Amortization Calculation - Overview

Amortization is the process of gradually paying off a loan over time through scheduled payments (EMIs). Each EMI consists of a principal component and an interest component.

In the case of fixed-rate loans, the EMI stays constant throughout the loan tenure. However, the composition changes - initially, the interest portion is higher, and the principal is lower; over time, this reverses.

The EMI is calculated using the following formula:

EMI = [P × R × (1+R)^N] / [(1+R)^N - 1]

Where:

- P = Loan Amount (Principal)
- R = Monthly Interest Rate (Annual Rate / 12 / 100)
- N = Loan Tenure (in months)

This formula ensures that the borrower pays the same amount every month, even though the principal and interest split changes monthly.

Monthly Breakdown - Detailed Computation

Every EMI payment includes two components:

1. Interest Component:

   - Interest for a month = Outstanding Balance × Monthly Interest Rate

2. Principal Component:

   - Principal = EMI - Interest

3. Outstanding Balance:

   - Updated every month as: Previous Balance - Principal Paid

For example:

Loan Amount: INR75,000

Annual Interest Rate: 12%

Monthly Interest Rate: 1%

Tenure: 12 months

EMI = INR6,663.66

Month 1:

- Interest = 75,000 × 1% = INR750.00
- Principal = 6,663.66 - 750.00 = INR5,913.66
- New Balance = 75,000 - 5,913.66 = INR69,086.34

This process repeats each month with updated outstanding balance.

Use Case: What-If Calculator Microservice

The What-If Calculator microservice enables borrowers to explore the impact of:

- Prepayments: How does paying INR10,000 early affect tenure or EMI?
- Tenure Changes: What happens if I switch to a shorter loan period?
- Interest Rate Variations: How will my EMI change if rates drop to 11%?

Microservice Inputs:

- loan_amount: float
- annual_interest_rate: float
- tenure_months: int
- prepayment_amount (optional): float

Outputs:

- New EMI or Tenure
- Amortization Schedule
- Interest Saved and Tenure Reduced (in case of prepayment)
- Total Repayment Amount

All simulations are calculated on-the-fly using the amortization logic described above. Results are returned in JSON format and displayed in the user dashboard or chatbot response.