

Preparing for Power BI Certification Exam 70-778

Presented by Ted Pattison
Born Again Power BI MVP

Agenda



- Preparing for the 70-778 Exam
 - Queries and Datasources
 - Data Modeling and DAX
 - Reports and Dashboards
 - Apps and App Workspaces



Skills Measured

- Consume and Transform Data with Power BI Desktop
(20-25%)
- Model and Visualize Data
(45-50%)
- Configure Dashboards in the Power BI Service
(25-30%)



Consume and Transform Data

- Connect to data sources
 - Connect to databases, files, folders
 - Import from Excel
 - Connect to SQL Azure, Big Data, SSAS
- Perform transformations
 - Design and implement basic & advanced transformations
 - Apply business rules
 - change data format to support visualization
- Cleanse data
 - Manage incomplete data
 - Meet data quality requirements



Model and Visualize Data – Part 1

- Create and optimize data models
 - Manage data relationships
 - Optimize models for reporting
 - Manually enter data
 - Use Power Query
- Create calculated columns, tables, and measures
 - Create DAX queries for calculated columns, tables, and measures
- Create performance KPIs
 - Calculate the actual, calculate the target, calculate actual to target
- Create hierarchies
 - Use date hierarchies, use business hierarchies, resolve hierarchy issues



Model and Visualize Data – Part 2

- Create and format interactive visualizations
 - Select a visualization type
 - Configure page layout and formatting
 - Setup visual relationships
 - Configure duplicate pages, handle categories that have no data
 - Setup default summaries and categories,
 - Position, align, and sort visuals
 - Enable and integrate R visuals
 - Format calculated measures



Model and Visualize Data – Part 3

- Manage custom reporting solutions
 - Use Power BI API
 - Use Microsoft Power BI Embedded
 - Enable developers to create dashboards with custom applications
 - Enable developers to embed dashboards in applications
 - Authenticate a Power BI web application
 - Enable developers to create custom visuals



Configure Dashboards – Part 1

- Configure a dashboard
 - Connect to the Power BI service
 - Publish connections to services by using SSAS
 - Publish visualizations including data
 - Configure a dashboard
 - Add text and images
 - Filter dashboards
 - Configure dashboard settings
 - Customize the URL and title
 - Enable natural language queries



Configure Dashboards – Part 2

- Publish dashboards
 - Publish to web
 - Publish to Microsoft SharePoint
 - Publish to SQL Server Reporting Services (SSRS)
- Configure security for dashboards
 - Create a security group by using the Admin Portal
 - Share dashboard with users or security groups
 - Integrate with Microsoft OneDrive for Business
 - Configure row-level Security
 - Configure gateways



Configure Dashboards – Part 3

- Configure organizational content packs and apps
 - Create a content pack
 - Publish a content pack
 - Edit a content pack
 - Package dashboards and reports
 - Configure app workspace



Sample Exam Question #1

Which of the following versions of the Windows operating system support installing Power BI Desktop?

✗ Windows Vista

→ Windows 10

→ Windows 8.1

→ Windows 7



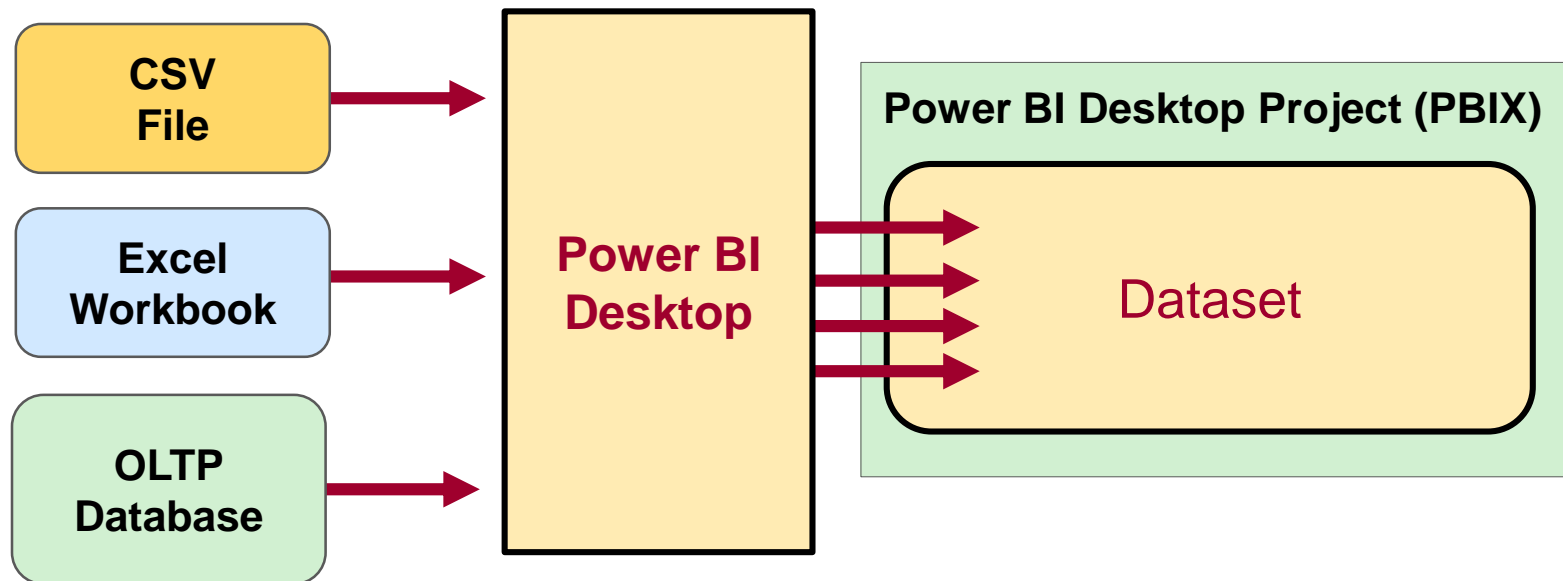
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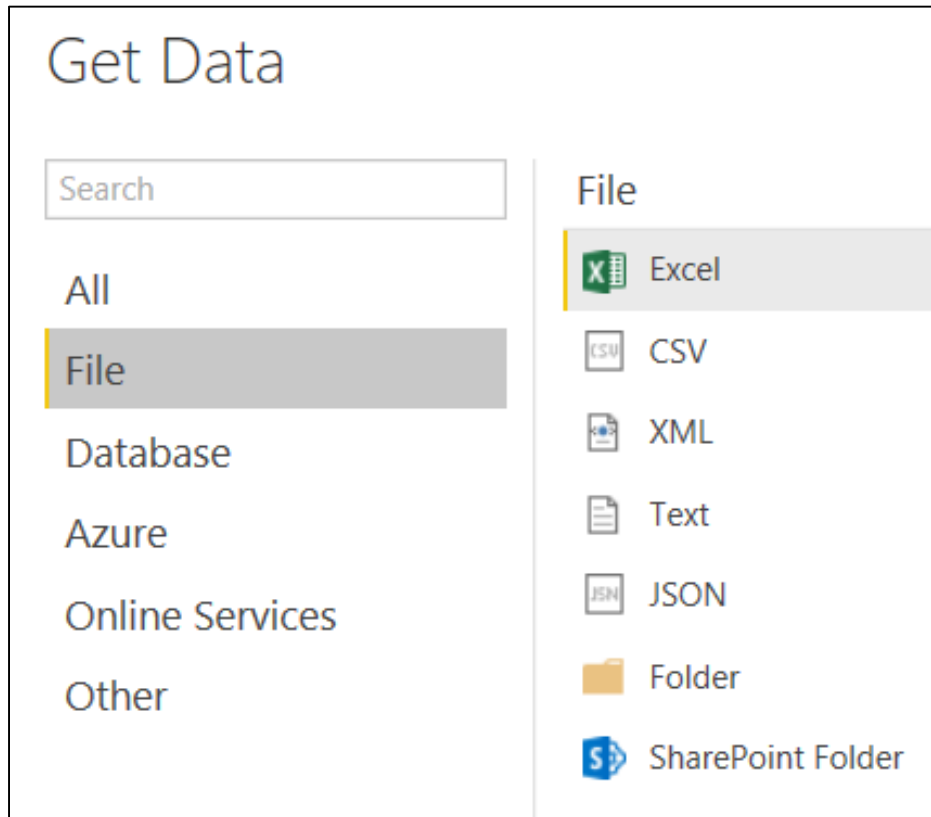
Power BI Desktop is an ETL Tool

