In [1]:

```
import pandas as pd

file_path = 'Grocery_Items_30.csv'
data = pd.read_csv(file_path, header=0)

print("Original dataset:")
print(data.head())

data = data.apply(lambda row: row.dropna().tolist(), axis=1)
print("\nDataset after removing null values within each row:")
print(data)

flattened_items = [item for sublist in data for item in sublist]
items_series = pd.Series(flattened_items)
items_series = items_series.str.strip()

unique_items = items_series.nunique()
print(f"\nNumber of unique items: {unique_items}")

total_records = len(data)
print(f"Number of transactions: {total_records}")

most_popular_item = items_series.value_counts().idxmax()
most_popular_count = items_series.value_counts().max()
print(f"Most popular item: {most_popular_item}, Transactions: {most_popular_count}"
Original dataset:
                   0            1              2             3    4    5    6  \
0  other vegetables        candy            NaN           NaN  NaN  NaN  NaN   
1         pip fruit       yogurt            NaN           NaN  NaN  NaN  NaN   
2              meat         soda  cream cheese            NaN  NaN  NaN  NaN   
3              pork      dessert            NaN           NaN  NaN  NaN  NaN   
4  other vegetables  hard cheese         liquor  brown bread  NaN  NaN  NaN   

     7    8   9  10  
0  NaN  NaN NaN NaN  
1  NaN  NaN NaN NaN  
2  NaN  NaN NaN NaN  
3  NaN  NaN NaN NaN  
4  NaN  NaN NaN NaN  

Dataset after removing null values within each row:
0                                [other vegetables, candy]
1                                      [pip fruit, yogurt]
2                              [meat, soda, cream cheese ]
3                                          [pork, dessert]
4        [other vegetables, hard cheese, liquor, brown ...
                               ...                        
7995                  [whole milk, pork, rolls/buns, yogurt]
7996                    [canned beer, whole milk, pork, oil]
7997                                     [whole milk, pasta]
7998                          [shopping bags, salty snack]
7999                                         [candy, coffee]
Length: 8000, dtype: object

Number of unique items: 166
Number of transactions: 8000
Most popular item: whole milk, Transactions: 1336
```

In [3]:

```python
from mlxtend.preprocessing import TransactionEncoder
from mlxtend.frequent_patterns import fpgrowth, association_rules


file_path = 'Grocery_Items_30.csv'
data1 = pd.read_csv(file_path)
transaction_list= data1.stack().groupby(level=0).apply(lambda x: x.tolist())

te = TransactionEncoder()
te_ary = te.fit(transaction_list).transform(transaction_list)
df = pd.DataFrame(te_ary, columns=te.columns_)

frequent_itemsets = fpgrowth(df, min_support=0.01, use_colnames=True)
frequent_itemsets
```

Out[3]:

	support	itemsets
0	0.124000	(other vegetables)
1	0.012500	(candy)
2	0.089250	(yogurt)
3	0.048375	(pip fruit)
4	0.093125	(soda)
...	...	...
64	0.019625	(salty snack)
65	0.014375	(other vegetables, whole milk)
66	0.012375	(whole milk, yogurt)
67	0.013500	(rolls/buns, whole milk)
68	0.010375	(rolls/buns, other vegetables)

69 rows × 2 columns

In [4]:

```
association_rules(frequent_itemsets, metric="confidence", min_threshold=0.08, num_i
```

