In [1]:
```python
#to add a new row to existing array
import numpy as np
arr = np.array([[1,2,3],[45,4,7],[9,6,10]])
print("\n",arr)
na = np.array([12,23,45])
new_arr = np.r_[arr,[na]]
print("\n",new_arr)
```

```
 [[ 1  2  3]
 [45  4  7]
 [ 9  6 10]]

 [[ 1  2  3]
 [45  4  7]
 [ 9  6 10]
 [12 23 45]]
```

In [2]:
```python
#frequency of all elements in series
import pandas as pd
se = pd.Series([1,1,1,2,2,2,2,3,3,3,4,4,5])
np.unique(se, return_counts=True)
```

Out[2]:
```
(array([1, 2, 3, 4, 5], dtype=int64), array([3, 4, 3, 2, 1], dtype=int64))
```

In [3]:
```python
df = pd.DataFrame(np.random.randn(5,4), ['A','B','C','D','E'],['w','x','y','z'])
print(df)
print("\n",df['w']) #-->to access specific column
print("\n",df.loc['A']) #-->to access specific row
```

```
          w         x         y         z
A  1.467851  1.350444  0.294435  0.476161
B  0.426812  0.165824  0.262140 -1.478847
C -1.093043 -0.492741  1.657188  0.222142
D -1.620623  1.410509  0.339862  0.908139
E  0.155973 -0.807121  0.760574  0.281043

 A    1.467851
B    0.426812
C   -1.093043
D   -1.620623
E    0.155973
Name: w, dtype: float64

 w    1.467851
x    1.350444
y    0.294435
z    0.476161
Name: A, dtype: float64
```

In [4]:
```python
#to access multiple columns
df.loc[['A','C']]
```

Out[4]:

	w	x	y	z
A	1.467851	1.350444	0.294435	0.476161
C	-1.093043	-0.492741	1.657188	0.222142

In [5]:
```python
#to access rows based on index position
df.iloc[3] #--> 3 is index value
```

Out[5]:
```
w   -1.620623
x    1.410509
y    0.339862
z    0.908139
Name: D, dtype: float64
```

In [6]:
```python
#to get specific value of co-ordinate in dataframe
df.loc['B','y'] #Syntax --> df.loc[row,column]
```

Out[6]:
```
0.26213980873531284
```

In [7]:
```python
#to get multiple co-ordinates
df.loc[['A','B'],['w','z']] #df.loc[[rows],[columns]]
```

Out[7]:

	w	z
A	1.467851	0.476161
B	0.426812	-1.478847

In [8]:
```python
#retrieving the data based on condition
print(df[df>0]) #Nan for false
print("\n",df[df['w']>0])
```

```
          w         x         y         z
A  1.467851  1.350444  0.294435  0.476161
B  0.426812  0.165824  0.262140       NaN
C       NaN       NaN  1.657188  0.222142
D       NaN  1.410509  0.339862  0.908139
E  0.155973       NaN  0.760574  0.281043

           w         x         y         z
A  1.467851  1.350444  0.294435  0.476161
B  0.426812  0.165824  0.262140 -1.478847
E  0.155973 -0.807121  0.760574  0.281043
```

In [9]:
```python
#to convert dictionary to dataframe
d = {"A": [1,2,np.nan], "B": [5,np.nan,np.nan], "C": [1,2,3], "D": [np.nan,np.nan,np.nan]}
df1 = pd.DataFrame(d)
df1
```

Out[9]:

	A	B	C	D
0	1.0	5.0	1	NaN
1	2.0	NaN	2	NaN
2	NaN	NaN	3	NaN

In [10]:
```python
#to drop values with Nan
#dropna(how, thresh, axis, inplace)
print(df1.dropna())
#how="all" or "any"
print("\n",df1.dropna(how="all")) #It will be checking the rows with all
print("\n",df1.dropna(how="any")) #It will delete the rows which have single Nan value
```

```
Empty DataFrame
Columns: [A, B, C, D]
Index: []

      A    B  C   D
0  1.0  5.0  1 NaN
1  2.0  NaN  2 NaN
2  NaN  NaN  3 NaN

 Empty DataFrame
Columns: [A, B, C, D]
Index: []
```

In [11]:
```python
df1.dropna(how="all",axis=1)
```

Out[11]:

	A	B	C
0	1.0	5.0	1
1	2.0	NaN	2
2	NaN	NaN	3

In [12]:
```python
#to check the sum of Nan values in each column
df1.isna().sum()
```

Out[12]:
```
A    1
B    2
C    0
D    3
dtype: int64
```

In [13]:
```python
#thresh
print(df1.dropna(thresh=2,axis=1))
```

```
     A  C
0  1.0  1
1  2.0  2
2  NaN  3
```

In [14]:
```python
#fillna()
df1.fillna(value=0.0)
```

Out[14]:

	A	B	C	D
0	1.0	5.0	1	0.0
1	2.0	0.0	2	0.0
2	0.0	0.0	3	0.0

In [15]:
```python
df1['A'].fillna(value=df1['A'].mean())
```

Out[15]:
```
0    1.0
1    2.0
2    1.5
Name: A, dtype: float64
```

In [16]:
```python
# Group by
# To group based on column and perform aggregate functions
data = {'company': ['Google','Google','Meta','Meta','Fb','Fb'],
        'person': ['sam','mani','sai','prasanth','mohan','mounika'],
        'sales': [300, 500, 100, 200, 600, 20]}
df2 = pd.DataFrame(data)
df2
```

Out[16]:

	company	person	sales
0	Google	sam	300
1	Google	mani	500
2	Meta	sai	100
3	Meta	prasanth	200
4	Fb	mohan	600
5	Fb	mounika	20

In [17]:
```python
bycomp = df2.groupby('company')
bycomp
bycomp.sum()['sales']
bycomp.value_counts()
bycomp['company'].value_counts()
```

Out[17]:
```
company
Fb        2
Google    2
Meta      2
Name: count, dtype: int64
```

In [18]:
```python
# To get the maximum salary person from each company
df2.loc[bycomp['sales'].idxmax()][['person','sales']]
```

Out[18]:

	person	sales
4	mohan	600
1	mani	500
3	prasanth	200

In [19]:
```python
bycomp.describe()
```

Out[19]:

	sales							
	count	mean	std	min	25%	50%	75%	max
company								
Fb	2.0	310.0	410.121933	20.0	165.0	310.0	455.0	600.0
Google	2.0	400.0	141.421356	300.0	350.0	400.0	450.0	500.0
Meta	2.0	150.0	70.710678	100.0	125.0	150.0	175.0	200.0

In [20]:
```python
# to access a csv_file
dp = pd.read_csv("samplecsv.csv")
dp.head() #to get first 5 rows
```

Out[20]:

	Year	Industry_aggregation_NZSIOC	Industry_code_NZSIOC	Industry_name_NZSIOC	Units	Variable_code	Variable_name	Variable_category	Value	Industry_code_ANZSIC06
0	2020	Level 1	99999	All industries	Dollars (millions)	H01	Total income	Financial performance	733,258	ANZSIC06 divisions A-S (excluding classes K633...
1	2020	Level 1	99999	All industries	Dollars (millions)	H04	Sales, government funding, grants and subsidies	Financial performance	660,630	ANZSIC06 divisions A-S (excluding classes K633...
2	2020	Level 1	99999	All industries	Dollars (millions)	H05	Interest, dividends and donations	Financial performance	54,342	ANZSIC06 divisions A-S (excluding classes K633...
3	2020	Level 1	99999	All industries	Dollars (millions)	H07	Non-operating income	Financial performance	18,285	ANZSIC06 divisions A-S (excluding classes K633...
4	2020	Level 1	99999	All industries	Dollars (millions)	H08	Total expenditure	Financial performance	654,872	ANZSIC06 divisions A-S (excluding classes K633...

