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# 10986B

## Updating Your Skills to SQL Server 2016

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# Module 1

## Introduction to SQL Server 2016

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## Lesson 1

# Overview of SQL Server 2016

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## Question and Answers

**Question:** How can the features of SQL Server 2016 help your business in the modern environment?

**Answer:** General discussion around the features described in this lesson and how they can be of benefit.

## Lesson 2

# SQL Server 2016 Editions and Components

### Contents:

Question and Answers

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## Question and Answers

**Question:** Which of the following is an edition of SQL Server 2016?

- ☐ Enterprise
- ☐ Business Intelligence
- ☐ Parallel Data Warehouse
- ☐ Compact
- ☐ Analysis Services

**Answer:**

- ☒ Enterprise
- ☐ Business Intelligence
- ☐ Parallel Data Warehouse
- ☐ Compact
- ☐ Analysis Services

## Lesson 3

# Installing SQL Server 2016

### Contents:

Question and Answers

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## Question and Answers

**Question:** True or false? SQL Server 2016 is available for both x32 and x64 architectures.

☐ True

☐ False

**Answer:**

☐ True

## Module Review and Takeaways

### Review Question(s)

**Question:** What data workloads are you involved in managing or implementing, and which components of SQL Server 2016 do you think you will find most useful?

**Answer:** There is no single correct answer.

# Lab Review Questions and Answers

## Lab: Exploring SQL Server 2016

### Question and Answers

#### Lab Review

**Question:** After exploring SQL Server 2016, what components are installed?

**Answer:** Give a list of installed components.



# Module 2

## What's New in SQL Server Performance?

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## Lesson 1

# Operational Analytics

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## Question and Answers

**Question:** How many columnstore indexes can you add to a table?

- ( ) One clustered columnstore index, or one nonclustered columnstore index.
- ( ) One clustered columnstore index, and one or more nonclustered columnstore indexes.
- ( ) One nonclustered columnstore index, and one or more clustered columnstore indexes.
- ( ) One or more clustered columnstore indexes, and one or more nonclustered columnstore indexes.
- ( ) None.

**Answer:**

- (√) One clustered columnstore index, or one nonclustered columnstore index.
- ( ) One clustered columnstore index, and one or more nonclustered columnstore indexes.
- ( ) One nonclustered columnstore index, and one or more clustered columnstore indexes.
- ( ) One or more clustered columnstore indexes, and one or more nonclustered columnstore indexes.
- ( ) None.

## Demonstration: Create Table with Columnstore Index

### Demonstration Steps

Create Table with Columnstore Index

1. Ensure that the 10986B-MIA-DC and 10986B-MIA-SQL virtual machines are both running, and then log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. Run **D:\Demofiles\Mod02\Setup.cmd** as an administrator. Click **Yes** when prompted. When prompted with the question **Do you want to continue with this operation?** type **Y**, then press Enter.
3. After the script has run successfully, press any key to exit the command window.
4. Start **SQL Server Management Studio**.
5. In the **Connect to Server** dialog box, connect to the **MIA-SQL** database engine instance using **Windows Authentication**.
6. Open the **Demo.ssmssl** solution in the **D:\Demofiles\Mod02\Demo** folder.
7. In Solution Explorer, expand **Queries**, and then double-click the **1 - Operational Analytics.sql** script file.
8. Highlight the script under the **Step 1** description, and then click **Execute**.
9. Highlight the script under the text **Drop the table if this already exists**, and then click **Execute**.
10. Highlight the script under the text **Create the copy of the Production.Product table**, and then click **Execute**.
11. Highlight the script under the **Step 3** description, and then click **Execute**.
12. In Object Explorer, expand **Databases**, expand **AdventureWorks2016**, expand **Tables**, expand **Production.Product\_CSIdx**, expand **Indexes**, note the newly created **NCCIdx\_Production\_Product\_CSIdx** index.
13. Keep SQL Server Management Studio open for the next demonstration.

## Lesson 2

# In-Memory OLTP Enhancements

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## Question and Answers

**Question:** Which of the following statements about memory-optimized tables is incorrect?

- ( ) Memory-optimized tables store all the data in memory.
- ( ) Locks and latches do not slow down transactions.
- ( ) T-SQL code can be converted to natively-compiled stored procedures.
- ( ) SQL Server drops memory-optimized tables when the service is restarted, and all data is lost.
- ( ) Memory-optimized tables improve the performance of heavily accessed tables.

**Answer:**

- ( ) Memory-optimized tables store all the data in memory.
- ( ) Locks and latches do not slow down transactions.
- ( ) T-SQL code can be converted to natively-compiled stored procedures.
- (v) SQL Server drops memory-optimized tables when the service is restarted, and all data is lost.
- ( ) Memory-optimized tables improve the performance of heavily accessed tables.

## Demonstration: Create Memory-Optimized Table

### Demonstration Steps

Create Memory-Optimized Table

1. Ensure that you have completed the previous demonstration in this module. Alternatively, complete the following steps:
  - a. Start the 10986B-MIA-DC and 10986B-MIA-SQL virtual machines, log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
  - b. Run **D:\Demofiles\Mod02\Setup.cmd** as an administrator. When prompted with the question **Do you want to continue with this operation?** type **Y**, then press Enter. After the script has run successfully, and **Press any key to continue** appears, press any key to exit the command window.
  - c. If SQL Server Management Studio is not already open, start it and connect to the **MIA-SQL** database engine instance using Windows authentication, and then open the **Demo.ssmssln** solution in the **D:\Demofiles\Mod02\Demo** folder.
2. In Solution Explorer, double-click the **2 - In-Memory OLTP.sql** script file.
3. Highlight the script under the **Step 1** description, and then click **Execute**.
4. In Object Explorer, right-click the **AdventureWorks2016** database, and then click **Properties**.
5. In the **Database Properties - AdventureWorks2016** dialog box, on the **Files** page, point out the **AdventureWorks2016\_mod** file.
6. On the **Filegroups** page, point out the **MEMORY\_OPTIMIZED DATA** file, and then click **Cancel**.
7. Highlight the script under the **Step 3** description, and then click **Execute**.
8. Highlight the script under the **Step 4** description, and then click **Execute**.
9. Highlight the script under the **Step 5** description, and then click **Execute**.
10. Keep SQL Server Management Studio open for the next demonstration.

## Lesson 3

# Query Store

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## Question and Answers

**Question:** What are the advantages of using the Query Store?

**Answer:** The Query Store helps you find troublesome queries in both on-premise and Azure SQL databases. Because it stores historical query plans, you can compare them over time to see when and why a plan has changed. After enabling the Query Store on your databases, it automatically runs in the background, collecting run-time statistics and query plans; it also categorizes queries, so it is easy to find those using the most resources, or the longest-running operations. It also separates data into time windows, so you can uncover database usage patterns over time.

