```
import pandas as pd
import matplotlib .pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn.metrics import r2_score,mean_squared_error,root_mean_squared_error,mean_absolute_error
import seaborn as sns
```

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

	city	date	rate	state
0	Agartala	2012-10-27	46.93	Tripura
1	Agartala	2013-01-18	47.45	Tripura
2	Agartala	2013-02-16	47.96	Tripura
3	Agartala	2013-03-23	47.46	Tripura
4	Agartala	2013-04-01	48.47	Tripura
...	...	...	...	...
17230	Varanasi	2020-12-27	74.84	Uttar Pradesh
17231	Varanasi	2020-12-28	74.84	Uttar Pradesh
17232	Varanasi	2020-12-29	74.84	Uttar Pradesh
17233	Varanasi	2020-12-30	74.84	Uttar Pradesh
17234	Varanasi	2020-12-31	74.84	Uttar Pradesh

17235 rows × 4 columns

Next steps: Generate code with df View recommended plots New interactive sheet

```
df.head(5)
```

	city	date	rate	state
0	Agartala	2012-10-27	46.93	Tripura
1	Agartala	2013-01-18	47.45	Tripura
2	Agartala	2013-02-16	47.96	Tripura
3	Agartala	2013-03-23	47.46	Tripura
4	Agartala	2013-04-01	48.47	Tripura

Next steps: Generate code with df View recommended plots New interactive sheet

```
df.tail(5)
```

	city	date	rate	state	year
17230	Varanasi	2020-12-27	74.84	Uttar Pradesh	2020
17231	Varanasi	2020-12-28	74.84	Uttar Pradesh	2020
17232	Varanasi	2020-12-29	74.84	Uttar Pradesh	2020
17233	Varanasi	2020-12-30	74.84	Uttar Pradesh	2020
17234	Varanasi	2020-12-31	74.84	Uttar Pradesh	2020

```
df.isnull()
```

	city	date	rate	state	year
0	False	False	False	False	False
1	False	False	False	False	False
2	False	False	False	False	False
3	False	False	False	False	False
4	False	False	False	False	False
...	...	...	...	...	...
17230	False	False	False	False	False
17231	False	False	False	False	False
17232	False	False	False	False	False
17233	False	False	False	False	False
17234	False	False	False	False	False

17235 rows × 5 columns

```
df.isnull().sum()
```

	0
city	0
date	0
rate	0
state	0
year	0

dtype: int64

```
df.shape
```

```
(17235, 5)
```

```
df.size
```

```
86175
```

```
df.empty
```

```
False
```

```
df.columns
```

```
Index(['city', 'date', 'rate', 'state', 'year'], dtype='object')
```

```
df.index
```

```
RangeIndex(start=0, stop=17235, step=1)
```

```
df.count()
```

	0
city	17235
date	17235
rate	17235
state	17235
year	17235

dtype: int64

```
df.dropna()
```

```
           city        date   rate          state  year
    0      Agartala  2012-10-27  46.93        Tripura  2012
    1      Agartala  2013-01-18  47.45        Tripura  2013
    2      Agartala  2013-02-16  47.96        Tripura  2013
    3      Agartala  2013-03-23  47.46        Tripura  2013
    4      Agartala  2013-04-01  48.47        Tripura  2013
   ...          ...         ...    ...            ...   ...
17230      Varanasi  2020-12-27  74.84  Uttar Pradesh  2020
17231      Varanasi  2020-12-28  74.84  Uttar Pradesh  2020
17232      Varanasi  2020-12-29  74.84  Uttar Pradesh  2020
17233      Varanasi  2020-12-30  74.84  Uttar Pradesh  2020
17234      Varanasi  2020-12-31  74.84  Uttar Pradesh  2020

17235 rows × 5 columns
```

```
df.duplicated()
```

```
            0
    0   False
    1   False
    2   False
    3   False
    4   False
  ...     ...
17230   False
17231   False
17232   False
17233   False
17234   False

17235 rows × 1 columns

dtype: bool
```

```
pd.to_datetime(df['date']).dt.year
df['year']=pd.to_datetime(df['date']).dt.year
df
```

	city	date	rate	state	year
0	Agartala	2012-10-27	46.93	Tripura	2012
1	Agartala	2013-01-18	47.45	Tripura	2013
2	Agartala	2013-02-16	47.96	Tripura	2013
3	Agartala	2013-03-23	47.46	Tripura	2013
4	Agartala	2013-04-01	48.47	Tripura	2013
...	...	...	...	...	...
17230	Varanasi	2020-12-27	74.84	Uttar Pradesh	2020
17231	Varanasi	2020-12-28	74.84	Uttar Pradesh	2020
17232	Varanasi	2020-12-29	74.84	Uttar Pradesh	2020
17233	Varanasi	2020-12-30	74.84	Uttar Pradesh	2020
17234	Varanasi	2020-12-31	74.84	Uttar Pradesh	2020

17235 rows × 5 columns

Next steps: Generate code with df View recommended plots New interactive sheet

```
X=df[['year']]
Y=df[['rate']]
```

```
X_train,X_test,Y_train,Y_test=train_test_split(X,Y,test_size=0.2,random_state=1)
```

```
X_train,X_test
Y_train,Y_test
```

```
(        rate
 4939   62.09
 3472   65.94
 534    66.79
 6514   66.29
 5082   77.58
 ...      ...
 7813   74.96
 10955  61.26
 5192   69.63
 12172  67.19
 235    68.27

 [13788 rows x 1 columns],
         rate
 12689  59.32
 2621   57.74
 4994   66.70
 4834   75.98
 8307   54.81
 ...      ...
 9935   59.46
 1520   60.48
 13795  66.93
 10101  70.66
 6824   69.43

 [3447 rows x 1 columns])
```

```
MODEL=LinearRegression()
MODEL.fit(X_train,Y_train)
Pred=MODEL.predict(X_test)
```

```
coefficients=MODEL.coef_
intercept=MODEL.intercept_
print(coefficients)
print(intercept)
```

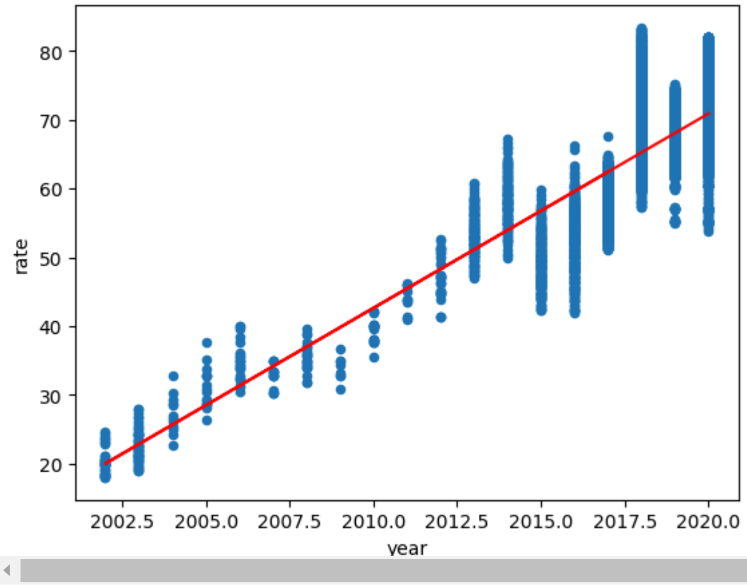
```
[[2.82514316]]
[-5635.91044847]
```

```
mse=mean_squared_error(Y_test,Pred)
rmse=root_mean_squared_error(Y_test,Pred)
mae=mean_absolute_error(Y_test,Pred)
r2=r2_score(Y_test,Pred)
```

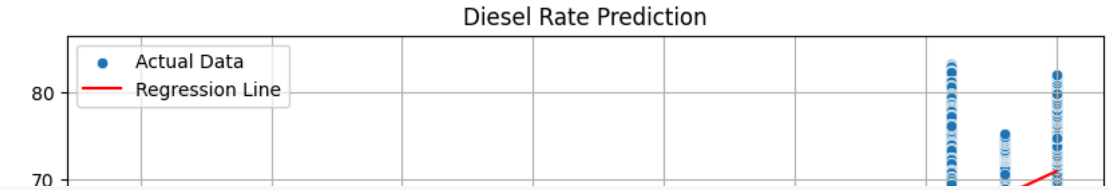
```
print('MSE:',mse)
print('RMSE:',rmse)
print('MAE:',mae)
print('R2:',r2)
```

```
MSE: 37.505633211236024
RMSE: 6.124184289457333
MAE: 4.778966235510822
R2: 0.5027340800830769
```

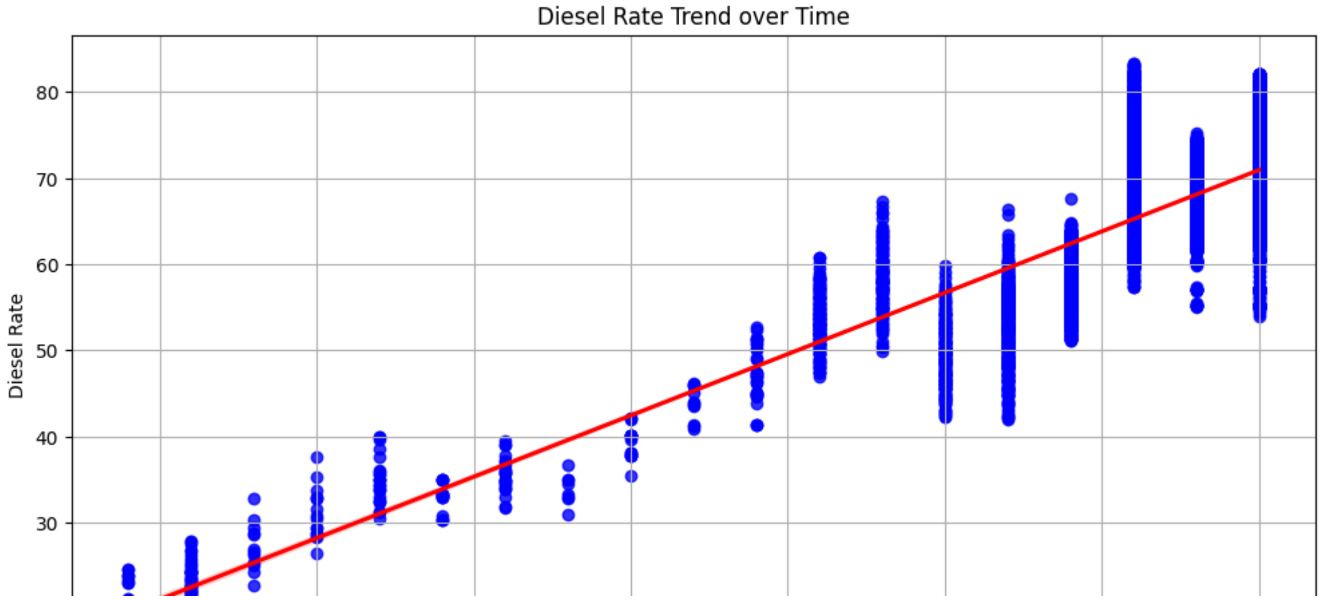
```
df.plot(kind='scatter',x='year',y='rate')
plt.plot(X_test,Pred,color='red')
plt.show()
```



```
plt.figure(figsize=(10, 6))  # Adjust figure size if needed
sns.scatterplot(x='year', y='rate', data=df, label='Actual Data')
plt.plot(X_test, Pred, color='red', label='Regression Line')
plt.xlabel('Year')
plt.ylabel('Rate')
plt.title('Diesel Rate Prediction')
plt.legend()
plt.grid(True)
plt.show()
```



```
plt.figure(figsize=(12, 6))
sns.regplot(x='year', y='rate', data=df, color='blue', line_kws={'color': 'red'})
plt.xlabel('Year')
plt.ylabel('Diesel Rate')
plt.title('Diesel Rate Trend over Time')
plt.grid(True)
plt.show()
```


Diesel Rate Trend over Time
Diesel Rate