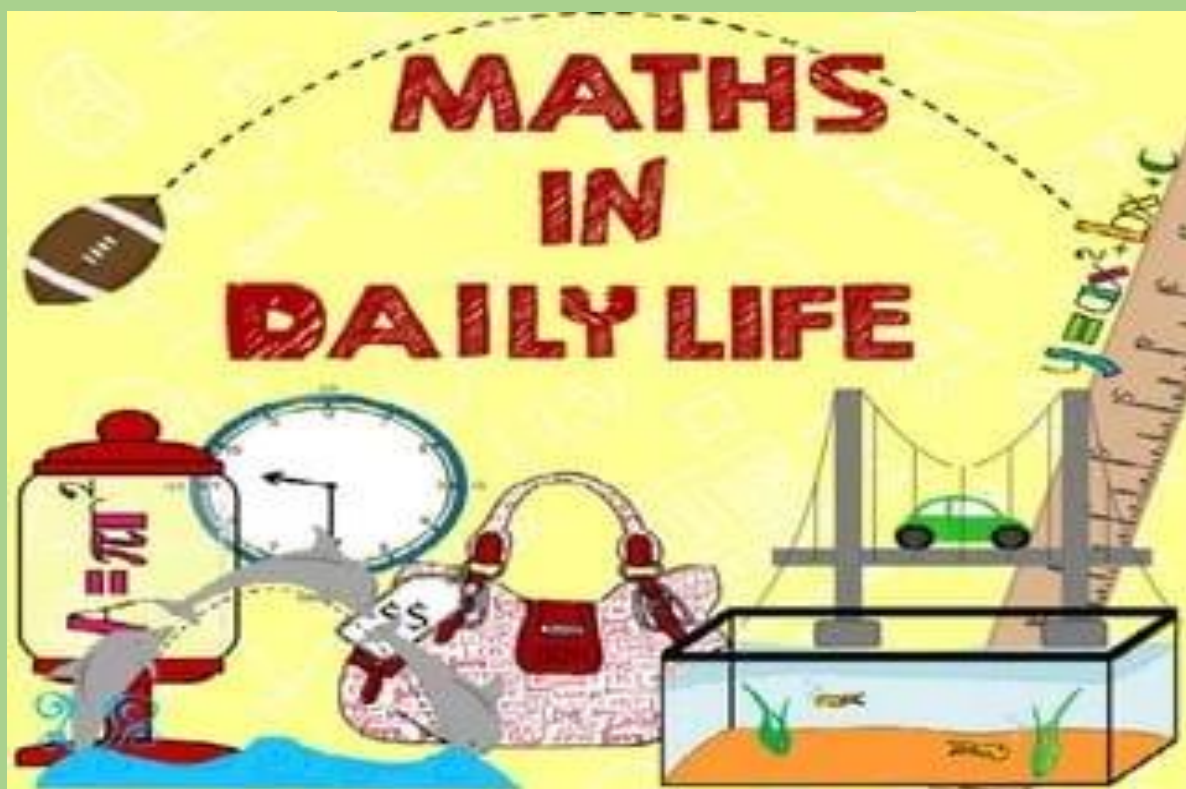


J&K SCIENCE  
TECHNOLOGY &  
INNOVATION  
COUNCIL

**One Day National Conference-Cum Awareness Program  
ON  
“Mathematics in Daily Life”  
(To Commemorate 137<sup>th</sup> birth anniversary of Srinivasa Ramanujan)  
27<sup>th</sup> December 2024**

# **SOUVENIR AND ABSTARCT**

**SKUAST-KASHMIR**



**JK SCIENCE TECHNOLOGY & INNOVATION COUNCIL**

**Edited By:  
Prof. Bilal A. Bhat  
Prof. Showkat Maqbool**

**Sher-e-Kashmir University of Agricultural  
Sciences and Technology of Kashmir**

**Faculty of Agriculture, Wadura, in Collaboration with JK Science Technology & Innovation Council**

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**Faculty of Agriculture, Wadura, SKUAST-Kashmir in Collaboration with**  
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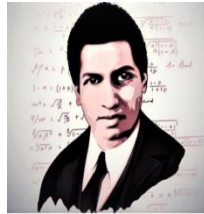
**Organizer:**

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**Division of Agri Econ & Statistics, SKUAST-K**

## Srinivasa Ramanujan



Srinivasa Ramanujan well known for Landau–Ramanujan constant; Mock theta functions; Ramanujan conjecture; Ramanujan prime; Ramanujan–Soldner constant; Ramanujan theta function; Ramanujan's sum; Rogers–Ramanujan identities; Ramanujan's master theorem was born on 22 December, 1887, Erode, India, and died on 26 April, 1920 at Kumbakonam. His family was of the Brahmin caste and lived in poverty. At the age of 12, he had gained knowledge in Trigonometry and without anyone's help, he had developed his own theorems and ideas. Do you know that at the age of 15 only he obtained a copy of George Shoobridge Carr's Synopsis of Elementary Results in Pure and Applied Mathematics? He had spent his childhood days in great difficulty in poverty. He used to borrow books and read books from friends in school. When he was young, he took up the job of a clerk to meet the economic needs of the house, and when he gets time he used to solve mathematics questions and worked on various types of theorems. Once, an Englishman saw those pages, he was impressed and took a personal interest. He sends Srinivasa Ramanujan to Hardy, the Professor of Oxford University. He then recognized the talent hidden in him and thereafter he got fame worldwide. His papers were published in the Journal of the Indian Mathematical Society in 1911. He had compiled about 3900 results mainly identities and equations that too on his own without anyone's assistance. Several results out of them are original and novel like the Ramanujan prime, The Ramanujan theta function, partition formulae, and mock theta functions. These results further inspired several other research and opened new fields of work. He discovered his theory of divergent series, worked out the Riemann series, the elliptic integrals, hypergeometric series, and the functional equations of the zeta function. The number 1729 is known as the Hardy-Ramanujan number. 1729, the Hardy-Ramanujan Number, is the smallest number which can be expressed as the sum of two different cubes in two different ways. 1729 is the sum of the cubes of 10 and 9 - cube of 10 is 1000 and cube of 9 is 729; adding the two numbers results in 1729. Mathematics is central to the efficient organization of societies for the benefit of all citizens. It optimizes transportation and communication networks and enables smart planning and management of health, economic, and social systems. Science and mathematics have a crucial role in steering decisions to promote peace and social justice. As a common language to the planet, mathematics is an essential part of humankind's cultural heritage. It is present in arts, music, and games, for human enjoyment and well-being. The world's biggest companies are coming to India for data analytics, artificial intelligence (AI) and machine learning (ML) skills. But renowned mathematicians believe the country needs to significantly improve its mathematics capabilities to be able to use these technologies to create really innovative and robust solutions — both for itself and the world. Manjul Bhargava, mathematics professor at Princeton University and winner of the Fields Medal, one of the highest honours in math, says

India can't hope to lead the fourth industrial revolution, "if we don't have strong mathematical talent coming up very soon". A very important application of math and ML in Indian cities can be to programme traffic lights and public transport systems to reduce traffic and improve traffic flows, says Bhargava. Varadhan says how well weather is predicted depends on how good the mathematical modelling of the atmosphere is. India invented the zero, but math is seen to have suffered a decline here for several reasons. The first is a global phenomenon. In the 1970s, there was a big separation between pure and applied mathematics. Bhargava describes it as a "very artificial separation", because all pure science and math eventually get applied. A second reason for math's decline is seen to be India's big focus on engineering from the time of Independence. The moment parents see their children doing well in math, they say you are going to become an engineer?" says Bhargava. Yet another mistake that happened after Independence, Bhargava says, was the separation of teaching and research in India's higher education system. India has some fantastic research institutions like Tata Institute of Fundamental Research (TIFR), International Centre for Theoretical Sciences (ICTS), Indian Statistical Institute (ISI). But they are little islands of excellence. And then there's the whole teaching sector, state universities, where no research happens. "How can you have excellent higher education in an environment where no knowledge creation takes place! The best education happens in places that combine these, like in the Ivy Leagues, or earlier in India in Takshashila and Nalanda,". It is encouraging that a number of Indian Institutes of Science Education & Research (IISERs), dedicated to science have been established, and many have excellent faculty. Mathematics research is the long-term, open-ended exploration of a set of related mathematics questions whose answers connect to and build upon each other. Problems are open-ended because students continually come up with new questions to ask based on their observations. The current current research topics in mathematics are Analysis, Topology, Differential Geometry, Algebra, Discrete Mathematics, Theoretical Computer Science, Numerical Analysis & Scientific Computing, ODE, PDE, Fluid Mechanics, Probability, Statistics. In brief, mathematics is one of the main subjects of our life. Information on mathematics helps us to make better choices throughout everyday life, which helps us to make life simpler. A film "The Man Who Knew Infinity" is dedicated to Ramanujan's life and his achievements which serves as an inspiration for young students of country.

Dr. Bilal Ahmad Bhat  
Professor & Head





**Sher-e-Kashmir**  
**University of Agricultural Sciences & Technology of Kashmir**

[www.skuastkashmir.ac.in](http://www.skuastkashmir.ac.in)



**Dr. Raihana Habib Kanth, Dean, FOA, Wadura**

### MESSAGE

Division of Agricultural Economics & Statistics, Faculty of Agriculture, Wadura, SKUAST-K. In collaboration with JKDST, we are thrilled to announce the One Day National Conference-Cum Awareness Program on “Mathematics in Daily Life”, taking place on 27<sup>th</sup> December, 2024, to commemorate the 137<sup>th</sup> birth anniversary of Srinivasa Ramanujan. It is an immense honor to host this prestigious event at the **Faculty of Agriculture, Wadura**, and to be part of an esteemed gathering where experts and enthusiasts from diverse fields will converge to explore the vast applications of Mathematics. This event aims to highlight the pivotal role of Mathematics in our daily lives—from shaping public policies and driving scientific discoveries to optimizing business strategies and providing significant revelations through descriptive and explorative data analysis. Mathematics is more than just numbers; it is a fundamental discipline that enhances our understanding of the world around us. Its applications are far-reaching and indispensable in various sectors, including science, technology, engineering, and economics. The conference will serve as a platform for intellectual exchange, where learned experts from across the country will share their knowledge and experiences. This presents a wonderful opportunity for budding scientists, scholars, and students to enrich their understanding and apply this knowledge for the greater good. We are privileged to celebrate the legacy of Srinivasa Ramanujan, whose contributions have had a profound impact on Mathematics. This conference aims to inspire and motivate the next generation of mathematicians and researchers by showcasing the transformative power of Mathematics.

I extend my heartfelt gratitude to all the organizers, participants, and speakers for their dedication and efforts in making this event a success. I wish the conference all the success and hope it will pave the way for groundbreaking discussions and collaborations. May this gathering foster a deeper appreciation for Mathematics and its endless possibilities.

Place: Wadura, Sopore

Date: 24<sup>th</sup> Dec, 2024

**Prof (Dr.) Raihana Habib Kanth**

**DEAN**

Prof. Aquil Ahmed  
Former Chairman



**DEPARTMENT OF Statistics & O.R.**  
**ALIGARH MUSLIM**  
**UNIVERSITY**  
**ALIGARH-202002 (INDIA)**



Date: 19-12-2024

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### MESSAGE



I am delighted to note that the Division of Agricultural Economics & Statistics, Faculty of Agriculture, Wadura, SKUAST-K is organizing the One Day National Conference-Cum Awareness Program on “Mathematics in Daily Life” on December 27, 2024 to commemorate the 137<sup>th</sup> birth anniversary Srinivasa Ramanujan. The theme of the Conference is of utmost importance as the subject of Mathematics is not only an indispensable tool for researchers but is a must for everyone for taking optimal decisions in everyday life. I am sure that the event will provide an opportunity to the participants to learn the proper use of Mathematical tools.

I wish the event a grand success.

Prof. Aquil Ahmed (Ph.D. Roorkee)

Former Chairman

Department of Statistics & Operations Research

Aligarh Muslim University, Aligarh-202002-India

Formerly, Dean, Faculty of Physical & Material Science and

Head, Department of Statistics, University of Kashmir, Srinagar



**Prof. (Dr.) Rashmi bhardwaj**  
**Professor of Mathematics, GGSIP University, Delhi**  
**Fellow of Institute of Mathematics & Applications, UK**

### MESSAGE

Division of Agricultural Economics & Statistics, Faculty of Agriculture, Wadura, SKUAST-K in collaboration with JKDST is organizing the One Day National Conference-Cum Awareness Program on “Mathematics in Daily Life” on December 27, 2024 to commemorate the 137<sup>th</sup> birth anniversary of great Indian mathematician Srinivasa Ramanujan, the day is being celebrated as Mathematics Day at the National level on 22<sup>nd</sup> December every year.

It gives me immense pleasure to be a part of the conference as Resource person to share my views with esteemed gathering from diverse backgrounds shall come together in the world of Mathematics and it's farreaching application. Mathematics plays a pivotal role in understanding the complex real-life situations in the world around us. The conference is expected to be attended by learned experts from across the country, which provides the wonderful opportunity to budding scientists, scholars, students to enrich their knowledge which could ultimately be transferred to the end use for their welfare and progress of the society.

I wish the conference all the success.

*RBhardwaj*

**Prof. (Dr.) Rashmi Bhardwaj**  
**FIMA, UK**

***Dated: 21-12-2024***



### MESSAGE

It gives me immense pleasure to extend my warm greetings and best wishes to all the participants of the One Day National Conference-Cum Awareness Program on "Mathematics in Daily Life" organized by the Division of Agricultural Economics & Statistics, Faculty of Agriculture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir (SKUAST-Kashmir) in collaboration with JKDST on December 27, 2024 to commemorate the 137<sup>th</sup> birth anniversary of legendary Mathematician Srinivasa Ramanujan. Mathematics, as the backbone of empirical research and decision-making, holds a significant position in the realm of knowledge. This conference presents a valuable opportunity for Mathematicians, researchers, academicians, and industry professionals to come together and explore the advancements, challenges, and applications of Mathematics in diverse fields particularly in Agricultural Sciences. In today's data-driven world, the role of Mathematics has become even more crucial. It provides us with the tools and methodologies to make sense of complex data, uncover hidden patterns, and extract meaningful insights. The One Day National Conference on "Mathematics in Daily Life" serves as a platform to exchange ideas, discuss recent developments, and explore the interdisciplinary aspects of Mathematics.

I commend the Division of Agricultural Economics & Statistics, FoA, SKUAST-K for organizing this conference and bringing together students, experts, researchers, and enthusiasts from various domains. The diverse range of sessions, including keynote addresses, paper presentations, workshops, and panel discussions, will foster a vibrant intellectual environment and promote the exchange of knowledge and experiences.

I would like to encourage all the participants to actively engage in the conference proceedings, share their research findings, and participate in thought-provoking discussions. Such interactions provide a fertile ground for collaboration, learning, and innovation in the field of Mathematics.

I am confident that this conference will not only broaden your understanding of Mathematical concepts but also inspire you to apply them creatively in your respective fields.

I extend my heartfelt appreciation to the organizers for their dedicated efforts in bringing this conference to fruition. I also extend my gratitude to all the participants for their valuable contributions to the field of Mathematics and their commitment to advancing knowledge in this domain. I wish you all an enriching and productive conference experience. May this conference serve as a stepping stone towards further advancements in Mathematics and its applications.

Warm regards,

A handwritten signature in dark ink, appearing to read 'Rahul Gupta'.

Prof. Rahul Gupta  
Registrar, University of Jammu, Jammu  
Dated: 21-12-2024



### Acknowledgement

We are very happy to organise One Day National Conference-Cum awareness Program on “Mathematics in Daily Life” on 27<sup>th</sup> December, 2024, with good response from different parts of the country. We are highly thankful to Hon’ble Vice Chancellor, SKUAST-K, Prof. Nazir Ahmad Ganai, Prof. Azmat Alam Khan (OSD, Vice Chancellor), Director Education, Director Research, Director Extension, Director Planning & Monitoring, Registrar, Dean Faculty of Agriculture, SKUAST-K, JKDST for providing financial assistance and other officials of SKUAST-K, for their support and guidance. The organizer thank from the core of his heart to all faculty members, HODs, conference committee members, speakers especially Prof. D.S. Hooda, Prof. Aquil Ahmad, Prof. Rashmi Bhardwaj, Prof. S.Pirzada (Dean Academic Affairs, University of Kashmir), Prof. Raihana Habib Kanth (Dean, FoA), Prof. Niyaz Ahmad Sheikh, Prof. H.R.Bhapkar, Prof. Shiny C. M. (Kochi), Prof T.Jalal for their support. The organiser specially thank to Co-organiser(S) of conference Prof. Showkat Maqbool, Prof. S.A.Saraf, Mr. S.H.Sidiquee, Dr. Fehim J.Wani alongwith their team including nonteaching staff of Division of Agri Econ & Statistics for their valuable support. The organiser would like to thank Dr. Nasir Shah and Dr. Bilal Ahmad (JKDST), academicians from different institutions/faculties, especially to Prof. Anwar Hassan, Prof. S.A.Mir, Prof. Ajaz A.Hakak, Prof. M.S.Pukhta, Prof. T.A.Raja, Prof. S.H.Baba, Mr. Altaf Husain Haji, Prof. N.A.Sofi, Prof. Manish Kumar (SKUAST-Jammu), Prof. Rahul Gupta (Registrar, University of Jammu), Prof. Parmil Kumar, Dr. Samira Khan (Arab), Dr. W.M.Shah (CUK), Dr. S.N.Z.Geelani, Dr. Farheen, Dr. Bilal A.Zargar, Dr.Khursheed A.Dar, Dr. Anupam Deka (Head Dept. of Statistics, Handique Girls’s College, Guwahati Assam, India), Dr. Vikas Doshi (Medical College, Baroda, Anand, Gujrat, India), Prof. Tariq Rashid Jan (Head, Dept of Statistics, Kashmir University), Dr. Peer Bilal Ahmad (Head, Dept of Mathematical Science, IUST), Dr. Parvaiz A. (Kashmir University), Mr. Irshad Ahmad, Mr. Saqib, Mr. Manoj Kumar, Ms. Aasifa Akhter and Mr. Hamidullah Bhat. The organiser would like to thank all participants, committee members, teaching and nonteaching staff of faculty of Agriculture and other institutions for their support. The researchers and students Ms. Shafaya Fayaz, Ms. Nazia Fayaz Azad, Dr Arshad, Mr. M.Inam, Ms Tabasum Bhat, Ms. Ishrat Gul, Dr. Shabir Ahmad, Mr. Intizar Ahmad, Mr. Adil deserve special thanks for their support. The main aim of organizing this conference was to popularize the use of Mathematics in everyday life and sensitize the public as to how Mathematics helps in shaping and framing policies. This book includes papers/abstracts received for presentations in the conference. We are planning to continue organizing National/International academic conferences to achieve our goal. We would like to thank the valuable researchers, scientists, people from different walks of life, press and media, scholars and all those people who helped in one way or the other for the success of our conference. Hope to see you all again at our future conference.



**Dr. Bilal Ahmad Bhat (Organizer)**

**Dated:23-12-2024**

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## 1. Mathematics in Everyday Life-Exploring Practical Applicability and Real-World Impact

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### Abstract

Mathematics is an essential part of daily life and influences decisions and problem-solving in various aspects of life. This study explores how mathematical concepts are embedded in daily activities such as financial management, cooking, travel planning, and technological interactions. We will show how arithmetic, algebra, geometry, and statistics are applied in real life to improve decision-making, efficiency, and productivity. Findings indicate that people with higher mathematical literacy solve problems more efficiently, especially in budgeting, as accurate calculations minimize financial mistakes and facilitate long-term financial planning. In cooking, proportional reasoning ensures the accuracy of recipes, thus providing consistent culinary results. Travel planning is made easier by calculations of time and distance, which optimize routes and save fuel. Statistical analysis helps in interpreting data trends, which is very important in areas such as health monitoring, market forecasting, and academic research. Moreover, mathematical skills improve spatial awareness in home design and construction, ensuring safety and functionality. Understanding probability supports decision-making in risk management, insurance, and gaming. In technology, algorithms based on mathematical models drive innovations from search engines to artificial intelligence applications. The study concludes that mathematical knowledge is essential for informed decision-making and resource management. Encouraging mathematical education through practical examples can bridge the gap between theoretical learning and real-world application, fostering a mathematically literate society equipped to tackle complex challenges in diverse fields.

**Keywords:** Mathematics, Problem-Solving, Decision-Making, Real-World Applications, Mathematical Literacy

### Introduction

Mathematics is not only a branch of science but also a universal language that governs the workings of the natural and human-made world. Whether consciously recognized or not, mathematical principles are intricately woven into the fabric of daily life [1]. From waking up and checking the time until decisions regarding the management of money, mathematics is at the very back of logical thought processes, efficiency, and ordered thought. This essay goes on to explore how mathematical concepts such as addition and subtraction, multiplication and division are essentially what makes more complex systems work and propels man into a technological future. It highlights the important role that mathematics plays in connecting everyday tasks and advanced technological innovation, even without needing to know the intricacies of topics like calculus or abstract algebra [2]. Mathematics is everywhere and affects choices and efficiency in a wide range of activities. For instance, mathematical principles are applied in managing finances, whether it's budgeting, saving, or calculating interest rates. Cooking also involves mathematics. The precise ratio and measurements must be used to get consistent results. Traveling in a city, planning a travel itinerary, or even optimizing fuel consumption requires basic calculations. Time management, which is an essential part of modern life, is inherently mathematical because we allocate hours, estimate

deadlines, and structure schedules. The most noticeable thing is how people usually use mathematics instinctively without formal education on higher-level concepts [3]. For instance, a shopkeeper calculating the day's earnings or a parent allocating a budget among household needs intuitively applies mathematical logic. Such daily examples indicate how basic mathematical operations are accessible and essential. Furthermore, such intuitive applications lead to the possibility of greater systems and innovations.

While calculus and linear algebra underpin the technological marvels of machine learning algorithms and weather prediction models, the roots of these innovations lie in basic operations. For example, a house is built on geometry and arithmetic in terms of area measurement, dimensions calculation, and stability of structure. Even banking systems, which are based on sophisticated algorithms, trace their origins back to simple arithmetic operations. Similarly, computer systems, which revolutionize every sector today, operate on the foundational principles of binary arithmetic. Basic and advanced mathematics are compared to show how essential the former is in everyday life and how it acts as a gateway to the latter. Budgeting and calculating expenses require simple addition and subtraction. However, the optimization of expenditures using calculus requires advanced training and understanding. Although not everyone directly deals with advanced mathematical theories, the underlying principles they are based on are universally applicable [4]. Arithmetic is accessible and will always empower people, whether for managing personal finances or solving practical problems. Furthermore, the connection between elementary and advanced mathematics is clearly observed in its applications in technology. Algorithms in artificial intelligence and machine learning depend on calculus for optimization, but their logical foundations are derived from basic arithmetic. Similarly, though statistical models may use complicated probability distributions, they start with simple concepts such as averages and sums. This interplay shows that while advanced mathematics propels innovation, it remains founded on the simplicity and universality of basic operations. The importance of mathematics in today's technological society cannot be overstated. Artificial intelligence, big data, and automation do dominate today's era. However, the very fundamentals of such technologies rest quite firmly on basic arithmetic and logic. Data visualization will depend upon the understanding of percentages and ratios in producing meaningful graphs and charts, for example. Programming and coding depend on logical structures that are based on arithmetic operations. Even predictive models, which depend on very complex algorithms, start from the preparation and cleaning of data by means of basic statistical measures. This interdependence between simplicity and complexity underlines the role of mathematics as a unifying force in technological progress. More importantly, it underlines the necessity of developing mathematical literacy among individuals to democratize access to these advancements. A mathematically literate society is better able to understand, adapt to, and contribute to a rapidly evolving technological landscape [5]. The importance of mathematics extends far beyond technological applications. It is the core reason for developing logical reasoning skills and problem-solving skills, that are useful in all walks of life. Be it the probability calculation in the risk management, or interpreting a trend in business and health analytics, mathematics empowers one with the ability to make sound judgments. It further has an unparalleled educational value: it trains the person on how to think critically and solve the problems systematically. By showing practical examples to encourage mathematical education, a gap will be bridged from theoretical learning to real application, making sure that many people

understand its importance. The results of this study indicate how ordinary mathematics leads to technological and societal advancement. Through its applications in everyday life, the paper shows how even very simple operations are part of bigger systems. The findings shown here point out the power of mathematical literacy in shaping a future where technology is at everyone's disposal [35].

### **Results of This Paper**

- The revolutionary role of elementary mathematics in laying down the basis of technological systems.
- A coherent outline for connecting mathematical training with real-world activities.
- Areas of domain applications in which mathematics plays a direct role in decision-making and productivity.
- Understanding how building basic mathematical competencies a step will be forward toward making societies ready for the technologically advanced future.

### **Sections Ahead**

- History of Mathematics: How ancient societies used mathematics to solve problems.
- Recent Applications: Examples of selected industries wherein basic mathematics power innovation
- Mathematics and Education: How to link real world applications in practice
- Future Prospect: Ways in which even the advanced technologies will always be driven by basic mathematics
- Conclusion and Recommendations: Practical steps taken by people and institutions.

This paper aims to give a comprehensive understanding of mathematics as an indispensable part of life, from simple everyday calculations to complex technological innovations.

### **Review of Literature**

Mathematics has been described as the cornerstone of human civilization, enabling significant advancements in science, technology, and daily life. Historically, its importance was first evident in ancient societies such as Mesopotamia and Egypt, where it was employed to solve practical problems related to trade, agriculture, and construction. Similarly, Greek mathematicians like Euclid and Pythagoras formalized mathematical theories that remain fundamental to modern mathematical thought. Works from such pioneers, the initial contributors, show that math never dies off and has been a key ingredient for reasoning, solving, and innovating. Indeed, throughout centuries, math-based ideas have spread and integrated within multiple aspects from natural sciences to human systems. In modern-day activities, the role of math was often quoted by scholars as providing means and ends to think critically so one could solve everyday challenges. For example, mathematical learning has been associated with better problem-solving and decision-making skills, which are a prerequisite for both personal and professional development. Research shows that even basic mathematics knowledge increases productivity in everyday activities like budgeting, time management, and navigation. In addition, mathematics is the foundation for technological advancements, as it is the backbone for computational algorithms, artificial intelligence, and data analytics [5]. These innovations are testaments to how mathematics can transform economic and technological development.

This integration of mathematics in daily life has been seen as an important aspect of education research since scholars have argued for real-life and contextualized teaching methodology [6]. The findings have been that mathematical literacy equips a person with the ability to respond appropriately in complex societal setup, especially concerning finance and healthcare issues [7]. For instance, other studies emphasize that the calculation for compound interest is



necessary when building long-term stability in finances [8]. Similarly, statistical methods in personal health monitoring have been successful in early disease diagnosis and prevention [9]. Such results demonstrate the importance of mathematics in helping people make better decisions that improve living standards. Another major body of literature focuses on the relationship between mathematics and technological innovation. The emergence of computer science as a discipline has, in turn, amplified the role of mathematics in modern society. Simple mathematical principles, such as basic arithmetic, form the foundation of digital computing [10]. Moreover, the development of encryption algorithms, which is a major backbone of cybersecurity, relies on the principles of number theory and advanced mathematical concepts [11]. Such achievements are shown to support digital infrastructure security and privacy protection [12]. On the other hand, with mathematical modeling being part of AI and ML, a wide array of areas including but not limited to, health, finance, transportation have transformed significantly [13]. The examples further underscore the widespread presence of mathematics in modernization through the digital platform. Math has been applied for data interpretation and analysis purposes in the field of social sciences. Economists often use mathematical models to forecast market trends and guide policy making. Such an example thus reflects the importance of mathematical thinking in the resolution of social problems [14]. Statisticians are also used by sociologists in the study of human behavioural patterns and their analysis of trends in culture and society [15]. This interdisciplinary usage reflects the power of mathematics in understanding and solving real-life problems. Mathematics also plays a very important role in the innovation of STEM fields. Engineers base their designs and optimization on mathematical principles for structures, systems, and processes [16]. For instance, in fluid dynamics, calculus has been used to aid the advancement of aerospace engineering [17]. Similarly, through mathematical models, physicists understand natural phenomena-whether it is the motion of celestial bodies or the behaviours of subatomic particles [18]. These contributions reflect the significant role of mathematics in scientific discovery and technological advancement.

Educational research has been conducted to explore strategies that enhance mathematical literacy, especially the need for engaging and accessible teaching methods [19]. Research findings indicate that mathematics can be made more relatable and appealing to learners if real-world applications are included in the curriculum [20]. For example, project-based learning initiatives have been found to be effective in demonstrating the practical relevance of mathematical concepts [21]. Further, digital tools and interactive mediums have been proved to enhance students' motivation and understanding [22]. The results show that innovative methods of teaching may be able to encourage a better affinity towards mathematics in students. In healthcare, math has played a crucial role in the development of diagnostic as well as treatment methods. Predictive models were designed to predict patient-related data and find risk factors of chronic diseases [23]. Statistical methods are also widely used in clinical studies to assess the effectiveness of new treatments [24]. In addition, the use of mathematical algorithms in medical imaging has greatly improved the precision and speed of diagnostic procedures [25]. All these developments are a testament to the essential role that mathematics plays in health care outcomes and patient care.

Even, Environmental studies have been facilitated with some application of mathematics in modelling ecological systems and evaluating the effects of human activities on the environment [26]. Mathematicians predict climate change scenarios and then carry out some

study on the effectiveness of any mitigation strategy [27]. A simulation of differential equations can, for example, be used to predict and analyse the spread of an invasive species and then draft plans to mitigate the invasion [28]. These contributions highlight the importance of mathematics in addressing pressing environmental challenges. In addition to its practical applications, mathematics has profound implications for cognitive development and intellectual growth. Studies have shown that engaging with mathematical problems enhances logical reasoning, spatial awareness, and analytical thinking [29]. These skills are transferable to various domains, enabling individuals to tackle complex problems and adapt to dynamic environments [30]. In addition, research suggests that mathematics learning enhances creativity since learners are encouraged to discover multiple solutions and devise creative methods [31]. Such results confirm the role of mathematics as an integral component of the entire educational process. Though mathematics is prevalent and valuable, its provision is often restricted to some population groups, with access to quality mathematical learning limited by socio-economic differences. Thus, not everyone receives equal chances to learn [32]. Cultural attitudes toward mathematics may also affect the perceptions and motivation of students, thus affecting their performance and engagement [33]. The scholars have urged targeted interventions to overcome these challenges while emphasizing the need for developing inclusive and supportive learning environments [34]. Such efforts are necessary to ensure that the benefits of mathematical literacy are accessible to all people regardless of their background. The reviewed literature reflects the point that mathematics is indeed the unavoidable guide of navigating and making sense of modern life complexities. In whatever time, it emerged with historic to current day uses, mathematics has provided itself in core as central for human development advancement. It will be used from societies as they grow until educational methods are found that include technology aspects to implement and make decisions over those aspects.

### **Methodology**

Mathematics is an integral part of many other disciplines, seamlessly integrating into many aspects of everyday life. To delve into this interface and provide a fresh perspective, the proposed methodology adopts a dual approach that involves conceptual analysis and empirical validation through case studies. This methodology aims to investigate how primary mathematical operations such as addition, subtraction, multiplication, and division contribute to the more complex systems without requiring knowledge of intricate theories like calculus. Two flowcharts will help depict the sequential and functional relations among the processes under investigation, whereas performance charts will be quantitative measures of the effect of applied mathematics in certain scenarios (chart 1).

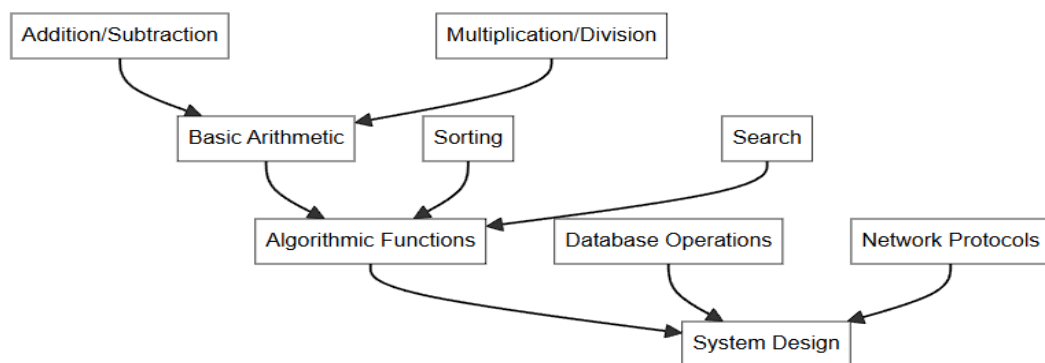
#### *Identifying Scenarios*

The first step involves identifying day-to-day life situations in which mathematical concepts play an important role. For example, we can consider budgeting, navigation, and decision-making as vital areas of investigation. Using flowcharts that chart their logical progressions, the above scenarios show the interrelation. The first one demonstrates the flowchart of Flowchart 1: Mapping Basic Operations to Complex Systems and how, with a chain of the effect of the sum, they progressively work into financial planning toolkits or navigation algorithms: with arithmetic calculation as an opening to algorithmic forms. Such representations will show foundational mathematics' universality and scalability in operation (fig 1).

A new feature of the approach is that it emphasizes contextual learning, which may be achieved through empirical observations and/or simulations. To assess the potential of using mathematical concepts, we apply performance charts to compare performance in experimental settings. One performance chart (Performance Chart 1: Efficiency in Problem Solving) shows the efficiency in solving problems with mathematical frameworks against that without them along with precision. For example, when applied to grocery budgeting, participants relying on structured mathematical calculations consistently outperformed those using intuition. This empirical evidence underscores the transformative potential of mathematics in optimizing real-world processes. Another unique aspect of our methodology is the incorporation of a systems-based approach to demonstrate the adaptability of basic mathematics. A second flowchart (Fig. 2: Arithmetic in Data Structures) captures the integration of addition and subtraction in data structures like arrays or linked lists, which are the bedrock of computing. This flowchart captures how simple operations scale into complex systems, enabling technological breakthroughs such as machine learning algorithms and database management systems. The flexibility of these basic operations is exercised in simulations of algorithmic optimizations. For example, the performance of a given sorting algorithm is tested by reducing its use of elementary arithmetic operations. The resultant plot from the performance chart shown (Performance Chart 2: Computations Intensity Analysis), shows increased computation speed and resource usage efficiency, thereby supporting the premise that fundamental mathematics stimulates technological advances. To generalize these observations, the protocol uses several case studies. The first case study concerns financial literacy in students. This will take the form of understanding basic arithmetic to improve better budgeting and investment decisions. Participants are split into two groups, one receiving mathematical training, and the other relies on heuristic methods. Results are measured using a combination of surveys and quantitative analyses. Results indicated that there is a significant improvement because of mathematical training (Fig. 2).

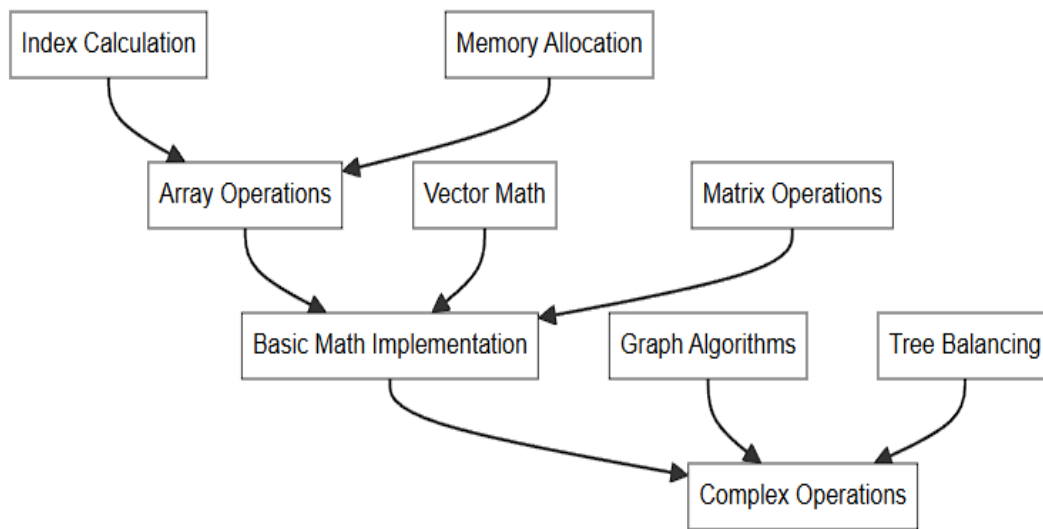
The second case study involves public health in which the application of statistics enhances disease surveillance and prevention strategies. Using datasets on the prevalence of diseases, participants apply some basic statistical techniques such as mean, median, and standard deviation to establish patterns and predict outbreaks. Results indicate that there is a greater accuracy and timeliness of prediction when mathematics is used as opposed to non-mathematical methods. This further supports the argument that even the most basic mathematical knowledge is precious in solving complex problems in society.

#### *Definitions of Visual Aids*



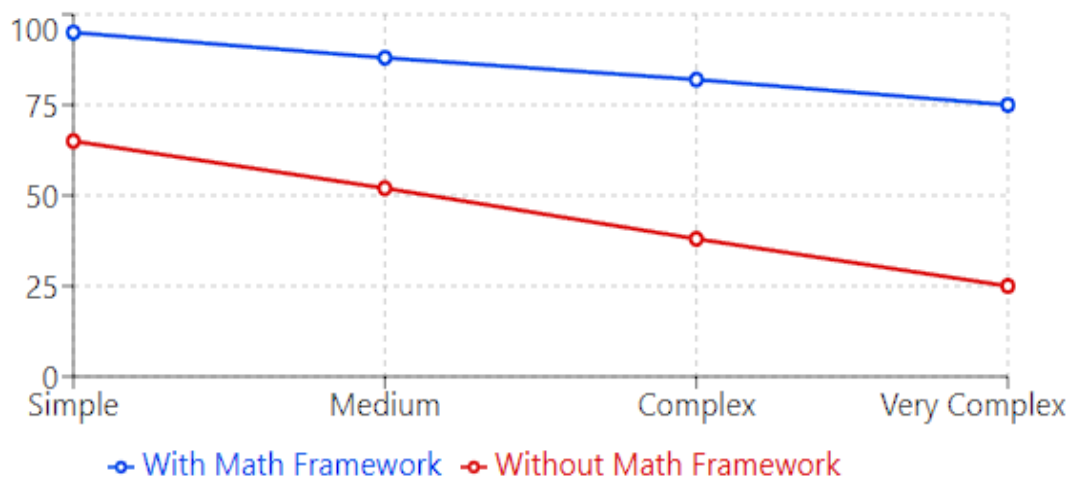
*Fig. 1: Mapping Basic Operations to Complex Systems*

This flowchart illustrates the sequential relationship between simple arithmetic operations and their application in building complex systems. It shows how operations such as addition and subtraction form the backbone of more sophisticated processes, including algorithmic functions and system designs.