## Demonstration: Enabling and Disabling the Query Store

### Demonstration Steps

Enabling and Disabling the Query Store

1. Ensure that you have completed the previous demonstration in this module. Alternatively, complete the following steps:
  - a. Start the 10986B-MIA-DC and 10986B-MIA-SQL virtual machines, log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
  - b. Run **D:\Demofiles\Mod02\Setup.cmd** as an administrator. When prompted with the question **Do you want to continue with this operation?** type **Y**, then press Enter. After the script has run successfully, and **Press any key to continue** appears, press any key to exit the command window.
  - c. If SQL Server Management Studio is not already open, start it and connect to the **MIA-SQL** database engine instance using Windows authentication, and then open the **Demo.ssmssl** solution in the **D:\Demofiles\Mod02\Demo** folder.
2. In Solution Explorer, double-click the **3 - Query Store.sql** script file.
3. Highlight the script under the **Step 1** description, and then click **Execute**.
4. Highlight the script under the **Step 2** description, and then click **Execute**.
5. In Object Explorer, right-click the **AdventureWorks2016** database, and then click **Properties**.
6. In the **Database Properties - AdventureWorks2016** dialog box, on the **Query Store** page, show that the **Operation Mode** option is now set to **Read Write**, and then click **Cancel**.
7. In Object Explorer, right-click the **AdventureWorks2016** database, and then click **Refresh**.
8. Expand **AdventureWorks2016**, expand **Query Store**, and note the queries being tracked.
9. Highlight the script under the **Step 5** description, and then click **Execute**.
10. Highlight the script under the **Step 6** description, and then click **Execute**.
11. Keep SQL Server Management Studio open for the next demonstration.

## Lesson 4

# Live Query Statistics

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## Question and Answers

**Question:** Which of the following statements will enable Live Query Statistics for all sessions in Activity Monitor?

- ( ) ALTER DATABASE SET STATISTICS ON
- ( ) SET LIVE QUERY STATISTICS ON
- ( ) ENABLE LIVE QUERY STATISTICS
- ( ) SET STATISTICS PROFILE OFF
- ( ) SET STATISTICS XML ON

**Answer:**

- ( ) ALTER DATABASE SET STATISTICS ON
- ( ) SET LIVE QUERY STATISTICS ON
- ( ) ENABLE LIVE QUERY STATISTICS
- ( ) SET STATISTICS PROFILE OFF
- (√) SET STATISTICS XML ON

## Demonstration: Enable Live Query Statistics for a Session

### Demonstration Steps

Enable Live Query Statistics

1. Ensure that you have completed the previous demonstration in this module. Alternatively, complete the following steps:
  - a. Start the 10986B-MIA-DC and 10986B-MIA-SQL virtual machines, log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
  - b. Run **D:\Demofiles\Mod02\Setup.cmd** as an administrator. When prompted with the question **Do you want to continue with this operation?** type **Y**, then press Enter. After the script has run successfully, and **Press any key to continue** appears, press any key to exit the command window.
  - c. If SQL Server Management Studio is not already open, start it and connect to the **MIA-SQL** database engine instance using Windows authentication, and then open the **Demo.ssmssl** solution in the **D:\Demofiles\Mod02\Demo** folder.
2. In Solution Explorer, double-click the **4 - Live Query Statistics.sql** script file.
3. Highlight the script under the **Step 1** description, and then click **Execute**.
4. Highlight the script under the **Step 2** description, and then click **Execute**.
5. On the **Query** menu, click **Include Live Query Statistics**.
6. Highlight the script under the **Step 4** description, and then click **Execute**.
7. On the **Query** menu, click **Include Live Query Statistics**.
8. On the **Query** menu, point out that the menu button is no longer highlighted.
9. Keep SQL Server Management Studio open for the next demonstration.

## Lesson 5

# Native JSON

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## Question and Answers

**Question:** Which of the following statements is incorrect?

- ( ) The FOR JSON clause forms data in JSON format.
- ( ) ISJSON returns a Boolean value to confirm whether or not the data is in correct JSON format.
- ( ) The JSON type can be used for column and variable data types.
- ( ) JSON\_VALUE returns a scalar value.
- ( ) JSON\_QUERY returns an array value.

**Answer:**

- ( ) The FOR JSON clause forms data in JSON format.
- ( ) ISJSON returns a Boolean value to confirm whether or not the data is in correct JSON format.
- (v) The JSON type can be used for column and variable data types.
- ( ) JSON\_VALUE returns a scalar value.
- ( ) JSON\_QUERY returns an array value.

## Demonstration: Extract and Work with JSON Data

### Demonstration Steps

Extract and Work with JSON Data

1. Ensure that you have completed the previous demonstration in this module. Alternatively, complete the following steps:
  - a. Start the 10986B-MIA-DC and 10986B-MIA-SQL virtual machines, log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
  - b. Run **D:\Demofiles\Mod02\Setup.cmd** as an administrator. When prompted with the question **Do you want to continue with this operation?** type **Y**, then press Enter. After the script has run successfully, and **Press any key to continue** appears, press any key to exit the command window.
  - c. If SQL Server Management Studio is not already open, start it and connect to the **MIA-SQL** database engine instance using Windows authentication, and then open the **Demo.ssmssl** solution in the **D:\Demofiles\Mod02\Demo** folder.
2. In Solution Explorer, double-click the **5 - Native JSON.sql** script file.
3. Highlight the script under the **Step 1** description, and then click **Execute**.
4. Highlight the script under the **Step 2** description, and then click **Execute**.
5. Highlight the script under the **Step 3** description, and then click **Execute**.
6. Highlight the script under the **Step 4** description, and then click **Execute**.
7. Keep SQL Server Management Studio open for the next demonstration.

## Lesson 6

# Temporal Tables

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## Question and Answers

**Question:** Which of the following statements regarding temporal tables is false?

- ( ) A temporal table can be created by creating a new table, or altering an existing table.
- ( ) System-versioning captures all inserts, updates, and deletes on a temporal table.
- ( ) System-versioning works by creating a pair of tables—one for the current data, one for the historical data.
- ( ) The current data table in a system-versioned pair must have a primary key.
- ( ) The historical table in the system-versioned pair uses a default name and cannot be changed.

**Answer:**

- ( ) A temporal table can be created by creating a new table, or altering an existing table.
- ( ) System-versioning captures all inserts, updates, and deletes on a temporal table.
- ( ) System-versioning works by creating a pair of tables—one for the current data, one for the historical data.
- ( ) The current data table in a system-versioned pair must have a primary key.
- (√) The historical table in the system-versioned pair uses a default name and cannot be changed.

## Resources

### Querying Temporal Tables



**Best Practice:** If you want to search historical data only, use the CONTAINED IN subclause because this gives the best performance.

## Demonstration: Create System-Versioned Tables

### Demonstration Steps

Create System-Versioned Tables

1. Ensure that you have completed the previous demonstration in this module. Alternatively, complete the following steps:
  - a. Start the 10986B-MIA-DC and 10986B-MIA-SQL virtual machines, log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
  - b. Run **D:\Demofiles\Mod02\Setup.cmd** as an administrator. When prompted with the question **Do you want to continue with this operation?** type **Y**, then press Enter. After the script has run successfully, and **Press any key to continue** appears, press any key to exit the command window.
  - c. If SQL Server Management Studio is not already open, start it and connect to the **MIA-SQL** database engine instance using Windows authentication, and then open the **Demo.ssmssln** solution in the **D:\Demofiles\Mod02\Demo** folder.
2. In Solution Explorer, double-click the **6 - Temporal Tables.sql** script file.
3. Highlight the script under the **Step 1** description, and then click **Execute**.
4. Highlight the script under the **Step 2** description, and then click **Execute**.