- ETL process is essential part of any BI Project
 - **Extract** the data from wherever it lives
 - **Transform** the shape of the data for better analysis
 - **Load** the data into dataset for analysis and reporting



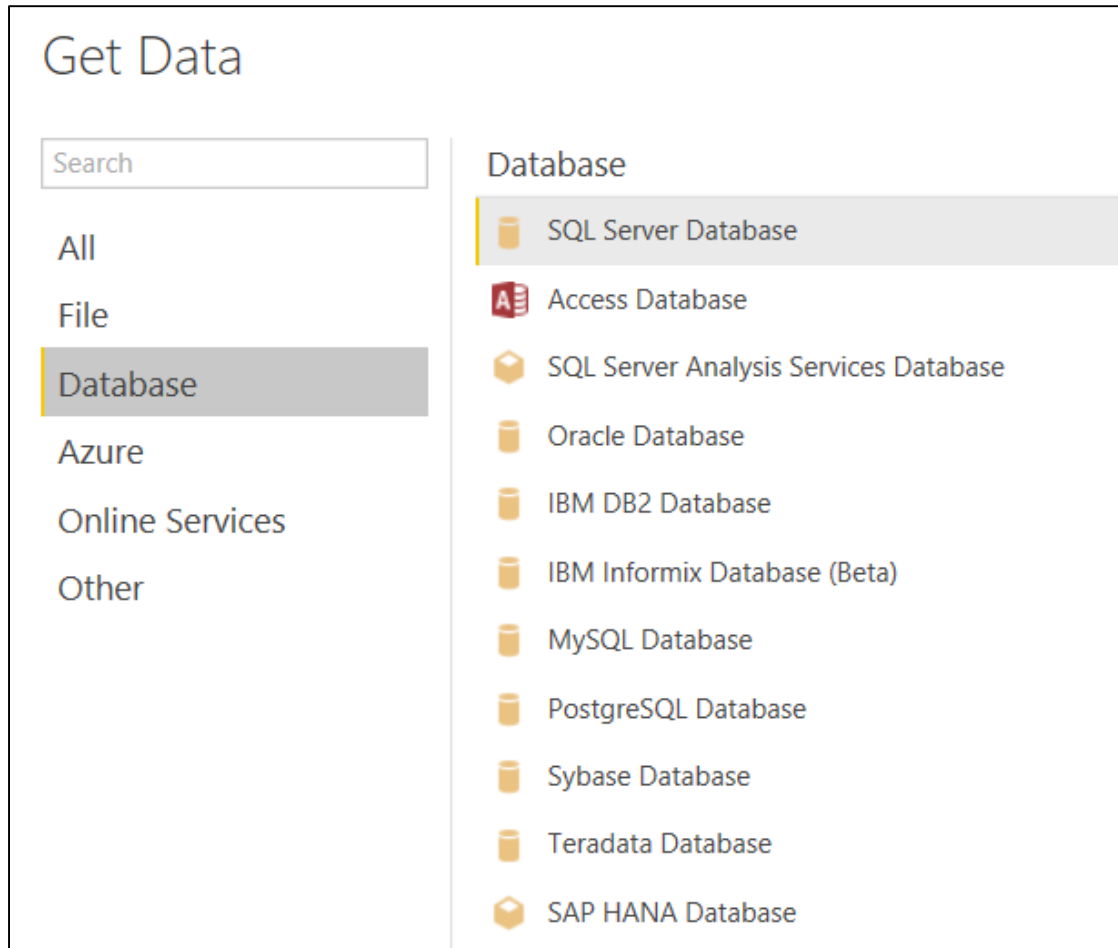
File-based Data Sources

- Power BI Desktop supports common file types



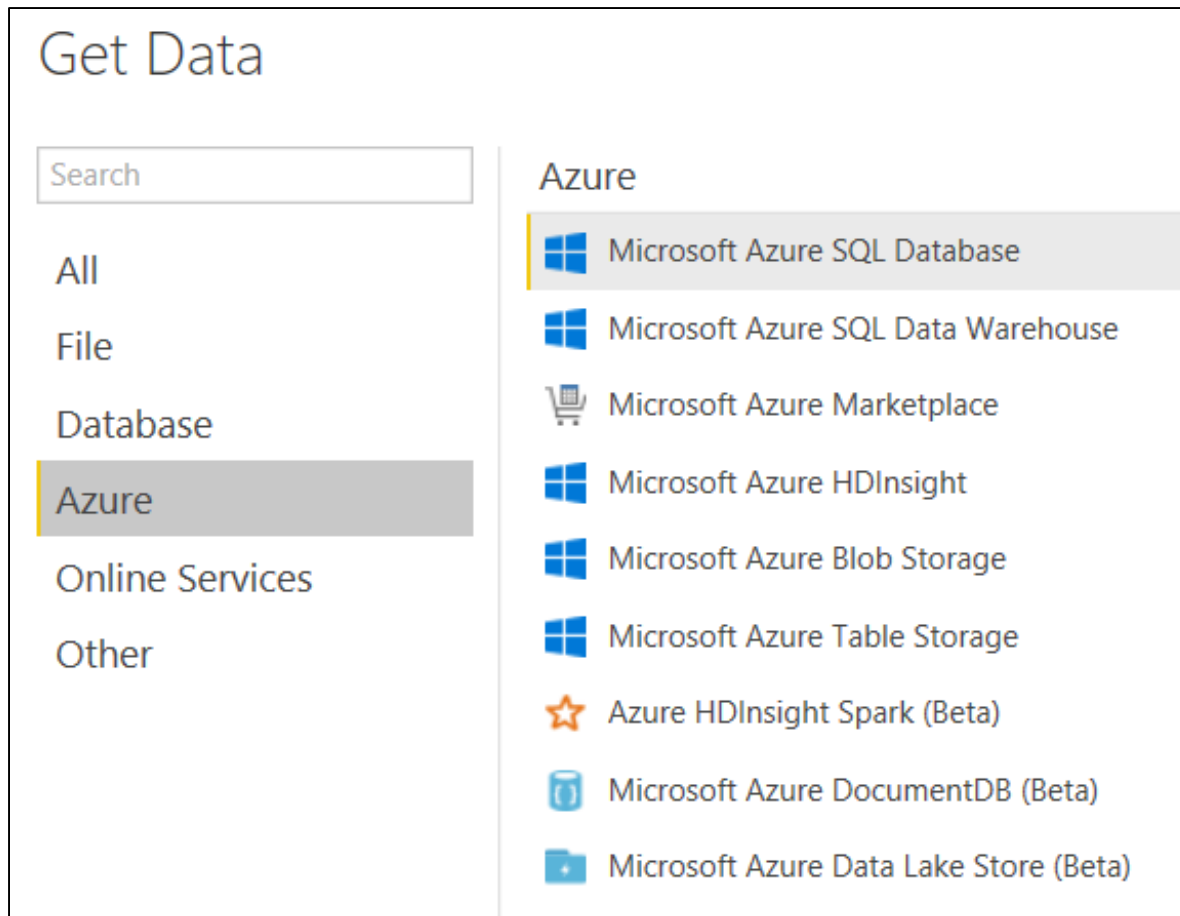
Supported Databases

- Power BI Desktop supports many database systems



Azure Data Sources

- Power BI Desktop supports many Azure data sources



Sample Exam Question #2

Which of the following items is never stored within a PBIX project file?

- ☐ Data for the rows of tables imported from external datasources
- ☐ Default values for query parameters
- ☐ Code written in R
- ☒ Data source credentials



Examples of Basic Query Steps

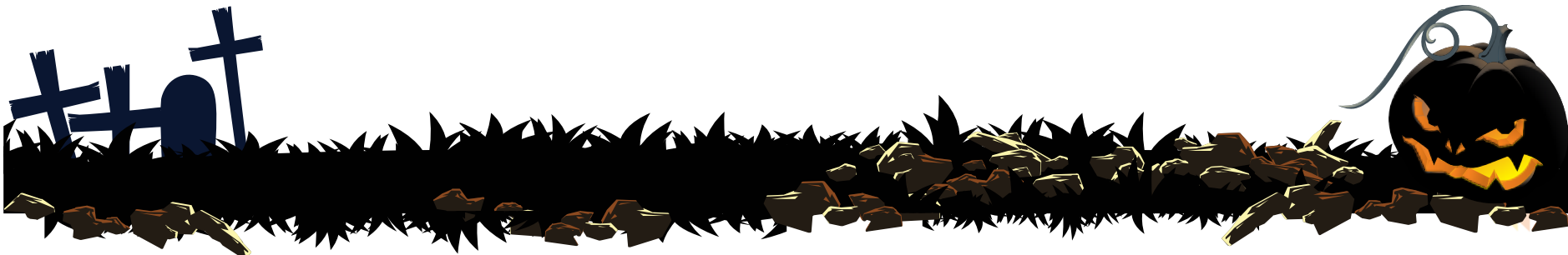
- Rename column
- Convert column type
- Format column values
- Replace column values
- Expanding related column
- Merging columns
- Splitting columns



Sample Exam Question #3

When designing a query in Power BI Desktop to clean up data, what operation can be used to remove non-printable characters?

- ☐ Scrub
- ☐ Trim
- ☒ Clean
- ☐ Sanitize




Query Steps for Cleaning Data

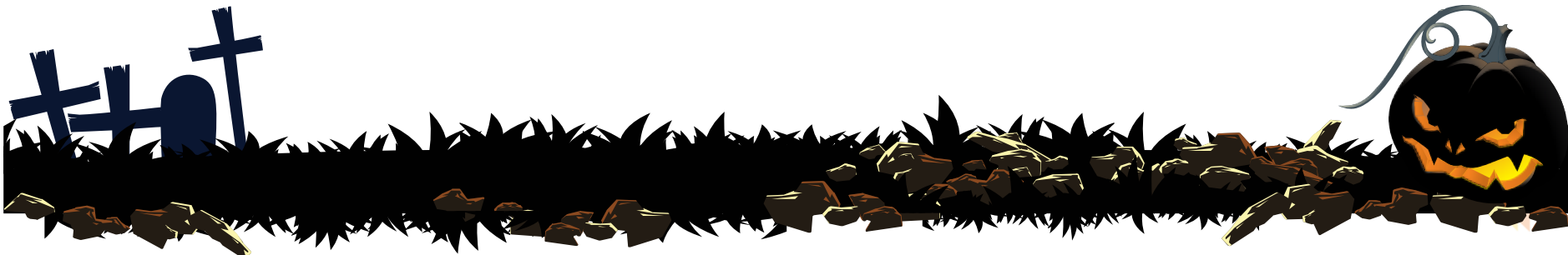
- Trim
 - Removes white space at start and end
- Clean
 - Removes non-printable characters
- Group By
 - Used to deduplicate rows and create unique ID values



Sample Exam Question #4

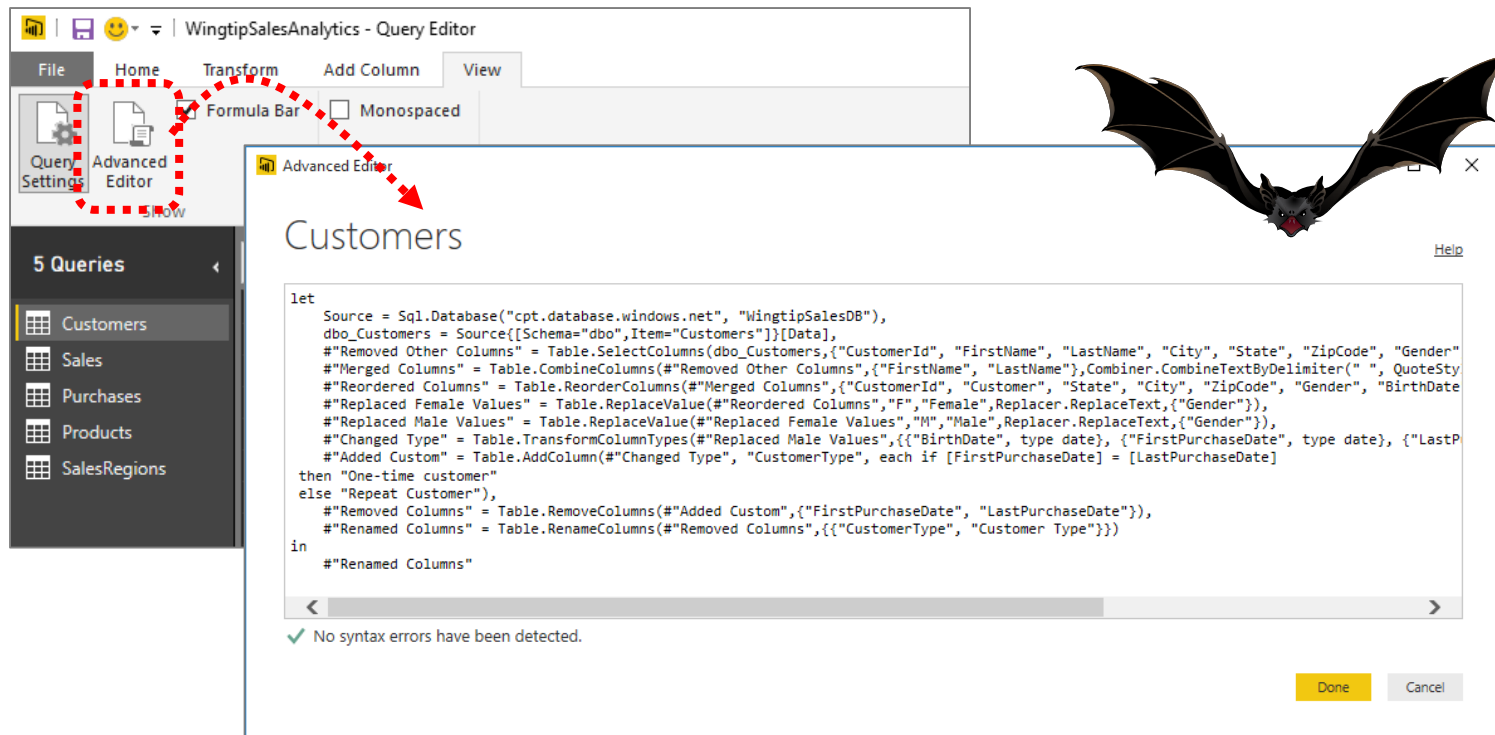
Which of the following is not a valid privacy level for a Power BI data source?

- ☐ Public
-  ☒ Protected
- ☐ Private
- ☐ Organizational



Queries and the M Language

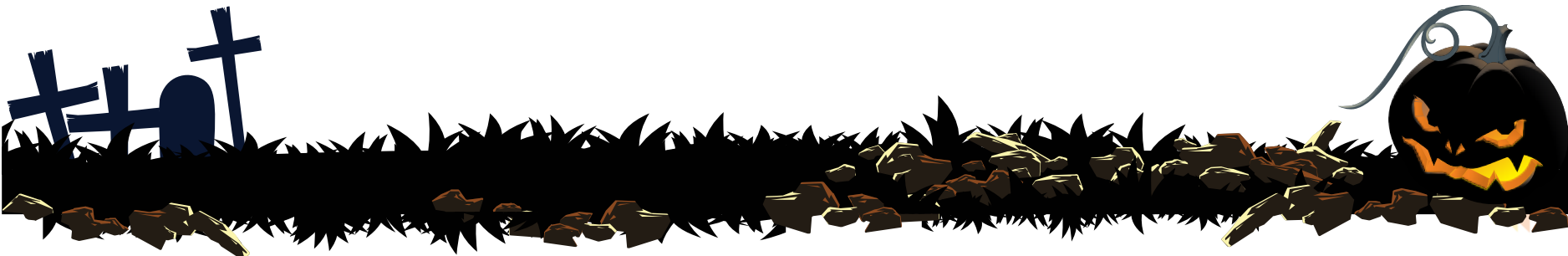
- Power BI Desktop based on "M" functional language
 - Query in Power BI Desktop saved as set of M statements in code
 - Query Editor generates code in M behind the scenes
 - Advanced users can view & modify query code in Advanced Editor



Sample Exam Question #5

Which of the following is not a valid variable type when programming in the M language?

- ☐ Record
- ☐ List
- ☐ Function
- ☒ Dataframe



Sample Exam Question #6

Which language(s) can be used when designing a query in Power BI Desktop?

→ SQL

→ M

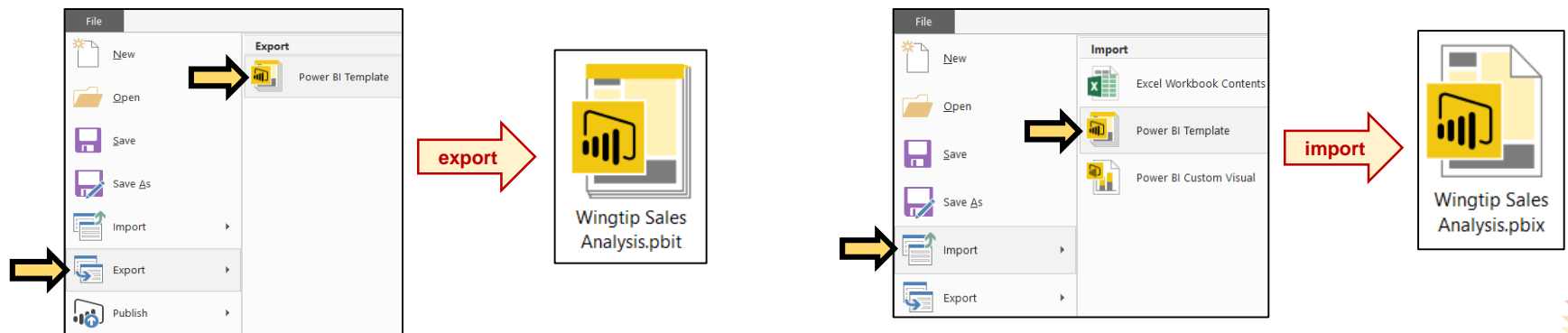
→ DAX

✗ Python



Power BI Project Template Files

- PBIX project can be exported to project template file
 - Template file created with PBIT file extension
 - Generated template files contains everything except for the data
 - PBIT template file can be imported to create new PBIX projects
 - Template files are powerful when used together with parameters
- How are template files used?
 - Export PBIX project to create a PBIT template file
 - Import the PBIT template file to create a new PBIX project



Sample Exam Question #7

Which of the following can be saved inside a PBIX project file but is never saved inside a PBIT project template file?

- ☐ Datasource credentials
- ☐ Query parameters
- ☒ Rows of data imported from tables in external datasources
- ☐ The default values for query parameters



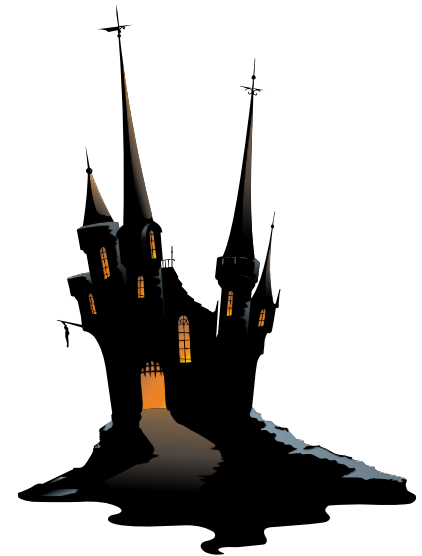
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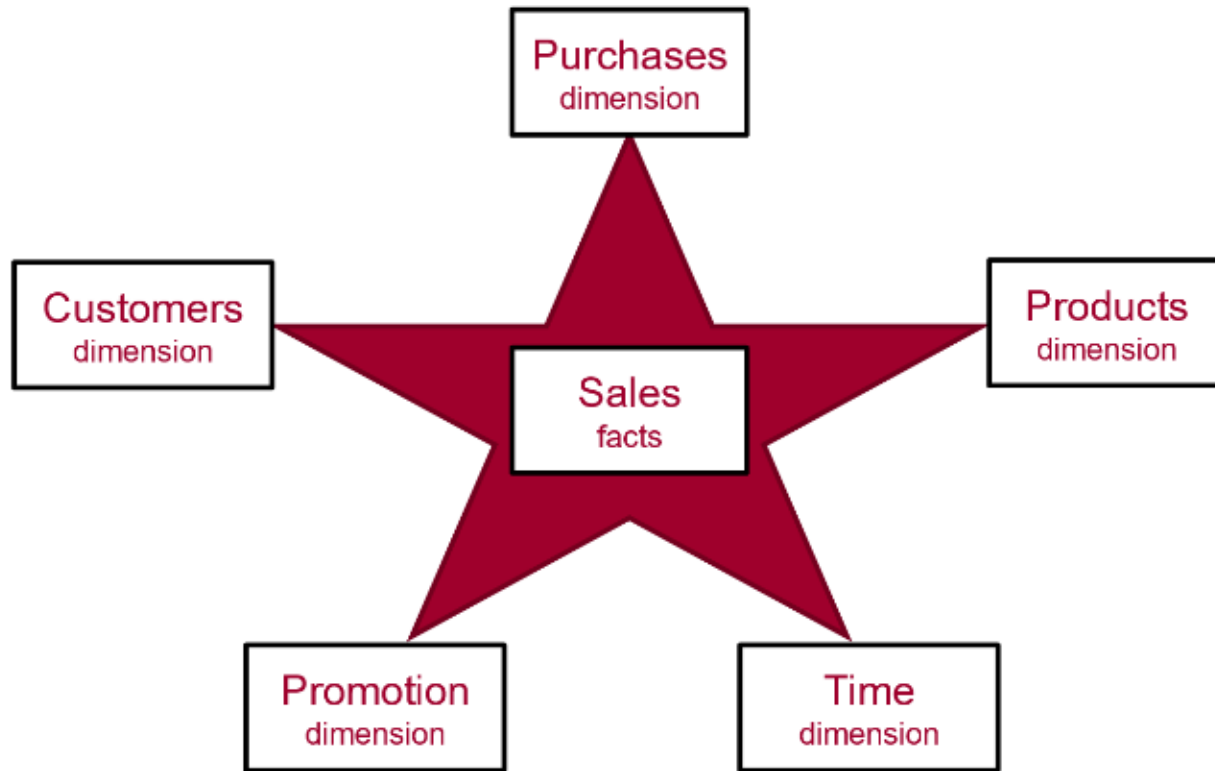
Data Modeling with Power BI Desktop

- Steps to create a data model with Power Pivot
 - Model imported tables using a star schema
 - Create relationships between tables
 - Modify columns (formatting, data category, etc)
 - Create calculated columns and measures
 - Create dimensional hierarchies
 - Add Calendar table(s)



Data Modeling using a Star Schema

- OLAP Modeling often based on Star Schema
 - Tables defined as fact tables or dimension tables
 - Fact tables related to dimension table using 1-to-many relationships



Sample Exam Question #8

When designing a data model with Power BI Desktop, which of the following statements are true regarding the rules for creating table relationships?



A relationship between two tables can be defined using multiple fields from each table.



At least one column defined in a table relationship must contain unique values.



A relationship between two tables must be defined using a single field from each table.

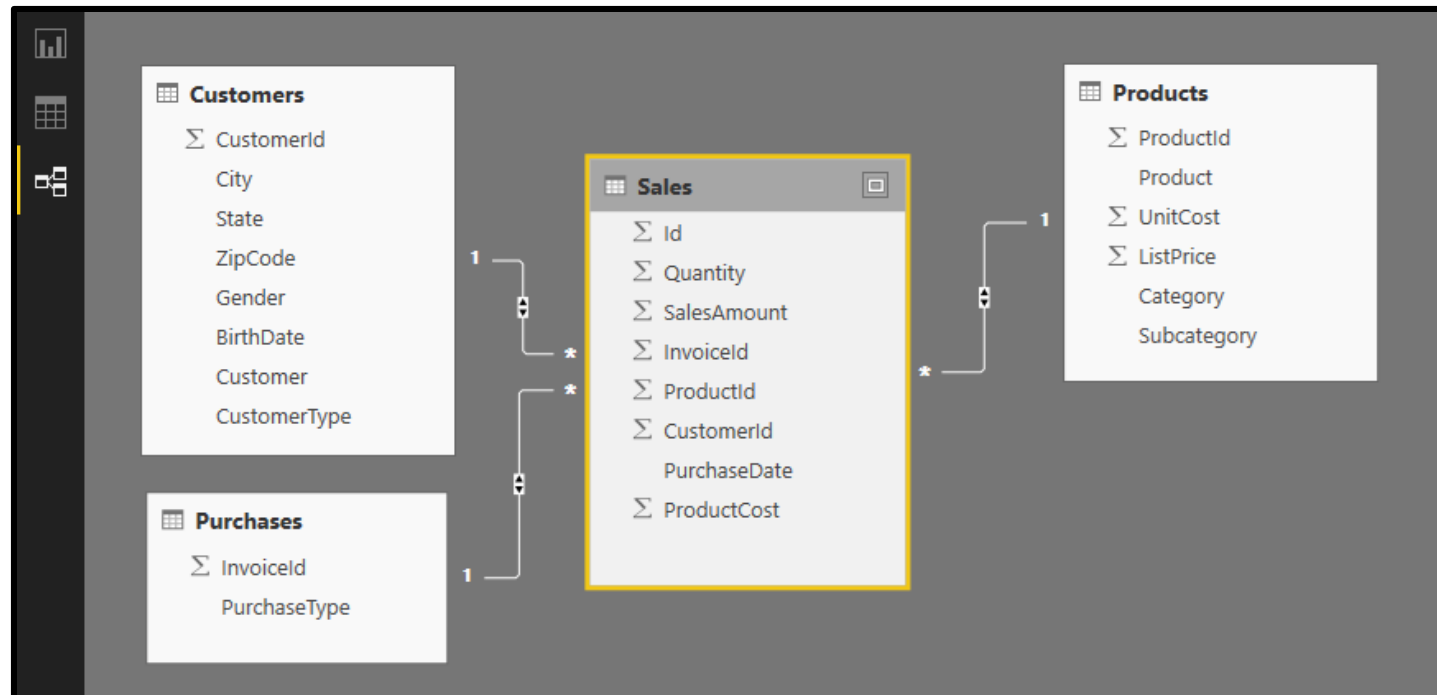


You can define multiple relationships between two tables in a data model but only one of the relationships can be marked as active.



Table Relationships

- Tables in data model associated with relationships
 - Relationships based on single columns
 - Tabular model supports [1-to-1] and [1-to-many] relationships
 - Relationships based on single column in each table



Relationship Properties

- Cardinality

Cardinality

Many to One (*:1)

Many to One (*:1)

One to One (1:1)

One to Many (1:*)

- Cross filter direction

Cross filter direction

Both

Single

Both

Edit Relationship

Select tables and columns that relate to one another.