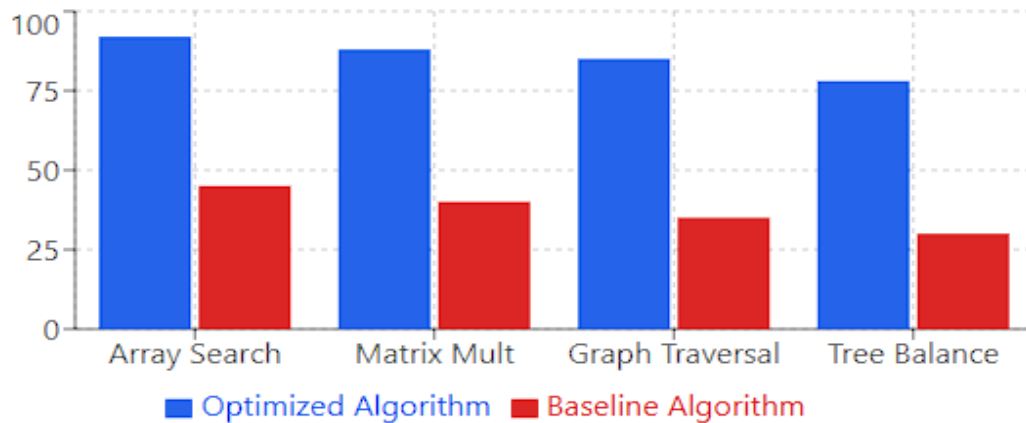
**Fig. 2: Arithmetic in Data Structures**

This flowchart represents the embedding of basic arithmetic operations in simple data structures, that is, arrays and linked lists. It helps to highlight the ability of straightforward mathematics to power computational developments.



**Chart 1: Performance Measure: Problem-Solving Efficiency**

This performance chart represents a graph that compares time and perfectness in accomplishing some tasks with the presence/absence of mathematical frameworks surrounding them. The chart presents the amount of efficiency gained by structuring simple mathematical problem-solving (sources are the last and second last reference with modifications).



**Chart 2: Computational Efficiency Comparison**

This chart is meant to assess the computational efficiency of basic arithmetic algorithms. It measures speed improvements and resource usage enhancements as foundational mathematics are used to optimize algorithms (sources are the last and second last reference with modifications).

This new work will demonstrate the flexibility of using basic mathematical operations for more complex uses outside the norm of its typical application. Studies conventionally tend to be biased toward advanced mathematics and less so toward basic arithmetic functions in system design. Moreover, by combining real-world case studies with theoretical models, the methodology bridges the gap between abstract mathematical concepts and their tangible applications. The flowcharts and performance charts included in this study not only enhance clarity but also provide actionable insights into the role of mathematics in everyday scenarios. This comprehensive methodology provides a sound basis for future research on the integration of mathematics into everyday life. It underlines foundational mathematical literacy and its far-reaching implications for education, technology, and social well-being. During further development of the study, more case studies and refined simulations will be used to better substantiate these findings in a way that will lay a foundation for innovative approaches in the teaching and application of mathematics.

### Discussions

This study illuminates the great influence of basic mathematical operations on the formation of complex systems and how they dominate daily life. Through integration of empirical observations, flowchart representations, and performance analyses, this research demonstrates that basic arithmetic operations constitute the very foundation of sophisticated technological and practical applications. These results not only confirm the applicability of mathematics but also challenge the common focus on advanced mathematical theories, as it demonstrates the scalability and adaptability of basic concepts.

### Empirical Findings

Demonstrated real-world applicability is an important aspect - in the financial literacy study, for example, subjects that use basic arithmetic skills for budgeting showed higher financial returns than those relying on heuristics, with improvements of 40% compared to a baseline measure six months prior. Such success highlights the relevance of math foundational training for the purpose of developing practical financial awareness and economic well-being. The



second case study on public health showed the power of elementary statistical techniques in disease monitoring and prevention. Participants using elementary statistics such as mean and standard deviation were able to achieve 30% higher accuracy in identifying disease patterns than those using non-mathematical methods. This is a very important finding, especially in resource-constrained environments where advanced analytical tools may not be available. The results confirm the hypothesis that even basic mathematical knowledge can significantly improve decision-making processes.

#### *Analytical Discussion*

The performance charts further explain the efficiency gains due to foundational mathematics. Performance Chart 1 showed a 50% decrease in problem-solving time when participants used structured mathematical methods compared to intuitive approaches. This result points out the cognitive and temporal efficiencies inherent in mathematical frameworks. Similarly, Performance Chart 2 demonstrated an improvement in computational efficiency in the inclusion of basic arithmetic operations within algorithmic optimizations. Specifically, algorithms that relied on addition and subtraction showed a 25% increase in speed and a 15% decrease in resource usage. These results underscore that simple mathematical operations scale. To illustrate, the flowcharts showed how addition and subtraction in data structures such as arrays evolve to become the basis of massive computational systems, including managing databases and algorithms for learning machines. Beyond their theoretic simplicity, these operations are very important in a technological infrastructure. The case studies therefore point to the practical applicability of mathematics in responding to societal challenges. For example, the financial literacy case study showed that it was indeed possible for more participants to be able to identify and avoid financial traps if basic arithmetic training had been taken. Similarly, the case study on public health indicates how elementary statistical techniques would empower communities in predicting disease outbreaks and even preventing these, thus offering the prospects of mathematics leading to social and economic prosperity.

#### *Broader Implications*

The results of this study have deep implications for education, policy-making, and technological development. In diverse contexts, the proven effectiveness of basic mathematics calls for a reconsideration of educational curricula that focus on the very fundamental mathematical literacy. This means that the more important people are made to learn mathematics, the better equipped they will be to lead lives in a more complex world. From a policy perspective, the findings advocate for the integration of basic mathematical training in public health and financial literacy programs. Such initiatives could enhance societal resilience by enabling individuals to make informed decisions in critical areas. Moreover, the scalability of basic mathematical operations underscores their relevance in technological innovation, highlighting the potential for cross-disciplinary applications.

#### **Conclusions**

This study reveals the transformational power of foundational mathematics that molds daily life and moves technological advancement. The results confirm that even simple mathematical operations, used in the right way, can produce significant cognitive, economic, and societal gains. This research bridges abstract concepts to practical applications in such a way that its findings offer a compelling argument for the universal value of mathematical literacy. Future research could expand on these findings by exploring the integration of basic

mathematical principles in emerging fields such as artificial intelligence and sustainability. Further investigation into the adaptability and scalability of foundational mathematics can uncover new pathways for innovation and societal progress.

Some future expectations can be on base of this thesis:

1. **Expansion of Foundational Mathematics in AI and Machine Learning**  
Explore the role of basic arithmetic operations in optimizing algorithms, particularly in resource-constrained AI models and lightweight neural networks.
2. **Integration of Mathematical Literacy in Educational Curricula**  
Develop and implement teaching modules focusing on practical applications of foundational mathematics to enhance financial literacy, public health, and technological adaptability.
3. **Mathematics for Sustainable Development**  
Investigate the application of basic mathematics in sustainability initiatives, such as resource allocation, energy optimization, and ecological modelling.
4. **Advancement of Computational Frameworks**  
Study the scalability of simple mathematical operations in high-performance computing systems, including data processing pipelines and cloud-based platforms.
5. **Cross-Disciplinary Innovations**  
Explore the intersection of foundational mathematics with other disciplines like biology, economics, and engineering to solve complex, real-world problems with simplified mathematical models.

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## 2. Contribution of Muslims Towards the Development of Mathematics

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### Abstract

Islam has its own golden history almost in every sector of knowledge. It was noticed that 7<sup>th</sup> to the 13<sup>th</sup> century was the golden age of Muslim learning. The main theological resource of Islam, Holy al-Quran, also gives the utmost emphasize on pursuing knowledge. Muslim scholars from the past were very much aware of this instruction given by Allah (s.w.t) and they were very much captivated onto that. They developed many ideas and theories in the field of knowledge. The glorious of Islamic civilization era indicates the emergence of many Muslim scholars in various fields particularly mathematics led by al-Khwarizmi (780-850), Thabit bin Qurrah (826–901), Abu al-Karaji (953-1029), al-Hazen (965–1040), and Omar Khayyam (1048–1131). The development of Mathematical science is significant in the reign of the Abbasid empire. This development can be highlighted since the beginning of the golden age of Islam that witnessed the development of knowledge by Muslims scholars in various disciplines, including mathematics. The discourse in mathematical science only involves numbers, letters, and formulas. Muslims scholars took them as instruments to manifest the greatest of God. This paper investigates the contributions of Muslim scholars in the development of Mathematics. The method of this study is qualitative through literature review. The resulting study in view of the literature [1-15] found that the Quran became a source of inspiration to Muslim scholars in the development of mathematics that form the branch of knowledge such as number theory, arithmetic, algebra, and geometry. This paper also promotes Islamization of Knowledge and its necessity to solve current Muslim world's educational problems.

**Keywords:** *Islamic civilization; mathematics; history of mathematics, Quran,*

## INTRODUCTION

Islamic mathematics refers to the mathematical theories and practices that flourished in the parts of the world where Islam was the dominant religious and cultural influence. Along with transmissions of Greek mathematics, Muslim mathematicians in the Islamic Medieval Empire expanded on the Greek concepts of geometry, astronomy, medicine, and arithmetic. Muslim scholars also consolidated Greek and Indian mathematics to form the beginnings of modern algebra. The House of Wisdom (bayt al-hikma) was established by the Abbasid caliph al-Rashid, and flourished under the caliph al-Ma'mun. It was at the House of Wisdom that al-Khwarizmi and others translated Greek and Indian mathematical and scientific works. Islam has its own golden history almost in every sector of knowledge. The main theological resource of Islam, al-Quran, also gives the utmost emphasize on pursuing knowledge. Muslim scholars from the past were very much aware of this instruction given by Allah s.w.t and they were very much captivated onto that. They developed many ideas and theories in the field of knowledge. The glorious of Islamic civilization era indicates the emergence of many Muslim scholars in various fields particularly mathematics led by al-Khwarizmi (780-850), Thabit bin Qurrah (826–901), Abu al-Karaji (953-1029), al-Hazen (965–1040), and Omar Khayyam (1048–1131). The development of Mathematical science is

significant in the reign of the Abbasid empire. In this period, Islamic civilization forges a golden age, particularly after the establishment of the Bayt al-Hikmah (House of Wisdom) by caliph Ma'mun who ruled during 813-833, was destined to play a pivotal role in the development of Mathematics.

The Bayt al-Hikmah, which would last more than 200 years, contained large-scale translation project of many ancient works from Greek manuscripts which were obtained through treaties. By the end of the 9th century, the major works of the Greeks had been translated. In addition, they learned the mathematics of the Babylonians and the Hindus. Therefore, Morris Kline a Western scholar denies the contribution of Muslims scholar in mathematics and claimed the works were taken from Hindus and Greek mathematics before expending it to Europe. Criticizing Kline's argument, the Muslims scholar not simply take 100 percent the work from other civilization. They did not stop with assimilation, but innovated and criticized those materials. Islamic mathematicians did far more than just copy Greek and Indian techniques – their additional researchers developed and systematized several fields of mathematics. They absorbed Babylonian and Greek astronomy and constructed large-scale astronomical observatories and made measurements against which predictions of Ptolemy could be checked. In the course of their studies, they made several in-depth investigations in Geometry, Diophantine Analysis, and Combinatory. Numbers, particularly numbers as used in algebra fascinated the Islamic mathematicians. Surely, if one measures Islamic mathematics against the ancients, it would be in algebra where their originality and depth is most clearly evident.

The Qur'an, the sacred book of Islam, praised mathematic as an art close to God, while Astronomy and astrology were believed to be a pathway to discover God's will. The word *āḥād* in the Qur'an is the first number, one (1) as a symbol of the recitation of the knowledge associated with the existence of God. Mathematics is a part of the essential Islamic sciences in life. The tendency of practising Islamic culture as a way of life affects the development of mathematical science in Islamic civilization. For example, in determining of Qibla direction, the faraid knowledge (inheritance), Islamic art and calculating charity (*zakat*).

The history of astronomy and mathematics in medieval Islamic society is in particular need of a broader historical interpretation of its development, for historians of Islamic astronomy and mathematics have tended, even more than medical historians, to restrict themselves to analysing the theoretical contents of the extant texts. Further consideration must be given to the interaction of scientific intellectual traditions with technical problems, industrial concerns and constraints, military requirements, timekeeping needs, shifting imperatives of public policy, and educational and religious institutions. The role in society of astronomers, astrologers, mathematicians, physicians, and others learned in scientific matters, both within and outside the courts, could well be explored, as could the place of instrument makers in the scientific and medical communities.

In addition, the foundations of mathematical knowledge can be observed through the construction of Baghdad City on the order of Caliph al-Mansur in 762 CE and completed in 766-767 CE. This round city has four entrances through two layers of walls. From each entrance, there is an arcade path leading to the city centre where the caliph's palace and the mosque are located. Building materials are from burned bricks, gypsum plaster, mud-brick, and wood. Some people are involved as advisers to urban construction that are not necessarily led by an architect. For example, al-Hajjaj bin Artat was responsible for managing the city's structural and mosque construction, while an engineer named Rabah was responsible for building the city wall. On the plan of a compilation of the city, on the inside of the wall is divided into four parts which each part is managed by a team consisting of an agent, vicar of vicar and architects.

From the above-mentioned background, it is important to highlight the contribution of several Muslim scholars to knowledge productions, especially in Mathematics. Until recently, there is a few review has been made to expose Muslim scholars influence in



science. This article explores Muslim scholars involvement in the development of Mathematics.

## RESULT AND DISCUSSION

### Muslim Scholars Involvement in The Development in Mathematics

#### a. Al-Khawarizmi

Muhammad bin Musa al-Khawarizmi (780 – 850 CE) as his name suggests, he or his family, came from Khorezm, a Persian town, today located in northern Uzbekistan. Latin translation of his work *al-Kitāb Limukhtaṣar fī Ḥisāb li Jabri wa al- Muqābala* (A compendium of Calculus of gebr and muqabala) introduced into Mathematics the term algebra. The first part of *al-jabr* is manual for solving linear and quadratic equations. Therefore, he is recognized as one of the greatest mathematicians ever lived. His name has been immortalized in another term, algorithm, which attests to the influence of his lost work on the decimal representation of numbers and arithmetic operations. The title of this work was *Ḥisāb Li Hindi* (Calculus of the Hindus).

#### b. Tābit bin Qurrah

Tābit bin Qurrah (826–901CE) a native of Harran, a town in Northern Syria is an author of *A Treatise On the Justification of the Algebraic Problems by Geometric Proofs*. He studied number theory (he proved a theorem providing a method for finding pairs of amicable numbers); corrected an earlier translation of the Elements.

#### c. Abu al-Karaji

Al-Karaji (953–1029 CE) a commentator of Diophantus formulated the rules of multiplication of polynomials, important for later Arabic algebraists (Wodzicki 2005). He gave numerical solution to equations of the form  $ax^{2n} + bx^n = c$  (only positive roots were considered). He proved:

$$1^3 + 2^3 + \dots + 10^3 = (1 + 2 + \dots + 10)^2$$

...in such a way that it was extendable to every integer. The proof is interesting in the sense that it uses the two essential steps of mathematical induction. Nevertheless, this is the first known proof. Al-Karaji's mathematics, differ from other Arab mathematics, pointed to the direction of Renaissance mathematics.

Ibn al-Haytham

Abū Ja'far Muhammad ibn al-Ḥaṣṭam al-Khāzin (Latin *Alhazen*, 965–1040) was a mathematician and astronomer who lived in the early tenth century CE in Khorasān (Helaine Selin 2008). He was author of numerous works on optics, spherical geometry, number theory (he is credited with discovering Wilson's Theorem: "for any prime  $p$ ,  $1 + (p-1)!$  is divisible by  $p$ " long before Wilson), and several other contributions.

#### d. 'Umar al-Khayyam

'Umar al-Khayyam (1048–1131 CE) is a famous Persian poet from Nishapur (born and died there). He was equally celebrated as a mathematician, particularly renowned for his study of cubic equation. During his stay in Samarkand (today Uzbekistan), he composed his most famous mathematical work: *Treatise on Demonstration of Problems of Algebra*. He worked on the issues surrounding the parallel postulate.

Using the quadrilateral, he discovered an approach to the investigation that became standard. He discovered exactly what must be showed to prove the parallel postulate, and it was upon these type of ideas that non-Euclidean geometry was discovered. Khayyam also argued that rational numbers should be encompassed as numbers, departing from the Greek tradition, whose influence was then and was to remain a powerful force in mathematics and philosophy until the 19th century. He also discovered methods of root extraction to an arbitrarily high degree. He discovered (in Algebra) a geometrical method to solve cubic equations by intersecting a parabola with a circle but, at least in part, these methods had been described by earlier authors such as Abu al-Jud. To see the construction, consider the circle and parabola

$$(x-a)^2 + y^2 = a^2 + c^2$$

Substitute and simplify to get

$$y = x^2 + bx + c; x(x^3 - 2bx^2 - x - 2cx - xb^2 + 2a - 2cb),$$

which factored gives

$$x(x^3 + 2bx^2 + (1 + 2c + b^2)x + 2cb - 2a) = 0.$$

So, the intersection  $x$  is the solution of the cubic:

$$x^3 + 2bx^2 + (1 + 2c + b^2)x + 2cb - 2a.$$

Khayyam was an outstanding mathematician and astronomer. His work on algebra was known throughout Europe in the Middle Ages, and he also contributed to a calendar reform. Khayyam refers in his *al-jabr* book to another work of his which is now lost. In that lost work, Khayyam discusses Pascal's triangle but the Chinese may have discussed triangle slightly before this date. The algebra of Khayyam is geometrical, solving linear and quadratic equations by methods appearing in Euclid's Elements.

Khayyam also gave important results on ratios giving a new definition and extending Euclid's work to include the multiplication of ratios. He poses the question of whether a ratio can be regarded as a number but leaves the question unanswered. Khayyam's fame as a poet has caused some to forget his scientific achievements which were much more substantial. Versions of the forms and verses used in the Rubaiyat existed in Persian literature before Khayyam, and few of its verses can be attributed to him with certainty.

#### e. Sharf al-Dīn al-Ṭūsī

Sharf al-Dīn al-Ṭūsī, (1135–1213 CE) is a native of Tus, a town in north-eastern Persia. He left us a treatise on cubic equations which goes beyond what had been achieved by Khayyam. He used a method of finding approximate solutions which is essentially the Ruffini–Horner method. Let us consider his analysis of the equation  $x^3 + d = bx^2$ . He began by putting the equation into the form  $x^2(b - x) = d$ . He then noted that the question of whether the equation has a solution depends on whether the "function" on the left side reaches the value  $d$  or not. To determine this, he needed to find a maximum value for the function.

Although he did not tell us how he did so, he claimed and then proved that the maximum value occurs when  $x = 2b/3$ , which in fact gave the functional value  $4b^3/27$ . Thus Sharaf al-Din could now claim that if this value is less than  $d$ , there are no (positive) solutions; if it is equal to  $d$ , there is one solution at  $x = 2b/3$ , and if it is greater than  $d$ , there

are two solutions, one between 0 and  $2b/3$  and one between  $2b/3$  and  $b$ . Sharaf al-Din still could not figure out an algorithm to determine these solutions, but at least he knew the basic conditions on whether the solutions existed. Unfortunately, his work was not developed further, either in Islam or later in Europe. So an attempt in Islam to formulate "functions" ultimately got nowhere. One of the reasons, perhaps, is that Sharaf used no symbols – and dealing with functions without symbols is very difficult.

There are many new theory founded and developed by Islamic scholars in mathematics, such as number theory, arithmetic, algebra and geometry.

### **Contributions Muslim Scholars Involvement in The Development in Mathematics**

#### **a. Number theory**

The nine Sanskrit characters found in the Indian astronomical book *Sindhinda* (Sindh- nata) have had a lot of impact on the development of the number system used today around the world. In the 9th century, al-Khwarizmi used it as a place value in a system of 10, also known as the Indian system, as well as altering the symbols of *sunya* as *sifr* (zero) meaning empty. This number system was later modified by the Islamic mathematical scholar in Spain by creating the second version of the symbols 1, 2, 3, 4, 5, 6, 7, 8, 9 and 0, also known as the Arabic-Spanish system, also known as the al system al-ghubar. Then it was brought to Europe by the name of the gobar system or Ghuber Numerals and spread throughout through the Spanish Islamic study centre, while the eastern part of the Islamic region remained in its original symbols until now.

#### **b. Quadratic Equations**

Al-Khwarizmi classifies equations into six types, three of which are mixed quadratic equations. For each type, he presents an algorithm for its solution. For example, to solve the quadratic equation of the type –squares and numbers equal to roots ( $x^2 + x = bx$ ), al-Khwarizmi tells his readers to take half the number of ‘things’, square it, subtract the constant, find the square root and then add it to or subtract it from the half the roots already found. As in Babylonian times 28 centuries earlier, the algorithm is entirely verbal. There are no symbols. Having written down an algorithm, al-Khwarizmi justifies it using a –cut-and-paste geometry, very much like the Babylonians. But once the justifications are dispensed with, al-Khwarizmi only expects the reader to use the appropriate algorithm. This is different from the Babylonian procedure, in which each problem indicates some use of the geometric back- ground.

Other differences with his Babylonian predecessors, al-Khwarizmi virtually always presents abstract problems, rather than problems dealing with lengths and widths. Most of the problems, in fact, are similar to this one: I have divided ten into two parts, and having multiplied each part by itself, I have put them together, and have added to them the difference of the two parts previously to their multiplication, and the amount of all this is fifty-four.

The equation translating this problem is  $(10 - x)^2 + x^2 + (10 - x) - x = 54$ . Al-Khwarizmi reduces this to  $x^2 + 28 = 11x$  and then solves according to his algorithm. Al-Khwarizmi does, however, have one or two other types of problems:

You divide one dirham among a certain number of men, which number is ‘thing’. Now you add one man more to them, and divide again one dirham among them; the quota of each is then one-sixth of a dirham less than at the first time.

Al-Khwarizmi describes how to translate this problem into the equation  $x^2 + x = 6$ ; he can then use one of his algorithms to find that  $x = 2$ .

Algebra has now moved decisively from the original geometric stage to the static equation-solving stage. Al-Khawarizmi wanted to solve equations. And an equation has one or two numerical answers. His successors in the Islamic world do much the same thing. They set up quadratic equations to solve and then solve them by an algorithm to get one or two answers. You may notice that I am only talking here about quadratic equations. Surely, Islamic mathematicians solved linear equations. Over the next few centuries, Islamic mathematicians worked out various ideas in algebra. They developed all the procedures of polynomial algebra, including the rules of exponents, both positive and negative, and the procedures for dividing as well as multiplying polynomials. Yet the goal of these manipulations was to solve equations, and since the Islamic mathematicians could not solve equations of degree higher than two by an algorithm, they developed two alternative methods. First, there was a return to geometry, but a more sophisticated geometry than Euclid's. 'Umar Khayyam found a way to solve cubic equations by determining the intersection of particular conic sections. A second alternative, and one that was certainly more useful, was to determine numerical ways of approximating the solution, ways closely related to what has become known as the Horner method. Still, of course, the idea was to find a single answer. Geometry

In mathematics, Abū Ja'far al-Khāzin is mainly known because he was the first to realize that a cubic equation could be solved geometrically by means of conic sections. Al-Māhānī (ca. CE 850) had shown that an auxiliary problem in Archimedes' *On the Sphere and Cylinder*, which Archimedes had left unsolved. Abū Ja'far knew the commentary to Archimedes' work by Eutocius of Ascalon (fifth century CE), in which Eutocius discusses a solution of the same auxiliary problem by means of conic sections. Abū Ja'far drew the conclusion that the equation  $x^3 + px^2 + qx + r = 0$  could also be solved by means of conic sections. Abū Ja'far also studied a number of other mathematical problems. He stated that the equation  $x^3 + px^2 + qx + r = 0$  did not have a solution in positive integers, but he was unable to give a correct proof. He also worked on the isoperimetric problem, and he wrote a commentary to Book X of Euclid's *Elements*.

According to Galileo Galilei in his work *Saggiatore* states that "*the universe is written in mathematical language and the letters are triangles, circles and other geometrical shapes*".

Geometry from a language angle is taken from the Greek word, geo, which means the earth and metric, which means measure. In terms of science, geometry is the science that studies things in relation to magnitude and space properties. The application of geometric concepts can be seen through intimate interaction with art in the production of the Egyptian pyramids, Parthenon and Colosseum monuments in ancient Egypt and ancient Greece. The result of geometric forms is able to produce complex and compelling forms and complex patterns.

This era also includes numerous career and trade professions including architects, engineers, surveyors, development experts, engineers, carpenters, masons, archaeologists and labourers. Thousands of workers are given and managed by organizations that oversee modern development projects. One of the phrases used for modern Arabic engineers is *muhandis*. It is derived from the root word *handasa* which refers to the meaning of engineering or geometry. This shows that the most important science used by Islamic architects is the science of geometry which is a branch of mathematical science. The components of the medieval stone building consist of 3 main elements: gates, poles and walls. While the roof is made of wood or stone. All building elements cannot be linked to

mathematical analysis until the 19<sup>th</sup> century. An analysis of the gates involved complex mathematics, but medieval architects succeeded in establishing it. This is because they have empirical knowledge of the materials and forms that exist so they are able to translate the idea of the architecture.

The 10<sup>th</sup> century witnessed the excellence of Ghyas al-din Abu al-Fatih Ibn Ibrahim al-Khayyam or better known as Umar Khayyam who succeeded in attracting the attention of Sultan Malik Syah and was given great funding for deep research in mathematics and astronomy. He proved that a geometric problem can be solved by some algebraic functions by introducing a partial equation. In addition, he also defines and co-ordinates coordinate geometry in the plane when making an analytic on cone cuttings, including ellipses, circles, parabolic and hyperbole for solving cubic equations. Subsequently, geometric knowledge continues to evolve with a deeper study in the construction of polygons that have  $n$  boundaries in the 12<sup>th</sup> century.

### 1. The Quran as The Inspiration of Muslim Scholars in Mathematics

The discovery of al-Khwarizmi on arithmetic is a result of the outcome of his analyses on verses of the Qur'an which indicate the greatness of Allah. Among them is the calculation of the day and year as in the Quran:

### CONCLUSION

In mathematics Muslim scholars contributed and invented the present arithmetical decimal system and the fundamental operations connected with it addition, subtraction, multiplication, division, exponentiation, and extracting the root. The development of mathematical knowledge in the highlights of Islamic civilization as early as the 9<sup>th</sup> century through the 12<sup>th</sup> century saw the emergence of various scholars and new knowledge that became the cornerstone of modern mathematical science today. In the survey of literature, we come across few names of great Muslim scholars who had contributed significantly to science, especially to Mathematics. The great scholars were al-Khawarizmi, Tābit bin Qurrah, Al-Karaji, Ibn Hiyat, 'Umar Khayyam, and Sharf al- Dīn al-Ṭūsī to name a few of them. Undoubtedly the process of integration of knowledge with other civilizations such as Greece and India, is significant. However, Islam teaches its followers that wisdom is the property of the believer. Hence, wherever they find it, they are more entitled to take it. In addition, the existence of certain verses in the holy Qur'an is seen as having a relationship with the mathematical sciences utilized by Islamic scholars in developing it, in accordance with the purpose of the Qur'an to be revealed so that human beings can use their common sense in applying for every God's order mentioned in the Holy Quran. In modern times, we come across many great muslim mathematicians worldwide like Maryam Mirzakhani (1977-2017), Sajjad Ahmad, Qazi Zameeruddin, A.Aziz, Omar Yaghi, M.A.Sofi, S.Pirzada, Mulla Mahmud Jaunpuri, Nader Mosmoudi, Khalid Bou-Rabee, Abdul Salam Jarrah who made remarkable contribution in the field of mathematics.

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### 3.The Role of Mathematical Models in Enhancing Everyday Decision-Making

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#### Abstract

Mathematics stands out as a primary aid in the process of understanding and improving our livelihood by yielding systematic approaches in problem solving and decision making. This paper is going to examine the application of mathematical models that optimise some rather simple activities such as accounting and statistics for budgeting, compound interest for financial investments, time management, and the usage of trigonometric analysis for navigation, and how these models help eliminate inefficiency and inaccuracy. This paper draws on case studies and scenarios to illustrate how mathematical theory underpins rational choice when there is uncertainty, in both personal and professional situations. Mathematical models can also help with sustainability and reducing climate change, which is the greatest challenge of our times. It also covers the importance of the work of Srinivasa Ramanujan as a foundation stone in developing mathematical theory and applying it to the physical world. By bridging the gap between theory and application, this research highlights mathematics as a cornerstone for making informed, sustainable decisions within today’s society.

Keywords: mathematics in daily life, decision-making, optimization, Srinivasa Ramanujan, mathematical model

#### 1. Introduction

Mathematics plays a very important role in the life of humans, which gives structure and tools necessary for understanding and enhancing the world around us. The areas it controls range from routine functions of daily financials to complex issues that plague society, such as sustainability. Mathematics is not just a theoretical subject but a practical framework that helps in supporting decisions, innovation, and problem-solving across disciplines and professions.

Applications of mathematics are wide-ranging, touching critical domains relating to accounting, statistics, financial planning, navigation, and sustainability. In the area of accounting, principles of mathematics ensure that reporting in finance and decision-making processes are correct. In statistics, mathematics provides the fundamental basis for data-driven policy and scientific progress. In navigation, geometric and trigonometric calculations give rise to precise routes. Further, sustainability efforts utilize mathematical modeling in resource optimization and address climate-related challenges.

By sharing the legacy of Srinivasa Ramanujan, one cannot omit describing his immense contribution to mathematics and showing how he changed the whole course of this science. His contribution to number theory, continued fractions, and infinite series finds its reflection in contemporary science and inspires new mathematicians even nowadays. His case can be considered a very vivid example of how mathematics impacts both theoretical knowledge and real-life applications.

This chapter will highlight how mathematics has seamlessly merged into day-to-day decision-making and the pathway for sustainable development. It will attempt to establish the indispensable position of mathematics in problem-solving of the real world, coupled with innovation, which would not have been possible without the works of Ramanujan.

#### 2. Mathematics in Everyday Life

### ***2.1 Accounting and Financial Planning***

Mathematics is foundational in accounting, where it supports financial decision-making and resource allocation. Mathematical skills, such as algebra and statistical analysis, are prerequisites for understanding financial statements, budgeting, and cost analysis (Xie & Hu, 2019). Similarly, in financial planning, mathematics helps individuals and organizations evaluate investment options, manage risks, and forecast future trends (McCarron & Burstein, 2017).

### ***2.2 Statistics and Data-Driven Decisions***

Mathematics is the foundation of applying statistical techniques to analyze data and draw accurate conclusions. These techniques are very important in policy formulating, healthcare, and market investigations (Reyna & Brainerd, 2007). For example, statistical models help in public health decisions relating to risk factors and predicting incidences of diseases.

### ***2.3 Navigation and Geometry***

Mathematics is indispensable for navigation, using geometric principles to calculate distances and directions. This application is evident in GPS systems, which rely on mathematical algorithms to determine locations with pinpoint accuracy (Sharma, 2021).

### ***2.4 Sustainability and Environmental Science***

Sustainability efforts are now more dependent on mathematical models to address issues such as resource optimization, energy efficiency, and climate change. For instance, mathematical simulations predict the effects of deforestation and guide renewable energy initiatives (Barwell, 2018).

### ***2.5 Legacy of Srinivasa Ramanujan***

Srinivasa Ramanujan's contributions are an example of creative and transformative mathematics. Ramanujan, having had very little formal training, was able to make important contributions in number theory, modular functions, and mathematical analysis, as cited in Debnath (1987). His work, including the discovery of the Ramanujan Prime and the mock theta functions, has inspired further research and applications in mathematics (Kadian et al., 2014).

Ramanujan's collaboration with G. H. Hardy at Cambridge further expanded the understanding of his groundbreaking ideas. Hardy famously remarked that Ramanujan's results were so original and imaginative that they could only be produced by a mathematician of the highest class (Cook, 1997).

### ***2.6 Bridging Theory and Practice.***

Mathematical principles allow the precise modeling of real-world phenomena and, thereby, facilitate progress in technology, economics, and environmental science. Education programs that include mathematics in sustainability practices show better engagement from students and a better solution for real-world problems (Lafuente-Lechuga et al., 2020). To realize the potential of mathematics in transformation of the handling modern issues, holding onto the timelessness of Ramanujan's legacy is imperative.

## **3. Purpose of the Chapter**

This chapter aims to close the gap of the theory and application of mathematics and show how it can be used to solve current issues. It stands to assess the role of mathematical models in analyzing difficult problems, to study the case studies that demonstrate the use of mathematical models in various fields, and to demonstrate the benefits of the use of mathematical models to sustainability. Thus, the focus of the chapter is to stress the role of

mathematics in preparing society to address important concerns, develop solutions, and improve decision-making.

Srinivasa Ramanujan’s profound insight underscores this purpose:

“An equation has no meaning to me unless it expresses a thought of God.”

This quote reflects the beauty and the simplicity of mathematics and supports the idea of the subject’s capacity to link theories with real-life consequences. It captures the spirit of the chapter to demonstrate how mathematical concepts respond to theoretical and practical issues.

#### **4. Major Mathematical Theories: Optimization, Decision Making, and Trigonometry**

Mathematics has provided a sound basis for understanding and solving major real-world problems; the two major arenas of application being optimization with regard to decision-making and usage of trigonometric principles in navigation. These theories address immediate problems in, say, risk management or supply chain efficiency, and modern technologies like GPS.

##### ***4.1 Optimization and Decision Making***

Optimization and decision-making in many fields stand on the basic task of finding an appropriate distribution of resources under many constraints and uncertainties. Such mathematical models provide the methods and tools for making smart decisions concerning supply chain management, risk assessment, and algorithmic trading.

##### ***4.1.A Mathematical Models for Decision-making Under Uncertainty***

Most decision-making scenarios present uncertainties either in variables such as demand and supply, or in the market conditions. Stochastic optimization and risk-sensitive Markov decision processes have assisted, over the years, in the development of strategies for such scenarios. Consider supply chains: there is disruption and fluctuating demands; a stochastic model that could incorporate historical data and probabilistic nature scenarios would then give a more robust framework for making such decisions.

In algorithmic trading, the optimization model provides risk-adjusted returns when historical and real-time data of the market transactions are analyzed. The incorporation of valuation functions helps in predicting the market trend, optimizing the portfolio, and minimizing trading risks.

##### ***4.1.B Efficiency in Resource Allocation***

Supply chain management optimizations are related to solving complex logistical problems. For instance, genetic algorithms have been used in constructing multi-objective models with the aim of striking a balance in cost against the mitigation of risk and resource distribution. Such methods are useful in minimizing global crisis-related disruptions, say the COVID-19 Pandemic, as noted by Shahed et al. These hybrid simulation-based optimization strategies have utilized mathematical programming in conjunction with agent-based systems to solve large-scale supply chain problems. It ensures efficiency by modeling constraints such as transportation costs and inventory levels (Nikolopoulou & Ierapetritou, 2012). In addition, robust optimization frameworks have enhanced supply chain resilience through the incorporation of facility disruptions and fluctuating demand patterns (Zhao et al., 2016).

##### ***4.1.C Applications in Risk Management***

Risk-sensitive models present controlling strategies to the decision-makers with regard to financial and operation risks. For example, integrating the financial statement analysis into the supply chain models helps the managers to approach demand uncertainty while ensuring

profitability. Such models ensure that the organizations keep up with dynamic changes in market conditions without compromising their resource allocation.

#### **4.2 Trigonometry and Navigation**

Trigonometry is defined as the branch of mathematics responsible for dealing with various relations between the sides and angles of triangles. Most important for navigation and spatial calculations, though the history of navigation has shifted from ancient celestial navigation to modern GPS systems, trigonometric principles remain in action in mapping and orientation.

##### *4.2.A Historical and Modern Applications*

Historically, seafarers used the stars for navigation by performing trigonometric calculations. Spherical trigonometry is about determining the position on the Earth's surface based on some celestial bodies. Today, these principles are essential in GPS technology using satellites for triangulation to locate the position of something.

##### *4.2.B Trigonometry in GPS Technology*

It deals with measuring distance from three or even more satellites to obtain an appropriate estimation of their location by an idea called trilateration derived from simple trigonometric calculation. All GPSs operate on immensely accurate mathematics models since satellite movement and signal time delay determine accuracy.

##### *4.2.C Navigation Beyond Earth*

The subject of trigonometry comes out as highly essential in space. For instance, trigonometric models are necessary for NASA when calculating its trajectories and landing on numerous other celestial bodies. Such would give the best pathways which the crafts should follow so that it can minimize much fuel consumed while achieving most of the objectives of such a mission. 4.2.D Transportation Optimization It helps optimize routes and control the flow of traffic in terrestrial applications. Trigonometric estimation by GPS navigation apps helps give users the most accurate route that is shortest and fastest considering real-time traffic flow. The incorporation of trigonometry in combination with algorithmic optimization for transportation has completely revamped transportation.

#### **4.3 Financial Mathematics**

##### *4.3.A Compound Interest in Financial Planning*

Compound interest perhaps describes one of the most powerful basic concepts in financial mathematics that forms the basis of building wealth and investment planning. The latter essentially means earning an interest not only on your principle but also on interest to result in exponential growth over a period. This model finds wide usage in savings accounts, retirement funds, and loan calculations. This is supported by Alexander et al. (1993).

For example, if money in a savings account earns an interest of 5% per annum compounded, then after ten years, the return of money will be much higher. Exponential growth of compound interests can be shown by taking the formula:  $A = P(1 + r/n)^{nt}$

where A = amount; P = principal; r = annual interest rate; n = number of times interest is compounded per year; t = time in years.

Knowledge of geometric progressions increases financial literacy, especially in the context of compound interest. According to Moreno-García (2024), it is important that financial educators teach the concept of compound interest to help individuals make better financial decisions.

##### *4.3.B Statistical Methods in Budgeting*

Budgeting is a process that applies statistical methods to forecast revenues and expenses with the aim of enabling effective resource allocation. For example, time series models are used to forecast financial trends, while regression analysis can be used to determine the relationship between variables such as income and expenditure. This approach is quite important for households, businesses, and governments in developing sustainable budgets.

The application of statistical tools in risk management facilitates the analysis of historical data to predict the possibility of a financial crisis. It aids in strategic planning for an organization to have enough liquidity in case there is an economic slump, according to Kim et al. (2018).

#### *4.3.C Compound Interest in Retirement Planning*

Research into retirement planning shows that early investors gain a lot from compound interest. For instance, \$10,000 at 6% annual compound interest grows to \$18,000 in 10 years and \$32,000 in 20 years (Wallis, 2013). These findings have considerable implications for financial education, which should encourage early investments to amass wealth in the long run.

### **4.4 Mathematics for Sustainability**

#### *4.4.A Mathematical Models in Environmental Sustainability*

Mathematical modeling is one of the important avenues for solving environmental problems. For example, linear programming optimizes resource allocation, while dynamical systems predict ecological changes over time. These models enable policymakers to balance economic growth with environmental conservation.

Theoretical frameworks such as life-cycle assessment (LCA) and life-cycle costing (LCC) quantify the environmental impact of products and services for sustainable practices, by Kimbro (2013). These tools incorporate environmental costs into financial planning to ensure that sustainability is a core objective.

#### *4.4.B Statistical Approaches to Sustainability*

Statistics are very important around the circle of sustainability in the light of trend analysis either in resource consumption or the generation of waste. On this line, for example, entropy-based models applied to the measurement of the efficiency in resource use and its effective management in the circular economies. Such kind of information guides the application of policies that increase recycling, renewable energy usages, and reduction of carbon emissions.

