

OFFICIAL MICROSOFT LEARNING PRODUCT

20765C

Provisioning SQL Databases

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Module 1

SQL Server Components

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Lesson 1

Introduction to the SQL Server Platform

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Question and Answers

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

Items	
1	SQL Server versions
2	SQL Server editions
3	SQL Server instances

Category 1		Category 2		Category 3
Major releases of SQL Server		Levels of capability within a major release of SQL Server		Installations of SQL Server

Answer:

Category 1		Category 2		Category 3
Major releases of SQL Server		Levels of capability within a major release of SQL Server		Installations of SQL Server
SQL Server versions		SQL Server editions		SQL Server instances

Demonstration: Identify the Edition and Version of a Running SQL Server Instance

Demonstration Steps

1. Ensure that the 20765C-MIA-DC and 20765C-MIA-SQL virtual machines are running and log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. On the taskbar, click the **Microsoft SQL Server Management Studio 17** shortcut.
3. In the **Connect to Server** dialog box, click **Connect**.
4. On the **File** menu, point to **Open**, and then click **File**.
5. In the **Open File** dialog box, navigate to **D:\Demofiles\Mod01**, click **Demonstration A - VersionAndEdition.sql**, and then click **Open**.
6. In Object Explorer, point to the server name (**MIA-SQL**) and show that the server number is in parentheses after the server name.
7. In Object Explorer, right-click the server name **MIA-SQL**, and then click **Properties**.
8. On the **General** page, note **Product** and **Version** properties are visible, and then click **Cancel**.
9. Start **File Explorer**. Navigate to **C:\Program Files\Microsoft SQL Server\MSSQL14.MSSQLSERVER\MSSQL\Log**.
10. In the **Log** dialog box, click **Continue**.
11. Double-click the **ERRORLOG** file.
12. In the **How do you want to open this file?** dialog box, click **Notepad**, and then click **OK**.
13. The first entry in the file displays the version name, version number and edition, amongst other information. Close Notepad.
14. In SQL Server Management Studio, select the code under the comment **Method 4**, and then click **Execute**.
15. Select the code under the comment **Method 5**, and then click **Execute**.
16. Close SQL Server Management Studio without saving changes.

Lesson 2

Overview of SQL Server Architecture

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Question and Answers

Put the following SQL Server architectural layers in order from highest (closest to the client application) to lowest (closest to the operating system) by numbering each to indicate the correct order.

	Steps
	Query Execution Layer
	Storage Engine
	SQLOS

Answer:

	Steps
1	Query Execution Layer
2	Storage Engine
3	SQLOS

Demonstration: CPU and Memory Configurations in SSMS

Demonstration Steps

1. Ensure that the 20765C-MIA-DC and 20765C-MIA-SQL virtual machines are running and log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. On the taskbar, click the **SQL Server Management Studio** shortcut.
3. In the **Connect to Server** dialog box, click **Connect**.
4. On the **File** menu, point to **Open**, and then click **File**.
5. In the **Open File** dialog box, navigate to **D:\Demofiles\Mod01**, click **Demonstration B - CPUAndMemory.sql**, and then click **Open**.
6. In **Object Explorer**, right-click the **MIA-SQL** server and click **Properties**. Note the values for **Platform**, **Memory** and **Processors**.
7. Select the **Processors** tab, fully expand the tree under the Processor column heading. Note the setting for **Max Worker Threads**.
8. Select the **Advanced** tab and in the **Parallelism** group, review the default values for **Cost Threshold for Parallelism** and for **Max Degree of Parallelism**.
9. Select the **Memory** tab and review the default memory configurations. Click **Cancel** to close the Server Properties window.
10. Execute the query below **Step 5**.
11. Close SQL Server Management Studio without saving any changes.

Lesson 3

SQL Server Services and Configuration Options

Contents:

Question and Answers

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Question and Answers

Question: On a newly-installed SQL Server instance, which of the following network protocols are enabled by default?

- ☐ Shared Memory
- ☐ Named Pipes
- ☐ TCP/IP

Answer:

- ☒ Shared Memory
- ☐ Named Pipes
- ☒ TCP/IP

Module Review and Takeaways

Review Question(s)

Question: On a single server, when might you use a multiple installation of SQL Server and when might you use multiple SQL Server instances?

Answer: These choices are determined by the context of the environment where you are deploying SQL Server.

Question: Which edition of SQL Server is most suitable in your organization?

Answer: This answer is determined by the context of the environment where you are deploying SQL Server.

Module 2

Installing SQL Server

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Lesson 1

Considerations for Installing SQL Server

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Question and Answers

Question: If you need to run repeatable load tests on an I/O subsystem, which tool should you use?

- () Diskspd
- () SQLIOSim

Answer:

- (v) Diskspd
- () SQLIOSim

Demonstration: Using SQLIOSim

Demonstration Steps

1. Ensure that the 20765C-MIA-DC and 20765C-MIA-SQL virtual machines are running and log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. In the **D:\Demofiles\Mod02** folder, right-click **Setup.cmd**, and then click **Run as administrator**.
3. In the **User Account Control** dialog box, click **Yes**, and wait for the script to finish.
4. On the taskbar, click the **File Explorer** shortcut.
5. In File Explorer, browse to **C:\Program Files\Microsoft SQL Server\MSSQL14.MSSQLSERVER\MSSQL\Binn**, right-click **SQLIOSIM.EXE**, and then click **Run as administrator**.
6. In the **User Account Control** dialog box, click **Yes**.
7. In the **Files and Configuration** dialog box, in the **System Level Configurations** section, in the **Cycle Duration (sec)** box, type **30**.
8. In the **Test Cycles (0 - infinite)** box, type **1**.
9. In the **Error Log (XML)** box, type **D:\sqliosim.log.xml**, and then click **OK**.
10. In SQLIOSim, on the **Simulator** menu, click **Start**.
11. Allow the test to run for one or two minutes.
12. On the **Simulator** menu, click **Stop**.
13. In the **SQLIOSim** message box, click **OK**.
14. Examine the results of the test.
15. In File Explorer, go to **D:**, and open **sqliosim.log.xml** with **Office XML Handler**.
16. Review the test results in the XML file, and then close the file without saving changes.
17. Close SQLIOSim.

Demonstration: Using Diskspd

Demonstration Steps

1. Ensure that the 20765C-MIA-DC and 20765C-MIA-SQL virtual machines are running and log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. Right-click Start and click **Windows PowerShell (Admin)**.
3. In the **User Account Control** dialog box, click **Yes**.

4. In Windows PowerShell, at the command prompt, type the following, and then press ENTER:

```
cd D:\Demofiles\Mod02\Diskspd-v2.0.17\amd64fre
```

5. Type the following, and then press ENTER:

```
.\diskspd.exe -c2G -r -t4 -w40 -o32 -b64K d:\test.dat; del d:\test.dat
```

6. Wait for the command to complete, and then review the output of the tool.
7. Close Windows PowerShell.

Lesson 2

tempdb Files

Contents:

Question and Answers

6

Question and Answers

Question: True or false? Tables you create in **tempdb** will still be present after you restart the SQL Server instance.

☐ True

☐ False

Answer:

☐ True

☒ False

Lesson 3

Installing SQL Server

Contents:

Question and Answers

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Question and Answers

Which of the following methods can be used to install SQL Server? Indicate your answer by writing the category number to the right of each item.

Items	
1	Installation Wizard
2	Windows Update
3	Command Prompt
4	Command Prompt with a configuration file
5	PowerShell

Category 1		Category 2
Can be used to install SQL Server		Cannot be used to install SQL Server

Answer:

Category 1	Category 2
Can be used to install SQL Server	Cannot be used to install SQL Server
Installation Wizard Command Prompt Command Prompt with a configuration file PowerShell	Windows Update

Lesson 4

Automating Installation

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Question and Answers

Question: What is the name of the configuration file generated by an installation of SQL Server using the Installation Wizard?

- () InstallationFile.ini
- () ConfigurationFile.ini
- () Wizard.ini
- () Config.ini

Answer:

- () InstallationFile.ini
- (√) ConfigurationFile.ini
- () Wizard.ini
- () Config.ini

Demonstration: Reviewing an Unattended Installation File

Demonstration Steps

1. Ensure that the 20765C-MIA-DC and 20765C-MIA-SQL virtual machines are running and log on to MIA-SQL-20765C as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. On the taskbar, click the **File Explorer** shortcut.
3. In File Explorer, browse to **D:\Demofiles\Mod02**, and then double-click **ConfigurationFile.ini**.
4. Review the content in conjunction with the *Install SQL Server Using a Configuration File* topic in the SQL Server online documentation. In particular, note the values of the following properties:
 - a. INSTANCEID
 - b. ACTION
 - c. FEATURES
 - d. QUIET
 - e. QUIETSIMPLE
 - f. INSTALLSHAREDDIR
 - g. INSTANCEDIR
 - h. INSTANCENAME
 - i. AGTSVCSTARTUPTYPE
 - j. SQLCOLLATION
 - k. SQLSVCAccount
 - l. SQLSYSADMINACCOUNTS
 - m. TCPENABLED
5. Close Notepad.
6. Close File Explorer.

Module Review and Takeaways

Question: What are the considerations for installing additional named instances on a server where SQL Server is already installed?

Answer: Multiple instances can coexist on a single server, but you must consider the impact on server resources. The workloads on each instance will compete for memory, CPU, and storage I/O resources that can affect application performance.

Module 3

Upgrading SQL Server to SQL Server 2017

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Lesson 1

Upgrade Requirements

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Question and Answers

Question: Which of the following is not a version of SQL Server for which a direct upgrade path exists to SQL Server 2017?

- () SQL Server 2014
- () SQL Server 2008
- () SQL Server 2008 R2
- () SQL Server 2012
- () SQL Server 2000

Answer:

- () SQL Server 2014
- () SQL Server 2008
- () SQL Server 2008 R2
- () SQL Server 2012
- (√) SQL Server 2000

Resources

Distributed Replay Utility



Additional Reading: For more information on the SQL Server Profiler utility and SQL Server Profiler traces, see course 20764: *Administering a SQL Database Infrastructure*.

