```
import json
import requests
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
import geopandas as gpd
import seaborn as sns
import numpy as np
pd.set_option('display.max_columns', None)
```

Obtain and read the building permit data set for all the places in Midwest region in 2015

```
df = pd.read_table("https://www2.census.gov/econ/bps/Place/Midwest
%20Region/mw2015a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
df["Unnamed 41"] = np.nan
df = df.shift(1, axis=1)
df.Survey = df.index
df.index = np.arange(len(df))

dict_names = {}
second  = df.iloc[0].fillna("")
for i in range(len(df.columns)):
    first = df.columns[i]
    if first.startswith("Unnamed"):
        if df.columns[i-1].startswith("Unnamed"):
            first = df.columns[i+1]
        else:
            first = df.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[df.columns[i]]= new
df = df.rename(columns = dict_names).drop([0])

# show the first five records
df.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2015         17     001000         095              0005
2        2015         17     002800         043              0015
3        2015         17     004900         195              0025
4        2015         17     005200         027              0030
```

```
5        2015         17     006100         131              0040

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1          00113         11891    3319.0       999     99999
NaN
2          00243         00250   36942.0       176     16980
NaN
3          00516         00529     891.0       999     99999
NaN
4          00555         44667    1190.0       476     41180
NaN
5          00646         48398    3640.0       209     19340
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  61410                 2             3
12
2          NaN  601012786             2             3
11
3          NaN  61230                 2             3
12
4          NaN  62215                 2             3
12
5          NaN  61231                 2             3
12

        Place Name Place Bldgs 1-unit Units 1-unit Value 2-units Bldgs
\
1         Abingdon           0            0            0             0

2  Addison village           4            4      1225000             0

3   Albany village           1            1       150000             0

4   Albers village           0            0            0             0

5            Aledo           1            1       250000             0


  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
0
3             0             0               0               0
0
4             0             0               0               0
```

```
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                0
2              0              0              0                4
3              0              0              0                1
4              0              0              0                0
5              0              0              0                1

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                0                0                 0
0
2                4          1225000                 0
0
3                1           150000                 0
0
4                0                0                 0
0
5                1           250000                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

Two types of housing units:

- Single-family units: 1-unit rep Units
- Multifamily units: > 1 (need to add those fields up)
  - 2-units rep Units
  - 3-4 units rep Units

– 5+ units rep Units

Obtain and read the building permit data set for all the places in Midwest region in 2016

```
df1 = pd.read_table("https://www2.census.gov/econ/bps/Place/Midwest
%20Region/mw2016a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
df1["Unnamed 41"] = np.nan
df1 = df1.shift(1, axis=1)
df1.Survey = df1.index
df1.index = np.arange(len(df1))

dict_names = {}
second  = df1.iloc[0].fillna("")
for i in range(len(df1.columns)):
    first = df1.columns[i]
    if first.startswith("Unnamed"):
        if df1.columns[i-1].startswith("Unnamed"):
            first = df1.columns[i+1]
        else:
            first = df1.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[df1.columns[i]]= new
df1 = df1.rename(columns = dict_names).drop([0])

# show the first five records
df1.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2016         17     001000         095              0005
2        2016         17     002800         043              0015
3        2016         17     004900         195              0025
4        2016         17     005200         027              0030
5        2016         17     006100         131              0040

  FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code Footnote
Code  \
1           00113         11891   3319.0       999     99999
NaN
2           00243         00250  36942.0       176     16980
NaN
3           00516         00529    891.0       999     99999
NaN
4           00555         44667   1190.0       476     41180
NaN
```

```
5          00646        48398    3640.0      209     19340
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  61410                 2             3
12
2          NaN  601012786             2             3
12
3          NaN  61230                 2             3
12
4          NaN  62215                 2             3
12
5          NaN  61231                 2             3
12

        Place Name Place Bldgs 1-unit Units 1-unit Value 2-units Bldgs
\
1         Abingdon            0             0             0              0

2  Addison village            3             3        950000              0

3   Albany village            0             0             0              0

4   Albers village            1             1         60000              0

5            Aledo            0             0             0              0


  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0                0                0
0
2             0             0                0                0
0
3             0             0                0                0
0
4             0             0                0                0
0
5             0             0                0                0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                0
2              0              0              0                3
3              0              0              0                0
4              0              0              0                1
5              0              0              0                0

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
```

```
Units  \
1                0                0                 0
0
2                3           950000                 0
0
3                0                0                 0
0
4                1            60000                 0
0
5                0                0                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

Obtain and read the building permit data set for all the places in Midwest region in 2017

```
df2 = pd.read_table("https://www2.census.gov/econ/bps/Place/Midwest
%20Region/mw2017a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
df2["Unnamed 41"] = np.nan
df2 = df2.shift(1, axis=1)
df2.Survey = df2.index
df2.index = np.arange(len(df2))

dict_names = {}
second  = df2.iloc[0].fillna("")
for i in range(len(df2.columns)):
    first = df2.columns[i]
    if first.startswith("Unnamed"):
        if df2.columns[i-1].startswith("Unnamed"):
            first = df2.columns[i+1]
        else:
            first = df2.columns[i-1]
    #          new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[df2.columns[i]]= new
df2 = df2.rename(columns = dict_names).drop([0])

# show the first five records
df2.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2017         17     001000         095              0005
2        2017         17     002800         043              0015
3        2017         17     004900         195              0025
4        2017         17     005200         027              0030
5        2017         17     006100         131              0040

  FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code Footnote
Code  \
1          00113         11891   3319.0       999     99999
NaN
2          00243         00250  36942.0       176     16980
NaN
3          00516         00529    891.0       999     99999
NaN
4          00555         44667   1190.0       476     41180
NaN
5          00646         48398   3640.0       209     19340
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  61410                 2             3
12
2          NaN  601012786             2             3
12
3          NaN  61230                 2             3
12
4          NaN  62215                 2             3
12
5          NaN  61231                 2             3
12

        Place Name Place Bldgs 1-unit Units 1-unit Value 2-units Bldgs
\
1         Abingdon           0            0            0             0
```

```
2  Addison village          16           16      3850000             0

3   Albany village           2            2       560000             0

4   Albers village           0            0            0             0

5            Aledo           0            0            0             0


  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
0
3             0             0               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                0
2              0              0              0               16
3              0              0              0                2
4              0              0              0                0
5              0              0              0                0

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                0                0                 0
0
2               16          3850000                 0
0
3                2           560000                 0
0
4                0                0                 0
0
5                0                0                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0
```

```
  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

Obtain and read the building permit data set for all the places in Midwest region in 2018

```
df3 = pd.read_table("https://www2.census.gov/econ/bps/Place/Midwest
%20Region/mw2018a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
df3["Unnamed 41"] = np.nan
df3 = df3.shift(1, axis=1)
df3.Survey = df3.index
df3.index = np.arange(len(df3))

dict_names = {}
second  = df3.iloc[0].fillna("")
for i in range(len(df3.columns)):
    first = df3.columns[i]
    if first.startswith("Unnamed"):
        if df3.columns[i-1].startswith("Unnamed"):
            first = df3.columns[i+1]
        else:
            first = df3.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[df3.columns[i]]= new
df3 = df3.rename(columns = dict_names).drop([0])

# show the first five records
df3.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2018         17     001000         095              0005
2        2018         17     002800         043              0015
3        2018         17     004900         195              0025
4        2018         17     005200         027              0030
```

```
5        2018         17     006100        131              0040

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1          00113         11891    3319.0      999     99999
NaN
2          00243         00250   36942.0      176     16980
NaN
3          00516         00529     891.0      999     99999
NaN
4          00555         44667    1190.0      476     41180
NaN
5          00646         48398    3640.0      209     19340
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  61410                 2             3
12
2          NaN  601012786             2             3
12
3          NaN  61230                 2             3
12
4          NaN  62215                 2             3
12
5          NaN  61231                 2             3
12

        Place Name Place Bldgs 1-unit Units 1-unit Value 2-units Bldgs
\
1         Abingdon           0            0            0             0

2  Addison village          30           30      7175000             0

3   Albany village           0            0            0             0

4   Albers village           0            0            0             0

5            Aledo           0            0            0             0


  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
0
3             0             0               0               0
0
4             0             0               0               0
```

```
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                0
2              0              0              0               30
3              0              0              0                0
4              0              0              0                0
5              0              0              0                0

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                0                0                 0
0
2               30          7175000                 0
0
3                0                0                 0
0
4                0                0                 0
0
5                0                0                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

Obtain and read the building permit data set for all the places in Midwest region in 2019

```
df4 = pd.read_table("https://www2.census.gov/econ/bps/Place/Midwest
%20Region/mw2019a.txt", sep=",",
                  skipinitialspace=True) #read the online table
```

```
# the web data table has some format issue, this block of code is to
address that issue
df4["Unnamed 41"] = np.nan
df4 = df4.shift(1, axis=1)
df4.Survey = df4.index
df4.index = np.arange(len(df4))

dict_names = {}
second  = df4.iloc[0].fillna("")
for i in range(len(df4.columns)):
    first = df4.columns[i]
    if first.startswith("Unnamed"):
        if df4.columns[i-1].startswith("Unnamed"):
            first = df4.columns[i+1]
        else:
            first = df4.columns[i-1]
    #          new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[df4.columns[i]]= new
df4 = df4.rename(columns = dict_names).drop([0])

# show the first five records
df4.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2019         17     001000         095              0005   
2        2019         17     002800         043              0015   
3        2019         17     004900         195              0025   
4        2019         17     005200         027              0030   
5        2019         17     006100         131              0040   

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1           00113         11891    3319.0       999     99999
NaN
2           00243         00250   36942.0       176     16980
NaN
3           00516         00529     891.0       999     99999
NaN
4           00555         44667    1190.0       476     41180
NaN
5           00646         48398    3640.0       209     19340
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  61410                 2             3
12
```

```
2          NaN  601012786             2             3
12
3          NaN  61230                 2             3
12
4          NaN  62215                 2             3
12
5          NaN  61231                 2             3
12

        Place Name Place Bldgs 1-unit Units 1-unit Value 2-units Bldgs
\
1         Abingdon           0            0            0             0

2  Addison village          28           28      6350625             0

3   Albany village           1            1       427000             0

4   Albers village           0            0            0             0

5            Aledo           0            0            0             0


  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
0
3             0             0               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                0
2              0              0              0               28
3              0              0              0                1
4              0              0              0                0
5              0              0              0                0

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                0                0                 0
0
2               28          6350625                 0
0
3                1           427000                 0
0
```

```
4                0                0                 0
0
5                0                0                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

```python
#combining all years data 2015-2019 for midwest region
vertical_concat = pd.concat([df,df1, df2,df3,df4], axis=0)
```

```python
#concatenated dfs for midwest region for 2015-2019
dfmw=vertical_concat

dfmw=dfmw.reset_index()

# Drop a specific column, e.g., 'Place Name'
dfmw = dfmw.drop(columns=['index'])

dfmw
```

```
      Survey Date State Code 6-Digit ID County Code Census Place Code
\
0            2015         17     001000         095              0005

1            2015         17     002800         043              0015

2            2015         17     004900         195              0025

3            2015         17     005200         027              0030
```

```
4            2015         17     006100         131              0040

...           ...        ...        ...         ...               ...

40022        2019         55     979000         043               NaN

40023        2019         55     979500         081              2880

40024        2019         55     980500         021              2885

40025        2019         55     982000         019               NaN

40026        2019         55     984000         103              2890


      FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code
Footnote Code  \
0               00113         11891    3319.0       999     99999
NaN
1               00243         00250   36942.0       176     16980
NaN
2               00516         00529     891.0       999     99999
NaN
3               00555         44667    1190.0       476     41180
NaN
4               00646         48398    3640.0       209     19340
NaN
...                 ...           ...       ...       ...       ...
...
40022           00000         89250     346.0       999     99999
NaN
40023           00000         89275     147.0       999     99999
NaN
40024           00000         89300     768.0       357     31540
NaN
40025           00000         89425     886.0       999     99999
NaN
40026           00000         89625      74.0       999     99999
NaN

      Central City     Zip Code Region Code Division Code  \
0               NaN  61410                2             3
1               NaN  601012786            2             3
2               NaN  61230                2             3
3               NaN  62215                2             3
4               NaN  61231                2             3
...             ...          ...         ...           ...
40022           NaN  53801                2             3
40023           NaN  54671                2             3
40024           NaN  53969                2             3
```

```
40025          NaN  54446                 2             3
40026          NaN  54634                 2             3

      Number of Months Rep        Place Name Place Bldgs 1-unit Units  
\
0                        12          Abingdon           0            0

1                        11   Addison village           4            4

2                        12    Albany village           1            1

3                        12    Albers village           0            0

4                        12             Aledo           1            1

...                     ...               ...         ...          ...

40022                    12    Wyalusing town           4            4

40023                    12  Wyeville village           0            0

40024                    12   Wyocena village           1            1

40025                     0         York town           0            0

40026                    12      Yuba village           0            0


      1-unit Value 2-units Bldgs 2-units Units 2-units Value 3-4 units 
Bldgs  \
0                0             0             0             0   
0
1          1225000             0             0             0   
0
2           150000             0             0             0   
0
3                0             0             0             0   
0
4           250000             0             0             0   
0
...            ...           ...           ...           ...   
...
40022       949000             0             0             0   
0
40023            0             0             0             0   
0
40024       178000             0             0             0   
0
40025            0             0             0             0   
0
```

```
40026            0             0             0             0
0

      3-4 units Units 3-4 units Value 5+ units Bldgs 5+ units Units  \
0                   0               0              0              0
1                   0               0              0              0
2                   0               0              0              0
3                   0               0              0              0
4                   0               0              0              0
...               ...             ...            ...            ...
40022               0               0              0              0
40023               0               0              0              0
40024               0               0              0              0
40025               0               0              0              0
40026               0               0              0              0

      5+ units Value 1-unit rep Bldgs 1-unit rep Units 1-unit rep
Value  \
0                  0                0                0
0
1                  0                4                4
1225000
2                  0                1                1
150000
3                  0                0                0
0
4                  0                1                1
250000
...              ...              ...              ...              ..
.
40022              0                4                4
949000
40023              0                0                0
0
40024              0                1                1
178000
40025              0                0                0
0
40026              0                0                0
0

      2-units rep Bldgs 2-units rep Units 2-units rep Value  \
0                     0                 0                 0
1                     0                 0                 0
2                     0                 0                 0
3                     0                 0                 0
4                     0                 0                 0
...                 ...               ...               ...
40022                 0                 0                 0
40023                 0                 0                 0
```

```
40024                 0                 0                 0
40025                 0                 0                 0
40026                 0                 0                 0

      3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
0                       0                   0                   0
1                       0                   0                   0
2                       0                   0                   0
3                       0                   0                   0
4                       0                   0                   0
...                   ...                 ...                 ...
40022                   0                   0                   0
40023                   0                   0                   0
40024                   0                   0                   0
40025                   0                   0                   0
40026                   0                   0                   0

      5+ units rep Bldgs 5+ units rep Units 5+ units rep Value
0                      0                  0                  0
1                      0                  0                  0
2                      0                  0                  0
3                      0                  0                  0
4                      0                  0                  0
...                  ...                ...                ...
40022                  0                  0                  0
40023                  0                  0                  0
40024                  0                  0                  0
40025                  0                  0                  0
40026                  0                  0                  0

[40027 rows x 41 columns]
```

```python
import pandas as pd

# Assuming your data is in a CSV file named 'data.csv'
data = dfmw

# Select the columns of interest
selected_columns = ['FIPS Place Code','Zip Code','Survey Date', '1-unit rep Units', 'Place Name']

# Extract the desired data
extracted_datas = data[selected_columns]
```

filtering the column with 1-unit rep unit data

```
#choosing the column with 1-unit rep unit data
extracted_datas

      FIPS Place Code     Zip Code Survey Date 1-unit rep Units  \
0              00113   61410              2015                0
1              00243   601012786          2015                4
2              00516   61230              2015                1
3              00555   62215              2015                0
4              00646   61231              2015                1
...               ...         ...          ...              ...
40022          00000   53801              2019                4
40023          00000   54671              2019                0
40024          00000   53969              2019                1
40025          00000   54446              2019                0
40026          00000   54634              2019                0

             Place Name
0              Abingdon
1       Addison village
2        Albany village
3        Albers village
4                 Aledo
...                 ...
40022    Wyalusing town
40023  Wyeville village
40024   Wyocena village
40025         York town
40026      Yuba village

[40027 rows x 5 columns]

# Group by 'Zip Code', 'FIPS Place Code', and 'Place Name', and sum
'1-unit rep Units'
grouped_df = extracted_datas.groupby(['Zip Code', 'FIPS Place Code',
'Place Name', 'Survey Date'])['1-unit rep Units'].sum().reset_index()

# Pivot the DataFrame to have years as columns
pivot_df = grouped_df.pivot_table(index=['Zip Code', 'FIPS Place
Code', 'Place Name'], columns='Survey Date', values='1-unit rep
Units', fill_value=0)

# Reset the index to have 'Zip Code', 'FIPS Place Code', and 'Place
Name' as columns
pivot_df.reset_index(inplace=True)

# Rename the columns
pivot_df.columns = ['Zip Code', 'FIPS Place Code', 'Place Name',
'2015', '2016', '2017', '2018', '2019']
```

```
# Display the pivot DataFrame
print(pivot_df)
```

```
         Zip Code FIPS Place Code                            Place Name
2015  \
0     15454                48855                                Manilla
0
1     19372                00000                        Tiffin township
0
2     42112                00000                        Milton township
14
3     43003                00000                     Westfield township
0
4     43011                00000                       Hilliar township
9
...             ...             ...                                    ...
...
8494  69358                32830                        Morrill village
0
8495  69360                42775                              Rushville
0
8496  693600039            99990    Sheridan County Unincorporated Area
0
8497  69361                44245                            Scottsbluff
9
8498  69367                52925                        Whitney village
0

      2016  2017  2018  2019
0        0     0     1     0
1        0     0     3     0
2       11    15    11    12
3        0     0     0     6
4       10    11    10    14
...    ...   ...   ...   ...
8494     1     0     1     0
8495     0     0     0     0
8496     0     0     0     0
8497    10    10     8     5
8498     0     0     0     0

[8499 rows x 8 columns]
```

Building permits for midwest region fips place code for single units from 2015-2019

```
pivot_df
```

```
        Zip Code FIPS Place Code                          Place Name
2015  \
0     15454                48855                             Manilla
0
1     19372                00000                     Tiffin township
0
2     42112                00000                     Milton township
14
3     43003                00000                  Westfield township
0
4     43011                00000                    Hilliar township
9
...          ...              ...                                 ...
...
8494  69358                32830                     Morrill village
0
8495  69360                42775                          Rushville
0
8496  693600039            99990   Sheridan County Unincorporated Area
0
8497  69361                44245                         Scottsbluff
9
8498  69367                52925                     Whitney village
0

      2016  2017  2018  2019
0        0     0     1     0
1        0     0     3     0
2       11    15    11    12
3        0     0     0     6
4       10    11    10    14
...    ...   ...   ...   ...
8494     1     0     1     0
8495     0     0     0     0
8496     0     0     0     0
8497    10    10     8     5
8498     0     0     0     0

[8499 rows x 8 columns]
```

```
dfmw
```

```
      Survey Date State Code 6-Digit ID County Code Census Place Code
\
0            2015         17     001000         095              0005

1            2015         17     002800         043              0015

2            2015         17     004900         195              0025
```

```
3            2015         17     005200          027              0030

4            2015         17     006100          131              0040

...           ...        ...        ...          ...               ...

40022        2019         55     979000          043               NaN

40023        2019         55     979500          081              2880

40024        2019         55     980500          021              2885

40025        2019         55     982000          019               NaN

40026        2019         55     984000          103              2890


      FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code
Footnote Code  \
0               00113          11891    3319.0       999     99999
NaN
1               00243          00250   36942.0       176     16980
NaN
2               00516          00529     891.0       999     99999
NaN
3               00555          44667    1190.0       476     41180
NaN
4               00646          48398    3640.0       209     19340
NaN
...                ...           ...      ...      ...       ...
...
40022           00000          89250     346.0       999     99999
NaN
40023           00000          89275     147.0       999     99999
NaN
40024           00000          89300     768.0       357     31540
NaN
40025           00000          89425     886.0       999     99999
NaN
40026           00000          89625      74.0       999     99999
NaN

      Central City     Zip Code Region Code Division Code  \
0               NaN  61410                 2             3
1               NaN  601012786             2             3
2               NaN  61230                 2             3
3               NaN  62215                 2             3
4               NaN  61231                 2             3
...             ...          ...         ...           ...
40022           NaN  53801                 2             3
```

```
40023          NaN  54671                 2             3
40024          NaN  53969                 2             3
40025          NaN  54446                 2             3
40026          NaN  54634                 2             3

      Number of Months Rep        Place Name Place Bldgs 1-unit Units
\
0                        12          Abingdon           0            0

1                        11   Addison village           4            4

2                        12    Albany village           1            1

3                        12    Albers village           0            0

4                        12             Aledo           1            1

...                     ...               ...         ...          ...