In [21]:
```python
# To access a xlsx_file
dp1 = pd.ExcelFile("sample.xlsx")
dr1 = dp1.parse('Sheet1')
dr1.tail() #to get last five rows
```

Out[21]:

	Segment	Country	Product	Discount Band	Units Sold	Manufacturing Price	Sale Price	Gross Sales	Discounts	Sales	COGS	Profit	Date	Month Number	Month Name	Year
695	Small Business	France	Amarilla	High	2475.0	260	300	742500.0	111375.00	631125.00	618750.0	12375.00	2014-03-01	3	March	2014
696	Small Business	Mexico	Amarilla	High	546.0	260	300	163800.0	24570.00	139230.00	136500.0	2730.00	2014-10-01	10	October	2014
697	Government	Mexico	Montana	High	1368.0	5	7	9576.0	1436.40	8139.60	6840.0	1299.60	2014-02-01	2	February	2014
698	Government	Canada	Paseo	High	723.0	10	7	5061.0	759.15	4301.85	3615.0	686.85	2014-04-01	4	April	2014
699	Channel Partners	United States of America	VTT	High	1806.0	250	12	21672.0	3250.80	18421.20	5418.0	13003.20	2014-05-01	5	May	2014

In [22]:
```python
# to access a csv_file
dp = pd.read_csv("delimatercsv.csv", sep=';', names=['sid','ages','places'])
dp.drop(0) #to delete a row
```

Out[22]:

	sid	ages	places
1	Alice	25	New York
2	Bob	30	San Francisco
3	Charlie	22	Los Angeles

In [23]:
```python
# to access a csv_file
df_titanic = pd.read_csv("titanic_train.csv")
df_titanic.columns
df_titanic.head()
df_titanic['Pclass'].unique()
df_titanic['Pclass'].value_counts()
```

Out[23]:
```
Pclass
3    491
1    216
2    184
Name: count, dtype: int64
```

In [24]:
```python
df_titanic.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 891 entries, 0 to 890
Data columns (total 12 columns):
 #   Column       Non-Null Count  Dtype
---  ------       --------------  -----
 0   PassengerId  891 non-null    int64
 1   Survived     891 non-null    int64
 2   Pclass       891 non-null    int64
 3   Name         891 non-null    object
 4   Sex          891 non-null    object
 5   Age          714 non-null    float64
 6   SibSp        891 non-null    int64
 7   Parch        891 non-null    int64
 8   Ticket       891 non-null    object
 9   Fare         891 non-null    float64
 10  Cabin        204 non-null    object
 11  Embarked     889 non-null    object
dtypes: float64(2), int64(5), object(5)
memory usage: 83.7+ KB
```

In [25]:
```python
df_titanic.describe()
```

Out[25]:

	PassengerId	Survived	Pclass	Age	SibSp	Parch	Fare
count	891.000000	891.000000	891.000000	714.000000	891.000000	891.000000	891.000000
mean	446.000000	0.383838	2.308642	29.699118	0.523008	0.381594	32.204208
std	257.353842	0.486592	0.836071	14.526497	1.102743	0.806057	49.693429
min	1.000000	0.000000	1.000000	0.420000	0.000000	0.000000	0.000000
25%	223.500000	0.000000	2.000000	20.125000	0.000000	0.000000	7.910400
50%	446.000000	0.000000	3.000000	28.000000	0.000000	0.000000	14.454200
75%	668.500000	1.000000	3.000000	38.000000	1.000000	0.000000	31.000000
max	891.000000	1.000000	3.000000	80.000000	8.000000	6.000000	512.329200

In [26]:
```python
#Sum of Nan's
df_titanic.isna().sum()
```

Out[26]:
```
PassengerId      0
Survived         0
Pclass           0
Name             0
Sex              0
Age            177
SibSp            0
Parch            0
Ticket           0
Fare             0
Cabin          687
Embarked         2
dtype: int64
```

In [27]:
```python
df_titanic.isna().sum()*100/len(df_titanic)
```

Out[27]:
```
PassengerId     0.000000
Survived        0.000000
Pclass          0.000000
Name            0.000000
Sex             0.000000
Age            19.865320
SibSp           0.000000
Parch           0.000000
Ticket          0.000000
Fare            0.000000
Cabin          77.104377
Embarked        0.224467
dtype: float64
```

In [28]:
```python
#To drop a column
df_titanic.drop(['Cabin'],axis=1)
```

Out[28]:

	PassengerId	Survived	Pclass	Name	Sex	Age	SibSp	Parch	Ticket	Fare	Embarked
0	1	0	3	Braund, Mr. Owen Harris	male	22.0	1	0	A/5 21171	7.2500	S
1	2	1	1	Cumings, Mrs. John Bradley (Florence Briggs Th...	female	38.0	1	0	PC 17599	71.2833	C
2	3	1	3	Heikkinen, Miss. Laina	female	26.0	0	0	STON/O2. 3101282	7.9250	S
3	4	1	1	Futrelle, Mrs. Jacques Heath (Lily May Peel)	female	35.0	1	0	113803	53.1000	S
4	5	0	3	Allen, Mr. William Henry	male	35.0	0	0	373450	8.0500	S
...	...	...	...	...	...	...	...	...	...	...	...
886	887	0	2	Montvila, Rev. Juozas	male	27.0	0	0	211536	13.0000	S
887	888	1	1	Graham, Miss. Margaret Edith	female	19.0	0	0	112053	30.0000	S
888	889	0	3	Johnston, Miss. Catherine Helen "Carrie"	female	NaN	1	2	W./C. 6607	23.4500	S
889	890	1	1	Behr, Mr. Karl Howell	male	26.0	0	0	111369	30.0000	C
890	891	0	3	Dooley, Mr. Patrick	male	32.0	0	0	370376	7.7500	Q

891 rows × 11 columns

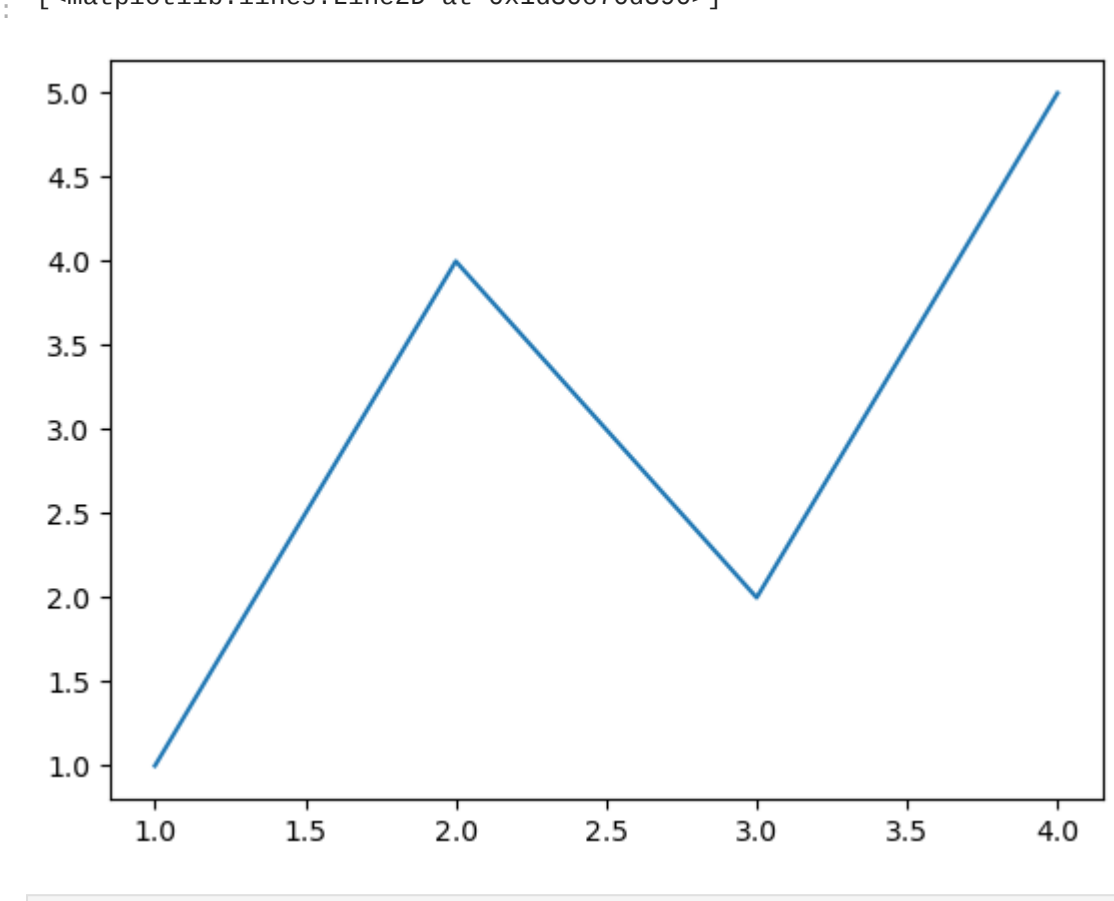
In [29]:
```python
#To find number of people dead
len(df_titanic)-df_titanic['Survived'].sum()
```

