



“Take up one idea. Make that one idea your life; dream of it; think of it; live on that idea. Let the brain, the body, muscles, muscles, nerves, nerves, every part of your body be full of that idea, and just leave every other idea alone. This is the way to success, and this is the way great spiritual giants are produced.”

– **Swami Vivekananda**



## For Further Details

### Co-ordinators'

#### **Sri. C.R. Sakthivel**

Head of the Department,  
Department of Computer Science  
SRMV CAS, Coimbatore – 641020

#### **Sri. M. Jaikumar**

Head of the Department,  
Department of Computer Applications  
SRMV CAS, Coimbatore – 641020

#### **Sri. N. Kamaraj**

Head of the Department,  
Department of Information Technology  
SRMV CAS, Coimbatore – 641020

### Instructor

#### **Sri. G. Dinesh**

Assistant Professor  
Department of Information Technology  
SRMV CAS, Coimbatore – 641020



## **Sri Ramakrishna Mission Vidyalaya College of Arts and Science**

(An Autonomous Institution Affiliated to Bharathiar University,  
Re-accredited by NAAC with 'A' Grade)  
SRKV Post, Periyanaickenpalayam,  
Coimbatore – 641020  
E-mail: srmvcascbe@gmail.com, Website: www.srmvcas.org

### **Department of Computer Studies (B.Sc(CS), BCA, B.Sc(IT))**

*Organizes*

**Certificate course on**

## **Oracle Database Design and Programming with SQL**

*Venue:* **Computer Science Lab(SF)**

*Date:* **04.07.2018**

## ABOUT US

Ramakrishna Mission Vidyalaya, Coimbatore, is a vast complex of 18 service wings, commenced its educational activities in the year 1930 with the blessing of Bhagavan Sri Ramakrishna. The father of our Nation, Mahatma Gandhi laid the foundation stone of the first wing, a school.

Ayya Sri T.S. Avinashilingam, the Founder-Director, nurtured the institution with his visionary and devoted service. As envisaged by the great Swami Vivekananda, the Vidyalaya strives hard to impart man-making and character-building education to youth, that are necessary to develop leadership, responsibility and love for the country.

## ABOUT OUR COLLEGE

Our college was started in the year 1964. Affiliated to the Bharathiar University, it was conferred with autonomous status in the year 1981-82. The college offers 13 UG and 6 PG programmes in both aided and unaided streams, besides offering 9 MPhil and PhD programmes. It was Re-accredited by NAAC with 'A' grade.

## ABOUT THE DEPARTMENT

The School of Computer Studies constitute of B.Sc(CS), BCA, MCA and B.Sc(IT).

The team of faculties comprises of skilled and motivated persons, having meritorious academic track record with excellent interpersonal and intrapersonal skills.

The Departments is equipped with spacious laboratories and sufficient time for conducting various certification courses like CCNA of CISCO, Hardware & Networking, Multimedia, Web Services, Big Data of DELL EMC and IoT of EASY Design Systems.

## OBJECTIVES OF THE COURSE

This course engages students to analyze complex business scenarios and create a data model—a conceptual representation of an organization's information. Participants implement their database design by creating a physical database using SQL. Basic SQL syntax and the rules for constructing valid SQL statements are reviewed. This course culminates with a project that challenges students to design, implement, and demonstrate a database solution for a business or organization.

Oracle Academy database curriculum is created by professional educators and enables students to learn and practice in Oracle Autonomous Database through Oracle Application Express (APEX) and the Oracle Academy Cloud Program. With Oracle Academy curriculum, students engage in hands-on learning and develop both database and career-ready skills such as problem solving, collaboration, and critical thinking.

The knowledge and practical skills students gain will help them advance their academic studies in computer science or enter the job market across industries and be ready to become innovators and leaders.

*By the end of the course, students will be able to:*

- ❖ Understand Database analysis and design.
- ❖ Understand SQL functions
- ❖ Be able to construct DML and DDL statements
- ❖ Be able to construct data views
- ❖ Be able to manage database integrity.

## Other Course Offered

- ❖ IT Essential Course
- ❖ Routing and Switching Essential
- ❖ Oracle Certification



# Database Design and Programming with SQL – Course Objectives

## Overview

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## Lesson-by-Lesson Topics and Objectives

### Database Design

#### Section 1 - Introduction

- 1-1 Introduction to the Oracle Academy
  - Give examples of jobs, salaries, and opportunities that are possible by participating in the Academy.
  - Explain how your participation in the Academy can help you take advantage of these opportunities.
- 1-2 Data vs. Information
  - Distinguish between data and information, and provide examples of each
  - Describe and give an example of how data becomes information
- 1-3 History of the Database
  - Describe the evolution of the database and give an example of its role in the business world
  - Name important historical contributions in database development and design
  - List and explain the three major steps in the database development process
  -
- 1-4 Major Transformations in Computing
  - List the major transformations in computing that have occurred since the 1970's.
  - Define and give an example of these terms: hardware, operating system, software
  - Identify examples of businesses that use database software and explain how it is essential to their success
  - Explain the overall mission of the Oracle Corporation

#### Section 2 - Entities and Attributes

- 2-1 Conceptual and Physical Models
  - Explain the importance of clearly communicating and accurately capturing information requirements
  - Distinguish between a conceptual model and its physical implementation
  - List five reasons for building a conceptual data model
  - Give examples of conceptual models and physical models
- 2-2 Entities, Instances, Attributes, and Identifiers
  - Define and give an example of an entity
  - Distinguish between an entity and an instance of an entity
  - Name and describe attributes for a given entity
  - Distinguish between an attribute and its value
  - Distinguish between mandatory and optional attributes, and between volatile and nonvolatile attributes
  - Select and justify a unique identifier (UID) for an entity
- 2-3 Entity Relationship Modeling and ERDs
  - Define the meaning of "implementation-free" as it relates to data models and database design implementation
  - List the four goals of entity relationship modeling
  - Identify an entity relationship diagram (ERD)

#### Section 3 - Relationship Basics

- 3-1 Identifying Relationships
  - Interpret and describe relationship optionality
  - Interpret and describe relationship cardinality
  - Relate (connect or join) entities by applying the rules of cardinality and optionality

- 3-2 ER Diagramming Conventions
  - Construct ER diagram components that represent entities, attributes and relationships according to diagramming conventions
- 3-3 Speaking ERDish and Drawing Relationships
  - State relationships between entities in precise words (ERDish)
  - Draw and label relationships correctly on an ERD
- 3-4 Matrix Diagrams
  - Identify relationships using a matrix diagram
  - Draw an ERD from a matrix diagram

#### Section 4 - Super/Sub Types and Business Rules

- 4-1 Supertypes and Subtypes
  - Define and give an example of a subtype
  - Define and give an example of a supertype
  - State the rules relating to entities and subtypes, and give examples of each
  - Apply the rules of supertype and subtype by evaluating the accuracy of ER diagrams that represent them
  - Apply the rules of supertype and subtype and include them in a diagram when appropriate
- 4-2 Documenting Business Rules
  - Define and compose a structural business rule
  - Define and compose a procedural business rule
  - Recognize that some business rules will require programming
  - Diagram business rules when they can be represented in an ER model