40022                    12    Wyalusing town           4            4

40023                    12  Wyeville village           0            0

40024                    12   Wyocena village           1            1

40025                     0         York town           0            0

40026                    12      Yuba village           0            0


      1-unit Value 2-units Bldgs 2-units Units 2-units Value 3-4 units
Bldgs  \
0                0             0             0             0
0
1          1225000             0             0             0
0
2           150000             0             0             0
0
3                0             0             0             0
0
4           250000             0             0             0
0
...            ...           ...           ...           ...
...
40022       949000             0             0             0
0
40023            0             0             0             0
0
40024       178000             0             0             0
0
```

```
40025            0             0             0             0
0
40026            0             0             0             0
0

      3-4 units Units 3-4 units Value 5+ units Bldgs 5+ units Units  \
0                   0               0              0              0
1                   0               0              0              0
2                   0               0              0              0
3                   0               0              0              0
4                   0               0              0              0
...               ...             ...            ...            ...
40022               0               0              0              0
40023               0               0              0              0
40024               0               0              0              0
40025               0               0              0              0
40026               0               0              0              0

      5+ units Value 1-unit rep Bldgs 1-unit rep Units 1-unit rep
Value  \
0                  0                0                0
0
1                  0                4                4
1225000
2                  0                1                1
150000
3                  0                0                0
0
4                  0                1                1
250000
...              ...              ...              ...              ..
.
40022              0                4                4
949000
40023              0                0                0
0
40024              0                1                1
178000
40025              0                0                0
0
40026              0                0                0
0

      2-units rep Bldgs 2-units rep Units 2-units rep Value  \
0                     0                 0                 0
1                     0                 0                 0
2                     0                 0                 0
3                     0                 0                 0
4                     0                 0                 0
...                 ...               ...               ...
```

```
40022                 0                 0                 0
40023                 0                 0                 0
40024                 0                 0                 0
40025                 0                 0                 0
40026                 0                 0                 0

      3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
0                       0                   0                   0
1                       0                   0                   0
2                       0                   0                   0
3                       0                   0                   0
4                       0                   0                   0
...                   ...                 ...                 ...
40022                   0                   0                   0
40023                   0                   0                   0
40024                   0                   0                   0
40025                   0                   0                   0
40026                   0                   0                   0

      5+ units rep Bldgs 5+ units rep Units 5+ units rep Value
0                      0                  0                  0
1                      0                  0                  0
2                      0                  0                  0
3                      0                  0                  0
4                      0                  0                  0
...                  ...                ...                ...
40022                  0                  0                  0
40023                  0                  0                  0
40024                  0                  0                  0
40025                  0                  0                  0
40026                  0                  0                  0

[40027 rows x 41 columns]
```

Filtering for multiple units for midwest region

```python
import pandas as pd


data = dfmw

# Select the columns of interest
selected_columnsm = ['FIPS Place Code','Zip Code','Survey Date', '2-units rep Units','3-4 units rep Units','5+ units rep Units', 'Place Name']

# Extract the desired data
extracted_datam = data[selected_columnsm]
```

```
extracted_datam

      FIPS Place Code     Zip Code Survey Date 2-units rep Units  \
0              00113   61410              2015                    0
1              00243   601012786          2015                    0
2              00516   61230              2015                    0
3              00555   62215              2015                    0
4              00646   61231              2015                    0
...               ...          ...         ...                  ...
40022          00000   53801              2019                    0
40023          00000   54671              2019                    0
40024          00000   53969              2019                    0
40025          00000   54446              2019                    0
40026          00000   54634              2019                    0

      3-4 units rep Units 5+ units rep Units        Place Name
0                       0                  0          Abingdon
1                       0                  0   Addison village
2                       0                  0    Albany village
3                       0                  0    Albers village
4                       0                  0             Aledo
...                   ...                ...               ...
40022                   0                  0    Wyalusing town
40023                   0                  0  Wyeville village
40024                   0                  0   Wyocena village
40025                   0                  0         York town
40026                   0                  0      Yuba village

[40027 rows x 7 columns]

# Group by 'Zip Code,' 'FIPS Place Code,' 'Place Name,' and 'Survey
Date,' and sum the units columns
grouped_dfm = extracted_datam.groupby(['Zip Code', 'FIPS Place Code',
'Place Name', 'Survey Date']).agg({
    '2-units rep Units': 'sum',
    '3-4 units rep Units': 'sum',
    '5+ units rep Units': 'sum'
}).reset_index()

# Create a new column 'multi unit' by summing the '2-units rep Units,'
'3-4 units rep Units,' and '5+ units rep Units'
grouped_dfm['multi unit'] = grouped_dfm['2-units rep Units'] +
grouped_dfm['3-4 units rep Units'] + grouped_dfm['5+ units rep Units']


# Display the grouped DataFrame
print(grouped_dfm)
```

```
          Zip Code FIPS Place Code       Place Name Survey Date  \
0      15454                48855          Manilla        2015
1      15454                48855          Manilla        2016
2      15454                48855          Manilla        2017
3      15454                48855          Manilla        2018
4      15454                48855          Manilla        2019
...            ...              ...              ...         ...
40004  69367                52925  Whitney village        2015
40005  69367                52925  Whitney village        2016
40006  69367                52925  Whitney village        2017
40007  69367                52925  Whitney village        2018
40008  69367                52925  Whitney village        2019

      2-units rep Units 3-4 units rep Units 5+ units rep Units multi
unit
0                     0                   0                  0
000
1                     0                   0                  0
000
2                     0                   0                  0
000
3                     0                   0                  0
000
4                     0                   0                  0
000
...                 ...                 ...                ...
...
40004                 0                   0                  0
000
40005                 0                   0                  0
000
40006                 0                   0                  0
000
40007                 0                   0                  0
000
40008                 0                   0                  0
000

[40009 rows x 8 columns]
```

```
grouped_dfm
```

```
          Zip Code FIPS Place Code       Place Name Survey Date  \
0      15454                48855          Manilla        2015
1      15454                48855          Manilla        2016
2      15454                48855          Manilla        2017
3      15454                48855          Manilla        2018
4      15454                48855          Manilla        2019
...            ...              ...              ...         ...
40004  69367                52925  Whitney village        2015
```

```
40005  69367                52925   Whitney village       2016
40006  69367                52925   Whitney village       2017
40007  69367                52925   Whitney village       2018
40008  69367                52925   Whitney village       2019

      2-units rep Units 3-4 units rep Units 5+ units rep Units multi
unit
0                     0                   0                  0
000
1                     0                   0                  0
000
2                     0                   0                  0
000
3                     0                   0                  0
000
4                     0                   0                  0
000
...                 ...                 ...                ...
...
40004                 0                   0                  0
000
40005                 0                   0                  0
000
40006                 0                   0                  0
000
40007                 0                   0                  0
000
40008                 0                   0                  0
000

[40009 rows x 8 columns]

# Pivot the DataFrame to have years as columns
pivot_dfm = grouped_dfm.pivot_table(index=['Zip Code', 'FIPS Place
Code', 'Place Name'], columns='Survey Date', values='multi unit',
fill_value=0)

# Reset the index to have 'Zip Code', 'FIPS Place Code', and 'Place
Name' as columns
pivot_dfm.reset_index(inplace=True)

# Rename the columns
pivot_dfm.columns = ['Zip Code', 'FIPS Place Code', 'Place Name',
'2015', '2016', '2017', '2018', '2019']

# Save the pivot DataFrame to a CSV file
pivot_dfm.to_csv('building_permits_grouped_2015-2019.csv',
index=False)
```

```
# Display the pivot DataFrame
print(pivot_dfm)
```

```
         Zip Code FIPS Place Code                            Place Name
2015  \
0     15454                48855                                Manilla
0
1     19372                00000                        Tiffin township
0
2     42112                00000                        Milton township
0
3     43003                00000                     Westfield township
0
4     43011                00000                       Hilliar township
0
...           ...             ...                                   ...
...
8494  69358                32830                        Morrill village
0
8495  69360                42775                              Rushville
0
8496  693600039            99990    Sheridan County Unincorporated Area
0
8497  69361                44245                            Scottsbluff
0
8498  69367                52925                        Whitney village
0

      2016  2017  2018  2019
0        0     0     0     0
1        0     0     0     0
2        0     0     0     0
3        0     0     0     0
4        0     0     0     0
...    ...   ...   ...   ...
8494     0     0     0     0
8495     0     0     0     0
8496     0     0     0     0
8497    12   200     0     0
8498     0     0     0     0

[8499 rows x 8 columns]
```

Building permits for fips place code for multi units for midwest region from 2015-2019

```
pivot_dfm
```

```
         Zip Code FIPS Place Code                           Place Name  
2015  \
0     15454                 48855                              Manilla  
0    
1     19372                 00000                      Tiffin township  
0    
2     42112                 00000                      Milton township  
0    
3     43003                 00000                   Westfield township  
0    
4     43011                 00000                     Hilliar township  
0    
...             ...               ...                                  ...
...  
8494  69358                 32830                      Morrill village  
0    
8495  69360                 42775                            Rushville  
0    
8496  693600039             99990   Sheridan County Unincorporated Area  
0    
8497  69361                 44245                         Scottsbluff  
0    
8498  69367                 52925                      Whitney village  
0    

      2016  2017  2018  2019  
0        0     0     0     0  
1        0     0     0     0  
2        0     0     0     0  
3        0     0     0     0  
4        0     0     0     0  
...    ...   ...   ...   ...  
8494     0     0     0     0  
8495     0     0     0     0  
8496     0     0     0     0  
8497    12   200     0     0  
8498     0     0     0     0  

[8499 rows x 8 columns]
```

Obtain and read the building permit data set for all the places in Northeast region

```
#Obtain and read the building permit data set for all the places in
Northeast Region

#https://www2.census.gov/econ/bps/Place/Northeast%20Region/ne2015a.txt
```

```
dfn1 = pd.read_table("https://www2.census.gov/econ/bps/Place/Northeast
%20Region/ne2015a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfn1["Unnamed 41"] = np.nan
dfn1 = dfn1.shift(1, axis=1)
dfn1.Survey = dfn1.index
dfn1.index = np.arange(len(dfn1))

dict_names = {}
second  = dfn1.iloc[0].fillna("")
for i in range(len(dfn1.columns)):
    first = dfn1.columns[i]
    if first.startswith("Unnamed"):
        if dfn1.columns[i-1].startswith("Unnamed"):
            first = dfn1.columns[i+1]
        else:
            first = dfn1.columns[i-1]
    #          new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfn1.columns[i]]= new
dfn1 = dfn1.rename(columns = dict_names).drop([0])

# show the first five records
dfn1.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2015         09     001000         013               NaN
2        2015         09     005000         009              0010
3        2015         09     009000         015               NaN
4        2015         09     013000         003               NaN
5        2015         09     021000         005               NaN

  FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code Footnote
Code  \
1           00000         01080   3303.0       278     25540
NaN
2           01150         01220  19249.0       408     35300
2
3           00000         01430   4317.0       148     49340
NaN
4           00000         02060  18098.0       278     25540
NaN
5           00000         02760   3799.0       999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
```

```
Rep  \
1          NaN  06232                 1             1
12
2          NaN  064011855             1             1
0
3          NaN  06278                 1             1
12
4          NaN  06001                 1             1
12
5          NaN  060633340             1             1
12

         Place Name Place Bldgs 1-unit Units 1-unit Value 2-units
Bldgs  \
1      Andover town           4            4       754900
0
2           Ansonia           0            0            0
0
3      Ashford town           2            2       281500
0
4         Avon town          31           31     10995334
0
5  Barkhamsted town           3            3      1035150
0

  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
0
3             0             0               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                4
2              0              0              0                0
3              0              0              0                2
4              0              0              0               31
5              0              0              0                3

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                4           754900                 0
0
2                0                0                 0
```

```
0
3                2           281500                 0
0
4               31         10995334                 0
0
5                3          1035150                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

```
dfn2 = pd.read_table("https://www2.census.gov/econ/bps/Place/Northeast
%20Region/ne2016a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfn2["Unnamed 41"] = np.nan
dfn2 = dfn2.shift(1, axis=1)
dfn2.Survey = dfn2.index
dfn2.index = np.arange(len(dfn2))

dict_names = {}
second  = dfn2.iloc[0].fillna("")
for i in range(len(dfn2.columns)):
    first = dfn2.columns[i]
    if first.startswith("Unnamed"):
        if dfn2.columns[i-1].startswith("Unnamed"):
            first = dfn2.columns[i+1]
        else:
            first = dfn2.columns[i-1]
    #         new = first+second[i]
    # else:
```

```
    new = first+" "+second[i]
    dict_names[dfn2.columns[i]]= new
dfn2 = dfn2.rename(columns = dict_names).drop([0])

# show the first five records
dfn2.head()

  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2016          09     001000         013               NaN
2        2016          09     005000         009              0010
3        2016          09     009000         015               NaN
4        2016          09     013000         003               NaN
5        2016          09     021000         005               NaN

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1          00000         01080    3303.0      278     25540
NaN
2          01150         01220   19249.0      408     35300
2
3          00000         01430    4317.0      148     49340
NaN
4          00000         02060   18098.0      278     25540
NaN
5          00000         02760    3799.0      999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  06232                 1             1
12
2          NaN  064011855             1             1
0
3          NaN  06278                 1             1
12
4          NaN  06001                 1             1
12
5          NaN  060633340             1             1
12

         Place Name Place Bldgs 1-unit Units 1-unit Value 2-units
Bldgs  \
1      Andover town           3            3       945000
0
2           Ansonia           0            0            0
0
3      Ashford town           5            5      1004883
1
4         Avon town          19           19      6756493
0
```

```
5  Barkhamsted town           0            0            0
0

  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
0
3             2        145000               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                3
2              0              0              0                0
3              0              0              0                5
4              0              0              0               19
5              0              0              0                0

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                3           945000                 0
0
2                0                0                 0
0
3                5          1004883                 1
2
4               19          6756493                 0
0
5                0                0                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3            145000                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
```

```
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

```
dfn3 = pd.read_table("https://www2.census.gov/econ/bps/Place/Northeast
%20Region/ne2017a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfn3["Unnamed 41"] = np.nan
dfn3 = dfn3.shift(1, axis=1)
dfn3.Survey = dfn3.index
dfn3.index = np.arange(len(dfn3))

dict_names = {}
second  = dfn3.iloc[0].fillna("")
for i in range(len(dfn3.columns)):
    first = dfn3.columns[i]
    if first.startswith("Unnamed"):
        if dfn3.columns[i-1].startswith("Unnamed"):
            first = dfn3.columns[i+1]
        else:
            first = dfn3.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfn3.columns[i]]= new
dfn3 = dfn3.rename(columns = dict_names).drop([0])

# show the first five records
dfn3.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2017         09     001000         013               NaN
2        2017         09     005000         009              0010
3        2017         09     009000         015               NaN
4        2017         09     013000         003               NaN
5        2017         09     021000         005               NaN

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1          00000         01080    3303.0      278     25540
NaN
2          01150         01220   19249.0      408     35300
2
3          00000         01430    4317.0      148     49340
NaN
```

```
4          00000         02060   18098.0      278     25540
NaN
5          00000         02760    3799.0      999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  06232                 1             1
12
2          NaN  064011855             1             1
12
3          NaN  06278                 1             1
12
4          NaN  06001                 1             1
7
5          NaN  060633340             1             1
12

         Place Name Place Bldgs 1-unit Units 1-unit Value 2-units
Bldgs  \
1      Andover town           3             3       835000
0
2           Ansonia           0             0            0
3
3      Ashford town           8             8      1395000
0
4         Avon town          20            20      6555963
0
5  Barkhamsted town           0             0            0
0

  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             6        697000               0               0
0
3             0             0               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                3
2              0              0              0                0
3              0              0              0                8
4              0              0              0               10
5              0              0              0                0
```

```
  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                3           835000                 0
0
2                0                0                 3
6
3                8          1395000                 0
0
4               10          2999913                 0
0
5                0                0                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2            697000                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

```python
dfn4 = pd.read_table("https://www2.census.gov/econ/bps/Place/Northeast
%20Region/ne2018a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfn4["Unnamed 41"] = np.nan
dfn4 = dfn4.shift(1, axis=1)
dfn4.Survey = dfn4.index
dfn4.index = np.arange(len(dfn4))

dict_names = {}
second  = dfn4.iloc[0].fillna("")
for i in range(len(dfn4.columns)):
    first = dfn4.columns[i]
    if first.startswith("Unnamed"):
        if dfn4.columns[i-1].startswith("Unnamed"):
            first = dfn4.columns[i+1]
        else:
            first = dfn4.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfn4.columns[i]]= new
dfn4 = dfn4.rename(columns = dict_names).drop([0])

# show the first five records
dfn4.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2018         09     001000         013               NaN
2        2018         09     005000         009              0010
3        2018         09     009000         015               NaN
4        2018         09     013000         003               NaN
5        2018         09     021000         005               NaN

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1          00000         01080    3303.0       278     25540
NaN
2          01150         01220   19249.0       408     35300
2
3          00000         01430    4317.0       148     49340
NaN
4          00000         02060   18098.0       278     25540
NaN
5          00000         02760    3799.0       999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  06232                 1             1
12
2          NaN  064011855             1             1
12
3          NaN  06278                 1             1
12
4          NaN  06001                 1             1
12
5          NaN  060633340             1             1
12

         Place Name Place Bldgs 1-unit Units 1-unit Value 2-units
Bldgs  \
1      Andover town          5            5       973000
0
```

```
2           Ansonia           2            2       300000
1
3      Ashford town           9            9      1945000
0
4         Avon town          13           13      3163450
0
5  Barkhamsted town           2            2       552000
0

  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             2        150000               0               0
0
3             0             0               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                5
2              0              0              0                2
3              0              0              0                9
4              0              0              0               13
5              0              0              0                2

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                5           973000                 0
0
2                2           300000                 1
2
3                9          1945000                 0
0
4               13          3163450                 0
0
5                2           552000                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2            150000                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
```

```
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0

dfn5 = pd.read_table("https://www2.census.gov/econ/bps/Place/Northeast
%20Region/ne2019a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfn5["Unnamed 41"] = np.nan
dfn5 = dfn5.shift(1, axis=1)
dfn5.Survey = dfn5.index
dfn5.index = np.arange(len(dfn5))

dict_names = {}
second  = dfn5.iloc[0].fillna("")
for i in range(len(dfn5.columns)):
    first = dfn5.columns[i]
    if first.startswith("Unnamed"):
        if dfn5.columns[i-1].startswith("Unnamed"):
            first = dfn5.columns[i+1]
        else:
            first = dfn5.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfn5.columns[i]]= new
dfn5 = dfn5.rename(columns = dict_names).drop([0])

# show the first five records
dfn5.head()

  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2019         09     001000         013               NaN
2        2019         09     005000         009              0010
3        2019         09     009000         015               NaN
4        2019         09     013000         003               NaN
5        2019         09     021000         005               NaN

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1          00000          01080    3303.0      278     25540
NaN
2          01150          01220   19249.0      408     35300
2
3          00000          01430    4317.0      148     49340
NaN
4          00000          02060   18098.0      278     25540
NaN
5          00000          02760    3799.0      999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  06232                 1             1
12
2          NaN  064011855             1             1
12
3          NaN  06278                 1             1
12
4          NaN  06001                 1             1
12
5          NaN  060633340             1             1
12

         Place Name Place Bldgs 1-unit Units 1-unit Value 2-units
Bldgs  \
1      Andover town           7            7      1673875
0
2           Ansonia           1            1        90000
0
3      Ashford town           5            5      1054500
0
4         Avon town          13           13      3754638
0
5  Barkhamsted town           3            3       924380
0

  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
0
3             0             0               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0
```

```
  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                7
2              0              0              0                1
3              0              0              0                5
4              0              0              0               13
5              0              0              0                3

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                7          1673875                0
0
2                1            90000                0
0
3                5          1054500                0
0
4               13          3754638                0
0
5                3           924380                0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

```
vertical_concatne = pd.concat([dfn1,dfn2, dfn3,dfn4,dfn5], axis=0)

dfne=vertical_concatne





dfne
```

```
     Survey Date State Code 6-Digit ID County Code Census Place
Code  \
1           2015         09     001000         013              NaN

2           2015         09     005000         009             0010

3           2015         09     009000         015              NaN

4           2015         09     013000         003              NaN

5           2015         09     021000         005              NaN

...          ...        ...        ...         ...              ...

5572        2019         50     591000         015              NaN

5573        2019         50     593000         023              NaN

5574        2019         50     595000         003              NaN

5575        2019         50     597000         027              NaN

5576        2019         50     599000         027             1500


     FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code
Footnote Code  \
1              00000         01080    3303.0      278     25540
NaN
2              01150         01220   19249.0      408     35300
2
3              00000         01430    4317.0      148     49340
NaN
4              00000         02060   18098.0      278     25540
NaN
5              00000         02760    3799.0      999     99999
NaN
...                ...           ...      ...      ...       ...
...
5572           00000         85375    1676.0      999     99999
NaN
5573           00000         85525     906.0      999     99999
NaN
5574           00000         85675     424.0      999     99999
NaN
5575           00000         85975    2148.0      999     99999
NaN
5576           85900         85975     900.0      999     99999
NaN

     Central City     Zip Code Region Code Division Code Number of
```

```
Months Rep  \
1            NaN  06232                 1             1
12
2            NaN  064011855             1             1
0
3            NaN  06278                 1             1
12
4            NaN  06001                 1             1
12
5            NaN  060633340             1             1
12
...          ...          ...         ...           ...
...
5572         NaN  05680                 1             1
12
5573         NaN  05683                 1             1
0
5574         NaN  052019410             1             1
12
5575         NaN  05091                 1             1
12
5576         NaN  05091                 1             1
12

             Place Name Place Bldgs 1-unit Units 1-unit Value 2-units
Bldgs  \
1          Andover town           4            4       754900
0
2               Ansonia           0            0            0
0
3          Ashford town           2            2       281500
0
4             Avon town          31           31     10995334
0
5       Barkhamsted town           3            3      1035150
0
...                  ...         ...          ...          ...
...
5572       Wolcott town           5            5       220000
0
5573      Woodbury town           4            4       984063
0
5574      Woodford town           0            0            0
0
5575     Woodstock town           4            4      1128930
0
5576  Woodstock village           1            1       282232
0

     2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units  \
1                 0             0               0               0
2                 0             0               0               0
3                 0             0               0               0
4                 0             0               0               0
5                 0             0               0               0
...             ...           ...             ...             ...
5572              0             0               0               0
5573              0             0               0               0
5574              0             0               0               0
5575              0             0               0               0
5576              0             0               0               0

     3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1                  0              0              0              0
2                  0              0              0              0
3                  0              0              0              0
4                  0              0              0              0
5                  0              0              0              0
...              ...            ...            ...            ...
5572               0              0              0              0
5573               0              0              0              0
5574               0              0              0              0
5575               0              0              0              0
5576               0              0              0              0

     1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep
Bldgs  \
1                   4                4           754900
0
2                   0                0                0
0
3                   2                2           281500
0
4                  31               31         10995334
0
5                   3                3          1035150
0
...               ...              ...              ...
...
5572                5                5           220000
0
5573                0                0                0
0
5574                0                0                0
0
5575                4                4          1128930
0
5576                1                1           282232
0
```

```
     2-units rep Units 2-units rep Value 3-4 units rep Bldgs  \
1                    0                 0                   0
2                    0                 0                   0
3                    0                 0                   0
4                    0                 0                   0
5                    0                 0                   0
...                ...               ...                 ...
5572                 0                 0                   0
5573                 0                 0                   0
5574                 0                 0                   0
5575                 0                 0                   0
5576                 0                 0                   0

     3-4 units rep Units 3-4 units rep Value 5+ units rep Bldgs  \
1                      0                   0                  0
2                      0                   0                  0
3                      0                   0                  0
4                      0                   0                  0
5                      0                   0                  0
...                  ...                 ...                ...
5572                   0                   0                  0
5573                   0                   0                  0
5574                   0                   0                  0
5575                   0                   0                  0
5576                   0                   0                  0

     5+ units rep Units 5+ units rep Value
1                     0                  0
2                     0                  0
3                     0                  0
4                     0                  0
5                     0                  0
...                 ...                ...
5572                  0                  0
5573                  0                  0
5574                  0                  0
5575                  0                  0
5576                  0                  0

[27892 rows x 41 columns]
```

```
dfne=dfne.reset_index()
```

```
# Drop a specific column, e.g., 'Place Name'
dfne = dfne.drop(columns=['index'])
```

```
dfne
```

```
      Survey Date State Code 6-Digit ID County Code Census Place Code
\
0            2015         09     001000         013                NaN

1            2015         09     005000         009               0010

2            2015         09     009000         015                NaN

3            2015         09     013000         003                NaN

4            2015         09     021000         005                NaN

...           ...        ...        ...         ...                ...

