TestOut

Lesson Plans

SQL Server 2005

(Exam 70-431)

Version 2.0

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Table of Contents

Course Overview

This course prepares students for the MCTS: SQL Server certification exam (70-431) by Microsoft. It focuses on how to configure, implement, manage and troubleshoot the SQL Server 2005 database management system environment.

Before starting this course, you should have a knowledge of basic concepts of relational databases.

Module 1 – SQL Server

This module teaches the foundational concepts of the components of SQL Server, the editions of SQL Server, and the components of a relational database. Students will also be introduced to Transact-SQL, the primary database query and programming language used by SQL Server.

Module 2 – Installation

In Module 2 students will learn to install SQL Server, install multiple instances of SQL Server on the same server, and to upgrade from a previous version of SQL Server. Students are also taught how to fine-tune the system after installation.

Module 3 – Databases

In Module 3 students will learn to create and manage databases, set a recovery model, and configure and manage database mail.

Module 4 – Database Objects

Module 4 provides a basic overview of database objects. Students will learn how to create tables to hold data, use constraints to ensure data integrity, create indexes to improve performance, define triggers, create views, use stored procedures to execute multiple TSQL statements, and create user-defined functions.

Module 5 – Data Manipulation

In Module 5 students will learn data manipulation. They will learn how to write queries, change the collation type, create the correct data type when defining data, handle SQL Server errors, define an explicit transaction, and create a common table expression.

Module 6 – Security

In Module 6 students will learn the basics of the security mechanisms used to control access to servers and databases. This includes managing logins, granting users access to a database, using roles to define a group of users with similar needs, applying permissions on securables, creating schemas, and using encryption.

Module 7 – Protection and Availability

In Module 7 students will become familiar with concepts that will provide protection to and availability of the data. They will learn recovery planning and back up strategies. They will also learn how to restore a database to a specific point in time and move a

database from one location to another. Students will learn about implementing database mirroring, log shipping and database snapshots to protect data.

Module 8 – Data Access

In Module 8 students will learn strategies to control access to data. This includes configuring linked servers, using service brokers, importing and exporting data, data replication between servers, and creating and securing an HTTP endpoint.

Module 9 – XML Data

Module 9 discusses the storing and manipulation of XML text. Students will learn how to create and use an XML variable, create and use an XML schema collection, implement XML queries, and use XML indexes to improve performance.

Module 10 – Management and Performance

In Module 10 students will learn methods and tools to manage and enhance the performance of the database. This will include configuring jobs and alerts, using a database maintenance plan, employing a full-text search to find documents, optimizing query performance using the Database Engine Tuning Advisor, improving performance through partitioning, detecting and correcting excessive index fragmentation, monitoring and resolving blocks and deadlocks, and monitoring replication.

Section 1.1: SQL Server Overview

Preparation

This section introduces the students to the course, provides an overview of the SQL Server components that provide database services, and all the editions available for SQL Server 2005. Students are advised to research the feature sets of the editions and select the correct edition before installing SQL Server 2005.

Lecture Focus Questions:

- What is ELT? What type of processing is it used with?
- What is the primary function of SQL Server Database Services?
- How can Analysis Services and Integration Services be used together?
- What types of activities are performed using the SQL Server Business Intelligence Development Studio?
- What edition of SQL Server 2005 is typically recommended for large production environments?
- What is the target market for Workgroup Edition?
- What is the purpose of Developer Edition?

Time

About 15 minutes

Section 1.2: Management Tools

Preparation

This section discusses SQL Server 2005 management tools: SQL Server Management Studio, SQL Server Business Intelligence Development Studio, SQL Server Configuration, SQL Server Profiler, SQL Server Surface Area Configuration Tool, Database Engine Tuning Advisor, and Report Manager. Students will learn how to use SQL Server Management Studio to connect to databases, review reports, use the query window and perform other management tasks. They will also learn how to use Business Intelligence Development Studio to start a new project, start the Report Server Project Wizard, and work with reports.

Lecture Focus Questions:

- Which tool do you use to create databases and construct queries?
- What is SQL Server Management Studio?
- Which tool would you use for data mining and creating business solutions?
- Which tool would you use to change network protocols?
- Which tool allows you enhance the security of SQL Server?
- Which tools allow you to analyze and enhance SQL Server performance?

Time

About 30 minutes

Section 1.3: Database Concepts

Preparation

In this section students will learn the foundational concepts of a database including the components of a relational database, SQL Server databases types, database objects types, and data types. It is important that the students have a good understanding of these concepts before they continue the course.

Lecture Focus Questions:

- What are tables, rows, and columns?
- What is the purpose of keys?
- What is the difference between a primary key and a foreign key?
- How do users retrieve information from a database?
- How do indexes improve database performance?
- How does locking affect a database?
- What are the different types of databases within SQL Server and the purpose of each?
- What is the importance of data types?

Time

About 30 minutes

Section 1.4: Transport-SQL Overview

Preparation

This section presents the basics of using Transport-SQL, the primary database query and programming language used by SQL Server. Transact-SQL statements are a common way to interact with SQL server. Students will learn how to specify a fully qualified name (FQN) or a partially qualified name (PQN). They will also learn how groups of SQL statements can be saved for later use by way of scripts, stored procedures, triggers, and user-defined functions.

SQL Server 2005 Objectives

- 301. Retrieve data to support ad hoc and recurring queries.
  - Construct SQL queries to return data.
- 302. Manipulate relational data.
  - Insert, update, and delete data.

Lecture Focus Questions:

- What is Transact-SQL?
- What is the structure of a query?
- What are the different ways you can query an SQL Server database?
- What is the difference between commands and functions?
- What is the purpose of identifiers? What is a delimited identifier?
- What must an identifier contain to be considered complete?
- What is an execution plan?
- What is the difference between batch statements and an execution plan?
- What are stored procedures?
- How do fully qualified and partially qualified names differ?
- What settings are used for an implicit reference?

Time

About 20 minutes

Section 2.1: SQL Server Installation

Preparation

This section discusses and demonstrates a SQL Server installation. Installation requirements and installation steps are outlined. Students will learn how to verify installation prerequisites are in place, perform a custom installation, and review the summary installation log.

