

# Maths Circle Explorations: Session 5

TIFR, Mumbai

24<sup>th</sup> December 2021

## Problem 1

### Metrics and Distances

In a piece of paper ( $\mathbb{R}^2$ ) one measures distance between two points  $(x_1, y_1)$  and  $(x_2, y_2)$  by the “length” of the straight line segment joining the two points. By Pythagoras Theorem this is given by the formula

$$\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}.$$

Now, say, one defines in a colony, two people are neighbors if the distance between their houses is less than 2 units.

1. Are you your neighbor ?
2. If I am your neighbor then are you my neighbor ?
3. Is there anyone other than you who is at a distance 0 from you ?
4. Can you have a group of neighbors who are neighbor to each other ? Can you ‘describe’ this collection ?

This idea will be further developed during the session.