MAD

Mad is a two-player board game using a rectangular board of 6 × 4 or 5 × 5 squares. Each player controls eight pieces (red or blue) marked with three digits, each being either 1 or 2: the M digit (motion), the A digit (attack) and the D digit (defense).

Players alternate moves; reds begin. On his or her turn, a player *must* make *one and only one* of three possible moves: ***moving*** a single piece, ***swapping*** two pieces or ***rotating*** three pieces. Moving a piece may result in ***ejecting*** an opponent's piece. Exception (*positioning turn*): in the first turn of each player (and only in the first turn), moving a single piece is forbidden, but on the other hand passing is allowed.

A piece removed from the board is said to be ***exiled***. Exile can result from ejection by an opposing piece, but also from a permutation or rotation as explained below.

The goal of the game is the exile of the opponent's piece 111.

The movement. A piece whose M digit is 1 can move 1 square. A piece whose M digit is 2 can move 1 *or* 2 squares. Movements are performed either horizontally or vertically, in all directions. When moving a piece two squares, the piece can change directions in-between the two squares, but may not make a U turn; the first square must be vacant.

The destination must be vacant *or* occupied by an opponent's piece whose D digit is less than or equal to the A digit of the moving piece. So, a piece whose A digit is 1 cannot go to a square occupied by a piece whose D digit is 2. When a piece arrives on a square occupied by an opponent's piece, the moving piece replaces the opponent's piece and the latter is ejected from the board.

The permutation. A permutation consists in swapping the location of two complementary pieces. The pairs of *complementary* pieces are (111, 222), (121, 212), (112, 221) and (211, 122). Permutation is allowed if the two pieces are on the board *or* if only one piece is on the board. In the second case, the one that was on the board is exiled, and the one that was exiled takes its place.

The rotation. It consists of exchanging the locations of the three *minor* pieces (112, 121, 211) or of the three *major* pieces (221, 212, 122). More precisely, one of the three pieces takes the place of one of the other two, which itself takes the place of the third, which itself takes the place of the first. Rotation is allowed if all three pieces are on the board *or* only two are on the board. In this second case, the one that was exiled takes the place of one of those on the board, which itself takes the place of the other piece on the board, which itself is exiled.

A singularity (*bonus move*): If a player moves a piece by a *single* square and if the destination square is on the *last* row of four or five squares (the one on the opponent's side), he or she *may* immediately perform a permutation or a rotation with that piece.

When the piece 111 of a player is exiled, the game ends and his or her opponent wins. This is the main (and usual) way to win. Nevertheless if the number of pieces on the board remains constant for 30 consecutive turns (15 for each player), the game ends and the player who made the last ejection wins (or if there has been no ejection at all, blues win); this is however only considered as a *semi-victory* (counting for ½ point).

221	111	211	222	212
121		122		112
121		122		112
221	111	211	222	212

Initial position 5×5

221	111	222	212
121	122	211	112
121	122	211	112
221	111	222	212

initial position 6×4