Sales

Id	Quantity	SalesAmount	InvoiceId	ProductId	CustomerId	PurchaseDate	ProductCost
2899	100	100	1457	14	888	Thursday, June 21, 2012	\$8
3824	100	100	1901	14	1137	Saturday, July 21, 2012	\$8
3968	100	100	1969	14	1173	Wednesday, July 25, 2012	\$8

Customers

CustomerId	City	State	ZipCode	Gender	BirthDate	Customer	CustomerType
55	San Jose	CA	95110	Female	Thursday, March 10, 1949	Jewell Ryan	Repeat Customer
73	San Jose	CA	95123	Male	Thursday, May 9, 1985	Granville Perry	Repeat Customer
74	San Jose	CA	95122	Female	Tuesday, June 19, 1979	Sheri Mercado	Repeat Customer

Cardinality

Many to One (*:1)

Cross filter direction

Both

☒ Make this relationship active

OK Cancel



The RELATED Function

- RELATED function performs cross-table lookup
 - Effectively replaces older VLOOKUP function
 - Used in many-side table to look up value from one-side
 - Used to pull data from lookup table into primary table


Sales Region = RELATED(SalesRegions[SalesRegion])										
CustomerId	City	State	ZipCode	Gender	BirthDate	Customer	CustomerType	Age	Age Group	Sales Region
55	San Jose	CA	95110	Female	3/10/49	Jewell Ryan	Repeat Customer	66	Ages 65 and over	Western Region
73	San Jose	CA	95123	Male	5/9/85	Granville Perry	Repeat Customer	30	Ages 30 TO 39	Western Region
74	San Jose	CA	95122	Female	6/19/79	Sheri Mercado	Repeat Customer	36	Ages 30 TO 39	Western Region
78	San Jose	CA	95110	Male	6/16/78	Raleigh Olson	Repeat Customer	37	Ages 30 TO 39	Western Region
136	San Jose	CA	95124	Female	1/2/45	Carrie Foreman	Repeat Customer	70	Ages 65 and over	Western Region
150	San Jose	CA	95134	Female	8/11/84	Renee McMillan	Repeat Customer	31	Ages 30 TO 39	Western Region

State Name = RELATED(SalesRegions[StateFullName])

State	ZipCode	Gender	BirthDate	Customer	CustomerType	Age	Age Group	Sales Region	State Name
CA	95110	Female	3/10/49	Jewell Ryan	Repeat Customer	66	Ages 65 and over	Western Region	California
CA	95123	Male	5/9/85	Granville Perry	Repeat Customer	30	Ages 30 TO 39	Western Region	California
CA	95122	Female	6/19/79	Sheri Mercado	Repeat Customer	36	Ages 30 TO 39	Western Region	California
CA	95110	Male	6/16/78	Raleigh Olson	Repeat Customer	37	Ages 30 TO 39	Western Region	California
CA	95124	Female	1/2/45	Carrie Foreman	Repeat Customer	70	Ages 65 and over	Western Region	California
CA	95134	Female	8/11/84	Renee McMillan	Repeat Customer	31	Ages 30 TO 39	Western Region	California

Sample Exam Question #9

When writing the DAX expression for a calculated column, you can assume your DAX code automatically has row context for the table in which the calculated column is defined.

 ☒ True

☐ False

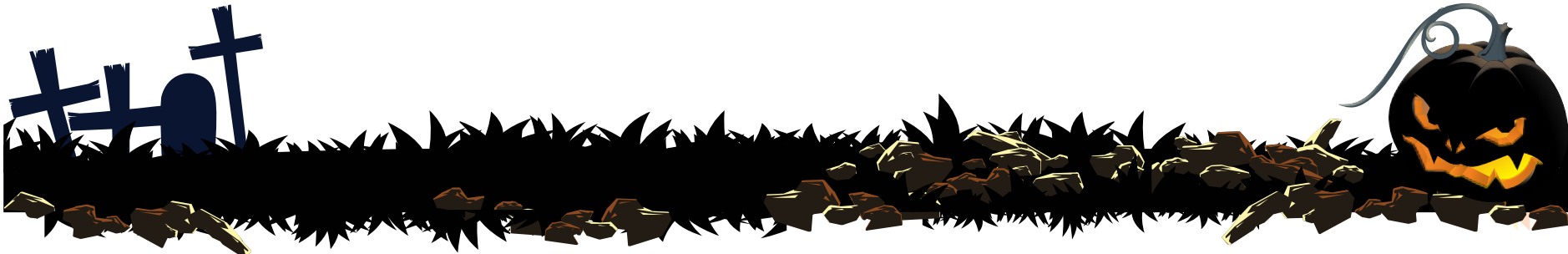


Sample Exam Question #10

When writing the DAX expression for a measure, you can assume your DAX code automatically has row context for the table in which the measure is defined

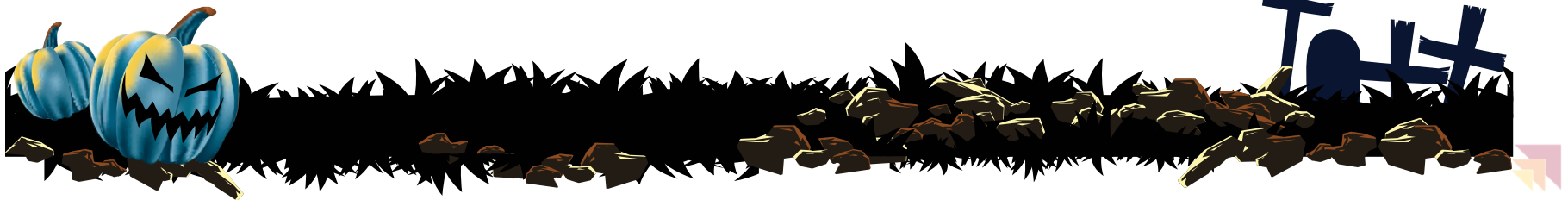
☐ True

☒ False




Calculated Columns vs Measures

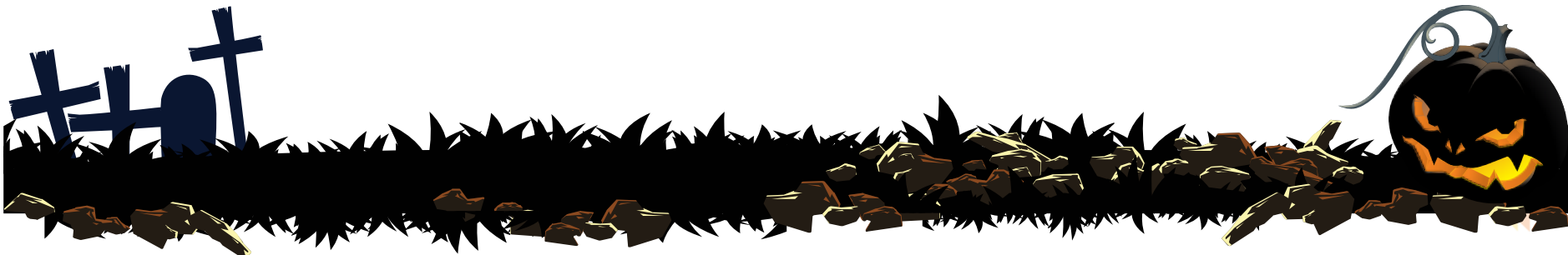
- Calculated Columns (aka Columns)
 - Evaluated based on row context
 - Evaluated when data model is loaded into memory
 - Defined within scope of table inside data model
- Measures
 - Evaluated at query time based on current filter context
 - Commonly used for aggregations (e.g. SUM, AVG, etc.)
 - Defined at scope of data model



Sample Exam Question #11

Which of the following statements is false?

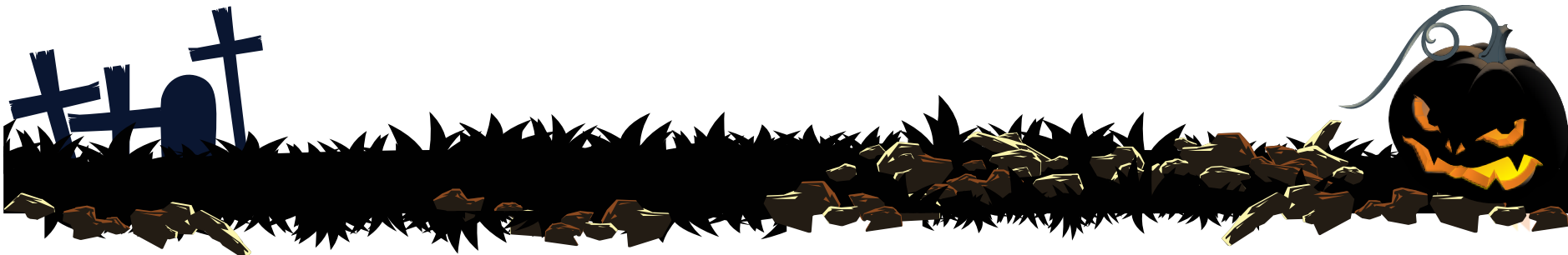
- ☐ When referencing a calculated column in a DAX expression, you must include the table name.
-  ☒ When referencing a measure in a DAX expression, you must include the table name.
- ☐ When referencing a measure in a DAX expression, you should prefer not include the table name.
- ☐ When referencing a measure in a DAX expression, you can optionally include the table name.



Sample Exam Question #12

Which of the following statements are true about data modeling in Power BI Desktop project?

- ✗ Within a Power BI Desktop project, all dimensional hierarchy names must be unique.
- Within a Power BI Desktop project, all measure names must be unique.
- ✗ Within a Power BI Desktop project, all calculated column names must be unique.
- Within a Power BI Desktop project, all query parameter names must be unique.



Working with DAX

- DAX is the language used to create data model
 - DAX stands for "Data Analysis Expression Language"
- DAX expressions are similar to Excel formulas
 - They always start with an equal sign (=)
 - DAX provides many built-in functions similar to Excel
- DAX Expressions are unlike Excel formulas...
 - DAX expressions cannot reference cells (e.g. A1 or C4)
 - Instead DAX expressions reference columns and tables

```
=SUM('Sales' [SalesAmount])
```




Types of DAX Functions

- Date and Time Functions
- Information Functions
- Logical Functions
- Mathematical and Trigonometric Functions
- Statistical Functions
- Filter Functions
- Text Functions
- Time Intelligence Functions



Sample Exam Question #13

Which of the following DAX functions does not return a table?

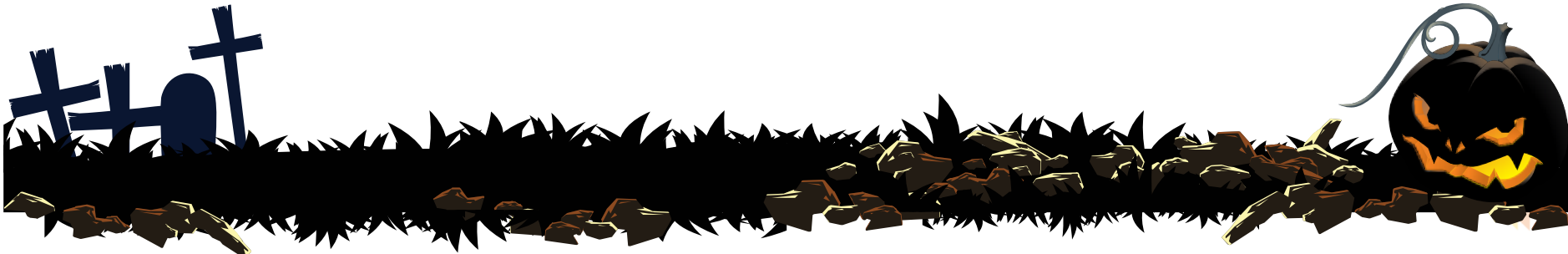
-  ☒ Calculate
- ☐ Values
- ☐ AllExcept
- ☐ Filter



Sample Exam Question #14

Which of the following DAX expressions are valid and can be used for table filters when configuring row-level security

- ✗ `[State]="WA" OR [State]="OR" OR [State]="CA"`
- `OR([State]="WA", OR([State]="OR", [State]="CA"))`
- `[State]="WA" || [State]="OR" || [State]="CA"`
- ✗ `[State] IN ("WA", "OR", "CA")`



Sample Exam Question #15

Which of the following Data Category settings can be used for mapping data to geographic locations in Power BI?

- Latitude and Longitude (e.g. 47.6080, -122.3351)
- A city (e.g. London)
- An address (e.g. 1 Microsoft Way, Redmond, WA 98052)
- A place (e.g. Logan International Airport)



Geographic Field Metadata

- Fields in data model have metadata properties
 - Metadata used by visuals and reporting tools
 - Used as hints to Bing Mapping service
 - “Tampa, FL” value mapped as **Place** and not as **City**

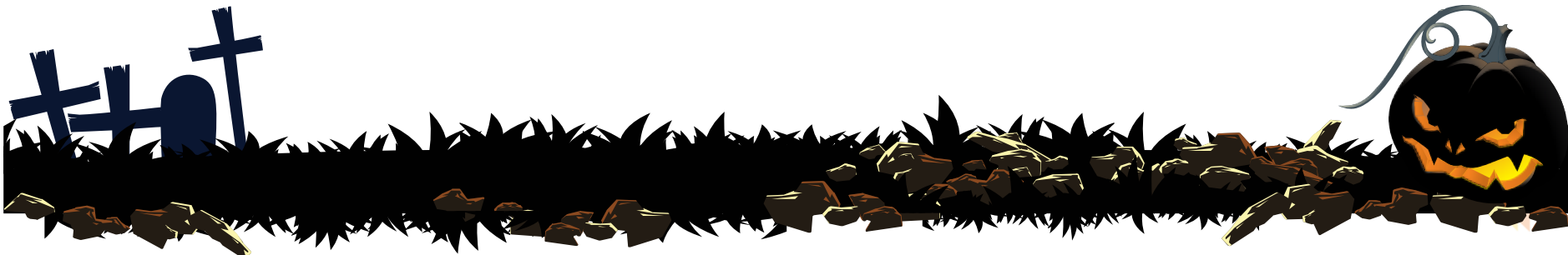
The screenshot shows the Power BI Desktop interface with the 'Modeling' tab selected. A data table is displayed with columns: State, Zipcode, Gender, BirthDate, and Customer. The 'State' column is highlighted. A dropdown menu for 'Data Category' is open, showing options like 'City', 'State or Province', etc. The 'State or Province' option is selected, and an arrow points to it from the 'State' field in the data table.

State	Zipcode	Gender	BirthDate	Customer
CA	95133	Female	3/16/1968	Lucile Blake
CA	95133	Female	7/19/1942	Rochelle Owens
CA	95133	Female	3/7/1943	Corinne Finch
CA	95133	Female	9/3/1990	Twila Masse
CA	95133	Female	7/14/1955	Kellie Yang
CA	95133	Female	3/25/1951	Megan Marshall
CA	95133	Female	4/3/1946	Cynthia Blake
CA	95133	Female	5/2/1960	Karyn Hodgson
CA	95133	Female	5/26/1948	Priscilla Potter
CA	95133	Female	11/10/1949	Nadia Gray

Sample Exam Question #16

Which of the following statements are true with respect to designing a Power BI Desktop project in DirectQuery mode?

- ✗ You cannot add calculated columns to the data model.
- All queries within the project must be based on a single source database.
- You cannot convert column data types when editing a query.
- ✗ You cannot add measures to the data model.



Limitations of DirectQuery

- DirectQuery imposes the following limitations
 - All tables must come from a single database
 - Many types of query steps are not supported
 - You cannot convert column type in a query
 - No special treatment of date columns
 - Calculated columns only allowed since June 2017
 - By default, limitations placed on DAX in measures



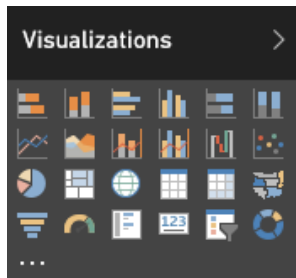
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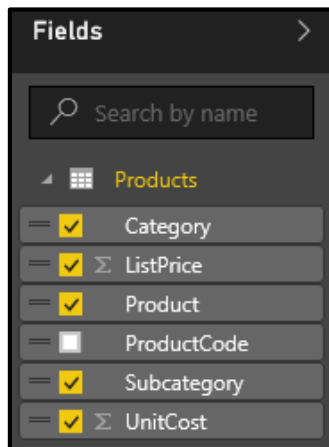


Visuals (aka Visualizations)

- Reports are designed using visual (aka visualizations)
 - Each visual is based on an underlying visualization type
 - Visualization type can be changed using **Visualizations** pane



- Visuals creating by using fields from tables inside **Fields** list



Power BI Licensing

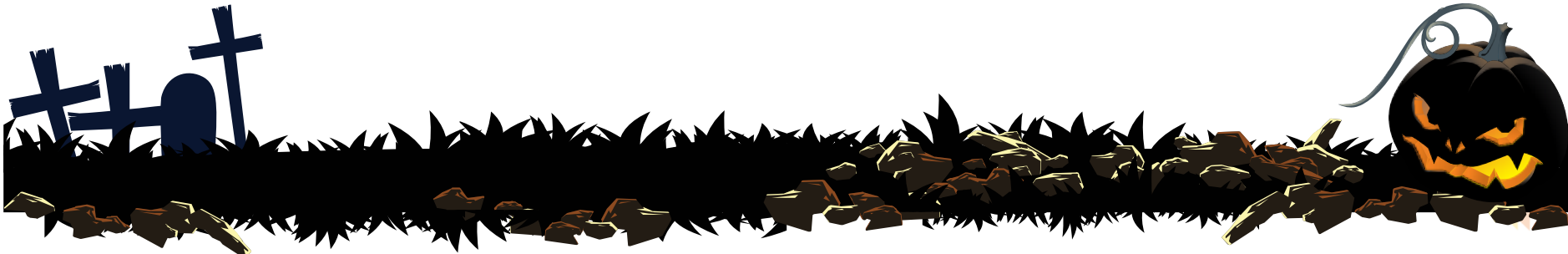
- Microsoft initially offered two Power BI licensing options
 - Power BI Free license
 - Power BI Pro license (\$10/month)
 - Everything has been running within a shared capacity
- Microsoft recently introduced Power BI Premium licensing
 - Power BI Premium customers can create dedicated capacities
 - Power BI Premium licensing has monthly fee for dedicated capacity
 - Dedicated capacity remove limits on upload size and # of refreshes
 - Dedicated capacity can serve Power BI content to non-licensed users
- More info at <https://powerbi.microsoft.com/en-us/pricing/>
 - Please ask questions about licensing offline and not during lectures



Sample Exam Question #17





Which of the following field types can be added to the Field well of a Slicer visual?

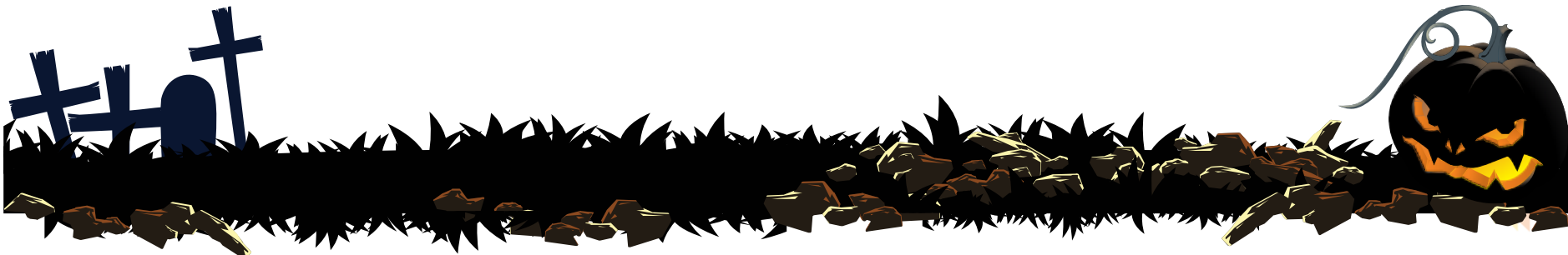
- Groups created inside a table using the "New Group" Command in Power BI Desktop
- Calculated columns created with a DAX expression
- ✗ Measures created by a DAX expression
- Native columns returned by a query



Sample Exam Question #18

Into which of the following scopes can you import a custom visual created for Power BI?

-  Into the scope of an app workspace
-  Into the scope of a Power BI Desktop project
-  Into the scope of your personal workspace
-  Into the scope of a premium capacity







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Sample Exam Question #19

Which of the following are advantages associated with moving an App Workspace into a premium capacity created using a Power BI Premium P1 subscription?

-  Users who have the Power BI Free license can enter the App Workspace for read-only access to its content
-  Dashboards within the App Workspace can be shared with users who have the Power BI Free license
-  The App published from the App Workspace can be installed and consumed by users who have the Power BI Free license
-  Reports and dashboards from the App Workspace can be embedded in custom applications and served to non-licensed users



Sample Exam Question #20

Which of the following Power BI subscriptions provides the proper licensing for users to view Power BI content through the Power BI mobile apps?

- ☒ Power BI Pro (user license)
- ☒ Power BI Free (user license)
- ☐ Power BI Premium EM3 (capacity license)
- ☒ Power BI Premium P1 (capacity license)



The background is a Halloween-themed illustration. It features a dark orange and black color scheme. At the top, there are black, gnarled tree branches with small brown leaves. A large, white spiderweb is on the left. Several jack-o'-lanterns with glowing yellow faces are scattered around. In the bottom foreground, there is a field of black grass and several grey tombstones. One tombstone is clearly visible with the text 'R.I.P TABLEAU'. A large bat with spread wings is flying in the center. Other smaller bats are visible in the background. The overall atmosphere is spooky and festive.

Summary

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Critical Path Training

<https://www.CriticalPathTrainig.com>

- **PBI365: Power BI Certification Bootcamp – 4 Days**
 - Audience is Business Users, Analysts and Data Professionals
 - Provides hands-on introduction to the Power BI platform
 - Focuses on build solutions using Power BI Desktop
 - Query design, data modeling and report and dashboard design
 - Apps and App Workspaces
 - Learn about “import” vs “connect to” with Excel workbooks
- **PBD365: Power BI Developer Bootcamp – 4 Days**
 - Audience is Professional Developers
 - Teaches developing custom visuals with TypeScript and D3
 - Teaches R programming and integrating R with Power BI
 - Teaches programming with the Power BI APIs
 - Teaches developing with Power BI Embedded

