

# Oracle Database 19c: SQL Tuning Workshop Live Class

Oracle Database

DURATION

**4 Days**

MODULES

**8 Lectures**

COURSE CODE

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## Course Overview

This Oracle SQL Tuning for Developers Workshop will help you explore Oracle SQL statement tuning. Learn how to write well-tuned SQL statements appropriate for the Oracle Database.

## What You Will Learn

- 1 Course Introduction
- Lesson Agenda
- Course Objectives
- Audience and Prerequisites
- Course Outline Map
- Activities
- Lesson Agenda
- Sample Schemas Used in the Course
- Human Resources (HR) Schema
- Sales History (SH) Schema
- Order Entry(OE) Schema
- Lesson Agenda
- Class Account Information
- Lesson Agenda
- SQL Environments Available in the Course
- Lesson Agenda
- Workshops, Demo Scripts, Code Examples, and Solution Scripts
- Appendixes in the Course
- 2 Introduction to SQL Tuning
- Objectives
- Lesson Agenda
- What Is SQL Tuning?
- SQL Tuning Session
- Recognize: What Is Bad SQL?
- Clarify: Understand the Current Issue

- Verify: Collect Data
- Verify: Is Bad SQL a Real Problem? (Top-Down Analysis)
- Lesson Agenda
- SQL Tuning Strategies: Overview
- Checking the Basics
- Advanced SQL Tuning Analysis
- Plan Comparison Strategy
- Quick Solution Strategy
- Finding a Good Plan
- iii
- Implementing the New Good Plan
- Query Analysis Strategy: Overview
- Query Analysis Strategy: Collecting Data
- Query Analysis Strategy: Examining SQL Statements
- Query Analysis Strategy: Analyzing Execution Plans
- Query Analysis Strategy: Finding Execution Plans
- Query Analysis Strategy: Reviewing Common Observations and Causes
- Query Analysis Strategy: Determining Solutions
- Lesson Agenda
- Development Environments: Overview
- What Is Oracle SQL Developer?
- Coding PL/SQL in Oracle SQL\*Plus
- Quiz
- Summary
- Practice 2: Overview
- 3 Using Application Tracing Tools
- Objectives
- Lesson Agenda
- Using Application Tracing: Overview
- Steps Needed Before Tracing
- Lesson Agenda
- Application Tracing Tools: Overview
- Lesson Agenda
- Using the SQL Tracing Facility
- Tracing Your Own Session: Example
- Tracing a Specific User: Example
- Consideration: Tracing Challenge
- Lesson Agenda
- End-to-End Application Tracing
- Service Tracing: Example
- Module Tracing: Example
- Action Tracing: Example
- Client Tracing: Example
- Session Tracing: Example
- Tracing Your Own Session: Example
- Lesson Agenda

- trcscs Utility
- Invoking the trcscs Utility
- Using the trcscs Utility: Example
- Lesson Agenda
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- TKPROF Utility: Overview
- Invoking the TKPROF Utility
- TKPROF Sorting Options
- TKPROF Report Structure
- Interpreting a TKPROF Report: Example 1
- Interpreting a TKPROF Report: Example 2
- Interpreting a TKPROF Report: Example 3
- What to Verify: Example
- Quiz
- Summary
- Practice 3: Overview
- 4 Optimizer Fundamentals
- Objectives
- Lesson Agenda
- SQL Statement Representation
- Lesson Agenda
- SQL Statement Processing: Overview
- SQL Statement Parsing
- SQL Optimization
- SQL Row Source Generation
- SQL Row Source Generation: Example
- SQL Execution
- Quiz
- Lesson Agenda
- Why Do You Need an Optimizer?
- Components of the Optimizer
- Lesson Agenda
- Query Transformer
- Transformer: Cost-Based OR Expansion Example
- Transformer: Subquery Unnesting Example
- Transformer: View Merging Example
- Transformer: Predicate Pushing Example
- Transformer: Transitivity Example
- Cursor-Duration Temporary Tables
- Hints for Query Transformation
- Quiz
- Lesson Agenda
- Query Estimator: Selectivity and Cardinality
- Importance of Selectivity and Cardinality
- Selectivity and Cardinality: Example
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- Query Estimator: Cost
- Query Estimator: Cost Components
- Lesson Agenda
- Plan Generator
- Lesson Agenda
- Adaptive Query Optimization
- Lesson Agenda
- Quarantined SQL Plans
- Lesson Agenda
- Controlling the Behavior of the Optimizer
- Optimizer Features and Oracle Database Releases
- Summary
- Practice 4: Overview
- 5 Generating and Displaying Execution Plans
- Objectives
- Lesson Agenda
- What Is an Execution Plan?
- Reading an Execution Plan
- Reviewing the Execution Plan
- Where to Find Execution Plans
- Viewing Execution Plans
- Lesson Agenda
- The EXPLAIN PLAN Command: Overview
- The EXPLAIN PLAN Command: Syntax
- The EXPLAIN PLAN Command: Example
- Lesson Agenda
- PLAN\_TABLE
- Displaying from PLAN\_TABLE
- Displaying from PLAN\_TABLE: ALL
- Displaying from PLAN\_TABLE: ADVANCED
- Explain Plan Using Oracle SQL Developer
- Quiz
- Lesson Agenda
- AUTOTRACE
- The AUTOTRACE Syntax
- AUTOTRACE: Examples
- AUTOTRACE: Statistics
- AUTOTRACE by Using SQL Developer
- Quiz
- Lesson Agenda
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- Links Between Important Dynamic Performance Views
- V\$SQL\_PLAN View: Overview
- V\$SQL\_PLAN Columns
- The V\$SQL\_PLAN\_STATISTICS View
- Querying V\$SQL\_PLAN

- Hint Usage Reporting
- Lesson Agenda
- Automatic Workload Repository
- Important AWR Views
- Comparing Execution Plans by Using AWR
- Comparing SQL Execution Plans
- Generating SQL Reports from AWR Data
- Lesson Agenda
- SQL Monitoring: Overview
- SQL Monitoring Report: Example
- Quiz
- Summary
- Practice 5: Overview
- 6 Interpreting Execution Plans and Enhancements
- Objectives
- Lesson Agenda
- Interpreting a Serial Execution Plan
- Execution Plan Interpretation: Example 1
- Execution Plan Interpretation: Example 2
- Execution Plan Interpretation: Example 3
- Execution Plan Interpretation: Example 4
- Lesson Agenda
- Looking Beyond Execution Plans
- Quiz
- Lesson Agenda
- Adaptive Query Optimization: Overview
- Adaptive Plans: Join Method
- Adaptive Join Method: Example
- Adaptive Join Method: Working
- Displaying the Default Plan
- Displaying the Final Plan
- Displaying the Full Adaptive Plan
- Adaptive Plans: Indicator in V\$SQL
- Summary
- Practice 6: Overview
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- 7 Optimizer: Table and Index Access Paths
- Objectives
- Lesson Agenda
- Row Source Operations
- Lesson Agenda
- Main Structures and Access Paths
- Lesson Agenda
- Full Table Scan
- Using Full Table Scan
- ROWID Scan

- Sample Table Scans
- Quiz
- Lesson Agenda
- Indexes: Overview
- Normal B\*-tree Indexes
- Index Scans
- Index Unique Scan
- Index Range Scan
- Index Range Scan: Descending
- Descending Index Range Scan
- Index Range Scan: Function-Based
- Index Full Scan
- Index Fast Full Scan
- Index Skip Scan
- Index Join Scan
- Index Skip Scan: Example
- B\*-tree Indexes and Nulls
- Using Indexes: Considering Nullable Columns
- Index-Organized Tables
- Index-Organized Table Scans
- Bitmap Indexes
- Bitmap Index Access: Examples
- Combining Bitmap Indexes: Examples
- Combining Bitmap Index Access Paths
- Bitmap Operations
- Bitmap Join Index
- Composite Indexes
- Invisible Index: Overview
- Invisible Indexes: Examples
- Guidelines for Managing Indexes
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- Common Observations
- Why Is a Full Table Scan Used?
- Why Is a Full Table Scan Not Used?
- Why Is an Index Scan Not Used?
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- Automatic Indexing Task
- Workflow
- Automatic Indexing Task Reporting
- Automatic Indexing Views
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- Practice 7: Overview
- 8 Optimizer: Join Operators
- Objectives

- Lesson Agenda
- How the Query Optimizer Executes Join Statements
- Join Methods
- Nested Loops Join
- Nested Loops Join: Prefetching
- Sort-Merge Join
- Hash Join
- Cartesian Join
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- Join Types
- Equijoins and Nonequijoins
- Outer Joins
- Semijoins
- Antijoins
- Quiz
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- Practice 8: Overview
- 9 Other Optimizer Operators
- Objectives
- Lesson Agenda
- Result Cache Operator
- Using RESULT\_CACHE
- Using Result Cache Table Annotations
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- When Are Clusters Useful?
- Cluster Access Path: Examples
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- Sorting Operators
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- Buffer Sort Operator
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- Inlist Iterator
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- View Operator
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- Count Stop Key Operator
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- Other N-Array Operations
- FILTER Operations
- OR Expansion Operation
- UNION [ALL], INTERSECT, MINUS
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- 10 Introduction to Optimizer Statistics Concepts
- Objectives
- Lesson Agenda
- Optimizer Statistics
- Table Statistics(USER\_TAB\_STATISTICS)
- Index Statistics(USER\_IND\_STATISTICS)
- Index Clustering Factor
- Column Statistics (USER\_TAB\_COL\_STATISTICS)
- Lesson Agenda
- Column Statistics: Histograms
- Frequency Histograms
- Viewing Frequency Histograms
- Top Frequency Histogram
- Viewing Top Frequency Histograms
- Height-Balanced Histograms
- Viewing Height-Balanced Histograms
- Hybrid Histograms
- Viewing Hybrid Histograms
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- Column Statistics: Extended Statistics
- Column Group Statistics
- Expression Statistics
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- Session-Specific Statistics for Global Temporary Tables
- Session-Specific Statistics for Global Temporary Tables: Example
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- System Statistics
- System Statistics: Example
- Lesson Agenda
- Gathering Statistics: Overview
- Manual Statistics Gathering
- When to Gather Statistics Manually
- Managing Statistics: Overview (Export/Import/Lock/Restore/Publish)
- Lesson Agenda
- Real-Time Statistics
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- Summary
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- 11 Using Bind Variables
- Objectives
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- Cursor Sharing and Different Literal Values

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- Bind Variables in SQL\*Plus
- Bind Variables in Oracle SQL Developer
- Lesson Agenda
- Bind Variable Peeking
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- Cursor Sharing Enhancements
- CURSOR\_SHARING Parameter
- Forcing Cursor Sharing: Example
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- Adaptive Cursor Sharing: Architecture
- Adaptive Cursor Sharing: Views
- Adaptive Cursor Sharing: Example
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- Loading SQL Plan Baselines
- SQL Plan Selection
- Evolving SQL Plan Baselines
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- Managing the SPM Evolve Advisor Task
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- Possible SQL Plan Manageability Scenarios
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