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The decennial census gives rise to several problems involving mathematics and fair political representation. The constitutional requirement every ten years is to apportion the seats (currently fixed at 435) in the U.S. House of Representatives among the 50 states according to the populations of the states. A superb exposition of the apportionment problem in U.S. history is presented in the forthcoming book "Fair Representation" by M.L. Balinski and H.P. Young, Yale University Press, 1982. Shifts in population figures and changes in the number of representatives brings about the need for redistricting or other reapportionment at the state and local levels of government. The principle of "one person, one vote" is normally enforced at the national and state level so as to require legislative districts of appropriate size. The courts have also ruled that this principle must be enforced at the local level. However, reapportionment at the local level can only be achieved by means of either weighted voting or multimember districts, as well as by redistricting. The former methods may prove desirable in order to have "single-member" (or voting) districts respond to preexisting municipalities of unequal population sizes. Many counties in local government have county boards of representatives in the State have implemented or at least seriously considered weighted voting since the late 1960s. The courts in New York State have accepted the Banzhaf power index (also called the Coleman value or Chow parameters) as an appropriate measure for such weighted voting systems. The goal is to weigh the representatives' votes so that the computed Banzhaf indices are nearly proportional to the corresponding populations. This calculation normally requires the aid of a computer or good programmable calculator. Weighted voting is thus frequently referred to as "computerized voting." Many counties will consequently hire a specialized consultant to undertake such computations. However, since the 1980 census, some counties (e.g., Cortland and Tompkins) have instead asked local mathematicians or computer scientists to determine a suitable set of weights, and at about 25% of the cost of a consultant.

The following study was undertaken in order to introduce a weighted voting system in Tompkins County, New York, in which the authors reside.

