In [1]:

```
import pandas as pd
```

In [2]:

```
df = pd.read_csv('customer_acq.csv')
```

In [3]:

```
df.head()
```

Out[3]:

	food_category	food_department	food_family	store_sales(in millions)	store_cost(in millions)	unit_sales(in millions)	I
0	Breakfast Foods	Frozen Foods	Food	7.36	2.7232	4	
1	Breakfast Foods	Frozen Foods	Food	5.52	2.5944	3	
2	Breakfast Foods	Frozen Foods	Food	3.68	1.3616	2	
3	Breakfast Foods	Frozen Foods	Food	3.68	1.1776	2	
4	Breakfast Foods	Frozen Foods	Food	4.08	1.4280	3	

5 rows × 40 columns

In [4]:

```
df.tail()
```

Out[4]:

	food_category	food_department	food_family	store_sales(in millions)	store_cost(in millions)	unit_sales(million
60423	Specialty	Carousel	Non-Consumable	2.76	1.3248	
60424	Specialty	Carousel	Non-Consumable	1.60	0.4960	
60425	Specialty	Carousel	Non-Consumable	5.52	2.5392	
60426	Specialty	Carousel	Non-Consumable	8.28	2.5668	
60427	Specialty	Carousel	Non-Consumable	9.20	4.2320	

5 rows × 40 columns

In [5]:

```
df.shape
```

Out[5]:

```
(60428, 40)
```

In [6]:

```
df.columns
```

Out[6]:

```
Index(['food_category', 'food_department', 'food_family',
       'store_sales(in millions)', 'store_cost(in millions)',
       'unit_sales(in millions)', 'promotion_name', 'sales_country',
       'marital_status', 'gender', 'total_children', 'education',
       'member_card', 'occupation', 'houseowner', 'avg_cars_at home(appro
x)',
       'avg. yearly_income', 'num_children_at_home',
       'avg_cars_at home(approx).1', 'brand_name', 'SRP', 'gross_weight',
       'net_weight', 'recyclable_package', 'low_fat', 'units_per_case',
       'store_type', 'store_city', 'store_state', 'store_sqft', 'grocery_s
qft',
       'frozen_sqft', 'meat_sqft', 'coffee_bar', 'video_store', 'salad_ba
r',
       'prepared_food', 'florist', 'media_type', 'cost'],
      dtype='object')
```

In [8]:

```
df.duplicated().sum()
```

Out[8]:

```
0
```

In [9]:

```
df.isnull().sum()
```

Out[9]:

```
food_category                 0
food_department               0
food_family                   0
store_sales(in millions)      0
store_cost(in millions)       0
unit_sales(in millions)       0
promotion_name                0
sales_country                 0
marital_status                0
gender                        0
total_children                0
education                     0
member_card                   0
occupation                    0
houseowner                    0
avg_cars_at home(approx)      0
avg. yearly_income            0
num_children_at_home          0
avg_cars_at home(approx).1    0
brand_name                    0
SRP                           0
gross_weight                  0
net_weight                    0
recyclable_package            0
low_fat                       0
units_per_case                0
store_type                    0
store_city                    0
store_state                   0
store_sqft                    0
grocery_sqft                  0
frozen_sqft                   0
meat_sqft                     0
coffee_bar                    0
video_store                   0
salad_bar                     0
prepared_food                 0
florist                       0
media_type                    0
cost                          0
dtype: int64
```

In [10]:

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 60428 entries, 0 to 60427
Data columns (total 40 columns):
 #   Column                      Non-Null Count  Dtype  
---  ------                      --------------  -----  
 0   food_category               60428 non-null  object 
 1   food_department             60428 non-null  object 
 2   food_family                 60428 non-null  object 
 3   store_sales(in millions)    60428 non-null  float64
 4   store_cost(in millions)     60428 non-null  float64
 5   unit_sales(in millions)     60428 non-null  int64  
 6   promotion_name              60428 non-null  object 
 7   sales_country               60428 non-null  object 
 8   marital_status              60428 non-null  object 
 9   gender                      60428 non-null  object 
 10  total_children              60428 non-null  int64  
 11  education                   60428 non-null  object 
 12  member_card                 60428 non-null  object 
 13  occupation                  60428 non-null  object 
 14  houseowner                  60428 non-null  object 
 15  avg_cars_at home(approx)    60428 non-null  int64  
 16  avg. yearly_income          60428 non-null  object 
 17  num_children_at_home        60428 non-null  int64  
 18  avg_cars_at home(approx).1  60428 non-null  int64  
 19  brand_name                  60428 non-null  object 
 20  SRP                         60428 non-null  float64
 21  gross_weight                60428 non-null  float64
 22  net_weight                  60428 non-null  float64
 23  recyclable_package          60428 non-null  int64  
 24  low_fat                     60428 non-null  int64  
 25  units_per_case              60428 non-null  int64  
 26  store_type                  60428 non-null  object 
 27  store_city                  60428 non-null  object 
 28  store_state                 60428 non-null  object 
 29  store_sqft                  60428 non-null  int64  
 30  grocery_sqft                60428 non-null  int64  
 31  frozen_sqft                 60428 non-null  int64  
 32  meat_sqft                   60428 non-null  int64  
 33  coffee_bar                  60428 non-null  int64  
 34  video_store                 60428 non-null  int64  
 35  salad_bar                   60428 non-null  int64  
 36  prepared_food               60428 non-null  int64  
 37  florist                     60428 non-null  int64  
 38  media_type                  60428 non-null  object 
 39  cost                        60428 non-null  float64
dtypes: float64(6), int64(17), object(17)
memory usage: 18.4+ MB
```

In [11]:

