

# RAM Maths Circle

August 03, 2025

Nagpur

## Introduction

These two problems are designed to challenge logical reasoning and problem-solving skills through creative constraints and recursive thinking. Both problems encourage the use of step-by-step deduction, modular arithmetic, and iterative reasoning to arrive at a valid solution.

## Problem 1: Cake Cutting Problem

A cake is to be cut and distributed equally among 5 people.

**Constraint:** You are not allowed to cut the cake into 5 equal parts, or into any number of pieces that is a multiple of 5.

**Example:** If the cake is cut into 7 equal slices, each of the 5 people receives one full slice. The remaining 2 slices must then be cut into exactly 7 equal parts each. These smaller parts are then distributed equally among the 5 people.

**Objective:** Find a way to cut and distribute the cake so that each person receives exactly one-fifth of the total cake, while adhering to the constraint.

## Problem 2: Coconut Problem

Five sailors land on an island and collect a large pile of coconuts. There is also a monkey on the island.

At night, all the sailors go to sleep. During the night, the first sailor wakes up, divides the pile into 5 equal parts, and finds that one coconut is left over. He gives the extra coconut to the monkey, hides his share, and goes back to sleep.

Then the second sailor wakes up and does the same:

- He divides the remaining coconuts into 5 equal parts.
- One coconut remains, which he gives to the monkey.
- He takes his share, hides it, and returns to sleep.

This process is repeated in the same way by the third, fourth, and fifth sailors.

In the morning, the remaining coconuts are evenly divided among all five sailors, with no coconut left over.

**Objective:** Determine the least number of coconuts that could have been in the original pile.

