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The **product** of two categories is just the category of pairs of objects and morphisms

Definition 0.1. Given categories $\mathcal{C}$ and $\mathcal{D}$, the **product category** $\mathcal{C} \times \mathcal{D}$ has

- as objects the pairs (c, d) where $c \in \mathcal{C}$, $d \in \mathcal{D}$
- as morphisms tha pairs $(f, g) : (c, d) \to (c', d')$ where
  - $f : c \to c'$
  - $g : d \to d'$
- as identity morphisms the pairs $\mathbf{1}_{(c,d)} = (\mathbf{1}_c, \mathbf{1}_d)$
- composition is defined as:

$$(f', g') \circ (f, g) = (f' \circ f, g' \circ g)$$