27887        2019         50     591000         015                NaN

27888        2019         50     593000         023                NaN

27889        2019         50     595000         003                NaN

27890        2019         50     597000         027                NaN

27891        2019         50     599000         027               1500


      FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code
Footnote Code  \
0               00000         01080    3303.0       278     25540
NaN
1               01150         01220   19249.0       408     35300
2
2               00000         01430    4317.0       148     49340
NaN
3               00000         02060   18098.0       278     25540
NaN
4               00000         02760    3799.0       999     99999
NaN
...               ...           ...       ...       ...       ...
...
27887           00000         85375    1676.0       999     99999
NaN
27888           00000         85525     906.0       999     99999
NaN
27889           00000         85675     424.0       999     99999
NaN
27890           00000         85975    2148.0       999     99999
NaN
27891           85900         85975     900.0       999     99999
NaN

      Central City     Zip Code Region Code Division Code  \
0               NaN  06232                1             1
```

```
1              NaN  064011855             1             1
2              NaN  06278                 1             1
3              NaN  06001                 1             1
4              NaN  060633340             1             1
...            ...         ...         ...           ...
27887          NaN  05680                 1             1
27888          NaN  05683                 1             1
27889          NaN  052019410             1             1
27890          NaN  05091                 1             1
27891          NaN  05091                 1             1

      Number of Months Rep         Place Name Place Bldgs 1-unit Units
\
0                       12       Andover town           4            4

1                        0            Ansonia           0            0

2                       12       Ashford town           2            2

3                       12          Avon town          31           31

4                       12   Barkhamsted town           3            3

...                    ...                ...         ...          ...

27887                   12       Wolcott town           5            5

27888                    0      Woodbury town           4            4

27889                   12      Woodford town           0            0

27890                   12     Woodstock town           4            4

27891                   12  Woodstock village           1            1


      1-unit Value 2-units Bldgs 2-units Units 2-units Value 3-4 units
Bldgs  \
0           754900             0             0             0
0
1                0             0             0             0
0
2           281500             0             0             0
0
3         10995334             0             0             0
0
4          1035150             0             0             0
0
...            ...           ...           ...           ...
...
```

```
27887       220000             0             0             0
0
27888       984063             0             0             0
0
27889            0             0             0             0
0
27890      1128930             0             0             0
0
27891       282232             0             0             0
0

      3-4 units Units 3-4 units Value 5+ units Bldgs 5+ units Units  \
0                   0               0              0              0
1                   0               0              0              0
2                   0               0              0              0
3                   0               0              0              0
4                   0               0              0              0
...               ...             ...            ...            ...
27887               0               0              0              0
27888               0               0              0              0
27889               0               0              0              0
27890               0               0              0              0
27891               0               0              0              0

      5+ units Value 1-unit rep Bldgs 1-unit rep Units 1-unit rep
Value  \
0                  0                4                4
754900
1                  0                0                0
0
2                  0                2                2
281500
3                  0               31               31
10995334
4                  0                3                3
1035150
...              ...              ...              ...              ..
.
27887              0                5                5
220000
27888              0                0                0
0
27889              0                0                0
0
27890              0                4                4
1128930
27891              0                1                1
282232

      2-units rep Bldgs 2-units rep Units 2-units rep Value  \
0                     0                 0                 0
1                     0                 0                 0
2                     0                 0                 0
3                     0                 0                 0
4                     0                 0                 0
...                 ...               ...               ...
27887                 0                 0                 0
27888                 0                 0                 0
27889                 0                 0                 0
27890                 0                 0                 0
27891                 0                 0                 0

      3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
0                       0                   0                   0
1                       0                   0                   0
2                       0                   0                   0
3                       0                   0                   0
4                       0                   0                   0
...                   ...                 ...                 ...
27887                   0                   0                   0
27888                   0                   0                   0
27889                   0                   0                   0
27890                   0                   0                   0
27891                   0                   0                   0

      5+ units rep Bldgs 5+ units rep Units 5+ units rep Value
0                      0                  0                  0
1                      0                  0                  0
2                      0                  0                  0
3                      0                  0                  0
4                      0                  0                  0
...                  ...                ...                ...
27887                  0                  0                  0
27888                  0                  0                  0
27889                  0                  0                  0
27890                  0                  0                  0
27891                  0                  0                  0

[27892 rows x 41 columns]
```

```python
import pandas as pd

# Assuming your data is in a CSV file named 'data.csv'
datane = dfne

# Select the columns of interest
selected_columnsne = ['FIPS Place Code','Zip Code','Survey Date', '1-unit rep Units', 'Place Name']
```

```python
# Extract the desired data
extracted_datasne = datane[selected_columnsne]



#choosing the column with 1-unit rep unit data
extracted_datasne
```

```
      FIPS Place Code     Zip Code Survey Date 1-unit rep Units  \
0               00000   06232            2015                 4
1               01150   064011855        2015                 0
2               00000   06278            2015                 2
3               00000   06001            2015                31
4               00000   060633340        2015                 3
...               ...         ...         ...               ...
27887           00000   05680            2019                 5
27888           00000   05683            2019                 0
27889           00000   052019410        2019                 0
27890           00000   05091            2019                 4
27891           85900   05091            2019                 1

              Place Name
0          Andover town
1               Ansonia
2          Ashford town
3             Avon town
4       Barkhamsted town
...                  ...
27887      Wolcott town
27888     Woodbury town
27889     Woodford town
27890    Woodstock town
27891  Woodstock village

[27892 rows x 5 columns]
```

```python
# Group by 'Zip Code', 'FIPS Place Code', and 'Place Name', and sum
'1-unit rep Units'
grouped_df1ne = extracted_datasne.groupby(['Zip Code', 'FIPS Place
Code', 'Place Name', 'Survey Date'])['1-unit rep
Units'].sum().reset_index()

# Pivot the DataFrame to have years as columns
pivot_df1ne = grouped_df1ne.pivot_table(index=['Zip Code', 'FIPS Place
Code', 'Place Name'], columns='Survey Date', values='1-unit rep
Units', fill_value=0)

# Reset the index to have 'Zip Code', 'FIPS Place Code', and 'Place
Name' as columns
pivot_df1ne.reset_index(inplace=True)
```

```
# Rename the columns
pivot_df1ne.columns = ['Zip Code', 'FIPS Place Code', 'Place Name',
'2015', '2016', '2017', '2018', '2019']


# Display the pivot DataFrame
print(pivot_df1ne)

         Zip Code FIPS Place Code                 Place Name  2015
2016  \
0     01001                00840                Agawam Town    12
16
1     01002                00000               Amherst town     0
0
2     01002                00000                Pelham town     0
1
3     01005                00000                 Barre town     7
14
4     01007                00000           Belchertown town    35
65
...        ...               ...                        ...   ...   .
..
5970  19608                00000  South Heidelberg township     0
2
5971  19608                00000            Spring township    12
13
5972  19608                70880     Sinking Spring borough     0
0
5973  19610                86880         Wyomissing borough     1
0
5974  19611                83928       West Reading borough     0
0

      2017  2018  2019
0       31    19     8
1        0    25     0
2        2     1     1
3        7    10     9
4       39    58    41
...    ...   ...   ...
5970     3     6    17
5971     2    12     6
5972     0     0     1
5973     1     3     1
5974     0     6     6

[5975 rows x 8 columns]

pivot_df1ne
```

```
         Zip Code FIPS Place Code                   Place Name  2015
2016  \
0     01001                 00840                  Agawam Town    12
16
1     01002                 00000                 Amherst town     0
0
2     01002                 00000                  Pelham town     0
1
3     01005                 00000                   Barre town     7
14
4     01007                 00000              Belchertown town    35
65
...           ...              ...                        ...   ...   .
..
5970  19608                 00000   South Heidelberg township     0
2
5971  19608                 00000             Spring township    12
13
5972  19608                 70880      Sinking Spring borough     0
0
5973  19610                 86880          Wyomissing borough     1
0
5974  19611                 83928        West Reading borough     0
0

      2017  2018  2019
0       31    19     8
1        0    25     0
2        2     1     1
3        7    10     9
4       39    58    41
...    ...   ...   ...
5970     3     6    17
5971     2    12     6
5972     0     0     1
5973     1     3     1
5974     0     6     6

[5975 rows x 8 columns]
```

```
dfne
```

```
      Survey Date State Code 6-Digit ID County Code Census Place Code
\
0            2015         09     001000         013               NaN

1            2015         09     005000         009              0010

2            2015         09     009000         015               NaN
```

```
3            2015         09     013000         003               NaN

4            2015         09     021000         005               NaN

...           ...        ...        ...         ...               ...

27887        2019         50     591000         015               NaN

27888        2019         50     593000         023               NaN

27889        2019         50     595000         003               NaN

27890        2019         50     597000         027               NaN

27891        2019         50     599000         027              1500


      FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code
Footnote Code  \
0              00000         01080    3303.0      278     25540
NaN
1              01150         01220   19249.0      408     35300
2
2              00000         01430    4317.0      148     49340
NaN
3              00000         02060   18098.0      278     25540
NaN
4              00000         02760    3799.0      999     99999
NaN
...                ...           ...      ...      ...       ...
...
27887          00000         85375    1676.0      999     99999
NaN
27888          00000         85525     906.0      999     99999
NaN
27889          00000         85675     424.0      999     99999
NaN
27890          00000         85975    2148.0      999     99999
NaN
27891          85900         85975     900.0      999     99999
NaN

      Central City     Zip Code Region Code Division Code  \
0              NaN  06232                 1             1
1              NaN  064011855             1             1
2              NaN  06278                 1             1
3              NaN  06001                 1             1
4              NaN  060633340             1             1
...            ...          ...         ...           ...
27887          NaN  05680                 1             1
```

```
27888          NaN  05683                 1             1
27889          NaN  052019410             1             1
27890          NaN  05091                 1             1
27891          NaN  05091                 1             1

      Number of Months Rep         Place Name Place Bldgs 1-unit Units
\
0                       12       Andover town           4            4

1                        0            Ansonia           0            0

2                       12       Ashford town           2            2

3                       12          Avon town          31           31

4                       12   Barkhamsted town           3            3

...                    ...                ...         ...          ...

27887                   12       Wolcott town           5            5

27888                    0      Woodbury town           4            4

27889                   12      Woodford town           0            0

27890                   12     Woodstock town           4            4

27891                   12  Woodstock village           1            1


      1-unit Value 2-units Bldgs 2-units Units 2-units Value 3-4 units
Bldgs  \
0           754900             0             0             0
0
1                0             0             0             0
0
2           281500             0             0             0
0
3         10995334             0             0             0
0
4          1035150             0             0             0
0
...            ...           ...           ...           ...
...
27887       220000             0             0             0
0
27888       984063             0             0             0
0
27889            0             0             0             0
0
```

```
27890      1128930             0             0             0
0
27891       282232             0             0             0
0

      3-4 units Units 3-4 units Value 5+ units Bldgs 5+ units Units  \
0                   0               0              0              0
1                   0               0              0              0
2                   0               0              0              0
3                   0               0              0              0
4                   0               0              0              0
...               ...             ...            ...            ...
27887               0               0              0              0
27888               0               0              0              0
27889               0               0              0              0
27890               0               0              0              0
27891               0               0              0              0

      5+ units Value 1-unit rep Bldgs 1-unit rep Units 1-unit rep
Value  \
0                  0                4                4
754900
1                  0                0                0
0
2                  0                2                2
281500
3                  0               31               31
10995334
4                  0                3                3
1035150
...              ...              ...              ...              ..
.
27887              0                5                5
220000
27888              0                0                0
0
27889              0                0                0
0
27890              0                4                4
1128930
27891              0                1                1
282232

      2-units rep Bldgs 2-units rep Units 2-units rep Value  \
0                     0                 0                 0
1                     0                 0                 0
2                     0                 0                 0
3                     0                 0                 0
4                     0                 0                 0
...                 ...               ...               ...
```

```
27887                 0                 0                 0
27888                 0                 0                 0
27889                 0                 0                 0
27890                 0                 0                 0
27891                 0                 0                 0

      3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
0                       0                   0                   0
1                       0                   0                   0
2                       0                   0                   0
3                       0                   0                   0
4                       0                   0                   0
...                   ...                 ...                 ...
27887                   0                   0                   0
27888                   0                   0                   0
27889                   0                   0                   0
27890                   0                   0                   0
27891                   0                   0                   0

      5+ units rep Bldgs 5+ units rep Units 5+ units rep Value
0                      0                  0                  0
1                      0                  0                  0
2                      0                  0                  0
3                      0                  0                  0
4                      0                  0                  0
...                  ...                ...                ...
27887                  0                  0                  0
27888                  0                  0                  0
27889                  0                  0                  0
27890                  0                  0                  0
27891                  0                  0                  0

[27892 rows x 41 columns]
```

```python
import pandas as pd

# Assuming your data is in a CSV file named 'data.csv'
datane2 = dfne

# Select the columns of interest
selected_columnsne2 = ['FIPS Place Code','Zip Code','Survey Date', '2-units rep Units','3-4 units rep Units','5+ units rep Units', 'Place Name']

# Extract the desired data
extracted_datamne2 = datane2[selected_columnsne2]

extracted_datamne2
```

```
      FIPS Place Code     Zip Code Survey Date 2-units rep Units  \
0              00000   06232              2015                 0
```

```
1              01150   064011855          2015                    0
2              00000   06278              2015                    0
3              00000   06001              2015                    0
4              00000   060633340          2015                    0
...               ...          ...         ...               ...
27887          00000   05680              2019                    0
27888          00000   05683              2019                    0
27889          00000   052019410          2019                    0
27890          00000   05091              2019                    0
27891          85900   05091              2019                    0

      3-4 units rep Units 5+ units rep Units          Place Name
0                       0                  0       Andover town
1                       0                  0            Ansonia
2                       0                  0       Ashford town
3                       0                  0          Avon town
4                       0                  0   Barkhamsted town
...                   ...                ...                ...
27887                   0                  0       Wolcott town
27888                   0                  0      Woodbury town
27889                   0                  0      Woodford town
27890                   0                  0     Woodstock town
27891                   0                  0  Woodstock village

[27892 rows x 7 columns]

# Group by 'Zip Code,' 'FIPS Place Code,' 'Place Name,' and 'Survey
Date,' and sum the units columns
grouped_dfmne = extracted_datamne2.groupby(['Zip Code', 'FIPS Place
Code', 'Place Name', 'Survey Date']).agg({
    '2-units rep Units': 'sum',
    '3-4 units rep Units': 'sum',
    '5+ units rep Units': 'sum'
}).reset_index()

# Create a new column 'multi unit' by summing the '2-units rep Units,'
'3-4 units rep Units,' and '5+ units rep Units'
grouped_dfmne['multi unit'] = grouped_dfmne['2-units rep Units'] +
grouped_dfmne['3-4 units rep Units'] + grouped_dfmne['5+ units rep
Units']


# Display the grouped DataFrame
print(grouped_dfmne)




          Zip Code FIPS Place Code            Place Name Survey
Date  \
0      01001               00840          Agawam Town       2015

1      01001               00840          Agawam Town       2016

2      01001               00840          Agawam Town       2017

3      01001               00840          Agawam Town       2018

4      01001               00840          Agawam Town       2019

...           ...             ...                 ...        ...

27850  19611               83928   West Reading borough     2015

27851  19611               83928   West Reading borough     2016

27852  19611               83928   West Reading borough     2017

27853  19611               83928   West Reading borough     2018

27854  19611               83928   West Reading borough     2019


      2-units rep Units 3-4 units rep Units 5+ units rep Units multi
unit
0                    20                   0                  0
2000
1                     8                   3                 16
8316
2                     2                   0                  0
200
3                     4                   0                  0
400
4                     6                   0                  0
600
...                 ...                 ...                ...
...
27850                 0                   0                  0
000
27851                 0                   0                  0
000
27852                 0                   0                  0
000
27853                 0                   0                  0
000
27854                 0                   0                  0
000

[27855 rows x 8 columns]

grouped_dfmne
```

```
          Zip Code FIPS Place Code           Place Name Survey
Date  \
0      01001                00840          Agawam Town        2015

1      01001                00840          Agawam Town        2016

2      01001                00840          Agawam Town        2017

3      01001                00840          Agawam Town        2018

4      01001                00840          Agawam Town        2019

...            ...             ...                   ...         ...

27850  19611                83928   West Reading borough        2015

27851  19611                83928   West Reading borough        2016

27852  19611                83928   West Reading borough        2017

27853  19611                83928   West Reading borough        2018

27854  19611                83928   West Reading borough        2019


      2-units rep Units 3-4 units rep Units 5+ units rep Units multi
unit
0                    20                  0                  0
2000
1                     8                  3                 16
8316
2                     2                  0                  0
200
3                     4                  0                  0
400
4                     6                  0                  0
600
...                 ...                ...                ...
...
27850                 0                  0                  0
000
27851                 0                  0                  0
000
27852                 0                  0                  0
000
27853                 0                  0                  0
000
27854                 0                  0                  0
000
```

```
[27855 rows x 8 columns]

# Pivot the DataFrame to have years as columns
pivot_dfmne = grouped_dfmne.pivot_table(index=['Zip Code', 'FIPS Place
Code', 'Place Name'], columns='Survey Date', values='multi unit',
fill_value=0)

# Reset the index to have 'Zip Code', 'FIPS Place Code', and 'Place
Name' as columns
pivot_dfmne.reset_index(inplace=True)

# Rename the columns
pivot_dfmne.columns = ['Zip Code', 'FIPS Place Code', 'Place Name',
'2015', '2016', '2017', '2018', '2019']


# Display the pivot DataFrame
print(pivot_dfmne)

         Zip Code FIPS Place Code                 Place Name  2015
2016  \
0     01001                00840                 Agawam Town  2000
8316
1     01002                00000                Amherst town     0
0
2     01002                00000                 Pelham town     0
0
3     01005                00000                  Barre town   200
200
4     01007                00000            Belchertown town     0
0
...           ...              ...                        ...   ...   .
..
5970  19608                00000   South Heidelberg township     0
0
5971  19608                00000             Spring township     0
0
5972  19608                70880      Sinking Spring borough     0
0
5973  19610                86880          Wyomissing borough     0
0
5974  19611                83928        West Reading borough     0
0

      2017   2018  2019
0      200    400   600
1        0  80126     0
2        0      0     0
3        0      0     0
```

```
4        0      0     0
...    ...    ...   ...
5970     0      0     0
5971   400      0   210
5972     0      0     0
5973     0     84     0
5974     0      0     0

[5975 rows x 8 columns]
```

```
pivot_dfmne
```

```
         Zip Code FIPS Place Code                 Place Name  2015
2016  \
0     01001                00840                 Agawam Town  2000
8316
1     01002                00000                Amherst town     0
0
2     01002                00000                 Pelham town     0
0
3     01005                00000                  Barre town   200
200
4     01007                00000            Belchertown town     0
0
...           ...             ...                        ...   ...   .
..
5970  19608                00000   South Heidelberg township     0
0
5971  19608                00000             Spring township     0
0
5972  19608                70880      Sinking Spring borough     0
0
5973  19610                86880          Wyomissing borough     0
0
5974  19611                83928        West Reading borough     0
0

      2017   2018  2019
0      200    400   600
1        0  80126     0
2        0      0     0
3        0      0     0
4        0      0     0
...    ...    ...   ...
5970     0      0     0
5971   400      0   210
5972     0      0     0
5973     0     84     0
```

```
5974     0      0     0

[5975 rows x 8 columns]
```

```python
#extra
import pandas as pd

# Assuming you have the 'grouped_dfmne' DataFrame

# List of unique survey years in the dataset
survey_years = ['2015', '2016', '2017', '2018', '2019']

# Initialize an empty DataFrame to store the pivoted data
pivoted_dfsne = []

# Loop through each survey year and pivot the DataFrame
for year in survey_years:
    # Filter the DataFrame for the current year
    filtered_dfne = grouped_dfmne[grouped_dfmne['Survey Date'] ==
year]

    # Pivot the filtered DataFrame
    pivot_dfne = filtered_dfne.pivot_table(index=['Zip Code', 'FIPS
Place Code', 'Place Name'],
                                       columns='Survey Date',
values='multi unit', fill_value=0)

    # Reset the index to have 'Zip Code', 'FIPS Place Code', and
'Place Name' as columns
    pivot_dfne.reset_index(inplace=True)

    # Rename the columns
    pivot_dfne.columns = ['Zip Code', 'FIPS Place Code', 'Place Name',
year]

    # Append the pivoted DataFrame to the list
    pivoted_dfsne.append(pivot_dfne)

# Merge the individual pivoted DataFrames on 'Zip Code', 'FIPS Place
Code', and 'Place Name'
final_pivot_dfne = pivoted_dfsne[0]
for i in range(1, len(pivoted_dfsne)):
    final_pivot_dfne = final_pivot_dfne.merge(pivoted_dfsne[i],
on=['Zip Code', 'FIPS Place Code', 'Place Name'], how='outer')


# Display the final pivoted DataFrame
print(final_pivot_dfne)
```

```
         Zip Code FIPS Place Code            Place Name    2015
2016  \
0     01001                00840            Agawam Town  2000.0
8316.0
1     01002                00000           Amherst town     0.0
0.0
2     01002                00000            Pelham town     0.0
0.0
3     01005                00000             Barre town   200.0
200.0
4     01007                00000       Belchertown town     0.0
0.0
...           ...             ...                   ...     ...     ..
.
5970  18801                00000   Forest Lake township     NaN
NaN
5971  18854                00000         Wysox township     NaN
NaN
5972  19018                15432         Colwyn borough     NaN
NaN
5973  193204950            00000   Londonderry township     NaN
NaN
5974  19526                00000   Charlestown township     NaN
NaN

       2017     2018   2019
0     200.0    400.0  600.0
1       0.0  80126.0    0.0
2       0.0      0.0    0.0
3       0.0      0.0    0.0
4       0.0      0.0    0.0
...     ...      ...    ...
5970    NaN      NaN    0.0
5971    NaN      NaN    0.0
5972    NaN      NaN    0.0
5973    NaN      NaN  400.0
5974    NaN      NaN   80.0

