

Relational algebra is a theoretical framework and a formal query language used to manipulate data stored in relational databases. It provides a set of mathematical operations that can be applied to relations (tables) to perform queries and transformations on the data. Relational algebra serves as the foundation for the design and implementation of relational database management systems (RDBMS).

The core operations in relational algebra include:

1. **Selection (σ)**: Selects rows from a relation that satisfy a given predicate (condition).
2. **Projection (π)**: Selects specific columns (attributes) from a relation, discarding the rest.
3. **Union (\cup)**: Combines two relations to form a new relation that contains all the rows from both input relations, removing duplicates.
4. **Intersection (\cap)**: Produces a relation that contains only the rows that appear in both input relations.
5. **Difference ($-$)**: Produces a relation that contains the rows from one input relation that do not appear in the other input relation.
6. **Cartesian Product (\times)**: Combines every row from one relation with every row from another relation to form a new relation.
7. **Join (\bowtie)**: Combines two relations based on a common attribute or condition. Common types of joins include inner join, left join, right join, and full outer join.
8. **Division (\div)**: Computes a relation that contains all tuples from one relation that are associated with all tuples of another relation.