

GROUPS

The study of groups, which we begin in this chapter, is usually thought of as the real beginning of abstract algebra. The step from arithmetic to algebra involves starting to use variables, which just represent various numbers. But the operations are still the usual ones for numbers, addition, subtraction, multiplication, and division.

The step from algebra to abstract algebra involves letting the operation act like a variable. At first we will use $*$ or \cdot to represent an operation, to show that $*$ might represent ordinary addition or multiplication, or possibly operations on matrices or functions, or maybe even something quite far from your experience. One of the things we try to do with notation is to make it look familiar, even if it represents something new; very soon we will just write ab instead of $a * b$, so long as everyone knows the convention that we are using.