

```
import pandas as pd
import numpy as np
```

```
#importing data
data_crime=pd.read_excel('crim usa 2016.xls' , header = 3)
```

```
data_crime
```

	Year	Population1	Violent crime2	Violent crime rate	Murder and nonnegligent manslaughter	Murder and nonnegligent manslaughter rate	Rape (revised definition3)	Rape (revised definition) rate3	Rape (legacy definition4)	Rape (legacy definition) rate4
0	1997	267783607.0	1636096.0	611	18208.0	6.8	NaN	NaN	96153.0	35.9
1	1998	270248003.0	1533887.0	567.6	16974.0	6.3	NaN	NaN	93144.0	34.5
2	1999	272690813.0	1426044.0	523	15522.0	5.7	NaN	NaN	89411.0	32.8
3	2000	281421906.0	1425486.0	506.5	15586.0	5.5	NaN	NaN	90178.0	32.0
4	20015	285317559.0	1439480.0	504.5	16037.0	5.6	NaN	NaN	90863.0	31.8
5	2002	287973924.0	1423677.0	494.4	16229.0	5.6	NaN	NaN	95235.0	33.1
6	2003	290788976.0	1383676.0	475.8	16528.0	5.7	NaN	NaN	93883.0	32.3
7	2004	293656842.0	1360088.0	463.2	16148.0	5.5	NaN	NaN	95089.0	32.4
8	2005	296507061.0	1390745.0	469	16740.0	5.6	NaN	NaN	94347.0	31.8
9	2006	299398484.0	1435123.0	479.3	17309.0	5.8		NaN	94472.0	31.6
10	2007	301621157.0	1422970.0	471.8	17128.0	5.7	NaN	NaN	92160.0	30.6
11	2008	304059724.0	1394461.0	458.6	16465.0	5.4	NaN	NaN	90750.0	29.8
12	2009	307006550.0	1325896.0	431.9	15399.0	5.0	NaN	NaN	89241.0	29.1
13	2010	309330219.0	1251248.0	404.5	14722.0	4.8	NaN	NaN	85593.0	27.7
14	2011	311587816.0	1206005.0	387.1	14661.0	4.7	NaN	NaN	84175.0	27.0
15	2012	313873685.0	1217057.0	387.8	14856.0	4.7	NaN	NaN	85141.0	27.1
16	2013	316497531.0	1168298.0	369.1	14319.0	4.5	113695	35.9	82109.0	25.9
17	2014	318907401.0	1153022.0	361.6	14164.0	4.4	118027	37.0	84864.0	26.6
18	20156	320896618.0	1199310.0	373.7	15883.0	4.9	126134	39.3	91261.0	28.4
19	2016	323127513.0	1248185.0	386.3	17250.0	5.3	130603	40.4	95730.0	29.6

[illegible][illegible]

22	3 The figures shown in this column for the off...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
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23	4 The figures shown in this column for the off...	Population1	Violent crime2	Violent crime rate	Murder and nonnegligent manslaughter	Murder and nonnegligent manslaughter rate	Rape (revised definition)3	Rape (revised definition) rate3	Rape (legacy definition)4	Rape (legacy definition) rate4
24	5 The murder and nonnegligent homicides that o...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
25	6 The crime figures have been adjusted.	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
26	NOTE: Although arson data are included in the...	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
27		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
28		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
29		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
30		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
31		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
32		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
33		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
34		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
35		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
36		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
37		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
38		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
39		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
40		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN
41		NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN	NaN

42 rows x 22 columns



In [72]:

```
data_crime=data_crime.dropna(thresh=3)
```

In [73]:

```
data_crime
```

Out[73]:

	Year	Population1	Violent crime2	Violent crime rate	Murder and nonnegligent manslaughter	Murder and nonnegligent manslaughter rate	Rape (revised definition)3	Rape (revised definition) rate3	Rape (legacy definition)4	Rape (legacy definition) rate4	Age
0	1997	267783607.0	1636096.0	611	18208.0	6.8	NaN	NaN	96153.0	35.9	...
1	1998	270248003.0	1533887.0	567.6	16974.0	6.3	NaN	NaN	93144.0	34.5	...
2	1999	272690813.0	1426044.0	523	15522.0	5.7	NaN	NaN	89411.0	32.8	...
3	2000	281421906.0	1425486.0	506.5	15586.0	5.5	NaN	NaN	90178.0	32.0	...
4	20015	285317559.0	1439480.0	504.5	16037.0	5.6	NaN	NaN	90863.0	31.8	...
5	2002	287973924.0	1423677.0	494.4	16229.0	5.6	NaN	NaN	95235.0	33.1	...