[5975 rows x 8 columns]
```

```
#extra
final_pivot_dfne
```

```
         Zip Code FIPS Place Code            Place Name    2015
2016  \
0     01001                00840            Agawam Town  2000.0
8316.0
1     01002                00000           Amherst town     0.0
0.0
2     01002                00000            Pelham town     0.0
0.0
3     01005                00000             Barre town   200.0
```

```
200.0
4     01007                00000       Belchertown town     0.0
0.0
...            ...             ...                   ...     ...     ..
.
5970  18801                00000   Forest Lake township     NaN
NaN
5971  18854                00000         Wysox township     NaN
NaN
5972  19018                15432         Colwyn borough     NaN
NaN
5973  193204950            00000   Londonderry township     NaN
NaN
5974  19526                00000   Charlestown township     NaN
NaN

       2017     2018   2019
0     200.0    400.0  600.0
1       0.0  80126.0    0.0
2       0.0      0.0    0.0
3       0.0      0.0    0.0
4       0.0      0.0    0.0
...     ...      ...    ...
5970    NaN      NaN    0.0
5971    NaN      NaN    0.0
5972    NaN      NaN    0.0
5973    NaN      NaN  400.0
5974    NaN      NaN   80.0

[5975 rows x 8 columns]
```

South region

Repeating all steps for south region

```
#https://www2.census.gov/econ/bps/Place/Northeast%20Region/ne2015a.txt

dfso1 = pd.read_table("https://www2.census.gov/econ/bps/Place/South
%20Region/so2015a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
```

```
dfso1["Unnamed 41"] = np.nan
dfso1 = dfso1.shift(1, axis=1)
dfso1.Survey = dfso1.index
dfso1.index = np.arange(len(dfso1))

dict_names = {}
second  = dfso1.iloc[0].fillna("")
for i in range(len(dfso1.columns)):
    first = dfso1.columns[i]
    if first.startswith("Unnamed"):
        if dfso1.columns[i-1].startswith("Unnamed"):
            first = dfso1.columns[i+1]
        else:
            first = dfso1.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfso1.columns[i]]= new
dfso1 = dfso1.rename(columns = dict_names).drop([0])

# show the first five records
dfso1.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2015         01     001000         067               0020
2        2015         01     002000         073               0030
3        2015         01     005000         117               0025
4        2015         01     006000         095               0030
5        2015         01     007000         123               0035

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1          00124         00000    2688.0      222     20020
NaN
2          00460         00000    4522.0      142     13820
NaN
3          00820         00000   30352.0      142     13820
NaN
4          00988         00000   21160.0      999     99999
NaN
5          01132         00000   14875.0      999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  36310                 3             6
12
2          NaN  35005                 3             6
12
3          NaN  35007                 3             6
```

```
12
4          NaN  35950                 3              6
12
5          NaN  350110552             3              6
12

       Place Name Place Bldgs 1-unit Units 1-unit Value 2-units Bldgs  
\
1       Abbeville           0            0            0             0

2      Adamsville           1            1       200596             0

3       Alabaster         109          109     33075811             0

4     Albertville           0            0            0             0

5  Alexander City          18           18      4124433             0


  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4 
units Value  \
1             0             0               0               0 
0
2             0             0               0               0 
0
3             0             0               0               0 
0
4             0             0               0               0 
0
5             0             0               0               0 
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                0   
2              0              0              0                1   
3              0              0              0              109   
4              0              0              0                0   
5              0              0              0               18   

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep 
Units  \
1                0                0                 0 
0
2                1           200596                 0 
0
3              109         33075811                 0 
0
4                0                0                 0 
0
5               18          4124433                 0 
```

```
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0

dfso2 = pd.read_table("https://www2.census.gov/econ/bps/Place/South
%20Region/so2016a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfso2["Unnamed 41"] = np.nan
dfso2 = dfso2.shift(1, axis=1)
dfso2.Survey = dfso2.index
dfso2.index = np.arange(len(dfso2))

dict_names = {}
second  = dfso2.iloc[0].fillna("")
for i in range(len(dfso2.columns)):
    first = dfso2.columns[i]
    if first.startswith("Unnamed"):
        if dfso2.columns[i-1].startswith("Unnamed"):
            first = dfso2.columns[i+1]
        else:
            first = dfso2.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfso2.columns[i]]= new
dfso2 = dfso2.rename(columns = dict_names).drop([0])

# show the first five records
dfso2.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2016         01     001000         067              0020
2        2016         01     002000         073              0030
3        2016         01     005000         117              0025
4        2016         01     006000         095              0030
5        2016         01     007000         123              0035

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1          00124         00000    2688.0      222     20020
NaN
2          00460         00000    4522.0      142     13820
NaN
3          00820         00000   30352.0      142     13820
NaN
4          00988         00000   21160.0      999     99999
NaN
5          01132         00000   14875.0      999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  36310                 3             6
0
2          NaN  35005                 3             6
12
3          NaN  35007                 3             6
12
4          NaN  35950                 3             6
12
5          NaN  350110552             3             6
12

       Place Name Place Bldgs 1-unit Units 1-unit Value 2-units Bldgs
\
1       Abbeville           0            0            0             0

2      Adamsville           0            0            0             0

3       Alabaster         132          132     32974365             0

4     Albertville           2            2       404000             0

5  Alexander City          12           12      3607770             0


  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
```

```
0
3             0             0               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                0
2              0              0              0                0
3              0              0              0              132
4              0              0              0                2
5              0              0              0               12

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                0                0                 0
0
2                0                0                 0
0
3              132         32974365                 0
0
4                2           404000                 0
0
5               12          3607770                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0

dfso3 = pd.read_table("https://www2.census.gov/econ/bps/Place/South
%20Region/so2017a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfso3["Unnamed 41"] = np.nan
dfso3 = dfso3.shift(1, axis=1)
dfso3.Survey = dfso3.index
dfso3.index = np.arange(len(dfso3))

dict_names = {}
second  = dfso3.iloc[0].fillna("")
for i in range(len(dfso3.columns)):
    first = dfso3.columns[i]
    if first.startswith("Unnamed"):
        if dfso3.columns[i-1].startswith("Unnamed"):
            first = dfso3.columns[i+1]
        else:
            first = dfso3.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfso3.columns[i]]= new
dfso3 = dfso3.rename(columns = dict_names).drop([0])

# show the first five records
dfso3.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2017         01     001000         067              0020
2        2017         01     002000         073              0030
3        2017         01     005000         117              0025
4        2017         01     006000         095              0030
5        2017         01     007000         123              0035

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1          00124         00000    2688.0      222     20020
NaN
2          00460         00000    4522.0      142     13820
NaN
3          00820         00000   30352.0      142     13820
NaN
4          00988         00000   21160.0      999     99999
NaN
5          01132         00000   14875.0      999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  36310                 3             6
```

```
12
2          NaN  35005                 3             6
12
3          NaN  35007                 3             6
12
4          NaN  35950                 3             6
12
5          NaN  350110552             3             6
12

       Place Name Place Bldgs 1-unit Units 1-unit Value 2-units Bldgs
\
1       Abbeville           1            1       350000             0

2      Adamsville           0            0            0             0

3       Alabaster          92           92     22168266             0

4     Albertville          23           23      3707000             0

5  Alexander City          14           14      3247000             0


  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
0
3             0             0               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                1
2              0              0              0                0
3              0              0              0               92
4              0              0              0               23
5              0              0              0               14

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                1           350000                 0
0
2                0                0                 0
0
3               92         22168266                 0
```

```
0
4               23          3707000                 0
0
5               14          3247000                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                   0
0
2                   0                  0                   0
0
3                   0                  0                   0
0
4                   0                  0                   0
0
5                   0                  0                   0
0
```

```
dfso4 = pd.read_table("https://www2.census.gov/econ/bps/Place/South
%20Region/so2018a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfso4["Unnamed 41"] = np.nan
dfso4 = dfso4.shift(1, axis=1)
dfso4.Survey = dfso4.index
dfso4.index = np.arange(len(dfso4))

dict_names = {}
second  = dfso4.iloc[0].fillna("")
for i in range(len(dfso4.columns)):
    first = dfso4.columns[i]
    if first.startswith("Unnamed"):
        if dfso4.columns[i-1].startswith("Unnamed"):
            first = dfso4.columns[i+1]
        else:
            first = dfso4.columns[i-1]
    #          new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfso4.columns[i]]= new
```

```
dfso4 = dfso4.rename(columns = dict_names).drop([0])

# show the first five records
dfso4.head()

  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2018          01     001000          067              0020
2        2018          01     002000          073              0030
3        2018          01     005000          117              0025
4        2018          01     006000          095              0030
5        2018          01     007000          123              0035

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1          00124         00000    2688.0      222     20020
NaN
2          00460         00000    4522.0      142     13820
NaN
3          00820         00000   30352.0      142     13820
NaN
4          00988         00000   21160.0      999     99999
NaN
5          01132         00000   14875.0      999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  36310                 3            6
12
2          NaN  35005                 3            6
8
3          NaN  35007                 3            6
10
4          NaN  35950                 3            6
12
5          NaN  350110552             3            6
12

       Place Name Place Bldgs 1-unit Units 1-unit Value 2-units Bldgs
\
1       Abbeville           0            0            0             0

2      Adamsville           0            0            0             0

3       Alabaster          65           65     19967174             0

4     Albertville          34           34      4997000             0

5  Alexander City          13           13      3177319             0
```

```
  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
0
3             0             0               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                0
2              0              0              0                0
3              0              0              0               52
4              0              0              0               34
5              0              0              0               13

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
Units  \
1                0                0                 0
0
2                0                0                 0
0
3               52         16834702                 0
0
4               34          4997000                 0
0
5               13          3177319                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
```

```
0
5                   0                  0                  0
0
```

```
dfso5 = pd.read_table("https://www2.census.gov/econ/bps/Place/South
%20Region/so2019a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfso5["Unnamed 41"] = np.nan
dfso5 = dfso5.shift(1, axis=1)
dfso5.Survey = dfso5.index
dfso5.index = np.arange(len(dfso5))

dict_names = {}
second  = dfso5.iloc[0].fillna("")
for i in range(len(dfso5.columns)):
    first = dfso5.columns[i]
    if first.startswith("Unnamed"):
        if dfso5.columns[i-1].startswith("Unnamed"):
            first = dfso5.columns[i+1]
        else:
            first = dfso5.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfso5.columns[i]]= new
dfso5 = dfso5.rename(columns = dict_names).drop([0])

# show the first five records
dfso5.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2019         01     001000         067              0020
2        2019         01     002000         073              0030
3        2019         01     005000         117              0025
4        2019         01     006000         095              0030
5        2019         01     007000         123              0035

  FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code Footnote
Code  \
1           00124         00000    2688.0      222     20020
NaN
2           00460         00000    4522.0      142     13820
NaN
3           00820         00000   30352.0      142     13820
NaN
4           00988         00000   21160.0      999     99999
NaN
```

```
5          01132         00000   14875.0      999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  36310                3             6
12
2          NaN  35005                3             6
12
3          NaN  35007                3             6
12
4          NaN  35950                3             6
12
5          NaN  350110552            3             6
12

       Place Name Place Bldgs 1-unit Units 1-unit Value 2-units Bldgs
\
1       Abbeville           0            0            0             0

2      Adamsville           0            0            0             0

3       Alabaster          47           47     15849853             0

4     Albertville          29           29      5553000             0

5  Alexander City          17           17      3637837             0


  2-units Units 2-units Value 3-4 units Bldgs 3-4 units Units 3-4
units Value  \
1             0             0               0               0
0
2             0             0               0               0
0
3             0             0               0               0
0
4             0             0               0               0
0
5             0             0               0               0
0

  5+ units Bldgs 5+ units Units 5+ units Value 1-unit rep Bldgs  \
1              0              0              0                0
2              0              0              0                0
3              0              0              0               47
4              1              5         264000               29
5              0              0              0               17

  1-unit rep Units 1-unit rep Value 2-units rep Bldgs 2-units rep
```

```
Units  \
1                 0                0                 0
0
2                 0                0                 0
0
3                47         15849853                 0
0
4                29          5553000                 0
0
5                17          3637837                 0
0

  2-units rep Value 3-4 units rep Bldgs 3-4 units rep Units  \
1                 0                   0                   0
2                 0                   0                   0
3                 0                   0                   0
4                 0                   0                   0
5                 0                   0                   0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  1                  5
264000
5                   0                  0                  0
0
```

```
vertical_concatso = pd.concat([dfso1,dfso2, dfso3,dfso4,dfso5],
axis=0)

dfso=vertical_concatso
```

```
dfso
```

```
     Survey Date State Code 6-Digit ID County Code Census Place
Code  \
1           2015         01     001000         067              0020

2           2015         01     002000         073              0030
```

```
3           2015         01     005000         117             0025

4           2015         01     006000         095             0030

5           2015         01     007000         123             0035

...          ...        ...        ...         ...              ...

4461        2019         54     577000         079             1730

4462        2019         54     579000         105              NaN

4463        2019         54     583000         107              NaN

4464        2019         54     585000         049             1745

4465        2019         54     587000         109              NaN


     FIPS Place Code FIPS MCD Code     Pop  CSA Code CBSA Code
Footnote Code  \
1             00124         00000    2688.0      222     20020
NaN
2             00460         00000    4522.0      142     13820
NaN
3             00820         00000   30352.0      142     13820
NaN
4             00988         00000   21160.0      999     99999
NaN
5             01132         00000   14875.0      999     99999
NaN
...              ...           ...      ...      ...       ...
...
4461          87988         00000    2301.0      170     26580
NaN
4462          00000         00000    4894.0      425     37620
NaN
4463          99990         00000   40975.0      425     37620
NaN
4464          88708         00000     158.0      999     99999
NaN
4465          99990         00000   20175.0      999     99999
NaN

     Central City     Zip Code Region Code Division Code Number of
Months Rep  \
1             NaN  36310                 3             6
12
2             NaN  35005                 3             6
12
```

```
3             NaN  35007                 3             6
12
4             NaN  35950                 3             6
12
5             NaN  350110552             3             6
12
...           ...          ...         ...           ...
...
4461          NaN  252130596             3             5
12
4462          NaN  26143                 3             5
0
4463          NaN  26101                 3             5
12
4464          NaN  26591                 3             5
0
4465          NaN  24874                 3             5
0

                              Place Name Place Bldgs 1-unit Units  \
1                              Abbeville           0            0
2                             Adamsville           1            1
3                              Alabaster         109          109
4                            Albertville           0            0
5                         Alexander City          18           18
...                                  ...         ...          ...
4461                       Winfield town           3            3
4462                         Wirt County           9            9
4463     Wood County Unincorporated Area          43           43
4464                    Worthington town           0            0
4465  Wyoming County Unincorporated Area           0            0

     1-unit Value 2-units Bldgs 2-units Units 2-units Value 3-4 units
Bldgs  \
1               0             0             0             0
0
2          200596             0             0             0
0
3        33075811             0             0             0
0
4               0             0             0             0
0
5         4124433             0             0             0
0
...           ...           ...           ...           ...
...
4461       495000             0             0             0
0
4462      1368000             0             0             0
```

```
0
4463      9822556             1             2         90000
12
4464            0             0             0             0
0
4465            0             0             0             0
0

     3-4 units Units 3-4 units Value 5+ units Bldgs 5+ units Units  \
1                  0               0              0              0
2                  0               0              0              0
3                  0               0              0              0
4                  0               0              0              0
5                  0               0              0              0
...              ...             ...            ...            ...
4461               0               0              0              0
4462               0               0              0              0
4463              48         3840000              0              0
4464               0               0              0              0
4465               0               0              0              0

     5+ units Value 1-unit rep Bldgs 1-unit rep Units 1-unit rep Value
\
1                 0                0                0                0

2                 0                1                1           200596

3                 0              109              109         33075811

4                 0                0                0                0

5                 0               18               18          4124433

...             ...              ...              ...              ...

4461              0                3                3           495000

4462              0                0                0                0

4463              0               43               43          9822556

4464              0                0                0                0

4465              0                0                0                0


     2-units rep Bldgs 2-units rep Units 2-units rep Value  \
1                    0                 0                 0
2                    0                 0                 0
3                    0                 0                 0
4                    0                 0                 0
```

```
5                    0                 0                 0
...                ...               ...               ...
4461                 0                 0                 0
4462                 0                 0                 0
4463                 1                 2             90000
4464                 0                 0                 0
4465                 0                 0                 0

     3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
1                      0                   0                   0
2                      0                   0                   0
3                      0                   0                   0
4                      0                   0                   0
5                      0                   0                   0
...                  ...                 ...                 ...
4461                   0                   0                   0
4462                   0                   0                   0
4463                  12                  48             3840000
4464                   0                   0                   0
4465                   0                   0                   0

     5+ units rep Bldgs 5+ units rep Units 5+ units rep Value
1                     0                  0                  0
2                     0                  0                  0
3                     0                  0                  0
4                     0                  0                  0
5                     0                  0                  0
...                 ...                ...                ...
4461                  0                  0                  0
4462                  0                  0                  0
4463                  0                  0                  0
4464                  0                  0                  0
4465                  0                  0                  0

[22341 rows x 41 columns]
```

```
dfso=dfso.reset_index()
```

```
# Drop a specific column, e.g., 'Place Name'
dfso = dfso.drop(columns=['index'])
```

```
dfso
```

```
      Survey Date State Code 6-Digit ID County Code Census Place Code
\
0            2015         01     001000         067              0020

1            2015         01     002000         073              0030

2            2015         01     005000         117              0025
```

```
3            2015         01     006000          095             0030

4            2015         01     007000          123             0035

...           ...        ...        ...          ...              ...

22336        2019         54     577000          079             1730

22337        2019         54     579000          105              NaN

22338        2019         54     583000          107              NaN

22339        2019         54     585000          049             1745

22340        2019         54     587000          109              NaN


      FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code
Footnote Code  \
0              00124          00000    2688.0       222     20020
NaN
1              00460          00000    4522.0       142     13820
NaN
2              00820          00000   30352.0       142     13820
NaN
3              00988          00000   21160.0       999     99999
NaN
4              01132          00000   14875.0       999     99999
NaN
...                ...            ...       ...       ...       ...
...
22336          87988          00000    2301.0       170     26580
NaN
22337          00000          00000    4894.0       425     37620
NaN
22338          99990          00000   40975.0       425     37620
NaN
22339          88708          00000     158.0       999     99999
NaN
22340          99990          00000   20175.0       999     99999
NaN

      Central City     Zip Code Region Code Division Code  \
0              NaN  36310                3             6
1              NaN  35005                3             6
2              NaN  35007                3             6
3              NaN  35950                3             6
4              NaN  350110552            3             6
...            ...          ...         ...           ...
22336          NaN  252130596            3             5
```

```
22337          NaN  26143                 3             5
22338          NaN  26101                 3             5
22339          NaN  26591                 3             5
22340          NaN  24874                 3             5

      Number of Months Rep                          Place Name Place
Bldgs  \
0                       12                           Abbeville
0
1                       12                          Adamsville
1
2                       12                           Alabaster
109
3                       12                         Albertville
0
4                       12                      Alexander City
18
...                    ...                                 ...
...
22336                   12                       Winfield town
3
22337                    0                         Wirt County
9
22338                   12     Wood County Unincorporated Area
43
22339                    0                    Worthington town
0
22340                    0  Wyoming County Unincorporated Area
0

      1-unit Units 1-unit Value 2-units Bldgs 2-units Units 2-units
Value  \
0                0            0             0             0
0
1                1       200596             0             0
0
2              109     33075811             0             0
0
3                0            0             0             0
0
4               18      4124433             0             0
0
...            ...          ...           ...           ...
...
22336            3       495000             0             0
0
22337            9      1368000             0             0
0
22338           43      9822556             1             2
```

```
90000
22339            0            0             0             0
0
22340            0            0             0             0
0

      3-4 units Bldgs 3-4 units Units 3-4 units Value 5+ units
Bldgs  \
0                   0               0               0              0

1                   0               0               0              0

2                   0               0               0              0

3                   0               0               0              0

4                   0               0               0              0

...               ...             ...             ...            ...

22336               0               0               0              0

22337               0               0               0              0

22338              12              48         3840000              0

22339               0               0               0              0

22340               0               0               0              0


      5+ units Units 5+ units Value 1-unit rep Bldgs 1-unit rep Units
\
0                  0              0                0                0

1                  0              0                1                1

2                  0              0              109              109

3                  0              0                0                0

4                  0              0               18               18

...              ...            ...              ...              ...

