RAM MATHS CIRCLE - BANGALORE

Session 1 and 2

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Playing with grids

Consider the following 3 x 3 grid.

2	6	9
1	3	8
5	7	4

Here the numbers 1 to 9 are filled, each exactly once. Some rows (read left to right) are **increasing**. E.g the first and second row. Some columns (read top to bottom) are **decreasing**. In the above example, the third column is decreasing. Other rows and columns are neither increasing nor decreasing. We will call them **mixed**.

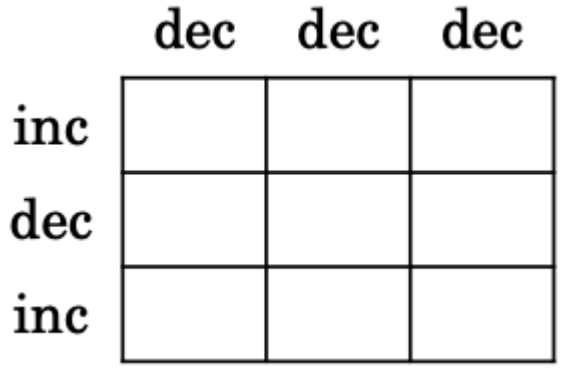
Question 1: Is it possible to fill the 3 x 3 grid using each digit from 1 to 9 exactly once such that all the three rows are increasing, and all the three columns are decreasing?

	dec	dec	dec
inc			
inc			
inc			

There are many solutions to the above challenge.

Question 2: How many distinct solutions are there to Question 1? Find all of them.

Question 4: Is there a systematic way to list all the solutions?
Suppose we impose conditions on individual rows and columns. For example, we say the first and third row must be increasing, while the second row and all the columns are decreasing. Assume that we impose a condition on each row and column.



Question 5: How many different sets of conditions can we come up with?

Question 6: Are all of these grids solvable? In other words, does a solution exist for any set of conditions? Justify your answer.

Question 7: Can you find a method to find the solution given the set of conditions?