Demonstration: Preparing for an Upgrade with Data Migration Assistant

Demonstration Steps

1. Ensure that the 20765C-MIA-DC-UPGRADE and 20765C-MIA-SQL-UPGRADE virtual machines are running and log on to 20765C-MIA-SQL-UPGRADE as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. Run **Setup.cmd** in the **D:\Demofiles\Mod03** folder as Administrator.
3. When the script has completed, press any key to close the window.
4. Navigate to <https://www.microsoft.com/en-us/download/details.aspx?id=42642>.
5. In the **Microsoft .NET Framework 4.5.2 (Offline Installer)** page, ensure that **English** is selected, then click **Download**.
6. In Internet Explorer, click **Save**.
7. When the download has completed, click **Run**.
8. In the User Account Control window, click **Yes**.
9. Check **I have read and accept the license terms**, then click **Install**.
10. When prompted, restart the 20765-MIA-SQL-UPGRADE computer and log on again as **ADVENTUREWORKS\Student** with a password of **Pa55w.rd**.

11. Download **Data Migration Assistant** from <https://www.microsoft.com/en-us/download/confirmation.aspx?id=53595>.
12. In Internet Explorer, click **Save**.
13. When the file has downloaded, click **Run**.
14. In the Microsoft Data Migration Assistant Setup window, click **Next**.
15. Select the **I accept the terms in the License Agreement** check box, and then click **Next**.
16. Select the **I agree to the Privacy Policy** check box, and then click **Install**.
17. In the **User Account Control** dialog box, click **Yes**, and then click **Finish**.
18. On the **Start** screen, type **Microsoft Data Migration Assistant**, and then click **Microsoft Data Migration Assistant**.
19. In the Data Migration Assistant, on the left-hand side, click the + sign.
20. Under New, click **Assessment**.
21. In the Project Name Field, enter **2014 Migration**.
22. Ensure that **Source server type** and **Target server type** are both set to **SQL Server**.
23. Click **Create**.
24. In the **Options** pane, ensure that **Select target version** is set to **SQL Server 2017 on Windows**, and that **Compatibility Issues** is selected, then click **Next**.
25. In the **SERVER NAME** box, type **MIA-SQL**, check that **Authentication type** is set to **Windows Authentication**.
26. Check the **Trust server certificate** box and then click **Connect**.
27. In the Select sources pane, under the list of databases, check **TSQL** and **MDS**, and click **Add**.
28. Click **Start Assessment**.
29. When analysis is complete, in the left-hand pane under **MIA-SQL (SQL Server 2014)**, click **TSQL**.
30. In the **Compatibility 140 (1)** blade, under **Behavior changes (1)**, click **SET ROWCOUNT used in the context of DML statements such as INSERT, UPDATE, or DELETE**.
31. Show the students the output from this check and the implications when using SET ROWCOUNT statements.
32. Close the Data Migration Assistant.
33. In the **Data Migration Assistant** dialog box, click **Yes**.

Lesson 2

Upgrade of SQL Server Services

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Question and Answers

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

Items	
1	Database Engine
2	Integration Services
3	Reporting Services
4	SQL Server management tools
5	Analysis Services
6	Master Data Services

Category 1		Category 2
Supports side-by-side upgrade on a single server		Does not support side-by-side upgrade on a single server

Answer:

Category 1	Category 2
Supports side-by-side upgrade on a single server	Does not support side-by-side upgrade on a single server
Database Engine Reporting Services Analysis Services Master Data Services	Integration Services SQL Server management tools

Resources**Upgrading Database Engine**

Additional Reading: For more information on working with database backups, data files, and log files, see the module *Working with Databases* later in this course, and course 20764: *Administering a SQL Database Infrastructure*.

Demonstration: Carry Out an In-Place Upgrade**Demonstration Steps**

1. Ensure that the 20765C-MIA-DC-UPGRADE and 20765C-MIA-SQL-UPGRADE virtual machines are running, and log on to 20765C-MIA-SQL-UPGRADE as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. In File Manager, double-click **X:\setup.exe**.
3. In the **User Account Control** dialog box, click **Yes**.
4. In SQL Server Installation Center, click **Installation**, and then click **Upgrade from a previous version of SQL Server**.
5. On the **Product Key** page, click **Next**.
6. On the **License Terms** page, select **I accept the license terms**, and then click **Next**.
7. On the **Product Updates** page, click **Next**. Any error relating to a failure to search for updates through Windows Update can be ignored.
8. On the **Select Instance** page, set the value of the **Instance to upgrade** box to **MSSQLSERVER**, and then click **Next**.
9. On the **Reporting Services Migration** page, check **Uninstall Reporting Services**, then click **Next**.

10. On the **Select Features** page, click **Next**.
11. On the **Instance Configuration** page, click **Next**.
12. On the **Server Configuration** page, click **Next**.
13. On the **Full-text Upgrade** page, click **Next**.
14. The demonstration stops at this point because you cannot complete the upgrade with an Evaluation version of SQL Server.
15. On the **Feature Rules** page, click **Cancel**, and then click **Yes** to Cancel the installation.
16. Close the SQL Server Installation Center.

Lesson 3

Side-by-Side Upgrade: Migrating SQL Server Data and Applications

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Question and Answers

Question: True or false? During a side-by-side upgrade, if a login is created with the same SID on the new SQL Server instance, a database user will automatically be mapped to the login when a database is upgraded.

() True

() False

Answer:

(√) True

() False

Resources

Migrating SQL Server Databases



Additional Reading: For more information on installing SQL Server 2017, see Module 2 of this course: *Installing SQL Server*.

Transferring Logins and Passwords



Additional Reading: For a more detailed discussion of authentication and authorization in SQL Server, see course 20764: *Administering a SQL Database Infrastructure*.

Demonstration: Scripting SQL Server Logins

Demonstration Steps

1. Ensure that the 20765C-MIA-DC-UPGRADE and 20765C-MIA-SQL-UPGRADE virtual machines are running, and log on to 20765C-MIA-SQL-UPGRADE as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. On the taskbar, click the **SQL Server Management Studio** shortcut.
3. In the **Connect to Server** dialog box, click **Connect**.
4. On the **File** menu, point to **Open**, and then click **File**.
5. In the **Open File** dialog box, navigate to **D:\Demofiles\Mod03**, click **Demonstration - Login and User.sql**, and then click **Open**.
6. Select the code under the comment **Demonstration - Login and User**, and then click **Execute**.
7. Select the code under the comment **Step 1**, and then click **Execute**.
8. Select the code under the comment **Step 2**, and then click **Execute**.
9. Select the code under the comment **Step 3**, and then click **Execute**.
10. Select the code under the comment **Step 4**, and then click **Execute**.
11. In Object Explorer, expand **Security**, and then expand **Logins**.
12. Right-click **DemoLogin1**, point to **Script Login as**, point to **CREATE To**, and then click **New Query Editor Window**. If **DemoLogin1** is not visible, right-click the **Logins** node and click **Refresh**.

13. Examine the generated script. Note that the password is not correct, and then close the tab.
14. Select the code under the comment **Step 6**, and then click **Execute**.
15. Close SQL Server Management Studio without saving changes.

Module Review and Takeaways

Question: Which upgrade strategy would best suit your organization? Why?

Answer: This will depend on your organization's requirements.

Lab Review Questions and Answers

Lab: Upgrading SQL Server

Question and Answers

Lab Review

Question: In the task where you ran a report for orphaned users, why was only one orphaned user found, even though the database had two users?

Answer: The reportuser login was created with the same SID as it had on the source SQL Server 2014 instance.

Module 4

Working with Databases

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Lesson 1

Introduction to Data Storage with SQL Server

Contents:

Question and Answers

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Question and Answers

Question: Consider the following statement—to which of these storage options does it most closely refer?

“Disks are stored in an enclosure and connected to the server by a RAID controller.”

- ☐ SAN
- ☐ Windows Storage Pools
- ☐ External Multiple SSD on SATA
- ☐ DAS
- ☐ Nimble Storage Arrays

Answer:

- ☐ SAN
- ☐ Windows Storage Pools
- ☐ External Multiple SSD on SATA
- ☒ DAS
- ☐ Nimble Storage Arrays

Question: When determining file placement and the number of files, what should you consider?

Answer:

- Isolating data and log files.
- Data file management.
- Number of log files.

Lesson 2

Managing Storage for System Databases

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Question and Answers

Question: Which of these is not a SQL Server system database?

- ☐ master
- ☐ adventureworks
- ☐ model
- ☐ tempdb
- ☐ resource

Answer:

- ☐ master
- ☒ adventureworks
- ☐ model
- ☐ tempdb
- ☐ resource

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

Steps
Open SQL Server Configuration Manager.
In the SQL Server Services node, right-click the instance of SQL Server, click Properties, and then click the Startup Parameters tab.
Edit the Startup Parameters values to point to the planned location for the master database data (-d parameter) and log (-l parameter) files.
Stop the instance of SQL Server.
Move the master.mdf and mastlog.ldf files to the new location.
Restart the instance of SQL Server.

Answer:

	Steps
1	Open SQL Server Configuration Manager.
2	In the SQL Server Services node, right-click the instance of SQL Server, click Properties, and then click the Startup Parameters tab.
3	Edit the Startup Parameters values to point to the planned location for the master database data (-d parameter) and log (-l parameter) files.
4	Stop the instance of SQL Server.
5	Move the master.mdf and mastlog.ldf files to the new location.
6	Restart the instance of SQL Server.

Demonstration: Moving tempdb Files**Demonstration Steps**

Move **tempdb** Files

1. Ensure that the MT17B-WS2016-NAT, 20765C-MIA-DC, and 20765C-MIA-SQL virtual machines are running, and log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. In the **D:\Demofiles\Mod04** folder, run **Setup.cmd** as Administrator. Click **Yes** when prompted.
3. Start SQL Server Management Studio and connect to the **MIA-SQL** database engine using Windows authentication.
4. In Object Explorer, expand **Databases**, expand **System Databases**, and then right-click **tempdb** and click **Properties**.
5. In the **Database Properties - tempdb** dialog box, on the **Files** page, note the current files and their location, and then click **Cancel**.
6. Open the **MovingTempdb.sql** script file in the **D:\Demofiles\Mod04** folder.
7. View the code in the script, and then click **Execute**. Note the message that is displayed after the code has run.
8. View the contents of **T:** and note that no files have been created in that location, because the SQL Server service has not yet been restarted.
9. In Object Explorer, right-click **MIA-SQL** and click **Restart**. Click **Yes** when prompted.
10. If the **User Account** prompt is displayed, click **Yes** to allow SQL Server to make changes. When prompted to allow changes, to restart the service, and to stop the dependent SQL Server Agent service, click **Yes**.

11. View the contents of **T:** and note that the **tempdb.mdf** and **templog.ldf** files have been moved to this location.
12. Keep SQL Server Management Studio open for the next demonstration.

Lesson 3

Managing Storage for User Databases

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Question and Answers

Question: Which of these options is incorrect with regard to SQL Server user databases?

- ☐ () A user database must have at least one primary data file and one log file.
- ☐ () The default file extension for the primary data file is .mdf.
- ☐ () To delete a database, you use the DROP DATABASE Transact-SQL statement.
- ☐ () The maximum length of a database name is 128 characters.
- ☐ () Logical file names for data and log files do not have to be unique.

Answer:

- ☐ () A user database must have at least one primary data file and one log file.
- ☐ () The default file extension for the primary data file is .mdf.
- ☐ () To delete a database, you use the DROP DATABASE Transact-SQL statement.
- ☐ () The maximum length of a database name is 128 characters.
- ☒ (v) Logical file names for data and log files do not have to be unique.

Question: True or false? Database files can belong to many filegroups.

- ☐ () True
- ☐ () False

Answer:

- ☐ () True
- ☒ (v) False

Question: When expanding a database, you must increase its size by at least 1 MB.

- ☐ () True
- ☐ () False

Answer:

- ☒ (v) True
- ☐ () False

Question: What Transact-SQL would you use to modify the default filegroup in the Customers database to the Transactions filegroup?

Answer:

```
ALTER DATABASE Customers  
MODIFY FILEGROUP Transactions DEFAULT;
```

Demonstration: Creating Databases

Demonstration Steps

Create a Database by Using SQL Server Management Studio

1. Ensure that you have completed the previous demonstration. If not, start the 20765C-MIA-DC and 20765C-MIA-SQL virtual machines, log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**, and run **D:\Demofiles\Mod04\Setup.cmd** as **Administrator**.
2. If SQL Server Management Studio is not open, start it and connect to the **MIA-SQL** database engine using Windows authentication.
3. In Object Explorer, right-click **Databases** and click **New Database**.
4. In the **Database name** box, type **DemoDB1**.
5. In the **Database files** list, note the default logical names, initial size, and autogrowth settings. Change the **Path** and **File Name** by typing the following values:
 - o **DemoDB1:**
 - o **Path:** D:\Demofiles\Mod04
 - o **File Name:** DemoDB1.mdf
 - o **DemoDB1_log:**
 - o **Path:** D:\Demofiles\Mod04
 - o **File Name:** DemoDB1.ldf
6. Click **OK** to create the new database.
7. Expand the **Databases** folder, right-click **DemoDB1**, and then click **Properties**.
8. On the **Options** tab, review the database options, and then click **Cancel**.

Create a Database by Using the CREATE DATABASE Statement

1. In SQL Server Management Studio, open the **CreatingDatabases.sql** script file from the **D:\Demofiles\Mod04** folder.
2. Select the code under the comment **Create a database** and click **Execute** to create a database named **DemoDB2**.
3. Select the code under the comment **View database info** and click **Execute**. View the information that is returned.
4. Keep SQL Server Management Studio open for the next demonstration.

Lesson 4

Moving and Copying Database Files

Contents:

Question and Answers	12
Demonstration: Detaching and Attaching a Database	12

Question and Answers

Question: You can move database files to a different location within the same instance by using SSMS or which Transact-SQL statement?

- ☐ MOVE DATABASE
- ☐ MODIFY FILE
- ☐ UPDATE PATH
- ☐ ALTER PATH
- ☐ ALTER DATABASE

Answer:

- ☐ MOVE DATABASE
- ☐ MODIFY FILE
- ☐ UPDATE PATH
- ☐ ALTER PATH
- ☒ ALTER DATABASE

Question: True or false? Databases that are configured for replication, mirrored, or in a suspect state, cannot be detached.

- ☐ True
- ☐ False

Answer:

- ☒ True
- ☐ False

Demonstration: Detaching and Attaching a Database

Demonstration Steps

Detach a Database

1. Ensure that you have completed the previous demonstrations in this module, and that you have created a database named **DemoDB2**.
2. In Object Explorer, right-click the **Databases** folder and click **Refresh**; verify that the **DemoDB2** database is listed.
3. Right-click **DemoDB2**, point to **Tasks**, and click **Detach**.
4. In the **Detach Database** dialog box, select **Drop Connections** and **Update Statistics**, and then click **OK**.
5. View the **M:\Data** and **L:\Logs** folders and verify that the **DemoDB2.mdf** and **DemoDB2.ldf** files have not been deleted.

Attach a Database

1. In SQL Server Management Studio, in Object Explorer, in the **Connect** drop-down list, click **Database Engine**.
2. Connect to the **MIA-SQL\SQL2** database engine using Windows authentication.

3. In Object Explorer, under **MIA-SQL\SQL2**, expand **Databases** and view the databases on this instance.
4. In Object Explorer, under **MIA-SQL\SQL2**, right-click **Databases** and click **Attach**.
5. In the **Attach Databases** dialog box, click **Add**.
6. In the **Locate Database Files - MIA-SQL\SQL2** dialog box, select the **M:\Data\DemoDB2.mdf** database file, then click **OK**.
7. In the **Attach Databases** dialog box, after you have added the **master** databases file, note that all of the database files are listed, then click **OK**.
8. In Object Explorer, under **MIA-SQL\SQL2**, under **Databases**, verify that **DemoDB2** is now listed.

Lesson 5

Configuring the Buffer Pool Extension

Contents:

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Demonstration: Configuring the Buffer Pool Extension	15

Question and Answers

Question: Which of these statements is not true about buffer pool extensions?

- () Extends buffer cache to nonvolatile storage.
- () SSD devices are cheaper than conventional hard disk storage.
- () Improves performance for read-heavy OLTP workloads.
- () Simple configuration with no changes to existing applications.
- () SSD devices are often more cost effective than adding physical memory.

Answer:

- () Extends buffer cache to nonvolatile storage.
- (√) SSD devices are cheaper than conventional hard disk storage.
- () Improves performance for read-heavy OLTP workloads.
- () Simple configuration with no changes to existing applications.
- () SSD devices are often more cost effective than adding physical memory.

Demonstration: Configuring the Buffer Pool Extension

Demonstration Steps

Enable the Buffer Pool Extension

1. Ensure that you have completed the previous demonstration. If not, start the MT17B-WS2016-NAT, 20765C-MIA-DC, and 20765C-MIA-SQL virtual machines, log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**, and then run `D:\Demofiles\Mod04\Setup.cmd` as Administrator.
2. If SQL Server Management Studio is not open, start it and connect to the **MIA-SQL** database engine using Windows authentication.
3. Open the script file **ConfiguringBPE.sql** in the **D:\Demofiles\Mod04** folder.
4. Review the code under the comment **Enable buffer pool extension**, and note that it creates a buffer pool extension file named **MyCache.bpe** on **T:**. On a production system, this file location would typically be on an SSD device.
5. Use File Explorer to view the contents of the **T:** folder and note that no **MyCache.bpe** file exists.
6. In SQL Server Management Studio, select the code under the comment **Enable buffer pool extension**, then click **Execute**.
7. Use File Explorer to view the contents of the **T:** folder and note that the **MyCache.bpe** file has been created.
8. Select the code under the comment **View buffer pool extension details**, click **Execute**, then review the output in the **Results** tab and note that buffer pool extension is enabled.
9. Select the code under the comment **Monitor buffer pool extension**, click **Execute**, then review the output in the **Results** tab.

Disable the Buffer Pool Extension

1. In SQL Server Management Studio, select the code under the comment **Disable buffer pool extension**, then click **Execute**.
2. Use File Explorer to view the contents of the **T:** folder and note that the **MyCache.bpe** file has been deleted.
3. In SQL Server Management Studio, select the code under the comment **View buffer pool extension details again**, and click **Execute**. Review the row in the **Results** tab, and note that the buffer pool extension is disabled.
4. Close SQL Server Management Studio, without saving any changes.

Module Review and Takeaways

Best Practice

When working with database storage, consider the following best practices:

- Carefully plan and test your file layout.
- Separate data and log files on the physical level.
- Keep the data files of a database at the same size.
- Create the database in an appropriate size so it doesn't have to be expanded too often.
- Shrink files only if absolutely necessary.
- Set a filegroup other than PRIMARY as the default filegroup.

Review Question(s)

Question: Why is it typically sufficient to have one log file in a database?

Answer: Log files are written sequentially. If more than one log file exists, SQL Server writes them in a circular manner, which doesn't provide any advantages for performance and availability.

Question: Why should only temporary data be stored in the **tempdb** system database?

Answer: Because it is recreated with every new start of the instance.

Module 5

Performing Database Maintenance

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Lesson 1

Ensuring Database Integrity

Contents:

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Resources	3
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Question and Answers

Question: Which of the following DBCC commands can you use to perform logical consistency checks on the metadata tables in the database?

- () DBCC CHECKTABLE
- () DBCC CHECKALLOC
- () DBCC CHECKCATALOG

Answer:

- () DBCC CHECKTABLE
- () DBCC CHECKALLOC
- (√) DBCC CHECKCATALOG

Introduction to Database Integrity

Question: If you have a perfectly good data archiving process, and a regularly tested restoral system, do you still need the DBCC commands?

Answer: Yes, because no matter how well the technical architecture is functioning, there is always the possibility that a system outage might compromise the integrity of your data.

The real strength of a relational database management system comes from storing each piece of data in just one place within a normalized database. This means that a change to the data in one location could have a ripple effect throughout your information stores, effectively reducing the information back to data, and preventing it from becoming trusted information—because there is no way of ensuring its complete integrity.

Backup and restore processes can present their own challenges: restoring a complete database might be too time consuming or the transaction log might be corrupt. In disaster situations, being able to recover some of the data quickly is often essential to a business.

Resources

DBCC CHECKDB Repair Options



Additional Reading: For more information about backing up and restoring a SQL Server database, see course 20754B: *Administering a SQL Database Infrastructure*.

Demonstration: Using DBCC CHECKDB

Demonstration Steps

1. Ensure that the MT17B-WS2016-NAT, 20765C-MIA-DC, and 20765C-MIA-SQL virtual machines are running, and log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. In the **D:\Demofiles\Mod05** folder, run **Setup.cmd** as Administrator. Click **Yes** when prompted.
3. Start Microsoft SQL Server Management Studio and connect to the **MIA-SQL** database engine instance using Windows authentication.
4. Open the **1 DemoDBCCRecovery.sql** file in the **D:\Demofiles\Mod05** folder.

5. Select the code under the comment -- **Run DBCC CHECKDB with default options** and click **Execute**. This checks the integrity of the **AdventureWorks** database and provides maximum information.
6. Select the code under the comment -- **Run DBCC CHECKDB without informational messages** and click **Execute**. This code checks the integrity of the **AdventureWorks** database and only displays messages if errors were present.
7. Select the code under the comment -- **Run DBCC CHECKDB against CorruptDB** and click **Execute**. This checks the integrity of the **CorruptDB** database and identifies some consistency errors in the **dbo.Orders** table in this database. The last line of output tells you the minimum repair level required.
8. Select the code under the comment -- **Try to access the Orders table** and click **Execute**. This attempts to query the **dbo.Orders** table in the **CorruptDB** database, and returns an error because of a logical consistency issue.
9. Select the code under the comment -- **Access a specific order** and click **Execute**. This succeeds, indicating that only "some data pages are affected by the inconsistency issue".
10. Select the code under the comment -- **Repair the database** and click **Execute**. Note that this technique is a last resort, when no valid backup is available. There is no guarantee of logical consistency in the database, such as the checking of foreign key constraints. These will need checking after running this command.
11. Select the code under the comment -- **Access the Orders table** and click **Execute**. This succeeds, indicating that the physical consistency is re-established.
12. Select the code under the comment -- **Check the internal database structure** and click **Execute**. Note that no error messages appear, indicating that the database structure is now consistent.
13. Select the code under the comment -- **Check data loss** and click **Execute**. Note that a number of order details records have no matching order records. The foreign key constraint between these tables originally enforced a relationship, but some data has been lost.
14. Close the file without saving changes.

Lesson 2

Maintaining Indexes

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Demonstration: Maintaining Indexes	6

Question and Answers

Question: Which of these observations indicate that you should reorganize your data pages, rather than rebuild them?

- () You are looking at an index, on a reporting table, with a fill factor of 0.
- () You are looking at an index, on a reporting table, with a fragmentation of 0 percent.
- () You are looking at an index, on a transactional table, with a fragmentation of 0 percent.
- () You are looking at an index, on a transactional table, with fragmentation of less than 30 percent.
- () You are looking at an index, on a transactional table, with a fragmentation of 50 percent.

Answer:

- () You are looking at an index, on a reporting table, with a fill factor of 0.
- () You are looking at an index, on a reporting table, with a fragmentation of 0 percent.
- () You are looking at an index, on a transactional table, with a fragmentation of 0 percent.
- (√) You are looking at an index, on a transactional table, with fragmentation of less than 30 percent.
- () You are looking at an index, on a transactional table, with a fragmentation of 50 percent.

Demonstration: Maintaining Indexes

Demonstration Steps

Maintain Indexes

1. If SQL Server Management Studio is not open, start it and connect to the MIA-SQL database engine instance using Windows authentication.
2. Open the **2 DemoIndexFragmentation.sql** script file in the **D:\Demofiles\Mod05** folder.
3. Select the code under the comment -- **Create a table with a primary key** and click **Execute**. This creates a table with a primary key, which by default creates a clustered index on the primary key field.
4. Select the code under the comment -- **Insert some data into the table** and click **Execute**. This inserts 10,000 rows into the table.
5. Select the code under the comment -- **Check fragmentation** and click **Execute**. In the results, note the avg_fragmentation_in_percent and avg_page_space_used_in_percent values for each index level.
6. Select the code under the comment -- **Modify the data in the table** and click **Execute**. This updates the table.
7. Select the code under the comment -- **Re-check fragmentation** and click **Execute**. In the results, note that the avg_fragmentation_in_percent and avg_page_space_used_in_percent values for each index level have changed because the data pages have become fragmented.
8. Select the code under the comment -- **Rebuild the table and its indexes** and click **Execute**. This rebuilds the indexes on the table.
9. Select the code under the comment -- **Check the fragmentation again** and click **Execute**. In the results, note that the avg_fragmentation_in_percent and avg_page_space_used_in_percent values for each index level indicate less fragmentation.
10. Close the file without saving changes.

Lesson 3

Automating Routine Maintenance Tasks

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Question and Answers

Your manager asks you to implement a maintenance solution that minimizes data loss and cost in addition to maximizing performance. Sort items by writing the appropriate category number to the right of each one.

Items	
1	Use multiple data maintenance plans combined with SQL Server Agent scheduled jobs
2	Use Transact-SQL statements to implement maintenance tasks
3	Use one data maintenance plan
4	Use jobs and schedules to implement multiple maintenance plans

Category 1		Category 2		Category 3
Definitely appropriate		May be appropriate		Not appropriate

Answer:

Category 1	Category 2	Category 3
Definitely appropriate	May be appropriate	Not appropriate
Use multiple data maintenance plans combined with SQL Server Agent scheduled jobs	Use Transact-SQL statements to implement maintenance tasks Use jobs and schedules to implement multiple maintenance plans	Use one data maintenance plan

Demonstration: Configuring a Database Maintenance Plan**Demonstration Steps**

1. If SQL Server Management Studio is not open, start it and connect to the **MIA-SQL** database engine instance using Windows authentication.
2. In Object Explorer, under **MIA-SQL**, expand **Management**, right-click **Maintenance Plans**, and click **Maintenance Plan Wizard**.
3. In the SQL Server Maintenance Plan Wizard, click **Next**.
4. On the **Select Plan Properties** page, in the **Name** box, type **Maintenance Plan for Optimization of AdventureWorks Database**, and then click **Next**.
5. On the **Select Maintenance Tasks** page, select the following tasks, and then click **Next**:
 - Shrink Database
 - Rebuild Index
 - Update Statistics
6. On the **Select Maintenance Task Order** page, change the order of the tasks to **Rebuild Index**, **Shrink Database**, and **Update Statistics**, and then click **Next**.
7. On the **Define Rebuild Index Task** page in the **Databases** list, click **AdventureWorks**, and then click **OK** to close the drop-down list box. Click **Next**.
8. On the **Define Shrink Database Task** page, in the **Databases** list, click **AdventureWorks**, click **OK** to close the drop-down list box, and then click **Next**.
9. On the **Define Update Statistics** page, in the **Databases** list, click **AdventureWorks**. Click **OK** to close the drop-down list box, and then click **Next**.
10. On the **Select Report Options** page, review the default settings, and then click **Next**.
11. On the **Complete the Wizard** page, click **Finish** to create the Maintenance Plan. Wait for the operation to complete, and then click **Close**.

12. Close SQL Server Management Studio without saving changes.

Module Review and Takeaways

Best Practice

When planning ongoing database maintenance, consider the following best practices:

Run DBCC CHECKDB regularly.

Synchronize DBCC CHECKDB with your backup strategy.

If corruption occurs, consider restoring the database from a backup, and only repair the database as a last resort.

Defragment your indexes when necessary, but if they get beyond about 30 percent fragmentation, consider rebuilding instead.

Update statistics on a schedule if you don't want it to occur during normal operations.

Use maintenance plans to implement regular tasks.

Real-world Issues and Scenarios

Where possible, it is always a good idea to separate the data from the log files within the operating system to ensure that, if one goes down, the other is still available.

It is also preferable to have multiple files and filegroups for the data and system—and to change the default from the primary system filegroup to one of the business focused ones. This will ensure that you can perform partial recoveries rather than having to do a full database recovery, in the case where damage only occurs to part of the database structures.

Lab Review Questions and Answers

Lab: Performing Ongoing Database Maintenance

Question and Answers

Lab Review

Question: What is the difference between an OLTP database and an OLAP database in terms of recoverability and the probability that you will have to use Emergency mode?

Answer: There is a substantial difference in the recovery requirements of the two types of system. It is much more likely that you will have to use Emergency mode to recover changes in an OLTP system rather than an OLAP system.

Question: Is fragmentation always a bad thing in a database?

Answer: No.

Module 6

Database Storage Options

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Lesson 1

SQL Server Storage Performance

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Question and Answers

Question: You are implementing a SQL Server instance and decide to use RAID disks. Which RAID levels might you choose for storing the following types of SQL Server files?

Transaction log files

Data files

tempdb

Answer: There is no correct answer—much will depend on database usage and budget.

Demonstration: Moving tempdb Files

Demonstration Steps

1. Ensure that the 20765C-MIA-DC and 20765C-MIA-SQL virtual machines are running, and log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. In the **D:\Demofiles\Mod06** folder, run **Setup.cmd** as Administrator. Click **Yes** when prompted.
3. Start SQL Server Management Studio and connect to the **MIA-SQL** database engine using Windows authentication.
4. In Object Explorer, expand **Databases**, expand **System Databases**, right-click **tempdb**, and then click **Properties**.
5. In the **Database Properties** dialog box, on the **Files** page, note the current files and their location. Then click **Cancel**.
6. Open the **MovingTempdb.sql** script file in the **D:\Demofiles\Mod06** folder.
7. View the code in the script, and then click **Execute**. Note the message that is displayed after the code has run.
8. View the contents of **D:** and note that no files have been created in that location, because the SQL Server service has not yet been restarted.
9. In Object Explorer, right-click **MIA-SQL**, and then click **Restart**. When prompted, click **Yes**.
10. In the **Microsoft SQL Server Management Studio** dialog boxes, when prompted to allow changes, to restart the service, and to stop the dependent SQL Server Agent service, click **Yes**.
11. View the contents of **D:** and note that the **tempdb MDF** and **LDF** files have been moved to this location.
12. Keep SQL Server Management Studio open for the next demonstration.