SQL Server 2005 Objectives

- 101. Install SQL Server 2005.
  - Verify prerequisites.
  - Create an instance.

Lecture Focus Questions:

- How do you identify a named instance of SQL Server?
- How many default instances of SQL Server are possible on a single machine? How many named instances?
- Why is the service user account important?
- What must you do to change the collation after you've installed SQL Server?
- Which authentication type would you use to allow users to connect to your database across a non-secure network like the Internet?
- What factors do you consider when choosing a licensing mode?
- What two protocols should be disabled on all computers on which SQL Server 2005 is installed?
- What function does SQL Server 2005 perform as part of installation before installing files?

Time

About 30 minutes

Section 2.2: Upgrade and Coexistence

Preparation

In this section students will learn how to use named instances to install multiple instances of SQL Server on the same server. The Upgrade Advisor Utility can be used to identify potential upgrade issues before an installation. Students will learn how to use SQL Server 2005 Upgrade Advisor to upgrade from a previous version of SQL Server, and how to create an instance of SQL Server 2005.

SQL Server 2005 Objectives

- 101 Install SQL Server 2005.
  - Upgrade to SQL Server 2005 from a previous version of SQL Server.

Lecture Focus Questions:

- In what ways does a Detach/Attach upgrade differ from a Backup/Restore upgrade?
- Why is it important to make a copy of the database when using the Detach/Attach upgrade method?
- What are the advantages of using the Copy Database Wizard over the Manual Schema Rebuild and Data Export/Import upgrade?
- SQL Server 2005 supports upgrades from which previous versions of SQL Server? (include service pack numbers)
- What are the steps for upgrading a non-failover instance to a SQL Server 2005 failover cluster?
- What are the steps to prepare a previous version of SQL Server for upgrade to SQL Server 2005.

Time

About 25 minutes

Section 2.3: Post Installation

Preparation

In this section students will become familiar with the tools and utilities used to fine-tune the system after installation. They will learn how to configure server properties, use the Surface Scan Area Utility, and configure services and protocols.

SQL Server 2005 Objectives

- 101. Install SQL Server 2005.

Lecture Focus Questions:

- What tasks can you perform using the sac utility?
- How does the sp_configure stored procedure differ from the ALTER DATABASE and SET statements?
- The SQL Server Configuration Manager allows you to perform tasks on what type of SQL Server functions?
- Which server properties can you change after installation using SQL Server Management Studio?
- What can you do to verify your SQL Server installation?
- Which log file do you check to troubleshoot configuration errors?
- Which SQL Server services are instance aware?
- What does the Net-Library allow you to do?

Time

About 40 minutes

Lab/Activity

- Configure Server Properties

Section 3.1: Database Files

Preparation

This section discusses the components that make up a database and the methods to create databases. Students will learn how to create and manage databases using SQL server Management Studio. They will also learn how to create and configure data and log files.

SQL Server 2005 Objectives

- 102. Configure SQL Server 2005 instances and databases.
  - Configure log files and data files.

Lecture Focus Questions:

- How can you change the locations of data and log files?
- What is the purpose of a filegroup?
- What are the different types of filegroups?
- In what ways are the placement of files, filegroups and data pages significant?

Time

About 45 minutes

Lab/Activity

- Create Database Files
- Modify Database Properties
- Create a Filegroup

Section 3.2: Recovery Model

Preparation

In this section students will learn when they are creating a database on SQL Server that they will have to set a recovery model. There are three recovery models discussed: Simple Recovery, Full Recovery, and Bulk-Logged Recovery. Students will learn how to change the recovery model for a database using SQL Server Management Studio or Transact-SQL statements.

SQL Server 2005 Objectives

- 102. Configure SQL Server 2005 instances and databases.
  - Choose a recovery model for the database.

Lecture Focus Questions:

- How are the full recovery model and the bulk-logged recovery model similar?
- What significant differences does a bulk-logged recovery model and a full recovery model have?
- What SQL Server 2005 implementation would it be acceptable to use the simple recovery model?
- When should you change the recovery model from the full to bulk-logged?
- How can you change the recovery model?

Time

About 15 minutes

Lab/Activity

- Reset the Recovery Model

Section 3.3: Database Mail

Preparation

In this section students will learn how to configure and manage database mail. Students will learn how to use the Database Mail Configuration Wizard to configure database mail.

SQL Server 2005 Objectives

- 102. Configure SQL Server 2005 instances and databases.
  - Configure the SQL Server DatabaseMail subsystem for an instance.

Lecture Focus Questions:

- What does **sysmail_event_log** do?
- In addition to a profile, what other configuration object must be created for database mail?
- What is the advantage of specifying multiple SMTP servers for mail?
- How does LoggingLevel 1 differ from LoggingLevel 3?
- How can you prevent a certain type of executable from being sent as an e-mail attachment?

Time

About 25 minutes

Lab/Activity

- Configure Database Mail

Section 4.1: Tables

Preparation

This section discusses the basics of creating tables to hold data. Students will learn how to create and modify tables using SQL Server Management Studio and Transact-SQL. They will also learn how to add columns and select column data types and lengths.

SQL Server 2005 Objectives

- 601. Implement a table.
  - Specify column details.

Lecture Focus Questions:

- What properties make up the column definition?
- What information do you need in order to create a table?
- Why is the data type of a column important?
- Which property would you set to allow a table to accept blank values?
- What is the relationship of the seed and increment properties to the IDENTITY property?
- In which situations would you use the ROWGUIDCOL property?
- How are scale and precision used to define a column?

Time

About 10 minutes

Section 4.2: Constraints

Preparation

This section discusses using constraints to prevent invalid data from being entered into a database. Students will learn how to create tables using defaults and constraints. They will also learn how to force data integrity using primary key and foreign key constraints.

SQL Server 2005 Objectives

- 606. Implement constraints.
  - Specify the scope of a constraint.
  - Create a new constraint.

Lecture Focus Questions:

- Why do you use constraints?
- How do constraints work?
- What are the possible consequences of disabling a constraint?
- How does entity integrity differ from domain integrity?
- What two Transact-SQL statements allow you to create constraints?
- What is the recommended Transact-SQL statement for creating a constraint? Why?
- What is the purpose of the DEFAULT keyword?

Time

About 35 minutes

Section 4.3: Indexes

Preparation

This section discusses using indexes to improve performance in searching data pages. Three types of indexes are outlined: Unique, Clustered, and Nonclustered. The CREATE INDEX statement can be used to create indexes and the ALTER INDEX statement can be used to manage an existing index. Students will learn how to use the Database Tuning Advisor to select columns for index creation, create indexes, and reorganize and rebuild an index.

SQL Server 2005 Objectives

- 607. Implement indexes.
  - Specify the index type.
  - Specify relational index options.
  - Specify columns.

Lecture Focus Questions:

- How can an index optimize a database?
- How do nonclustered and clustered indexes differ in the way they arrange data?
- What is the relationship between a primary key and a clustered index?
- When do indexes begin to decrease database performance?
- How do uniform extends differ from mixed extents?
- What utility is available to help you create effective indexes?

Time

About 30 minutes

Section 4.4: Triggers

Preparation

This section discusses defining triggers on a database object to regulate database operations. The following types of triggers are presented: DML triggers, DDL triggers, Nested triggers, and recursive triggers. Students will learn how to use the ALTER TRIGGER statement to revise triggers, and design triggers to manipulate database data.

SQL Server 2005 Objectives

- 603. Implement triggers.
  - Create a trigger.
  - Create DDL triggers for responding to database structure changes.
  - Identify recursive triggers.
  - Identify nest triggers.
  - Identify transaction triggers.

Lecture Focus Questions:

- What happens to data with an AFTER trigger? How does data altered with an INSTEAD OF trigger differ from data altered with an AFTER trigger?
- Under what circumstances would you choose to use a trigger over a constraint?
- When should you use a constraint instead of a trigger?
- Which type of DML trigger cannot be used for views?
- For recursive triggers, how does an indirect recursion differ from direct recursion?

Time

About 50 minutes

Section 4.5: Views

Preparation

This section teaches a student how to use views to reference a defined portion of data. Students will learn how to use the CREATE VIEW statement, optimize a view by using an index, use SCHEMABINDING to bind a view to a table schema, and create an updatable view.

SQL Server 2005 Objectives

- 602. Implement a view.
  - Create an indexed view.
  - Create an updatable view.
- 607. Implement indexes.
  - Specify the index type.

Lecture Focus Questions:

- How does a view differ from a table?
- Under what circumstances do you use views?
- What security advantages do views offer?
- When would you use SCHEMABINDING?
- What are the restrictions on using views?
- What are the restrictions for indexing views?
- What criteria must an updatable view meet?

Time

About 15 minutes

Section 4.6: Stored Procedures

Preparation

This section discusses creating stored procedures to execute multiple TSQL statements. Students will learn how to create stored procedures that use variables and force stored procedures to recompile and recreate execution plans. They will also learn how to create encrypted stored procedures.

SQL Server 2005 Objectives

- 605. Implement stored procedures.
  - Create a stored procedure.
  - Recompile a stored procedure.

Lecture Focus Questions:

- How can you identify a system stored procedure?
- What is the difference between extended stored procedures and system stored procedures?
- Why should you avoid using sp_ as the prefix for a local stored procedure?
- What permissions do you have to have on the underlying objects in order to create a stored procedure?
- What are three benefits of using stored procedures?
- When can you reference an object created in the stored procedure?
- What is the advantage of using managed code instead of Transact-SQL in stored procedures?

Time

About 40 minutes

Section 4.7: Functions

Preparation

In this section students will learn how to use functions in Transact_SQL statements to perform certain tasks. SQL Server supports two kinds of functions: Scalar functions, and Table-valued functions. Students will also learn how to create user-defined functions that allow you to create code once and call it multiple times.

SQL Server 2005 Objectives

- 604. Implement functions.
  - Create a function.
  - Identify deterministic versus nondeterministic functions.
- 608. Create user-defined types.
  - Create a CLR user-defined type.

Lecture Focus Questions:

- When would you use DENSE RANK instead of RANK?
- Which functions do you use to remove extra spaces before and after text?
- What data does the GETDATE function return?
- What type of functions perform calculations?
- How do user-defined functions differ from stored procedures?
- What are the benefits of using user-defined functions?

Time

About 30 minutes

Section 5.1: Queries

Preparation

In this section students will learn how to write queries to retrieve data. Students will also learn to use the most common DML statements: INSERT, UPDATE, and DELETE.

SQL Server 2005 Objectives

- 301. Retrieve data to support ad hoc and recurring queries.
  - Construct SQL queries to return data.
  - Format the results of queries.
- 302. Manipulate relational data.
  - Insert, update, and delete data.
- 601 Implement a table.
  - Specify a transaction.

Lecture Focus Questions:

- How do queries executed using SQLCMD mode differ from queries created using Transact-SQL statements from the command line?
- Which type of join would you use to retrieve rows from both right and left tables?
- Which type of join would you use to retrieve rows that do not have an associated row in the other table?
- Which operator would you use to return unique values from two tables that may contain the same values for some of the columns you are querying?
- For what type of queries are ad hoc names used?
- Why should system tables never be altered by any user or application?

Time

About 35 minutes

Section 5.2: Collations

Preparation

This section discusses using collations to control how Unicode and non-Unicode data is stored and sorted within a database. Collations are specified during installation and are based on language and regional settings. Students will learn how to change the collation type at the database and column levels.

SQL Server 2005 Objectives

- 301. Retrieve data to support ad hoc and recurring queries.
  - Format the results of SQL queries.
  - Identify collation details.
- 601 Implement a table.
  - Specify column details.

Lecture Focus Questions:

- Why are collation types important?
- When a new database is created, what collation type is used?
- How do you set the collation type for database objects that allow collation settings?
- How does SQL Server collation relate to application collation?
- Which stored procedure can you use to determine the collation type of a database?

Time

About 15 minutes

Section 5.3: Data Types

Preparation

This section discusses the importance of using the correct data types when defining data. Students will learn about the order of data type precedence, which is a set of rules SQL Server uses for calculations of two or more expressions that are of different data types. Students will learn how to use the CAST and CONVERT function, create user-defined data types, and create an assembly.

SQL Server 2005 Objectives

- 608. Create user-defined types.
  - Create Transact-SQL user-defined types.
  - Specify details of the data type.
  - Create a CLR user-defined type.

Lecture Focus Questions:

- Why is it important to choose the correct data type?
- What happens when two varchar strings are added together?
- What are the advantages of explicit conversion versus implicit conversion of data types?
- How can you explicitly convert data types?

Time

About 30 minutes

Section 5.4: Error Handling

Preparation

This section discusses SQL Server error handling. Students will learn how to use a TRY…CATCH block to handle errors.

SQL Server 2005 Objectives

- 302. Manipulate relational data.
  - Handle exceptions and errors.

Lecture Focus Questions:

- How does a CATCH block relate to a TRY block?
- What must you do when using TRY...CATCH blocks if errors must be returned to the application?
- How do you return the error number and error message for errors caught in a CATCH block?
- How can you handle compile errors?
- How can you immediately receive information if a particular transaction was committed or uncommittable?

Time

About 15 minutes

Section 5.5: Transactions

Preparation

This section discusses using transactions to ensure data integrity. A transaction is a collection of Transact-SQL statements that are treated as a single unit of work. In this section students will learn how to define an explicit transaction.

SQL Server 2005 Objectives

- 302. Manipulate relational data.
  - Manage transactions.
- 601 Implement a table.
  - Specify a transaction.

Lecture Focus Questions:

- How do explicit transactions differ from implicit transactions?
- How do you implement explicit transactions?
- What is a way to keep track of nested transactions?
- What is a transaction lock and what is the purpose of a lock?
- What is the best way to manage object or database locking for transactions?

Time

About 10 minutes

Section 5.6: Common Table Expression

Preparation

This section discusses using common table expressions to reduce the complexity of queries. Students will learn how to create a common table expression and use a common table expression recursively.

SQL Server 2005 Objectives

- 301. Retrieve data to support ad hoc and recurring queries.
  - Construct SQL queries to return data.

Lecture Focus Questions:

- What are the uses of a common table expression?
- How do common table expression differ from views?
- When can a common table expression replace a view?
- How are recursive common table expressions implemented?

Time

About 10 minutes

Section 6.1: Security Concepts

Preparation

This section provides an overview of the security mechanisms used to control access to the server and databases. Students will learn how to change the authentication mode.

SQL Server 2005 Objectives

- 103. Configure SQL Server security.
  - Configure server security principals.
  - Configure database securables.

Lecture Focus Questions:

- How does a SQL Authentication login differ from a Windows Authentication login?
- What is the difference between permissions assigned to a login and permissions assigned to a database user?
- How do roles simplify permission assignments?
- What is the difference between access and permissions?

Time

About 20 minutes

Section 6.2: Logins and Users

Preparation

This section discusses managing SQL Server logins and granting users access to a database. Students will learn how to map logins to database users using SQL Server Management Studio.

SQL Server 2005 Objectives

- 103. Configure SQL Server security.
  - Configure server security principals.

Lecture Focus Questions:

- How do you prevent the user from logging in, but at the same time have the user's log entries available for review?
- What is the exception to the rule that the user who creates an object is the object owner?
- Which keyword would you specify in a CREATE LOGIN statement to require a user change the password on initial login?
- How are GUIDs used in SQL Server 2005?
- Which keyword would you specify in a CREATE LOGIN statement to require that the Windows password policy is applied to the login being created?
- When do you use the **guest** account?

Time

About 35 minutes

Lab/Activity

- Create Login Accounts
- Deny Database Access

Section 6.3: Roles

Preparation

This section discusses using roles to define a group of users that need similar permissions to perform certain tasks. Students will learn how to assign logins to server, database and application roles, how to create a database and application role, how to drop a login from a role, and how to activate an application role.

SQL Server 2005 Objectives

- 103. Configure SQL Server security.
  - Configure server security principals.

Lecture Focus Questions:

- How can you determine the logins assigned to a fixed server role?
- When should you assign a permission to the public role?
- Which group should you remove from the **sysadmin** role to make your system more secure?
- To which role must users belong to manage linked servers?
- If you want to delegate object management to a user, which role do you give the user?
- What database roles could you assign to a person who backs up the database but should not be able to see the data?
- How does the **public** role affect permissions assignments?
- What kind of application role login would you use if you wanted to track user actions?

Time

About 30 minutes

Lab/Activity

- Assign Server Roles
- Assign Database Roles

Section 6.4: Permissions

Preparation

In this section students will learn how to apply permissions on securables. Permissions can be assigned to statements that allow actions on specific objects. Students will learn how to use GRANT, DENY, and REVOKE statements to assign permissions.

SQL Server 2005 Objectives

- 103. Configure SQL Server security.
  - Configure database securables.
- 601. Implement a table.
  - Assign permissions to a role for tables.
- 602. Implement a view.
  - Assign permissions to a role or schema for a view.
- 605. Implement stored procedures.
  - Assign permissions to a role for a stored procedure.

Lecture Focus Questions:

- If you want to delegate the job of adding tables to databases, what permissions do you give?
- Which permission allows a user to run a stored procedure?
- How does a user get implied permissions?
- What happens if a permission is revoked?
- What is the difference between revoked permissions and denied permissions?
- When you want to know exactly what actions a user can take, which combination of permissions must you examine?

Time

About 50 minutes

Lab/Activity

- Set Database Permissions
- Set Permissions on a View
- Set Permissions on a Stored Procedure
- Deny Server Access
- Configure Database Access

Section 6.5: Schemas

Preparation

This section discusses using schemas, a logical grouping of objects, to organize objects and assign permissions. Students will learn how to create a schema and assign permissions to a schema.

SQL Server 2005 Objectives

- 103. Configure SQL Server security.
  - Configure database securables.

Lecture Focus Questions:

- In what schema is an object created when the user does not have a default schema specified?
- What are the advantages of schemas?
- When a table is moved to a new schema, what happens to the permissions granted for the table?
- When a table is moved to a new schema, what happens to ownership of the table?
- Can multiple users have the same default schema?
- How do schemas enhance permission management?

Time

About 15 minutes

Section 6.6: Encryption

Preparation

This section discusses encrypting data to provide an additional layer of security. The Service Master Key is implemented on the server level and the Database Master Key is implemented on the database level. Students will learn how to use a certificate, symmetric key, and asymmetric key for encryption.

SQL Server 2005 Objectives

- 103. Configure SQL Server security.
  - Configure encryption.

Lecture Focus Questions:

- What is the purpose of the service master key?
- How is the service master key created?
- What is the relationship of the service master key and the database master key?
- When are symmetric keys stored in the database unencrypted?
- How does symmetric key encryption differ from asymmetric key encryption?
- What is the purpose of a certificate?

Time

About 10 minutes

Section 7.1: Recovery Planning

Preparation

This section provides an overview of three recovery models used to simplify recovery planning: simple recovery, full recovery, and bulk-logged recovery. The recovery model dictates what type of files can be backed up and how much data can be recovered in the event of a loss. This section also discusses the types of backup available to meet the needs of the selected recovery model.

SQL Server 2005 Objectives

- 403. Back up a database.
  - Perform a full backup.
  - Perform a differential backup.
  - Perform a transaction log backup.
- 404. Restore a database.

Lecture Focus Questions:

- Which roles have default permissions to perform backups?
- What are the advantages of performing frequent transaction log file backups?
- When you create a new database, what controls the default setting for the recovery model?
- If you switch from the simple to the full recovery model, when should you back up the database?

Time

About 30 minutes

Section 7.2: Backup

Preparation

In this section students will learn how to configure backup devices, change the recovery model on a database, and perform backups to files and devices.

SQL Server 2005 Objectives

- 403. Back up a database.
  - Perform a full backup.
  - Perform a differential backup.
  - Perform a transaction log backup.
  - Initialize a media set by using the FORMAT option.
  - Append or overwrite an existing media set.
  - Create a backup device.
  - Back up filegroups.

Lecture Focus Questions:

- What happens if a user runs a query during a backup operation?
- What happens if you truncate a transaction log file during a backup operation?
- Which option do you use when you want to overwrite the media, but keep the same backup name?
- When can a backup be overwritten before the expiration date?
- When should you use MEDIAPASSWORD instead of PASSWORD?
- What does the VERIFY option verify?

Time

About 60 minutes

Lab/Activity

- Back Up to a File
- Create Backup Devices
- Back Up to a Device
- Change the Recovery Model
- Implement a Backup Strategy
- Implement a Filegroup Backup

Section 7.3: Recovery

Preparation

In this section students will learn how to perform database recovery operations and restore a database to a specific point in time.

SQL Server 2005 Objectives

- 404. Restore a database.
  - Identify which files are needed from the backup strategy.
  - Restore a database from a single file and from multiple files.
  - Choose an appropriate restore method.

Lecture Focus Questions:

- What is the difference between restoring a database and recovering a database?
- What types of backups do you need in order to recover from a full system failure?
- Why should you wait until after the last restore operation to recover a database?
- What safety checks does SQL Server perform as part of the restore process?
- What permissions do you need to restore a database?
- Why should you perform a transaction log backup before you begin the restore process?
- In addition to point-in-time recovery, what other type of specific recovery can you perform using the transaction log?

Time

About 50 minutes

Lab/Activity

- Perform a Simple Recovery
- Perform a Full Recovery
- Restore to a Point in Time

Section 7.4: Moving a Database

Preparation

This section discusses strategies for moving databases from one location to another. Students will learn how to use the Copy Database Wizard to move a database. They will also learn how to use the CREATE DATABASE and ALTER DATABASE statements to move databases.

SQL Server 2005 Objectives

- 405. Move a database between servers.
  - Choose an appropriate method for moving a database.

Lecture Focus Questions:

- What should you do if you received errors when you detach a database?
- Which Transact-SQL statement can you use to perform the tasks necessary to move database files to a new location on the same instance?
- Which situations would prevent you from moving a database?
- How can you move a database involved in replication without removing replication?
- Which permissions do you need to move a database?

Time

About 15 minutes

Section 7.5: Database Mirroring

Preparation

This section discusses using database mirroring to protect data and increase performance. Students will learn how to use the Database Mirroring Security Wizard to set up database mirroring. They will also learn how to create and configure endpoints for database mirroring.

SQL Server 2005 Objectives

- 201. Implement database mirroring.
  - Prepare databases for database mirroring.
  - Create endpoints.
  - Specify database partners.
  - Specify a witness server.
  - Configure an operating mode.

Lecture Focus Questions:

- Which type of failover requires a Witness server?
- Which type of endpoint does database mirroring require?
- What are the benefits of running database mirroring in a high performance mode? What could be a potential liability?
- What is a benefit of using synchronous mirroring? Asynchronous mirroring?
- How do you set the operating mode for database mirroring?

Time

About 30 minutes

Section 7.6: Log Shipping

Preparation

In this section students will learn how to use log shipping to create a warm, standby copy of the database. Students will learn how to use SQL Server Management Studio to implement log shipping. They will also learn how to review log files and monitor tables for log shipping.

SQL Server 2005 Objectives

- 202. Implement log shipping.
  - Initialize a secondary database.
  - Configure log shipping options.
  - Configure a log shipping mode.
  - Configure monitoring.

Lecture Focus Questions:

- How does log shipping differ from database backups? Database mirroring?
- What role does the backup share perform in log shipping?
- How is log shipping implemented?
- How does the permissions required for log shipping, copy and restore differ from those required for log shipping alerts?
- What recovery model is required on the primary server when setting up log shipping?
- Which recovery model should a secondary server be in if you want to use the server as a hot, standby server?