5. In Object Explorer, expand **Databases**, expand **AdventureWorks2016**, expand **Tables**, and note the **HumanResources.EmployeeBenefit (System-Versioned)** table. If the table is not visible, right-click **Tables**, and then click **Refresh**.
6. Expand the **HumanResources.EmployeeBenefit (System-Versioned)** table, and note the **HumanResources.EmployeeBenefitHistory (History)** table.
7. Expand **Columns**, expand the **HumanResources.EmployeeBenefitHistory (History)** table, expand **Columns**, and note the tables are the same, other than the PK.
8. Highlight the script under the **Step 4** description, and then click **Execute**.
9. Highlight the script under the **Step 5** description, and then click **Execute**.
10. In Object Explorer, right-click **Tables**, and then click **Refresh**.
11. Expand the **Sales.SalesTaxRate (System-Versioned)** table, and note the **Sales.SalesTaxRateHistory (History)** table.
12. Expand **Columns**, expand the **Sales.SalesTaxRateHistory (History)** table, expand **Columns**, and note the tables are the same, other than the PK and FK.
13. Highlight the script under the **Step 7** description, and then click **Execute**.
14. Close SQL Server Management Studio, without saving any changes.

# Module Review and Takeaways

## Best Practice

Become familiar with the troubleshooting tools available in SQL Server. These should be as much a part of your toolset as your development skills.

## Review Question(s)

**Question:** What are the advantages of using system-versioning versus a custom-built application to store data changes?

**Answer:**

- The functionality of detecting and storing changes is built-in, so it just requires the additional columns and to be switched on for each table.
- Can be used in all your user databases in the production environment.
- It is very quick to set up.
- Can be added to existing tables with minimal coding and disruption.
- The new FOR SYSTEM\_TIME subclauses return historical data within precise time spans.
- It can be turned off at any time.

## Real-world Issues and Scenarios

Real-Time Operational Analytics offers the ability to run analysis against your OLTP system concurrently with operational queries. This feature delivers up-to-date data, right to the last transaction. Before implementing this on your production databases, recreate the data in a test environment, and use a tool such as SQL Server's Distributed Replay to simulate the real-life workload. At the same time as running this simulation, you can also run analytical queries against the same database to ensure the performance of the OLTP operational queries is not reduced to an unacceptable level. If you intend to run real-time reports against your production database during busy work periods then, in most cases, priority should be given to operations, not reporting.

## Common Issues and Troubleshooting Tips

Common Issue	Troubleshooting Tip
Query sometimes runs slowly, but not all the time.	Check SQL Agent jobs to see if anything is running that might be causing your query to slow down. Also check Windows Task Scheduler for any jobs that might clash with your query and affect the performance.

## Lab Review Questions and Answers

### Lab: Implementing SQL Server 2016 Performance Improvements

#### Question and Answers

#### Exercise 1: Implementing the Query Store

**Question:** Which other system views can you use to return information about the Query Store?

**Answer:** You can query the following views for direct access to the data that Query Store gathers:

- sys.query\_store\_plan
- sys.query\_store\_query
- sys.query\_store\_query\_text
- sys.query\_store\_runtime\_stats
- sys.query\_store\_runtime\_stats\_interval

# Module 3

## What's New in SQL Server Security

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## Lesson 1

# Using Always Encrypted

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## Question and Answers

**Question:** When would you use Always Encrypted?

- ( ) To encrypt your database backup in the event of theft.
- ( ) To protect highly sensitive data by encrypting specific columns.
- ( ) As an alternative to Transparent Data Encryption.
- ( ) To protect your data against hard disk failure.
- ( ) To prevent data from being migrated to the cloud.

**Answer:**

- ( ) To encrypt your database backup in the event of theft.
- (√) To protect highly sensitive data by encrypting specific columns.
- ( ) As an alternative to Transparent Data Encryption.
- ( ) To protect your data against hard disk failure.
- ( ) To prevent data from being migrated to the cloud.

## Why Use Always Encrypted?

**Question:** What sensitive data do you hold in your organization? Do you currently encrypt any data?

**Answer:** Answers will vary.

## Always Encrypted Encryption Types

**Question:** Which columns might be suitable for Randomized encryption, and why? Which would be unsuitable, and why?

Which columns might be suitable for Deterministic encryption, and why? Which would be unsuitable, and why?

**Answer:**

### Randomized encryption

Suitable: credit card numbers, social security numbers. Why? Unlikely to perform operations, or need them indexed.

Unsuitable: date of birth. Why? You might need to perform operations, or index the column.

### Deterministic encryption

Suitable: surname. Why? You may need to index the column.

Unsuitable: gender. Why? It is easy to guess, has few (known) values. Other unsuitable columns include anything else with very few unique values—for example, Regions.

## Implementing Always Encrypted

**Question:** For security, Always Encrypted stores encryption keys on the server. True or false?

( ) True

( ) False

**Answer:**

( ) True

(√) False

## Demonstration: Using Always Encrypted with Azure SQL Database

### Demonstration Steps

1. Start the MSL-TMG1, 10986B-MIA-DC and 10986B-MIA-SQL virtual machines, and log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. Open SQL Server Management Studio and connect to the server you created earlier, for example **10986nnnyymmdd.database.windows.net**, using **SQL Server Authentication**.
3. In the **Login** box, type **Student**, and in the **Password** box, type **Pa\$\$w0rd**, and then click **Connect**.
4. Click **New Query** to open a new query window.
5. In the **Available Databases** list, click **AdventureWorksLT**.
6. In Object Explorer, expand **Databases**, expand **AdventureWorksLT**, expand **Security**, and then expand **Always Encrypted Keys**.
7. Right-click **Column Master Keys** and click **New Column Master Key**.
8. In the **New Column Master Key** dialog box, in the **Name** box, type **CMK1**.
9. In the **Key store** list, click **Windows Certificate Store - Current User**.
10. Click **Generate Certificate**. The certificate appears in the list.
11. Click **OK** to close.
12. In the tree hierarchy, right-click **Column Encryption Keys** and click **New Column Encryption Key**.
13. In the **New Column Encryption Key** dialog box, in the **Name** box, type **CEK1**.
14. In the **Column master key** list, click **CMK1**, and then click **OK**.
15. Under **AdventureWorksLT**, expand **Tables** to display the list of tables. Expand **SalesLT.Address**, and then expand **Columns** to display the list of columns.
16. In the query window, type:

```
SELECT * FROM [SalesLT].[Address]
```

17. Click **Execute** to show that all the columns are displayed in plaintext.
18. In Object Explorer, under **SalesLT.Address**, expand **Indexes**.
19. Right-click the **IX\_Address\_AddressLine1 ...** index, point to **Script Index as**, point to **DROP And CREATE To**, and then click **New Query Editor Window**.



20. In the database list, ensure **AdventureWorksLT** is selected, and run the first part of the script to drop the index. Remember the USE AS statement does not work with Azure SQL Database. Columns cannot be encrypted or decrypted with an index. Once the column has been encrypted, it could be successfully reindexed, although we will not reindex in this demo.
21. In Object Explorer, under **Columns**, right-click **City (nvarchar(30), not null)**, and then click **Encrypt Column**.
22. In the **Always Encrypted** wizard, on the **Introduction** page, click **Next**.
23. On the **Column Selection** page, select the **City** row check box, in the **Encryption Type** column, click **Deterministic**, and in the **Encryption Key** column, click **CEK1**, and then click **Next**.
24. On the **Master Key Configuration** page, click **Next**.
25. On the **Run Settings** page, ensure **Proceed to finish now** is selected, and then click **Next**.
26. On the **Summary** page, click **Finish**.
27. When the process is complete, click **Close**.
28. In the **SQLQuery1.sql** query window, click **Execute** to run the query to show the column appears with obfuscated text. Note the values are repeated.
29. In the query window, type:

```
SELECT count(City)
FROM salesLT.Address
GROUP BY City
```

