

RAM Maths Circle - Nashik

Bhas Bhamre Academy

Session - 4

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Introduction

This problem sheet contains a collection of challenging problems from probability, combinatorics, logical reasoning, and mathematical thinking. Students are encouraged to carefully analyze each question, look for patterns, justify their arguments, and explore multiple approaches whenever possible.

Problem Sheet

P-1

I've got lottery balls numbered from 1 to 100 in my tombola. I'm going to remove two numbers at random from the bag and replace them with a lottery ball which has the difference between these two numbers on it. I repeat this process. Is it possible for me to be left with the number 1 at the end? Is it possible for me to be left with the number 50 at the end? Which numbers from 1 to 100 are achievable?

P-2

You and your friend both throw a fair die. What is the probability that:

- i) you get a higher number?
- ii) you get a number greater than your friend by exactly 2?
- iii) the product of the two numbers is even?
- iv) the difference between the two numbers is a square number?
- v) the difference between the two numbers is a square number, knowing both dice have 100 faces (from 1 to 100)?

P-3

If 5 balls are placed at random into 5 buckets, what is the probability that exactly one bucket remains empty?

P-4

What is the fewest number of weights needed to be able to balance any weight from 1 to 40 on a two-sided scale?

P-5

How many people do you need, so that the probability of two having the same birthday is at least 50%?

