

Report

2022



EPSILON INDIA
Bright and Early

A two-week summer program for the mathematically gifted



EPSILON INDIA 2022

Raising A Mathematician (RAM) Foundation was excited to conduct Epsilon India in May 2022, after its successful launch in 2021. Epsilon India is India's only summer camp for students between the ages 9 through 12 who are profoundly gifted in Mathematics. The camp was held in collaboration with Chennai Mathematical Institute (CMI), as its knowledge partner. The students are chosen through a rigorous selection process based on their performance in an Exploratory test and Algebra test or their performance in the previous year at Epsilon India.

The purpose of the camp is to provide an early start and exposure to higher level Mathematics through a curriculum and pedagogy that serves outliers who are otherwise not challenged in school. The camp also provided an opportunity for the students to engage with other gifted children, thereby serving as a milieu for not only the academic growth but also the social and emotional growth of these unique and gifted children.

TESTIMONIALS

(STUDENT)

I had a great time at this camp. I learned a lot of stuff I didn't know. This is the first time I have ever presented a paper!

-Sai Arun Prasad Sundar

Awesome Epsilon. Thank you to the mentors, teachers, TA's, and all my peers. Loved it!

-Siddharth Laxmisha

This camp was really really good with Manjul sir and his relation with math and nature, with our beloved Dr.T and his awesome methods of proofs and his funny and inspiring stories, and with Shivkumar sir and us playing with remainders!

- Owee Kirdat

It was like being on Mars, with the teachers guiding us through the whole planet. The homework was like the lava, burning but still fun (fun for Martians, not Earthlings).

- Swasti



Structure of the Camp

The camp started with a high note from the Fields Medalist and Padma Bhushan Dr. Manjul Bhargava taking the plenary session and interacting with the students.

Faculty and Student Mentors

The students were taught by professional mathematicians and industry experts with a majority holding PhD in Mathematics or allied fields. The purpose of having professional Mathematicians as the faculty is that they are able to stretch any part of the curriculum to challenge all the campers. The students were also mentored by Teaching Assistants (Undergraduate students studying Mathematics from some of the top colleges in India) and Teachers' aides (Senior students of RAM Foundation who have completed a substantial amount of coursework in Mathematics and had a solid foundation in course work being taught in the camp).

Daily Schedule and format of the Classes

The day usually started at 7:30 am and went on till 8:15 pm with adequate breaks. The first-time attendees of Epsilon India ('Shridhara' batch) had three classroom sessions as well as office hours.



The office hours allowed the students to work with each other and their student mentors. The office hours allowed for collaborative work between the students, allowing them to explore further the topics that were handled in class. The student mentors guided the discussions and were trained to not provide answers but to serve as facilitators. Having young mentors head the office hours allowed even the most introverted camper to open up and work with their fellow classmates. The office hour time eventually led to a social breakthrough for many of the campers hence the camp became more than just an academic experience for the students.

The second-year participants of Epsilon India ('Brahmagupta' batch) had two classroom sessions and a dedicated session for reading research papers. Each student was assigned a carefully selected research paper. The students went through the process of reading and understanding the research paper under the mentorship of the Teaching Assistants. This was a tremendous learning experience for the students of the senior batch as they went through the process of reading actual published papers. We hope this triggers the interest to read and write research papers.

Guest Lectures

The invited speakers for the guest lectures were usually people from the industry or academia. The purpose of the guest lectures was to introduce the campers to cutting-edge research and technology at a pace and depth that would serve to stretch their imagination and inspire them to embark on a self-study of these topics.



This year, the guest lectures also included topics that would help students broaden their horizons beyond Mathematics.

Sessions on Mathematics and Computer Science

- **Ethics in AI** - Dr. Anjana Susarla, Omura Saxena Professor in Responsible AI at Michigan State University, USA
- **Introduction to Game Theory** - Dr. Hariharan, Assistant Professor of Managerial Accounting at the Frankfurt School of Finance and Management, Germany
- **Cryptography** - Dr. Tyler (Preceptor at Harvard)
- **Concepts and Hands-on session in basic of AI** - Creya Learning
- **Trust in the Internet** - Mr. Rosarin Jolly Roy, Co-founder of Zycada networks, Mountain View, Canada
- **Quantitative Methods in Public Health: How Math Saves Lives** - Mr. Nishwant Swami, Masters in Public Health from Harvard

Non-Mathematics Sessions

- **Yoga and Physics** - Mr. Tapan Parekh (Founder and Camp Director, Yoveda)
- **Science and Sustainability** - Mr. Tapan Parekh (Founder and Camp Director, Yoveda)
- **Being Friends with our Emotions** - Mr. Sreedhar (Psychologist, Darwin Psychology Center)
- **Expanding your Horizons** - Mr. Mahipal Nair (Executive Coach and Human Resources Leader)

TESTIMONIALS

(STUDENT)

Epsilon 2022 was everything that I could ask for: Amazing, Fun, Interactive and so much more. This really captured how much I loved math with the vast variety of topics covered.

- Amol Bansal

This is the first time I was in a class with students that were at around the same level of math as me and who loved math as much as me! I LOVED it!!!!

- Ziana Singh

I had an amazing time at Epsilon. I learned so much, much of which I didn't even know existed. Each professor taught me something special - something I had never given a thought about either.

- Jayaditya Gupta

Classroom sessions

The classroom sessions with the Professors were college lecture style and intense. The students were asked to complete and submit homework solutions to gauge their understanding. Given that the nature of the homework was such that the student can approach a problem from different perspectives, the TAs graded the homework and provided individual feedback to the students on the methodology and approach that each student had used.