6	2003	290788976.0	1383676.0	475.8	16528.0	5.7	NaN	NaN	93883.0	32.3	...	Age
7	Year	Population1	Violent crime2	Violent crime rate	Murder and nonnegligent manslaughter	Murder and nonnegligent manslaughter rate	Rape (revised definition3)	Rape (revised definition) rate3	Rape (legacy definition4)	Rape (legacy definition) rate4	...	Age
8	2005	296507061.0	1390745.0	469	16740.0	5.6	NaN	NaN	94347.0	31.8	...	
9	2006	299398484.0	1435123.0	479.3	17309.0	5.8		NaN	94472.0	31.6	...	
10	2007	301621157.0	1422970.0	471.8	17128.0	5.7	NaN	NaN	92160.0	30.6	...	
11	2008	304059724.0	1394461.0	458.6	16465.0	5.4	NaN	NaN	90750.0	29.8	...	
12	2009	307006550.0	1325896.0	431.9	15399.0	5.0	NaN	NaN	89241.0	29.1	...	
13	2010	309330219.0	1251248.0	404.5	14722.0	4.8	NaN	NaN	85593.0	27.7	...	
14	2011	311587816.0	1206005.0	387.1	14661.0	4.7	NaN	NaN	84175.0	27.0	...	
15	2012	313873685.0	1217057.0	387.8	14856.0	4.7	NaN	NaN	85141.0	27.1	...	
16	2013	316497531.0	1168298.0	369.1	14319.0	4.5	113695	35.9	82109.0	25.9	...	
17	2014	318907401.0	1153022.0	361.6	14164.0	4.4	118027	37.0	84864.0	26.6	...	
18	2015	320896618.0	1199310.0	373.7	15883.0	4.9	126134	39.3	91261.0	28.4	...	
19	2016	323127513.0	1248185.0	386.3	17250.0	5.3	130603	40.4	95730.0	29.6	...	

20 rows x 22 columns



In [74]:

```
data_crime.iat[4,0]='2001'
```

In [75]:

```
data_crime.iat[18,0]='2015'
```

In [76]:

```
data_crime
```

Out[76]:

	Year	Population1	Violent crime2	Violent crime rate	Murder and nonnegligent manslaughter	Murder and nonnegligent manslaughter rate	Rape (revised definition3)	Rape (revised definition) rate3	Rape (legacy definition4)	Rape (legacy definition) rate4	...	Age
0	1997	267783607.0	1636096.0	611	18208.0	6.8	NaN	NaN	96153.0	35.9	...	10
1	1998	270248003.0	1533887.0	567.6	16974.0	6.3	NaN	NaN	93144.0	34.5	...	9
2	1999	272690813.0	1426044.0	523	15522.0	5.7	NaN	NaN	89411.0	32.8	...	9
3	2000	281421906.0	1425486.0	506.5	15586.0	5.5	NaN	NaN	90178.0	32.0	...	9
4	2001	285317559.0	1439480.0	504.5	16037.0	5.6	NaN	NaN	90863.0	31.8	...	9
5	2002	287973924.0	1423677.0	494.4	16229.0	5.6	NaN	NaN	95235.0	33.1	...	8
6	2003	290788976.0	1383676.0	475.8	16528.0	5.7	NaN	NaN	93883.0	32.3	...	8
7	2004	293656842.0	1360088.0	463.2	16148.0	5.5	NaN	NaN	95089.0	32.4	...	8
8	2005	296507061.0	1390745.0	469	16740.0	5.6	NaN	NaN	94347.0	31.8	...	8
9	2006	299398484.0	1435123.0	479.3	17309.0	5.8		NaN	94472.0	31.6	...	8
10	2007	301621157.0	1422970.0	471.8	17128.0	5.7	NaN	NaN	92160.0	30.6	...	8
11	2008	304059724.0	1394461.0	458.6	16465.0	5.4	NaN	NaN	90750.0	29.8	...	8
12	2009	307006550.0	1325896.0	431.9	15399.0	5.0	NaN	NaN	89241.0	29.1	...	8
13	2010	309330219.0	1251248.0	404.5	14722.0	4.8	NaN	NaN	85593.0	27.7	...	7
14	2011	311587816.0	1206005.0	387.1	14661.0	4.7	NaN	NaN	84175.0	27.0	...	7
15	2012	313873685.0	1217057.0	387.8	14856.0	4.7	NaN	NaN	85141.0	27.1	...	7
16	2013	316497531.0	1168298.0	369.1	14319.0	4.5	113695	35.9	82109.0	25.9	...	7