Lesson 2

SMB Fileshare

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Question and Answers

Question: You are creating a database on an SMB fileshare. Which of the following statements is a valid CREATE DATABASE statement?

```
( ) CREATE DATABASE [Sales]
ON PRIMARY
( NAME = N'Sales_Data', FILENAME = N'\\SMBServer\d$\SMBShare\Sales_data.mdf' )
LOG ON
( NAME = N'Sales_Log', FILENAME = N'\\SMBServer\d$\SMBShare\Sales_Log.ldf' )
GO
```

```
( ) CREATE DATABASE [Sales]
ON PRIMARY
( NAME = N'Sales_Data', FILENAME = N'\\127.0.0.1\SMBShare\Sales_data.mdf' )
LOG ON
( NAME = N'Sales_Log', FILENAME = N'\\127.0.0.1\SMBShare\Sales_Log.ldf' )
GO
```

```
( ) CREATE DATABASE [Sales]
ON PRIMARY
( NAME = N'Sales_Data', FILENAME = N'\\SMBServer\SMBShare\Sales_data.mdf' )
LOG ON
( NAME = N'Sales_Log', FILENAME = N'\\SMBServer\SMBShare\Sales_Log.ldf' )
GO
```

Answer:

```
( ) CREATE DATABASE [Sales]
ON PRIMARY
( NAME = N'Sales_Data', FILENAME = N'\\SMBServer\d$\SMBShare\Sales_data.mdf' )
LOG ON
( NAME = N'Sales_Log', FILENAME = N'\\SMBServer\d$\SMBShare\Sales_Log.ldf' )
GO
```

```
( ) CREATE DATABASE [Sales]
ON PRIMARY
( NAME = N'Sales_Data', FILENAME = N'\\127.0.0.1\SMBShare\Sales_data.mdf' )
LOG ON
( NAME = N'Sales_Log', FILENAME = N'\\127.0.0.1\SMBShare\Sales_Log.ldf' )
GO
```

```
(√) CREATE DATABASE [Sales]
ON PRIMARY
( NAME = N'Sales_Data', FILENAME = N'\\SMBServer\SMBShare\Sales_data.mdf' )
LOG ON
( NAME = N'Sales_Log', FILENAME = N'\\SMBServer\SMBShare\Sales_Log.ldf' )
GO
```

Demonstration: Storing a Database on an SMB Fileshare

Demonstration Steps

1. Ensure that the 20765C-MIA-DC and 20765C-MIA-SQL virtual machines are running, and log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. Open File Explorer and navigate to the **D:** drive, right-click the **smbshare** folder, and then click **Properties**.
3. In the **smbshare Properties** dialog box, on the **Sharing** tab, in the **Network File and Folder Sharing** section, note that this folder is shared with the network path **\\MIA-SQL\smbshare**, and then click **Cancel**.
4. In SQL Server Management Studio, open the file **SMBDemo.sql** located in the **D:\Demofiles\Mod06** folder and execute the code it contains.
5. In File Explorer, navigate to the **D:\smbshare** folder and note the database files have been created.
6. Close SQL Server Management Studio without saving any changes.

Lesson 3

SQL Server Storage in Microsoft Azure

Contents:

Question and Answers

8

Question and Answers

Question: One of your organization's databases has grown to a size that makes it difficult to back up during the available backup window. How might storing the SQL Server data files in Microsoft Azure help with this?

- () An Azure blob can be read faster than a local mdf file.
- () SQL Server data files in Azure do not need to be backed up.
- () With SQL Server data files in Azure, you can use Azure snapshots, providing almost instantaneous backups for your data.
- () Putting data files in Azure will not help because SQL Server data files in Azure take longer to back up because the data is sourced from the Internet.

Answer:

- () An Azure blob can be read faster than a local mdf file.
- () SQL Server data files in Azure do not need to be backed up.
- (√) With SQL Server data files in Azure, you can use Azure snapshots, providing almost instantaneous backups for your data.
- () Putting data files in Azure will not help because SQL Server data files in Azure take longer to back up because the data is sourced from the Internet.

Lesson 4

Stretch Database

Contents:

Question and Answers

10

Question and Answers

Question: Where might Stretch Database prove useful in your organization?

Answer: There is no correct answer.

Module Review and Takeaways

Review Question(s)

Question: What are the advantages of SMB Fileshare storage over SAN storage?

Answer:

SMB Fileshare is easy to manage.

With SMB Fileshare, migrating databases becomes a simple detach/attach operation in SQL Server.

SMB Fileshare is cost effective.

Module 7

Planning to Deploy SQL Server on Microsoft Azure

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Lesson 1

SQL Server on Virtual Machines and Azure SQL Database

Contents:

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Question and Answers

Question: True or false: Azure SQL Database supports exactly the same set of functionality as an on-premises SQL Server installation.

() True

() False

Answer:

() True

(√) False

Demonstration: Provisioning an Azure Virtual Machine

Demonstration Steps

1. Ensure that the MT17B-WS2016-NAT, 20765C-MIA-DC, and 20765C-MIA-SQL VMs are running and log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. Open **Internet Explorer** and go to **https://portal.azure.com/**.
3. Sign in to the Azure portal with your Azure Pass or Microsoft Account credentials.
4. In the Azure portal, click **New**, then in the Search box, type **SQL Server 2017**.
5. Click **SQL Server 2017 Enterprise Windows Server 2016**.
6. In the **SQL Server 2017 Enterprise Windows Server 2016** pane, in the **Select a deployment model** box, click **Resource Manager**, and then click **Create**.
7. On the **Basics** blade, in the **Name** box, type a name for your server of up to 15 characters. This must be unique throughout the whole Azure service, so cannot be specified here. A suggested format is **sql2017vm-<your initials> <one or more digits>**. For example, **sql2017vm-js123**. Keep a note of the name you have chosen.
8. In the **User name** box, type **demoAdmin**.
9. In the **Password** box, type **Pa55w.rd1234**.
10. In the **Resource group** box, type **resource1**.
11. Change the value of the **Location** box to a region near your current geographical location, and click **OK**.
12. In the **Choose a size** blade, click **View all** then click **DS11 Standard**, and then click **Select**.
13. On the **Settings** blade, click **OK**.
14. On the **SQL Server settings** blade, click **OK**.
15. On the **Summary** blade, click **Create**. Deployment may take some time to complete.
16. When deployment is complete, click **Virtual machines**, then click the name of the machine you created in step 7.
17. In the server name blade, click **Connect**, then click **Open**.
18. In the **Remote Desktop Connection** dialog box, click **Connect**.
19. In the **Windows Security** dialog box, click **More choices**, then click **Use a different account**.
20. In the **User name** box, type **\demoAdmin**, in the **Password** box, type **Pa55w.rd1234**, and then click **OK**.

21. In the **Remote Desktop Connection** dialog box, click **Yes**.
22. Inside the remote desktop session, Click **Start**, then click **Microsoft SQL Server Tools 17** and click **SQL Server Management Studio 17** (SSMS) and connect to the VM instance of SQL Server. Demonstrate that it's a standard SQL Server installation.
23. Close the Remote Desktop connection, and then delete the Azure Virtual Machine.

Lesson 2

Azure Storage

Contents:

Question and Answers

6

Question and Answers

Question: Of the following statements, which is not true about Azure virtual machines?

- () You can add extra virtual disks.
- () You can remove the temporary disk.
- () You can choose the type of virtual machine based on CPU, memory, and storage capacity.
- () Virtual machine data disks can be either HDD or SSD.
- () You can delete an Azure virtual machine when you no longer need it.

Answer:

- () You can add extra virtual disks.
- () You can remove the temporary disk.
- (√) You can choose the type of virtual machine based on CPU, memory, and storage capacity.
- () Virtual machine data disks can be either HDD or SSD.
- () You can delete an Azure virtual machine when you no longer need it.

Lesson 3

Azure SQL Server Authentication

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Question and Answers

Question: To what degree is your organization concerned with security when it considers moving data to the cloud? Do you think the security measures that are available in Azure SQL Database adequately answer those concerns? If not, what concerns do you feel have not been addressed?

Answer: Security is a common concern when moving data to the cloud. Azure SQL Database offers a range of security options including encryption and auditing, in addition to the authentication and authorization features that are familiar to SQL Server database administrators. When coupled with the stringent physical security that is employed at Azure data centers, there is a case that data is more secure in the cloud, rather than less secure.

A common concern that Azure security features do not address includes delegating responsibility for data protection to a third-party organization.

Resources

Security Overview of Azure SQL Database



Best Practice: Grant users the least permissions necessary. Security is often a trade-off between convenience and protecting data. Grant the least permissions necessary for users to complete their work, and grant additional permissions temporarily for exceptional tasks.

Lesson 4

Deploying Databases in Azure SQL Database

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Demonstration: Connecting to a Database in Azure SQL Database	11

Question and Answers

Question: Which of the following best defines a database transaction unit?

- () A database transaction unit is a measure of CPU performance.
- () A database transaction unit is a measure of storage I/O performance.
- () A database transaction unit is a measure of memory performance.
- () A database transaction unit is a measure of overall system performance.

Answer:

- () A database transaction unit is a measure of CPU performance.
- () A database transaction unit is a measure of storage I/O performance.
- () A database transaction unit is a measure of memory performance.
- (√) A database transaction unit is a measure of overall system performance.

Demonstration: Provisioning a Database in Azure SQL Database

Demonstration Steps

1. On MIA-SQL, start **Windows PowerShell**.
2. Link your Azure account to PowerShell by running the following cmdlet:

```
Add-AzureRmAccount
```

When prompted press **y**, and then press Enter. When the sign-in screen appears, use the same email and password you use to sign in to the Azure portal. If you have already linked your Azure account to PowerShell on this VM, use the command:

```
Login-AzureRMAccount
```

3. Use the subscription Id returned in the output of the previous step and run the following cmdlet:

```
Select-AzureRmSubscription -SubscriptionId <your subscription id>
```

(replace <your subscription id> with the GUID value returned by the previous step.)

4. Run the following cmdlet to return the list of Azure data center locations supporting SQL Database:

```
(Get-AzureRmResourceProvider -ListAvailable | Where-Object {$_.ProviderNamespace -eq 'Microsoft.Sql'}).Locations
```

5. Run the following cmdlet to create a resource group. Substitute a location near your current geographical location from the result returned by the previous step for <location>:

```
New-AzureRmResourceGroup -Name "resourcegroupPSTest" -Location "<location>"
```

6. Run the following cmdlet to create a server in the new resource group. Substitute the location used in the previous step for <location>. Substitute a unique server name for <your server name>; This must be unique throughout the whole Azure service, so cannot be specified here. A suggested format is **sql2017ps-<your initials> <one or more digits>**. For example, **sql2017ps-js123**.

```
New-AzureRmSqlServer -ResourceGroupName "resourcegroupPSTest" -ServerName "<your server name>" -Location "<location>" -ServerVersion "12.0"
```

In the credential request dialog box, type the User name **psUser** and the password **Pa55w.rd**. This step may take a few minutes to complete.

7. Run the following cmdlets separately to create a firewall rule to allow your current client to connect to the server. Substitute the server name created in the previous step for <your server name>. Substitute your current external IP address for <your external ip>. You can get your current external IP address from the Azure Portal (see the value returned by the "Add Client IP" button on the firewall for an existing server), or from third party services such as Google (search for "what is my ip") or www.whatismyip.com:

```
$currentIP = "<your external ip>"
New-AzureRmSqlServerFirewallRule -ResourceGroupName "resourcegroupPSTest" -ServerName
"<your server name>" -FirewallRuleName "clientFirewallRule1" -StartIpAddress
$currentIP -EndIpAddress $currentIP
```

8. Run the following cmdlet to create a database on the new server. Substitute the server name created in a previous step for <your server name>.

```
New-AzureRmSqlDatabase -ResourceGroupName "resourcegroupPSTest" -ServerName "<your
server name>" -DatabaseName "TestPSDB" -Edition Standard -
RequestedServiceObjectiveName "S1"
```

9. Close Windows PowerShell.

Demonstration: Connecting to a Database in Azure SQL Database

Demonstration Steps

1. Open **Internet Explorer** and go to <https://portal.azure.com/>.
2. Sign in to the Azure portal with your Azure Pass or Microsoft Account credentials.
3. Click **SQL Databases**, then click **TestPSDB**. Note the value of **Server name**, and then click **Show database connection strings**.
4. Open **SQL Server Management Studio**.
5. In the **Connect to Server** dialog box, type the server name noted in the previous step (it will take the form <your server name>.database.windows.net).
6. Set **Authentication** to **SQL Server Authentication**. In the **Login** box, type **psUser**, in the **Password** box, type **Pa55w.rd**, and then click **Connect**.
7. In **Object Explorer**, expand the **Databases** node to show the **TestPSDB** database.
8. On the **File** menu, point to **Open**, and click **File**.
9. In the **Open File** dialog box, open **D:\Demofiles\Mod07\query Azure.sql**.
10. On the **Available Databases** drop-down menu, click **TestPSDB**.
11. Select the script below **2. execute the following query**, and click **Execute**.
12. Open **Windows PowerShell**, and then type the command below **3. Open Windows PowerShell and type the following command** into the Windows PowerShell window, replacing <your server name> in the command with the server name used on step 3.
13. At the **Password** prompt, type **Pa55w.rd**, and then press Enter.
14. Close PowerShell, close SSMS without saving any changes, and then close Internet Explorer.

Module Review and Takeaways

Real-world Issues and Scenarios

You may have to consider compliance with your local privacy and data protection legislation before you move sensitive data or personal identity data into cloud services such as Azure.

Review Question(s)

Question: Are Azure database services suitable for your organization?

Is Azure SQL Database or SQL Server on Azure virtual machines more suitable for you?

Answer: The answer will depend on the circumstances of your organization.

Module 8

Migrating Databases to Azure SQL Database

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Lesson 1

Database Migration Testing Tools

Contents:

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Demonstration: Test Compatibility of a SQL Server Database with Azure SQL Database	3

Question and Answers

Question: You have installed the latest version of SSDT for Visual Studio. You have imported a database as a new project from an on-premises SQL Server, which you want to migrate to Azure SQL Database. When you build the project, no compatibility issues are displayed in the error list. What should you do next?

Answer: This method does not test for Azure SQL Database compatibility because you did not set the target platform for the project to **Microsoft Azure SQL Database V12**. If you set this property and rebuild the project, compatibility issues will be listed. If no issues are listed, you can proceed to migrate the database into Azure SQL Database.

Demonstration: Test Compatibility of a SQL Server Database with Azure SQL Database

Demonstration Steps

1. Run **Setup.cmd** in the **D:\Demofiles\Mod08** folder as Administrator.
2. In the **User Account Control** dialog box, click **Yes**.
3. Wait for the script to complete and then press Enter.
4. Start a command prompt. Type the following command, and then press Enter:

```
cd C:\Program Files (x86)\Microsoft SQL Server\140\DAC\bin
```

5. Type the following command, and then press Enter:

```
sqlpackage.exe /Action:Export /ssn:MIA-SQL /sdn:TestPSDB  
/tf:D:\Demofiles\Mod08\TSQL.compatibility.bacpac /p:TableData=Stats.Tests >  
D:\Demofiles\Mod08\ExportReport.txt 2>&1
```

6. Type the following command, and then press Enter:

```
Notepad D:\Demofiles\Mod08\ExportReport.txt
```

7. Examine the contents of the text file, and then close Notepad.
8. Close the command prompt.

Lesson 2

Database Migration Compatibility Issues

Contents:

Question and Answers

5

Question and Answers

Question: You are migrating a database from SQL Server 2012 to Azure SQL Database. The database is hosted on two database servers and is synchronized by using database mirroring. What feature should you use to replace database mirroring in Azure SQL Database?

Answer: Azure datacenters are designed to provide high availability and resilience. They might provide the same or higher availability as database mirroring in a less well-designed infrastructure. However, to ensure the highest levels of availability in Azure SQL Database, use active geo-replication.

Lesson 3

Migrating an On-Premises Database to an Azure SQL Database

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Demonstration: Migrate a SQL Server Database to Azure SQL Database with BACPAC	7

Question and Answers

Question: True or false? Azure SQL Database includes SQL Server Agent.

☐ True

☐ False

Answer:

☐ True

☒ False

Demonstration: Migrate a SQL Server Database to Azure SQL Database with BACPAC

Demonstration Steps

1. Start a command prompt. Type the following to generate an export BACPAC file for the TestPSDB database:

```
cd C:\Program Files (x86)\Microsoft SQL Server\140\DAC\bin
sqlpackage.exe /Action:Export /ssn:MIA-SQL /sdn:TestPSDB
/xf:D:\Demofiles\Mod08\TSQL.export.bacpac
```

2. Verify that the export BACPAC file exists at **D:\Demofiles\Mod08\TSQL.export.bacpac**.
3. Type the following command to import the database to Azure SQL Database. Substitute <your server name> with the name of the Azure server hosting the target database:

```
sqlpackage.exe /Action:Import /tsn:<your server name. database.windows.net>
/tdn:TestPSDB /tu:psUser /tp:Pa55w.rd /sf:D:\Demofiles\Mod08\TSQL.export.bacpac
```



Note: This step may take several minutes to complete.

4. Verify that the import has completed successfully by connecting to the Azure SQL server <**your server name. database.windows.net**> using SSMS, then expanding the database **TestPSDB** and showing the tables that now exist.
5. Close SSMS, and then close the command prompt.

Module Review and Takeaways

Real-world Issues and Scenarios

You might have to consider compliance with your local privacy and data protection legislation before you move sensitive data or personal identity data into cloud services such as Azure.

Review Question(s)

Question: Are Azure database services suitable for your organization?

Is Azure SQL Database or SQL Server on Azure VMs more suitable for you?

Answer: The answer will depend on the circumstances of your organization.

Module 9

Deploying SQL Server on a Microsoft Azure Virtual Machine

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Lesson 1

Deploying SQL Server on Azure Virtual Machines

Contents:

Question and Answers	3
Demonstration: Provisioning an Azure Virtual Machine	3

Question and Answers

Question: You want to implement an instance of SQL Server on a virtual machine in Azure to host a business-critical database. You want to ensure that you license the server properly, but you do not have Software Assurance. How can you license SQL Server to run on the virtual machine?

Answer: Use an image from the Azure Virtual Machine Gallery that includes SQL Server. The per-minute rate that is displayed in the gallery entry includes all licensing requirements, including those for SQL Server.

Demonstration: Provisioning an Azure Virtual Machine

Demonstration Steps

1. Ensure that the MT17B-WS2016-NAT, 20765C-MIA-DC, and 20765C-MIA-SQL VMs are running and log on to 20765C-MIA-SQL as **AdventureWorks\Student** with the password **Pa55w.rd**.
2. Open **Internet Explorer** and go to **https://portal.azure.com/**.
3. Sign in to the Azure portal with your Azure Pass or Microsoft Account credentials.
4. Click **New** and click **Compute**.
5. In the search box, type **SQL Server 2017**, then click **SQL Server 2017**.
6. In the results, click **SQL Server 2017 Enterprise Windows Server 2016**.
7. In the **SQL Server 2017 Enterprise Windows Server 2016** blade, in the **Select a deployment model** list, click **Resource Manager**, and then click **Create**.
8. On the **Basics** blade, in the **Name** box, type a name for your server. This must be unique throughout the whole Azure service, so cannot be specified here. A suggested format is **sql2017vm<your initials> <one or more digits>**. For example, **sql2017vmjs123**. Keep a note of the name you have chosen.
9. In the **VM disk type** list, ensure that **SSD** is selected.
10. In the **User name** box, type **demoAdmin**.
11. In the **Password**, type **Pa55w.rd1234**.
12. In the **Confirm password** box, type **Pa55w.rd1234**.
13. Under **Resource group**, click **Use existing** and then select **resource1**.
14. In the **Location** list, select a location near you, and then click **OK**.
15. In the **Choose a size** blade, click **View all**, click **DS11_V2 Standard**, and then click **Select**.
16. On the **Settings** blade, click **OK**.
17. On the **SQL Server settings** blade, click **OK**.
18. On the **Summary** blade, click **Create**. Deployment may take some time to complete.
19. When deployment is complete, Azure starts the VM and displays the overview blade. Click **Connect**, and then click **Open**.
20. In the **Remote Desktop Connection** dialog box, click **Connect**.
21. In the **Windows Security** dialog box, in the **User name** box, type **demoAdmin**, in the **Password** box, type **Pa55w.rd1234**, and then click **OK**.
22. In the **Remote Desktop Connection** dialog box, click **Yes**.

23. When the remote desktop session has started, start **SQL Server Management Studio** and connect to the local SQL Server instance. Demonstrate the structure of the installation.
24. If the **Networks** pane appears, click **No**.

Lesson 2

Migrating a Database to a Microsoft Azure Virtual Machine

Contents:

Question and Answers	6
Demonstration: Migrating a Database to an Azure Virtual Machine	6

Question and Answers

Question: You want to migrate a business-critical production database to an Azure virtual machine. Users must be able to make changes to the database throughout the migration process. An Always On Availability Group protects the on-premises system. What method should you use for the migration?

Answer: Use the Add Replica Wizard to create a secondary replica of the database on the Azure virtual machine. When the replication has completed, use failover to change the Azure virtual machine to be the primary replica of the database, and then remove the on-premises replica. This is the appropriate method to use when you want to minimize downtime and you have an Always On deployment.

Demonstration: Migrating a Database to an Azure Virtual Machine

Demonstration Steps

1. Ensure that the 20765C-MIA-DC and 20765C-MIA-SQL virtual machines are running and log on to 20765C-MIA-SQL as **AdventureWorks\Student** with the password **Pa55w.rd**.
2. Run **Setup.cmd** in the **D:\Demofiles\Mod09** folder as Administrator.
3. When the script has completed, press any key to close the window.
4. Start **SQL Server Management Studio**.
5. In the **Connect to Server** dialog box, select **MIA-SQL** and click **Connect**.
6. In Object Explorer, expand **Databases**, expand **ExampleDB**, and then expand **Tables**.
7. Right-click **HR.Employees**, and then click **Select Top 1000 Rows**. Show the students the results of the query against the local database. You will compare results against the cloud-hosted database after the migration.
8. On the **File** menu, point to **New**, and then click **Query with current connection**.
9. Type the following Transact-SQL script, and then click **Execute**:

```
USE ExampleDB;
GO
BACKUP DATABASE ExampleDB
TO DISK = 'D:\Demofiles\Mod09\ExampleDB.bak'
WITH COMPRESSION, FORMAT,
    MEDIANAME = 'MigrationBackups',
    NAME = 'Full Backup of ExampleDB';
GO
```

10. In File Explorer, browse to **D:\Demofiles\Mod09**, right-click **ExampleDB.bak**, and then click **Copy**.
11. Open Internet Explorer, and browse to **http://portal.azure.com**.
12. Sign in to the Azure portal with your Azure Pass or Microsoft Account credentials.
13. In the navigation on the left, click **Virtual machines**.
14. In the list of virtual machines, click the one you created in the first demonstration in this module.
15. On the virtual machine blade, click **Connect**, and then click **Open**.
16. In the **Remote Desktop Connection** dialog box, click **Connect**.
17. In the **Windows Security** dialog box, click **More choices**, then click **Use a different account**.
18. In the **User name** box, type **demoAdmin**.
19. In the **Password** box, type **Pa55w.rd1234**, and then click **OK**.

20. In the **Remote Desktop Connection** dialog box, click **Yes**.
21. When the remote desktop session has started, open File Explorer, and browse to **C:**.
22. On the **Home** menu, click **Paste**. Explorer pastes the backup file into the VM.
23. Start **SQL Server Management Studio**.
24. In the **Connect to Server** dialog box, click **Connect**.
25. In Object Explorer, expand **Databases** and show that there are no user databases.
26. On the **File** menu, point to **New**, and then click **Query with Current Connection**.
27. Type the following Transact-SQL script, and then click **Execute**:

```
RESTORE DATABASE [ExampleDB] FROM DISK = 'C:\ExampleDB.bak'
WITH REPLACE,
MOVE 'TSQL' TO 'F:\Data\ExampleDB.mdf',
MOVE 'TSQL_log' TO 'F:\Log\ExampleDB_log.ldf';
GO
```
28. When the query completes, in Object Explorer, right-click **Databases**, and then click **Refresh**.
29. Expand **ExampleDB**, and then expand **Tables**.
30. Right-click **HR.Employees**, and then click **Select Top 1000 Rows**. The results should be the same as they were on the original database.
31. Close Internet Explorer, close SSMS without saving any changes, then close the Remote Desktop connection.

Module Review and Takeaways

Question: You have created an Always On Availability Group that includes three virtual machines in Azure. You want to ensure that the three virtual machines are in different fault domains and different update domains. What should you do?

Answer: Place the three virtual machines into a single availability set. This indicates to Azure that it should automatically place these virtual machines into different fault domains and update domains.

Lab Review Questions and Answers

Lab: Deploying SQL Server on an Azure Virtual Machine

Question and Answers

Lab Review

Question: After you created the backup file, the on-premises server remained available for clients to connect to and modify data. What would happen to these modifications after you had moved clients to the new database?

Answer: Changes that are made to the on-premises database will not reach the Azure-hosted database. To avoid this problem, you should perform the migration during off-peak hours and disable access to the database immediately before you take the backup. After the database has been restored on the virtual machine, you can reconfigure clients to connect to the SQL Server instance on the virtual machine and resume normal service.

Module 10

Managing Databases in the Cloud

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Lesson 1

Managing Security in Azure SQL Database

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Question and Answers

Question: When might you use Always Encrypted?

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

Resources

Always Encrypted for Azure SQL Database



Reference Links: Click the **Script** option, and then select **New Query Window** to see the syntax for both **Column Master Key** and **Column Encryption Key**. You can also right-click existing keys, and then select **Script ...** to view the script in a new query window.



Best Practice: You can create Windows PowerShell scripts to create encryption keys. You can also create Windows PowerShell scripts to encrypt data.

Configuring Firewall Rules



Best Practice: Before you add the current Client IP address to the firewall rules, check that the correct IP address is displayed.

Demonstration: Encrypting Sensitive Data

Demonstration Steps

1. Start the MT17B-WS2016-NAT, 20765C-MIA-DC, and 20765C-MIA-SQL virtual machines, and log on to **20765C-MIA-SQL** as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. Open SQL Server Management Studio and connect to the server you created earlier, for example **20765CCE.database.windows.net**, using SQL Server Authentication.
3. In the **Login** box, type **Student**, and in the **Password** box, type **Pa55w.rd**, and then click **Connect**.

Create the encryption keys

1. Click **New Query** to open a new query window.
2. In Available Databases, select **AdventureWorksLT**.

3. In Object Explorer, expand **Databases**, expand **AdventureWorksLT**, expand **Security**, and then expand **Always Encrypted Keys**.
4. Right-click **Column Master Keys** and click **New Column Master Key**.
5. In the **New Column Master Key** dialog box, in the **Name** box, type **CMK1**.
6. In the **Key store** list, select **Windows Certificate Store - Current User**.
7. Click **Generate Certificate**. The certificate appears in the list, and then click **OK**.
8. In Object Explorer, right-click **Column Encryption Keys** and click **New Column Encryption Key**.
9. In the **New Column Encryption Key** dialog box, in the **Name** box, type **CEK1**.
10. In the **Column master key** list, click **CMK1**, and then click **OK**. Click **Refresh** if CMK1 is not showing.

Encrypt the Data

1. In Object Explorer, under **AdventureWorksLT**, expand **Tables**, expand **SalesLT.Address**, and then expand **Columns** to display the list of columns.
2. In the query window, type:


```
SELECT * FROM [SalesLT].[Address]
```
3. Click **Execute** to show that all the columns are displayed in plaintext.
4. Under **Columns**, right-click **City**, and then click **Encrypt Column**.
5. In the **Always Encrypted** wizard, on the **Introduction** page, click **Next**.
6. On the **Column Selection** page, select **City**, and in the **Encryption Type** column, select **Deterministic**, and in the **Encryption Key** column, select **CEK1_Auto1**. Note the collation message, and then click **Next**.
7. On the **Master Key Configuration** page, click **Next**.
8. On the **Run Settings** page, ensure **Proceed to finish now** is selected, and then click **Next**.
9. On the **Summary** page, click **Finish**.
10. When it has completed, click **Close**.
11. In the query window, type:

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

12. Click **Execute** to run the query to show the column appears with obfuscated text. NOTE: Values are repeated because deterministic encryption has been used, and each City appears more than once.
13. In the query window, type:

```
SELECT CountryRegion, PostalCode, count(City) as CityCount
FROM salesLT.Address
GROUP BY CountryRegion, PostalCode, City
```

14. Highlight the query and click **Execute** to show the number of Cities in each postal code. This is possible because deterministic encryption was selected.
15. In Object Explorer, under **SalesLT.Address**, expand **Indexes**, right-click **IX_Address_AddressLine1_AddressLine2_City_StateProvince_PostalCode_CountryRegion**, point to **Script Index as**, point to **DROP And CREATE To**, and then click **New Query Editor Window** in order to drop the index.

16. The **PostalCode** column cannot be encrypted while it is included in an index. Run the first part of the script to drop the index.
17. In Object Explorer, right-click **PostalCode**, and then click **Encrypt Column**.
18. In the **Always Encrypted** wizard, on the **Introduction** page, click **Next**.
19. On the **Column Selection** page, select **PostalCode**, and in the **Encryption Type** column, click **Randomized**, and in the **Encryption Key** column, click **CEK1_Auto1**. Note the collation message, and then click **Next**.
20. On the **Master Key Configuration** page, click **Next**.
21. On the **Run Settings** page, ensure **Proceed to finish now** is selected, and then click **Next**.
22. On the **Summary** page, click **Finish**.
23. When it has completed, click **Close**.
24. Click **New Query** to open a new query window.
25. In the query window, type:

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

26. Click **Execute** to show that the columns appear with obfuscated text.
27. In the query window, type:

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

28. Highlight the query and click **Execute** to show that the GROUP BY operation fails with randomized encryption. The error message explains that Deterministic encryption is required for the statement to succeed.

Remove Encryption from a Column

1. In Object Explorer, right-click **PostalCode** and click **Encrypt Column**.
2. In the **Always Encrypted** wizard, on the **Introduction** page, click **Next**.
3. On the **Column Selection** page, select **PostalCode**, and in the **Encryption Type** column, select **Plaintext**, and in the **Encryption Key** column, select **CEK1**, and then click **Next**. Note that the correct key is required to decrypt the data.
4. On the **Master Key Configuration** page, click **Next**.
5. On the **Run Settings** page, ensure **Proceed to finish now** is selected, and then click **Next**.
6. On the **Summary** page, click **Finish**.
7. When it has completed, click **Close**.
8. In the query window, type:

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

9. Highlight the query and click **Execute** to show that the **PostalCode** column has been decrypted.
10. 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.

11. Close SQL Server Management Studio, without saving any changes.

Lesson 2

Configuring Azure Storage

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Question and Answers

Question: What types of storage does Azure not support?

- () NoSQL table data
- () Queue storage
- () Hierarchical storage
- () File storage
- () BLOB storage

Answer:

- () NoSQL table data
- () Queue storage
- (√) Hierarchical storage
- () File storage
- () BLOB storage

Demonstration: Creating a Storage Pool

Demonstration Steps

Create a Storage Pool

1. Start the MT17B-WS2016-NAT, 20765C-MIA-DC and 20765C-MIA-SQL virtual machines, and log on to 20765C-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa55w.rd**.
2. In the **D:\Demofiles\Mod10** folder, right-click **Setup.cmd**, and then click **Run as administrator**.
3. In the **User Account Control** dialog box, click **Yes**, and wait for the script to finish.
4. Open **Internet Explorer** and navigate to the **Azure portal** at **www.azure.portal.com**. Sign in with your Azure pass credentials.
5. Click **Resource Groups**, and then click **StorageSpacesDemo**.
6. From the list, click **VM1**.
7. From the **Essentials** group, copy the **Public IP address** onto the clipboard. If prompted, click **Allow Access**.
8. Change to the **Start** screen, type **Remote Desktop** and then click **Remote Desktop Connection**.
9. Connect to the Azure VM by pasting the IP address into the **Computer** box (delete everything after the IP address), and then click **Connect**.
10. When prompted, type the password **Pa55w.rd**, and then click **OK**.
11. In the **Remote Desktop Connection** dialog box, click **Yes**. The **Server Manager** dashboard is displayed.
12. If the **Networks** pane appears, click **No**.
13. In Server Manager, click **File and Storage Services, Volumes**, and then **Storage Pools**.
14. In Storage Pools, click **Primordial**.
15. Next to Storage Pools, click **Tasks**, and then click **New Storage Pool**.

16. In the **New Storage Pool Wizard** dialog box, on the **Before you begin** page, click **Next**.
17. On the **Specify a storage pool name and subsystem** page, in the **Name** box, type **MyStoragePool**, and click **Next**.
18. On the **Select physical disks for the storage pool**, select all four disks, and click **Next**.
19. On the **Confirm Selections** page, click **Create**.
20. When it has completed, click **Close**.
21. Click **MyStoragePool** to see that it is made up of the four disks you selected.

Set the Media Type

1. The four disks added to the Storage Pool all show the media type **Unknown**. However, there are three HDDs and one SSD. We will now use a PowerShell script to assign the correct media type.
2. Minimize Server Manager.
3. On the Start menu, right-click **Windows PowerShell ISE**, point to **More**, and then click **Run as administrator**.
4. Click **OK** when prompted at the **User Account**.
5. From **D:\Demofiles\Mod10\Demo** copy the PowerShell script called **ChangeMediaType.ps1** to the Azure VM **C:** drive.
6. In Windows PowerShell ISE, on the **File** menu, click **Open**.
7. In the **Open** dialog box, browse to **C:**, click **ChangeMediaType**, and then click **Open**.
8. Use **Run Selection** to run the script under **# List the physical disks**. Note that the media type is unspecified.
9. Copy the **UniqueID** of the disk identified as **LUN 1** to the **\$uniqueIdPremium1** variable value (between "").
10. Copy the **UniqueID** of the disk identified as **LUN 2** to the **\$uniqueIDStandard1** variable value.
11. Copy the **UniqueID** of the disk identified as **LUN 3** to the **\$uniqueIDStandard2** variable value.
12. Copy the **UniqueID** of the disk identified as **LUN 4** to the **\$uniqueIDStandard3** variable value.
13. Once all the variables have a value, use **Run Selection** to run the script under **# Initialize variables**.
14. Use **Run Selection** to run the script under **# Set media type**.
15. To check the media types have been assigned correctly, run the script under **# List the physical disks**. You will see that the media types are now set.
16. Close Windows PowerShell ISE, without saving any changes.

Create a Virtual Disk with Tiered Storage

1. In Server Manager, in the top right corner, click **Tasks**, and then click **Refresh**. The Media type of the disks should now be shown correctly.
2. Next to Virtual Disks, click **Tasks**, and click **New Virtual Disk**.
3. In the **Select the storage pool** dialog box, click **MyStoragePool**, and then click **OK**.
4. **In the New Virtual Disk Wizard, on the Before you begin page, click Next.**
5. **On the Specify the virtual disk name, in the Name box, type MyVirtualDisk.**
6. **Select the Create Storage tiers on this virtual disk check box, and then click Next.**

7. **On the** Specify enclosure resiliency **page, click** Next.
8. On the Select the storage layout page, click Simple, and then click Next.
9. **On the** Specify the provisioning type **page, click** Fixed, **and then click** Next.
10. On the Specify the size of the virtual disk page, in the Faster Tier box, type 85, and in the Standard Tier box, type 180, and then click Next.
11. On the Confirm selections page, click Create. The tiered virtual disk will be created.
12. On the View results page, click Close to finish. You can then create a drive letter.
13. **In the** New Volume Wizard, **on the** Before you begin **page, click** Next.
14. **On the** Select the server and disk **page, click** MyVirtualDisk, **and then click** Next.
15. **On the** Specify the size of the volume **page, click** Next.
16. **On the** Assign to a drive letter or folder **page, click** Next.
17. **On the** Select file system settings **page, click** Next.
18. On the **Confirm selections** page, click **Create**.
19. On the **Completion** page, click **Close**. You can now see the new virtual disk you created.
20. Close Server Manager.
21. Disconnect from the Azure VM.

Lesson 3

Azure Automation

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Question and Answers

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

	Steps
	Create an Azure Automation account
	Browse the Runbook Gallery
	Select a runbook
	Import the runbook
	Edit the runbook
	Publish the runbook
	Test the runbook
	Schedule the runbook
	Check whether the task has been completed

Answer:

	Steps
1	Create an Azure Automation account
2	Browse the Runbook Gallery
3	Select a runbook
4	Import the runbook
5	Edit the runbook
6	Publish the runbook
7	Test the runbook
8	Schedule the runbook
9	Check whether the task has been completed

Demonstration: Introducing Azure Automation

Demonstration Steps

1. Start the MT17B-WS2016-NAT, 20765C-MIA-DC and 20765C-MIA-SQL virtual machines, and log on to **20765C-MIA-SQL** as **AdventureWorks\Student** with the password **Pa55w.rd**.
2. Using Internet Explorer, navigate to **<https://portal.azure.com>**.
3. Login using your Azure Pass credentials.

4. At the dashboard, click **New**.
5. On the **New** blade, click **Monitoring + Management**.
6. On the **Monitoring + Management** blade, click **Automation**.
7. On the **Add Automation Account** blade, in the **Name** box, type **automate + your initials**. The name must be in lowercase characters and numbers. A green tick appears when the name is acceptable. If necessary, add additional numbers to create a unique name.
8. In the **Resource group** box, either create a new resource group, or select the resource group created in the first demo.
9. In the **Location** box, select a Microsoft data center close to you.
10. For **Create Azure Run As account**, click **Yes**.
11. Click **Create**. The Automation Account takes a short while to be created. A message is displayed when the account has been created.
12. Click **All resources** to see that the new Automation account has been created.
13. Click on the new Automation account name as named in step 7. The **Automation Account** blade is displayed.
14. Click **Runbooks Gallery**.
15. Point out the options to filter the Runbook Gallery, including **Gallery Source**, **Type**, and **Publisher**, and then click **OK**.
16. Point out the icon for **Graphical** runbooks.
17. Point out the icon for **PowerShell** runbooks.
18. Point out the icon for **PowerShell Workflow** runbooks.
19. Click the **Hello World for Azure Automation** runbook (PowerShell Workflow Runbook).
20. Examine the script, and then click **Import**.
21. On the **Import** blade, click **OK**. The runbook is imported into your account.
22. Click **Edit** to edit the code.
23. On line 33, overwrite **World** with your name, and then click **Save**.
24. Click **Publish**, and when prompted, click **Yes**.
25. Click **Start**.
26. In the **Start Runbook** blade, click **OK**, the workflow runs in a test window.
27. Click **Output** to see the results.
28. Close each blade until you return to the dashboard.
29. Close Internet Explorer.

Module Review and Takeaways

Best Practice

Whether you hold your data on-premises or in Azure, carry out a threat analysis. This will help you to identify where data protection is weakest, and which features might help you to mitigate the risks that you have identified.

Review Question(s)

Question: What are the main data security concerns in your organization? Which features of Azure SQL Database are most appropriate to mitigate those concerns?

Answer: Answers will vary.

Lab Review Questions and Answers

Lab: Managing Databases in the Cloud

Question and Answers

Lab Review

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

- **Answer: Default.** The complete value is masked.
- **Email.** Partially obfuscate email addresses. This may be used to identify people, without revealing the full email address.
- **Custom.** Partially masks the value.
- **Random.** Can be customized to specific requirements.
- **Credit card.** Only the last four digits of a credit card number are displayed; the rest of the number is masked.

Question: What are the benefits of using Azure Automation?

Answer: Answers will vary.

