

# Thinking About the Axioms for a group<sup>1</sup>

Choose any group from the library and do the following under the group table tab: Choose **rename elements** under the main menu and rename one of the elements with a name that is already in use for the group. Thus, for example, if the group consists of  $\{1, A, B, C, D, E, F, G\}$  then rename all the Ds to be Es.

- Does the resulting table still have an identity?
- Does the resulting table still have inverses for every element?
- Is the resulting table still a group? Could it ever be the table (admittedly in an unconventional form) for a group?
- If it is not the table for a group then what group axiom(s) now must be violated? Check that this is indeed the case.
- After you try this you will probably see that the program will complain that it cannot find orders for some of the elements. How are the violated axioms part of the proof that in a group every element has a positive power which gives the identity?

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<sup>1</sup>This is a good activity for students to think about before they ever fire up the software. You can have a discussion as to how one in general checks a Cayley table to determine if the axioms hold.