

Mathematics in Everyday Life: A Reflection

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Abstract:

This paper attempts to explain the profound impact of mathematics in everyday life, despite its common perception as a classroom-bound subject. Mathematics plays a crucial role in various aspects, including mundane tasks like finance management and cooking, as well as complex fields like engineering, data science, sports, games, TV game shows, and gambling. It underpins daily activities such as budgeting, investments, and tax comprehension, driving innovation in medicine, engineering, and data analysis. Mathematical concepts also shape art and design through patterns, symmetry, and geometry. Real-life examples illustrate math's ubiquity: mobile phone algorithms, statistical news analysis, and recipe measurements. By recognizing math's practical significance, we can appreciate its power and utility beyond academia, revealing how it shapes decisions and structures our understanding of the world. This is where the paper's relevance actually lies.

Key words

Everyday, mathematics, practical.

Introduction:

We know that mathematics is a discipline that explores the logic of shape, quantity, and arrangement, serving as a universal language that enables us to comprehend and interpret the intricacies of our surroundings through concepts like patterns, structure, and relationships. It spans multiple areas, including algebra, geometry, calculus, and statistics, each tackling distinct facets of reality. Mathematics functions as an instrument for describing, analyzing, and resolving issues in domains such as science, technology, engineering, and economics. Beyond its functional uses, mathematics embodies an artistic quality, showcasing the elegance of logic and structure, bridging cultural and linguistic divides, and facilitating the precise communication of intricate concepts, ultimately representing a mode of thought, a problem-solving approach, and a means to grasp the world, with its importance extending far beyond numbers and equations to influence daily life, shape our cosmic perspective, and propel innovation.

In everyday life, mathematics plays a crucial role in various aspects, including personal finance, financial transactions, differential equations (such as first-order equations, second-order equations with constant coefficients, and linked systems), sports and games (like Lawn Tennis and Golf), business applications, social sciences (including voting methods and dilemmas), TV game shows, gambling, and computer applications, highlighting the immense practical utility of mathematics that cannot be evaded. Thus, it can be said that mathematics represents a mode of thought, a problem-solving approach, and a means to grasp the world, with its importance surpassing mere numbers and equations, permeating daily life, shaping our cosmic perspective, and propelling innovation.

Objectives: The primary goals of the paper are outlined below:

- (i) To illustrate and explain how math applies to everyday activities such as finance, sports, and business operations.
- (ii) To uncover math's broader significance and demonstrate how math serves as a problem-solving tool and mindset that drives innovation and impacts our lives.
- (iii) To recognize math's ubiquity and highlight the essential role math plays in various aspects of life, making it indispensable.

Methodology: The paper employs a descriptive and analytical methodology to meet its goals, exploring real-world examples and case studies to showcase math's relevance in finance, sports, business, and other domains. It assesses math's contribution to problem-solving, innovation, and decision-making, utilizing illustrations to underscore its importance and pervasive presence in daily life, ultimately revealing math's practical value and significance. Both primary and secondary literature are reviewed and synthesized in this paper to achieve the stated objectives.

Discussion and findings:

How does mathematics influence daily life through everyday situations or events? Mathematics shapes daily life in various ways, influencing routine situations and events. Its applications span calculus, algebra, geometry, trigonometry, probability, and more, demonstrating its pervasive impact on everyday activities. A detailed description of the application of mathematics and mathematical ideas is found in money matters or finance and interest, differential equations, sports and games, business applications, social sciences, game shows, and beyond, discussed as follows.

Money Interest:

Mathematics is inevitably used in calculating money interest. When dealing with money, math plays a crucial role in calculating interest. Whether you're borrowing or lending, interest rates come into play. Take investing £100 for 100 years at 5% annual interest, for instance. With simple interest, you would get £5 each year, adding up to £500, making the total £600. But with compound interest, things get interesting - the amount grows exponentially. If S is the starting amount and E is the end amount, $E = S(1 + 5/100)^t$. Applying this yearly, £100 grows to a whopping £13,150.13 after 100 years, showcasing the power of compound interest.

The stark contrast highlights Albert Einstein's famous quote: "Compound interest is the eighth wonder of the world. He who understands it, earns it; he who doesn't, pays it."¹ This implies that compound interest was deemed by Einstein as the most profound mathematical finding, highlighting its substantial influence and significance in financial realms and more. Moving ahead, compound interest will be assumed in calculations unless specified otherwise.

Personal Value and APR:

In personal finance, maths plays a key role in understanding interest rates, focusing on concepts like Personal Value and APR. Personal Value means evaluating financial decisions like investments, loans and savings to pick the best option. For instance, comparing savings accounts with different interest rates and requirements involves calculating returns over time. APR, including fees, shows the true cost of loans or credit cards, calculated as $APR = (1 + r/n)^{n*t} - 1$, where r is the nominal rate, n is compounding frequency, and t is time. Grasping APR helps borrowers understand credit costs, like a 12% nominal rate credit card compounded monthly equating to roughly 12.68% APR. With these concepts individuals can compare loans, evaluate investments and optimise savings, making informed financial decisions with confidence.

Investing:

Smart investing relies on maths to guide decisions and boost returns. Benjamin Graham's wisdom, "Investing isn't about beating others; it's about controlling yourself,"²

(The Intelligent Investor) is key here. Maths helps calculate returns (e.g., ₹ 10,000 at 5% earns ₹ 500), assess risk using beta (a 1.2 beta stock is 20% more volatile, per Burton G. Malkiel's 'A Random Walk Down Wall Street'), and leverage compound growth (₹ 10,000 grows to ₹ 46,900 in 20 years at 8%). This helps balance choices like 6% low-risk vs 8% moderate-risk returns, matching gains with risk comfort. Thus, maths clearly plays a big role in daily finances.

Differential Equations:

Mathematics plays a crucial role in differential equations, serving as a powerful tool to analyse relationships between quantities. As John Haigh noted, "A differential equation may arise when the relation between these quantities includes information about the rate at which one variable changes as the other one changes."³ This is particularly evident in problems where we have two quantities of interest and some information on how they are related, allowing us to decipher the relation as precisely as possible. For instance, consider time 't' and distance 'y' as variables; if 't' increases from t_1 to t_2 , causing 'y' to increase from y_1 to y_2 , the average velocity over this period is given by the slope of line AB, calculated as $(y_2 - y_1) / (t_2 - t_1)$. This fundamental concept forms the basis of differential equations, enabling us to model real-world phenomena, like motion, growth, and optimization, with remarkable accuracy. Thus, by utilizing differential equations, we can uncover underlying patterns, make predictions, and gain insights into complex systems, underscoring the significance of mathematics in understanding and describing the world around us.

First-Order and second-Order Equations:

Mathematics plays a key role in understanding first-order and second-order equations, essential for modelling various real-world phenomena. First-order equations, which involve first derivatives, are used to model processes such as population growth and chemical reactions. Mathematical techniques like separation of variables and integrating factors help solve these equations, providing insights into equilibrium points and stability. Second-order equations, involving second derivatives, are vital in describing motion, vibrations and wave propagation. Thus, mathematics facilitates solving both homogeneous and non-homogeneous second-order equations and analysing their oscillatory behaviour including damping effects. Overall, mathematics provides the tools to solve these equations analytically or numerically, offering valuable insights into physical systems.

Linked System:

Mathematics is key to grasping linked systems, where multiple variables interplay, seen in fields like physics, biology, economics and engineering. It models interactions via differential equations, difference equations or graph theory, aiding analysis of stability, oscillations and chaos. These models predict outcomes, guiding decisions in complex

systems. Examples range from ecological predator-prey dynamics to economic supply-demand balances and biological gene networks. Maths thus equips us to decipher and navigate intricate linked systems, driving insights and forecasts.

Sports and Games:

It would not be an exaggeration to claim that mathematics plays a vital, yet often unseen, role in sports and games, influencing various aspects such as score calculation, player performance tracking, strategy optimization and outcome prediction. This, in turn, significantly impacts the outcome of games and tournaments. For example, math is used to track scores, calculate averages, and determine rankings in most sports. Cricket's batting average, calculated by dividing Total Runs Scored by Number of Innings Batted, and basketball's points per game (PPG), calculated by dividing total points scored by games played, are two such instances. Furthermore, math informs game strategies and optimizes team performance, as evident in football coaches' use of probability and statistics to make crucial decisions and baseball managers' analysis of data to determine batting orders and defensive positions.

Math has a profound impact on sports, predicting game and tournament outcomes and informing strategic decisions. Tennis statisticians, for instance, leverage player performance data, court surface, and weather conditions to forecast match winners. Various sports have also developed unique mathematical applications, such as cricket's Duckworth-Lewis Method, basketball's shot clock, and golf's handicap system. These examples showcase math's influence on scorekeeping, strategy, and performance, enabling athletes and teams to gain a competitive edge and enhance their overall performance.