Time

About 25 minutes

Lab/Activity

- Configure Log Shipping

Section 7.7: Database Snapshots

Preparation

This section provides an overview of using database snapshots to protect data. Students will learn how to create a database snapshot and recover data from a database snapshot.

SQL Server 2005 Objectives

- 203. Manage database snapshots.
  - Create a snapshot.
  - Revert a database from a snapshot.

Lecture Focus Questions:

- What is a limitation for using database snapshots for reporting?
- How do database snapshots differ from snapshot backups?
- How do database snapshot filegroups relate to the source database filegroups?
- When a data page in the source database changes, how are subsequent changes to the same page reflected in a database snapshot?
- What are the guidelines for allocating disk space for database snapshot files?

Time

About 25 minutes

Section 7.8: High Availability

Preparation

This section discusses high availability, which refers to constant and reliable access to data and the systems that manage it. Always on Technologies is used to provide a set of technologies to increase database availability.

Lecture Focus Questions:

- What is the advantage of clustering over database mirroring?
- What is a vulnerability of failover clusters?
- How can database snapshots be used to protect data?
- What is a drawback to failing over to a secondary log shipping database?

Time

About 3 minutes

Section 8.1: Linked Servers

Preparation

This section provides an overview of how linked servers are used to connect to an OLE DB provider or an ODBC provider. This will include information about security mappings, managing OLE DB datasources, and distributed queries. Students will learn how to map local logins to a remote account, configure settings for a linked server and query a linked server.

SQL Server 2005 Objectives

- 104. Configure linked servers by using SQL Server Management Studio.
  - Identify the external data source.
  - Identify the characteristics of the data source.
  - Identify the security model of the data source.

Lecture Focus Questions:

- What types of servers can be linked to SQL Server?
- Which option in SQL Server Management Studio allows you to use the same login credential for a remote and local login?
- What information do you have to provide when linking to remote servers that are not SQL Servers?
- What are pass-through queries?

Time

About 60 minutes

Lab/Activity

- Create a Linked Server 1
- Create a Linked Server 2
- Create a Linked Server 3
- Create a Linked Server 4

Section 8.2: Service Broker

Preparation

This section discusses using a Service Broker to provide messages between SQL Server and other applications. Students will learn the steps to configure Server Broker components, how to begin a conversation, and how to send messages using Service Broker.

SQL Server 2005 Objectives

- 305. Implement Service Broker components.
  - Create services.
  - Create queues.
  - Create contracts.
  - Create conversations.
  - Create message types.
  - Send messages to a service.
  - Route a message to a service.
  - Receive messages from a service

Lecture Focus Questions:

- Which two Service Broker components are used to establish the port and TCP/IP address for Service Broker communication?
- What is the function of the contract when using Service Broker?
- You want to verify that messages sent using Service Broker are well-formed XML. In which Service Broker component do you specify this requirement?
- How is a conversation handle generated as unique identifier?
- How do you specify the amount of time that should be allowed to expire before the receive message returns with an empty result set?

Time

About 50 minutes

Section 8.3: Data Transfer

Preparation

This section provides an overview of different methods for transferring data. It focuses on how to import and export data using the **bcp** utility and the SQL Server Integration Wizard.

SQL Server 2005 Objectives

- 306. Import and export data from a file.
  - Set a database to the bulk-logged recovery model to avoid inflating the transaction log.
  - Run the bcp utility
  - Perform a Bulk Insert task.
  - Copy data from one table to another by using the SQL Server 2005 Integration Services (SSIS) Import and Export Wizard.

Lecture Focus Questions:

- What are the steps the **bcp** utility uses to transfer data?
- What are the advantages to using the **bcp** utility?
- Which data transfer method provides the best support for formatting transferred data?
- When should the SSIS Designer be used to create SSIS packages?
- How is the connection manager in SSIS used?

Time

About 35 minutes

Section 8.4: Data Replication

Preparation

This section discusses methods available to duplicate data between servers. Students will learn how to configure a publisher and a local distributor, create a publication, and configure a push subscription. They will also learn how to implement snapshot, merge and transactional replication.

SQL Server 2005 Objectives

- 307. Manage replication.
  - Distinguish between replication types.
  - Configure a publisher, a distributor, and a subscriber.
  - Configure replication security.
  - Configure conflict resolution settings for merge replication.

Lecture Focus Questions:

- Which type of replication provides failover protection?
- How are merge replication and peer-to-peer replication similar?
- What is the advantage of transaction replication over snapshot replication?
- How does an anonymous subscription model differ from a push subscription model?
- Which type of subscription should you use to when a client needs full control of obtaining subscription updates?
- Which type of subscription should you use to reduce the amount of overhead on the Distributor?

Time

About 90 minutes

Lab/Activity

- Configure a Publisher
- Create a Push Subscription
- Configure Merge Replication
- Remove a Subscriber

Section 8.5: HTTP Endpoints

Preparation

This section discusses how endpoints are used to define the network communication link between a server and a client. Students will learn how to create and secure an HTTP endpoint.

SQL Server 2005 Objectives

- 304. Implement an HTTP endpoint.
  - Create an HTTP endpoint.
  - Secure an HTTP endpoint.

Lecture Focus Questions:

- Which webmethod should you specify in an ENDPOINT if you are receiving XML data from a web-based application?
- How does Kerberos authentication differ from NTLM?
- If you do not specify a namespace for the webmethod, what namespace does SQL Server give the endpoint?
- What does CLEAR_PORT specify?
- What activates the endpoint so that it is ready to be used?

Time

About 20 minutes

Section 9.1: XML Data

Preparation

In this section students learn that SQL Server 2005 recognizes Extensible Markup Language (XML) as a data type and supports database storing and manipulation of XML text. Students will learn how to create and use an XML variable, create a column as an XML data type, and use typed XML.

SQL Server 2005 Objectives

- 303. Manage XML data.
  - Identify the specific structure needed by a consumer.

Lecture Focus Questions:

- How does well-formed XML data relate to typed and untyped XML data?
- When is it necessary to identify a schema for XML?
- How does SQL Server support bulk loading of XML data?
- What are the components of an XML element?
- How are XML columns created?

Time

About 10 minutes

Section 9.2: XML Schemas

Preparation

In this section students will learn how to create a schema collection, store schemas in the schema collection, and drop schema collections.

SQL Server 2005 Objectives

- 303. Manage XML data
  - Identify the specific structure needed by a consumer.
  - Load an XML schema

Lecture Focus Questions:

- How do you store an XML schema in SQL Server?
- You want to use the same XML schema on several databases. How do you do this?
- What does the XML_schema_namespace function allow you to do?
- How can you determine the schema namespaces that have been defined?

Time

About 10 minutes

Section 9.3: XML Queries

Preparation

This section discusses managing XML queries. Students will learn how to return XML data from a database in a specified format, query and modify XML data, and convert XML data into relational data. They will also learn how to bulk insert XML data into a table.

SQL Server 2005 Objectives

- 303. Manage XML data.
  - Retrieve XML data.
  - Modify XML data.
  - Convert between XML data and relational data.
  - Import bulk XML data by using the OPENROWSET function.

Lecture Focus Questions:

- What is the difference between FOR XML RAW and FOR XML AUTO?
- When using FOR XML RAW how are attribute names determined?
- What does using the ELEMENTS keyword in a FOR XML AUTO statement do?
- How can you create an element for a column with a NULL value?
- How can you add a root node to XML when using a FOR XML statement?
- What are the three ways you can shred XML data?

Time

About 20 minutes

Section 9.4: XML Indexes

Preparation

This section focuses on using XML indexes to improve performance of queries executed against XML data by creating an index on the XML data type. Students will learn how to create a primary and a secondary XML index.

SQL Server 2005 Objectives

- 303. Manage XML data.
  - Create an XML index.

Lecture Focus Questions:

- Which index type would you create when you want to search for path values?
- What is a prerequisite to building a primary index?
- How does the function of the PROPERTY keyword differ from the PATH and VALUE keywords?
- Which keyword should you use in creating a secondary index when you need to search for specific values that are associated with the parent row in the base table?

Time

About 5 minutes

Section 10.1: Monitoring Tools

Preparation

This section presents tools that can be used to monitor SQL Server. Students will learn how to configure SQL Server Profiler trace properties and configure a System Monitor counter log. They will also learn how to connect to a database using a Dedicated Administrator Connection (DAC), and use Dynamic Management Views (DMVs) to analyze server statistics.

SQL Server 2005 Objectives

- 501. Gather performance and optimization data by using the SQL Server Profiler.
  - Start a new trace.
  - Save the trace logs.
  - Configure SQL Server Profiler trace properties.
  - Configure a System Monitor counter log.
  - Correlate a SQL Server Profiler trace with System Monitor log data
- 504. Diagnose and resolve database server errors.
  - Connect to a nonresponsive server by using the dedicated administrator connection (DAC).
  - Review SQL Server startup logs.
  - Review error messages in event logs.
- 506. Gather performance and optimization data by using DMV's.

Lecture Focus Questions:

- Which SQL Server monitoring tool allows you to view log truncations?
- How can you use System Monitor to determine memory usage in SQL Server?
- In which situations would you use the Dedicated Administrator Connection?
- Which database should you access with the Dedicated Administrator Connection if you suspect problems with the default database?
- What criteria should you use in selecting tools to use with a Dedicated Administrator Connection?
- What is the correct syntax to display all information of a DMV? Only certain columns?
- Which category of DMV do you use to determine performance when query execution is slow?

Time

About 50 minutes

Section 10.2: Jobs and Alerts

Preparation

In this section students will learn how to configure jobs and alerts to execute in response to certain events. Students will learn how to create operators, alerts, and jobs in SQL Server Management Studio.

SQL Server 2005 Objectives

- 401. Implement and maintain SQL Server Agent jobs.
  - Set a job owner.
  - Create a job schedule.
  - Create job steps.
  - Configure job steps.
  - Disable a job.
  - Create a maintenance job.
  - Set up alerts.
  - Configure operators.
  - Modify a job.
  - Delete a job.
  - Manage a job.
- 505. Monitor SQL Server Agent job history
  - Identify the cause of a failure.
  - Identify outcome details.
  - Find out when a job ran last.

Lecture Focus Questions:

- What is the relationship between steps and jobs?
- What is the purpose of an operator?
- Which service must be running to execute a job?
- How can you get a job to run only during low-load periods?
- Where do alerts that run as part of a job get logged?
- Which database holds job, alert, and operator configurations?
- How can you track jobs that have been run?

Time

About 40 minutes

Lab/Activity

- Create an Operator
- Create and Start Jobs
- Create an Alert

Section 10.3: Database Maintenance

Preparation

This section discusses using a database maintenance plan to ensure high performance and continued availability of a database. Students will learn how to use the Maintenance Plan Wizard to schedule maintenance tasks. They will learn how to shrink database and logfiles, add datafiles and logfiles to a database, and alter the size of a datafile. They will also learn how to use Database Console Commands (DBCC) to maintain and repair a database.

SQL Server 2005 Objectives

- 401. Implement and maintain SQL Server Agent jobs.
  - Create a maintenance job.
- 402. Manage databases by using Transact-SQL.
  - Manage statistics.
  - Shrink files.
  - Perform database integrity checks by using DBCC CHECKDB.

Lecture Focus Questions:

- What are the guidelines for creating datafiles and logfiles?
- What happens when the transaction log is full?
- How can you shrink a database smaller than its initial size?
- How do VLFs influence how transaction logs can be shrunk?
- Which command would you use to when you want to check and repair disk space allocation only?
- Which parameter would you use with DBCC CHECKDB when you want a quick fix for a disk space allocation problem?

Time

About 45 minutes

Section 10.4: Full-text Search

Preparation

This section discusses the basics of using a full-text search to find documents that contain specified words or phrases. Students will learn how to create a full-text catalog and a full-text index. They will also learn how to specify a full-text population method.

