## Calculation

In [100]:

```
weight=[51,62,69,64,65,56,58,57,55]
height=[162,182,176,173,172,174,169,173,170]
Class=['U','N','N','N','N','U','N','N','N']
data=pd.DataFrame(list(zip(weight,height,Class)),columns=('Weight','Height','Class'))
data
```

...

In [101]:

```
import matplotlib.pyplot as plt
plt.scatter(data['Height'],data['Weight'])
plt.scatter(170,57,c='r')
plt.grid()
```

...

In [102]:

```
import math

b=(170-167)**2+(57-51)**2
b1=(170-176)**2+(57-69)**2
#a=math.sqrt(b)"""
print(math.sqrt(b))
print(math.sqrt(b1))
```

...

1.Get The data

In [2]:

```
import pandas as pd
```

In [3]:

```
df=pd.read_csv('UniversalBank.csv')
df.head(5)
```

Out[3]:

| | ID | Gender | Age | Experience | Income | ZIP Code | Family | CCAvg | Education | Mortgage | Person Loa |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 1 | F | 25 | 1 | 49 | 91107 | 4 | 1.6 | 1 | 0 | |
| **1** | 2 | F | 45 | 19 | 34 | 90089 | 3 | 1.5 | 1 | 0 | |
| **2** | 3 | M | 39 | 15 | 11 | 94720 | 1 | 1.0 | 1 | 0 | |
| **3** | 4 | M | 35 | 9 | 100 | 94112 | 1 | 2.7 | 2 | 0 | |
| **4** | 5 | M | 35 | 8 | 45 | 91330 | 4 | 1.0 | 2 | 0 | |

In [3]:

```
df.drop('ID',axis=1,inplace=True)
```

In [5]:

```
df.drop('ZIP Code',axis=1,inplace=True)
```

In [6]:

```
df.head()
```

Out[6]:

| | Age | Experience | Income | Family | CCAvg | Education | Mortgage | Personal Loan | Securities Account | Accou |
|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 25 | 1 | 49 | 4 | 1.6 | 1 | 0 | 0 | 1 | |
| **1** | 45 | 19 | 34 | 3 | 1.5 | 1 | 0 | 0 | 1 | |
| **2** | 39 | 15 | 11 | 1 | 1.0 | 1 | 0 | 0 | 0 | |
| **3** | 35 | 9 | 100 | 1 | 2.7 | 2 | 0 | 0 | 0 | |
| **4** | 35 | 8 | 45 | 4 | 1.0 | 2 | 0 | 0 | 0 | |

In [8]:

```
df.isna().sum().sum()
```

Out[8]:

```
0
```

In [10]:

```
df.info()
```

...

In [98]:

```
import seaborn as sns
sns.pairplot(df)
```

...

In [11]:

```
X=df[['Experience','Income']]
y=df['CreditCard']
```

In [12]:

```
from sklearn.model_selection import train_test_split
```

In [13]:

```
X_train,x_test,y_train,y_test=train_test_split(X,y,test_size=0.3)
```

In [15]:

```
X_train.shape
```

Out[15]:

```
(3500, 2)
```

In [16]:

```
x_test.shape
```

Out[16]:

```
(1500, 2)
```

In [17]:

```
from sklearn.neighbors import KNeighborsClassifier
```

In [20]:

```
model=KNeighborsClassifier(n_neighbors=3)
```

In [21]:

```
model.fit(X_train,y_train)
```

Out[21]:

```
KNeighborsClassifier(algorithm='auto', leaf_size=30, metric='minkowski',
           metric_params=None, n_jobs=None, n_neighbors=3, p=2,
           weights='uniform')
```

In [22]:

```
pred=model.predict(x_test)
```

In [23]:

```

```

Out[23]:

```
array([1, 0, 0, ..., 0, 0, 0], dtype=int64)
```

### Check the Accuracy Score

In [24]:

```
from sklearn.metrics import accuracy_score
```

In [26]:

```
accuracy_score(y_test,pred)*100
```

Out[26]:

```
60.73333333333333
```

In [27]:

```
from sklearn.metrics import confusion_matrix
```

In [28]:

```
confusion_matrix(y_test,pred)
```

Out[28]:

```
array([[824, 244],
       [345,  87]], dtype=int64)
```

In [32]:

```
df.sample(5)
```

Out[32]:

| | Age | Experience | Income | Family | CCAvg | Education | Mortgage | Personal Loan | Securities Account | Ac |
|---|---|---|---|---|---|---|---|---|---|---|
| **2735** | 36 | 12 | 70 | 3 | 2.6 | 2 | 165 | 0 | 0 | |
| **2169** | 52 | 27 | 30 | 2 | 0.7 | 2 | 0 | 0 | 0 | |
| **3764** | 63 | 37 | 15 | 2 | 0.4 | 1 | 0 | 0 | 0 | |
| **3735** | 40 | 14 | 78 | 1 | 5.2 | 1 | 0 | 0 | 0 | |
| **4574** | 35 | 11 | 193 | 2 | 6.5 | 1 | 0 | 0 | 0 | |

In [33]:

```
model.predict([[27 , 30]])
```

Out[33]:

```
array([1], dtype=int64)
```

In [34]:

```
model.predict([[14,78]])
```

Out[34]:

```
array([0], dtype=int64)
```

In [36]:

```
model.predict([[11,193]])
```

Out[36]:

```
array([0], dtype=int64)
```

## to find best k values

In [40]:

```
K_values = [3,5,7,9,21,25,51]
scores = {}
```

In [41]:

```
for k in K_values:
    model = KNeighborsClassifier(n_neighbors=k)
    model.fit(X_train,y_train)
    scores[k] = model.score(X_train,y_train)
```

In [42]:

```
scores.keys()
```

Out[42]:

```
dict_keys([3, 5, 7, 9, 21, 25, 51])
```

In [43]:

```
scores.values()
```

Out[43]:

```
dict_values([0.794, 0.752, 0.7257142857142858, 0.7188571428571429, 0.7037142
857142857, 0.7045714285714286, 0.7034285714285714])
```

In [44]:

```
scores
```

Out[44]:

```
{3: 0.794,
 5: 0.752,
 7: 0.7257142857142858,
 9: 0.7188571428571429,
 21: 0.7037142857142857,
 25: 0.7045714285714286,
 51: 0.7034285714285714}
```

In [45]:

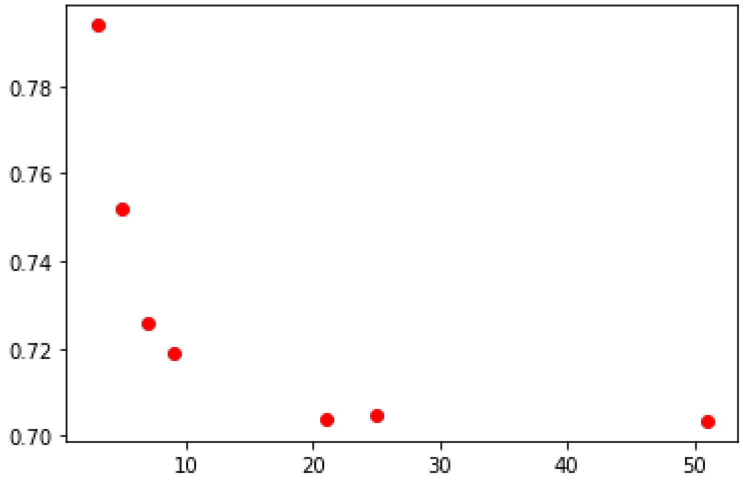
```
import matplotlib.pyplot as plt
```

In [46]:

```
plt.figure()

plt.scatter(scores.keys(),scores.values(),c='red')

plt.show()
```



In [61]:

```
df.columns
```

Out[61]:

```
Index(['Age', 'Experience', 'Income', 'Family', 'CCAvg', 'Education',
       'Mortgage', 'Personal Loan', 'Securities Account', 'CD Account',
       'Online', 'CreditCard'],
      dtype='object')
```

In [56]:

```
pred=model.predict(X_test)
```

In [57]:

```
pred
```

Out[57]:

```
array([0, 1, 0, ..., 0, 0, 1], dtype=int64)
```

In [58]:

```
accuracy_score(y_test,pred)
```

Out[58]:

```
0.668
```

In [59]:

```
confusion_matrix(y_test,pred)
```

Out[59]:

```
array([[739, 156],
       [259,  96]], dtype=int64)
```

In [70]:

```
X=df[['CD Account']]
y=df['CreditCard']
```

In [71]:

```
X_train,X_test,y_train,y_test=train_test_split(X,y,test_size=0.25)
```

In [72]:

```
from sklearn.neighbors import KNeighborsClassifier
```

In [73]:

```
model=KNeighborsClassifier(n_neighbors=3)
```

In [74]:

```
model.fit(X_train,y_train)
```

Out[74]:

```
KNeighborsClassifier(algorithm='auto', leaf_size=30, metric='minkowski',
           metric_params=None, n_jobs=None, n_neighbors=3, p=2,
           weights='uniform')
```

In [75]:

```
pred=model.predict(X_test)
```

In [76]:

```
accuracy_score(y_test,pred)
```

Out[76]:

```
0.7392
```

In [77]:

```
confusion_matrix(y_test,pred)
```

Out[77]:

```
array([[857,  18],
       [308,  67]], dtype=int64)
```

### KN Regressor

In [78]:

```
data=pd.read_csv('palcement.csv')
data.head()
```

Out[78]:

|   | year | ECE | CSE | EEE | placement data |
|---|---|---|---|---|---|
| **0** | 1980 | 10.0 | 10.0 | 20 | 40.0 |
| **1** | 1981 | 50.0 | 50.0 | 25 | 125.0 |
| **2** | 1982 | 20.0 | 30.0 | 40 | 90.0 |
| **3** | 1983 | 152.0 | 50.0 | 45 | 247.0 |
| **4** | 1984 | 25.0 | 40.0 | 55 | 120.0 |

In [79]:

```
input_data=data[['year']]
output_data=data['placement data']
```

In [80]:

```
X_train,x_test,y_train,y_test=train_test_split(input_data,output_data,test_size=0.25)
```

In [81]:

```
from sklearn.neighbors import KNeighborsRegressor
```

In [82]:

```
model=KNeighborsRegressor()
```

In [83]:

```
model.fit(X_train,y_train)
```

Out[83]:

```
KNeighborsRegressor(algorithm='auto', leaf_size=30, metric='minkowski',
          metric_params=None, n_jobs=None, n_neighbors=5, p=2,
          weights='uniform')
```

In [84]:

```
pred=model.predict(x_test)
```

In [85]:

```
model.score(X_train,y_train)*100
```

Out[85]:

```
55.586560284638665
```

In [86]:

```
model.score(x_test,y_test)
```

Out[86]:

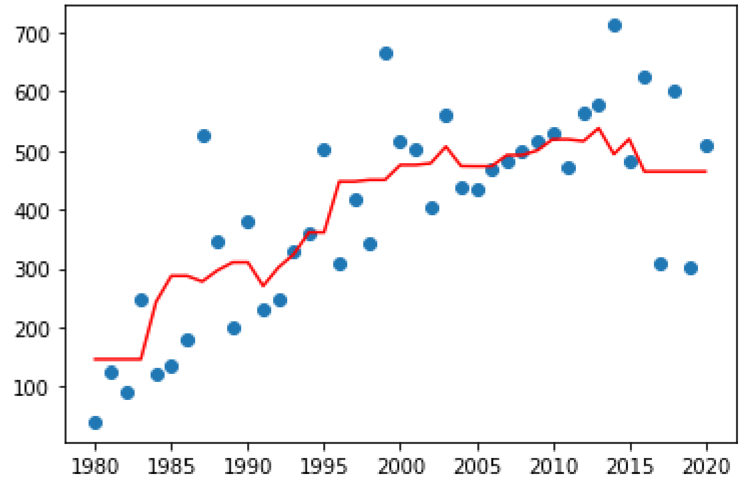
```
0.7571900471389608
```

In [92]:

```
plt.scatter(data['year'],data['placement data'])
plt.plot(data['year'],model.predict(data[['year']]),c='r')
```

Out[92]:

```
[<matplotlib.lines.Line2D at 0x1d2401f2710>]
```



In [ ]:

```
```