1125-B1-417 **Rick Klima*** (klimare@appstate.edu), Department of Mathematical Sciences, 342 Walker Hall, Appalachian State University, Boone, NC 28608, and **Neil Sigmon** (npsigmon@radford.edu), Department of Mathematics and Statistics, P.O. Box 6942, Radford University, Radford, VA 24142. *Enigma: A Combinatorial Analysis and Maple Simulator.*

The German Enigma machine was the most widely used mechanical field cipher during World War II, and is arguably the most famous military cipher ever. The various possibilities for rotors, ring settings, notch positions, reflectors, and plugboard connections combined to give a theoretical number of potential initial configurations of the machine that was astronomical, each resulting in a unique way in which the machine functioned. However, rotors and reflectors with only a very small number of different wirings were never produced, and for most of the war a fixed number of plugboard cables was used. This dramatically reduced the actual number of potential initial configurations of the machine, and was an important contribution to the Allied codebreaking effort at Bletchley Park that resulted in its cryptanalysis. In this talk we will show how combinatorics can be used to determine the number of theoretical and actual potential initial configurations of the Enigma, and demonstrate a Maple simulator of its operation. (Received September 01, 2016)