A gyrogroup is a group-like structure, introduced by Abraham A. Ungar in 1988. Gyrogroups share many algebraic properties with groups. In fact, any group may be viewed as a gyrogroup with trivial gyroautomorphisms. In this work we present the notion of gyrogroup actions, which is a natural generalization of the usual notion of group actions. In particular, we prove three celebrated theorems in group theory for gyrogroups: the orbit-stabilizer theorem, the Burnside lemma (or the Cauchy-Frobenius lemma), and the orbit decomposition theorem. We then prove that under a certain condition, a gyrogroup $G$ acts transitively on the set $G/H$ of left cosets of a subgyrogroup $H$ in $G$ by left gyroaddition. (Received August 17, 2015)