30. Highlight the query and click **Execute** to show the number of companies that each salesperson handles. This is possible because deterministic encryption was selected.
31. In Object Explorer, right-click **PostalCode (nvarchar(15), not null)**, and then click **Encrypt Column**.
32. In the **Always Encrypted** wizard, step through the wizard to encrypt the **PostalCode** column with **Randomized** encryption with the **CEK1** encryption key.
33. In the **SQLQuery1.sql** query window, type:

```
SELECT * FROM [SalesLT].[Address]
```

34. Highlight the query and click **Execute** to show that the columns appear with obfuscated text.
35. In the query window, type:

```
SELECT COUNT(*) FROM SalesLT.Address
GROUP BY PostalCode
```

36. Highlight the query and click **Execute** to show that the GROUP BY operation fails with randomized encryption.
37. In Object Explorer, right-click **PostalCode** and click **Encrypt Column**. Step through the wizard but select **Plaintext** for the encryption type.
38. In the query window, type:

```
SELECT * FROM [SalesLT].[Address]
```

39. Highlight the query and click **Execute** to show that the **PostalCode** column has been decrypted.

40. In Object Explorer, right-click **SalesLT.Address**, point to **Script Table as**, point to **CREATE To**, and then click **New Query Editor Window**. Point out the encrypted column, and the encryption algorithm used.
41. Close SQL Server Management Studio, without saving any changes.

## Lesson 2

# Row-Level Security

### Contents:

Question and Answers

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## Question and Answers

**Question:** What is the purpose of a row-level filter predicate?

- ☐ Developers can use it to specify the criteria that must be met for table rows to be returned.
- ☐ It is a container for block predicates.
- ☐ It encrypts specific rows, based on criteria in the filter predicate.
- ☐ It is a container for security schemas.
- ☐ It improves the performance of parameterized stored procedures.

**Answer:**

- ☒ Developers can use it to specify the criteria that must be met for table rows to be returned.
- ☐ It is a container for block predicates.
- ☐ It encrypts specific rows, based on criteria in the filter predicate.
- ☐ It is a container for security schemas.

## Module Review and Takeaways

### Review Question(s)

**Question:** What are the main data security concerns in your organization? Which new security features in SQL Server 2016 are most appropriate to mitigate those security concerns?

**Answer:** Answers will vary.

# Lab Review Questions and Answers

## Lab: SQL Server 2016 Security Improvements

### Question and Answers

#### Lab Review

**Question:** What are the advantages of using row-level security, rather than views or stored procedures?

**Answer:**

1. Centralized security.
2. Filter and block predicates act on the underlying tables, regardless of how they are accessed.
3. Very flexible.

**Question:** What are the four different types of dynamic data masking? When might you use each one?

**Answer:**

- Email: partially obfuscate email addresses. This may be used to identify people, without revealing the full email address.
- Phone number: partially obfuscate phone numbers. May be used to confirm which phone number is held in the database, without revealing the full details.
- Partial: can be customized to specific requirements.
- Random: can be customized to specific requirements.

# Module 4

## What's New in SQL Server Availability and Scalability?

### Contents:

<b>Lesson 1:</b> Enhanced Always On Availability Groups	2
<b>Lesson 2:</b> What's New with tempdb?	4
Module Review and Takeaways	6
Lab Review Questions and Answers	7

## Lesson 1

# Enhanced Always On Availability Groups

### Contents:

Question and Answers	3
Resources	3



## Question and Answers

**Question:** When did your organization last have a hardware or software failure that impacted business operations? What does your organization do to mitigate the risks of system failures?

**Answer:** Answers will vary, but should include database mirroring, replication, backups, and finger crossing.

## Resources

### SQL Server 2016 Enhancements to Always On Availability Groups



**Best Practice:** Use your readable secondary replicas, with load balancing, for analytics. To some extent, this enables OLTP databases to perform part of the role of a data warehouse, but without aggregation.

## Lesson 2

# What's New with tempdb?

### Contents:

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## Question and Answers

### Configure tempdb at Installation

**Question:** What is the relationship between user databases and tempdb?

- ( ) Each SQL Server user database has one tempdb.
- ( ) tempdb is shared between all databases on a SQL Server instance.
- ( ) The number of tempdb databases depends on the number of logical processors on the server.
- ( ) You can have any number of user databases, but the number of tempdb databases is hidden.

**Answer:**

- ( ) Each SQL Server user database has one tempdb.
- (v) tempdb is shared between all databases on a SQL Server instance.
- ( ) The number of tempdb databases depends on the number of logical processors on the server.
- ( ) You can have any number of user databases, but the number of tempdb databases is hidden.

## Resources

### Improve Performance with tempdb



**Best Practice:** Use fast storage for tempdb. Unlike a log file which sequentially writes records to disk, tempdb has more varied reads and writes, and benefits from faster storage.



**Additional Reading:** *Microsoft SQL Server 2012 Internals* (Kalen Delaney) has an excellent chapter on system databases, and a lot of detail about working with tempdb.

### Configure tempdb at Installation



**Database Engine Configuration – TempDB**

<http://aka.ms/asq68r>

## Module Review and Takeaways

This module has covered what's new in SQL Server 2016 availability and scalability, in addition to introducing some new features expected in Windows Server 2016.

# Lab Review Questions and Answers

## Lab: Monitoring tempdb

### Question and Answers

#### Lab Review

**Question:** How can you improve tempdb performance when using several data files?

**Answer:** Place the data files on separate disks. Consider using SSD storage.

**Question:** How frequently do you monitor the way in which tempdb is being used on your database instances?

**Answer:** Answers will vary.



# Module 5

## What's New in SQL Server Reporting and BI

### Contents:

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<b>Lesson 2:</b> Power BI Enhancements	5
<b>Lesson 3:</b> Mobile Report Publisher	8
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## Lesson 1

# Reporting Services Enhancements

### Contents:

Question and Answers	3
Demonstration: Using the Tree Map and Sunburst Charts in SSRS	3



## Question and Answers

**Question:** Which of the following is not a valid destination for exporting an SSRS report?

- ( ) PDF
- ( ) Microsoft Word
- ( ) SQL Server query file
- ( ) Microsoft PowerPoint
- ( ) CSV

**Answer:**

- ( ) PDF
- ( ) Microsoft Word
- (v) SQL Server query file
- ( ) Microsoft PowerPoint
- ( ) CSV

## Demonstration: Using the Tree Map and Sunburst Charts in SSRS

### Demonstration Steps

Use New Charts in a Report

1. Ensure that the 10986B-MIA-DC and 10986B-MIA-SQL virtual machines are both running, and then log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. Run **D:\Demofiles\Mod05\Setup.cmd** as an Administrator, click **Yes** when prompted.
3. At the command prompt, type **y** when prompted, and then press Enter. When the script completes, press any key to close the window.
4. Start SQL Server Management Studio and connect to the **MIA-SQL** database engine instance using Windows authentication.
5. In the **D:\Demofiles\Mod05\Demo** folder, double-click **Demo.ssmssln**.
6. In Solution Explorer, expand the **Queries** folder, and double-click **1 – Charts.sql**.
7. Start Visual Studio 2015, and open the **1 - Charts.sln** solution in the **D:\DemoFiles\Mod05\SSRS\1 - Charts** folder.
8. In Solution Explorer, double-click **New Charts.rdl** to open the chart.
9. In the **Report Data** pane, right-click on **Data Sources**, and then click **Add Data Source**.
10. In the **Data Source Properties** dialog box, click **Edit**.
11. In the **Connection Properties** dialog box, in the **Server name** box, type **MIA-SQL**.
12. In the **Select or enter a database name** list, click **AdventureWorks2016**, and then click **OK**.
13. In the **Data Source Properties** dialog box, change the **Name** to **AdventureWorks**, and then click **OK**.
14. In the **Report Data** pane, right-click **AdventureWorks**, and click **Add Dataset**.
15. In the **Dataset Properties** dialog box, name the dataset **SalesByTerritory**.

