

OOPs:

- 1) Create S3 and S4 classes to create objects that contain the information of students in school. Each object should contain a slot for the name and roll number of the student along with his/her marks in maths, physics, and chemistry.
 - a) Create three such student profiles.
 - b) Create your own print() method for the student profiles. See the cat() function to better implement this function.
 - c) Create a percentage() function that calculates the percentage marks scored by the students.
 - d) Create a function that takes in a list of objects (students) and returns the top ranker based on percentage.
 - e) Is it better to create a single object with all the information, or multiple objects with the information of each student individually? Discuss the pros and cons.

Recursive functions:

- 1) Write a function that takes in an input “n” such that it returns the n^{th} number in the Fibonacci series. Can you append the calculated result into a list and globally update it?
- 2) Write a function to convert a decimal number into a binary number.

Efficient looping in R:

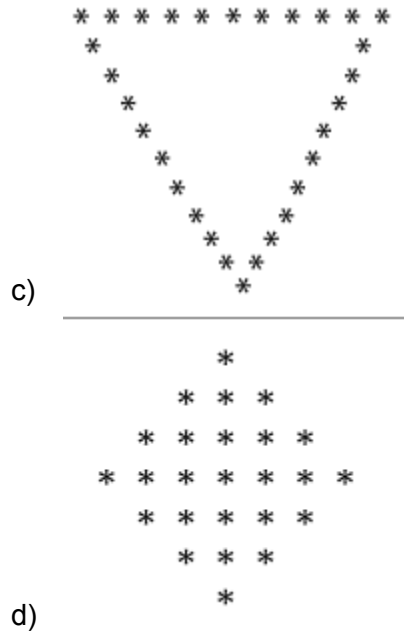
- 1) Write a function to multiply two 3*3 matrices using a for loop and lapply with an argument type such that you choose which type of looping is to be applied. The function should be something like this: ``%*%` <- function(matrix_a, matrix_b, type) {#write logic here}`
- 2) Write a function that takes “n” as an argument to define the number of rows, and you have to print the following:

a)

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b)

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Logical questions for expanding your thinking:

- 1) There are 100 doors in a row, and all doors are initially closed. A person walks through all doors multiple times and toggles (if open then close, if closed then open) them in the following way:

In the first walk, the person toggles every door.

In the second walk, the person toggles every second door, i.e., 2nd, 4th, 6th, 8th, ...

In the third walk, the person toggles every third door, i.e. 3rd, 6th, 9th, ...

Likewise, in the 100th walk, the person toggles the 100th door.

Which doors are open at the end?

- 2) You have eight identical balls, with one being heavier than the rest. You cannot differentiate the balls by using any of your senses, and hence you are given a weighing scale to identify the heavier ball. What is the minimum number of weighings you need to perform in order to find out which ball is heavier, and why?
- 3) Suppose you're on a game show, and you're given the choice of three doors: Behind one door is a car; behind the others are goats. You pick a door, say No. 1, and the host, who knows what's behind the doors, opens another door, say No. 3, which has a goat. He then says to you, "Do you want to pick door No. 2?" Is it to your advantage to switch your choice?

- 4) You have 25 horses, and you have a racetrack on which you can race five horses at a time. What is the minimum number of races you need to conduct to know your top three fastest horses? Answer: 7