In [2]:
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
from sklearn.pipeline import Pipeline
from sklearn.preprocessing import StandardScaler,PolynomialFeatures
from sklearn.linear_model import LinearRegression
%matplotlib inline
```

In [3]:
```
file_name='https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDevelo
df=pd.read_csv(file_name)
```

In [4]:
```
df.head(5)
```

Out[4]:

	Unnamed: 0	id	date	price	bedrooms	bathrooms	sqft_living	sqft_lot	floo
0	0	7129300520	20141013T000000	221900.0	3.0	1.00	1180	5650	1
1	1	6414100192	20141209T000000	538000.0	3.0	2.25	2570	7242	2
2	2	5631500400	20150225T000000	180000.0	2.0	1.00	770	10000	1
3	3	2487200875	20141209T000000	604000.0	4.0	3.00	1960	5000	1
4	4	1954400510	20150218T000000	510000.0	3.0	2.00	1680	8080	1

5 rows × 22 columns

In [35]:
```
df.dtypes
```

Out[35]:
```
date             object
price           float64
bedrooms        float64
bathrooms       float64
sqft_living       int64
sqft_lot          int64
floors          float64
waterfront        int64
view              int64
condition         int64
grade             int64
sqft_above        int64
sqft_basement     int64
yr_built          int64
yr_renovated      int64
zipcode           int64
lat             float64
long            float64
sqft_living15     int64
sqft_lot15        int64
dtype: object
```

In [5]:
```
df.describe()
```

Out[5]:

	Unnamed: 0	id	price	bedrooms	bathrooms	sqft_living	sqft_lo
count	21613.00000	2.161300e+04	2.161300e+04	21600.000000	21603.000000	21613.000000	2.161300e+0
mean	10806.00000	4.580302e+09	5.400881e+05	3.372870	2.115736	2079.899736	1.510697e+0
std	6239.28002	2.876566e+09	3.671272e+05	0.926657	0.768996	918.440897	4.142051e+0
min	0.00000	1.000102e+06	7.500000e+04	1.000000	0.500000	290.000000	5.200000e+0
25%	5403.00000	2.123049e+09	3.219500e+05	3.000000	1.750000	1427.000000	5.040000e+0
50%	10806.00000	3.904930e+09	4.500000e+05	3.000000	2.250000	1910.000000	7.618000e+0
75%	16209.00000	7.308900e+09	6.450000e+05	4.000000	2.500000	2550.000000	1.068800e+0
max	21612.00000	9.900000e+09	7.700000e+06	33.000000	8.000000	13540.000000	1.651359e+0

8 rows × 21 columns

In [6]:

```
df=pd.read_csv(file_name)

df.drop(["id", "Unnamed: 0"], axis=1, inplace = True)

df.describe()
```

Out[6]:

	price	bedrooms	bathrooms	sqft_living	sqft_lot	floors	waterfro
count	2.161300e+04	21600.000000	21603.000000	21613.000000	2.161300e+04	21613.000000	21613.0000
mean	5.400881e+05	3.372870	2.115736	2079.899736	1.510697e+04	1.494309	0.0075
std	3.671272e+05	0.926657	0.768996	918.440897	4.142051e+04	0.539989	0.0865
min	7.500000e+04	1.000000	0.500000	290.000000	5.200000e+02	1.000000	0.0000
25%	3.219500e+05	3.000000	1.750000	1427.000000	5.040000e+03	1.000000	0.0000
50%	4.500000e+05	3.000000	2.250000	1910.000000	7.618000e+03	1.500000	0.0000
75%	6.450000e+05	4.000000	2.500000	2550.000000	1.068800e+04	2.000000	0.0000
max	7.700000e+06	33.000000	8.000000	13540.000000	1.651359e+06	3.500000	1.0000

In [7]:

```
print("number of NaN values for the column bedrooms :", df['bedrooms'].isnull().sum())
print("number of NaN values for the column bathrooms :", df['bathrooms'].isnull().sum()
```

```
number of NaN values for the column bedrooms : 13
number of NaN values for the column bathrooms : 10
```

In [8]:

```
mean=df['bedrooms'].mean()
df['bedrooms'].replace(np.nan,mean, inplace=True)
```

In [9]:

```
mean=df['bathrooms'].mean()
df['bathrooms'].replace(np.nan,mean, inplace=True)
```

In [10]:
```
print("number of NaN values for the column bedrooms :", df['bedrooms'].isnull().sum())
print("number of NaN values for the column bathrooms :", df['bathrooms'].isnull().sum())
```

```
number of NaN values for the column bedrooms : 0
number of NaN values for the column bathrooms : 0
```

In [11]:
```
#Q3
df['floors'].value_counts
```

Out[11]:
```
<bound method IndexOpsMixin.value_counts of 0        1.0
1        2.0
2        1.0
3        1.0
4        1.0
        ...
21608    3.0
21609    2.0
21610    2.0
21611    2.0
21612    2.0
Name: floors, Length: 21613, dtype: float64>
```

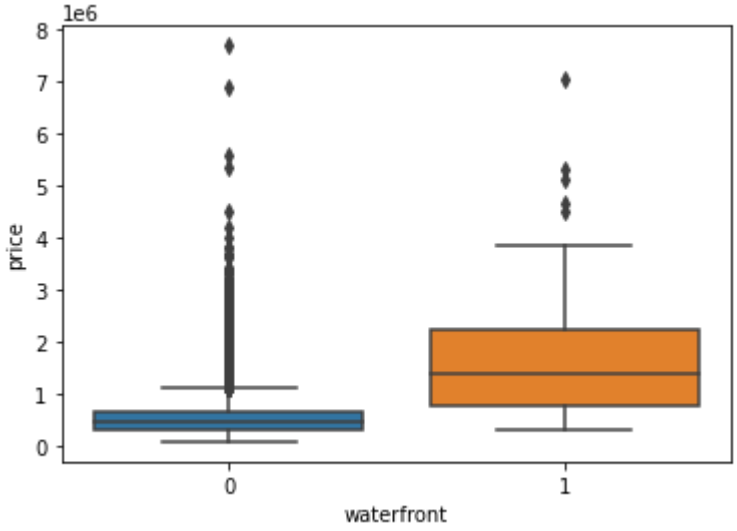
In [12]:
```
#Q3
df['floors'].value_counts().to_frame()
```

Out[12]:

	floors
1.0	10680
2.0	8241
1.5	1910
3.0	613
2.5	161
3.5	8

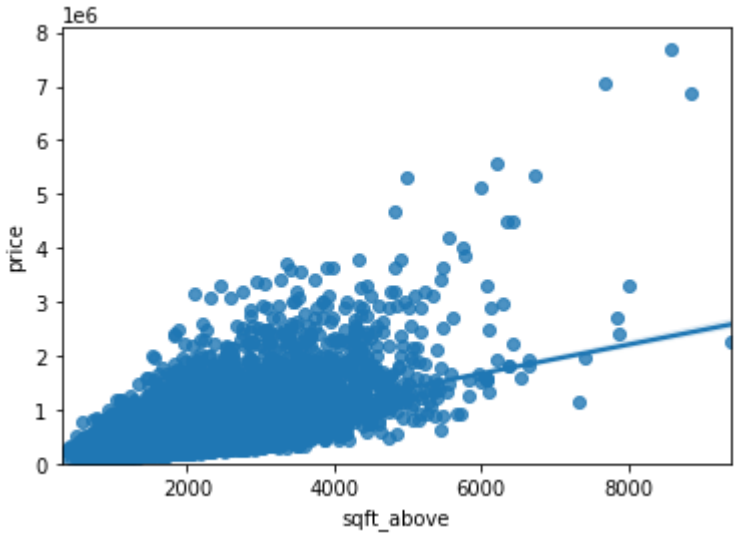
In [13]:
```
sns.boxplot(x="waterfront", y="price", data=df)
```

Out[13]:
```
<AxesSubplot:xlabel='waterfront', ylabel='price'>
```



In [14]:
```
#Q5
sns.regplot(x="sqft_above", y="price", data=df)
plt.ylim(0,)
```

Out[14]: (0.0, 8081250.0)



In [15]:
```
df.corr()['price'].sort_values()
```

Out[15]:
```
zipcode         -0.053203
long             0.021626
condition        0.036362
yr_built         0.054012
sqft_lot15       0.082447
sqft_lot         0.089661
yr_renovated     0.126434
floors           0.256794
waterfront       0.266369
lat              0.307003
bedrooms         0.308797
sqft_basement    0.323816
view             0.397293
bathrooms        0.525738
sqft_living15    0.585379
sqft_above       0.605567
```

