Using functions, formulas and calculations in Web Intelligence
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# Document History: Web Intelligence Functions, Formulas and Calculations

The following table provides an overview of the most important document changes.

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>SAP BusinessObjects Interactive Analysis 4.0</td>
<td>30, November 2011</td>
<td>Initially rebranded Interactive Analysis. First release of this document</td>
</tr>
<tr>
<td>SAP BusinessObjects Interactive Analysis 4.0 Service Pack 1</td>
<td>25, February 2011</td>
<td>Support Package 1</td>
</tr>
<tr>
<td>BusinessObjects Web Intelligence 4.0 Service Pack 2</td>
<td>15, June 2011</td>
<td>Support Package 2. Rebranded back to Web Intelligence</td>
</tr>
<tr>
<td>BusinessObjects Web Intelligence 4.0 Feature Pack 3</td>
<td>20, February 2012</td>
<td>Feature Pack 3</td>
</tr>
<tr>
<td>BusinessObjects Web Intelligence 4.1</td>
<td>10, May 2013</td>
<td>Includes RTL (Right-to-Left) support for Arabic locale, this particularly affects the meaning of the following character functions for RTL locales:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Left</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• LeftPad</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• LeftTrim</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Right</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• RightPad</td>
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<td></td>
<td>• RightTrim</td>
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Using functions, formulas and calculations in Web Intelligence

Document History: Web Intelligence Functions, Formulas and Calculations
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2 About this guide

The Using Functions, Formulas and Calculations in Web Intelligence guide provides detailed information on the advanced calculation capabilities available when you perform data analysis. It also provides a syntax reference to the available functions and operators.
3 Using standard and custom calculations

You can use standard calculation functions to make quick calculations on data.

If standard calculations are not sufficient for your needs, you can use the formula language to build custom calculations.

3.1 Standard calculations

You can use standard calculation functions to make quick calculations on data.

The following standard calculations are available:

<table>
<thead>
<tr>
<th>Calculation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sum</td>
<td>Calculates the sum of the selected data.</td>
</tr>
<tr>
<td>Count</td>
<td>Counts all rows for a measure object or count distinct rows for a dimension or detail object.</td>
</tr>
<tr>
<td>Average</td>
<td>Calculates the average of the data.</td>
</tr>
<tr>
<td>Minimum</td>
<td>Displays the minimum value of the selected data.</td>
</tr>
<tr>
<td>Maximum</td>
<td>Display the maximum value of the selected data.</td>
</tr>
<tr>
<td>Percentage</td>
<td>Displays the selected data as a percentage of the total. The results of the percentage are displayed in an additional column or row of the table.</td>
</tr>
</tbody>
</table>

**Note**

Percentages are calculated for the selected measure compared to the total results for that measure on the table or break. To calculate the percentage of one measure compared to another measure, you need to build a custom calculation.

Default

Applies the default aggregation function to a standard measure, or the database aggregation function to a smart measure.

When you apply standard calculations to table columns, the calculation results appear in footers. One footer is added for each calculation.

3.2 Using formulas to build custom calculations

Custom calculations allow you to add additional calculations to your report beyond its base objects and standard calculations.

You add a custom calculation by writing a formula. A formula can consist of base report variables, functions, operators and calculation contexts.
A custom calculation is a formula that can consist of report objects, functions and operators. Formulas have a calculation context that you can specify explicitly if you choose.

**Example**

**Showing average revenue per sale**

If you have a report with Sales Revenue and Number Sold objects and you want to add revenue per sale to the report. The calculation \( \frac{\text{Sales Revenue}}{\text{Number Sold}} \) gives this value by dividing the revenue by the number of items sold in order to give the revenue per item.

**Related Information**

*Calculation contexts defined [page 16]*

The calculation context is the data that a calculation takes into account to generate a result. This means that the value given by a measure is determined by the dimensions used to calculate the measure.

### 3.2.1 Using variables to simplify formulas

If a formula is complex you can use variables to simplify it.

By using variables you break a complex formula down into manageable parts and make it much easier to read, as well as making building formulas much less error-prone.

You can use previously-created variables in a formula in exactly the same way as you use other report objects. Variables appear in the formula editor under the Variables folder.

You can type this variable name into a formula or drag the variable to the Formula toolbar as you would for any report object.

**Related Information**

*Simplifying a variance formula with variables [page 13]*

Variance is a statistical term. The variance of a set of values measures the spread of those values around their average.

### 3.3 Working with functions

A custom calculation sometimes contains only report objects, for example \( \frac{\text{Sales Revenue}}{\text{Number of Sales}} \). Calculations can also include functions in addition to report objects.
A function receives zero or more values as input and returns output based on those values. For example, the \textit{Sum} function totals all the values in a measure and outputs the result. The formula \texttt{Sum([Sales Revenue])} outputs a total of sales revenues. In this case, the function input is the Sales Revenue measure and the output is the total of all Sales Measures.

\subsection*{Related Information}

\textit{Function and formula operators} [page 14]

Operators link the various components in a formula.

\textit{Functions} [page 44]

Formula functions are divided into several categories.

\subsection*{3.3.1 Including functions in cells}

The text in report cells always begins with `=`.

Literal text appears in quotation marks, while formulas appear without quotation marks. For example, the formula \texttt{Average([Revenue])} appears in a cell as \texttt{=Average([Revenue])}. The text “Average Revenue?” appears as \texttt{="Average Revenue?"}

You can use text alone in a cell, or mix formulas and text by using the `+` operator. If you want a cell to display the average revenue preceded by the text “Average Revenue:”, the cell text is as follows: \texttt{="Average Revenue: " + Average([Revenue])}

Note the space at the end of the text string so that the text and the value are not placed directly side-by-side in the cell.

\subsection*{3.3.2 Function syntax}

The \textit{Formula Editor} displays the function syntax when you select the function.

To use a function you need to know its name, how many input values it requires and the data types of these input values. You also need to know the type of data that the function outputs.

For example, the \textit{Sum} function takes a numerical object as input (for example a measure showing sales revenue) and outputs numeric data (the sum of all the values of the measure object).

Here is the syntax of the \texttt{Abs} function:

\begin{verbatim}
num Abs(number)
\end{verbatim}

This syntax tells you that the \texttt{Abs} function takes a single number as input and returns a number as output.
3.3.3 Examples of functions

This topic offers examples of functions used in formulas.

**Example**

**Showing prompt input with the UserResponse function**

You have a report showing Year, Quarter and Sales revenue. The State object also appears in the report data, although it is not displayed. When the user runs the report they are presented with a prompt and they must choose a state. You want to show the state that they have chosen in the report title. If your data provider is called “eFashion” and the text in the prompt is “Choose a State”, the formula for the title is:

"Quarterly Revenues for " + UserResponse("eFashion");"Choose a State")

The report is as follows when the user has chosen Illinois as the state when refreshing the data provider:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>$256,454</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>$241,458</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>$107,006</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>$133,306</td>
</tr>
<tr>
<td>2001</td>
<td>Total</td>
<td>$738,223.80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>Q1</td>
<td>$334,297</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>$254,722</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>$230,573</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>$331,067</td>
</tr>
<tr>
<td>2002</td>
<td>Total</td>
<td>$1,150,058.80</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>Q1</td>
<td>$255,658</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>$354,724</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>$273,186</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>$260,517</td>
</tr>
<tr>
<td>2003</td>
<td>Total</td>
<td>$1,134,085.40</td>
</tr>
</tbody>
</table>

**Example**

**Calculating a percentage using the Percentage function**

The Percentage function calculates percentages. This function calculates the percentage of a number in relation to its surrounding context. For example, the following table shows revenues by year and quarter. The percentage column contains the formula Percentage ([Sales Revenue]).
In this case the function calculates each revenue as a percentage of the total revenue. The surrounding context is the total revenue; this is the only revenue figure that is relevant outside the breakdown by year and quarter in the table.

If the report is split into sections by year, the surrounding context outside the table becomes the total revenue in the section.

If the Percentage cell is placed outside the table but still inside the section, the surrounding context becomes the total revenue. In this case the Percentage function calculates the total revenue for the section as a percentage of the total overall revenue.
Example

Calculating a percentage using the Sum function

You can gain more control over the context in which a percentage is calculated by using the Sum function rather than the Percentage function. If you divide one figure in a set of figures by the total of those figures, you get its percentage of the total; for example, the formula ([Sales Revenue]/Sum([Sales Revenue])) gives the sales revenue as a percentage of the total revenue.

In the following table the Percentage of Total column has the formula:

\[
\frac{\text{[Sales revenue]}}{\text{Sum([Sales revenue] In Report)}}
\]

and the Percentage of Year column has the formula:

\[
\frac{\text{[Sales revenue]}}{\text{Sum([Sales revenue] In Section)}}
\]

These formulas take advantage of the extended syntax keywords Report and Section to instruct the Sum function to calculate the overall total revenue and yearly revenue respectively.
3.3.3.1 Simplifying a variance formula with variables

Variance is a statistical term. The variance of a set of values measures the spread of those values around their average.

The \texttt{Var} function calculates the variance in one step, but manual calculation of variance provides a good example of how to simplify a complex formula using variables. To calculate the variance manually you need to:

- calculate the average number of items sold
- calculate the difference between each number of items sold and the average, then square this value
- add up all these squared differences
- divide this total by the number of values - 1

You have a report showing numbers of items sold by quarter and you want to include the variance. Without the use of variables to simplify it, this complex formula is as follows:

\[
\text{Sum}(((\text{[Quantity sold]} - \text{Average(ForEach [Quarter] In Report)})*\text{[Quantity sold]} - \text{Average(ForEach [Quarter] In Report)})*\text{[Quarter]})/(\text{Count (ForEach [Quarter]} - 1)
\]

Creating the variance formula

There are several steps involved in creating a variance formula. You encapsulate each of these steps in a variable. The variables you create are:

- average number of items sold
- number of observations (that is, the number of separate values of the number of items sold)
- difference between an observation and the average, squared
- sum of these differences divided by the number of observations - 1

The variable formulas are as follows:

<table>
<thead>
<tr>
<th>Variable</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Sold</td>
<td>\text{Average(ForEach [Quarter] In Report)}</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>\text{Count(ForEach [Quarter] In Report)}</td>
</tr>
<tr>
<td>Difference Squared</td>
<td>\text{Power(\text{[Quantity sold]} - \text{Average(ForEach [Quarter])},2)</td>
</tr>
<tr>
<td>Variance</td>
<td>\text{Sum(ForEach [Quarter]})/\text{[(Number of Observations] - 1)}</td>
</tr>
</tbody>
</table>
The final formula becomes the following:

\[
\text{Sum (}[\text{Difference Squared}] / \text{[Number of Observations]} - 1)
\]

This formula is much easier to understand. This simplified version of the formula gives you a high-level view of what the formula is doing, rather than plunging you into the confusing details. You can then examine the formulas of the variables referenced in the high-level formula to understand its component parts.

For example, the formula references the variable Difference Squared, which itself references the variable Average Sold. By examining the formulas of Difference Squared and Average sold, you can drill down into the formula to understand the details of what it is doing.

### 3.3.4 Function and formula operators

Operators link the various components in a formula.

Formulas can contain mathematical, conditional, logical, function-specific or extended syntax operators.

#### 3.3.4.1 Mathematical operators

Mathematical operators are familiar from everyday arithmetic.

There are addition (+), subtraction (-), multiplication (\*), division (/) operators that allow you to perform mathematical operations in a formula. The formula \([\text{Sales Revenue}] - [\text{Cost of Sales}]\) contains a mathematical operator, in this case subtraction.

**Note**

When used with character strings, the ‘+’ operator becomes a string concatenation operator. That is, it joins character strings. For example, the formula “John” + ” Smith” returns ”John Smith”.

#### 3.3.4.2 Conditional operators

Conditional operators determine the type of comparison to be made between values.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>Equal to</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater than</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less than</td>
</tr>
<tr>
<td>&gt;=</td>
<td>Greater than or equal to</td>
</tr>
<tr>
<td>&lt;=</td>
<td>Less than or equal to</td>
</tr>
</tbody>
</table>
### Operator Description

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;&gt;</td>
<td>Not equal to</td>
</tr>
</tbody>
</table>

You use conditional operators with the If function, as in:

```plaintext
If [Revenue] > 10000 Then "High" Else "Low"
```

which returns “High” for all rows where the revenue is greater than or equal to 10000 and “Low” for all other rows.

#### 3.3.4.3 Logical operators

The logical operators are And, Or, Not, Between and InList.

Logical operators are used in boolean expressions, which return True or False.

#### 3.3.4.4 Context operators

Context operators form part of extended calculation syntax.

Extended syntax allows you to define which dimensions a measure or formula takes into account in a calculation.

#### 3.3.4.5 Function-specific operators

Some functions can take specific operators as arguments.

For example, the Previous function can take the Self operator.

All functions use ) and ( to enclose function arguments. Functions that accept multiple parameters use ; to separate the parameters.
4 Understanding calculation contexts

4.1 Calculation contexts defined

The calculation context is the data that a calculation takes into account to generate a result. This means that the value given by a measure is determined by the dimensions used to calculate the measure.

A report contains two kinds of objects:

- Dimensions represent business data that generate figures. Store outlets, years or regions are examples of dimension data. For example, a store outlet, a year or a region can generate revenue: we can talk about revenue by store, revenue by year or revenue by region.

- Measures are numerical data generated by dimension data. Examples of measure are revenue and number of sales. For example, we can talk about the number of sales made in a particular store.

Measures can also be generated by combinations of dimension data. For example, we can talk about the revenue generated by a particular store in 2005.

The calculation context of a measure has two components:

- the dimension or list of dimensions that determine the measure value
- the part of the dimension data that determines the measure value

The calculation context has two components:

- The input context
- The output context

Related Information

The input context [page 16]
The input context of a measure or formula is the list of dimensions that feed into the calculation.

The output context [page 17]
The output context causes the formula to output a value if it is placed in the footer of a block containing a break.

4.1.1 The input context

The input context of a measure or formula is the list of dimensions that feed into the calculation.

The list of dimensions in an input context appears inside the parentheses of the function that outputs the value. The list of dimensions must also be enclosed in parentheses (even if it contains only one dimension) and the dimensions must be separated by semicolons.
Example

Specifying an input context

In a report with Year sections and a block in each section with Customer and Revenue columns, the input contexts are:

<table>
<thead>
<tr>
<th>Report part</th>
<th>Input context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section header and block footers</td>
<td>Year</td>
</tr>
<tr>
<td>Rows in the block</td>
<td>Year, Customer</td>
</tr>
</tbody>
</table>

In other words, the section headers and block footers show aggregated revenue by Year, and each row in the block shows revenue aggregated by Year and Customer (the revenue generated by that customer in the year in question).

When specified explicitly in a formula, these input contexts are:

\[
\text{Sum ([Revenue] In ([Year]))}
\]

\[
\text{Sum ([Revenue] In ([Year];[Customer]))}
\]

That is, the dimensions in the input context appear inside the parentheses of the function (in this case, Sum) whose input context is specified.

4.1.2 The output context

The output context causes the formula to output a value if it is placed in the footer of a block containing a break.

Example

Specifying an output context

The following report shows revenue by year and quarter, with a break on year, and the minimum revenue calculated by year:
What if you want to show the minimum revenue by year in a block with no break? You can do this by specifying the output context in a formula. In this case, the formula looks like this:

\[
\text{Min} ([\text{Revenue}]) \text{ In} ([\text{Year}])
\]

That is, the output context appears after the parentheses of the function whose output context you are specifying. In this case, the output context calculates the minimum revenue by year.

If you add an additional column containing this formula to the block, the result is as follows:
You can see that the Min By Year column contains the minimum revenues that appear in the break footers in the previous report.

Notice that in this example, the input context is not specified because it is the default context (Year, Quarter) for the block. In other words, the output context determines which revenue by year and quarter to output. In full, with both input and output formulas explicitly specified, the formula looks like this:

\[ \text{Min} \left( [\text{Sales Revenue}] \text{ In} ([\text{Year}]; [\text{Quarter}]) \right) \text{ In} ([\text{Year}]) \]

Explained in words, this formula calculates revenues by year by quarter, then outputs the smallest of these revenues that occurs in each year.

What would happen if you did not specify the output context in the Min By Year column? In this case, these figures would be identical to the figures in the Sales Revenue column. Why? Remember that the default context in a block includes the dimensions in that block. The minimum revenue by year by quarter is the same as the revenue by year by quarter simply because there is only one revenue for each year/quarter combination.

### 4.2 Default calculation contexts

A measure has a default calculation context depending on its place in the report.

The figures returned by a measure depend on the dimensions with which it is associated. This combination of dimensions represents the calculation context.

You can change the default context with extended syntax. In other words, you can determine the set of dimensions used to generate a measure. This is what is meant by defining the calculation context.

**Example**

**Default contexts in a report**

This example describes the default calculation context of the measures in a simple report. The report shows revenue generated by customers and is split into sections by year.
The table below lists the calculation context of the measures in this report:

<table>
<thead>
<tr>
<th>Measure</th>
<th>Value</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report total</td>
<td>20000</td>
<td>Total of all revenues in the report</td>
</tr>
<tr>
<td>Section header total</td>
<td>8000</td>
<td>Year</td>
</tr>
<tr>
<td>Customer total</td>
<td>1000, 3000, 4000</td>
<td>Year;Customer</td>
</tr>
<tr>
<td>Block footer total</td>
<td>8000</td>
<td>Year</td>
</tr>
</tbody>
</table>

**Related Information**

*Calculation contexts defined* [page 16]

The calculation context is the data that a calculation takes into account to generate a result. This means that the value given by a measure is determined by the dimensions used to calculate the measure.

*Modifying the default calculation context with extended syntax* [page 24]

Extended syntax uses context operators that you add to a formula or measure to specify its calculation context.

### 4.2.1 Default contexts in a vertical table

A vertical table is a standard report table with headers at the top, data going from top to bottom and footers at the bottom.

The default contexts in a down table are:

<table>
<thead>
<tr>
<th>When the calculation is in the...</th>
<th>The input context is</th>
<th>The output context is</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header</td>
<td>The dimensions and measures used to generate the body of the block</td>
<td>All the data is aggregated then the calculation function returns a single value</td>
</tr>
</tbody>
</table>
4.2.2 Default contexts in a horizontal table

The default contexts for a horizontal table are the same as those for a vertical table.

A horizontal table is like a vertical table turned on its side.

The appearance of the horizontal table depends on the Preferred Viewing Locale you have selected in the BI launch pad preferences. Some locales, like the English locale, use the left-to-right (LTR) interface positioning, whereas others, like the Arabic locale, use the right-to-left (RTL) interface positioning.

In an LTR locale, headers appear at the left, data goes left to right and footers appear at the right. In an RTL locale, headers appear at the right, data goes right to left and footers appear at the left.

4.2.3 Default contexts in a crosstab table

A crosstab displays data in a matrix with measures appearing at the intersections of dimensions.

The default contexts in a crosstab are:

<table>
<thead>
<tr>
<th>The calculation is in the...</th>
<th>The input context is...</th>
<th>The output context is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Header</td>
<td>The dimensions and measures used to generate the body of the block.</td>
<td>All the data is aggregated, then the calculation function returns a single value.</td>
</tr>
<tr>
<td>Body of the block</td>
<td>The dimensions and measures used to generate the body of the block.</td>
<td>The same as the input context.</td>
</tr>
<tr>
<td>Footer</td>
<td>The dimensions and measures used to generate the body of the block.</td>
<td>All the data is aggregated, then the calculation function returns a single value.</td>
</tr>
<tr>
<td>VBody footer</td>
<td>The dimensions and measures used to generate the current column.</td>
<td>All the data is aggregated, then the calculation function returns a single value.</td>
</tr>
<tr>
<td>HBody Footer</td>
<td>The dimensions and measures used to generate the current row.</td>
<td>All the data is aggregated, then the calculation function returns a single value.</td>
</tr>
</tbody>
</table>
### Example

#### Default contexts in a crosstab

The following report shows the default contexts in a crosstab:

<table>
<thead>
<tr>
<th></th>
<th>FY2000 Q1</th>
<th>FY2000 Q2</th>
<th>FY2000 Q3</th>
<th>FY2000 Q4</th>
<th>1,115,730</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>259,170</td>
<td>61,895</td>
<td>76,555</td>
<td>70,000</td>
<td>50,543</td>
</tr>
<tr>
<td>US</td>
<td>856,500</td>
<td>196,001</td>
<td>169,000</td>
<td>234,574</td>
<td>235,259</td>
</tr>
<tr>
<td>Sum</td>
<td>1,115,730</td>
<td>256,726</td>
<td>266,441</td>
<td>304,554</td>
<td>285,909</td>
</tr>
</tbody>
</table>

### 4.2.4 Default contexts in a section

A section consists of a header, body and footer.

