



Database and its Applications

Data Models and Mathematical Foundations

Pooja T S
Computer Applications

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Experiential Learning I: Predicate Logic and Set Theory

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- ▶ P1. Classify as proposition or not:
 - (a) $2 + 3 = 5$ (b) "Close the door." (c) $x + 2 = 7$ (d) "Bengaluru is in India."
- ▶ P2. Build the truth table for $(p \vee q) \rightarrow (\neg p \wedge q)$.
- ▶ P3. Show $\neg(p \rightarrow q) \equiv p \wedge \neg q$ (truth table or laws).
- ▶ P4. Prove $(p \rightarrow q) \equiv (\neg q \rightarrow \neg p)$ (contrapositive) and give a counterexample for $(p \rightarrow q) \not\equiv (q \rightarrow p)$.
- ▶ P5. Predicates, domain = all students. $E(x)$: "x submitted every assignment." $P(x)$: "x passed". Translate:
 - (a) Every student who submitted every assignment passed.
 - (b) Some student passed without submitting every assignment.
 - (c) No student both failed and submitted every assignment.



- ▶ S1. $A = \{1, 2, 3, 4\}$, $B = \{3, 4, 5, 6\}$: find $A \cup B$, $A \cap B$, $A - B$, $B - A$; with $U = \{1, \dots, 6\}$ find A' .
- ▶ S2. Verify with elements that $(A \cup B)' = A' \cap B'$ for $A = \{a, b, c\}$, $B = \{b, c, d\}$, $U = \{a, b, c, d, e\}$.
- ▶ S3. Survey (two sets): 120 students; $|C| = 70$ (Cartoons), $|K| = 50$ (Comics), $|C \cap K| = 30$.
 - (a) At least one (b) Exactly one (c) Neither
- ▶ S4. PIE (three sets): $|M| = 128$, $|P| = 87$, $|C| = 134$, $|M \cap P| = 31$, $|M \cap C| = 54$, $|P \cap C| = 30$, total failed = 250. Find $|M \cap P \cap C|$.
- ▶ S5. Complement counting: How many 3-digit numbers contain at least one digit 7?



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