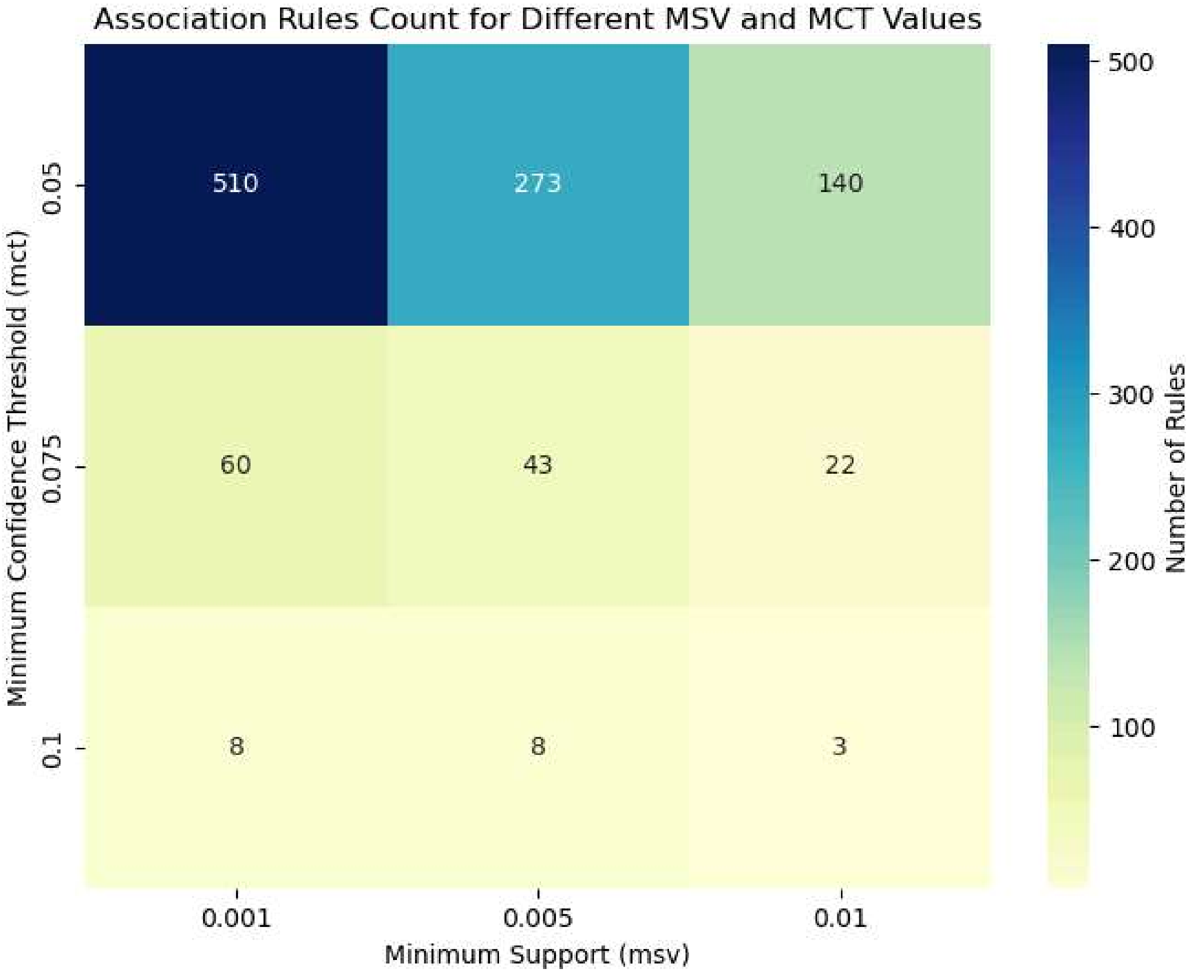
Out[4]:

	antecedents	consequents	antecedent support	consequent support	support	confidence	lift	rep
0	(other vegetables)	(whole milk)	0.12400	0.15750	0.014375	0.115927	0.736047	
1	(whole milk)	(other vegetables)	0.15750	0.12400	0.014375	0.091270	0.736047	
2	(yogurt)	(whole milk)	0.08925	0.15750	0.012375	0.138655	0.880352	
3	(rolls/buns)	(whole milk)	0.11225	0.15750	0.013500	0.120267	0.763602	
4	(whole milk)	(rolls/buns)	0.15750	0.11225	0.013500	0.085714	0.763602	
5	(rolls/buns)	(other vegetables)	0.11225	0.12400	0.010375	0.092428	0.745384	
6	(other vegetables)	(rolls/buns)	0.12400	0.11225	0.010375	0.083669	0.745384	

In [5]:

```
import seaborn as sns
import matplotlib.pyplot as plt
from mlxtend.frequent_patterns import apriori, association_rules

msv_values = [0.001, 0.005, 0.01]
mct_values = [0.05, 0.075, 0.1]
```

```
rule_counts = []

for msv in msv_values:
    row = []
    for mct in mct_values:
        frequent_itemsets = apriori(df, min_support=msv, use_colnames=True)

        rules = association_rules(frequent_itemsets, metric="confidence", min_thres

        row.append(len(rules))

    rule_counts.append(row)

heatmap_data = pd.DataFrame(rule_counts, index=mct_values, columns=msv_values)

plt.figure(figsize=(8, 6))
sns.heatmap(heatmap_data, annot=True, cmap='YlGnBu', fmt='d', cbar_kws={'label': 'N
plt.title('Association Rules Count for Different MSV and MCT Values')
plt.xlabel('Minimum Support (msv)')
plt.ylabel('Minimum Confidence Threshold (mct)')
plt.show()
```


Association Rules Count for Different MSV and MCT Values
Minimum Confidence Threshold (mct)
Minimum Support (msv)
Number of Rules