The course outline for year 1 and year 2 for the 2 weeks is as follows:

Shridhara batch

Dr. Thomas: Methods of Proof

Dr. Reshma Menon and Dr. Tyler: Ideas in calculus with real world examples

Dr. Shivkumar:

- RRR: Rows, Remainders and Rationals
- Division and Finding Remainders: A relook into the division algorithm, and efficient ways of finding remainders for certain divisors
- Examining the extension of the elegant digit-sum-based divisibility test for 3 to other divisors.
- Remainder Cycles and Fermat's Little Theorem (idea and motivation)
- Developing viewpoints to understand the division algorithm
- Rational numbers in the lens of the division algorithm, and a relook into its foundations



Dr. K. V. Subrahmanyam:

- Induction
- Pigeon Hole Principle
- Introduction to Graph Theory
- Introduction to Ramsey Theory
-

Brahmagupta batch

Dr. Thomas: Set theory

Dr. Shivkumar:

- Modern Algebra for Recreational Mathematics and Study of Numbers
- Getting started with classical algebra
- Collection of objects for which the classical algebraic identities hold
- Solving Recreational math puzzles using the tools of modern algebra
- Unit-digit preserving powers
- Solving a number challenge using the tools of modern algebra

Dr. Aditya Karnataki: Bernoulli Numbers

Parent Programs

The camp also included parent workshops that were curated for parents raising gifted children. The parent programs were designed to support parents in nurturing mathematical and social growth in their exceptionally gifted children.

- **Higher Education and Planning** - Ms. Bhuvana (Academic counselor)
- **Parenting** - Swami Ramakrsihnananda (Chinmaya Mission)
- **Multiple Intelligence** - Mr. Mahipal Nair
- **Mr. Sreedhar** - Understanding the world of teenagers

Valedictory

The camp ended on a high note with a session with Dr. Roughgarden, Professor of Computer Science and member of the Data Science Institute at Columbia University.



Faculty Profile



Dr. Thomas

*Independent Researcher,
Founder of Epsilon USA,
MathPath, MathCamp*



Dr. Hari R.

*Head of Academic Affairs, RAM
Foundation and Assistant Professor in
Managerial Accounting at the Frankfurt
School of Finance and Management.*



Prof. K V Subrahmanyam

*The Dean of studies at Chennai
Mathematical Institute*



Dr. Aditya Karnataka

*Postdoctoral Fellow at the Beijing
International Center for Mathematical
Research (BICMR), Peking University*



Dr. Shivkumar

*PhD from Electronics and Communications
Engineering Department in IISc*



Dr. Reshma Menon

Currently at PRECEPTOR, Harvard

TESTIMONIALS

(PARENT)

Your differentiated approach to introducing and teaching higher level Math is truly unique. I wish the very best to Team RAM and Team Epsilon for all future endeavors.

- Vipul Jhaveri, Parent of Karnam

It was a great camp. My son enjoyed it thoroughly. He was excited for a whole day of math every two weeks!

- Preethi Rao, Parent of Karthik Rusum

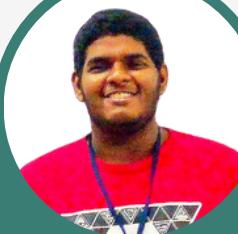
I am very happy to be a part of this Epsilon program as a parent. To see such talented young minds from across the country flourish under the nurture and care of experts and develop their mathematical acumen is truly exciting.

- Bhuvana, Parent of Atri Anand



Teaching Assistant

Lead Teaching Assistants (Full-time)



Sundarraman M.

*B.Sc Mathematics and
Computer Science (Hons), CMI*



Saeet Patil

*Senior student at RAM,
Spirit of Ramanujan Fellow*



Manu Param

Senior student at RAM



Hetvi Pethad

Senior student at RAM

Teaching Assistants (Part-time)



Ruhi Pungaliya

High school student



Parth Chavan

*High school student,
Spirit of Ramanujan Fellow*

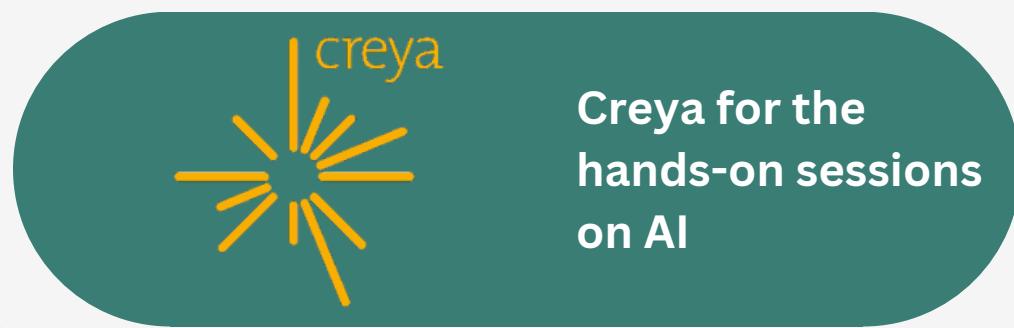


Nikhil Kulkarni

*Senior student at RAM,
Spirit of Ramanujan Fellow*

Supporters of Epsilon India 2022

Epsilon India 2022 was generously supported by Individuals and Organizations deeply invested in supporting gifted Math education.
We thank:



Epsilon India 2022 was immensely supported by an enthusiastic band of volunteers who were pivotal in ensuring the smooth operations of the camp.