```
grade            0.667434
sqft_living      0.702035
price            1.000000
Name: price, dtype: float64
```

In [16]:
```
import matplotlib.pyplot as plt
from sklearn.linear_model import LinearRegression
```

In [17]:
```
X = df[['long']]
Y = df['price']
lm = LinearRegression()
lm.fit(X,Y)
lm.score(X, Y)
```

Out[17]: 0.00046769430149007363

In [18]:
```
# 6
X= df[['sqft_living']]
Y= df['price']
lm = LinearRegression()
lm.fit(X,Y)
lm.score(X,Y)
```

Out[18]: 0.4928532179037931

In [21]:
```
features =["floors", "waterfront","lat" ,"bedrooms" ,"sqft_basement" ,"view" ,"bathroom
```

In [22]:
```
X = df[['waterfront']]
Y = df['price']

lm= LinearRegression()
lm.fit(X, Y)
lm.score(X, Y)
```

Out[22]: 0.07095267538578309

In [23]:
```
X = df[['lat']]
Y = df['price']

lm= LinearRegression()
lm.fit(X, Y)
lm.score(X, Y)
```

Out[23]: 0.09425113672917462

In [24]:
```
# Q8
Input=[('scale',StandardScaler()),('polynomial', PolynomialFeatures(include_bias=False)
```

In [25]:
```
pipe=Pipeline(Input)
pipe
```

Out[25]:
```
Pipeline(steps=[('scale', StandardScaler()),
                ('polynomial', PolynomialFeatures(include_bias=False)),
                ('model', LinearRegression())])
```

In [26]:
```
pipe.fit(X,Y)
```

Out[26]:
```
Pipeline(steps=[('scale', StandardScaler()),
                ('polynomial', PolynomialFeatures(include_bias=False)),
                ('model', LinearRegression())])
```

In [27]:
```
pipe.score(X,Y)
```

Out[27]:
```
0.12408245310068433
```

In [28]:
```
from sklearn.model_selection import cross_val_score
from sklearn.model_selection import train_test_split
print("done")
```

```
done
```

In [30]:
```
features =["floors", "waterfront","lat" ,"bedrooms" ,"sqft_basement" ,"view" ,"bathroom
X = df[features ]
Y = df['price']

x_train, x_test, y_train, y_test = train_test_split(X, Y, test_size=0.15, random_state=

print("number of test samples :", x_test.shape[0])
print("number of training samples:",x_train.shape[0])
```

```
number of test samples : 3242
number of training samples: 18371
```

In [33]:
```
#Q7
X2 = df[features]
Y2 = df['price']
lm.fit(X2,Y2)
lm.score(X2,Y2)
```

Out[33]:
```
0.65765288394285
```

In [31]:
```
#Q9
from sklearn.linear_model import Ridge

RigeModel = Ridge(alpha=0.1)
RigeModel.fit(x_train, y_train)
RigeModel.score(x_test, y_test)
```

Out[31]:
```
0.6478759163939112
```

In [32]:
```
#Q10
pr=PolynomialFeatures(degree=2)
x_train_pr=pr.fit_transform(x_train[features])
```

```
x_test_pr=pr.fit_transform(x_test[features])

RigeModel = Ridge(alpha=0.1)
RigeModel.fit(x_train_pr, y_train)
RigeModel.score(x_test_pr, y_test)
```

Out[32]: 0.7002744255607272

In [ ]: