Researchers in the social sciences currently employ a variety of mathematical/computational models for studying complex systems. Despite the diversity of these models, the majority can be grouped into one of three types: agent (rule-based) modeling, dynamical (equation-based) modeling and statistical (aggregate-based) modeling. The purpose of the current paper is to offer a fourth type: case-based modeling. To do so, we review the SACS Toolkit—a case-based, mixed-method, system clustering, data-compressing toolkit for modeling complex social systems. The SACS Toolkit is comprised of three components: a theoretical blueprint of a complex system (social complexity theory); a set of case-based instructions for modeling complex systems (assemblage); and a recommend list of case-friendly modeling techniques (case-based toolset), e.g., cluster analysis, network analysis, agent-based modeling. Mathematically speaking, the SACS Toolkit defines complex systems as a set of n-dimensional vectors (cases), which researchers compare and contrast, and then condense and cluster to create a low-dimensional model (map) of a complex system's structure and dynamics over time/space. Because the SACS Toolkit is, in part, a data-compression technique that preserves the most important aspects of a complex system's structure and dynamics over time, it works very well with large, complex databases. It is also versatile, allowing researchers to employ a variety of computational techniques in the model building process. To date, while the SACS Toolkit has been used to study several topics, a mathematical outline of its case-based approach to quantitative analysis (along with a case study) has yet to be written—hence the purpose of the current paper.