

Playing 3-D Tic Tac Toe remotely

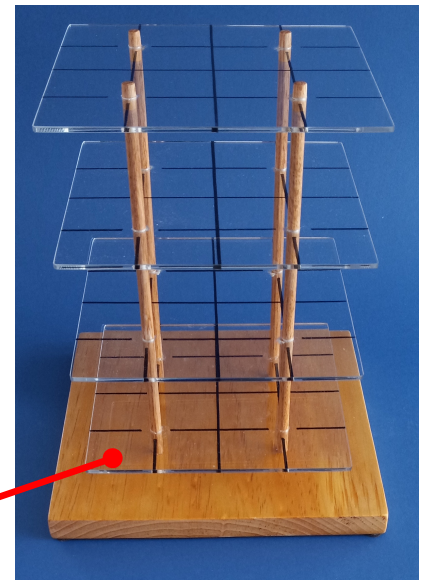
You can play 3-D Tic Tac Toe with a friend who is somewhere else as long as you each have a board and a way to communicate: phone, zoom, text, email, etc.

First, you need to label both boards in exactly the same way. There are 3 possible methods to do this described below. You can choose one of these, or you can make up your own system.

Fill out and stick on the included labels to name the spaces, or you can use a dry-erase marker.

To keep the numbering simple, for the first 2 methods we use the bottom left corner as the starting point, or origin. This is different than the origin you are using if you are studying 3-dimensional coordinates in Geometry. (If your Geometry teacher questions this, you can explain that we want only positive numbers going left to right and bottom to top.)

Origin



You play one move at a time. Let's say the first player chooses Os, or spheres. That player places a sphere on a space and announces that space to the other player by phone, text, or whatever. The second player then places a sphere on the same space on his or her own board. The second player then announces where the X, or cross, is being placed. The first player in turn places the X in that space on that board, and then announces the space for the next O. Continue play using whichever set of rules you've decided on.

Method 1: Sequential numbering

Starting at the bottom left corner, you simply number each square 1 – 64 for a 4 by 4 by 4 board.

Start on the bottom level at the left edge of the row closest to you. Number the spaces going across to the right, then move to the left edge of the next row. The spaces on the bottom level will be numbered 1 – 16. The 16 will be at the right corner, in the row furthest away from you.

Move to the next level up and continue. The spaces on that level will be numbered 17 – 32. The third level up will contain 33 – 48, and the fourth or top level will have 49 – 64.

Note that 17 is directly above 1, 21 is directly above 5, and so on. There is a difference of 16 between one number and the number directly above or below it.

Level 4	61	62	63	64
	57	58	59	60
	53	54	55	56
	49	50	51	52
Level 3	45	46	47	48
	41	42	43	44
	37	38	39	40
	33	34	35	36
Level 2	29	30	31	32
	25	26	27	28
	21	22	23	24
	17	18	19	20
Level 1	13	14	15	16
	9	10	11	12
	5	6	7	8
	1	2	3	4

Method 2: Naming the Levels, Rows, and Spaces

This is a simplified coordinate system. We will give a name to each level, row, and space.

We will then indicate a space using those names in that order:
Level, Row, Space.

We will use Roman Numerals to name the levels.

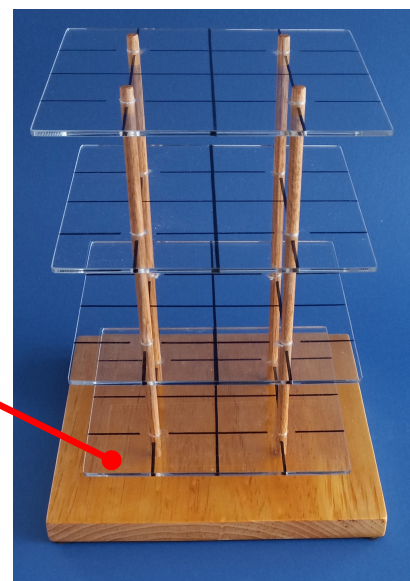
The bottom Level is I.

2nd level going up = II.

3rd level = III.

4th (Top) level = IV.

