SET® AND MATRIX ALGEBRA

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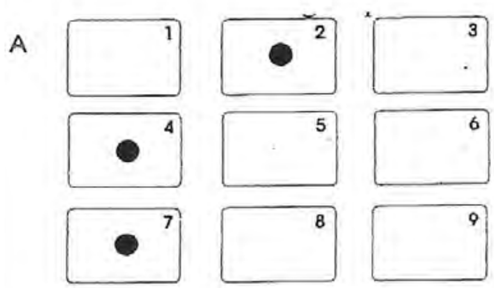
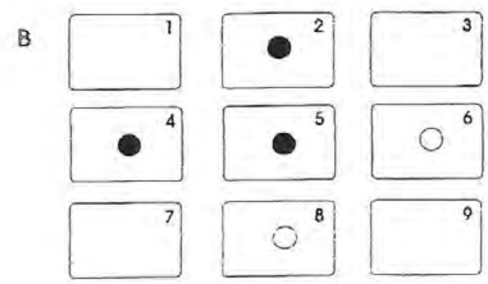
The following two tables represent ways of aligning SET cards on a tic-tac-toe type board to make a magic square of *SET*s.

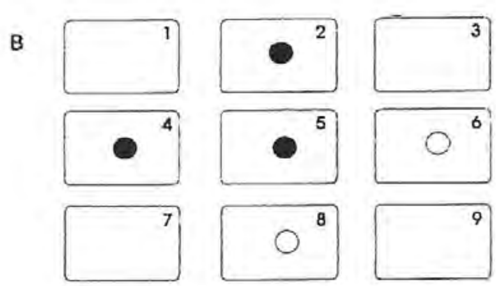


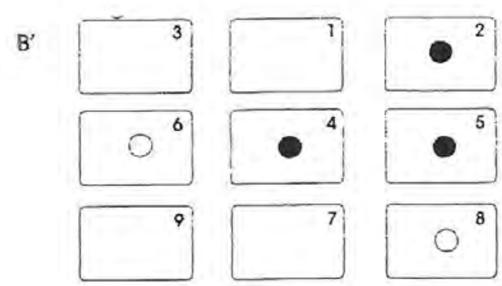


In both tables three SET cards are selected that in themselves do not make a *SET*. These cards are arranged on the board so that two of the cards are in a line, and the third card is laid anywhere except the third position in that line. When the two cards in that line are known, the third card in that line can be determined by the rules of SET. That card now forms a relation with the other card on the board, and the third card in that line can now be determined. Subsequently the entire board can be filled in.

In Table A cards #4 and #7 define card #1. Then cards #1 and #2 define card #3. Cards #3 and #7 define card #5, and so on.

In table B cards #2 and #5 define #8. Cards #4 and #5 define #6. Now it does not appear that two cards are in a line. But this table also has a unique solution. Two methods are available to finish the puzzle: trial and error (until every row, column, and diagonal makes a *SET*), or using a concept from matrix algebra.





In the above two tables matrix B has been transformed into matrix B'. In matrix algebra the absolute value of matrix B is negative the absolute value of matrix B' (/B/ = - /B'/) – any row or column transformation will work. In this transformed state one can now see that cards #2 and #4 will define card #9, and so on. The transformation can now be returned to the original table.

By doing a series of row and column transformations one can then see that four additional *SETs* that are not so obvious on the original board. In addition to each row, column, and diagonal being a *SET*, the four additional patterns are: 1) cards #2, #4, and #9; 2) cards #2, #6, and #7; #) cards #1, #6, and #8; 4) cards #3, #4, and #8 – a total of twelve *SETs* in nine cards.