16. In SQL Server Management Studio, copy the query from the **1 – Charts.sql** query.
17. In Visual Studio, paste the query into the **Query** box, and then click **OK**.
18. Right-click on the report and point to **Insert**, and then click **Chart**.
19. In the **Select Chart Type** dialog box, in the **Shape** section, click **Tree Map**, and then click **OK**.
20. Move the chart to the top left-hand corner of the report and then widen the chart.
21. Right-click on an empty space on the report and point to **Insert**, and then click **Chart**.
22. In the **Select Chart Type** dialog box, in the **Shape** section, click **Sunburst**, and then click **OK**.
23. Increase the height of the report page by dragging the bottom of the report down. Move the sunburst chart to the bottom left-hand corner of the tree map chart and then widen the chart to the same width as the tree map and fill the report page.
24. Click the **Tree Map** to give focus, then click the chart to open the **Chart Data** properties.
25. Click the **Plus** icon next to **Values**, and then click **LineTotal**.
26. Click the **Plus** icon next to **Category Groups**, and then click **CategoryName**.
27. Click the **Plus** icon next to **Category Groups**, and then click **SubCategoryName**.
28. Click the **Plus** icon next to **Series Groups**, and then click **TerritoryName**.
29. Click the **Sunburst** to give focus, then click the chart to open the **Chart Data** properties.
30. Click the **Plus** icon next to **Values**, and then click **LineTotal**.
31. Click the **Plus** icon next to **Category Groups**, and then click **CategoryName**.
32. Click the **Plus** icon next to **Category Groups**, and then click **SubCategoryName**.
33. Click the **Plus** icon next to **Category Groups**, and then click **SalesReasonName**.
34. Click the **Plus** icon next to **Series Groups**, and then click **TerritoryName**.
35. Click the **Preview** tab at the top of the report. When the report displays, point out the proportional sizes of the segments in both charts.
36. Click **Export**, and then click **PowerPoint**.
37. In the **Save As** dialog box, save the report in the **D:\Demofiles\Mod05\SSRS** folder, as **New Reports.pptx**.
38. Open the **D:\Demofiles\Mod05\SSRS** folder, and double-click **New Reports.pptx** to open the file. Mention that each chart displays on a single page.
39. Press F5, or click **Start From Beginning** to begin the presentation. If a **Microsoft PowerPoint** dialog box appears, click **OK**. After displaying the tree map chart, press the right arrow to navigate to the sunburst chart. Press ESC to exit presentation mode.
40. Exit PowerPoint, Visual Studio and SSMS, without saving any changes.

## Lesson 2

# Power BI Enhancements

### Contents:

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## Demonstration: Creating a Report with Power BI Desktop

### Demonstration Steps

#### Install Power BI Desktop

1. Start the MSL-TMG1, 10986B-MIA-DC and 10986B-MIA-SQL virtual machines, and then log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. Open Internet Explorer, and browse to **http://aka.ms/W11rg9**, and then click **Download**.
3. On the **Choose the download you want** page, select the **PBIDesktop\_x64.msi** check box, and then click **Next**.
4. In the message box, click **Run**.
5. In the **Microsoft Power BI Desktop (x64) Setup** dialog box, on the **Welcome to the Microsoft Power BI Desktop (x64) Setup Wizard** page, click **Next**.
6. On the **Microsoft Software License Terms** page, select the **I accept the terms in the License Agreement** check box, and then click **Next**.
7. On the **Destination Folder** page, click **Next**.
8. On the **Ready to install Microsoft Power BI Desktop (x64)** page, click **Install**.
9. In the **User Account Control** dialog box, click **Yes**.
10. On the **Completed the Microsoft Power BI Desktop (x64) Setup Wizard** page, clear the **Launch Microsoft Power BI Desktop** check box, and then click **Finish**.
11. Close Internet Explorer.
12. On the Desktop, right-click the **Power BI Desktop** shortcut, and then click **Pin to Taskbar**.

#### Create a Report with Power BI Desktop

1. Run **D:\Demofiles\Mod05\Setup.cmd** as an Administrator, click **Yes** when prompted.
2. When the script completes, press any key to close the window.
3. Start SQL Server Management Studio and connect to the **MIA-SQL** database engine instance using Windows authentication.
4. Open the **Demo.ssmssl** solution in the **D:\Demofiles\Mod05\Demo** folder.
5. In Solution Explorer, open the **2 – Power BI.sql** script file.
6. On the taskbar, click **Power BI Desktop**.
7. In the Power BI Desktop window, click **Get Data**.
8. In the **Get Data** dialog box, click **Azure**, click **Microsoft Azure SQL Database**, and then click **Connect**.
9. In the **SQL Server Database** window, in the **Server** box, type the URL of the Azure server <Server Name>.database.windows.net (where <Server Name> is the name of the server you created), in the **Database (optional)** box, type **AdventureWorksLT**.
10. Expand the **Advanced options** box.
11. In SQL Server Management Studio, copy the **2 – Power BI.sql** query.
12. In Power BI Desktop, paste the query into the **SQL statement (optional)** box, and then click **OK**.
13. In the **Access a SQL Server Database** window, click **Database**.

14. In the **Username** box, type **Student**.
15. In the **Password** box, type **Pa\$\$w0rd**, and then click **Connect**.
16. The data preview window will appear, click **Load**.
17. If the **Connection Settings** window appears, leave **Import** selected, and then click **OK**. The window will close and a blank report canvas will open.
18. In the **Visualizations** pane, click **Stacked column chart**.
19. In the **Fields** pane, expand **Query1**, select the **ProductName** and **TotalSales** check boxes. The chart will auto populate. Expand the chart control to horizontally show the full names of the products.
20. In the **Visualizations** pane, click **Format**.
21. Expand **Title**, and change the **Title Text** value to **Top 10 Selling Products**. Click the **center icon** next to **Alignment**.
22. Toggle **Data labels** to be **On**.
23. Expand the **Data colors** list, and choose another color to change the bars on the chart.
24. Close Power BI Desktop, and SQL Server Management Studio without saving any changes.

## Lesson 3

# Mobile Report Publisher

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Demonstration: Creating a Report with Mobile Report Publisher	9

## Question and Answers

**Question:** Which of the following statements is incorrect?

- ( ) Mobile reports can be viewed on an iPhone or iPad using the Power BI for iOS.
- ( ) You can include data in a mobile report from a Microsoft Excel workbook.
- ( ) You can include data in a mobile report from any data source supported by Reporting Services.
- ( ) You can render mobile reports in the classic Reporting Services.
- ( ) The new Reporting Services enables you to create KPIs.

**Answer:**

- ( ) Mobile reports can be viewed on an iPhone or iPad using the Power BI for iOS.
- ( ) You can include data in a mobile report from a Microsoft Excel workbook.
- ( ) You can include data in a mobile report from any data source supported by Reporting Services.
- (√) You can render mobile reports in the classic Reporting Services.
- ( ) The new Reporting Services enables you to create KPIs.

## Resources

### Publishing Mobile Reports



**Best Practice:** It is a good idea to separate your mobile reports from your paginated reports, so create a folder dedicated to mobile reports and users will easily find them. You can then manage them in isolation from your paginated reports, as they are saved in a different format to the SSDT Report Definition Language (.rdl) files.

## Demonstration: Creating a Report with Mobile Report Publisher

### Demonstration Steps

Creating a Report with Mobile Report Publisher

1. Run **D:\Demofiles\Mod05\Setup.cmd** as an administrator, click **Yes** when prompted.
2. When the script completes, press any key to close the window.
3. On the Start menu, type **Microsoft SQL Server Mobile Report Publisher**, and then press Enter.
4. Click **New Mobile Report** and change the report title to **Adventure Works Sales**.
5. Drag a **Totals Chart** report item onto the design surface top left-hand grid. Grab the sizer and expand the bar chart to fill three grids across and two down.
6. In Visuals Properties, change **Title** to **Top 10 Selling Products**. Toggle **Show percentage totals** to **Off**.
7. Drag a **Pie Chart** to the grid below the bottom left-hand corner of the bar chart. Grab the sizer and expand the pie chart to fill three grids across and two down.
8. In Visuals Properties, change **Title** to **Sales by Sales Person**. Toggle **Show legend** to **On**.

9. In the top right-hand corner of the app, expand the list and select **Phone**. Point out that the design surface grids have changed and the reports items are not visible. Mention that these are still available on the Master layout.
10. Drag the **Top 10 Selling Products** bar chart onto the design surface top left-hand grid. Use the size to expand the item to four grids across and three down.
11. Drag the **Sales by Sales Person** pie chart onto the design surface under the pie chart and expand it to fill all the grids.
12. Click **Data**, click **Add data**.
13. In the **Add data** dialog box, click **Excel**.
14. In the **Open** dialog box, browse to the **D:\Demofiles\Mod05\Demo** folder, click **Mobile Report Data.xlsx**, and then click **Open**.
15. In the **Add data** dialog box, select the two check boxes next to the Excel worksheets, and click **Import**. After the data has imported, two new tabs appear for each new dataset.
16. On the **Data** tab, under **Report elements**, click the **Top 10 Selling Products** bar chart.
17. In the **Data properties** section, in the **Main series** list, click **Top10SellingProducts**, and then select all items in the list.
18. On the **Data** tab, under **Report elements**, click the **Sales by Sales Person** pie chart.
19. In the **Data properties** section, in the **Main series** list, click **SalesBySalesPerson**, and then select all items in the list.
20. Click the **Preview** tab.
21. Click the **back arrow** to return to the report designer.
22. Click **Save mobile report**, and click **Save to file system**.
23. In the **Save as** dialog box, browse to **D:\Demofiles\Mod05\Demo**, and then click **Save**.
24. In the Report Save window, click **OK**.
25. Close SQL Server Mobile Report Publisher.



## Module Review and Takeaways

**Question:** Self-Service BI empowers business users with the ability to use corporate data to compile reports without a dependency on an IT department, or a dedicated report developer. Giving users access to live data allows them to gain insights into the most up-to-date transactions. Real-time analysis is critical to organizations in certain industry sectors. While this is advantageous to the users, consideration must be given to the security and performance of your on-premises databases. What tools can you use to ensure the safety and performance of your databases?

**Answer:** Apply the same principles to Power BI users as you do to business users who have access to SQL Server. Methods that can be applied include:

- Create roles to group users together for easy management, and assign the minimal permissions that are required.
- Use views to limit access to data. There may be sensitive data that users must not be able to read.
- It is likely that read-only access is all that is needed to create reports in Power BI.
- A data steward can ensure users do not duplicate work, and help users to create dashboards that can be shared.
- For more complex queries, write these using stored procedures, so performance is optimal.



# Module 6

## What's New in SQL Server Data Access?

### Contents:

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<b>Lesson 2:</b> What's New in Integration Services?	4
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## Lesson 1

# PolyBase

### Contents:

Question and Answers

3

## Question and Answers

Put the following steps in the correct order by numbering each one:

	Steps
	Install and configure PolyBase.
	Configure SQL Server to allow distributed queries.
	Stop and start SQL Server.
	Create a master key for the database.
	Create a database scoped credential.
	Create an external file format for the contents format of the file.
	Create an external table that contains the metadata to access the data in the external table.

**Answer:**

	Steps
1	Install and configure PolyBase.
2	Configure SQL Server to allow distributed queries.
3	Stop and start SQL Server.
4	Create a master key for the database.
5	Create a database scoped credential.
6	Create an external file format for the contents format of the file.
7	Create an external table that contains the metadata to access the data in the external table.

## Lesson 2

# What's New in Integration Services?

### Contents:

Question and Answers

5

## Question and Answers

**Question:** What is the minimum number of outputs you need within a package to test the Balanced Data Distributor transformation?

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

**Answer:**

☒ 1

☐ 2

☐ 3

☐ 4

☐ 5

## Lesson 3

# Working with SSIS and Azure

### Contents:

Question and Answers	7
Demonstration: SSIS and Azure	7



## Question and Answers

**Question:** What is Azure Data Factory?

- ( ) An on-demand Azure service for generating artificial data.
- ( ) An on-demand Azure service for extracting, transforming, and preparing data for BI applications.
- ( ) A data visualization tool hosted in Azure.
- ( ) A downloadable add-in for SQL Server 2016 Integration Services that enables you to connect to Azure.
- ( ) An Azure data service designed to create PowerShell scripts.

**Answer:**

- ( ) An on-demand Azure service for generating artificial data.
- (√) An on-demand Azure service for extracting, transforming, and preparing data for BI applications.
- ( ) A data visualization tool hosted in Azure.
- ( ) A downloadable add-in for SQL Server 2016 Integration Services that enables you to connect to Azure.
- ( ) An Azure data service designed to create PowerShell scripts.

## Demonstration: SSIS and Azure

### Demonstration Steps

1. Ensure that the 10986B-MIA-DC and 10986B-MIA-SQL virtual machines are both running, and then log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. In the **D:\Demofiles\Mod06** folder, right-click **Setup.cmd**, and then click **Run as administrator**.
3. In the **User Account Control** dialog box, click **Yes**. When prompted with the question **Do you want to continue with this operation?** type **Y**, and press Enter, wait for the script to finish, and then press any key to continue.
4. Right-click on the PowerShell icon in the taskbar, and click **Run ISE as Administrator**.
5. In the **User Account Control** dialog box, click **Yes** and the Windows PowerShell ISE opens.
6. Click the **Show Script Pane** button. The ISE has two sections: the top half for running prepared scripts, and the bottom half for typing commands.
7. In the bottom pane, at the prompt, type **Install-Module AzureRM -Force**, and press Enter to ensure you have the latest version of the AzureRM PowerShell module.
8. In the **NuGet provider is required to continue** dialog box, click **Yes**. The latest AzureRM PowerShell module is installed, this may take several minutes to complete.
9. At the prompt, type **Update-Help**, and press Enter. The latest version of PowerShell help is installed, this may take several minutes to complete. If an error is displayed, it can be ignored for the moment.
10. On the **File** menu, click **Open**, navigate to **D:\Demofiles\Mod06\Demo**, click **CreateAzureStorage.ps1**, and then click **Open**.
11. Open Internet Explorer, and sign in to the Azure portal.
12. In PowerShell, amend the script with today's date as a suffix for **\$resourceGroupName** and **\$storageName**.

13. Highlight the section titled **# Initialize variables**, and click **Run Selection**.
14. Highlight the section titled **# Sign in to Azure**, and click **Run Selection**. You will be prompted to sign in again. Check you have the correct subscription once you have logged in.
15. Highlight the section titled **# Create a resource group**, and click **Run Selection**. If the name is not unique, add a suffix until it is unique.
16. Highlight the section **# Create a storage account**, and click **Run Selection**.
17. Highlight the section **# Create a container**, and click **Run Selection**.
18. Highlight the section **# Get storage account keys**, and click **Run Selection**.
19. Keep the PowerShell window open.
20. On the toolbar, click **Visual Studio 2015**.
21. On the **File** menu, point to **Open**, and then click **Project/Solution**, navigate to **D:\Demofiles\Mod06\Demo\Project1**, and then double-click **Lab1.sln**.
22. On the **View** menu, click **Solution Explorer**.
23. In Solution Explorer, double-click **UploadBlob.dtsx** to open the package.
24. Double-click **Generate Contacts\_csv** to see the data flow. You can double-click each element to see the workflow. Press **Cancel** each time to ensure you do not make changes.
  - a. The **Contacts** data flow reads contacts from AdventureWorks2014.
  - b. The **Clean data** transformation strips out unnecessary commas in the data.
  - c. The **Contacts\_csv** data flow writes data to a csv file on the local drive.
25. In Solution Explorer, under **Connection Managers**, double-click **AzureStorage.conmgr**.
26. In the PowerShell window, copy the **key1** account key.
27. In the **Azure Storage Connection Manager Editor** dialog box, amend the **Storage account name** used from step 12.
28. In the **Account key** box, paste the **Account key** from PowerShell, and then click **Test Connection**. When successful, click **OK**.
29. In the **Azure Storage Connection Manager Editor** dialog box, click **OK**.
30. On the **Debug** menu, click **Start Debugging** to run the package.
31. When a green tick appears next to each data flow, on the **Debug** menu, click **Stop Debugging**.
32. If any **Microsoft Visual Studio** dialog boxes appear, click **No**.
33. In File Explorer, navigate to **D:\Demofiles\Mod06\Demo** to see that the **Contacts.csv** file has been created.
34. Double-click **Contacts.csv** to inspect the contents. This .csv file has been uploaded to Azure Blob storage. Close Excel.
35. In Internet Explorer, in the Azure Portal, navigate to your storage container to see the **contacts** folder, and the **Contacts.csv** file. This demonstrates the new Upload to Azure Blob storage data flow in the Azure Feature Pack.
36. In Visual Studio, in Solution Explorer, double-click the **ProcessContacts.dtsx** package.
37. Double-click **Process Contacts** to open the data flow.

38. Open each element to understand the process. Press **Cancel** to close each one without saving.
  - a. Contacts Blob reads contacts from the Azure container.
  - b. Balanced Data Distributor sends the data to three separate CSV files. Each will have roughly the same number of records.
39. On the **Debug** menu, click **Start Debugging** to run the package.
40. When a green tick appears next to each data flow, on the **Debug** menu, click **Stop Debugging**.
41. Using File Explorer, navigate to **D:\Demofiles\Mod06\Demo\Output** to inspect the three .csv files. This demonstrates the new Balanced Data Distributor feature.
42. Close File Explorer, close Visual Studio, close Internet Explorer, and then close PowerShell, without saving any changes.

## Module Review and Takeaways

### Best Practice

Use PolyBase to access off-site data objects held in the cloud.

Use FileTables to access locally available external objects.

Use SQL Server to integrate the two types of data, along with data from inside the RDBMS.

Explore the new SSIS data access features you can use to split and combine data in novel ways that would take hours to do manually.

### Review Question(s)

**Question:** What external data do you use in your organization? What tools do you use to manage external data?

**Answer:** Answers will vary.

### Common Issues and Troubleshooting Tips

Common Issue	Troubleshooting Tip
When installing PolyBase you may be told that you cannot install it because Oracle Java Runtime is missing.	If relevant to your organization, download the Oracle Java Runtime or an alternative. If you install an alternative, you will have to follow the instructions from the vendor to set the various paths and configurations for the alternative Java RTE. There are links in the manual to help you locate relevant resources.
You find that, when you are trying to create an external data source, you get an error message about the term "external".	You need to switch on the relevant TRACEFLAG using the DBCC command <b>DBCC TRACEON(4631,-1)</b> .
It looks like everything is set up properly but you are getting messages back from different communication channels about the object or link not being accessible.	PolyBase runs on Java, which runs on Hadoop—they are used to talk to Azure. If your objects are stored within the Azure Blobs in other than UTF-8 format, PolyBase will not be able to read them.
No matter how hard you try, you cannot create the database credential to allow you to talk to Azure.	In SQL Server 2016, you use scoped database credentials. You should ensure that you have not used an old PDW code that does not contain the scoped keyword in creating the credential.

## Lab Review Questions and Answers

### Lab: Exploring the New Features of SQL Server Integrated Services (SSIS)

#### Question and Answers

##### Lab Review

**Question:** Which is the most important new feature of SQL Server Integration Services for you and your organization? Is your organization holding data in the cloud, and if so, how is the data being queried?

**Answer:** Answers will vary.



# Module 7

## New and Enhanced Features in SQL Server OLAP

### Contents:

<b>Lesson 1:</b> New and Enhanced Features in SQL Server OLAP	2
<b>Lesson 2:</b> What's New in SQL Server Analysis Services?	4
Lab Review Questions and Answers	6

## Lesson 1

# **New and Enhanced Features in SQL Server OLAP**

### **Contents:**

Question and Answers

3



## Question and Answers

Put the following steps in order by numbering each to indicate the correct order.

	Steps
	Install R Services using SQL Server Installation Center.
	Enable external scripts.
	Optionally set the maximum server memory.
	Test R Services with a calculation script.

**Answer:**

	Steps
1	Install R Services using SQL Server Installation Center.
2	Enable external scripts.
3	Optionally set the maximum server memory.
4	Test R Services with a calculation script.

## Lesson 2

# What's New in SQL Server Analysis Services?

### Contents:

Question and Answers

5

## Question and Answers

**Question:** Which of the following is not a new DAX function?

- ☐ GROUP BY
- ☐ INTERSECT
- ☐ UNION
- ☐ ISEMPY
- ☐ UNNATURALINNERJOIN

**Answer:**

- ☐ GROUP BY
- ☐ INTERSECT
- ☐ UNION
- ☐ ISEMPY
- ☒ UNNATURALINNERJOIN

# Lab Review Questions and Answers

## Lab: OLAP with SQL Server

### Question and Answers

#### Lab Review

**Question:** Discuss scenarios in which you could use R in your current workplace. What could you use it to predict?

**Answer:** Answers will vary depending on the students' experience.

**Question:** How could predictive analysis be useful to organizations such as the emergency services?

**Answer:** Predictive analysis is useful across a wide spectrum of business and industry. Organizations such as the police, fire, and ambulance services, could use predictive analysis to work out where and when incidents are most likely to happen. These services generally have limited funds with which to provide services, so helping them predicate incidents can assist them in delivering a better service, and cut costs, through more accurate planning and allocation of resources.

# Module 8

## What's New for SQL Server in the Cloud?

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## Lesson 1

# Stretch Database

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## Question and Answers

Place each item into the appropriate category. Indicate your answer by writing the category number to the right of each item.

Items	
1	To find out which tables are suitable for Stretch Database, run the SQL Server 2016 Upgrade Advisor.
2	The only way to determine whether a table is suitable for Stretch Database is to read the documentation on Limitations and Blocking Issues for Stretch Database.
3	Run the Enable Table for Stretch wizard to find out whether a table is suitable for Stretch Database.
4	Run the Check Table for Stretch wizard to find out whether a table is suitable for Stretch Database.
5	Tables that cannot be stretched do not display the Stretch option on the context-sensitive menu.