Origin

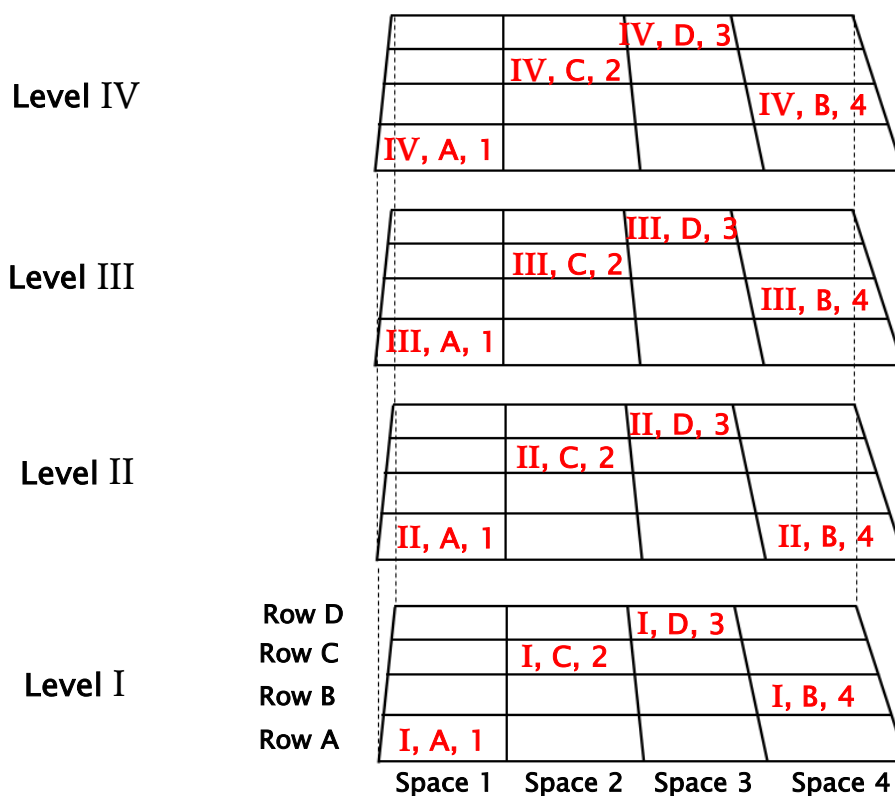


On each level, the front row is A. The next row going back is B, then C, and then D.

In each row, the left space is 1. The next spaces going across left to right are 2, 3, and 4.

Instead of ordered pairs that are used in 2-dimensional Geometry, we use ordered **triplets** -- 3 names in order: Roman Numeral, Letter, Number.

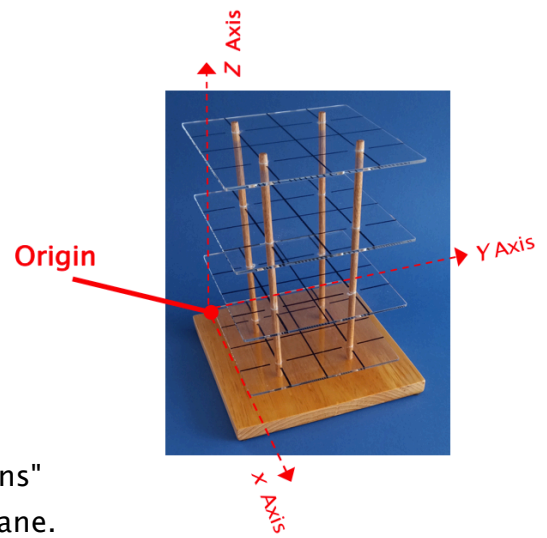
These name Level, Row, and Space in that order.



Method 3: 3-Dimensional Coordinates

This is the standard 3-dimensional system using x , y , z coordinates in the usual order. We are using Octant 1, so all the numbers are positive.

The origin is the "top left" corner in the bottom level. This is the row furthest to the back, at the left edge.



Both the x and y axes are horizontal. Their "directions" aren't the same as on the 2-dimensional coordinate plane.

The direction of the x axis is "back to front" along the left edge of the acrylic square. The x coordinate gets larger as it goes forward, towards you.

The y axis goes left to right along the back edge of the acrylic square, starting at the x axis. The y coordinate gets larger as it goes right.

The z axis goes straight up from the origin. The z coordinate gets larger as it goes up.

So the ordered triplet names, in order: Row, Space, Level
Remember that we are labeling **spaces**, not lines or intersections.