22336              0              0                3                3

22337              0              0                0                0

22338              0              0               43               43
```

```
22339              0              0                0                 0

22340              0              0                0                 0


      1-unit rep Value 2-units rep Bldgs 2-units rep Units 2-units rep
Value  \
0                    0                 0                 0
0
1               200596                 0                 0
0
2             33075811                 0                 0
0
3                    0                 0                 0
0
4              4124433                 0                 0
0
...                ...               ...               ...
...
22336           495000                 0                 0
0
22337                0                 0                 0
0
22338          9822556                 1                 2
90000
22339                0                 0                 0
0
22340                0                 0                 0
0

      3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
0                       0                   0                   0
1                       0                   0                   0
2                       0                   0                   0
3                       0                   0                   0
4                       0                   0                   0
...                   ...                 ...                 ...
22336                   0                   0                   0
22337                   0                   0                   0
22338                  12                  48             3840000
22339                   0                   0                   0
22340                   0                   0                   0

      5+ units rep Bldgs 5+ units rep Units 5+ units rep Value
0                      0                  0                  0
1                      0                  0                  0
2                      0                  0                  0
3                      0                  0                  0
4                      0                  0                  0
...                  ...                ...                ...
```

```
22336                  0                  0                  0
22337                  0                  0                  0
22338                  0                  0                  0
22339                  0                  0                  0
22340                  0                  0                  0

[22341 rows x 41 columns]
```

```python
import pandas as pd

# Assuming your data is in a CSV file named 'data.csv'
dataso = dfso

# Select the columns of interest
selected_columnsso = ['FIPS Place Code','Zip Code','Survey Date', '1-unit rep Units', 'Place Name']

# Extract the desired data
extracted_datasso = dataso[selected_columnsso]



#choosing the column with 1-unit rep unit data
extracted_datasso
```

```
      FIPS Place Code     Zip Code Survey Date 1-unit rep Units  \
0               00124   36310             2015                0
1               00460   35005             2015                1
2               00820   35007             2015              109
3               00988   35950             2015                0
4               01132   350110552         2015               18
...               ...          ...         ...              ...
22336           87988   252130596         2019                3
22337           00000   26143             2019                0
22338           99990   26101             2019               43
22339           88708   26591             2019                0
22340           99990   24874             2019                0

                                Place Name
0                               Abbeville
1                              Adamsville
2                               Alabaster
3                             Albertville
4                          Alexander City
...                                    ...
22336                       Winfield town
22337                         Wirt County
22338     Wood County Unincorporated Area
22339                    Worthington town
22340  Wyoming County Unincorporated Area
```

```
[22341 rows x 5 columns]

# Group by 'Zip Code', 'FIPS Place Code', and 'Place Name', and sum
'1-unit rep Units'
grouped_df1so = extracted_datasso.groupby(['Zip Code', 'FIPS Place
Code', 'Place Name', 'Survey Date'])['1-unit rep
Units'].sum().reset_index()

# Pivot the DataFrame to have years as columns
pivot_df1so = grouped_df1so.pivot_table(index=['Zip Code', 'FIPS Place
Code', 'Place Name'], columns='Survey Date', values='1-unit rep
Units', fill_value=0)

# Reset the index to have 'Zip Code', 'FIPS Place Code', and 'Place
Name' as columns
pivot_df1so.reset_index(inplace=True)

# Rename the columns
pivot_df1so.columns = ['Zip Code', 'FIPS Place Code', 'Place Name',
'2015', '2016', '2017', '2018', '2019']



# Display the pivot DataFrame
print(pivot_df1so)

         Zip Code FIPS Place Code                                  Place
Name  \
0     19709                47030                              Middletown
town
1     19711                50670
Newark
2     19720                50800                                   New
Castle
3     19720                99990   New Castle County Unincorporated
Area
4     197300111            54050                                 Odessa
town
...           ...              ...                                    .
..
4710  79855                75032                                Van Horn
town
4711  79901                24000                                     El
Paso
4712  79927                68636
Socorro
4713  79928                34832                                 Horizon
City
4714  983822530            62804
```

```
Rockport

      2015  2016  2017  2018  2019
0      128   112   158   188   149
1       19    21     8    20    51
2        5     8     1     3     4
3     1021   952   928   837  1046
4        0     0     1     0     0
...    ...   ...   ...   ...   ...
4710     1     3     6     7     8
4711  2282  2014  2020  1588  1873
4712   126    73   173   112   316
4713    68   101    33    45   234
4714    88     0     0     0     0

[4715 rows x 8 columns]

pivot_df1so

         Zip Code FIPS Place Code                             Place
Name  \
0     19709                47030                         Middletown
town
1     19711                50670
Newark
2     19720                50800                              New
Castle
3     19720                99990   New Castle County Unincorporated
Area
4     197300111            54050                             Odessa
town
...           ...             ...                                    .
..
4710  79855                75032                           Van Horn
town
4711  79901                24000                                 El
Paso
4712  79927                68636
Socorro
4713  79928                34832                            Horizon
City
4714  983822530            62804
Rockport

      2015  2016  2017  2018  2019
0      128   112   158   188   149
1       19    21     8    20    51
2        5     8     1     3     4
3     1021   952   928   837  1046
4        0     0     1     0     0
```

```
...    ...   ...   ...   ...   ...
4710     1     3     6     7     8
4711  2282  2014  2020  1588  1873
4712   126    73   173   112   316
4713    68   101    33    45   234
4714    88     0     0     0     0

[4715 rows x 8 columns]

dfso

      Survey Date State Code 6-Digit ID County Code Census Place Code
\
0            2015         01     001000         067              0020

1            2015         01     002000         073              0030

2            2015         01     005000         117              0025

3            2015         01     006000         095              0030

4            2015         01     007000         123              0035

...           ...        ...        ...         ...               ...

22336        2019         54     577000         079              1730

22337        2019         54     579000         105               NaN

22338        2019         54     583000         107               NaN

22339        2019         54     585000         049              1745

22340        2019         54     587000         109               NaN


      FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code
Footnote Code  \
0              00124         00000    2688.0       222     20020
NaN
1              00460         00000    4522.0       142     13820
NaN
2              00820         00000   30352.0       142     13820
NaN
3              00988         00000   21160.0       999     99999
NaN
4              01132         00000   14875.0       999     99999
NaN
...               ...           ...      ...       ...       ...
...
22336          87988         00000    2301.0       170     26580
```

```
NaN
22337          00000         00000    4894.0      425     37620
NaN
22338          99990         00000   40975.0      425     37620
NaN
22339          88708         00000     158.0      999     99999
NaN
22340          99990         00000   20175.0      999     99999
NaN

      Central City     Zip Code Region Code Division Code  \
0               NaN  36310                 3             6
1               NaN  35005                 3             6
2               NaN  35007                 3             6
3               NaN  35950                 3             6
4               NaN  350110552             3             6
...             ...          ...         ...           ...
22336           NaN  252130596             3             5
22337           NaN  26143                 3             5
22338           NaN  26101                 3             5
22339           NaN  26591                 3             5
22340           NaN  24874                 3             5

      Number of Months Rep                          Place Name Place
Bldgs  \
0                       12                           Abbeville
0
1                       12                          Adamsville
1
2                       12                           Alabaster
109
3                       12                         Albertville
0
4                       12                      Alexander City
18
...                    ...                                 ...
...
22336                   12                       Winfield town
3
22337                    0                         Wirt County
9
22338                   12     Wood County Unincorporated Area
43
22339                    0                    Worthington town
0
22340                    0  Wyoming County Unincorporated Area
0

      1-unit Units 1-unit Value 2-units Bldgs 2-units Units 2-units
Value  \
0                0            0             0             0
0
1                1       200596             0             0
0
2              109     33075811             0             0
0
3                0            0             0             0
0
4               18      4124433             0             0
0
...            ...          ...           ...           ...
...
22336            3       495000             0             0
0
22337            9      1368000             0             0
0
22338           43      9822556             1             2
90000
22339            0            0             0             0
0
22340            0            0             0             0
0

      3-4 units Bldgs 3-4 units Units 3-4 units Value 5+ units
Bldgs  \
0                   0               0               0              0

1                   0               0               0              0

2                   0               0               0              0

3                   0               0               0              0

4                   0               0               0              0

...               ...             ...             ...            ...

22336               0               0               0              0

22337               0               0               0              0

22338              12              48         3840000              0

22339               0               0               0              0

22340               0               0               0              0


      5+ units Units 5+ units Value 1-unit rep Bldgs 1-unit rep Units
\
0                        0              0                 0                 0
1                        0              0                 1                 1
2                        0              0               109               109
3                        0              0                 0                 0
4                        0              0                18                18
...                    ...            ...               ...               ...
22336                    0              0                 3                 3
22337                    0              0                 0                 0
22338                    0              0                43                43
22339                    0              0                 0                 0
22340                    0              0                 0                 0

      1-unit rep Value 2-units rep Bldgs 2-units rep Units 2-units rep
Value  \
0                    0                 0                 0
0
1               200596                 0                 0
0
2             33075811                 0                 0
0
3                    0                 0                 0
0
4              4124433                 0                 0
0
...                ...               ...               ...
...
22336           495000                 0                 0
0
22337                0                 0                 0
0
22338          9822556                 1                 2
90000
22339                0                 0                 0
0
22340                0                 0                 0
0

      3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
0                       0                   0                   0
```

```
1                       0                   0                   0
2                       0                   0                   0
3                       0                   0                   0
4                       0                   0                   0
...                   ...                 ...                 ...
22336                   0                   0                   0
22337                   0                   0                   0
22338                  12                  48             3840000
22339                   0                   0                   0
22340                   0                   0                   0

      5+ units rep Bldgs 5+ units rep Units 5+ units rep Value
0                      0                  0                  0
1                      0                  0                  0
2                      0                  0                  0
3                      0                  0                  0
4                      0                  0                  0
...                  ...                ...                ...
22336                  0                  0                  0
22337                  0                  0                  0
22338                  0                  0                  0
22339                  0                  0                  0
22340                  0                  0                  0

[22341 rows x 41 columns]
```

```python
import pandas as pd

# Assuming your data is in a CSV file named 'data.csv'
dataso2 = dfso

# Select the columns of interest
selected_columnsso2 = ['FIPS Place Code','Zip Code','Survey Date', '2-units rep Units','3-4 units rep Units','5+ units rep Units', 'Place Name']

# Extract the desired data
extracted_datamso2 = dataso2[selected_columnsso2]

extracted_datamso2
```

```
      FIPS Place Code     Zip Code Survey Date 2-units rep Units  \
0              00124   36310              2015                 0
1              00460   35005              2015                 0
2              00820   35007              2015                 0
3              00988   35950              2015                 0
4              01132   350110552          2015                 0
...               ...          ...         ...               ...
22336          87988   252130596          2019                 0
22337          00000   26143              2019                 0
```

```
22338          99990   26101              2019                 2
22339          88708   26591              2019                 0
22340          99990   24874              2019                 0

      3-4 units rep Units 5+ units rep Units  \
0                       0                  0
1                       0                  0
2                       0                  0
3                       0                  0
4                       0                  0
...                   ...                ...
22336                   0                  0
22337                   0                  0
22338                  48                  0
22339                   0                  0
22340                   0                  0

                               Place Name
0                               Abbeville
1                              Adamsville
2                               Alabaster
3                             Albertville
4                          Alexander City
...                                   ...
22336                       Winfield town
22337                         Wirt County
22338     Wood County Unincorporated Area
22339                    Worthington town
22340  Wyoming County Unincorporated Area

[22341 rows x 7 columns]
```

```
# Group by 'Zip Code,' 'FIPS Place Code,' 'Place Name,' and 'Survey
Date,' and sum the units columns
grouped_dfmso = extracted_datamso2.groupby(['Zip Code', 'FIPS Place
Code', 'Place Name', 'Survey Date']).agg({
    '2-units rep Units': 'sum',
    '3-4 units rep Units': 'sum',
    '5+ units rep Units': 'sum'
}).reset_index()

# Create a new column 'multi unit' by summing the '2-units rep Units,'
'3-4 units rep Units,' and '5+ units rep Units'
grouped_dfmso['multi unit'] = grouped_dfmso['2-units rep Units'] +
grouped_dfmso['3-4 units rep Units'] + grouped_dfmso['5+ units rep
Units']



# Display the grouped DataFrame
```

```
print(grouped_dfmso)
```

```
          Zip Code FIPS Place Code       Place Name Survey Date  \
0      19709                47030   Middletown town        2015
1      19709                47030   Middletown town        2016
2      19709                47030   Middletown town        2017
3      19709                47030   Middletown town        2018
4      19709                47030   Middletown town        2019
...            ...             ...              ...         ...
22333  79928                34832      Horizon City        2016
22334  79928                34832      Horizon City        2017
22335  79928                34832      Horizon City        2018
22336  79928                34832      Horizon City        2019
22337  983822530            62804          Rockport        2015

      2-units rep Units 3-4 units rep Units 5+ units rep Units multi
unit
0                     4                   0                 96
4096
1                     6                   0                120
60120
2                     4                   0                144
40144
3                     2                   0                 28
2028
4                     6                   0                168
60168
...                 ...                 ...                ...
...
22333                 0                   0                  0
000
22334                 0                   0                  0
000
22335                 0                   0                  0
000
22336                 0                   0                  0
000
22337                 0                   0                  0
000

[22338 rows x 8 columns]
```

```
grouped_dfmso
```

```
          Zip Code FIPS Place Code       Place Name Survey Date  \
0      19709                47030   Middletown town        2015
1      19709                47030   Middletown town        2016
```

```
2      19709                47030   Middletown town        2017
3      19709                47030   Middletown town        2018
4      19709                47030   Middletown town        2019
...          ...              ...             ...           ...
22333  79928                34832      Horizon City        2016
22334  79928                34832      Horizon City        2017
22335  79928                34832      Horizon City        2018
22336  79928                34832      Horizon City        2019
22337  983822530            62804          Rockport        2015

      2-units rep Units 3-4 units rep Units 5+ units rep Units multi
unit
0                      4                    0                  96
4096
1                      6                    0                 120
60120
2                      4                    0                 144
40144
3                      2                    0                  28
2028
4                      6                    0                 168
60168
...                  ...                  ...                 ...
...
22333                  0                    0                   0
000
22334                  0                    0                   0
000
22335                  0                    0                   0
000
22336                  0                    0                   0
000
22337                  0                    0                   0
000

[22338 rows x 8 columns]

# Pivot the DataFrame to have years as columns
pivot_dfmso = grouped_dfmso.pivot_table(index=['Zip Code', 'FIPS Place
Code', 'Place Name'], columns='Survey Date', values='multi unit',
fill_value=0)

# Reset the index to have 'Zip Code', 'FIPS Place Code', and 'Place
Name' as columns
pivot_dfmso.reset_index(inplace=True)

# Rename the columns
pivot_dfmso.columns = ['Zip Code', 'FIPS Place Code', 'Place Name',
'2015', '2016', '2017', '2018', '2019']
```

```python
# Display the pivot DataFrame
print(pivot_dfmso)
```

```
         Zip Code FIPS Place Code                             Place
Name  \
0     19709                47030                         Middletown
town
1     19711                50670
Newark
2     19720                50800                              New
Castle
3     19720                99990   New Castle County Unincorporated
Area
4     197300111            54050                             Odessa
town
...           ...             ...                                    .
..
4710  79855                75032                           Van Horn
town
4711  79901                24000                                 El
Paso
4712  79927                68636
Socorro
4713  79928                34832                            Horizon
City
4714  983822530            62804
Rockport

          2015     2016      2017      2018     2019
0         4096    60120     40144      2028    60168
1            0      224       320         0        0
2            0        0       120         0        0
3          269      120       138         0       60
4            0        0         0         0        0
...        ...      ...       ...       ...      ...
4710         0        0         0         0        0
4711  64361869  8471674  46187664  11822481  4824341
4712        40      600         5      3680   161560
4713         0        0         0         0        0
4714         0        0         0         0        0

[4715 rows x 8 columns]
```

```python
pivot_dfmso
```

```
         Zip Code FIPS Place Code                             Place
Name  \
0     19709                47030                         Middletown
town
1     19711                50670
Newark
2     19720                50800                              New
Castle
3     19720                99990   New Castle County Unincorporated
Area
4     197300111            54050                             Odessa
town
...           ...             ...                                    .
..
4710  79855                75032                           Van Horn
town
4711  79901                24000                                 El
Paso
4712  79927                68636
Socorro
4713  79928                34832                            Horizon
City
4714  983822530            62804
Rockport

          2015     2016      2017      2018     2019
0         4096    60120     40144      2028    60168
1            0      224       320         0        0
2            0        0       120         0        0
3          269      120       138         0       60
4            0        0         0         0        0
...        ...      ...       ...       ...      ...
4710         0        0         0         0        0
4711  64361869  8471674  46187664  11822481  4824341
4712        40      600         5      3680   161560
4713         0        0         0         0        0
4714         0        0         0         0        0

[4715 rows x 8 columns]
```

Repeating all steps for West Region

```
dfwo1 = pd.read_table("https://www2.census.gov/econ/bps/Place/West
%20Region/we2015a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
```

```
dfwo1["Unnamed 41"] = np.nan
dfwo1 = dfwo1.shift(1, axis=1)
dfwo1.Survey = dfwo1.index
dfwo1.index = np.arange(len(dfwo1))

dict_names = {}
second  = dfwo1.iloc[0].fillna("")
for i in range(len(dfwo1.columns)):
    first = dfwo1.columns[i]
    if first.startswith("Unnamed"):
        if dfwo1.columns[i-1].startswith("Unnamed"):
            first = dfwo1.columns[i+1]
        else:
            first = dfwo1.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfwo1.columns[i]]= new
dfwo1 = dfwo1.rename(columns = dict_names).drop([0])

# show the first five records
dfwo1.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2015         02     009000         013              0070
2        2015         02     041000         020              0140
3        2015         02     049000         105              0160
4        2015         02     085000         050              0310
5        2015         02     097000         060               NaN

  FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code Footnote
Code  \
1          01090         00000     1027.0      999     99999
NaN
2          03000         00000   291826.0      999     11260
NaN
3          03440         00000      459.0      999     99999
NaN
4          06520         00000     6080.0      999     99999
NaN
5          99990         00000      997.0      999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  99503                    4             9
0
2            1  995196650                4             9
0
3          NaN  998200189                4             9
```

```
0
4          NaN  99559                  4             9
12
5          NaN  996330189              4             9
12

                  Place Name Place Bldgs 1-unit Units 1-unit Value  \
1                     Akutan           0            0            0
2  Municipality of Anchorage         648          648    202797264
3                     Angoon           0            0            0
4                     Bethel           6            6      1300000
5        Bristol Bay Borough           3            3       401500

  2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs 3-4 units
Units  \
1             0             0             0               0
0
2             1             2        322399              12
36
3             0             0             0               0
0
4             2             4        700000               0
0
5             0             0             0               0
0

  3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1               0              0              0              0
2         6272178             17            148       23398143
3               0              0              0              0
4               0              0              0              0
5               0              0              0              0

  1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep Bldgs
\
1                0                0                0                 0

2                0                0                0                 0

3                0                0                0                 0

4                6                6          1300000                 2

5                3                3           401500                 0


  2-units rep Units 2-units rep Value 3-4 units rep Bldgs 3-4 units
rep Units  \
1                 0                 0                    0
0
```

```
2                 0                 0                   0
0
3                 0                 0                   0
0
4                 4            700000                   0
0
5                 0                 0                   0
0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0

dfwo2 = pd.read_table("https://www2.census.gov/econ/bps/Place/West
%20Region/we2016a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfwo2["Unnamed 41"] = np.nan
dfwo2 = dfwo2.shift(1, axis=1)
dfwo2.Survey = dfwo2.index
dfwo2.index = np.arange(len(dfwo2))

dict_names = {}
second  = dfwo2.iloc[0].fillna("")
for i in range(len(dfwo2.columns)):
    first = dfwo2.columns[i]
    if first.startswith("Unnamed"):
        if dfwo2.columns[i-1].startswith("Unnamed"):
            first = dfwo2.columns[i+1]
        else:
            first = dfwo2.columns[i-1]
    #          new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfwo2.columns[i]]= new
dfwo2 = dfwo2.rename(columns = dict_names).drop([0])

# show the first five records
dfwo2.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2016         02     009000         013              0070
2        2016         02     041000         020              0140
3        2016         02     049000         105              0160
4        2016         02     085000         050              0310
5        2016         02     097000         060               NaN

  FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code Footnote
Code  \
1           01090         00000     1027.0       999     99999
NaN
2           03000         00000   291826.0       999     11260
NaN
3           03440         00000      459.0       999     99999
2
4           06520         00000     6080.0       999     99999
NaN
5           99990         00000      997.0       999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  99503                 4             9
1
2            1  995196650             4             9
0
3          NaN  998200189             4             9
12
4          NaN  99559                 4             9
12
5          NaN  996330189             4             9
12

                  Place Name Place Bldgs 1-unit Units 1-unit Value  \
1                     Akutan           0            0            0
2  Municipality of Anchorage         719          719    225284620
3                     Angoon           0            0            0
4                     Bethel           6            6      1800000
5        Bristol Bay Borough           2            2       450000

  2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs 3-4 units
Units  \
1             0             0             0               0
0
2             0             0             0              12
37
3             0             0             0               0
0
4             1             2        450000               0
0
```

```
5             0             0             0               0
0

  3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1               0              0              0              0
2         6422957             18            174       27508629
3               0              0              0              0
4               0              0              0              0
5               0              0              0              0

  1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep Bldgs
\
1                0                0                0                 0

2                0                0                0                 0

3                0                0                0                 0

4                6                6          1800000                 1

5                2                2           450000                 0


  2-units rep Units 2-units rep Value 3-4 units rep Bldgs 3-4 units
rep Units  \
1                 0                 0                   0
0
2                 0                 0                   0
0
3                 0                 0                   0
0
4                 2            450000                   0
0
5                 0                 0                   0
0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

```
dfwo3 = pd.read_table("https://www2.census.gov/econ/bps/Place/West
%20Region/we2017a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfwo3["Unnamed 41"] = np.nan
dfwo3 = dfwo3.shift(1, axis=1)
dfwo3.Survey = dfwo3.index
dfwo3.index = np.arange(len(dfwo3))

dict_names = {}
second  = dfwo3.iloc[0].fillna("")
for i in range(len(dfwo3.columns)):
    first = dfwo3.columns[i]
    if first.startswith("Unnamed"):
        if dfwo3.columns[i-1].startswith("Unnamed"):
            first = dfwo3.columns[i+1]
        else:
            first = dfwo3.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfwo3.columns[i]]= new
dfwo3 = dfwo3.rename(columns = dict_names).drop([0])

# show the first five records
dfwo3.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1         2017         02     009000         013              0070
2         2017         02     041000         020              0140
3         2017         02     049000         105              0160
4         2017         02     085000         050              0310
5         2017         02     097000         060               NaN

  FIPS Place Code FIPS MCD Code       Pop  CSA Code CBSA Code Footnote
Code  \
1           01090         00000    1027.0       999     99999
NaN
2           03000         00000  291826.0       999     11260
NaN
3           03440         00000     459.0       999     99999
2
4           06520         00000    6080.0       999     99999
NaN
5           99990         00000     997.0       999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
```

```
Rep  \
1          NaN  99503                4             9
12
2            1  995196650            4             9
0
3          NaN  998200189            4             9
0
4          NaN  99559                4             9
12
5          NaN  996330189            4             9
11

                  Place Name Place Bldgs 1-unit Units 1-unit Value  \
1                     Akutan           0            0            0
2  Municipality of Anchorage         800          800    250599715
3                     Angoon           0            0            0
4                     Bethel          15           15      3522104
5         Bristol Bay Borough          0            0            0

  2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs 3-4 units
Units  \
1             0             0             0               0
0
2             0             0             0              14
47
3             0             0             0               0
0
4             0             0             0               0
0
5             0             0             0               0
0

  3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1               0              0              0              0
2         8165231             19            172       27192436
3               0              0              0              0
4               0              0              0              0
5               0              0              0              0

  1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep Bldgs
\
1                0                0                0                 0

2                0                0                0                 0

3                0                0                0                 0

4               15               15          3522104                 0

5                0                0                0                 0
```

```
  2-units rep Units 2-units rep Value 3-4 units rep Bldgs 3-4 units
rep Units  \
1                 0                 0                   0
0
2                 0                 0                   0
0
3                 0                 0                   0
0
4                 0                 0                   0
0
5                 0                 0                   0
0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

```
dfwo4 = pd.read_table("https://www2.census.gov/econ/bps/Place/West
%20Region/we2018a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfwo4["Unnamed 41"] = np.nan
dfwo4 = dfwo4.shift(1, axis=1)
dfwo4.Survey = dfwo4.index
dfwo4.index = np.arange(len(dfwo4))

dict_names = {}
second  = dfwo4.iloc[0].fillna("")
for i in range(len(dfwo4.columns)):
    first = dfwo4.columns[i]
    if first.startswith("Unnamed"):
        if dfwo4.columns[i-1].startswith("Unnamed"):
            first = dfwo4.columns[i+1]
        else:
            first = dfwo4.columns[i-1]
    #          new = first+second[i]
    # else:
```

```
    new = first+" "+second[i]
    dict_names[dfwo4.columns[i]]= new
dfwo4 = dfwo4.rename(columns = dict_names).drop([0])

# show the first five records
dfwo4.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2018         02     009000         013              0070
2        2018         02     041000         020              0140
3        2018         02     049000         105              0160
4        2018         02     085000         050              0310
5        2018         02     097000         060               NaN

  FIPS Place Code FIPS MCD Code       Pop  CSA Code CBSA Code Footnote
Code  \
1           01090         00000    1027.0       999     99999
NaN
2           03000         00000  291826.0       999     11260
NaN
3           03440         00000     459.0       999     99999
2
4           06520         00000    6080.0       999     99999
NaN
5           99990         00000     997.0       999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  99503                 4             9
12
2            1  995196650             4             9
0
3          NaN  998200189             4             9
0
4          NaN  99559                 4             9
12
5          NaN  996330189             4             9
10

                  Place Name Place Bldgs 1-unit Units 1-unit Value  \
1                     Akutan           0            0            0
2  Municipality of Anchorage         869          869    272231334
3                     Angoon           0            0            0
4                     Bethel           1            1       269793
5        Bristol Bay Borough           2            2       310000

  2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs 3-4 units
Units  \
1             0             0             0               0
```

```
0
2             0             0             0              13
48
3             0             0             0               0
0
4             0             0             0               0
0
5             0             0             0               0
0

  3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1               0              0              0              0
2         8337474             19            166       26243863
3               0              0              0              0
4               0              0              0              0
5               0              0              0              0

  1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep Bldgs
\
1                0                0                0                 0

2                0                0                0                 0

3                0                0                0                 0

4                1                1           269793                 0

5                2                2           310000                 0


  2-units rep Units 2-units rep Value 3-4 units rep Bldgs 3-4 units
rep Units  \
1                 0                 0                   0
0
2                 0                 0                   0
0
3                 0                 0                   0
0
4                 0                 0                   0
0
5                 0                 0                   0
0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
```

```
0
4                   0                  0                  0
0
5                   0                  0                  0
0
```

```
dfwo5 = pd.read_table("https://www2.census.gov/econ/bps/Place/West
%20Region/we2019a.txt", sep=",",
                  skipinitialspace=True) #read the online table

# the web data table has some format issue, this block of code is to
address that issue
dfwo5["Unnamed 41"] = np.nan
dfwo5 = dfwo5.shift(1, axis=1)
dfwo5.Survey = dfwo5.index
dfwo5.index = np.arange(len(dfwo5))

dict_names = {}
second  = dfwo5.iloc[0].fillna("")
for i in range(len(dfwo5.columns)):
    first = dfwo5.columns[i]
    if first.startswith("Unnamed"):
        if dfwo5.columns[i-1].startswith("Unnamed"):
            first = dfwo5.columns[i+1]
        else:
            first = dfwo5.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfwo5.columns[i]]= new
dfwo5 = dfwo5.rename(columns = dict_names).drop([0])

# show the first five records
dfwo5.head()
```

```
  Survey Date State Code 6-Digit ID County Code Census Place Code  \
1        2019         02     009000         013              0070
2        2019         02     041000         020              0140
3        2019         02     049000         105              0160
4        2019         02     085000         050              0310
5        2019         02     097000         060               NaN

  FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code Footnote
Code  \
1          01090         00000     1027.0       999     99999
NaN
2          03000         00000   291826.0       999     11260
NaN
3          03440         00000      459.0       999     99999
2
```

```
4          06520         00000     6080.0      999     99999
NaN
5          99990         00000      997.0      999     99999
NaN

  Central City     Zip Code Region Code Division Code Number of Months
Rep  \
1          NaN  99503                 4             9
12
2            1  995196650             4             9
0
3          NaN  998200189             4             9
0
4          NaN  99559                 4             9
12
5          NaN  996330189             4             9
12

                  Place Name Place Bldgs 1-unit Units 1-unit Value  \
1                     Akutan           0            0            0
2  Municipality of Anchorage         838          838    262513354
3                     Angoon           0            0            0
4                     Bethel           8            8      2267366
5        Bristol Bay Borough           8            8       925000

  2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs 3-4 units
Units  \
1             0             0             0               0
0
2             0             0             0              13
48
3             0             0             0               0
0
4             3             6       1037349               1
3
5             0             0             0               0
0

  3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1               0              0              0              0
2         8338126             20            173       27350531
3               0              0              0              0
4          372759              0              0              0
5               0              0              0              0

  1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep Bldgs
\
1                0                0                0                  0

2                0                0                0                  0
```

```
3                0                0                0                 0

4                8                8          2267366                 3

5                8                8           925000                 0


  2-units rep Units 2-units rep Value 3-4 units rep Bldgs 3-4 units
rep Units  \
1                 0                 0                   0
0
2                 0                 0                   0
0
3                 0                 0                   0
0
4                 6           1037349                   1
3
5                 0                 0                   0
0

  3-4 units rep Value 5+ units rep Bldgs 5+ units rep Units 5+ units
rep Value
1                   0                  0                  0
0
2                   0                  0                  0
0
3                   0                  0                  0
0
4              372759                  0                  0
0
5                   0                  0                  0
0
```

```
vertical_concatwo = pd.concat([dfwo1,dfwo2, dfwo3,dfwo4,dfwo5],
axis=0)

dfwo=vertical_concatwo
```

```
dfwo
```

```
     Survey Date State Code 6-Digit ID County Code Census Place
Code  \
1           2015         02     009000         013              0070

2           2015         02     041000         020              0140
```

```
3           2015          02     049000        105               0160

4           2015          02     085000        050               0310

5           2015          02     097000        060                NaN

...          ...         ...        ...        ...                ...

2043        2019          56     457000        037               0465

2044        2019          56     469000        031               0478

2045        2019          56     473000        043               0487

2046        2019          56     477000        005               0490

2047        2019          56     481000        015               0495


     FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code
Footnote Code  \
1             01090         00000     1027.0      999     99999
NaN
2             03000         00000   291826.0      999     11260
NaN
3             03440         00000      459.0      999     99999
NaN
4             06520         00000     6080.0      999     99999
NaN
5             99990         00000      997.0      999     99999
NaN
...              ...           ...       ...      ...       ...
...
2043          81300         00000      451.0      999     99999
NaN
2044          83040         00000     3627.0      999     99999
NaN
2045          84925         00000     5487.0      999     99999
NaN
2046          85015         00000     1807.0      999     99999
NaN
2047          86665         00000      151.0      999     99999
NaN

     Central City     Zip Code Region Code Division Code Number of
Months Rep  \
1             NaN  99503                 4             9
0
2               1  995196650             4             9
```

```
0
3             NaN  998200189             4             9
0
4             NaN  99559                 4             9
12
5             NaN  996330189             4             9
12
...           ...          ...         ...           ...
...
2043          NaN  82336                 4             8
12
2044          NaN  82201                 4             8
0
2045          NaN  82401                 4             8
12
2046          NaN  827320070             4             8
12
2047          NaN  82244                 4             8
12

                     Place Name Place Bldgs 1-unit Units 1-unit Value
\
1                        Akutan           0            0            0

2     Municipality of Anchorage         648          648    202797264

3                        Angoon           0            0            0

4                        Bethel           6            6      1300000

5           Bristol Bay Borough           3            3       401500

...                         ...         ...          ...          ...

2043             Wamsutter town           0            0            0

2044             Wheatland town           2            2       382500

2045                    Worland           1            1       275000

2046                Wright town           0            0            0

2047                 Yoder town           0            0            0


     2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs  \
1                0             0             0               0
2                1             2        322399              12
3                0             0             0               0
4                2             4        700000               0
```

```
5                0             0             0               0
...            ...           ...           ...             ...
2043             0             0             0               0
2044             0             0             0               0
2045             0             0             0               0
2046             0             0             0               0
2047             0             0             0               0

     3-4 units Units 3-4 units Value 5+ units Bldgs 5+ units Units  \
1                  0               0              0              0
2                 36         6272178             17            148
3                  0               0              0              0
4                  0               0              0              0
5                  0               0              0              0
...              ...             ...            ...            ...
2043               0               0              0              0
2044               0               0              0              0
2045               0               0              0              0
2046               0               0              0              0
2047               0               0              0              0

     5+ units Value 1-unit rep Bldgs 1-unit rep Units 1-unit rep Value
\
1                 0                0                0                0

2          23398143                0                0                0

3                 0                0                0                0

4                 0                6                6          1300000

5                 0                3                3           401500

...             ...              ...              ...              ...

2043              0                0                0                0

2044              0                0                0                0

2045              0                1                1           275000

2046              0                0                0                0

2047              0                0                0                0


     2-units rep Bldgs 2-units rep Units 2-units rep Value  \
1                    0                 0                 0
2                    0                 0                 0
3                    0                 0                 0
4                    2                 4            700000
```

```
5                    0                 0                 0
...                ...               ...               ...
2043                 0                 0                 0
2044                 0                 0                 0
2045                 0                 0                 0
2046                 0                 0                 0
2047                 0                 0                 0

     3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
1                      0                   0                   0
2                      0                   0                   0
3                      0                   0                   0
4                      0                   0                   0
5                      0                   0                   0
...                  ...                 ...                 ...
2043                   0                   0                   0
2044                   0                   0                   0
2045                   0                   0                   0
2046                   0                   0                   0
2047                   0                   0                   0

     5+ units rep Bldgs 5+ units rep Units 5+ units rep Value
1                     0                  0                  0
2                     0                  0                  0
3                     0                  0                  0
4                     0                  0                  0
5                     0                  0                  0
...                 ...                ...                ...
2043                  0                  0                  0
2044                  0                  0                  0
2045                  0                  0                  0
2046                  0                  0                  0
2047                  0                  0                  0

[10293 rows x 41 columns]
```

```
dfwo=dfwo.reset_index()

# Drop a specific column, e.g., 'Place Name'
dfwo = dfwo.drop(columns=['index'])

dfwo
```

```
      Survey Date State Code 6-Digit ID County Code Census Place Code
\
0            2015         02     009000         013              0070

1            2015         02     041000         020              0140

2            2015         02     049000         105              0160
```

```
3            2015         02     085000         050              0310
4            2015         02     097000         060               NaN
...           ...        ...        ...         ...               ...
10288        2019         56     457000         037              0465
10289        2019         56     469000         031              0478
10290        2019         56     473000         043              0487
10291        2019         56     477000         005              0490
10292        2019         56     481000         015              0495

      FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code  \
0               01090         00000   1027.0       999     99999
1               03000         00000 291826.0       999     11260
2               03440         00000    459.0       999     99999
3               06520         00000   6080.0       999     99999
4               99990         00000    997.0       999     99999
...               ...           ...      ...       ...       ...
10288           81300         00000    451.0       999     99999
10289           83040         00000   3627.0       999     99999
10290           84925         00000   5487.0       999     99999
10291           85015         00000   1807.0       999     99999
10292           86665         00000    151.0       999     99999

      Footnote Code Central City     Zip Code Region Code Division
Code  \
0               NaN          NaN  99503                   4
9
1               NaN            1  995196650               4
9
2               NaN          NaN  998200189               4
9
3               NaN          NaN  99559                   4
9
4               NaN          NaN  996330189               4
9
...             ...          ...          ...         ...           ..
.
10288           NaN          NaN  82336                   4
8
10289           NaN          NaN  82201                   4
8
10290           NaN          NaN  82401                   4
8
```

```
10291           NaN          NaN  827320070             4
8
10292           NaN          NaN  82244                 4
8

      Number of Months Rep                 Place Name Place Bldgs  \
0                        0                     Akutan           0
1                        0  Municipality of Anchorage         648
2                        0                     Angoon           0
3                       12                     Bethel           6
4                       12        Bristol Bay Borough           3
...                    ...                        ...         ...
10288                   12             Wamsutter town           0
10289                    0             Wheatland town           2
10290                   12                    Worland           1
10291                   12                Wright town           0
10292                   12                 Yoder town           0

      1-unit Units 1-unit Value 2-units Bldgs 2-units Units 2-units
Value  \
0                0            0             0             0
0
1              648    202797264             1             2
322399
2                0            0             0             0
0
3                6      1300000             2             4
700000
4                3       401500             0             0
0
...            ...          ...           ...           ...
...
10288            0            0             0             0
0
10289            2       382500             0             0
0
10290            1       275000             0             0
0
10291            0            0             0             0
0
10292            0            0             0             0
0

      3-4 units Bldgs 3-4 units Units 3-4 units Value 5+ units
Bldgs  \
0                   0               0               0              0

1                  12              36         6272178             17

2                   0               0               0              0
```

```
3                   0               0               0              0
4                   0               0               0              0
...               ...             ...             ...            ...
10288               0               0               0              0
10289               0               0               0              0
10290               0               0               0              0
10291               0               0               0              0
10292               0               0               0              0

      5+ units Units 5+ units Value 1-unit rep Bldgs 1-unit rep Units
\
0                  0              0                0                0
1                148       23398143                0                0
2                  0              0                0                0
3                  0              0                6                6
4                  0              0                3                3
...              ...            ...              ...              ...
10288              0              0                0                0
10289              0              0                0                0
10290              0              0                1                1
10291              0              0                0                0
10292              0              0                0                0

      1-unit rep Value 2-units rep Bldgs 2-units rep Units 2-units rep
Value  \
0                    0                 0                 0
0
1                    0                 0                 0
0
2                    0                 0                 0
0
```

```
3              1300000                 2                 4
700000
4               401500                 0                 0
0
...                ...               ...               ...
...
10288                0                 0                 0
0
10289                0                 0                 0
0
10290           275000                 0                 0
0
10291                0                 0                 0
0
10292                0                 0                 0
0

      3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
0                       0                   0                   0
1                       0                   0                   0
2                       0                   0                   0
3                       0                   0                   0
4                       0                   0                   0
...                   ...                 ...                 ...
10288                   0                   0                   0
10289                   0                   0                   0
10290                   0                   0                   0
10291                   0                   0                   0
10292                   0                   0                   0

      5+ units rep Bldgs 5+ units rep Units 5+ units rep Value
0                      0                  0                  0
1                      0                  0                  0
2                      0                  0                  0
3                      0                  0                  0
4                      0                  0                  0
...                  ...                ...                ...
10288                  0                  0                  0
10289                  0                  0                  0
10290                  0                  0                  0
10291                  0                  0                  0
10292                  0                  0                  0

[10293 rows x 41 columns]
```

```
import pandas as pd

# Assuming your data is in a CSV file named 'data.csv'
datawo = dfwo
```

```
# Select the columns of interest
selected_columnswo = ['FIPS Place Code','Zip Code','Survey Date', '1-unit rep Units', 'Place Name']

# Extract the desired data
extracted_dataswo = dataso[selected_columnswo]






#choosing the column with 1-unit rep unit data
extracted_dataswo

      FIPS Place Code     Zip Code Survey Date 1-unit rep Units  \
0              00124   36310              2015                0
1              00460   35005              2015                1
2              00820   35007              2015              109
3              00988   35950              2015                0
4              01132   350110552          2015               18
...               ...          ...         ...              ...
22336          87988   252130596          2019                3
22337          00000   26143              2019                0
22338          99990   26101              2019               43
22339          88708   26591              2019                0
22340          99990   24874              2019                0

                               Place Name
0                               Abbeville
1                              Adamsville
2                               Alabaster
3                             Albertville
4                          Alexander City
...                                   ...
22336                       Winfield town
22337                         Wirt County
22338     Wood County Unincorporated Area
22339                    Worthington town
22340  Wyoming County Unincorporated Area

[22341 rows x 5 columns]

# Group by 'Zip Code', 'FIPS Place Code', and 'Place Name', and sum '1-unit rep Units'
grouped_df1wo = extracted_dataswo.groupby(['Zip Code', 'FIPS Place Code', 'Place Name', 'Survey Date'])['1-unit rep Units'].sum().reset_index()

# Pivot the DataFrame to have years as columns
```

```
pivot_df1wo = grouped_df1wo.pivot_table(index=['Zip Code', 'FIPS Place
Code', 'Place Name'], columns='Survey Date', values='1-unit rep
Units', fill_value=0)

# Reset the index to have 'Zip Code', 'FIPS Place Code', and 'Place
Name' as columns
pivot_df1wo.reset_index(inplace=True)

# Rename the columns
pivot_df1wo.columns = ['Zip Code', 'FIPS Place Code', 'Place Name',
'2015', '2016', '2017', '2018', '2019']



# Display the pivot DataFrame
print(pivot_df1wo)
```

```
         Zip Code FIPS Place Code                             Place
Name  \
0     19709                47030                         Middletown
town
1     19711                50670
Newark
2     19720                50800                              New
Castle
3     19720                99990   New Castle County Unincorporated
Area
4     197300111            54050                             Odessa
town
...           ...             ...                                  .
..
4710  79855                75032                           Van Horn
town
4711  79901                24000                                 El
Paso
4712  79927                68636
Socorro
4713  79928                34832                            Horizon
City
4714  983822530            62804
Rockport

      2015  2016  2017  2018  2019
0      128   112   158   188   149
1       19    21     8    20    51
2        5     8     1     3     4
3     1021   952   928   837  1046
4        0     0     1     0     0
...    ...   ...   ...   ...   ...
4710     1     3     6     7     8
```

```
4711  2282  2014  2020  1588  1873
4712   126    73   173   112   316
4713    68   101    33    45   234
4714    88     0     0     0     0

[4715 rows x 8 columns]

pivot_df1wo

         Zip Code FIPS Place Code                             Place
Name  \
0     19709                 47030                        Middletown
town
1     19711                 50670
Newark
2     19720                 50800                             New
Castle
3     19720                 99990   New Castle County Unincorporated
Area
4     197300111             54050                            Odessa
town
...           ...             ...                                  .
..
4710  79855                 75032                          Van Horn
town
4711  79901                 24000                                El
Paso
4712  79927                 68636
Socorro
4713  79928                 34832                           Horizon
City
4714  983822530             62804
Rockport

      2015  2016  2017  2018  2019
0      128   112   158   188   149
1       19    21     8    20    51
2        5     8     1     3     4
3     1021   952   928   837  1046
4        0     0     1     0     0
...    ...   ...   ...   ...   ...
4710     1     3     6     7     8
4711  2282  2014  2020  1588  1873
4712   126    73   173   112   316
4713    68   101    33    45   234
4714    88     0     0     0     0

[4715 rows x 8 columns]

dfwo
```

```
      Survey Date State Code 6-Digit ID County Code Census Place Code
\
0            2015          02     009000          013              0070

1            2015          02     041000          020              0140

2            2015          02     049000          105              0160

3            2015          02     085000          050              0310

4            2015          02     097000          060               NaN

...           ...         ...        ...          ...               ...

10288        2019          56     457000          037              0465

10289        2019          56     469000          031              0478

10290        2019          56     473000          043              0487

10291        2019          56     477000          005              0490

10292        2019          56     481000          015              0495


      FIPS Place Code FIPS MCD Code      Pop  CSA Code CBSA Code  \
0               01090         00000    1027.0      999     99999
1               03000         00000  291826.0      999     11260
2               03440         00000     459.0      999     99999
3               06520         00000    6080.0      999     99999
4               99990         00000     997.0      999     99999
...               ...           ...       ...      ...       ...
10288           81300         00000     451.0      999     99999
10289           83040         00000    3627.0      999     99999
10290           84925         00000    5487.0      999     99999
10291           85015         00000    1807.0      999     99999
10292           86665         00000     151.0      999     99999

      Footnote Code Central City     Zip Code Region Code Division
Code  \
0               NaN          NaN  99503                 4
9
1               NaN            1  995196650             4
9
2               NaN          NaN  998200189             4
9
3               NaN          NaN  99559                 4
9
4               NaN          NaN  996330189             4
9
...             ...          ...          ...         ...           ..
```

```
.
10288           NaN          NaN  82336                 4
8
10289           NaN          NaN  82201                 4
8
10290           NaN          NaN  82401                 4
8
10291           NaN          NaN  827320070             4
8
10292           NaN          NaN  82244                 4
8

      Number of Months Rep                 Place Name Place Bldgs  \
0                         0                    Akutan            0
1                         0  Municipality of Anchorage         648
2                         0                    Angoon            0
3                        12                    Bethel            6
4                        12       Bristol Bay Borough            3
...                     ...                        ...         ...
10288                    12            Wamsutter town            0
10289                     0            Wheatland town            2
10290                    12                   Worland            1
10291                    12               Wright town            0
10292                    12                Yoder town            0

      1-unit Units 1-unit Value 2-units Bldgs 2-units Units 2-units
Value  \
0                0            0             0             0
0
1              648    202797264             1             2
322399
2                0            0             0             0
0
3                6      1300000             2             4
700000
4                3       401500             0             0
0
...            ...          ...           ...           ...
...
10288            0            0             0             0
0
10289            2       382500             0             0
0
10290            1       275000             0             0
0
10291            0            0             0             0
0
10292            0            0             0             0
0
```

```
      3-4 units Bldgs 3-4 units Units 3-4 units Value 5+ units
Bldgs  \
0                    0               0               0              0
1                   12              36         6272178             17
2                    0               0               0              0
3                    0               0               0              0
4                    0               0               0              0
...                ...             ...             ...            ...
10288                0               0               0              0
10289                0               0               0              0
10290                0               0               0              0
10291                0               0               0              0
10292                0               0               0              0

      5+ units Units 5+ units Value 1-unit rep Bldgs 1-unit rep Units
\
0                   0              0                 0                 0
1                 148       23398143                 0                 0
2                   0              0                 0                 0
3                   0              0                 6                 6
4                   0              0                 3                 3
...               ...            ...               ...               ...
10288               0              0                 0                 0
10289               0              0                 0                 0
10290               0              0                 1                 1
10291               0              0                 0                 0
10292               0              0                 0                 0

      1-unit rep Value 2-units rep Bldgs 2-units rep Units 2-units rep
Value  \
0                    0                 0                 0
0
1                    0                 0                 0
0
2                    0                 0                 0
0
3              1300000                 2                 4
700000
4               401500                 0                 0
0
...                ...               ...               ...
...
10288                0                 0                 0
0
10289                0                 0                 0
0
10290           275000                 0                 0
0
10291                0                 0                 0
0
10292                0                 0                 0
0

      3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
0                       0                   0                   0
1                       0                   0                   0
2                       0                   0                   0
3                       0                   0                   0
4                       0                   0                   0
...                   ...                 ...                 ...
10288                   0                   0                   0
10289                   0                   0                   0
10290                   0                   0                   0
10291                   0                   0                   0
10292                   0                   0                   0

      5+ units rep Bldgs 5+ units rep Units 5+ units rep Value
0                      0                  0                  0
1                      0                  0                  0
2                      0                  0                  0
3                      0                  0                  0
4                      0                  0                  0
...                  ...                ...                ...
10288                  0                  0                  0
10289                  0                  0                  0
10290                  0                  0                  0
10291                  0                  0                  0
10292                  0                  0                  0

[10293 rows x 41 columns]
```

```
import pandas as pd

# Assuming your data is in a CSV file named 'data.csv'
datawo2 = dfwo

# Select the columns of interest
selected_columnswo2 = ['FIPS Place Code','Zip Code','Survey Date', '2-
units rep Units','3-4 units rep Units','5+ units rep Units', 'Place
Name']

# Extract the desired data
extracted_datamwo2 = datawo2[selected_columnswo2]

extracted_datamwo2
```

```
      FIPS Place Code     Zip Code Survey Date 2-units rep Units  \
0               01090   99503             2015                 0
1               03000   995196650         2015                 0
2               03440   998200189         2015                 0
3               06520   99559             2015                 0
4               99990   996330189         2015                 0
...               ...          ...         ...               ...
10288           81300   82336             2019                 0
10289           83040   82201             2019                 0
10290           84925   82401             2019                 0
10291           85015   827320070         2019                 0
10292           86665   82244             2019                 0

      3-4 units rep Units 5+ units rep Units                 Place
Name
0                       0                  0
Akutan
1                       0                  0  Municipality of
Anchorage
2                       0                  0
Angoon
3                       0                  0
Bethel
4                       0                  0        Bristol Bay
Borough
...                   ...                ...                           ..
.
10288                   0                  0             Wamsutter
town
10289                   0                  0             Wheatland
town
10290                   0                  0
Worland
10291                   0                  0                Wright
town
```

```
10292                   0                  0                 Yoder
town

[10293 rows x 7 columns]

# Group by 'Zip Code,' 'FIPS Place Code,' 'Place Name,' and 'Survey
Date,' and sum the units columns
grouped_dfmwo = extracted_datamwo2.groupby(['Zip Code', 'FIPS Place
Code', 'Place Name', 'Survey Date']).agg({
    '2-units rep Units': 'sum',
    '3-4 units rep Units': 'sum',
    '5+ units rep Units': 'sum'
}).reset_index()

# Create a new column 'multi unit' by summing the '2-units rep Units,'
'3-4 units rep Units,' and '5+ units rep Units'
grouped_dfmwo['multi unit'] = grouped_dfmwo['2-units rep Units'] +
grouped_dfmwo['3-4 units rep Units'] + grouped_dfmwo['5+ units rep
Units']



# Display the grouped DataFrame
print(grouped_dfmwo)




          Zip Code FIPS Place Code                 Place Name Survey
Date  \
0       59007                04300              Bearcreek town
2015
1       59007                04300              Bearcreek town
2016
2       59007                04300              Bearcreek town
2017
3       59007                04300              Bearcreek town
2018
4       59007                04300              Bearcreek town
2019
...            ...             ...                        ...
...
10285   99929                86380   Wrangell city and borough
2015
10286   99929                86380   Wrangell city and borough
2016
10287   99929                86380   Wrangell city and borough
2017
10288   99929                86380   Wrangell city and borough
2018
```

```
10289  99929                86380   Wrangell city and borough
2019

      2-units rep Units 3-4 units rep Units 5+ units rep Units multi
unit
0                     0                   0                  0
000
1                     0                   0                  0
000
2                     0                   0                  0
000
3                     0                   0                  0
000
4                     0                   0                  0
000
...                 ...                 ...                ...
...
10285                 0                   0                  0
000
10286                 0                   0                  0
000
10287                 0                   0                  0
000
10288                 2                   0                  0
200
10289                 0                   0                  0
000

[10290 rows x 8 columns]
```

```
grouped_dfmwo
```

```
          Zip Code FIPS Place Code                 Place Name Survey
Date  \
0      59007                04300             Bearcreek town
2015
1      59007                04300             Bearcreek town
2016
2      59007                04300             Bearcreek town
2017
3      59007                04300             Bearcreek town
2018
4      59007                04300             Bearcreek town
2019
...            ...             ...                        ...
...
10285  99929                86380   Wrangell city and borough
2015
10286  99929                86380   Wrangell city and borough
2016
```

```
10287  99929                86380   Wrangell city and borough
2017
10288  99929                86380   Wrangell city and borough
2018
10289  99929                86380   Wrangell city and borough
2019

      2-units rep Units 3-4 units rep Units 5+ units rep Units multi
unit
0                     0                   0                  0
000
1                     0                   0                  0
000
2                     0                   0                  0
000
3                     0                   0                  0
000
4                     0                   0                  0
000
...                 ...                 ...                ...
...
10285                 0                   0                  0
000
10286                 0                   0                  0
000
10287                 0                   0                  0
000
10288                 2                   0                  0
200
10289                 0                   0                  0
000

[10290 rows x 8 columns]

# Pivot the DataFrame to have years as columns
pivot_dfmwo = grouped_dfmwo.pivot_table(index=['Zip Code', 'FIPS Place
Code', 'Place Name'], columns='Survey Date', values='multi unit',
fill_value=0)

# Reset the index to have 'Zip Code', 'FIPS Place Code', and 'Place
Name' as columns
pivot_dfmwo.reset_index(inplace=True)

# Rename the columns
pivot_dfmwo.columns = ['Zip Code', 'FIPS Place Code', 'Place Name',
'2015', '2016', '2017', '2018', '2019']
```

```python
# Display the pivot DataFrame
print(pivot_dfmwo)
```

```
         Zip Code FIPS Place Code                 Place Name  2015
2016  \
0     59007                04300              Bearcreek town     0
0
1     590116850            06475                  Big Timber     0
0
2     590147789            09475                Bridger town     0
0
3     59019                16825               Columbus town     0
0
4     59029                29575               Fromberg town     0
0
...           ...             ...                        ...   ...   .
..
2143  998400415            70760     Municipality of Skagway   200
0
2144  998410052            76260             Tenakee Springs     0
0
2145  999016059            99990   Ketchikan Gateway Borough   240
600
2146  99921                17740                       Craig   200
230
2147  99929                86380   Wrangell city and borough     0
0

      2017  2018  2019
0        0     0     0
1        0     0   200
2        0     0     0
3        0     0     0
4        0     0     0
...    ...   ...   ...
2143   600  6011  1200
2144     0     0     0
2145   800  1200   670
2146  1200   200   600
2147     0   200     0

[2148 rows x 8 columns]
```

```python
pivot_dfmwo
```

```
         Zip Code FIPS Place Code                 Place Name  2015
2016  \
0     59007                04300              Bearcreek town     0
```

```
0
1     590116850           06475                Big Timber     0
0
2     590147789           09475              Bridger town     0
0
3     59019               16825             Columbus town     0
0
4     59029               29575             Fromberg town     0
0
...           ...             ...                        ...   ...   .
..
2143  998400415           70760     Municipality of Skagway   200
0
2144  998410052           76260             Tenakee Springs     0
0
2145  999016059           99990   Ketchikan Gateway Borough   240
600
2146  99921               17740                       Craig   200
230
2147  99929               86380   Wrangell city and borough     0
0

      2017  2018  2019
0        0     0     0
1        0     0   200
2        0     0     0
3        0     0     0
4        0     0     0
...    ...   ...   ...
2143   600  6011  1200
2144     0     0     0
2145   800  1200   670
2146  1200   200   600
2147     0   200     0

[2148 rows x 8 columns]
```

Concatenating all regions data

```
vertical_concatall = pd.concat([pivot_df, pivot_df1ne,
pivot_df1wo ,pivot_df1so], axis=0)

vertical_concatall=vertical_concatall.reset_index()

vertical_concatall
```

```
       index     Zip Code FIPS Place Code          Place Name  2015
2016  \
0          0  15454                48855              Manilla     0
0
1          1  19372                00000      Tiffin township     0
0
2          2  42112                00000      Milton township    14
11
3          3  43003                00000   Westfield township     0
0
4          4  43011                00000     Hilliar township     9
10
...      ...          ...             ...                 ...   ...
...
23899   4710  79855                75032        Van Horn town     1
3
23900   4711  79901                24000              El Paso  2282
2014
23901   4712  79927                68636              Socorro   126
73
23902   4713  79928                34832         Horizon City    68
101
23903   4714  983822530            62804             Rockport    88
0

       2017  2018  2019
0         0     1     0
1         0     3     0
2        15    11    12
3         0     0     6
4        11    10    14
...     ...   ...   ...
23899     6     7     8
23900  2020  1588  1873
23901   173   112   316
23902    33    45   234
23903     0     0     0

[23904 rows x 9 columns]
```

All regions single unit bps for 2014,2015,2016,2017,2018,2019 and csv for it

```
# Drop a specific column, e.g., 'Place Name'
vertical_concatall = vertical_concatall.drop(columns=['index'])
```

```
# all regions single unit bps for 2014,2015,2016,2017,2018,2019
vertical_concatall
```

```
          Zip Code FIPS Place Code          Place Name  2015  2016
2017  \
0      15454                48855             Manilla     0     0
0
1      19372                00000     Tiffin township     0     0
0
2      42112                00000     Milton township    14    11
15
3      43003                00000  Westfield township     0     0
0
4      43011                00000    Hilliar township     9    10
11
...          ...              ...                 ...   ...   ...   .
..
23899  79855                75032       Van Horn town     1     3
6
23900  79901                24000             El Paso  2282  2014
2020
23901  79927                68636             Socorro   126    73
173
23902  79928                34832        Horizon City    68   101
33
23903  983822530            62804            Rockport    88     0
0

       2018  2019
0         1     0
1         3     0
2        11    12
3         0     6
4        10    14
...     ...   ...
23899     7     8
23900  1588  1873
23901   112   316
23902    45   234
23903     0     0

[23904 rows x 8 columns]
```

Building permits for All regions fips place code single unit for 2015,2016,2017,2018,2019 and csv for it

```
# Save the pivot DataFrame to a CSV file
vertical_concatall.to_csv('1building_permitssingleunit
all_grouped_2015-2019.csv', index=False)



vertical_concatallmu = pd.concat([pivot_dfmwo,pivot_dfmso,pivot_dfmne,
pivot_dfm], axis=0)

vertical_concatallmu=vertical_concatallmu.reset_index()
```

Building permits for All regions fips place code multi unit for 2015,2016,2017,2018,2019 and csv for it

```
vertical_concatallmu

       index     Zip Code FIPS Place Code  \
0          0  59007                 04300
1          1  590116850             06475
2          2  590147789             09475
3          3  59019                 16825
4          4  59029                 29575
...      ...          ...             ...
21332   8494  69358                 32830
21333   8495  69360                 42775
21334   8496  693600039             99990
21335   8497  69361                 44245
21336   8498  69367                 52925

                                Place Name  2015  2016  2017  2018
2019
0                           Bearcreek town     0     0     0     0
0
1                               Big Timber     0     0     0     0
200
2                            Bridger town     0     0     0     0
0
```

```
3                            Columbus town     0     0     0     0
0
4                            Fromberg town     0     0     0     0
0
...                                    ...   ...   ...   ...   ...   .
..
21332                      Morrill village     0     0     0     0
0
21333                            Rushville     0     0     0     0
0
21334  Sheridan County Unincorporated Area     0     0     0     0
0
21335                          Scottsbluff     0    12   200     0
0
21336                      Whitney village     0     0     0     0
0

[21337 rows x 9 columns]
```

```
# Drop a specific column, e.g., 'Place Name'
vertical_concatallmu = vertical_concatallmu.drop(columns=['index'])

vertical_concatallmu
```

```
          Zip Code FIPS Place Code                           Place
Name  2015  \
0      59007                04300                        Bearcreek
town     0
1      590116850            04300                            Big
Timber     0
2      590147789            09475                          Bridger
town     0
3      59019                16825                         Columbus
town     0
4      59029                29575                         Fromberg
town     0
...            ...              ...                                  ..
.   ...
21332  69358                32830                       Morrill
village     0
21333  69360                42775
Rushville     0
21334  693600039            99990   Sheridan County Unincorporated
Area     0
21335  69361                44245
Scottsbluff     0
21336  69367                52925                       Whitney
village     0

       2016  2017  2018  2019
```

```
0         0     0     0     0
1         0     0     0   200
2         0     0     0     0
3         0     0     0     0
4         0     0     0     0
...     ...   ...   ...   ...
21332     0     0     0     0
21333     0     0     0     0
21334     0     0     0     0
21335    12   200     0     0
21336     0     0     0     0

[21337 rows x 8 columns]


# Save the pivot DataFrame to a CSV file
vertical_concatallmu.to_csv('2building_permitsmultipleunit
all_grouped_2015-2019.csv', index=False)
```

Gathering county data for all years 2015-2019

County

```
#https://www2.census.gov/econ/bps/County/co2014a.txt

dfco1 =
pd.read_table("https://www2.census.gov/econ/bps/County/co2015a.txt",
sep=",",
                  skipinitialspace=True) #read the online table
                  # the web data table has some format issue, this
block of code is to address that issue
dfco1["Unnamed 41"] = np.nan
dfco1 = dfco1.shift(1, axis=1)
dfco1.Survey = dfco1.index
dfco1.index = np.arange(len(dfco1))

dict_names = {}
second  = dfco1.iloc[0].fillna("")
for i in range(len(dfco1.columns)):
    first = dfco1.columns[i]
    if first.startswith("Unnamed"):
        if dfco1.columns[i-1].startswith("Unnamed"):
            first = dfco1.columns[i+1]
        else:
            first = dfco1.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfco1.columns[i]]= new
dfco1 = dfco1.rename(columns = dict_names).drop([0])

# show the first five records
dfco1.head()

  Survey Date FIPS State FIPS.1 County Region Code Division Code  \
1        2015         01            001           3             6
2        2015         01            003           3             6
3        2015         01            005           3             6
4        2015         01            007           3             6
5        2015         01            009           3             6

                      County Name County Bldgs 1-unit Units 1-unit
Value  \
1  Autauga County                          158          158
39749354
2  Baldwin County                         1622         1622
302576607
3  Barbour County                           10           10
3292300
4  Bibb County                               9            9
2222180
5  Blount County                             9            9
1573173

  2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs 3-4 units
Units  \
1             0             0             0               0
0
2            11            22       2232258              29
109
3             0             0             0               0
0
4             0             0             0               0
0
5             0             0             0               0
0

  3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1               0              0              0              0
2        12724884             31            450       43856188
3               0              0              0              0
4               0              0              0              0
5               0              2             40        3831302

  1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep Bldgs
\
1              158              158         39749354                 0

2             1336             1336        238194418                11

3               10               10          3292300                 0

4                8                8          2108180                 0

5                9                9          1573173                 0


  2-units rep Units 2-units rep Value 3-4 units rep Bldgs 3-4 units
rep Units  \
1                 0                 0                   0
0
2                22           2232258                  29
109
3                 0                 0                   0
0
4                 0                 0                   0
0
5                 0                 0                   0
0

  3-4 units rep Value 5+units rep Bldgs 5+units rep Units 5+units rep
Value
1                   0                 0                 0
0
2            12724884                31               450
43856188
3                   0                 0                 0
0
4                   0                 0                 0
0
5                   0                 2                40
3831302

dfco2 =
pd.read_table("https://www2.census.gov/econ/bps/County/co2016a.txt",
sep=",",
                  skipinitialspace=True) #read the online table
                  # the web data table has some format issue, this
block of code is to address that issue
dfco2["Unnamed 41"] = np.nan
dfco2 = dfco2.shift(1, axis=1)
dfco2.Survey = dfco2.index
dfco2.index = np.arange(len(dfco2))

dict_names = {}
second  = dfco2.iloc[0].fillna("")
```

```
for i in range(len(dfco2.columns)):
    first = dfco2.columns[i]
    if first.startswith("Unnamed"):
        if dfco2.columns[i-1].startswith("Unnamed"):
            first = dfco2.columns[i+1]
        else:
            first = dfco2.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfco2.columns[i]]= new
dfco2 = dfco2.rename(columns = dict_names).drop([0])

# show the first five records
dfco2.head()
```

```
  Survey Date FIPS State FIPS.1 County Region Code Division Code  \
1        2016         01            001           3             6
2        2016         01            003           3             6
3        2016         01            005           3             6
4        2016         01            007           3             6
5        2016         01            009           3             6

                      County Name County Bldgs 1-unit Units 1-unit
Value  \
1  Autauga County                          169          169
45256130
2  Baldwin County                         2137         2137
399000143
3  Barbour County                            3            3
686200
4  Bibb County                              10           10
2355940
5  Blount County                            14           14
2815172

  2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs 3-4 units
Units  \
1             0             0             0               0
0
2            17            34       4525229              37
137
3             0             0             0               0
0
4             0             0             0               0
0
5             0             0             0               0
0

  3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1               0              0              0              0
2        15089250             17            212       71612677
3               0              0              0              0
4               0              0              0              0
5               0              0              0              0

  1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep Bldgs
\
1              169              169         45256130                 0

2             1996             1996        364360481                17

3                3                3           686200                 0

4                0                0                0                 0

5               14               14          2815172                 0


  2-units rep Units 2-units rep Value 3-4 units rep Bldgs 3-4 units
rep Units  \
1                 0                 0                   0
0
2                34           4525229                  37
137
3                 0                 0                   0
0
4                 0                 0                   0
0
5                 0                 0                   0
0

  3-4 units rep Value 5+units rep Bldgs 5+units rep Units 5+units rep
Value
1                   0                 0                 0
0
2            15089250                17               212
71612677
3                   0                 0                 0
0
4                   0                 0                 0
0
5                   0                 0                 0
0

dfco2

     Survey Date FIPS State FIPS.1 County Region Code Division Code  \
1           2016         01           001           3             6
2           2016         01           003           3             6
```

```
3           2016         01           005           3             6
4           2016         01           007           3             6
5           2016         01           009           3             6
...          ...        ...           ...         ...           ...
3035        2016         56           037           4             8
3036        2016         56           039           4             8
3037        2016         56           041           4             8
3038        2016         56           043           4             8
3039        2016         56           045           4             8

                         County Name County Bldgs 1-unit Units 1-unit
Value  \
1     Autauga County                          169          169
45256130
2     Baldwin County                         2137         2137
399000143
3     Barbour County                            3            3
686200
4     Bibb County                              10           10
2355940
5     Blount County                            14           14
2815172
...                              ...          ...          ...
...
3035  Sweetwater County                        70           70
19513641
3036  Teton County                            138          138
223351427
3037  Uinta County                             34           34
8079400
3038  Washakie County                           2            2
200000
3039  Weston County                             3            3
815000

     2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs  \
1                0             0             0               0
2               17            34       4525229              37
3                0             0             0               0
4                0             0             0               0
5                0             0             0               0
...            ...           ...           ...             ...
3035             1             2        290000               0
3036             4             8       5395000               0
3037             0             0             0               0
3038             1             2        200000               0
3039             0             0             0               0

     3-4 units Units 3-4 units Value 5+ units Bldgs 5+ units Units  \
1                  0               0              0              0
```

```
2                137        15089250             17            212
3                  0               0              0              0
4                  0               0              0              0
5                  0               0              0              0
...              ...             ...            ...            ...
3035               0               0              0              0
3036               0               0              2             17
3037               0               0              1             12
3038               0               0              0              0
3039               0               0              0              0

     5+ units Value 1-unit rep Bldgs 1-unit rep Units 1-unit rep Value
\
1                 0              169              169         45256130

2          71612677             1996             1996        364360481

3                 0                3                3           686200

4                 0                0                0                0

5                 0               14               14          2815172

...             ...              ...              ...              ...

3035              0               70               70         19513641

3036        3296081              138              138        223351427

3037         960000               34               34          8079400

3038              0                2                2           200000

3039              0                3                3           815000


     2-units rep Bldgs 2-units rep Units 2-units rep Value  \
1                    0                 0                 0
2                   17                34           4525229
3                    0                 0                 0
4                    0                 0                 0
5                    0                 0                 0
...                ...               ...               ...
3035                 1                 2            290000
3036                 4                 8           5395000
3037                 0                 0                 0
3038                 1                 2            200000
3039                 0                 0                 0

     3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
1                      0                   0                   0
```

```
2                     37                 137           15089250
3                      0                   0                  0
4                      0                   0                  0
5                      0                   0                  0
...                  ...                 ...                ...
3035                   0                   0                  0
3036                   0                   0                  0
3037                   0                   0                  0
3038                   0                   0                  0
3039                   0                   0                  0

     5+units rep Bldgs 5+units rep Units 5+units rep Value
1                    0                 0                 0
2                   17               212          71612677
3                    0                 0                 0
4                    0                 0                 0
5                    0                 0                 0
...                ...               ...               ...
3035                 0                 0                 0
3036                 2                17           3296081
3037                 1                12            960000
3038                 0                 0                 0
3039                 0                 0                 0

[3039 rows x 30 columns]
```

```python
dfco3 =
pd.read_table("https://www2.census.gov/econ/bps/County/co2017a.txt",
sep=",",
                  skipinitialspace=True) #read the online table
                  # the web data table has some format issue, this
block of code is to address that issue
dfco3["Unnamed 41"] = np.nan
dfco3 = dfco3.shift(1, axis=1)
dfco3.Survey = dfco3.index
dfco3.index = np.arange(len(dfco3))

dict_names = {}
second  = dfco3.iloc[0].fillna("")
for i in range(len(dfco3.columns)):
    first = dfco3.columns[i]
    if first.startswith("Unnamed"):
        if dfco3.columns[i-1].startswith("Unnamed"):
            first = dfco3.columns[i+1]
        else:
            first = dfco3.columns[i-1]
    #          new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfco3.columns[i]]= new
```

```
dfco3 = dfco3.rename(columns = dict_names).drop([0])

# show the first five records
dfco3.head()

  Survey Date FIPS State FIPS.1 County Region Code Division Code  \
1        2017         01           001           3             6
2        2017         01           003           3             6
3        2017         01           005           3             6
4        2017         01           007           3             6
5        2017         01           009           3             6

                      County Name County Bldgs 1-unit Units 1-unit
Value  \
1  Autauga County                          188          188
51711467
2  Baldwin County                         2207         2207
449821615
3  Barbour County                            3            3
901000
4  Bibb County                              10           10
2551290
5  Blount County                            18           18
4265412

  2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs 3-4 units
Units  \
1             0             0             0               0
0
2            46            92       4240286              32
98
3             0             0             0               0
0
4             0             0             0               0
0
5             0             0             0               0
0

  3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1               0              0              0              0
2         4034508              3             20        2091690
3               0              0              0              0
4               0              0              0              0
5               0              0              0              0

  1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep Bldgs
\
1              188              188         51711467                 0

2             2160             2160        443998177                46
```

```
3                3                3           901000                 0

4                2                2           490000                 0

5               18               18          4265412                 0


  2-units rep Units 2-units rep Value 3-4 units rep Bldgs 3-4 units
rep Units  \
1                  0                 0                   0
0
2                 92           4240286                  32
98
3                  0                 0                   0
0
4                  0                 0                   0
0
5                  0                 0                   0
0

  3-4 units rep Value 5+units rep Bldgs 5+units rep Units 5+units rep
Value
1                    0                 0                 0
0
2              4034508                 3                20
2091690
3                    0                 0                 0
0
4                    0                 0                 0
0
5                    0                 0                 0
0

import pandas as pd
import numpy as np
dfco4 =
pd.read_table("https://www2.census.gov/econ/bps/County/co2018a.txt",
sep=",",
                  skipinitialspace=True) #read the online table
                  # the web data table has some format issue, this
block of code is to address that issue
dfco4["Unnamed 41"] = np.nan
dfco4 = dfco4.shift(1, axis=1)
dfco4.Survey = dfco4.index
dfco4.index = np.arange(len(dfco4))

dict_names = {}
second  = dfco4.iloc[0].fillna("")
for i in range(len(dfco4.columns)):
    first = dfco4.columns[i]
    if first.startswith("Unnamed"):
        if dfco4.columns[i-1].startswith("Unnamed"):
            first = dfco4.columns[i+1]
        else:
            first = dfco4.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfco4.columns[i]]= new
dfco4 = dfco4.rename(columns = dict_names).drop([0])

# show the first five records
dfco4.head()
```

```
  Survey Date FIPS State FIPS.1 County Region Code Division Code  \
1        2018         01            001           3             6
2        2018         01            003           3             6
3        2018         01            005           3             6
4        2018         01            007           3             6
5        2018         01            009           3             6

                      County Name County Bldgs 1-unit Units 1-unit
Value  \
1  Autauga County                          185          185
56148262
2  Baldwin County                         2459         2459
502077608
3  Barbour County                            6            6
1536900
4  Bibb County                              13           13
2422591
5  Blount County                             7            7
1280871

  2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs 3-4 units
Units  \
1             0             0             0               0
0
2             3             6        393370               3
12
3             0             0             0               0
0
4             0             0             0               0
0
5             0             0             0               1
4

  3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1               0              0              0              0
```

```
2         1870926             28            570      110903040
3               0              0              0              0
4               0              0              0              0
5          223080              0              0              0

  1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep Bldgs
\
1              185              185         56148262                 0

2             2303             2303        463282763                 3

3                6                6          1536900                 0

4                4                4           165500                 0

5                7                7          1280871                 0


  2-units rep Units 2-units rep Value 3-4 units rep Bldgs 3-4 units
rep Units  \
1                 0                 0                   0
0
2                 6            393370                   3
12
3                 0                 0                   0
0
4                 0                 0                   0
0
5                 0                 0                   1
4

  3-4 units rep Value 5+units rep Bldgs 5+units rep Units 5+units rep
Value
1                   0                 0                 0
0
2             1870926                28               570
110903040
3                   0                 0                 0
0
4                   0                 0                 0
0
5              223080                 0                 0
0

dfco5 =
pd.read_table("https://www2.census.gov/econ/bps/County/co2019a.txt",
sep=",",
                  skipinitialspace=True) #read the online table
                  # the web data table has some format issue, this
block of code is to address that issue
```

```
dfco5["Unnamed 41"] = np.nan
dfco5 = dfco5.shift(1, axis=1)
dfco5.Survey = dfco5.index
dfco5.index = np.arange(len(dfco5))

dict_names = {}
second  = dfco5.iloc[0].fillna("")
for i in range(len(dfco5.columns)):
    first = dfco5.columns[i]
    if first.startswith("Unnamed"):
        if dfco5.columns[i-1].startswith("Unnamed"):
            first = dfco5.columns[i+1]
        else:
            first = dfco5.columns[i-1]
    #         new = first+second[i]
    # else:
    new = first+" "+second[i]
    dict_names[dfco5.columns[i]]= new
dfco5 = dfco5.rename(columns = dict_names).drop([0])

# show the first five records
dfco5.head()
```

```
  Survey Date FIPS State FIPS.1 County Region Code Division Code  \
1        2019          01          001           3             6
2        2019          01          003           3             6
3        2019          01          005           3             6
4        2019          01          007           3             6
5        2019          01          009           3             6

                      County Name County Bldgs 1-unit Units 1-unit
Value  \
1  Autauga County                          242          242
69003879
2  Baldwin County                         2740         2740
571399246
3  Barbour County                            9            9
2261600
4  Bibb County                              14           14
2925717
5  Blount County                            25           25
4341017

  2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs 3-4 units
Units  \
1             0             0             0               0
0
2            21            42       5607750               6
22
3             0             0             0               0
```

```
0
4             0             0             0               1
3
5             0             0             0               1
4

  3-4 units Value 5+ units Bldgs 5+ units Units 5+ units Value  \
1               0              0              0              0
2         2574702             10            346       42386042
3               0              0              0              0
4          280000              0              0              0
5          175000              0              0              0

  1-unit rep Bldgs 1-unit rep Units 1-unit rep Value 2-units rep Bldgs
\
1              242              242         69003879                 0

2             2740             2740        571399246                21

3                9                9          2261600                 0

4               14               14          2925717                 0

5               25               25          4341017                 0


  2-units rep Units 2-units rep Value 3-4 units rep Bldgs 3-4 units
rep Units  \
1                 0                 0                   0
0
2                42           5607750                   6
22
3                 0                 0                   0
0
4                 0                 0                   1
3
5                 0                 0                   1
4

  3-4 units rep Value 5+units rep Bldgs 5+units rep Units 5+units rep
Value
1                   0                 0                 0
0
2             2574702                10               346
42386042
3                   0                 0                 0
0
4              280000                 0                 0
0
```

```
5              175000                 0                 0
0
```

Concatenating all years data

```
vertical_concatcounty = pd.concat([dfco1,dfco2, dfco3,dfco4,dfco5],
axis=0)

# Drop a specific column, e.g., 'Place Name'
vertical_concatcounty =vertical_concatcounty.reset_index()

vertical_concatcounty=vertical_concatcounty.drop(columns=['index'])

vertical_concatcounty
```

```
      Survey Date FIPS State FIPS.1 County Region Code Division
Code  \
0            2015         01           001           3             6

1            2015         01           003           3             6

2            2015         01           005           3             6

3            2015         01           007           3             6

4            2015         01           009           3             6

...           ...        ...           ...         ...           ...

15189        2019         56           037           4             8

15190        2019         56           039           4             8

15191        2019         56           041           4             8

15192        2019         56           043           4             8

15193        2019         56           045           4             8


                          County Name County Bldgs 1-unit Units 1-unit
Value  \
0      Autauga County                          158          158
39749354
1      Baldwin County                         1622         1622
302576607
2      Barbour County                           10           10
3292300
3      Bibb County                               9            9
2222180
```

```
4      Blount County                             9            9
1573173
...                               ...          ...          ...
...
15189  Sweetwater County                        68           68
19672418
15190  Teton County                            122          122
185477431
15191  Uinta County                             42           42
8549000
15192  Washakie County                           2            2
415000
15193  Weston County                             0            0
0

      2-units Bldgs 2-units Units 2-units Value 3-4 units Bldgs  \
0                 0             0             0               0
1                11            22       2232258              29
2                 0             0             0               0
3                 0             0             0               0
4                 0             0             0               0
...             ...           ...           ...             ...
15189             0             0             0               0
15190             7            14       4363233               3
15191             0             0             0               0
15192             0             0             0               0
15193             0             0             0               0

      3-4 units Units 3-4 units Value 5+ units Bldgs 5+ units Units  \
0                   0               0              0              0
1                 109        12724884             31            450
2                   0               0              0              0
3                   0               0              0              0
4                   0               0              2             40
...               ...             ...            ...            ...
15189               0               0              0              0
15190               9          349497              2             10
15191               0               0              0              0
15192               0               0              0              0
15193               0               0              0              0

      5+ units Value 1-unit rep Bldgs 1-unit rep Units 1-unit rep
Value  \
0                  0              158              158
39749354
1           43856188             1336             1336
238194418
2                  0               10               10
3292300
3                  0                8                8
```

```
2108180
4            3831302                9                9
1573173
...              ...              ...              ...               ..
.
15189              0               68               68
19672418
15190        2080796               99               99
173455563
15191              0               34               34
6789000
15192              0                2                2
415000
15193              0                0                0
0

      2-units rep Bldgs 2-units rep Units 2-units rep Value  \
0                     0                 0                 0
1                    11                22           2232258
2                     0                 0                 0
3                     0                 0                 0
4                     0                 0                 0
...                 ...               ...               ...
15189                 0                 0                 0
15190                 0                 0                 0
15191                 0                 0                 0
15192                 0                 0                 0
15193                 0                 0                 0

      3-4 units rep Bldgs 3-4 units rep Units 3-4 units rep Value  \
0                       0                   0                   0
1                      29                 109            12724884
2                       0                   0                   0
3                       0                   0                   0
4                       0                   0                   0
...                   ...                 ...                 ...
15189                   0                   0                   0
15190                   0                   0                   0
15191                   0                   0                   0
15192                   0                   0                   0
15193                   0                   0                   0

      5+units rep Bldgs 5+units rep Units 5+units rep Value
0                     0                 0                 0
1                    31               450          43856188
2                     0                 0                 0
3                     0                 0                 0
4                     2                40           3831302
...                 ...               ...               ...
15189                 0                 0                 0
```

```
15190                 0                 0                 0
15191                 0                 0                 0
15192                 0                 0                 0
15193                 0                 0                 0

[15194 rows x 30 columns]
```

```
import pandas as pd


datacounty = vertical_concatcounty

# Select the columns of interest
selected_columnscounty = ['FIPS.1 County','Survey Date', '1-unit rep Units', 'County Name']

# Extract the desired data
extracted_datacounty = datacounty[selected_columnscounty]

extracted_datacounty
```

```
      FIPS.1 County Survey Date 1-unit rep Units  \
0               001        2015              158   
1               003        2015             1336   
2               005        2015               10   
3               007        2015                8   
4               009        2015                9   
...             ...         ...              ...   
15189           037        2019               68   
15190           039        2019               99   
15191           041        2019               34   
15192           043        2019                2   
15193           045        2019                0   

                          County Name  
0      Autauga County
1      Baldwin County
2      Barbour County
3      Bibb County
4      Blount County
...                               ...  
15189  Sweetwater County
15190  Teton County
15191  Uinta County
15192  Washakie County
15193  Weston County

[15194 rows x 4 columns]
```

```
# Group by 'FIPS.1 County', 'Survey Date', 'County Name', and sum '1-unit rep Units'
```

```
grouped_df1county = extracted_datacounty.groupby(['FIPS.1 County',
'Survey Date', 'County Name'])['1-unit rep Units'].sum().reset_index()

# Pivot the DataFrame to have years as columns
pivot_df1county = grouped_df1county.pivot_table(index=['FIPS.1
County', 'County Name'], columns='Survey Date', values='1-unit rep
Units', fill_value=0)

# Reset the index to have 'FIPS.1 County' and 'County Name' as columns
pivot_df1county.reset_index(inplace=True)

# Rename the columns
pivot_df1county.columns = ['FIPS.1 County', 'County Name', '2015',
'2016', '2017', '2018', '2019']

# Display the pivot DataFrame
print(pivot_df1county)
```

```
     FIPS.1 County                     County Name  2015   2016   2017
2018  \
0              000  Maine Unorganized Territory        0    0.0    0.0
0.0
1              000  Michigan Balance of State         51    0.0    0.0
0.0
2              000  Montana Balance of State           0    0.0    0.0
0.0
3              000  New Mexico Balance of State      168    0.0    0.0
0.0
4              000  Oregon Balance of State           49    0.0  162.0
7.0
...            ...                             ...   ...    ...    ...
...
2918           800  Suffolk (Independent City)       362  395.0  514.0
501.0
2919           810  Virginia Beach (Independent Ci   696  768.0  646.0
534.0
2920           820  Waynesboro (Independent City)     43   22.0   31.0
30.0
2921           830  Williamsburg (Independent City    20   49.0   43.0
25.0
2922           840  Winchester (Independent City)     13   25.0   18.0
0.0

       2019
0       0.0
1       0.0
2       0.0
3       0.0
4     402.0
...     ...
```

```
2918  500.0
2919  667.0
2920  100.0
2921   29.0
2922   37.0

[2923 rows x 7 columns]

# Group by 'FIPS.1 County', 'Survey Date', 'County Name', and sum '1-
unit rep Units'
grouped_df1county = extracted_datacounty[['FIPS.1 County', 'Survey
Date', 'County Name', '1-unit rep Units']].groupby(['FIPS.1 County',
'Survey Date', 'County Name'])['1-unit rep Units'].sum().reset_index()

# Pivot the DataFrame to have years as columns
pivot_df1county = grouped_df1county.pivot_table(index=['FIPS.1
County', 'County Name'], columns='Survey Date', values='1-unit rep
Units', fill_value=0)

# Reset the index to have 'FIPS.1 County' and 'County Name' as columns
pivot_df1county.reset_index(inplace=True)

# Rename the columns
pivot_df1county.columns = ['FIPS.1 County', 'County Name', '2015',
'2016', '2017', '2018', '2019']



# Display the pivot DataFrame
print(pivot_df1county)

     FIPS.1 County                      County Name  2015   2016   2017
2018  \
0              000  Maine Unorganized Territory         0    0.0    0.0
0.0
1              000  Michigan Balance of State          51    0.0    0.0
0.0
2              000  Montana Balance of State            0    0.0    0.0
0.0
3              000  New Mexico Balance of State       168    0.0    0.0
0.0
4              000  Oregon Balance of State            49    0.0  162.0
7.0
...            ...                              ...   ...    ...    ...
...
2918           800  Suffolk (Independent City)        362  395.0  514.0
501.0
2919           810  Virginia Beach (Independent Ci   696  768.0  646.0
534.0
2920           820  Waynesboro (Independent City)      43   22.0   31.0
```

```
30.0
2921           830  Williamsburg (Independent City    20   49.0   43.0
25.0
2922           840  Winchester (Independent City)     13   25.0   18.0
0.0

       2019
0       0.0
1       0.0
2       0.0
3       0.0
4     402.0
...     ...
2918  500.0
2919  667.0
2920  100.0
2921   29.0
2922   37.0

[2923 rows x 7 columns]
```

County single units

The Building permits for fips county code for all counties for single units from 2015-2019 and csv file for it

```
pivot_df1county

     FIPS.1 County                     County Name  2015   2016   2017
2018  \
0              000  Maine Unorganized Territory        0    0.0    0.0
0.0
1              000  Michigan Balance of State         51    0.0    0.0
0.0
2              000  Montana Balance of State           0    0.0    0.0
0.0
3              000  New Mexico Balance of State      168    0.0    0.0
0.0
4              000  Oregon Balance of State           49    0.0  162.0
7.0
...            ...                             ...   ...    ...    ...
...
2918           800  Suffolk (Independent City)       362  395.0  514.0
```

```
501.0
2919           810  Virginia Beach (Independent Ci   696  768.0  646.0
534.0
2920           820  Waynesboro (Independent City)     43   22.0   31.0
30.0
2921           830  Williamsburg (Independent City    20   49.0   43.0
25.0
2922           840  Winchester (Independent City)     13   25.0   18.0
0.0

       2019
0       0.0
1       0.0
2       0.0
3       0.0
4     402.0
...     ...
2918  500.0
2919  667.0
2920  100.0
2921   29.0
2922   37.0

[2923 rows x 7 columns]


# Save the pivot DataFrame to a CSV file
pivot_df1county.to_csv('3building_permitssingleunitcounty_grouped_2015
-2019.csv', index=False)

import pandas as pd

datacounty2 = vertical_concatcounty

# Select the columns of interest
selected_columnscounty2 = ['FIPS.1 County', 'Survey Date', 'County
Name',  '2-units rep Units','3-4 units rep Units','5+units rep Units']

# Extract the desired data
extracted_datamcounty2 = datacounty2[selected_columnscounty2]

extracted_datamcounty2

      FIPS.1 County Survey Date                     County Name  \
0               001        2015  Autauga County
1               003        2015  Baldwin County
2               005        2015  Barbour County
3               007        2015  Bibb County
4               009        2015  Blount County
...             ...         ...                             ...
15189           037        2019  Sweetwater County
```

```
15190           039        2019  Teton County
15191           041        2019  Uinta County
15192           043        2019  Washakie County
15193           045        2019  Weston County

      2-units rep Units 3-4 units rep Units 5+units rep Units
0                     0                   0                 0
1                    22                 109               450
2                     0                   0                 0
3                     0                   0                 0
4                     0                   0                40
...                 ...                 ...               ...
15189                 0                   0                 0
15190                 0                   0                 0
15191                 0                   0                 0
15192                 0                   0                 0
15193                 0                   0                 0

[15194 rows x 6 columns]

# Group by 'Zip Code,' 'FIPS Place Code,' 'Place Name,' and 'Survey
Date,' and sum the units columns
grouped_dfmcounty = extracted_datamcounty2.groupby(['FIPS.1 County',
'Survey Date', 'County Name', ]).agg({
    '2-units rep Units': 'sum',
    '3-4 units rep Units': 'sum',
    '5+units rep Units': 'sum'
}).reset_index()

# Create a new column 'multi unit' by summing the '2-units rep Units,'
'3-4 units rep Units,' and '5+ units rep Units'
grouped_dfmcounty['multi unit'] = grouped_dfmcounty['2-units rep
Units'] + grouped_dfmcounty['3-4 units rep Units'] +
grouped_dfmcounty['5+units rep Units']


# Display the grouped DataFrame
print(grouped_dfmcounty)

      FIPS.1 County Survey Date                     County Name  \
0               000        2015  Maine Unorganized Territory
1               000        2015  Michigan Balance of State
2               000        2015  Montana Balance of State
3               000        2015  New Mexico Balance of State
4               000        2015  Oregon Balance of State
...             ...         ...                             ...
14574           840        2015  Winchester (Independent City)
14575           840        2016  Winchester (Independent City)
14576           840        2017  Winchester (Independent City)
14577           840        2018  Winchester (Independent City)
```

```
14578           840        2019  Winchester (Independent City)

      2-units rep Units 3-4 units rep Units 5+units rep Units multi
unit
0                     0                   0                 0
000
1                     0                   0                 0
000
2                     0                   0                 0
000
3                     0                   0                 0
000
4                     0                   0                 0
000
...                 ...                 ...               ...        .
..
14574                 0                   0                 0
000
14575                 0                   0                 5
005
14576                 0                   8               144
08144
14577                 0                   0                 0
000
14578                 0                   0                 0
000

[14579 rows x 7 columns]

# Pivot the DataFrame to have years as columns
pivot_dfmcounty = grouped_dfmcounty.pivot_table(index=['FIPS.1
County', 'County Name'], columns='Survey Date', values='multi unit',
fill_value=0)

# Reset the index to have 'Zip Code', 'FIPS Place Code', and 'Place
Name' as columns
pivot_dfmcounty.reset_index(inplace=True)

# Rename the columns
pivot_dfmcounty.columns = ['FIPS.1 County', 'County Name', '2015',
'2016', '2017', '2018', '2019']

# Save the pivot DataFrame to a CSV file
pivot_dfmcounty.to_csv('4building_permitscountymulti_grouped_2015-
2019.csv', index=False)

# Display the pivot DataFrame
print(pivot_dfmcounty)
```

```
     FIPS.1 County                     County Name     2015   2016
2017  \
0              000  Maine Unorganized Territory         0.0    0.0
0.0
1              000  Michigan Balance of State           0.0    0.0
0.0
2              000  Montana Balance of State            0.0    0.0
0.0
3              000  New Mexico Balance of State         0.0    0.0
0.0
4              000  Oregon Balance of State             0.0    0.0
0.0
...            ...                             ...      ...    ...
...
2918           800  Suffolk (Independent City)        436.0  312.0
48.0
2919           810  Virginia Beach (Independent Ci  12785.0  815.0
877.0
2920           820  Waynesboro (Independent City)       0.0    0.0
0.0
2921           830  Williamsburg (Independent City      0.0    0.0
0.0
2922           840  Winchester (Independent City)       0.0    5.0
8144.0

       2018     2019
0       0.0      0.0
1       0.0      0.0
2       0.0      0.0
3       0.0      0.0
4       0.0      0.0
...     ...      ...
2918  216.0    195.0
2919  245.0    683.0
2920  276.0  20120.0
2921    0.0      0.0
2922    0.0      0.0

[2923 rows x 7 columns]
```

The Building permits for fips county code for all counties for multiple units from 2015-2019 and csv file for it

```
pivot_dfmcounty
```

```
     FIPS.1 County                    County Name     2015   2016  
2017  \
0              000  Maine Unorganized Territory         0.0    0.0  
0.0   
1              000  Michigan Balance of State           0.0    0.0  
0.0   
2              000  Montana Balance of State            0.0    0.0  
0.0   
3              000  New Mexico Balance of State         0.0    0.0  
0.0   
4              000  Oregon Balance of State             0.0    0.0  
0.0   
...            ...                              ...      ...    ...  
...   
2918           800  Suffolk (Independent City)        436.0  312.0  
48.0   
2919           810  Virginia Beach (Independent Ci  12785.0  815.0  
877.0   
2920           820  Waynesboro (Independent City)       0.0    0.0  
0.0   
2921           830  Williamsburg (Independent City      0.0    0.0  
0.0   
2922           840  Winchester (Independent City)       0.0    5.0  
8144.0   

       2018     2019  
0       0.0      0.0  
1       0.0      0.0  
2       0.0      0.0  
3       0.0      0.0  
4       0.0      0.0  
...     ...      ...  
2918  216.0    195.0  
2919  245.0    683.0  
2920  276.0  20120.0  
2921    0.0      0.0  
2922    0.0      0.0  

[2923 rows x 7 columns]
```