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Chapter No: 06

=> Learning objectives:

1- Distinguish between grouped and ungrouped data.

2- Compute mean, median, mode for both grouped and ungrouped data.

3- Build cumulative frequency table and draw ogives.

4- Calculate range, varience, and standard deviation.

5- Construct frequency tables, histograms and frequency

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polygons.

=> Content Summary:

Types of data: ungrouped vs grouped data; class intervals frequency distribution.
Central Trequency mean, median mode (for raw data and grouped data).
Comulative Trequency less than/ more than comulative Trequency; orgives and interpretation.
Graphical representation Histograms (equal and unequal intervals) Trequency polygons.

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Worked Example (key types)

Ungrouped data -> Find mean, media, mode from a list of numbers.

1- Grouped data -> use midpoints to compute mean; construct frequency tables.

2- Histograms -> draw with equal and unequal intervals.

3- Frequency polygon -> From histogram or frequency table.

4- Orgives -> less than / more than cumulative frequency curves.

5- Dispersion -> Range, variance standard deviation (direct and shortcut formulas) for both grouped and ungrouped data.

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Chapter NO: 07

Permutation, combination and probability:

=> What the chapter Cover's

1- Permutation:
Ways to arrange/ order objects includes:
permutation of distinct objects:
permutation when some objects are alike (repetition).
Circular permutations (arrangments in a circle).

2- Combination:
Ways to select objets without caring about the order.
Simple combinations:
Complementary Combinations:

3- probability:
Measure of likelihood of events, main topics include:

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Basic definition: (sample space, event, etc)
probability that an event does not occur.
Addition rule for probabilities (for events).
Multiplication rule for probabilities:

4- Exercises and Applications.
Many problem involves "real_life" examples: Cards, dice, Selection, orderings etc.
also problems combining all three points (permutation Combination, probability).

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Chapter No: 01

introduction and overview:-

1- Introduction:

The first chapter introdues the concept of uncertainty, its presence in everyday life, computer Science, Software engineering and how to make decisions under Such condition's. Since the outcomes of many process Cannot be predicted with Complete accuracy, probability.

2- key concepts:

2.1:

Making decisions under uncertainty:

Uncertainty mean's outcomes are not predetermined and depend on multiple factors

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and chance.

Examples of Uncertainty: lottery, coin toss, wheel of fortune.

Stock market fluctuations.
Weather forecasts (e.g 60% chance of rain).

Volcano eruptions or Sports results.

Computer Science: Software installation time, memory needs, virus attacks, printing queues, hardware failure.

In practice, we constantly make decisions without complete information.

Conclusion :-

Uncertainty is Unavoidable, but it can be measured quantified and managed through probality models.

2.2 :

Overview of the book:

The book progressess from describing uncertainty to advanced statistical modeling:

1-

probability as a language of uncertainty.

probabilities assigned between 0 (impossible event) and 1 (Certain event).

2-

Random Variables and distributions :-

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Quantity that varies due to chance.

described by probability distributions.

many unrelated phenomena can follow the same distribution.

3-

Manto Carlo methods (Simulation)

When direct Calculation is difficult, Simulate events using random number generation.

Used in Complex phenomena like queuing systems.

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4-

Stochastic processes:

Random Variables that evolve over time (e.g, internet traffic, Stock prices, temprature).

5-

Queuing theory:

Analyzing Systems with waiting lines and Server's. measure like average waiting time, Server utilization, response time.

6-

Statistical inference:

Based on observed data: estimating Unknown parameter's testing hypotheses, making fore casts.

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3-

Examples :-

probability problems :

A virus affects files with probability 0.2 for 50 files, find the probability that more than 15 are infected.

statistic problem:

From observation, 15 out of 50 files are affected. estimate the probability p of infection and check if $p > 0.2$.

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Chapter No : 02

Probability:

2.1 -

Event and probabilities:

Probability = chance of an event

event : a subset of Ω.

types of events:

mutally exclusive → cannot happen together.

Exhaustive → Cover all possibilities:

2.2 -

Rules of probability:

Axioms:

$P(\Omega) = 1, \quad P(\emptyset) = 0$

if $A \cap B = \emptyset \rightarrow P(A \cup B) = P(A) + P(B)$

general rule:

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$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$P(A^c) = 1 - P(A)$

$P(A \cap B) = P(A) \mid \text{times } P(B)$

2.3-

Combinatorics

Permutation (order matters):

$P(n, r) = \mid frac\{n!\}\{n-r)!\}$

$C(n, r) = \mid frac\{n!\}\{r!(n-r)!\}$

2.4-

Conditional probability

definition:

$P(A/B) = \mid frac\{P(A \cap B)\}\{P(B)\}$

Key Takeaways:

probability measures uncertainty:

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Events follow Set theory rules:

important formulas : Union, complement, conditional, independence.

Combinatorics helps in Counting outcomes quickly: