ACID Databases

What are Transactions?

In a Database Management System (DBMS), a **transaction** is a **sequence of one or more operations** (such as reading, writing, updating, or deleting data) that are treated as a single, indivisible unit of work. These operations are bundled together and either **all succeed** or **all fail**, ensuring that the database remains in a consistent state

Key Characteristics of Transactions:

1. **All-or-Nothing**: A transaction is designed so that either all of its operations are completed successfully (committed), or none of them are (rolled back). If any part of the transaction fails, all changes are undone, leaving the database in its original state.
2. **Logical Unit of Work**: Transactions combine multiple database operations that must be performed together to achieve a meaningful outcome. For example, transferring money from one account to another involves multiple operations, but they should be treated as a single unit.

What is ACID ?

Atomicity - each statement in a transaction (to read, write, update or delete data) is treated as a single unit. Either the entire statement is executed, or none of it is executed. This property prevents data loss and corruption from occurring if, for example, if your streaming data source fails mid-stream.

Consistency - ensures that transactions only make changes to tables in predefined, predictable ways. Transactional consistency ensures that corruption or errors in your data do not create unintended consequences for the integrity of your table.

Isolation - when multiple users are reading and writing from the same table all at once, isolation of their transactions ensures that the concurrent transactions don't interfere with or affect one another. Each request can occur as though they were occurring one by one, even though they're actually occurring simultaneously.

Durability - ensures that changes to your data made by successfully executed transactions will be saved, even in the event of system failure.

In summary, **ACID** ensures that database transactions are **reliable**, **consistent**, and **safe** from errors or crashes.