Out[29]:
```
549
```

In [30]:
```python
#MATHPLOTLIB
#It is mostly used for data visualization library.Whi was inspired by MATLAB
# It is used for data visualization in the form of various plots
import matplotlib.pyplot as plt
```

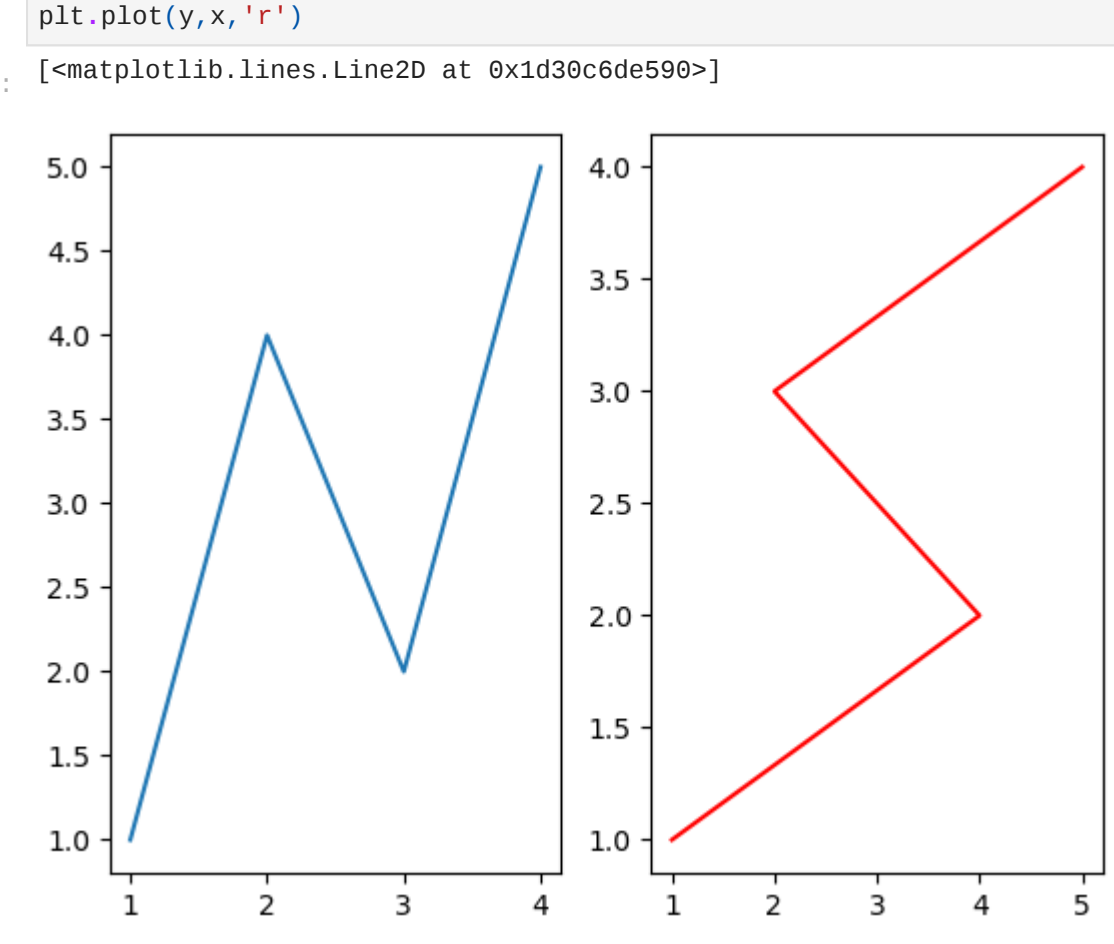
In [31]:
```python
x=[1,2,3,4]
y=[1,4,2,5]
plt.figure()
plt.plot(x,y)
```

Out[31]:
```
[<matplotlib.lines.Line2D at 0x1d30c70d390>]
```



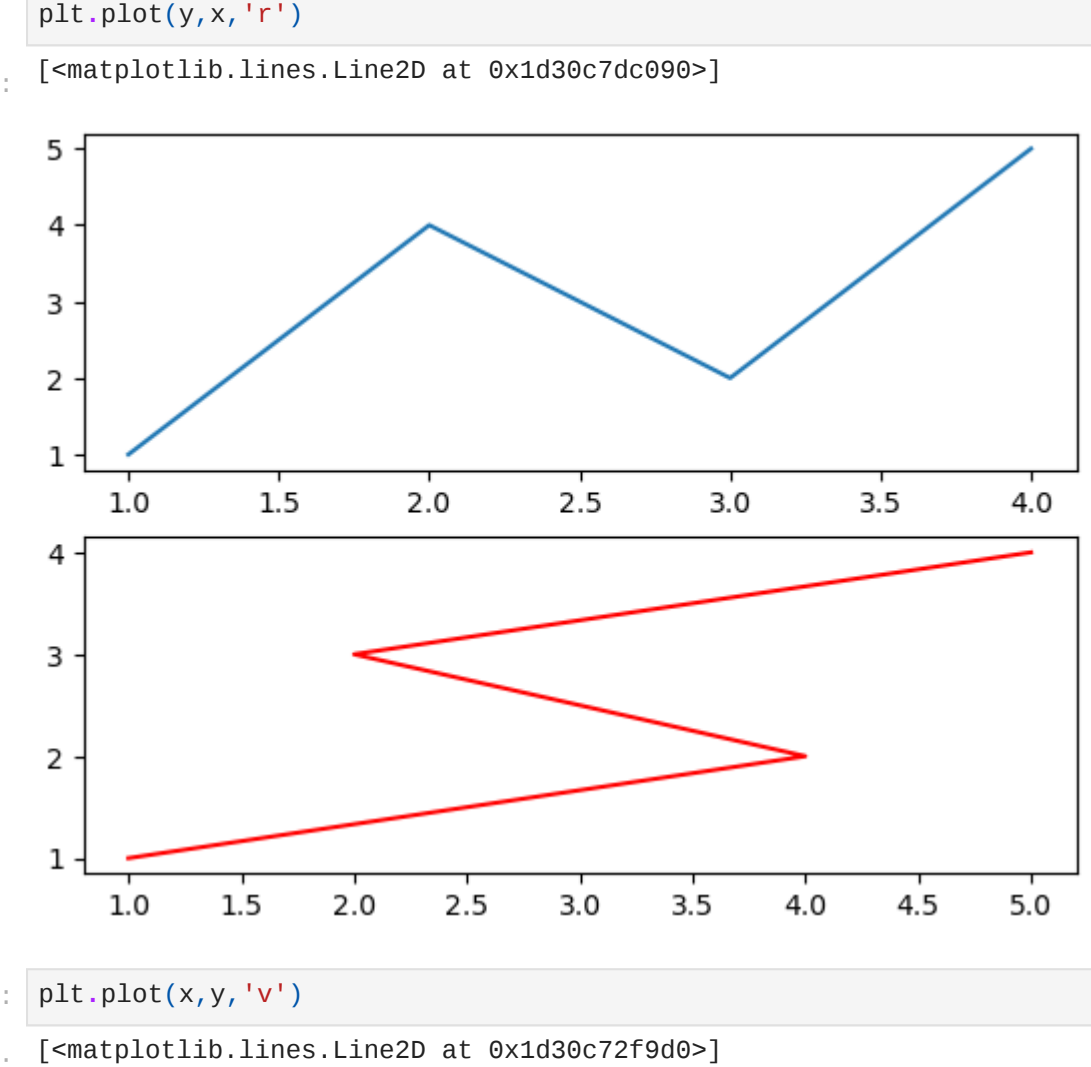
In [32]:
```python
plt.subplot(1,2,1)
plt.plot(x,y)
plt.subplot(1,2,2)
plt.plot(y,x,'r')
```

