

RAM Maths Circle

August 31, 2025

Nagpur

Introduction

The session on probability aimed to introduce participants to the fundamental concepts of chance and uncertainty. It focused on understanding how outcomes can be predicted, analyzed, and quantified using mathematical tools. Through a mix of theory and illustrative examples, the session highlighted the importance of logical reasoning, critical thinking, and the application of probability in real-life situations, enabling participants to make informed decisions under uncertainty.

1 Monty hall problem

A game show host presents you with three closed doors. Behind one door is a car, and behind the other two doors are goats. You choose one door.

After your choice, the host, who knows what is behind each door, opens one of the two remaining doors, always revealing a goat.

Now, you are given a choice:

- Stick with your original door, or
- Switch to the other unopened door.

What is the probability of winning the car if you switch, and what is the probability if you stay? Which strategy is better?

2 Birthday Paradox:

In a group of 23 people, what is the probability that at least two share the same birthday? Assume 365 days and ignore leap years.

3 Problem:

In a population, the probability of a person having a certain disease is 1%.

A medical test for this disease has the following properties:

- If the disease is present, the test always gives a positive result.
- If the disease is absent, the test gives a false positive result in 10% of cases.

If a randomly selected person tests positive, what is the probability that the person actually has the disease?