The default contexts in a section are:

<table>
<thead>
<tr>
<th>The calculation is in the...</th>
<th>The input context is...</th>
<th>The output context is...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body</td>
<td>The dimensions and measures in the report, filtered to restrict the data to the section data.</td>
<td>All the data is aggregated, then the calculation function returns a single value.</td>
</tr>
</tbody>
</table>

#### Example

#### Default contexts in a section

The following report shows the default contexts in a crosstab:
4.2.5  Default contexts in a break

A break consists of a header, body and footer.

The default contexts in a break are:

<table>
<thead>
<tr>
<th>The calculation is in the...</th>
<th>The input context is...</th>
<th>The output context is...</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Header</strong></td>
<td>Current instance of the break.</td>
<td>All the data is aggregated, then the calculation function returns a single value.</td>
</tr>
<tr>
<td><strong>Footer</strong></td>
<td>Current instance of the break.</td>
<td>All the data is aggregated, then the calculation function returns a single value.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales revenue</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>8,096,123.6</td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td>$2,660,700</td>
<td>8,096,123.6</td>
</tr>
<tr>
<td>Q2</td>
<td>$2,279,003</td>
<td>8,096,123.6</td>
</tr>
<tr>
<td>Q3</td>
<td>$1,367,841</td>
<td>8,096,123.6</td>
</tr>
<tr>
<td>Q4</td>
<td>$1,788,580</td>
<td>8,096,123.6</td>
</tr>
<tr>
<td>Sum</td>
<td>8,096,123.6</td>
<td></td>
</tr>
<tr>
<td>2002</td>
<td>13,232,246</td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td>$3,326,172</td>
<td>13,232,246</td>
</tr>
<tr>
<td>Q2</td>
<td>$2,640,651</td>
<td>13,232,246</td>
</tr>
<tr>
<td>Q3</td>
<td>$2,879,303</td>
<td>13,232,246</td>
</tr>
<tr>
<td>Q4</td>
<td>$4,186,120</td>
<td>13,232,246</td>
</tr>
<tr>
<td>Sum</td>
<td>13,232,246</td>
<td></td>
</tr>
<tr>
<td>2003</td>
<td>15,059,142.8</td>
<td></td>
</tr>
<tr>
<td>Q1</td>
<td>$3,742,989</td>
<td>15,059,142.8</td>
</tr>
<tr>
<td>Q2</td>
<td>$4,006,713</td>
<td>15,059,142.8</td>
</tr>
<tr>
<td>Q3</td>
<td>$3,953,385</td>
<td>15,059,142.8</td>
</tr>
<tr>
<td>Q4</td>
<td>$3,356,041</td>
<td>15,059,142.8</td>
</tr>
<tr>
<td>Sum</td>
<td>15,059,142.8</td>
<td></td>
</tr>
</tbody>
</table>
Example

Default contexts in a break

The following report shows the default contexts in a break:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>$8096123</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>$2660700</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>$2279003</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>$1367841</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>$1788580</td>
</tr>
<tr>
<td>Sum:</td>
<td></td>
<td>$8096124</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>$13232246</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Q1</td>
<td>$3326172</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>$2640651</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>$2679303</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>$4186120</td>
</tr>
<tr>
<td>Sum:</td>
<td></td>
<td>$13232246</td>
</tr>
</tbody>
</table>

4.3 Modifying the default calculation context with extended syntax

Extended syntax uses context operators that you add to a formula or measure to specify its calculation context. A measure or formula context consists of its input context and output context.

4.3.1 Extended syntax operators

You specify input and output contexts explicitly with context operators.

The following table lists the context operators:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>In</td>
<td>Specifies an explicit list of dimensions to use in the context.</td>
</tr>
<tr>
<td>ForEach</td>
<td>Adds dimensions to the default context</td>
</tr>
<tr>
<td>ForAll</td>
<td>Removes dimensions from the default context</td>
</tr>
</tbody>
</table>
The ForAll and ForEach operators are useful when you have a default context with many dimensions. It is often easier to add or subtract from the context using ForAll and ForEach than it is to specify the list explicitly using In.

4.3.1.1 In context operator

The In context operator specifies dimensions explicitly in a context.

Example

Using In to specify the dimensions in a context

In this example you have a report showing Year and Sales Revenue. Your data provider also contains the Quarter object but you do not include this dimension in the block. Instead, you want to include an additional column to show the maximum revenue by quarter in each year. Your report looks like this:

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales revenue</th>
<th>Max Quarterly Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>$8,096,123.60</td>
<td>$2,660,699.50</td>
</tr>
<tr>
<td>2002</td>
<td>$13,232,246.00</td>
<td>$4,186,120.00</td>
</tr>
<tr>
<td>2003</td>
<td>$15,059,142.80</td>
<td>$4,006,717.50</td>
</tr>
</tbody>
</table>

You can see where the values in the Max Quarterly Revenue column come from by examining this block in conjunction with a block that includes the Quarter dimension:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>$2,660,699.50</td>
</tr>
<tr>
<td>2001</td>
<td>Q2</td>
<td>$2,279,003.00</td>
</tr>
<tr>
<td>2001</td>
<td>Q3</td>
<td>$1,367,841.00</td>
</tr>
<tr>
<td>2001</td>
<td>Q4</td>
<td>$1,788,580.00</td>
</tr>
</tbody>
</table>

Max:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td></td>
<td>$3,326,172.00</td>
</tr>
<tr>
<td>Q2</td>
<td></td>
<td>$2,840,651.00</td>
</tr>
<tr>
<td>Q3</td>
<td></td>
<td>$2,879,303.00</td>
</tr>
<tr>
<td>Q4</td>
<td></td>
<td>$4,186,120.00</td>
</tr>
</tbody>
</table>

Max:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td></td>
<td>$3,742,989.00</td>
</tr>
<tr>
<td>Q2</td>
<td></td>
<td>$4,006,717.50</td>
</tr>
<tr>
<td>Q3</td>
<td></td>
<td>$3,953,395.00</td>
</tr>
<tr>
<td>Q4</td>
<td></td>
<td>$3,356,041.00</td>
</tr>
</tbody>
</table>
The Max Quarterly Revenue column shows the highest quarterly revenue in each year. For example, Q4 has the highest revenue in 2002, so the Max Quarterly Revenue shows Q4 revenue on the row showing 2002.

Using the In operator, the formula for Max Quarterly Revenue is

\[
\text{Max} \left( \text{[Sales Revenue]} \text{ In } ([\text{Year}] ; [\text{Quarter}]) \right) \text{ In } ([\text{Year}])
\]

This formula calculates the maximum sales revenue for each (Year,Quarter) combination, then outputs this figure by year.

Note

Because the default output context of the block is Year, you do not need to specify the output context explicitly in this formula.

### 4.3.1.2 ForEach context operator

The **ForEach** operator adds dimensions to a context.

**Example**

**Using ForEach to add dimensions to a context**

The following table shows the maximum revenue for each Quarter in a report which contains the Quarter dimension but does not include it in the block:

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales revenue</th>
<th>Max Quarterly Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>8096123.60</td>
<td>2660699.50</td>
</tr>
<tr>
<td>2002</td>
<td>13232246.00</td>
<td>4186120.00</td>
</tr>
<tr>
<td>2003</td>
<td>15059142.80</td>
<td>4006717.50</td>
</tr>
</tbody>
</table>

It is possible to create a formula for the Max Quarterly Revenue column that does not include the ForEach operator:

\[
\text{Max} \left( \text{[Sales Revenue]} \text{ In } ([\text{Year}] ; [\text{Quarter}]) \right) \text{ In } ([\text{Year}])
\]

Using the ForEach context operator, you can achieve the same result with the following formula:

\[
\text{Max} \left( \text{[Sales Revenue]} \text{ ForEach } ([\text{Quarter}]) \right) \text{ In } ([\text{Year}])
\]

Why? Because the Year dimension is the default input context in the block. By using the ForEach operator, you add the Quarter dimension to the context, giving an input context of ([Year],[Quarter]).
4.3.1.3 ForAll context operator

The ForAll context operator removes dimensions from a context.

Example

Using ForAll to remove dimensions from a context

You have a report showing Year, Quarter and Sales Revenue and you want to add a column that shows the total revenue in each year, as shown in the following block:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
<th>Yearly Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>$26560700</td>
<td>$8068124</td>
</tr>
<tr>
<td>2001</td>
<td>Q2</td>
<td>$2279003</td>
<td>$8068124</td>
</tr>
<tr>
<td>2001</td>
<td>Q3</td>
<td>$1367641</td>
<td>$8068124</td>
</tr>
<tr>
<td>2001</td>
<td>Q4</td>
<td>$1786580</td>
<td>$8068124</td>
</tr>
<tr>
<td>2002</td>
<td>Q1</td>
<td>$3326172</td>
<td>$13232246</td>
</tr>
<tr>
<td>2002</td>
<td>Q2</td>
<td>$2840651</td>
<td>$13232246</td>
</tr>
<tr>
<td>2002</td>
<td>Q3</td>
<td>$2975903</td>
<td>$13232246</td>
</tr>
<tr>
<td>2002</td>
<td>Q4</td>
<td>$4186120</td>
<td>$13232246</td>
</tr>
<tr>
<td>2003</td>
<td>Q1</td>
<td>$3742999</td>
<td>$15059143</td>
</tr>
<tr>
<td>2003</td>
<td>Q2</td>
<td>$4006718</td>
<td>$15059143</td>
</tr>
<tr>
<td>2003</td>
<td>Q3</td>
<td>$3953395</td>
<td>$15059143</td>
</tr>
<tr>
<td>2003</td>
<td>Q4</td>
<td>$3356041</td>
<td>$15059143</td>
</tr>
</tbody>
</table>

To total revenues by year the input context needs to be (Year); by default it is (Year; Quarter). Therefore, you can remove Quarter from the input context by specifying ForAll ([Quarter]) in the formula, which looks like this:

\[
\text{Sum([Sales Revenue] ForAll ([Quarter]))}
\]

Note that you can use the In operator to achieve the same thing; in this case the formula is:

\[
\text{Sum([Sales Revenue] In ([Year]))}
\]

This version of the formula explicitly specifies Year as the context, rather than removing Quarter to leave Year.

4.3.2 Extended syntax keywords

Extended syntax keywords are a form of shorthand that allows you to refer to dimensions in extended syntax without specifying those dimensions explicitly.

These keywords help future-proof reports. If formulas do not contain hard-coded references to dimensions, they will continue to work even if dimensions are added to or removed from a report.

There are five extended syntax keywords: Report, Section, Break, Block and Body.
4.3.2.1 The Report keyword

This topic describes the data referenced by the Report keyword, depending on where it is placed in a report:

<table>
<thead>
<tr>
<th>When placed in...</th>
<th>References this data...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A block</td>
<td>All data in the report</td>
</tr>
<tr>
<td>A block break (header or footer)</td>
<td>All data in the report</td>
</tr>
<tr>
<td>A section (header, footer, or outside a block)</td>
<td>All data in the report</td>
</tr>
<tr>
<td>Outside any blocks or sections</td>
<td>All data in the report</td>
</tr>
</tbody>
</table>

Example

The Report keyword

You have a report showing Year, Quarter and Sales revenue. The report has a column, Report Total, that shows the total of all revenue in the report.

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
<th>Report Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>$2,660,700</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2001</td>
<td>Q2</td>
<td>$2,279,005</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2001</td>
<td>Q3</td>
<td>$1,367,841</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2001</td>
<td>Q4</td>
<td>$1,788,580</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2002</td>
<td>Q1</td>
<td>$3,326,172</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2002</td>
<td>Q2</td>
<td>$2,640,651</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2002</td>
<td>Q3</td>
<td>$2,879,303</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2002</td>
<td>Q4</td>
<td>$4,186,120</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2003</td>
<td>Q1</td>
<td>$3,742,989</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2003</td>
<td>Q2</td>
<td>$4,006,716</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2003</td>
<td>Q3</td>
<td>$3,953,395</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2003</td>
<td>Q4</td>
<td>$3,366,041</td>
<td>36,387,512.4</td>
</tr>
</tbody>
</table>

The formula for the Report Total column is as follows:

\[
\text{Sum}([\text{Sales revenue}]) \text{ In Report}
\]

Without the Report keyword, this column would duplicate the figures in the Sales Revenue column because it would use the default output context ([Year];[Quarter]).

4.3.2.2 The Section keyword

This topic describes the data referenced by the keyword for a Section, depending on where it is placed in a report.
When placed in... | References this data...
---|---
A block | All data in the section
A block break (header or footer) | All data in the section
A section (header, footer, or outside a block) | All data in the section
Outside any blocks or sections | Not applicable

**Example**

**The Section keyword**

You have a report showing Year, Quarter, and Sales revenue.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Sales revenue</th>
<th>Section Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>$2,650,700</td>
<td>8,095,814</td>
</tr>
<tr>
<td>Q2</td>
<td>$2,279,693</td>
<td>8,095,814</td>
</tr>
<tr>
<td>Q3</td>
<td>$1,367,841</td>
<td>8,095,814</td>
</tr>
<tr>
<td>Q4</td>
<td>$1,788,580</td>
<td>8,095,814</td>
</tr>
</tbody>
</table>

The report has a section based on Year. The Section Total column has the formula:

\[ \text{Sum} \left( \{ \text{Sales Revenue} \} \right) \text{ In Section} \]

The figure in the Section Total column is the total revenue for 2001, because the section break occurs on the Year object. Without the Section keyword this column would duplicate the figures in the Sales revenue column, because it would use the default output context ([Year],[Quarter]).

**4.3.2.3 The Break keyword**

The following table describes the dimensions referenced by the Break keyword depending on where it is placed in a report.

| When placed in... | References this data...
---|---
A block | Data in the part of a block delimited by a break
A block break (header or footer) | Data in the part of a block delimited by a break
A section (header, footer, or outside a block) | Not applicable
Outside any blocks or sections | Not applicable

**Example**

**The Break keyword**

You have a report showing Year, Quarter and Sales revenue:
<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
<th>Break Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>$2,660,700</td>
<td>$8,096,124</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>$2,279,003</td>
<td>$8,096,124</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>$1,367,841</td>
<td>$8,096,124</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>$1,788,580</td>
<td>$8,096,124</td>
</tr>
</tbody>
</table>

The report has break on Year. The Break Total column has the formula:

\[
\text{Sum ([Sales Revenue]) In Break}
\]

Without the Break keyword this column would duplicate the figures in the Sales revenue column, because it would use the default output context ([Year];[Quarter]).

### 4.3.2.4 The Block keyword

This topic describes the dimensions referenced by the Block keyword, depending on where it is placed in a report. The Block keyword often encompasses the same data as the Section keyword.

The difference is that Block accounts for filters on a block whereas Section ignores them.

<table>
<thead>
<tr>
<th>When placed in...</th>
<th>References this data...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A block</td>
<td>Data in the whole block, ignoring breaks, respecting filters</td>
</tr>
<tr>
<td>A block break (header or footer)</td>
<td>Data in the whole block, ignoring breaks, respecting filters</td>
</tr>
<tr>
<td>A section (header, footer, or outside a block)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Outside any blocks or sections</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

**Example**

**The Block keyword**

You have a report showing Year, Quarter and Sales revenue. The report has a section based on Year. The block is filtered to exclude the third and fourth quarters.
The Yearly Average column uses the following formula:

\[
\text{Average([Sales revenue] In Section)}
\]

The First Half Average column uses the following formula:

\[
\text{Average ([Sales revenue]) In Block}
\]

You can see how the Block keyword takes account of the filter on the block.

### 4.3.2.5 The Body keyword

This topic describes the dimensions referenced by the keyword in a block Body, depending on where it is placed in a report.

<table>
<thead>
<tr>
<th>When placed in...</th>
<th>References this data...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A block</td>
<td>Data in the block</td>
</tr>
<tr>
<td>A block break (header or footer)</td>
<td>Data in the block</td>
</tr>
<tr>
<td>A section (header, footer, or outside a block)</td>
<td>Data in the section</td>
</tr>
<tr>
<td>Outside any blocks or sections</td>
<td>Data in the report</td>
</tr>
</tbody>
</table>
The Body keyword

You have a report showing Year, Quarter and Sales revenue, with a break on Year. The report has a section based on Year and a break on Quarter.

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
<th>Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>2,660,700</td>
<td>2,660,699.5</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>2,279,003</td>
<td>2,279,003</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>1,367,841</td>
<td>1,367,840.7</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>1,788,580</td>
<td>1,788,580.4</td>
</tr>
<tr>
<td>2001</td>
<td></td>
<td></td>
<td>8,096,123.6</td>
</tr>
</tbody>
</table>

The Body column has the formula

\[ \text{Sum ([Sales Revenue]) In Body} \]

The totals in the Body column are the same as those in the Sales revenue column because the Body keyword refers to the data in the block. If you were to remove the Month object, the figures in the Block column would change to correspond with the changed figures in the Sales revenue column. If you were to place the formula in the report footer it would return the total revenue for the body.

4.3.2.6 Using keywords to make reports generic

Extended syntax keywords future-proof your report against changes.

If you refer to data explicitly (by specifying dimensions using In, ForEach or ForAll) your reports might return unexpected data if dimensions are added or removed. The following example illustrates this.

Using the Report keyword to display percentages

In this example you have a block that contains Year, Quarter and Sales revenue objects. You want to display revenues by year and quarter, and the percentage of the total revenue in the report that each individual revenue represents, as shown:
The formula for the Percentage of Total column is:

\[
\left(\frac{\text{Sales revenue}}{\text{Sum(Sales revenue) In Report}}\right) \times 100
\]

In a block, the Report includes all data in a report, so this formula could be written:

\[
\left(\frac{\text{Sales revenue}}{\text{Sum(Sales revenue) ForAll ([Year],[Quarter])}}\right) \times 100
\]

This formula removes Year and Quarter from the output context (in other words, calculates a grand total) because there are no other dimensions in the report. The formula then divides each revenue by the grand total to give its percentage of the total.

Although you can use ForAll in this situation, it is much better to use the Report keyword. Why? What if the Month dimension were subsequently added to the report? The version of the formula that uses the Report keyword still calculates each percentage correctly, but the version that explicitly specifies the Year and Quarter dimensions is now wrong:
Why is this? The problem lies in:

\[ \text{Sum} \left( \text{Sales Revenue} \right) \text{ ForAll} \left( \text{Year}; \text{Quarter} \right) \]

When Year and Quarter were the only dimensions in the report, this was equivalent to "a grand total of all revenues". Once you add the Month dimension, this expression removes Year and Quarter from the default output context, but leaves Month.

