

OFFICIAL MICROSOFT LEARNING PRODUCT

# 20778A

## Analyzing Data with Power BI

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# Module 1

## Introduction to Self-Service BI Solutions

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## Lesson 1

# Introduction to Business Intelligence

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## Question and Answers

**Question:** How does your organization approach BI? Is this a major part of the corporate strategy? What BI solutions does your organization use? Is Excel used as a self-service tool? What do you think are the major issues with your organization's approach to BI?

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

## Lesson 2

# Introduction to Data Analysis

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## Question and Answers

**Question:** How much data does your organization gather? Have you noticed an increase in the volume of data that you have to work with? Do you have a mix of data sources, such as on-premises databases, cloud services, and SaaS providers?

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

## Demonstration: Importing Data with Power BI Desktop

### Demonstration Steps

1. Ensure that the MSL-TMG1, 20778A-MIA-DC, and 20778A-MIA-SQL virtual machines are running, and then log on to 20778A-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. In the **D:\Demofiles\Mod01** folder, run **Setup.cmd** as Administrator.
3. In the **User Account Control** dialog box, click **Yes**. When prompted that do you want to continue this operation, type **Y** and then wait for the script to finish.
4. If you do not have a Power BI login, open Internet Explorer, go to **<https://powerbi.microsoft.com/en-us/documentation/powerbi-admin-signing-up-for-power-bi-with-a-new-office-365-trial>**, and follow the steps to create an account.
5. In Internet Explorer, go to **<https://www.microsoft.com/en-us/download/details.aspx?id=45331>**, and then click **Download**.
6. On the **Choose the download you want** page, select the **PBIDesktop\_x64.msi** check box, and then click **Next**.
7. In the message box, click **Run**.
8. In the **Microsoft Power BI Desktop (x64) Setup** dialog box, on the **Welcome to the Microsoft Power BI Desktop (x64) Setup Wizard** page, click **Next**.
9. On the **Microsoft Software License Terms** page, select the **I accept the terms in the License Agreement** check box, and then click **Next**.
10. On the **Destination Folder** page, click **Next**.
11. On the **Ready to install Microsoft Power BI Desktop (x64)** page, click **Install**.
12. In the **User Account Control** dialog box, click **Yes**.
13. On the **Completed the Microsoft Power BI Desktop (x64) Setup Wizard** page, clear the **Launch Microsoft Power BI Desktop** check box, and then click **Finish**.
14. Close Internet Explorer.
15. On the desktop, double-click **Power BI Desktop**.
16. When the **Get Data** screen shows, click **Get Data**.
17. In the **Get Data** dialog box, click **SQL Server database**, and then click **Connect**.
18. In the **SQL Server database** dialog box, in the **Server** box, type **MIA-SQL**. In the **Database (optional)** box, type **AdventureWorksDW**, and then click **OK**.
19. In the **Access a SQL Server Database** dialog box, leave the default settings unchanged, and click **Connect**.
20. In the **Encryption Support** dialog box, click **OK**.

21. In the **Navigator** dialog box, select the **FactInternetSales** check box.
22. Click **Select Related Tables**. Click **Edit**.
23. If the **Connection Settings** dialog box appears, leave Import checked and click **OK**.
24. In the **Untitled - Query Editor** window, in the **Queries** pane, click **FactInternetSales**.
25. Right-click the **CarrierTrackingNumber** column, and click **Remove**.
26. Right-click the **CustomerPONumber** column, and click **Remove**.
27. In the **Queries** pane, click **DimCustomer**.
28. Right-click the **Title** column, and click **Remove**.
29. Right-click the **NameStyle** column, and click **Remove**.
30. Right-click the **Suffix** column, and click **Remove**.
31. Right-click the **MaritalStatus** column, and click **Replace Values**.
32. In the **Value To Find** box, type **M**.
33. In the **Replace With** box, type **Married**, and then click **OK**.
34. Right-click the **MaritalStatus** column, and click **Replace Values**.
35. In the **Value To Find** box, type **S**.
36. In the **Replace With** box, type **Single**, and then click **OK**.
37. Right-click the **Gender** column, and click **Replace Values**.
38. In the **Value To Find** box, type **F**.
39. In the **Replace With** box, type **Female**, and then click **OK**.
40. Right-click the **Gender** column, and click **Replace Values**.
41. In the **Value To Find** box, type **M**.
42. In the **Replace With** box, type **Male**, and then click **OK**.
43. Click **Close & Apply**.
44. Wait until the data has successfully loaded.
45. In the **Fields** pane, expand **FactInternetSales**, and click **SalesAmount**.
46. On the **Modeling** tab, in the **Formatting** group, click **Format: Currency General**, point to **Currency**, and then click **\$ English (United States)**.
47. In the **Fields** pane, right-click **DimCustomer**, and then click **New column**.
48. In the formula bar, type:

```
FullName = DimCustomer[FirstName] & " " & DimCustomer[LastName]
```

49. Press **Enter**.
50. Click **Save**. Name the file **Adventure Works Sales**, and save the file to **D:\Demofiles\Mod01**.
51. Leave Power BI Desktop open for the next demonstration.



## Lesson 3

# Introduction to Data Visualization

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## Question and Answers

**Question:** Which of the following is not a real chart type?

- ( ) 100% Stacked Bar Chart
- ( ) Line and Column Chart
- ( ) Multirow Card Chart
- ( ) Donut Chart
- ( ) Pie and Line Chart

**Answer:**

- ( ) 100% Stacked Bar Chart
- ( ) Line and Column Chart
- ( ) Multirow Card Chart
- ( ) Donut Chart
- (√) Pie and Line Chart

## Demonstration: Visualizing Data with Power BI Desktop

### Demonstration Steps

1. In Power BI Desktop, in the **Fields** pane, under **DimCustomer**, select **Gender**, and **MaritalStatus**.
2. Under **FactInternetSales**, select **SalesAmount**.
3. In the **Visualizations** pane, click **Clustered column chart**.
4. Click **Format**, and then expand **Title**.
5. Change the **Title Text** to **Sales by Gender and Marital Status**.
6. Change **Alignment** to **Center**.
7. In the **Fields** pane, expand **DimProduct**, and drag the **Color** field onto the report canvas to create a new table.
8. Under **FactInternetSales**, drag the **OrderQuantity** field onto the new table.
9. In the **Visualizations** pane, click **Donut chart**.
10. Click **Format**, and then expand **Title**.
11. Change the **Title Text** to **Orders by Color**.
12. Change **Alignment** to **Center**.
13. In the **Fields** pane, under **FactInternetSales**, drag the **SalesAmount** field onto the report canvas to create a new column chart.
14. In the **Visualizations** pane, click **Fields**.
15. In the **Fields** pane, expand **DimDate**, and drag the **EnglishMonthName** to the **Axis** property.
16. Grab the resizer on the column chart to widen the chart so that the month names display clearly.
17. In the **Visualizations** pane, click **Format**, and then expand **Title**.
18. Change the **Title Text** to **Sales by Month**.
19. Change **Alignment** to **Center**.

20. Click **Save**.
21. Leave Power BI Desktop open for the next demonstration.

## Lesson 4

# Overview of Self-Service BI

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## Question and Answers

**Question:** Given what you have learned so far in this module, regarding the limitations of managed BI and the uptake of self-service BI with all its advantages, do you think there is a future for managed BI?

**Answer:** To some extent, there will always be a need for IT to be involved in BI, as self-service can only go so far. IT will still be required to develop, execute and manage the ETL process, design, build, and manage the data warehouse, provide access to data, and ensure users only have access to the data they need. A developer is still required to write complex queries, and stored procedures.

## Lesson 5

# Considerations for Self-Service BI

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## Question and Answers

**Question:** Discuss the role of the data steward. Does your organization have a data steward? If not, do you think one is necessary? Discuss some of the issues your organization faces, that your existing data steward manages, or that the addition of one could solve.

**Answer:** Answers will depend on the opinion of the students.

## Lesson 6

# Microsoft Tools for Self-Service BI

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## Question and Answers

**Question:** Which of the following is not an Excel power tool?

- ( ) Power Map
- ( ) Get & Transform
- ( ) Power Pack
- ( ) Power Pivot
- ( ) Power View

**Answer:**

- ( ) Power Map
- ( ) Get & Transform
- (v) Power Pack
- ( ) Power Pivot
- ( ) Power View

## Demonstration: Publishing a Report to the Power BI Service

### Demonstration Steps

1. In Power BI Desktop, on the **Home** tab, click **Publish**.
2. If you are prompted to save your changes, click **Save**.
3. In the **Power BI Desktop** dialog box, enter the email address, and then click **Sign in**.
4. In the **Sign in to your account** dialog box, enter the password for your account, and then click **Sign in**.
5. The report will then be published to the Power BI portal. When the window displays **Success**, click **Open 'Adventure Works Sales.pbix' in Power BI** to view the report online.
6. When the browser opens, if you are prompted to Sign in, click **Sign in** and then enter your Power BI credentials, enter your email address and password, and wait for the report to open.
7. On the **Sales by Gender and Marital Status** column chart, click **Pin visual**.
8. In the **Pin to dashboard** dialog box, click **New dashboard**, and type **Adventure Works Sales**, and then click **Pin**.
9. On the **Orders by Color** donut chart, click **Pin visual**.
10. In the **Pin to dashboard** dialog box, click **Existing dashboard**, in the list click **Adventure Works Sales**, and then click **Pin**.
11. On the **Sales by Month** column chart, click **Pin visual**.
12. In the **Pin to dashboard** dialog box, click **Existing dashboard**, in the list click **Adventure Works Sales**, and then click **Pin**.
13. In the upper-left corner of the window, below the PowerBI icon, click **Show the navigation pane**.
14. Under **Dashboards**, point out the star icon to indicate a new dashboard, and click **Adventure Works Sales**.

15. Drag the lower-right corner of the **Sales by Month** column chart, and expand it so it is as wide as the two charts above it.
16. Close Internet Explorer.
17. In the **Publishing to Power BI** dialog box, click **Got it**.
18. Close Power BI Desktop.

# Lab Review Questions and Answers

## Lab: Exploring an Enterprise BI Solution

### Question and Answers

#### Lab Review

**Question:** Discuss using Power BI Desktop and Power BI Service, compared to using Excel and Excel Services in SharePoint. Which do you think is the best, and why?

**Answer:** Answers will vary.

**Question:** Has your organization started using Power BI? If not, how easy do you think it will be to implement, and convert existing business users from Excel, or other BI solutions? If you have already started using it, how do users find the experience compared to the previous solution?

**Answer:** Answers will vary.



# Module 2

## Introducing Power BI

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## Lesson 1

# Power BI

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## Question and Answers

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

- ( ) You can import data and create reports with the Power BI Desktop app.
- ( ) You can create and share dashboards on the PowerBI.com online portal.
- ( ) You can sign up to PowerBI.com using a Hotmail email account.
- ( ) Data can be imported from an on-premises SQL Server or Azure SQL Database.
- ( ) Data can be imported from Facebook.

**Answer:**

- ( ) You can import data and create reports with the Power BI Desktop app.
- ( ) You can create and share dashboards on the PowerBI.com online portal.
- (√) You can sign up to PowerBI.com using a Hotmail email account.
- ( ) Data can be imported from an on-premises SQL Server or Azure SQL Database.
- ( ) Data can be imported from Facebook.

## Demonstration: Creating a Report with Power BI Desktop

### Demonstration Steps

Create a Report with Power BI Desktop

1. Ensure the MSL-TMG1, 20778A-MIA-DC and 20778A-MIA-SQL virtual machines are running, log on to 20778A-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. Run **D:\Demofiles\Mod02\Setup.cmd** as an Administrator, when prompted click **Yes**, type **Y**, and then press Enter.
3. When the script completes, press any key to close the window.
4. Start SQL Server Management Studio and connect to the **MIA-SQL** database engine instance using Windows authentication.
5. Open the **Demo.ssmssln** solution in the **D:\Demofiles\Mod02\Demo** folder.
6. In Solution Explorer, open the **1 - Power BI.sql** script file.
7. On the taskbar, click **Power BI Desktop**.
8. In the Power BI Desktop window, click **Get Data**.
9. In the **Get Data** dialog box, click **Microsoft Azure SQL Database**, and then click **Connect**.
10. In the SQL Server Database window, in the **Server** box, type the URL of the Azure server <Server Name>.database.windows.net (where <Server Name> is the name of the server you created), and in the **Database** box, type **AdventureWorksLT**.
11. Expand **Advanced options**.
12. In SQL Server Management Studio, copy the **1 - Power BI.sql** query.
13. In the Power BI Desktop, paste the query into the **SQL statement (optional, requires database)** box, and then click **OK**.
14. In the **SQL Server database** window, click **Database**.
15. In the **Username** box, type **Student**.

16. In the **Password** box, type **Pa\$\$w0rd**, and then click **Connect**.
17. The data preview window will appear. Click **Load**.
18. If the **Connection Settings** window opens, leave **Import** selected, and click **OK**.
19. In the **Visualizations** pane, click **Stacked column chart**.
20. In the **Fields** pane, under **Query1**, select **ProductName** and **TotalSales**. The chart will auto populate. Expand the chart control to horizontally show the full names of the products.
21. In the **Visualizations** pane, click **Format**.
22. Expand **Title**, and change the **Title Text** value to **Top 10 Selling Products**.
23. Next to **Alignment**, click the **center** icon.
24. Toggle **Data labels** to be **On**.
25. Expand the **Data colors** list, and choose another color to change the bars on the chart.
26. On the **File** menu, click **Save As**. Name the report **Adventure Works Sales**, and save to the **D:\Demofiles\Mod02\Demo** folder.
27. Leave Power BI Desktop and the report open for the next demonstration.



## Lesson 2

# The Power BI Service

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## Question and Answers

**Question:** Discuss the benefits of using Power BI in an organization looking to create reports to analyze their data.

**Answer:** Power BI has many benefits, including:

- Quick to create and publish reports.
- Easy to use UI.
- Integration with Microsoft Excel.
- Free, or low cost licensing.
- Reports and dashboards can be shared between users in the organization.
- A multitude of data sources, both on-premises and SaaS vendors, can be amalgamated into one report.
- The Q&A feature facilitates the identification of trends and answers to data questions.
- Power BI is self-service, eliminating the dependency upon a dedicated report developer.

## Demonstration: Creating a Content Pack

### Demonstration Steps

1. In Power BI Desktop, on the **Home** ribbon, click **Publish**.
2. If you are prompted to save your changes, click **Save**.
3. In the **Power BI Desktop** window, enter the email address for your Microsoft account, and then click **Sign in**.
4. In the **Sign in to your account** window, enter the password for your Microsoft account, and then click **Sign in**.
5. The report will then be published to the Power BI portal. When the window displays Success, click **Open 'Adventure Works Sales.pibx' in Power BI** to view the report online.
6. When the browser opens, click **Sign in**, enter your email address and password, **Sign in**, and wait for the report to open in Internet Explorer.
7. When the report is visible, click **Pin Live Page**.
8. In the **Pin to dashboard** dialog box, click **New dashboard**. Type **Adventure Works Sales** in the box, and click **Pin live**.
9. In the upper left, click **Show the navigation pane**. The dashboard will appear under the **Dashboards** list.
10. Click **Settings**, then click **Create content pack**.
11. In the Microsoft AppSource window, click **My entire organization**.
12. In the **Title** box, type **Adventure Works Sales**.
13. In the **Description** box, type **Top 10 selling products**, and then click **Upload**.
14. In the **Choose File to Upload** dialog box, navigate to **D:\Demofiles\Mod02\Demo\Demo**, click **content\_pack.png**, and then click **Open**.
15. Under **Dashboards**, select **Adventure Works Sales**. The **Reports** and **Datasets** are automatically added, and then click **Publish**.



**Note:** The organizational content packs are a Power BI Pro feature, and so are unavailable to the standard trial accounts.

16. Click **Get Data**, and then click **My organization**. The content pack appears in the list under My organization.

# Lab Review Questions and Answers

## Lab: Creating a Power BI Dashboard

### Question and Answers

#### Lab Review

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

**Answer:** The security of your SQL Servers is critical. Always ensure that you adhere to your organizational policies on only giving users access to permissible data. If users are reporting directly from production databases, performance might be affected. Safeguard performance by using views to limit the data that is returned, and employ a data steward to check users are sharing, rather than duplicating, reports. This will limit the data that is exported to Power BI.

**Question:** Discuss the different SaaS providers that your organization uses, and how this data could be used in Power BI dashboards. How could this data be combined with data from production databases to create greater insights into data?

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

# Module 3

## Power BI Data

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## Lesson 1

# Using Excel as a Data Source for Power BI

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## Question and Answers

**Question:** Which of the following file formats is not a compatible data source in Power BI?

- ☐ CSV
- ☐ TXT
- ☐ XML
- ☐ SQL
- ☐ JSON

**Answer:**

- ☐ CSV
- ☐ TXT
- ☐ XML
- ☒ SQL
- ☐ JSON

## Demonstration: Importing Files from a Local Folder

### Demonstration Steps

Import Data from an Excel File

1. Ensure that the MSL-TMG1, 20778A-MIA-DC, and 20778A-MIA-SQL virtual machines are running, and then log on to 20778A-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. In the **D:\Demofiles\Mod03** folder, run **Setup.cmd** as Administrator, and then click **Yes** when prompted.
3. At the command prompt to close the **SQL Server Launchpad**, type **Y**, and then press Enter.
4. When the script completes, press any key to close the window.
5. On the taskbar, click **Power BI Desktop**.
6. In the Power BI Desktop window, click **Get Data**.
7. In the **Get Data** dialog box, click **Excel**, and then click **Connect**.
8. In the **Open** dialog box, navigate to **D:\Demofiles\Mod03\Demo\Files for Import**, click **Sales.xlsx**, and then click **Open**.
9. In the Navigator window, click **Sales** to show a preview of the data. Use the horizontal scrollbar to display the columns, select the **Sales** check box, and then click **Load**.
10. When the load completes, in the **Fields** pane, point out the **Sales** table. Mention that Power BI has detected columns that can be used in aggregations, as indicated by the **Sum** symbol next to the column names.

#### Import Data from a CSV File

1. On the **Home** ribbon, click **Get Data**.
2. In the **Get Data** dialog box, click **CSV**, and then click **Connect**.
3. In the **Open** dialog box, navigate to **D:\Demofiles\Mod03\Demo\Files for Import**, click **SalesPerson.csv**, and then click **Open**.
4. In the preview window, drag the lower-right corner to enlarge the window and display more of the data.
5. Click **Load**.
6. In the **Fields** pane, expand the **SalesPerson** table to show the columns. Mention that the two tables from different sources are now available to use together in a report. If the report is published, the tables will be part of the same dataset.
7. Click **File**, click **Save As**, name the report **Adventure Works Sales**, and then save to the **D:\Demofiles\Mod03\Demo** folder.
8. Leave Power BI open for the next demonstration.



## Lesson 2

# The Power BI Data Model

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## Question and Answers

**Question:** Discuss some of the different data sources that you might use in your organization to import data into the data model in Power BI. What problems would you need to overcome? How easy would it be to relate the data in tables from different sources? How easy do you think it would be to use data from the web within your model?

**Answer:** When importing data from sources such as a database, while data types and relationships might already be established, you may find that the volume of data is too great, so that you need to write a query or use filters to reduce the size of the data. Data from the web or Excel, is unlikely to be correctly typed, so it is best to correct the types used. You might need to use bi-directional cross filtering to overcome many-to-many relationships.

## Demonstration: Creating a Hierarchy

### Demonstration Steps

#### Creating a Hierarchy

1. In the **Fields** pane, under **Sales**, right-click **Country**, and then click **new hierarchy**. The new hierarchy column is added.
2. Right-click **Territory**, point to **Add to Hierarchy**, and then click **Country Hierarchy**.
3. Right-click **State Province**, point to **Add to Hierarchy**, and then click **Country Hierarchy**.
4. Right-click **City**, point to **Add to Hierarchy**, and then click **Country Hierarchy**.
5. Right-click **Country Hierarchy**, click **Rename**, type **Region Hierarchy**, and then press Enter.
6. In the **Fields** pane, under **Sales**, drag the **Total Due** column to the report canvas to create a new chart.
7. Drag the **Region Hierarchy** to the **Axis** in the **Visualizations** pane.
8. Resize and move the chart on the canvas so it fills the report canvas.
9. In the **Fields** pane, under **Sales**, click the **Total Due** column to give it focus.

#### Using a Hierarchy

1. In the top right-hand corner of the chart, click **Click to turn on Drill Down**. Notice that the arrow icon is now black.
2. Click the **United States** column in the chart to show the data by Territory. Notice that the chart title has changed.
3. Click the **Northwest** column, and again, notice that the chart title changes.
4. Click the **Oregon** column. Notice that the title of the chart has changed, and the down arrow in the top left-hand corner is disabled.
5. Click the **Drill Up** icon to return to the State Province level.
6. Click the **Drill Up** icon to return to the Territory level.
7. Click the **Expand all down one level in the hierarchy** icon to see the Total Due by Country, Territory, and State Province.
8. Leave Power BI open for the next demonstration.

## Lesson 3

# Using Databases As a Data Source for Power BI

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## Question and Answers

**Question:** True or false? You can use the Power BI Q&A natural language to ask questions of your data when using DirectQuery.

☐ True

☐ False

**Answer:**

☐ True

☒ False

## Demonstration: Importing Data from SQL Server

### Demonstration Steps

Import Data from SQL Server

1. On the **Home** ribbon, click **Get Data**, and then click **SQL Server**.
2. In the **SQL Server database** dialog box, in the **Server** box, type **MIA-SQL**, in the **Database (optional)** box, type **AdventureWorks**, and then click **OK**.
3. If you are prompted to enter your credentials, ensure the **Windows** tab is selected, click **Use my current credentials**, and then click **Connect**. If you see the notice regarding unsupported encryption, click **OK**.
4. In the Navigator window, select **Sales.vSalesPerson** to preview the data, and ensure the box is selected.
5. Select **Sales.vStoreWithDemographics** to preview data, and ensure the box is selected, and then click **Load**.

Import Data Using a Query

1. On the **Home** ribbon, click **Get Data**, and then click **SQL Server**.
2. In the **SQL Server database** dialog box, in the **Server** box, type **MIA-SQL**, in the **Database (optional)** box, type **AdventureWorks**.
3. Expand **Advanced options**, and in the **SQL statement (optional, required database)** box, type **SELECT \* FROM [Production].[Product]**, and then click **OK**.
4. In the MIA-SQL: AdventureWorks window, a preview of the data is displayed. Click **Edit**.
5. In Query Editor, in the **ProductSubcategoryID** column, click the filter icon, and then click **Remove Empty**.
6. In the **Queries** pane, right-click **Query1**, click **Rename**, type **Products**, and then click **Close & Apply**.

## Lesson 4

# The Power BI Service

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## Question and Answers

**Question:** How could your organization use content packs and groups? What are the major advantages of content packs and groups?

**Answer:** Answers depend on the students' ideas for using content packs and groups within their organization.

Content packs are useful for bundling related dashboards, reports, and datasets into a package that is easy to share and consume. Content packs can be based on departments such as manufacturing, sales, or finance, and each can have their own set of relevant data and key performance indicators (KPIs). Using an icon for each content pack helps users to quickly identify the pack that they need. Content packs can consist of reports and dashboards that are designed specifically for mobile devices, or targeted as a specific mobile operating system such as iOS, or Windows 10.

Groups are quick to set up, and they enable members to collaborate on dashboards and reports, and communicate through the integration of Exchange services such as calendar, tasks, and conversations. Closed groups that are only available to invited members offer security by preventing other users from viewing the data contained in the group workspace.

## Demonstration: Querying Data by Using Q&A

### Demonstration Steps

Ask a Question by Using Q&A

1. In Power BI Desktop, on the **Home** ribbon, click **Publish**.
2. If you are prompted to save your changes, click **Save**.
3. In the **Power BI Desktop** dialog box, enter the email address for your Microsoft account, and then click **Sign in**.
4. In the **Sign in to your account** dialog box, enter the password for your Microsoft account, and then click **Sign in**.
5. The report will then be published to the Power BI portal. When the window displays Success, click **Open 'Adventure Works Sales.pbix' in Power BI** to view the report online.
6. When the browser opens, click **Sign in**, enter your email address and password, click **Sign in**, and then wait for the report to open in Internet Explorer.
7. When the report is visible, click **Pin Live Page**.
8. In the **Pin to dashboard** dialog box, click **New dashboard**, type **Adventure Works Sales** in the box, and then click **Pin live**. If the Introducing Featured dashboard message appears, click **Got it**.
9. Click **Show the navigation pane**, under **Dashboards**, click **Adventure Works Sales**.
10. Click in the **Ask a question about your data** box, and then point out the list of tables and fields that automatically appears.
11. Type **sales person**. Q&A returns a list of suggestions. Select **sales person by city** and the table is reordered.
12. In the Q&A box, type **show company name and unit price as pie chart**. When the chart is visible, in the top-right of the report, click **Pin visual**.
13. In the **Pin to dashboard** dialog box, leave **Existing dashboard** selected, and then click **Pin**.

14. Click **unit price** to highlight it, and then scroll down the list of suggestions in the Q&A box, to show how Q&A is picking up the columns from the dataset to create suggestions.
15. Click **Show the navigation pane**, under **Dashboards**, click **Adventure Works Sales**. Scroll down the dashboard if necessary, to display the new charts on the dashboard.
16. Close Internet Explorer.
17. In Power BI Desktop, in the Publishing to Power BI window, click **Got it**, and then close Power BI Desktop.

## Module Review and Takeaways

### Review Question(s)

**Question:** Discuss the different ways in which Power BI could reduce your organization's dependency on shared Excel files. How would having a central location for data, reports, and dashboards benefit different departments? How could each department make use of features such as content packs and the natural query language in Q&A?

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



# Lab Review Questions and Answers

## Lab: Importing Data into Power BI

### Question and Answers

#### Lab Review

**Question:** Discuss the different data sources that your organization could use to create Power BI reports. Can you think of a scenario where users perhaps have Excel workbooks for one set of reports, and reports in SQL Server Reporting Services for another set of data? Could this be combined into a single dataset in Power BI?

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



# Module 4

## Shaping and Combining Data

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## Lesson 1

# Power BI Desktop Queries

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Demonstration: Using Applied Steps	3

## Question and Answers

**Question:** Which of the following statements about Applied Steps is false?

- ( ) Steps are added in sequential order.
- ( ) You can rename the steps.
- ( ) The Source step is always the first step.
- ( ) The Navigation step only shows if you have selected tables or views from the data source, instead of using a query.
- ( ) You can move a step between the Source step, and the Navigation step.

**Answer:**

- ( ) Steps are added in sequential order.
- ( ) You can rename the steps.
- ( ) The Source step is always the first step.
- ( ) The Navigation step only shows if you have selected tables or views from the data source, instead of using a query.
- (√) You can move a step between the Source step, and the Navigation step.

## Resources

### Applied Steps



**Best Practice:** Providing sensible names for the steps in your queries helps if you return to the data after a long time, and have forgotten exactly what transformations were applied. This is particularly helpful if you want to stop halfway through shaping your data, and return later. You can see the list of transformations, and pick up from where you finished before. This will be helpful if you share the query with colleagues.

## Demonstration: Using Applied Steps

### Demonstration Steps

1. If it is not already running, start the MSL-TMG1, 20778A-MIA-DC and 20778A-MIA-SQL virtual machines, log on to 20778A-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. On the taskbar, click **Power BI Desktop**.
3. In the Power BI Desktop window, click **Get Data**.
4. In the **Get Data** dialog box, click **Microsoft Azure SQL Database**, and then click **Connect**.
5. In the SQL Server Database window, in the **Server** box, type the URL of the Azure server <Server Name>.database.windows.net (where <Server Name> is the name of the server you created), and in the **Database** box, type **AdventureWorksLT**, and then click **OK**.
6. In the **SQL Server database** dialog box, click **Database**.
7. In the **Username** box, type **Student**, in the **Password** box type **Pa\$\$w0rd**, and then click **Connect**.
8. In the **Navigator** window, select **SalesLT.SalesOrderDetail**, and click **Edit**.

9. On the Ribbon, in the **Query** group, click **Advanced Editor**. The window opens to display the query code. Note that no transformations have been applied yet. Click **Cancel**.
10. Right-click the **SalesOrderDetailID** column, and click **Remove**.
11. In the **Applied Steps** list, right-click **Removed Columns**, and click **Rename**. Type **Removed SalesOrderDetailID**, and then press Enter.
12. In the center pane, right-click the **OrderQty** column, and click **Rename**. Type **OrderQuantity**, and then press Enter.
13. In the **Applied Steps** list, right-click **Renamed Columns**, and click **Rename**. Type **Renamed OrderQty**, and then press Enter.
14. In the center pane, click the **rowguid** column, and with the Ctrl key held down, click **ModifiedDate**.
15. Right-click either of the column headings, and then click **Remove Columns**.
16. In the **Applied Steps** list, right-click **Removed Columns**, and click **Rename**. Type **Removed rowguid and ModifiedDate**, and then press Enter.
17. On the Ribbon, in the **Query** group, click **Advanced Editor**. The window opens to display the query code. Note that the transformations have been added, and they are in the same order as the list of Applied Steps. Click **Cancel**.
18. In the **Applied Steps** list, right-click **Removed rowguid and ModifiedDate**, and click **Move Up**.
19. In the **Applied Steps** list, click the **delete** icon next to **Removed SalesOrderDetailID**.
20. In the **Delete Step** dialog box, click **Delete**. The **SalesOrderDetailID** column reappears in the table.
21. In the **Applied Steps** list, click the **gear** icon next to **Navigation**.
22. In the Navigation window, select **SalesLT.SalesOrderHeader**, and click **OK**. Note that the data preview has been updated with the **SalesLT.SalesOrderHeader** data. Also note the warning icon under **Queries [1]**.
23. In the **Applied Steps** list, click the **delete** icon next to **Removed rowguid and ModifiedDate**.
24. In the **Delete Step** dialog box, click **Delete**.
25. In the **Applied Steps** list, click the **delete** icon next to **Renamed OrderQty**.
26. Note that the warning is no longer displayed.
27. On the Ribbon, in the **Query** group, click **Advanced Editor**. The window opens to display the query code. Note that the transformations have been removed, and the source table has been changed. Click **Cancel**.
28. On the Ribbon, click **Close & Apply** to return to Power BI Desktop.
29. Leave Power BI Desktop open for the next demonstration.

## Lesson 2

# Shaping Data

### Contents:

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Demonstration: Transforming Data with the Query Editor	6

## Question and Answers

**Question:** Which of the following is not good advice for shaping your data?

- ( ) Remove all columns and rows that are not used in the reports.
- ( ) Rename columns to provide names that represent the column data, and can be used by Power BI Q&A.
- ( ) Let Power BI guess the data types of your columns because it will always be correct.
- ( ) Create an index column if you want to guarantee the sort order in a visual, or if you are appending data.
- ( ) Use the Age function on a Date of Birth column to calculate the current age.

**Answer:**

- ( ) Remove all columns and rows that are not used in the reports.
- ( ) Rename columns to provide names that represent the column data, and can be used by Power BI Q&A.
- (√) Let Power BI guess the data types of your columns because it will always be correct.
- ( ) Create an index column if you want to guarantee the sort order in a visual, or if you are appending data.
- ( ) Use the Age function on a Date of Birth column to calculate the current age.

## Resources

### Formatting Data



**Best Practice:** The Merge Columns function can be used on address fields to quickly create a full address column. Highlight your address columns in order, and click **Merge Columns**. For the separator, choose **Custom**, and enter ", " (comma and a space). This concatenates all the values together in a comma separated list.

However, you are likely to have null values or empty strings in some columns, perhaps Address2, which results in double commas. You can use the **Replace Values** function on the **Any Column** group of the **Transform** tab, to replace ", ", with ", ".

## Demonstration: Transforming Data with the Query Editor

### Demonstration Steps

1. If Power BI Desktop is not already open, click **Power BI Desktop** on the taskbar. Click **Get Data** if the **Get Data** dialog box displays.
2. If Power BI Desktop is already open, click **Get Data**.
3. In the **Get Data** dialog box, click **Excel**, and then click **Connect**.
4. In the **Open** dialog box, browse to the **D:\Demofiles\Mod04\Demo** folder, click **Sales Matrix.xlsx**, and then click **Open**.
5. In the **Navigator** dialog box, select **Sales**, and then click **Load**.
6. When the data has finished loading, on the Ribbon, click **Edit Queries**, and from the drop-down list, click **Edit Queries**.



7. In the **Untitled - Query Editor** dialog box, in the **Queries** pane, click **Sales**.
8. On the **Transform** ribbon, click **Transpose**.
9. Note that the columns are now rows.
10. Click the **table** icon in the top left-hand corner of the table, and click **Use First Row As Headers**.
11. Right-click the **Column1** column, click **Rename**, type **Country**, and then press Enter.
12. Right-click the **Column2** column, click **Rename**, type **Category**, and then press Enter.
13. Click the **Country** column, and on the ribbon, in the **Any Column** group, click **Fill**, and then click **Down**. The null values are replaced.
14. Click the **2005** column, hold down the Ctrl key and click the **2006**, **2007**, and **2008** columns.
15. Right-click any of the selected column headers, and then on the ribbon, in the **Any Column** group, click **Unpivot Columns**.
16. Note that the names of the columns are **Attribute** and **Value** for the attribute-value pairing.
17. Right-click the **Attribute** column, click **Rename**, type **Year**, and then press Enter.
18. Right-click the **Value** column, click **Rename**, type **Sales**, and then press Enter.
19. On the **File** menu, click **Close & Apply**.
20. In the **Fields** pane, expand **Sales**, click **Country** to select the field.
21. On the **Modeling** ribbon, click **Data Category: Uncategorized**. Select **Country/Region**.
22. In the **Fields** pane, note the map icon next to **Country**.
23. In the **Fields** pane, under **Sales**, click **Sales** to select the field.
24. In the **Formatting** group, click **Data Type: Text**, and click **Fixed Decimal Number**.
25. If a **Data type change** dialog box appears, click **Yes**.
26. Click **Format: Currency General**, click **Currency**, and then select **\$ English (United States)**.
27. In the **Fields** pane, note the sum symbol next to **Sales**.
28. Drag the **Country** field onto the report. Note that Power BI automatically chooses the map chart.
29. Drag the **Sales** field onto the map, and note that the bubble sizes now represent the Sales figure.
30. Click the report canvas.
31. In the **Visualizations** pane, click **Clustered column chart**.
32. Drag **Category** onto the **Axis** property.
33. Drag **Year** onto the **Axis** property.
34. Drag **Country** onto the **Legend** property.
35. Drag **Sales** onto the **Value** property.
36. Grab the corner edge of the chart to expand the width and height.
37. Click the **Click to turn on Drill Down** arrow icon in the top right-hand corner of the chart.
38. Click the tallest column in the **Bikes** group. This now breaks down the sales by year.
39. Save the file report as **AdventureWorks Sales.pbix** to **D:\Demofiles\Mod04\Demo**, as this will be used for the next demonstration.

## Lesson 3

# Combining Data

### Contents:

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Demonstration: Adding and Shaping Data from the Internet	9

## Question and Answers

**Question:** Which of the following is not a true join type for merging columns?

- ( ) Left Outer (all from first, matching from second).
- ( ) Right Outer (all from second, matching from first).
- ( ) Full Outer (all rows from both).
- ( ) Inner (matching rows only).
- ( ) Random (let Power BI decide).

**Answer:**

- ( ) Left Outer (all from first, matching from second).
- ( ) Right Outer (all from second, matching from first).
- ( ) Full Outer (all rows from both).
- ( ) Inner (matching rows only).
- (√) Random (let Power BI decide).

## Resources

### Merging Data



**Best Practice:** If you are appending rows from multiple sources, and the table contains index values that overlap when the data is combined, combine the data, and then create a new index column on the table into which the rows have been appended.

## Demonstration: Adding and Shaping Data from the Internet

### Demonstration Steps

1. If Power BI Desktop is not already open, click **Power BI Desktop** on the taskbar. If the **Get Data** dialog box displays, click **Get Data**. In the Navigator window, click **Web**, and click **Connect**.
2. If Power BI Desktop is already open, on the **Home** tab, click **Get Data**, click **Web**.
3. In the **From Web** dialog box, in the **URL** box, type **http://www.imdb.com/chart/top**, and then click **OK**.
4. In the Navigator window, select **Table 0**, and click **Edit**.
5. In Query Editor, right-click the left-most column, and click **Remove**.
6. Right-click the right-most column, and click **Remove**.
7. Right-click the **Your Rating** column, and click **Remove**.
8. Note that these steps have been grouped together in the **Applied Steps** list as **Removed Columns**.
9. Click the **Rank & Title** column, and then on the **Home** tab, in the **Transform** group, click **Split Column**, and then click **By Delimiter**.
10. In the **Select or enter delimiter** list, select **--Custom--**, and type a period (.) in the box.
11. In the **Split** section, click **At the left-most delimiter**, and then click **OK**.
12. The Rank data now shows in its own column. Right-click the **Rank & Title.1** column, click **Rename**, type **Rank**, and press Enter.

13. Click the **Rank & Title.2** column, and on the **Transform** ribbon, in the **Any Column** group, click **Replace Values**.
14. In the **Replace Values** dialog box, in the **Value to Find** box, type **(**, and then click **OK**.
15. With focus on the **Rank & Title.2** column, from the **Any Column** group, click **Replace Values**.
16. In the **Replace Values** dialog box, in the **Value to Find** box, type **)**, and then click **OK**.
17. With focus on the **Rank & Title.2** column, in the **Text Column** group, click **Split Column**, and then click **By Number of Characters**.
18. In the **Number of characters** box, type **4**.
19. In the **Split** section, click **Once, as far right as possible**, and then click **OK**.
20. The Year data has been moved to a separate column.
21. Right-click the **Rank & Title.2.1** column, click **Rename**, type **Title**, and press Enter.
22. In the **Text Column** group, click **Format**, and then click **Trim**. The white space around the titles is removed.
23. Right-click the **Rank & Title.2.2** column, click **Rename**, type **Year**, and press Enter.
24. In the **Query Settings** pane, under **Properties**, in the **Name** box, type **IMDB Top 250 Movies**, and then press Enter.
25. On the **File** menu, click **Close & Apply**.
26. In Power BI Desktop, on the **File** menu, click **Exit**. If prompted to save your changes, click **Save**.

## Module Review and Takeaways

**Question:** Discuss the benefits of using Power BI, rather than Excel, to shape and transform your data. Are there any disadvantages? What can Power BI do that Excel cannot, and vice versa? Which tool do you think is most straightforward to use?

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

# Lab Review Questions and Answers

## Lab: Shaping and Combining Data

### Question and Answers

#### Lab Review

**Question:** Discuss the types of different data in your organization that could be combined using the Query Editor. Do you have data stored across locations that could be appended, or lookup data that could be merged into other tables to make it more useful for reporting?

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

# Module 5

## Modeling Data

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## Lesson 1

# Relationships

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## Question and Answers

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

- ( ) The Power BI Autodetect feature works out the cardinality of the relationship between two tables.
- ( ) When querying the data source, Power BI automatically determines the relationships, and creates them.
- ( ) The Sales table is related to the Customer table using the CustomerID column. There are many orders in the Sales table for each customer, and one row in the Customers table for each customer. This is a Many to One relationship.
- ( ) The Employees table has one row for each employee, and is related to the EmployeeAdditionalDetails table using the EmployeeID column. There is one instance of each employee in the EmployeeAdditionalDetails table. This is a One to One relationship.
- ( ) After Power BI automatically creates a relationship, you cannot change the cardinality or cross filter direction options.

**Answer:**

- ( ) The Power BI Autodetect feature works out the cardinality of the relationship between two tables.
- ( ) When querying the data source, Power BI automatically determines the relationships, and creates them.
- ( ) The Sales table is related to the Customer table using the CustomerID column. There are many orders in the Sales table for each customer, and one row in the Customers table for each customer. This is a Many to One relationship.
- ( ) The Employees table has one row for each employee, and is related to the EmployeeAdditionalDetails table using the EmployeeID column. There is one instance of each employee in the EmployeeAdditionalDetails table. This is a One to One relationship.
- (√) After Power BI automatically creates a relationship, you cannot change the cardinality or cross filter direction options.

## Demonstration: Viewing Relationships in Power BI

### Demonstration Steps

1. Run **D:\Demofiles\Mod05\Setup.cmd** as an Administrator, and, in the **User Account Control** dialog box, click **Yes**.
2. When prompted press **Y**, press Enter, and when the script completes, press any key to close the window.
3. On the desktop, double-click **Power BI Desktop**.
4. In the **Get Data** dialog box, click **Get Data**. Ensure **Excel** is selected, and click **Connect**.
5. In the **Open** dialog box, navigate to **D:\Demofiles\Mod05\Demo**, click **Adventure Works Sales Data.xlsx**, and then click **Open**.
6. In the **Navigator** dialog box, select **DimCurrency**, **DimCustomer**, **DimDate**, **DimProduct**, **DimPromotion**, **DimSalesTerritory**, and **FactInternetSales**.
7. Click **Load**.
8. In the views pane on the left-hand side, click **Relationships**.

9. Point out that Power BI has created the relationships automatically. The layout represents a star schema.
10. Maximize the tables in the relationship diagram to display all columns.
11. Point out that Power BI has not created a relationship to **DimDate** from **FactInternetSales**.
12. On the **Home** tab, click **Manage Relationships**.
13. In the **Manage Relationships** dialog box, click **New**.
14. In the **Create Relationships** dialog box, in the top table list, click **FactInternetSales**. When the table preview appears below, click the **OrderDateKey** column.
15. In the bottom table list, click **DimDate**. When the table preview appears below, click the **DateKey** column.
16. Check that the **Cardinality** is set to **Many to One (\*:1)**, the **Cross filter direction** is **Single**, and **Make this relationship active** is selected, and then click **OK**.
17. In the **Manage Relationships** dialog box, click **Close**.
18. In the diagram, in the **FactInternetSales** table, click the **DueDateKey** column. Drag the **DueDateKey** column to the **DateKey** column in the **DimDate** table. Point out the dotted line to show that the relationship is inactive. This is because there is more than one related column in the two tables.
19. In the diagram, in the **FactInternetSales** table, click the **ShipDateKey** column. Drag the **ShipDateKey** column to the **DateKey** column of the **DimDate** table. Point out the dotted line to show that the relationship is inactive.
20. Point out that the relationships from **FactInternetSales** to **DimCurrency**, **DimProduct**, **DimPromotion**, and **DimSalesTerritory**, have a cross filter direction of Both, indicated by the double arrow icon. These are lookup tables, so should be Single.
21. On the **Home** tab, click **Manage Relationships**.
22. In the **Manage Relationships** dialog box, double-click the **FactInternetSales (CurrencyKey)** relationship.
23. In the **Edit Relationships** dialog box, in the **Cross filter direction** list, click **Single**, and then click **OK**.
24. In the **Manage Relationships** dialog box, double-click the **FactInternetSales (ProductKey)** relationship.
25. In the **Edit Relationships** dialog box, in the **Cross filter direction** list, click **Single**, and then click **OK**.
26. In the **Manage Relationships** dialog box, double-click the **FactInternetSales (PromotionKey)** relationship.
27. In the **Edit Relationships** dialog box, in the **Cross filter direction** list, click **Single**, and then click **OK**.
28. In the **Manage Relationships** dialog box, double-click the **FactInternetSales (SalesTerritoryKey)** relationship.
29. In the **Edit Relationships** dialog box, in the **Cross filter direction** list, click **Single**, and then click **OK**.
30. In the **Manage Relationships** dialog box, click **Close**.
31. Click the relationship line between **FactInternetSales** and **DimCustomer**. Point out that this is a One to One relationship because the FactInternetSales table only contains an extract. Normally this would be Many to One. This must be changed so it is ready for the remainder of the data to be loaded later.
32. Click the relationship line between **FactInternetSales** and **DimCustomer** and press **Delete**.
33. In the **Delete Relationship** dialog box, click **Delete**.

34. On the **Home** tab, click **Manage Relationships**.
35. In the **Manage Relationships** dialog box, click **New**.
36. In the **Create Relationships** dialog box, in the top table list, click **FactInternetSales** and in the data preview, click the **CustomerKey** column.
37. In the bottom table list, click **DimCustomer**, and in the data preview, click **CustomerKey**.
38. In the **Cardinality** list, click **Many to One (\*:1)**, and then click **OK**.
39. In the **Manage Relationships** dialog box, click **Close**.
40. In the diagram, point out that the 1 icon next to **FactInternetSales** is now a star icon.
41. Click **Save**, and save the file to the **D:\Demofiles\Mod05\Demo** folder as **Adventure Works Sales.pbix**.
42. Leave Power BI Desktop open for the next demonstration.

## Lesson 2

# DAX Queries

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## Question and Answers

**Question:** You want to concatenate and manipulate columns containing string data. Which of the following functions will not be compatible for working with text?

- ( ) CONCATENATE
- ( ) MEDIAN
- ( ) REPLACE
- ( ) TRIM
- ( ) UPPER

**Answer:**

- ( ) CONCATENATE
- (√) MEDIAN
- ( ) REPLACE
- ( ) TRIM
- ( ) UPPER

## Demonstration: Row and Filter Context in DAX Formulas

### Demonstration Steps

1. In Power BI Desktop, in the Views list on the left side of the window, click **Report**.
2. In the **Fields** pane, click **FactInternetSales**.
3. On the **Modeling** ribbon, in the **Calculations** group, click **New Measure**.
4. In the formula bar, highlight **Measure =**, type the following script, and then press Enter:

```
TotalSales = SUM(FactInternetSales[SalesAmount])
```

5. In the **Fields** pane, click **FactInternetSales**.
6. Click **New Column**, and in the formula bar, highlight **Column =**, and type:

```
European Sales = CALCULATE(FactInternetSales[TotalSales],  
DimSalesTerritory[SalesTerritoryGroup] = "Europe")
```

7. Point out that the **TotalSales** measure has been used in the formula, and then press Enter.
8. In the **Fields** pane, select the **European Sales** check box to add it to the report.
9. In the **Visualizations** pane, click **Gauge**, and then click **Format**.
10. Expand **Gauge axis**, in the **Max** field, type **1000000**, and in the **Target** field, type **1000000**.
11. Leave Power BI open for the next demonstration.

## Lesson 3

# Calculations and Measures

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## Question and Answers

**Question:** Which of the following DAX functions is not suitable for creating a calculated table?

- ( ) UNION
- ( ) SUM
- ( ) CROSSJOIN
- ( ) NATURALINNERJOIN
- ( ) NATURALLEFTOUTERJOIN

**Answer:**

- ( ) UNION
- (√) SUM
- ( ) CROSSJOIN
- ( ) NATURALINNERJOIN
- ( ) NATURALLEFTOUTERJOIN

## Demonstration: Creating Calculated Columns and Measures with DAX

### Demonstration Steps

1. In Power BI Desktop, in the view pane, click **Data** to open the data view.
2. In the **Fields** pane, click **DimCustomer** to select the table, and preview the data.
3. Right-click **DimCustomer**, and click **New column**.
4. In the formula bar, highlight **Column =**, and type:

```
FullName = [FirstName] & " " & [LastName]
```

5. Press Enter.
6. If the new column is not visible, scroll to the right of the table. Note the new **FullName** column in the table. In the **Fields** pane, point out the icon next to the new column, which indicates that this has been created using a DAX formula.
7. In the **Fields** pane, right-click **DimCustomer** and click **New column**.
8. In the formula bar, highlight **Column =**, and type:

```
MaleFemale = IF([Gender] = "M", "Male", "Female")
```

9. Press Enter.
10. Note the new column at the end of the table.
11. On the **Modeling** ribbon, in the **Calculations** group, click **New Column**.
12. In the formula bar, highlight **Column =**, and type:

```
Relationship = IF([MaritalStatus] = "M", "Married", "Single")
```

13. Press Enter.
14. Note the new column at the end of the table.
15. On the **Modeling** ribbon, in the **Calculations** group, click **New Table**.

16. In the formula bar, highlight **Table =**, and type:

```
DimCountry = DATATABLE (
    "Country", STRING, "Code", STRING,
    {
        {"United States", "US"},
        {"United Kingdom", "UK"},
        {"France", "FR"},
        {"Germany", "DE"},
        {"Spain", "ES"}
    }
)
```

17. Click Enter.
18. In the **Fields** pane, note the new table.
19. On the **Modeling** ribbon, in the **Calculations** group, click **New Measure**.
20. In the formula bar, highlight **Measure =**, and type:

```
MostRecentOrder = MAX(FactInternetSales[OrderDateKey])
```

21. Press Enter.
22. In the **Fields** pane, note the icon next to the measure, to indicate that this is a calculated field.
23. In the **Fields** pane, click the **MostRecentOrder** field.
24. On the **Modeling** ribbon, in the **Properties** group, click **Home Table: DimCountry**, and click **FactInternetSales**. This moves the measure so that it resides in the **FactInternetSales** table.
25. In the **Fields** pane, note that the **MostRecentOrder** measure now appears under **FactInternetSales**.
26. Close Power BI Desktop, saving any changes.



# Lab Review Questions and Answers

## Lab: Modeling Data

### Question and Answers

#### Lab Review

**Question:** Discuss the functions covered in this topic, or use the link provided in the functions lesson of the Dax Queries topic to look online at the DAX Function Reference. How many of these have you already used? Have you used the equivalent functions in Excel? Which functions can you use for creating columns and measures in your organizational datasets?

**Answer:** Answers will vary, depending on the opinions of the students.

**Question:** Look at the dataset you used in the labs. How else can you use DAX formulas to add additional columns or create new measures? Do you think there are any gaps in the data that you could fill using DAX?

**Answer:** Answers will vary, depending on the opinions of the students.



# Module 6

## Interactive Data Visualizations

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## Lesson 1

# Creating Power BI Reports

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## Question and Answers

**Question:** Discuss some of the charts that you could use to represent your organizational data. What types of chart would you use? Would different charts represent the data in different ways? Do you have data that would benefit from using a scatter chart, so that you can identify clusters, or outliers? Are there any missing chart types in Power BI that you might be able to download from the community gallery to fulfill your requirements?

**Answer:** Answers will depend on the students' experience.

## Demonstration: Adding Visualizations to a Report

### Demonstration Steps

1. If you do not have a Power BI login, open **Internet Explorer**, go to **<https://powerbi.microsoft.com/en-us/documentation/powerbi-admin-signing-up-for-power-bi-with-a-new-office-365-trial>**, and follow the steps to create an account.
2. In Internet Explorer®, go to **<https://www.microsoft.com/en-us/download/details.aspx?id=45331>**, and then click **Download**.
3. On the **Choose the download you want** page, select the **PBIDesktop\_x64.msi** check box, and then click **Next**.
4. In the message box, click **Run**.
5. In the **Microsoft Power BI Desktop (x64) Setup** dialog box, on the **Welcome to the Microsoft Power BI Desktop (x64) Setup Wizard** page, click **Next**.
6. On the **Microsoft Software License Terms** page, select the **I accept the terms in the License Agreement** check box, and then click **Next**.
7. On the **Destination Folder** page, click **Next**.
8. On the **Ready to install Microsoft Power BI Desktop (x64)** page, click **Install**.
9. In the **User Account Control** dialog box, click **Yes**.
10. On the **Completed the Microsoft Power BI Desktop (x64) Setup Wizard** page, clear the **Launch Microsoft Power BI Desktop** check box, and then click **Finish**.
11. Close Internet Explorer.

Connect to a Database in Azure SQL Database and Import Data

1. Ensure that the MSL-TMG1, 20778A-MIA-DC, and 20778A-MIA-SQL virtual machines are running, and then log on to 20778A-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. In the **D:\Demofiles\Mod06** folder, run **Setup.cmd** as Administrator, and then click **Yes** when prompted. If asked **Do you want to continue with this operation?**, type **Y** and press Enter.
3. When the script completes, press any key to close the window.
4. Start Microsoft SQL Server Management Studio from the taskbar, and then connect to the **MIA-SQL** database engine instance by using Windows® authentication.
5. In the **D:\Demofiles\Mod06\Demo** folder, open the **Demo.ssmssln** solution.
6. In Solution Explorer, open the **1 - Charts.sql** script file.
7. On the desktop, double-click the **Power BI Desktop** icon.
8. In the Power BI Desktop window, click **Get Data**.

9. In the **Get Data** dialog box, click **Microsoft Azure SQL Database**, and then click **Connect**.
10. In the SQL Server database window, in the **Server** box, type the URL of the Azure server **<Server Name>.database.windows.net** (where *<Server Name>* is the name of the server that you created).
11. In the **Database** box, type **AdventureWorksLT**.
12. Expand the **Advanced options** box.
13. In SQL Server Management Studio, copy the query under **Customer Address** in the **1 - Charts.sql** query.
14. In Power BI Desktop, paste the query into the **SQL Statement (optional, requires database)** box, and then click **OK**.
15. In the SQL Server database window, click **Database**, in the **Username** box, type **Student**, and in the **Password** box, type **Pa\$\$w0rd**, and then click **Connect**.
16. The data preview window will appear. Click **Load**.
17. The window will close and a blank report canvas will open.
18. In the Power BI Desktop window, click **Get Data**.
19. In the **Get Data** dialog box, click **Microsoft Azure SQL Database**, and then click **Connect**.
20. In the SQL Server database window, in the **Server** box, type the URL of the Azure server **<Server Name>.database.windows.net** (where *<Server Name>* is the name of the server that you created).
21. In the **Database** box, type **AdventureWorksLT**.
22. Expand the **Advanced options** box.
23. In SQL Server Management Studio, copy the query under **Sales** in the **1 - Charts.sql** query.
24. In Power BI Desktop, paste the query into the **SQL Statement (optional, requires database)** box, and then click **OK**.
25. The data preview window will appear. Click **Load**.
26. The window will close and return to the report.

#### Add Visualizations to a Report in Power BI Desktop

1. In the **Fields** pane, right-click **Query1**, click **Rename**, type **Customers**, and then press Enter.
2. Right-click **Query2**, click **Rename**, type **Sales**, and then press Enter. Expand the two tables to display all the fields.
3. In the **Fields** pane, under **Sales**, select the **SubCategory**, and **OrderQty** check boxes. Power BI creates a table.
4. In the **Visualizations** pane, click **Stacked column chart**.
5. Grab the expander on the right edge of the chart, and then widen the chart so that all category labels are visible.
6. Ensure that the chart is still selected, and then in the **Visualizations** pane, click **Analytics**.
7. Expand **Constant Line**, and click **Add**.
8. In the **Value** box, type **100**.
9. Change the color to **red**.
10. Toggle **Data label** to **On**.

11. Change the color to **red** to match the reference line.
12. Click **Format**, and expand **Title**, in the **Title Text** box, type **Orders by Sub Category**, and then click **Center** to align to the center.
13. In the **Fields** pane, click **Sales**.
14. On the **Modeling** ribbon, click **New Column**.
15. In the formula bar, type the following code:

```
LineTotal = Sales[OrderQty] * Sales[ListPrice]
```

16. On the **Modeling** ribbon, click **Format: General**, point to **Currency**, and then click **\$ English (United States)**.
17. Click a blank area of the page.
18. In the **Fields** pane, under **Sales**, select the **Product** check box, which adds a table, and then select the **LineTotal** check box.
19. In the **Visualizations** pane, click **Fields**, under **Filters**, expand **LineTotal(All)**.
20. In the list, click **is greater than**, and in the box, type **25000**.
21. Click **Apply filter**, and then note that the number of products in the table is reduced.
22. In the **Visualizations** pane, click **Format**, click **Title**, and change the **Title** slider to **On**.
23. Under **Title**, in the **Title Text** box, type **Product Sales Over \$25k**, and then click **Center**.
24. Select the table, and then click **Stacked bar chart**.
25. Use the expander to widen the chart to the same width as the column chart.
26. On the chart, click **More Options**, and then click **Sort By LineTotal**.
27. At the bottom of the window, click the + icon to add a new report.
28. On the **Home** ribbon, click **Manage Relationships**, and then point out that Power BI has auto-detected the relationship on the **CustomerID** columns, then click **Close**.
29. In the **Fields** pane, expand **Customers**, and then select the **City** check box. Power BI automatically adds a map chart. Expand the map to show all countries.
30. In the **Fields** pane, under **Sales**, select the **LineTotal** check box to add it to the map. Grab the right corner of the map, and then drag it to fill the whole of the report page.
31. Zoom in on the map to focus on the **UK**. Point out that the bubbles now represent the sales for each customer, and are proportionately sized. Position the cursor over some of the bubbles to display the data labels.
32. Save the file as **Customer Sales**, in the **D:\Demofiles\Mod06\Demo** folder.
33. Leave Power BI open for the next demonstration.

## Lesson 2

# Managing a Power BI Solution

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## Question and Answers

**Question:** Which of the following statements about the Manage Data portal is false?

- ( ) The portal enables you to manage your shared queries.
- ( ) You can edit and control access to your data sources in the portal.
- ( ) Using the portal enables you to delete data sources that you no longer need.
- ( ) The Usage Report shows how many times a dashboard was consumed in Power BI.
- ( ) The Usage Report displays the most active groups in Power BI.

**Answer:**

- ( ) The portal enables you to manage your shared queries.
- ( ) You can edit and control access to your data sources in the portal.
- (√) Using the portal enables you to delete data sources that you no longer need.
- ( ) The Usage Report shows how many times a dashboard was consumed in Power BI.
- ( ) The Usage Report displays the most active groups in Power BI.

## Demonstration: Creating Featured Questions

### Demonstration Steps

Add Featured Questions to a Dashboard

1. Ensure that the MSL-TMG1, 20778A-MIA-DC, and 20778A-MIA-SQL virtual machines are running, and then log on to 20778A-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. In Power BI Desktop, click **Publish** to publish the report you created in the previous demo.
3. In the **Power BI Desktop** dialog box, enter the password for the account you used to sign up for the Power BI service, and click **Sign in**.
4. In Internet Explorer, go to **http://www.powerbi.com** and click **Sign in**.
5. Sign in using the credentials you used to sign up for Power BI service.
6. In Power BI, click **Show the navigation pane**.
7. Under **Report**, click **Customer Sales**.
8. At the bottom of the page, click **Page 1**, click the **Orders by Sub Category** visual, and then click **Pin visual**.
9. In the **Pin to dashboard** dialog box, click **New dashboard**, type **Customer Sales**, and then click **Pin**.
10. Under **Dashboards**, click the ellipses (...) next to **Customer Sales**, and then click **Settings**.
11. On the **Dashboards** tab, under **Q&A**, ensure the **Show the Q&A search box on this dashboard** check box is selected.
12. On the **Datasets** tab, click **Customer Sales**.
13. Under **Settings for Customer Sales**, click **Featured Q&A Questions** to expand the list.
14. Click **Add a question** and in the text box, type **Show sales by customer**.
15. Click **Add a question**, and in the text box, type **Show all products with unit price greater than \$250**, and then click **Apply**.

#### Use Featured Questions

1. Under **Dashboards**, click **Customer Sales**.
2. Click **Ask a question about your data**, and the Featured Questions you have just added now appear at the top of the list of suggestions.
3. Click the **Show sales by customer** question to see the results.
4. Remove the question text, and then click the **Show all products with unit price greater than \$250** question to see the results.
5. Close Internet Explorer.
6. In the **Publishing to Power BI** dialog box, click **Got it**.
7. Close Power BI Desktop.

## Module Review and Takeaways

**Question:** Why do you think the Manage Data portal prevents you from deleting data sources? Do you agree with this, or should you be able to delete the data sources for the queries that you have shared?

**Answer:** Deleting a data source creates problems because queries depend on data sources. In particular, if you were to delete a shared query and data source that colleagues are currently using, you would have the potential to break their reports. It could be professionally damaging if a data source was removed that a user depended on for a report that the business urgently required—and the user could not deliver the data in the expected timeframe. The Usage Report shows you which users are sharing your data sources and queries, so dependent users can be informed if the data source is to be removed by using Excel. The Manage Data portal is connected to the Lync system, so you can easily contact those users who are sharing your data sources and queries, if you want to use another method to delete them.

# Lab Review Questions and Answers

## Lab: Creating a Power BI Report

### Question and Answers

#### Lab Review

**Question:** Discuss the tools that you used to shape and combine data in the labs. How did this compare to using Excel, or coding Transact-SQL to deliver the same results? Do you think it is quicker to use Power BI rather than the applications that you currently use?

**Answer:** Answers will depend on the opinions of the students.

**Question:** Discuss some of the visualizations that you used in the optional exercise to create a report that was relevant for your organization. If you did not have time to do the optional exercise, which of the charts that you used in the lab will you reuse to create reports for your organization? Can you think of data that you can present by using the map charts?

