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second isomorphism theorem

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Let $(G, *)$ be a group. Let H be a subgroup of G and let K be a normal subgroup of G . Then

- $HK := \{h * k \mid h \in H, k \in K\}$ is a subgroup of G ,
- K is a normal subgroup of HK ,
- $H \cap K$ is a normal subgroup of H ,
- There is a natural group isomorphism $H/(H \cap K) = HK/K$.

The same statement also holds in the category of modules over a fixed ring (where normality is neither needed nor relevant), and indeed can be formulated so as to hold in any abelian category.