

Group Tables and Inverses

These exercises will start to acquaint you with the group table calculator and lead to some basic properties of inverses.

Groups are accessed by picking a type from the drop-down list, entering some data, and then clicking on *Show Group*.

1. For each of the groups below, find the identity element. Then make a table of elements and their inverses. Each element should have exactly one inverse (know how to prove this), and elements and their inverses can be paired (if a is the inverse of b , then b is the inverse of a – know how to prove this too).
 - (a) Using *By order ...* as the group type, do both groups of order 6.
 - (b) Using *By order ...* as the group type, do all 5 groups of order 8.
 - (c) The group *Mystery ...*, maximum order 16 and group number 64 (henceforth referred to as “Mystery group (16,64)”).
2. You should have noticed that some elements are their own inverses. For each group of order ≤ 10 , determine the number of elements which are their own inverses. Make a conjecture about how these numbers are related to the orders of the groups, and try to prove your conjecture.
3. Considering only groups \mathbf{Z}_n , make a conjecture about the number of elements which are their own inverses in \mathbf{Z}_n based on n .