Out[32]:
```
[<matplotlib.lines.Line2D at 0x1d30c6de590>]
```



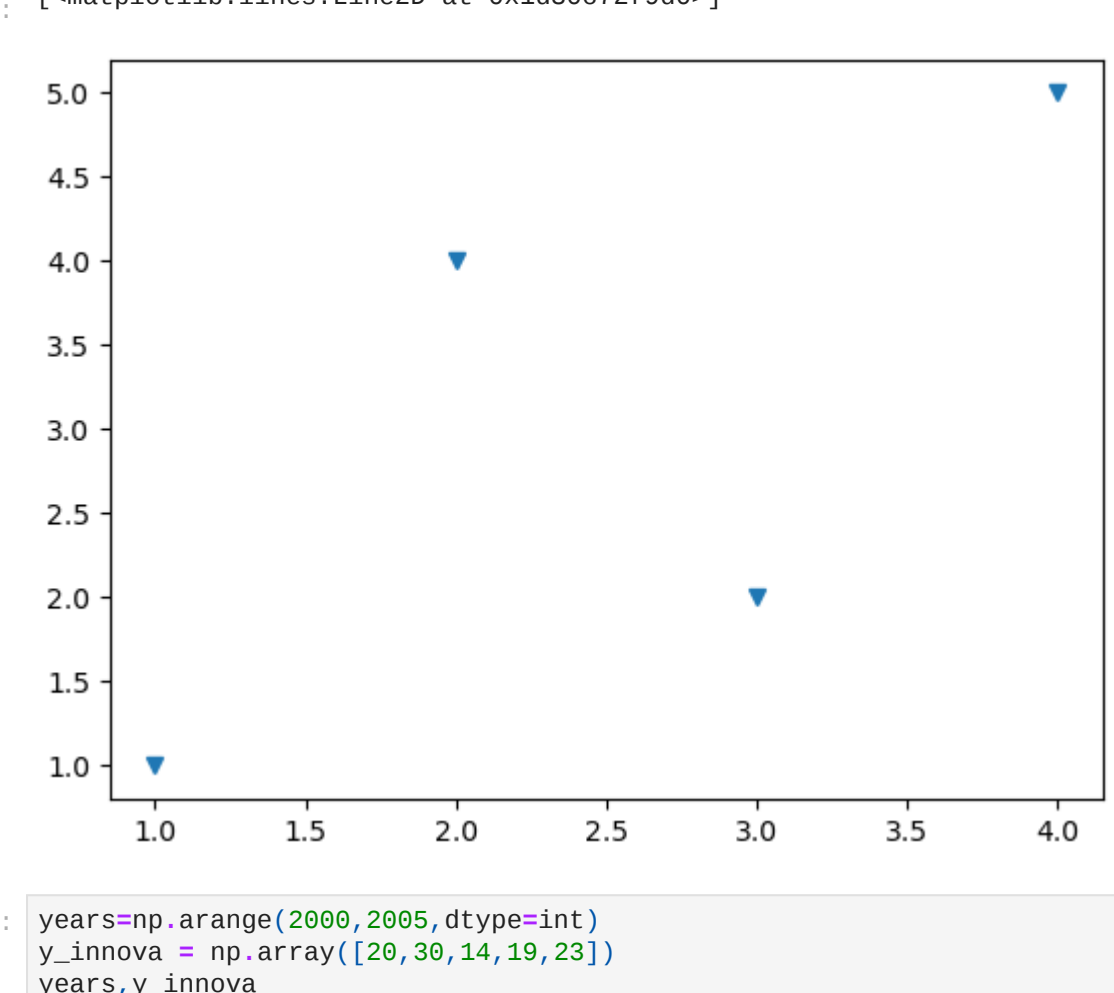
In [33]:
```python
plt.subplot(2,1,1)
plt.plot(x,y)
plt.subplot(2,1,2)
plt.plot(y,x,'r')
```

Out[33]:
```
[<matplotlib.lines.Line2D at 0x1d30c7dc090>]
```



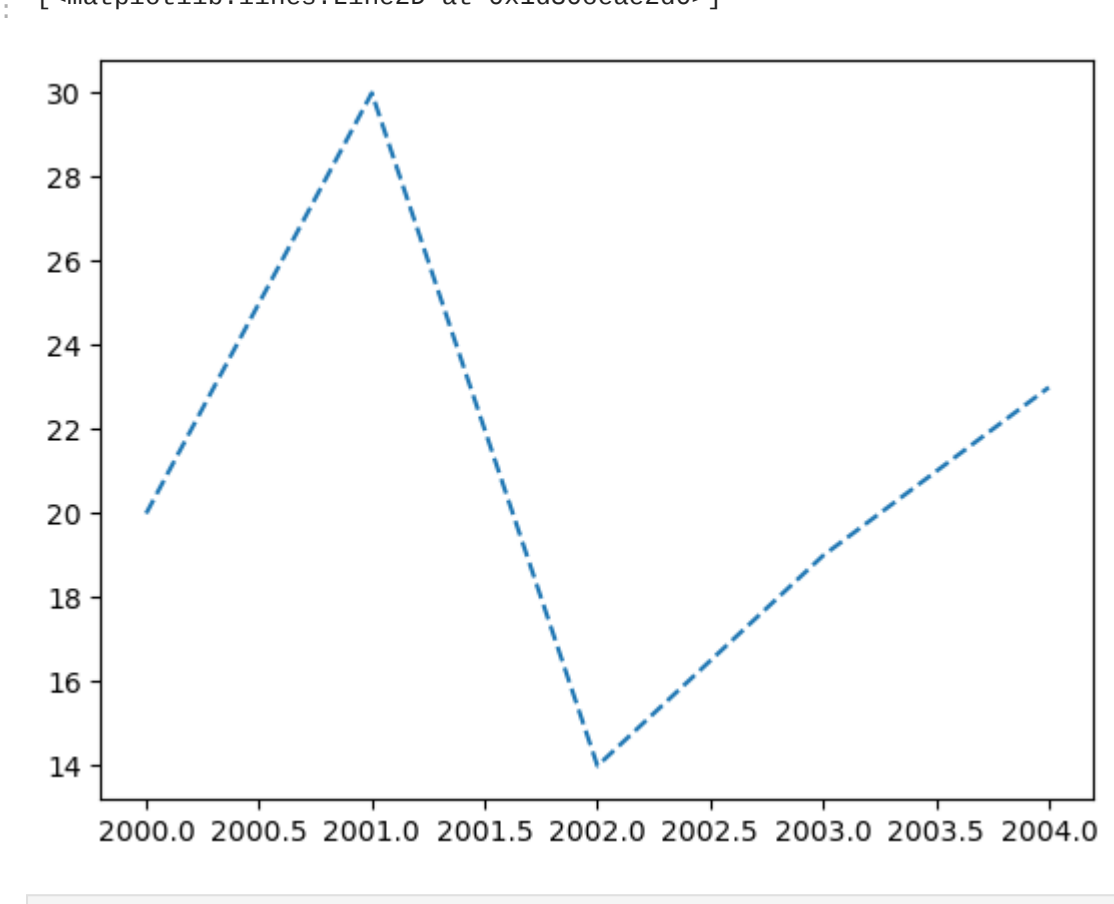
In [34]:
```python
plt.plot(x,y,'v')
```

