# Actions

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**Definition 0.1** (Bekka and Mayer (2000) Section 2)**.** An *action* of a group, $G$, on a measurable space $(X, \mathscr{B})$ is a measurable mapping

$$G \times X \to X, \ (g, x) \mapsto g.x$$

with the following properties:

1. Associativity: For all $g, g' \in G, x \in X$, then $g.(g'.x) = (g \cdot g').x$
2. Identity: There exists an identity element $e \in G$ such that $e.x = x$ for all $x \in X$.
3. Quasi-Invariance: For any $B \in \mathscr{B}$ and for all $g \in G$, we have $\mu(g.B) = 0$ if and only if $\mu(B) = 0$.

The action of $G$ is also ergodic if it satisfies the additional property:

4. If $B \in \mathscr{B}$ and $\mu(B) = \mu(g.B)$ for any $g \in G$, then $\mu(B) = 0$ or $\mu(X \setminus B) = 0$.

Bekka, M. B. and Mayer, M. (2000). *Ergodic theory and topological dynamics of group actions on homogeneous spaces*. Cambridge University Press. https://doi.org/10.1017/cbo9780511758898.