Coding Challenge:

X is the minimum number of individuals who must initially be made sick.

m is the number of rows in the grid.

n is the number of columns in the grid.

This equation can be derived by considering the worst-case scenario, where the infected individuals are all lined up along one edge of the grid. In this case, each infected individual can infect two others in the next iteration, and so on. Therefore, the number of infected individuals will double in each iteration until the entire grid is infected.

To ensure that the entire grid is infected, we need to make sure that there are enough infected individuals in the initial iteration to cause a chain reaction that will eventually reach every non-immune individual. The equation $X = m + n - 2$ takes this into account by calculating the number of individuals needed to create two lines of infected individuals, one along each edge of the grid. These two lines will then infect each other in the next iteration, and so on, until the entire grid is infected.

The -2 term in the equation accounts for the fact that the two corner individuals in the grid are counted twice, once for each of the two lines they are on. Therefore, we need to subtract 2 from the total number of individuals to avoid overcounting them.

This equation is a general solution that will work for any grid size. However, it is important to note that it is only a lower bound on the number of individuals that need to be infected. In some cases, it may be possible to infect the entire grid with fewer individuals than this equation suggests.

Bonus point:

If some individuals are initially immune in the grid, the equation for the minimum number of infected individuals (X) needs to be adjusted to account for the reduced susceptible population. Subtract the number of immune individuals:

The simplest approach is to directly subtract the number of immune individuals (I) from the initial equation:

$X = m + n - 2 - I$

This assumes that the immune individuals are randomly distributed and don't significantly affect the infection spread dynamics. They act as "empty spaces" hindering the spread.