Out[34]:
```
[<matplotlib.lines.Line2D at 0x1d30c72f9d0>]
```



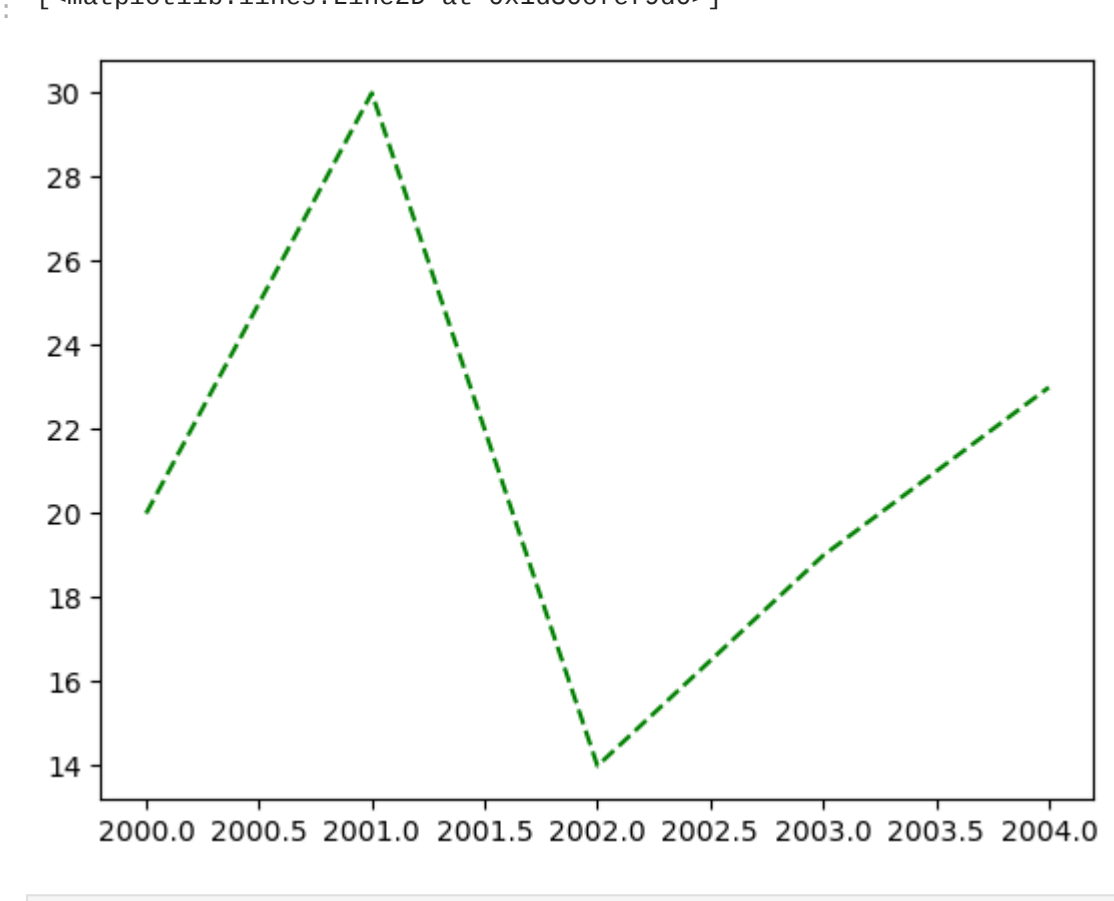
In [35]:
```python
years=np.arange(2000,2005,dtype=int)
y_innova = np.array([20,30,14,19,23])
years,y_innova
plt.plot(years,y_innova,'--')
```

Out[35]:
```
[<matplotlib.lines.Line2D at 0x1d30ceae2d0>]
```



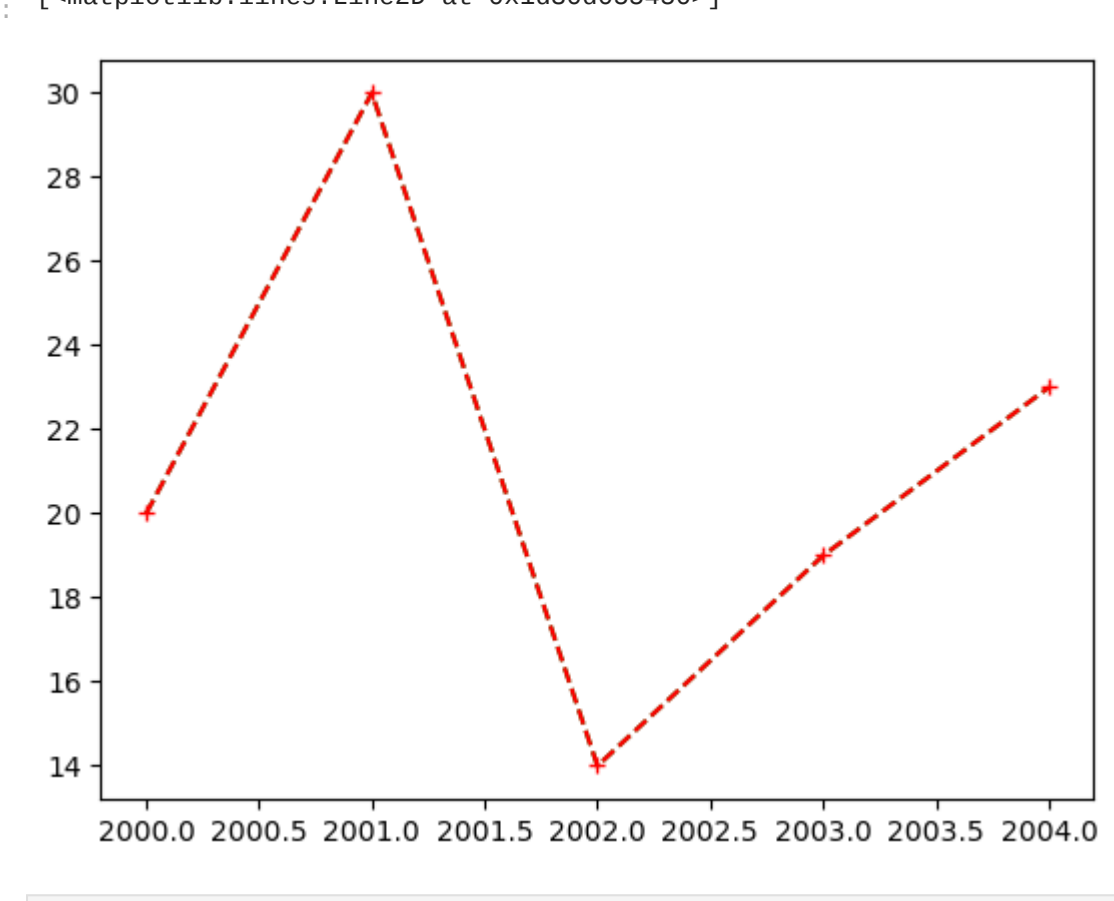
In [36]:
```python
years=np.arange(2000,2005,dtype=int)
y_innova = np.array([20,30,14,19,23])
years,y_innova
plt.plot(years,y_innova,'--g')
```

