CONFUSION MATRIX

Example: Medical Test for Disease

Suppose we tested **100 people**.

- 40 actually had the disease.
- 60 did not have the disease.

Our model's predictions:

	Predicted Positive	**Predicted Negative**	**Total**
Actual Positive	**TP = 30**	**FN = 10**	40
Actual Negative	**FP = 15**	**TN = 45**	60
Total	45	55	100

Calculations

1. **Accuracy** = (TP + TN) / Total
   = (30 + 45) / 100 = **0.75 (75%)**
2. **Error Rate** = 1 − Accuracy
   = 1 − 0.75 = **0.25 (25%)**
3. **Precision (Positive Predictive Value)** = TP / (TP + FP)
   = 30 / (30 + 15) = 30 / 45 = **0.67 (67%)**
4. **Recall (Sensitivity, TPR)** = TP / (TP + FN)
   = 30 / (30 + 10) = 30 / 40 = **0.75 (75%)**
5. **Specificity (True Negative Rate)** = TN / (TN + FP)
   = 45 / (45 + 15) = 45 / 60 = **0.75 (75%)**
6. **F1 Score** = 2 × (Precision × Recall) / (Precision + Recall)
   = 2 × (0.67 × 0.75) / (0.67 + 0.75)
   ≈ 0.71 (**71%**)

Summary of Metrics:

- Accuracy = **75%**
- Error Rate = **25%**
- Precision = **67%**

- Recall (Sensitivity) = **75%**
- Specificity = **75%**
- F1 Score = **71%**