rm4huy7b6

July 31, 2023

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

[ ]:
```
df=pd.read_csv("/content/17_student_marks.csv")
df
```

[ ]:

	Student_ID	Test_1	Test_2	Test_3	Test_4	Test_5	Test_6	Test_7	\
0	22000	78	87	91	91	88	98	94	
1	22001	79	71	81	72	73	68	59	
2	22002	66	65	70	74	78	86	87	
3	22003	60	58	54	61	54	57	64	
4	22004	99	95	96	93	97	89	92	
5	22005	41	36	35	28	35	36	27	
6	22006	47	50	47	57	62	64	71	
7	22007	84	74	70	68	58	59	56	
8	22008	74	64	58	57	53	51	47	
9	22009	87	81	73	74	71	63	53	
10	22010	40	34	37	33	31	35	39	
11	22011	91	84	78	74	76	80	80	
12	22012	81	83	93	88	89	90	99	
13	22013	52	50	42	38	33	30	28	
14	22014	63	67	65	74	80	86	95	
15	22015	76	82	88	94	85	76	70	
16	22016	83	78	71	71	77	72	66	
17	22017	55	45	43	38	43	35	44	
18	22018	71	67	76	74	64	61	57	
19	22019	62	61	53	49	54	59	68	
20	22020	44	38	36	34	26	34	39	
21	22021	50	56	53	46	41	38	47	
22	22022	57	48	40	45	43	36	26	
23	22023	59	56	52	44	50	40	45	
24	22024	84	92	89	80	90	80	84	
25	22025	74	80	86	87	90	100	95	
26	22026	92	84	74	83	93	83	75	
27	22027	63	70	74	65	64	55	61	

28	22028	78	77	69	76	78	74	67
29	22029	55	58	59	67	71	62	53
30	22030	54	54	48	38	35	45	46
31	22031	84	93	97	89	86	95	100
32	22032	95	100	94	100	98	99	100
33	22033	64	61	63	73	63	68	64
34	22034	76	79	73	77	83	86	95
35	22035	78	71	61	55	54	48	41
36	22036	95	89	91	84	89	94	85
37	22037	99	89	79	87	87	81	82
38	22038	82	83	85	86	89	80	88
39	22039	65	56	64	62	58	51	61
40	22040	100	93	92	86	84	76	82
41	22041	78	72	73	79	81	73	71
42	22042	98	100	100	93	94	92	100
43	22043	58	62	67	77	71	63	64
44	22044	96	92	94	100	99	95	98
45	22045	86	87	85	84	85	91	86
46	22046	48	55	46	40	34	29	37
47	22047	56	52	54	47	40	35	43
48	22048	42	44	46	53	62	59	57
49	22049	64	54	49	59	54	55	57
50	22050	50	44	37	29	37	46	53
51	22051	70	60	70	62	67	67	68
52	22052	63	73	70	63	60	67	61
53	22053	92	100	100	100	100	100	92
54	22054	64	55	54	61	63	57	47
55	22055	60	66	68	58	49	47	39

	Test_8	Test_9	Test_10	Test_11	Test_12
0	100	100	100	100	93
1	69	59	60	61	67
2	96	88	82	90	86
3	62	72	63	72	76
4	98	91	98	95	88
5	26	19	22	27	31
6	75	85	87	85	89
7	56	64	70	67	59
8	45	42	43	34	24
9	45	39	43	46	38
10	38	40	48	44	50
11	73	75	71	79	70
12	99	95	85	75	84
13	22	12	20	19	20
14	96	92	83	75	81
15	60	50	58	49	59
16	75	66	61	61	66

17	37	45	37	45	54
18	64	61	51	51	58
19	74	65	55	60	61
20	44	36	45	35	44
21	39	44	36	43	46
22	19	9	12	22	27
23	46	54	57	52	47
24	74	68	73	81	74
25	87	85	79	85	88
26	82	81	73	70	73
27	58	48	46	46	51
28	69	78	68	65	68
29	61	67	76	75	70
30	47	41	37	30	25
31	100	100	99	100	100
32	90	80	84	75	80
33	58	50	51	56	64
34	89	90	95	100	100
35	32	41	40	48	38
36	91	100	100	100	92
37	74	64	54	51	50
38	95	87	93	90	89
39	68	70	70	63	73
40	74	79	72	79	85
41	77	83	92	97	99
42	100	98	94	97	100
43	73	83	76	86	91
44	92	84	84	84	91
45	82	85	87	84	83
46	34	39	41	31	40
47	44	40	39	47	43
48	53	43	35	37	43
49	59	63	73	78	88
50	57	55	61	64	68
51	67	72	69	64	65
52	59	52	58	56	46
53	87	94	100	94	98
54	37	44	48	54	54
55	29	39	44	39	45

