- hex 100x100: see webnotes hex:properties
- hex, after black b2: top-bottom vc with carrier {b1,c1,a3,b3}
- hex, white-to-play: white mustplay must intersect winning black semi-connection, carrier {b2} union previous answer only win is white b3, after this move, winning white vc here:

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left  side:  (a3)   or   ((b1) and (a1 or a2) and (c1 or b2))
right side:  symmetric
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- nim transition diagram: answer in asn 2 solutions
- minimax search: the 1st number is within a few per cent of the 2nd number, so we know that the minimax did not use isomorphism checking (bigger reduction) or transposition table (bigger reduction), 2nd number is number of paths in search tree from initial position to full board, not all paths will be searched to end, because terminal position might occur before board is full
- minimax code: see webnotes ttt:mmx
- ttt: win for x, only 2 winning moves: b2 or c3. best reply is to prevent x from winning on next move
- root child with best win rate, and most visits, is unique: a3

  selection: at root, max picks a3; at next level, min picks b2 or b3 or c3 (all have win rate .5, using formula $f(w,v) = (w+t)/(v+2t)$) from a3-b2 max picks b3, from a3-b2-b3 min picks c2 or c3

  from c3, expand, children b2,b3,c1,c2; pick one of these at random, simulate, result at this node is 0 1 or 1 1; now back up at parent c2, parent a3, parent r
- 4 nodes, choose one, then choose 01 or 11, so 4x2 = 8 correct answers

  each time execution reaches r-b3, min chooses a3 (only node with winrate $f(w,v) < .5$, but this is a terminal position, black wins, so simulation returns loss. so number of visits increases, number of wins at a3 stays at 0, so final number wins at b3 will stay exactly 1