,brown bread with interest 9.996364
sugar --> pip fruit with interest 27.989818
sugar --> UHT-milk with interest 9.996364
sugar --> whole milk,rolls/buns with interest 12.995273
sugar --> waffles with interest 20.992364
napkins --> sugar with interest 11.995636
sugar --> long life bakery product with interest 10.996000
canned beer,shopping bags --> sugar with interest 11.995636
sugar --> butter with interest 10.996000
sugar --> frozen meals with interest 15.994182
sugar --> dishes with interest 9.996364
sugar --> pet care with interest 9.996364
soda,bottled beer --> sausage,rolls/buns,soda with interest 9.996364
hygiene articles --> sausage,rolls/buns,soda with interest 9.996364
brown bread --> sausage,rolls/buns,soda with interest 9.996364
whole milk,pastry --> sausage,rolls/buns,soda with interest 9.996364
chewing gum --> sausage,rolls/buns,soda with interest 9.996364
soda,canned beer --> sausage,rolls/buns,soda with interest 9.996364
rolls/buns,brown bread --> sausage,rolls/buns,soda with interest 9.996364
sausage,rolls/buns,soda --> pip fruit with interest 27.989818
UHT-milk --> sausage,rolls/buns,soda with interest 9.996364
whole milk,rolls/buns --> sausage,rolls/buns,soda with interest 9.996364
sausage,rolls/buns,soda --> waffles with interest 20.992364
napkins --> sausage,rolls/buns,soda with interest 9.996364
long life bakery product --> sausage,rolls/buns,soda with interest 9.996364
canned beer,shopping bags --> sausage,rolls/buns,soda with interest 9.996364
butter --> sausage,rolls/buns,soda with interest 9.996364
frozen meals --> sausage,rolls/buns,soda with interest 9.996364
sausage,rolls/buns,soda --> dishes with interest 9.996364
sausage,rolls/buns,soda --> pet care with interest 9.996364
hygiene articles --> soda,bottled beer with interest 9.996364
soda,bottled beer --> brown bread with interest 19.992727
soda,bottled beer --> whole milk,pastry with interest 11.995636
soda,bottled beer --> chewing gum with interest 14.994545
soda,bottled beer --> soda,canned beer with interest 14.994545
soda,bottled beer --> rolls/buns,brown bread with interest 9.996364
soda,bottled beer --> pip fruit with interest 27.989818
soda,bottled beer --> UHT-milk with interest 9.996364
soda,bottled beer --> whole milk,rolls/buns with interest 12.995273
soda,bottled beer --> waffles with interest 20.992364
napkins --> soda,bottled beer with interest 9.996364
soda,bottled beer --> long life bakery product with interest 10.996000
canned beer,shopping bags --> soda,bottled beer with interest 9.996364
soda,bottled beer --> butter with interest 10.996000
soda,bottled beer --> frozen meals with interest 15.994182
soda,bottled beer --> dishes with interest 9.996364
soda,bottled beer --> pet care with interest 9.996364
hygiene articles --> brown bread with interest 19.992727

hygiene articles --> whole milk,pastry with interest 11.995636
hygiene articles --> chewing gum with interest 14.994545
hygiene articles --> soda,canned beer with interest 14.994545
hygiene articles --> rolls/buns,brown bread with interest 9.996364
hygiene articles --> pip fruit with interest 27.989818
hygiene articles --> UHT-milk with interest 9.996364
hygiene articles --> whole milk,rolls/buns with interest 12.995273
hygiene articles --> waffles with interest 20.992364
hygiene articles --> napkins with interest 14.994545
hygiene articles --> long life bakery product with interest 10.996000
hygiene articles --> canned beer,shopping bags with interest 10.996000
hygiene articles --> butter with interest 10.996000
hygiene articles --> frozen meals with interest 15.994182
hygiene articles --> dishes with interest 9.996364
hygiene articles --> pet care with interest 9.996364
brown bread --> whole milk,pastry with interest 11.995636
chewing gum --> brown bread with interest 19.992727
soda,canned beer --> brown bread with interest 19.992727
rolls/buns,brown bread --> brown bread with interest 19.992727
brown bread --> pip fruit with interest 27.989818
UHT-milk --> brown bread with interest 19.992727
whole milk,rolls/buns --> brown bread with interest 19.992727
brown bread --> waffles with interest 20.992364
napkins --> brown bread with interest 19.992727
brown bread --> long life bakery product with interest 10.996000
canned beer,shopping bags --> brown bread with interest 19.992727
brown bread --> butter with interest 10.996000
frozen meals --> brown bread with interest 19.992727
brown bread --> dishes with interest 9.996364
brown bread --> pet care with interest 9.996364
chewing gum --> whole milk,pastry with interest 11.995636
soda,canned beer --> whole milk,pastry with interest 11.995636
rolls/buns,brown bread --> whole milk,pastry with interest 11.995636
whole milk,pastry --> pip fruit with interest 27.989818
UHT-milk --> whole milk,pastry with interest 11.995636
whole milk,rolls/buns --> whole milk,pastry with interest 11.995636
whole milk,pastry --> waffles with interest 20.992364
napkins --> whole milk,pastry with interest 11.995636
long life bakery product --> whole milk,pastry with interest 11.995636
canned beer,shopping bags --> whole milk,pastry with interest 11.995636
butter --> whole milk,pastry with interest 11.995636
frozen meals --> whole milk,pastry with interest 11.995636
whole milk,pastry --> dishes with interest 9.996364
whole milk,pastry --> pet care with interest 9.996364
chewing gum --> soda,canned beer with interest 14.994545
chewing gum --> rolls/buns,brown bread with interest 9.996364
chewing gum --> pip fruit with interest 27.989818
UHT-milk --> chewing gum with interest 14.994545
whole milk,rolls/buns --> chewing gum with interest 14.994545
chewing gum --> waffles with interest 20.992364
napkins --> chewing gum with interest 14.994545
chewing gum --> long life bakery product with interest 10.996000
canned beer,shopping bags --> chewing gum with interest 14.994545
chewing gum --> butter with interest 10.996000
frozen meals --> chewing gum with interest 14.994545
chewing gum --> dishes with interest 9.996364
chewing gum --> pet care with interest 9.996364

rolls/buns,brown bread --> soda,canned beer with interest 14.994545
soda,canned beer --> pip fruit with interest 27.989818
UHT-milk --> soda,canned beer with interest 14.994545
whole milk,rolls/buns --> soda,canned beer with interest 14.994545
soda,canned beer --> waffles with interest 20.992364
napkins --> soda,canned beer with interest 14.994545
soda,canned beer --> long life bakery product with interest 10.996000
canned beer,shopping bags --> soda,canned beer with interest 14.994545
soda,canned beer --> butter with interest 10.996000
frozen meals --> soda,canned beer with interest 14.994545
soda,canned beer --> dishes with interest 9.996364
soda,canned beer --> pet care with interest 9.996364
rolls/buns,brown bread --> pip fruit with interest 27.989818
UHT-milk --> rolls/buns,brown bread with interest 9.996364
whole milk,rolls/buns --> rolls/buns,brown bread with interest 9.996364
rolls/buns,brown bread --> waffles with interest 20.992364
napkins --> rolls/buns,brown bread with interest 9.996364
rolls/buns,brown bread --> long life bakery product with interest 10.996000
canned beer,shopping bags --> rolls/buns,brown bread with interest 9.996364
rolls/buns,brown bread --> butter with interest 10.996000
frozen meals --> rolls/buns,brown bread with interest 9.996364
rolls/buns,brown bread --> dishes with interest 9.996364
rolls/buns,brown bread --> pet care with interest 9.996364
UHT-milk --> pip fruit with interest 27.989818
whole milk,rolls/buns --> pip fruit with interest 27.989818
waffles --> pip fruit with interest 27.989818
napkins --> pip fruit with interest 27.989818
long life bakery product --> pip fruit with interest 27.989818
canned beer,shopping bags --> pip fruit with interest 27.989818
butter --> pip fruit with interest 27.989818
frozen meals --> pip fruit with interest 27.989818
dishes --> pip fruit with interest 27.989818
pet care --> pip fruit with interest 27.989818
UHT-milk --> whole milk,rolls/buns with interest 12.995273
UHT-milk --> waffles with interest 20.992364
napkins --> UHT-milk with interest 9.996364
UHT-milk --> long life bakery product with interest 10.996000
canned beer,shopping bags --> UHT-milk with interest 9.996364
UHT-milk --> butter with interest 10.996000
UHT-milk --> frozen meals with interest 15.994182
UHT-milk --> dishes with interest 9.996364
UHT-milk --> pet care with interest 9.996364
whole milk,rolls/buns --> waffles with interest 20.992364
napkins --> whole milk,rolls/buns with interest 12.995273
whole milk,rolls/buns --> long life bakery product with interest 10.996000
canned beer,shopping bags --> whole milk,rolls/buns with interest 12.995273
whole milk,rolls/buns --> butter with interest 10.996000
whole milk,rolls/buns --> frozen meals with interest 15.994182
whole milk,rolls/buns --> dishes with interest 9.996364
whole milk,rolls/buns --> pet care with interest 9.996364
napkins --> waffles with interest 20.992364
long life bakery product --> waffles with interest 20.992364
canned beer,shopping bags --> waffles with interest 20.992364
butter --> waffles with interest 20.992364
frozen meals --> waffles with interest 20.992364
dishes --> waffles with interest 20.992364
pet care --> waffles with interest 20.992364

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napkins --> long life bakery product with interest 10.996000
napkins --> canned beer,shopping bags with interest 10.996000
napkins --> butter with interest 10.996000
napkins --> frozen meals with interest 15.994182
napkins --> dishes with interest 9.996364
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canned beer,shopping bags --> long life bakery product with interest 10.996000
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butter --> long life bakery product with interest 10.996000
frozen meals --> long life bakery product with interest 10.996000
long life bakery product --> dishes with interest 9.996364
long life bakery product --> pet care with interest 9.996364
canned beer,shopping bags --> butter with interest 10.996000
canned beer,shopping bags --> frozen meals with interest 15.994182
canned beer,shopping bags --> dishes with interest 9.996364
canned beer,shopping bags --> pet care with interest 9.996364
frozen meals --> butter with interest 10.996000
butter --> dishes with interest 9.996364
butter --> pet care with interest 9.996364
frozen meals --> dishes with interest 9.996364
frozen meals --> pet care with interest 9.996364
pet care --> dishes with interest 9.996364
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In [122]: L2_PCY_N10

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Out[122]: [frozenset({'rolls/buns', 'whole milk'}),
frozenset({'potted plants', 'whole milk'}),
frozenset({'beef', 'whole milk'}),
frozenset({'fruit/vegetable juice', 'whole milk'}),
frozenset({'chocolate', 'whole milk'}),
frozenset({'specialty bar', 'whole milk'}),
frozenset({'other vegetables', 'whole milk'}),
frozenset({'whole milk', 'yogurt'}),
frozenset({'pastry,soda', 'whole milk'}),
frozenset({'canned beer', 'whole milk'}),
frozenset({'coffee', 'whole milk'}),
frozenset({'misc. beverages', 'whole milk'}),
frozenset({'bottled water', 'whole milk'}),
frozenset({'soda', 'whole milk'}),
frozenset({'berries', 'whole milk'}),
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frozenset({'bottled beer,liquor', 'soda'}),
frozenset({'hamburger meat', 'soda'}),
frozenset({'pastry', 'soda'}),
frozenset({'bottled water,soda', 'soda'}),
frozenset({'salty snack', 'soda'}),
frozenset({'soda', 'yogurt,rolls/buns'}),
frozenset({'domestic eggs', 'soda'}),
frozenset({'frankfurter', 'soda'}),
frozenset({'soda', 'tropical fruit'}),
frozenset({'soda', 'whipped/sour cream'}),
frozenset({'soda', 'sugar'}),
frozenset({'sausage,rolls/buns,soda', 'soda'}),

```

```
frozenset({'soda', 'soda,bottled beer'}),
frozenset({'hygiene articles', 'soda'}),
frozenset({'brown bread', 'soda'}),
frozenset({'soda', 'whole milk,pastry'}),
frozenset({'chewing gum', 'soda'}),
frozenset({'soda', 'soda,canned beer'}),
frozenset({'rolls/buns,brown bread', 'soda'}),
frozenset({'pip fruit', 'soda'}),
frozenset({'UHT-milk', 'soda'}),
frozenset({'soda', 'whole milk,rolls/buns'}),
frozenset({'soda', 'waffles'}),
frozenset({'napkins', 'soda'}),
frozenset({'long life bakery product', 'soda'}),
frozenset({'canned beer,shopping bags', 'soda'}),
frozenset({'butter', 'soda'}),
frozenset({'frozen meals', 'soda'}),
frozenset({'dishes', 'soda'}),
frozenset({'pet care', 'soda'}),
frozenset({'berries', 'detergent'}),
frozenset({'berries', 'sparkling wine'}),
frozenset({'berries', 'newspapers'}),
frozenset({'berries', 'frankfurter,rolls/buns'}),
frozenset({'berries', 'bottled beer'}),
frozenset({'berries', 'rolls/buns,canned beer'}),
frozenset({'berries', 'specialty chocolate'}),
frozenset({'berries', 'beverages'}),
frozenset({'berries', 'white wine'}),
frozenset({'berries', 'rolls/buns,soda'}),
frozenset({'berries', 'ice cream'}),
frozenset({'berries', 'liquor'}),
frozenset({'berries', 'pork'}),
frozenset({'berries', 'root vegetables'}),
frozenset({'berries', 'sausage'}),
frozenset({'berries', 'candy'}),
frozenset({'berries', 'sausage,rolls/buns'}),
frozenset({'berries', 'photo/film'}),
frozenset({'berries', 'chicken'}),
frozenset({'berries', 'shopping bags'}),
frozenset({'berries', 'oil'}),
frozenset({'berries', 'citrus fruit'}),
frozenset({'berries', 'frozen vegetables'}),
frozenset({'berries', 'rolls/buns,bottled beer'}),
frozenset({'berries', 'bottled beer,liquor'}),
frozenset({'berries', 'hamburger meat'}),
frozenset({'berries', 'pastry'}),
frozenset({'berries', 'bottled water,soda'}),
frozenset({'berries', 'salty snack'}),
frozenset({'berries', 'yogurt,rolls/buns'}),
frozenset({'berries', 'domestic eggs'}),
frozenset({'berries', 'frankfurter'}),
frozenset({'berries', 'tropical fruit'}),
frozenset({'berries', 'whipped/sour cream'}),
frozenset({'berries', 'sugar'}),
frozenset({'berries', 'sausage,rolls/buns,soda'}),
frozenset({'berries', 'soda,bottled beer'}),
frozenset({'berries', 'hygiene articles'}),
frozenset({'berries', 'brown bread'}),
```

```

frozenset({'berries', 'whole milk,pastry'}),
frozenset({'berries', 'chewing gum'}),
frozenset({'berries', 'soda,canned beer'}),
frozenset({'berries', 'rolls/buns,brown bread'}),
frozenset({'berries', 'pip fruit'}),
frozenset({'UHT-milk', 'berries'}),
frozenset({'berries', 'whole milk,rolls/buns'}),
frozenset({'berries', 'waffles'}),
frozenset({'berries', 'napkins'}),
frozenset({'berries', 'long life bakery product'}),
frozenset({'berries', 'canned beer,shopping bags'}),
frozenset({'berries', 'butter'}),
frozenset({'berries', 'frozen meals'}),
frozenset({'berries', 'dishes'}),
frozenset({'berries', 'pet care'}),
frozenset({'detergent', 'sparkling wine'}),
frozenset({'detergent', 'newspapers'}),
frozenset({'detergent', 'frankfurter,rolls/buns'}),
frozenset({'bottled beer', 'detergent'}),
frozenset({'detergent', 'rolls/buns,canned beer'}),
frozenset({'detergent', 'specialty chocolate'}),
frozenset({'beverages', 'detergent'}),
frozenset({'detergent', 'white wine'}),
frozenset({'detergent', 'rolls/buns,soda'}),
frozenset({'detergent', 'ice cream'}),
frozenset({'detergent', 'liquor'}),
frozenset({'detergent', 'pork'}),
frozenset({'detergent', 'root vegetables'}),
frozenset({'detergent', 'sausage'}),
frozenset({'candy', 'detergent'}),
frozenset({'detergent', 'sausage,rolls/buns'}),
...]
```

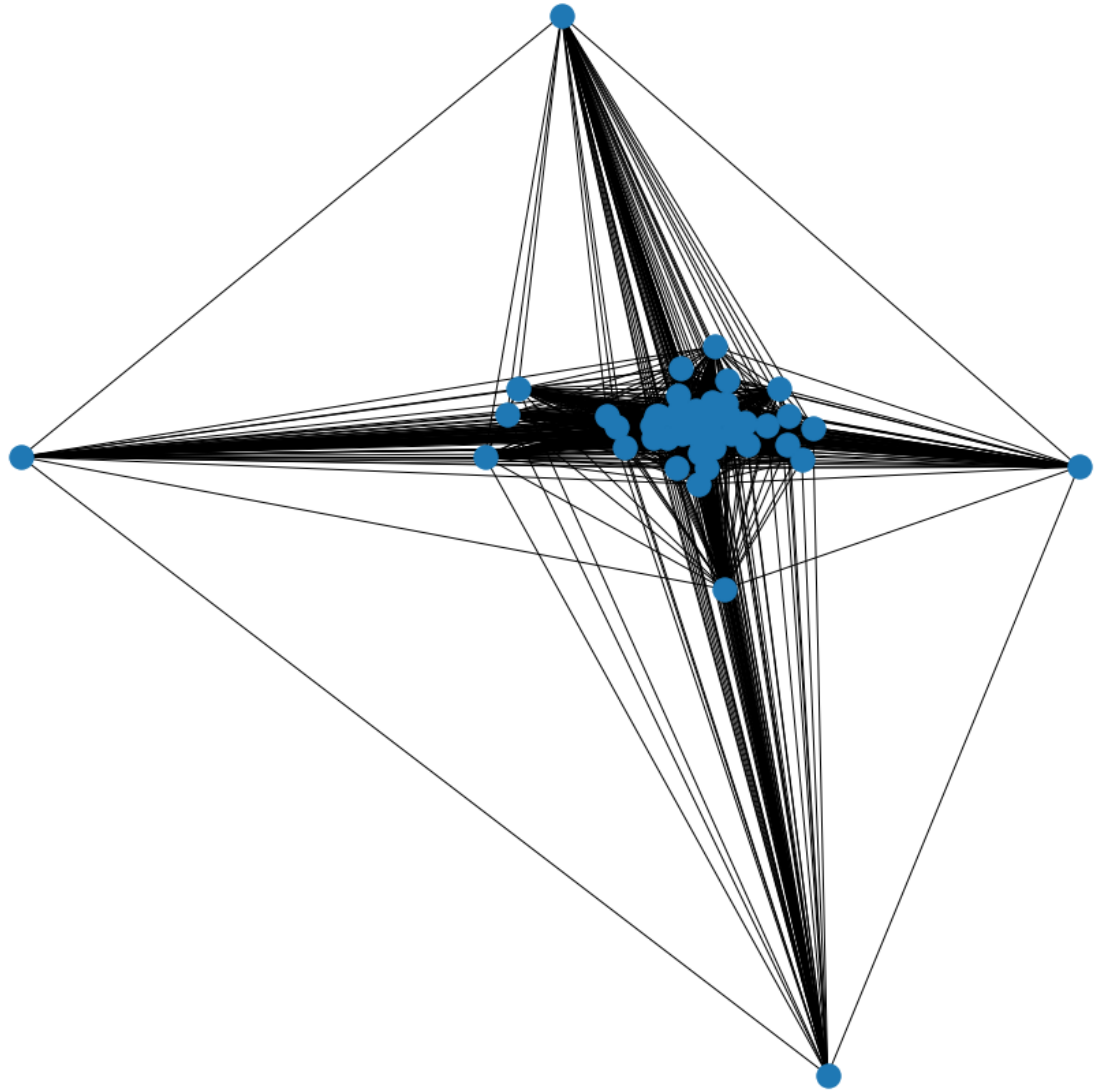
```

In [123]: # create DataFrame using data
# dfs100a=pd.DataFrame(L2N100.items(), columns=['basket', 'count'])
dfs10pcy=pd.DataFrame(L2_PCY_N10, columns=['source', 'target'])
dfs10pcy.head(10)
```

Out[123]:

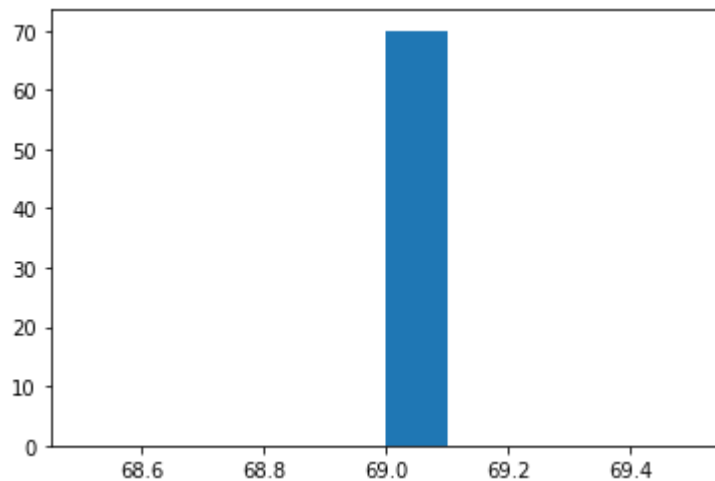
	source	target
0	rolls/buns	whole milk
1	potted plants	whole milk
2	beef	whole milk
3	fruit/vegetable juice	whole milk
4	chocolate	whole milk
5	specialty bar	whole milk
6	other vegetables	whole milk
7	yogurt	whole milk
8	pastry,soda	whole milk
9	canned beer	whole milk

```
In [124]: plt.figure(figsize=(12, 12))  
G_pcy_n10=nx.from_pandas_edgelist(dfs10pcy,source='source',target='target')  
nx.draw_spectral(G_pcy_n10)
```




```
In [125]: plt.hist([v for k,v in nx.degree(G_pcy_n10)])
```

```
Out[125]: (array([ 0.,  0.,  0.,  0.,  0., 70.,  0.,  0.,  0.,  0.]),
          array([68.5, 68.6, 68.7, 68.8, 68.9, 69. , 69.1, 69.2, 69.3, 69.4, 69.5]),
          <a list of 10 Patch objects>)
```



N = 50

```
In [126]: start_time_pcy50 = time.time()
          # hash table
          max_hash1 = 10*1000000
          H1 = np.zeros((max_hash1,), dtype=np.int)
          for key in readdata(k=2, report=True):
              hash_cell_1 = hash(key) % max_hash1
              H1[hash_cell_1] += 1
```

```
In [127]: # compact hash table
          H_good_1 = set(np.where(H1 >= N50)[0])

          del H1
```

```
In [128]: # find frequent 2-tuples
C2 = {}
for key in readdata(k=2):
    # hash-based filtering stage from PCY
    hash_cell_1 = hash(key) % max_hash1
    if hash_cell_1 not in H_good_1:
        continue

    # filter out non-frequent tuples
    if key not in C2N50_items:
        continue

    # record frequent tuples
    if key not in C2:
        C2[key] = 1
    else:
        C2[key] += 1

print("{} items".format(len(C2)))
```

36 items

```
In [129]: # filter stage
L2_PCY_N50 = {}
for key, count in C2.items():
    if count >= N50:
        L2_PCY_N50[key] = count
print('{} items with >{} occurrences'.format(len(L2_PCY_N50), N50))
end_time_pcy50=time.time()
time_pcy50=start_time_pcy50-end_time_pcy50
```

36 items with >50 occurrences

Generate rules A -> B

```
In [130]: L2_PCY_N50 = [ elem for elem in list(L2_PCY_N50) if len(elem)>1] # clean our list a bit.

for i in range(len(L2_PCY_N50)):

    A, B = list(L2_PCY_N50[i])
    support_AB = C2[frozenset([A, B])]
    support_A = C1N50[frozenset([A])]
    conf_A_leads_to_B = support_AB / support_A

    support_B = C1N50[frozenset([B])]
    prob_B = support_B / 2750.0

    interest_A_leads_to_B = conf_A_leads_to_B - prob_B

    if interest_A_leads_to_B > 0.7:
        print("{} --> {} with interest {:.3f}".format(A, B, interest_A_leads_to_B))
```

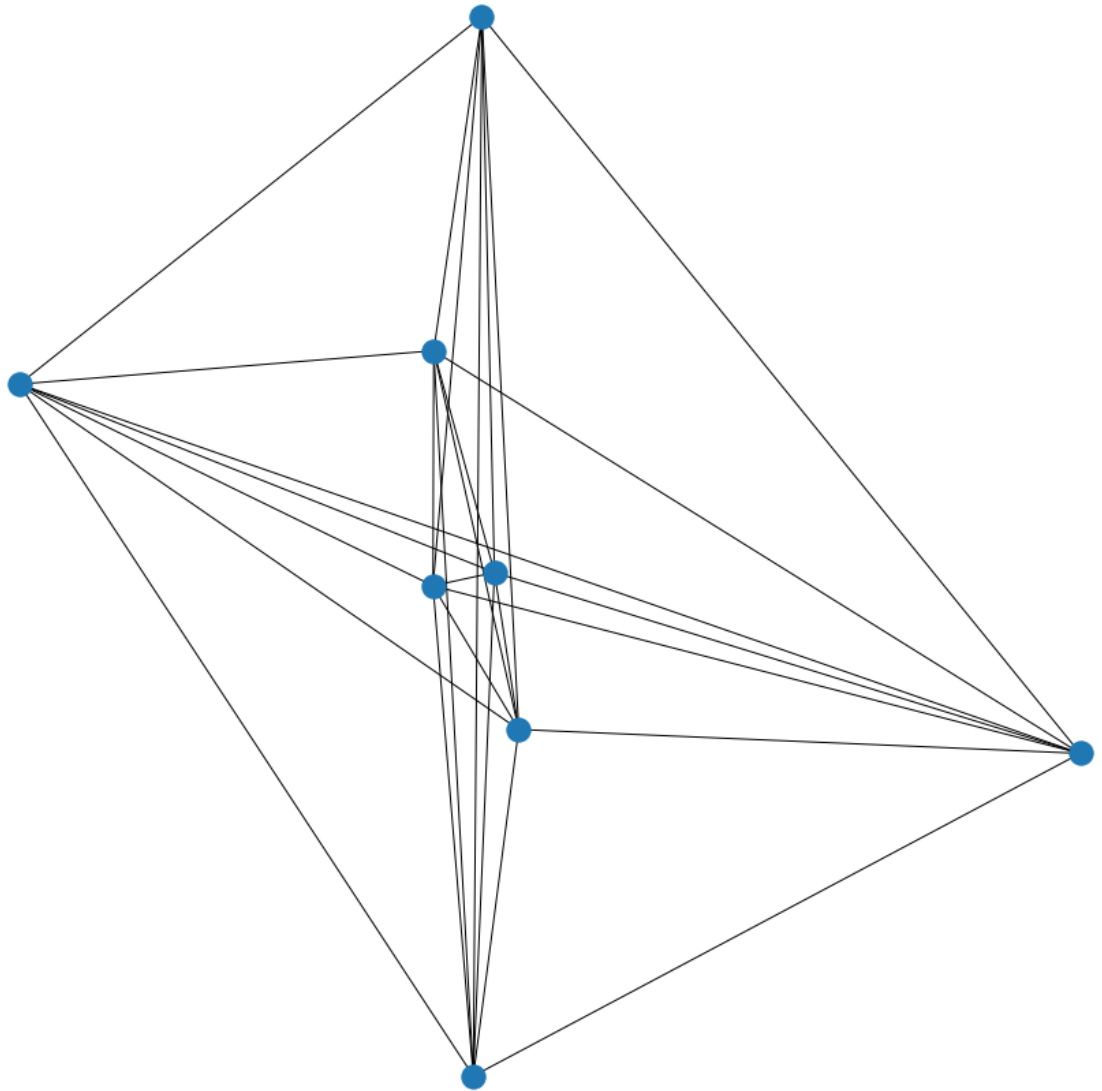
```
rolls/buns --> whole milk with interest 120.956000
other vegetables --> whole milk with interest 120.956000
canned beer --> whole milk with interest 120.956000
bottled water --> whole milk with interest 120.956000
soda --> whole milk with interest 120.956000
newspapers --> whole milk with interest 120.956000
bottled beer --> whole milk with interest 120.956000
rolls/buns --> other vegetables with interest 61.977455
rolls/buns --> canned beer with interest 259.905455
rolls/buns --> bottled water with interest 66.975636
rolls/buns --> soda with interest 155.943273
rolls/buns --> newspapers with interest 53.980364
rolls/buns --> bottled beer with interest 119.956364
other vegetables --> canned beer with interest 259.905455
other vegetables --> bottled water with interest 66.975636
other vegetables --> soda with interest 155.943273
other vegetables --> newspapers with interest 53.980364
bottled beer --> other vegetables with interest 61.977455
bottled water --> canned beer with interest 259.905455
canned beer --> soda with interest 155.943273
canned beer --> newspapers with interest 53.980364
bottled beer --> canned beer with interest 259.905455
bottled water --> soda with interest 155.943273
bottled water --> newspapers with interest 53.980364
bottled beer --> bottled water with interest 66.975636
soda --> newspapers with interest 53.980364
bottled beer --> soda with interest 155.943273
bottled beer --> newspapers with interest 53.980364
```

```
In [131]: # create DataFrame using data
# dfs100a=pd.DataFrame(L2N100.items(), columns=['basket', 'count'])
dfs50pcy=pd.DataFrame(L2_PCY_N50, columns=['source', 'target'])
dfs50pcy.head(10)
```

Out[131]:

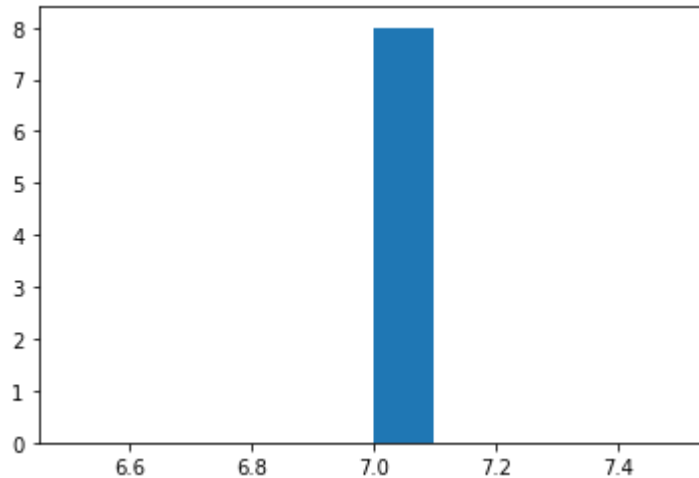
	source	target
0	rolls/buns	whole milk
1	other vegetables	whole milk
2	canned beer	whole milk
3	bottled water	whole milk
4	soda	whole milk
5	newspapers	whole milk
6	bottled beer	whole milk
7	rolls/buns	other vegetables
8	rolls/buns	canned beer
9	rolls/buns	bottled water

```
In [132]: plt.figure(figsize=(12, 12))  
G_pcy_n50=nx.from_pandas_edgelist(dfs50pcy,source='source',target='target')  
nx.draw_spectral(G_pcy_n50)
```



```
In [133]: plt.hist([v for k,v in nx.degree(G_pcy_n50)])
```

```
Out[133]: (array([0., 0., 0., 0., 0., 8., 0., 0., 0., 0.]),
  array([6.5, 6.6, 6.7, 6.8, 6.9, 7. , 7.1, 7.2, 7.3, 7.4, 7.5])),
  <a list of 10 Patch objects>)
```



N = 100

```
In [134]: start_time_pcy100 = time.time()
# hash table
max_hash1 = 10*1000000
H1 = np.zeros((max_hash1,), dtype=np.int)
for key in readdata(k=2, report=True):
    hash_cell_1 = hash(key) % max_hash1
    H1[hash_cell_1] += 1
```

```
In [135]: start_time_pcy100 = time.time()
# compact hash table
H_good_1 = set(np.where(H1 >= N100)[0])

del H1
```

```
In [136]: # find frequent 2-tuples
C2 = {}
for key in readdata(k=2):
    # hash-based filtering stage from PCY
    hash_cell_1 = hash(key) % max_hash1
    if hash_cell_1 not in H_good_1:
        continue

    # filter out non-frequent tuples
    if key not in C2N100_items:
        continue

    # record frequent tuples
    if key not in C2:
        C2[key] = 1
    else:
        C2[key] += 1

print("{} items".format(len(C2)))
```

15 items

```
In [137]: # filter stage
L2_PCY_N100 = {}
for key, count in C2.items():
    if count >= N100:
        L2_PCY_N100[key] = count
print('{} items with >{} occurrences'.format(len(L2_PCY_N100), N100))
end_time_pcy100=time.time()
time_pcy100=start_time_pcy100-end_time_pcy100
```

15 items with >100 occurrences

Generate rules A -> B

```
In [138]: L2_PCY_N100 = [ elem for elem in list(L2_PCY_N100) if len(elem)>1] # clean our
list a bit.

for i in range(len(L2_PCY_N100)):

    A, B = list(L2_PCY_N100[i])
    support_AB = C2[frozenset([A, B])]
    support_A = C1N100[frozenset([A])]
    conf_A_leads_to_B = support_AB / support_A

