

**MATH 8**  
**ASSIGNMENT 7: LOGIC 2: LOGIC GATES**

NOV 8, 2020

BONUS PROBLEMS

1. Four people sit in a room, each of them wearing a nametag given to them. The nametag is supposed to have their name on it, but some of them are blank.

Nobody is allowed to look at their own nametag, so the people with blank tags don't know that theirs is blank.

Nobody talks to each other (or communicates at all), other than being allowed to read everyone else's name tags.

A moderator enters the room and tells the four people that if any of them figure out that their name tag is blank, they are allowed to leave the room within one minute.

It turns out, all their nametags are blank. The moderator says: at least one of your tags is blank.

Assuming everyone is logical and wants to leave the room (but those with actual name tags may not leave), can they figure out that their tags are all blank?

2. In chess, rooks are pieces that occupy one square on a grid and may move to any other square in the same row or column as them, as one move. If a piece is able to move onto another piece, then we say it is 'attacking' or 'can capture' that piece.

Now, make a three dimensional grid of cubic cells (like a rubik's cube but bigger), where a rook occupies one cell and can attack any piece in the same row, column, or tower (vertical line).

How many rooks can one put on an 8x8x8 chess cube so that none of them are attacking each other?