1064-97-38 **Paul E. Becker*** (peb8@psu.edu), School of Science, Penn State Erie, Erie, PA 16563, and **Mark Medwid**. *Matrix Representations in Group Theory and Geometry.*

Computer algebra systems are now widely available. We discuss one aspect of this new reality: Cayley's theorem as an instructional tool connecting abstract algebra, linear algebra, and geometry. The theorem may be broadly stated: each group with n elements is isomorphic to at least one group of permutation matrices. Most small groups are isomorphic to groups of block-diagonal permutation matrices with dimension much less than (n x n). With the aid of computer algebra systems, group theory can be treated as a continuation of introductory linear algebra. Students use the software to create and manipulate matrix groups. The block-diagonal structure provides a simple visual model of underlying subgroup structure. Undergraduates develop fundamental group theory concepts through experimentation. We present Maple worksheets developing the basic definitions of group, subgroup, homomorphism, isomorphism, etc. Further worksheets direct students toward normal subgroups, direct products, and semi-direct products. This approach allows immediate and frequent introduction of group actions. Every matrix group is inherently a group of functions, acting on vectors by multiplication. We conclude by describing a current geometry course which utilizes this approach. (Received August 18, 2010)