```
df.describe()
```

Out[11]:

	store_sales(in millions)	store_cost(in millions)	unit_sales(in millions)	total_children	avg_cars_at home(approx)	num_childre
count	60428.000000	60428.000000	60428.000000	60428.000000	60428.000000	60
mean	6.541031	2.619460	3.093169	2.533875	2.200271	
std	3.463047	1.453009	0.827677	1.490165	1.109644	
min	0.510000	0.163200	1.000000	0.000000	0.000000	
25%	3.810000	1.500000	3.000000	1.000000	1.000000	
50%	5.940000	2.385600	3.000000	3.000000	2.000000	
75%	8.670000	3.484025	4.000000	4.000000	3.000000	
max	22.920000	9.726500	6.000000	5.000000	4.000000	

8 rows × 23 columns

In [12]:

```
df.nunique()
```

Out[12]:

```
food_category                 45
food_department               22
food_family                    3
store_sales(in millions)    1033
store_cost(in millions)     9919
unit_sales(in millions)        6
promotion_name                49
sales_country                  3
marital_status                 2
gender                         2
total_children                 6
education                      5
member_card                    4
occupation                     5
houseowner                     2
avg_cars_at home(approx)       5
avg. yearly_income             8
num_children_at_home           6
avg_cars_at home(approx).1     5
brand_name                   111
SRP                          315
gross_weight                 376
net_weight                   332
recyclable_package             2
low_fat                        2
units_per_case                36
store_type                     5
store_city                    19
store_state                   10
store_sqft                    20
grocery_sqft                  20
frozen_sqft                   20
meat_sqft                     20
coffee_bar                     2
video_store                    2
salad_bar                      2
prepared_food                  2
florist                        2
media_type                    13
cost                         328
dtype: int64
```

In [13]:

```
obj_cols = df.select_dtypes(include=['object']).columns
print('Object columns:', obj_cols)
```

```
Object columns: Index(['food_category', 'food_department', 'food_family',
'promotion_name',
       'sales_country', 'marital_status', 'gender', 'education', 'member_c
ard',
       'occupation', 'houseowner', 'avg. yearly_income', 'brand_name',
       'store_type', 'store_city', 'store_state', 'media_type'],
      dtype='object')
```

In [15]:

```
import numpy as np
```

In [16]:

```
num_cols = df.select_dtypes(include=np.number).columns
print('Numerical columns:', num_cols)
```

```
Numerical columns: Index(['store_sales(in millions)', 'store_cost(in milli
ons)',
       'unit_sales(in millions)', 'total_children', 'avg_cars_at home(appr
ox)',
       'num_children_at_home', 'avg_cars_at home(approx).1', 'SRP',
       'gross_weight', 'net_weight', 'recyclable_package', 'low_fat',
       'units_per_case', 'store_sqft', 'grocery_sqft', 'frozen_sqft',
       'meat_sqft', 'coffee_bar', 'video_store', 'salad_bar', 'prepared_fo
od',
       'florist', 'cost'],
      dtype='object')
```

In [17]:

```
import matplotlib.pyplot as plt
import seaborn as sns
```

In [18]:

```
import warnings
warnings.filterwarnings('ignore')
```

In [21]:

```
for i in obj_cols:
    print(i)
    print(df[i].unique())
    print('\n')
```