SQL Server 2005 Objectives

- 609. Implement a full-text search.
  - Create a catalog.
  - Create an index.
  - Specify a full-text population method

Lecture Focus Questions:

- What are the prerequisites for creating a full-text search?
- How do full-text searches differ from other data queries?
- What is the role of helper services?
- How can you full-text search files created by applications such as Word and Acrobat?
- How can you circumvent the limitation of only one full-text search per column?

Time

About 15 minutes

Section 10.5: Query Performance

Preparation

In this section students learn methods to optimize query performance. The Database Engine Tuning Advisor is a utility that analyzes system performance and provides recommendations for tuning the system. Students will learn how to display and review execution plans. They should be able to obtain and analyze query statistics. They will also learn how to tune a workload file by using the Database Engine Tuning Advisor recommendations.

SQL Server 2005 Objectives

- 502. Gather performance and optimization data by using the Database Engine Tuning Advisor.
  - Build a workload file by using the SQL Server Profiler.
  - Tune a workload file by using the Database Engine Tuning Advisor.
  - Save recommended indexes.
- 605 Implement stored procedures.
  - Recompile a stored procedure.
- 607. Implement indexes.

Lecture Focus Questions:

- How does the database tuning advisor use workloads?
- What are the requirements for workload created using SQL Server Profiler?
- How are database tuning advisor recommendations implemented?
- How can you use the **xp_msver** extended stored procedure with Database Engine Tuning Advisor?

Time

About 15 minutes

Section 10.6: Partitioning

Preparation

This section discusses improving query performance through partitioning. Students will learn how to create a table, a partition function, and a partition scheme. They will also learn how to assign table partitions to filegroups.

SQL Server 2005 Objectives

- 601. Implement a table.
  - Specify a partition scheme when creating a table.
- 607. Implement indexes.
  - Specify a partition scheme when creating an index.
- 610. Implement partitions.

Lecture Focus Questions:

- How does table partitioning enhance database performance?
- Which type of partitioning splits data by columns?
- How does the AS RANGE value determine the partition the data is put into?
- What are the steps for partitioning a table?
- What is the role of the partition scheme?
- How does a partition scheme differ from a partition function?

Time

About 40 minutes

Section 10.7: Index Optimization

Preparation

This section focuses on optimizing the index by detecting and correcting excessive fragmentation which can affect the query performance. Students will learn how to use index options with the CREATE INDEX statement. They will also learn how to use Transact SQL and the **sys.dm_db_index_physical_stats** dynamic management view to analyze and correct index fragmentation.

SQL Server 2005 Objectives

- 402. Manage databases by using Transact-SQL.
  - Manage index fragmentation.
  - Manage statistics.
- 502. Gather performance and optimization data by using the Database Engine Tuning Advisor.
  - Build a workload file by using the SQL Server Profiler.
  - Tune a workload file by using the Database Engine Tuning Advisor.
  - Save recommended indexes.
- 607. Implement indexes.
  - Specify the filegroup.
  - Specify the index type.
  - Specify relational index options.
  - Specify columns.
  - Specify a partition scheme when creating an index.
  - Disable an index.
  - Create an online index by using an ONLINE argument.

Lecture Focus Questions:

- Which tool can you use to determine how frequently a table or view is being access?
- Which tool would you use to determine if an index is missing from a table or a view?
- When should you disable an index?
- How does rebuilding an index differ from reorganizing an index?
- Which scan mode should you use with **sys.dm_db_index_physical_stats** to make a quick assessment of index fragmentation without impacting performance?
- How can you determine the percentage of fragmentation of an index?
- When does disabling an index result in a performance benefit?

Time

About 20 minutes

Section 10.8: Blocks and Deadlocks

Preparation

This section discusses how in some cases transaction locking can create conflicts between two processes trying to access the same data. Conflicts in locking are called blocks and deadlocks. Students will learn how to identify transaction blocks and terminate a process that is deadlocking the system. They will also learn how to identify the cause of a block using **sys.dm_exec_requests system view**.

SQL Server 2005 Objectives

- 501. Gather performance and optimization data by using the SQL Server Profiler.
- 503. Monitor and resolve blocks and deadlocks.
  - Identify the cause of a block by using the sys.dm_exec_requests system view.
  - Terminate an errant process.
  - Configure SQL Server Profiler trace properties.
  - Identify transaction blocks.

Lecture Focus Questions:

- How does blocking differ from deadlocking?
- What options are available to view blocked processes using Activity Monitor?
- Which two SQL Server Profiler options can you use to determine how long a resource has been locked?
- In what ways can you find the Unit of Work of an orphaned distributed transaction?
- How does terminating a process differ from terminating a Unit of Work?
- What is the isolation level transaction property and how do you set it?
- How do update locks differ from exclusive locks?

Time

About 35 minutes

Section 10.9: Replication Monitoring

Preparation

This section familiarizes students with the Microsoft SQL Server Replication Monitor (SSRM) used to monitor the replication process. It can be used to provide detailed status and performance information, alerts, and a baseline of the replication process.

SQL Server 2005 Objectives

- 307. Manage replication.
  - Monitor replication.
  - Improve replication performance.
  - Plan for, stop, and restart recovery procedures.

Lecture Focus Questions:

- Which tool would you use to resolve conflicts for a local subscriber?
- How can you use a tracer token?
- Where in SQL Server Replication Monitor would you find information about the Log Reader Agent?

Time

About 10 minutes

Section 10.10: Optimization Review

Preparation

This section reviews monitoring tools that can be used for troubleshooting database issues and methods to optimize database performance.

SQL Server 2005 Objectives

- 506. Gather performance and optimization data by using DMVs.

Lecture Focus Questions:

- Which SQL Server monitoring tool allows you to view log truncations?
- If you want to monitor system resources, which SQL Server monitoring tool would you use?
- How can traces be used to optimize a database?
- Which stored procedures can be used in resolving deadlocks?
- Which dynamic management views can be used in resolving deadlocks.
- Which RAID solution should you select when you want to balance performance, fault tolerance and cost?

Time

About 15 minutes