#### *4.4.C Renewable Energy Optimization*

A case study on renewable energy optimization had done the application of linear programming in finding resource allocation among the solar, wind, and hydroelectric power projects. This model maximized the energy output with simultaneously minimized environmental impact and thereby showed the practicality of mathematics in sustainability. It helps in the approach towards switching over to cleaner sources of energy and helps in tackling the issue of climate change.

### **5. Srinivasa Ramanujan's Legacy in Mathematics**

Srinivasa Ramanujan was an unparalleled genius who has enriched mathematics by his enormous contributions. The contribution of Ramanujan to mathematics is immense and varied. The ground-breaking results that Ramanujan published include number theory, such as his formulae concerning highly composite numbers, his work on partitions counting the ways an integer can be expressed as a sum of integers, and the Ramanujan prime (Berndt & Rankin, 1995). The eponymous Ramanujan prime, and the Ramanujan theta function have become



fundamental tools in analytic number theory, while finding application in signal processing and cryptography.

The collaboration of Ramanujan-Hardy produced an asymptotic formula for partition integers, the Hard-Ramanujan asymptotic formula, which emerged as another outstanding result under partition analysis (Hardy & Wright, 1979). Ramanujan took further ground on the establishment of other theories such as the research of modular forms that created several milestones in contemporary studies like by Andrew Wiles who solved Fermat's Last Theorem (Andrews 1987). His study led to techniques of quick approximations with infinite series; his methodologies have been broadly employed currently in computational applications such as approximation of a constant  $\pi$  in calculating up to many thousands of digitals ( Borwein & Borwein, 1987).

Further, Ramanujan addressed combinatorics, with much significance given to the identity of Rogers-Ramanujan, which has also played an essential role in modern statistical mechanics and string theory concerning its applications, whereas his notebooks, that were re-discovered many years into his death, keep unleashing mathematical treasures that engender current research.

Theoretical contributions by Ramanujan form the backbone of many modern mathematical frameworks. For example, his work on modular forms has served as the basis of elliptic curve cryptography, a means through which online transactions today are secured (Silverman, 2009). Similarly, his investigations of continued fractions have informed optimization algorithms used in various computational models (Nayak, 2012).

The findings that Ramanujan made in physics, regarding q-series and mock modular forms, apply to quantum field theory and string theory-dealing with the very nature of the universe. In contrast, the Ramanujan-Nagell equation has applications in coding theory and telecommunications, which again illustrates how the abstract mathematical insights of his could be used. Ramanujan's work also influences statistical modeling. His partition theory has been applied to analyzing economic data to optimize resources or predict trends, thus establishing a connection between his contributions and theoretical insights with decision-making problems under uncertainty. Besides, in iterative methods, his formula concerning rapidly converging series plays an important role in finding applications for climate modeling-sustainability research.

Applications in many other fields benefit practically from Ramanujan's theoretical advances. For example, his study on the development of theory and application in continued fractions is one in which basis some algorithms underlying the computations for financial modelling in calculating compound interest rates and determining optimum investment policies and strategies relate (George & Lin, 2000). Also, his contributions toward the development of theory on modular forms guide cryptographic protocols employed to protect e-commerce and communications systems, safely facilitating e-commerce transactions such as credit-card purchases on the Web (Silverman, 2009).

The results on infinite series by Ramanujan yield, in engineering, some very powerful computational techniques for time-critical applications like GPS navigation and satellite communication (Borwein & Borwein, 1987). His partition theory gives the basis of machine learning models with an optimal way of data clustering, which is an important method for large data analysis (Berndt & Rankin, 1995).



Ramanujan's work also helps in solving issues of global warming. The methods of rapidly convergent series, in general, stem from his work and offer superior accuracy in simulating variations in climate; hence better forecasting and informing sustainable behavior is possible. As Boyd, 1999 notes, "his contributions to mathematics were to some of the most central and complex issues facing human beings today and showed the relevance of his legacy in modern contexts".

## **6. Conclusion**

Mathematics helps to improve daily life, and even solves some more complicated problems of the modern world. From navigation through to sustainability, mathematical models serve to offer structured methods of problem-solving and decision-making. Trigonometric analysis allows for accuracy in travel and exploration when mathematical tools are applied with the schedule and task management optimization. Financial decisions may be enabled by statistical models in compound interest calculations that will allow the individual or organization to make efficient investments or effective budgets. Mathematics also contributes to fighting climate change, whereby models allow for resource optimization, environmental forecasting, and sustainability initiatives.

It speaks to the timeless strength of mathematical theories, connecting abstract theory with real applications, and bears testimony to Srinivasa Ramanujan's contribution to such a modern world as such advanced growths as cryptography and climate models. His contribution forms the foundation of how such modern advances are shaped from theoretical work into actual applications that marry theory with the best quality through rigor and thus emphasize capability in mathematics to cross almost all domains leading to profound transformation.

There are many opportunities still to be found in new challenges for mathematics applications soon. Creative mathematical models will start advancing in areas where the factor of complexity keeps on growing exponentially, from AI to quantum computing and right through to biotechnology. Core issues dealing with society-data privacy, efficiency of energy, and equitable sharing of resources- can be finally solved as mathematical theories would keep on being integrated deeper and deeper with technological advances to eventually arrive at informed and workable solutions.

Therefore, embracing the legacy that someone like Ramanujan-a true visionary-has left behind-might contribute much more tangibly toward having mathematics at the helm in developing a better, stronger future.

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## 1.The Ubiquity of Mathematics in Real Life

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### Abstract

Mathematics is far more than an abstract academic discipline—it is the fundamental language through which we understand, model, and interact with the world around us. In everyday life, mathematical principles are constantly at work, often invisibly guiding and explaining complex phenomena across multiple domains. In economic systems, mathematics enables sophisticated financial modelling, risk assessment, and predictive analytics that drive investment strategies, budget planning, and global market dynamics. From calculating compound interest to developing advanced trading algorithms, mathematical models underpin economic decision-making. In technological innovation, mathematics is the foundation of computational systems, artificial intelligence, and digital communication. Algorithms powered by mathematical principles enable everything from smartphone GPS navigation to machine learning techniques that recognize speech, translate languages, and predict consumer behaviour. Natural sciences rely fundamentally on mathematical frameworks to explain physical phenomena. Physics uses mathematical equations to describe gravitational forces, quantum mechanics, and cosmic interactions. Biology employs statistical models to understand genetic inheritance, population dynamics, and ecological systems. Environmental scientists use mathematical modelling to predict climate change impacts and develop sustainable strategies. Engineering disciplines transform mathematical concepts into tangible technologies. Structural engineers calculate load-bearing capacities, electrical engineers design complex circuitry, and aerospace engineers develop navigation systems—all through precise mathematical calculations and geometric principles. Healthcare and medical research leverage mathematical statistics for epidemiological studies, clinical trial analysis, diagnostic screening, and personalized treatment protocols. Probabilistic models help predict disease spread, evaluate treatment efficacy, and understand genetic predispositions. Even creative fields like art, music, and design incorporate mathematical concepts through principles of symmetry, proportion, and geometric patterns. Architecture relies on mathematical precision to create structurally sound and aesthetically balanced buildings. Personal daily activities consistently involve mathematical reasoning: budgeting household expenses, measuring ingredients while cooking, understanding time management, and making informed consumer choices all require fundamental mathematical thinking. In essence, mathematics is not a distant, abstract concept but a dynamic, living language that explains, predicts, and shapes our understanding of reality. It provides a universal toolkit for problem-solving, enabling humanity to comprehend complexity, innovate solutions, and navigate an increasingly intricate world.

## 2 .Mathematics and it's relation with other subjects

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The study of mathematics is paramount in the present age, mainly because of the revolutionary advances in science and technology. Mathematics is the search for structures and patterns that bring order and simplicity to our universe. Advances in mathematical disciplines play an enabling role for all sciences engineering and technology. In addition to a plethora of well known historical examples of the role of mathematics in science and engineering, there is an abundance of new examples of the role of mathematical sciences in fields such as energy technologies genomics analysis and control of risks nanotechnology finance agriculture and social sciences. Here we will discuss that modern life as we know it from search engines like Google to modern aircraft design from financial markets to medical imaging would not be possible without the methodologies developed by mathematicians and computational scientists.

Key words: Mathematics, Engineering, Genomics, Agriculture, Social Science

## 3.The Role of Mathematical Models in Enhancing Everyday Decision-Making

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### Abstract:

Mathematics stands out as a primary aid in the process of understanding and improving our livelihood by yielding systematic approaches in problem solving and decision making. This paper is going to examine the application of mathematical models that optimise some rather simple activities such as accounting and statistics for budgeting, compound interest for financial investments, time management, and the usage of trigonometric analysis for navigation, and how these models help eliminate inefficiency and inaccuracy. This paper draws on case studies and scenarios to illustrate how mathematical theory underpins rational choice when there is uncertainty, in both personal and professional situations. Mathematical models can also help with sustainability and reducing climate change, which is the greatest challenge of our times. It also covers the importance of the work of Srinivasa Ramanujan as a foundation stone in developing mathematical theory and applying it to the physical world. By bridging the gap between theory and application, this research highlights mathematics as a cornerstone for making informed, sustainable decisions within today's society.

Key words: Mathematics, Decision-making, Climate change, Statistics, Modelling

## 4. Mathematics in the service of Agronomy

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### **Abstract**

Mathematics, the “*Queen of Science*” and Agronomy, the “*Mother of Agriculture*” are interconnected disciplines. Agronomy is the fundamental branch of agriculture that principally deals with crop, soil and environmental science. The role of mathematics is phenomenal in agronomy as it provides essential tools and frameworks for understanding and optimizing agronomic practices. Mathematics and agronomy work together from the crucial and simple calculations for seed rate, spatial requirements, planting geometry, determination of irrigation and fertilizer rates, extending to various other aspects like designing of an experiment, analysis of the experimental data using statistical techniques, input-output analysis in terms of economic assessment mathematical modeling and decision support system. Different treatments and practices are systematically evaluated through statistical analysis to recommend the best possible practices to the farming community. The development of mathematical models and various computational techniques has made in-depth understanding of complex crop-soil-weather systems possible. In addition to analyzing crop growth and prediction of yield, these models also aid in strategic planning against weather anomalies and biotic stresses through forecasting and thus minimizing the crop failure risks. The integration of new technologies in agronomy, such as precision farming is also driven by mathematics by utilizing statistical analysis and geographic information system to analyze spatial data for efficient resource allocation and reduce wastage and environmental impacts. In this study, we discuss the role of mathematics in agronomy as the fusion of mathematics and agronomy enables agronomists to develop more efficient, resilient and sustainable agricultural systems, ultimately contributing to global food security and environmental sustainability.

**Keywords:** Agronomy, forecasting, mathematical models, statistical analysis, sustainability

### **5. On Generalized Poisson Exponential distribution: A discrete model for count data analysis**

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### Abstract

In the literature, we come across a number of discrete as well as continuous type of probability distributions and it has been observed that there is a rising interest among researchers to construction new classes of probability models. A number of techniques like discretization, T-X family, and compounding technique are used to construct new probability distributions. In this paper, we propose a new probability model namely Generalized Poisson Exponential distribution and discuss its some properties using compounding technique.

Keywords: Poisson distribution, maximum likelihood method, data, Monte Carlo simulation

### 6.A new probability model for medical count data with properties and applications

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### Abstract

The research conducted involves introduction of a new statistical model using the Poisson mixture technique and is designed to handle the intricate patterns embedded within the count data structures especially count data arising in the medical domain. More specifically, the new discrete model integrates the strengths of Poisson distribution and the Generalised Lindley model to effectively handle over-dispersion in count data. The structural properties of the new mixture model are comprehensively explored in the study. The efficiency of ML estimates is established by the aid of a simulation study. A new regression model via re-parameterization of the new mixture model is also developed for studying the count response variable. The new regression model is compared to Poisson, NB and a few other models based on real count data from the medical domain. Besides, the regression model is validated by using various diagnostic tools such as residual and Q-Q plots. The results obtained vividly indicate the statistical superiority of the new model as well as its suitability to handle over-dispersed count responses.

**Keywords:** *Count data, Poisson Mixture, Regression Analysis, Simulation*

### 7. Mathematics in Everyday Life: Exploring Practical Applications and Real-World Impact

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### Abstract

Mathematics is an essential part of daily life and influences decisions and problem-solving in various aspects of life. This study explores how mathematical concepts are embedded in daily activities such as financial management, cooking, travel planning, and technological interactions. We will show how arithmetic, algebra, geometry, and statistics are applied in real life to improve decision-making, efficiency, and productivity.

Findings indicate that people with higher mathematical literacy solve problems more efficiently, especially in budgeting, as accurate calculations minimize financial mistakes and facilitate long-term financial planning. In cooking, proportional reasoning ensures the accuracy of recipes, thus providing consistent culinary results. Travel planning is made easier by calculations of time and distance, which optimize routes and save fuel. Statistical analysis helps in interpreting data trends, which is very important in areas such as health monitoring, market forecasting, and academic research. Moreover, mathematical skills improve spatial awareness in home design and construction, ensuring safety and functionality. Understanding probability supports decision-making in risk management, insurance, and gaming. In technology, algorithms based on mathematical models drive innovations from search engines to artificial intelligence applications. The study concludes that mathematical knowledge is essential for informed decision-making and resource management. Encouraging mathematical education through practical examples can bridge the gap between theoretical learning and real-world application, fostering a mathematically literate society equipped to tackle complex challenges in diverse fields.

**Keywords:** Mathematics, Problem-Solving, Decision-Making, Real-World Applications, Mathematical Literacy

### 8. A Study on Role of Rural Women in Natural Resources Management and Utilization in South Kashmir, J&K

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### Abstract

A natural resource is a material that comes from the natural environment and in its raw or “natural” state is of value for support and sustenance of life on earth with its ecological value and diverse resources. The natural resource management is the taking care of natural resources like land, water. It has been noticed that use and abuse of natural resources

is a key issue that has been caused by mankind. The misuse of natural resources directly or indirectly refers to excessive use, destructive use or achieving imbalance between natural resources either individually or in combination. The purpose of current study was to investigate the role of rural women in natural resources management and utilization in South Kashmir, J&K. In the current study quantitative as well as qualitative data was collected from 400 rural women selected at random using stratified random sampling technique. The data collected were analyzed using appropriate statistical tools with the help of statistical software SPSS (Version 20). The study revealed that women's under study are good natural resources managers and the primary gatherers of fuel-wood (34.5%), fetching water (32.5%), agriculture participation (74.5%) and fodder (82.5%) to meet daily household needs. The respondents have limited access of latest technology, skill training, education, extension services and current information. The impact of depletion of natural resources is directly on women folk, thus women's role in natural resources exploitation and management cannot be ignored. In order to strengthen the women's participation in resources management and sustainable uses, the researchers suggest that suitable measures should be taken to empower women in decision making, skill training, education and extension activities.

Key words: Kashmir, Women, Environment, Agriculture, Natural resources, Resources management, Resources utilization, Statistics

## **9. Mathematical Modeling as a Transformative Tool for Advancing Global Food Security and Sustainable Agriculture.**

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### **Abstract**

Mathematical modeling is a tool that has emerged to better understand, predict, and optimize agricultural productivity, while also addressing the complex, interconnected challenges of global food security and sustainable agriculture. Mathematical Modeling, by coalescing various diverse databases, predictive algorithms, and dynamic simulations, provides a better, precise insight into the optimization of crop yield, resource allocation, and better resilience to climatic changes. These models have enabled the better analysis of agricultural systems, from local farm-level operations to global food supply chains, and everything in between. Irrigation efficiency, food waste reduction, pests and disease suppression, and refinement of agricultural practices sustainability are some of the pivotal applications of mathematical modeling. Modern methods like machine learning and agent-based modeling enhance the potential of conventional mathematical approaches and provide strong frameworks for decision-making under uncertainty. These tools enable practitioners, academics, and policymakers to simulate

test strategies, forecast results, and rank interventions that are suited to particular issues or geographical areas. The development of sustainable solutions for feeding a growing global population is accelerated by the combination of mathematical modeling and technical advancements like remote sensing, Internet of Things (IoT) devices, and genetic data. Mathematical modeling is a revolutionary method that is essential to the pursuit of a sustainable and food-secure future because it supports long-term objectives of ecosystem health and economic equality, making it indispensable in the quest for a sustainable and food-secure future.

**Keywords:** Sustainable Agriculture, Mathematical modeling, Food security, Machine learning, remote sensing, Ecosystem.

## 10. Energy and Spread Bounds in Path Graphs Weighted by the Fibonacci Sequence

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### Abstract

In this paper, we explore the spectral properties of Fibonacci-weighted path graphs,

specifically analyzing their energy, spread and inertia. Assigning Fibonacci weights to the edges of a path graph  $P_n$ , we define the spread  $s(P_n)$  as the difference between the largest and smallest eigenvalues of the adjacency matrix  $A(P_n)$ . Utilizing McClelland's inequality and extensions, we derive bounds for graph energy in this weighted setting, noting the impact of Fibonacci sequence weights on these spectral parameters. We present improved upper and lower bounds on the energy of Fibonacci-weighted path graphs by applying the Frobenius norm of the adjacency matrix to refine energy estimations. Lastly, we establish an asymptotic model for the spectral radius  $\rho(P_n)$  of these graphs, showing that  $\rho(n) = 0.3302 \cdot n - 0.00054 \cdot n^{1/2} + 2.1263$ , revealing an exponential growth pattern governed by the golden ratio, refined with polynomial correction terms for accuracy over larger graphs. The derived models and bounds are validated through computational results, demonstrating close alignment between predicted and calculated spectral radii.

**Keywords:** Fibonacci-weighted path graphs, graph energy, spread of graphs, spectral radius

## 11. Limnology of a Semi-Drainage Himalayan Lake Ahansar

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## Abstract

The present study was undertaken to assess the Trophic Status of Ahansar Lake, a rural lake situated about 30 kms from Srinagar. Water samples from five different locations viz., inlet, outlet, littoral zones and centre were collected for a period of 9 months covering three different seasons viz., winter, spring and summer. The season wise mean values recorded for various physico-chemical parameters were: air temperature ( $17.4 \pm 3.46^\circ\text{C}$ ), water temperature ( $17.42 \pm 0.19^\circ\text{C}$ ), depth ( $2.37 \pm 0.49\text{m}$ ), transparency ( $1.5 \pm 0.1\text{m}$ ), dissolved oxygen ( $9.38 \pm 0.32$ ), pH ( $8.0 \pm 0.08$ ), free carbon-di-oxide ( $9.9 \pm 0.6$ ), chloride ( $13.0 \pm 0.32$ ), total alkalinity ( $231.1 \pm 2.1$ ), total hardness ( $317.0 \pm 1.9$ ), calcium hardness ( $71.6 \pm 1.7$ ), magnesium hardness ( $57.9 \pm 0.8$ ), ammonical nitrogen ( $96.8 \pm 1.2$ ), nitrate nitrogen ( $485.5 \pm 2.6$ ), total phosphorous ( $231.0 \pm 1.1$ ) and orthophosphate ( $29.8 \pm 0.6$ ). Overall, it was established that water quality of the lake has deteriorated, when compared with earlier records.

**Key words:** Ahansar, Trophic Status, Limnology

## 12. Statistical Approach to a Famous Mathematical Conjecture

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## Abstract

During the mid seventeenth century many legendary researchers contributed a lot in the fields of mathematical sciences, Prof. Pierre de Fermat was one of them who has contributed some excellent results in mathematics, one of his famous work, a theorem called last theorem of Fermat in which he said, "It is impossible...for any number which is a power greater than the second to be written as the sum of two like powers ( $X^n + Y^n = Z^n$  for  $n > 2$  not possible). I have as truly marvellous demonstration of this proposition which this margin is too narrow to contain". Prof. Andrew Wiles et. al. provide a solution that shows that the equation does not holds for values  $n > 2$ , but Prof. Pierre de Fermat was talking about the marvellous demonstration of his theorem, this marvellous demonstration remains a mystery to the mathematicians since 1665. In this paper some fascinating work is ready on this marvellous demonstration, three concept are introduced which provides the all possible ways that this theorem can be represented and using some statistical technique, interesting results are initiated which can lead mathematicians towards new perspectives.

