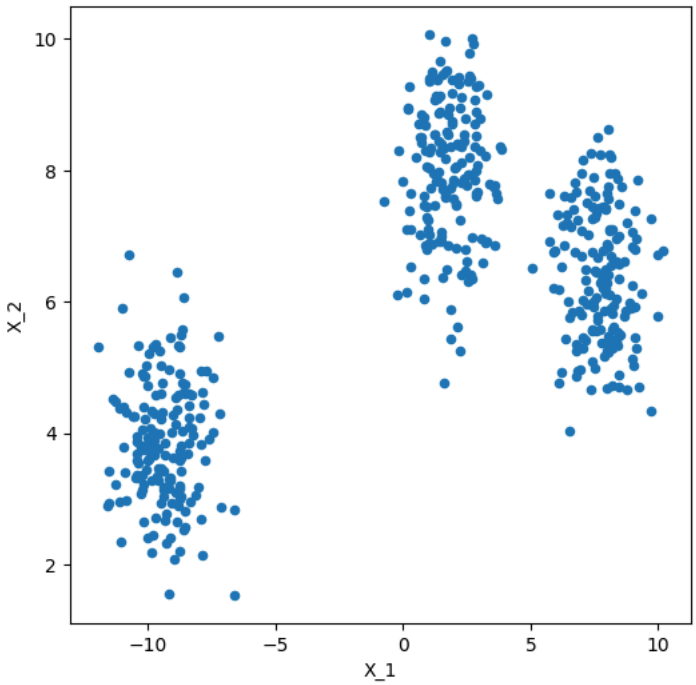
```
import numpy as np
from sklearn.datasets import make_blobs
from matplotlib import pyplot as plt
from matplotlib.pyplot import figure
from pandas import DataFrame
X,_= make_blobs(n_samples=500 , centers=3, n_features=2, random_state=20)


df = DataFrame (dict(x=X[:,0],y=X[:,1]))
fig, ax=plt.subplots(figsize=(6,6))
df.plot(ax=ax, kind='scatter',x='x', y='y')
plt.xlabel('X_1')
plt.ylabel('X_2')
plt.show()
```




```
from sklearn.cluster import DBSCAN
clustering=DBSCAN(eps=1, min_samples=5).fit(X)
cluster=clustering.labels_
len(set(cluster))
```

```
4
```

```
clustering.labels_
```

```
array([ 0,  1,  0,  0,  1,  1,  2,  2,  0,  0,  0,  1,  2,  2,  2,  0,  1,
        0,  2,  2,  0,  0,  1,  2,  1,  1,  0,  1,  0,  2,  2,  2,  1,  2,
        0,  1,  0,  2,  1,  1,  2,  1,  2,  2,  2,  2,  0,  0,  0,  2,  2,
        2,  1,  1,  1,  0,  2,  1,  2,  2,  0,  2,  2,  1,  2,  0,  0,  2,
        0,  2,  2,  1,  2,  2,  1,  0,  0,  0,  2,  0,  1,  1,  0,  0,  0,
        2,  2,  2,  0,  2,  0,  2,  2,  0,  0,  2,  1,  0,  2,  0,  1,  2,
        1,  0,  2,  2,  2,  1,  1,  0,  0, -1,  0,  0,  0,  1,  1,  0,  1,
        2,  1,  2,  2,  0,  0,  2,  1,  2,  1,  2,  0,  2,  1,  0,  1,  1,
        2,  0,  2,  1,  1,  2,  2,  1,  1,  1,  2,  0,  2,  1,  0,  0,  0,
        0,  0,  1,  2,  0,  1,  0,  2,  0,  0,  2,  0,  0,  0,  0,  0,  0,
        2,  0,  1,  1,  2,  2,  2,  2,  0,  1,  1,  1,  1,  2,  0,  2,  1,
        2,  1,  2,  1,  1,  0,  1,  1,  1,  2,  2,  1,  1,  0,  2,  2,  1,
        0,  2,  2,  1,  2,  1,  0,  0,  1,  1,  0,  2,  1,  1,  0,  2,  0,
        2,  0,  2,  0,  2,  1,  0,  1,  0,  1,  0,  2,  0,  0,  0,  2,  1,
        0,  1,  1,  2,  2,  1,  2,  2,  2,  0,  1,  2,  2,  1,  0,  0,  2,
        2,  2,  1,  1,  0,  2,  1,  2,  2,  2,  0,  0,  2,  1,  0,  1,  1,
        2,  1,  0,  1,  0,  0,  1,  1,  1,  2,  1,  0,  2,  2,  2,  0,  2,
        0,  2,  0,  1,  1,  0,  2,  2,  0,  1,  2,  1,  0,  1,  0,  0,  0,
        1,  1,  0,  0,  0,  1,  1,  1,  2,  1,  1,  2,  2,  1,  2,  1,  1,
        2,  0,  1,  2,  2,  1,  2,  1,  2,  1,  1,  0,  0,  0,  2,  1,  1,
        0,  0,  2,  0,  0,  1,  2,  1, -1,  1,  0,  2,  1,  1,  0,  1,  0,
        1,  1,  0,  1,  2,  1,  1,  0,  0,  0,  2,  0,  2,  1,  1,  1,  0,
        0,  2,  2,  0,  2,  2,  1,  1,  2,  1,  1,  1,  1,  1,  2,  1,  2,
        2,  0,  1,  2,  0,  1,  0,  0,  2,  0,  1,  1,  2,  1,  2,  0,  1,
```

```
2,  2,  0,  0,  0,  1,  2,  0,  0,  1,  1,  2,  1,  2,  1,  2,  2,
2,  2,  0,  0,  0,  1,  1,  0,  0,  1,  1,  0,  2,  1,  2,  1,  1,
1,  1,  2,  0,  1,  2,  1,  1,  1,  0,  0,  2,  0,  2,  0,  1,  1,
0,  0,  0,  0,  0,  2,  2,  1,  2,  0,  2,  0,  1,  1,  0,  1,  0,
0,  2,  2,  1,  2,  2,  0,  2,  0,  2,  2,  0,  0,  0,  0,  1,  1,
2,  1,  0,  2,  2,  2,  1])
```

```
def show_clusters (X,cluster):
  df=DataFrame(dict(x=X[:,0],y=X[:,1], label=cluster))
  colors={-1:'red',0:'blue',1:'orange',2:'green',3:'pink'}
  fig, ax=plt.subplots(figsize=(8,8))
  grouped=df.groupby('label')
  for key , group in grouped:
    group.plot(ax=ax,kind='scatter',x='x',y='y',label=key , color=colors[key])
  plt.xlabel('X_1')
  plt.ylabel('X_2')
  plt.show()
```

```
show_clusters(X,cluster)
```