1- Give Example of using PCA.

2- **Confusion matrix**

A Confusion matrix **is an *N x N matrix* used for evaluating the** performance of a classification model**, where** N **is the number of *target classes*.**

Suppose that we have a total of 2**0 cats and dogs** and our model predicts whether it is a cat or a dog.

Actual values = [‘dog’, ‘cat’, ‘dog’, ‘cat’, ‘dog’, ‘dog’, ‘cat’, ‘dog’, ‘cat’, ‘dog’, ‘dog’, ‘dog’, ‘dog’, ‘cat’, ‘dog’, ‘dog’, ‘cat’, ‘dog’, ‘dog’, ‘cat’]

Predicted values = [‘dog’, ‘dog’, ‘dog’, ‘cat’, ‘dog’, ‘dog’, ‘cat’, ‘cat’, ‘cat’, ‘cat’, ‘dog’, ‘dog’, ‘dog’, ‘dog’, ‘cat’, ‘dog’, ‘dog’, ‘cat’, ‘dog’, ‘dog’, ‘cat’]

Build a **Confusion matrix** and calculate the following:

a. Accuracy

b. Precision

c. Recall (TPR, Sensitivity)

d. F1-Score

e. FPR (Type I Error)

f. FNR (Type II Error)

Confusion Matrix

Actual / Predict	0	1
0	TN	FN
1	FP	TP

$$Precision = \frac{TP}{TP + FP}$$

$$Recall = \frac{TP}{TP + FN}$$

$$F1\ Score = \frac{2 * Precision * Recall}{Precision + Recall}$$

$$Accuracy = \frac{TP+TN}{TP+TN+FP+FN}$$