In [11]:
```
import numpy as np
import pandas as pd     #importing the necessary libraries
```

In [13]:
```
df = pd.read_csv('/Users/sagarbanjara/Downloads/Takeo projects/bda62_ Sagar/
```

In [15]:
```
df.head()     #exploring the first five rows of data
```

Out[15]:

	CustomerID	Gender	Age	Annual Income (k$)	Spending Score (1-100)
0	1	Male	19	15	39
1	2	Male	21	15	81
2	3	Female	20	16	6
3	4	Female	23	16	77
4	5	Female	31	17	40

In [17]:
```
df.info()   #checking the data details
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 200 entries, 0 to 199
Data columns (total 5 columns):
 #   Column                  Non-Null Count  Dtype 
---  ------                  --------------  ----- 
 0   CustomerID              200 non-null    int64 
 1   Gender                  200 non-null    object
 2   Age                     200 non-null    int64 
 3   Annual Income (k$)      200 non-null    int64 
 4   Spending Score (1-100)  200 non-null    int64 
dtypes: int64(4), object(1)
memory usage: 7.9+ KB
```

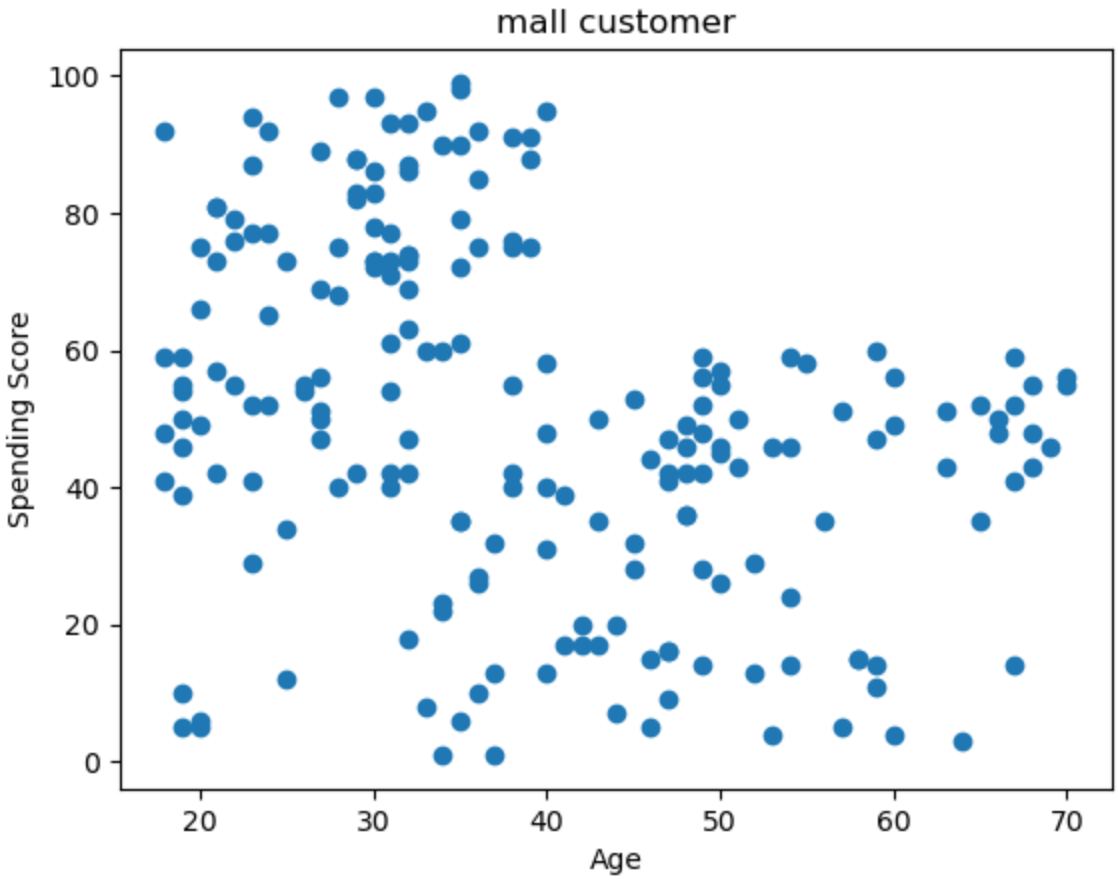
In [19]:
```
missing_values = df.isnull().sum()     #checking whether there are missing v
```

