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# relations in quiver

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Let $Q$ be a quiver and $k$ a field.

**Definition.** A **relation** in $Q$ is a linear combination (over $k$) of paths of length at least 2 such that all paths have the same source and target. Thus a relation is an element of the path algebra $kQ$ of the form

$$\rho = \sum_{i=1}^{m} \lambda_i \cdot w_i$$

such that there exist $x, y \in Q_0$ with $s(w_i) = x$ and $t(w_i) = y$ for all $i$, all $w_i$ are of length at least 2 and not all $\lambda_i$ are zero.

If a relation $\rho$ is of the form $\rho = w$ for some path $w$, then it is called a **zero relation** and if $\rho = w_1 - w_2$ for some paths $w_1, w_2$, then $\rho$ is called a **commutativity relation**.