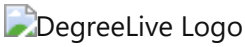

B.Com Honours | Semester IV | Calicut University

BUSINESS STATISTICS

Course Code: COM4CJ205 • Module 3 Notes

Module III: Set Theory, Probability, & Combinatorics

Establishes mathematical foundations for risk evaluation, random events, set operations, conditional probability, and combinatorial decision-making.

Unit 5: Set Theory & Venn Diagrams

Set operations: Union ((A cup B)), Intersection ((A cap B)), Difference ((A - B)), and Complement ((A')). Venn diagrams visually represent event spaces and overlapping consumer segments.

Unit 6: Probability Concepts & Approaches

Quantitative measure of likelihood ((0 le P(E) le 1)). Approaches: Classical / A priori, Empirical / Relative Frequency, and Subjective. Conditional Probability: (P(A|B) = rac{P(A cap B)}{P(B)}).

Unit 7: Theorems of Probability – Addition & Multiplication

1. Addition Theorem:

> **For non-mutually exclusive events: (P(A cup B) = P(A) + P(B) - P(A cap B))**

2. Multiplication Theorem:

> **For independent events: (P(A cap B) = P(A) imes P(B))**

Unit 8: Permutations & Combinations

Permutations (Order matters): (^n P_r = rac{n!}{(n-r)!}).
Combinations (Order irrelevant): (^n C_r = rac{n!}{r!(n-r)!}).

Practical Problem 1 (Probability Addition & Multiplication Solved Numerical): In a market research study of 100 consumers: 60 read Magazine A, 50 read Magazine B, and 30 read both Magazine A & B.
Calculate (a) Probability that a randomly selected consumer reads at least one magazine (P(A cup B)), (b) Probability that a consumer reads Magazine A given they read Magazine B (P(A|B)), and (c) Check whether reading Magazine A and B are statistically independent.

Step-by-Step Solved Probability Calculations:

- **1. Individual Probabilities:**
  (P(A) = 60/100 = 0.60); (P(B) = 50/100 = 0.50); (P(A cap B) = 30/100 = 0.30).
- **2. Probability of Reading At Least One Magazine (P(A cup B)):**
  > **(P(A cup B) = P(A) + P(B) - P(A cap B) = 0.60 + 0.50 - 0.30 = mathbf{0.80} ext{ (or 80%)})**
- **3. Conditional Probability (P(A|B)):**
  > **(P(A|B) = P(A cap B) / P(B) = 0.30 / 0.50 = mathbf{0.60} ext{ (or 60%)})**

- **4. Independence Test Check:**
  (P(A) imes P(B) = 0.60 imes 0.50 = 0.30).
  Since (P(A cap B) = 0.30 = P(A) imes P(B)), the events are **statistically independent**!