In [14]:
```
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
from sklearn.cluster import KMeans
from sklearn.preprocessing import LabelEncoder
```

In [15]:
```
import warnings

warnings.filterwarnings('ignore')
```

In [16]:
```
df = pd.read_csv('Dry_Bean_Dataset.csv')
encoder = LabelEncoder()
df['Class'] = encoder.fit_transform(df['Class'])
df.head()
```

Out[16]:

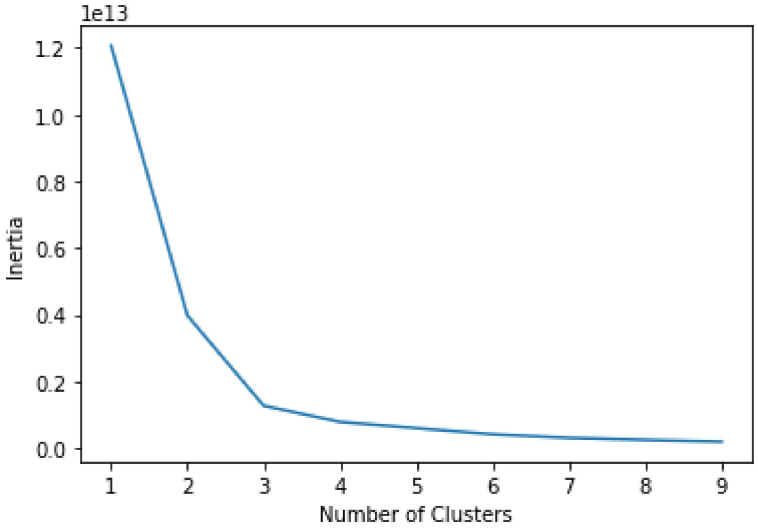
	Area	Perimeter	MajorAxisLength	MinorAxisLength	AspectRation	Eccentricity	ConvexArea	Equiv
0	28395	610.291	208.178117	173.888747	1.197191	0.549812	28715	19
1	28734	638.018	200.524796	182.734419	1.097356	0.411785	29172	19
2	29380	624.110	212.826130	175.931143	1.209713	0.562727	29690	19
3	30008	645.884	210.557999	182.516516	1.153638	0.498616	30724	19
4	30140	620.134	201.847882	190.279279	1.060798	0.333680	30417	19

In [17]:
```
df.columns
```

Out[17]:
```
Index(['Area', 'Perimeter', 'MajorAxisLength', 'MinorAxisLength',
       'AspectRation', 'Eccentricity', 'ConvexArea', 'EquivDiameter', 'Extent',
       'Solidity', 'roundness', 'Compactness', 'ShapeFactor1', 'ShapeFactor2',
       'ShapeFactor3', 'ShapeFactor4', 'Class'],
      dtype='object')
```

In [18]:
```
points = df.iloc[:, 1:14].values
x = points[:, 0]
y = points[:, 1]
inertias = []
for i in range(1, 10):
    kmeans = KMeans(n_clusters=i, random_state=0)
    kmeans.fit(points)
    inertias.append(kmeans.inertia_)
plt.plot(range(1, 10), inertias)
plt.xlabel('Number of Clusters')
plt.ylabel('Inertia')
```

Out[18]:
```
Text(0, 0.5, 'Inertia')
```

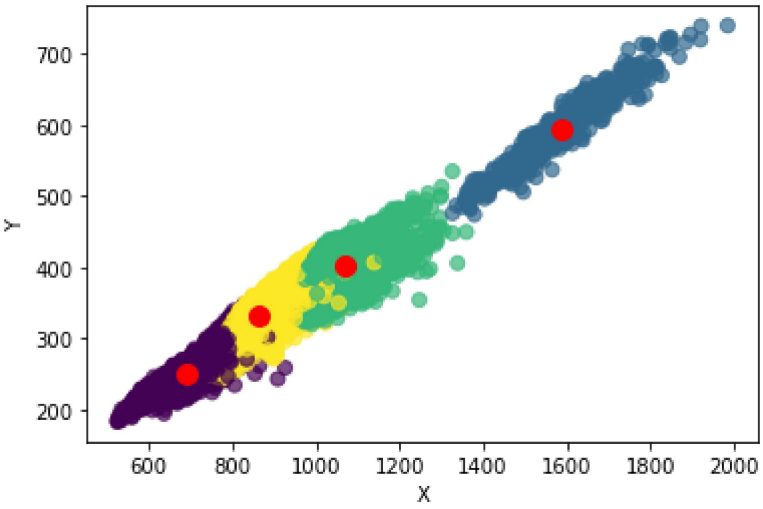


In [19]:

```
kmeans = KMeans(n_clusters=4, random_state=0)
kmeans.fit(points)
predicted_cluster_indexes = kmeans.predict(points)
plt.scatter(x, y, c=predicted_cluster_indexes, s=50, alpha=0.7, cmap='viridis')
plt.xlabel('X')
plt.ylabel('Y')
centers = kmeans.cluster_centers_
plt.scatter(centers[:, 0], centers[:, 1], c='red', s=100)
```

Out[19]:

```
<matplotlib.collections.PathCollection at 0x2085c3f3ca0>
```



In [20]:

```
kmeans = KMeans(n_clusters=4, random_state=0)
kmeans.fit(points)
df['Cluster'] = kmeans.predict(points)
df.head()
```

Out[20]:

	Area	Perimeter	MajorAxisLength	MinorAxisLength	AspectRation	Eccentricity	ConvexArea	Equiv
0	28395	610.291	208.178117	173.888747	1.197191	0.549812	28715	1
1	28734	638.018	200.524796	182.734419	1.097356	0.411785	29172	1
2	29380	624.110	212.826130	175.931143	1.209713	0.562727	29690	1

	Area	Perimeter	MajorAxisLength	MinorAxisLength	AspectRation	Eccentricity	ConvexArea	Equiv
3	30008	645.884	210.557999	182.516516	1.153638	0.498616	30724	19
4	30140	620.134	201.847882	190.279279	1.060798	0.333680	30417	19

In [22]:
```
results = pd.DataFrame(columns = ['Cluster', 'Average Area', 'Average Perimeter', 'Aver
                                  'No. of SEKER', 'No. of BARBUNYA', 'No. of BOMBAY', '
                                  'No. of HOROZ', 'No. of SIRA', 'No. of DERMASON'])
for i in range(len(kmeans.cluster_centers_)):
    area = df[df['Cluster'] == i]['Area'].mean()
    perimeter = df[df['Cluster'] == i]['Perimeter'].mean()
    roundness = df[df['Cluster'] == i]['roundness'].mean()
    compactness = df[df['Cluster'] == i]['Compactness'].mean()
    gdf = df[df['Cluster'] == i]
    SEKER = gdf[gdf['Class'] == 5].shape[0]
    BARBUNYA = gdf[gdf['Class'] == 0].shape[0]
    BOMBAY = gdf[gdf['Class'] == 1].shape[0]
    CALI = gdf[gdf['Class'] == 2].shape[0]
    HOROZ = gdf[gdf['Class'] == 4].shape[0]
    SIRA = gdf[gdf['Class'] == 6].shape[0]
    DERMASON = gdf[gdf['Class'] == 3].shape[0]
    results.loc[i] = ([i, area, perimeter, roundness, compactness, SEKER, BARBUNYA, BOM
results.head()
```

Out[22]:

	Cluster	Average Area	Average Perimeter	Average roundness	Average Compactness	No. of SEKER	No. of BARBUNYA	No. of BOMBAY	No. of CALI
0	0.0	34759.875454	690.084493	0.913375	0.835969	1517.0	2.0	0.0	0.0
1	1.0	173708.005769	1586.822840	0.864298	0.792304	0.0	0.0	520.0	0.0
2	2.0	74879.485610	1069.011704	0.822366	0.769356	0.0	1014.0	2.0	1521.0
3	3.0	50292.596872	863.302043	0.850264	0.769239	510.0	306.0	0.0	109.0

In [ ]: