**Definition**: When $A$ and $B$ are sets, we say any subset of $A \times B$ is a **binary relation**. A relation $R$ can also be represented as

- A function $f_{TF} : A \times B \to \{T, F\}$ where, for $a \in A$ and $b \in B$, $f_{TF}(\ (a,b)\ ) = \begin{cases} T & \text{when } (a,b) \in R \\ F & \text{when } (a,b) \notin R \end{cases}$
- A function $f_{\mathcal{P}} : A \to \mathcal{P}(B)$ where, for $a \in A$, $f_{\mathcal{P}}(a) = \{b \in B \mid (a,b) \in R\}$

When $A$ is a set, we say any subset of $A \times A$ is a (binary) **relation** on $A$.