```
food_category
['Breakfast Foods' 'Bread' 'Canned Shrimp' 'Baking Goods' 'Vegetables'
 'Frozen Desserts' 'Candy' 'Snack Foods' 'Dairy' 'Starchy Foods'
 'Cleaning Supplies' 'Decongestants' 'Meat' 'Hot Beverages'
 'Jams and Jellies' 'Carbonated Beverages' 'Seafood' 'Specialty'
 'Kitchen Products' 'Electrical' 'Beer and Wine' 'Candles' 'Fruit'
 'Pure Juice Beverages' 'Canned Soup' 'Paper Products' 'Canned Tuna'
 'Eggs' 'Hardware' 'Canned Sardines' 'Canned Clams' 'Pain Relievers'
 'Side Dishes' 'Bathroom Products' 'Magazines' 'Frozen Entrees' 'Pizza'
 'Cold Remedies' 'Canned Anchovies' 'Drinks' 'Hygiene' 'Plastic Product
s'
 'Canned Oysters' 'Packaged Vegetables' 'Miscellaneous']


food_department
['Frozen Foods' 'Baked Goods' 'Canned Foods' 'Baking Goods' 'Produce'
 'Snacks' 'Snack Foods' 'Dairy' 'Starchy Foods' 'Household'
 'Health and Hygiene' 'Meat' 'Beverages' 'Seafood' 'Deli'
 'Alcoholic Beverages' 'Canned Products' 'Eggs' 'Periodicals'
 'Breakfast Foods' 'Checkout' 'Carousel']
```

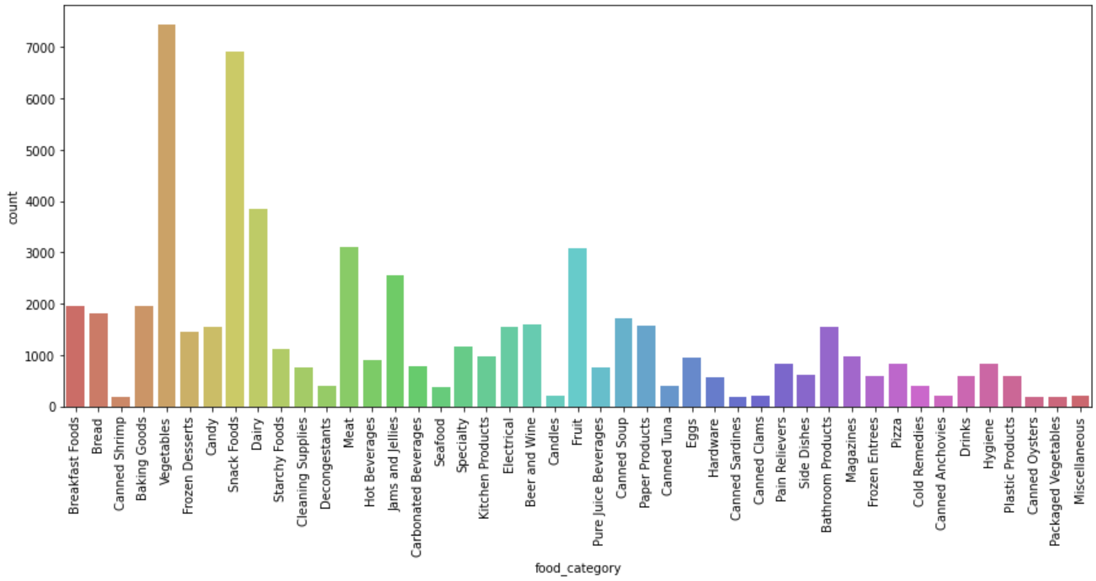
In [22]:

```
for i in obj_cols:
    print(i)
    print(df[i].value_counts())
    print('\n')
```

```
food_category
Vegetables               7440
Snack Foods              6919
Dairy                    3835
Meat                     3107
Fruit                    3080
Jams and Jellies         2550
Baking Goods             1947
Breakfast Foods          1946
Bread                    1797
Canned Soup              1722
Beer and Wine            1590
Paper Products           1568
Bathroom Products        1552
Electrical               1544
Candy                    1538
Frozen Desserts          1446
Specialty                1174
Starchy Foods            1103
```

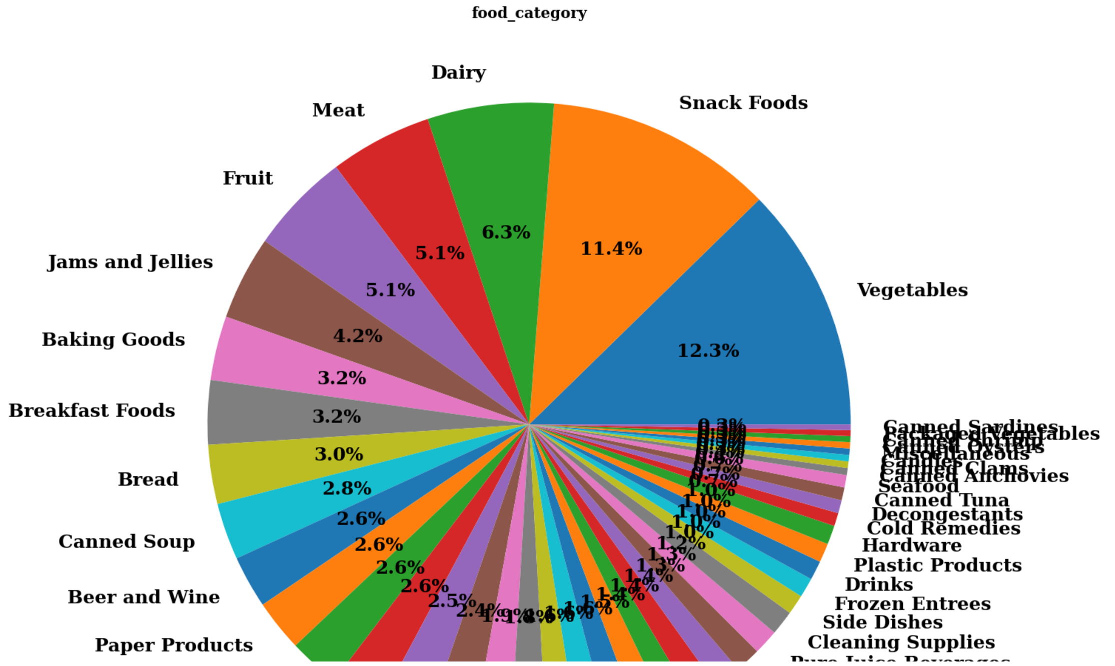
In [24]:

```
for i in obj_cols:
    plt.figure(figsize=(15,6))
    sns.countplot(df[i], data = df, palette = 'hls')
    plt.xticks(rotation = 90)
    plt.show()
```



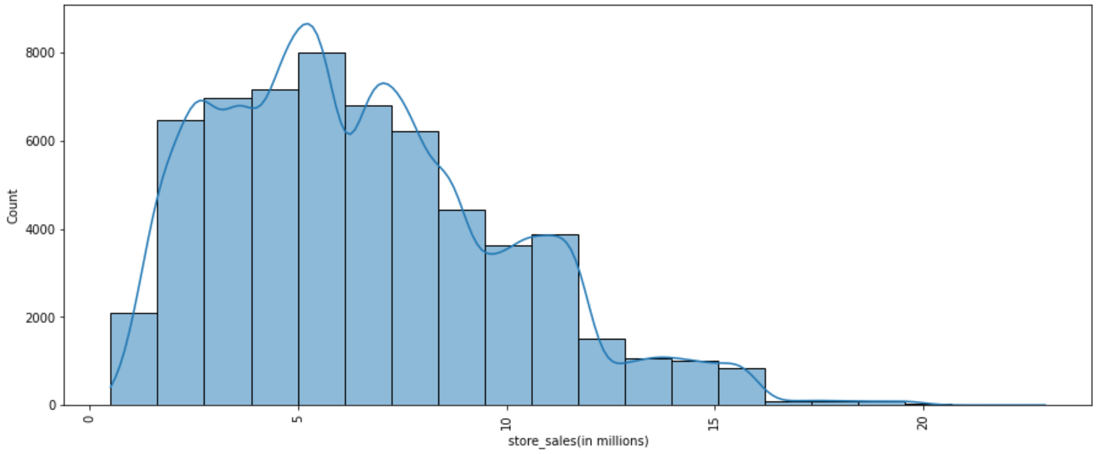
In [25]:

```
for i in obj_cols:
    plt.figure(figsize=(30,20))
    plt.pie(df[i].value_counts(), labels=df[i].value_counts().index, autopct='%1.1f%%',
    hfont = {'fontname':'serif', 'weight': 'bold'}
    plt.title(i, size=20, **hfont)
    plt.show()
```



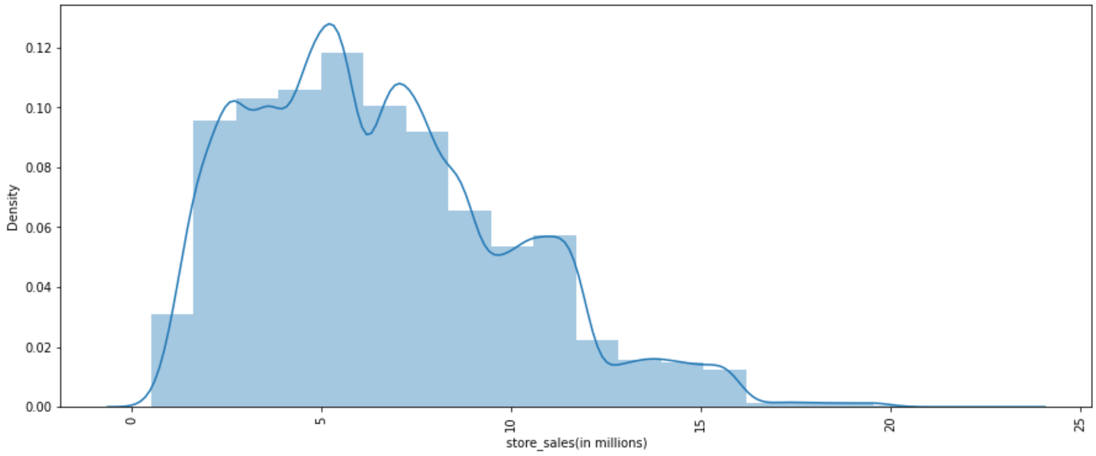
In [26]:

```
for i in num_cols:
    plt.figure(figsize=(15,6))
    sns.histplot(df[i], kde = True, bins = 20, palette = 'hls')
    plt.xticks(rotation = 90)
    plt.show()
```



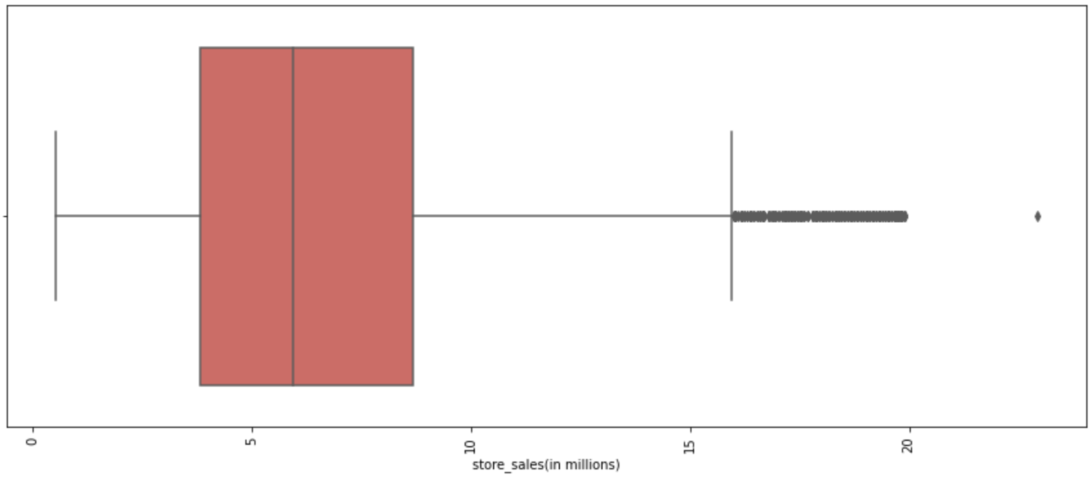
In [27]:

```
for i in num_cols:
    plt.figure(figsize=(15,6))
    sns.distplot(df[i], kde = True, bins = 20)
    plt.xticks(rotation = 90)
    plt.show()
```



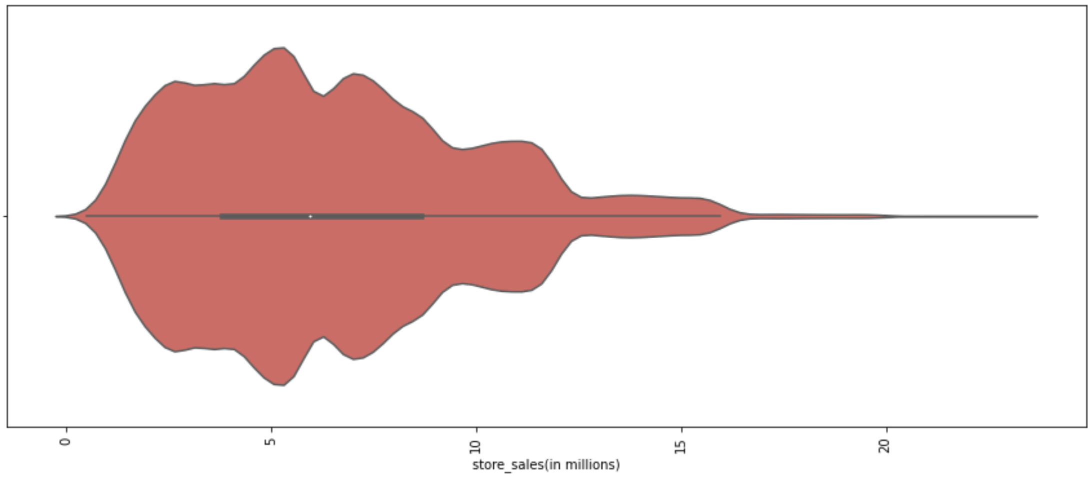
In [28]:

```
for i in num_cols:
    plt.figure(figsize=(15,6))
    sns.boxplot(df[i], data = df, palette = 'hls')
    plt.xticks(rotation = 90)
    plt.show()
```



In [29]:

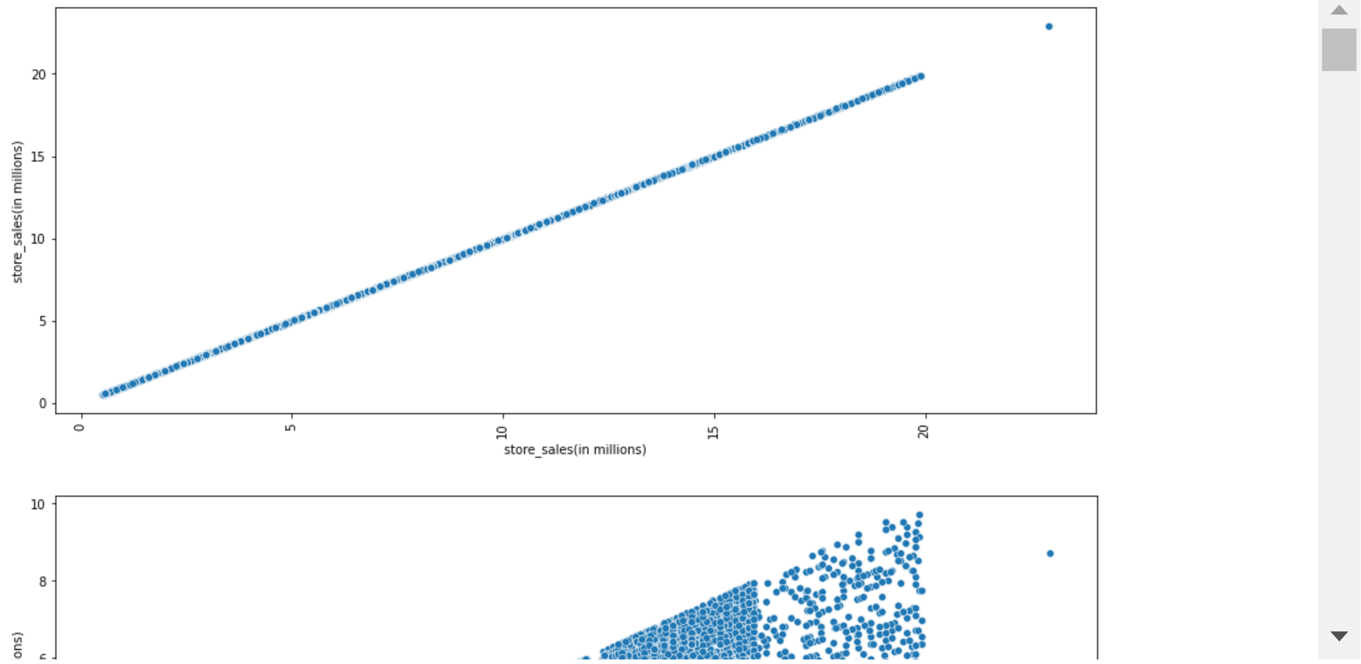
```
for i in num_cols:
    plt.figure(figsize=(15,6))
    sns.violinplot(df[i], data = df, palette = 'hls')
    plt.xticks(rotation = 90)
    plt.show()
```



for i in num_cols: for j in num_cols: plt.figure(figsize=(15,6)) sns.lineplot(x = df[i], y = df[j], data = df, palette = 'hls') plt.xticks(rotation = 90) plt.show()

In [31]:

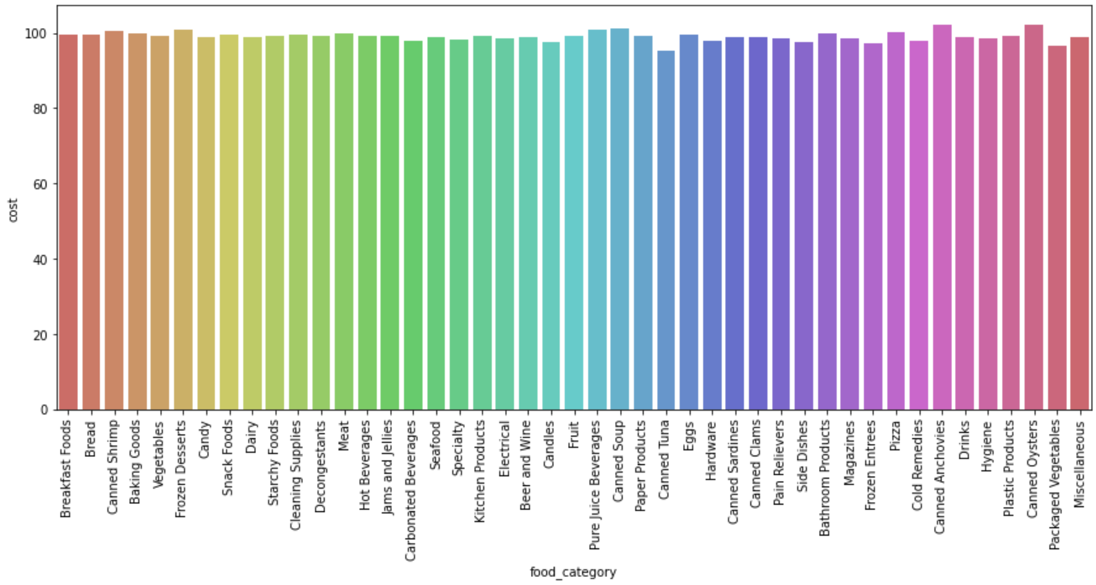
```
for i in num_cols:
    for j in num_cols:
        plt.figure(figsize=(15,6))
        sns.scatterplot(x = df[i], y = df[j], data = df, palette = 'hls')
        plt.xticks(rotation = 90)
        plt.show()
```



for i in obj_cols: for j in num_cols: plt.figure(figsize=(15,6)) sns.barplot(x = df[i], y = df[j], data = df, palette = 'hls') plt.xticks(rotation = 90) plt.show()

In [34]:

