

# MTA Database Administrator Fundamentals Course

## Session 1

### Section A: Database Tables

- Tables
- Representing Data with Tables
- SQL Server Management Studio

### Section B: Database Relationships

- Flat File Databases
- Relational Databases
- RDBMS Benefits
- Related Tables
- Review
- Recursive Relationships
- M:N Relationships

### Section C: Understanding DML

- Structured Query Language
- DDL/DML
- Data Control Language

### Section D: Database Data Types

- Data Types
- Choosing a Data Type
- SQL Data Types
- Integers
- Exact Numbers
- Money Data Types
- Exceeding Data Type Limits
- Approximate Numerics
- Character Data Types
- Variable vs. Fixed
- Dates and Times
- Numeric and Alphanumeric Date Formats
- DateTime2(n)
- ISO 8601 Format
- DateTimeOffset(n)

### Section E: Creating and Manipulating Tables

- Table Types
- Simple Syntax
- NULL or NOT NULL
- Creating a Table
- Adding Columns using ALTER TABLE
- Adding Columns with Default Values

- Changing Columns using ALTER TABLE
- UNIQUE Constraints
- Adding UNIQUE Constraints

### **Section F: Selecting Data**

- SELECT Statement
- Performing a SELECT
- Selecting Data using Expressions
- Specifying Column Order and Aliases
- Special Character Considerations
- Using Operators and Expressions
- Schema Defined
- Character Operators
- Arithmetic Expressions
- Using Table Aliases

### **Section G: Filtering Data using Comparisons**

- WHERE Clauses
- Comparison Operators
- Logical Operators
- Using WHERE Clauses
- Using Comparison Operators
- Combining using AND
- Combining using OR and NOT

## **Session 2**

### **Section A: Filtering Data using Lists and Ranges**

- Range of Values
- Selecting a Range of Values
- Selecting Values in a List

### **Section B: Filtering Data using Pattern Matching**

- Understanding String Pattern Matching
- String Comparison Operators
- Using LIKE Operators
- Percent (%) Wildcards
- Underscore (\_) Wildcards
- Braces ([]) Wildcards

### **Section C: Filtering Data with NULLs**

- NULLs Defined
- NULL Handling

### **Section D: Selecting Data using Functions**

- Aggregate Function Types

### **Section E: Sorting Data**

- Sorting Data with ORDER BY

- Ordinal Column Position
- Using ORDER BY
- ORDER BY Ordinal Column Position

## **Section F: Working with Duplicates**

- Eliminating Duplicates
- Using DISTINCT

## **Section G: Joining Data**

- Introduction to JOINS
- JOIN Process
- INNER JOIN
- INNER JOIN Example
- Joining Data with Table Aliases
- INNER JOIN with DISTINCT

## **Section H: OUTER and CROSS JOINS**

- OUTER JOIN Defined
- OUTER JOIN Example
- FULL OUTER JOIN Example
- CROSS JOIN Defined
- CROSS JOIN Example

## **Section I: Combining and Limiting Result Sets**

- UNIONS
- UNION ALL vs. UNION
- UNION Correct Syntax
- Limiting Rows using TOPN
- INTERSECT Defined
- EXCEPT Defined
- INTERSECT and EXCEPT Example

## **Session 3**

### **Section A: Adding Data**

- Inserting Data
- INSERT Example
- Inserting Multiple Rows
- Inserting Partial Values

### **Section B: Updating and Deleting Data**

- Updating Data
- UPDATE Example
- Updating Multiple Rows and Columns
- UPDATE Example Continued
- Deleting Data
- DELETE Example
- Deleting Data using Subqueries
- Understanding Transactions
- Creating and Committing a Transaction

## **Section C: Working with Views**

- View Defined
- View Types
- Standard Views
- CREATE VIEW Example
- Using a View to Rename Columns
- Filtering Data with Views
- Creating Views Graphically

## **Section D: Stored Procedures and Functions**

- Stored Procedures Defined
- SP Parameters and Best Practices
- CREATE PROC Example
- Late Binding
- Using Parameters with Stored Procedures
- Built-in vs. User-Defined Functions
- Function Parameters
- Sample Scalar Function Syntax
- Proper Function Body Syntax
- Calling Scalar Functions
- Table-Valued Functions
- Scalar Function Example

## **Section E: Data Normalization**

- Database Design Phases
- Understanding Database Normalization
- Design Problems
- Row INSERT Anomalies
- DELETE Anomalies
- UPDATE Anomalies

## **Section F: First Normal Form**

- Overview of Normal Forms
- First Normal Form Rules
- First Normal Form Example 1
- Candidate Keys Defined
- Primary Keys Defined
- Non-Prime Attributes Defined
- First Normal Form Example 2
- First Normal Form Anomalies

## **Section G: Second and Third Normal Forms**

- Functional Dependency Defined
- Second Normal Form Rules
- Second Normal Form Example
- Second Normal Form Rules Continued
- Transitive Dependencies
- Third Normal Form

## **Section H: Fourth and Fifth Normal Forms**

- BCNF
- Fourth Normal Form Example
- Fifth Normal Form Example

## **Session 4**

### **Section A: Primary, Foreign, and Composite Keys**

- Primary Keys Defined
- Foreign Keys
- Composite Keys
- Creating a Table with a Primary Key

### **Section B: Clustered Indexes**

- Overview
- Indexes Improve Table Scans
- Seek
- Clustered Index Benefits
- Data Storage Considerations
- Clustered Index on a Heap Table

### **Section C: Non-Clustered Indexes**

- Non-Clustered Index Basics
- Non-Clustered Index on a Heap Table
- Non-Clustered Index Benefits
- Index Creation
- Dropping an Index
- Non-Indexed Table Execution Plan
- Indexed Table Execution Plan

### **Section D: Database Security Concepts**

- SQL Security Steps
- Fixed Server Roles
- Permissions Hierarchy
- Adding Database Users
- Special Database Users
- Permissions
- Database Roles
- Creating a Role
- Role Usage

### **Section E: Database Backup and Restore**

- SQL Backup Methods
- Backup Rights and Permissions
- Backing Up to Disk
- Backup Frequency Considerations
- Full Backups
- Full Backup Syntax
- Restore vs. Recovery
- Automatic Recovery
- Performing a Full Backup
- Backup with Compression

- Restore Types
- Restore Process
- Simple Restore

## **Section F: Incremental Backups**

- Incremental Backup Usage
- Incremental Backups Defined
- Normal Log Backup
- Backup Log Options
- Restoring the Log
- Transaction Log Backup Example
- Transaction Log Restore Example