Category 1		Category 2
True		False

**Answer:**

Category 1		Category 2
True		False
<p>To find out which tables are suitable for Stretch Database, run the SQL Server 2016 Upgrade Advisor.</p> <p>Run the Enable Table for Stretch wizard to find out whether a table is suitable for Stretch Database.</p>		<p>The only way to determine whether a table is suitable for Stretch Database is to read the documentation on Limitations and Blocking Issues for Stretch Database.</p> <p>Run the Check Table for Stretch wizard to find out whether a table is suitable for Stretch Database.</p> <p>Tables that cannot be stretched do not display the Stretch option on the context-sensitive menu.</p>



## Lesson 2

# Enhanced Backup to Azure

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## Question and Answers

### Why Use Microsoft Azure for Backups?

**Question:** How do you back up your SQL Server data? What are the pros and cons of your method? What is the attitude toward Azure backups in your organization?

**Answer:** Answers will vary. Organizations are likely to be using several different backup systems including tape, disk, and high availability configurations. Discuss attitudes to the cost of Azure backups with students, and the type of backups that are most suited to Azure.

## Resources



**Best Practice:** For data security, select an Azure data center that is geographically remote from your SQL Server data. This protects your data in the event of a disaster that happens close to your server, which runs SQL Server.

## Lesson 3

# Introduction to SQL Server 2016 Hybrid Cloud

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## Resources

### Storing SQL Server Data Files in Microsoft Azure



**Best Practice:** For improved performance, run SQL Server in an Azure virtual machine and access data in a storage account in the same regional data center. This reduces latency and improves performance.

### Demonstration: Using SQL Server Data Files in Microsoft Azure

#### Demonstration Steps

##### Create Azure Resources

1. Ensure that the MSL-TMG1, 10986B-MIA-DC and 10986B-MIA-SQL virtual machines are running, and then log on to 10986B-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. On the taskbar, right-click the **Windows PowerShell** icon, and then click **Run ISE as Administrator**.
3. In the **User Account Control** dialog box, click **Yes**.
4. At the command prompt, type **Install-Module AzureRM -FORCE**, and then press Enter.
5. In the **NuGet provider is required to continue** dialog box, click **Yes**. Wait a few minutes until the download and installation has completed.
6. On the **File** menu, click **Open**.
7. In the **Open** dialog box, navigate to **D:\Demofiles\Mod08\Setup**, and then double-click **CreateAzureResources.ps1**.
8. Amend the **\$subscriptionName** to match your subscription name.
9. Amend the **\$resourceGroupName** to a unique Resource Group name.
10. Amend the **\$storageAccountName** to a unique Storage Account name.
11. Highlight the script in the section marked **#1#**, and click **Run Selection**. This section initializes variables.
12. Highlight the script in the section marked **#2#**, and click **Run Selection**.
13. In the **Sign in to your account** dialog box, enter your Microsoft Azure account user name and password, and then click **Sign in**.
14. Highlight the script in the section marked **#3#**, and click **Run Selection**. This section creates a resource group.
15. Highlight the script in the section marked **#4#**, and click **Run Selection**. This section creates a storage account and takes a minute or so to complete.
16. Highlight the script in the section marked **#5#**, and click **Run Selection**. This section creates a storage container.
17. Highlight the script in the section marked **#6#**, and click **Run Selection**. This section creates a shared access policy (SAS).

### Create a Database with Data Files in Azure

1. Start SQL Server Management Studio, and connect to the **MIA-SQL** instance using Windows Authentication.
2. On the **File** menu, point to **Open**, and then click **File**.
3. In the **Open File** dialog box, navigate to **D:\Demofiles\Mod08\Setup**, and then double-click **InstallAdventureWorks2014.sql**.
4. Underneath the comment **Create credential**, amend all the **https://xxxx.blob.core.windows.net/sql2014-database** entries to the **Cloud Blob Container URL** in the PowerShell window.
5. Amend the **xxxxxxxxxy1&sig=kRSQsz0Sqa1caQx7EMsFqNlu8%2F%2FqLwF3HBAWdP8ML6U%3D** entry to the **Shared Access Signature** in the PowerShell window.
6. Highlight the statement underneath the comment **Create credential**, and click **Execute**. Wait for the script to finish executing.
7. Highlight the statement underneath the comment **Test the database**, and click **Execute**.
8. Highlight the statement underneath the comment **View the database files**, and click **Execute**.

### Connect to Azure Storage

1. In Object Explorer, click **Connect**, and then click **Azure Storage**.
2. In the **Connect to Microsoft Azure Storage** dialog box, in the **Storage account** box, type the storage name as created previously.
3. In Internet Explorer, sign in to the Azure Portal, navigate to the storage account, and then click **Access keys**.
4. Copy the **key1** key to the clipboard.
5. In the **Connect to Microsoft Azure Storage** dialog box, in the **Account key** box, paste the key1 key, and then click **Connect**.
6. In Object Explorer, notice the Azure Blob storage account appears in the tree.
7. Click **New Query**, and then type the following code, to demonstrate the database working with the data files held in Azure Blob storage:

```
SELECT *
FROM Person.Person;
```

8. Highlight the statement, and click **Execute**.
9. Type the following code, to demonstrate the database working with the data files held in Azure Blob storage:

```
SELECT *
FROM Sales.SalesOrderHeader;
```

10. Highlight the statement, and click **Execute**.
11. In Object Explorer, expand **Containers**, and then expand **adventureworks-backup** to show the data files.

## Module Review and Takeaways

### Best Practice

Be sure you understand the pricing models for the services you use in Microsoft Azure, and monitor costs regularly. Managing costs in Azure is very different from the Capex model that most companies are familiar with. Ensure your processes support regular monitoring of how you are using Azure, and that costs are in line with your projections.

### Review Question(s)

**Question:** Has your company migrated any data from SQL Server on-premises to Microsoft Azure? If yes, what were the advantages and disadvantages?

If your company has not migrated any SQL Server data to Azure, what are the main reasons for keeping data on-premises? Do you agree or disagree with these reasons?

**Answer:** Answers will vary.

### Common Issues and Troubleshooting Tips

Common Issue	Troubleshooting Tip
Managing Azure costs	Ensure you have a system in place to budget for Azure services. Create a process to monitor costs regularly, including when people are off sick or on holiday.
Have an Azure naming convention	Before adding data to Azure, agree a naming convention for resource groups, storage containers, and so on. This makes it easier to identify who owns what data, and to remove unwanted services as required. This is more important with Azure as, unlike on-premises hardware, you pay for what you use.
Create an Azure policy	It is easy to create an account and move data to Azure; however, to get the best out of Azure, it needs managing in the same way that on-premises resources are managed. Create policies at a company or department level that help people to understand what they can and cannot do with company data.
Keep backups in multiple places	Microsoft Azure provides an additional option for backing up data. It is easily accessible, and provides an additional format for your backups.

# Lab Review Questions and Answers

## Lab: Using Stretch Database

### Question and Answers

#### Lab Review

**Question:** How do you query data that has been stretched to Azure?

**Answer:** Data is queried as if it were held in an on-premises database. No alterations to queries or applications are needed.

**Question:** What type of backup to Azure would you use for a large, on-premises, SQL Server database? Let's say that you want to keep your backup in Azure, improve performance, and reduce the cost of backups held in Azure.

**Answer:** Backup to URL.

