In [1]:

```
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LinearRegression
from sklearn import metrics
import seaborn as sns
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
```

Import Data

In [2]:

```
data = pd.read_csv('real-estate.csv')
data
```

Out[2]:

	No	X1 transaction date	X2 house age	X3 distance to the nearest MRT station	X4 number of convenience stores	X5 latitude	X6 longitude	Y house price of unit area
0	1	2012.917	32.0	84.87882	10	24.98298	121.54024	37.9
1	2	2012.917	19.5	306.59470	9	24.98034	121.53951	42.2
2	3	2013.583	13.3	561.98450	5	24.98746	121.54391	47.3
3	4	2013.500	13.3	561.98450	5	24.98746	121.54391	54.8
4	5	2012.833	5.0	390.56840	5	24.97937	121.54245	43.1
...	...	...	...	...	...	...	...	...
409	410	2013.000	13.7	4082.01500	0	24.94155	121.50381	15.4
410	411	2012.667	5.6	90.45606	9	24.97433	121.54310	50.0
411	412	2013.250	18.8	390.96960	7	24.97923	121.53986	40.6
412	413	2013.000	8.1	104.81010	5	24.96674	121.54067	52.5
413	414	2013.500	6.5	90.45606	9	24.97433	121.54310	63.9

414 rows × 8 columns

In [3]:

```
data.shape
```

Out[3]:

```
(414, 8)
```

In [4]:

```
data.head()
```

Out[4]:

	No	X1 transaction date	X2 house age	X3 distance to the nearest MRT station	X4 number of convenience stores	X5 latitude	X6 longitude	Y house price of unit area
0	1	2012.917	32.0	84.87882	10	24.98298	121.54024	37.9
1	2	2012.917	19.5	306.59470	9	24.98034	121.53951	42.2
2	3	2013.583	13.3	561.98450	5	24.98746	121.54391	47.3
3	4	2013.500	13.3	561.98450	5	24.98746	121.54391	54.8
4	5	2012.833	5.0	390.56840	5	24.97937	121.54245	43.1

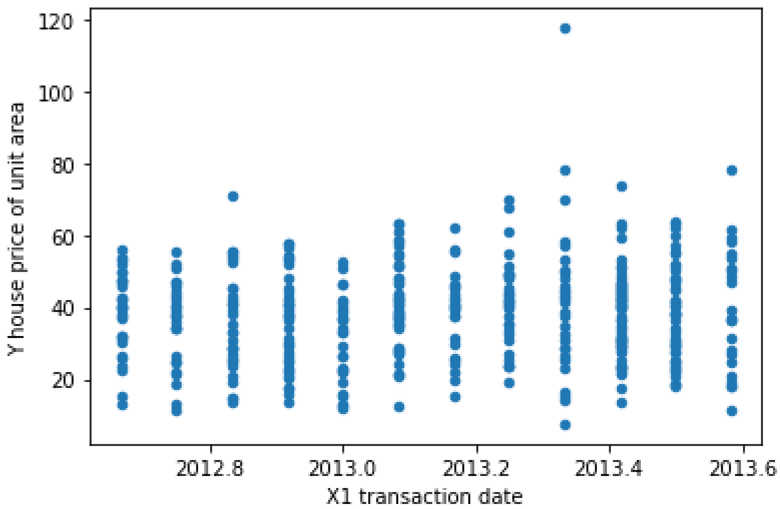
Check the effect of transaction date on price

In [5]:

```
data.plot.scatter("X1 transaction date", "Y house price of unit area")
```

Out[5]:

```
<AxesSubplot:xlabel='X1 transaction date', ylabel='Y house price of unit a
rea'>
```



Drop No and transaction date column

In [6]:

```
data.drop('No',axis=1,inplace=True)
data.drop('X1 transaction date',axis=1,inplace=True)
```

In [7]:

```
data.describe()
```

Out[7]:

	X2 house age	X3 distance to the nearest MRT station	X4 number of convenience stores	X5 latitude	X6 longitude	Y house price of unit area
count	414.000000	414.000000	414.000000	414.000000	414.000000	414.000000
mean	17.712560	1083.885689	4.094203	24.969030	121.533361	37.980193
std	11.392485	1262.109595	2.945562	0.012410	0.015347	13.606488
min	0.000000	23.382840	0.000000	24.932070	121.473530	7.600000
25%	9.025000	289.324800	1.000000	24.963000	121.528085	27.700000
50%	16.100000	492.231300	4.000000	24.971100	121.538630	38.450000
75%	28.150000	1454.279000	6.000000	24.977455	121.543305	46.600000
max	43.800000	6488.021000	10.000000	25.014590	121.566270	117.500000

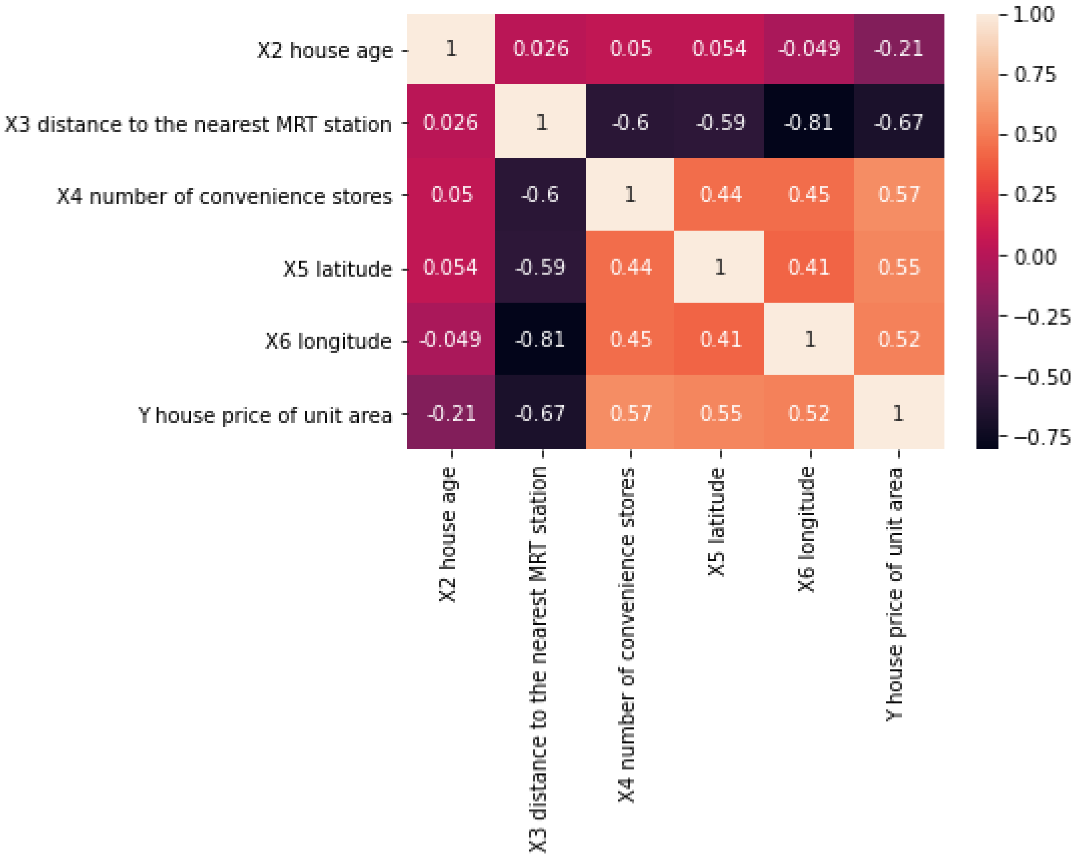
Heatmap of data

In [8]:

```
sns.heatmap(data.corr(),annot=True)
```

Out[8]:

<AxesSubplot:>



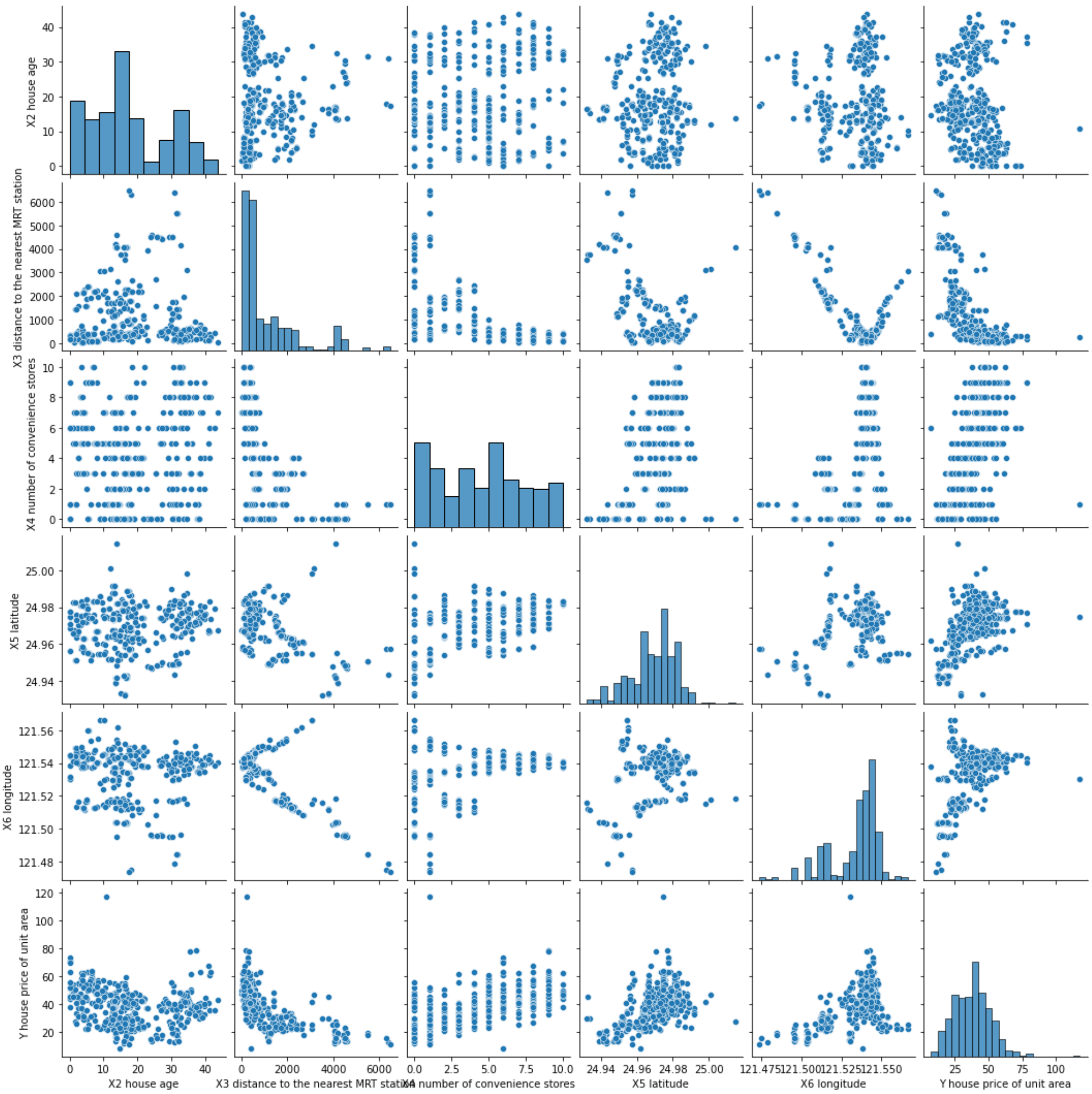
Pair plot to see dependency of each pair of column on each other

In [9]:

```
sns.pairplot(data)
```

Out[9]:

<seaborn.axisgrid.PairGrid at 0x25ef1bc8fc8>

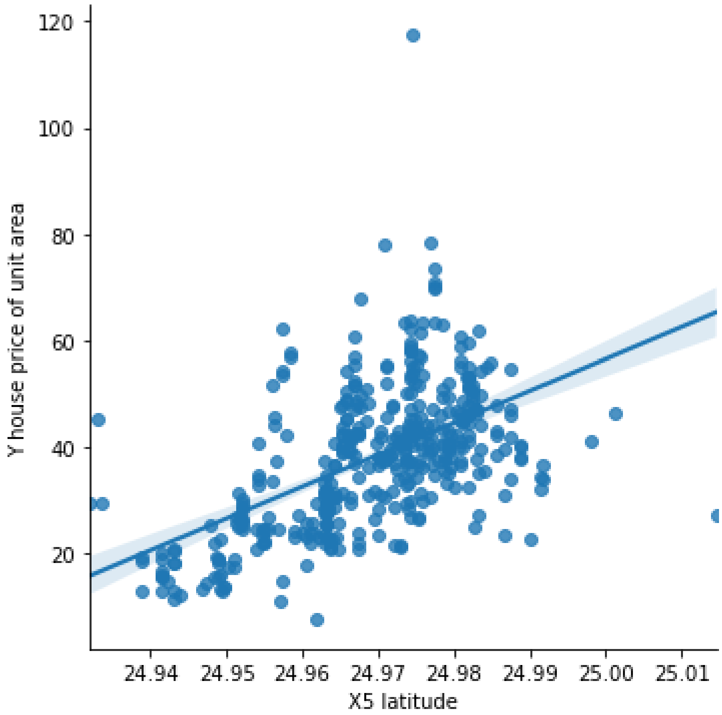


In [10]:

```
sns.lmplot(x='X5 latitude',y ='Y house price of unit area', data=data)
```

Out[10]:

<seaborn.axisgrid.FacetGrid at 0x25ef29fb7c8>

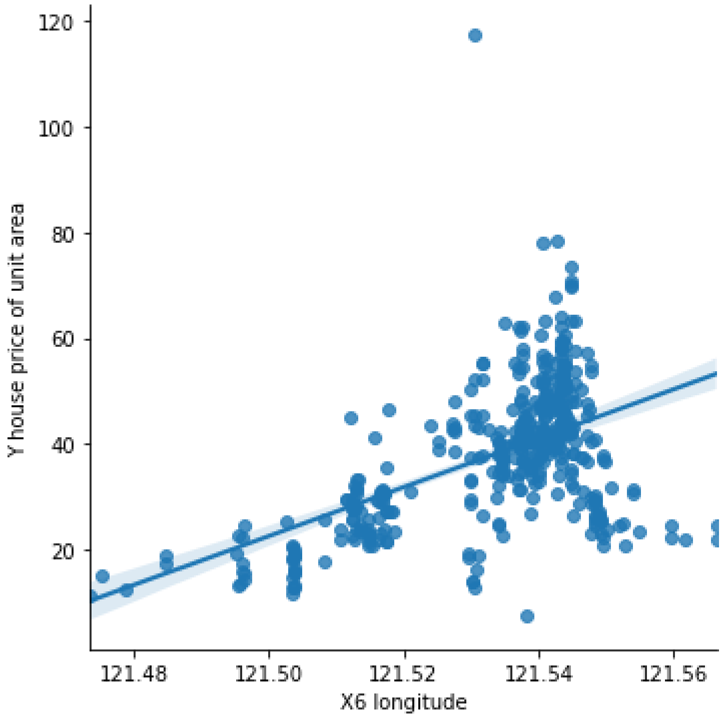


In [11]:

```
sns.lmplot(x='X6 longitude',y ='Y house price of unit area', data=data)
```

Out[11]:

```
<seaborn.axisgrid.FacetGrid at 0x25ef455ee08>
```

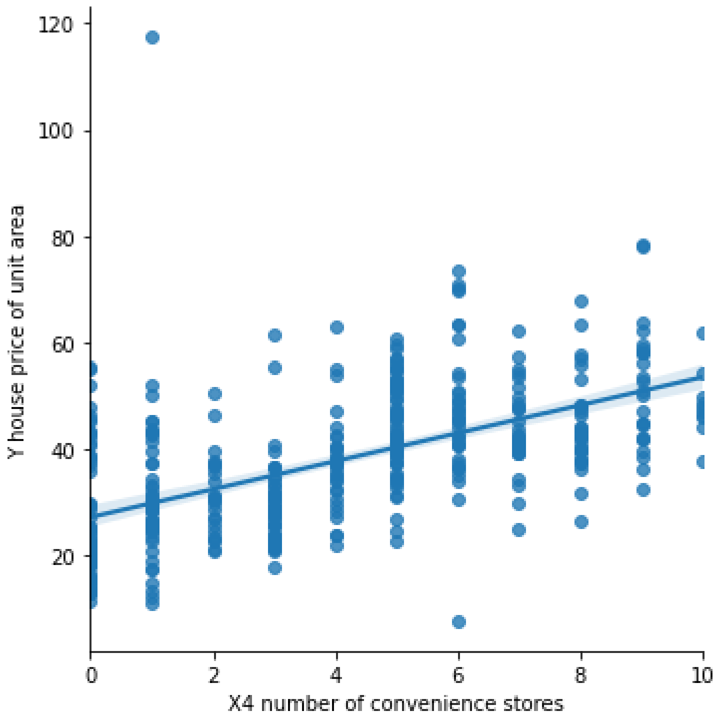


In [12]:

```
sns.lmplot(x='X4 number of convenience stores',y ='Y house price of unit area', data=da
ta)
```

Out[12]:

```
<seaborn.axisgrid.FacetGrid at 0x25ef45c8e88>
```



Take data from dataframe and split it to test and train data

In [13]:

```
y = data["Y house price of unit area"]
X = data[["X2 house age", "X3 distance to the nearest MRT station", "X4 number of conve
nience stores","X5 latitude", "X6 longitude"]]
```

In [14]:

```
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.4, random_state=1
01)
```

Train the linear regression model

In [15]:

```
LinearRegression(copy_X=True, fit_intercept=True, n_jobs=1, normalize=False)
lm = LinearRegression()
lm.fit(X_train,y_train)
```

Out[15]:

```
LinearRegression()
```

In [16]:

```
print('Coefficients: \n', lm.coef_)
```

```
Coefficients:
 [-2.87589333e-01 -4.62269977e-03  1.04958764e+00  2.42814162e+02
 -1.47224350e+01]
```

In [17]:

```
predictions = lm.predict(X_test)
```

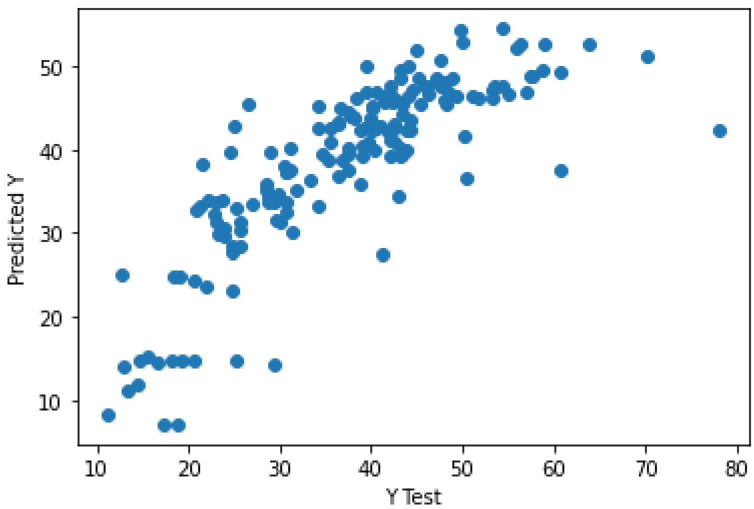
Plot the predicted data vs actual data

In [18]:

```
plt.scatter(y_test,predictions)
plt.xlabel('Y Test')
plt.ylabel('Predicted Y')
```

Out[18]:

```
Text(0, 0.5, 'Predicted Y')
```



Calculate the dfferent errors

In [19]:

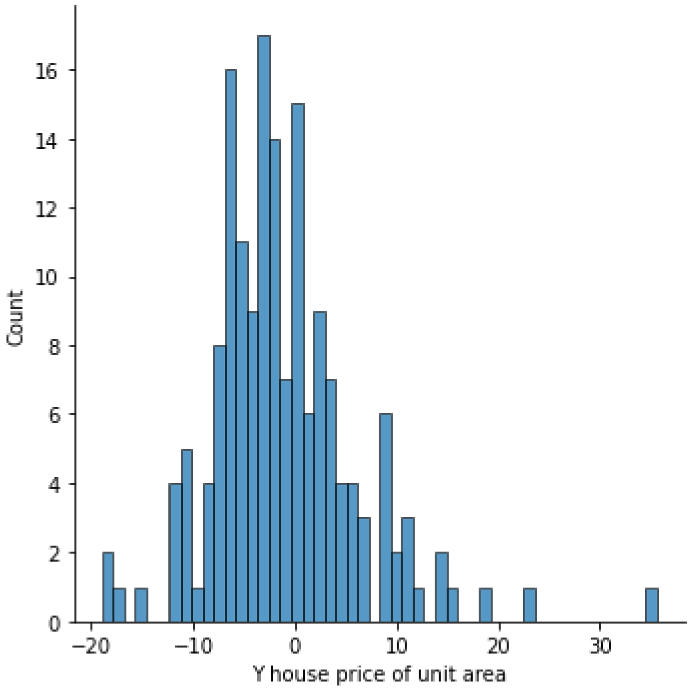
```
print('MAE:', metrics.mean_absolute_error(y_test, predictions))
print('MSE:', metrics.mean_squared_error(y_test, predictions))
print('RMSE:', np.sqrt(metrics.mean_squared_error(y_test, predictions)))
```

```
MAE: 5.550201321415762
MSE: 54.375728544924726
RMSE: 7.3739900016832625
```

Plot histogram of residuals to check if its normally distributed

In [20]:

```
sns.displot((y_test-predictions),bins=50);
```



In [ ]: