Problem Statement

Linear Regression

Import Libraries

In [1]:

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

In [2]:

```
a=pd.read_csv("horse1.csv")
a
```

Out[2]:

	Dato	Track	Race Number	Distance	Surface	Prize money	Starting position	Jockey	Jockey weight	Country	...	Tr
0	03.09.2017	Sha Tin	10	1400	Gress	1310000	6	K C Leung	52	Sverige	...	
1	16.09.2017	Sha Tin	10	1400	Gress	1310000	14	C Y Ho	52	Sverige	...	
2	14.10.2017	Sha Tin	10	1400	Gress	1310000	8	C Y Ho	52	Sverige	...	
3	11.11.2017	Sha Tin	9	1600	Gress	1310000	13	Brett Prebble	54	Sverige	...	
4	26.11.2017	Sha Tin	9	1600	Gress	1310000	9	C Y Ho	52	Sverige	...	
...	...	...	...	...	...	...	...	...	...	...	...	
27003	14.06.2020	Sha	11	1200	Gress	1450000	6	A	50	Australia		

To display top 10 rows

In [3]:

```
c=a.head(15)
c
```

Out[3]:

	Dato	Track	Race Number	Distance	Surface	Prize money	Starting position	Jockey	Jockey weight	Cou
0	03.09.2017	Sha Tin	10	1400	Gress	1310000	6	K C Leung	52	Sve
1	16.09.2017	Sha Tin	10	1400	Gress	1310000	14	C Y Ho	52	Sve
2	14.10.2017	Sha Tin	10	1400	Gress	1310000	8	C Y Ho	52	Sve
3	11.11.2017	Sha Tin	9	1600	Gress	1310000	13	Brett Prebble	54	Sve
4	26.11.2017	Sha Tin	9	1600	Gress	1310000	9	C Y Ho	52	Sve
5	10.12.2017	Sha Tin	1	1800	Gress	1310000	4	C Y Ho	52	Sve
6	01.01.2018	Sha Tin	9	1800	Gress	1310000	9	C Schofield	54	Sve
7	04.02.2018	Sha Tin	5	1800	Gress	1310000	6	Joao Moreira	57	Sve
8	03.03.2018	Sha Tin	8	1800	Gress	1310000	3	C Y Ho	56	Sve
9	11.03.2018	Sha Tin	10	1600	Gress	1310000	8	C Y Ho	57	Sve
10	28.03.2018	Happy Valley	8	1800	Gress	1310000	9	M F Poon	53	Sve
11	11.04.2018	Happy Valley	6	1650	Gress	1310000	11	W M Lai	55	Sve
12	25.04.2018	Happy Valley	3	2200	Gress	1310000	2	W M Lai	54	Sve
13	09.05.2018	Happy Valley	7	1650	Gress	1310000	3	W M Lai	54	Sve
14	22.09.2018	Sha Tin	4	1600	Gress	920000	11	C Y Ho	57	Sve

15 rows × 21 columns

To find Missing values

In [4]:

```
c.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15 entries, 0 to 14
Data columns (total 21 columns):
 #   Column             Non-Null Count  Dtype 
---  ------             --------------  ----- 
 0   Dato               15 non-null     object
 1   Track              15 non-null     object
 2   Race Number        15 non-null     int64 
 3   Distance           15 non-null     int64 
 4   Surface            15 non-null     object
 5   Prize money        15 non-null     int64 
 6   Starting position  15 non-null     int64 
 7   Jockey             15 non-null     object
 8   Jockey weight      15 non-null     int64 
 9   Country            15 non-null     object
 10  Horse age          15 non-null     int64 
 11  TrainerName        15 non-null     object
 12  Race time          15 non-null     object
 13  Path               15 non-null     int64 
 14  Final place        15 non-null     int64 
 15  FGrating           15 non-null     int64 
 16  Odds               15 non-null     object
 17  RaceType           15 non-null     object
 18  HorseId            15 non-null     int64 
 19  JockeyId           15 non-null     int64 
 20  TrainerID          15 non-null     int64 
dtypes: int64(12), object(9)
memory usage: 2.6+ KB
```

To display summary of statistics

In [5]:

```
a.describe()
```

Out[5]:

	Race Number	Distance	Prize money	Starting position	Jockey weight	Horse age
count	27008.000000	27008.000000	2.700800e+04	27008.000000	27008.000000	27008.000000
mean	5.268624	1401.666173	1.479445e+06	6.741447	55.867373	5.246408
std	2.780088	276.065045	2.162109e+06	3.691071	2.737006	1.519880
min	1.000000	1000.000000	6.600000e+05	1.000000	47.000000	2.000000
25%	3.000000	1200.000000	9.200000e+05	4.000000	54.000000	4.000000
50%	5.000000	1400.000000	9.670000e+05	7.000000	56.000000	5.000000
75%	8.000000	1650.000000	1.450000e+06	10.000000	58.000000	6.000000
max	11.000000	2400.000000	2.800000e+07	14.000000	63.000000	12.000000

To display column heading

In [6]:

```
a.columns
```

Out[6]:

```
Index(['Dato', 'Track', 'Race Number', 'Distance', 'Surface', 'Prize mone
y',
       'Starting position', 'Jockey', 'Jockey weight', 'Country', 'Horse a
ge',
       'TrainerName', 'Race time', 'Path', 'Final place', 'FGrating', 'Odd
s',
       'RaceType', 'HorseId', 'JockeyId', 'TrainerID'],
      dtype='object')
```

Pairplot

In [7]:

```
s=a.dropna(axis=1)
s
```

Out[7]:

	Dato	Track	Race Number	Distance	Surface	Prize money	Starting position	Jockey	Jockey weight	C
0	03.09.2017	Sha Tin	10	1400	Gress	1310000	6	K C Leung	52	
1	16.09.2017	Sha Tin	10	1400	Gress	1310000	14	C Y Ho	52	
2	14.10.2017	Sha Tin	10	1400	Gress	1310000	8	C Y Ho	52	
3	11.11.2017	Sha Tin	9	1600	Gress	1310000	13	Brett Prebble	54	
4	26.11.2017	Sha Tin	9	1600	Gress	1310000	9	C Y Ho	52	
...	...	...	...	...	...	...	...	...	...	
27003	14.06.2020	Sha Tin	11	1200	Gress	1450000	6	A Hamelin	59	A
27004	21.06.2020	Sha Tin	2	1200	Gress	967000	7	K C Leung	57	A
27005	21.06.2020	Sha Tin	4	1200	Gress	967000	6	Blake Shinn	57	A
27006	21.06.2020	Sha Tin	5	1200	Gress	967000	14	Joao Moreira	57	Z
27007	21.06.2020	Sha Tin	11	1200	Gress	1450000	7	C Schofield	55	Z

27008 rows × 21 columns

In [8]:

```
s.columns
```

Out[8]:

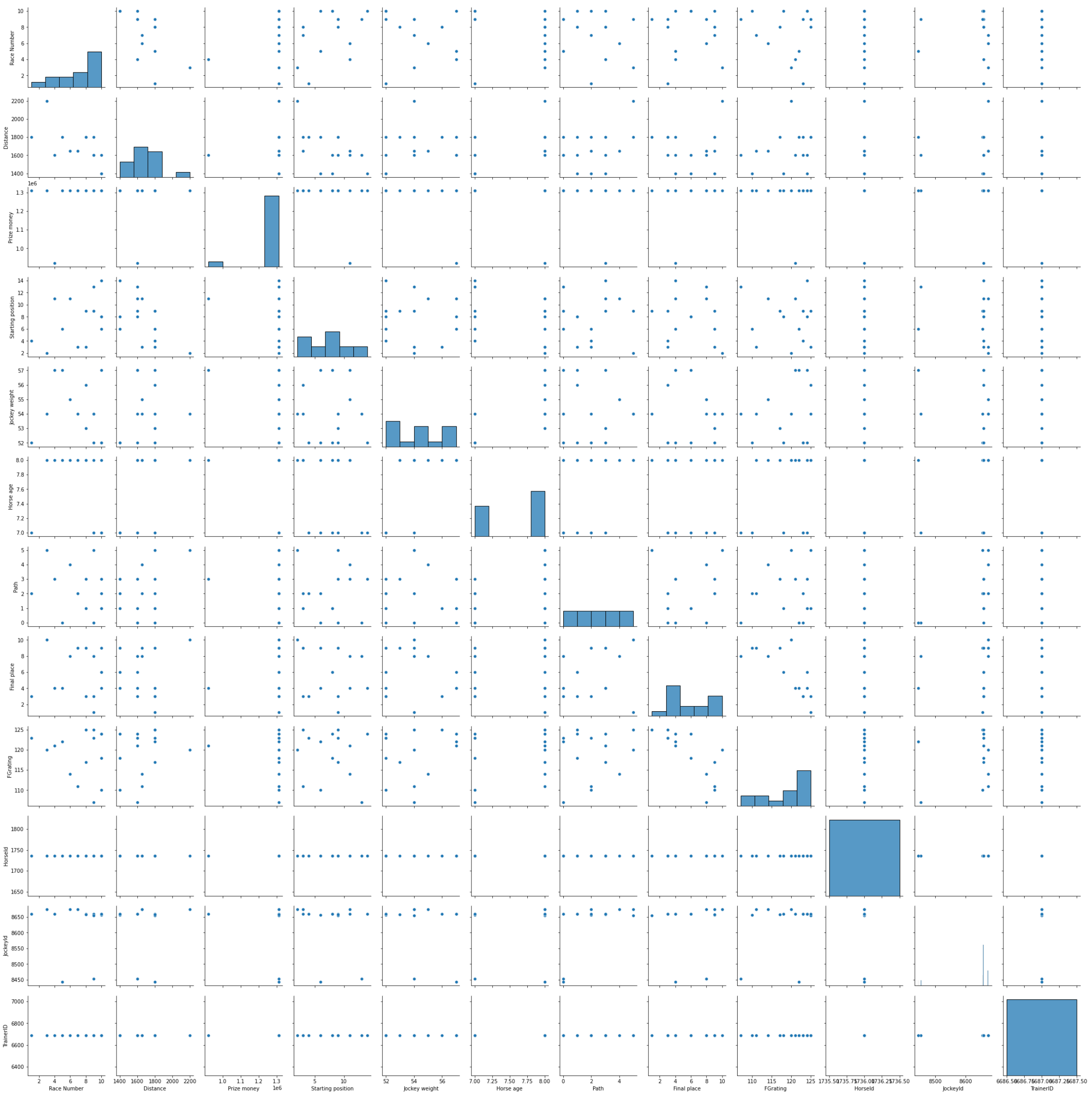
```
Index(['Dato', 'Track', 'Race Number', 'Distance', 'Surface', 'Prize mone
y',
       'Starting position', 'Jockey', 'Jockey weight', 'Country', 'Horse a
ge',
       'TrainerName', 'Race time', 'Path', 'Final place', 'FGrating', 'Odd
s',
       'RaceType', 'HorseId', 'JockeyId', 'TrainerID'],
      dtype='object')
```

In [9]:

```
sns.pairplot(c)
```

Out[9]:

```
<seaborn.axisgrid.PairGrid at 0x1a583088af0>
```



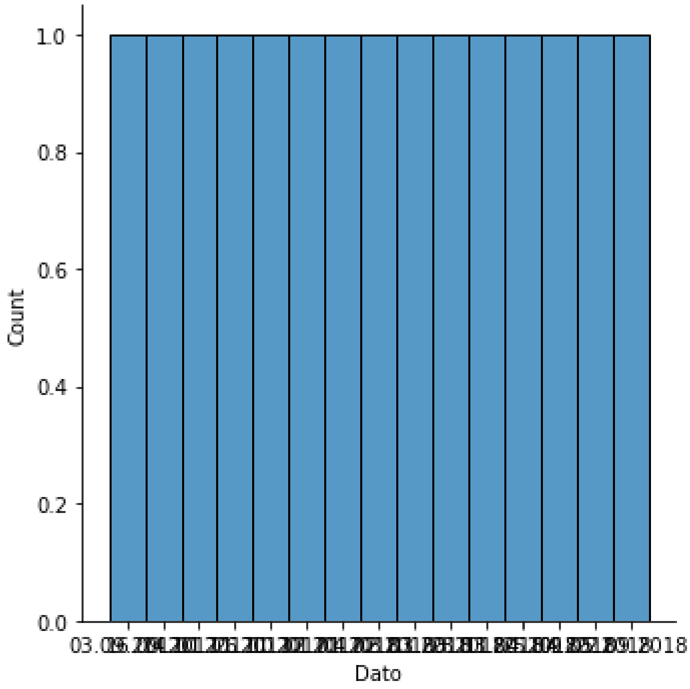
Distribution Plot

In [10]:

```
sns.displot(c['Dato'])
```

Out[10]:

```
<seaborn.axisgrid.FacetGrid at 0x1a589d70910>
```



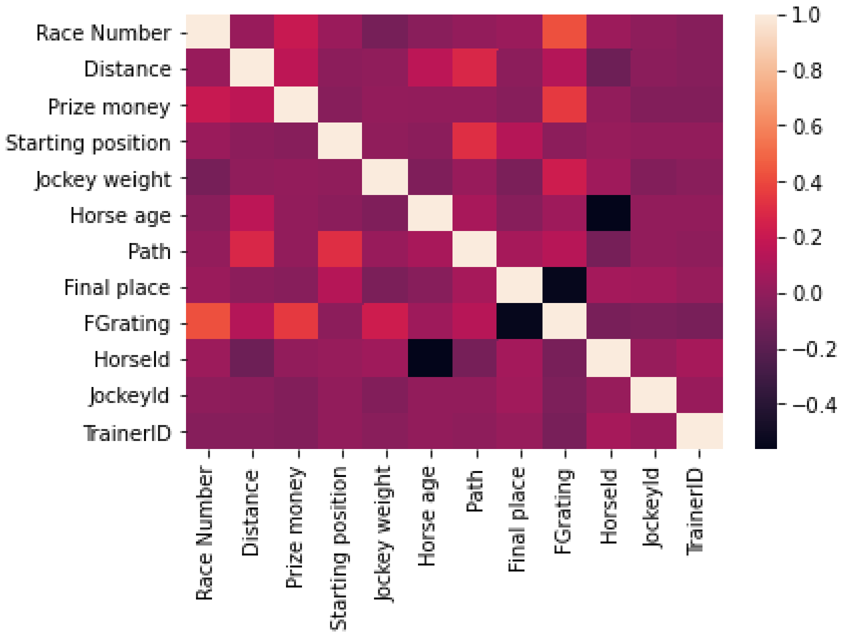
Correlation

In [11]:

```
b=a[['Race Number', 'Distance', 'Surface', 'Prize money',
       'Starting position', 'Jockey', 'Jockey weight', 'Country', 'Horse age',
       'TrainerName', 'Race time', 'Path', 'Final place', 'FGrating', 'Odds',
       'RaceType', 'HorseId', 'JockeyId', 'TrainerID']]
sns.heatmap(b.corr())
```

Out[11]:

```
<AxesSubplot:>
```



Train the model - Model Building

In [12]:

```
g=c[['Distance','Prize money',
       'Starting position','HorseId','JockeyId']]
h=c['TrainerID']
```

To split dataset into training end test

In [13]:

```
from sklearn.model_selection import train_test_split
g_train,g_test,h_train,h_test=train_test_split(g,h,test_size=0.6)
```

To run the model

In [14]:

```
from sklearn.linear_model import LinearRegression
```

In [15]:

```
lr=LinearRegression()
lr.fit(g_train,h_train)
```

Out[15]:

```
LinearRegression()
```

In [16]:

```
print(lr.intercept_)
```

```
6687.0
```

Coeffecient

In [17]:

```
coeff=pd.DataFrame(lr.coef_,g.columns,columns=['Co-effecient'])
coeff
```

Out[17]:

	Co-effecient
Distance	0.0
Prize money	0.0
Starting position	0.0
HorseId	0.0
JockeyId	0.0

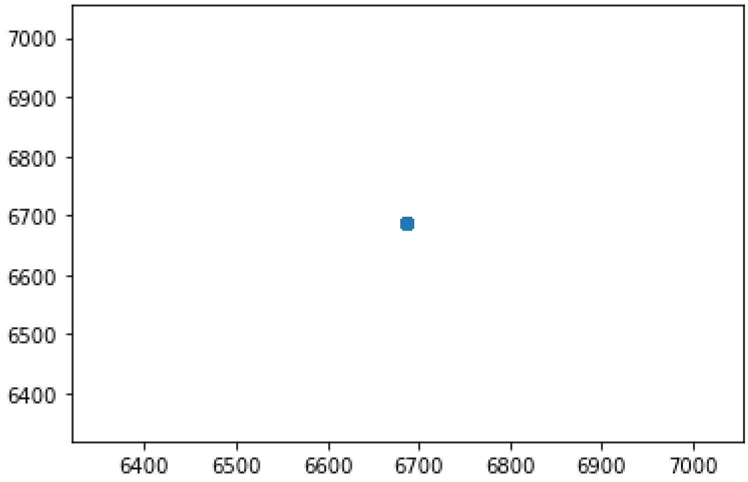
Best Fit line

In [18]:

```
prediction=lr.predict(g_test)
plt.scatter(h_test,prediction)
```

Out[18]:

```
<matplotlib.collections.PathCollection at 0x1a58d0b1790>
```



To find score

In [19]:

```
print(lr.score(g_test,h_test))
```

```
1.0
```

Import Lasso and ridge

In [20]:

```
from sklearn.linear_model import Ridge,Lasso
```

Ridge

In [21]:

```
ri=Ridge(alpha=5)
ri.fit(g_train,h_train)
```

Out[21]:

```
Ridge(alpha=5)
```

In [22]:

```
ri.score(g_test,h_test)
```

Out[22]:

```
1.0
```

In [23]:

```
ri.score(g_train,h_train)
```

Out[23]:

```
1.0
```

Lasso

In [24]:

```
l=Lasso(alpha=6)
l.fit(g_train,h_train)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\linear_model\_coordinat
e_descent.py:530: ConvergenceWarning: Objective did not converge. You migh
t want to increase the number of iterations. Duality gap: 0.0, tolerance:
0.0
  model = cd_fast.enet_coordinate_descent(
```

Out[24]:

```
Lasso(alpha=6)
```

In [25]:

```
l.score(g_test,h_test)
```

Out[25]:

```
1.0
```

In [27]:

```
ri.score(g_train,h_train)
```

Out[27]:

```
1.0
```

ElasticNet

In [28]:

```
from sklearn.linear_model import ElasticNet
e=ElasticNet()
e.fit(g_train,h_train)
```

```
C:\ProgramData\Anaconda3\lib\site-packages\sklearn\linear_model\_coordinat
e_descent.py:530: ConvergenceWarning: Objective did not converge. You migh
t want to increase the number of iterations. Duality gap: 0.0, tolerance:
0.0
  model = cd_fast.enet_coordinate_descent(
```

Out[28]:

```
ElasticNet()
```

Coeffecient,intercept

In [29]:

```
print(e.coef_)
```

```
[0. 0. 0. 0. 0.]
```

In [30]:

```
print(e.intercept_)
```

```
6687.0
```

Prediction

In [31]:

```
d=e.predict(g_test)
d
```

Out[31]:

```
array([6687., 6687., 6687., 6687., 6687., 6687., 6687., 6687., 6687.])
```

In [32]:

```
print(e.score(g_test,h_test))
```

```
1.0
```

Evaluation

In [33]:

```
from sklearn import metrics
print("Mean Absolute error:",metrics.mean_absolute_error(h_test,d))
```

```
Mean Absolute error: 0.0
```

In [34]:

```
print("Mean Squared error:",metrics.mean_squared_error(h_test,d))
```

```
Mean Squared error: 0.0
```

In [35]:

```
print("Mean Squared error:",np.sqrt(metrics.mean_squared_error(h_test,d)))
```

```
Mean Squared error: 0.0
```

In [ ]:

```
```