In [21]:
```
missing_values
```

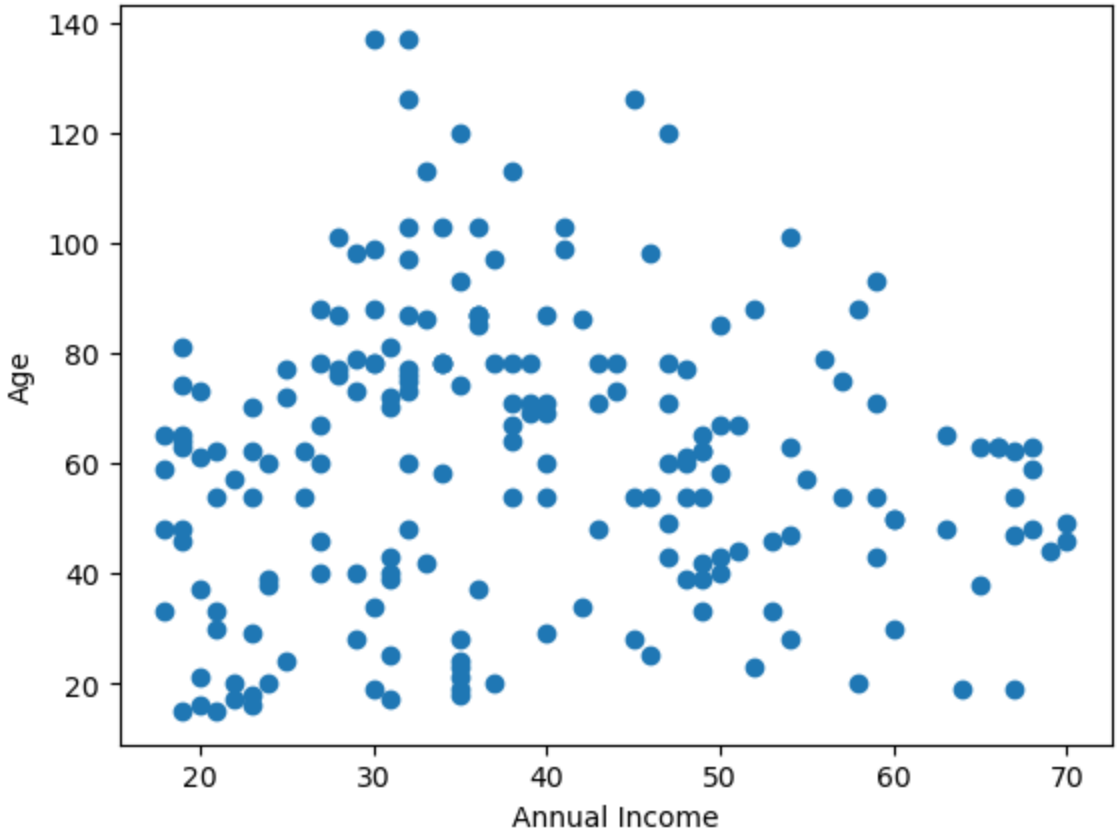
Out[21]:
```
CustomerID                0
Gender                    0
Age                       0
Annual Income (k$)        0
Spending Score (1-100)    0
dtype: int64
```

In [23]:
```
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans     #importing necessary libraries for vi
```

In [24]:
```
plt.scatter(df['Age'], df['Spending Score (1-100)'])
plt.xlabel('Age')
plt.ylabel('Spending Score')
plt.title('mall customer')        #giving the specific name for x axis and y
plt.show()
```



In [25]:
```
plt.scatter(df['Age'], df['Annual Income (k$)'])
plt.xlabel('Annual Income')
plt.ylabel('Age')
plt.show()
```



