Appendix A: Database Design Specialist Objectives and Locations

The CIW *Database Design Specialist* course and this appendix are designed to help students prepare for the CIW Database Design Specialist certification exam. Students can use this appendix as a study guide to locate content within the *Database Design Specialist* course that corresponds to the specific skills objectives of the Database Design Specialist program.

You can register for the Database Design Specialist certification exam by visiting Prometric at *http://secureregЗ.prometric.com/* or VUE at *www.vue.com/*. You can also contact your participating academic institution. For more information about the Database Design Specialist exam and CIW certifications, visit *www.CIWcertified.com*.

CIW Database Design Specialist Objective	Lesson and Section(s)
Domain 1 Relational Database Fundamentals	
Subdomain 1.1 Identify basic database types and management systems.	
1.1.1 List database types (e.g., flat file, relational), and identify their uses and architectures.	**Lesson 1: Introduction to Databases** - File-Based Databases
1.1.2 Describe the types of database management system (DBMS), and explain the benefits and limitations of each DBMS type.	**Lesson 1: Introduction to Databases** - Relational Databases and Database Management Systems (DBMSs)
1.1.3 Define common database architectures (e.g., single, multi-tier).	**Lesson 2: Relational Database Fundamentals** - Multitier Database Architecture
Subdomain 1.2 List common database languages and their purposes, and identify language subsets of Structured Query Language (SQL).	
1.2.1 Describe the function of Structured Query Language (SQL), including language subsets.	**Lesson 2: Relational Database Fundamentals** - Database Languages
1.2.2 Describe the function of Data Definition Language (DDL)	**Lesson 2: Relational Database Fundamentals** - Database Languages
1.2.3 Describe the function of Data Manipulation Language (DML).	**Lesson 2: Relational Database Fundamentals** - Database Languages
1.2.4 Describe the function of Data Control Language (DCL).	**Lesson 2: Relational Database Fundamentals** - Database Languages

CIW Database Design Specialist Objective	Lesson and Section(s)
Subdomain 1.3 Identify relational data modeling schemas, characteristics and manipulation.	
1.3.1 Define essential database concepts and terms, including relation, relation name, table, row, column, value, relational algebra, data modeling, data relationship.	**Lesson 2: Relational Database Fundamentals** - Relational Model Terminology **Lesson 2: Relational Database Fundamentals** - Using Tables to Represent Data
1.3.2 Explain the concepts of attribute, degree, tuple and cardinality.	**Lesson 2: Relational Database Fundamentals** - Relational Model Terminology
1.3.3 Define entities, including strong entities, weak entities.	**Lesson 2: Relational Database Fundamentals** - Entities and Data Relationships
1.3.4 List characteristics of relations (e.g., column characteristics, row characteristics).	**Lesson 2: Relational Database Fundamentals** - Characteristics of Relations
1.3.5 Describe table types (e.g., base tables, virtual tables).	**Lesson 2: Relational Database Fundamentals** - Characteristics of Relations
1.3.6 Distinguish between primary and foreign keys, including null value, composite key.	**Lesson 2: Relational Database Fundamentals** - Characteristics of Relations
1.3.7 Explain data models in relational databases.	**Lesson 2: Relational Database Fundamentals** - Data Models
1.3.8 Describe common database relationships (e.g., one to one, one to many, many to many) and identify the notation for such relationships (e.g., 1:n).	**Lesson 2: Relational Database Fundamentals** - Entities and Data Relationships
1.3.9 Define relational integrity concepts, including domain constraints, entity and referential integrity, views.	**Lesson 2: Relational Database Fundamentals** - Relational Integrity
1.3.10 Explain the structure and purpose of a data dictionary.	**Lesson 2: Relational Database Fundamentals** - Data Dictionaries **Lesson 6: Logical Database Design** - Using a Database Definition Language
Domain 2 Relational Database Design and Application	
Subdomain 2.1 Identify the steps of the database planning life cycle.	
2.1.1 Describe the elements of a database planning strategy (e.g., defining the scope of a database application).	**Lesson 3: Database Planning** - Introduction to Database Planning - Database Design Life Cycle - Lab 3-1: Starting the ProAudio Database
2.1.2 List the necessary steps for creating a database requirements document, including conducting interviews, noting project constraints, identifying the precise duties of the database, creating a database design document.	**Lesson 3: Database Planning** - Database Design Life Cycle - Database Requirements Document

CIW Database Design Specialist Objective	Lesson and Section(s)
2.1.3 Explain the importance of data modeling and entity relationship diagrams during the planning stage (e.g., define the concept of an entity-relationship [ER] diagram).	**Lesson 3: Database Planning** - Database Design Life Cycle
2.1.4 Create a database prototype.	**Lesson 3: Database Planning** - Database Design Life Cycle
2.1.5 Describe the purpose of database application testing, including white-box testing, black-box testing.	**Lesson 3: Database Planning** - Database Design Life Cycle
2.1.6 List the criteria for selecting a database management system and an application interface.	**Lesson 3: Database Planning** - Selecting a DBMS - Selecting an Application Interface
Subdomain 2.2 Identify the activities in the conceptual design phase of a database.	
2.2.1 List the steps of the conceptual design phase (e.g., identifying entities, attribute domains, relationships).	**Lesson 4: Overview of Database Design Methodology** - Conceptual Database Design
2.2.2 Describe how to identify entities.	**Lesson 4: Overview of Database Design Methodology** - Conceptual Database Design
2.2.3 List ways to identify attributes and attribute domains for entities.	**Lesson 4: Overview of Database Design Methodology** - Conceptual Database Design
2.2.4 List ways to identify candidate and primary keys for entities.	**Lesson 4: Overview of Database Design Methodology** - Conceptual Database Design
2.2.5 Identify and determine data relationships.	**Lesson 4: Overview of Database Design Methodology** - Conceptual Database Design
2.2.6 Create an entity-relationship (ER) diagram.	**Lesson 4: Overview of Database Design Methodology** - Entity-Relationship Models
2.2.7 Analyze an entity-relationship (ER) diagram or model to determine relation types.	**Lesson 4: Overview of Database Design Methodology** - Entity-Relationship Models
2.2.8 Define and describe domains.	**Lesson 4: Overview of Database Design Methodology** - Entity-Relationship Models
2.2.9 Explain the results of poor database design, and describe insertion, deletion and update anomalies in databases.	**Lesson 4: Overview of Database Design Methodology** - Effects of Poor Database Design Practices
Domain 3 Normalization and Database Design	
Subdomain 3.1 Apply normalization techniques and processes.	
3.1.1 Distinguish between specific normal forms, including first normal form (1NF), second normal form (2NF), third normal form (3NF), Boyce-Codd normal form (BCNF).	**Lesson 5: Normalization** - First Normal Form - Second Normal Form - Third Normal Form - Boyce-Codd Normal Form (BCNF)

CIW Database Design Specialist Objective	Lesson and Section(s)
3.1.2 Describe the normalization process.	**Lesson 5: Normalization** - Introduction to Normalization
3.1.3 Define and explain determinant, decomposition and functional dependency.	**Lesson 5: Normalization** - Second Normal Form
Subdomain 3.2 Describe logical database design steps and practices.	
3.2.1 Identify logical database design issues.	**Lesson 6: Logical Database Design** - Logical Database Design
3.2.2 Analyze and select appropriate database designs, and identify the solution that addresses the application needs.	**Lesson 1: Introduction to Databases** - Relational Databases and Database Management Systems (DBMSs)
3.2.3 List the steps of the logical database design phase (e.g., creating a raw data model; identifying and documenting entities, attributes, relationships, domains, and candidate and primary keys).	**Lesson 6: Logical Database Design** - Introduction to Logical Database Design - Logical Database Design - Creating a Logical Data Model
3.2.4 Identify the cardinality of data relationships.	**Lesson 6: Logical Database Design** - Logical Database Design
3.2.5 Identify and resolve inexpedient data relationships.	**Lesson 6: Logical Database Design** - Logical Database Design
3.2.6 Create an integrated logical data model from a conceptual data model.	**Lesson 6: Logical Database Design** - Creating a Logical Data Model
3.2.7 Use Data Definition Language (DDL).	**Lesson 6: Logical Database Design** - Using a Database Definition Language
3.2.8 Validate a logical data model against user operations and system requirements.	**Lesson 6: Logical Database Design** - Validating the Logical Data Model
3.2.9 Define integrity constraints (e.g., necessary data, domain constraints, entity integrity, referential integrity).	**Lesson 6: Logical Database Design** - Defining Integrity Constraints
3.2.10 Create corporate and enterprise data models based on user views of data.	**Lesson 6: Logical Database Design** - Creating an Enterprise Data Model
3.2.11 Validate the enterprise data model.	**Lesson 6: Logical Database Design** - Creating an Enterprise Data Model
3.2.12 Describe database design steps, including determining the proper steps in creating entities, applying normalization, selecting a database management system (DBMS).	**Lesson 3: Database Planning** - Selecting a DBMS **Lesson 4: Overview of Database Design Methodology** - Conceptual Database Design **Lesson 5: Normalization** - What is Normalization? **Lesson 6: Logical Database Design** - Logical Database Design

CIW Database Design Specialist Objective	Lesson and Section(s)
Subdomain 3.3 Interpret logical data models into a physical data model that can be implemented by a particular database management system (DBMS).	
3.3.1 List the elements of physical database design.	**Lesson 7: Physical Database Design** - Introduction to Physical Database Design
3.3.2 Determine physical database design issues.	**Lesson 7: Physical Database Design** - Physical Database Design
3.3.3 Describe how to create base relations for a target database management system (DBMS) using Data Definition Language (DDL).	**Lesson 7: Physical Database Design** - Physical Database Design
3.3.4 Identify and create enterprise constraints for a target database management system (DBMS).	**Lesson 7: Physical Database Design** - Creating Enterprise Constraints
3.3.5 Define secondary indexes and determine when to use them.	**Lesson 7: Physical Database Design** - Using Secondary Indexes
3.3.6 Create a base relation.	**Lesson 7: Physical Database Design** - MySQL Query Browser - Lab 7-1: Creating base relations for the Pro Audio database - Lab 7-2: Creating relations and adding CHECK constraints
3.3.7 Identify referential constraints.	**Lesson 7: Physical Database Design** - Creating Enterprise Constraints
3.3.8 Explain denormalization and describe when it is necessary.	**Lesson 7: Physical Database Design** - Denormalization
3.3.9 Create user views (e.g., the CREATE VIEW SQL statement).	**Lesson 7: Physical Database Design** - Creating User Views - Lab 7-3: Creating views
3.3.10 Design database access rules.	**Lesson 7: Physical Database Design** - Designing Database Access Rules - Lab 7-4: Creating users and granting privileges
3.3.11 Perform data manipulation.	**Lesson 8: Structured Query Language** - Data Manipulation Language - Lab 8-3: Deleting and updating records
Domain 4 Structured Query Language (SQL)	
Subdomain 4.1 Identify SQL commands and syntax.	
4.1.1 Describe basic SQL syntax.	**Lesson 8: Structured Query Language** - SQL Basics
4.1.2 List data types used in SQL, including SMALLINT, DECIMAL(p, q), CHAR(n) and TIMESTAMP	**Lesson 8: Structured Query Language** - SQL Basics

CIW Database Design Specialist Objective	Lesson and Section(s)
Subdomain 4.2 Create statements using Data Definition Language (DDL).	
4.2.1 Define the term schema in relation to databases.	**Lesson 8: Structured Query Language** - Data Definition Language
4.2.2 Create a schema using the CREATE SCHEMA statement.	**Lesson 8: Structured Query Language** - Data Definition Language
4.2.3 Drop schemas from a database using the DROP SCHEMA statement.	**Lesson 8: Structured Query Language** - Data Definition Language
Subdomain 4.3 Form commands using Data Manipulation Language (DML).	
4.3.1 Use appropriate commands to create, insert and retrieve data from a database table, including using the SELECT, CREATE TABLE and CREATE VIEW statements.	**Lesson 7: Physical Database Design** - MySQL Query Browser - Lab 7-1: Creating base relations for the ProAudio database - Creating User Views - Lab 7-3: Creating views **Lesson 8: Structured Query Language** - Data Definition Language - Lab 8-1: Using DDL - Data Manipulation Language - Lab 8-2: Using the INSERT statement - Lab 8-3: Deleting and updating records - Retrieving Data from Relations - Lab 8-4: Retrieving records from a database - Lab 8-5: Using the IN, BETWEEN, and LIKE operators
4.3.2 Use the INSERT command appropriately.	**Lesson 8: Structured Query Language** - Data Manipulation Language
4.3.3 Use appropriate UPDATE and DELETE statements to update or delete information from a database, including working with tuples.	**Lesson 8: Structured Query Language** - Data Manipulation Language
4.3.4 Use the DISTINCT keyword.	**Lesson 8: Structured Query Language** - Retrieving Data from Relations
4.3.5 Compose predicates and other statements using the WHERE clause.	**Lesson 8: Structured Query Language** - Retrieving Data from Relations
4.3.6 Identify the use and structure of Boolean operators.	**Lesson 8: Structured Query Language** - Retrieving Data from Relations
4.3.7 Describe SQL special operators and ORDER BY clauses (e.g., the IN, BETWEEN and LIKE operators).	**Lesson 8: Structured Query Language** - Retrieving Data from Relations - Lab 8-5: Using the IN, BETWEEN and LIKE operators
4.3.8 Deploy the ORDER BY clause to order output by column or group of columns.	**Lesson 8: Structured Query Language** - Retrieving Data from Relations

CIW Database Design Specialist Objective	Lesson and Section(s)
4.3.9 Retrieve data from relations using the SELECT statement.	**Lesson 8: Structured Query Language** - Retrieving Data from Relations - Lab 8-4: Retrieving records from a database
Subdomain 4.4 Use Data Control Language (DCL) statements to control the access to data in a database and to grant users permissions for data operations.	
4.4.1 Create statements using the GRANT keyword to control user access to relations.	**Lesson 8: Structured Query Language** - Data Control Language
4.4.2 Use the REVOKE keyword to limit access.	**Lesson 8: Structured Query Language** - Data Control Language
Domain 5 Relational Algebra and Databases	
Subdomain 5.1 Define and describe the use of relational algebra in order to create new relationships from existing database relations.	
5.1.1 Describe a selection operation.	**Lesson 9: Relational Algebra** - Selection
5.1.2 Create a projection operation.	**Lesson 9: Relational Algebra** - Projection
5.1.3 Explain and use a Cartesian product operation.	**Lesson 9: Relational Algebra** - Cartesian Product
5.1.4 Create unions.	**Lesson 9: Relational Algebra** - Union
5.1.5 Define a set difference operation.	**Lesson 9: Relational Algebra** - Difference
5.1.6 Describe an intersection operation.	**Lesson 9: Relational Algebra** - Intersection
Subdomain 5.2 Compose joins in a database.	
5.2.1 Create a theta-join.	**Lesson 9: Relational Algebra** - Joins
5.2.2 Use a natural join.	**Lesson 9: Relational Algebra** - Joins
5.2.3 Create an equi-join.	**Lesson 9: Relational Algebra** - Joins
5.2.4 Create an outer join.	**Lesson 9: Relational Algebra** - Joins
Domain 6 Transactions, Currency Control and Database Security	
Subdomain 6.1 Create transactions and enable currency control.	
6.1.1 Define the concept of a transaction, including use of the INSERT, DELETE and UPDATE operations.	**Lesson 10: Transactions and Database Security** - Introduction to Database Transactions and Security

CIW Database Design Specialist Objective	Lesson and Section(s)
6.1.2 Identify the two results of a transaction (commit and rollback).	**Lesson 10: Transactions and Database Security** - Transactions
6.1.3 Describe the four desirable "ACID" properties (atomicity, consistency, isolation, durability).	**Lesson 10: Transactions and Database Security** - Transactions
6.1.4 Define serializability in relation to a DBMS.	**Lesson 10: Transactions and Database Security** - Concurrency Control
6.1.5 List concurrency control methods, including locking and timestamps.	**Lesson 10: Transactions and Database Security** - Concurrency Control
6.1.6 Describe the steps involved in optimistic concurrency control (e.g., reading, validation, writing), including knowing when and when not to use optimistic concurrency control.	**Lesson 10: Transactions and Database Security** - Concurrency Control
6.1.7 Identify issues that can occur if currency control is not enacted properly (e.g., dirty reads, lost and uncommitted updates, unrepeatable query results).	**Lesson 10: Transactions and Database Security** - Concurrency Control
Subdomain 6.2 Identify elements of database security.	
6.2.1 Identify issues and determine the scope of database security (e.g., theft, privacy, integrity control, availability).	**Lesson 10: Transactions and Database Security** - Database Security
6.2.2 List typical security threats to databases.	**Lesson 10: Transactions and Database Security** - Database Security
6.2.3 Describe database countermeasure and protection techniques (e.g., encryption, ways to create views).	**Lesson 10: Transactions and Database Security** - Database Security

