

“Maths circles can be a real national movement”

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October 20, 2024

Collaboration, exploration and problem solving ... this is what the Bengaluru-based ICTS-RRI Maths Circle hopes to trigger in children

Published - October 20, 2024 01:00 pm IST

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A session in progress | Photo Credit: Special arrangement

Maths has always been Shloka Suraj’s favourite subject. But, in school, she says, it is often taught in a boring way. “They start saying that it is complex, and they make it complex,” says the precocious 10-year-old, a member of the ICTS-RRI Maths Circle, a Bengaluru-based initiative for secondary school students by the International Centre for Theoretical Sciences (ICTS) and Raman Research Institute (RRI).

According to her, teachers don’t always explain the reasoning behind complex concepts. “They make us memorise things. But when we start understanding the why of things, we remember better,” says the home-schooled student. “We can ask why here. Most of the time, they have answers,” she says. “I don’t have to waste my time on assignments and homework and all of that. But we get into really complex domains (here).”

For gifted children

The ICTS-RRI Maths Circle is part of a larger initiative launched by ICTS to identify exceptionally gifted children early and expose them to problem-solving and thinking about Maths in an open-ended way, according to the institute's website. "There are very talented children in the country but, often, the process kills creativity," says theoretical physicist Rajesh Gopakumar, Director of ICTS, adding that rote learning or grinding through hours of coaching class is not the best approach to studying the subject. "Mathematical creativity is a very delicate flower," he says.

The idea of a Maths circle is something Gopakumar has felt passionate about for a long time. "The philosophy that we have been nurturing at ICTS differs from the ones we usually have in these Maths Olympiads or other competition-based events." The focus (here) is on collaboration, not competition, and is based on open-ended exploration and problem solving rather than on speed solving. "That way, it hopefully unleashes your creativity and ability to ask new questions in Maths. It's more in that spirit of exploration than getting an answer," he says, pointing out that this is how Maths research functions "because, in research, half the task is asking the right questions... that's where the real creative breakthroughs come."

Beginnings

Maths circles came into being in Bulgaria in the early 1900s, soon spreading to the Soviet Union, says Joseph Samuel, ICTS Endowed Visiting Professor, who has been involved with these sessions. "It was very strong in Eastern Europe. The idea was to get groups of children together and encourage them to engage in mathematical exploration," he says. Over the years, the idea of bringing talented students together to examine Maths concepts spread worldwide, reaching the U.S. in the 1990s. "ICTS is trying to popularise this in India," says Samuel.

According to Roshini George, who coordinates the sessions, ICTS launched the initiative in 2019 in collaboration with the National Institute of Advanced Studies (NIAS). The sessions were held at the National Institute of Advanced Studies and run by Pranav Pandit, a professor at ICTS. Once they understood where they wanted to go, they identified talented students and started conducting pilot sessions. "I think there were around 25 or so students for the initial four sessions. "

Then, the pandemic started, and things came to a halt. In-person sessions gave way to online sessions. Once the worst was over, ICTS considered restarting in-person sessions in addition to online ones. "Online has a larger reach because we are not constrained by distance," says Samuel. "But, in the in-person sessions, there is more interaction between the students, resulting in peer-group learning."

In January 2023, ICTS began conducting sessions at RRI on second and fourth Saturdays. “We advertised widely and got a lot of responses,” says George, adding that the selection process was based on evaluating an online Maths challenge. “By end of December, we selected about 25 to 30 students.”

The ICTS-RRI Maths Circle started in January of 2023 with a session involving games and puzzles. Some later sessions dealt with modular arithmetic, cryptography, divisibility, optimisation, the pigeonhole principle, Platonic Solids, etc. This activity was initially nurtured by Samuel and Supurna Sinha (both retired professors of Theoretical Physics from RRI). Over time, they have been bringing in more experts and areas to diversify the character and scope of the activity. “We have tried to find children who are really interested in Maths for its own sake. The focus is more on how the children go about solving a challenge than arriving at the answer,” explains Samuel

Scope and beyond

On a pleasant second Saturday afternoon, groups of young people huddle around tables on the terrace of the library building at the densely wooded RRI in Sadashivanagar. Heads bent over exercise sheets and a couple of Rubik’s Cubes lie around while the green board on the wall in front of them lists the various rights of this gathering: to be wrong, to be different, to question.

This session, which is being handled by Maths educator and author Ashwin Guha, is focused on Group Theory, a branch of Maths that studies algebraic structures known as groups. “Symmetry is central to Group theory,” says Sinha, now an ICTS-RRI Maths Circle coordinator, explaining the role of the Rubik’s Cube in unpacking this concept. “The Rubik’s Cube gives a natural context to understand symmetry. She points out that hands-on activities help children understand Maths better and adds that Guha has conducted a series of Maths Circle sessions introducing Group Theory through hands-on explorations using the Rubik’s cube.

Sumedh Rao, a Class 12 student who has been part of the initiative for nearly two years now, says he particularly enjoys this exploratory approach, describing his sessions as a “most engaging learning experience.” While many of the concepts have similarities with what he learns at school, he feels that the approach here is more creative, hands-on, and focused on practical application. “You are carving your own path rather than getting someone else to do it for you.”

ICTS seeks to take this movement beyond Bengaluru, hoping to catalyse its spread across the country. “ICTS is just one institution, and we are trying to take the lead in creating a network of institutions,” says Gopakumar, adding that ICTS is willing to act as a repository for the resources for all the Maths explorations and handhold any institution or group

interested in starting their own circle. “We invite people to come and join our online monthly meetings if they’re interested in how to start a Maths circle. These have to be run by people who enjoy Maths and have the talent to run these sorts of things,” he says.

There are already Maths circles, both independent of and in collaboration with ICTS in Chennai, Kolkata, Bhopal, Mumbai, and Palakkad. Gopakumar firmly believes that there is scope to scale up. “I think it can be a real national movement,” he says, drawing a parallel with the chess clubs that have mushroomed nationwide. He dreams that these Maths circles will someday be the analogue of the chess clubs: filled with bright kids who will come to one of the many circles, hang out and do exciting things together. “I see no reason it can’t be because you do it in the same spirit as these people who play chess; you’re just having fun with your mind.”

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