#### Section 5 - Relationship Basics

- 5-1 Relationship Transferability
  - Describe and give an example of relationship transferability
  - Understand the difference between transferable and nontransferable relationships
  - Illustrate nontransferable relationships on ERDs
- 5-2 Relationship Types
  - Recognize and give examples of a one-to-one relationship
  - Recognize and give examples of a one-to-many relationship
  - Recognize and give examples of a many-to-many relationship
  - Recognize redundant relationships and remove them from the ERD
- 5-3 Resolving Many-to-Many Relationships
  - Identify attributes which belong to many-to-many relationships
  - Demonstrate the steps to resolve a many-to-many relationship using an intersection entity
  - Identify the UID of an intersection entity and represent it in the entity relationship diagram
- 5-4 Understanding CRUD Requirements
  - Create ER models that reflect all business rules gathered during the interview process
  - Identify the create, retrieve, update, and delete (CRUD) requirements of the business
  - Validate your ER model by performing a CRUD analysis

#### Section 6 - UIDs and Normalization

- 6-1 Artificial, Composite, and Secondary UIDs
  - Define the different types of unique identifiers (UIDs)
  - Define a candidate UID and explain why an entity can sometimes have more than one candidate UID
  - Analyze business rules and choose the most suitable primary UID from the candidates
  - Recognize and discuss the issues of identification in the real world
- 6-2 Normalization and First Normal Form
  - Define the purpose of normalization in database models
  - Define the rule of First Normal Form in the normalization process
  - Determine if an entity conforms to the rule of First Normal Form
  - Convert an entity to First Normal Form if needed
- 6-3 Second Normal Form
  - Define the rule of Second Normal Form in the normalization process
  - Examine a non-normalized entity and determine which rule, or rules of normalization are being violated
  - Apply the rule of Second Normal Form to resolve a violation in the model
- 6-4 Third Normal Form
  - Identify transitive dependencies in a data model
  - Define the rule of Third Normal Form in the normalization process
  - Examine a non-normalized entity and determine which rule, or rules of normalization are being violated
  - Apply the rule of Third Normal Form to resolve a violation in the model

## Section 7 - Arcs, Hierarchies, and Recursive Modeling

- 7-1 Arcs
  - Define the term "constraint" as it applies to data modeling
  - Identify an exclusive OR relationship in a business scenario
  - Diagram an arc constraint to represent an exclusive OR relationship
  - Distinguish between the use of an arc and a subtype in the data model
- 7-2 Hierarchies and Recursive Relationships
  - Define and give an example of a hierarchical relationship
  - Identify the UIDs in a hierarchical model
  - Define and give an example of a recursive relationship
  - Represent a recursive relationship in an ERD given a scenario
  - Construct a model using both recursion and hierarchies to express the same conceptual meaning

## Section 8 - Changes and Historical Modeling

- 8-1 Modeling Historical Data
  - Identify the need to track data that changes over time
  - Construct ERD models that incorporate elements of "data over time"
  - Identify the UID of an entity that stores historical data; explain and justify the choice of UID
- 8-2 Modeling Change: Time
  - Distinguish between using date as an attribute and DAY as an entity in a data model, depending on business requirements
  - Solve the problem of keeping characteristics of a date by constructing a model that uses DAY as an entity
  - Identify at least three time-related constraints that can result from a time-sensitive model
  - Define and give an example of conditional non-transferability in a time-constrained model
- 8-3 Modeling Change: Price
  - Solve the business requirement of tracking changes in price or values by constructing a model that uses a historical entity
  - Describe the meaning of journaling/logging
  - Identify the business need for journaling/logging and construct a model that addresses this requirement
- 8-4 Drawing Conventions for Readability
  - Apply the Oracle drawing conventions to a data model diagram
  - Identify high volume entities in a data model diagram and explain their significance to the business
  - Redraw a given data model diagram to increase clarity and readability
  - Recognize the usefulness of dividing a complex ERD into a number of functional sub-diagrams

## Section 9 - Mapping

- 9-1 Introduction to Relational Database Concepts
  - Define a primary key
  - Define a foreign key
  - Define a column-integrity rule
  - Identify row, column, primary key, unique key, and foreign key elements given a diagram of a table containing these elements
  - Identify violations of data-integrity rules
- 9-2 Basic Mapping: The Transformation Process
  - Distinguish between a conceptual model and a physical model
  - Apply terminology mapping between the two models
  - Understand and apply the Oracle naming conventions for tables and columns used in physical models
  - Transform an entity into a table diagram
- 9-3 Relationship Mapping
  - Apply the rule of relationship mapping to correctly transform 1:M and barred relationships
  - Apply the rule of relationship mapping to correctly transform M:M relationships
  - Transform 1:1 relationships
  - Apply the rule of relationship mapping to correctly transform relationships in an arc
- 9-4 Subtype Mapping
  - State and apply the table, column, identifiers, relationship, and integrity constraint rules for mapping:
    - supertype implementations
    - subtype implementations
    - supertype and subtype arc implementations

## Section 10 - Creating Database Projects

- 10-1 System Development Life Cycle
  - List and describe the different stages of the system development life cycle (SDLC)
  - Identify the role of data modeling in the system development life cycle
  - Relate the project tasks to the different stages of the system development life cycle

- 10-2 Project Overview and Getting Started
  - Identify a data-modeling project to solve a business information need
  - Demonstrate essential skills in solving business problems using technology, and professionally presenting these solutions
  - Demonstrate effective team-building skills
- 10-3 Presentation Project Management
  - Track responsibility and progress on a project by using a project-management document
  - Show evidence of progress on the final presentation project by filling in the final project tracking grid
- 10-4 Final Presentation Components
  - Organize the final oral presentation content in logical outline order
  - Identify appropriate content for each part of the presentation
  - Assign presentation roles to each group member

#### Section 11 - Presenting Database Projects

- 11-1 Creating Tables for the Final Presentation
  - Create sample tables from the final project presentation ERD
  - Insert sample data to the created tables
- 11-2 Preparing Written Documentation
  - Compose well-organized written documentation to accompany a presentation
  - Create a rough draft of, review, and finalize the written documentation.
- 11-3 Preparing Visual Materials
  - Construct entity relationship diagrams that demonstrate industry conventions
  - Prepare tables and visuals that support their database documentation
  - Demonstrate and provide examples of table formatting for database documentation
  - Demonstrate and refine oral presentation skills during rehearsal and refinement
- 11-4 Final Presentations
  - Demonstrate the use of a central message and supporting arguments for a final presentation
  - Demonstrate logical analysis of the business rules, operations, and processes in a way that is clear and easy for the client to understand
  - Demonstrate the selection of appropriate business attire for a final presentation

## Database Programming with SQL

#### Section 1 - Introduction

- 1-1 Oracle Application Express
  - Distinguish between application software and system software and give an example of each
  - Log-in to the Oracle Application Express practice environment
  - Execute a simple query to retrieve information from the Database
  - Apply the rules of SQL to display all columns and a subset of columns specified by criteria
- 1-2 Relational Database Technology
  - Define and give an example of a relational database
  - Identify table-key terms, including row, column, field, primary key, and foreign key
  - Relate the importance of databases to everyday life
- 1-3 Anatomy of a SQL Statement
  - Match projection and selection with their correct capabilities
  - Create a basic SELECT statement
  - Use the correct syntax to display all rows in a table
  - Use the correct syntax to select specific columns in a table, modify the way data is displayed, and perform calculations using arithmetic expressions and operators

#### Section 2 – SELECT and WHERE

- 2-1 Columns, Characters, and Rows
  - Apply the concatenation operator to link columns to other columns, arithmetic expressions, or constant values to create a character expression
  - Use column aliases to rename columns in the query result
  - Enter literal values of type character, number, or date into a SELECT statement
  - Define and use DISTINCT to eliminate duplicate rows
  - Edit, execute, and save SQL statements in Oracle Application Express
- 2-2 Limit Rows Selected
  - Apply SQL syntax to restrict the rows returned from a query
  - Demonstrate application of the WHERE clause syntax
  - Explain why it is important, from a business perspective, to be able to easily limit data retrieved from a table
  - Construct and produce output using a SQL query containing character strings and date values

- 2-3 Comparison Operators
  - Apply the proper comparison operator to return a desired result
  - Demonstrate proper use of BETWEEN, IN, and LIKE conditions to return a desired result
  - Distinguish between zero and NULL, the latter of which is unavailable, unassigned, unknown, or inapplicable
  - Explain the use of comparison conditions and NULL

### Section 3 - WHERE, ORDER BY, and Intro to Functions

- 3-1 Logical Comparisons and Precedence Rules
  - Evaluate logical comparisons to restrict the rows returned based on two or more conditions
  - Apply the rules of precedence to determine the order in which expressions are evaluated and calculated
- 3-2 Sorting Rows
  - Construct a query to sort a result set in ascending or descending order
  - State the order in which expressions are evaluated and calculated based on the rules of precedence
  - Construct a query to order a result set using a column alias
  - Construct a query to order a result set for single or multiple columns
- 3-3 Introduction to Functions
  - Identify appropriate applications of single-row functions in query statements
  - Classify a function as a single-row or multi-row function
  - Differentiate between single-row functions and multi-row functions and the results returned by each

### Section 4 - Single Row Functions Part I

- 4-1 Case and Character Manipulation
  - Select and apply single-row functions that perform case conversion and/or character manipulation
  - Select and apply character case-manipulation functions LOWER, UPPER, and INITCAP in a SQL query
  - Select and apply character-manipulation functions CONCAT, SUBSTR, LENGTH, INSTR, LPAD, RPAD, TRIM, and REPLACE in a SQL query
  - Write flexible queries using substitution variables
- 4-2 Number Functions
  - Select and apply the single-row number functions ROUND, TRUNC, and MOD in a SQL query
  - Distinguish between the results obtained when TRUNC is applied to a numeric value and ROUND is applied to a numeric value
  - State the implications for business when applying TRUNC and ROUND to numeric values
- 4-3 Date Functions
  - Demonstrate the use of SYSDATE and date functions
  - State the implications for world businesses to be able to easily manipulate data stored in date format

### Section 5 - Single Row Functions Part II

- 5-1 Conversion Functions
  - Provide an example of an explicit data-type conversion and an implicit data-type conversion
  - Explain why it is important, from a business perspective, for a language to have built-in data-conversion capabilities
  - Construct a SQL query that correctly applies TO\_CHAR, TO\_NUMBER, and TO\_DATE single-row functions to produce a desired result
  - Apply the appropriate date and/or character format model to produce a desired output
  - Explain and apply the use of YY and RR to return the correct year as stored in the database
- 5-2 NULL Functions
  - Demonstrate and explain the evaluation of a nested function
  - List at least four general functions that work with any data type and relate to handling null values
  - Explain the use of the COALESCE and the NVL functions
  - Explain the use of general functions to deal with null values in data
  - Construct and execute a SQL query that correctly applies NVL, NVL2, NULLIF, and COALESCE single-row functions
- 5-3 Conditional Expressions
  - Compare and contrast the DECODE and CASE functions
  - Construct and execute a SQL query that correctly uses the DECODE and CASE functions
  - Construct and execute two methods for implementing IF-THEN-ELSE conditional logic

### Section 6 - JOINS Part I

- 6-1 Cross Joins and Natural Joins
  - Construct and execute a natural join using ANSI-99 SQL join syntax
  - Create a cross join using ANSI-99 SQL join syntax
  - Explain the importance of having a standard for SQL as defined by ANSI
  - Describe a business need for combining information from multiple data sources
- 6-2 Join Clauses
  - Construct and execute a join with the ANSI-99 USING Clause
  - Construct and execute a join with the ANSI-99 ON Clause
  - Construct and execute an ANSI-99 query that joins three tables

- 6-3 Inner versus Outer Joins
  - Compare and contrast an inner and an outer join
  - Construct and execute a query to use a left outer join
  - Construct and execute a query to use a right outer join
  - Construct and execute a query to use a full outer join
- 6-4 Self-Joins and Hierarchical Queries
  - Construct and execute a SELECT statement to join a table to itself using a self-join
  - Interpret the concept of a hierarchical query
  - Create a tree-structured report
  - Format hierarchical data
  - Exclude branches from the tree structure

## Section 7 - JOINS Part II

- 7-1 Oracle Equijoin and Cartesian Product
  - Name the Oracle proprietary joins and their ANSI/ISO SQL: 99 counterparts
  - Construct and execute a SELECT statement that results in a Cartesian product
  - Construct and execute SELECT statements to access data from more than one table using an equijoin
  - Construct and execute SELECT statements that add search conditions using the AND operator
  - Apply the rule for using table aliases in a join statement
- 7-2 Oracle Nonequijoins and Outer Joins
  - Construct and execute a SELECT statement to access data from more than one table using a nonequijoin
  - Create and execute a SELECT statement to access data from more than one table using an Oracle outer join

## Section 8 - Group Functions Part I

- 8-1 Group Functions
  - Define and give an example of the seven group functions: SUM, AVG, COUNT, MIN, MAX, STDDEV, VARIANCE
  - Construct and execute a SQL query using group functions
  - Construct and execute group functions that operate only with numeric data types
- 8-2 COUNT, DISTINCT, NVL
  - Construct and execute a SQL query using the COUNT group function
  - Use DISTINCT and the NVL function with group functions

## Section 9 - Group Functions Part II

- 9-1 Using Group By and Having Clauses
  - Construct and execute a SQL query using GROUP BY
  - Construct and execute a SQL query using GROUP BY ... HAVING
  - Construct and execute a GROUP BY on more than one column
  - Nest group functions
- 9-2 Using Rollup and Cube Operations, and Grouping Sets
  - Use ROLLUP to produce subtotal values
  - Use CUBE to produce cross-tabulation values
  - Use GROUPING SETS to produce a single result set
  - Use the GROUPING function to identify the extra row values created by either a ROLLUP or CUBE operation
- 9-3 Using Set Operators
  - Define and explain the purpose of Set Operators
  - Use a set operator to combine multiple queries into a single query
  - Control the order of rows returned using set operators

## Section 10 – Subqueries

- 10-1 Fundamentals of Subqueries
  - Define and explain the purpose of subqueries for retrieving data
  - Construct and execute a single-row subquery in the WHERE clause
  - Distinguish between single-row and multiple-row subqueries
- 10-2 Single-Row Subqueries
  - Construct and execute a single-row subquery in the WHERE clause or HAVING clause
  - Construct and execute a SELECT statement using more than one subquery
  - Construct and execute a SELECT statement using a group function in the subquery
- 10-3 Multiple-Row Subqueries
  - Correctly use the comparison operators IN, ANY, and ALL in multiple-row subqueries
  - Construct and execute a multiple-row subquery in the WHERE clause or HAVING clause
  - Describe what happens if a multiple-row subquery returns a null value
  - Understand when multiple-row subqueries should be used, and when it is safe to use a single-row subquery
  - Distinguish between pair-wise and non-pair-wise subqueries
  - Create a query using the EXISTS and NOT EXISTS operators to test for returned rows from the subquery
- 10-4 Correlated Subqueries



- Identify when correlated subqueries are needed.
- Construct and execute correlated subqueries.
- Construct and execute named subqueries using the WITH clause.

#### Section 11 – Ensuring Quality Queries Part I

- 11-1 Ensuring Quality Query Results
  - Create a query to produce specified data
  - Modify a query to produce specified data

#### Section 12 - DML

- 12-1 INSERT Statements
  - Explain the importance of being able to alter the data in a database
  - Construct and execute INSERT statements which insert a single row using a VALUES clause
  - Construct and execute INSERT statements that use special values, null values, and date values
  - Construct and execute INSERT statements that copy rows from one table to another using a subquery
- 12-2 Updating Column Values and Deleting Rows
  - Construct and execute an UPDATE statement
  - Construct and execute a DELETE statement
  - Construct and execute a query that uses a subquery to update and delete data from a table
  - Construct and execute a query that uses a correlated subquery to update and delete from a table
  - Explain how foreign-key and primary-key integrity constraints affect UPDATE and DELETE statements
  - Explain the purpose of the FOR UPDATE Clause in a SELECT statement
- 12-3 DEFAULT Values, MERGE, and Multi-Table Inserts
  - Understand when to specify a DEFAULT value
  - Construct and execute a MERGE statement
  - Construct and execute DML statements using subqueries
  - Construct and execute multi-table inserts

#### Section 13 - DDL

- 13-1 Creating Tables
  - List and categorize the main database objects
  - Review a table structure
  - Describe how schema objects are used by the Oracle database
  - Create a table using the appropriate data type for each column
  - Explain the use of external tables
  - Query the Data Dictionary to obtain the names and other attributes of database objects
- 13-2 Using Data Types
  - Create a table using TIMESTAMP and TIMESTAMP WITH TIME ZONE column data types
  - Create a table using INTERVAL YEAR TO MONTH and INTERVAL DAY TO SECOND column data types
  - Give examples of organizations and personal situations where it is important to know to which time zone a date-time value refers
  - List and provide an example of each of the number, date, and character data types
- 13-3 Modifying a Table
  - Explain why it is important to be able to modify a table
  - Explain and provide an example for each of the DDL statements—ALTER, DROP, RENAME, and TRUNCATE—and the effect each has on tables and columns
  - Construct a query and execute the ALTER TABLE commands ADD, MODIFY, and DROP
  - Explain and perform FLASHBACK QUERY on a table
  - Explain and perform FLASHBACK table operations
  - Track the changes to data over a period of time
  - Explain the rationale for using TRUNCATE versus DELETE for tables
  - Add a comment to a table using the COMMENT ON TABLE command
  - Name the changes that can and cannot be made to modify a column
  - Explain when and why the SET UNUSED statement is advantageous

#### Section 14 - Constraints

- 14-1 Intro to Constraints; NOT NULL and UNIQUE Constraints
  - Define the term "constraint" as it relates to data integrity
  - State when it is possible to define a constraint at the column level, and when it is possible at the table level
  - State why it is important to give meaningful names to constraints
  - State which data integrity rules are enforced by NOT NULL and UNIQUE constraints
  - Write a CREATE TABLE statement which includes NOT NULL and UNIQUE constraints at the table and column levels
  - Explain how constraints are created at the time of table creation

- 14-2 PRIMARY KEY, FOREIGN KEY, and CHECK Constraints
  - Define and give an example of a PRIMARY KEY, FOREIGN KEY, and CHECK constraint
  - Explain the purpose of defining PRIMARY KEY, FOREIGN KEY, and CHECK constraints
  - Demonstrate the creation of constraints at the column level and table level in a CREATE TABLE statement
  - Evaluate a business problem requiring the addition of a PRIMARY KEY and FOREIGN KEY constraint and write the code to execute the change
- 14-3 Managing Constraints
  - List four different functions that the ALTER statement can perform on constraints
  - Write ALTER TABLE statements to add, drop, disable, and enable constraints
  - Name a business function that would require a DBA to drop, enable, and/or disable a constraint or use the CASCADE syntax
  - Query the data dictionary for USER\_CONSTRAINTS and interpret the information returned

#### Section 15 - Views

- 15-1 Creating Views
  - List three uses for views from the standpoint of a database administrator
  - Explain, from a business perspective, why it is important to be able to create and use logical subsets of data derived from one or more tables
  - Create a view with and without column aliases in the subquery using a single base table
  - Create a complex view that contains group functions to display values from two tables
  - Retrieve data from a view
- 15-2 DML Operations and Views
  - Write and execute a query that performs DML operations on a simple view
  - Name the conditions that restrict your ability to modify a view using DML operations
  - Write and execute a query using the WITH CHECK OPTION clause
  - Explain the use of WITH CHECK OPTION as it applies to integrity constraints and data validation
  - Apply the WITH READ ONLY option to a view to restrict DML operations
- 15-3 Managing Views
  - Create and execute a SQL statement that removes a view
  - Create and execute a query using an inline view
  - Create and execute a top-n-analysis query

#### Section 16 - Sequences and Synonyms

- 16-1 Working With Sequences
  - List at least three useful characteristics of a sequence
  - Write and execute a SQL statement that creates a sequence
  - Query the data dictionary using USER\_SEQUENCES to confirm a sequence definition
  - Apply the rules for using NEXTVAL to generate sequential unique numbers in a table
  - List the advantages and disadvantages of caching sequence values
  - Name three reasons why gaps can occur in a sequence
- 16-2 Indexes and Synonyms
  - Define an index and its use as a schema object
  - Name the conditions that cause an index to be created automatically
  - Create and execute a CREATE INDEX and DROP INDEX statement
  - Create and execute a function-based index
  - Create private and public synonyms

#### Section 17 - Privileges and Regular Expressions

- 17-1 Controlling User Access
  - Compare the difference between object privileges and system privileges
  - Construct the two commands required to enable a user to have access to a database
  - Construct and execute a GRANT... ON ...TO statement to assign privileges to objects in their schema to other users and/or PUBLIC
  - Query the data dictionary to confirm privileges granted
- 17-2 Creating and Revoking Object Privileges
  - Explain what a ROLE is and what its advantages are
  - Construct a statement to create a ROLE and GRANT privileges to it
  - Construct a GRANT .. ON .. TO.. WITH GRANT OPTION statement to assign privileges on objects in your schema to other users and/or PUBLIC
  - Construct and execute a statement to REVOKE object privileges from other users and/or from PUBLIC
  - Distinguish between privileges and roles
  - Explain the purpose of a database link

- 17-3 Regular Expressions
  - Describe regular expressions
  - Use regular expressions to search, match, and replace strings in SQL statements
  - Construct and execute regular expressions and check constraints

#### Section 18 - TCL

- 18-1 Database Transactions
  - Define the terms COMMIT, ROLLBACK, and SAVEPOINT as they relate to data transactions
  - List three advantages of the COMMIT, ROLLBACK, and SAVEPOINT statements
  - Explain why it is important, from a business perspective, to be able to control the flow of transaction processing

#### Section 19 - Final Project and Exam Review

- 19-1 Testing
  - Develop and apply a strategy for testing that a database functions as designed
- 19-2 Final Project Database Creation
  - Apply SQL concepts to create a functional database appropriate for a small business
- 19-3 Final Exam Review
  - Review the key points about case and character manipulation
  - Review number, date, conversion, and general functions
  - Review conditional expressions
  - Review Cartesian product and join operations
  - Review non-equijoins, outer joins, self joins, cross joins, natural joins, and join clauses
  - Review group functions, group by syntax, and having clauses
  - Review single-row and multiple row subqueries
  - Review pair-wise and non-pair-wise subqueries
  - Review correlated subqueries
  - Review DML statements insert, update, delete, merge, and multi-table inserts
  - Review DDL statements CREATE, ALTER, RENAME, TRUNCATE, FLASHBACK TABLE, DROP, and FLASHBACK QUERY
  - Review DCL statements CREATE and REVOKE object privileges

#### Section 20 - Ensuring Quality Queries Part II

- 20-1 Ensuring Quality Query Results - Advanced Techniques
  - Create an advanced query to produce specified data
  - Modify an advanced query to produce specified data