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Month</th>
<th>Sales revenue</th>
<th>Percentage of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>1</td>
<td>$1003541.20</td>
<td>26.13</td>
</tr>
<tr>
<td>2001</td>
<td>Q1</td>
<td>2</td>
<td>$630073.20</td>
<td>29.57</td>
</tr>
<tr>
<td>2001</td>
<td>Q1</td>
<td>3</td>
<td>$1027085.10</td>
<td>27.12</td>
</tr>
<tr>
<td>2001</td>
<td>Q2</td>
<td>4</td>
<td>$865259.80</td>
<td>28.1</td>
</tr>
<tr>
<td>2001</td>
<td>Q2</td>
<td>5</td>
<td>$865615.10</td>
<td>24.3</td>
</tr>
<tr>
<td>2001</td>
<td>Q2</td>
<td>6</td>
<td>$517818.60</td>
<td>21.77</td>
</tr>
<tr>
<td>2001</td>
<td>Q3</td>
<td>7</td>
<td>$529903.60</td>
<td>20.42</td>
</tr>
<tr>
<td>2001</td>
<td>Q3</td>
<td>8</td>
<td>$173756.40</td>
<td>11.11</td>
</tr>
<tr>
<td>2001</td>
<td>Q3</td>
<td>9</td>
<td>$668180.60</td>
<td>16.45</td>
</tr>
<tr>
<td>2001</td>
<td>Q4</td>
<td>10</td>
<td>$656206.40</td>
<td>18.04</td>
</tr>
<tr>
<td>2001</td>
<td>Q4</td>
<td>11</td>
<td>$484024.20</td>
<td>18.55</td>
</tr>
<tr>
<td>2001</td>
<td>Q4</td>
<td>12</td>
<td>$649349.80</td>
<td>21.01</td>
</tr>
<tr>
<td>2002</td>
<td>Q1</td>
<td>1</td>
<td>$1336401.90</td>
<td>34.77</td>
</tr>
<tr>
<td>2002</td>
<td>Q1</td>
<td>2</td>
<td>$659012.00</td>
<td>26.97</td>
</tr>
<tr>
<td>2002</td>
<td>Q1</td>
<td>3</td>
<td>$1381757.50</td>
<td>36.49</td>
</tr>
<tr>
<td>2002</td>
<td>Q2</td>
<td>4</td>
<td>$1068308.90</td>
<td>33.53</td>
</tr>
<tr>
<td>2002</td>
<td>Q2</td>
<td>5</td>
<td>$1031884.80</td>
<td>30.38</td>
</tr>
<tr>
<td>2002</td>
<td>Q2</td>
<td>6</td>
<td>$650457.10</td>
<td>29.03</td>
</tr>
<tr>
<td>2002</td>
<td>Q3</td>
<td>7</td>
<td>$801964.70</td>
<td>31.14</td>
</tr>
<tr>
<td>2002</td>
<td>Q3</td>
<td>8</td>
<td>$581093.50</td>
<td>37.15</td>
</tr>
<tr>
<td>2002</td>
<td>Q3</td>
<td>9</td>
<td>$1496254.00</td>
<td>36.64</td>
</tr>
<tr>
<td>2002</td>
<td>Q4</td>
<td>10</td>
<td>$1545871.80</td>
<td>42.57</td>
</tr>
<tr>
<td>2002</td>
<td>Q4</td>
<td>11</td>
<td>$1003915.30</td>
<td>41.47</td>
</tr>
<tr>
<td>2002</td>
<td>Q4</td>
<td>12</td>
<td>$1658332.90</td>
<td>50.43</td>
</tr>
<tr>
<td>2003</td>
<td>Q1</td>
<td>1</td>
<td>$1501366.70</td>
<td>39.09</td>
</tr>
<tr>
<td>2003</td>
<td>Q1</td>
<td>2</td>
<td>$683461.90</td>
<td>41.07</td>
</tr>
<tr>
<td>2003</td>
<td>Q1</td>
<td>3</td>
<td>$1378170.30</td>
<td>36.39</td>
</tr>
<tr>
<td>2003</td>
<td>Q2</td>
<td>4</td>
<td>$1222329.40</td>
<td>38.37</td>
</tr>
<tr>
<td>2003</td>
<td>Q2</td>
<td>5</td>
<td>$1614147.30</td>
<td>45.32</td>
</tr>
<tr>
<td>2003</td>
<td>Q2</td>
<td>6</td>
<td>$1170240.00</td>
<td>49.2</td>
</tr>
<tr>
<td>2003</td>
<td>Q3</td>
<td>7</td>
<td>$1247313.50</td>
<td>48.44</td>
</tr>
<tr>
<td>2003</td>
<td>Q3</td>
<td>8</td>
<td>$809365.40</td>
<td>51.74</td>
</tr>
<tr>
<td>2003</td>
<td>Q3</td>
<td>9</td>
<td>$1896716.40</td>
<td>46.7</td>
</tr>
<tr>
<td>2003</td>
<td>Q4</td>
<td>10</td>
<td>$1430300.10</td>
<td>39.39</td>
</tr>
<tr>
<td>2003</td>
<td>Q4</td>
<td>11</td>
<td>$1043098.60</td>
<td>39.98</td>
</tr>
<tr>
<td>2003</td>
<td>Q4</td>
<td>12</td>
<td>$882642.20</td>
<td>28.56</td>
</tr>
</tbody>
</table>

Sum: 1200
The formula now has a “break” on month. In other words, on every row where Month is 1, this expression now means “the total revenue of all month 1s”. In every row where Month is 2, it means “the total revenue of all month 2s”. As a result, the percentages are not the percentages you expect.
Calculating values with smart measures

Smart measures are measures whose values are calculated by the database (relational or OLAP) on which a universe is based.

They differ from classic measures, which are calculated from the detailed values returned by the database. The data returned by smart measures is aggregated in ways not supported natively by the Web Intelligence component of the SAP BusinessObjects Business Intelligence platform.

Queries that contain smart measures calculate the measures in all the calculation contexts required in a report. These contexts can change as the report changes. As a result, the query changes at each data refresh after the required contexts have changed.

When you edit such a report, automatically the #TOREFRESH message is inserted in the report reminding you that the report should be refreshed in order to reflect the changes. You can choose to update the report automatically by selecting the Auto-refresh document option in the Document properties dialog.

The measure delegation is static and defined based on the report definition at design time. In some cases (formula based on “if [choice]= 1 then [dimension 1] else [dimension 2]”) the dimensional context is variable at run time. In this case the system cannot delegate the measure calculation and returns an empty value.

Smart measures behave differently from classic measures, which support a basic set of aggregation functions (Max, Min, Count, Sum, Average) that can be calculated in all contexts without help from the database. For example, if you build a query containing the [Country] and [Region] dimensions and the [Revenue] measure (which calculates the sum of the revenue), the initial display shows Country, Region and Revenue in a block. If you remove Region from the block, the total revenue for each country can still be calculated without a data refresh by summing the revenues for all the regions in the country. A smart measure requires a data refresh in this situation.

Calculation contexts are represented by grouping sets in the generated query.

Grouping sets and smart measures

A grouping set is a set of dimensions that generates a result for a measure.

The generated SQL that returns the data in a smart measure includes grouping sets for all the aggregations of that measure that are included in the report.

Example

Grouping sets in a query

A query contains the [Country], [Region], [City] dimensions and the [Revenue] smart measure. These objects imply the following grouping sets to calculate revenue in all possible contexts:

- Total smart measure value
- smart measure value by (Country, Region, City)
- smart measure value by (Country, City)
• smart measure value by (City)
• smart measure value by (Region, City)
• smart measure value by (Region)
• smart measure value by (Country, Region)
• smart measure value by (Country)

If the database supports **UNION**, each grouping set is represented in a **UNION** clause in the generated SQL.

The grouping sets are updated according to the calculation contexts required by the report, which can change in response to changes in the report structure.

### 5.1.1 Management of grouping sets

When you first build and run a query including smart measures, the generated SQL includes the grouping set necessary to calculate the smart measures at the most detailed level implied by the query objects.

For example, if you build a query containing the [Country], [Region] and [City] dimensions and the [Revenue] smart measure, the (Country, Region, City) grouping set appears in the generated SQL. The most detailed grouping set always appears in the SQL. Other grouping sets are added and removed in response to changes in the report.

If you remove the [City] dimension from the block, the (Country, Region) grouping set is required to return the revenue values. This grouping set is not yet available in the query SQL, so **#TOREFRESH** appears in the [Revenue] cells. When you refresh the data, **#TOREFRESH** is replaced with the revenue values.

If you then replace the [City] dimension in the block, the (Country, Region) grouping set is no longer needed. It is removed from the query SQL and its values discarded the next time you refresh the data.

Each time you refresh the report data, grouping sets are included or discarded according to the calculation contexts required by the report.

In certain situations, it is not possible to display the value of a smart measure. In this case, **#UNAVAILABLE** appears in the measure cells.

### 5.2 Smart measures and the scope of analysis

When you build a query with a scope of analysis, the initial grouping set contains the result objects, but not the scope objects.

The query does not generate all the possible grouping sets from the combination of the result objects and the scope objects.

**Example**

A query with a scope of analysis and a smart measure

A query has the result objects [Country] and [Revenue]. The scope of analysis contains the [Region] and [City] dimensions. When you run the query, its SQL contains the (Country) grouping set and it displays [Country] and [Revenue] in a block.
5.3  Smart measures and SQL

5.3.1  Grouping sets and the UNION operator

Some databases support grouping sets explicitly with the `GROUPING SETS` operator.

When you build a query containing smart measures, the generated SQL uses multiple result sets and the `UNION` operator to simulate the effect of `GROUPING SETS`.

**Example**

**Grouping sets retrieved with the UNION operator**

This example describes a query containing [Country], [Region], [City] dimensions and the [Revenue] smart measure.

**Note**

For simplicity, the smart measure calculates a sum. In practice, a smart measure is not needed for this aggregation because sums are supported natively in Web Intelligence.

When the query is first run, the grouping set is (Country, Region, City). The entire SQL query returns this grouping set and there is no need for the `UNION` operator in the SQL.

If you remove the [City] dimension from the table, the (Country, Region) grouping set is required to display the revenue (which appears initially as #TOREFRESH). After data refresh, the SQL is as follows:

```sql
SELECT
    0 AS GID,
    country.country_name,
    NULL,
    sum(city.revenue)
FROM
    country,
    region,
    city
WHERE
    ( country.country_id=region.country_id )
AND  ( region.region_id=city.region_id )
GROUP BY
    country.country_name,
    region.region_name
UNION
SELECT
    1 AS GID,
    country.country_name,
    region.region_name,
    city.city_name,
    sum(city.revenue)
FROM
    country,
    region,
    city
WHERE
    ( country.country_id=region.country_id )
AND  ( region.region_id=city.region_id )
GROUP BY
```
Each grouping set is represented by a `SELECT` statement, and each has its own ID (the GID column). Grouping sets that do not contain the full set of dimensions include empty columns (`SELECT ''`) because each `SELECT` statement in a query including `UNION` must have the same number of columns.

If you add a new block containing [Country] and [Revenue] to the report, the (Country) grouping set is required. The generated SQL now includes three grouping sets as follows:

```sql
SELECT 0 AS GID,
country.country_name,
region.region_name,
NULL,
sum(city.revenue)
FROM country,
region,
city
WHERE ( country.country_id=region.country_id )
AND ( region.region_id=city.region_id )
GROUP BY country.country_name,
region.region_name
UNION
SELECT 1 AS GID,
country.country_name,
NULL,
NULL,
sum(city.revenue)
FROM country,
city,
region
WHERE ( country.country_id=region.country_id )
AND ( region.region_id=city.region_id )
GROUP BY country.country_name
UNION
SELECT 2 AS GID,
country.country_name,
region.region_name,
city.city_name,
sum(city.revenue)
FROM country,
region,
city
WHERE ( country.country_id=region.country_id )
AND ( region.region_id=city.region_id )
GROUP BY country.country_name,
region.region_name,
city.city_name
```
5.4 Smart measures and formulas

5.4.1 Smart measures and dimensions containing formulas

If a formula or variable appears as a dimension in the calculation context of a smart measure, and the formula determines the grouping set required by the measure, the values of the smart measure can be displayed.

For example, smart measures and dimensions now return values for:

- A URL created with hyperlink wizard.
- Simple concatenation on a dimension (or blank removal).
- When FormatDate is used on [date]

Note

The message #UNAVAILABLE is still returned for the following functions: ForEach, ForAll, In, Where, Rank, Previous, RelativeValue, RelativeDate, TimeDim, and in the Aggregation function when Min, Max, Last, or First are used in the formula: if ([selection] =1) then [dim1] else [dim2]

5.4.2 Smart measures in formulas

Smart measures can return values when included in formulas, even when the formula requires a different calculation context from the context implied by the position of the formula.

For example, a report contains a block as follows:

<table>
<thead>
<tr>
<th>Country</th>
<th>Region</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>North</td>
<td>10000</td>
</tr>
<tr>
<td>US</td>
<td>South</td>
<td>15000</td>
</tr>
<tr>
<td>US</td>
<td>East</td>
<td>14000</td>
</tr>
<tr>
<td>US</td>
<td>West</td>
<td>12000</td>
</tr>
</tbody>
</table>

If you include an additional column in this table with the formula

```
[Revenue] ForAll ([Region])
```

the initial value of the column is #TOREFRESH because the formula, which excludes regions from the calculation, requires the grouping set (Country). Refreshing the data adds the (Country) grouping set to the query and displays the values of the measure.

Related Information

ForAll context operator [page 27]
The `ForAll` context operator removes dimensions from a context.

5.5 **Smart measures and filters**

5.5.1 **Restrictions concerning smart measures and filters**

A smart measure can be evaluated in the body of a table when there is no filter in the table or in the parent context (a report filter).

The following table describes how smart measures are evaluated when filters are present.

Table 1: How smart measures are evaluated when a filter is present in the report

<table>
<thead>
<tr>
<th>When the filter is on a ...</th>
<th>The smart measure is evaluated this way</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure</td>
<td>The smart measure will be correctly evaluated, but some rows will be removed from the table.</td>
</tr>
<tr>
<td>Dimension that is already part of the table axis</td>
<td>The smart measure will be correctly evaluated, but some rows will be removed from the table. The smart measure can be evaluated, because there is no aggregation after the filtering.</td>
</tr>
<tr>
<td>Dimension that is not part of the axis of the table, and when the filter operand is mono-value (the filter will return one value/row).</td>
<td>The smart measure will be correctly evaluated. The smart measure can be evaluated because there is no aggregation after the filtering.</td>
</tr>
<tr>
<td>Dimension that is not part of the axis of the table, and if the filter operand is multivalue (the filter can return many values/rows).</td>
<td>The smart measure can’t be evaluated (#UNAVAILABLE is displayed) because in this case, filtering is done before aggregation, and for one row of the table, aggregation is required.</td>
</tr>
</tbody>
</table>

5.5.2 **Smart measures and filters on dimensions**

If you apply a multi-valued filter to a dimension on which the value of a smart value depends, but the dimension does not appear explicitly in the calculation context of the measure, the smart measure cannot return a value, and the cell displays #UNAVAILABLE.

This also applies when a report filter comes from an input control.

#UNAVAILABLE appears because the measure must be filtered in the report and then aggregated, but a smart measure cannot be aggregated after a report-level filter is applied. Calculating the measure would be possible by adding a query filter to the generated SQL, but this solution carries the risk of impacting other reports based on the same query.

Note

A multi-valued filter filters on multiple values using operators such as Greater Than, In List or Less Than. You can apply single-valued filters such as Equal To without generating the #UNAVAILABLE error.
There is a workaround for cases which do not require aggregation: Define the formula as variable whose qualification is a measure and be sure that the used dimension is included in the block with the variable (you can hide that column for a better display).

A smart measure and a filter on a dimension

A query contains the Country and Product dimensions and the Revenue smart measure. Country and Revenue are displayed in a block. If you apply a report filter restricting the values of Product to "Dresses" or "Jackets", #UNAVAILABLE appears in the Revenue cells.

<table>
<thead>
<tr>
<th>Country</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>#UNAVAILABLE</td>
</tr>
<tr>
<td>US</td>
<td>#UNAVAILABLE</td>
</tr>
<tr>
<td>Sum:</td>
<td>#UNAVAILABLE</td>
</tr>
</tbody>
</table>

If you restrict Product to "Jackets" only, the values are displayed.

<table>
<thead>
<tr>
<th>Country</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>971,444</td>
</tr>
<tr>
<td>Sum:</td>
<td>971,444</td>
</tr>
</tbody>
</table>

A multivalue filter on Country will return results because the filter is in the table.

5.5.3 Filtering smart measures

The value in the table footer must be the aggregation of what the user sees in the table. If what user sees in the table is filtered locally, then the system cannot return delegated aggregation of what is locally filtered.

Filtering a smart measure

<table>
<thead>
<tr>
<th>Country</th>
<th>OrderAmountDel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>28,833.36</td>
</tr>
<tr>
<td>China</td>
<td>51,384.33</td>
</tr>
<tr>
<td>France</td>
<td>68,630.22</td>
</tr>
<tr>
<td>USA</td>
<td>3,529,511.14</td>
</tr>
</tbody>
</table>
When the data in the following table is filtered by OrderAmountDel > 60,000

The table shows the rows for which the OrderAmountDel in the context of table (per country) is greater than 60,000:

Sum in footer calculates the sum of the visible rows;

Total returns #UNAVAILABLE because the calculation is pushing the aggregation to the back end, but because Web Intelligence has performed local filtering, the aggregation cannot be delegated.

<table>
<thead>
<tr>
<th>Country</th>
<th>OrderAmountDel</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>68,630.22</td>
</tr>
<tr>
<td>USA</td>
<td>3,529,511.14</td>
</tr>
<tr>
<td>Total</td>
<td>#UNAVAILABLE</td>
</tr>
<tr>
<td>Sum</td>
<td>3,598,141.36</td>
</tr>
</tbody>
</table>

### 5.5.4 Smart measures and drill filters

A drill filter is a single valued filter.

You can drill using the drill bar directly.

### 5.5.5 Smart measures and nested OR filters

Nested OR filters in which at least one of the filtered dimensions does not appear in a block generate the #UNAVAILABLE error for a smart measure in the block.

This is because the smart measure has to be aggregated locally after some local processing (for example, filtering; some specific Web Intelligence formula) and this is not delegated.
6 Functions, operators and keywords

6.1 Functions

Formula functions are divided into several categories.

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate</td>
<td>Aggregates data (for example by summing or averaging a set of values)</td>
</tr>
<tr>
<td>Character</td>
<td>Manipulates character strings</td>
</tr>
<tr>
<td>Date and Time</td>
<td>Returns date or time data</td>
</tr>
<tr>
<td>Document</td>
<td>Returns data about a document</td>
</tr>
<tr>
<td>Data Provider</td>
<td>Returns data about a document’s data provider</td>
</tr>
<tr>
<td>Logical</td>
<td>Returns TRUE or FALSE</td>
</tr>
<tr>
<td>Numeric</td>
<td>Returns numeric data</td>
</tr>
<tr>
<td>Misc</td>
<td>Functions that do not fit into the above categories</td>
</tr>
<tr>
<td>Set</td>
<td>Returns sets of members from hierarchies</td>
</tr>
</tbody>
</table>

6.1.1 Custom formats

In tables, you can use the Custom format type to define a customized format for any cell.

In Web Intelligence functions, the day/date, calendar and time of day character definitions below apply.

<table>
<thead>
<tr>
<th>Character(s)</th>
<th>Display(s)</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>The correponding digit. If the number has less digits than the number of # characters used to specify the format, no leading zeros are inserted.</td>
<td>‘12345’ with the format #, ##0 gives ‘12,345’ (if your locale defines the grouping separator as a comma) or ‘12 345’ (if your locale defines the grouping separator as a space)</td>
</tr>
</tbody>
</table>

Note: You cannot apply custom formats to numbers in tables in the Web Intelligence HTML interface.
<table>
<thead>
<tr>
<th>Character(s)</th>
<th>Display(s)</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>The corresponding digit. If the number has less digits than the number of 0 characters used to specify the format, a leading zero(s) is inserted before the number.</td>
<td>‘123’ with the format #0,000 gives ‘0,123’</td>
</tr>
<tr>
<td>,</td>
<td>The grouping separator as defined by your locale.</td>
<td>‘1234567’ with the format #,##0 gives ‘1,234,567’ (if you locale defines the grouping separator as a comma) or ‘1 234 567’ (if your locale defines the grouping separator as a non-breaking space)</td>
</tr>
<tr>
<td>.</td>
<td>The decimal separator as defined by your locale.</td>
<td>‘12.34’ with the format #.#0 gives ‘12.34’ (if your locale defines the decimal separator as a period) or ‘12,34’ (if your locale defines the decimal separator as a comma)</td>
</tr>
<tr>
<td>[%]%</td>
<td>Displays a percentage sign (%) after the result and multiplies the result by 100.</td>
<td>0.50 becomes 50%</td>
</tr>
<tr>
<td>%</td>
<td>The % sign after the result, but does not multiply the result by 100.</td>
<td>0.50 becomes 0.50%</td>
</tr>
<tr>
<td></td>
<td>A non-breaking space ( )</td>
<td>‘1234567’ with the format # #0 gives ‘1234 567’</td>
</tr>
<tr>
<td>1, 2, 3, a, b, c, $, f, e (and so on)</td>
<td>The alphanumeric character.</td>
<td>‘705.15’ with the format $#.0 gives ‘$705.15’ or with the format #.#0 $ gives ‘705,15 $’</td>
</tr>
<tr>
<td>[Red], [Blue], [Green], [Yellow], [Gray], [White], [Dark Red], [Dark Blue], [Dark Green]</td>
<td>The value in the specified color.</td>
<td>‘150’ with the format #,#0[Red] gives ‘150’ #,#0[Blue] gives ‘150’</td>
</tr>
<tr>
<td>Day/date characters</td>
<td>(day, date)</td>
<td>The first day of a month with the format d gives ‘1’</td>
</tr>
<tr>
<td>d</td>
<td>The number of the day in the month with no leading zeros. If the date for day is less than two characters, the date displays without a zero before it.</td>
<td>The first day of a month with the format dd gives ‘01’</td>
</tr>
<tr>
<td>dd</td>
<td>The number of the day with leading zeros. If the date for day is less than two characters, the date displays with a zero before it.</td>
<td>The first day of a month with the format ddd gives ‘01’</td>
</tr>
<tr>
<td>ddd</td>
<td>The name of the day abbreviated. The first letter is capitalized if the</td>
<td>‘Monday’ with the format ddd gives ‘Mon’ in English, in French, lundi gives lun.</td>
</tr>
<tr>
<td>Character(s)</td>
<td>Display(s)</td>
<td>Example</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>selected locale uses capitalized day names.</td>
<td></td>
</tr>
<tr>
<td>Dddd</td>
<td>Forced the capitalization of the day name, for any locale.</td>
<td>‘Monday’ with the format Dddd gives ‘Mon’ in English, in French, lundi gives Lun.</td>
</tr>
<tr>
<td>dddd</td>
<td>The name of the day in full. The first letter is capitalized if the selected</td>
<td>‘Monday’ with the format dddd gives ‘Monday’ in English. In French, the day is lundi.</td>
</tr>
<tr>
<td></td>
<td>locale uses capitalized day names.</td>
<td></td>
</tr>
<tr>
<td>DDDD</td>
<td>The name of the day in full, in uppercase.</td>
<td>‘Monday’ with the format DDDD gives ‘MONDAY’ in English. In French, the day is LUNDI.</td>
</tr>
<tr>
<td>dddd dd</td>
<td>The day of the week followed by a space and the number of the day.</td>
<td>‘Monday’ with the format dddd dd gives ‘Monday 01’</td>
</tr>
<tr>
<td>Calendar characters</td>
<td>(month, year)</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>The number of the month with no leading zeros. If the number for month is</td>
<td>‘January’ with the format M gives ‘1’</td>
</tr>
<tr>
<td></td>
<td>less than two characters, the number displays without a zero before it.</td>
<td></td>
</tr>
<tr>
<td>MMM</td>
<td>The number of the month with leading zeros. If the number for month is</td>
<td>‘January’ with the format MMM gives 01</td>
</tr>
<tr>
<td></td>
<td>less than two characters, the number displays with a zero before it.</td>
<td></td>
</tr>
<tr>
<td>mmm</td>
<td>The name of the month abbreviated. The first letter is capitalized if the</td>
<td>‘January’ with the format mmm gives Jan in English. In French, this is ‘jan’.</td>
</tr>
<tr>
<td></td>
<td>selected locale uses capitalization.</td>
<td></td>
</tr>
<tr>
<td>Mmmm</td>
<td>The name of the month abbreviated. The first letter is capitalized for all</td>
<td>‘January’ with the format Mmmm gives Jan in English. In French, this is ‘Jan’.</td>
</tr>
<tr>
<td></td>
<td>locales.</td>
<td></td>
</tr>
<tr>
<td>mmmmm</td>
<td>The name of the month in full. The first letter is capitalized if the</td>
<td>‘January’ with the format mmmmm gives January in English, janvier in French</td>
</tr>
<tr>
<td></td>
<td>selected locale used capitalization.</td>
<td></td>
</tr>
<tr>
<td>MMMMM</td>
<td>The name of the month in full all in uppercase.</td>
<td>‘January’ with the format MMMMM gives JANUARY in English, JANVIER in French</td>
</tr>
<tr>
<td>yy</td>
<td>The last two digits for year.</td>
<td>‘2003’ with the format yy gives ‘03’</td>
</tr>
<tr>
<td>yyyy</td>
<td>All four digits for year.</td>
<td>‘2003’ with the format yyyy gives ‘2003’</td>
</tr>
<tr>
<td>Time of day characters</td>
<td>(hours, minutes, seconds, am/pm)</td>
<td></td>
</tr>
<tr>
<td>Character(s)</td>
<td>Display(s)</td>
<td>Example</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
<td>---------</td>
</tr>
<tr>
<td>hh:mm:ss a</td>
<td>The hour with no leading zeros and the minutes and seconds with leading zeros. The “a” character displays AM or PM after the time when available.</td>
<td>‘21:05:03’ with the format hh:mm:ss a gives ‘9:05:03 PM’ for English locale</td>
</tr>
<tr>
<td>H</td>
<td>The hour according to the 24-hour clock, starting at 0. No leading zero for single figure hours.</td>
<td>‘21:00’ with the format H gives ‘21’. Possible values are 0-23.</td>
</tr>
<tr>
<td>HH</td>
<td>The hour according to the 24-hour clock, starting at 0.</td>
<td>‘21:00’ with the format HH gives ‘21’. Possible values are 00-23.</td>
</tr>
<tr>
<td>k</td>
<td>The hour according to the 24-hour clock, starting at 1. No leading zero for single figure hours.</td>
<td>‘21:00’ with the format k gives ‘21’. Possible values are 1-24.</td>
</tr>
<tr>
<td>kk</td>
<td>The hour according to the 24-hour clock, starting at 01.</td>
<td>‘21:00’ with the format kk gives ‘21’. Possible values are 01-24.</td>
</tr>
<tr>
<td>hh</td>
<td>The hour according to the 12-hour clock.</td>
<td>‘21:00’ with the format hh gives ‘09’</td>
</tr>
<tr>
<td>HH:mm</td>
<td>The hour and minutes with leading zeros.</td>
<td>‘7.15 am’ with the format HH:mm gives ‘07:15’</td>
</tr>
<tr>
<td>HH:mm:ss</td>
<td>The hour, minutes, and seconds with leading zeros.</td>
<td>‘7.15 am’ with the format HH:mm:ss gives ‘07:15:00’</td>
</tr>
<tr>
<td>mm:ss</td>
<td>The minutes, and seconds with leading zeros.</td>
<td>‘07:15:03’ with the format mm:ss gives ‘15:03’</td>
</tr>
</tbody>
</table>

### 6.1.2 Aggregate functions

#### 6.1.2.1 Aggregate

**Description**

Returns the default aggregation of a measure for a given member set

**Function Group**

Aggregate
Syntax

`num Aggregate(measure[:member_set])`

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
<tr>
<td>member_set</td>
<td>The member set used to calculate the aggregation</td>
<td>Member set</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes

- You can use extended syntax context operators with `Aggregate`.
- If you include `member_set`, `Aggregate` returns the aggregate value of the measure for all members in the member set.
- `member_set` can include multiple sets separated by semicolons (:).
- The list of member sets must be enclosed in `{}`.
- If the member set expression does not specify a precise member or node, the hierarchy referenced must be present in the table, then the member set expression references the current member in the hierarchy in the table. If the hierarchy is not in the table, the function returns the message `#MULTIVALE`.
- Delegated measure aggregation returns `#TOREFRESH` when the required aggregation is not available in the query. The user has to refresh the document to get the new level of aggregation. This occurs for example when using the filter bar when the user selects a value before “all values” and vice versa when selecting “all values” before a selected value.

Examples

If the default aggregation of the [Sales Revenue] measure is Sum, and [California] is a member in the [Geography] hierarchy (Country > State > City), `Aggregate([Sales Revenue];Descendants([Geography]&[US].[California];1))` returns the total sales revenue of all cities in California.

Related Information

*Referring to members and member sets in hierarchies* [page 235]

You refer to members and member sets in functions using the syntax `[hierarchy]&path.function.`
6.1.2.2 Average

Description

Returns the average value of a measure

Function Group

Aggregate

Syntax

```
num Average(measure[;member_set] [;IncludeEmpty])
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
<tr>
<td>member_set</td>
<td>A set of members</td>
<td>Member set</td>
<td>No</td>
</tr>
<tr>
<td>IncludeEmpty</td>
<td>Includes empty rows in the</td>
<td>Keyword</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>calculation</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes

- You can use extended syntax context operators with `Average`.
- If you include `member_set`, `Average` returns the average value of the measure for all members in the member set.
- `member_set` can include multiple sets separated by semicolons (`;`).
- The list of member sets must be enclosed in `{}`.
- If the member set expression does not specify a precise member or node, the hierarchy referenced must be present in the table, then the member set expression references the current member in the hierarchy in the table. If the hierarchy is not in the table, the function returns the message #MULTIVALUE.
- Delegated measure aggregation returns #TOREFRESH when the required aggregation is not available in the query. The user has to refresh the document to get the new level of aggregation. This occurs for example
when using the filter bar when the user selects a value before “all values” and vice versa when selecting “all values” before a selected value.

- A delegated measure given against a group returns #UNAVAILABLE as it requires local aggregation (aggregation of the measure value of the grouped values).

Even when you force local aggregation on a delegated measure against an “if then else” formula or group value it will still return the #MULTIVALUE message.

Examples

If the [Sales Revenue] measure has the values 41569, 30500, 40000 and 50138, Average([Sales Revenue]) returns 40552.

If [California] is a member in the [Geography] hierarchy (Country > State > City), Average([Sales Revenue]; {[Geography]&[US].[California].children}) returns the average sales revenue of all cities in California.

Related Information

Referring to members and member sets in hierarchies [page 235]
You refer to members and member sets in functions using the syntax [hierarchy]&path.function.

IncludeEmpty operator [page 219]
The IncludeEmpty operator works with aggregate functions.

6.1.2.3 Count

Description

Returns the number of values in a set of values

Function Group

Aggregate

Syntax

integer Count(aggregated_data[;member_set][;IncludeEmpty][;Distinct|All])
### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>aggregated_data</td>
<td>Any dimension, measure, hierarchy, level or member set</td>
<td>Dimension, measure, hierarchy, member set</td>
<td>Yes</td>
</tr>
<tr>
<td>member_set</td>
<td>The member set used to calculate the count</td>
<td>Member set</td>
<td>No</td>
</tr>
<tr>
<td>IncludeEmpty</td>
<td>Includes empty values in the calculation</td>
<td>Keyword</td>
<td>No</td>
</tr>
<tr>
<td>Distinct</td>
<td>All</td>
<td>Includes distinct values only (default for dimensions) or all values (default for measures) in the calculation</td>
<td>Keyword</td>
</tr>
</tbody>
</table>

### Notes

- You can use extended syntax context operators with `Count`.
- If you specify `IncludeEmpty` as the second argument, the function takes empty (null) values into consideration in the calculation.
- If you do not specify the `Distinct|All` parameter, the default values are `Distinct` for dimensions and `All` for measures.
- If you include `member_set`, `Count` restricts the count to the number of values in `member_set`.
- `member_set` can include multiple sets separated by semicolons (;).
- The list of member sets must be enclosed in `{}`.
- If the member set expression does not specify a precise member or node, the hierarchy referenced must be present in the table, then the member set expression references the current member in the hierarchy in the table. If the hierarchy is not in the table, the function returns the message #MULTIVALUE.
- Delegated measure aggregation returns #TOREFRESH when the required aggregation is not available in the query. The user has to refresh the document to get the new level of aggregation. This occurs for example when using the filter bar when the user selects a value before `All values` and vice versa when selecting `All values` before a selected value.
- A delegated measure given against a group returns #UNAVAILABLE as it requires local aggregation (aggregation of the measure value of the grouped values). Even when you force local aggregaton on a delegated measure against an "if then else" formula or group value it will still return the #MULTIVALUE message.

### Examples

```
Count("Test") returns 1

Count([City];Distinct) returns 5 if there are 5 different cities in a list of cities, even if there are more than 5 rows in the list due to duplication.
```
Count([City];All) returns 10 if there are 10 cities in a list of cities, even though some are duplicated.

Count([City];IncludeEmpty) returns 6 if there are 5 cities and one blank row in a list of cities.

Count([Product];{[Geography]&[State]}) returns the total number of products at the [State] level in the [Geography] hierarchy.

Related Information

IncludeEmpty operator [page 219]
The IncludeEmpty operator works with aggregate functions.

Distinct/All operators [page 219]
The Distinct/All operators work with the Count function.

6.1.2.4 First

Description

Returns the first value in a data set

Function Group

Aggregate

Syntax

\[\text{input\_type \ First\{dimension\_measure\}}\]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension_measure</td>
<td>Any dimension or measure</td>
<td>Dimension or measure</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Notes

- When placed in a break footer, First returns the first value in the break.
- When placed a section footer, First returns the first value in the section.

Examples

When placed in a table footer, First([Revenue]) returns the first value of [Revenue] in the table.

6.1.2.5 Last

Description

Returns the last value in a dimension or measure

Function Group

Aggregate

Syntax

input_type Last(dimension|measure)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension</td>
<td>measure</td>
<td>Any dimension or measure</td>
<td>Dimension or measure</td>
</tr>
</tbody>
</table>

Notes

- When placed in a break footer, Last returns the last value in the break.
• When placed a section footer, \texttt{Last} returns the last value in the section.

**Examples**

When placed in a table footer, \texttt{First([Revenue])} returns the first value of [Revenue] in the table.

### 6.1.2.6 Max

**Description**

Returns the largest value in a set of values

**Function Group**

Aggregate

**Syntax**

\[
\text{input_type} \texttt{Max(\text{aggregated_data}[:member\_set])}
\]

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>aggregated_data</td>
<td>Any dimension, measure, hierarchy, level or member set</td>
<td>Dimension, measure, hierarchy, level or member set</td>
<td>Yes</td>
</tr>
<tr>
<td>member_set</td>
<td>A set of members</td>
<td>Member set</td>
<td>No</td>
</tr>
</tbody>
</table>

**Notes**

• You can use extended syntax context operators with \texttt{Max}.
• If you include \texttt{member\_set}, \texttt{Max} returns the maximum value of the aggregated data for all members in the member set.
• `member_set` can include multiple sets separated by semicolons (;).
• The list of member sets must be enclosed in `{}`.
• If the member set expression does not specify a precise member or node, the hierarchy referenced must be present in the table, then the member set expression references the current member in the hierarchy in the table. If the hierarchy is not in the table, the function returns the message #MULTIVALE.
• Delegated measure aggregation returns #TOREFRESH when the required aggregation is not available in the query. The user has to refresh the document to get the new level of aggregation. This occurs for example when using the filter bar when the user selects a value before “all values” and vice versa when selecting “all values” before a selected value.
• A delegated measure given against a group returns #UNAVAILABLE as it requires local aggregation (aggregation of the measure value of the grouped values). Even when you force local aggregation on a delegated measure against an “if then else” formula or group value it will still return the #MULTIVALE message.

Examples

If the [Sales Revenue] measure has the values 3000, 60034 and 901234, `Max([Sales Revenue])` returns 901234.

If the [City] dimension has the values “Aberdeen” and “London”, `Max([City])` returns “London”.

If [US] is a member in the [Geography] hierarchy (Country > State > City), `Max([Sales Revenue]; {[Geography].[US].Children})` returns the highest sales revenue for a US state.

6.1.2.7 Median

Description

Returns the median (middle value) of a measure

Function Group

Aggregate

Syntax

```
num Median(measure)
```
### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Notes

If the set of numbers has an even number of values, \textit{Median} takes the average of the middle two values.

### Examples

\texttt{Median([Revenue])} returns 971,444 if \texttt{[Revenue]} has the values 835420, 971444, and 1479660.

### 6.1.2.8 Min

#### Description

Returns the smallest value in a set of values

#### Function Group

\textit{Aggregate}

#### Syntax

\texttt{input\_type Min(aggregated\_data[;member\_set])}
**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>aggregated_data</td>
<td>Any dimension, measure, hierarchy, level or member set</td>
<td>Dimension, measure, hierarchy, level or member set</td>
<td>Yes</td>
</tr>
<tr>
<td>member_set</td>
<td>A set of members</td>
<td>Member set</td>
<td>No</td>
</tr>
</tbody>
</table>

**Notes**

- You can use extended syntax context operators with `Min`.
- If you include `member_set`, `Min` returns the minimum value of the aggregated data for all members in the member set.
- `member_set` can include multiple sets separated by semicolons (;).
- The list of member sets must be enclosed in `{}`.
- If the member set expression does not specify a precise member or node, the hierarchy referenced must be present in the table, then the member set expression references the current member in the hierarchy in the table. If the hierarchy is not in the table, the function returns the message #MULTIVALUE.
- Delegated measure aggregation returns #TOREFRESH when the required aggregation is not available in the query. The user has to refresh the document to get the new level of aggregation. This occurs for example when using the filter bar when the user selects a value before "all values" and vice versa when selecting "all values” before a selected value.
- A delegated measure given against a group returns #UNAVAILABLE as it requires local aggregation (aggregation of the measure value of the grouped values). Even when you force local aggregation on a delegated measure against an "if then else" formula or group value it will still return the #MULTIVALUE message.

**Examples**

If the [Sales revenue] measure has the values 3000, 60034 and 901234, `Min([Sales Revenue])` returns 3000.

If the [City] dimension has the values Aberdeen and London, `Min([City])` returns "Aberdeen".

`Min([Sales Revenue];{[Geography]&[US].children})` returns the lowest sales revenue for a US state if [US] is a member in the [Geography] hierarchy with levels [Country] > [State] > [City].

**6.1.2.9 Mode**

**Description**

Returns the most frequently-occurring value in a data set
**Function Group**

Aggregate

**Syntax**

```
input_type Mode(dimension|measure)
```

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension</td>
<td>measure</td>
<td>Any dimension or measure</td>
<td>Measure</td>
</tr>
</tbody>
</table>

**Notes**

- `Mode` returns null if the data set does not contain one value that occurs more frequently than all the others.

**Examples**

- `Mode([Revenue])` returns 200 if `[Revenue]` has the values 100, 200, 300, 200.
- `Mode([Country])` returns the most frequently-occurring value of `[Country]`.

**6.1.2.10 Percentage**

**Description**

Expresses a measure value as a percentage of its embedding context

**Function Group**

Aggregate
Syntax

num Percentage(measure[,Break][;Row|Col])

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
<tr>
<td>Break</td>
<td>Accounts for table breaks</td>
<td>Keyword</td>
<td>No</td>
</tr>
<tr>
<td>Row</td>
<td>Col</td>
<td>Sets the calculation direction</td>
<td>Keyword</td>
</tr>
</tbody>
</table>

Examples

In the following table, the Percentage column has the formula Percentage([Sales Revenue])

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales Revenue</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1000</td>
<td>10</td>
</tr>
<tr>
<td>2002</td>
<td>5000</td>
<td>50</td>
</tr>
<tr>
<td>2003</td>
<td>4000</td>
<td>40</td>
</tr>
<tr>
<td>Sum:</td>
<td>10000</td>
<td>100</td>
</tr>
</tbody>
</table>

By default the embedding context is the measure total in the table. You can make the function take account of a break in a table by using the optional Break argument. In this case the default embedding context becomes the table section.

In the following table, the Percentage column has the formula Percentage([Sales Revenue], Break)

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Revenue</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>1000</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>2000</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>5000</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>2000</td>
<td>20</td>
</tr>
<tr>
<td>2001</td>
<td>Sum:</td>
<td>10000</td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Revenue</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>Q1</td>
<td>2000</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>2000</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>5000</td>
<td>50</td>
</tr>
<tr>
<td>-------</td>
<td>----</td>
<td>------</td>
<td>----</td>
</tr>
<tr>
<td>Q4</td>
<td></td>
<td>1000</td>
<td>10</td>
</tr>
<tr>
<td><strong>2002</strong></td>
<td><strong>Sum:</strong></td>
<td><strong>10000</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

You can use the `Percentage` function across columns or rows; you can specify this explicitly using the optional `Row|Col` argument. For example, in the following crosstab, the % column has the formula `Percentage([Sales Revenue];Row)`.

<table>
<thead>
<tr>
<th></th>
<th>Q1</th>
<th>%</th>
<th>Q2</th>
<th>%</th>
<th>Q3</th>
<th>%</th>
<th>Q4</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2001</strong></td>
<td>1000</td>
<td>10</td>
<td>2000</td>
<td>20</td>
<td>5000</td>
<td>50</td>
<td>2000</td>
<td>20</td>
</tr>
<tr>
<td><strong>2002</strong></td>
<td>2000</td>
<td>20</td>
<td>2000</td>
<td>20</td>
<td>5000</td>
<td>50</td>
<td>1000</td>
<td>10</td>
</tr>
</tbody>
</table>

### 6.1.2.11 Percentile

**Description**

Returns the nth percentile of a measure

**Function Group**

Numeric

**Syntax**

```plaintext
num Percentile(measure;percentile)
```

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
<tr>
<td>percentile</td>
<td>A percentage expressed as a decimal</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>
**Notes**

The nth percentile is a number that is greater than or equal to n% of the numbers in a set. You express n% in the form 0.n.

**Examples**

If [measure] has the set of numbers (10;20;30;40;50), Percentile([measure];0.3) returns 22, which is greater than or equal to 30% of the numbers in the set.

### 6.1.2.12 Product

**Description**

Multiplies the values of a measure

**Function Group**

Aggregate

**Syntax**

```
num Product(measure)
```

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Examples**

Product([Measure]) returns 30 if [Measure] has the values 2, 3, 5.
6.1.2.13  RunningAverage

Description

Returns the running average of a measure

Function Group

Aggregate

Syntax

```
num RunningAverage(measure[;Row|Col][;IncludeEmpty][;(reset_dims)])
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
<tr>
<td>Row</td>
<td>Col</td>
<td>Sets the calculation direction</td>
<td>Keyword</td>
</tr>
<tr>
<td>IncludeEmpty</td>
<td>Includes empty values in the</td>
<td>Keyword</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>calculation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>reset_dims</td>
<td>Resets the calculation on the</td>
<td>Dimension list</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>specified dimensions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes

- You can use extended syntax context operators with `RunningAverage`.
- You can set the calculation direction with the `Row` and `Col` operators.
- If you apply a sort on the measure referenced by `RunningAverage`, the running average is calculated after the measure is sorted.
- You must always place dimensions in parentheses even if there is only one dimension in the list of reset dimensions.
- When you specify a set of reset dimensions you must separate them with semi-colons.
- `RunningAverage` does not automatically reset the average after a block break or new section.
Examples

RunningAverage([Revenue]) returns these results in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Resort</th>
<th>Revenue</th>
<th>Running Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>Hawaiian Club</td>
<td>1,479,660</td>
<td>835,420</td>
</tr>
<tr>
<td>US</td>
<td>Bahamas Beach</td>
<td>971,444</td>
<td>1,225,552</td>
</tr>
<tr>
<td>France</td>
<td>French Riviera</td>
<td>835,420</td>
<td>1,095,508</td>
</tr>
</tbody>
</table>

RunningAverage([Revenue];([Country])) returns these results in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Resort</th>
<th>Revenue</th>
<th>Running Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>Hawaiian Club</td>
<td>1,479,660</td>
<td>835,420</td>
</tr>
<tr>
<td>US</td>
<td>Bahamas Beach</td>
<td>971,444</td>
<td>1,225,552</td>
</tr>
<tr>
<td>France</td>
<td>French Riviera</td>
<td>835,420</td>
<td>835,420</td>
</tr>
</tbody>
</table>

Related Information

IncludeEmpty operator [page 219]
The IncludeEmpty operator works with aggregate functions.

