Etude 10: Epidemic Report

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Part 2 of this etude is to determine the minimum number of initially sick individuals so that every vulnerable individual gets sick in a given universe.

This task is much simpler if there are no immune individuals in the initial given universe. This reduces the number of variables in the relationship, making the relationship easier to calculate. To find this number, I simply drew a set of grids with increasing numbers of rows and columns, and determined the relationship between the numbers of rows and columns and minimum sick individuals required to make every vulnerable individual sick. This resulted in the formula:

$$x = \frac{r + c}{2}$$

Where x = minimum number of initially sick individuals, r = number of rows in the grid, and c = number of columns in the grid. If $r + c$ is an odd number, it should be rounded **up** to the nearest even number.

However, when the number of immune individuals in the initial state is involved, this complicates the problem as it introduces another variable, which exponentially increases the total number of possible states. Thus, solving this problem with manual trial and error is unfeasible.

To find the relationship between the size of the grid, number of immune individuals, and minimum number of sick individuals, I would create a program that would compute every possible state given a grid size and immune individuals up to a certain grid size. For each given grid, the minimum number of sick individuals in all the possible states would be stored. Then, I would use the Pandas Python library to find the correlation between the dependent variable x and independent variables c, r, and i (immune individuals).