

# Maths Contents



Chapter	Main Topic	Subtopic
CHAPTER 1: STATISTICS	Introduction to Statistics	1.1 Introduction and types of statistics
		1.2 Population and sample data
		1.3 Types of sampling
		1.4 Types of data and scale of measurement
	Descriptive Statistics	2.1 Measure of central tendency (mean, median, mode)
		2.2 Measure of dispersion (range, variance, standard deviation, IQR)
		2.3 Percentile and quartile
		2.4 Five number summary
		2.5 Histogram and skewness
		2.6 Correlation and covariance
	Inferential Statistics and Hypothesis Testing	3.1 Hypothesis testing and its mechanism
		3.2 P-value and hypothesis testing
		3.3 Z-test and hypothesis testing
		3.4 T-test and hypothesis testing
		3.5 Type 1 & Type 2 error
		3.6 Bayes' Theorem
		3.7 Chi-square test
		3.8 ANOVA test
CHAPTER 2: PROBABILITY	Introduction to Probability	1.1 Addition and multiplication rule
	Probability Distribution Functions	2.1 Probability Mass Function (PMF)
		2.2 Cumulative Distribution Function (CDF)
		2.3 Probability Density Function (PDF)
	Types of Probability Distributions	3.1 Bernoulli distribution
		3.2 Binomial distribution
		3.3 Poisson distribution
		3.4 Normal/Gaussian distribution
		3.5 Standard Normal distribution

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Chapter	Main Topic	Subtopic
		3.6 Uniform distribution
		3.7 Log-Normal distribution
		3.8 Power Law distribution
		3.9 Pareto distribution
		3.10 Central Limit Theorem
		3.11 Estimates
	Sequential & Structured Probabilistic Models	4.1 Markov chains (discrete-time, states, transition matrix)
		4.2 Markov Decision Process (MDP) - States, actions, transition probabilities, re
		4.4 Forward-backward algorithm and Viterbi (high-level)
CHAPTER 3: LINEAR ALGEBRA	Basics of Linear Algebra	1.1 Scalars, vectors, matrices, tensors
	Basics of Linear Algebra	1.2 Indexing and slicing
	Vector Operations	2.1 Vector addition and subtraction
		2.2 Scalar multiplication
		2.3 Dot product (inner product)
		2.4 Cross product
		2.5 Norms (L1, L2 norms/magnitude/length)
		2.6 Unit vectors and direction
	Matrix Operations	3.1 Matrix addition and subtraction
		3.2 Matrix multiplication (dot product)
		3.3 Scalar multiplication
		3.4 Transpose of matrix
		3.5 Element-wise operations
		3.6 Zero matrix
		3.7 Orthogonal matrix
	Special Matrices and Properties	4.1 Identity matrix
		4.2 Diagonal matrix
		4.3 Symmetric matrix, Inverse matrix

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Chapter	Main Topic	Subtopic
		4.4 Rank of matrix, Trace of matrix
	System of Linear Equations	5.1 Representing linear system as matrix equation
		5.2 Row Echelon form & Gaussian Elimination
		5.3 Matrix Inverse method and Determinant
		5.4 Cramer's Rule
	Matrix Inverse and Determinant	6.1 Determinant of $2 \times 2$ and $N \times N$ matrices
		6.2 Properties of determinants
		6.3 Invertibility (condition of matrix to be invertible)
	Linear Transformations	7.1 Function and vector transformation
		7.2 Linear transformation
		7.3 Linear transformation in Data Science
		7.4 Projections
	Inverse Function or Transformation	8.1 Inverse of function
		8.2 Application of inverse function
	Eigenvalues and Eigenvectors	9.1 Eigenvalues and Eigenvectors
	Equation of Line, Plane and Hyperplane	10.1 Equation of Line, Plane and Hyperplane
CHAPTER 4: CALCULUS	Differential Calculus	1.1 Functions and Limits
		1.2 Definition of Derivatives
	Power Rules and Derivative Rules	2.1 Power Rule
		2.2 Sum/Difference Rule
		2.3 Constant Multiple Rule
	Product Rules	3.1 Product Rule
		3.2 Quotient Rule
	Chain Rule of Derivatives	4.1 Chain Rule
		4.2 Applications of Chain Rule