MTH208: Quiz 1

Instructions:

- Download the template file `q1_template.R` and rename it `q1_ID.R`, where `ID` stands for your roll number (for example, if your roll number is `123456`, then the filename is `q1_123456.R`). Complete the given tasks by filling in the gaps in the template file.
- Only the codes without any bugs with get the credit, so make sure to run and test your code before submission.
- **Finish your work by 2:35 pm** and upload/submit the **renamed template file q1_ID.R** on the Quiz 1 page on the helloIITK. **Submission by email or any mode other than upload on helloIITK will not be accepted.**

Problem 1: Rainfall Analysis in Kanpur

You are provided with a CSV file `kanpur_rainfall.csv` containing historical monthly rainfall data (in millimeters) for Kanpur. The file has the following structure:

Year	Month	Rainfall_mm
2018	Jan	12.3
2018	Feb	5.8
…	…	…

Task

Find the month with maximum average rainfall across all years in the dataset.

Problem 2: Winning a Vollyball Game

In a simplified volleyball game, two players, Ajay and Bharat, compete for points.

The rules are:

1. A player wins the game if they have at least 15 points and a 2-point lead over the opponent.

2. The game continues until these conditions are met.

Suppose Ajay has probability p of winning a rally, and Bharat has probability $1 - p$.

Task

Write an R function `volleyball` that simulates one game and returns the total number of rallies played until the game ends. The function should take p as input.

For each value of $p = 0.50, 0.55, 0.60$, simulate 2000 games and store the results in a vector (e.g., `rallies_vec`). Compute the average number of rallies played and store in a named vector `ans` such that `ans["0.50"]` gives the average for $p = 0.50$, etc.
