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Peter Staab* (pstaab@fitchburgstate.edu), Dept. of Math, Fitchburg State University, Fitchburg, MA 02130, and **Jared Weed**. *How Many Unique 4 by 4 Natural Magic Squares are There?* Preliminary report.

If we think of a magic squares as matrices, there are 7040 unique natural magic squares that are often classified into one of 12 types, called Dudeney types. Historically, two magic squares are considered equal if you can rotate or reflect one to get the other. In this light each magic square has another 7 related ones, which reduces the total number of unique ones 880. We seek to reduce this number further by finding families of magic squares that are formed by multiplication by permutation matrices. Depending on the Dudeney type of a magic square, there are between 16 and 384 in its family. The determination of the family of every magic square can determine the total number of unique magic squares. Come join us to find the answer to the title question. (Received September 22, 2011)