Out[36]:
```
[<matplotlib.lines.Line2D at 0x1d30cfef9d0>]
```



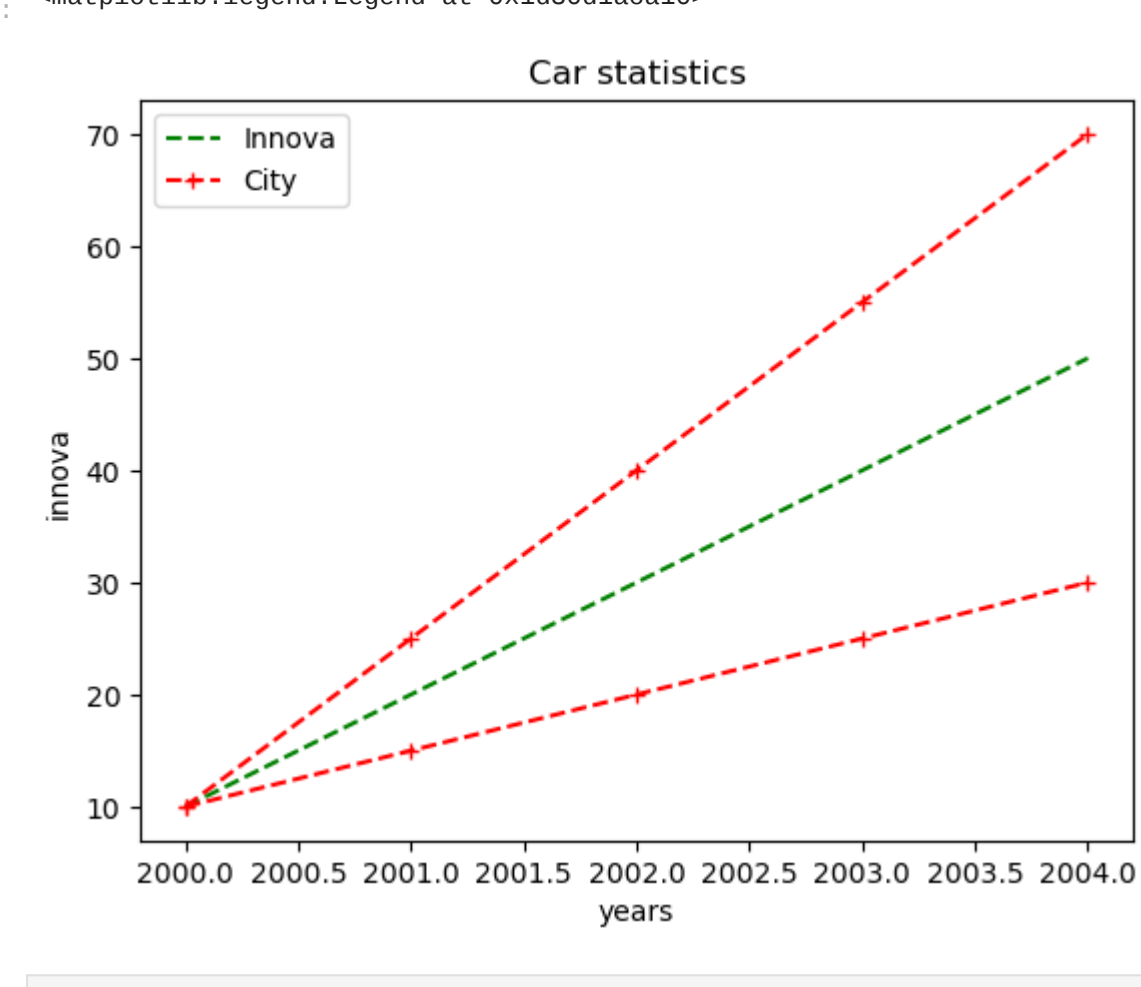
In [37]:
```python
years=np.arange(2000,2005,dtype=int)
y_innova = np.array([20,30,14,19,23])
years,y_innova
plt.plot(years,y_innova,'--g')
plt.plot(years,y_innova,'--+r')
```

Out[37]:
```
[<matplotlib.lines.Line2D at 0x1d30d055450>]
```



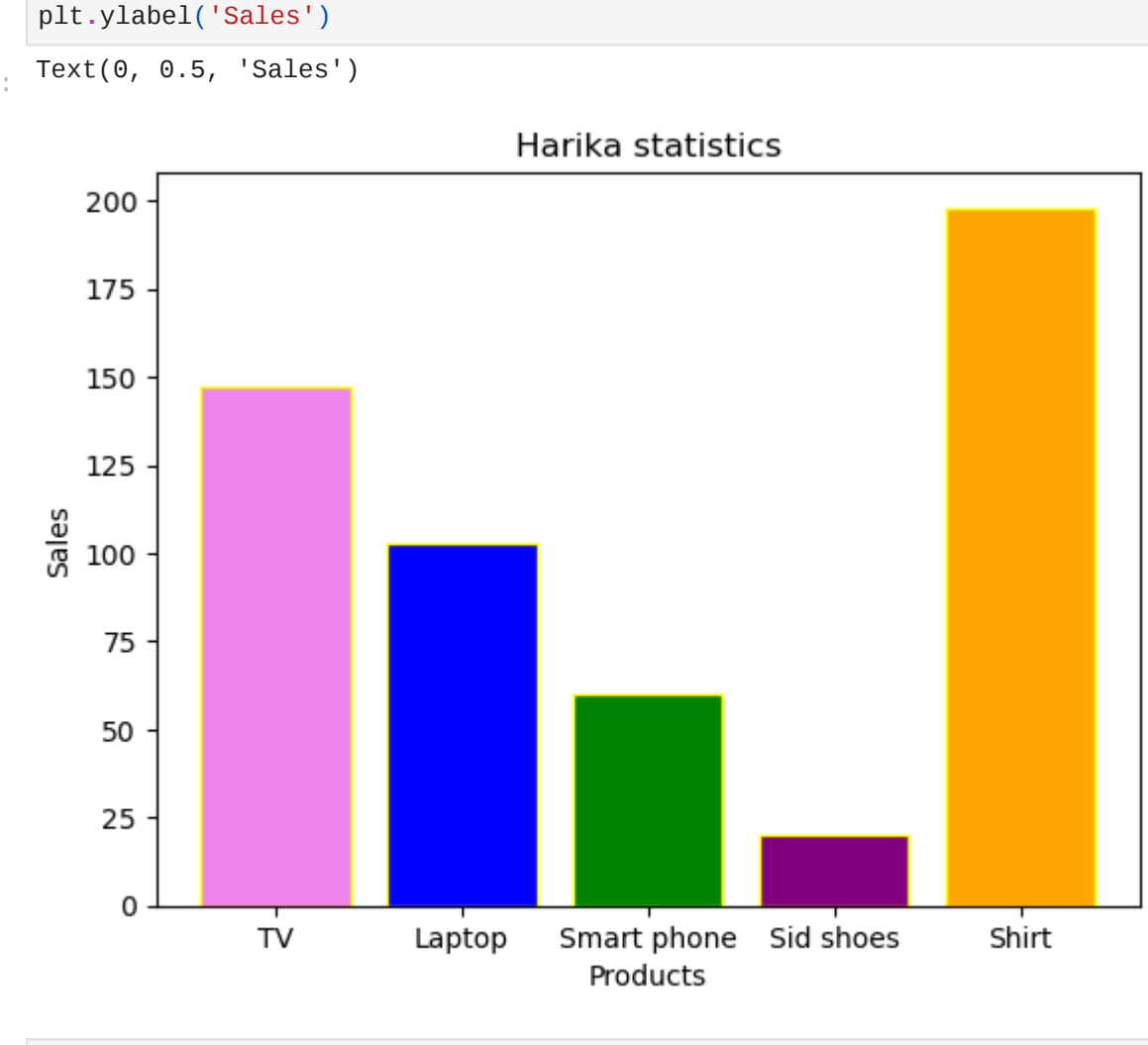
In [38]:
```python
years=np.arange(2000,2005,dtype=int)
y_innova = np.array([10,20,30,40,50])
honda=np.array([10,15,20,25,30])
kia=np.array([10,25,40,55,70])
years,y_innova
plt.plot(years,y_innova,'--g')
plt.plot(years,honda,'--+r')
plt.plot(years,kia,'--+r')
plt.title('Car statistics')
plt.xlabel('years')
plt.ylabel('innova')
plt.legend(['Innova','City'])
```

Out[38]:
```
<matplotlib.legend.Legend at 0x1d30d1aca10>
```



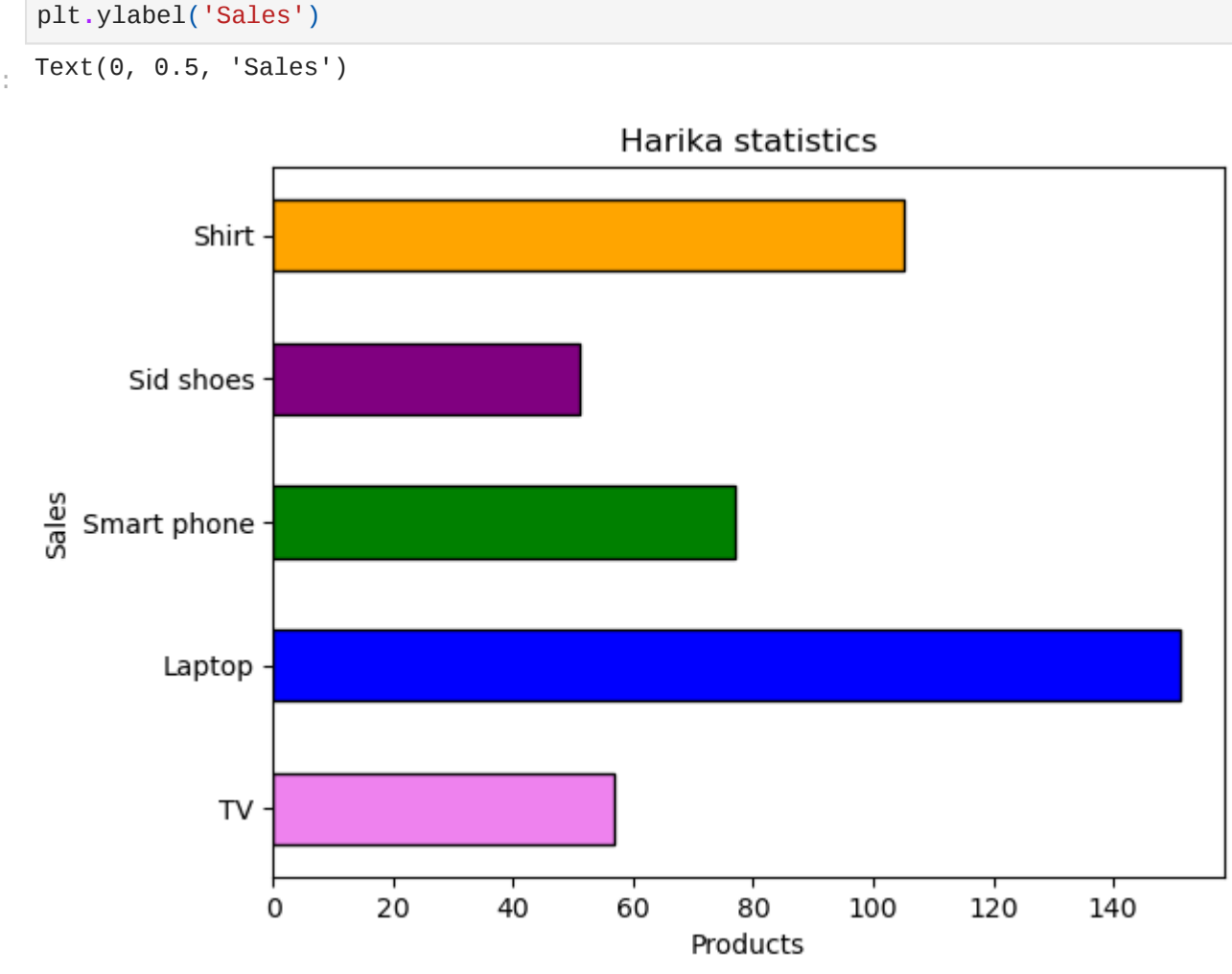
In [39]:
```python
products=['TV','Laptop','Smart phone','Sid shoes','Shirt']
sales=np.random.randint(10,200,size=len(products))
plt.bar(products,sales,color=['violet','blue','green','purple','orange'],edgecolor='yellow')
plt.title('Harika statistics')
plt.xlabel('Products')
plt.ylabel('Sales')
```

Out[39]:
```
Text(0, 0.5, 'Sales')
```



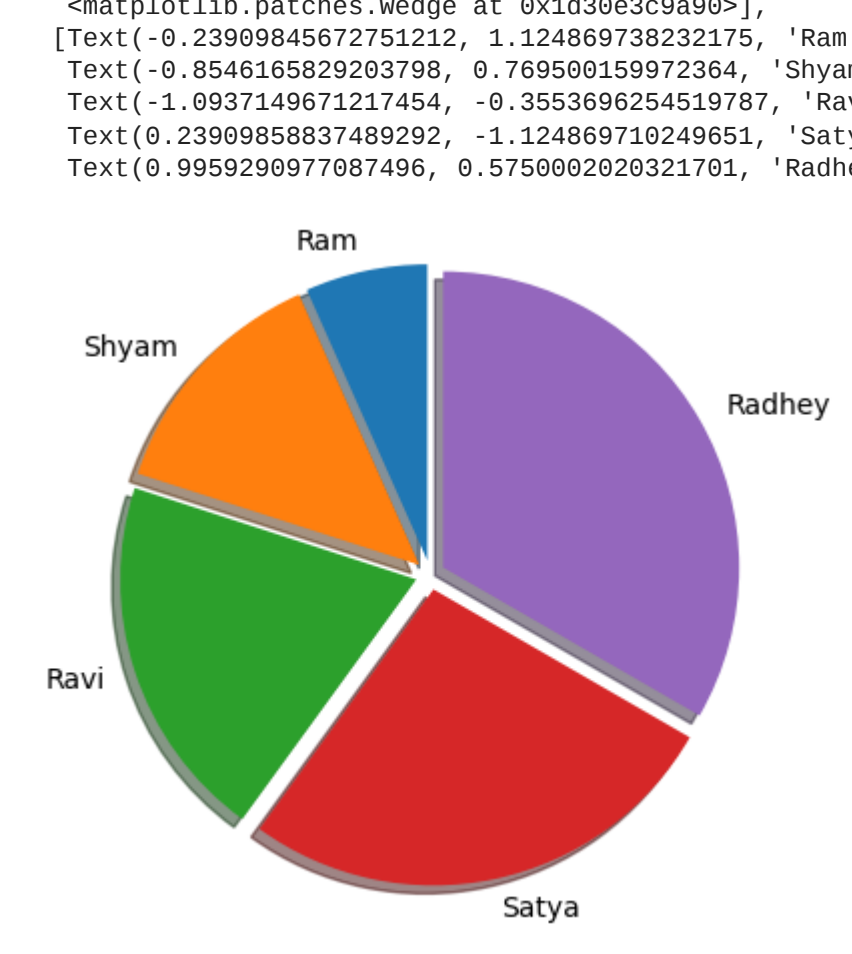
In [40]:
```python
products=['TV','Laptop','Smart phone','Sid shoes','Shirt']
sales=np.random.randint(10,200,size=len(products))
plt.barh(products,sales,color=['violet','blue','green','purple','orange'],edgecolor='black',height=0.5)
plt.title('Harika statistics')
plt.xlabel('Products')
plt.ylabel('Sales')
```

