Definition (Categorical Product)

Let **C** be a category and let $X, Y \in Ob_{\mathbf{C}}$ be objects. The *product* of X and Y is:

Constituents

- 1. an object $Z \in Ob_{\mathbb{C}}$ (this is "the product of X and Y");
- 2. projection morphisms $\pi_1: \mathbb{Z} \to X$ and $\pi_2: \mathbb{Z} \to Y$,

Conditions

1. For any $T \in Ob_{\mathbb{C}}$ and any morphisms $f: T \to X, g: T \to Y$, there

exists a unique morphism $\phi_{f,g}: T \to Z$ such that $f = (\phi_{f,g}) \ \ \pi_1$ and $\mathbf{g} = (\phi_{f,\mathbf{g}}) \ \mathring{,} \ \pi_2$.