Unit 3.3 Assignment Unsupervised Machine Learning

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Solution

In [1]:
```
#First imported the necessary libraries
import matplotlib.pyplot as plt
import numpy as np
from sklearn import datasets
from sklearn.metrics import adjusted_rand_score
from sklearn.cluster import KMeans
from sklearn.decomposition import PCA
```

In [2]:
```
iris=datasets.load_iris() #load dataset
```

In [3]:
```
# Extract the features and target variable from the dataset
x=iris.data
y=iris.target
```

K-Mean

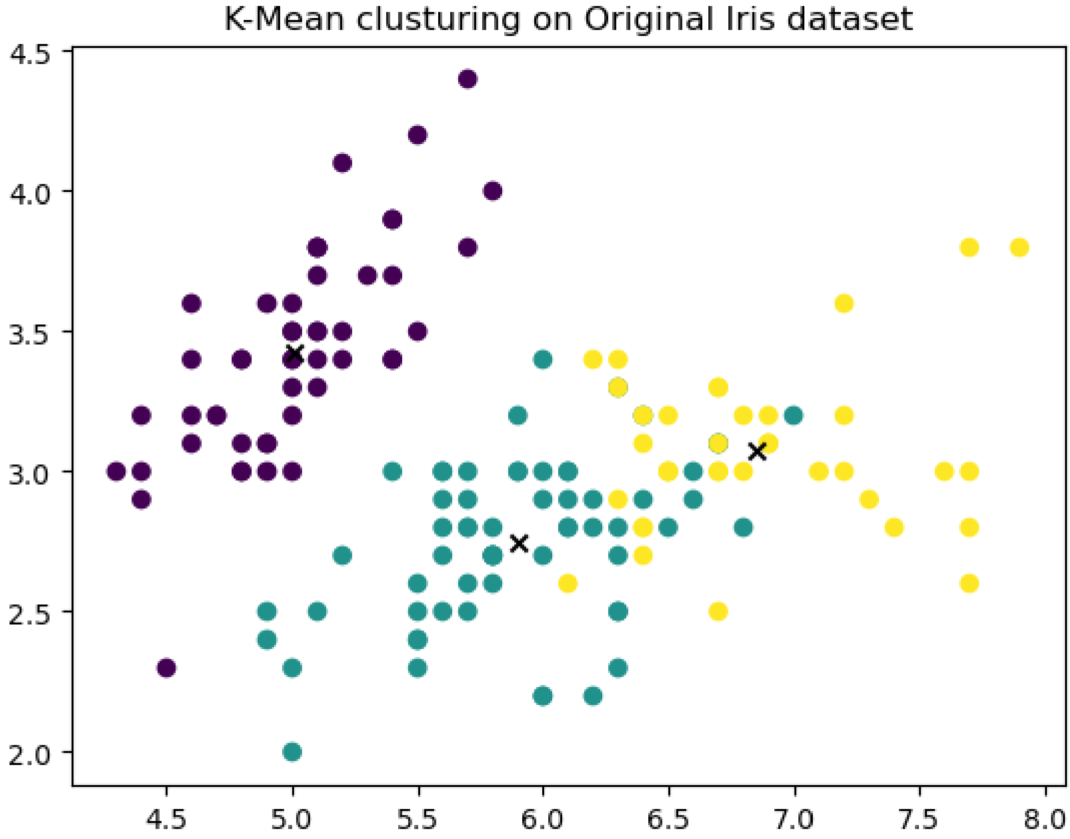
In [4]:
```
# Initialize KMeans model with 3 clusters, 1 initialization, and 100 max
model = KMeans(n_clusters=3, n_init=1, max_iter=100)

# Fit the model to the original data
model.fit(x)

# Predict the cluster labels for the original data
prediction_before_pca = model.predict(x)

# Get the coordinates of the centroids for each cluster
centroids = model.cluster_centers_
centroids
```

Out[4]:
```
array([[5.006     , 3.428     , 1.462     , 0.246     ],
       [5.9016129 , 2.7483871 , 4.39354839, 1.43387097],
       [6.85      , 3.07368421, 5.74210526, 2.07105263]])
```

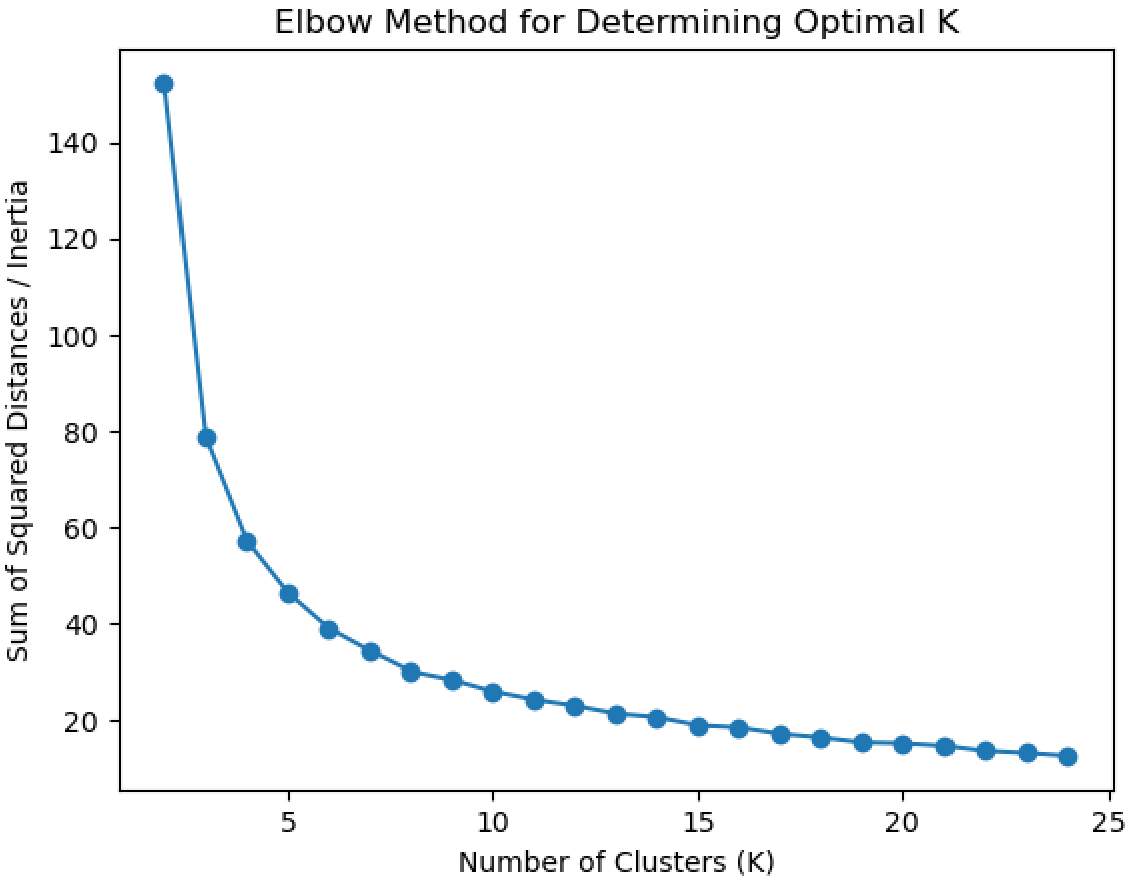
In [5]:
```
# Plot the scatter plot of the original data with predicted clusters
plt.scatter(x[:,0],x[:,1],c=prediction_before_pca)
# Plot the centroids of each cluster
plt.scatter(centroids[:,0],centroids[:,1],marker="x",color="black")
```

```
plt.title("K-Mean clusturing on Original Iris dataset")
plt.show
```

Out[5]: <function matplotlib.pyplot.show(close=None, block=None)>



In [6]:
```
# Initialize empty lists to store inertia scores and corresponding K valu
k_values = []
inertia_scores = []

# Iterate over a range of K values and calculate inertia scores for each
for k in range(2, 25):
    # Initialize KMeans model with current K value
    model = KMeans(n_clusters=k)
    # Fit the model to the data
    model.fit(x)
    # Append the inertia score and corresponding K value to the respectiv
    inertia_scores.append(model.inertia_)
    k_values.append(k)

# Plot the inertia scores for each K value and mark the data points
plt.plot(k_values, inertia_scores)
plt.scatter(k_values, inertia_scores)
# Set the x and y labels of the plot
plt.xlabel("Number of Clusters (K)")
plt.ylabel("Sum of Squared Distances / Inertia")
# Set the title of the plot
plt.title("Elbow Method for Determining Optimal K")
# Show the plot
plt.show()
```



K Mean with Reduce data by PCA

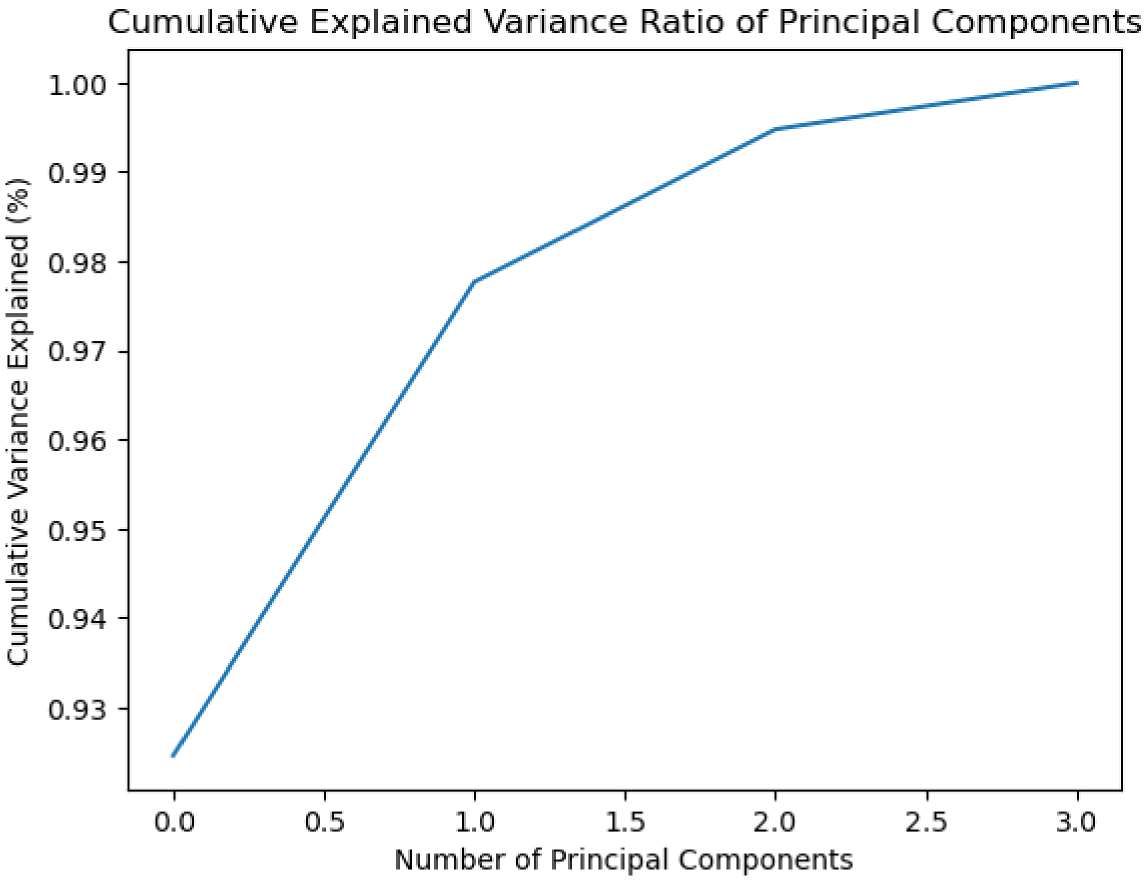
PCA

In [7]:
```
iris=datasets.load_iris() #load dataset
```

In [8]:
```
x.shape
```

Out[8]: (150, 4)

In [9]:
```
pca=PCA(n_components=2)
# Fit and transform the data to 2 principal components
x_reduce=pca.fit_transform(x)
pca = PCA().fit(x)
# Calculate the cumulative explained variance ratio of the principal comp
cumulative_var_explained = np.cumsum(pca.explained_variance_ratio_)

# Plot the cumulative explained variance ratio for each principal compone
plt.plot(cumulative_var_explained)
plt.xlabel("Number of Principal Components")
plt.ylabel("Cumulative Variance Explained (%)")
plt.title("Cumulative Explained Variance Ratio of Principal Components")
plt.show()

print("Cumulative Explained Variance by Number of Components:\n", cumulat
```




```
Cumulative Explained Variance by Number of Components:
 [0.92461872 0.97768521 0.99478782 1.        ]
```

Now perform K Mean clusturing with reduce dataset

In [10]:
```
# Initialize KMeans with 3 clusters, 1 initialization and 100 maximum ite
model = KMeans(n_clusters=3, n_init=1, max_iter=100)

# Fit KMeans to the reduced data
model.fit(x_reduce)

# Predict the clusters of the reduced data
prediction_after_pca = model.predict(x_reduce)

# Get the coordinates of the cluster centers
centroids = model.cluster_centers_
```

In [11]:
```
plt.scatter(x_reduce[:,0],x_reduce[:,1],c=prediction_after_pca)
plt.scatter(centroids[:,0],centroids[:,1],marker="x",color="black")
plt.title('K-Means Clustering on Iris Dataset Reduced with PCA')
plt.show()
```

In [12]:
```
adjusted_rand_value=adjusted_rand_score(prediction_after_pca,prediction_b
print(f"The Adjusted Rand Index comparing clustering before and after PCA
```

```
The Adjusted Rand Index comparing clustering before and after PCA is : 0.9
80
```

"adjusted_rand_score" is a function that is used to compute the Adjusted Rand Index (ARI) between two clusterings. The ARI is a measure of the similarity between two clusterings, the ARI is a good measure to use when evaluating the similarity between two clusterings of a dataset.

In [ ]: