Preview: IT4731 : Database Development

Syllabus

Course Overview

This course focuses on managing database development and data requirements and modeling. You will learn to assess and demonstrate database design and implementation principles, and use the Structured Query Language (SQL) to query and manipulate data, use functions, and create tables and constraints. Topics also include database administration and various uses of databases in contemporary web, traditional, and mobile applications. In this course, you will be presented with a real-world scenario in which you will design and deploy data storage strategies.

Technology Resources

Capella offers tutorials, labs, or a virtual desktop as part of this course. These resources offer software or guided practice in performing tasks related to achieving course competencies and completing assessments. If you require the use of assistive technology or alternative communication methods to participate in these activities, please contact Disability Services to request accommodations.

Course Competencies

(Read Only)

To successfully complete this course, you will be expected to:

1. Plan a strategy for designing and deploying data storage that solves an organizational problem.
2. Assess the organization of data in a database.
3. Design a database data storage strategy to solve a business problem.
4. Manage fundamental database features and tools.
5. Manipulate data using data query and manipulation languages.
6. Troubleshoot database storage issues.

7. Implement basic data storage security strategies and policies.

8. Communicate effectively.

Course Prerequisites

Prerequisite(s): Completion of or concurrent registration in IT3345; IT3348 or IT3349.

Syllabus >> Course Materials

Required

The materials listed below are required to complete the learning activities in this course.

Integrated Materials

Many of your required books are available via the VitalSource Bookshelf link in the courseroom, located in your Course Tools. Registered learners in a Resource Kit program can access these materials using the courseroom link on the Friday before the course start date. Some materials are available only in hard-copy format or by using an access code. For these materials, you will receive an email with further instructions for access. Visit the Course Materials page on Campus for more information.

Software

Capella University requires learners to meet certain minimum computer requirements. The following software is required to complete learning activities in this course.

Microsoft SQL Server 2017

Library

The following required readings are provided in the Capella University Library or linked directly in this course. To find specific readings by journal or book title, use Journal and Book Locator. Refer to the Journal and Book Locator library guide to learn how to use this tool.

- McQuillan, M. (2015). *Introducing SQL server.* Apress Media.
- Sampson, A. (2016). Microsoft SQL Server 2016: Configuring data access and permissions [Video]. Skillsoft Ireland.
- Sampson, A. (2017). *Filter and modify data in SQL Server 2016* [Tutorial]. Skillsoft Ireland.
- Sampson, A. (2017). *Using functions in SQL Server 2016* [Tutorial]. Skillsoft Ireland.

- Sampson, A. (2018). *T-SQL querying* [Tutorial]. Skillsoft Ireland.
- Sampson, A. (2018). *Aggregating data in SQL Server 2016* [Tutorial]. Skillsoft Ireland.
- Sampson, A. (2018). *Generic database fundamentals: Architecture and normalization concepts* [Tutorial]. Skillsoft Ireland.
- Sampson, A. (2018). *Generic design and modeling databases: Logical and physical design* [Tutorial]. Skillsoft Ireland.
- Sampson, A. (2018). *Installing and upgrading SQL Server 2016* [Tutorial]. Skillsoft Ireland.
- Sampson, A. (2018). *Querying and manipulating data* [Tutorial]. Skillsoft Ireland.
- Sampson, A. (2018). *Transactions and isolation levels* [Tutorial]. Skillsoft Ireland.

External Resource

Please note that URLs change frequently. While the URLs were current when this course was designed, some may no longer be valid. If you cannot access a specific link, contact your instructor for an alternative URL. Permissions for the following links have been either granted or deemed appropriate for educational use at the time of course publication.

- Microsoft. (2016). Create tables (database engine). Retrieved from https://docs.microsoft.com/en-us/sql/relational-databases/tables/create-tables-database-engine?view=sql-server-2017
- Microsoft. (2017). Install SQL Server. Retrieved from https://docs.microsoft.com/en-us/sql/database-engine/install-windows/install-sql-server?view=sql-server-2017
- Microsoft. (2017). Overview of SQL Server security. Retrieved from https://docs.microsoft.com/en-us/dotnet/framework/data/adonet/sql/overview-of-sql-server-security
- Microsoft. (2017). Primary and foreign key constraints. Retrieved from https://docs.microsoft.com/en-us/sql/relational-databases/tables/primary-and-foreign-key-constraints?view=sql-server-2017
- Microsoft. (2017). Tutorials for SQL Server Management Studio (SSMS). Retrieved from https://docs.microsoft.com/en-us/sql/ssms/tutorials/tutorial-sql-server-management-studio?view=sql-server-2017
- Microsoft. (2017). Unique constraints and check constraints. Retrieved from https://docs.microsoft.com/en-us/sql/relational-databases/tables/unique-constraints-and-check-constraints?view=sql-server-2017
- Microsoft. (2018). Joins (SQL Server). Retrieved from https://docs.microsoft.com/en-us/sql/relational-databases/performance/joins?view=sql-server-2017
- Microsoft. (2018). Subqueries (SQL Server). Retrieved from https://docs.microsoft.com/en-us/sql/relational-databases/performance/subqueries?view=sql-server-2017

Suggested

The following materials are recommended to provide you with a better understanding of the topics in this course. These materials are not required to complete the course, but they are aligned to course activities and assessments and are highly recommended for your use.

Optional

The following optional materials are offered to provide you with a better understanding of the topics in this course. These materials are not required to complete the course.

Library

The following optional Skillsoft resources are available via the Capella University Library.

- Sampson, A. (2014). MySQL: Introducing MySQL [Video]. Skillsoft Ireland.
- Sampson, A. (2015). Generic database fundamentals: Introduction to SQL [Video]. Skillsoft Ireland.
- Sampson, A. (2017). *Performance tuning* [Tutorial]. Skillsoft Ireland.
- Sampson, A. (2018). *Components of a SQL Server 2016 installation* [Tutorial]. Skillsoft Ireland.
- Sampson, A. (2018). *Generic design and modeling databases: Concepts and conceptual design* [Tutorial]. Skillsoft Ireland.
- Sampson, A. (2018). *SQL Server instances and storage considerations* [Tutorial]. Skillsoft Ireland.
- Skillsoft. (2018). *SQL Server database fundamentals: Design principles and data manipulation* [Tutorial]. Skillsoft Ireland.

External Resource

Please note that URLs change frequently. While the URLs were current when this course was designed, some may no longer be valid. If you cannot access a specific link, contact your instructor for an alternative URL. Permissions for the following links have been either granted or deemed appropriate for educational use at the time of course publication.

- Microsoft. (2017). Generate scripts (SQL Server Management Studio). Retrieved from https://docs.microsoft.com/en-us/sql/ssms/scripting/generate-scripts-sql-server-management-studio?view=sql-server-2017

Projects

Project >> Database Manipulation Language Statements

Project Overview

In this project, you will work individually to create a database for the company in the scenario outlined below. You will be creating reports based on the database structure.

This course takes a problem-based, case-based approach to learning the course material by placing you in the role of a consultant who will provide solutions to customers. There will be components of the project due

throughout the course. You will receive feedback and use it to update your designs for the final project submission.

Project Scenario

The chief information officer (CIO) of SmartHomes, Inc., has hired your consulting company to document its database requirements and its need to develop a database that will be created for an e-commerce solution. The company has developed its own Web-based system selling the SmartHomes thermostats and other products. The company needs you to develop a database that will permit customers to register as a customer, sign up, and purchase these products.

Technical Details and Resources

Assume that this database is centralized, not distributed. You will use SQL Server for your database management system.

- **Written communication:** Written communication is free of errors that detract from the overall message.
- **Length of paper:** There are no page length requirements for these assignments. The database scripts you design will dictate the number of pages required.
- **Diagrams:** All diagrams must be done in an application such as Visio (Windows) or through SQL Developer.
- **Font:** Arial, 10 point.

Unit 1 >> Creating and Manipulating Complex Databases

Introduction

Various versions of Microsoft SQL Server are available, but the core functionality remains the same across each versions. SQL Server is not only a relational database system; it also has other components to help with operational and analytical processes for the organization.

SQL Server has generally been the best relational database management system (RDBMS) for Windows operating systems because of its tight integration with Windows and its low pricing. Since the number of installed Windows systems is still increasing, SQL Server is a widely used RDBMS. SQL Server comprises several components including the database engine, analysis service, reporting services, and integration services. These components together give end users and developers a broad choice for developing business applications.

The database engine is the relational database system component for SQL Server. Its user interface is intuitive and follows the design of many of the other Microsoft tools. Within the database engine, many different tools help create database objects, tune database applications, and manage many of the database administration tasks.

There are many ways that you can create, connect with, and work with the database regardless of the version of SQL Server you use. Most databases in general are created and designed for users who may have varying levels of knowledge and experience. Graphical user interfaces and command-line interfaces are commonly available for most commercial databases.

As we begin, we will explore various SQL Server editions and what each versions consists of to help identify which edition would be most appropriate. In particular, we will focus on using SQL Server Standard Edition, but it is good to be aware of the differences. Although there are many different editions in SQL Server, the most important ones are:

- **Express Edition.** This lightweight version of SQL Server is created for application developers. It is a free download and you can download the SQL Server Management Studio Express (SSMSE) to manage the database.
- **Standard Edition.** This is the version that we will be installing and configuring this week. It is designed for small and medium-sized businesses. It has support for up to four processors and 2TB of RAM. It includes all the business intelligence (BI) features including analysis services, reporting services, and integration services. It does not, however, include many of the enterprise-based features from Enterprise Edition.
- **Enterprise Edition.** This unique form of SQL Server is meant for time-critical application with a large number of users. It has additional features that can be useful for high-end installations for cloud deployment, clusters, or symmetrical multiprocessors. There are also many maintenance packages including data partitioning, database snapshots, and online database maintenance.
- **Developer Edition.** This edition allows developers to build and test any type of application with SQL Server. It includes all the features and functionality of the Enterprise Edition, but it is only licensed for use with development, functionality, and demo purposes.
- **Web Edition.** This low-cost option is used for web development purposes, focusing on scalability and manageability for small to large web applications.

Before we install SQL Server, it is important to know what SQL Server components you will want to install. You will be able to choose from two groups of features. Instance features are components that are installed once for each instance so that you have multiple copies of them (one for each instance). Shared features exist across all instances of a given machine, and those shared features are meant to be backwards-compatible with other SQL Server versions that can be installed side-by-side. Most shared features will be advanced functionality that are only required for specific use cases.

The instance features include the following.

- **Database Engine Services:**
  - SQL Server Replication – Allows you to replicate data from one system to another. We will not need this feature in this class.
  - R Services – This allows us to execute scripts written in R language for data mining. We will not need this feature in this class.
  - Full-Text and Semantic Extractions – Allows us to search through unstructured data. We will not need this feature in this class.
  - Data Quality Services – This feature focuses on the Data Quality Client. We will need this feature.
- **PolyBase Query Service** – Allows us to create a gateway to Hadoop. We will not need this feature.
- **Analysis Services** – A group of services to manage and query data stored in a data warehouse. We will need this feature.
- **Reporting Services** – Allows you to create and manage reports. We will need this feature.

Learning Activities

u01s1 - SQL Server Introduction

Readings

In your *Introducing SQL Server* library e-book, read the following:

- Chapter 1, "What Is SQL Server?"
- Chapter 2, "Obtaining and Installing SQL Server."
- Chapter 3, "Database Basics."

Multimedia

Complete the following Capella presentation:

- Three Levels of Data Modeling.

u01s1 - Learning Components

- Create documentation that describes a proposed data storage strategy.
- Identify business and IT requirements for planning a database.
- Define the activities and people involved in designing a database for a small organization.
- Control database access using database languages to grant or revoke system and object privileges for users and roles within a database.

u01s2 - Software Preparation and Technology Access

In this course, you will be using software and technology that is needed to complete designated activities and assignments. There is no additional cost for this software and technology. Some software packages will be made available to you at no additional cost through Capella's subscription with Microsoft, while other software packages are available for free download through open-source licensing.

Capella University requires learners to meet certain minimum computer requirements. Note that some software required for a course may exceed these minimum requirements. Check the requirements for the software you may need to download and install to make sure it will work on your device. Most software will require a Windows PC. If you use a Mac, refer to Installing a Windows Virtual Environment.

The software and technologies below are strongly recommended to support you in completing the course objectives. If you have access to other tools that you believe may still meet course requirements or if you have any difficulties accessing this resource or completing the related assignments, please contact your course faculty member to discuss potential alternatives.

If you use assistive technology or any alternative communication methods to access course content, contact Disability Services with any access-related questions or to request accommodations.

The database server you will use in this course is Microsoft SQL Server 2017. The software you will use in this course is Microsoft SQL Server Management Studio. Follow the instructions provided through the links below to download and install software or register for an account, as required.

Microsoft Software

1. Visit Capella's Microsoft software page for instructions on obtaining free Microsoft software.
2. Identify the version of MS SQL Server 2017 that is compatible with your operating system.
3. Download and install.

For more information on downloading and installing SQL Server, see the following resources:

- Microsoft. (2017). Install SQL Server. Retrieved from https://docs.microsoft.com/en-us/sql/database-engine/install-windows/install-sql-server?view=sql-server-2017
- Microsoft. (2017). Tutorials for SQL Server Management Studio (SSMS). Retrieved from https://docs.microsoft.com/en-us/sql/ssms/tutorials/tutorial-sql-server-management-studio?view=sql-server-2017

Bloom's Taxonomy: Enhance Your Critical Thinking Skills

Critical thinking is an important skill to cultivate for both your coursework and professional development. Many learners do not initially realize that there are different ways of thinking and levels of depth in understanding. Bloom's taxonomy provides a structure to help conceptualize these different levels. Awareness of different ways to approach information helps you move beyond basic understanding to more effectively analyze, evaluate, and synthesize important concepts. It also helps you to clarify expectations and provide an appropriate level of response for your coursework. Review this presentation on Bloom's Taxonomy to see how the levels are defined and to explore how this can help in your academic and professional work.

Capella University Library

Being able to identify, analyze, and synthesize information is a critical skill. Many resources are readily available online, but it is important to use appropriate and high-quality information to support academic and professional activities. This process includes not only locating information but also ensuring that the information is sound, appropriate, and worthy of academic use. Using Library Guides provides guidance for accessing and using the rich resources available in the Capella University Library and beyond.

Here are some key Capella library resources:

- Tour the Library.
- Get Critical Search Skills.
- Finding/Identifying Peer Reviewed Articles

The Writing Center

Visit the Writing Center for a variety of tools to help you improve your written communication and presentation skills. You may also send papers to Smarthinking Tutoring to receive feedback and revision suggestions prior to submitting assignments.

Here are some key Writing Center resources:

- APA Style and Format.
- The Annotated Bibliography.
- Academic Integrity and Honesty [PDF].

Campus Resources

The following resources for learners are commonly used in Capella courses:

- Career Center.
- Capella Research and Scholarship Center.

u01s4 - Project Preparation

Your final project is a series of assignments resulting in a database that supports a cohesive database with reporting capabilities. The final project has four components:

- Unit 2 assignment: Table Creation and Constraints.
- Unit 3 assignment: Simple Queries.
- Unit 4 assignment: Complex Queries.
- Unit 5 assignment: Database Manipulation Language Statements.

To achieve a successful project experience and outcome, you are expected to meet the following requirements:

- Read the course project description to learn the requirements for your course project. Examine each assignment's objectives and requirements and view the grading criteria.
- Contact your instructor if you have any questions about the course project or the associated project components.
- Completing the series of assignments will require several hours of Internet and library research. Take time during this unit, and in the coming weeks, to begin researching and gathering potential references to support your project.

u01d1 - Database Options

Discussion Resource

A relational database is structured to recognize relations among stored items of information. The following resource provides an overview of the SQL Server 2016 architecture, as well as the functions and capabilities available. The fundamentals of T-SQL querying is covered, as well as topics such as sets and predicate logic.

- Sampson, A. (2018). *T-SQL querying* [Tutorial]. Skillsoft Ireland.
    - Introduction to Microsoft SQL Server 2016 (39 minutes).

Discussion Instructions

Consider the following scenario:

In the past, your organization has used MS Excel for storing most of its data. The leaders of your organization would like to move towards using a relational database, but they are not familiar with the options available. They would like to use Windows Server to have the database deployed on. They have internal processes which they have been outsourcing that they would like to bring in-house. In addition, they are launching an online community anticipated to be 100,000 users which will be stored in this database.

They have asked you to do some research and provide recommendations about the available choices. Look at various versions of the database options on top of various databases with your research. What features and tools stand out to you?

Response Guidelines

Review the posts of your peers and respond to two. Offer comments or arguments that contribute to your peers' ideas.

Read the Discussion Participation Scoring Guide to learn how the instructor will evaluate your discussion participation throughout this course. The resource for this discussion is provided for your reference.

Course Resources
Undergraduate Discussion Participation Scoring Guide

u01d1 - Learning Components

- Create documentation that describes a proposed data storage strategy.
- Identify business and IT requirements for planning a database.
- Assess the translation of business structures into IT systems and data storage structures.
- Appropriately apply professional writing standards and practices within IT environments and when creating IT documentation.

u01a1 - SQL Server and User Account Setup

Use the Unit 1 Assignment Template, linked in the Resources, to document and submit your assignment. Your completed SQL Server installation and user account setup should accomplish the following:

- Demonstrate an ability to install and configure SQL Server Database.
- Demonstrate an ability to create an admin account and a regular user account.
- Demonstrate an ability to load data into an existing schema using SQL Server Management Studio.
- Compare and contrast various database management systems' features and tools.

Note: SQL Server automatically creates the **sa** account that has full database administration privileges. This account can be used to create and manage other user accounts and help maintain database security. As with an administrator account, it is not ideal to keep logging in using **sa** to avoid any accidental issues.

To break this down, a database user is a type of database object. The database user itself is linked to a database schema. A database schema is just a collection of database objects such as tables, views, indexes, and sequences. The database user allows you to connect to the database as it is the owner of various database objects including tables, functions, packages, and more.

Assignment Overview

For this assignment, you will install Microsoft SQL Server 2017 Standard from Microsoft Imagine. Use the Installation Guide: SQL Server 2017 Standard, linked in the Resources, to help guide you through the installation process. The following tutorial and video, linked in the Resources, will also help you during this assignment:

- Sampson, A. (2018). *Installing and upgrading SQL Server 2016* [Tutorial]. Skillsoft Ireland.
  - 1 hour, 49 minutes.
- Sampson, A. (2016). Microsoft SQL Server 2016: Configuring data access and permissions [Video]. Skillsoft Ireland.
  - 5 minutes.

Once installed, you will log in as **sa** through SQL Server Management Studio and create a new database and user account for your database objects. As part of the process, you will create a Database Installation Guide for the system administrators of how to create SQL Server admin accounts and user accounts to the DB4731 database. Use the Unit 1 Assignment Template to create the guide.

Assignment Instructions

Start by creating your database:

- Open Microsoft SQL Server Management Studio.
- Log in using the sa account to the Database Engine server.
- After you successfully connect in, you should see the object explorer on the left side.
  - Right-click **Databases** and select **New Database**.
  - Set the **Database Name** as DB4731.
  - Set the **Owner** as [sa] by clicking **Browse** under the object names.
  - Under your database connection (not DB4731), expand **Security**.
  - Right-click **Logins** and select **New Login**.
  - Enter **admin4731** for the Login Name.
  - Select **SQL Server authentication** with the password as Password1.
  - Click **OK**.
- Expand the database DB4731.
  - You should see **Security** as the last item in the list.
  - Right-click **Security** and select **New** > **User**.
  - Select **SQL user** with **Login**
  - Set the username as admin4731 with the Login Name set as admin4731.
  - Under **Membership**, select db_owner, db_accessadmin, db_datareader, db_ddladmin, and db_datawriter.
- You can now test this account by disconnecting to the database by right-clicking the database connection under the object explorer and choosing disconnect. Then you can test your created account right-clicking **Connect**, selecting **Database Engine**. Under the **Authentication**, select **SQL Server Authentication** and enter your credentials you have used.

- Once you have logged in again, you will create a regular user named user1 with Password1 as the password. The user should only have db_datareader and db_datawriter for membership.

The next step is to load the database with a script as the admin4731 account.

- Open the connection in Microsoft SQL Server Management Studio and go to **File** > **Open**.
  - Click **File** and choose the load_sample.sql file provided.
  - You should see it load under the Query Editor Window tool.
  - Click **Execute** to execute the script.
  - You should see the script entirely run with all of the tables created.
  - To view the tables in an ERD format, right-click **Database Diagrams** and click **New Database Diagram**. Select all of the tables that are available and click **OK**.

Under the connection, take a screenshot of the table list, the users under **Security**, and the resulting ERD. You will save the screenshot for submission to be included with your database setup guide using the template provided in the resources area. Complete all other areas of the database setup guide template. Submit your database setup guide to the assessment area.

Submit your assignment by 11:59 p.m. Sunday this week.

Course Resources
Unit 1 Assignment Template [DOCX]
Installation Guide: SQL Server 2017 Standard [DOCX]
Installing and Upgrading SQL Server 2016 [Tutorial]
Microsoft SQL Server 2016: Configuring Data Access and Permissions [Video]
Load_Sample.sql

u01s5 - Optional Resources

Resources with additional information about the topics for this unit are listed here.

- Sampson, A. (2018). *Components of a SQL Server 2016 installation* [Tutorial]. Skillsoft Ireland.
  - 1 hour, 59 minutes.

- Skillsoft. (2018). *SQL Server database fundamentals: Design principles and data manipulation* [Tutorial]. Skillsoft Ireland.
  - Database Design (48 minutes).
- Sampson, A. (2014). MySQL: Introducing MySQL [Video]. Skillsoft Ireland.
  - 7 minutes.
- Sampson, A. (2015). Generic database fundamentals: Introduction to SQL [Video]. Skillsoft Ireland.
  - 5 minutes.
- Microsoft. (2017). Install SQL Server. Retrieved from https://docs.microsoft.com/en-us/sql/database-engine/install-windows/install-sql-server?view=sql-server-2017

Unit 2 >> Create Table and Constraints

Introduction

In this unit, you will learn about logical database design. This is a high-level look at a data architecture, independent of the database management system you are using. To apply your knowledge, you will create an entity relationship diagram (ERD).

Throughout the process of building this database, we will look at business rules, how and why the data model should be normalized, and then how to apply business rules to database design methodologies to create the logical database design. The process of normalization allows you to organize the tables in a structured manner through a series of steps and techniques.

Without normalization principles and procedures, we lack evaluation standards and must rely on experience (and some intuition) to minimize the probability of generating data integrity problems.

The problem with relying on experience is that we usually learn from it by making errors. But who and what will be hurt by the errors we make in the meantime?

Relying on intuition may work reasonably well for some, but you cannot teach intuition. For this reason, we rely on normalization principles and rules to drastically decrease the likelihood of producing bad table structures. These rules help standardize the process of producing good tables, and they make it possible to transmit skills to the next generation of database designers.

Once the data model has been adequately normalized, and the content for each table has been determined, the actual data type and width to be assigned to each column (attribute) in the table can be determined. It is important to remember that table names as well as the column names within each table must be unique. The constraint names within a schema (a whole set of tables and objects belonging to a user) must also be unique. Once that is complete, we can then build our physical data model in the database.

SQL Server provides a fairly organized system to allow you to store, manage, and retrieve any information. At the very base of this would be using tables; these tables are what we use to store business data. You would have to get started by creating, changing, or removing these tables or objects. These fall under the data definition language (DDL). This allows us to create and manage tables in the database.

As you may know already, tables are one of the different types of schema objects that we can have in a database. Each row in the table represents a data record that is split into columns that represent a field in the table.

We can do different things with tables, including creating, modifying, managing, and then removing them from a database.

The CREATE TABLE statement is used to create a table. When we create the table, we have to identify at least the following items:

- Table name.
- Column names.
- Column data types for each column.

We can modify our tables if we need to add another column, remove a column, or perhaps change a column. To do that, we would use the ALTER TABLE statement.

Lastly, if we no longer need a table, we can remove it simply by using the DROP TABLE statement.

One key concern with databases is data integrity. Data integrity means that the data that we have stored in the database is consistent and correct. The business rules of an organization dictate the database constraints. These constraints are used to help correlate business rules to what our tables will have. Using these constraints will enforce our business rules whenever any data is being inserted, updated, or deleted from the table.

There are a few key constraint types:

- **Not Null:** This type of constraint defines that the column of the data *must* have a value. It will not permit an empty, or what we would call a null, value. An example of something like this may be the first and last name in an employee table, as those should be populated when a row is inserted.
- **Unique:** A unique constraint can have an empty value or a null value, but if it does have a value set to it, it must be different than every single other record in the table. An example of this could be an e-mail address where each e-mail address in the table must be unique, but it is quite possible that some individuals may not have an e-mail address.
- **Primary key:** Typically a primary key is one that is both *not null* and *unique*. This helps to uniquely identify a specific row in the table using that primary key value. Every table should have a primary key. You will find that in some cases these can be an auto-generated number if there are no columns that are unique and not null at the same time.
- **Foreign key:** This type of constraint helps us define referential integrity. This means that the values stored in a specific column of one table to enforce that it should exist in another table. We use this as a means to ensure that a value has to be first valid in one table before we can reference it to avoid having data be invalid.

- **Check:** This helps verify that the data must meet a specific condition. An example of this could be on a date field to ensure that any value being added in must be greater than the current date or perhaps a numeric grade value must be between 0–100.

Learning Activities

u02s1 - SQL and Tables

Readings

In your *Introducing SQL Server* library e-book, read the following:

- Chapter 4, "Tables."
- Chapter 5, "Putting Good Tables Together."
- Chapter 7, "NULLs and Table Constraints."
- Appendix A, "SQL Data Types."

u02s1 - Learning Components

- Apply normalizing techniques to optimize a logical structure of a database.
- Acquire working knowledge of SQL Server editing and development tools and environments.
- Evaluate ERD diagrams and other data representation models.
- Design a data storage structure that applies best practices.

u02d1 - Business Rules

Discussion Resources

Business rules need to be understood when designing a database, and can be managed using unique constraints and check constraint SQL rules. The following resources provide information about database design and the application of SQL constraint rules.

- Microsoft. (2017). Unique constraints and check constraints. Retrieved from https://docs.microsoft.com/en-us/sql/relational-databases/tables/unique-constraints-and-check-constraints?view=sql-server-2017
- Sampson, A. (2018). *Generic design and modeling databases: Logical and physical design* [Tutorial]. Skillsoft Ireland.

Discussion Instructions

This discussion continues the business scenario discussed in Unit 1.

Your organization would like you to continue as a consultant on the project referenced in the Unit 1 discussion. They want you to work on the database design process and start developing the database. Before you can begin, many steps are required, including the gathering of business rules. The organization's leaders believe, however, that you can simply start the design right away.

Provide a memo explaining various issues that can occur without the proper analysis of the business rules. Your memo should explain how these business rules affect the database design, how business rules are used to normalize the design, and why you cannot simply jump in and build tables and add data right away.

Response Guidelines

Respond to at least two of your peers' posts. Discuss similarities and differences that you find in the posts.

Course Resources
Undergraduate Discussion Participation Scoring Guide

u02d1 - Learning Components

- Create documentation that describes a proposed data storage strategy.
- Identify business and IT requirements for planning a database.
- Assess the translation of business structures into IT systems and data storage structures.
- Appropriately apply professional writing standards and practices within IT environments and when creating IT documentation.

u02a1 - Table Creation and Constraints

Use the Unit 2 Assignment Template, linked in the Resources, to document and submit your assignment. You will complete the following for this assignment:

- Create an ERD relational model and apply business constraints.
- Create an ERD that displays a data model from a logical design perspective.
- Demonstrate the setup of data relationships with data dependencies.
- Demonstrate the ability to use scripts in writing create table statements and generating successful results. You will achieve this by providing screenshots of your reports.
- Create tables while applying the correct constraints.

Assignment Overview

For this assignment, you will create your initial database for SmartHomes, Inc. This database should act as your foundation for the rest of the course.

In preparation for this assignment, it is important to be familiar with the Microsoft SQL Server Management Studio tool. It is important to understand the fundamentals of the logical data model and creating the tables.

The following resources, linked in the Resources, will help you during this assignment:

- Simple Database Schema.
- Sampson, A. (2017). *Filter and modify data in SQL Server 2016* [Tutorial]. Skillsoft Ireland.
    - SQL Server 2016 Data Types (37 minutes).
- Microsoft. (2016). Create tables (database engine). Retrieved from https://docs.microsoft.com/en-us/sql/relational-databases/tables/create-tables-database-engine?view=sql-server-2017
- Microsoft. (2017). Primary and foreign key constraints. Retrieved from https://docs.microsoft.com/en-us/sql/relational-databases/tables/primary-and-foreign-key-constraints?view=sql-server-2017
- Sampson, A. (2018). *Generic database fundamentals: Architecture and normalization concepts* [Tutorial]. Skillsoft Ireland.
    - 3 hours, 14 minutes.

Assignment Instructions

For this component, you will develop the database and resulting ERD using Microsoft SQL Server Management Studio. SmartHomes has provided you a list of the key tables, columns, and constraints that you should focus on with the database. You may choose to add more tables and columns if you deem it necessary:

Customer

- CustomerID (PK).
- FirstName (NOT NULL).
- LastName (NOT NULL).
- Address.
- City.
- State.
- Zip.
- Country.
- Phone.
- Email (UNIQUE and NOT NULL).
- Username (UNIQUE and NOT NULL).
- Password (NOT NULL).

Order

- OrderID (PK).
- CustomerID (FK).
- OrderDate.
- ShipDate.

Order Detail

- OrderDetailID (PK).
- OrderID (FK).
- ProductID (FK).
- Price.
- Quantity (CHECK > 0).

Product

- ProductID (PK).
- CategoryID (FK).
- ProductName.
- ProductDescription.
- UnitPrice.
- Picture.

Category

- CategoryID (PK).
- CategoryName.
- Description

Create these tables in your database while planning out the data types for each of these fields by reviewing the SmartHomes Data file, linked in the Resources. Generate the ERD for the tables using the Database Diagrams tool after the tables have been created and joined using the foreign keys and take a screenshot of this to place into MS Word.

Import the data provided into the tables by right-clicking on the database and selecting **Tasks** > **Import Data**. For the Data Source, select Excel and find the SmartHomes data file downloaded from the Resources. For the destination, select **SQL Server Native Client** using the admin4731 account while selecting DB4731 as the database.

The table script can be retrieved by right-clicking each table and choosing **Script Table As** > **Create To** > N**ew Query Editor Window**. The database table data can also be exported by right-clicking on the database and selecting **Tasks** > **Export Data**. Select **SQL Server Native Client** as the source and have the output selected as a flat file for each of the tables.

For your completed assessment, you should accomplish the following:

- Create a database appropriate for SmartHomes. Provide the SQL Script that shows you have created each table containing appropriate data.
- Generate the ERD for the tables and take a screenshot to place into MS Word.
- Provide your code and SQL scripts that you executed to create the forms and reports and show screenshots or other evidence that your scripts generated your reports successfully.

Submit your assignment by 11:59 p.m. Sunday this week.

Course Resources
Unit 2 Assignment Template [DOCX]
SmartHomes Data [XLSX]
Simple Database Schema | Transcript
Filter and Modify Data in SQL Server 2016 [Tutorial]
Create Tables (Database Engine)
Primary and Foreign Key Constraints
Generic Database Fundamentals: Architecture and Normalization Concepts [Tutorial]

u02s2 - Optional Resources

Resources with additional information about the topics for this unit are listed here.

- Sampson, A. (2018). *SQL Server instances and storage considerations* [Tutorial]. Skillsoft Ireland.
  - 1 hour, 38 minutes.
- Skillsoft. (2018). *SQL Server database fundamentals: Design principles and data manipulation* [Tutorial]. Skillsoft Ireland.
  - Database Design (48 minutes).
- Microsoft. (2017). Generate scripts (SQL Server Management Studio). Retrieved from https://docs.microsoft.com/en-us/sql/ssms/scripting/generate-scripts-sql-server-management-studio?view=sql-server-2017
- Sampson, A. (2018). *Generic design and modeling databases: Concepts and conceptual design* [Tutorial]. Skillsoft Ireland.

Unit 3 >> Querying and Single Row Functions

Introduction

Within SQL Server or any database, using SQL statements is the foundation of working on data. In this unit, you will get a chance to work with the SQL SELECT statement to access and report data from the tables. You also have the flexibility to use the Query Editor tool directly in SQL Server Management Studio.

The SELECT statement is the basic format in which the mandatory clauses are the SELECT clause and the FROM clause. The SELECT clause indicates which column (or columns) of data should be returned, while the FROM clause indicates which table (or tables) should be selected based on the columns displayed.

```
SELECT columnName, …

FROM tableName;
```

We can limit the rows of a table through the use of the WHERE clause in the SELECT statement.

```
SELECT columnName, …

FROM tableName

WHERE columnName = value;
```

There are also functions in SQL that customize and format the data for a report. For example, you could customize the data output to have a specific format or replace NULL values with a different value. The basic functions available include:

- String functions.
- Math or numeric functions.
- Date functions.
- Advanced functions.

SQL Server's string functions include case-manipulation functions and character-manipulation functions. The case-manipulation functions alter the casing of the characters that are passed in, which include UPPER and LOWER. Some of the character-manipulation strings are CONCAT, SUBSTRING, LEFT, RIGHT, REVERSE, TRIM, and REPLACE.

The basic syntax would look something like this:

```
SELECT functionName {columnName | expression, argument1, argument2…}

FROM tableName;
```

Number and math functions, on the other hand, are used to accept numeric input and return numeric values. These include CEIlNGL, FLOOR, ROUND, SUM, MAX, MIN, and COUNT.

