

```
In [1]: import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
In [2]: df=pd.read_csv("23_Vande Bharat.csv")
df.fillna(0,inplace=True)
df
```

Out[2]:

	Sr. No.	Train Name	Train Number	Originating City	Originating Station	Terminal City	Terminal Station	Operator	No. of Cars	Frequency	Distance
0	1	New Delhi - Varanasi Vande Bharat Express	22435/22436	Delhi	New Delhi	Varanasi	Varanasi Junction	NR	16	Except Thursdays	759 km (472 mi)
1	2	New Delhi - Shri Mata Vaishno Devi Katra Vande...	22439/22440	Delhi	New Delhi	Katra	Shri Mata Vaishno Devi Katra	NR	16	Except Tuesdays	655 km (407 mi)
2	3	Mumbai Central - Gandhinagar Capital Vande Bha...	20901/20902	Mumbai	Mumbai Central	Gandhinagar	Gandhinagar Capital	WR	16	Except Wednesdays	522 km (324 mi)
3	4	New Delhi - Amb Andaura Vande Bharat Express	22447/22448	Delhi	New Delhi	Andaura	Amb Andaura	NR	16	Except Fridays	412 km (256 mi)
4	5	MGR Chennai Central - Mysuru Vande Bharat Express	20607/20608	Chennai	Chennai Central	Mysuru	Mysore Junction	SR	16	Except Wednesdays	496 km (308 mi)
5	6	Bilaspur - Nagpur Vande Bharat Express	20825/20826	Bilaspur, Chhattisgarh	Bilaspur Junction	Nagpur	Nagpur Junction	SECR	8	Except Saturdays	412 km (256 mi)
6	7	Howrah - New Jalpaiguri Vande Bharat Express	22301/22302	Kolkata	Howrah Junction	Siliguri	New Jalpaiguri Junction	ER	16	Except Wednesdays	565 km (351 mi)
7	8	Visakhapatnam - Secunderabad Vande Bharat Express	20833/20834	Visakhapatnam	Visakhapatnam Junction	Hyderabad	Secunderabad Junction	ECOR	16	Except Sundays	698 km (434 mi)
8	9	Mumbai CSMT - Solapur Vande Bharat Express	22225/22226	Mumbai	Chhatrapati Shivaji Terminus	Solapur	Solapur	CR	16	Except Wednesdays (22225) , Except Thursdays (...)	452 km (281 mi)
9	10	Mumbai CSMT - Sainagar Shirdi Vande Bharat Exp...	22223/22224	Mumbai	Chhatrapati Shivaji Terminus	Shirdi	Sainagar Shirdi	CR	16	Except Tuesdays	339 km (211 mi)
10	11	Rani Kamalapati (Habibganj) - Hazrat Nizamuddi...	20171/20172	Bhopal	Habibganj (Rani Kamalapati)	Delhi	Hazrat Nizamuddin	WCR	16	Except Saturdays	702 km (436 mi)
11	12	Secunderabad - Tirupati Vande Bharat Express	20701/20702	Hyderabad	Secunderabad Junction	Tirupati	Tirupati	SCR	16	Except Tuesdays	661 km (411 mi)
12	13	MGR Chennai Central - Coimbatore Vande Bharat ...	20643/20644	Chennai	Chennai Central	Coimbatore	Coimbatore Junction	SR	8	Except Wednesdays	495 km (308 mi)
13	14	Delhi Cantonment - Ajmer Vande Bharat Express	20977/20978	Delhi	Delhi Cantonment	Ajmer	Ajmer Junction	NWR	16	Except Wednesdays	428 km (266 mi)
14	15	Kasaragod - Thiruvananthapuram Vande Bharat Ex...	20633/20634	Kasaragod	Kasaragod	Thiruvananthapuram	Thiruvananthapuram Central	SR	16	Except Thursdays	587 km (365 mi)
15	16	Howrah - Puri Vande Bharat Express	22895/22896	Kolkata	Howrah Junction	Puri	Puri	SER	16	Except Thursdays	500 km (310 mi)
16	17	Anand Vihar Terminal - Dehradun Vande Bharat E...	22457/22458	Delhi	Anand Vihar Terminal	Dehradun	Dehradun Terminal	NR	8	Except Wednesdays	304 km (189 mi)
17	18	New Jalpaiguri - Guwahati Vande Bharat Express	22227/22228	Siliguri	New Jalpaiguri Junction	Guwahati	Guwahati	NFR	8	Except Tuesdays	407 km (253 mi)
18	19	Mumbai CSMT - Madgaon Vande Bharat Express	22229/22230	Mumbai	Chhatrapati Shivaji Terminus	Madgaon	Madgaon Junction	CR	16	Except Fridays\n(Non-Monsoon)	586 km (364 mi) 0:
19	19	Mumbai CSMT - Madgaon Vande Bharat Express	22229/22230	Mumbai	Chhatrapati Shivaji Terminus	Madgaon	Madgaon Junction	CR	16	Monday, Wednesday, Friday (22229)\nTuesday, Th...	586 km (364 mi) 05
20	20	Patna - Ranchi Vande Bharat Express	22349/22350	Patna	Patna Junction	Ranchi	Ranchi Junction	ECR	8	Except Tuesdays	379 km (235 mi)
21	21	KSR Bengaluru - Dharwad Vande Bharat Express	20661/20662	Bangalore	Bangalore City	Hubballi - Dharwad	Dharwad	SWR	8	Except Tuesdays	490 km (300 mi)
22	22	Rani Kamalapati (Habibganj) - Jabalpur Vande B...	20173/20174	Bhopal	Habibganj (Rani Kamalapati)	Jabalpur	Jabalpur Junction	WCR	8	Except Tuesdays	337 km (209 mi)
23	23	Indore - Bhopal Vande Bharat Express	20911/20912	Indore	Indore Junction	Bhopal	Bhopal Junction	WR	8	Except Sundays	250 km (160 mi)

	Sr. No.	Train Name	Train Number	Originating City	Originating Station	Terminal City	Terminal Station	Operator	No. of Cars	Frequency	Distance
24	24	Jodhpur - Sabarmati (Ahmedabad) Vande Bharat E...	12461/12462	Jodhpur	Jodhpur Junction	Ahmedabad	Sabarmati Junction	NWR	8	Except Tuesdays	449 km (279 mi)
25	25	Gorakhpur - Lucknow Charbagh Vande Bharat Express	22549/22550	Gorakhpur	Gorakhpur Junction	Charbagh	Lucknow Charbagh	NER	8	Except Saturdays	296 km (184 mi)

In [3]:

df.info()

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 26 entries, 0 to 25
Data columns (total 16 columns):
#   Column                Non-Null Count  Dtype
---  -
0   Sr. No.                26 non-null    int64
1   Train Name            26 non-null    object
2   Train Number          26 non-null    object
3   Originating City      26 non-null    object
4   Originating Station   26 non-null    object
5   Terminal City         26 non-null    object
6   Terminal Station      26 non-null    object
7   Operator              26 non-null    object
8   No. of Cars           26 non-null    int64
9   Frequency             26 non-null    object
10  Distance              26 non-null    object
11  Travel Time           26 non-null    object
12  Speed                26 non-null    object
13  Average Speed         26 non-null    object
14  Inauguration          26 non-null    object
15  Average occupancy     26 non-null    object
dtypes: int64(2), object(14)
memory usage: 3.4+ KB
```

In [4]:

df.describe()

Out[4]:

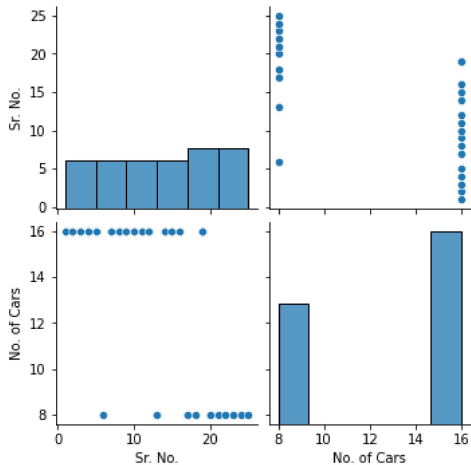
	Sr. No.	No. of Cars
count	26.000000	26.000000
mean	13.230769	12.923077
std	7.306478	3.969112
min	1.000000	8.000000
25%	7.250000	8.000000
50%	13.500000	16.000000
75%	19.000000	16.000000
max	25.000000	16.000000

In [5]:

sns.pairplot(df)

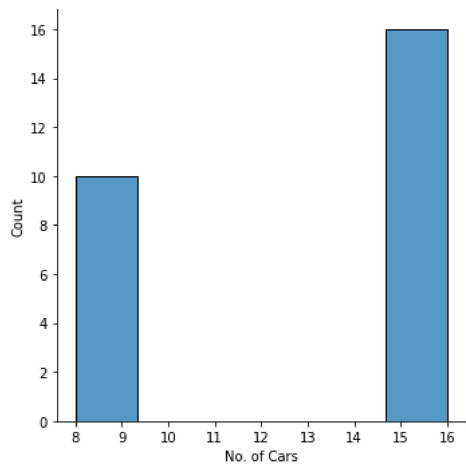
Out[5]:

<seaborn.axisgrid.PairGrid at 0x20091d9be50>



```
In [6]: sns.displot(df['No. of Cars'])
```

```
Out[6]: <seaborn.axisgrid.FacetGrid at 0x2008e0869a0>
```



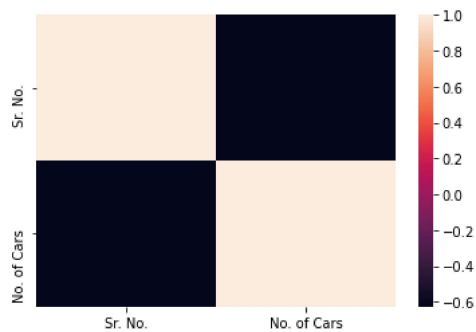
```
In [7]: df1=df.drop(['Train Name'],axis=1)
df1
```

Out[7]:

ing ion	Terminal City	Terminal Station	Operator	No. of Cars	Frequency	Distance	Travel Time	Speed	Average Speed	Inauguration	Average occupancy
elhi	Varanasi	Varanasi Junction	NR	16	Except Thursdays	759 km (472 mi)	08h 00m	130 km/h (81 mph)	95 km/h (59 mph)	2/15/2019	126%
elhi	Katra	Shri Mata Vaishno Devi Katra	NR	16	Except Tuesdays	655 km (407 mi)	08h 00m	130 km/h (81 mph)	82 km/h (51 mph)	10/3/2019	114%
rbai itral	Gandhinagar	Gandhinagar Capital	WR	16	Except Wednesdays	522 km (324 mi)	06h 25m	130 km/h (81 mph)	82 km/h (51 mph)	9/30/2022	132%
elhi	Andaura	Amb Andaura	NR	16	Except Fridays	412 km (256 mi)	05h 10m	130 km/h (81 mph)	79 km/h (49 mph)	10/13/2022	70%
inai itral	Mysuru	Mysore Junction	SR	16	Except Wednesdays	496 km (308 mi)	06h 30m	130 km/h (81 mph)	79 km/h (49 mph)	11/11/2022	75%
ipur tion	Nagpur	Nagpur Junction	SECR	8	Except Saturdays	412 km (256 mi)	05h 30m	130 km/h (81 mph)	75 km/h (47 mph)	12/11/2022	96%
rah tion	Siliguri	New Jalpaiguri Junction	ER	16	Except Wednesdays	565 km (351 mi)	07h 30m	130 km/h (81 mph)	75 km/h (47 mph)	12/30/2022	100%
am tion	Hyderabad	Secunderabad Junction	ECoR	16	Except Sundays	698 km (434 mi)	08h 30m	130 km/h (81 mph)	82 km/h (51 mph)	1/15/2023	120%
pati vaji nus	Solapur	Solapur	CR	16	Except Wednesdays (22225) , Except Thursdays (...)	452 km (281 mi)	06h 30m	110 km/h (68 mph)	70 km/h (43 mph)	2/10/2023	100%
pati vaji nus	Shirdi	Sainagar Shirdi	CR	16	Except Tuesdays	339 km (211 mi)	05h 20m	110 km/h (68 mph)	64 km/h (40 mph)	2/10/2023	93%
anj ani ati)	Delhi	Hazrat Nizamuddin	WCR	16	Except Saturdays	702 km (436 mi)	07h 30m	160 km/h (99 mph)	94 km/h (58 mph)	4/1/2023	90%
bad tion	Tirupati	Tirupati	SCR	16	Except Tuesdays	661 km (411 mi)	08h 15m	130 km/h (81 mph)	80 km/h (50 mph)	4/8/2023	110%
inai itral	Coimbatore	Coimbatore Junction	SR	8	Except Wednesdays	495 km (308 mi)	05h 50m	130 km/h (81 mph)	85 km/h (53 mph)	4/8/2023	150%
elhi ent	Ajmer	Ajmer Junction	NWR	16	Except Wednesdays	428 km (266 mi)	05h 15m	110 km/h (68 mph)	82 km/h (51 mph)	4/12/2023	70%
god	Thiruvananthapuram	Thiruvananthapuram Central	SR	16	Except Thursdays	587 km (365 mi)	08h 05m	110 km/h (68 mph)	73 km/h (45 mph)	4/25/2023	177%
rah tion	Puri	Puri	SER	16	Except Thursdays	500 km (310 mi)	06h 25m	130 km/h (81 mph)	78 km/h (48 mph)	5/18/2023	99%
ihar inal	Dehradun	Dehradun Terminal	NR	8	Except Wednesdays	304 km (189 mi)	04h 45m	130 km/h (81 mph)	64 km/h (40 mph)	5/25/2023	100%
guri tion	Guwahati	Guwahati	NFR	8	Except Tuesdays	407 km (253 mi)	05h 30m	110 km/h (68 mph)	74 km/h (46 mph)	5/29/2023	91%
pati vaji nus	Madgaon	Madgaon Junction	CR	16	Except Fridays\n(Non- Monsoon)	586 km (364 mi)	07h 45m\n(Non- Monsoon)	120 km/h (75 mph)	75 km/h (47 mph)\n(Non- Monsoon)	6/27/2023	94%
pati vaji nus	Madgaon	Madgaon Junction	CR	16	Monday, Wednesday, Friday (22229)\nTuesday, Th...	586 km (364 mi)	10h 05m\n(Monsoon)	120 km/h (75 mph)	57 km/h (35 mph)\n(Monsoon)	6/27/2023	94%
tion	Ranchi	Ranchi Junction	ECR	8	Except Tuesdays	379 km (235 mi)	06h 00m	130 km/h (81 mph)	63 km/h (39 mph)	6/27/2023	118%
City	Hubballi - Dharwad	Dharwad	SWR	8	Except Tuesdays	490 km (300 mi)	06h 25m	130 km/h (81 mph)	76 km/h (47 mph)	6/27/2023	72%
anj ani ati)	Jabalpur	Jabalpur Junction	WCR	8	Except Tuesdays	337 km (209 mi)	04h 40m	110 km/h (68 mph)	73 km/h (45 mph)	6/27/2023	44%
tion	Bhopal	Bhopal Junction	WR	8	Except Sundays	250 km (160 mi)	03h 05m	110 km/h (68 mph)	82 km/h (51 mph)	6/27/2023	37%
ipur tion	Ahmedabad	Sabarmati Junction	NWR	8	Except Tuesdays	449 km (279 mi)	06h 10m	130 km/h (81 mph)	73 km/h (45 mph)	7/7/2023	53%
ipur tion	Charbagh	Lucknow Charbagh	NER	8	Except Saturdays	296 km (184 mi)	04h 15m	110 km/h (68 mph)	71 km/h (44 mph)	7/7/2023	77%

```
In [8]: sns.heatmap(df1.corr())
```

```
Out[8]: <AxesSubplot:>
```



```
In [9]: from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
```

```
In [10]: Terminal Station','Operator','Frequency','Distance','Travel Time','Speed','Average Speed','Inauguration','Average occupancy'],axi
```

```

Sr. No.  No. of Cars
11      12         16
4       5          16
18      19         16
1       2          16
9       10         16
23      23          8
21      21          8
8       9          16
17      18          8
12      13          8
15      16         16
20      20          8
0       1          16
19      19         16
24      24          8
22      22          8
5       6          8
7       8          16
```

```
In [11]: model=LinearRegression()
model.fit(x_train,y_train)
model.intercept_
```

```
Out[11]: 0.0
```

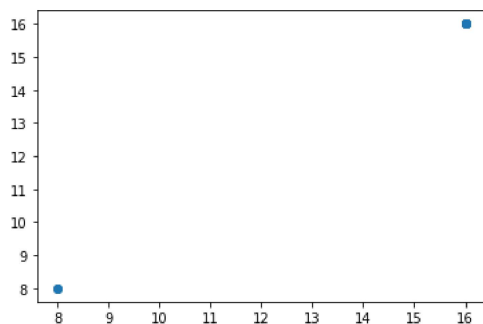
```
In [12]: coeff=pd.DataFrame(model.coef_,x.columns,columns=["Coefficient"])
coeff
```

```
Out[12]:
```

	Coefficient
Sr. No.	0.0
No. of Cars	1.0

```
In [13]: prediction=model.predict(x_test)
plt.scatter(y_test,prediction)
```

```
Out[13]: <matplotlib.collections.PathCollection at 0x200939dd460>
```



```
In [14]: model.score(x_test,y_test)
```

```
Out[14]: 1.0
```

```
In [15]: from sklearn.linear_model import Ridge,Lasso
```

```
In [16]: rr = Ridge(alpha=10)
rr.fit(x_train,y_train)
```

```
Out[16]: Ridge(alpha=10)
```

```
In [17]: rr.score(x_test,y_test)
```

```
Out[17]: 0.9987108779847362
```

```
In [18]: la = Lasso(alpha=10)
la.fit(x_train,y_train)
```

```
Out[18]: Lasso(alpha=10)
```

```
In [19]: la.score(x_test,y_test)
```

```
Out[19]: 0.5246397175047621
```

```
In [20]: from sklearn.linear_model import ElasticNet
en=ElasticNet()
en.fit(x_train,y_train)
print(en.coef_)
print(en.intercept_)
print(en.predict(x_test))
print(en.score(x_test,y_test))
from sklearn import metrics
print("Mean Absolute Error:",metrics.mean_absolute_error(y_test,prediction))
print("Mean Squared Error:",metrics.mean_squared_error(y_test,prediction))
print("Root Mean Squared Error:",np.sqrt(metrics.mean_squared_error(y_test,prediction)))
```

```
[-0.0138785   0.92474431]
1.1277301091400567
[15.77097561 15.72934011 15.86812512 15.82648962 15.88200362 15.71546161
  8.28975011  8.1787221 ]
0.9960001277440717
Mean Absolute Error: 0.0
Mean Squared Error: 0.0
Root Mean Squared Error: 0.0
```

```
In [22]: import pickle
filename='prediction'
pickle.dump(model,open(filename,'wb'))
model = pickle.load(open(filename,'rb'))
real = [[10,20],[12,13]]
result = model.predict(real)
result
```

```
Out[22]: array([20., 13.])
```

```
In [ ]:
```

```
In [ ]:
```