

# Maths Circle India

TIFR-STCS Maths Circle Team

Session 3: May 20, 2022

## 1 Paintings

It is summer vacation and Gopal is again visiting his uncle, aunt, and his little cousin, Jiya. In his previous vacation, he had made several friends in the neighbourhood, and now he goes to play cricket with them every evening. But now the vacations are about to end, and Gopal is yet to complete his vacation homework for drawing and painting. Sitting by the window with a couple of white sheets and water colors, Gopal gets the idea to paint a scenery with blue sky, and green grass, with faint and snowy mountains in the background. He has just taken out his blue and green paints in a tray, and water in a bowl, when his friends call him for the game. Excited, he rushes to play cricket leaving the paints and sheets open in the hall.

All this while Jiya had been sleeping quietly in the hall. But due to the slamming of the door, she gets up. She sees the colors lying on the floor. Intrigued, she dips her hands, one in blue, other in green, and randomly places her hands on all the sheets that Gopal had left behind and her face, coloring all of them completely with random patterns of green and blue.

On returning, Gopal notices the random patterns made by Jiya on his drawing sheets and makes a curious observation - "No matter how Jiya colored the sheets, I can always find at least 2 points, exactly 1 cm apart that are both either blue, or both green".

Can you help Gopal understand this observation?