SQL Server has date functions that can be used to return the current date and time using CURRENT_TIMESTAMP. Other date functions can get the DAY, MONTH, and YEAR of a specified date. Calculations can be done to add a time or date interval to a date or calculate the differences between two dates using the DATEADD and DATEDIFF functions.

There are different advanced functions. The CAST function converts the value of any type into a specified datatype. You can also check if a value is NULL using ISNULL or check if a value or expression is a number using ISNUMERIC. You can also tell who the current user is in SQL Server using CURRENT_USER and find out the login name of the current user using SYSTEM_USER.

Learning Activities

u03s1 - Introducing SQL

Readings

In your *Introducing SQL Server* library e-book, read the following:

- Chapter 11, "The SELECT Statement."
- Chapter 14, "Indexes."
- Chapter 16, "Functions."

u03s1 - Learning Components

- Construct basic SQL queries of a database using SQL commands, syntax, and query structure.
- Construct database query, manipulation, and control statements for a database.
- Construct SQL statements to retrieve, sort, restrict, convert and manipulate data and conditions from within a database.
- Manage SQL editing and development tools to manipulate data stored in a database.

u03d1 - Security Issues

Discussion Resource

Database security is an aspect of database design that protects a database from vulnerabilities that may occur in the various aspects of a database including the data stored in the database, the data servers, and database applications. The following resource provides information about database security.

- Microsoft. (2017). Overview of SQL Server security. Retrieved from https://docs.microsoft.com/en-us/dotnet/framework/data/adonet/sql/overview-of-sql-server-security

Discussion Instructions

Put yourself in the role of lead database designer for your organization. The CIO has asked you to provide a report describing various database vulnerabilities. Create a memo that provides an analysis of database

vulnerabilities and recommends methods for dealing with them effectively. Focus on various aspects, including database user rights, user groups, deadlock issues, programming code, and SQL injection.

Response Guidelines

Review the posts of your peers and respond to two. Offer comments or arguments that contribute to your peers' ideas.

Course Resources
Undergraduate Discussion Participation Scoring Guide

u03d1 - Learning Components

- Apply agile methodology to a database development project.
- Appropriately apply professional writing standards and practices within IT environments and when creating IT documentation.
- Manage SQL editing and development tools to manipulate data stored in a database.

u03a1 - Simple Queries

Use the Unit 3 Assignment Template, linked in the Resources, to document and submit your assignment. Your completed assignment will be graded using the following criteria:

- Design simple queries that meet the organization's needs.
- Design five additional queries that use single-row functions from each category.
- Demonstrate the ability to use scripts in SQL statements and generate successful results. You will achieve this by providing screenshots of your reports.
- Refer to the Simple Queries scoring guide to ensure that you meet the grading criteria for this assignment.

Assignment Overview

For this assignment, you will create at least 10 simple queries that support SmartHomes that have the data directly correlating. You will choose to use Microsoft SQL Server Management Studio or the SQL Command Line to build your simple queries. In some ways, it will help you double-check that you have all the data elements matching up with one another between the tables.

SmartHomes has asked you to generate the SQL SELECT statements for a few reports it would like to include on the administrative side of its website. Before you can do this, you must populate the database with some dummy data. Add the data using the SQL Developer table view. There should be at least five rows in each table

with 10 orders. Each order should have a mix of 1–3 products being ordered. The picture in the product should be a URL, such as *http://www.capella.edu/images/product1.jpg*, and be unique for each product.

These queries will be used to help build the reports directed to upper management.

In preparation for this assignment, it is important to understand the SELECT statement as well as the ways to filter data. Also, you should be familiar with SQL programming language and single-row functions. Use the suggested resources (linked in the Resources) or other research to learn more about these topics.

- Sampson, A. (2017). *Filter and modify data in SQL Server 2016* [Tutorial]. Skillsoft Ireland.
  - Sorting and Filtering SQL Server 2016 Data (39 minutes).
  - Unknown Values (14 minutes).
- Sampson, A. (2017). *Using functions in SQL Server 2016* [Tutorial]. Skillsoft Ireland.
  - 1 hour, 36 minutes.
- Sampson, A. (2018). *Querying and manipulating data* [Tutorial]. Skillsoft Ireland.
  - 2 hours, 14 minutes.

Assignment Instructions

For this assignment, complete the following SQL statements:

1. A list of all customers ordered by last name, first name with the first name, and last name concatenated together with a space in between.
2. A list of all orders with the date ordered output as MONTH DD, YYYY.
3. A list of all products that will initialize the first letter of each word on the product name.
4. A list of all orders that have been ordered in the current month.
5. A list of products with their prices rounded to the nearest dollar.
6. A list of the total price of each line item based on the price and quantity.
7. A list of all customers with the first name that starts with a specific letter (your choice).
8. A list of products with the cost more than $10.
9. A list of all customers with only the first four characters of their last name.
10. A list of products with the picture path removing the full path and only including the filename.

Export the database including the data and your SELECT statements. Submit these along with screenshots of their execution in a Word document in a report format using the template file.

Submit your assignment by 11:59 p.m. Sunday this week.

Course Resources
Unit 3 Assignment Template [DOCX]
SmartHomes Data [XLSX]

Filter and Modify Data in SQL Server 2016 [Tutorial]

Using Functions in SQL Server 2016 [Tutorial]

Querying and Manipulating Data [Tutorial]

u03s2 - Optional Resources

Resources with additional information about the topics for this unit are listed here.

- Skillsoft. (2018). *SQL Server database fundamentals: Design principles and data manipulation* [Tutorial]. Skillsoft Ireland.
    - DML Statements (37 minutes).

Unit 4 >> Joins and Group Functions

Introduction

When you use a query or SELECT statement, you are selecting data from one or more tables to view. You can also limit the data to some or all of the data as well. When there is more than one table to select from, join the tables together. Typically, you will join the tables based on primary and foreign keys, although you can also join them based on data comparisons as well.

A natural join is used to display data between two different tables when one column directly refers to the values in another column of the second table. Generally, this is done based on the primary key and related foreign keys. You can join these two tables with a USING clause to indicate the column name. The column name between the two tables should be the same and ideally have the same data type. An example follows:

```
SELECT columnName, …

FROM tableName1 JOIN tableName2

USING columnName;
```

If you are joining a table to itself or joining two tables that are NOT related through the primary and foreign keys, you use the ON clause to separate the join condition from any filters in the WHERE clause. In that scenario, the

column names do not have to match, as the column names are listed between the tables. However, the data types still must match. An example follows:

```
SELECT columnName, …

FROM tableName1 JOIN tableName2

ON columnName1 = columnName2;
```

Note that we can also add additional criteria and filters by using the AND clause or the WHERE clause. For example:

```
SELECT columnName, …

FROM tableName1 JOIN tableName2

ON columnName1 = columnName2

AND columnName3 = value;

SELECT columnName, …

FROM tableName1 JOIN tableName2

ON columnName1 = columnName2

WHERE columnName3 = value;
```

We can also join multiple tables by including a JOIN and ON clause for each table that is added:

```
SELECT columnName, …

FROM tableName1

JOIN tableName2

ON columnName1 = columnName2

JOIN tableName3

ON columnName3 = columnName4;
```

In addition, we can work on groups of data. Based on aggregate data, these group functions tend to run based on a set of rows and return just one result based on the group. As an example, you may want to find the AVERAGE of all of the students in a class or the SUM of all order totals for each month. Several aggregate group functions are available, including AVG, SUM, MAX, MIN, and COUNT. An example of the syntax follows:

```
SELECT groupFunctionName(argument)

FROM tableName
```

You may need to divide a group into specific smaller groups to provide meaningful results when you use GROUP functions. For example, you may need to follow that procedure if you have a roster of students at a school, and you want a count of students at each letter grade. Without the grouping of the information, if you attempt a count only the total would result. Using the GROUP BY clause to organize the table would look like this:

```
SELECT columnName1, columnName2, groupFunctionName(argument)

FROM tableName

GROUP BY columnName1, columnName2
```

You will notice that only the columns that are defined in the GROUP BY clause can be listed in the SELECT clause. Using this format, our code could look something like the following:

```
SELECT letterGrade, COUNT(letterGrade)

FROM grades

GROUP BY letterGrade;
```

This result set would look like this:

- A 500
- C 100
- D 10
- B 600
- F 5

In the same way that we use the WHERE clause to restrict rows, we can also use the HAVING clause to restrict groups that are being returned. Using the same example above, we may have it as:

```
SELECT letterGrade, COUNT(letterGrade)

FROM grades

GROUP BY letterGrade

HAVING COUNT(letterGrade) >= 50;
```

This would not include the D and F averages as the count for those are below 50 (10 and 5 respectively).

Learning Activities

u04s1 - Join and Group Functions

Readings

In your *Introducing SQL Server* library e-book, read the following:

- Chapter 12, "Joining Tables."
- Chapter 17, "Table-Valued Functions."

u04s1 - Learning Components

- Add, modify, and drop schema and non-schema objects within a database using database languages.
- Create relationships between data and tables within a database using relational algebra statements, joins, outer joins, and grouping functions, statements, and expressions.
- Troubleshoot and resolve errors and inefficiencies in the logical organization of a database.
- Use of subqueries and set operators and combine queries to solve complex problems.

u04d1 - Types of Joins

Discussion Resource

Joins are used in database design to retrieve data from two or more tables based upon the relationships between the tables. Joins are commands used in queries to instruct how the SQL Server uses data from one table in the rows of another table. The following resource provides information about using joins in an SQL query.

- Microsoft. (2018). Joins (SQL Server). Retrieved from https://docs.microsoft.com/en-us/sql/relational-databases/performance/joins?view=sql-server-2017

Discussion Instructions

You are consulting for an organization that wants to learn more about types of joins.

The basic join condition allows you to combine rows from two or more tables. The organization's developers are mostly familiar with the equijoin, but would like to learn more about the other types of joins including equijoins, self-joins, cartesian products, inner join, outer joins, antijoins, and semijoins. Prepare a presentation to demonstrate each types of joins using either the sample database from Unit 1 or your SmartHomes database. On each slide, provide an explanation of what the join is, the SQL statement, and a screenshot of the resulting execution. Explain why the type of join was required for that example.

Response Guidelines

Review the posts of your peers and respond to two. Offer comments or arguments that contribute to your peers' ideas.

Course Resources

Undergraduate Discussion Participation Scoring Guide

u04d1 - Learning Components

- Construct basic SQL queries of a database using SQL commands, syntax, and query structure.
- Apply agile methodology to a database development project.
- Appropriately apply professional writing standards and practices within IT environments and when creating IT documentation.
- Analyze the syntax and structure of a SQL statement to identify and resolve errors.
- Construct database query, manipulation, and control statements for a database.
- Create relationships between data and tables within a database using relational algebra statements, joins, outer joins, and grouping functions, statements, and expressions.
- Construct SQL statements to retrieve, sort, restrict, convert and manipulate data and conditions from within a database.
- Troubleshoot data retrieval errors related to query statement construction.

u04a1 - Complex Queries

Use the Unit 4 Assignment Template, linked in the Resources, to document and submit your assignment. Your completed assignment will be evaluated according to the following criteria:

- Design complex queries that meet the organization's needs.
- Design complex queries that join multiple tables optimally.
- Design complex queries that use subqueries effectively.
- Design complex queries that use group functions optimally.
- Use subqueries and set operators to control database access.
- Demonstrate an ability to use scripts in SQL statements and generate successful results.

Assignment Overview

For this assignment, you will design and develop complex queries that join multiple tables and use group functions. Continue to use the database you created in Unit 2. Use external research and the suggested resources to design your infrastructure.

Expanding on the reports from Unit 3, there are a few more reports that require joins and group functions. Given the greater complexity, you need to add at least 10 more orders with 1–3 products for each to help with testing purposes. These queries will be used for reports directed at upper management.

In preparation for this assignment, it is important to understand the fundamentals of SQL joins. You should also be familiar with SQL data retrieval constructs and statements to support the creation of complex nested queries. The following resources (linked in the Resources) will help you with this assignment:

- Samson, A. (2018). *Aggregating data in SQL Server 2016* [Tutorial]. Skillsoft Ireland.

    - 2 hours, 20 minutes.
- Microsoft. (2018). Subqueries (SQL Server). Retrieved from https://docs.microsoft.com/en-us/sql/relational-databases/performance/subqueries?view=sql-server-2017

Assignment Instructions

For this assignment, complete the following queries:

1. A list of customer names with the number of orders that have been placed.
2. A list of all customers that have ordered a product within the last 30 days.
3. A list of customer name, order date, and product name ordered by the customer name.
4. A list of product name and the category name that they belong to.
5. A list of each product and the total amount that they have sold for along with their average number of units sold. Include products that have been sold.
6. A list of states with the number of units that have been sold to that state.
7. A list of month, year, and average order total for each month.
8. A list of mailing addresses that have at least five orders.
9. A list of the most popular products sold (consider quantity) with the number of items they have sold.
10. A list of product names that belongs to the same category as the most popular product (use a subquery).

Provide screenshots of your reports using the template format.

Refer to the Complex Queries scoring guide to ensure that you meet the grading criteria for this assignment.

Submit your assignment by 11:59 p.m. Sunday this week.

Course Resources
Unit 4 Assignment Template [DOCX]
SmartHomes Data [XLSX]
Aggregating Data in SQL Server 2016 [Tutorial]
Subqueries (SQL Server)

u04s2 - Optional Resources

Resources with additional information about the topics for this unit are listed here.

- Skillsoft. (2018). *SQL Server database fundamentals: Design principles and data manipulation* [Tutorial]. Skillsoft Ireland.
    - Multi-Table Queries (38 minutes).
- Sampson, A. (2017). *Performance tuning* [Tutorial]. Skillsoft Ireland.
    - 2 hours, 7 minutes.

Unit 5 >> Data Manipulation Language

Introduction

This unit focuses on the use of data manipulation language (DML). DML statements allow you to access (SELECT) and manipulate (INSERT, DELETE, and UPDATE) data in tables. With SQL Server, it is important to note that these changes are not permanent until you COMMIT them in a transaction. A transaction is a sequence of SQL statements that is treated as a single unit. Before it is committed, all the statements within that transaction can be rolled back (or undone).

You should already be familiar with adding data through SQL Server Management Studio from prior units. Now, you will use the INSERT statement to insert content. Before inserting data into a table, you must know the columns in the table as well as which values are valid (based on the constraints). Note that any dates or character values must be placed into single quotes.

Changes to data are quite common in a database. These can be executed by running an UPDATE statement. Specify the columns and the rows that will be updated along with the new values. Note though that if you do not specify a condition, the entire table is updated with the UPDATE statement.

Lastly, use the DELETE statement to remove a row or set of rows. With the DELETE statement, there cannot be any dependencies on the data removed. If they are removed, the dependent rows must also be deleted or changed. For example, in the SmartHome database, suppose you want to remove a customer, but the customer has orders in the Order table. Due to the referential integrity of the CustomerID, you cannot delete the customer unless the corresponding orders either have a different CustomerID or those records are also removed. Note that trying to delete those rows in the Order table would require removing the rows in the OrderDetail table, as the OrderID would no longer exist.

Learning Activities

u05s1 - Manipulating Data

Readings

In your *Introducing SQL Server* library e-book, read the following:

- Chapter 8, "DML (or Inserts, Updates and Deletes)."
- Chapter 15, "Transactions."

u05s1 - Learning Components

- Construct basic SQL queries of a database using SQL commands, syntax, and query structure.
- Analyze the syntax and structure of a SQL statement to identify and resolve errors.
- Construct database query, manipulation, and control statements for a database.
- Construct SQL statements to retrieve, sort, restrict, convert and manipulate data and conditions from within a database.
- Troubleshoot and resolve errors and inefficiencies in the logical organization of a database.

u05d1 - Transactions

Discussion Resource

SQL Server transaction are used to group several statements together to form a single unit of work, and isolation levels are an SQL Server feature that helps control the way transactions are locked during database design, development, and maintenance when multiple users making changes to the database at the same time. The following resource provides information about transactions and isolation levels.

- Sampson, A. (2018). *Transactions and isolation levels* [Tutorial]. Skillsoft Ireland.

Discussion Instructions

In your organization, the company's CIO is concerned about incidents in which statements committed changes without finishing up the whole series of statements. These incidents caused the data to be inconsistent, with errors in the later statements that did not get changed.

Write a memo in which you address how the use of transactions can help resolve this issue. Provide examples using the SmartHomes database setup. Explain the importance of an atomic transaction.

Response Guidelines

Review the posts of your peers and respond to two. Offer comments or arguments that contribute to your peers' ideas.

Course Resources

Undergraduate Discussion Participation Scoring Guide

u05d1 - Learning Components

- Appropriately apply professional writing standards and practices within IT environments and when creating IT documentation.
- Analyze the syntax and structure of a SQL statement to identify and resolve errors.
- Troubleshoot and resolve errors and inefficiencies in the logical organization of a database.
- Troubleshoot data retrieval errors related to query statement construction.

u05a1 - Database Manipulation Language Statements

Use the Unit 5 Assignment Template, linked in the Resources, to document and submit your assignment. Your completed assignment will be graded using the following criteria:

- Designed SQL transactions that meet the organization's needs.
- Designed SQL transactions that effectively uses INSERT statements.
- Designed SQL transactions that effectively uses UPDATE statements.
- Designed SQL transactions that effectively uses DELETE statements.
- Demonstrate an ability to use scripts in SQL statements and generate successful results.

Assignment Overview

For this assignment, you will develop a series of transactions using data manipulation language (DML) in SQL.

Now that the database has been populated, SmartHomes needs DML statements in order to insert, update, and delete content from their site. Although these statements need to be customized to allow input from the website, SmartHomes wants statements based on the dummy data in the database first to ensure that they work correctly. Some of them may require multiple statements in the transaction and need to consider the order in which the statements must occur. These statements will be shared with the application developers to use within their application.

In preparation for this assignment, you must understand the fundamentals of SQL data manipulation language. You should be familiar with INSERT, UPDATE, and DELETE statements to support the manipulation of the database. Use the suggested resource (linked in the Resources) or other resources you find to learn more about these topics.

- Sampson, A. (2017). *Filter and modify data in SQL Server 2016* [Tutorial]. Skillsoft Ireland.
    - Modifying Data Using DML (43 minutes).

Assignment Instructions

For this assignment, complete the following:

1. There are some situations in which a product requires some changes in terms of price and description. Create an UPDATE statement that will update a specific product's price and description (of your choice). Query the row to validate the changes.
2. A category has to be removed. DELETE the category and UPDATE all of the products in that category to an existing category.
3. A "fake" user has made a few orders. DELETE the user account along with all their orders.
4. Insert a new product with no category included. Then run an update statement to add it to a category.
5. There has been a price increase on some items. UPDATE all product prices that are greater than $10 to be $1 more.
6. The database server had been reset with the wrong date and time without anyone knowing. UPDATE any order date in the past week to add seven days.
7. Too many user accounts do not have any orders and should be removed. DELETE all customer records that do not have any orders.
8. UPDATE the product's description to include on the following string on those products that have not been ordered yet: "Special promotion: 25% off."
9. While the website was down, someone had taken in a manual order. Create the INSERT statements to add a customer and the three products that they have purchased.
10. A customer had called in with their name (no order or customerID) and had purchased the incorrect product. Using an UPDATE statement, update the OrderDetail table using their first and last name (consider it to be unique).

Be sure to provide screenshots of your transactions.

Refer to the Data Manipulation Language Statements scoring guide to ensure that you meet the grading criteria for this assignment.

Submit your assignment by 11:59 p.m. Sunday this week.

Course Resources
Unit 5 Assignment Template [DOCX]
SmartHomes Data [XLSX]
Filter and Modify Data in SQL Server 2016 [Tutorial]

u05d2 - Reflection

Discussion Instructions

You learned a great deal about advanced database development in this course. Please share what you have learned and how what you have learned will make you a better database designer.

Course Resources
Undergraduate Discussion Participation Scoring Guide

u05s2 - Optional Resources

Resources with additional information about the topics for this unit are listed here.

- Skillsoft. (2018). *SQL Server database fundamentals: Design principles and data manipulation* [Tutorial]. Skillsoft Ireland.
    - Working with Data (40 minutes).