Out[40]:
```
Text(0, 0.5, 'Sales')
```



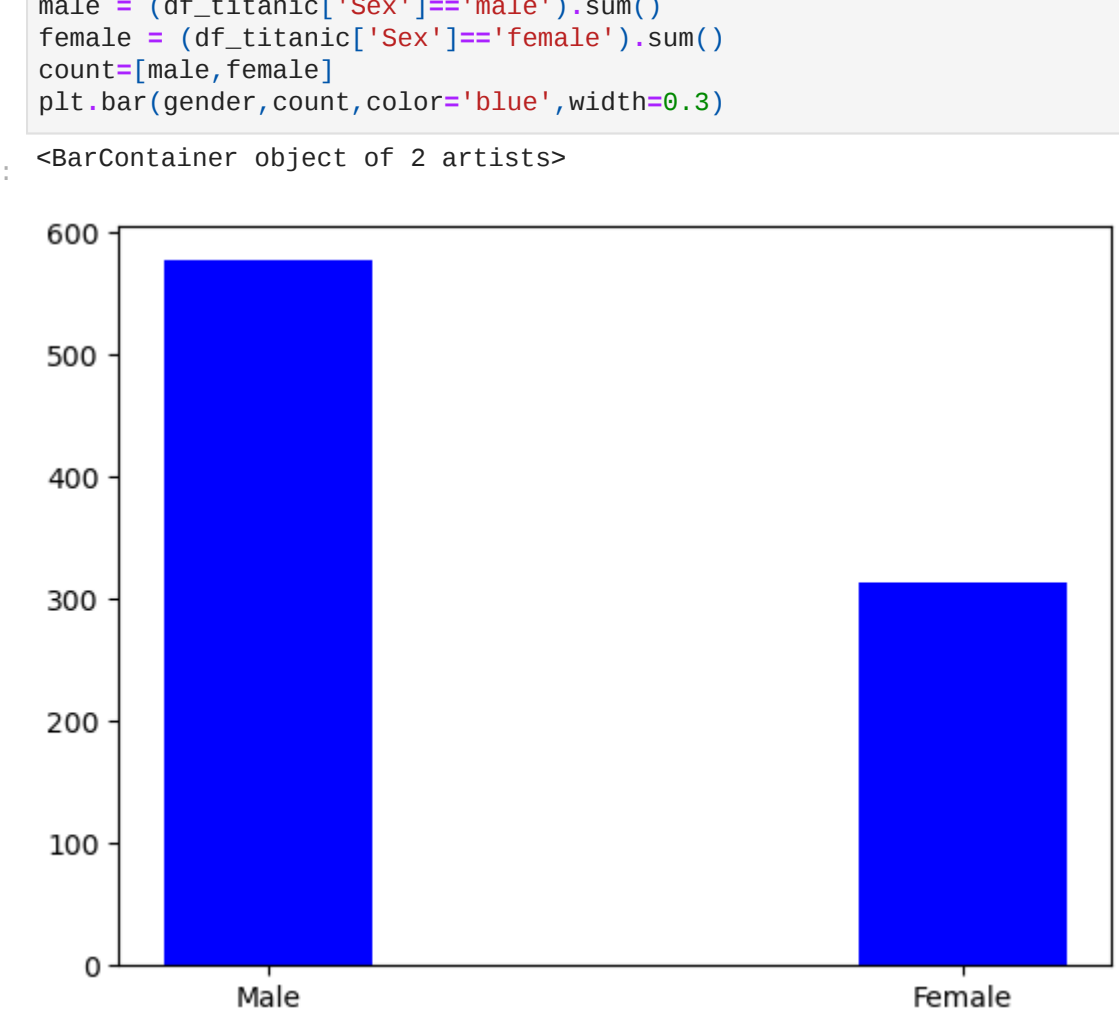
In [41]:
```python
names=['Ram','Shyam','Ravi','Satya','Radhey']
slices=[0.05,0.05,0.05,0.05,0.05]
scores=[10,20,30,40,50]
plt.pie(scores,slices,labels=names,startangle=90,shadow=True)
```

Out[41]:
```
([<matplotlib.patches.Wedge at 0x1d30d128650>,
  <matplotlib.patches.Wedge at 0x1d30e3afe90>,
  <matplotlib.patches.Wedge at 0x1d30e3c5c90>,
  <matplotlib.patches.Wedge at 0x1d30e3c7b50>,
  <matplotlib.patches.Wedge at 0x1d30e3c9a90>],
 [Text(-0.23909845672751212, 1.124869738232175, 'Ram'),
  Text(-0.8546165829203798, 0.769500159972364, 'Shyam'),
  Text(-1.0937149671217454, -0.3553696254519787, 'Ravi'),
  Text(0.23909858837489292, -1.124869710249651, 'Satya'),
  Text(0.9959290977087496, 0.5750002020321701, 'Radhey')])
```



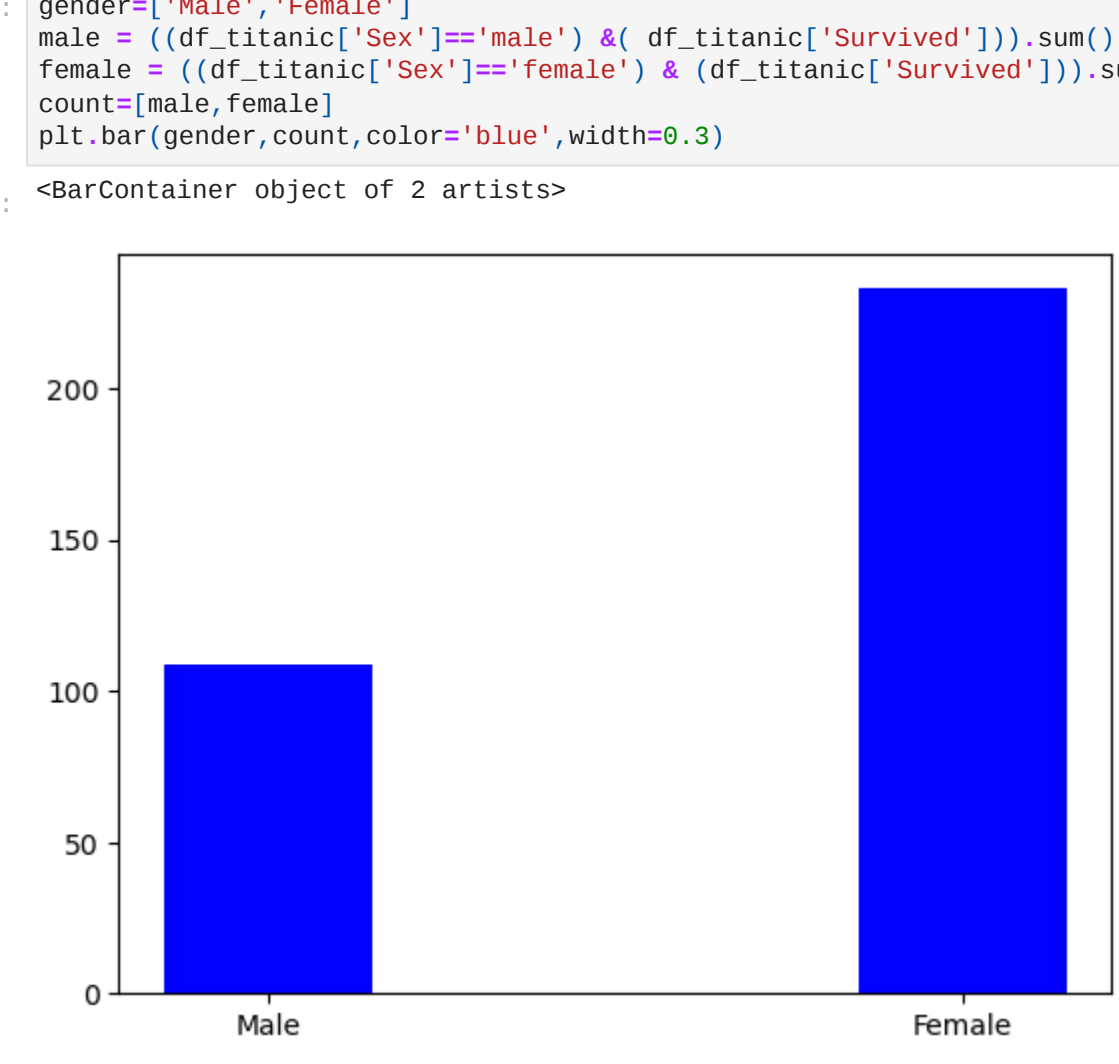
In [42]:
```python
gender=['Male','Female']
male = (df_titanic['Sex']=='male').sum()
female = (df_titanic['Sex']=='female').sum()
count=[male,female]
plt.bar(gender,count,color='blue',width=0.3)
```

Out[42]:
```
<BarContainer object of 2 artists>
```



In [43]:
```python
gender=['Male','Female']
male = ((df_titanic['Sex']=='male') &( df_titanic['Survived'])).sum()
female = ((df_titanic['Sex']=='female') & (df_titanic['Survived'])).sum()
count=[male,female]
plt.bar(gender,count,color='blue',width=0.3)
```

Out[43]:
```
<BarContainer object of 2 artists>
```



In [44]:
```python
np.random.seed(8)
arr1=np.random.normal(160,15,321)
arr2=np.random.normal(200,25,550)
col=[arr1,arr2]
fig=plt.figure()
axes=fig.add_axes([0,0,1,1])
v=axes.violinplot(col)
```