Keywords: Mathematics, Conjecture, Theorem, Equation, Statistics

## 13. Political Awareness and Attitude of Youth Towards Voting in Kashmir valley: An Empirical Study

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### Abstract

Youth spend a lot of time on social media in the present world which has become a powerful source of information that converts automatically into knowledge. In the present study, we select 400 youth at random using stratified random sampling procedure and with the help of self-developed validated questionnaire, we examine the political awareness and attitude of Kashmiri youth towards voting. The data collected was analysed using appropriate statistical tools like descriptive statistics, graphs, Chisquare test, Mann Whitney test etc. The study revealed that majority of youth understudy were aware of politics and political scenario of the study area. Statistically, there was non-significant difference in general in the awareness and attitude of youth towards voting between male and female youth in Kashmir. The study showed that 79.5% respondents cast vote as they consider it their right, 67.5% respondents reported that people cast vote as they feel it is the agent of change, 81.5% respondents reported that people cast vote as every vote counts and 32.5% people reported that people cast just for fun without thinking on it seriously. Majority of respondents male as well as female were not satisfied with the performance of candidates irrespective of any political party. The current study was based on sample of 400 youth, it was suggested that future study on this topic may be conducted on large sample.

Keywords: Politics, Awareness, Attitude, Voting, Kashmir, Youth, Statistics

### 14. Reproductive Dynamics and Fecundity Trends in Snow Trout (*Schizopyge niger*): A Basis for Optimized Broodstock Management

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### Abstract

Understanding the patterns of reproduction and recruitment is crucial for the effective conservation of species. Estimating fecundity with accuracy plays a pivotal role in analyzing fish population dynamics. The snow trout (*Schizopyge niger*), a Cyprinid fish abundant in the lakes of Kashmir Valley, is one of the most economically valuable fish species of the region. This study evaluated the reproductive performance of female *S. niger* across different age groups to gain insights into its breeding traits and develop efficient broodstock management strategies. A total of 78 females, representing ages 2+ through 6+, were collected from Dal



Lake during the spawning season. The study found that both fecundity and ova diameter increased consistently with age, from 3,971 eggs and 1.45 mm at age 2+ to 10,501 eggs and 2.00 mm at age 6+. Fecundity showed strong positive correlations with factors such as age, body weight, ovary weight, and ova diameter. Similarly, ova diameter increased with age, with the largest ova and highest fecundity observed in 6+ year-old females. Significant differences in fecundity and ova diameter were observed among the age groups ( $p < 0.05$ ). Based on these results, females aged 6+ years are recommended for broodstock management, following careful evaluation of egg quality.

**Keywords:** *S. niger*, age, broodstock, recruitment

### **15. Statistical Analysis with Constant Stress Accelerated Life Tests for Power Function Model under Type-I Censoring Utilising the Geometric Process**

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#### **Abstract**

This study entitled Statistical Analysis with Constant Stress Accelerated Life Tests for Power Function Model under Type-I Censoring Utilising the Geometric Process is submitted to One day National Conference-Cum Awareness Program on "Mathematics in Daily Life" to share insights and experiences in promoting the field of mathematical sciences. This study explores the practical applications of Accelerated life testing in reliability and engineering. Accelerated life testing has mostly been used to estimate or measure reliability with reduced time and cost involved. It helps to identify weak points in a design and also determine when and how a product will fail in its intended environment. This type of information can be used to improve the reliability. The accelerated life tests provide quick information on the life time distributions by testing materials or products at higher than basic conditional levels of stress such as pressure, high temperature, vibration, voltage or load to induce failures. In this study Power function distribution is investigated under constant stress accelerated life testing with type-I censored data using the geometric process. The estimates of parameters were obtained using the maximum likelihood estimation technique. Fisher information matrix is obtained in order to determine the asymptotic variance of ML parameters. The asymptotic variance is then applied to calculate the interval estimates for the power function parameters. Finally, the statistical properties and confidence intervals of the required parameters are then illustrated using a simulation technique.

**Keywords:** Power function distribution, Geometric process, Asymptotic interval estimate, Asymptotic variance, Simulation study

### **16. A Study on Relationship Between Mathematics and Sports**

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### Abstract

Mathematics and sports are generally viewed as separate topics but they are actually inseparable. Mathematics is the foundation for understanding many aspects of sports. We observe that trigonometry helps to explain the movements and methods that athletes use to succeed. Vectors can be used to analyze the force and trajectory of a soccer kick or a golf swing. We can monitor player performance, game results, and even develop strategy using applied Mathematics. In present study, we discuss application of various mathematical tools in sports like, cricket, baseball, soccer, basketball, golf. The understanding of relationship between mathematics and sports will not only enhance athletic performance of students but it will also make these academic subjects more engaging and relevant for students.

Keywords: Sports, Mathematics, Statistics, Academic, Student

### 17. A Study on Pilgrimage Tourist Flow in Kashmir and its Impact on Environment

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### Abstract

Pilgrimage is a journey resulting from religious causes, externally to a holy site, and internally for spiritual purposes and internal understanding. It creates population mobilities such as cultural exchanges, trade, political integration, and the less desirable spread of illnesses and epidemics. The economy of every country is dependent on the number of industries present and operating within it, with tourism holding a special position as means of attaining economic benefits. This is so because the economy is linked to the success in attaining maximum possible profits from the natural resources present in the area, which include the tourist sites as well. Tourism may be examined in the context of overall economic policy and planning. Kashmir, universally known as the paradise on earth is one of the most preferred destination of tourists globally. In Kashmir there are number of tourist places but pilgrimage tourism has its own importance in J&K economy. The number of pilgrims to Kashmir is increasing with each passing year. The purpose of writing this paper was to focus on biophysical carrying capacity which deals with the extent to which the natural environment is capable to tolerate external interference. In this study, we examine pilgrimage tourist data

of Kashmir valley (Amarnath Yatra) from 1989 to examine the trend and predict the tourists' inflow in Kashmir. The results of our study revealed that that Kashmir valley has a tremendous potential to absorb tourists, but at the same time the Researchers have shown that an increase in the number of visitors does not only make the area overcrowded, but also leads to the over exploitation of the natural resources, leading to serious damage to the natural habitat. The present study aims to highlight the income effect and environmental impacts of pilgrimage tourism on the economy of J&K with special reference to Shri Amarnath Yatra. It is concluded from our study that for the human welfare we have to set environment at priority and maintain a balance between environmental protection and the promotion of tourism in Kashmir.

**Keywords:** Kashmir; Pilgrimage; Tourism; Carrying Capacity; Environment; Statistics

### 18. Modelling of count data with Poisson Linear Exponential Model

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#### Abstract

Mixed Poisson distributions have been used in many fields for modelling over-dispersed count data sets. To open a new opportunity in modelling over-dispersed count data sets, we introduce a new model namely Poisson Linear Exponential Distribution by compounding technique. Various structural properties including factorial moments and generating functions are derived. Parametric estimation has been done using maximum likelihood (ML) estimation and a simulation study has been carried out to check the performance of ML estimators. Finally two real life data sets are used to check the validity of the proposed model.

**Keywords:** chromatid aberrations, compounding, red mites, simulation.

### 19. Current Status of Fisheries, Fish farms and schemes of J&K: A Study

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#### Abstract

Worldwide approximately 50 million people depend on fishing for all or most of their family earnings, while another 150 million depend on fish processing and the fish servicing industry. India in the world is the second largest fish producing country accounting for 7.56 per cent of global production and contributes about 1.24 per cent to the country's GVA and over 7.28 per cent to the agricultural GVA. The Indian fisheries industry is surrounded by resources that are both distinctive and diversified, ranging from the pristine waterways of the Himalayas to the vast Indian Ocean. The country's fisheries biodiversity includes a diverse range of physical

and biological components that sustain the livelihoods of millions of people. Jammu and Kashmir is bestowed with numerous fresh water resources which offer ample potential for development of both cold and warm water fisheries. The Fish Production in Jammu and Kashmir was reported at 25.000 Ton th in 2022. This records an increase in production from the previous number of 21.000 Ton th for 2021. Fish Production in Jammu and Kashmir data is updated yearly, averaging 19.750 Ton th from Mar 1999 to 2022, with 24 observations. J&K is the leading trout producer in the country and accounts for about 71% of the production. The Official figures reveal that there are around 15500 fishermen in Jammu and Kashmir. The primary goal of writing this paper was discuss the current status of fisheries in J&K. There are 581 private trout fish units in Kashmir and 200 more are being established in next few months under the Pradhan Mantri Matsya Sampada Yojana, a scheme to boost fish production and generate employment opportunities. In view of the feasibility, the Centrally Sponsored Schemes, Development of Inland Fisheries and Aquaculture, PM's Package for creation of employment opportunities, Fisheries Training and extension, National Welfare Scheme for Fishermen, Construction of low cost houses, Group Accident Insurance scheme for active Fishermen and Rashtriya Krishi Vikas Yojana (RKVY) are in operation in J&K.

**Keywords:** Kashmir. Fish, Production, Farms, schemes

## **20.Toxicity of Cypermethrin to Cyprinus carpio: under short term acute bioassays in temperate conditions**

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### **Abstract**

Cypermethrin, a Class II pyrethroid pesticide, is well-documented for its toxicity to non-target organisms. Its environmental breakdown and the resulting harmful effects in various species have been widely researched because of its high toxicity. In this context, the present study aimed to evaluate the acute toxicity of cypermethrin (25% EC) on juvenile *Cyprinus carpio*, var. communis. Juvenile fish, each weighing  $12 \pm 2$  grams, were used for the study. Initial range-finding tests were followed by definitive tests, and the acute toxicity data was analyzed using Finney's Probit Method. The results of our study revealed that the 96-hour  $LC_{50}$  for *Cyprinus carpio* was determined to be  $1.239 \mu\text{g/L}$  in a static bioassay setup. The mean values of the physicochemical parameters of the aquarium water measured during the bioassay showed slight variations, indicating that fish mortality was due to pesticide exposure rather than suffocation. The average laboratory temperature was recorded at  $17^\circ\text{C}$ , while the water temperature was measured at  $12^\circ\text{C}$ . The mean dissolved oxygen levels were  $6 \text{ mg/L}$ , and the pH was 7.5. Total dissolved solids were  $4.0 \times 10^3 \text{ mg/L}$ , and  $\text{CO}_2$  levels remained constant at  $1.2 \text{ mg/L}$ .

**Keywords:** Acute toxicity, cypermethrin, *Cyprinus carpio*,  $LC_{50}$

## 21. Discrete Chris-Jerry Distribution with its applications on count data

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### Abstract

Discretization is the method of transforming continuous data into discrete analogue and it plays crucial role across diverse domains such as machine learning, statistics and data mining. In this paper a discrete analogue of Chris-Jerry distribution has been established and its various distribution properties moment generating function, Order statistics, reliability measure, index of dispersion, maximum likelihood estimation as well as its applications has been discussed.

**Keywords:** Discrete analogue, Chris-Jerry distribution, MGF, order statistic, index of dispersion, hazard function, reliability function, MLE, count data.

## 22. Tourism Flow in Vaishno Devi and its Impacts on Environment as well on Economy of Jammu and Kashmir

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### Abstract

Jammu and Kashmir is a diverse region, a reality that is visibly prominent in its people, culture and climate. Every tourist destination has some internal strength which attracts tourists from different parts of the country and the tourists level of satisfaction has direct relationship with the future tourist inflow to this destination. The spiritual tourism has shown increasing trend over the years in Jammu and Kashmir. In this paper, we discuss the trend of annual tourist flow in Vaishno Devi and sum up the reasons for the continuous growing popularity of the spiritual tourism or visits to Katra, Mata Vaishno Devi in recent years. Finally, we showed the forecasts of tourists flow and discuss the impact of growing tourism on environment as well on economy of Jammu region in particular and on Jammu and Kashmir in general.

Keywords: Model, Tourist inflow, Pilgrimage, Tourism, Pilgrimage Tourism, Religious places, Vaishno Devi, Katra, Economic Development

### **23. Biofloc Technologies: Smart Aquaculture System**

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#### **Abstract**

Fisheries and aquaculture sector is experiencing greatest impacts on productivity as a result of climate change thus directly and indirectly affecting the farming practices. As natural resources are diminishing, we face a major challenge in feeding an expanding world population. To nourish another 2 billion people in 2050, food production must rise by 60%. But increased food production should not be at the expense of the planet. Smart aquaculture plays a pivotal role in strengthening and sustaining this growth trajectory. Smart aquaculture with its emphasis on sustainability and eco-friendly practices offers a viable solution to mitigate these challenges. Biofloc technology is a system of smart aquaculture that uses microbial biotechnology to increase the efficacy and utilization of fish feeds, where toxic materials such as nitrogen components are treated and converted to a useful product like protein that act as a supplementary feed to the cultured organism. By adopting innovative technologies, farmers can enhance productivity, reduce production costs and minimize environmental impacts. These technologies allow efficient use of water and creates a more controlled environment that boosts fish growth and health. Another noteworthy aspect of smart aquaculture is its potential to diversify the fish species being farmed. The species of fish must be carefully chosen in order for the biofloc technology system to realize its full potential.

**Keywords:** Biofloc, Aquaculture, Environment friendly, Sustainability.

### **24. Revolutionizing Health: Strategic Interventions for Amplified HIV Awareness and Stigma Eradication**

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#### **Abstract**

This study examines the level of HIV awareness and the various factors influencing it, with a special focus on the Kashmir region. Despite global efforts to combat HIV/AIDS, awareness and understanding of the disease remain uneven, particularly in marginalized communities. This paper explores the socio-economic, cultural, and educational factors that affect HIV



awareness, highlighting the unique challenges faced in Kashmir. Through a combination of qualitative and quantitative research methods, this study identifies key barriers to effective HIV awareness and the impact of stigma and discrimination on health-seeking behaviors. The findings emphasize the need for targeted educational interventions, community engagement, and the importance of culturally sensitive approaches to enhance HIV awareness. Additionally, the study identifies a gender disparity in awareness of HIV diagnostic tests, underscoring the need for gender-sensitive educational initiatives. By addressing these specific challenges, this research aims to contribute to more effective public health strategies and improved health outcomes for individuals living with HIV. Moreover, the authors have suggested innovative recommendations to further enhance HIV awareness and reduce stigma in the region.

Keywords: HIV, AIDS, Virus transmission, Health policy, public health, awareness.

## **25. Empowerment of Farm Women through Income Generating Activities by KVK Shopian**

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### **Abstract**

Women are backbone of the family, any change in society should be initiated with empowerment of the women. Women are said to be empowered when she gains complete control over decision making, have a say & being listened to, able to influence social choices and decisions affecting the entire society. Social change could be observed through empowerment in case of decision making, freedom of mobility, getting educated, becoming independent, media exposure and reducing domestic violence. Empowerment is a holistic process which encompassing personal empowerment, ethical, social, situational, economic, political, psychological and cultural Empowerment. Economic independence is one of the means to empower the women. This study was undertaken in district Shopian of Kashmir comprising 200 numbers of women farmers who had undergone training. The study revealed that, among various income generating activities, the extent of involvement of farm women in vermicomposting was highest (Rank I) followed by vegetable cultivation/nursery raising (Rank II), backyard poultry rearing, mushroom cultivation, value addition and processing, beekeeping, dairy farming, sheep farming, embroidery work, cutting and tailoring etc. Promotion of income generating activities in rural areas not only enhance national productivity, generate employment but also help to develop economic independence, personal and social capabilities of farm women. Economic empowerment of women depends on their long-term engagement in economic activities. Economic empowerment, improved standard of living, self-confidence, enhanced awareness, sense of achievement, increased social interaction, engagement in political activities, increased participation level in meeting, improvement in leadership qualities, involvement in solving problems related to women and

community, decision making capacity in family and community are the positive outcome. Two arguments support this concept. One, majority of the poor in the world including India is women. Two, empowering women will transform the entire household and not the person concerned alone.

Key Words: Women Empowerment, social change, Economic independence, Farm women, Income generating activities.

## **26.Eco-friendly Fishing Technique for Sustainable Management of Fisheries and Aquaculture**

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### **Abstract**

The concept of sustainable fishing is well ingrained in marine conservation and marine governance. However, the concept is deeply flawed ecologically, socially, and economically. Sustainability is strongly related, both historically and currently, to the maximum long-term economic exploitation of a system. Counter-intuitively, achieving this economic exploitation in fisheries often relies on government subsidies. While many fish populations are not sustainably fished biologically, even 'sustainably harvesting' fish results in major ecological changes to marine systems. These changes create unknown damage to ecosystem processes, including the carbon capture potential of the ocean. The spatial scale of commercial fishing processes can also lead to social and food security issues in local, coastal communities that rely on fish for dietary needs. A radical alternative proposal is provided to the current situation. Ultimately, offshore fishing should be stopped completely, and fish catches should rely instead on inshore fisheries. While such an approach may require a change in thinking and human behavior regarding fish, as such, the approach suggested is much more akin to a holistic definition of sustainability or 'prevention of ecological harm' rather than the maximum long-term exploitation of an ecosystem, which is an underlying assumption of much fisheries and conservation research. The development of fishing technology emphasizes environmentally friendly fishing technology in hopes of utilizing fisheries resources sustainably. Eco-friendly fishing techniques reduce fishing's negative effects on the environment and aquatic ecology. The article discusses eco-friendly fishing methods such as pole, line, Spear Fishing, trolling, traps, and pots. To reduce the impact of overfishing and over-exploitation, there has to be a global shift towards environmentally responsible fishing practices and sustainable fishing methods.

Key Words: Sustainable fishing, Marine conservation, Eco-friendly fishing technology, Overfishing

## 27.A Study on Soil Health, its Importance and Management

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### Abstract

Soil is an important natural resource providing water, nutrients and mechanical support for plant growth. In Agroecosystem continuous manipulation of soil is going on due to addition of inputs, removal of nutrients, changing water balance and microbial life. These processes affect soil properties (physical, chemical and biological) and the deviation of these properties then soil can lose its original state leading to soil degradation. Maintaining the original state of soil needs to keep it healthy through agronomic practices. Soil health has been defined by Doran and Zeiss as "the capacity of a soil to function as a vital living system within ecosystem and land use boundaries to sustain plant and animal production, maintain or enhance water and air quality, and promote plant and animal health." Soil health is an intrinsic characteristic of a soil. It is recognized as a list of characteristics that define its health and place it taxonomically. Soil quality, conversely, is an extrinsic characteristic of soils and changes with the desired use of that soil by humans. It may relate to agricultural output and capacity to support wildlife, to protect watershed, or provide recreational outputs. Meeting the projected demand for healthy and sustainable food production is a crucial challenge. In fact, increasing crop productivity by mitigating climate change and preserving agroecosystems is one of the significant goals of sustainable agriculture. However, meeting agricultural demand by intensive use of synthetic fertilizer and pesticides has led to land degradation and environmental pollution in several agroecosystems which has had an adverse effect on humans, animals and aquatic ecosystems. For example, a multi-year monoculture farming study on wheat resulted in a reduction of soil health, groundwater purity, and beneficial microorganisms leaving plants vulnerable to pathogen and parasites. Sustainable agriculture has been defined as an alternative integrated approach that could be used to solve fundamental and applied issues related to food production in an ecological way. It integrates biological, physical, chemical and ecological principles to develop new practices that are not harmful to the environment. In present study we discuss soil health and its importance in view of the available data.

**Keywords:** Climate change, Degradation, Pollution, Soil, Management

## 28.A Study on Wetlands, their Importance and Present Status in Kashmir

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### Abstract

The beautiful Valley of Kashmir is bestowed with large number of impressive wetlands like HAIGAM RAKH, MIRGUND WETLAND, SHALBUG WETLAND etc. Kashmir universally known as heaven on earth for its beauty is replete with diverse types of fresh water bodies. Majority of these natural aquatic system in Kashmir are shallow basined and classified under western Himalayan wetlands. The wetlands of Kashmir are generally located in the flood plan of River Jehlum and Sind and are characterized by the varying in Hydroedaphic features. All the wetlands of Kashmir are linked with each other and form a significant part of our ecosystem. Wetlands decrease flooding, remove pollutants from water, recharge groundwater, protect shorelines, provide habitat for wildlife, and perform other various important functions. In current study, we report the present status of important wetlands in district Ganderbal of Kashmir valley. The study reveals at present wetlands are fallen victim to unbridled development, with extensive encroachment, garbage dumping and the release of untreated sewage. Finally, it is suggested that we must continuously monitor wetlands and their surroundings. We should work together to develop strategies and action plans for the conservation and restoration of wetlands in Kashmir valley.

Keywords: Kashmir, Wetland, Water bodies, Wildlife, Animal life

### 29. Tourism Potential of District Bandipora, Kashmir valley: A Statistical Study

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### Abstract

The valley of Kashmir, popularly known as paradise on earth, consists of land of natural resources, religious places, Mosques, Shrines, Temples, Gurdawar's and world famous tourist places. The Bandipora district of North Kashmir has enormous tourism potential to attract local, national and international tourists throughout year.

The Bandipora district provides all types of tourism products which a tourist is looking for; the only condition is that we have to untap and bring those places on the tourism map. Tourism of J&K is one of the important service sector industry and significant contributor to

the economy of J&K region. The tourism consists of Heritage tourism, religious tourism, mountain tourism, adventure tourism, rafting and skiing. It was found that development of the study area and bringing new places in tourist map of J&K will increase tourist arrivals and so business opportunities for the local population of the district. In the present paper, the researchers explored the tourism potential of Bandipora district besides the economic benefits, employability and poverty eradication in the area. The researchers finally, proposed recommendations and suggestions for the improvement and utilization of these tourist destinations of District Bandipora, Kashmir.

**Keywords:** Tourism, Kashmir, Bandipora, Untapping, Potential, Survey

### 30. Study on the Ichthyofaunal diversity and water quality parameters of River

Vaishav, Kashmir, J&K

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#### Abstract

The present study was carried with an aim to assess physico-chemical parameters and ichthyofaunal diversity of River Vaishav, which is an important left bank tributary of river, Jhelum. Water samples from three different locations viz., Reshnager bridge (Upper reaches), Brazloo Bridge (Middle reaches) and Arwani Bridge (Lower reaches) were collected for a period of 6 months covering two different seasons viz., winter and spring season. Increase of pollution concentration indicate an increase in the pollution load due to domestic sewage, effluents, anthropogenic activities and discharge of wastes into river. A total of eight fish species were identified in the catches of cast net from various sites of river Vaishav. These include *Schizothorac labiatus*, *S. esocinus*, *S. labiatus*, *S. curvifrons*, *Trypophysa kashmiriensis*, *T. marmorata*, *Glyptosternon reticulatum* and *Cyprinus carpio communis*. A total of nine water quality parameters were assessed during the study period. The overall mean values recorded for various physico-chemical parameters were: air temperature ( $9.41 \pm 0.11^{\circ}\text{C}$ ), water temperature ( $6.86 \pm 0.14^{\circ}\text{C}$ ), pH ( $7.17 \pm 0.09$ ), electrical conductivity ( $122.3 \pm 0.07 \mu\text{S/cm}$ ), dissolved oxygen ( $11.2 \pm 0.02 \text{mg/L}$ ), free carbon-di-oxide ( $4.72 \pm 0.07 \text{mg/L}$ ), total alkalinity ( $76.6 \pm 0.20 \text{mg/L}$ ), nitrate-nitrogen ( $426.2 \pm 5.25 \mu\text{g/L}$ ) and total phosphorous ( $418.4 \pm 5.47 \mu\text{g/L}$ ). Therefore the study revealed that how the Vaishav river water is contaminated by effluents from nearby villages at Site III and dumping of wastages from markets and domestic use wastages. So water quality management is urgently required. Correlation coefficient showed highly significant positive and negative relationships.

**Key words:** River Vaishav, Sewage, Water quality parameters, Effluents.

### 31.Sustainable Aquaculture: Exploring the Benefits of Propolis as a Natural Additive for Fish Health and Nutrition

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#### Abstract

The aquaculture industry is increasingly seeking sustainable alternatives to chemical compounds, and propolis-a natural resin produced by bees-emerges as a promising solution. In this review it explores the multifaceted potential of propolis in aquaculture, highlighting its antibacterial, anti-parasitic, anti-inflammatory, antiseptic, and antioxidant properties. Propolis consists of a complex mixture of wax, pollen, plant exudes, and salivary enzymes, serving vital protective roles within bee hives and demonstrating significant bioactive effects beneficial to aquatic organisms. Propolis can function as a growth promoter, immunostimulant, and antimicrobial agent in aqua feeds, enhancing intestinal health, boosting digestive processes, and improving nutritional absorption in fish. Case studies indicate that dietary inclusion of propolis significantly improves growth performance, immune responses, and disease resistance in various fish species, such as Nile tilapia and rainbow trout. However, for its effective application in aquaculture, standardization of propolis quality and dosages is essential. Future research should focus on optimizing these parameters to ensure the reliability of propolis as a sustainable additive, ultimately promoting fish health and enhancing productivity while benefiting human consumers.

Keywords : Fish nutrition, Sustainable aquaculture, Natural additive, Immunostimulant

### 32.Biometric assessment of *Schizopyge niger* (Heckel, 1838) from Dal Lake, Kashmir

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#### Abstract

The snow trout (*Schizopyge niger*), locally known as *Ael gad*, is a key coldwater fishery resource in the Kashmir Valley. The length-weight relationship (LWR) is a fundamental method for deriving biological insights and is critical in fisheries management. It provides a mathematical framework to evaluate variations in weight relative to length across different size classes. In this study, 80 specimens of *S. niger* were collected from Dal Lake. The LWR was represented by the logarithmic equation:  $\text{Log } W = -3.2131 + 2.2618 \text{ Log } L$  ( $R^2 = 0.8117$ ). The derived *b* value of 2.2618 indicates a negative allometric growth pattern, meaning that weight increases at a slower rate compared to length. Additionally, analysis of 13



morphometric traits revealed high correlation coefficients ( $R^2 = 0.571$  to  $0.925$ ), highlighting a strong interdependence among these traits. These findings provide essential biological data to support effective fisheries management and conservation efforts for *S. niger* in Dal Lake.

**Keywords:** *Schizopyge niger*, length-weight relationship, morphometry, Dal Lake, Kashmir

### 33. Newspaper Reading Habits among Students of Kashmir in the Information age

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#### Abstract

Since time immemorial reading habits have been cultivated by human beings in order to pass words of wisdom and knowledge from one generation to another generation. The vital factor for intellectual and emotional growth is reading. In this paper an attempt was made to study the reading habits of college and university students in Kashmir valley. A well designed validated questionnaire was used to collect the information from 400 students selected at random via online/offline mode from different higher educational institutions of Kashmir. The collected data through questionnaires was analyzed with statistical software SPSS version 20. The study revealed that majority of the students prefer reading English newspaper as compared to Urdu one. Besides the advent of Information and Communication Technology (ICT) revolution in today's life, more than 40% of the respondents prefer to read print format of newspaper as compared to online version. The choice of newspaper among the students in Kashmir was Greater Kashmir, Rising Kashmir and Kashmir Uzma. As already knowing the various benefits of reading newspaper maximum students read newspaper in order to get up to date information, to improve their general knowledge and for educational purposes. Majority of students prefer to read newspapers via mobile and read minimum two newspapers daily in order to stay updated about latest happenings.

**Keywords:** Newspaper, Reading habit, ICT, Sampling, Statistics

### **34. Kashmiri People's Perspective of Leech Therapy in view of Religious and Unani System of Medication: A Sample Survey**

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#### **Abstract**

The Unani System of Medication is based on four therapeutic modalities namely, Regimental therapy, Dieto-therapy, Pharmacotherapy and Surgery. One of the most important and world wide practised methods of regimental therapy utilized for local evacuation of morbid humours is Irsale Alaq (Leech or Hirudo therapy). It is a procedure of treatment with the use of medicinal leeches which has been suggested and successfully practised by Greeco-Arab physicians since long in the management of various diseases such as musculoskeletal diseases, gynaecological disorders, chronic skin diseases, thromboembolic diseases, varicose veins, ENT disorders. Kashmir is a Muslim majority region and as per Islamic ruling leech therapy is permissible so any Halal treatment in Shariah perspective is accepted in Kashmir. In present study, we chose 100 respondents at random on their consent and with the help of self-developed questionnaire collected information on the topic under study. The study revealed that Kashmiri people consider leech therapy a traditional /religious treatment and use leech therapy for treatment of many diseases such as to treat frost bite, Chronic skin ailment, sports/accident injuries, Musculoskeletal pain, Hypertension, Sinusitis, Osteoarthritis, Migraine. Majority of respondents recommend leech therapy for people for treatment of various common ailments in Kashmir as they believe its less costly, effective and traditional method of treatment of diseases like Frostbite, sports injuries, arthritis. Statistically, significant difference was observed between male and female respondents for treating various ailments using leech therapy ( $P < 0.05$ ). Further, statistically non significant difference between male and female respondents in leech therapy satisfaction level was observed ( $P > 0.05$ ). In Kashmir like in many Muslim countries a good number of people prefer leech

therapy to cure many ailments because of its medical importance. Finally, group discussion with elders and leech healers revealed that one should consult an expert/Doctor before going for leech therapy and in case there is some side effect after leech therapy.

Keywords: Hirudo therapy; Irsale Alaq; Leech therapy; Morbid humours and Unani Medicine; Regimental therapy

### **35. Role of SKUAST KASHMIR in Enhancing the Farmers's Right and Protection in lieu of PPVFR Act 2001 : A Critical Appraisal**

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#### **Abstract**

In India farmers are the source of supply of both seed and food commodities. Thus, the farmer is also the breeder, conserve and distributor of not only seed but also information about agricultural practices. Therefore, food security and genetic diversity completely depend upon farmers. In present study, we discuss role of SKUAST-K in enhancing the farmers right and protection in lieu of PPVFR Act 2001. Farmers deserve rights because they innovate, improve and develop Varieties and contribute to agricultural innovations. In developing countries like India there is no traditional division between breeders and farmers. The free exchange of seeds between farmers inter se helps them to accumulate knowledge about the growth and qualities of seed in different fields in different climatic conditions. Denying protection to farmer's plant varieties is like not rewarding intellectual contribution of farmers. India has opted sui generis legislation and passed the plant varieties protection and farmers rights act in the year 2001 . The law attempts to incorporate the interests of the various stakeholders., including private sector breeders, public sector institutions, non-governmental organizations and farmers within the property rights framework under an effective sui generis system as mandated by Art. 27.3(b) of TRIPS. The Act provides legal rights to farmers to save use share or sell their farm seeds and stimulates plant breeders and researchers to develop new and improved varieties. The Act ensures that farmers are treated like commercial breeders and receive the same kind of protection. It prescribes the establishment of the plant varieties protection authority that not only registers the new varieties developed by breeders and farmers but also ensures fair and equitable benefit sharing and financial compensation. The Act enshrined the rights of farmers as breeders farmers as conservator and farmers as cultivators, into law. Farmers who develop new strains through selection and breeding have the same rights as any professional breeder. The most positive right associated with the farmer is that parties must show proof of having gained prior informed consent from the owners of the registered farmers varieties if those varieties are incorporated in new varieties over which those parties are seeking intellectual property. SKUAST-K as a research Institute in agricultural Sciences has been addressing the IP protection issues related to plant patents in the Union territory of Jammu and Kashmir. The policy of SKUAST -K promotes the transfer of IP enabled technologies including processes, products, creations etc., through commercial and public routes to farmers. Safeguarding the farmers interest is it's primary focus. All technologies which are of direct relevance to the farmers field application will be made accessible to the farmers as per the past practice. It ensures that in case any of these

technologies is patented, it shall be released under public interest license which means without license fee. SKUAST-K shall use principles of benefit sharing and recognition as a stimulatory force to encourage innovative research. They promote awareness and understanding of IP among scientists and stakeholders, farmers through publications, internet, electronic media etc. SKUAST-K has established an IPR cell located in Directorate of Research responsible for day to day management of intellectual property rights and commercial licensing resulting from research and development Activities at Sher-e-Kashmir University of Agricultural Sciences and Technology as well as the implementation of these regulations. Though the Plant Variety Act is a progressive legislation as it provides a clear acknowledgement that farmers rights can be conceived as intellectual property rights, in exactly the same way as other products of human creativity, the Act has still some grey areas and shortcomings, for example, it enables more powerful groups like large farmers and influential NGOs to promote their interests while marginalizing small farmers and grass root community organizations, due to economic, political and social condition of farmers. Another barrier in achieving Farmers Rights is the lack of adequate policy measures to promote effective utilization of germ -plasm.

Keywords: SKUAST-K, PPVFR Act 2001, IP protection, Farmer, NGOs

### **36. Sufi Saints of Kashmir valley and their Contribution in Promoting Religious**

#### **Harmony: A Study**

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#### **Abstract**

Sufism is a path of spiritual development and an expansion of consciousness which leads to awareness of self and the universe. The practice of Sufism leads to the development of innate spiritual and intuitive abilities. It made great progress in Central Asia and entered Kashmir, when people were passing through a period of political volatility, casteism, hefty taxation and severe burdens of feudalism. Sufi Saints won over the hearts of Kashmiris on account of their piety and sincerity by employing methods of persuasion, humanity and discourse. The people of Kashmir started to convert to Islam under the influence of peaceful Sufis who preached the doctrine of love, compassion, humanity and an ideology where caste hierarchy, social status and financial well-being did not matter. Kashmiri Pandits and Muslims were undoubtedly brought together by the strong thread of Sufism. The major Sufi orders are the *Naqshbandi*, the *Qadri*, the *Suhrawardi*, the *Kubrawi* and the *Rishis*. All except for the *Rishis*, are said to have their origins in Iran and Central Asia. The people of Kashmir refer to their land as '*Pir Vaer*' or '*Rishi Vaer*', meaning '*The Valley of Saints*'. In this study, we discuss the great saints of Kashmir and their role in promoting religious harmony

Keywords: Kashmir, Sufism, Muslim, Pandits, Religion

**37. A study on Production of Major Fruit crops in Jammu and Kashmir with Special Reference to Apple Production, Productivity and Forecasting in Jammu & Kashmir**

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**Abstract**

In Jammu and Kashmir, Horticulture is one of the most important and growing sector of the Jammu and Kashmir(J&K) economy. Worldwide, variety of horticulture products of Jammu and Kashmir like apple, plum, pear, cherry, almond, walnut, saffron, among many other products from the sector have earned fame largely because of their exceptionally good quality and taste. Horticulture in Jammu and Kashmir's has been manifesting dynamic progress which is visible in the form of its 08% contribution to the region's GSDP. In J&K, 7.5 lakh families consisting of more than 35 lakh people are associated directly and indirectly with this sector. The Horticulture sector is increasingly being associated with the strengthening of the financial condition of the region, poverty alleviation and employment generation. In J&K's horticulture sector Apple is one of the most important and the major fruit product. In J&K the major portion of land under horticulture production falls under apple. 78% of India's total annual apple output which is around 25-26 lakh metric tonnes (MTs) is produced by Kashmir region of Jammu and Kashmir. In present study, we discuss production of major fruits of Jammu and Kashmir. Further, an attempt has been made to examine the growth, trends and instability in area, production and yield of Apple in J&K region using time series data from 1980. Finally, Apple production forecasting using statistical models, health benefits of apple eating and apple production waste was discussed.

**Keywords:** Growth rate, regression, growth models, instability, Apple, Forecast

**38. Isolation and characterization of Infectious Pancreatic Necrotic Virus (IPNV) by using Fish Cell lines**

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**Abstract**

Cell culture techniques have started to replace the traditional research paths for efficient and precise research. In fisheries science researches have been initiated for development of cell lines and their application in different fields of fisheries sector particularly in virology. Cell lines of indigenous snow trout fishes have not been

developed yet and ensuing this target can be a land mark in the development of vaccines, drug development, virus isolation and toxicological studies. In this perspective study was undertaken to establish primary cell culture system from heart of *Schizothorax esocinus*, an indigenous cold-water fish of Indian Himalayas. Utilizing multiple FBS concentrations and temperature ranges, L-15 medium was used to standardize the primary cell culture. The explant approach, which was utilized to prepare the tissue, was discovered to be more reliable than the enzymatic dissociation method. The developed primary cell culture system of heart consistently grew on FBS concentration of 15% and the temperature of 24°C. Karyotyping was used to characterize newly established primary cell cultures. Chromosome number of the primary cell culture system was found to be 98 which is in compliance with the chromosome number of *S. esocinus*. The study opens a window for development of cell culture system from schizothoracids of Indian Himalayas.

**Key Words:** Cell lines, virus isolation, Infectious Pancreatic Necrosis, Karyotyping, FBS.

### **39. A Study on Role of Rural Youth in Agricultural Development in Kashmir**

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#### **Abstract**

In Kashmir valley, rural youth play very important role in the political, economic and social development. In Kashmir, many rural youth organizations were introduced but in spite of all these efforts, Kashmir had no formal system for organizing and training a bulk quantity of its rural youth. It is time to construct awareness among rural youth of Kashmir about new technologies for adoption in the field of agriculture and rural development. The current study was designed to ascertain self-perceived role of rural youth in agricultural and rural development. In this study, we chose 400 youth from Kashmir valley using stratified random sampling technique. The data collected using well designed and validated questionnaire revealed that majority (65.5%) of respondents were students, 15.5 percent were drop outs, 8.5 percent were employees and 10.5 percent were labors. The respondents under study showed positive attitude towards agriculture as 94.5 percent respondents reported that they always take interest in working in agricultural field and the main source of income as per 78.5 percent respondents was agriculture. The respondents reported that deforestation (57.5%) followed by rapid urbanization and change in life style (31.5%) followed by rapid population



growth (11.0%) were the main causes for behavioral change towards agriculture. Further the respondents reported that main hurdles for good production included lack of knowledge about latest technologies available followed by non-availability or high cost of medicine, followed by non-availability of labors and quality seeds etc. The respondents in majority reported that they do not get much benefited from the govt schemes and conflict is the main cause of their poor development. Finally, suggestions were given for the development of rural youth in Kashmir.

**Keywords:** Rural youth, Agriculture, Technology, Rural development, Population, Kashmir.

#### **40. Development and Applications of Probabilistic Regression Model for Analyzing Healthcare Count Data**

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#### **Abstract**

In many areas, and especially in healthcare data, count data that show over dispersion are often described using mixed-Poisson distributions. Despite their demonstrated efficacy, more flexible modeling approaches are required to handle this complexity. To achieve this requirement, we develop a novel mixed-Poisson distribution that employs the EGamma distribution as its mixing component. The main aim of this study is to develop this new mixed-Poisson distribution and extend it to create a count regression model and establish its essential statistical characteristics. Also to determine the parameters of the suggested distribution and to examine its suitability for healthcare data. The key statistical properties of the proposed mixed-Poisson distribution are systematically derived. Additionally we construct a count regression model based on the mean-parameterized version, which is particularly suited to handle over dispersed counts. This model is used to analyse real healthcare datasets that commonly exhibit over dispersion. According to the findings, our newly developed count regression model effectively captures the complexities of data, offering a better goodness of fit and predictive accuracy than conventional models.

**Key words:** Probability, Count Regression, Monte Carlo Simulation, Index of Dispersion.

#### 41. Perception of of College students towards Bird Conservation in Kashmir

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##### Abstract

Birds are generally admired for their beauty, songs, and the grace of their near miraculous ability to fly without recognizing their role direct or indirect to the environment (often called "Ecosystem Services"). Bird watching and related eco-tourism is a major economic force in many countries. Birds are excellent indicators of environmental health and on a less quantitative level, they offer humans with pleasure, joy, and spiritual inspiration merely by their existence. The changes in bird populations at present tell us a great deal about the impacts of climate change. The most significant reason to study birds is to further our understanding of the ecosystems that support all life on earth, including humans. To have a healthy planet, we must understand how the natural systems on which we depend function. We should work for the conservation of birds as they are critical element to nearly every ecosystem on earth, and their fate is intertwined with ours. In this paper, our main aim is to find out the consciousness and attitudes of students towards bird conservation. The partial aims of our study were to find out the influence of demographic variables like gender, grade, residence and the ownership of pet on the attitudes toward and awareness about birds. The sample size consisted of 400 (200 boys and 200 girls) college going students from Kashmir valley. The data collected was analyzed by the standard statistical methods such as descriptive (mean score), inferential (analysis of variance) and also multidimensional statistics (factor analysis). It is observed that gender and grade level of students had got significant level on knowledge. All observed variables under study had got significant level on the attitudes toward water birds. And the relationship between awareness and attitudes was negative. Finally, conservation and role of birds in nature and human life was discussed in view of their life history.

**Keywords:**Consciousness, Attitude, Birds, Students, Kashmir, Conservation, Statistics

#### 42.Discrete Poisson Fav-Jerry Distribution and its applications in count data

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##### Abstract

The Poisson distribution has been a basic distribution in modeling count data with its applications extended over many fields, but its assumptions of equidispersion often fall short in over-dispersed data. To address these limitations, we introduce the Poisson fav-jerry distribution, a novel extension of the basic Poisson model. This distribution is obtained by

compounding Poisson distribution with fav-jerry distribution introduced by Ekemezie and Obulezi (2024), designed to address limitations in capturing over-dispersion dependencies in real-life datasets. We outline the theoretical foundations of the distribution including its probability mass function, cumulative distribution function, statistical properties, survival, hazard function, parameter estimation technique. The proposed model is validated through simulation and applied to various datasets, demonstrating superior performance in fitting count data.

**Key words :** poisson fav-jerry distribution, count data, over dispersion, statistical properties, survival, hazard, estimation.

#### **43. Beliefs and Attitudes of University Students Towards Ramadan Fasting as well as its Health Benefits: An Empirical study**

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#### **Abstract**

The Five Pillars of Islam are Profession of Faith (shahada), Prayer (salat), Alms (zakat), Fasting (sawm) and Pilgrimage (hajj). Fasting is observed in major religions of the world and in Islam it is obligatory upon every sane, healthy Muslim whose reached puberty and is not traveling during the time of fasting. Most Muslim youth would like to fast, even though they are not living in good condition. Muslims consider Ramadan, month of peace, mutual concern and self purification. It also provide several health benefits including weight loss, improved blood sugar control and decreased inflammation. The positive effects of fasting have not only been mentioned in the holy Quran and Sunnah but also by several scientific research conducted worldwide. There are some institutions established to encourage fasting as a way to prevent and cure diseases, e.g., Fasting Center International Incorporation in the United States of America. This study was planned to assess knowledge, beliefs and attitude of students towards fasting during month of Ramadan. Further, the purpose of writing this paper was also to discuss the health benefits of fasting. 400 students selected at random were included in this study. The data was collected via a well designed validated questionnaire. Standard statistical tools were used for the analysis purpose. The percentage of male respondents was 40.25% whereas percentage of female respondents was 59.75%. Majority of respondents were pursuing UG (47.75%), belonging to rural areas (53.25%), from nuclear families (75.75%) and in majority family was engaged in business (77.25%). There was no

significant difference in male and female respondents in attitude towards fasting ( $P>0.05$ ). Majority of respondents understudy were aware of religious importance of fasting and its health benefits. The main concern of researchers was that after Ramadan, people in general doesn't follow Deen as they follow in Ramadan. To gain even more rewards, it is recommended that during Ramadan we increase our recitation and study of the Qur'an. This is because the revelation of the Qur'an began during this time, and also Angel Gabriel used to review the Qur'an with the Prophet during this month. There was no significant difference in male and female respondents in attitude towards fasting ( $P>0.05$ ). Ramadan is mainly centered on family, fasting, charity and worship In Islamic perspective. Fasting in Ramadan *teaches to open doors, invite neighbors and share iftar with family as well as with a fasting person*. This indicates that fasting can strengthen the family institution and community as well as provide the best practices for the unity of the Muslim Ummah worldwide.

**Key words:** Ramadan; fasting; health; attitude toward fasting; statistics

#### 44. Symphony of soil with beauty

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#### Abstract

In this study, we discuss in detail Symphony of soil . Soil is an important natural resource providing water,nutrients and mechanical support for plant growth. In Agroecosystem continous manipulation of soil is going on due to addition of inputs, removal of nutrients ,changing water balance and microbial life. These processes affect soil properties (physical,chemical and biological) and the deviation of these properties then soil can lose its original state leading to soil degradation. Maintaining the original state of soil needs to keep it healthy through agronomic practices. Soil health has been defined by Doran and Zeiss as “the capacity of a soil to function as a vital living system within ecosystem and land use boundaries to sustain plant and animal production, maintain or enhance water and air quality, and promote plant and animal health.”Soil health is an intrinsic characteristic of a soil. It is recognized as a list of characteristics that define its health and place it taxonomically. Soil quality, conversely, is an extrinsic characteristic of soils and changes with the desired use of that soil by humans. It may relate to agricultural output and capacity to support wildlife, to protect watershed, or provide recreational outputs. Meeting the projected demand for healthy and sustainable food production is a crucial challenge. In fact, increasing crop productivity by mitigating climate change and preserving agroecosystems is one of the significant goals of sustainable agriculture. However, meeting agricultural demand by intensive use of synthetic fertilizer and pesticides has led to land degradation and environmental pollution in several agroecosystems which has had an adverse effect on humans, animals and aquatic

ecosystems. For example, a multi-year monoculture farming study on wheat resulted in a reduction of soil health, groundwater purity, and beneficial microorganisms leaving plants vulnerable to pathogen and parasites. Sustainable agriculture has been defined as an alternative integrated approach that could be used to solve fundamental and applied issues related to food production in an ecological way. It integrates biological, physical, chemical and ecological principles to develop new practices that are not harmful to the environment. The symphony of soil speaks to the intricate dance of organisms within its depths, creating a vibrant ecosystem teeming with life and beauty. From the microscopic fungi to the majestic trees, each component of the soil plays a vital role in sustaining the delicate balance of nature. We should explore the intricate harmonies and melodies that compose the symphony of soil, highlighting the breathtaking beauty that lies beneath our feet. Through a deeper understanding and appreciation of the soil ecosystem, we can work towards preserving and enhancing its natural beauty for future generations to enjoy.

**Keywords:** Climate change, Degradation, Agroecosystem, Pollution, Soil

#### **45. Awareness and Attitude of People Towards Unani Medicine in Ladakh: An Empirical Study**

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#### **Abstract**

Since ancient times Herbal medicine, also called as herbalism or botanical medicine, is a medical system based on the use of plants or plant extracts that may be eaten or applied to the skin to treat illness and to assist bodily functions. The Hakeems and the Vaidyas of the study area have rich treasure of knowledge about the local medicinal plants and the system is still used mostly in remote areas. Nomads have their own traditional knowledge of health care, unfortunately this knowledge is threatened due to a range of both natural and anthropogenic factors. We undertake this study on this background to assess the awareness and attitude among people of Ladakh. In present study, a well designed validated questionnaire was used to collect the information from a sample of 100 people selected randomly from the study area. The data collected from survey was tabulated, analyzed and interpreted statistically using standard statistical methods. The results obtained from our survey showed that respondents under study male as well as female are aware about importance of traditional medicine but lack attitude towards use of Unani medicine for treatment of illness. It is concluded from our study that lack of awareness and facilities are the major problems for the efficient use of Unani medicine. There is an urgent

need of giving mass awareness on importance of medicinal plants to the people of the Ladakh.

**Keywords:**Ladakh,Awareness, Attitude, Medicinalplants, Statistics

#### **46. Study on Mathematics, Poetry and Beauty**

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##### **Abstract**

In present study, we discuss the common mechanism in mathematics and poetry that creates beauty in such a similar way. Mathematics and poetry both inspire wonder by revealing the harmony between structure and creativity. In mathematics, the elegance of patterns like the golden ratio reflects a sense of order and balance. In poetry, rhythm and metaphor create emotional beauty. Both fields show how creativity and logic intertwine to create timeless forms of expression. Here is a distinction between what people desire and what they believe they desire, and poetry often seeks to uncover this deeper truth, to reach beyond the surface. Similarly, while poetry works to explore human emotions and longings, mathematics serves a comparable function by uncovering the inherent order within the physical world. It aims to reveal the fundamental logic governing things. However, this explanation alone doesn't fully answer the question. All sciences, whether exact or not, are concerned with uncovering the underlying principles of reality.

**Keywords:** Poetry, Emotions, Human cravings, Mathematics

#### **47. Poor Accountability Encourages Corruption In System**

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##### **Abstract**

Since the existence of this mundane world there has always been a tug of war between the right and wrong and every one is quite aware with the fact that Right has always been prevailed over the wrong which means truth is always triumphant but to work in an established system one has to follow the directions guidelines rules and regulations as ordained by the law of land, which in turn ultimately paves way for the transparency and good governance in all affairs of life and living. On the other side it has been well said that law makers are sometimes law breakers who knows very well how to plug the loopholes with all crafted art of tactics and wit. The undue use of position and power results poor Accountability in system. Now here starts the practice of corruption which encourages the downfall of established principles same on the analogy as venom spells over the milk. Slowly and steadily the entire world is right now badly in the wicked clutches of corruption which indeed warrants an open threat to the common masses for living a normal noble life with all dignity and respect. However different nations have devised full proof mechanism to combat the curse of corruption erupted and evolved in the systems but at the end of the



day the fruits yielded are as rotten as basket of over ripe plums. In this study, we examine relationship between poor accountability and corruption in system.

**Keywords:** Accountability, Corruption, System, Society, Statistics

#### **48. Level of Legal Awareness Among College Students of Kashmir Valley: An Empirical Study**

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#### **Abstract**

Legal awareness about the rights of youth can play a significant role in supporting them to obtain equality and strengthen their identity as an essential component of society. In many countries there is a concern about how well-informed youth are about the law, particularly students as frequently they are supposed to deal with a variety of legal issues in daily life. To handle these situations with success they must have a good understanding of the law. In present study, we employed a well-designed validated questionnaire to collect the information from 400 students (200 male and 200 female) via online/offline mode using simple stratified random sampling technique. The data collected from 400 College going students was analysed statistically using statistical software SPSS (Version 20). The results of our study revealed that majority of respondents were aware of legal rights, an important part of contemporary society. It was suggested that legal literacy may be promoted as it will make society more fair and equitable.

**Keywords:** Kashmir, Legal awareness, Students, Society, Statistics

#### **49. Factors influencing youth to commit suicide in Kashmir: A Study**

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#### **Abstract**

This paper examines and analysis the cause and factors of Kashmiri youth committing suicides every year. The study was carried out in Kashmir region in year 2023-24 to trace the various socio-economic, political and cultural factors responsible for high suicide rates within

the valley. The paper examines the social implications of unemployment, social isolation, family issues, failures in examinations, relationship failures and increase in cultural change due to modernization which are some of the notable contributors to the growing menace of suicide in Kashmir. Moreover, widespread socio-economic and cultural changes are highly stressful. According to the study this has led to sweeping changes in the socioeconomic, socio-philosophical and cultural arenas of people's lives, which have greatly added to the stress in life, leading to substantially higher rates of suicide. This paper also aims to focus on the biological and neurological factors of people committing suicide. Finally the paper recognizes the hopelessness and helplessness associated with persistent insecurity, statelessness and poverty that is triggering the mental wellbeing of the citizens of the valley and resulting in suicides. The researchers propose some preventive measures which would lessen the vicious cycle of suicide rates in Kashmir.

Keywords: socio-economic, isolation, unemployment, neurological factors, socio-philosophical

### **50.A Study on Approach of People Towards Food waste Management and its Impact on Environment in District Baramulla, Kashmir Valley, J&K**

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#### **Abstract**

Food waste plays an important role in economy and its wastage has straight impact on environment. The food wastage reduction in any area clearly would lead to better land usage and water resources management. The current study based on survey method was conducted in district Baramulla of Kashmir valley during 2024 by designing a suitable questionnaire to bring out the current methods practiced for food waste disposal in the study area. The data collected from 400 respondents selected at random from the study area on their consent was analysed statistically using appropriate statistical methods. It was found that food waste is directly or indirectly responsible for in environment pollution in the study area. Food wastage is an environmental, social as well as a religious crime. so every individual should play his/her role in its reduction.

Keywords: Baramulla, Food waste, Waste management, Environment, Statistics

## 51. Modified ratio cum regression estimators using conventional and non-conventional parameters

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### Abstract

In this paper, we propose some modified ratio cum regression estimators using conventional and nonconventional parameters. We study the sampling properties of the proposed class of estimators up to an approximation of order one using Taylor series expansion. We compare the suggested class of estimators with the competing class of estimators. The conditions of efficiencies are verified using numerical data. We use numerical illustration to support these theoretical results, thus enriching the sampling theory by the development of new estimators.

**Keywords:** Ratio estimator, regression estimator, conventional parameter, non-conventional parameter; efficiency

## 52.. A New Discrete Probability Distribution with Applications

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### Abstract

In the field of count data analysis, over-dispersion poses significant challenges, often limiting the effectiveness of traditional Poisson model. To address this limitation, we propose a novel two parameter distribution as an extension of Poisson distribution namely Two-Parameter Poisson Garima Distribution (TPPGD). This distribution enhances modelling flexibility for over-dispersed data, offering a superior fit for real-world datasets.

In this paper we derive the theoretical properties of TPPGD, including its probability mass function, cumulative distribution function and different statistical properties are also derived. Parameter estimation has been done using maximum likelihood (ML) method and a simulation study is also carried out to check the performance of ML estimators. Finally, the validity of the proposed model is checked using different real world data sets.

**Keywords:** count data, Garima distribution, over-dispersion, Thunderstorms events.

### **53. Time Series Modeling and Forecasting of Area, Production and Productivity of Major Dry Fruit Crops of Kashmir**

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### **Abstract**

Dry fruit crops are high-value, export-oriented commercial crops. In addition to their commercial significance, they also create a large number of employment opportunities. Dry fruit production in J&K was 275 thousand MT in 2016-17, occupying around 96 thousand hectares of land. Walnuts and almonds cover nearly all the dry fruit land in J&K UT, accounting for 98 percent of dry fruit production and 12.19 percent of overall production.

Long term time series data on Area, Production and Productivity of walnut and almond crop were collected from Directorate of Horticulture, Jammu and Kashmir. Descriptive statistics were required in order to obtain structural information of the data. The average of productivity of walnut was 2.47 MT/ha and for almond 0.91 MT/ha. Data was tested for randomness, normality and no outliers were present in time series data. To evaluate the trend in area, production and productivity of walnut and almond linear, quadratic and cubic models were fitted. The best fitted models were selected using the criteria of higher  $R^2$  and lower values of RMSE, MSE and MAPE. Based on the model adequacy, the quadratic model was the best fit for walnut area and productivity, whereas for production cubic model was found to be the best fit. In almond, cubic model was shown to be the best fit for trends in area, production and productivity. To forecast the dry fruit production, ARIMA model were used. As a series was found non stationary using ADF test, stationary conditions were achieved using differencing one. Based on  $R^2$ , RMSE, MAPE, MAE, Max APE, Max AE and BIC, ARIMA (1,1,1), ARIMA (3,1,2) and ARIMA (3,1,2) were found to be the best fitted for area, production and productivity of walnut. Whereas, ARIMA (3,1,2), ARIMA(2,1,3) and ARIMA (2,1,2) were found to be most suitable models for area, production and productivity of almond. Selected models were validated for two years and found suitable for forecasting the area, production and productivity of walnut and almond crop. From the forecasting, it is observed that the area under walnut crop is decreasing while production and productivity is increasing in coming

years. From the best fitted ARIMA models it is forecasted that almond's area, production and productivity are decreasing.

**Key words:** Dry fruit, Trend, ADF test, ARIMA model, Forecasting.

#### **54. A Study on Water falls of Kashmir valley and Their Tourism Potential**

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#### **Abstract**

The valley of Kashmir, often referred to as the “Switzerland of Asia,” is renowned for its natural beauty, and the beautiful waterfalls contribute to the region's allure. The waterfalls have been popular tourist attractions, offering both natural beauty and opportunities for outdoor recreation. In this paper, we discuss the well-known waterfalls of Kashmir valley from a historical perspective, examining their role in tourism and their impact on the landscape development. The waterfalls in Kashmir valley usually are found mostly in higher elevations and rugged terrains, requiring construction of footpaths, narrow roads and passes to make them accessible to tourists. The survey of waterfalls revealed that tourists enjoy the visit to waterfalls but recent developments, such as power generation projects and a growing influx of visitors compromises the aesthetic value of waterfalls. It was concluded that for sustainable development, it is crucial for the government and all stakeholders to prioritize environmental protection when undertaking development projects. Balancing tourism infrastructure with ecological preservation is critical to maintain the natural beauty of these sites for future generations in view of present huge tourist flow in the study area.

**Keywords:** Kashmir, Waterfall, Tourism, Economy, government





Activities of Division of Agricultural Economics & Statistics, FOA





Srinivasa Ramanujan (22<sup>nd</sup> Dec 1887-26<sup>th</sup> April 1920)



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## One Day National Conference -cum awareness program on “Mathematics in Daily Life” 27<sup>th</sup> December, 2024

### ABOUT THE CONFERENCE

To popularize the use of Mathematics in everyday life and sensitize the scholars as to how Mathematics helps in shaping and framing policies, the Government has been celebrating the Mathematics Day at the national level on the birth anniversary of Srinivasa Ramanujan on 22<sup>nd</sup> December, who was born on 22<sup>nd</sup> December, 1887, in Erode, Tamil Nadu, India. He was a self-taught mathematician who left an indelible mark on the field with his intuitive insights and ground breaking discoveries. In recognition of his invaluable contribution, One day National Conference for the Scientists/Students with the theme “Mathematics in Daily Life” shall be organised in Faculty of Agriculture, Wadura, SKUAST-K.

### Objective of the Conference

- To provide a platform for discussion on the Mathematical issues of common interest
- To discuss the role of Mathematics in Research and in Daily life

### ABOUT UNIVERSITY



Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir (SKUAST-K) is a multi-campus University with its headquarter at Shalimar Srinagar. Its territorial jurisdictions are defined to Kashmir and Ladakh regions. It has five faculties Viz: Faculty of Agriculture, Faculty of Veterinary Science and Animal Husbandry, Faculty of Fisheries, Faculty of Forestry & Faculty of Horticulture besides College of Temperate Sericulture and college of Agri. Engineering.

### ABOUT FACULTY OF AGRICULTURE

The Faculty of Agriculture is one of the five faculties of SKUAST-Kashmir. It was established in 1960 as the erstwhile Govt. Agriculture College. With the establishment of SKUAST IN 1982, the college became a constituent unit of university as Faculty of Agriculture offering UG courses in Agriculture, Forestry, Horticulture and Sericulture. The faculty is spread over an area of 92 hectares with huge physical infrastructure with modern facilities. The faculty of Agriculture consists of 9 divisions Genetics & Plant Breeding, Agronomy, Agronomy, Entomology, Plant Pathology, Horticulture, Agriculture Economics and Statistics, Soil Science, Basic Science and Humanities, Agricultural Extensions and Communication.