Definition 1. An object 0 is an initial object if for every object A, there is a unique map $0 \to A$

Proposition 1. Initial and terminal objects are unique up to isomorphism.

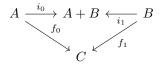
Proof. Suppose that 0 and 0' are both terminal or initial objects in some category C; this diagram states that 0 and 0' are uniquely isomorphic.

For terminal objects, apply the previous to C^{op} .

Definition 2. Disjoint Union The disjoint union of two sets A and B is the set

$$A \sqcup B = (0, a) : a \in A \cup (1, b) : b \in B.$$

Definition 3. Coproduct Let A and B be objects in a category. Then a sum (or coproduct) of A and B is an object A+B together with maps $i_0:A\to A+B$ and $i_1:B\to A+B$ such that whenever we have an object C and maps $f_0:A\to C$ and $f_1:B\to C$, there is a unique map $f:A+B\to C$ such that $f_0=fi_0$ and $f_1=fi_1$



Theorem 0.1. Let A and B be objects and let $A \to ["i_0"]P \leftarrow ["i_1"]B$ and $A \to ["j_0"]Q \leftarrow ["j_1"]B$ be two sums of A and B. Then there exists a unique isomorphism $f: P \to Q$ such that the following diagram commutes:

