

1.33: Direct product

In group theory, **direct product** of two groups $(G, *)$ and (H, o) , denoted by $G \times H$ is the set of the elements obtained by taking the cartesian product of the sets of elements of G and H : $\{(g, h): g \text{ in } G, h \text{ in } H\}$;

For abelian groups which are written additively, it may also be called the *direct sum* of two groups, denoted by $G \oplus H$.

The group obtained in this way has a normal subgroup isomorphic to G (given by the elements of the form $(g, 1)$), and one isomorphic to H (comprising the elements $(1, h)$).

The reverse also holds: if a group K contains two normal subgroups G and H , such that $K = GH$ and the intersection of G and H contains only the identity, then $K = G \times H$. A relaxation of these conditions gives the semidirect product.

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