[ ]:
```
df.head()
```

[ ]:

	Student_ID	Test_1	Test_2	Test_3	Test_4	Test_5	Test_6	Test_7	Test_8	\
0	22000	78	87	91	91	88	98	94	100	
1	22001	79	71	81	72	73	68	59	69	
2	22002	66	65	70	74	78	86	87	96	
3	22003	60	58	54	61	54	57	64	62	

```
4       22004      99       95       96       93       97       89       92       98

   Test_9  Test_10  Test_11  Test_12
0     100      100      100       93
1      59       60       61       67
2      88       82       90       86
3      72       63       72       76
4      91       98       95       88
```

1 DATA CLEANING AND DATA PREPROCESSING

[ ]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 56 entries, 0 to 55
Data columns (total 13 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   Student_ID  56 non-null     int64
 1   Test_1      56 non-null     int64
 2   Test_2      56 non-null     int64
 3   Test_3      56 non-null     int64
 4   Test_4      56 non-null     int64
 5   Test_5      56 non-null     int64
 6   Test_6      56 non-null     int64
 7   Test_7      56 non-null     int64
 8   Test_8      56 non-null     int64
 9   Test_9      56 non-null     int64
 10  Test_10     56 non-null     int64
 11  Test_11     56 non-null     int64
 12  Test_12     56 non-null     int64
dtypes: int64(13)
memory usage: 5.8 KB
```

[ ]:
```
df.describe()
```

[ ]:
```
         Student_ID      Test_1      Test_2      Test_3      Test_4  \
count     56.000000   56.000000   56.000000   56.000000   56.000000
mean   22027.500000   70.750000   69.196429   68.089286   67.446429
std       16.309506   17.009356   17.712266   18.838333   19.807179
min    22000.000000   40.000000   34.000000   35.000000   28.000000
25%    22013.750000   57.750000   55.750000   53.000000   54.500000
50%    22027.500000   70.500000   68.500000   70.000000   71.500000
75%    22041.250000   84.000000   83.250000   85.000000   84.000000
max    22055.000000  100.000000  100.000000  100.000000  100.000000
```

```
           Test_5      Test_6      Test_7      Test_8      Test_9     Test_10  \
count   56.000000   56.000000   56.000000   56.000000   56.000000   56.000000
mean    67.303571   66.000000   66.160714   65.303571   64.392857   64.250000
std     20.746890   21.054043   21.427914   22.728372   23.211814   22.598673
min     26.000000   29.000000   26.000000   19.000000    9.000000   12.000000
25%     53.750000   50.250000   47.000000   45.750000   44.000000   45.750000
50%     69.000000   65.500000   64.000000   67.500000   65.500000   65.500000
75%     85.250000   83.750000   85.250000   83.250000   84.250000   83.250000
max    100.000000  100.000000  100.000000  100.000000  100.000000  100.000000

          Test_11     Test_12
count   56.000000   56.000000
mean    64.517857   65.928571
std     22.610529   22.464402
min     19.000000   20.000000
25%     46.750000   46.750000
50%     64.000000   67.500000
75%     84.000000   86.500000
max    100.000000  100.000000
```

[ ]:
```
df.columns
```

[ ]:
```
Index(['Student_ID', 'Test_1', 'Test_2', 'Test_3', 'Test_4', 'Test_5',
       'Test_6', 'Test_7', 'Test_8', 'Test_9', 'Test_10', 'Test_11',
       'Test_12'],
      dtype='object')
```

[ ]:
```
df1=df.dropna(axis=1)
df1
```

[ ]:
```
    Student_ID  Test_1  Test_2  Test_3  Test_4  Test_5  Test_6  Test_7  \
0        22000      78      87      91      91      88      98      94
1        22001      79      71      81      72      73      68      59
2        22002      66      65      70      74      78      86      87
3        22003      60      58      54      61      54      57      64
4        22004      99      95      96      93      97      89      92
5        22005      41      36      35      28      35      36      27
6        22006      47      50      47      57      62      64      71
7        22007      84      74      70      68      58      59      56
8        22008      74      64      58      57      53      51      47
9        22009      87      81      73      74      71      63      53
10       22010      40      34      37      33      31      35      39
11       22011      91      84      78      74      76      80      80
12       22012      81      83      93      88      89      90      99
13       22013      52      50      42      38      33      30      28
14       22014      63      67      65      74      80      86      95
15       22015      76      82      88      94      85      76      70
```

16	22016	83	78	71	71	77	72	66
17	22017	55	45	43	38	43	35	44
18	22018	71	67	76	74	64	61	57
19	22019	62	61	53	49	54	59	68
20	22020	44	38	36	34	26	34	39
21	22021	50	56	53	46	41	38	47
22	22022	57	48	40	45	43	36	26
23	22023	59	56	52	44	50	40	45
24	22024	84	92	89	80	90	80	84
25	22025	74	80	86	87	90	100	95
26	22026	92	84	74	83	93	83	75
27	22027	63	70	74	65	64	55	61
28	22028	78	77	69	76	78	74	67
29	22029	55	58	59	67	71	62	53
30	22030	54	54	48	38	35	45	46
31	22031	84	93	97	89	86	95	100
32	22032	95	100	94	100	98	99	100
33	22033	64	61	63	73	63	68	64
34	22034	76	79	73	77	83	86	95
35	22035	78	71	61	55	54	48	41
36	22036	95	89	91	84	89	94	85
37	22037	99	89	79	87	87	81	82
38	22038	82	83	85	86	89	80	88
39	22039	65	56	64	62	58	51	61
40	22040	100	93	92	86	84	76	82
41	22041	78	72	73	79	81	73	71
42	22042	98	100	100	93	94	92	100
43	22043	58	62	67	77	71	63	64
44	22044	96	92	94	100	99	95	98
45	22045	86	87	85	84	85	91	86
46	22046	48	55	46	40	34	29	37
47	22047	56	52	54	47	40	35	43
48	22048	42	44	46	53	62	59	57
49	22049	64	54	49	59	54	55	57
50	22050	50	44	37	29	37	46	53
51	22051	70	60	70	62	67	67	68
52	22052	63	73	70	63	60	67	61
53	22053	92	100	100	100	100	100	92
54	22054	64	55	54	61	63	57	47
55	22055	60	66	68	58	49	47	39

	Test_8	Test_9	Test_10	Test_11	Test_12
0	100	100	100	100	93
1	69	59	60	61	67
2	96	88	82	90	86
3	62	72	63	72	76
4	98	91	98	95	88

5	26	19	22	27	31
6	75	85	87	85	89
7	56	64	70	67	59
8	45	42	43	34	24
9	45	39	43	46	38
10	38	40	48	44	50
11	73	75	71	79	70
12	99	95	85	75	84
13	22	12	20	19	20
14	96	92	83	75	81
15	60	50	58	49	59
16	75	66	61	61	66
17	37	45	37	45	54
18	64	61	51	51	58
19	74	65	55	60	61
20	44	36	45	35	44
21	39	44	36	43	46
22	19	9	12	22	27
23	46	54	57	52	47
24	74	68	73	81	74
25	87	85	79	85	88
26	82	81	73	70	73
27	58	48	46	46	51
28	69	78	68	65	68
29	61	67	76	75	70
30	47	41	37	30	25
31	100	100	99	100	100
32	90	80	84	75	80
33	58	50	51	56	64
34	89	90	95	100	100
35	32	41	40	48	38
36	91	100	100	100	92
37	74	64	54	51	50
38	95	87	93	90	89
39	68	70	70	63	73
40	74	79	72	79	85
41	77	83	92	97	99
42	100	98	94	97	100
43	73	83	76	86	91
44	92	84	84	84	91
45	82	85	87	84	83
46	34	39	41	31	40
47	44	40	39	47	43
48	53	43	35	37	43
49	59	63	73	78	88
50	57	55	61	64	68
51	67	72	69	64	65

```
52      59      52       58       56       46
53      87      94      100       94       98
54      37      44       48       54       54
55      29      39       44       39       45
```

[ ]:
```
df1.columns
```

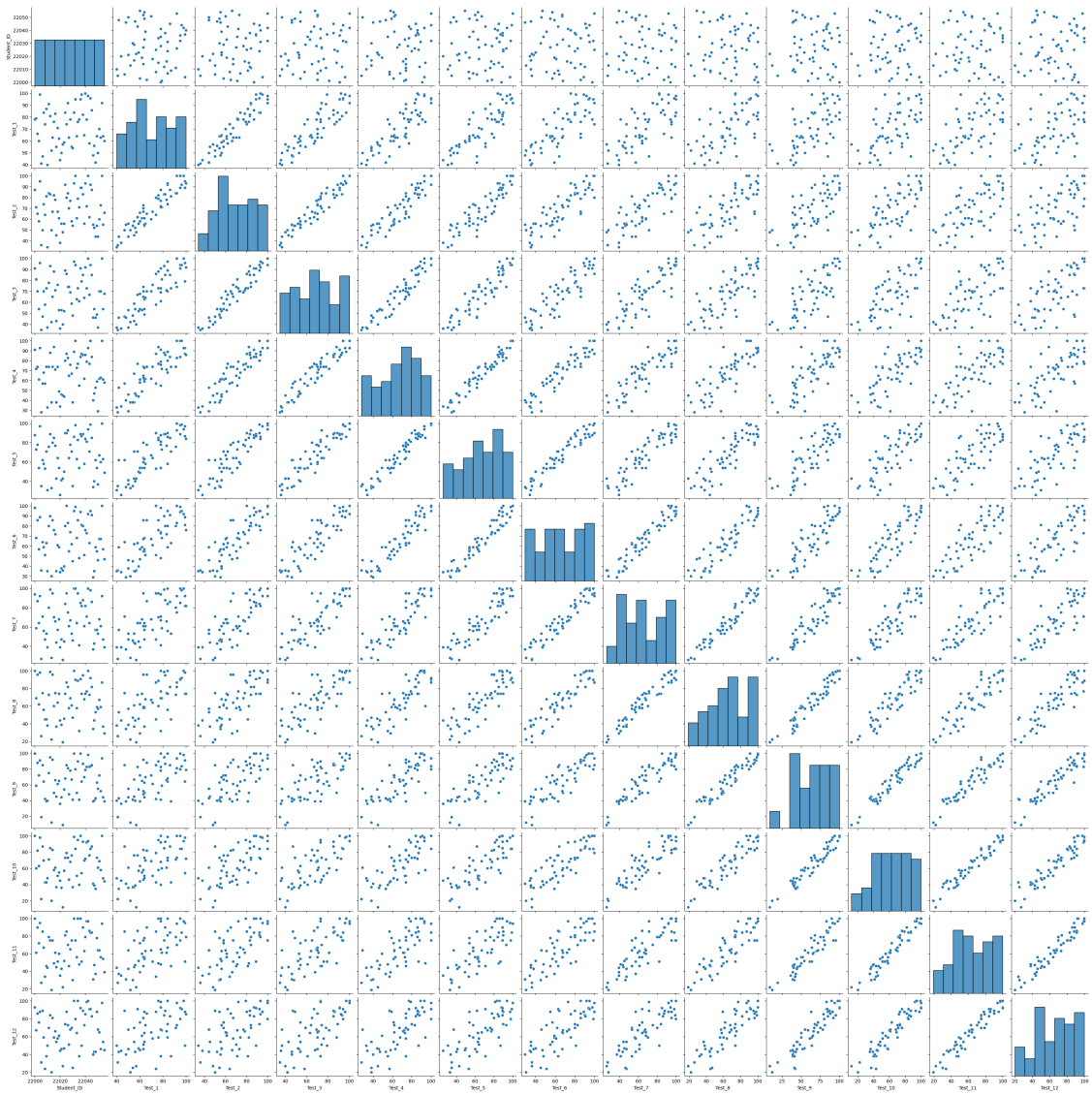
[ ]:
```
Index(['Student_ID', 'Test_1', 'Test_2', 'Test_3', 'Test_4', 'Test_5',
       'Test_6', 'Test_7', 'Test_8', 'Test_9', 'Test_10', 'Test_11',
       'Test_12'],
      dtype='object')
```

[ ]:
```
df1=df1[['Student_ID', 'Test_1', 'Test_2', 'Test_3', 'Test_4', 'Test_5',
       'Test_6', 'Test_7', 'Test_8', 'Test_9', 'Test_10', 'Test_11',
       'Test_12']]
```

2 EDA AND VISUALIZATION

[ ]:
```
sns.pairplot(df1)
```

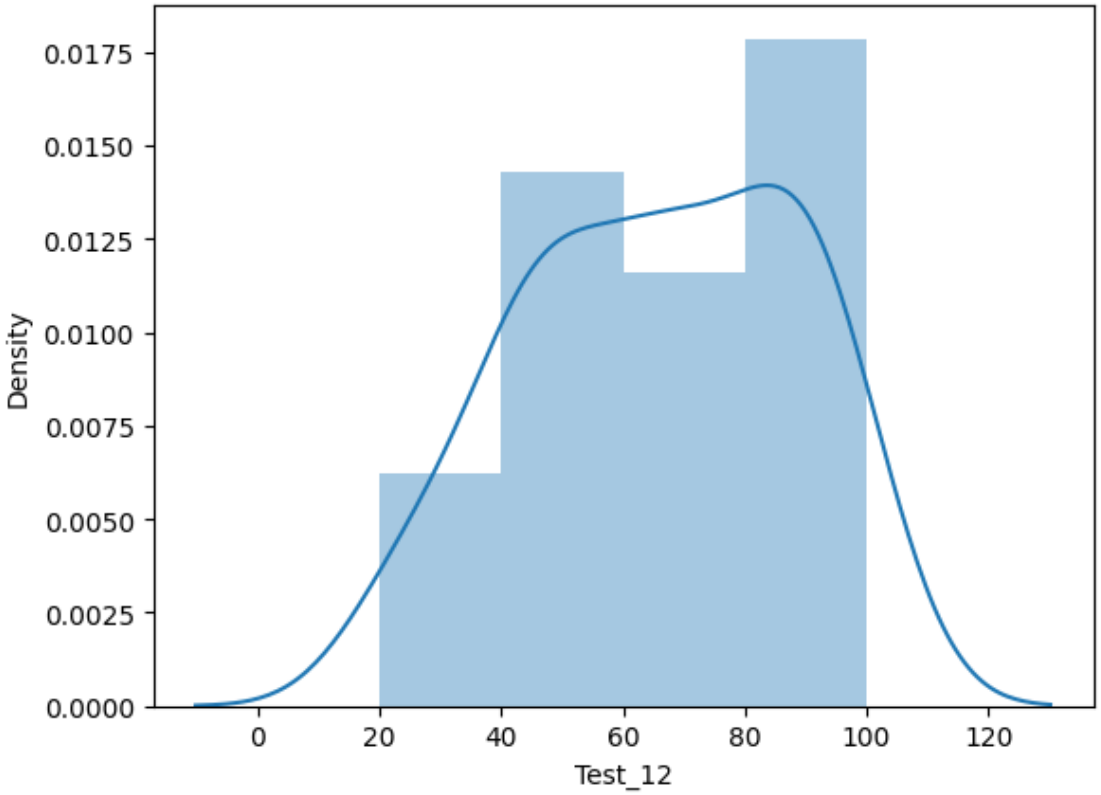
[ ]:
```
<seaborn.axisgrid.PairGrid at 0x7d7eb86d5cf0>
```



[ ]:
```
sns.distplot(df1['Test_12'])
```

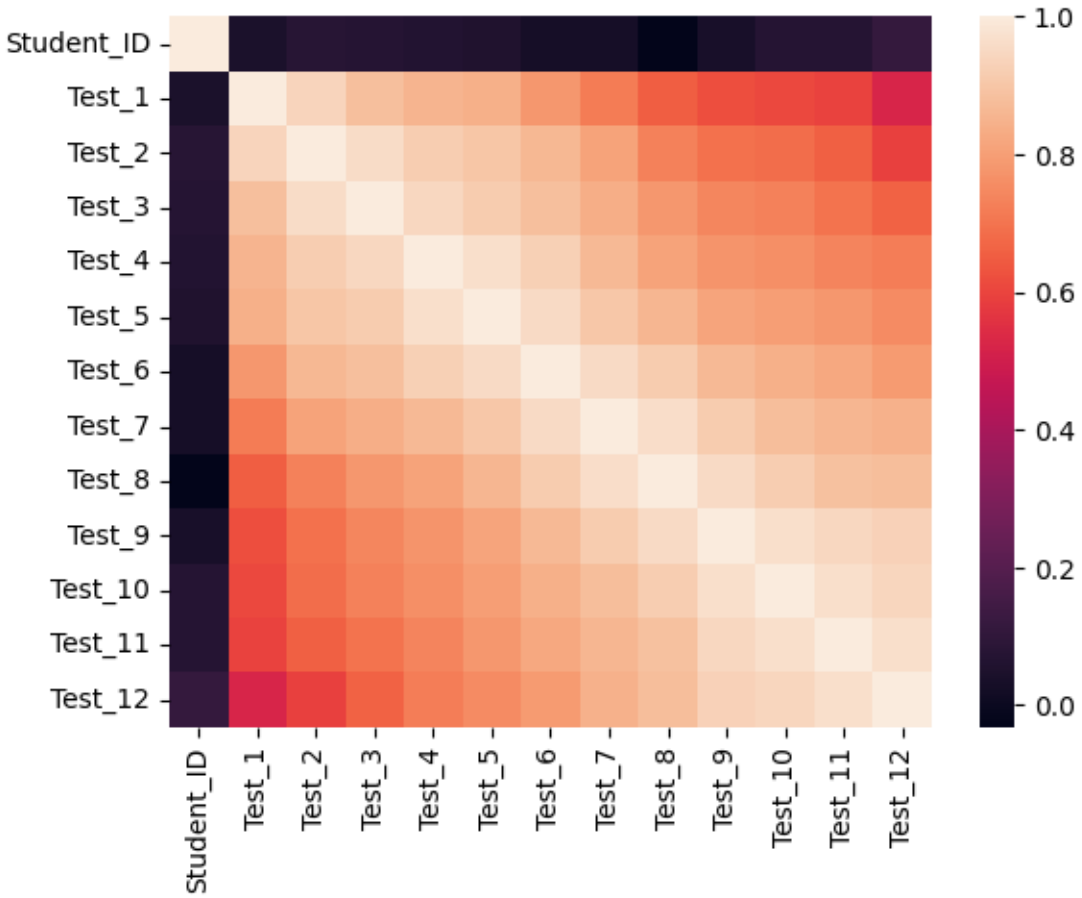
```
<ipython-input-11-c52684cbf714>:1: UserWarning:

`distplot` is a deprecated function and will be removed in seaborn v0.14.0.

Please adapt your code to use either `displot` (a figure-level function with
similar flexibility) or `histplot` (an axes-level function for histograms).

For a guide to updating your code to use the new functions, please see
https://gist.github.com/mwaskom/de44147ed2974457ad6372750bbe5751

  sns.distplot(df1['Test_12'])
```

[ ]: <Axes: xlabel='Test_12', ylabel='Density'>



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

[ ]: <Axes: >



3 TO TRAIN THE MODEL AND MODEL BULDING

[ ]:
```
x=df[['Student_ID', 'Test_1', 'Test_2', 'Test_3', 'Test_4', 'Test_5',
       'Test_6', 'Test_7', 'Test_8', 'Test_9', 'Test_10', 'Test_11',
       'Test_12']]
y=df['Test_12']
```

[ ]:
```
from sklearn.model_selection import train_test_split
x_train,x_test,y_train,y_test=train_test_split(x,y,test_size=0.3)
```

[ ]:
```
from sklearn.linear_model import LinearRegression
lr=LinearRegression()
lr.fit(x_train,y_train)
```

[ ]:
```
LinearRegression()
```

[ ]:
```
lr.intercept_
```

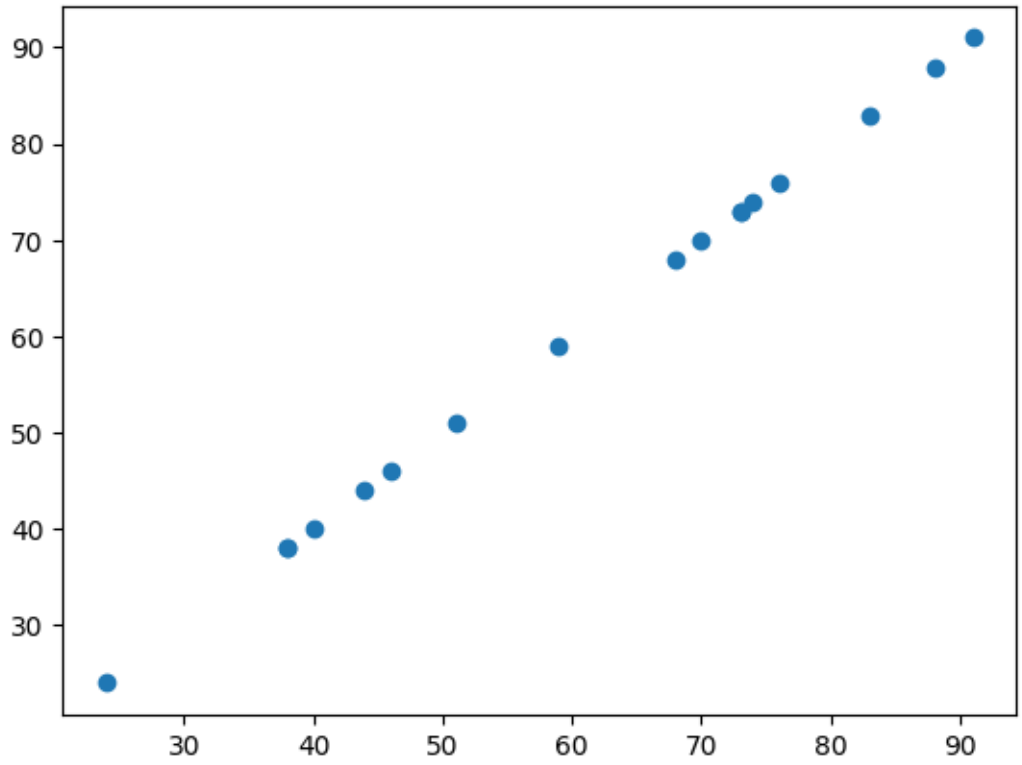
[ ]:
```
2.8279600883251987e-12
```

[ ]:
```
coeff=pd.DataFrame(lr.coef_,x.columns,columns=['Co-efficient'])
coeff
```

[ ]:
```
            Co-efficient
Student_ID -1.334753e-16
Test_1     -1.110223e-15
Test_2      1.353084e-15
Test_3      8.881784e-16
Test_4     -4.857226e-16
Test_5     -6.036838e-16
Test_6      3.157197e-16
Test_7      3.356690e-16
Test_8      1.387779e-16
Test_9     -9.950808e-16
Test_10     9.020562e-16
Test_11    -2.567391e-16
Test_12     1.000000e+00
```

[ ]:
```
prediction =lr.predict(x_test)
plt.scatter(y_test,prediction)
```

[ ]:
```
<matplotlib.collections.PathCollection at 0x7d7eaa9d13c0>
```



4 ACCURACY

[ ]:
```
lr.score(x_test,y_test)
```

[ ]: 1.0

[ ]:
```
lr.score(x_train,y_train)
```

[ ]: 1.0

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

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

[ ]: Ridge(alpha=10)

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

[ ]: 0.9999604978833921

[ ]:
```
rr.score(x_train,y_train)
```

[ ]: 0.9999928272016786

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

[ ]: Lasso(alpha=10)

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

[ ]: 0.9995838044806998

[ ]:
```
la.score(x_train,y_train)
```

[ ]: 0.9996459901661114

[ ]:
```
from sklearn.linear_model import ElasticNet
en=ElasticNet()
en.fit(x_train,y_train)
```

[ ]: ElasticNet()

[ ]:
```
print(en.coef_)
print(en.intercept_)
```

```
[-0.00000000e+00  0.00000000e+00  0.00000000e+00  0.00000000e+00
  5.57427580e-04  0.00000000e+00  0.00000000e+00  0.00000000e+00
  0.00000000e+00  3.66649971e-04  0.00000000e+00  1.81885353e-02
  9.79189312e-01]
0.15104004713477082
```

[ ]:
```
prediction = en.predict(x_test)
prediction
```

[ ]:
```
array([43.90412047, 38.25245553, 72.83796359, 24.31716642, 74.15384693,
       90.8716458 , 46.01762971, 72.98102246, 67.9363107 , 83.02957911,
       38.27897478, 39.91905359, 87.94538649, 75.93940422, 50.9801996 ,
       59.20321202, 70.1999346 ])
```

[ ]:
```
en.score(x_test,y_test)
```

[ ]:
```
0.9999347650142614
```

[ ]:
```
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)))
```

```
Mean Absolute Error:  0.12574659872491414
Mean Squared Error:  0.02460103860109311
Root Mean Squared Error:  0.156847182317991
```