In [29]:
```
inertia = []
for k in range(1, 10):
    kmeans = KMeans(n_clusters =  k)
    kmeans.fit(df[['Annual Income (k$)', 'Spending Score (1-100)']])
    inertia.append(kmeans.inertia_)
```

```
/opt/anaconda3/lib/python3.12/site-packages/sklearn/cluster/_kmeans.py:1412:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' i
n 1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
/opt/anaconda3/lib/python3.12/site-packages/sklearn/cluster/_kmeans.py:1412:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' i
n 1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
/opt/anaconda3/lib/python3.12/site-packages/sklearn/cluster/_kmeans.py:1412:
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/opt/anaconda3/lib/python3.12/site-packages/sklearn/cluster/_kmeans.py:1412:
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n 1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
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/opt/anaconda3/lib/python3.12/site-packages/sklearn/cluster/_kmeans.py:1412:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' i
n 1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
/opt/anaconda3/lib/python3.12/site-packages/sklearn/cluster/_kmeans.py:1412:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' i
n 1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
```
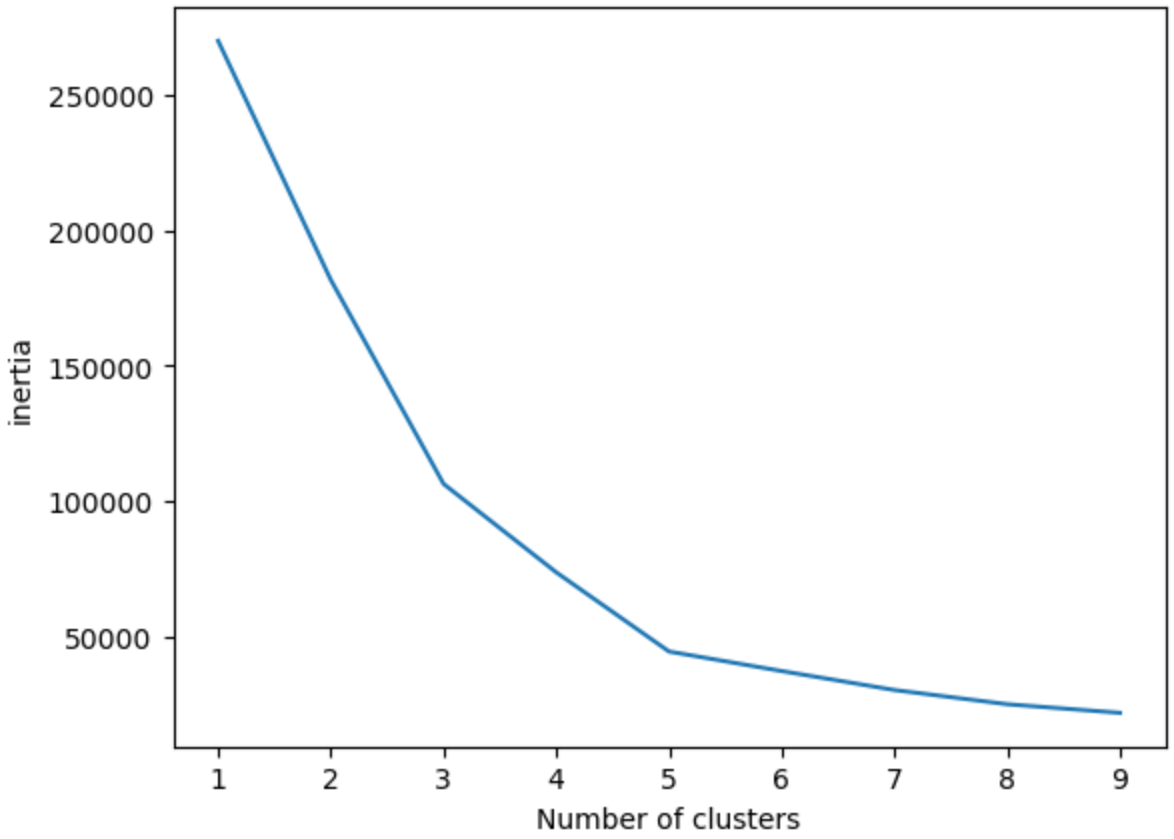

In [31]:

```
plt.plot(range(1,10), inertia)     #indicating the range
plt.xlabel('Number of clusters')
plt.ylabel("inertia")
```

Out[31]:

```
Text(0, 0.5, 'inertia')
```



In [33]:
```
kmeans = KMeans(n_clusters = 4)
predicted = kmeans.fit_predict(df[['Annual Income (k$)', 'Spending Score (1-
```

```
/opt/anaconda3/lib/python3.12/site-packages/sklearn/cluster/_kmeans.py:1412:
FutureWarning: The default value of `n_init` will change from 10 to 'auto' i
n 1.4. Set the value of `n_init` explicitly to suppress the warning
  super()._check_params_vs_input(X, default_n_init=10)
```

In [35]:
```
predicted
```

Out[35]:
```
array([3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1,
       3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1, 3, 1,
       3, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 2, 0, 2, 0, 2, 0, 2, 0, 2,
       0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2,
       0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2,
       0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2, 0, 2,
       0, 2], dtype=int32)
```

In [37]:
```
df['Cluster'] = predicted     #checking the number of cluster
```

In [39]:
```
df
```