

**Ques 1.: Perform elementary mathematical operations in Octave/MATLAB like addition, multiplication, division and exponentiation.**

Code:

```
val1=2, val2=3
```

```
#using addition operator res1=val1+val2 print("First
    value-",val1,"\nSecond value-",val2)
    print("Addition-",res1)
#using multiplication operator
    res2=val1*val2
    print("Multiplication-",res2)
#using division operator
    res3=val1/val2 print("Division-
    ",res3)
#using exponential operator
    res4=val1 ** val2
    print("Exponent-",res4)
```

Output:

```
===== RESTART: C:/Users/Dell/Desktop/Q1.py
First value- 2
Second value- 3
Addition- 5
Multiplication- 6
Division- 0.6666666666666666
Exponent- 8
>>> |
```

**Ques 2: Perform elementary logical operations in Octave/MATLAB (like OR, AND, Checking for Equality, NOT, XOR).**

Code:

```
#Logical and operator
a=10
```

```
b=5 c=-4 if a>0
and b>0:
print("The numbers are greater than 0")
if a>0 and b>0 and c>0:
print("The numbers are greater than 0")
else:
print("Atleast one number is not greater than 0")
```

#### *#Logical or operator*

```
a=10 b=-10
c=0 if a>0 or
b>0:
print("Either of the number is greater than 0")
else:
print("No number is greater than 0")
if b>0 or c>0:
print("Either of the number is greater than 0") else:
print("No number is greater than 0")#Logical not
operator a=10 if not a:
print("Boolean value of a is true")
if not(a%3==0 or a%6==0):
print("10 is not divisible by either 3 and 6")
else:
print("10 is divisible by either 3 or 6")
```

#### *#Logical xor operator*

```
a=6 b=3
c=a^b
print("XOR of a=6, b=3 is",c)
```

#### *#Logical equality operator*

```
a=5 b=3 c=5 if
a==b:
print("Equal")
else:
print("Not Equal")
if a==c:
print("Equal")
else: print("Not
Equal")
```

Output:

```
The numbers are greater than 0
Atleast one number is not greater than 0
Either of the number is greater than 0
No number is greater than 0
10 is not divisible by either 3 and 6
XOR of a=6, b=3 is 5
Not Equal
Equal
>>>
```

**Ques 3: Create, initialize and display simple variables and simple strings and use simple formatting for variable.**

Code & Output:

```
s='apples'
print('I like to have {0} every day.'.format(s))
```

I like to have apples every day.

In [12]:

```
s='{0} is of type integer, {1} is of type float,{2} is of type string'
print(f'{6} is of type integer, {1.9} is of type float,{"hello"} is of type string')
```

6 is of type integer, 1.9 is of type float,hello is of type string

**Ques 4: Create/Define single dimension / multi-dimension arrays, and arrays with specific values like array of all ones, all zeros, array with random values within a range, or a diagonal matrix.**

Code & Output:

```
import numpy as py
```

In [23]:

```
arr=py.array([1,2,3,4,5,6])  
print('dimension of array is',arr.ndim)  
arr
```

dimension of array is 1

Out[23]:

```
array([1, 2, 3, 4, 5, 6])
```

In [26]:

```
arr1=arr.reshape((2,3))  
arr1
```

Out[26]:

```
array([[1, 2, 3],  
       [4, 5, 6]])
```

```
import numpy as py
```

In [23]:

```
arr=py.array([1,2,3,4,5,6])  
print('dimension of array is',arr.ndim)  
arr
```

dimension of array is 1

Out[23]:

```
array([1, 2, 3, 4, 5, 6])
```

In [26]:

```
arr1=arr.reshape((2,3))  
arr1
```

Out[26]:

```
array([[1, 2, 3],  
       [4, 5, 6]])
```

```
print('dimension of array is',arr1.ndim)
```

dimension of array is 2

In [30]:

```
arr2=py.zeros((2,3))  
arr2
```

Out[30]:

```
array([[0., 0., 0.],  
       [0., 0., 0.]])
```

```
arr3=py.ones((3,3))  
arr3
```

Out[32]:

```
array([[1., 1., 1.],  
       [1., 1., 1.],  
       [1., 1., 1.]])
```

In [34]:

```
arr2=py.zeros_like(arr3)  
arr2
```

Out[34]:

```
array([[0., 0., 0.],  
       [0., 0., 0.],  
       [0., 0., 0.]])
```

```
py.eye(4)
```

Out[35]:

```
array([[1., 0., 0., 0.],
       [0., 1., 0., 0.],
       [0., 0., 1., 0.],
       [0., 0., 0., 1.]])
```

In [46]:

```
t=py.random.rand(12)
```

In [47]:

```
py.array(t).reshape(6,2)
```

Out[47]:

```
array([[0.09181146, 0.21945836],
       [0.87899698, 0.07955509],
       [0.81871293, 0.2883827 ],
       [0.78245522, 0.67570252],
       [0.18602969, 0.7805035 ],
       [0.86961489, 0.70818977]])
```

**Ques 5: Use command to compute the size of a matrix, size/length of a particular row/column, load data from a text file, store matrix data to a text file, finding out variables and their features in the current scope.**

Code & Output:

```
import numpy as np
```

In [2]:

```
mat=np.array([1,2,3,4,5,6]).reshape(2,3)
```

In [3]:

```
mat
```

Out[3]:

```
array([[1, 2, 3],
       [4, 5, 6]])
```

In [4]:

```
mat.size
```

Out[4]:

```
6
```

In [5]:

```
mat[0].size
```

Out[5]:

```
3
```

```
import pandas as pd
```

In [7]:

```
df=pd.read_csv('pro-5-text.txt',sep=" ",header=None)
```

In [8]:

```
df
```

Out[8]:

	0	1	2
0	a	b	c
1	d	e	f
2	g	h	i

In [9]:

```
df.to_csv('text_file.txt')
```

```
f=open('text_file.txt')
```

In [15]:

```
print(f.read())
```

```
,0,1,2
0,a,b,c
1,d,e,f
2,g,h,i
```

**Ques 6: Perform basic operations on matrices (like addition, subtraction, multiplication) and display specific rows or columns of the matrix.**



Code & Output:

```
print('addition of two arrays \n',arr1+arr)
```

```
addition of two arrays
[[12 14]
 [16 18]
 [20 22]
 [24 26]]
```

In [14]:

```
print('subtraction of two arrays \n',arr1-arr)
```

```
subtraction of two arrays
[[10 10]
 [10 10]
 [10 10]
 [10 10]]
```

```
print('multiplication of two arrays \n',py.dot(arr1,arr))
```

```
multiplication of two arrays
[[ 71  94 117 140]
 [ 83 110 137 164]
 [ 95 126 157 188]
 [107 142 177 212]]
```

**Ques 7: Perform other matrix operations like converting matrix data to absolute values, taking the negative of matrix values, adding/removing rows/columns from a matrix, finding the maximum or minimum values in a matrix or in a row/column, and finding the sum of some/all elements in a matrix.**

Code & Output:

```
print('Adding column')
py.append(arr, [['a'], ['b'], ['c'], ['d']], axis=1)
```

Adding column

Out[21]:

```
array([[ '1', '2', 'a'],
       [-3, '4', 'b'],
       [-5, '6', 'c'],
       [ '7', '8', 'd']], dtype='<U11')
```

In [23]:

```
print('Adding row')
py.insert(arr, 2, [[88, 88]], axis=0)
```

Adding row

Out[23]:

```
array([[ 1,  2],
       [-3,  4],
       [88, 88],
       [-5,  6],
       [ 7,  8]])
```

```
print('maximum of matrix ', py.max(arr))
```

maximum of matrix 8

In [30]:

```
print('minimum of matrix ', py.min(arr))
```

minimum of matrix -5

In [31]:

```
print('sum of matrix ', py.sum(arr))
```

sum of matrix 20

In [35]:

```
print('sum of first row of matrix ', py.sum(arr[0]))
```

sum of first row of matrix 3

```
print('Absolute values of matrix')
py.absolute(arr)
```

Absolute values of matrix

Out[5]:

```
array([[1, 2],
       [3, 4],
       [5, 6],
       [7, 8]])
```

In [6]:

```
print('Negative of matrix')
py.negative(arr)
```

Negative of matrix

Out[6]:

```
array([[ -1,  -2],
       [ 3, -4],
       [ 5, -6],
       [-7, -8]])
```

**Ques 8: Create various type of plots/charts like histograms, plot based on sine/cosine function based on data from a matrix. Further label different axes in a plot and data in a plot.**

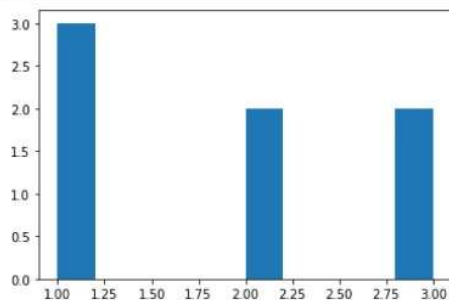
Code & Output:

### Histogram

```
import matplotlib.pyplot as plt
import numpy as np
import math
```

In [4]:

```
plt.hist([1,1,1,2,2,3,3])
plt.show()
```



```
arr=py.array([1,2,3,4,5,6]).reshape(3,2)
```

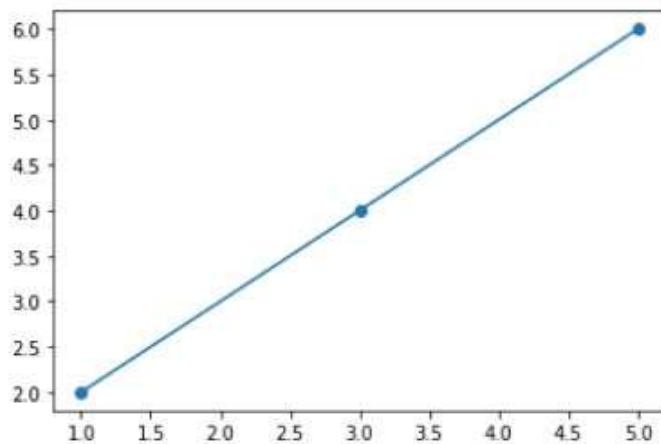
In [6]:

```
arr
```

Out[6]:

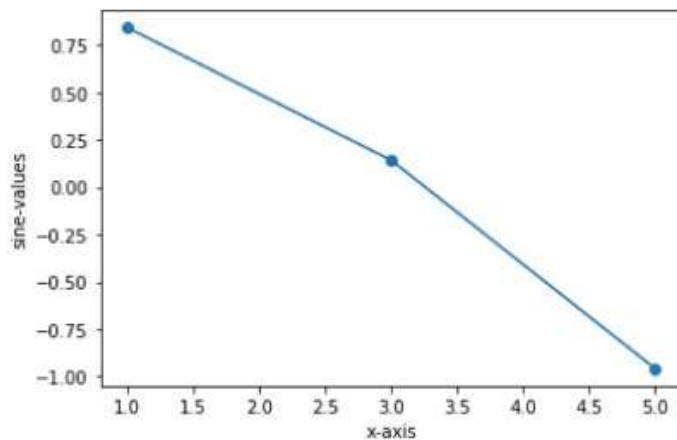
```
array([[1, 2],  
       [3, 4],  
       [5, 6]])
```

```
plt.plot(arr[:,0],arr[:,1],marker='o')  
plt.show()
```



```
sin_value=[math.sin(i) for i in arr[:,0]]
```

```
plt.plot(arr[:,0],sin_value,marker='o')  
plt.xlabel('x-axis')  
plt.ylabel('sine-values')  
plt.show()
```



**Ques 9: Generate different subplots from a given plot and color plot data.**

Code & Output:

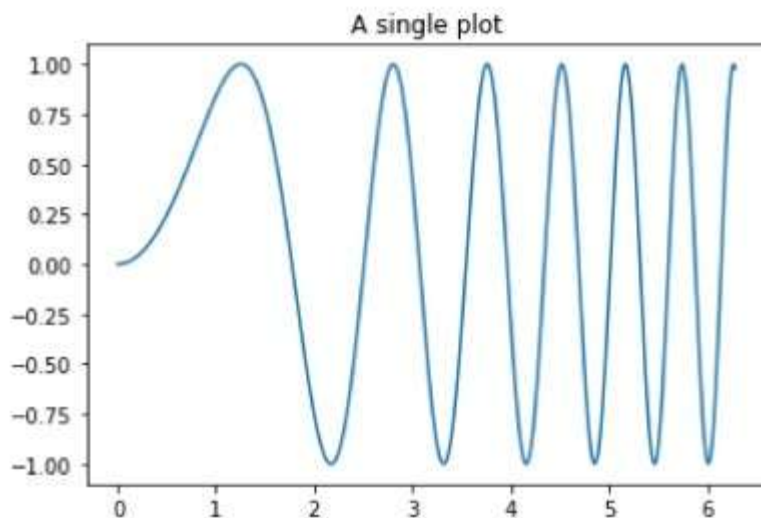
```
import matplotlib.pyplot as plt
import numpy as np

x = np.linspace(0, 2 * np.pi, 400)
y = np.sin(x ** 2)
```

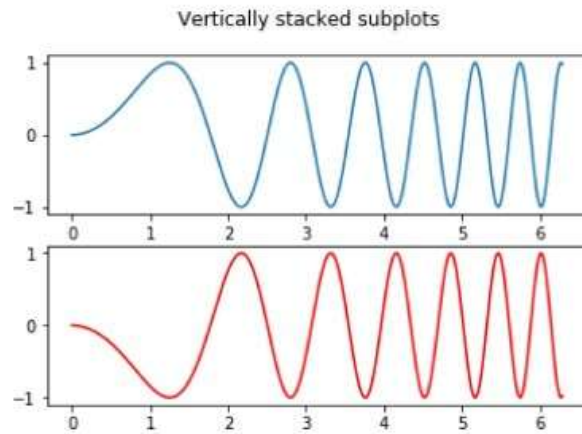
```
fig, ax = plt.subplots()
ax.plot(x, y)
ax.set_title('A single plot')
```

Out[5]:

Text(0.5, 1.0, 'A single plot')



```
fig, axs = plt.subplots(2)
fig.suptitle('Vertically stacked subplots')
axs[0].plot(x, y)
axs[1].plot(x, -y, 'red')
plt.show()
```



**Ques 10: Use conditional statements and different type of loops based on simple example/s.**

Code & Output

```
fruits = ["apple", "banana", "cherry"]
for x in fruits:
    print(x)
    if x == "banana":
        break
```

apple  
banana

In [3]:

```
i = 1
while i < 6:
    print(i)
    if i == 3:
        break
    i += 1
```

1  
2  
3

**Ques 12: Implement Linear Regression problem. For example, based on a dataset comprising of existing set of prices and area/size of the houses, predict the estimated price of a given house.**

Code & Output

In [57]:

```
import pandas as pd
import matplotlib.pyplot as plt
```

In [56]:

```
df= pd.read_csv('ex1data1 - ex1data1.csv')
df.columns=['X','Y']
df
```

Out[56]:

	X	Y
0	5.5277	9.13020
1	8.5186	13.66200
2	7.0032	11.85400
3	5.8598	6.82330
4	8.3829	11.88600

```
def leastSquareRegression(indep_val,dep_val,predict_indep_val):
    mean_dep_val=dep_val.mean()
    mean_indep_val=indep_val.mean()
    diff_dep_val=[]
    diff_indep_val=[]
    numerator=0.0
    denominator=0.0

    diff_dep_val=dep_val.map(lambda i:i-mean_dep_val)
    diff_indep_val=indep_val.map(lambda i:i-mean_indep_val)

    for i,j in zip(diff_indep_val,diff_dep_val):
        numerator = numerator+(i*j)

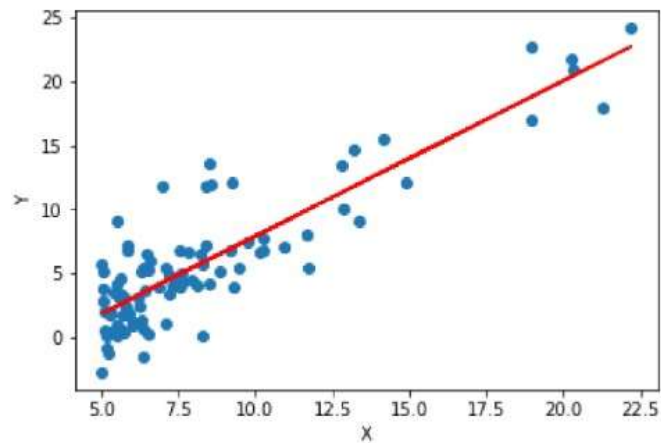
    for i in diff_indep_val:
        denominator=denominator+i**2

    beta1=numerator/denominator

    beta0=mean_dep_val - (beta1*mean_indep_val)

    predict_dep_val=[]
    for i in indep_val:
        predict_dep_val.append(beta0 + (beta1*i))
```

```
result=leastSquareRegression(df.X,df.Y, 15.67)
print(f'predicted value for x = {15.67} is: ',result['predict_val'])
```



predicted value for x = 15.67 is: 14.804781463319879

**Ques 13: Based on multiple features/variables perform Linear Regression. For example, based on a number of additional features like number of bedrooms, servant room, number of balconies, number of houses of years a house has been built – predict the price of a house.**

```
import pandas as pd
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
import numpy as np
from sklearn.metrics import mean_squared_error, r2_score
import matplotlib.pyplot as plt
```

In [2]:

```
df= pd.read_csv('ex1data1 - ex1data1.csv')
df.columns=['X','Y']
df
```

Out[2]:

	X	Y
0	5.5277	9.13020
1	8.5186	13.66200
2	7.0032	11.85400
3	5.8598	6.82330
4	8.3829	11.88600



```
X = np.array(df['X']).reshape(-1, 1)
Y = np.array(df['Y']).reshape(-1, 1)
```

In [65]:

```
x_train, x_test, y_train, y_test = train_test_split(X,Y, test_size = 0.25)
```

In [66]:

```
lr=LinearRegression()
lr.fit(x_train,y_train)
```

Out[66]:

```
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None, normalize=False)
```

```
Y_pred=lr.predict(x_test)
```

In [68]:

```
print('mean square error: ',mean_squared_error(y_test, Y_pred))
print(r2_score(y_test, Y_pred))
```

```
mean square error:  4.431495395674081
0.8404885818633169
```

In [69]:

```
lr.score(x_test,y_test)
```

Out[69]:

```
0.8404885818633169
```

In [70]:

```
print('slope: ',lr.coef_)
print('Intercept: ',lr.intercept_)
```

```
slope: [[1.22152923]]
Intercept: [-4.27942216]
```

```
y=lr.predict([[15.67]])
```

```
In [72]:
```

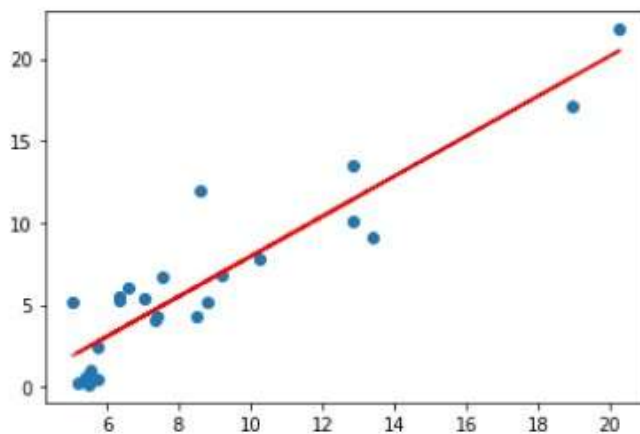
```
y[0][0]
```

```
Out[72]:
```

```
14.861940946088342
```

```
In [73]:
```

```
plt.scatter(x_test,y_test)  
plt.plot(x_test,y_pred,'red')  
plt.show()
```



**Ques 14: Implement a classification/ logistic regression problem. For example based on different features of students data, classify, whether a student is suitable for a particular activity. Based on the available dataset, a student can also implement another classification problem like checking whether an email is spam or not.**

Code & Output:

```
import pandas as pd
from sklearn.linear_model import LogisticRegression
from sklearn.model_selection import train_test_split
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [2]:

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

In [3]:

```
df
```

Out[3]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFu
0	6	148	72	35	0	33.6	
1	1	85	66	29	0	26.6	
2	8	183	64	0	0	23.3	
3	1	89	66	23	94	28.1	
4	0	137	40	35	168	43.1	
...	...	...	...	...	...	...	
763	10	101	76	48	180	32.9	

```
feature_cols = ['Pregnancies', 'Insulin', 'BMI', 'Age', 'Glucose', 'BloodPressure', 'DiabetesPedigreeFunction']
X = df[feature_cols]
y = df.Outcome
```

In [5]:

```
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.25,random_state=0)
```

```
logreg = LogisticRegression()  
logreg.fit(X_train,y_train)  
y_pred=logreg.predict(X_test)
```

C:\ProgramData\Anaconda3\lib\site-packages\sklearn\linear\_model\\_logistic.py:940: ConvergenceWarning: lbfgs failed to converge (status=1):  
STOP: TOTAL NO. of ITERATIONS REACHED LIMIT.

Increase the number of iterations (max\_iter) or scale the data as shown in:

<https://scikit-learn.org/stable/modules/preprocessing.html>

Please also refer to the documentation for alternative solver options:

[https://scikit-learn.org/stable/modules/linear\\_model.html#logistic-regression](https://scikit-learn.org/stable/modules/linear_model.html#logistic-regression)

```
extra_warning_msg=_LOGISTIC_SOLVER_CONVERGENCE_MSG)
```

In [7]:

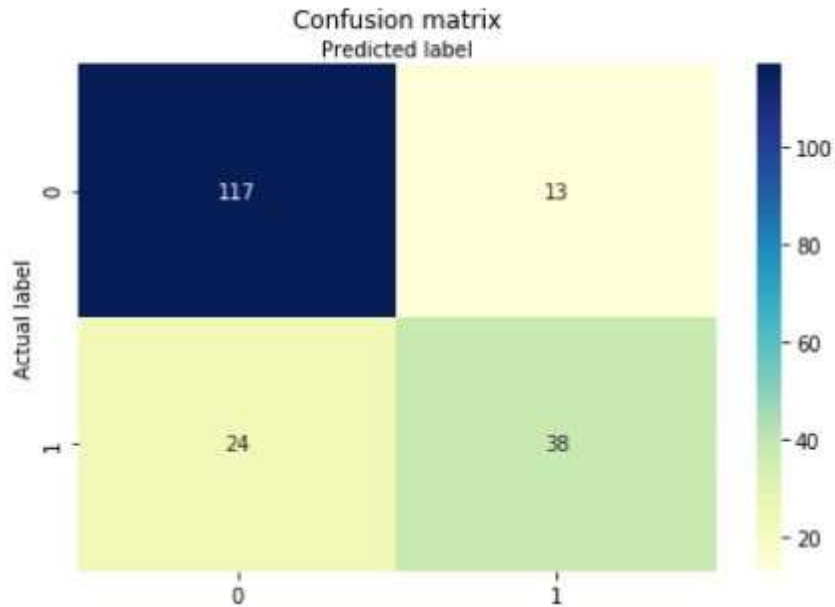
```
from sklearn import metrics  
cnf_matrix = metrics.confusion_matrix(y_test, y_pred)  
cnf_matrix
```

Out[7]:

```
array([[117, 13],  
       [ 24, 38]], dtype=int64)
```

```
class_names=[0,1]  
fig, ax = plt.subplots()  
tick_marks = np.arange(len(class_names))  
plt.xticks(tick_marks, class_names)  
plt.yticks(tick_marks, class_names)  
# create heatmap  
sns.heatmap(pd.DataFrame(cnf_matrix), annot=True, cmap="YlGnBu", fmt='g')  
ax.xaxis.set_label_position("top")  
plt.tight_layout()  
plt.title('Confusion matrix', y=1.1)  
plt.ylabel('Actual label')  
plt.xlabel('Predicted label')
```

```
Text(0.5, 257.44, 'Predicted label')
```



```
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
print("Precision:",metrics.precision_score(y_test, y_pred))
print("Recall:",metrics.recall_score(y_test, y_pred))
```

```
Accuracy: 0.8072916666666666
Precision: 0.7450980392156863
Recall: 0.6129032258064516
```

**Ques 15: Use some function for regularization of dataset based on problem 14.**

Code & Output:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [3]:

```
from sklearn import datasets
from sklearn.linear_model import LinearRegression
from sklearn.model_selection import train_test_split
```

In [4]:

```
boston_dataset= datasets.load_boston()
```

```
boston_dataset
```

```
{'data': array([[6.3200e-03, 1.8000e+01, 2.3100e+00, ..., 1.5300e+01, 3.96
90e+02,
    4.9800e+00],
 [2.7310e-02, 0.0000e+00, 7.0700e+00, ..., 1.7800e+01, 3.9690e+02,
    9.1400e+00],
 [2.7290e-02, 0.0000e+00, 7.0700e+00, ..., 1.7800e+01, 3.9283e+02,
    4.0300e+00],
 ...,
 [6.0760e-02, 0.0000e+00, 1.1930e+01, ..., 2.1000e+01, 3.9690e+02,
    5.6400e+00],
 [1.0959e-01, 0.0000e+00, 1.1930e+01, ..., 2.1000e+01, 3.9345e+02,
    6.4800e+00],
 [4.7410e-02, 0.0000e+00, 1.1930e+01, ..., 2.1000e+01, 3.9690e+02,
    7.8800e+00]]),
 'target': array([24. , 21.6, 34.7, 33.4, 36.2, 28.7, 22.9, 27.1, 16.5, 1
8.9, 15. ,
    18.9, 21.7, 20.4, 18.2, 19.9, 23.1, 17.5, 20.2, 18.2, 13.6, 19.6,
    15.2, 14.5, 15.6, 13.9, 16.6, 14.8, 18.4, 21. , 12.7, 14.5, 13.2,
    13.1, 13.5, 18.9, 20. , 21. , 24.7, 30.8, 34.9, 26.6, 25.3, 24.7,
    21.2, 19.3, 20. , 16.6, 14.4, 19.4, 19.7, 20.5, 25. , 23.4, 18.9,
    35.4, 24.7, 31.6, 23.3, 19.6, 18.7, 16. , 22.2, 25. , 33. , 23.5,
    19.4, 22. , 17.4, 20.9, 24.2, 21.7, 22.8, 23.4, 24.1, 21.4, 20. ,
    20.8, 21.2, 20.3, 28. , 23.9, 24.8, 22.9, 23.9, 26.6, 22.5, 22.2,
    23.6, 28.7, 22.6, 22. , 22.9, 25. , 20.6, 28.4, 21.4, 38.7, 43.8,
    33.2, 27.5, 26.5, 18.6, 19.3, 20.1, 19.5, 19.5, 20.4, 19.8, 19.4,
    21.7, 22.8, 18.8, 18.7, 18.5, 18.3, 21.2, 19.2, 20.4, 19.3, 22. ,
    20.3, 20.5, 17.3, 18.8, 21.4, 15.7, 16.2, 18. , 14.3, 19.2, 19.6,
```

```
boston_pd=pd.DataFrame(boston_dataset.data)
boston_pd_target=py.asarray(boston_dataset.target)
```

```
In [18]:
```

```
boston_pd['House Price']=pd.Series(boston_pd_target)
```

```
In [25]:
```

```
boston_dataset.feature_names
```

```
Out[25]:
```

```
array(['CRIM', 'ZN', 'INDUS', 'CHAS', 'NOX', 'RM', 'AGE', 'DIS', 'RAD',
      'TAX', 'PTRATIO', 'B', 'LSTAT'], dtype='<U7')
```



```
X=boston_pd.iloc[:, :-1]
Y=boston_pd.iloc[:, -1]
print(boston_pd)
```

	0	1	2	3	4	5	6	7	8	9
10 \										
0	0.00632	18.0	2.31	0.0	0.538	6.575	65.2	4.0900	1.0	296.0
5.3										
1	0.02731	0.0	7.07	0.0	0.469	6.421	78.9	4.9671	2.0	242.0
7.8										
2	0.02729	0.0	7.07	0.0	0.469	7.185	61.1	4.9671	2.0	242.0
7.8										
3	0.03237	0.0	2.18	0.0	0.458	6.998	45.8	6.0622	3.0	222.0
8.7										
4	0.06905	0.0	2.18	0.0	0.458	7.147	54.2	6.0622	3.0	222.0
8.7										
..	...	...	...	...	...	...	...	...	...	...
...										
501	0.06263	0.0	11.93	0.0	0.573	6.593	69.1	2.4786	1.0	273.0
1.0										
502	0.04527	0.0	11.93	0.0	0.573	6.120	76.7	2.2875	1.0	273.0
1.0										
503	0.06076	0.0	11.93	0.0	0.573	6.976	91.0	2.1675	1.0	273.0
1.0										

```
X_train,X_test,y_train,y_test=train_test_split(X,Y,test_size=0.25,random_state=0)
```

In [21]:

```
lreg=LinearRegression()
lreg.fit(X_train,y_train)
```

Out[21]:

```
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=None, normalize=False)
```

```
y_pred=lreg.predict(X_test)
```

In [23]:

```
lreg_coff=pd.DataFrame()  
lreg_coff['Columns']=X_train.columns  
lreg_coff['Coefficient']=pd.Series(lreg.coef_)
```

In [24]:

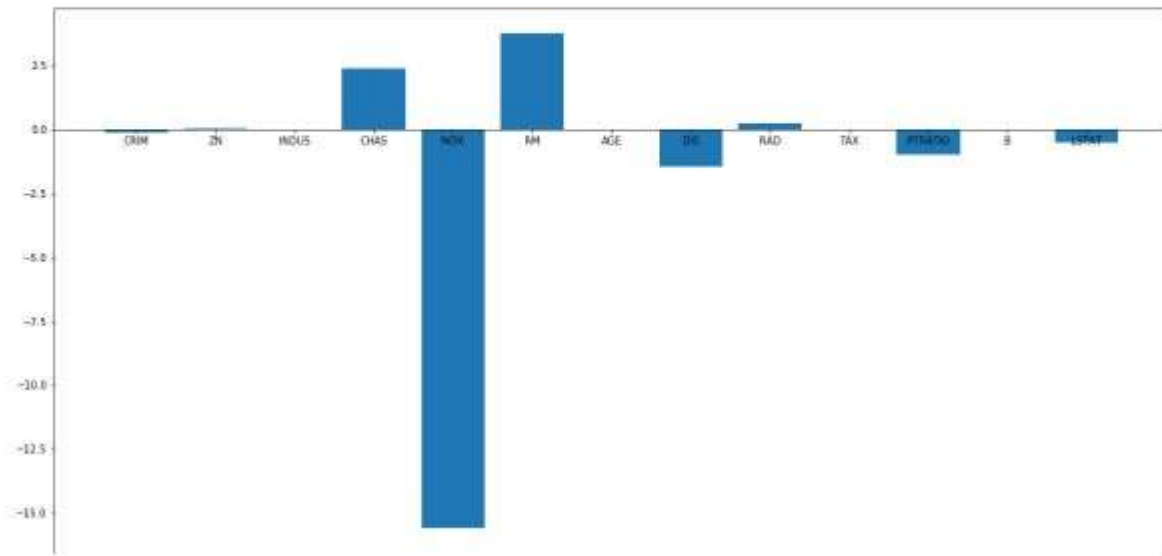
```
lreg_coff
```

Out[24]:

	Columns	Coefficient
0	0	-0.117735
1	1	0.044017
2	2	-0.005768
3	3	2.393416
4	4	-15.589421
5	5	3.768968
6	6	-0.007035
7	7	-1.434956



```
fig,ax=plt.subplots(figsize=(20,10))
ax.bar(['CRIM', 'ZN', 'INDUS', 'CHAS', 'NOX', 'RM', 'AGE', 'DIS', 'RAD',
       'TAX', 'PTRATIO', 'B', 'LSTAT'],lreg_coff['Cofficient'])
ax.spines['bottom'].set_position('zero')
plt.show()
```



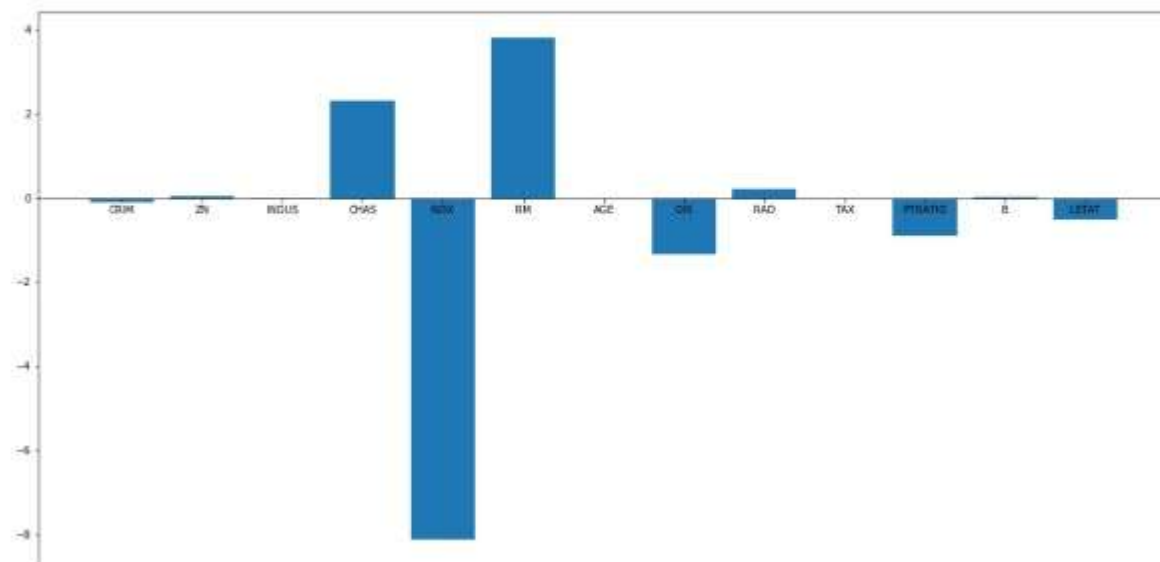
```
from sklearn.linear_model import Ridge
```

```
ri=Ridge()  
ri.fit(X_train,y_train)  
ri_y_pred=ri.predict(X_test)
```

In [30]:

```
ri_coff=pd.DataFrame()  
ri_coff['Columns']=X_train.columns  
ri_coff['Coefficient']=pd.Series(ri.coef_)
```

```
fig,ax=plt.subplots(figsize=(20,10))  
ax.bar(['CRIM', 'ZN', 'INDUS', 'CHAS', 'NOX', 'RM', 'AGE', 'DIS', 'RAD',  
        'TAX', 'PTRATIO', 'B', 'LSTAT'],ri_coff['Coefficient'])  
ax.spines['bottom'].set_position('zero')  
plt.show()
```



**Ques 16: Use some function for neural networks, like Stochastic Gradient Descent or backpropagation - algorithm to predict the value of a variable based on the dataset of problem 14.**

Code & Output:

```
import pandas as pd
from sklearn.model_selection import train_test_split
import numpy as np
from sklearn.linear_model import SGDClassifier
from sklearn import metrics
```

In [2]:

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

In [3]:

```
df
```

Out[3]:

	Pregnancies	Glucose	BloodPressure	SkinThickness	Insulin	BMI	DiabetesPedigreeFu
0	6	148	72	35	0	33.6	
1	1	85	66	29	0	26.6	
2	8	183	64	0	0	23.3	
3	1	89	66	23	94	28.1	
4	0	137	40	35	168	43.1	
...	...	...	...	...	...	...	
763	10	101	76	48	180	32.9	
764	2	122	70	27	0	36.8	

```
feature_cols = ['Pregnancies', 'Insulin', 'BMI', 'Age', 'Glucose', 'BloodPressure', 'DiabetesPedigreeFunction']
X = df[feature_cols]
y = df.Outcome
```

In [5]:

```
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.25,random_state=0)
```

In [12]:

```
sgdc = SGDClassifier(max_iter=100,)
```

```
sgdc.fit(X_train,y_train)
y_pred=sgdc.predict(X_test)
```

In [14]:

```
print("Accuracy:",metrics.accuracy_score(y_test, y_pred))
print("Precision:",metrics.precision_score(y_test, y_pred))
print("Recall:",metrics.recall_score(y_test, y_pred))
print("F1-score:",metrics.f1_score(y_test, y_pred))
```

Accuracy: 0.6510416666666666  
Precision: 0.463768115942029  
Recall: 0.5161290322580645  
F1-score: 0.4885496183206106

In [15]:

```
cnf_matrix = metrics.confusion_matrix(y_test, y_pred)
cnf_matrix
```

Out[15]:

```
array([[93, 37],
       [30, 32]], dtype=int64)
```