**Answer:** Answers will depend on the opinions of the students.

# Module 7

## Direct Connectivity

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## Lesson 1

# Cloud Data

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## Demonstration: Using Databases in Azure SQL Database As a Power BI Data Source

### Demonstration Steps

Import Data from Tables in a Database in Azure SQL Database

1. Ensure that the MSL-TMG1, 20778A-MIA-DC, and 20778A-MIA-SQL virtual machines are running, and then log on to 20778A-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. On the taskbar, click **Power BI Desktop**.
3. In the **Power BI Desktop** window, click **Get Data**.
4. In the **Get Data** dialog box, click **Microsoft Azure SQL Database**, and then click **Connect**.
5. In the **SQL Server database** window, in the **Server** box, type the URL of the Azure server **<Server Name>.database.windows.net** (where **<Server Name>** is the name of the server that you created).
6. In the **Database (optional)** box, type **AdventureWorksLT**, and then click **OK**.
7. In the **SQL Server database** dialog box, click **Database**.
8. In the **Username** box, type **Student**.
9. In the **Password** box, type **Pa\$\$w0rd**, and then click **Connect**.
10. In the **Navigator** dialog box, select **SalesLT.Customer**, **SalesLT.SalesOrderDetail**, and **SalesLT.SalesOrderHeader**, and then click **Load**.
11. In the **Fields** pane, notice that the three tables have been added. When the report is published to the Power BI service, the tables are combined into a single dataset.

View Relationships Between the Tables

1. In the menu of the left, click **Relationships**, and then expand the **SalesLT SalesOrderDetail**, **SalesLT SalesOrderHeader**, and **SalesLT Customer** tables to display all columns.
2. Position the cursor on the relationship arrow between **SalesLT SalesOrderDetail** and **SalesLT SalesOrderHeader**. Notice that the related columns are highlighted.
3. Position the cursor on the relationship arrow between **SalesLT SalesOrderHeader** and **SalesLT Customer**. Point out that the related columns are highlighted.
4. In the menu of the left, click **Report** to return to the report canvas.
5. Drag the **CompanyName** field from **SalesLT Customer** onto the canvas to create a table.
6. Drag the **LineTotal** field from **SalesLT SalesOrderDetail** onto the **Customers** table on the report.
7. In the **Visualizations** pane, click **Stacked column chart**.
8. Drag the right edge of the chart to stretch it across the report and display the customers in full.
9. In the **Visualizations** pane, click **Format**, expand **Title**, and then rename the chart **Line Total by Company Name**.
10. Click on the canvas, and then drag the **CompanyName** field from **SalesLT Customer** onto the canvas to create a table below the chart.
11. Drag the **OrderQty** field from **SalesLT SalesOrderDetail** onto the **Customers** table on the report.
12. In the **Visualizations** pane, click **Stacked column chart**.
13. Drag the right edge of the chart to stretch it across the report and display the customers in full.

14. In the **Visualizations** pane, click **Format**, expand **Title**, and then rename the chart **Order Quantity by Company Name**.
15. Expand **Data colors**, and then select a different color from the **Default color** selector.
16. Click on the canvas, drag the **CompanyName** field from **SalesLT Customer** onto **Page level filters**.



## Module Review and Takeaways

**Question:** Discuss the different ways in which your organization could use Power BI to connect to online data sources. What would be some of the potential benefits of direct connectivity to services such as Azure SQL Database? Are there any scenarios in your organization that could use the On-premises data gateway?

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

## Lab Review Questions and Answers

### Lab: Direct Connectivity

#### Question and Answers

##### Lab Review

**Question:** Discuss the different online data sources that your organization could use to create Power BI reports. Can you think of a scenario where users perhaps have Azure SQL database for one set of reports, and data in another online database for another set of reports? Could this be combined into a single dataset in Power BI?

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

**Question:** Discuss the issues to consider when deciding whether to import data or use DirectQuery when building reports against large online databases. Ask students about their own organizations—ask them how they would make such a decision.

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

# Module 8

## The Developer API

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## Lesson 1

# The Developer API

### Contents:

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## Demonstration: Using the Developer API and Registering an App

### Demonstration Steps

Using the Developer API in the Interactive Console:

1. Start the MSL-TMG1, 20778A-MIA-DC, and 20778A-MIA-SQL virtual machines, and then log on to 20778A-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.
2. In Internet Explorer, go to **<http://docs.powerbi.apiary.io/>**.
3. In the **Dashboards - Preview** section, click **List all Dashboards**.
4. In the right console pane, describe the results that are now displayed, such as the **GET URL**, and the example **Response** body.
5. In the right console pane, click **Try**.
6. In the **Authentication needed** window, click **Authenticate**.
7. In the **Sign in to your account** dialog box, enter the credentials you used to sign up for Power BI service, and then click **Sign in**.
8. On the **Apiary for Power BI** page, click **Accept**.
9. If the right console pane has not refreshed, click **List all Dashboards**.
10. In the right console pane, click **Call Resource**.
11. Scroll down to see the **Response** details in the console pane.

Registering an App

1. In Internet Explorer, go to **<http://dev.powerbi.com>**.
2. Scroll down the page, and under **Client app**, click **Register your app**.
3. In the **Step 1** section, click **Sign in with your existing account**.
4. Sign in using the credentials you used to sign up for Power BI service.
5. In the **Step 2** section, enter the following information:
  - App Name: **Power BI Mobile Integration**
  - App Type: **Native app**
  - Redirect URL: **<https://powerbiapp.contoso.com/gettoken>**
6. In the **Step 3** section, select all the APIs.
7. In the **Step 4** section, click **Register App**.
8. In the **Client ID** box, select the text, and copy the string.
9. Paste the text into Notepad; point out that this string would now be used in the app.

## Lesson 2

# Custom Visuals

### Contents:

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## Demonstration: Importing and Using a Custom Visual

### Demonstration Steps

Import a Custom Visualization:

1. In Internet Explorer, go to **<https://app.powerbi.com/visuals>**.
2. In the **Visuals library** section, ensure that **Custom visuals** is selected, and then browse or search for **Donut Chart**.
3. Click the **Donut Chart** visual, and then click **Download Visual**.
4. In the license dialog box, click **I agree**.
5. At the download prompt, click **Save**, and download the Donut Chart to a folder on your local machine.
6. On the taskbar, click **Power BI Desktop**.
7. In the **Power BI Desktop** window, click **Open Other Reports**.
8. In the **Open** dialog box, browse to **D:\Demofiles\Mod08\Demo**, click **Adventure Works Sales.pbix**, and then click **Open**.
9. In the **Visualizations** pane, click the ellipsis (...), and then click **Import a custom visual**.
10. In the **Caution: Import Custom Visual** dialog box, click **Import**.
11. In the **Open** dialog box, browse to the location where you saved the Donut Chart, click **Donut Chart.x.x.x.pbiviz**, and then click **Open**.
12. In the **Import Custom Visual** dialog box, click **OK**.

Use a Custom Visualization:

1. In Power BI Desktop, in the **Report** view, at the bottom of the page, click the **Company Report** tab.
2. Click the **Line Total by Company Name** visual.
3. In the **Visualizations** pane, click the **DonutChartGMO** icon. Data that was previously displayed using the **Clustered column chart** should now be displayed in the **Donut Chart** visualization.
4. Close Power BI Desktop, without saving any changes, and then close Internet Explorer.

## Module Review and Takeaways

**Question:** Discuss the potential of the Power BI Developer API for your own organization. Are there any particular Power BI-based applications that you already use, or would like to see developed?

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



# Lab Review Questions and Answers

## Lab: Using the Developer API

### Question and Answers

#### Lab Review

**Question:** Do you think that the Sunburst visualization provides additional insights into the Sales Order data, compared with the clustered column chart that was originally used?

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

**Question:** From your own experience, are there any other custom visuals from the Power BI visuals gallery that would add value to the Sales Order data?

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



# Module 9

## Power BI Mobile

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## Lesson 1

# Power BI Mobile Apps

### Contents:

Question and Answers

3

## Question and Answers

**Question:** If you have an iOS, Android, or Windows 10 phone or tablet, download the Power BI app if you don't already have it. You do not need to sign in with a Power BI account, because you can use the sample data. However, an account will be needed for the lab. Users who do not have an account can create one using the following steps:

Ensure that the 20778A-1-MIA-DC and 20778A-1-MIA-SQL virtual machines are both running, and then log on to 20778A-1-MIA-SQL as **ADVENTUREWORKS\Student** with the password **Pa\$\$w0rd**.

Open Internet Explorer from the taskbar, and browse to the Office 365 Trial sign-up page, and follow the instructions: <http://aka.ms/Y682m2>.

Sign in to Power BI on your phone or tablet.

Explore the features of the Power BI app, and look at the samples and demo server if these are available. Discuss useful features that could be added to improve the app, in addition to features you like and don't like, and how they could be useful in your organization.

**Answer:** Answers depend on the opinions of the students, based on the version of the app they download, and how they think Power BI mobile can benefit their workplace.

## Module Review and Takeaways

**Question:** Discuss the types of information that are likely to work best on a mobile device. Ask students how they think Power BI mobile apps could be used in their own organizations, and which types of visualizations and data formats they would choose for mobile reports and dashboards.

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