# Practice Question with Solution

**A video-streaming platform deploys a machine learning system to automatically detect copyright-violating videos.**
**The system classifies uploaded videos as Violating or Non-Violating.**

Confusion Matrix:

| | **Predicted Violating** | **Predicted Non-Violating** |
|---|---|---|
| **Actual Violating** | 180 (TP) | 30 (FN) |
| **Actual Non-Violating** | 45 (FP) | 245 (TN) |

a. Calculate overall accuracy.
b. Calculate precision.
c. Calculate recall.
d. Evaluate system effectiveness.

Note : A confusion matrix is a table that summarizes the performance of a classification model by showing the relationship between actual and predicted classes using true positives, false positives, false negatives, and true negatives. Precision measures the proportion of correctly predicted positive instances out of all predicted positives, indicating how reliable positive predictions are. Recall measures the proportion of correctly predicted positive instances out of all actual positives, indicating how well the model identifies all relevant cases.

**Solution:**

**Given:**

- True Positives (TP) = 180
- False Negatives (FN) = 30
- False Positives (FP) = 45
- True Negatives (TN) = 245
- Total samples = 180 + 30 + 45 + 245 = 500

Accuracy = (TP + TN) / Total = (180 + 245)/500 = 85%
Precision = TP / (TP + FP) = 180/225 = 80%
Recall = TP / (TP + FN) = 180/210 ≈ 85.7%

So we can conclude that:

The system is more effective at detecting copyright-violating videos. This is supported by the high recall (85.7%), indicating that most actual violating videos are successfully identified. Although precision is slightly lower (80%), the system prioritizes catching violations over minimizing false alarms, which is appropriate for content moderation where missing violations can have serious consequences.

**Part B:**

**Machine learning systems can be described using the Task (T), Performance Measure (P), and Experience (E) framework. Using the scenarios below, identify T, P, and E for each case.**

| **Scenario** | **Task (T)** | **Performance Measure (P)** | **Experience (E)** |
|---|---|---|---|
| **A food-delivery platform predicts delivery time based on traffic, distance, restaurant load, and past delivery records.** | | | |
| **A music streaming app recommends playlists based on listening history, skips, likes, and user mood selections.** | | | |
| **A bank uses machine learning to flag suspicious transactions in real time.** | | | |

**Solution:**

| **Scenario** | **Task (T)** | **Performance Measure (P)** | **Experience (E)** |
|---|---|---|---|
| **Food-delivery time prediction** | Predict delivery time | Prediction accuracy | Past delivery records, traffic, distance |
| **Music playlist recommendation** | Recommend relevant playlists | Click-through rate, listening duration | User listening history, likes, skips |
| **Fraud detection in banking** | Detect fraudulent transactions | Detection accuracy, false-positive rate | Historical transaction data, fraud labels |