Motivating students in an introductory matrix algebra course

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Linear algebra is certainly an area of mathematics of increasing importance. Unfortunately, most business and economics students do not appreciate courses in mathematics and statistics. This is particularly true for the (introductory) matrix algebra course because most topics are rather abstract and easy-to-apply examples are difficult to find.

However, magic squares can be very helpful in stimulating students’ interest in matrix algebra and are easy to apply. A magic square of order n is a square arrangement of \( n^2 \) real numbers, such that the sum of the elements in each row, column, and diagonal is equal to a constant \( s \), its magic sum.

Many interesting activities can be carried out in class at very different stages of the course, using a Computer Algebra System to facilitate computations.

Any 3x3 magic square \( M \) can be written as the sum of two matrices, \( M = sG + N \), where \( G = \frac{1}{3}J \) (\( J \) denotes the matrix of ones), and also \( N \) has a simple structure defined by only two real numbers. This allows additional interesting activities.

Magic squares from different times and regions, like the ancient Chinese 3x3 Lo-Shu (4,9,2;3,5,7;8,1,6), will be used as examples in the presentation.