Nashik Maths Circle

February 7, 2026

Delhi Public School, Nashik

Session Overview

The Nashik Maths Circle session on February 7th was conducted by Mr. Bhas Bhamre. The session focused on the transition from specific problem-solving to high-level mathematical generalization, specifically within the realms of Number Theory and Algebra.

From Conjectures to Theorems

The hallmark of this session was the emphasis on the ”Mathematical Method.” Students were not merely seeking numerical answers; they were encouraged to:

- **Observe Patterns:** Analyze specific cases to identify recurring properties.
- **Formulate Conjectures:** Make educated guesses about the underlying structure of the problems.
- **Pursue Generalization:** Move from a single solution to a rule that applies to all cases.

Highlight: Bézout's Identity

The first problem of the session served as a gateway to advanced Number Theory. Through a process of generalization, students (primarily from 6th and 7th grades) were guided to discover the foundations of **Bézout's Theorem**.

$$ax + by = \gcd(a, b)$$

The realization that integers x and y can be found to satisfy this equation was a pivotal ”eye-opening” moment, introducing students to concepts typically reserved for undergraduate mathematics.

Algebraic Exploration

Following the work on Number Theory, the session transitioned into algebraic problems that required students to apply similar logic. By observing how variables interacted in simple cases, students were able to predict behavior in much more complex algebraic expressions.

Conclusion

The session was truly insightful. It demonstrated that with the right guidance, even young students in middle school are capable of grasping profound mathematical theorems. By focusing on the "why" and the "always," Mr. Bhamre opened a door to the beauty of formal mathematical proof.

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Raising A Mathematician Foundation™

Nashik Mathematics Circle

Problem Sheet **7^{th} February 2026**

- Bhas Bhamre, bbhasnsk@gmail.com

P-1: **Wait for weights!**

We have unlimited supply of 3 *kg* and 8 *kg* weights.

(1) How can we make an average weight of 6 *kg*?

(2) What are the integer average weight that can be made from these weights?

(3) What is the greatest integer average weight with these weights?

(4) What is the smallest integer average with these weights?

(5) Solve these problems (1) to (4) with unlimited supply of weights (7 *kg*, 2 *kg*).

(6) Solve these problems (1) to (4) with unlimited supply of weights (17 *kg*, 57 *kg*).

(7) Solve these problems (1) to (4) with unlimited supply of weights (28 *kg*, 49 *kg*).

(8) Solve these problems (1) to (4) with unlimited supply of weights (a *kg*, b *kg*).

Any conjecture(s) here? – Write down!

P-2: **Playing with numbers (in different ways) is always a Fun!**

In a certain street, there are more than fifty but less than five hundred houses in a row, numbered from 1, 2, 3 etc. consecutively. There is a house in the street, the sum of all the house numbers on the left side of which is equal to the sum of all house numbers on its right side. Find the number of this house.

In addition to this, find a general solution to this problem, and find all solutions where the total number of houses is less than 1000. [**Note:** In mathematics generalisation has great importance!]

Some historical background:

This is a very famous puzzle. This is quoted in the biography of S. Ramanujan.

This problem was first published in the English magazine 'Strand' in December 1914. A King's college student, P.C. Mahalanobis, saw this puzzle in the magazine, solved it by trial and error, and decided to test the legendary mathematician Srinivasa Ramanujan. Ramanujan was stirring vegetables in a frying pan over the kitchen fire when Mahalanobis read this problem to him. After listening to this problem, still stirring vegetables, Ramanujan asked Mahalanobis to take down the solution, and gave the general solution to the problem, not just the one with the given constraints.

P-3: **More fun in Number-Factor(y)!**

There are 1000 bulbs in a room numbered 1 to 1000, each one having a numbered switch to turn the bulb on or off. Also, there are 1000 people numbered 1 to 1000.

Each of the 1000 persons go into the room, at random, once and only once, and toggles (i.e., if the bulb was off, turns it on; if it was on, turns it off.) all the switches that are multiples of his/her number.

For example, the person numbered 150 toggles bulbs numbered 150, 300, 450, 600, 750 and 900 as these are multiples of 150.

All the bulbs are off at the start, and each person goes exactly once to the room.

What will be the state at the end, i.e., which bulbs will be on and which will be off?

Generalise your answer!

P-4: **I like counting!**

How many nine-digit numbers that has all the nine digits 1 to 9? If we write that in the ascending order, which will be the 100000^{th} one?

Note: Besides directly working on the nine-digit numbers, try to work on three-digit numbers formed by digits 1, 2, 3; four-digit numbers formed by 1, 2, 3, 4; etc. And try to get any convenient n^{th} number if they are arranged in their ascending order in each case.

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