Problem #11099 *Proposed by Matthias Beck (Max-Planck Institute, Bonn), Richard Ehrenborg (University of Kentucky), and Thomas Zaslavsky (Binghamton University of SUNY).* A 3×3 square array of nine distinct integers is called *semimagic* if all the row and column sums are equal, and it is *magic* if in addition the two diagonals have the same sum as the rows and columns. Let's make out of the square a set of three 3-sided dice, as follows: the sides of die i are labelled with the numbers in row i. We say die i *beats* die j if we expect die i to show a bigger number than die j more than half the time.

(a) Suppose the square is a magic square whose entries are $1, 2, \ldots, 9$. Prove that no die beats the other two and no die loses to the other two. Every die beats one die and loses to the other die.

(b) Show the same is true if the entries are any distinct integers that form a magic square.

(c) Suppose the square is a semimagic square whose entries are $1, 2, \ldots, 9$. Show the same conclusion holds as in (a) and (b).

(d) But, there are semimagic squares for which one die beats both other dice.

(e) * What happens with larger magic and semimagic squares?