

Exercise 1:

- (a) Below is an empty confusion matrix for a binary classification problem. Assign the correct terms (TP, FP, FN, TN) to fields (A), (B), (C), (D) and explain what each term represents.

	Actual Positive	Actual Negative
Predicted Positive	(A)	(B)
Predicted Negative	(C)	(D)

- (b) Below is a table that incorrectly assigns 11 metrics derived from the confusion matrix to their corresponding formulas and descriptions. The table contains the following columns:

- Metric Names (Lettered A-O): Commonly used names (including alternative names) for each metric.
- Formula (Lettered a-o): Expressions using TP, FP, FN, TN.
- Description (Numbered 1-11): Brief descriptions of metrics derived from the confusion matrix.

Your task is to:

- Correctly match metric names, formulas, and descriptions in a new table.
- Identify metric names that are synonyms (i.e., referring to the same metric).
- Identify any formula that does not correspond to a metric or description and list them separately.

Metric Name	Formula	Description
A) True Positive Rate (TPR)	a) $\frac{FN}{TP+FN}$	1) Proportion of actual positives correctly identified.
B) Recall	b) $\frac{TP}{TP+FN}$	2) Proportion of actual negatives correctly identified.
C) Sensitivity	c) $\frac{TN}{TN+FP}$	3) Proportion of positive predictions that are correct.
D) True Negative Rate (TNR)	d) $\frac{TP}{TP+FP}$	4) Proportion of positive predictions that are incorrect.
E) Specificity	e) $\frac{FP}{TP+FP}$	5) Proportion of actual negatives incorrectly classified as positive.
F) Precision	f) $\frac{FP}{FP+TN}$	6) Overall proportion of correct predictions.
G) Positive Predictive Value (PPV)	g) $\frac{TP+TN}{TP+FP+FN+TN}$	7) Combines precision and recall using their harmonic mean.
H) False Discovery Rate (FDR)	h) $\frac{2 \cdot \text{Precision} \cdot \text{Recall}}{\text{Precision} + \text{Recall}}$	8) Proportion of actual positives in the dataset.
I) False Positive Rate (FPR)	i) $\frac{2 \cdot (\text{Precision} + \text{Recall})}{\text{Precision} \cdot \text{Recall}}$	9) Proportion of negative predictions that are correct.
J) False Negative Rate (FNR)	j) $\frac{TP+FN}{TP+FP+FN+TN}$	10) Proportion of negative predictions that are incorrect.
K) Negative Predictive Value (NPV)	k) $\frac{TN}{TN+FN}$	11) Proportion of actual positives incorrectly classified as negative.
L) Accuracy	l) $\frac{FN}{TN+FN}$	
M) False Omission Rate (FOR)	m) $\frac{FN}{FP+FN}$	
N) Prevalence	n) $\frac{FN+FP}{TP+TN+FP+FN}$	
O) F1 Score	o) $\frac{TP-FP}{TP+FN+FP+TN}$	