17	2014	318907401.0	1153022.0	Violent crime rate	379.7	Murder and nonnegligent manslaughter	14104.0	Murder and nonnegligent manslaughter rate	4.4	Rape (revised definition)	118027	Rape (revised definition) rate3	37.0	Rape (legacy definition)	84884.9	Rape (legacy definition) rate4	26.6	...	Age
18	2015	320896618.0	1199310.0	Violent crime rate	372.7	Murder and nonnegligent manslaughter	14688.0	Murder and nonnegligent manslaughter rate	4.5	Rape (revised definition)	126123	Rape (revised definition) rate3	39.3	Rape (legacy definition)	91261.4	Rape (legacy definition) rate4	28.4	...	Age
19	2016	323127513.0	1248185.0	Violent crime rate	386.3	Murder and nonnegligent manslaughter	17250.0	Murder and nonnegligent manslaughter rate	5.3	Rape (revised definition)	130603	Rape (revised definition) rate3	40.4	Rape (legacy definition)	95730.0	Rape (legacy definition) rate4	29.6	...	Age

20 rows x 22 columns

In [77]:

```
data_crime.rename(columns={ 'Rape\n(revised \ndefinition3)' : 'Rape_revised', 'Rape\n(revised \ndefinition) \nrate3' : 'Rape_revised3'}, inplace = True)
```

In [88]:

```
data_crime=data_crime.drop('Rape_revised', axis=1)
```

In [79]:

```
data_crime.dtypes
```

Out[79]:

```
Year                                object
Population1                        float64
Violent\ncrime2                    float64
Violent \ncrime \nrate              object
Murder and\nnonnegligent \nmanslaughter float64
Murder and \nnonnegligent \nmanslaughter \nrate float64
Rape_revised                       object
Rape_revised3                      float64
Rape\n(legacy \ndefinition4)         float64
Rape\n(legacy \ndefinition) \nrate4   float64
Robbery                           float64
Robbery \nrate                     float64
Aggravated \nassault               float64
Aggravated \nassault rate          object
Property \ncrime                    float64
Property \ncrime \nrate             object
Burglary                           object
Burglary \nrate                     float64
Larceny-\ntheft                    float64
Larceny-\ntheft rate                object
Motor \nvehicle \ntheft             float64
Motor \nvehicle \ntheft \nrate      float64
dtype: object
```

In [80]:

```
data_crime
```

Out[80]:

	Year	Population1	Violent crime2	Violent crime rate	Murder and nonnegligent manslaughter	Murder and nonnegligent manslaughter rate	Rape_revised	Rape_revised3	Rape (legacy definition4)	Rape (legacy definition) rate4
0	1997	267783607.0	1636096.0	611	18208.0	6.8	NaN	NaN	96153.0	35.9
1	1998	270248003.0	1533887.0	567.6	16974.0	6.3	NaN	NaN	93144.0	34.5
2	1999	272690813.0	1426044.0	523	15522.0	5.7	NaN	NaN	89411.0	32.8
3	2000	281421906.0	1425486.0	506.5	15586.0	5.5	NaN	NaN	90178.0	32.0
4	2001	285317559.0	1439480.0	504.5	16037.0	5.6	NaN	NaN	90863.0	31.8
5	2002	287973924.0	1423677.0	494.4	16229.0	5.6	NaN	NaN	95235.0	33.1
6	2003	290788976.0	1383676.0	475.8	16528.0	5.7	NaN	NaN	93883.0	32.3
7	2004	293656842.0	1360088.0	463.2	16148.0	5.5	NaN	NaN	95089.0	32.4

8	2005	296507061.0	1390745.0	469	16740.0	Murder and nonnegligent manslaughter rate	5.8	NaN	NaN	94347.0	Rape (legacy definition) rate4	31.6
9	2006	299398484.0	1435123.0	479.3	17309.0	Murder and nonnegligent manslaughter rate	5.8	NaN	NaN	94472.0	Rape (legacy definition) rate4	31.6
10	2007	301621157.0	1422970.0	471.8	17128.0	Murder and nonnegligent manslaughter rate	5.7	NaN	NaN	92160.0	Rape (legacy definition) rate4	30.6
11	2008	304059724.0	1394461.0	458.6	16465.0	Murder and nonnegligent manslaughter rate	5.4	NaN	NaN	90750.0	Rape (legacy definition) rate4	29.8
12	2009	307006550.0	1325896.0	431.9	15399.0	Murder and nonnegligent manslaughter rate	5.0	NaN	NaN	89241.0	Rape (legacy definition) rate4	29.1
13	2010	309330219.0	1251248.0	404.5	14722.0	Murder and nonnegligent manslaughter rate	4.8	NaN	NaN	85593.0	Rape (legacy definition) rate4	27.7
14	2011	311587816.0	1206005.0	387.1	14661.0	Murder and nonnegligent manslaughter rate	4.7	NaN	NaN	84175.0	Rape (legacy definition) rate4	27.0
15	2012	313873685.0	1217057.0	387.8	14856.0	Murder and nonnegligent manslaughter rate	4.7	NaN	NaN	85141.0	Rape (legacy definition) rate4	27.1
16	2013	316497531.0	1168298.0	369.1	14319.0	Murder and nonnegligent manslaughter rate	4.5	113695	35.9	82109.0	Rape (legacy definition) rate4	25.9
17	2014	318907401.0	1153022.0	361.6	14164.0	Murder and nonnegligent manslaughter rate	4.4	118027	37.0	84864.0	Rape (legacy definition) rate4	26.6
18	2015	320896618.0	1199310.0	373.7	15883.0	Murder and nonnegligent manslaughter rate	4.9	126134	39.3	91261.0	Rape (legacy definition) rate4	28.4
19	2016	323127513.0	1248185.0	386.3	17250.0	Murder and nonnegligent manslaughter rate	5.3	130603	40.4	95730.0	Rape (legacy definition) rate4	29.6

20 rows x 22 columns



In [81]:

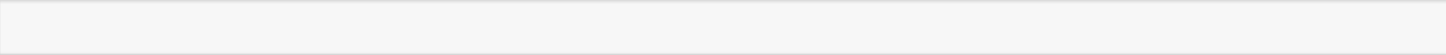
```
data_crime.Rape_revised3.interpolate(method='linear', limit_direction='backward', inplace=True)
```

C:\Users\HSA\Anaconda3\lib\site-packages\pandas\core\generic.py:6039: SettingWithCopyWarning: A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html#indexing-view-versus-copy>

```
self._update_inplace(new_data)
```

In []:



In [82]:

```
data_crime
```

Out[82]:

	Year	Population1	Violent crime2	Violent crime rate	Murder and nonnegligent manslaughter	Murder and nonnegligent manslaughter rate	Rape_revised	Rape_revised3	Rape (legacy definition4)	Rape (legacy definition) rate4
0	1997	267783607.0	1636096.0	611	18208.0	6.8	NaN	35.9	96153.0	35.9
1	1998	270248003.0	1533887.0	567.6	16974.0	6.3	NaN	35.9	93144.0	34.5
2	1999	272690813.0	1426044.0	523	15522.0	5.7	NaN	35.9	89411.0	32.8
3	2000	281421906.0	1425486.0	506.5	15586.0	5.5	NaN	35.9	90178.0	32.0
4	2001	285317559.0	1439480.0	504.5	16037.0	5.6	NaN	35.9	90863.0	31.8
5	2002	287973924.0	1423677.0	494.4	16229.0	5.6	NaN	35.9	95235.0	33.1
6	2003	290788976.0	1383676.0	475.8	16528.0	5.7	NaN	35.9	93883.0	32.3
7	2004	293656842.0	1360088.0	463.2	16148.0	5.5	NaN	35.9	95089.0	32.4
8	2005	296507061.0	1390745.0	469	16740.0	5.6	NaN	35.9	94347.0	31.8
9	2006	299398484.0	1435123.0	479.3	17309.0	5.8		35.9	94472.0	31.6
10	2007	301621157.0	1422970.0	471.8	17128.0	5.7	NaN	35.9	92160.0	30.6
11	2008	304059724.0	1394461.0	458.6	16465.0	5.4	NaN	35.9	90750.0	29.8
12	2009	307006550.0	1325896.0	431.9	15399.0	5.0	NaN	35.9	89241.0	29.1

13	2010	309330219.0	1251248.0	404.5	14722.0	14.6	NaN	35.9	85593.0	Rape
14	Year	Population1	Violent crime2	Violent crime rate	Murder and nonnegligent manslaughter	nonnegligent manslaughter rate	Rape_revised	Rape_revised3	Rape (legacy definition4)	Rape (legacy definition) rate4
15	2012	313873685.0	1217057.0	387.8	14856.0	4.7	NaN	35.9	85141.0	27.1
16	2013	316497531.0	1168298.0	369.1	14319.0	4.5	113695	35.9	82109.0	25.9
17	2014	318907401.0	1153022.0	361.6	14164.0	4.4	118027	37.0	84864.0	26.6
18	2015	320896618.0	1199310.0	373.7	15883.0	4.9	126134	39.3	91261.0	28.4
19	2016	323127513.0	1248185.0	386.3	17250.0	5.3	130603	40.4	95730.0	29.6

20 rows x 22 columns



In []:

In []:

In [83]:

```
import matplotlib.pyplot as plt
%matplotlib inline
```

In [84]:

```
data_crime.columns
```

Out[84]:

```
Index(['Year', 'Population1', 'Violent\ncrime2', 'Violent \ncrime \nrate ',
      'Murder and\nnonnegligent \nmanslaughter',
      'Murder and \nnonnegligent \nmanslaughter \nrate ', 'Rape_revised',
      'Rape_revised3', 'Rape\n(legacy \ndefinition4)',
      'Rape\n(legacy \ndefinition) \nrate4', 'Robbery', 'Robbery \nrate ',
      'Aggravated \nassault', 'Aggravated \nassault rate ',
      'Property \ncrime', 'Property \ncrime \nrate ', 'Burglary',
      'Burglary \nrate ', 'Larceny-\ntheft', 'Larceny-\ntheft rate ',
      'Motor \nvehicle \ntheft', 'Motor \nvehicle \ntheft \nrate '],
      dtype='object')
```

In [85]:

```
plot_data=data_crime[['Population1','Violent\ncrime2']]
```

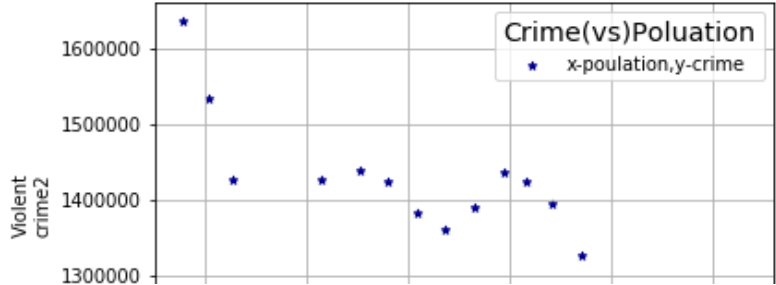
plot_data

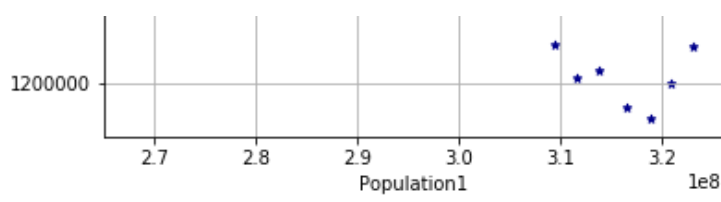
In [86]:

```
plot_data=plot_data.plot.scatter(x='Population1', y='Violent\ncrime2', color='DarkBlue',
label='x-pouluation,y-crime', marker='*')
plt.grid()
plt.legend(loc='upper right', fontsize='medium', title ='Crime(vs)Poluation', title_fonts
ize='x-large')
```

Out[86]:

<matplotlib.legend.Legend at 0x2080cb6bf28>





In [87]:

```
%pwd
```

Out[87]:

```
'C:\\Users\\HSA\\Downloads'
```

In []: