In [1]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn import metrics
import warnings
warnings.filterwarnings("ignore")
```

Reading the data

In [2]:
```
insurance_dataset = pd.read_csv('downloads\insurance.csv')
```

In [3]:
```
insurance_dataset.head()
```

Out[3]:

	age	sex	bmi	children	smoker	region	charges
0	19	female	27.900	0	yes	southwest	16884.92400
1	18	male	33.770	1	no	southeast	1725.55230
2	28	male	33.000	3	no	southeast	4449.46200
3	33	male	22.705	0	no	northwest	21984.47061
4	32	male	28.880	0	no	northwest	3866.85520

In [4]:
```
insurance_dataset.describe()
```

Out[4]:

	age	bmi	children	charges
count	1338.000000	1338.000000	1338.000000	1338.000000
mean	39.207025	30.663397	1.094918	13270.422265
std	14.049960	6.098187	1.205493	12110.011237
min	18.000000	15.960000	0.000000	1121.873900
25%	27.000000	26.296250	0.000000	4740.287150
50%	39.000000	30.400000	1.000000	9382.033000
75%	51.000000	34.693750	2.000000	16639.912515
max	64.000000	53.130000	5.000000	63770.428010

In [5]:
```
insurance_dataset.shape
```

Out[5]: (1338, 7)

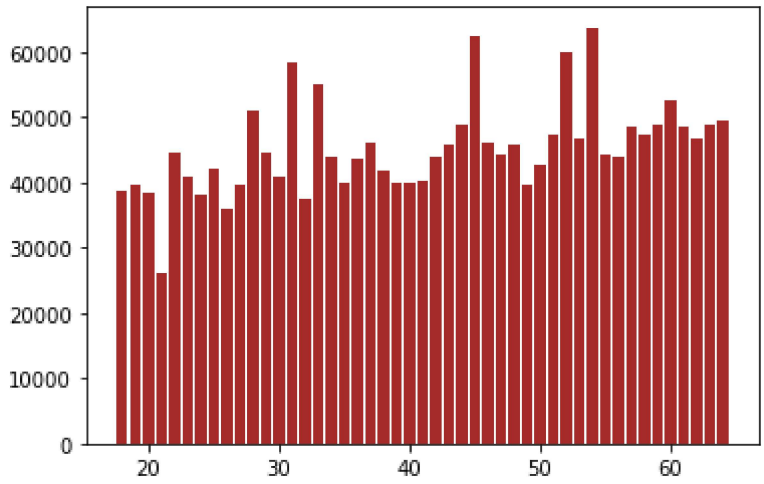
In [6]:
```
insurance_dataset.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1338 entries, 0 to 1337
Data columns (total 7 columns):
 #   Column    Non-Null Count  Dtype  
---  ------    --------------  -----  
 0   age       1338 non-null   int64  
 1   sex       1338 non-null   object 
 2   bmi       1338 non-null   float64
 3   children  1338 non-null   int64  
 4   smoker    1338 non-null   object 
 5   region    1338 non-null   object 
 6   charges   1338 non-null   float64
dtypes: float64(2), int64(2), object(3)
memory usage: 73.3+ KB
```

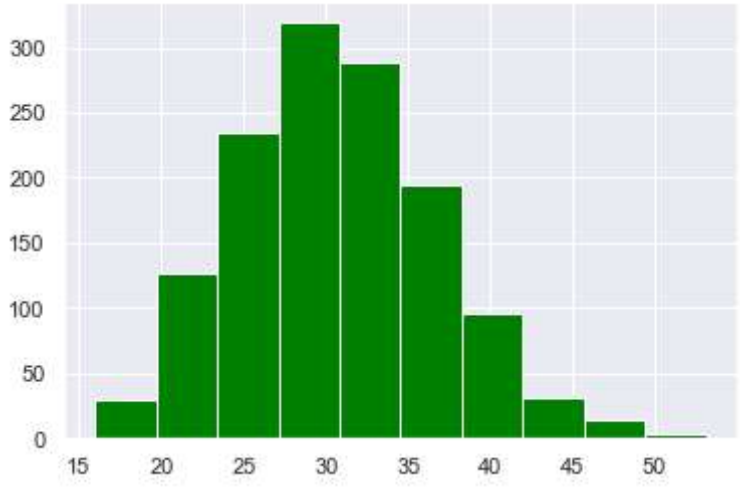
In [7]:
```
insurance_dataset.isnull().sum()
```

Out[7]:
```
age         0
sex         0
bmi         0
children    0
smoker      0
region      0
charges     0
dtype: int64
```

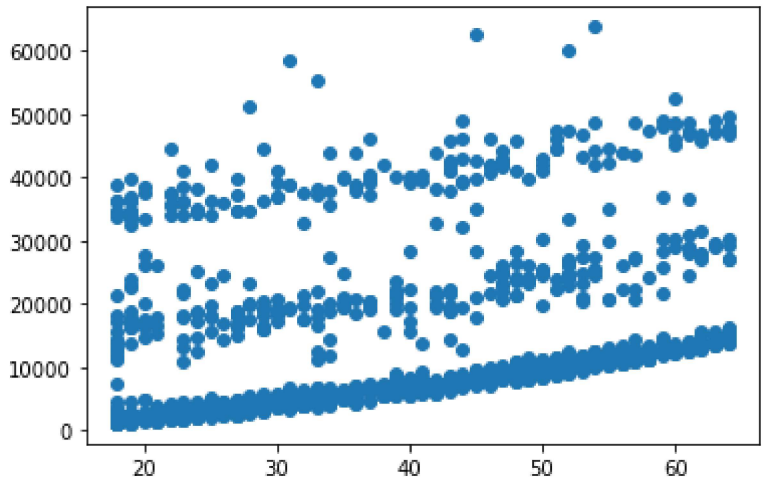
In [8]:
```
plt.bar(insurance_dataset["age"],insurance_dataset["charges"],color='brown')
plt.show()
```



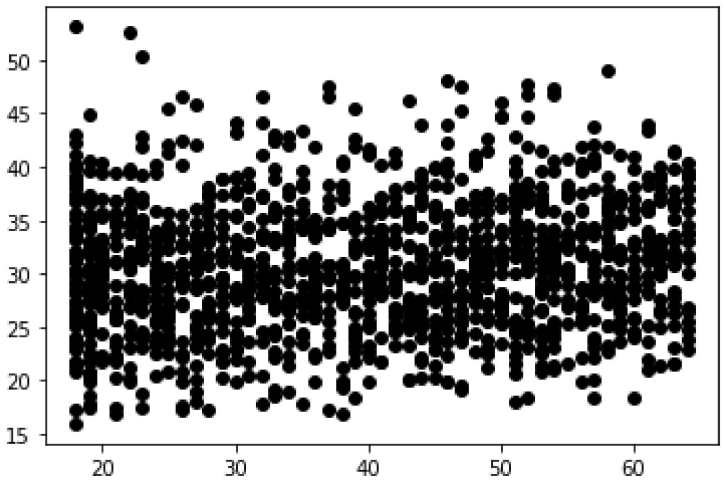
In [53]:
```
plt.hist(insurance_dataset["bmi"],color='green')
plt.show()
```



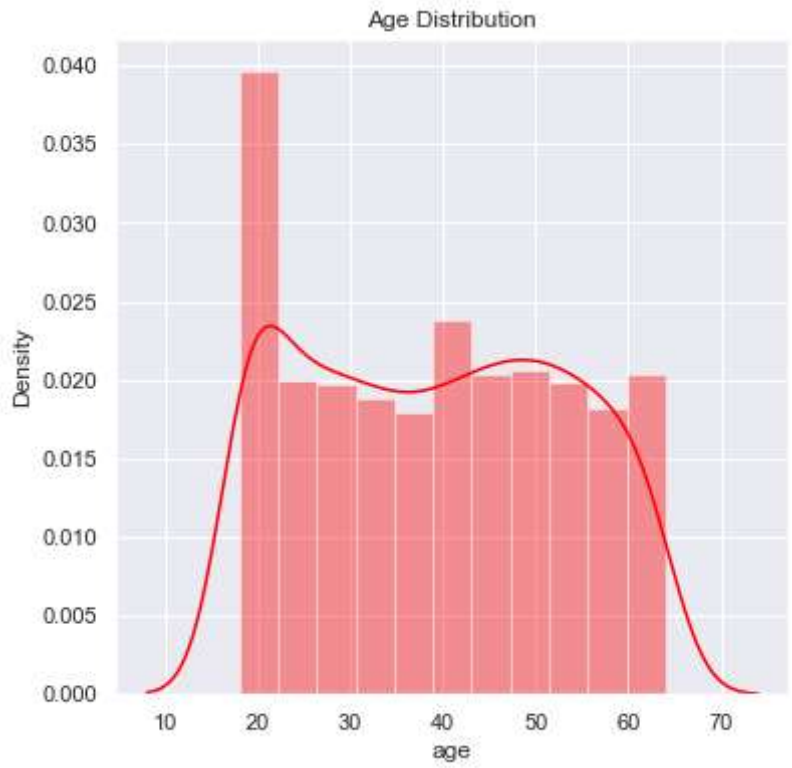
In [9]:
```
plt.scatter(insurance_dataset['age'],insurance_dataset['charges'])
plt.show()
```



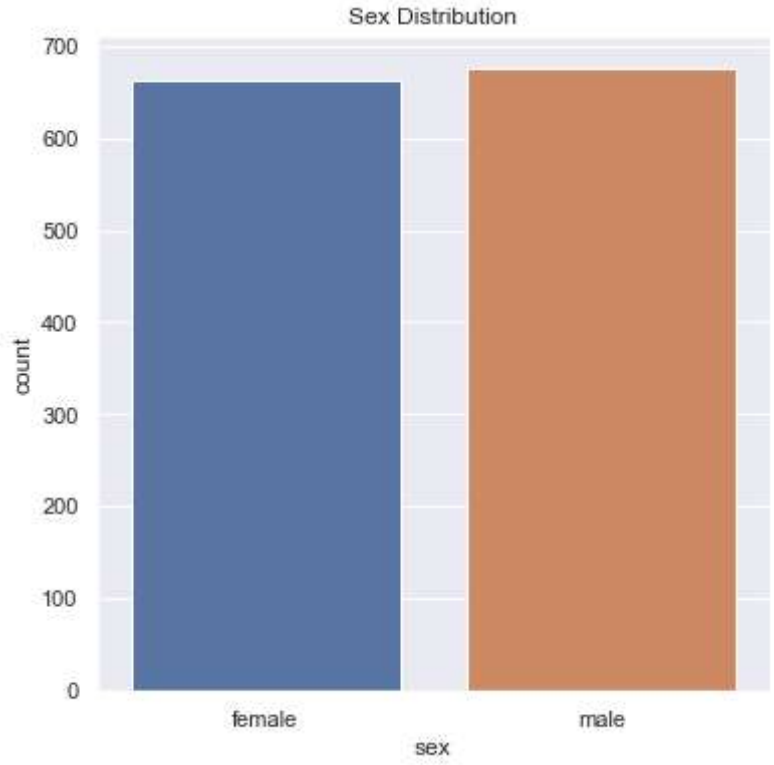
In [10]:
```
plt.scatter(insurance_dataset['age'],insurance_dataset['bmi'],color='black')
plt.show()
```



In [11]:
```
sns.set()
plt.figure(figsize=(6,6))
sns.distplot(insurance_dataset['age'],color='red')
plt.title('Age Distribution')
plt.show()
```



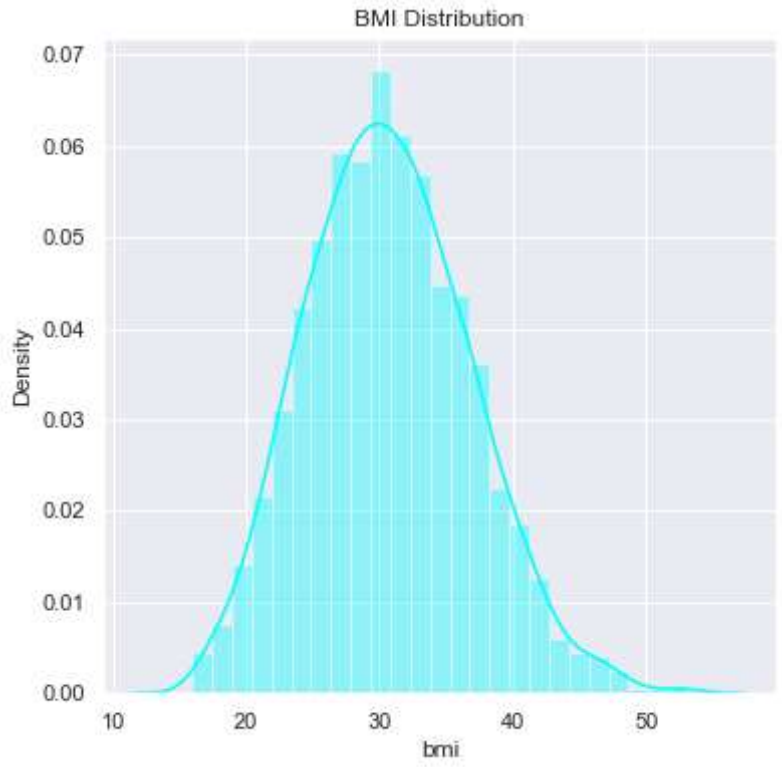
In [12]:
```
plt.figure(figsize=(6,6))
sns.countplot(x='sex', data=insurance_dataset)
plt.title('Sex Distribution')
plt.show()
```



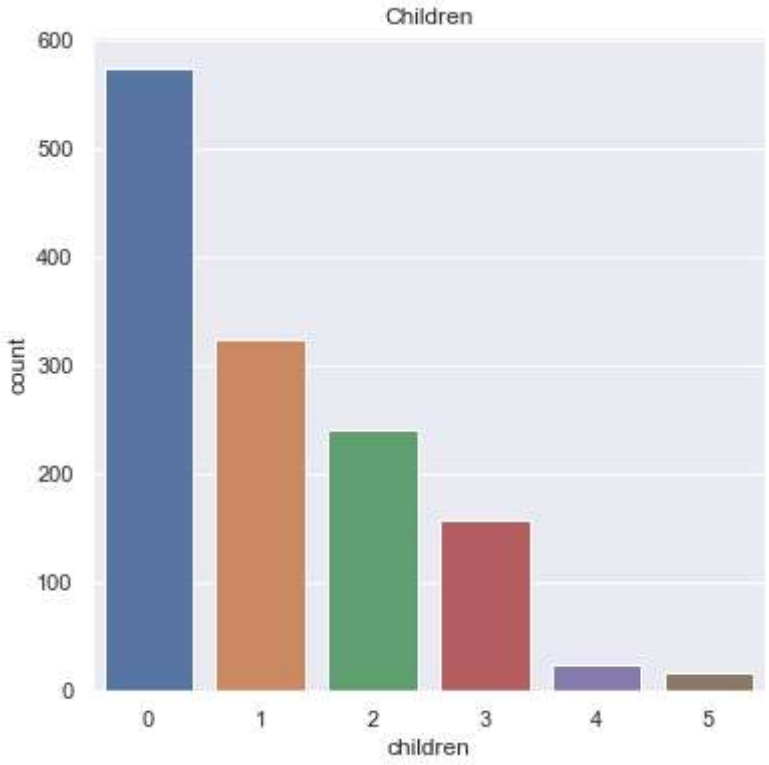
In [14]:
```
insurance_dataset['sex'].value_counts()
```

Out[14]:
```
male      676
female    662
Name: sex, dtype: int64
```

In [13]:
```
plt.figure(figsize=(6,6))
sns.distplot(insurance_dataset['bmi'],color='cyan')
plt.title('BMI Distribution')
plt.show()
```



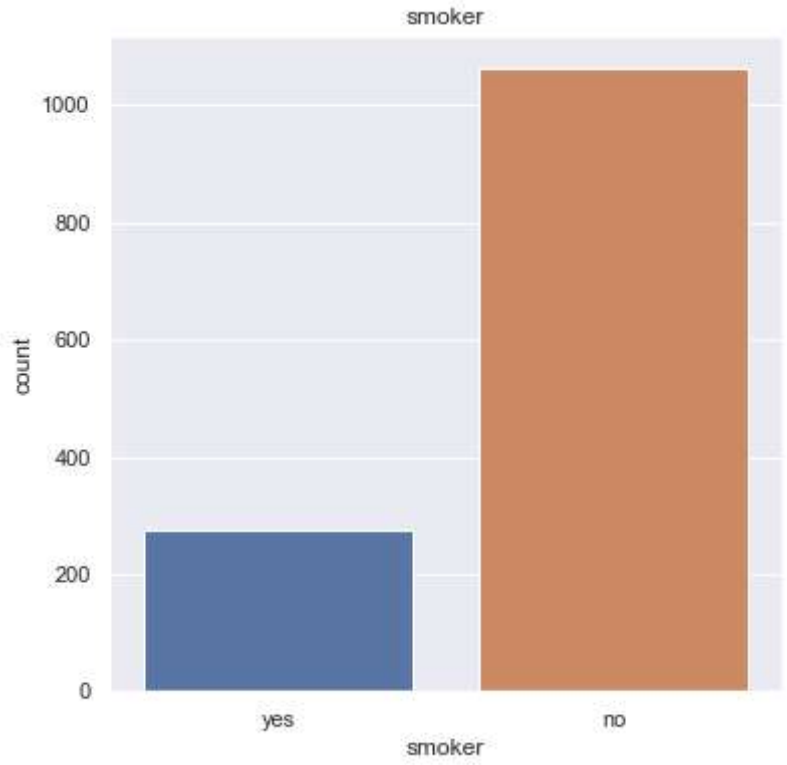
In [14]:
```
plt.figure(figsize=(6,6))
sns.countplot(x='children', data=insurance_dataset)
plt.title('Children')
plt.show()
```



In [15]:
```
insurance_dataset['children'].value_counts()
```

Out[15]:
```
0    574
1    324
2    240
3    157
4     25
5     18
Name: children, dtype: int64
```

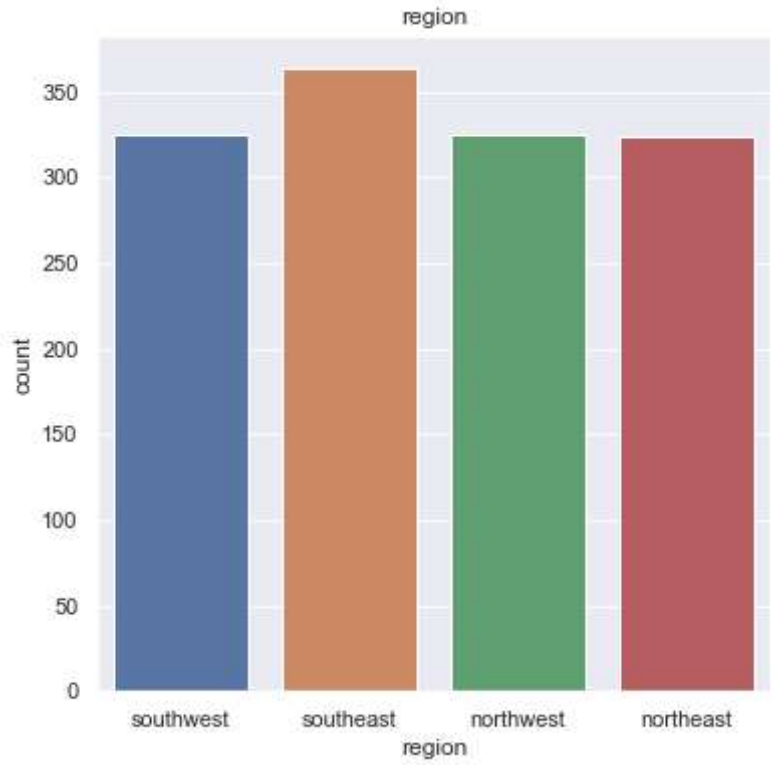
In [16]:
```
plt.figure(figsize=(6,6))
sns.countplot(x='smoker', data=insurance_dataset)
plt.title('smoker')
plt.show()
```



In [17]:
```
insurance_dataset['smoker'].value_counts()
```

Out[17]:
```
no     1064
yes     274
Name: smoker, dtype: int64
```

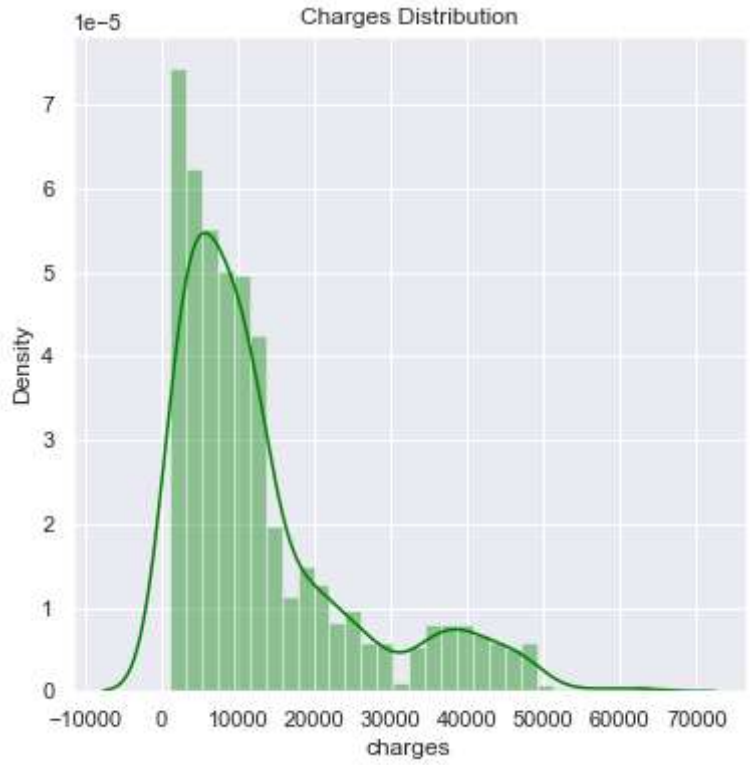
In [18]:
```
plt.figure(figsize=(6,6))
sns.countplot(x='region', data=insurance_dataset)
plt.title('region')
plt.show()
```



In [19]:
```
insurance_dataset['region'].value_counts()
```

Out[19]:
```
southeast    364
northwest    325
southwest    325
northeast    324
Name: region, dtype: int64
```

In [20]:
```
plt.figure(figsize=(6,6))
sns.distplot(insurance_dataset['charges'],color="green")
plt.title('Charges Distribution')
plt.show()
```



Data Pre-Processing

In [21]:
```
insurance_dataset.replace({'sex':{'male':0,'female':1}}, inplace=True)
```

In [22]:
```
insurance_dataset.replace({'smoker':{'yes':0,'no':1}}, inplace=True)
```

In [23]:
```
insurance_dataset.replace({'region':{'southeast':0,'southwest':1,'northeast':2,'r
```

In [24]:
```
X = insurance_dataset.drop(columns='charges', axis=1)
Y = insurance_dataset['charges']
```

In [25]:
```
X
```

Out[25]:

	age	sex	bmi	children	smoker	region
0	19	1	27.900	0	0	1
1	18	0	33.770	1	1	0
2	28	0	33.000	3	1	0
3	33	0	22.705	0	1	3
4	32	0	28.880	0	1	3
...	...	...	...	...	...	...
1333	50	0	30.970	3	1	3
1334	18	1	31.920	0	1	2
1335	18	1	36.850	0	1	0
1336	21	1	25.800	0	1	1
1337	61	1	29.070	0	0	3

1338 rows × 6 columns

In [26]:
```
Y
```

Out[26]:
```
0       16884.92400
1        1725.55230
2        4449.46200
3       21984.47061
4        3866.85520
           ...
1333    10600.54830
1334     2205.98080
1335     1629.83350
1336     2007.94500
1337    29141.36030
Name: charges, Length: 1338, dtype: float64
```

Splitting the data into Training data & Testing Data

In [27]:
```
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.2, random_s
```

In [28]:
```
print(X.shape, X_train.shape, X_test.shape)
```

```
(1338, 6) (1070, 6) (268, 6)
```

Model Training

In [29]:
```
regressor = LinearRegression()
```

In [30]:
```
regressor.fit(X_train, Y_train)
```

Out[30]:
```
LinearRegression()
```

In [31]:
```
training_data_prediction =regressor.predict(X_train)
```

In [32]:
```
r2_train = metrics.r2_score(Y_train, training_data_prediction)
print('R squared mean value : ', r2_train)
```

```
R squared mean value :  0.751505643411174
```

In [33]:
```
test_data_prediction =regressor.predict(X_test)
```

In [34]:
```
r2_test = metrics.r2_score(Y_test, test_data_prediction)
print('R squared mean value : ', r2_test)
```

```
R squared mean value :  0.7447273869684077
```

Predicting with test values

In [35]:
```
input_data = (31,1,25.74,0,1,0)
input_data_as_numpy_array = np.asarray(input_data)
input_data_reshaped = input_data_as_numpy_array.reshape(1,-1)
prediction = regressor.predict(input_data_reshaped)
print(prediction)

print('The insurance cost is USD $',prediction[0])
```

```
[3760.0805765]
The insurance cost is USD $ 3760.0805764960487
```

In [ ]:
```

```