    support_B = C1N100[frozenset([B])]
    prob_B = support_B / 2750.0

    interest_A_leads_to_B = conf_A_leads_to_B - prob_B

    if interest_A_leads_to_B > 0.7:
        print("{} --> {} with interest {:.3f}".format(A, B, interest_A_leads_to
_B))
```

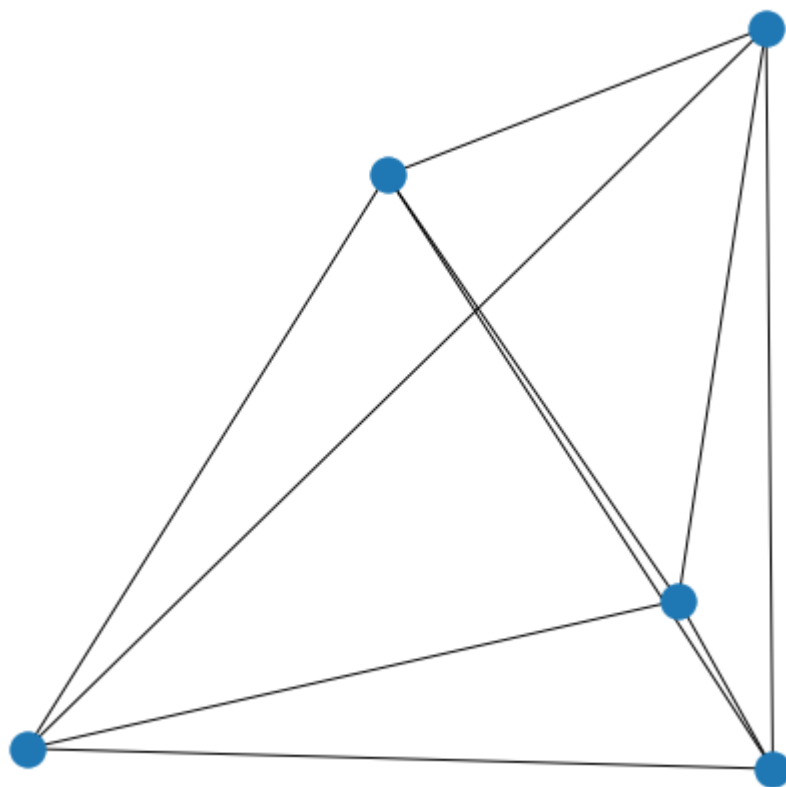
```
rolls/buns --> whole milk with interest 120.956000
canned beer --> whole milk with interest 120.956000
soda --> whole milk with interest 120.956000
bottled beer --> whole milk with interest 120.956000
rolls/buns --> canned beer with interest 259.905455
rolls/buns --> soda with interest 155.943273
rolls/buns --> bottled beer with interest 119.956364
canned beer --> soda with interest 155.943273
bottled beer --> canned beer with interest 259.905455
bottled beer --> soda with interest 155.943273
```

```
In [139]: # create DataFrame using data
# dfs100a=pd.DataFrame(L2N100.items(), columns=['basket', 'count'])
dfs100pcy=pd.DataFrame(L2_PCY_N100, columns=['source', 'target'])
dfs100pcy.head(10)
```

Out[139]:

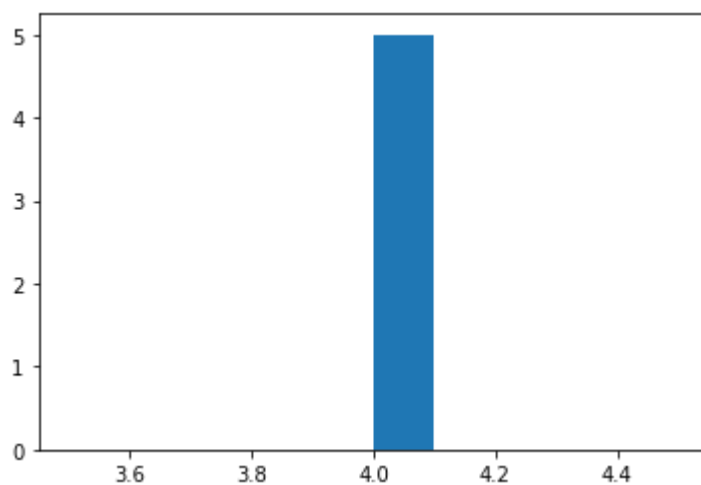
	source	target
0	rolls/buns	whole milk
1	canned beer	whole milk
2	soda	whole milk
3	bottled beer	whole milk
4	rolls/buns	canned beer
5	rolls/buns	soda
6	rolls/buns	bottled beer
7	canned beer	soda
8	bottled beer	canned beer
9	bottled beer	soda


```
In [143]: plt.figure(figsize=(6, 6))  
G_pcy_n100=nx.from_pandas_edgelist(dfs100pcy,source='source',target='target')  
nx.draw_random(G_pcy_n100)
```



```
In [141]: plt.hist([v for k,v in nx.degree(G_pcy_n100)])
```

```
Out[141]: (array([0., 0., 0., 0., 0., 5., 0., 0., 0., 0.]),  
array([3.5, 3.6, 3.7, 3.8, 3.9, 4. , 4.1, 4.2, 4.3, 4.4, 4.5]),  
<a list of 10 Patch objects>)
```



```
In [144]: print('total time consumed')
print()
print(f'N = 10 -> naive : {time_naive10*-1:{15}} sec')
print(f'N = 10 -> apriori: {time_apriori10*-1:{15}} sec')
print(f'N = 10 -> pcy : {time_pcy10*-1:{15}} sec')
print()
print(f'N = 50 -> naive : {time_naive50*-1:{15}} sec')
print(f'N = 50 -> apriori: {time_apriori50*-1:{15}} sec')
print(f'N = 50 -> pcy : {time_pcy50*-1:{15}} sec')
print()
print(f'N = 100 -> naive : {time_naive100*-1:{15}} sec')
print(f'N = 100 -> apriori: {time_apriori100*-1:{15}} sec')
print(f'N = 100 -> pcy : {time_pcy100*-1:{15}} sec')
print()
```

total time consumed

N = 10 -> naive : 12.02414059638977 sec
N = 10 -> apriori: 56.12089443206787 sec
N = 10 -> pcy : 125.07769799232483 sec

N = 50 -> naive : 128.03057718276978 sec
N = 50 -> apriori: 30.031583786010742 sec
N = 50 -> pcy : 134.53179121017456 sec

N = 100 -> naive : 32.09468150138855 sec
N = 100 -> apriori: 30.110475778579712 sec
N = 100 -> pcy : 47.60384178161621 sec

In []: