the logic of sports betting Manual

the logic of sports betting

Sports betting is an age-old activity that combines passion, skill, and a keen understanding of probability and statistics. At its core, it involves predicting the outcome of sporting events and placing wagers based on those predictions. While it might seem straightforward on the surface?pick a team, place a bet, and hope for a win?the underlying logic is intricate, rooted in mathematical principles, psychological insights, and strategic decision-making. Understanding the logic of sports betting is essential for anyone looking to approach it responsibly and maximize their chances of success.

Foundations of Sports Betting Logic

Understanding Odds and Probabilities

At the heart of sports betting lies the concept of odds, which represent the bookmaker?s assessment of the likelihood of a particular outcome. Odds are not just about what a bookmaker thinks will happen; they also serve to determine potential payouts.

- **Decimal Odds:** Common in Europe and Canada, these reflect the total payout for a winning bet, including the original stake. For example, odds of 2.00 mean that for every $1 wagered, the total return will be $2 if successful.
- **Fractional Odds:** Popular in the UK, these express the profit relative to the stake, e.g., 5/1 means earning $5 for every $1 bet, plus the original stake.
- **Moneyline Odds:** Used mainly in the US, these show how much you need to wager to win $100 (positive odds) or how much you can win with a $100 stake (negative odds).

The core principle is that odds are a numerical translation of the probability of an event happening. To determine whether a bet offers value, bettors compare the implied probability derived from the odds with their own assessment of the true probability.

The Concept of Value

Value betting is fundamental to the logic of sports betting. It occurs when the bettor recognizes that the bookmaker?s odds underestimate the true probability of an outcome.

- Estimate the true probability of an event based on research, statistics, and intuition.
- Calculate the implied probability from the bookmaker?s odds: **Implied Probability = 1 / Decimal Odds**.
- Compare your estimated probability with the implied probability.
- If your estimate suggests the true probability is higher than implied, a value bet exists.

For example, if you believe a team has a 60% chance of winning, but the bookmaker?s odds imply only a 50% chance, then a wager on that team has positive expected value.

The Role of Statistical Analysis

Data-Driven Decision Making

Modern sports betting relies heavily on statistical analysis. Bettors analyze historical data, player performance metrics, weather conditions, and other factors to refine their probability estimates.

- **Performance Metrics:** Goals scored, assists, player efficiency ratings, and advanced stats.
- **Situational Factors:** Home/away advantages, injuries, fatigue, and recent form.
- **Predictive Models:** Algorithms that synthesize multiple variables to forecast outcomes.

By quantifying these factors, bettors can develop models that better estimate true probabilities, leading to more informed betting decisions.

Expected Value and Bankroll Management

Expected value (EV) quantifies the average amount a bettor can expect to win or lose per bet over the long term.

EV = (Probability of Win × Payout) + (Probability of Loss × Loss Amount)

A positive EV indicates a profitable betting strategy, while a negative EV suggests the opposite. Proper bankroll management involves betting only a small percentage of the total bankroll on each wager to mitigate risk and sustain long-term betting activities.

Strategic Approaches in Sports Betting

Types of Bets and Their Logic

Different betting options have distinct logical foundations, each requiring specific analysis.

- **Point Spread:** Betting on the margin of victory or defeat. The favorite must win by more than the spread, while the underdog can lose by less or win outright.
- **Moneyline:** Straight-up win/loss bets, based purely on who wins the game.
- **Over/Under (Totals):** Betting on the combined score of both teams exceeding or falling short of a set total.
- **Prop Bets:** Specific events within a game, such as player performance stats or game-specific occurrences.
- **Futures:** Bets on outcomes occurring over a longer period, like season champions or tournament winners.

Each requires a different analytical approach, from assessing team strength to evaluating individual player performance.

Handicapping and Market Efficiency

Handicapping involves analyzing and predicting how various factors influence the outcome, aiming to find inefficiencies in the betting market.

- Identify bookmaker biases or overreactions to recent events.
- Explore underpriced or overpriced markets.
- Use statistical models to find discrepancies between perceived and actual probabilities.

Market efficiency?the degree to which odds accurately reflect all available information?determines how easy or difficult it is to find value bets. Inefficient markets often present more opportunities for skilled bettors.

Psychological and Behavioral Aspects

Cognitive Biases in Sports Betting

Bettors are susceptible to biases that can distort logical decision-making.

- **Confirmation Bias:** Favoring information that confirms existing beliefs about a team or player.
- **Recency Bias:** Overweighting recent performances while ignoring long-term trends.
- **Betting Bias:** Chasing losses or overbetting on favorites due to emotional attachment.

Recognizing and mitigating these biases is crucial to maintaining rational betting strategies.

Emotional Discipline and Strategy

Successful sports bettors maintain discipline, avoiding impulsive bets driven by emotion or hype. Establishing a clear strategy, setting profit and loss limits, and sticking to predefined criteria help in managing emotional responses.

Conclusion: The Logic Behind Successful Sports Betting

The logic of sports betting is grounded in understanding probabilities, leveraging statistical analysis, and making rational decisions based on value. It involves assessing the true chances of outcomes, comparing them with bookmaker odds, and exploiting market inefficiencies. Moreover, it requires disciplined bankroll management, awareness of psychological biases, and continuous learning.

While luck plays a role in short-term outcomes, a logical and analytical approach can significantly improve long-term profitability. Recognizing that sports betting is a form of probabilistic reasoning rather than pure chance allows bettors to approach it as an investment activity?one that, when executed skillfully, can yield consistent gains. Ultimately, the success in sports betting hinges on the bettor?s ability to think critically, analyze data effectively, and maintain emotional discipline, all rooted in the fundamental logic that underpins the activity.

The Logic of Sports Betting: An In-Depth Guide to Understanding the Fundamentals and Strategies

Sports betting has become a global phenomenon, captivating millions of fans and bettors alike. Whether you're a casual fan looking to add excitement to your favorite game or a serious bettor aiming to turn a profit, understanding the logic of sports betting is essential. At its core, sports betting is not just about luck; it involves a combination of analysis, probability, psychological insight, and strategic decision-making. This guide aims to demystify the fundamental principles behind sports betting, helping you develop a more informed and rational approach to wagering.

What Is Sports Betting?

Before diving into the logic, it's important to clarify what sports betting involves. Essentially, sports betting is placing a wager on the outcome of a sporting event or a specific aspect of that event. Bets can range from simple predictions?such as which team will win?to more complex propositions like point spreads, over/under totals, or player performance metrics.

Key components of sports betting include:

- Odds: The numerical representation of the likelihood of an event, which also indicates potential payout.
- Stake: The amount of money wagered.
- Probability: The likelihood of an event happening, which bettors attempt to estimate better than the bookmaker does.
- Bookmaker (or sportsbook): The entity that sets odds and accepts bets, aiming to balance their risk to ensure profit regardless of the outcome.

The Fundamental Principles Behind the Logic of Sports Betting

Understanding the underlying logic requires grasping the relationship between probability, odds, and value. Here are core concepts to consider:

- Probabilistic Thinking

At the heart of sports betting is the idea of estimating the probability of an event. Successful bettors aim to identify situations where their estimated probability of an outcome exceeds what the bookmaker's odds imply.

Example: If you believe a team has a 60% chance of winning a game, but the bookmaker's implied probability suggests only a 50% chance, then there might be a value bet?offering potential for profit.

- Odds and Implied Probability

Odds are a reflection of the bookmaker's assessment of outcome likelihoods. They can be expressed in various formats:

- Decimal odds: e.g., 2.00
- Fractional odds: e.g., 1/1
- Moneyline odds: e.g., +100 (American odds)

The relationship between odds and implied probability is straightforward:

- Implied probability = 1 / decimal odds

Example: Decimal odds of 2.00 imply a 50% chance (1 / 2.00).

Bettors seek to find discrepancies between their perceived probabilities and those implied by the odds to identify value.

The Logic of Value Betting

Value betting is the cornerstone of a profitable sports betting strategy. It involves placing bets where the bettor's estimated probability of an outcome is higher than the implied probability suggested by the bookmaker's odds.

Steps to identify value bets:

- Estimate the true probability of an outcome based on research, data analysis, intuition, or a combination.
- Convert the bookmaker's odds into implied probability.
- Compare your estimated probability with the implied probability.
- Place a bet if your estimate indicates a positive expected value.

Expected value (EV) is a key concept:

EV = (Probability of Winning) × (Payout) - (Probability of Losing) × (Stake)

A positive EV indicates a profitable wager over the long run.

Why Bookmakers Adjust Odds

Bookmakers set odds not only based on the actual chances but also to ensure they profit regardless of the outcome. They do this by:

- Balancing the book: Setting odds to attract bets on all outcomes to minimize their risk.
- Adding a margin (vig or juice): The bookmaker's profit margin built into the odds, making it difficult for bettors to find value unless they have an edge.

Understanding this adjustment is vital for bettors aiming to find value opportunities.

The Role of Probability and Statistics

Sports betting is fundamentally a game of probabilities. The more accurately a bettor can assess the true likelihood of different outcomes, the better their chances of making profitable bets.

Key statistical concepts include:

- Expected value: As discussed, predicting long-term profitability.
- Variance and risk management: Recognizing that even bets with positive EV can lose in the short term due to variability.
- Sample size: Relying on a large number of bets to smooth out variance and realize expected gains.

Advanced bettors often use statistical models, machine learning algorithms, and data analysis to refine their probability estimates.

Psychological and Behavioral Aspects

The logic of sports betting isn't purely mathematical; psychology plays a significant role. Factors such as bias, emotion, overconfidence, and the gambler's fallacy can distort rational decision-making.

Common psychological pitfalls include:

- Overestimating one's ability: Believing you can beat the odds without sufficient data.
- Confirmation bias: Only seeking information that supports preconceived notions.
- Chasing losses: Increasing bets to recover previous losses, which often leads to bigger losses.
- Recency bias: Overweighting recent outcomes rather than long-term probabilities.

Understanding these biases helps bettors stick to logical strategies and avoid costly mistakes.

Strategies Derived from the Logic of Sports Betting

While there's no guaranteed way to win, certain strategies leverage the core principles discussed:

- Arbitrage Betting

Finding discrepancies in odds across different sportsbooks to guarantee profit regardless of outcome. This requires rapid identification and execution.

- Hedging

Placing opposing bets to lock in profits or minimize losses after initial bets are placed.

- Bankroll Management

Using disciplined stake sizing based on the perceived value and confidence level to avoid ruin.

- Data-Driven Approaches

Utilizing statistical models, historical data, and algorithms to improve probability estimates.

Limitations and Challenges

Despite understanding the logic of sports betting, several challenges persist:

- Odds are not always accurate: Bookmakers are skilled, and their odds reflect a lot of information.
- Variance: Even correct bets can lose due to luck.
- Information asymmetry: Access to better information can be costly or illegal.
- Market efficiency: In highly efficient markets, finding value becomes increasingly difficult.

Recognizing these limitations ensures realistic expectations and encourages a disciplined, long-term approach.

Final Thoughts: The Rational Approach to Sports Betting

The logic of sports betting revolves around the application of probability, analytical thinking, and disciplined strategy. Successful bettors view betting as a game of odds and value, not just chance. By estimating true probabilities more accurately than the bookmaker, managing risk wisely, and avoiding emotional pitfalls, bettors can tilt the odds in their favor over the long run.

Remember, no strategy guarantees success, but understanding the fundamental principles provides a strong foundation for making informed, rational bets. Whether you?re analyzing team stats, studying betting markets, or managing your bankroll, keeping the core ideas of probability and value at the forefront will help you navigate the complex world of sports betting with greater confidence and discipline.

QuestionAnswer What is the basic principle behind sports betting odds? Sports betting odds reflect the probability of a particular outcome occurring and determine the potential payout. They are

set by bookmakers to balance their risk and attract bets on all outcomes. How do bookmakers set the odds in sports betting? Bookmakers analyze various factors like team form, player injuries, historical data, and public betting patterns to set odds that favor balanced betting and ensure profit regardless of the outcome. What is the concept of 'value' in sports betting? Value in sports betting refers to finding bets where the odds offered are higher than the true probability of the event happening, indicating a potentially profitable opportunity. How does understanding probability improve sports betting strategies? Understanding probability allows bettors to assess the likelihood of outcomes accurately, identify undervalued bets, and make more informed decisions to maximize their chances of winning. What is the difference between fixed odds and live betting? Fixed odds involve placing bets at set odds before the event begins, while live betting allows placing wagers during the event, with odds fluctuating based on the current game situation. Why is bankroll management important in sports betting? Bankroll management helps bettors control their funds, avoid significant losses, and sustain long-term betting activity by setting limits on individual bets relative to their total bankroll. What role does statistical analysis play in sports betting? Statistical analysis helps bettors evaluate teams and players more objectively, identify patterns, and develop strategies based on data-driven insights rather than guesswork or intuition. How can understanding different betting markets improve your success? Knowing various markets like point spreads, totals, and futures allows bettors to exploit different opportunities, diversify their bets, and find the best value across a range of options. What is arbitrage betting and how does it work? Arbitrage betting involves placing bets on all possible outcomes across different sportsbooks to guarantee profit regardless of the result, exploiting discrepancies in odds offered by various bookmakers. How does the concept of 'expected value' influence sports betting decisions? Expected value (EV) quantifies the average amount a bettor can expect to win or lose per bet over the long term, guiding them to make bets with positive EV for better profitability.

Related keywords: sports betting strategy, odds calculation, betting odds, betting systems, probability in sports, betting markets, odds analysis, betting patterns, sports analytics, wager types

Logic a very short introduction very short introd

logic a very short introduction very short introd

Logic is the foundational discipline that underpins critical thinking, reasoning, and decision-making across various fields. It provides the tools to analyze arguments, distinguish valid from invalid reasoning, and develop sound conclusions. Whether in philosophy, mathematics, computer science, or everyday problem-solving, understanding logic is essential for clarity and rationality. In this brief introduction, we will explore what logic is, its significance, and its core components, setting a solid groundwork for further exploration.

What is Logic?

Definition of Logic

Logic is the systematic study of the principles of valid reasoning and argumentation. It involves understanding the structure of arguments and evaluating their validity based on established rules.

Historical Background

- Ancient Origins: Logic traces back to ancient civilizations, notably the Greeks with Aristotle, who formalized early principles of deductive reasoning.
- Development Over Centuries: From medieval scholasticism to modern symbolic logic, the field has evolved considerably.
- Contemporary Relevance: Today, logic is integral to computer science, artificial intelligence, linguistics, and philosophy.

Why is Logic Important?

Applications of Logic

- Critical Thinking: Enhances the ability to analyze arguments and identify fallacies.
- Mathematics: Provides the foundation for proof systems and formal theories.
- Computer Science: Underpins programming languages, algorithms, and machine reasoning.
- Everyday Decision-Making: Assists in making rational choices based on sound reasoning.

Benefits of Studying Logic

- Improves clarity in communication.
- Fosters analytical skills.
- Enables understanding complex concepts systematically.
- Supports the development of automated reasoning systems.

Core Components of Logic

Propositions

Propositions are statements that can be either true or false. They are the basic building blocks of logical reasoning.

Logical Connectives

Logical connectives are operators that combine propositions to form complex expressions:

- **And (?):** Both propositions are true.
- **Or (?):** At least one proposition is true.
- **Not (¬):** Negation of a proposition.
- **Implication (?):** If one proposition is true, then another is true.
- **Bi-conditional (?):** Both propositions are equivalent.

Arguments and Validity

An argument consists of premises leading to a conclusion. Validity depends on the logical structure:

- The premises should support the conclusion logically.
- Invalid arguments may have true premises and a false conclusion.

Logical Systems

Different logical systems exist to analyze various types of reasoning:

- **Propositional Logic:** Focuses on propositions and connectives.
- **Predicate Logic:** Incorporates quantifiers and predicates for more detailed reasoning.
- **Modal Logic:** Deals with necessity and possibility.

Types of Logic

Deductive Logic

Deductive logic involves reasoning from general principles to specific conclusions. If the premises are true, the conclusion must be true.

Inductive Logic

Inductive reasoning draws generalizations from specific observations, though conclusions may be probabilistic.

Formal Logic

Formal logic uses symbolic notation and strict rules to analyze the structure of arguments.

Informal Logic

Focuses on everyday reasoning, argumentation, and fallacy detection without symbolic notation.

Basic Logical Fallacies

Common Fallacies to Recognize

- Straw Man: Misrepresenting an argument to make it easier to attack.
- Ad Hominem: Attacking the person instead of the argument.
- False Dilemma: Presenting only two options when others exist.
- Appeal to Authority: Relying solely on authority rather than evidence.
- Slippery Slope: Suggesting a relatively small step leads to a significant consequence without proof.

Learning and Applying Logic

Steps to Improve Logical Thinking

- Study basic logical principles and vocabulary.
- Practice analyzing arguments in daily life and media.
- Learn to identify logical fallacies.
- Engage with puzzles, riddles, and formal logic exercises.
- Explore formal logic systems and proof techniques.

Tools and Resources

- Logic textbooks and online courses.
- Proof software and logic calculators.
- Philosophical and mathematical forums.
- Critical thinking workshops.

Conclusion

Logic is an essential intellectual tool that sharpens reasoning, enhances communication, and supports decision-making across all areas of life. Its study ranges from understanding simple

propositions to complex formal systems, and its applications are vast?from computer programming to philosophy. Gaining a solid grasp of logic not only improves analytical skills but also fosters a rational approach to understanding the world. Whether you are a student, a professional, or a curious mind, delving into the basics of logic provides a valuable foundation for lifelong learning and effective reasoning.

If you'd like, I can expand on specific sections or include additional topics related to logic, such as symbolic notation, logical puzzles, or advanced logical theories.

Logic: A Foundational Pillar of Reasoning and Inquiry

Introduction

Logic, the systematic study of reasoning, has been a cornerstone of philosophy, mathematics, computer science, and cognitive science for centuries. Its primary purpose is to distinguish valid from invalid arguments, providing the framework for rigorous thinking and decision-making. As we navigate a world increasingly influenced by complex data, algorithms, and automated reasoning, understanding the fundamentals and evolution of logic becomes more crucial than ever. This article aims to explore the historical development, core principles, modern advancements, and ongoing debates within the field of logic, offering a comprehensive overview suitable for review and scholarly analysis.

The Historical Evolution of Logic

Ancient Foundations

The origins of logic trace back to ancient civilizations, with early formalizations emerging in Greece. Aristotle (384?322 BCE) is often regarded as the father of Western formal logic. His work Organon laid the groundwork for deductive reasoning, emphasizing syllogistic logic?a system of reasoning where conclusions are derived from two premises. Aristotle's logical system was primarily qualitative, focusing on categorical propositions and their relationships.

Meanwhile, in India, the Ny?ya school developed sophisticated logical theories around the same period, emphasizing inference and debate. Simultaneously, Chinese philosophers like Mozi and later Confucian scholars addressed logical reasoning in ethical and political contexts.

Medieval and Early Modern Developments

During the Islamic Golden Age, scholars such as Al-F?r?b? and Avicenna expanded upon Aristotle?s logic, integrating it with their philosophical systems. The medieval period in Europe saw the rise of scholastic logic, exemplified by figures like Thomas Aquinas, who used logical analysis to

reconcile faith and reason.

The 17th and 18th centuries ushered in the scientific revolution, where logic began to intertwine with empirical science. The development of propositional and predicate logic laid the foundation for modern formal systems.

Modern and Contemporary Logic

In the late 19th century, George Boole formalized Boolean algebra, which became instrumental in the development of digital computers. Concurrently, Gottlob Frege introduced predicate logic, enabling more expressive formal languages.

The 20th century saw the emergence of mathematical logic as a rigorous discipline, with key figures such as Bertrand Russell, Kurt Gödel, and Alan Turing. Gödel?s incompleteness theorems revealed fundamental limitations in formal systems, profoundly impacting philosophy and mathematics.

Today, logic continues to evolve with subfields like modal logic, non-classical logics (fuzzy, intuitionistic), and computational logic, reflecting the diverse applications and ongoing research frontiers.

Core Principles and Types of Logic

Deductive vs. Inductive Logic

Understanding the distinction between deductive and inductive reasoning is essential:

- Deductive Logic: Conclusions necessarily follow from premises. Validity is absolute; if premises are true, the conclusion must be true. Example: All humans are mortal; Socrates is human; therefore, Socrates is mortal.

- Inductive Logic: Conclusions are probable, based on patterns or evidence. They are not guaranteed but supported by likelihood. Example: The sun has risen every day; therefore, it will rise again tomorrow.

Formal vs. Informal Logic

- Formal Logic: Uses symbolic systems, mathematical notation, and rigorous rules to analyze validity. It includes propositional logic, predicate logic, modal logic, etc.

- Informal Logic: Focuses on natural language arguments, fallacies, and reasoning in everyday contexts. It is vital for critical thinking and assessing persuasive arguments.

Major Types of Logical Systems

- Propositional Logic

Deals with simple declarative sentences connected by logical connectives (and, or, not, implies).

- Predicate Logic

Extends propositional logic by including quantifiers (for all, there exists) and predicates, allowing more detailed statements about objects.

- Modal Logic

Incorporates notions of necessity and possibility, useful in philosophy and computer science.

- Non-Classical Logics

- Fuzzy Logic: Handles degrees of truth, useful in AI and control systems.
- Intuitionistic Logic: Rejects some classical principles, relevant in constructive mathematics.
- Relevance Logic: Emphasizes the relevance of premises to conclusions.

Modern Applications of Logic

Logic in Computer Science

The influence of logic on computer science is profound. Formal logic underpins:

- Programming Languages: Formal semantics define how programs behave.

- Automated Theorem Proving: Algorithms verify the correctness of software and hardware.

- Artificial Intelligence: Knowledge representation, reasoning engines, and expert systems rely heavily on logical frameworks.

- Cryptography: Logical rigor ensures security protocols.

Logic in Philosophy and Cognitive Science

Philosophers utilize logic to analyze arguments, clarify concepts, and investigate metaphysical and epistemological questions. Cognitive scientists study how humans process logical reasoning, shedding light on rationality and biases.

Logic in Mathematics and Formal Sciences

Mathematicians leverage logic to formalize proofs, develop new theories, and explore foundational issues such as set theory and the nature of mathematical truth.

Current Debates and Future Directions

Limits of Formal Systems

Gödel?s incompleteness theorems demonstrate that no sufficiently powerful and consistent formal system can prove all truths within its language. This raises questions about the completeness of logical frameworks and whether human reasoning can transcend formal limitations.

Artificial Intelligence and Logic

As AI systems grow more complex, the adequacy of classical logic for modeling real-world reasoning is debated. Alternative logics and probabilistic reasoning are being explored to address uncertainty and ambiguity.

Non-Classical Logics and Their Adoption

The expansion of non-classical logics reflects recognition that classical logic may not suffice for all applications. Their integration into practical systems remains an active area of research.

Philosophical Challenges

Questions about the nature of logical truth, the relationship between logic and language, and the possibility of alternative logical systems continue to stimulate philosophical inquiry.

Conclusion: The Enduring Relevance of Logic

Logic remains an indispensable discipline, bridging abstract reasoning and practical application. Its evolution from ancient syllogisms to modern computational systems illustrates its adaptability and foundational significance. As technology advances and interdisciplinary research expands, logic continues to shape our understanding of reasoning, truth, and the nature of knowledge itself. Future developments promise to deepen our grasp of rationality, challenge existing paradigms, and open new horizons for innovation and inquiry.

In essence, logic is not merely a tool for philosophers or mathematicians but a universal language of reasoning that underpins our pursuit of understanding in every domain of human thought.

QuestionAnswer What is the main purpose of 'Logic: A Very Short Introduction'? The book aims to provide a concise overview of logic, its principles, and its importance in philosophy and everyday reasoning. Who is the author of 'Logic: A Very Short Introduction'? The book is written by Graham Priest, a renowned philosopher and logician. What topics are covered in this short introduction to logic? It covers fundamental concepts like propositional and predicate logic, logical reasoning, fallacies, and the significance of logic in philosophy. Is 'Logic: A Very Short Introduction' suitable for beginners? Yes, it is designed to be accessible for newcomers to logic, providing clear explanations without requiring prior knowledge. How does this book differ from more comprehensive logic textbooks? It offers a brief, high-level overview ideal for quick understanding, whereas detailed textbooks delve deeper into technical aspects. Can this book help improve critical thinking skills? Absolutely, by understanding logical principles, readers can enhance their reasoning and decision-making abilities. Is knowledge of formal logic necessary to understand this book? No, the book introduces formal logic concepts in a straightforward way suitable for beginners. Where can I find 'Logic: A Very Short Introduction'? It is available in bookstores, online retailers, and can often be accessed through libraries or digital platforms.

Related keywords: logic, introduction, philosophy, reasoning, critical thinking, argumentation, formal systems, propositional logic, deductive reasoning, logic fundamentals

Read the full article online: Logic A Very Short Introduction Very Short Introd