# T-SQL Comprehensive Guide

From Beginner to Advanced Topics

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# Introduction to T-SQL

Transact-SQL (T-SQL) is an extension of SQL used by Microsoft SQL Server. It includes procedural programming features, local variables, and error handling. This guide takes you through T-SQL basics to advanced features.

## 1. Basics of T-SQL

- Overview of SQL vs. T-SQL  
- Syntax Rules  
- How to Connect to a Database  
- Query Execution Order (SELECT, FROM, WHERE, etc.)

## 2. Declaring and Using Variables

- DECLARE @VariableName DataType  
- SET vs. SELECT for Assigning Values  
- Using Variables in Queries  
- Example:  
 DECLARE @Name NVARCHAR(50);  
 SET @Name = 'John';  
 SELECT @Name;

## 3. Control Flow Statements

- IF...ELSE: Conditional Statements  
- WHILE: Loops  
- BREAK and CONTINUE  
- GOTO and Labels

## 4. Functions in T-SQL

- Built-in Functions:  
 - String Functions: LEN(), CHARINDEX(), REPLACE()  
 - Date Functions: GETDATE(), DATEADD(), DATEDIFF()  
 - Conversion Functions: CAST(), CONVERT()  
- User-defined Functions

## 5. Working with Joins

- Understanding INNER, LEFT, RIGHT, FULL OUTER JOINS  
- CROSS JOIN and SELF JOIN  
- Practical Examples

## 6. Subqueries

- Definition and Types  
- Correlated vs. Non-correlated Subqueries  
- Using Subqueries in SELECT, FROM, and WHERE Clauses

## 7. Common Table Expressions (CTEs)

- Syntax of CTEs  
- Recursive CTEs  
- Example:  
 WITH EmployeeCTE AS (  
 SELECT EmployeeID, Name  
 FROM Employees  
 )  
 SELECT \* FROM EmployeeCTE;

## 8. Indexes

- Types of Indexes: Clustered, Non-Clustered, Full-Text  
- Creating and Dropping Indexes  
- Best Practices for Using Indexes

## 9. Stored Procedures and Triggers

- Defining and Executing Stored Procedures  
- Input and Output Parameters  
- Understanding Triggers  
- Examples for Automation

## 10. Error Handling

- TRY...CATCH Block  
- ERROR\_MESSAGE(), ERROR\_LINE(), and ERROR\_SEVERITY()  
- THROW Statement  
- Example of Comprehensive Error Handling

## 11. Performance Optimization

- Using Execution Plans  
- Avoiding Table Scans  
- Best Practices for Writing Efficient Queries  
- Using Query Hints

## 12. Advanced Topics

- Dynamic SQL  
- Transactions and Locking  
- Using OUTPUT Clause  
- Pivot and Unpivot

# Conclusion

Mastering T-SQL is essential for database management and development. This guide covers topics from beginner to advanced levels. Practice is key to gaining proficiency.