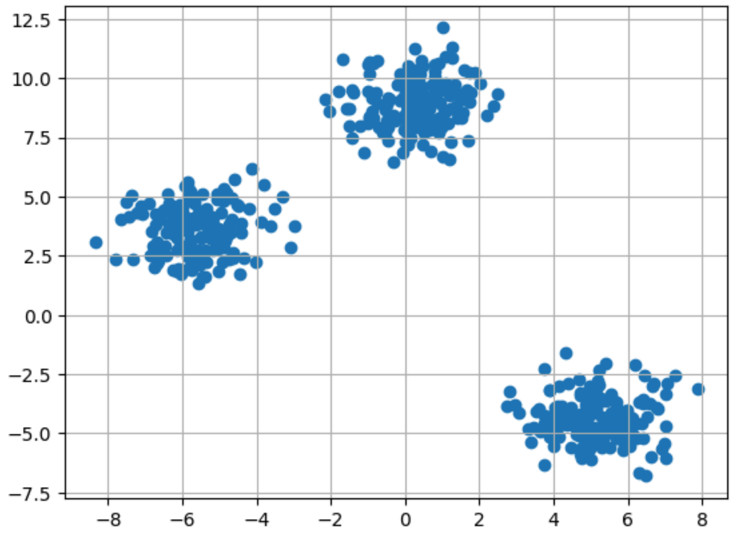
```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.datasets import make_blobs
X,y = make_blobs(n_samples = 500,n_features = 2,centers = 3,random_state = 23)

fig = plt.figure(0)
plt.grid(True)
plt.scatter(X[:,0],X[:,1])
plt.show()
```

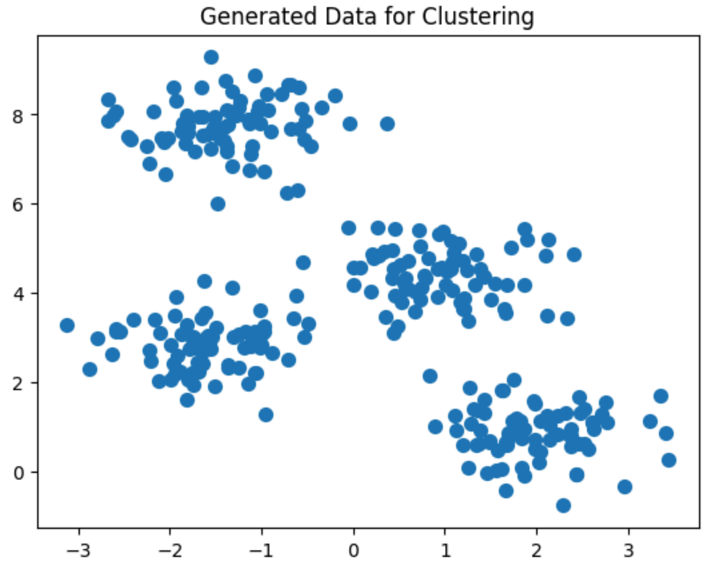


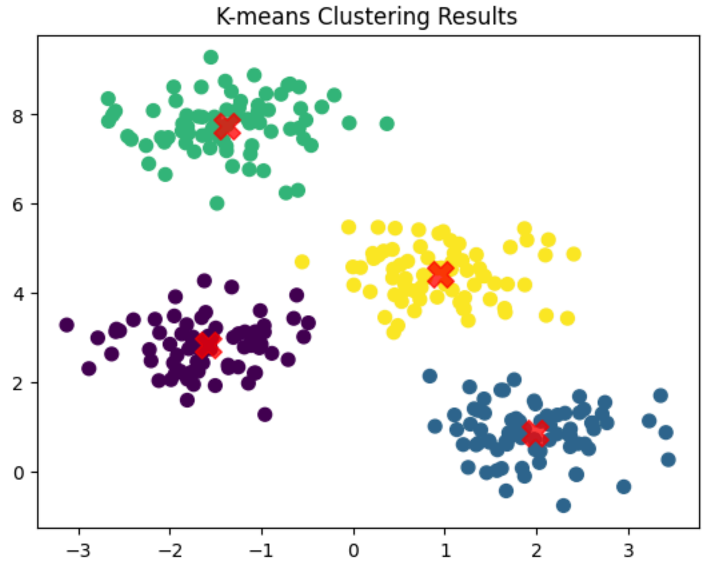
```
k = 3

clusters = {}
np.random.seed(23)

for idx in range(k):
    center = 2*(2*np.random.random((X.shape[1],))-1)
    points = []
    cluster = {
        'center' : center,
        'points' : []
    }

    clusters[idx] = cluster

clusters
```

```
{0: {'center': array([0.06919154, 1.78785042]), 'points': []},
 1: {'center': array([ 1.06183904, -0.87041662]), 'points': []},
 2: {'center': array([-1.11581855,  0.74488834]), 'points': []}}
```

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans
from sklearn.datasets import make_blobs

# Generate sample data for clustering
X, y = make_blobs(n_samples=300, centers=4, cluster_std=0.60, random_state=0)

# Visualize the data
plt.scatter(X[:, 0], X[:, 1], s=50, cmap='viridis')
plt.title("Generated Data for Clustering")
plt.show()

# Apply KMeans clustering
kmeans = KMeans(n_clusters=4)  # Let's choose 4 clusters
kmeans.fit(X)

# Get the cluster centers (centroids)
centers = kmeans.cluster_centers_

# Get the cluster labels (which cluster each point belongs to)
labels = kmeans.labels_

# Visualize the clusters
plt.scatter(X[:, 0], X[:, 1], c=labels, s=50, cmap='viridis')
plt.scatter(centers[:, 0], centers[:, 1], c='red', s=200, alpha=0.75, marker='X')  # Mark the centroids
plt.title("K-means Clustering Results")
plt.show()
```

```
<ipython-input-5-68fdee1d3361>:10: UserWarning: No data for colormapping provided via 'c'. Parameters 'cmap' will be ignored
  plt.scatter(X[:, 0], X[:, 1], s=50, cmap='viridis')
```


Generated Data for Clustering


K-means Clustering Results