Thus, mathematical concepts play a crucial role in shaping tournaments, ensuring they are fair, efficient, and thrilling. Math optimizes schedules, minimizing clashes, reducing travel times and providing teams with adequate rest. Statistical methods like the Elo rating system inform seeding and draw procedures, creating balanced and competitive matches. Math also structures tournaments, balancing fairness, match numbers, and time constraints, and determines tiebreakers, rankings, and standings with consistency and accuracy. Additionally, math helps analyse and adjust tournament structures, promoting competitive balance and exciting matches. Examples of math in action include FIFA World Cup's format, Grand Slam tennis tournaments' seeding, and cricket's ICC World Cup scheduling, demonstrating how math enables tournament designers to craft engaging, fair, and efficient competitions.⁴

Business Applications:

Nobody can evade the utility and use of mathematics in business applications. Businesses have transformed their operations, decision-making, and strategic planning by integrating mathematics into their applications. Mathematical models and techniques help

analyze complex data, identify patterns, and predict outcomes, allowing companies to optimize processes and boost profits. “Math plays a key role in financial analysis and planning, where techniques like linear programming and regression analysis optimize investment portfolios, manage risk, and forecast revenue.”⁵ The Black-Scholes model, developed by Fischer Black and Myron Scholes, “is a widely used mathematical formula for calculating options and financial derivatives.”⁶ Marketing also leverages math to analyse customer behaviour, predict sales and optimize pricing. “Data mining and machine learning identify patterns in customer data, enabling targeted marketing campaigns.”⁷ Peter Drucker noted, “The best way to predict the future is to create it.”⁸ What it reveals is that by harnessing math, businesses create a better future through informed decisions and staying competitive.

Math is also crucial in operations management, optimizing supply chains, managing inventory, and streamlining production. Techniques like queuing theory and simulation modelling analyse complex systems and identify bottlenecks. Math has become essential for organizations to stay competitive and achieve goals. Applying mathematical models and techniques helps businesses analyse data, predict outcomes and make informed decisions. Thus, in a nutshell, it can be said that by using math companies can drive growth and success.

Applications of Mathematics in Social Sciences:

Mathematics plays a crucial role in social sciences, providing tools to understand complex social phenomena. It enables statistical analysis, game theory applications, econometric modelling, demographic studies and network analysis, offering insights into human behaviour, economic trends, and social interactions. Mathematical techniques help social scientists analyse data, identify patterns and predict outcomes, informing policy decisions and theory development. Researchers can study relationships between variables, model strategic decision-making and understand social networks, contributing to a deeper understanding of social dynamics. Even math is applied in voting systems and addressing voting paradoxes facilitating informed decision-making in political science and public policy.

Math Behind TV Game Shows:

TV game shows seamlessly blend mathematical concepts like probability, strategy, and decision-making, creating an electrifying experience. Contestants harness math to make savvy decisions, outwit opponents, and amplify their winning prospects. Shows like Deal or No Deal rely on probability to compute expected values, helping contestants decide on the banker’s offer. In *Who Wants to Be a Millionaire?*, contestants apply probability and decision theory to optimize lifeline usage. *The Price is Right* requires contestants to crunch numbers and estimate prices accurately. The math behind these shows includes probability, expected value, decision theory, and game theory. These shows demonstrate

how math is used in real-time, merging entertainment and learning. For example, in Deal or No Deal, with two boxes containing ₹ 1 lakh and ₹ 10 lakhs, and ₹ 5 lakhs offer, the expected value is ₹ 5.5 lakhs, influencing a contestant's risk decision.

Conclusion:

From the above discussion, it becomes clear that math is a silent yet powerful force that shapes our daily lives, making things easier, more convenient and more informed. Whether it is budgeting, cooking, commuting, or shopping, math is always at work. While its role in science, tech, engineering and business is well-known, its impact on our everyday choices is just as profound. The use of mathematics is numerous. It is used not only in science, commerce, engineering and technology but also in arts and humanities, for example, in social science, particularly in the case of voting methods and voting dilemmas, no one can evade the use of mathematics. Thus, by embracing math and boosting our numerical skills, we can make smarter decisions, tackle problems with ease and appreciate the hidden patterns that govern our world. Ultimately, math enables us to live more efficiently, creatively and purposefully.

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