Dear \textit{Crux} readers,

When was the last time you played a game of tic-tac-toe? It’s been a while, hasn’t it? Once you’ve figured out how not to lose a game, you were done with it. But have you tried expanding the board? Below, I offer you a couple of modifications of the original tic-tac-toe game with the hope of bringing back some of the game’s original charm.

First, we might want to bump our two-dimensional game into three dimensions. Suppose you are playing on a $3 \times 3 \times 3$ cube consisting of 27 $1 \times 1 \times 1$ little cubes. Each turn, a player puts their symbol inside one small cube and the goal of the game is as usual: to get three of your symbols in a line. Who has the winning strategy, the first player or the second one?

Now, suppose we decide to stick to two dimensions and want to avoid simply expanding the board. So we decide to go multi scale. Let’s label the cells on any $3 \times 3$ board with numbers 1 through 9 left to right from the top row down. We will play on a big $3 \times 3$ board with each cell containing a small $3 \times 3$ tic-tac-toe board. The first player gets to place their symbol in any unused cell within one of the small boards, say in small board $j$ cell $i$. The next player is then forced into playing on small board $i$ of a big board. To win, a player must win on three small boards in a line. So what’s the winning strategy? (You can check out a description of this game with drawings here: \url{http://mathwithbaddrawings.com/ultimate-tic-tac-toe-original-post/})

How about a game of tic-tac-toe in disguise? You have two players and numbers 1 through 9. Each turn, a player picks a number (he/she might want to write them down to keep track). The winner is the first person to have in the selection three numbers that add up to 15. Figure out how this is like tic-tac-toe and you will quickly know who has the winning strategy.

I can’t take credit for these games. The first one already exists and can be purchased at game stores - just search for 3D tic-tac-toe online. The second was passed on to me by Eric Cytrynbaum, who watched graduate students playing it at the Institute for Applied Mathematics’ Annual Retreat. The third, I most recently saw in a presentation by Richard Hoshino and we both originally saw it being presented by Luis Goddyn at a Combinatorial Potlatch at University of Victoria. Good games, like good gossip, travel around.

Do you have any interesting modifications of familiar games? Please share!

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