**Core**

SQL - Course Objectives Document

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Table of Contents

1 Aims, objectives and scope 3

2 Course Strategy 4

3 Topic Details 5

# Aims, objectives and scope

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| --- | --- |
| **Target audience** | FDM Applicants   * All entrants joining the FDM Academy |
| **Course Objectives** | After completion of this Course, delegates should be able to:   * understand and write efficient DML statements * understand how queries are processed and know how to use EXPLAIN PLAN * write DDL to create tables, constraints, views, and sequences * understand data model Entity Relationship Diagrams (ERDs) * write simple PL/SQL procedures * answer interview questions regarding SQL and ORACLE |
| **Topics covered** | * Data Modeling - Entities, Attributes and Relationships * Data Definition Language - CREATE, ALTER, DROP, TRUNCATE * Data Manipulation Language - SELECT, INSERT, UPDATE, DELETE * Built in Functions - String Functions, Date Function, Numeric Functions, DECODE and CASE * Views * Set Operations - UNION, INTERSECT, MINUS * In-line views and sub queries - Correlated and Non-correlated sub queries. * Indexes, Explain Plan, and Query Statistics * Introduction to PL/SQL - basic block, stored procedures, functions, DML triggers * COMMIT, ROLLBACK, Snapshots, Deadlock and Database Isolation Settings: READ COMMITTED, SERIALIZABLE |
| **Topics not covered** | * PL/SQL Exceptions * DML Triggers * DDL Triggers |
| **Prerequisites** | * None |

# Course Strategy

The course will be 9 days, and will include 5 days of instructor led classroom sessions followed by an SQL project to be completed in the remaining time. Each session in the instructor led part of the course will include exercises to consolidate learning.

|  |  |
| --- | --- |
| Length of course | 9 days SQL takes place during core training. |
| Delivery style | The course will be delivered in the following ways:   * Instructor led training sessions * Individual exercises |
| Assessment | Assessment will take the following forms:   * SQL project to write queries, DML and stored procedures |
| Pre-course work | None |
| Post course activities | Following successful completion of the course delegates will be required to complete the following:   * Regular SQL revision * SQL sign off exam |

# Topic Details

## INTRODUCTION

### Awareness of Terminology: What is an RDBMS?

Relational Database Management System

Examples: Oracle, SQL Server, SYBASE, Informix, DB2, MS Access

### Awareness of Terminology: DML, DDL, and DCL

#### Data Manipulation Language (DML)

SELECT, INSERT, UPDATE, DELETE

#### Data Definition Language (DDL)

CREATE, ALTER, DROP, TRUNCATE

#### Data Control Language (DCL)

GRANT, REVOKE

### Awareness of Terminology: Who works with Databases?

Database Administrators

Database Analysts

Data Analysts

Managers, Users, programmers

### Awareness of Terminology: Database Components

Server

* Parser
* Optimizer
* Database Engine

Client Tool: SQL Developer

## DATA MODELING

### Awareness of Terminology and Concepts

entities (things)

attributes (qualities of the entities)

Tables

“row” = “record” = “tuple”

“column” = “attribute” ~ “field”

PRIMARY KEY,

FOREIGN KEY

Maximum Cardinality

Minimum Cardinality

Identifying vs. Non-identifying Relationships

Foreign Key Constraints referencing Unique Constraints

Normalization to 3NF

### Introductory (Novice) Level Skills

Data modeling and creating ER diagrams

One-to-Many Relationships

One-to-many self-referencing relationships

Many-to-Many Relationships and resolution with associative entities (joining tables)

Many-to-many self-referencing relationships

One-to-one relationships and sub-types

Modeling Time

## DDL

### Awareness of Terminology and Concepts

DDL means “data definition language”

Data types: NUMBER(m,n), VARCHAR2(m), DATE

NULL/NOT NULL

FOREIGN KEY: NO ACTION, CASCADE, SET NULL, SET DEFAULT

### Introductory Level skills

Introductory level ability to use the following commands

CREATE TABLE

ALTER TABLE

DROP TABLE

TRUNCATE TABLE

Creating PRIMARY KEYs and FOREIGN KEYs.

CHECK CONSTRAINT

UNIQUE CONSTRAINT

DEFAULT CONSTRAINT

CREATE SEQUENCE

CREATE VIEW [ Optional: WITH CHECK OPTION ]

## DML

### SELECT

#### Awareness Level Skills

##### JOINs – Awareness Level Only

Old join syntax (pre ANSI 92)

- “FROM table, table, table WHERE …”

JOIN USING

NATURAL JOIN

#### Introductory Level Skills

Concatenation of strings

Column aliases

Table aliases

ORDER BY

SELECT FROM dual

##### WHERE

BETWEEN x AND y

AND, OR, NOT

IN (hardcoded list)

LIKE %, \_

(col1, col2) IN ((a,b),(c,d),(e,f)) -- doubles

##### Date Functions

TO\_CHAR

TO\_DATE

TRUNC

LAST\_DAY

ADD\_MONTHS

MONTHS\_BETWEEN

SYSDATE

##### Number Functions

ceil, floor, round, trunc

abs, sign

greatest, least

to\_char

to\_number

##### String Functions

LIKE operator

UPPER, LOWER, INITCAP

CONCAT

LENGTH

REPLACE

TRANSLATE

INSTR

SUBSTR

LTRIM, RTRIM, TRIM

LPAD, RPAD, PAD

##### CASE & DECODE

Decode

Two forms of CASE.

#### Intermediate to Advanced Skills

##### Joins

New Join Syntax (ANSI 92)

INNER JOIN between two tables

Joining more than two tables

Joining the same table more than once

JOINs involving composite keys

Self-join

LEFT, RIGHT, FULL OUTER JOIN, CROSS JOIN

Trainees who complete all the exercises including challenge exercises are “advanced”.

##### Aggregation

Primary aggregation functions: COUNT, MAX, MIN, AVG, SUM

(Other aggregation functions include STDDEV, VARIANCE)

COUNT(DISTINCT col)

GROUP BY

HAVING

WHERE vs. HAVING

Trainees who complete all the exercises including challenge exercises are “advanced”.

##### Sub queries

Sub queries in the WHERE

In-line Views (SELECT in the FROM or JOIN)

IN, EXISTS, =

Sub queries in the HAVING

WITH Clause

Trainees who complete all the exercises including challenge exercises are “advanced”.

### UNION, INTERSECT, MINUS

Trainees should have awareness of the UNION, INTERSECTION, and MINUS operations, and introductory to intermediate level skills in applying them.

Trainees who complete all the exercises are “intermediate”.

### INSERT – Intermediate Skill Level

INSERT table (...) VALUES (...)

INSERT table (...) SELECT ...

### UPDATE – Intermediate Skill Level

Simple UPDATE

UPDATE with non-correlated subqueries

UPDATE with correlated subqueries

### DELETE – Intermediate Skill Level

Simple DELETE FROM WHERE...

DELETE with subqueries

## QUERY EXECUTION and STATISTICS

### Awareness of Terminology

Memory Blocks and file blocks

B-Tree Indexes

Physical Reads

Logical Reads or Consistent Gets

Indexed search vs. table scan

Join Algorithms (Nested loops, hash join, merge join). Trainees do not have to memorize the join algorithms. They should just have a basic understanding.

### Introductory Level Skills

Read Explain Plan output

Read Autotrace output and use Consistent Gets to compare the efficiency of queries.

## PL/SQL

### Basic Block – Introductory Level Skills

Anonymous block

Local variables

SELECT INTO

IF statements

### Stored Procedures – Introductory Level Skills

CREATE PROCEDURE

Parameters IN, OUT

Specifying datatypes using: table.column%TYPE

Local variables

Calling procedures using exec

### Functions – Optional

If time permits, trainees could have introductory level skills:

Use the CREATE FUNCTION command to create functions

And able to call user defined functions

## TRANSACTION CONTROL

### Awareness of Terminology

COMMIT

ROLLBACK

A.C.I.D. – Atomic, Consistent, Isolated and Durable

Snapshots

READ COMMITTED, SERIALIZABLE

Deadlock