Definition (Transpose of a relation). Let $\mathbf{R} \subseteq \mathbf{A} \times \mathbf{B}$ be a relation. The *transpose* (or *opposite*, *reverse*) of $\mathbf{R}$ is the relation given by:

$$\mathbf{R}^{\intercal} := \{\langle y, x\rangle \in \mathbf{B} \times \mathbf{A} \mid \langle x, y\rangle \in \mathbf{R}\}.$$

note that $\mathbf{R}^{\intercal} : \mathbf{B} \to \mathbf{A}$, while $\mathbf{R} : \mathbf{A} \to \mathbf{B}$.