```
for i in obj_cols:
    plt.figure(figsize=(15,6))
    sns.barplot(x = df[i], y = df['cost'], data = df, ci = None, palette = 'hls')
    plt.xticks(rotation = 90)
    plt.show()
```



In [35]:

```
df_corr = df[num_cols].corr()
```

In [36]:

```
df_corr
```

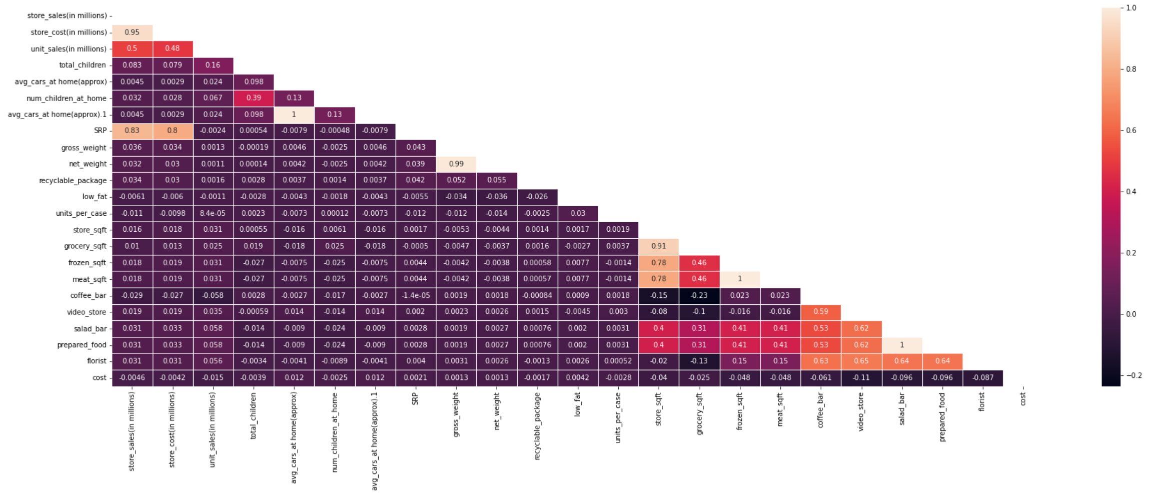
Out[36]:

	store_sales(in millions)	store_cost(in millions)	unit_sales(in millions)	total_children	avg_cars_ home(appro
store_sales(in millions)	1.000000	0.954685	0.503482	0.083313	0.0044
store_cost(in millions)	0.954685	1.000000	0.480087	0.079058	0.0028
unit_sales(in millions)	0.503482	0.480087	1.000000	0.163188	0.0236
total_children	0.083313	0.079058	0.163188	1.000000	0.0981
avg_cars_at home(approx)	0.004498	0.002865	0.023667	0.098110	1.0000
num_children_at_home	0.032437	0.027576	0.066725	0.394709	0.1308
avg_cars_at home(approx).1	0.004498	0.002865	0.023667	0.098110	1.0000
SRP	0.833478	0.795880	-0.002358	0.000545	-0.0079
gross_weight	0.036179	0.034237	0.001255	-0.000186	0.0045
net_weight	0.032014	0.030257	0.001137	0.000142	0.0041
recyclable_package	0.034293	0.030213	0.001599	0.002794	0.0037
low_fat	-0.006134	-0.005976	-0.001129	-0.002824	-0.0043
units_per_case	-0.010630	-0.009792	0.000084	0.002307	-0.0072
store_sqft	0.015543	0.017877	0.031464	0.000555	-0.0158
grocery_sqft	0.010442	0.012884	0.024857	0.018526	-0.0176
frozen_sqft	0.017886	0.019245	0.030563	-0.026926	-0.0074
meat_sqft	0.017883	0.019242	0.030557	-0.026923	-0.0074
coffee_bar	-0.029368	-0.027126	-0.057633	0.002836	-0.0027
video_store	0.019179	0.019252	0.034996	-0.000591	0.0140
salad_bar	0.031459	0.033206	0.057878	-0.013764	-0.0089
prepared_food	0.031459	0.033206	0.057878	-0.013764	-0.0089
florist	0.030603	0.030929	0.055885	-0.003361	-0.0041
cost	-0.004621	-0.004162	-0.015015	-0.003900	0.0116

23 rows × 23 columns

In [38]:

```
plt.figure(figsize=(30, 10))
matrix = np.triu(df_corr)
sns.heatmap(df_corr, annot=True, linewidth=.8, mask=matrix, cmap="rocket");
plt.show()
```


store_sales(in millions)
store_cost(in millions) 0.95
unit_sales(in millions) 0.5 0.48
total_children 0.083 0.079 0.16
avg_cars_at home(approx) 0.0045 0.0029 0.024 0.098
num_children_at_home 0.032 0.028 0.067 0.39 0.13
avg_cars_at home(approx).1 0.0045 0.0029 0.024 0.098 1 0.13
SRP 0.83 0.8 -0.0024 0.00054 -0.0079 -0.00048 -0.0079
gross_weight 0.036 0.034 0.0013 -0.00019 0.0046 -0.0025 0.0046 0.043
net_weight 0.032 0.03 0.0011 0.00014 0.0042 -0.0025 0.0042 0.039 0.99
recyclable_package 0.034 0.03 0.0016 0.0028 0.0037 0.0014 0.0037 0.042 0.052 0.055
low_fat -0.0061 -0.006 -0.0011 -0.0028 -0.0043 -0.0018 -0.0043 -0.0055 -0.034 -0.036 -0.026
units_per_case -0.011 -0.0098 8.4e-05 0.0023 -0.0073 0.00012 -0.0073 -0.012 -0.012 -0.014 -0.0025 0.03
store_sqft 0.016 0.018 0.031 0.00055 -0.016 0.0061 -0.016 0.0017 -0.0053 -0.0044 0.0014 0.0017 0.0019
grocery_sqft 0.01 0.013 0.025 0.019 -0.018 0.025 -0.018 -0.0005 -0.0047 -0.0037 0.0016 -0.0027 0.0037 0.91
frozen_sqft 0.018 0.019 0.031 -0.027 -0.0075 -0.025 -0.0075 0.0044 -0.0042 -0.0038 0.00058 0.0077 -0.0014 0.78 0.46
meat_sqft 0.018 0.019 0.031 -0.027 -0.0075 -0.025 -0.0075 0.0044 -0.0042 -0.0038 0.00057 0.0077 -0.0014 0.78 0.46 1
coffee_bar -0.029 -0.027 -0.058 0.0028 -0.0027 -0.017 -0.0027 -1.4e-05 0.0019 0.0018 -0.00084 0.0009 0.0018 -0.15 -0.23 0.023 0.023
video_store 0.019 0.019 0.035 -0.00059 0.014 -0.014 0.014 0.002 0.0023 0.0026 0.0015 -0.0045 0.003 -0.08 -0.1 -0.016 -0.016 0.59
salad_bar 0.031 0.033 0.058 -0.014 -0.009 -0.024 -0.009 0.0028 0.0019 0.0027 0.00076 0.002 0.0031 0.4 0.31 0.41 0.41 0.53 0.62
prepared_food 0.031 0.033 0.058 -0.014 -0.009 -0.024 -0.009 0.0028 0.0019 0.0027 0.00076 0.002 0.0031 0.4 0.31 0.41 0.41 0.53 0.62 1
florist 0.031 0.031 0.056 -0.0034 -0.0041 -0.0089 -0.0041 0.004 0.0031 0.0026 -0.0013 0.0026 0.00052 -0.02 -0.13 0.15 0.15 0.63 0.65 0.64 0.64
cost -0.0046 -0.0042 -0.015 -0.0039 0.012 -0.0025 0.012 0.0021 0.0013 0.0013 -0.0017 0.0042 -0.0028 -0.04 -0.025 -0.048 -0.048 -0.061 -0.11 -0.096 -0.096 -0.087
store_sales(in millions)
store_cost(in millions)
unit_sales(in millions)
total_children
avg_cars_at home(approx)
num_children_at_home
avg_cars_at home(approx).1
SRP
gross_weight
net_weight
recyclable_package
low_fat
units_per_case
store_sqft
grocery_sqft
frozen_sqft
meat_sqft
coffee_bar
video_store
salad_bar
prepared_food
florist
cost