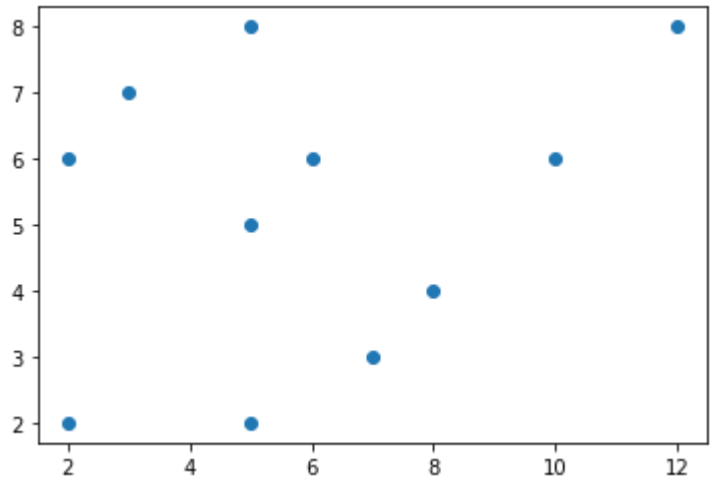
```
import numpy as np
import sklearn
import matplotlib.pyplot as plt
import scipy.cluster.hierarchy as sch
from sklearn.cluster import AgglomerativeClustering


X = np.array([[2,2],[2,6],[3,7],[5,2],[5,5],[5,8],
    [6,6],[7,3],[8,4],[10,6],[12,8],])


plt.scatter(X[:,0],X[:,1])
```

```
<matplotlib.collections.PathCollection at 0x7fd689f6fc90>
```



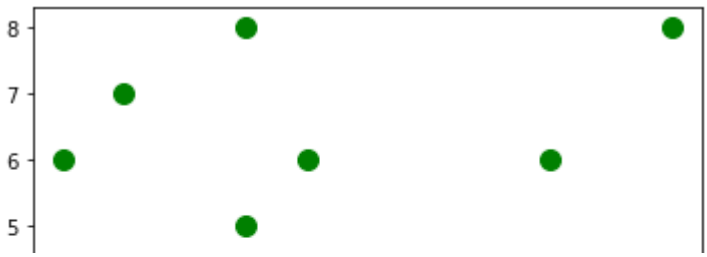

```
hcs = AgglomerativeClustering(linkage='single',n_clusters=2).fit(X)
hcs.labels_
```

```
array([1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0])
```

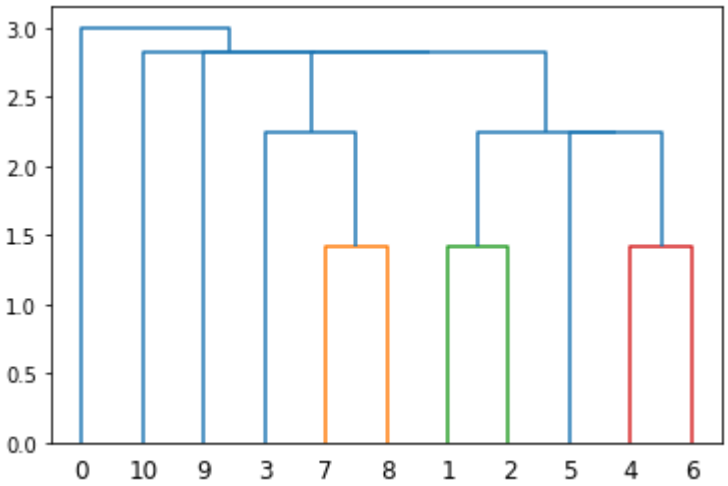
```
y_hcs = hcs.fit_predict(X)


plt.scatter(X[y_hcs ==0,0],X[y_hcs==0,1],s=100,c='green')
plt.scatter(X[y_hcs ==1,0],X[y_hcs==1,1],s=100,c='blue')
plt.scatter(X[y_hcs ==2,0],X[y_hcs==2,1],s=100,c='yellow')
plt.scatter(X[y_hcs ==3,0],X[y_hcs==3,1],s=100,c='red')
plt.scatter(X[y_hcs ==4,0],X[y_hcs==4,1],s=100,c='black')
plt.scatter(X[y_hcs ==5,0],X[y_hcs==5,1],s=100,c='gray')
```

```
<matplotlib.collections.PathCollection at 0x7fd689a06f50>
```




```
dendrogram = sch.dendrogram(sch.linkage(X,method='single'))
```




```
hcc = AgglomerativeClustering(linkage='complete',n_clusters=3).fit(X)
hcc.labels_
```

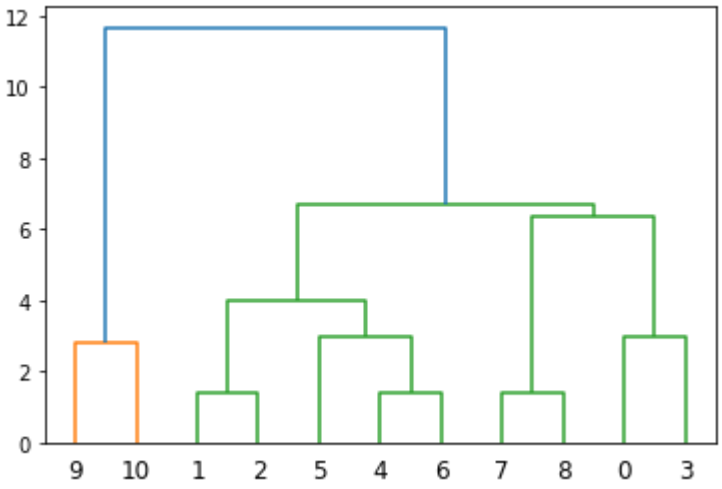
```
array([0, 2, 2, 0, 2, 2, 2, 0, 0, 1, 1])
```

```
y_hcc = hcc.fit_predict(X)
```

```
plt.scatter(X[y_hcc ==0,0],X[y_hcc==0,1],s=100,c='green')
plt.scatter(X[y_hcc ==1,0],X[y_hcc==1,1],s=100,c='blue')
plt.scatter(X[y_hcc ==2,0],X[y_hcc==2,1],s=100,c='yellow')
plt.scatter(X[y_hcc ==3,0],X[y_hcc==3,1],s=100,c='red')
plt.scatter(X[y_hcc ==4,0],X[y_hcc==4,1],s=100,c='black')
plt.scatter(X[y_hcc ==5,0],X[y_hcc==5,1],s=100,c='gray')
```

```
<matplotlib.collections.PathCollection at 0x7fd68791af10>
```


```
dendrogram = sch.dendrogram(sch.linkage(X,method='complete'))
```



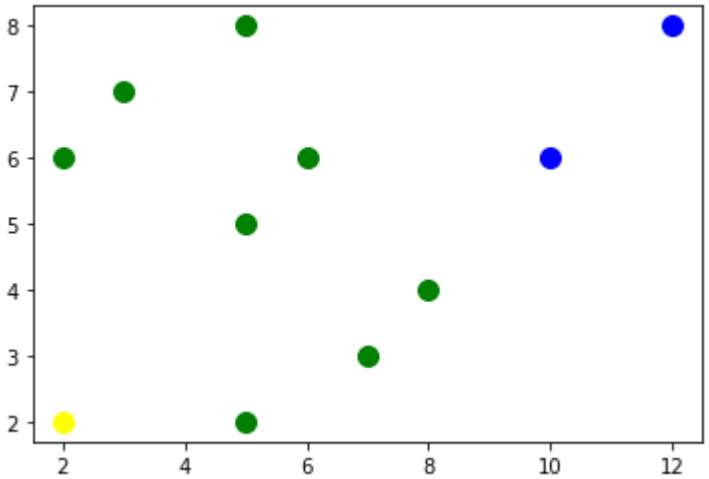

```
hca = AgglomerativeClustering(linkage='average',n_clusters=3).fit(X)
hca.labels_
```

```
array([2, 0, 0, 0, 0, 0, 0, 0, 0, 1, 1])
```

```
y_hca = hca.fit_predict(X)
```

```
plt.scatter(X[y_hca ==0,0],X[y_hca==0,1],s=100,c='green')
plt.scatter(X[y_hca ==1,0],X[y_hca==1,1],s=100,c='blue')
plt.scatter(X[y_hca ==2,0],X[y_hca==2,1],s=100,c='yellow')
plt.scatter(X[y_hca ==3,0],X[y_hca==3,1],s=100,c='red')
plt.scatter(X[y_hca ==4,0],X[y_hca==4,1],s=100,c='black')
plt.scatter(X[y_hca ==5,0],X[y_hca==5,1],s=100,c='gray')
```

```
<matplotlib.collections.PathCollection at 0x7fd68781e890>
```



```
dendrogram = sch.dendrogram(sch.linkage(X,method='average'))
```