Welcome to Critical Math, a series of reports that describes applications of mathematic concepts to everyday life. Critical Math is a partner between the students in Math Appreciation classes at New Mexico State and KRWG radio. On today's installment of Critical Math, the research was conducted by NMSU students, NAMES DELETED. Today's topic on Critical Math is: Magic Squares: From Lo Shu to Sudoku.

Sudoku has become increasingly popular among people of all ages. As they struggle to complete a puzzle, they are unaware that they are actually using a math concept that has been around for over 4,000 years. The Chinese tell the legend of the Lo Shu. Floods were overtaking China, and to calm the god of the river Lo, the Chinese offered sacrifices. However each of the sacrifices was rejected by the god. It is said that when a sacrifice was made, a strange turtle rose out of the water. The turtle was strange because it carried a shell with a pattern of numbers, represented by dots that were arranged on a three by three grid. People saw that the grid was the number of sacrifices they were supposed to make. The Chinese called this the Lo Shu and used this pattern in attempts to control the river.

Taking the Chinese example, mathematicians explored this square. The nine square grid is made up of integers 1-9, with each number appearing only once. The sum of the numbers in each, column, row, and diagonal is always 15. The mathematicians decided that they would call this remarkable pattern a magic square.

A square can be considered magic only if the rows, columns, and diagonals add up to a constant. A magic square can be made with all the values of "n", "n" being the number of squares in each row. The square is then called a magic square of the order of n. The Lo Shu is the only magic square of the order of three. However, there can be many squares of other orders. There are 880 magic squares of the order of 4 and over 200,000 magic squares of the order of 5. The only positive number that cannot be the order of a magic square is the number 2.

The Sudoku square is a simpler type of the Lo Shu. The Sudoku story began in the late 19th century, when French puzzle makers began experimenting with removing numbers from magic squares. After much simplification, the puzzle makers came up with Sudoku, a 9 by 9 grid that was made up of 3 by 3 squares in which the numbers 1-9 are not repeated. Of course, Sudoku is not a true magic square because the diagonals do not necessarily add up. But it is still fun to play, and challenges many people each day!

Magic Squares: From Lo Shu to Sudoku was researched by NAMES DELETED for the series Critical Math, a partnership between the students in Math Appreciation classes at New Mexico State University and KRWG Las Cruces. I'm Charles Winnicki, producer of Critical Math. Next week at this time on KRWG Las Cruces, we will explore…