A PERFECT MAGIC SQUARE

By Jeremiah Farrell

For any positive integer \( n \) let \( s(n) \) be the sum of the divisors of \( n \). Then \( n \) is said to be perfect in case \( s(n) - n = n \). For example \( 6 = 1 + 2 + 3 \) and \( 28 = 1 + 2 + 4 + 7 + 14 \) are the first two perfects. When that sum is less than \( n \) the number is deficient like \( n = 4 \) or any prime and when the sum is greater like \( n = 12 \) or \( 18 \) the number is called abundant. It is known that any multiple of an abundant is abundant so there are infinitely many deficient or abundant numbers. However, it is not known whether the number of perfect numbers is infinite.

Our magic square is composed of 16 different dominoes from a double nine set. Each domino consists of one of the numbers 0, 1, 2, 3 (note the perfect sum 6) and one of the numbers 4, 5, 6 or 7. The magic constant when the pips are added is the perfect 28.

Not only every row and column sum to 28 but also all eight diagonals (including the 2-2 and 3-1) sum to 28. In addition the four corners of every square of size 2x2, 3x3 and 4x4 sum to the constant. Note also that the four corners of every 2x4 rectangle have constant sum 28. This square is a variation of magic squares called “Most Perfect” by England’s Kathleen Ollerenshaw (1912-2014).
More Magic with the Perfect Square

The five colored strips are to be folded so that every domino occurs on the front side or the back side. A subject is asked to turn any strips of their choice over and then secretly chose any one of the 16 dominoes. The subject divides the slips into two parts one that has the choice and one that does not. The magician is not told which is which. But the magician quickly correctly names the subject’s selection.

Method: The square can be thought of as a torus or donut shape with the top and bottom red edges joined and then the left and right blue edges also. Now no matter how the strips are turned there is exactly one “key” domino that either appears on all or appears on none of them. For example the 3-6 occurs on the right of each strip as shown and would therefore be the key. Note which strips are turned by the subject and trace these from 3-6 to obtain the new key. The white strip always refers to a unique diagonal hop. Suppose for example the subject turns red, yellow and white. The new key becomes 1-4 by going from 3-6 to 0-4 to 2-7 to 1-4. Any order of the strips leads to the new key. Note also that 1-4 is arrived from 3-6 via blue and green 3-6 to 2-5 to 1-4.

As a further magic effect use the nine domino squares to construct the unique ancient Lo Shu magic square below.
Before this square is constructed we encode the new key from the subject's choice of strip layouts – here 1-4. We use the 2 and 3 alone with the 6 and 7 to encode as:

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0 1 2
3
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This 3x3 square can now be shown by phone to an accomplice who can name 1-4 as the final ending.

The final ending uses the colored circle as the guide. The subject can start at any domino and note the color strips it is on to trace the edges on the circle. (white traces the black lines.) This will always end on the key, here 1-4.
The above effects can also be done with playing cards. Setting 0, 1, 2 and 3 as A, K, Q and J respectively along with 4, 5, 6 and 7 as hearts, spades, diamonds and clubs make the 4x4 square magic as well as the five colored strips and magic circle. Every former trick carries over unchanged.

And even the mindreading effect on the 3x3 square can be done. The square can be constructed with Ace through nine of a suit. Note that spades, hearts or clubs, but not diamonds, have certain cards that can be “up” or “down” and this can encode the subject’s earlier choice or what can be discovered on the wheel. In fact there can be as many as six different cards used in the coding which could choose one of 64 different items. That is, one of the 64 squares of a chessboard.