Row/Col operators [page 222]
The Row operator calculates each value in the row as a percentage of the total value of all the rows in the embedding context. The Col operator calculates each value in the column as a percentage of the total value of all the columns in the embedding context.

6.1.2.14 RunningCount

Description

Returns the running count of a number set

Function Group

Aggregate
Syntax

\[ \text{num } \text{RunningCount(dimension|measure[;Row|Col][;IncludeEmpty][;(reset_dims)])} \]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension</td>
<td>measure</td>
<td>Any dimension or measure</td>
<td>Dimension or measure</td>
</tr>
<tr>
<td>Row</td>
<td>Col</td>
<td>Sets the calculation direction</td>
<td>Keyword</td>
</tr>
<tr>
<td>IncludeEmpty</td>
<td>Includes empty values in the calculation</td>
<td>Keyword</td>
<td>No</td>
</tr>
<tr>
<td>reset_dims</td>
<td>Resets the calculation on the specified dimensions</td>
<td>Dimension list</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes

- You can use extended syntax context operators with \text{RunningCount}.
- You can set the calculation direction with the \text{Row} and \text{Col} operators.
- If you apply a sort on the measure referenced by \text{RunningCount}, the running count is calculated after the measure is sorted.
- You must always place dimensions in parentheses even if there is only one dimension in the list of reset dimensions.
- When you specify a set of reset dimensions you must separate them with semi-colons.
- \text{RunningCount} does not automatically reset the count after a block break or new section.

Examples

\text{RunningCount([Revenue])} returns these results in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Resort</th>
<th>Revenue</th>
<th>Running Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>Hawaiian Club</td>
<td>1,479,660</td>
<td>1</td>
</tr>
<tr>
<td>US</td>
<td>Bahamas Beach</td>
<td>971,444</td>
<td>2</td>
</tr>
<tr>
<td>France</td>
<td>French Riviera</td>
<td>835,420</td>
<td>3</td>
</tr>
</tbody>
</table>

\text{RunningCount([Revenue];([Country]))} returns these results in the following table:
### Country Resort Revenue Running Count

<table>
<thead>
<tr>
<th>Country</th>
<th>Resort</th>
<th>Revenue</th>
<th>Running Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>Hawaiian Club</td>
<td>1,479,660</td>
<td>1</td>
</tr>
<tr>
<td>US</td>
<td>Bahamas Beach</td>
<td>971,444</td>
<td>2</td>
</tr>
<tr>
<td>France</td>
<td>French Riviera</td>
<td>835,420</td>
<td>1</td>
</tr>
</tbody>
</table>

**Related Information**

*IncludeEmpty operator* [page 219]

The *IncludeEmpty* operator works with aggregate functions.

*Row/Col operators* [page 222]

The *Row* operator calculates each value in the row as a percentage of the total value of all the rows in the embedding context. The *Col* operator calculates each value in the column as a percentage of the total value of all the columns in the embedding context.

*IncludeEmpty operator* [page 219]

The *IncludeEmpty* operator works with aggregate functions.

*IncludeEmpty operator* [page 219]

The *IncludeEmpty* operator works with aggregate functions.

### 6.1.2.15 RunningMax

**Description**

Returns the running maximum of a dimension or measure

**Function Group**

Aggregate

**Syntax**

```
input_type RunningMax(dimension|measure;Row|Col;(reset_dims))
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension</td>
<td>measure</td>
<td>Any dimension or measure</td>
<td>Dimension or measure</td>
</tr>
<tr>
<td>Row</td>
<td>Col</td>
<td>Sets the calculation direction</td>
<td>Keyword</td>
</tr>
<tr>
<td>reset_dims</td>
<td>Resets the calculation on the specified dimensions</td>
<td>Dimension list</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes

- You can use extended syntax context operators with RunningMax.
- You can set the calculation direction with the Row and Col operators.
- If you apply a sort on the measure referenced by RunningMax, the running maximum is calculated after the measure is sorted.
- You must always place dimensions in parentheses even if there is only one dimension in the list of reset dimensions.
- When you specify a set of reset dimensions you must separate them with semi-colons.
- RunningMax does not automatically reset the max after a block break or new section.

Examples

RunningMax([Revenue]) returns these results in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Resort</th>
<th>Revenue</th>
<th>Running Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>French Riviera</td>
<td>835,420</td>
<td>835,420</td>
</tr>
<tr>
<td>US</td>
<td>Bahamas Beach</td>
<td>971,444</td>
<td>971,444</td>
</tr>
<tr>
<td>US</td>
<td>Hawaiian Club</td>
<td>1,479,660</td>
<td>1,479,660</td>
</tr>
</tbody>
</table>

Related Information

IncludeEmpty operator [page 219]
The IncludeEmpty operator works with aggregate functions.

Row/Col operators [page 222]
The Row operator calculates each value in the row as a percentage of the total value of all the rows in the embedding context. The Col operator calculates each value in the column as a percentage of the total value of all the columns in the embedding context.
6.1.2.16  RunningMin

Description

Returns the running minimum of a dimension or measure

Function Group

Aggregate

Syntax

```
input_type RunningMin(dimension|measure;[Row|Col];{(reset_dims)})
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension</td>
<td>detail</td>
<td>measure</td>
<td>Any dimension or measure</td>
</tr>
<tr>
<td>Row</td>
<td>Col</td>
<td>Sets teh calculation direction</td>
<td>Keyword</td>
</tr>
<tr>
<td>reset dims</td>
<td>Resets the calculation on the specified dimensions</td>
<td>Dimension list</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes

- You can use extended syntax context operators with RunningMin.
- You can set the calculation direction with the Row and Col operators.
- If you apply a sort on the measure referenced by RunningMin, the running minimum is calculated after the measure is sorted.
- You must always place dimensions in parentheses even if there is only one dimension in the list of reset dimensions.
- When you specify a set of reset dimensions you must separate them with semi-colons.
- RunningMin does not automatically reset the minimum after a block break or new section.
Examples

RunningMin([Revenue]) returns these results in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Resort</th>
<th>Revenue</th>
<th>Running Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>French Riviera</td>
<td>835,420</td>
<td>835,420</td>
</tr>
<tr>
<td>US</td>
<td>Bahamas Beach</td>
<td>971,444</td>
<td>835,420</td>
</tr>
<tr>
<td>US</td>
<td>Hawaiian Club</td>
<td>1,479,660</td>
<td>835,420</td>
</tr>
</tbody>
</table>

Related Information

IncludeEmpty operator [page 219]
The IncludeEmpty operator works with aggregate functions.

Row/Col operators [page 222]
The Row operator calculates each value in the row as a percentage of the total value of all the rows in the embedding context. The Col operator calculates each value in the column as a percentage of the total value of all the columns in the embedding context.

6.1.2.17 RunningProduct

Description

Returns the running product of a measure

Function Group

Aggregate

Syntax

num RunningProduct(measure;[Row|Col];(reset_dims))
# Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
<tr>
<td>Row</td>
<td>Col</td>
<td>Sets the calculation direction</td>
<td>Keyword</td>
</tr>
<tr>
<td>reset_dims</td>
<td>Resets the calculation on the specified dimensions</td>
<td>Dimension list</td>
<td>No</td>
</tr>
</tbody>
</table>

## Notes

- You can use extended syntax context operators with `RunningProduct`.
- You can set the calculation direction with the `Row` and `Col` operators.
- If you apply a sort on the measure referenced by `RunningProduct`, the running product is calculated after the measure is sorted.
- You must always place dimensions in parentheses even if there is only one dimension in the list of reset dimensions.
- When you specify a set of reset dimensions you must separate them with semi-colons.
- `RunningProduct` does not automatically reset the product after a block break or new section.

## Examples

`RunningProduct([Number of guests])` returns these results in the following table:

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>City</th>
<th>Number of guests</th>
<th>Running Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>Kobe</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Japan</td>
<td>Osaka</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>US</td>
<td>Chicago</td>
<td>241</td>
<td>5,784</td>
</tr>
</tbody>
</table>

`RunningProduct([Number of guests];([Country of origin]))` returns these results in the following table:

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>City</th>
<th>Number of guests</th>
<th>Running Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>Kobe</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Japan</td>
<td>Osaka</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>US</td>
<td>Chicago</td>
<td>241</td>
<td>5,784</td>
</tr>
</tbody>
</table>
Related Information

IncludeEmpty operator [page 219]
The IncludeEmpty operator works with aggregate functions.

Row/Col operators [page 222]
The Row operator calculates each value in the row as a percentage of the total value of all the rows in the embedding context. The Col operator calculates each value in the column as a percentage of the total value of all the columns in the embedding context.

6.1.2.18 RunningSum

Description

Returns the running sum of a measure

Function Group

Aggregate

Syntax

```
num RunningSum(measure[;Row|Col][; (reset_dims)])
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
<tr>
<td>Row</td>
<td>Col</td>
<td>Sets the calculation direction</td>
<td>Keyword</td>
</tr>
<tr>
<td>reset_dims</td>
<td>Resets the calculation on the</td>
<td>Dimension list</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>specified dimensions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Notes

- You can use extended syntax context operators with the `RunningSum`.
- You can set the calculation direction with the `Row` and `Col` operators.
- If you apply a sort on the measure referenced by the `RunningSum` function, the running sum is calculated after the measure is sorted.
- You must always place dimensions in parentheses even if there is only one dimension in the list of reset dimensions.
- When you specify a set of reset dimensions you must separate them with semi-colons.
- `RunningSum` does not automatically reset the sum after a block break or new section.

Example

`RunningSum([Revenue])` returns these results in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Resort</th>
<th>Revenue</th>
<th>Running Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>French Riviera</td>
<td>835,420</td>
<td>835,420</td>
</tr>
<tr>
<td>US</td>
<td>Bahamas Beach</td>
<td>971,444</td>
<td>1,806,864</td>
</tr>
<tr>
<td>US</td>
<td>Hawaiian Club</td>
<td>1,479,660</td>
<td>3,286,524</td>
</tr>
</tbody>
</table>

`RunningSum([Revenue];([Country]))` returns these results in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Resort</th>
<th>Revenue</th>
<th>Running Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>French Riviera</td>
<td>835,420</td>
<td>835,420</td>
</tr>
<tr>
<td>US</td>
<td>Bahamas Beach</td>
<td>971,444</td>
<td>971,444</td>
</tr>
<tr>
<td>US</td>
<td>Hawaiian Club</td>
<td>1,479,660</td>
<td>2,451,104</td>
</tr>
</tbody>
</table>

Related Information

*IncludeEmpty operator* [page 219]

The `IncludeEmpty` operator works with aggregate functions.

*Row/Col operators* [page 222]

The `Row` operator calculates each value in the row as a percentage of the total value of all the rows in the embedding context. The `Col` operator calculates each value in the column as a percentage of the total value of all the columns in the embedding context.
6.1.2.19 ServerValue

Description

Returns the database value of a measure

Function Group

Aggregate

Syntax

```
num ServerValue([measure])
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- `ServerValue` ignores all local filters applied to dimensions or hierarchies used to calculate the measure

Example

`ServerValue([Internet Sales Amount])` returns the database value of the measure `[Internet Sales Amount]`
6.1.2.20  StdDev

Description

Returns the standard deviation of a measure

Function Group

Aggregate

Syntax

num StdDev(measure)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

The standard deviation is a measure of the statistical dispersion in a set of numbers. It is calculated by:

- finding the average of the set of numbers
- subtracting the average from each number in the set and squaring the difference
- summing all these squared differences
- dividing this sum by (<number of numbers in the set> - 1)
- finding the square root of the result

Examples

If measure has the set of values (2, 4, 6, 8) StdDev([measure]) returns 2.58.
Related Information

Related Information

6.1.2.21  StdDevP

Description

Returns the population standard deviation of a measure

Function Group

Aggregate

Syntax

num StdDevP(measure)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

The population standard deviation is a measure of the statistical dispersion in a set of numbers. It is calculated by:

- finding the average of the set of numbers;
- subtracting the average from each number in the set and squaring the difference;
- summing all these squared differences;
- dividing this sum by (number of numbers in the set);
- finding the square root of the result.

You can use extended syntax context operators with StdDevP.
Examples

If measure has the set of values (2, 4, 6, 8) StdDevP([measure]) returns 2.24.

6.1.2.22 Sum

Description

Returns the sum of a measure

Function Group

Aggregate

Syntax

num Sum(measure[;member_set])

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
<tr>
<td>member_set</td>
<td>A set of members</td>
<td>Member set</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes

- You can use extended syntax context operators with Sum.
- If you include member_set. Sum returns the sum of the measure for all members in the member set.
- member_set can include multiple sets separated by semicolons (;).
- The list of member sets must be enclosed in {}.
- If the member set expression does not specify a precise member or node, the hierarchy referenced must be present in the table, then the member set expression references the current member in the hierarchy in the table. If the hierarchy is not in the table, the function returns the message #MULTIVALUE.
• Delegated measure aggregation returns #TOREFRESH when the required aggregation is not available in the query. The user has to refresh the document to get the new level of aggregation. This occurs for example when using the filter bar when the user selects a value before “all values” and vice versa when selecting “all values” before a selected value.

• When migrating from XIR2 to XIR3, aggregation functions containing IN and WHERE clauses in XI2 queries should be included into Sum function definitely by using parenthesis as follows:
  In XIR2, the formula: =Sum([Measure] In ([Dim 1];[Dim 2])) In ([Dim 1]) Where ([Dim 3]="Constant")
  From XIR3 onwards, modify the declaration: =Sum(([Measure] In ([Dim 1];[Dim 2])) In ([Dim 1])
Where ([Dim 3]="Constant")

• A delegated measure given against a group returns #UNAVAILABLE as it requires local aggregation (aggregation of the measure value of the grouped values).
  Even when you force local aggregation on a delegated measure against an "if then else" formula or group value it will still return the #MULTIVALE message.

Examples

If the Sales Revenue measure has the values 2000, 3000, 4000, and 1000, \(\text{Sum([Sales Revenue])}\) returns 10000.

If [California] is a member in the [Geography] hierarchy (Country > State > City), \(\text{Sum([Sales Revenue];
\{Descendants([Geography]&[US].[California];1)\})}\) returns the total sales revenue of all cities in California.

6.1.2.23 Var

Description

Returns the variance of a measure

Function Group

Aggregate

Syntax

\text{num Var(measure)}
### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Notes

The variance is a measure of the statistical dispersion in a set of numbers. It is calculated by:

- finding the average of the set of numbers
- subtracting the average from each number in the set and squaring the difference
- summing all these squared differences
- dividing this sum by \( \frac{\text{number of numbers in the set}}{\cdot 1} \)

The variance is the square of the standard deviation.

You can use extended syntax context operators with \( \texttt{Var} \).

### Examples

If \( \text{measure} \) has the set of values \((2, 4, 6, 8)\)

\[
\text{Var}(\{\text{measure}\}) \text{ returns 6.67.}
\]

### Related Information

- \( \texttt{StdDev} \) [page 73]

### 6.1.2.24 VarP

### Description

Returns the population variance of a measure

### Function Group

Aggregate
Syntax

```
num VarP(measure)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

The population variance is a measure of the statistical dispersion in a set of numbers. It is calculated by:

- finding the average of the set of numbers
- subtracting the average from each number in the set and squaring the difference
- summing all these squared differences
- dividing this sum by (\(<\text{number of numbers in the set}>\))

The population variance is the square of the population standard deviation.

You can use extended syntax context operators with `VarP`.

Examples

If `measure` has the set of values (2, 4, 6, 8) `VarP([measure])` returns 5.

Related Information

`StdDevP` [page 74]
6.1.3 Character functions

6.1.3.1 Asc

Description

Returns the ASCII value of a character

Function Group

Character

Syntax

\[
\text{int Asc(string)}
\]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>Any string</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

If \text{string} contains more than one character, the function returns the ASCII value of the first character in the string.

Examples

\[
\begin{align*}
\text{Asc(“A”)} & \text{ returns 65.} \\
\text{Asc(“ab”)} & \text{ returns 97.} \\
\text{Asc([Country])} & \text{ returns 85 when the value of [Country] is "US".}
\end{align*}
\]
6.1.3.2  Char

Description

Returns the character associated with an ASCII code

Function Group

Character

Syntax

```
string Char(ascii_code)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>ascii_code</td>
<td>An ASCII code</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

If `number` is a decimal, the function ignores the decimal part.

Example

```
s
Char(123) returns "\"\".
```
6.1.3.3 Concatenation

Description

Concatenates (joins) two character strings

Function Group

Character

Syntax

```
string Concatenation(first_string;second_string)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>first_string</td>
<td>The first string</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>second_string</td>
<td>The second string</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

You can also use the '+' operator to concatenate strings.

"First " + "Second" returns "First Second".

"First " + "Second" + " Third" returns "First Second Third".

You can use concatenation to include multiple dimensions in an aggregation function. For example, 
Count([Sales Person]+[Quarter]+[Resort]) is equivalent to the syntax Count(<Sales Person>,<Quarter>,<Resort>) that is allowed by Desktop Intelligence.

Examples

```
Concatenation("First ";"Second") returns "First Second".
```
Concatenation("First ";Concatenation("Second ";"Third")) returns "First Second Third".

### 6.1.3.4 Fill

**Description**

Builds a string by repeating a string \( n \) times

**Function Group**

Character

**Syntax**

```plaintext
string Fill(repeating_string;num_repeats)
```

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>repeating_string</td>
<td>The repeating string</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>num_repeats</td>
<td>The number of repeats</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Examples**

Fill ("New York ";2) returns "New York New York".

### 6.1.3.5 FormatDate

**Description**

Formats a date according to a specified format
Function Group

Character

Syntax

```plaintext
string DateFormat(date;format_string)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>The date to format</td>
<td>Date</td>
<td>Yes</td>
</tr>
<tr>
<td>format_string</td>
<td>The format to apply</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- The format of the output is dependent on the date format applied to the cell.
- The color formatting strings (for example: [Red], [Blue] and so on) cannot be applied to `DateFormat`.

Examples

```plaintext
DateFormat(CurrentDate();"dd/MM/yyyy") returns "15/12/2005" if the current date is 15 December 2005.
```

6.1.3.6 FormatNumber

Description

Formats a number according to a specified format

Function Group

Character
Syntax

```plaintext
string FormatNumber(number;format_string)
```

## Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>The number to format</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>format_string</td>
<td>The format to apply</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

## Notes

- The format of the output is dependent on the number format applied to the cell.
- The color formatting strings (for example: [Red], [Blue] and so on) cannot be applied to `FormatNumber`.

## Examples

```
FormatNumber([Revenue];"#,###.00") returns 835.420.00 if [Revenue] is 835.420.
```

### 6.1.3.7 HTMLEncode

## Description

Applies HTML encoding rules to a string

## Function Group

Character

## Syntax

```plaintext
string HTMLEncode(html)
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>html</td>
<td>An HTML string</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples


6.1.3.8 InitCap

Description

Capitalize the first letter of a string

Function Group

Character

Syntax

```
string InitCap(string)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The string to capitalize</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

`InitCap("we hold these truths to be self-evident")` returns "We hold these truths to be self-evident".
6.1.3.9 Left

Description

Returns the leftmost characters of a string.

Note

When the selected interface locale is Arabic (Right-To-Left display/reading) this function returns the first characters from the logical start of the string.

Function Group

Character

Syntax

string Left(string;num_chars)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The input string</td>
<td>string</td>
<td>Yes</td>
</tr>
<tr>
<td>num_chars</td>
<td>The number of characters to return from the start of the string</td>
<td>number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Example

`Left([Country];2) returns "Fr" if [Country] is "France".`
6.1.3.10  LeftPad

Description

Pads a string on its left with another string.

**Note**

When the selected interface locale is Arabic (Right-To-Left display/reading) this function pads the string before its logical start with characters of another string.

Function Group

Character

Syntax

```
string LeftPad(padded_string;length;left_string)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>padded_string</td>
<td>The original string</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>length</td>
<td>The length of the output string</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>left_string</td>
<td>The string to be added to the start of padded_string</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- If `length` is less than the length of `left_string` and `padded_string` combined, `left_string` is truncated.
- If `length` is less than or equal to the length of `padded_string`, the function returns `padded_string`.
- If `length` is greater than the lengths of `padded_string` and `left_string` combined, `left_string` is repeated or partially repeated enough times to fill out the length.
Examples

LeftPad("York";8;"New ") returns "New York"
LeftPad("York";6;"New ") returns "NeYork"
LeftPad("York";11;"New ") returns "New NewYork"
LeftPad("New ";2;"York") returns "New".

6.1.3.11 LeftTrim

Description

Trims the leading spaces from a string.

Note

When the selected interface locale is Arabic (Right-To-Left display/reading) this function removes the first space characters from the logical start of the string.

Function Group

Character

Syntax

string LeftTrim(trimmed_string)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>trimmed_string</td>
<td>The string to be trimmed</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Examples

LeftTrim([Country]) returns "France" if [Country] is "France".

6.1.3.12  Length

Description

Returns the number of characters in a string

Function Group

Character

Syntax

\[
\text{int Length(string)}
\]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The input string</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

Length([Last Name]) returns 5 if [Last Name] is "Smith".

6.1.3.13  Lower

Description

Converts a string to lower case
**Function Group**

Character

**Syntax**

```
string Lower(string)
```

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The string to be converted to lower case</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Examples**

`Lower("New York")` returns "new york".

### 6.1.3.14 Match

**Description**

Determines whether a string matches a pattern
### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>test_string</td>
<td>The string to be tested against the text pattern</td>
<td>string</td>
<td>Yes</td>
</tr>
<tr>
<td>pattern</td>
<td>The text pattern</td>
<td>string</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Notes

- The pattern can contain the wildcards "*" (replaces any set of characters) or "?" (replaces any single character).

### Examples

- `Match([Country];"F*")` returns True if `[Country]` is "France".
- `Match([Country];"?S?")` returns True if `[Country]` is "USA".
- `Match("New York";"P*")` returns False.

### 6.1.3.15 Pos

**Description**

Returns the starting position of a text pattern in a string

**Function Group**

Character

**Syntax**

```csharp
int Pos(test_string;pattern)
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>test_string</td>
<td>The string to be tested for the text pattern</td>
<td>string</td>
<td>Yes</td>
</tr>
<tr>
<td>pattern</td>
<td>The text pattern</td>
<td>string</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- If the pattern occurs more than once, Pos returns the position of the first occurrence.

Examples

```
Pos("New York";"Ne") returns 1.
Pos("New York, New York";"Ne") returns 1.
Pos("New York"; "York") returns 5.
```

6.1.3.16 Replace

Description

Replaces part of a string with another string

Function Group

Character

Syntax

```
string Replace(replace_in;replaced_string;replace_with)
```
### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>replace_in</td>
<td>The string in which the text is replaced</td>
<td>string</td>
<td>Yes</td>
</tr>
<tr>
<td>replaced_string</td>
<td>The text to be replaced</td>
<td>string</td>
<td>Yes</td>
</tr>
<tr>
<td>replace_with</td>
<td>The text that replaces replaced_string</td>
<td>string</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Examples

Replace("New YORK";"ORK";"ork") returns "New York".

#### 6.1.3.17 Right

**Description**

Returns the rightmost characters of a string (the characters at the end of the string).

**Note**

When the selected interface locale is Arabic (Right-To-Left display/reading) this function returns the first characters from the logical start of the string.

**Function Group**

Character

**Syntax**

```plaintext
string Right(string;num_chars)
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>Any string</td>
<td>string</td>
<td>Yes</td>
</tr>
<tr>
<td>num_chars</td>
<td>The number of characters to return from the right</td>
<td>number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

Right([Country];2) returns "ce" if [Country] is "France".

6.1.3.18 RightPad

Description

Pads a string on its right with another string (adds a string to the start of the original string).

Note

When the selected interface locale is Arabic (Right-To-Left display/reading) this function adds a string to the first characters from the logical start of the string.

Function Group

Character

Syntax

string RightPad(padded_string;length;right_string)
## Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>padded_string</td>
<td>The original string</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>length</td>
<td>The length of the output string</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>right_string</td>
<td>The string to be added to the end of padded_string</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Notes

- If length is less than the length of right_string and padded_string combined, right_string is truncated.
- If length is less than or equal to the length of padded_string, the function returns padded_string.
- If length is greater than the lengths of padded_string and right_string combined, right_string is repeated or partially repeated enough times to fill out the length.

### Examples

- `RightPad("New ";8;"York")` returns "New York"
- `RightPad("New ";6;"York")` returns "New Yo"
- `RightPad("New ";11;"York")` returns "New YorkYor"
- `RightPad("New ";2;"York")` returns "New".

## 6.1.3.19 RightTrim

### Description

Trims the trailing spaces from a string.

### Note

When the selected interface locale is Arabic (Right-To-Left display/reading) this function trims the trailing space from the logical end of the string.
Function Group
Character

Syntax

```
string RightTrim(trimmed_string)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>trimmed_string</td>
<td>The string to be trimmed</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

```
RightTrim([Country]) returns "France" if [Country] is "France ".
```

6.1.3.20 Substr

Description

Returns part of a string

Function Group

Character

Syntax

```
string SubStr(string; start; length)
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>Any string</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>start</td>
<td>The start position of the extracted string</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>length</td>
<td>The length of the extracted string</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

SubStr("Great Britain";1;5) returns "Great".
SubStr("Great Britain";7;7) returns "Britain".

6.1.3.21 Trim

Description

Trims the leading and trailing spaces from a string

Function Group

Character

Syntax

\[
\text{string Trim(trimmed\_string)}
\]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The string to be trimmed</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Examples

Trim(" Great Britain ") returns "Great Britain".

6.1.3.22 Upper

Description

Converts a string to upper case

Function Group

Character

Syntax

string Upper(string)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The string to be converted</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

Upper("New York") returns "NEW YORK".

6.1.3.23 UrlEncode

Description

Applies URL encoding rules to a string
Function Group

Character

Syntax

```plaintext
string UrlEncode(html)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>html</td>
<td>The URL to be encoded</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples


6.1.3.24 WordCap

Description

Capitalizes the first letter of all the words in a string

Function Group

Character

Syntax

```plaintext
string WordCap(string)
```
## Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The string to be capitalized</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Examples

WordCap("Sales revenue for March") returns "Sales Revenue For March".

### 6.1.4 Date and Time functions

#### 6.1.4.1 CurrentDate

#### Description

Returns the current date formatted according to the regional settings

#### Function Group

Date and Time

#### Syntax

```
date CurrentDate()
```

#### Examples

`CurrentDate()` returns 10 September 2002 if the date is 10 September 2002.
6.1.4.2  CurrentTime

Description

Returns the current time formatted according to the regional settings

Function Group

Date and Time

Syntax

```plaintext
time CurrentTime()
```

Examples

CurrentTime returns 11:15 if the current time is 11:15.

6.1.4.3  DayName

Description

Returns the day name in a date

Function Group

Date and Time

Syntax

```plaintext
string DayName(date)
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>The input date</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

DayName([Reservation Date]) returns "Saturday" when the date in [Reservation Date] is 15 December 2001 (which is a Saturday).

Note

The input date must be a variable. You cannot specify the date directly, as in DayName("07/15/2001").

6.1.4.4 DayNumberOfMonth

Description

Returns the day number in a month

Function Group

Date and Time

Syntax

int DayNumberOfMonth(date)
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>The input date</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

DayNumberOfMonth([Reservation Date]) returns 15 when the date in [Reservation Date] is 15 December 2001.

6.1.4.5 DayNumberOfWeek

Description

Returns the day number in a week

Function Group

Date and Time

Syntax

```
int DayNumberOfWeek(date)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>The input date</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

The function treats Monday as the first day of the week.
Examples

DayNumberOfWeek([Reservation Date]) returns 1 when the date in [Reservation Date] is 2 May 2005 (which is a Monday).

6.1.4.6 DayNumberOfYear

Description

Returns the day number in a year

Function Group

Date and Time

Syntax

```java
int DayNumberOfYear(date)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>The input date</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

DayNumberOfYear([Reservation Date]) returns 349 when the date in [Reservation Date] is 15 December 2001.
6.1.4.7 DaysBetween

Description

Returns the number of days between two dates

Function Group

Date and Time

Syntax

\[
\text{int DaysBetween(first_date;last_date)}
\]

Note

You must ensure that the dates given in the arguments are in the same timezone. This applies to all date operations: comparison and calculation.

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>first_date</td>
<td>The first date</td>
<td>Date</td>
<td>Yes</td>
</tr>
<tr>
<td>last_date</td>
<td>The last date</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

DaysBetween([Sale Date];[Invoice Date]) returns 2 if [Sale Date] is 15 December 2001 and [Invoice Date] is 17 December 2001.
6.1.4.8 LastDayOfMonth

Description

Returns the date of the last day in a month

Function Group

Date and Time

Syntax

date LastDayOfMonth(date)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>Any date in the month</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

LastDayOfMonth([Sale Date]) returns 31 December 2005 if [Sale Date] is 11 December 2005.

6.1.4.9 LastDayOfWeek

Description

Returns the date of the last day in a week

Function Group

Date and Time
Syntax

```
date LastDayOfWeek(date)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>Any date in the week</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

The function treats Monday as the first day of the week.

Examples

```
LastDayOfWeek([Sale Date]) returns 15 May 2005 (a Sunday) if [Sale Date] is 11 May 2005.
```

6.1.4.10  Month

Description

Returns the month name in a date

Function Group

Date and Time

Syntax

```
string Month(date)
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>The input date</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

Month([Reservation Date]) returns "December" when the date in [Reservation Date] is 15 December 2005.

6.1.4.11 MonthNumberOfYear

Description

Returns the month number in a date

Function Group

Date and Time

Syntax

```plaintext
int MonthNumberOfYear(date)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>Any date in the year</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Example

MonthNumberOfYear([Reservation Date]) returns 12 when the date in [Reservation Date] is 15 December 2005.
6.1.4.12  MonthsBetween

Description

Returns the number of months between two dates

Function Group

Date and Time

Syntax

```
int MonthsBetween(first_date;last_date)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>first_date</td>
<td>The first date</td>
<td>Date</td>
<td>Yes</td>
</tr>
<tr>
<td>last_date</td>
<td>The last date</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

- `MonthsBetween([Sale Date];[Invoice Date])` returns 1 if [Sale Date] is 2 December 2005 and [Invoice Date] is 2 January 2006.
- `MonthsBetween([Sale Date];[Invoice Date])` returns 1 if [Sale Date] is 31/03/2008 and [Invoice Date] is 30/04/2008.
- `MonthsBetween([Sale Date];[Invoice Date])` returns 118 if [Sale Date] is 07/01/1993 and [Invoice Date] is 06/11/2002.
6.1.4.13 Quarter

Description

Returns the quarter number in a date

Function Group

Date and Time

Syntax

```
int Quarter(date)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>Any date in the quarter</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

`Quarter([Reservation Date])` returns 4 when the date in [Reservation Date] is 15 December 2005.

6.1.4.14 RelativeDate

Description

Returns a date relative to another date

Function Group

Date and Time
Syntax

\[ \text{date RelativeDate(start_date;num_days)} \]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>start_date</td>
<td>The start date</td>
<td>Date</td>
<td>Yes</td>
</tr>
<tr>
<td>num_days</td>
<td>The number of days from the start date</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

The `num_days` parameter can be negative to return a date earlier than `start_date`.

Examples

RelativeDate[Reservation Date];2\) returns 17 December 2005 when `[Reservation Date]` is 15 December 2005.

RelativeDate[Reservation Date];-3\) returns 9 January 2007 when `[Reservation Date]` is 12 January 2007.

6.1.4.15 TimeDim

Description

The **TimeDim** time dimension allows you to build a time axis from a date type universe object. **TimeDim** returns the data for the dates given as the first parameter over the time periods given as the second parameter. When there are periods that have no data, the first day of each empty period is returned. This ensures a full axis for the given period. This guarantees:

- That the axis retains the natural time order (oldest objects first, the most recent objects last).
- The axis contains all the periods between the minimum and maximum dates in the current context.

**Note**

You cannot use the `TimeDim` function to filter on formulas (for example in a filter, input-control, element-link, filter/drill bar). Instead you should directly filter on the underlaying date dimension.
Function Group

Date and Time

Syntax

TimeDim([Date Type]; Period Type)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date Type</td>
<td>The date object for the report, for example, InvoiceDate.</td>
<td>Date</td>
<td>Yes</td>
</tr>
<tr>
<td>Period Type</td>
<td>The period for the results, from the following values:</td>
<td>Pre-defined</td>
<td>Optional</td>
</tr>
<tr>
<td></td>
<td>● DayPeriod</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● MonthPeriod</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● QuarterPeriod</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● YearPeriod</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>When no value is selected, the DayPeriod is used by default. This object</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>should be a data provider object, it must be available from report</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>objects, and cannot be a variable.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Use the above function in conjunction with the following functions:

- DayName
- DayNumberOfMonth
- DayNumberOfWeek
- DayNumberOfYear
- Month
- MonthNumberOfYear
- Quarter
- Year
- FormatDate
Example

The first table below contains data that concerns only certain dates. The query examples that follow show how the results are interpreted.

<table>
<thead>
<tr>
<th>Invoice Date</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/3/00</td>
<td>31,607</td>
</tr>
<tr>
<td>1/8/00</td>
<td>31,244</td>
</tr>
<tr>
<td>7/3/00</td>
<td>38,154</td>
</tr>
</tbody>
</table>

The following formula `DayName(TimeDim([Invoice Date] ; QuarterPeriod)` returns daily values from the above table.

<table>
<thead>
<tr>
<th>Invoice Date</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/3/00</td>
<td>31,607</td>
</tr>
<tr>
<td>1/8/00</td>
<td>31,244</td>
</tr>
<tr>
<td>4/1/00</td>
<td></td>
</tr>
<tr>
<td>7/3/00</td>
<td>38,154</td>
</tr>
</tbody>
</table>

You should format the results of the `TimeDim` function with the `Quarter` function to return the results by Quarter (Q1, Q2...) to give you the following result table:

<table>
<thead>
<tr>
<th>Invoice Date</th>
<th>Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>62,851</td>
</tr>
<tr>
<td>Q2</td>
<td></td>
</tr>
<tr>
<td>Q3</td>
<td>38,154</td>
</tr>
</tbody>
</table>

6.1.4.16 ToDate

Description

Turns a character string into a date. Give the date format as the parameter to indicate to Web Intelligence how to convert the string into a date. The date format you provide must match the format of the date in the original string. Refer to the link below for the possible date formats.

Function Group

Date and Time
Syntax

```plaintext
date ToDate(date_string;format)
```
or

```plaintext
date ToDate(date_string;INPUT_DATE_TIME)
```

Note

When the PVL can be different depending on the user, a fixed format (for a particular locale) is not appropriate. In this case use the INPUT_DATE_TIME parameter as shown in the second example above.

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date_string</td>
<td>The date to be formatted</td>
<td>string</td>
<td>Yes</td>
</tr>
<tr>
<td>format</td>
<td>The date format.</td>
<td>string</td>
<td>Yes*</td>
</tr>
<tr>
<td>INPUT_DATE_TIME</td>
<td>Use this instead of ‘format’, this forces the format of the response to that of the local regional settings.</td>
<td>string</td>
<td>Yes*</td>
</tr>
</tbody>
</table>

* See the note above. Use format or INPUT_DATE_TIME depending on your needs.

Examples

```
ToDate("15/12/2002";"dd/MM/yyyy") returns 15/12/2002.
ToDate("15/12/02";"dd/MM/yyyy") returns 15/12/02.
ToDate("15/12/02";"dd/MM/yy") returns 15/DECEMBER/02.
ToDate("15/12/02";"INPUT_DATE_TIME") returns the response in the format used by the local regional settings on the user’s machine.
```

Related Information

**Custom formats [page 44]**

In tables, you can use the Custom format type to define a customized format for any cell.
6.1.4.17  Week

Description

Returns the week number in the year

Function Group

Date and Time

Syntax

```plaintext
int Week(date)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>The input date</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

`Week([Reservation Date])` returns 1 when the date in [Reservation Date] is 4 January 2004 (which occurs in the first week of the year 2004).

6.1.4.18  Year

Description

Returns the year in a date
**Function Group**

Date and Time

**Syntax**

```
int Year(date)
```

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>The input date</td>
<td>Date</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Examples**

`Year([Reservation Date])` returns 2005 when the date in `[Reservation Date]` is 15 December 2005.

6.1.5 **Data Provider functions**

6.1.5.1 **Connection**

**Description**

Returns the parameters of the database connection used by a data provider

**Function Group**

Data Provider
Syntax

```plaintext
string Connection(dp)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- You must enclose the name of the data provider in square brackets.
- For security reasons, the output of the function does not include the database host name, user name and user password.

6.1.5.2 DataProvider

Description

Returns the name of the data provider containing a report object

Function Group

DataProvider

Syntax

```plaintext
string DataProvider(obj)
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>A report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

DataProvider([Total Revenue]) returns "Sales" if the [Total Revenue] measure is in a data provider called "Sales".

6.1.5.3 DataProviderKeyDate

Description

Returns the keydate of a data provider

Function Group

Data Provider

Syntax

```
date DataProviderKeyDate(dp)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Notes

- You must enclose the name of the data provider in square brackets.
- The returned keydate is formatted according to the document locale.

Examples

`DataProviderKeyDate([Sales])` returns 3 August 2007 if the keydate for the Sales data provider is 3 August 2007.

6.1.5.4 DataProviderKeyDateCaption

Description

Returns the keydate caption of a data provider

Function Group

Data Provider

Syntax

```
string DataProviderKeyDateCaption(dp)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

You must enclose the name of the data provider in square brackets.
Examples

DataProviderKeyDateCaption([Sales]) returns "Current calendar date" if the keydate caption in the Sales data provider is "Current calendar date".

6.1.5.5 DataProviderSQL

Description

Returns the SQL generated by a data provider

Function Group

Data Provider

Syntax

string DataProviderSQL(dp)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

You must enclose the name of the data provider in square brackets.

Examples

DataProviderSQL([Query 1]) returns SELECT country.country_name FROM country if the data provider SQL is SELECT country.country_name FROM country.
6.1.5.6 DataProviderType

Description

Returns the type of a data provider

Function Group

Data Provider

Syntax

```
string DataProviderType(dp)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- `DataProviderType` returns "Universe" for universe data providers or "Personal data" for personal data providers.
- You must enclose the name of the data provider in square brackets.

Examples

`DataProviderType([Sales])` returns "Universe" if the "Sales" data provider is based on a universe.
6.1.5.7  IsPromptAnswered

Description

Determines whether a prompt has been answered

Function Group

Data Provider

Syntax

```csh
bool IsPromptAnswered([dp];prompt_string)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider containing the prompt</td>
<td>Data provider</td>
<td>No</td>
</tr>
<tr>
<td>prompt_string</td>
<td>The prompt text</td>
<td>String</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

You must enclose the name of the data provider in square brackets.

Examples

```csh
IsPromptAnswered("Choose a city") returns true if the prompt identified by the text "Choose a city" has been answered.

IsPromptAnswered([Sales];"Choose a city") returns true if the prompt identified by the text "Choose a city" in the [Sales] data provider has been answered.
```
6.1.5.8 LastExecutionDate

Description

Returns the date on which a data provider was last refreshed

Function Group

Data Provider

Syntax

\[
\text{date LastExecutionDate(dp)}
\]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- If your report has one data provider only you can omit the \( dp \) parameter.
- You must enclose the name of the data provider in square brackets.
- You can use the DataProvider function to provide a reference to a data provider.

Examples

\[
\text{LastExecutionDate([Sales Query]) returns "3/4/2002" if the Sales Query data provider was last refreshed on 4 March 2002.}
\]
6.1.5.9 LastExecutionDuration

Description

Returns the time in seconds taken by the last refresh of a data provider

Function Group

Data Provider

Syntax

```plaintext
num LastExecutionDuration(dp)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

You must enclose the name of the data provider in square brackets.

Examples

`LastExecutionDuration([Sales])` returns 3 if the "Sales" data provider took 3 second to return its data the last time it was run.
6.1.5.10 LastExecutionTime

Description

Returns the time at which a data provider was last refreshed

Function Group

Data Provider

Syntax

```
time LastExecutionTime(dp)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- If your report has one data provider only you can omit the `dp` parameter.
- You can use the `DataProvider` function to provide a reference to a data provider.
- You must enclose the name of the data provider in square brackets.

Examples

`LastExecutionTime([Sales Query])` returns "2:48:00 PM" if the Sales Query data provider was last refreshed at 2:48:00 PM.
Related Information

DataProvider [page 117]

6.1.5.11 NumberOfDataProviders

Description

Returns the number of data providers in a report

Function Group

Data Provider

Syntax

```
int NumberOfDataProviders()
```

Examples

```
NumberOfDataProviders() returns 2 if the report has two data providers.
```

6.1.5.12 NumberOfRows

Description

Returns the number of rows in a data provider

Function Group

Data Provider
### Syntax

```
int NumberOfRows(dp)
```

### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Notes

- You must enclose the name of the data provider in square brackets.
- You can use the `DataProvider` function to provide a reference to a data provider.

### Examples

`NumberOfRows([Query 1])` returns 10 if the "Query 1" data provider has 10 rows.

### Related Information

`DataProvider` [page 117]

### 6.1.5.13 RefValueDate

#### Description

Returns the date of the reference data used for data tracking

#### Function Group

Data Provider
Syntax

date RefValueDate()

Examples

RefValueDate() returns 15 December 2008 if the reference date is 15 December 2008.

6.1.5.14  RefValueUserResponse

Description

Returns the response to a prompt when the reference data was the current data

Function Group

Data Provider

Syntax

string RefValueUserResponse([dp:]prompt_string[;Index])

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>No</td>
</tr>
<tr>
<td>prompt_string</td>
<td>The prompt text</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>Index</td>
<td>Tells the function to return the database primary keys of the prompt values</td>
<td>Keyword</td>
<td>No</td>
</tr>
</tbody>
</table>
Notes

- The function returns an empty string if data tracking is not activated.
- You must enclose the name of the data provider in square brackets.
- You can use the `DataProvider` function to provide a reference to a data provider.
- If you selected more than one value in answer to a prompt, the function returns a string consisting of a list of values (or primary keys if the `Index` operator is specified) separated by semi-colons.

Examples

```
RefValueUserResponse("Which city?") returns "Los Angeles" if you entered "Los Angeles" in the "Which City?" prompt at the time when the reference data was the current data.

RefValueUserResponse([Sales Query];"Which city?") returns "Los Angeles," if you entered "Los Angeles" in the "Which City?" prompt in the "Sales Query" data provider at the time when the reference data was the current data.
```

6.1.5.15 UniverseName

Description

Returns the name of the universe on which a data provider is based

Function Group

Data Provider

Syntax

```
string UniverseName(dp)
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- The value of `dp` in the formula is automatically updated if the name of the data provider changes. If the data provider is renamed to "Q1", the formula becomes `UniverseName([Q1])`.
- You must enclose the name of the data provider in square brackets.
- You can use the `DataProvider` function to provide a reference to a data provider.

Examples

`UniverseName([Query 1])` returns "eFashion" if the [Query 1] data provider is based on the eFashion universe.

Related Information

`DataProvider` [page 117]

6.1.5.16 UserResponse

Description

Returns the response to a prompt

Function Group

Data Provider
Syntax

`string UserResponse([dp];prompt_string[Index])`

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>The data provider</td>
<td>Data provider</td>
<td>No</td>
</tr>
<tr>
<td>prompt_string</td>
<td>The prompt text</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>Index</td>
<td>Tells the function to return the database primary keys of the prompt values</td>
<td>Keyword</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes

- You must enclose the name of the data provider in square brackets.
- You can use the `DataProvider` function to provide a reference to a data provider.
- If you select more than one value in answer to a prompt, the function returns a string consisting of a list of values (or primary keys if the `Index` operator is specified) separated by semi-colons.

Examples

`UserResponse("Which city?")` returns "Los Angeles" if you entered "Los Angeles" in the "Which City?" prompt.

`UserResponse([Sales Query];"Which city?")` returns "Los Angeles," if you entered "Los Angeles" in the "Which City?" prompt in the "Sales Query" data provider.

`UserResponse([Sales Query];"Which city?";Index)` returns 23 if you entered "Los Angeles" in the "Which City?" prompt in the "Sales Query" data provider, and the database primary key of Los Angeles is 23.
6.1.6 Document functions

6.1.6.1 DocumentAuthor

Description

Returns the InfoView logon of the document creator

Function Group

Document

Syntax

```
string DocumentAuthor()
```

Examples

```
DocumentAuthor() returns "gkn" if the document author's login is "gkn".
```

6.1.6.2 DocumentCreationDate

Description

Returns the date on which a document was created

Function Group

Document
Syntax

date DocumentCreationDate()

Examples

DocumentCreationDate() returns 15 December 2008 if the document was created on 15 December 2008.

6.1.6.3  DocumentCreationTime

Description

Returns the time when a document was created

Function Group

Document

Syntax

time DocumentCreationTime()

Examples

DocumentCreationTime() returns 11:15 if the document was created at 11:15.

6.1.6.4  DocumentDate

Description

Returns the date on which a document was last saved
Function Group

Document

Syntax

date DocumentDate()

Examples

DocumentDate() returns 8 August 2005 if the document was last saved on 8 August 2005.

6.1.6.5 DocumentName

Description

Returns the document name

Function Group

Document

Syntax

string DocumentName()

Examples

DocumentName() returns "Sales Report" if the document is called "Sales Report".
6.1.6.6 DocumentOwner

Description

Returns the BI launch pad logon/user name of the owner of the document (the last person who saved the document). (To return the original author/creator of the document, use the DocumentAuthor function.)

Function Group

Document

Syntax

```
string DocumentOwner()
```

Examples

```
DocumentOwner() returns "gkn" if the last person who saved the document has the user name or login "gkn".
```

6.1.6.7 DocumentPartiallyRefreshed

Description

Determines whether a document is partially refreshed

Function Group

Document

Syntax

```
bool DocumentPartiallyRefreshed()
```
Notes

`DocumentPartiallyRefreshed` returns a boolean value that you can use in the `If` function.

Examples

`DocumentPartiallyRefreshed()` returns `True` if the document is partially refreshed.

6.1.6.8 DocumentTime

Description

Returns the time when a document was last saved.

Function Group

Document

Syntax

```plaintext
time DocumentTime()
```

Notes

The format of the returned time varies depending on the cell format.

Example

`DocumentTime()` returns `15:45` if the document was last saved at `15:45`.
6.1.6.9 DrillFilters

Description

Returns the results of drill filters applied to a document or object in an declared report in drill mode. You can declare a different report within the document. If you do not declare a report, the current active report is used.

Function Group

Document

Syntax

```
string DrillFilters([obj|separator[;report]])
```  

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>A report object</td>
<td>Report object</td>
<td>Either obj or separator required</td>
</tr>
<tr>
<td>separator</td>
<td>The drill filter separator</td>
<td>String</td>
<td>Either obj or separator required</td>
</tr>
<tr>
<td>report</td>
<td>Optional. The name of the report you want to use. It must be in the document. If no report is declared, then the current report is used.</td>
<td>String</td>
<td>Either obj or separator required</td>
</tr>
</tbody>
</table>

Notes

- You can insert `DrillFilters` directly without the need to enter the formula manually by inserting a `DrillFilters` cell.
- If you do not specify an object, the function returns all drill filters applied to the document.
Examples

DrillFilters() returns "US" if the document has a drill filter restricting the [Country] object to US.


DrillFilters ([Quarter]) returns "Q3" if the document has a drill filter restricting [Quarter] to "Q3".

6.1.6.10 PromptSummary

Description

Returns the prompt text and user response of all prompts in a document

Function Group

Document

Syntax

string PromptSummary()

Examples

Example output of the PromptSummary function appears as follows:

Enter Quantity Sold: 5000
Enter value(s) for State (optional): California, Texas, Utah
Enter Customer (optional):
6.1.6.11  QuerySummary

Description

Returns information about the queries in a document

Function Group

Document

Syntax

```plaintext
string QuerySummary([dp])
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp</td>
<td>A data provider</td>
<td>Data provider</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes

- You must enclose the name of the data provider in square brackets.

Examples

QuerySummary() returns information about all the queries in a document.

QuerySummary([Query 1]) returns information about the queries based on the [Query 1] data provider.

Output example:

```
Query 1:
  Universe: eFashion
  Last execution time: 1s
  NB of rows: 34500
  Result objects: State, Year, Sales Revenue
  Scope of analysis: State, City, Year, Quarter, Month
  Filters:
```
Query 2:
Source file: D:\Data\datacar.xls
Result objects: State, Year, Sales Revenue

6.1.6.12 ReportFilter

Description

Returns the report filters applied to an object or report

Function Group

Document

Syntax

string ReportFilter(obj)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>A report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

ReportFilter([Country]) returns "US" if there is a report filter on the Country object that restricts it to "US".
6.1.6.13  ReportFilterSummary

Description

Returns a summary of the report filters in a document or report

Function Group

Document

Syntax

```
string ReportFilterSummary(report_name)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>report_name</td>
<td>The name of the report</td>
<td>String</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes

If `report_name` is omitted, `ReportFilterSummary` returns a summary of all the report filters in all the reports in the document.

Examples

`ReportFilterSummary()` returns information about all the report filters in a document.


Example output of the `ReportFilterSummary` function appears as follows:

```
Filters on Report1:
(Sales Revenue Greater Than 1000000
Or (Sales Revenue Less Than 3000))
Filters on Section on City:
(City InList("Los Angeles";"San Diego";))
```
6.1.7 Logical functions

6.1.7.1 Even

Description

Determines whether a number is even.

Function Group

Logical

Syntax

```plaintext
bool Even(number)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- `Even` returns a boolean value that you can use in the `If` function.
- If you place `Even` directly into a column, it returns an integer (1=true; 0=false). You can format this integer using a Boolean number format.
Examples

Even(4) returns True.
Even(3) returns False.
Even(23.2) returns False.
Even(-4) returns True.
Even(-2.2) returns False.

6.1.7.2 IsDate

Description

Determines whether a value is a date

Function Group

Logical

Syntax

```plaintext
bool IsDate(obj)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>Any report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- `IsDate` returns a boolean value that you can use in the `If` function.
- If you place `IsDate` directly into a column, it returns an integer (1=true; 0=false). You can format this integer using a Boolean number format.
Examples

IsDate([Reservation Date]) returns True if [Reservation Date] is a date.

If(IsDate([Reservation Date]) Then "Date" Else "Not a date" returns "Date" if [Reservation Date] is a date.

Related Information

If...Then...Else [page 197]

6.1.7.3 IsError

Description

Determines whether an object returns an error

Function Group

Logical

Syntax

bool IsError(obj)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>Any report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Notes

- `IsError` returns a boolean value that you can use in the `If` function.
- If you place `IsError` directly into a column, it returns an integer (1=true; 0=false). You can format this integer using a Boolean number format.

Examples

`IsError([Revenue])` returns False if the [Revenue] variable does not return an error.

`IsError([Average Guests])` returns True if the [Average Guests] variable returns a division by zero (#DIV/0) error.

`If IsError([Average Guests]) Then "Error" Else "No error"` returns "Error" if the [Average Guests] variable returns a division by zero (#DIV/0) error.

Related Information

`If...Then...Else` [page 197]

6.1.7.4 IsLogical

Description

Determines whether a value is boolean

Function Group

Logical

Syntax

```plaintext
bool IsLogical(obj)
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>Any report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- `IsLogical` returns a boolean value that you can use in the If function.
- If you place `IsLogical` directly into a column, it returns an integer (1=true; 0=false). You can format this integer using a Boolean number format.

Examples

`IsLogical(IsString([Country]))` returns `True`.

`IsLogical([Country])` returns `False` if `country` returns any data type other than boolean.

If `IsLogical(IsDate([Country]))` Then "Boolean" Else "Not boolean" returns "Boolean".

Related Information

`If...Then...Else` [page 197]

6.1.7.5 IsNull

Description

Determines whether a value is null

Function Group

Logical
Syntax

```plaintext
bool IsNull(obj)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>Any report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- `IsNull` returns a boolean value that you can use in the `If` function.
- If you place `IsNull` directly into a column, it returns an integer (1=true; 0=false). You can format this integer using a Boolean number format.

Examples

- `IsNull([Revenue])` returns False if the `[Revenue]` variable is not null.
- `IsNull([Average Guests])` returns True if the `[Average Guests]` variable is null.

Related Information

*If...Then...Else* [page 197]

6.1.7.6 IsNumber

Description

Determines whether a value is a number
Function Group

Logical

Syntax

```plaintext
bool IsNumber(obj)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>Any report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- `IsNumber` returns a boolean value that you can use in the `If` function.
- If you place `IsNumber` directly into a column, it returns an integer (1=true; 0=false). You can format this integer using a Boolean number format.

Examples

`IsNumber([Revenue])` returns True if the [Revenue] variable is a number.

`IsNumber([Customer Name])` returns False if the [Customer Name] variable is not a number.

`If IsNumber([Customer Name]) Then "Number" Else "Not a number"` returns "Not a number" if the [Customer Name] variable is not a number.

Related Information

*If...Then...Else* [page 197]
6.1.7.7  IsString

Description

Determines whether a value is a string

Function Group

Logical

Syntax

```c
bool IsString(obj)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>Any report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- `IsString` returns a boolean value that you can use in the `If` function.
- If you place `IsString` directly into a column, it returns an integer (1=true; 0=false). You can format this integer using a Boolean number format.

Examples

- `IsString([Revenue])` returns false if the [Revenue] variable is not a string.
- `IsString([Customer Name])` returns true if the [Customer Name] variable is a string.
- `If IsString([Customer Name]) Then "String" Else "Not a string"` returns "String" if the [Customer Name] variable is a string.
Related Information

If...Then...Else [page 197]

6.1.7.8 IsTime

Description

Determines whether a variable is a time variable

Function Group

Logical

Syntax

```c
bool IsTime(obj)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>Any report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- IsTime returns a boolean value that you can use in the If function.
- If you place IsTime directly into a column, it returns an integer (1=true; 0=false). You can format this integer using a Boolean number format.

Examples

```
IsTime([Reservation Time]) returns true if the [Reservation Time] variable is a time variable.
```
IsTime([Average Guests]) returns false if the [Average Guests] variable is not a time variable.

If IsTime([Average Guests]) Then "Time" Else "Not time" returns "Not time" if the [Average Guests] variable is not a time variable.

Related Information

If...Then...Else [page 197]

6.1.7.9 Odd

Description

Determines whether a number is odd

Function Group

Logical

Syntax

bool Odd(number)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- Odd returns a boolean value that you can use in the If function.
- If you place Odd directly into a column, it returns an integer (1=true; 0=false). You can format this integer using a Boolean number format.
• Odd ignores the fractional parts of decimal numbers.

Examples

Odd(5) returns True.
Odd(4) returns False.
Odd(23.2) returns True.
Odd(24.2) returns True.
Odd(-23.2) returns True.
Odd(-24.2) returns True.

Related Information

If...Then...Else [page 197]

6.1.8 Numeric functions

6.1.8.1 Abs

Description

Returns the absolute value of a number

Function Group

Numeric

Syntax

num Abs(number)
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

Abs(25) returns 25.
Abs(-11) returns 11.

6.1.8.2 Ceil

Description

Returns a number rounded up to the nearest integer

Function Group

Numeric

Syntax

num Ceil(number)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Examples

Ceil(2.4) returns 3.
Ceil(3.1) returns 4.
Ceil(-3.1) returns -3.

6.1.8.3 Cos

Description

Returns the cosine of an angle

Function Group

Numeric

Syntax

num Cos(angle)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>angle</td>
<td>An angle in radians</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Example

Cos(180) returns -0.6.
6.1.8.4  EuroConvertFrom

Description

Converts a Euro amount to another currency

Function Group

Numeric

Syntax

\[
\text{num EuroConvertFrom(euro\_amount;curr\_code;round\_level)}
\]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>euro_amount</td>
<td>The amount in Euros</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>curr_code</td>
<td>The ISO code of the target currency</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>round_level</td>
<td>The number of decimal places to which the result is rounded</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

The currency code must be the code of one of the 12 EU currencies whose values were fixed in relation to the Euro prior to their abolition in January 2002. If it is not, the function returns #ERROR. The currencies are:

<table>
<thead>
<tr>
<th>Code</th>
<th>Currency</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEF</td>
<td>Belgian franc</td>
</tr>
<tr>
<td>DEM</td>
<td>German mark</td>
</tr>
<tr>
<td>GRD</td>
<td>Greek drachma</td>
</tr>
<tr>
<td>ESP</td>
<td>Spanish peseta</td>
</tr>
<tr>
<td>FRF</td>
<td>French franc</td>
</tr>
</tbody>
</table>
### Examples

- `EuroConvertFrom(1000;"FRF";2)` returns 6559.57.
- `EuroConvertFrom(1000;"FRF";1)` returns 6559.60.
- `EuroConvertFrom(1000.04;"DEM";2)` returns 1955.83.
- `EuroConvertFrom(1000.04;"DEM";1)` returns 1955.80.

### Related Information

*Rounding and truncating numbers* [page 234]

Several functions contain a parameter that determines to what level the function rounds or truncates the value it returns.

### 6.1.8.5 EuroConvertTo

#### Description

Converts an amount to Euros

#### Function Group

Numeric
**Syntax**

\[
\text{num EuroConvertTo(noneuro_amount;curr_code;round_level)}
\]

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>euro_amount</td>
<td>The amount in the non-euro currency</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>curr_code</td>
<td>The ISO code of the non-euro currency</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>round_level</td>
<td>The number of decimal places to which the result is rounded</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Example**

\[
\begin{align*}
\text{EuroConvertTo(6559;"FRF";2)} & \text{ returns } 999.91. \\
\text{EuroConvertTo(6559;"FRF";1)} & \text{ returns } 999.90. \\
\text{EuroConvertTo(1955;"DEM";2)} & \text{ returns } 999.58. \\
\text{EuroConvertTo(1955;"DEM";1)} & \text{ returns } 999.60. \\
\end{align*}
\]

**Note**

The currency code must be the code of one of the 12 EU currencies whose values were fixed in relation to the Euro prior to their abolition in January 2002. If it is not, the function returns #ERROR. The currencies are:

<table>
<thead>
<tr>
<th>Code</th>
<th>Currency</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEF</td>
<td>Belgian franc</td>
</tr>
<tr>
<td>DEM</td>
<td>German mark</td>
</tr>
<tr>
<td>GRD</td>
<td>Greek drachma</td>
</tr>
<tr>
<td>ESP</td>
<td>Spanish peseta</td>
</tr>
<tr>
<td>FRF</td>
<td>French franc</td>
</tr>
<tr>
<td>IEP</td>
<td>Irish punt</td>
</tr>
<tr>
<td>ITL</td>
<td>Italian lira</td>
</tr>
<tr>
<td>LUF</td>
<td>Luxembourg franc</td>
</tr>
</tbody>
</table>
Related Information

Rounding and truncating numbers [page 234]
Several functions contain a parameter that determines to what level the function rounds or truncates the value it returns.

6.1.8.6 EuroFromRoundError

Description

Returns the rounding error in a conversion from Euros

Function Group

Numeric

Syntax

num EuroFromRoundError(euro_amount;curr_code;round_level)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>euro_amount</td>
<td>The amount in Euros</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>curr_code</td>
<td>The ISO code of the target currency</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Type</td>
<td>Required</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------------------</td>
<td>--------</td>
<td>----------</td>
</tr>
<tr>
<td>round_level</td>
<td>The number of decimal places to which the result is rounded</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Output**

The rounding error in the calculation

**Examples**

\[ \text{EuroFromRoundErr}(1000; "FRF"; 2) \] returns 0. (There is no difference between the unrounded conversion and the conversion rounded to 2 decimal places.)

\[ \text{EuroFromRoundErr}(1000; "FRF"; 1) \] returns 0.03. (The unrounded conversion is 6559.57. The conversion rounded to 1 decimal place is 6559.60. The rounding error is 0.03.)

\[ \text{EuroFromRoundErr}(1000; "DEM"; 2) \] returns 0. (There is no difference between the unrounded conversion and the conversion rounded to 2 decimal places.)

\[ \text{EuroFromRoundErr}(1000; "DEM"; 1) \] returns -0.01. (The unrounded conversion is 1955.83. The conversion rounded to 1 decimal place is 1995.80. The rounding error is -0.03.)

**Note**

The currency code must be the code of one of the 12 EU currencies whose values were fixed in relation to the Euro prior to their abolition in January 2002. If it is not, the function returns #ERROR. The currencies are:

<table>
<thead>
<tr>
<th>Code</th>
<th>Currency</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEF</td>
<td>Belgian franc</td>
</tr>
<tr>
<td>DEM</td>
<td>German mark</td>
</tr>
<tr>
<td>GRD</td>
<td>Greek drachma</td>
</tr>
<tr>
<td>ESP</td>
<td>Spanish peseta</td>
</tr>
<tr>
<td>FRF</td>
<td>French franc</td>
</tr>
<tr>
<td>IEP</td>
<td>Irish punt</td>
</tr>
<tr>
<td>ITL</td>
<td>Italian lira</td>
</tr>
<tr>
<td>LUF</td>
<td>Luxembourg franc</td>
</tr>
<tr>
<td>NLG</td>
<td>Dutch guilder</td>
</tr>
<tr>
<td>ATS</td>
<td>Austrian schilling</td>
</tr>
</tbody>
</table>
Several functions contain a parameter that determines to what level the function rounds or truncates the value it returns.

### 6.1.8.7 EuroToRoundError

**Description**

Returns the rounding error in a conversion to Euros

**Function Group**

Numeric

**Syntax**

```plaintext
num EuroToRoundError(noneuro_amount;curr_code;round_level)
```

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>euro_amount</td>
<td>The amount in the non-euro currency</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>curr_code</td>
<td>The ISO code of the non-euro currency</td>
<td>String</td>
<td>Yes</td>
</tr>
<tr>
<td>round_level</td>
<td>The number of decimal places to which the result is rounded</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Examples

EuroToRoundErr(6559;"FRF";2) returns 0. (There is no difference between the unrounded conversion and the conversion rounded to 2 decimal places.)

EuroToRoundErr(6559;"FRF";1) returns -0.01. (The unrounded conversion is 999.91. The conversion rounded to 1 decimal place is 999.90. The rounding error is -0.01.)

EuroToRoundErr(1955;"DEM";2) returns 0. (There is no difference between the unrounded conversion and the conversion rounded to 2 decimal places.)

EuroToRoundErr(1955;"DEM";1) returns 0.02. (The unrounded conversion is 999.58. The conversion rounded to 1 decimal place is 999.60. The rounding error is 0.02.)

Note

The currency code must be the code of one of the 12 EU currencies whose values were fixed in relation to the Euro prior to their abolition in January 2002. If it is not, the function returns #ERROR. The currencies are:

<table>
<thead>
<tr>
<th>Currency Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEF</td>
<td>Belgian franc</td>
</tr>
<tr>
<td>DEM</td>
<td>German mark</td>
</tr>
<tr>
<td>GRD</td>
<td>Greek drachma</td>
</tr>
<tr>
<td>ESP</td>
<td>Spanish peseta</td>
</tr>
<tr>
<td>FRF</td>
<td>French franc</td>
</tr>
<tr>
<td>IEP</td>
<td>Irish punt</td>
</tr>
<tr>
<td>ITL</td>
<td>Italian lira</td>
</tr>
<tr>
<td>LUF</td>
<td>Luxembourg franc</td>
</tr>
<tr>
<td>NLG</td>
<td>Dutch guilder</td>
</tr>
<tr>
<td>ATS</td>
<td>Austrian schilling</td>
</tr>
<tr>
<td>PTS</td>
<td>Portuguese escudo</td>
</tr>
<tr>
<td>FIM</td>
<td>Finnish mark</td>
</tr>
</tbody>
</table>

Related Information

Rounding and truncating numbers [page 234]

Several functions contain a parameter that determines to what level the function rounds or truncates the value it returns.
6.1.8.8 Exp

Description

Returns an exponential (e raised to a power)

Function Group

Numeric

Syntax

```
num Exp(power)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>power</td>
<td>The power</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

An exponential is the constant e (2.718...) raised to a power.

Examples

```
Exp(2.2) returns 9.03.
```

6.1.8.9 Fact

Description

Returns the factorial of a number
### Function Group

**Numeric**

### Syntax

```
int Fact(number)
```

### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Notes

The factorial of `number` is the product of all the integers from 1 to `number`.

### Examples

```
Fact(4) returns 24.
Fact(5.9) returns 120.
```

### 6.1.8.10 Floor

#### Description

Returns a number rounded down to the nearest integer.

#### Function Group

**Numeric**
Syntax

```plaintext
int Floor(number)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Example

`Floor(24.4)` returns 24.

6.1.8.11 Interpolation

Description

Calculates empty measure values by interpolation

Function Group

Numeric

Syntax

```plaintext
num Interpolation(measure[P;PointToPoint|Linear][;NotOnBreak|{reset_dims}][;Row|Col])
```
## Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
<tr>
<td>PointToPoint</td>
<td>Linear</td>
<td>The interpolation method:</td>
<td>Keyword</td>
</tr>
<tr>
<td></td>
<td>● PointToPoint - point-to-point interpolation</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>● Linear - linear regression with least squares interpolation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NotOnBreak</td>
<td>reset_dims</td>
<td>● NotOnBreak - prevents the function from resetting the calculation on block and section breaks</td>
<td>Keyword</td>
</tr>
<tr>
<td></td>
<td>● reset_dims - the list of dimensions used to reset the interpolation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row</td>
<td>Col</td>
<td>Sets the calculation direction</td>
<td>Keyword</td>
</tr>
</tbody>
</table>

## Notes

- **Interpolation** is particularly useful when you create a line graph on a measure that contains missing values. By using the function you ensure that the graph plots a continuous line rather than disconnected lines and points.
- Linear regression with least squares interpolation calculates missing values by calculating a line equation in the form \( f(x) = ax + b \) that passes as closely as possible through all the available values of the measure.
- Point-to-point interpolation calculates missing values by calculating a line equation in the form \( f(x) = ax + b \) that passes through the two adjacent values of the missing value.
- The sort order of the measure impacts the values returned by **Interpolation**.
- You cannot apply a sort or a ranking to a formula containing **Interpolation**.
- If there is only one value in the list of values, **Interpolation** uses this value to supply all the missing values.
- Filters applied to an interpolated measure can change the values returned by **Interpolation** depending on which values the filter impacts.

## Examples

**Interpolation([Value])** supplies the following missing values using the default point-to-point interpolation method:
<table>
<thead>
<tr>
<th>Day</th>
<th>Value</th>
<th>Interpolation([Value])</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Tuesday</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>Wednesday</td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Thursday</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Friday</td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Saturday</td>
<td></td>
<td>18</td>
</tr>
<tr>
<td>Sunday</td>
<td>19</td>
<td>19</td>
</tr>
</tbody>
</table>

**Related Information**

*Linear operator* [page 220]

The Linear operator works with the Interpolation function.

*PointToPoint operator* [page 222]

The PointToPoint operator tells the Interpolation function to use point-to-point interpolation to supply missing measure values.

### 6.1.8.12 Ln

**Description**

Returns the natural logarithm of a number

**Function Group**

Numeric

**Syntax**

```
num Ln(number)
```
### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Examples

\[ \ln(10) \] returns 2.

### 6.1.8.13 Log

#### Description

Returns the logarithm of a number in a specified base

#### Function Group

Numeric

#### Syntax

```
num Log(number;base)
```

#### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>base</td>
<td>The base of the logarithm</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

#### Examples

\[ \log(125;5) \] returns 3.
6.1.8.14 Log10

Description

Returns the base 10 logarithm of a number

Function Group

Numeric

Syntax

num Log10(number)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

Log10(100) returns 2.

6.1.8.15 Mod

Description

Returns the remainder from the division of two numbers

Function Group

Numeric
Syntax

```
num Mod(dividend;divisor)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dividend</td>
<td>The dividend</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>divisor</td>
<td>The divisor</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

Mod(10;4) returns 2.
Mod(10.2;4.2) returns 1.8.

6.1.8.16 Power

Description

Returns a number raised to a power

Function Group

Numeric

Syntax

```
num Power(number;power)
```
**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>The number to raise to a power</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>power</td>
<td>The power</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Example**

`Power(10;2)` returns 100.

### 6.1.8.17 Rank

**Description**

Ranks a measure by dimensions

**Function Group**

Numeric

**Syntax**

```plaintext
int Rank(measure;[ranking_dims][;Top|Bottom][;(reset_dims)])
```

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>The measure to be ranked</td>
<td>Measure</td>
<td>Yes</td>
</tr>
<tr>
<td>ranking_dims</td>
<td>The dimensions used to rank the measure</td>
<td>Dimension list</td>
<td>No</td>
</tr>
<tr>
<td>Top</td>
<td>Bottom</td>
<td>Sets the ranking order:</td>
<td>Keyword</td>
</tr>
<tr>
<td>Parameter</td>
<td>Description</td>
<td>Type</td>
<td>Required</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>Top</td>
<td>descending</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom</td>
<td>ascending</td>
<td></td>
<td></td>
</tr>
<tr>
<td>reset_dims</td>
<td>The dimensions that reset the ranking</td>
<td>Dimension list</td>
<td>No</td>
</tr>
</tbody>
</table>

**Notes**

- The function uses the default calculation context to calculate the ranking if you do not specify ranking dimensions.
- You must always place dimensions in parentheses even if there is only one dimension in the list of ranking or reset dimensions.
- When you specify a set of ranking or reset dimensions you must separate them with semi-colons.
- By default the ranking is reset over a section or block break.

**Examples**

In the following table the rank is given by `Rank([Revenue];([Country]));`:

<table>
<thead>
<tr>
<th>Country</th>
<th>Revenue</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>835,420</td>
<td>2</td>
</tr>
<tr>
<td>US</td>
<td>2,451,104</td>
<td>1</td>
</tr>
</tbody>
</table>

In the following table the rank is given by `Rank([Revenue];([Country]);Bottom)`. The `Bottom` argument means that the measures are ranked in descending order.

<table>
<thead>
<tr>
<th>Country</th>
<th>Revenue</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>835,420</td>
<td>1</td>
</tr>
<tr>
<td>US</td>
<td>2,451,104</td>
<td>2</td>
</tr>
</tbody>
</table>

In the following table the rank is given by `Rank([Revenue];([Country];[Resort]));`:

<table>
<thead>
<tr>
<th>Country</th>
<th>Resort</th>
<th>Revenue</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>French Riviera</td>
<td>835,420</td>
<td>3</td>
</tr>
<tr>
<td>US</td>
<td>Bahamas Beach</td>
<td>971,444</td>
<td>2</td>
</tr>
<tr>
<td>US</td>
<td>Hawaiian Club</td>
<td>1,479,660</td>
<td>1</td>
</tr>
</tbody>
</table>

In the following table the rank is given by `Rank([Revenue];([Country];[Year]);([Country]));`. The rank is reset on the Country dimension.
<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>Revenue</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>FY1998</td>
<td>295,940</td>
<td>1</td>
</tr>
<tr>
<td>France</td>
<td>FY1999</td>
<td>280,310</td>
<td>2</td>
</tr>
<tr>
<td>France</td>
<td>FY2000</td>
<td>259,170</td>
<td>3</td>
</tr>
<tr>
<td>US</td>
<td>FY1998</td>
<td>767,614</td>
<td>3</td>
</tr>
<tr>
<td>US</td>
<td>FY1999</td>
<td>826,930</td>
<td>2</td>
</tr>
<tr>
<td>US</td>
<td>FY2000</td>
<td>856,560</td>
<td>1</td>
</tr>
</tbody>
</table>

**Related Information**

*Bottom/Top operators* [page 217]

The *Bottom/Top operators* work with the *Rank* function.

### 6.1.8.18 Round

**Description**

Rounds a number

**Function Group**

Numeric

**Syntax**

`num Round (number;round_level)`

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>The number to be rounded</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>round_level</td>
<td>The number of decimal places to which the number is rounded</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Examples

- `Round(9.44; 1)` returns 9.4.
- `Round(9.45; 1)` returns 9.5.
- `Round(9.45; 0)` returns 9.
- `Round(9.45; -1)` returns 10.
- `Round(4.45; -1)` returns 0.

### Related Information

*Rounding and truncating numbers* [page 234]

Several functions contain a parameter that determines to what level the function rounds or truncates the value it returns.

### 6.1.8.19 Sign

#### Description

Returns the sign of a number

#### Function Group

Numeric

#### Syntax

```
int Sign(number)
```
### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Notes

Sign returns -1 if number is negative, 0 if number is zero and 1 if number is positive.

### Examples

- `Sign(3)` returns 1.
- `Sign(-27.5)` returns -1.

### 6.1.8.20 Sin

#### Description

Returns the sine of an angle

#### Function Group

Numeric

#### Syntax

```plaintext
num Sin(angle)
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>angle</td>
<td>An angle in radians</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Example

\[ \text{Sin}(234542) \text{ returns } -0.116992. \]

6.1.8.21 Sqrt

Description

Returns the square root of a number

Function Group

Numeric

Syntax

\[ \text{num Sqrt(number)} \]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>Any number</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Example

\[ \text{Sqrt}(25) \text{ returns } 5. \]
6.1.8.22  Tan

Description

Returns the tangent of an angle

Function Group

Numeric

Syntax

\[ \text{num Tan(angle)} \]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>angle</td>
<td>An angle in radians</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

\[ \text{tan(90)} \] returns -2.

6.1.8.23  ToNumber

Description

Returns a string as a number

Function Group

Numeric
Syntax

num ToNumber(string)

or

num ToNumber(INPUT_DATE_TIME)

i Note
When the PVL can be different depending on the user, a fixed format (for a particular locale) is not appropriate. In this case use the INPUT_DATE_TIME parameter as shown in the second example.

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>A number as a string</td>
<td>String</td>
<td>Yes*</td>
</tr>
<tr>
<td>INPUT_DATE_TIME</td>
<td>Use this instead of ‘string’. this forces the format of the response to that of the local regional settings.</td>
<td>String</td>
<td>Yes*</td>
</tr>
</tbody>
</table>

* See the note above. Use string or INPUT_DATE_TIME depending on your needs.

Notes

If string is not a number, ToNumber returns #ERROR.

Examples

ToNumber("45") returns 45.

6.1.8.24 Truncate

Description

Truncates a number
Function Group

Numeric

Syntax

```
num Truncate(number;truncate_level)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>number</td>
<td>The number to be rounded</td>
<td>Number</td>
<td>Yes</td>
</tr>
<tr>
<td>truncate_level</td>
<td>The number of decimal places to which the number is truncated</td>
<td>Number</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

Example

```
Truncate(3.423;2) returns 3.42.
```

Related Information

*Rounding and truncating numbers* [page 234]

Several functions contain a parameter that determines to what level the function rounds or truncates the value it returns.
6.1.9 Set functions

6.1.9.1 Children

Description

Returns the child members of a member

Function Group

Set

Syntax

member_set member.Children

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>member</td>
<td>Any member</td>
<td>member</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- Children is not used as a standalone function. It is used in the input parameter in aggregate functions that specifies the member set for aggregation.
- member is either specified explicitly or is the current member of a hierarchy. If you specify the member explicitly you must specify the full path in the hierarchy. If you specify a hierarchy and the hierarchy is not in the context of the formula, the formula returns an empty value.

Examples

[Geography].[US].[California].Children returns [Los Angeles], [San Francisco], [San Diego].

[Geography].Children returns [Los Angeles], [San Francisco], [San Diego] if [California] is the current member in the [Geography] hierarchy.
Related Information

*Aggregate* [page 47]
*Average* [page 49]
*Count* [page 50]
*Max* [page 54]
*Min* [page 56]
*Sum* [page 75]

### 6.1.9.2 Depth

**Description**

Returns the depth of a member in a hierarchy

**Function Group**

Set

**Syntax**

```
int member.Depth
```

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>member</td>
<td>Any member</td>
<td>member</td>
<td>Yes</td>
</tr>
</tbody>
</table>

**Notes**

- The depth is the distance of the member from top level of the hierarchy.
- The top level of the hierarchy is level 0.
- `member` is either specified explicitly or is the current member of a hierarchy. If you specify the member explicitly you must specify the full path in the hierarchy. If you specify a hierarchy and the hierarchy is not in the context of the formula, the formula returns an empty value.
Examples


6.1.9.3 Descendants

Description

Returns descendant members of a member

Function Group

Set

Syntax

\[ \text{member_set} \text{ Descendants}(\text{member}[;\text{level}|\text{distance}][;\text{desc_flag}]) \]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>member</td>
<td>Any member</td>
<td>member</td>
<td>Yes</td>
</tr>
<tr>
<td>level</td>
<td>The level of the descendants</td>
<td>level</td>
<td>No (the level of member is the default)</td>
</tr>
<tr>
<td>distance</td>
<td>The distance of the descendant level from the current level</td>
<td>int</td>
<td>No (the level of member is the default)</td>
</tr>
<tr>
<td>desc_flag</td>
<td>Determines which descendant members are returned</td>
<td>keyword</td>
<td>No (default is Self)</td>
</tr>
</tbody>
</table>

Notes

- Descendants is not used as a standalone function. It is used in the input parameter in aggregate functions that specifies the member set for aggregation.
• The member is either specified explicitly or is the current member of a hierarchy. If you specify the member explicitly you must specify the full path in the hierarchy. If you specify a hierarchy and the hierarchy is not in the context of the formula, the formula returns an empty value.

• Self in desc_flag refers to the level specified by the level|distance parameter.

• Before in desc_flag refers to all levels above the level specified by the level|distance parameter.

• After in desc_flag refers to all levels below the level specified by the level|distance parameter.

• The values of desc_flag are as follows:

<table>
<thead>
<tr>
<th>desc_flag</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self</td>
<td>Returns the descendants at the level specified by the level</td>
</tr>
<tr>
<td>Before</td>
<td>Returns the current member and all descendants above the level specified by the level</td>
</tr>
<tr>
<td>After</td>
<td>Returns the descendants below the level specified by the level</td>
</tr>
<tr>
<td>Self_Before</td>
<td>Returns the current member and all descendants above and including the level specified by the level</td>
</tr>
<tr>
<td>Self_After</td>
<td>Returns the current member and all descendants at and below the level specified by the level</td>
</tr>
<tr>
<td>Before_After</td>
<td>Returns the current member and all descendants except those at the level specified by the level</td>
</tr>
<tr>
<td>Self_Before_After</td>
<td>Returns the current member and all descendants.</td>
</tr>
<tr>
<td>Leaves</td>
<td>Returns all members between the current member and the level specified by the level</td>
</tr>
</tbody>
</table>

• distance must be positive.

Examples

All examples are based on the following data:

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>Nevada</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>US</td>
<td>Nevada</td>
</tr>
<tr>
<td>Los Angeles</td>
<td>San Diego</td>
<td>Las Vegas</td>
</tr>
<tr>
<td>San Francisco</td>
<td>Reno</td>
<td>Carson City</td>
</tr>
</tbody>
</table>

Descendants([Geography].[US].[California];[Geography].[City]) returns [San Francisco], [San Diego], [Los Angeles].

Descendants([Geography];1) returns [California], [Nevada] if the current member is [US].

Descendants([Geography].[US];2;Before) returns [US], [California], [Nevada], [San Francisco], [San Diego], [Los Angeles], [Las Vegas], [Reno], [Carson City].
Descendants([Geography];[Geography].[State];After) returns [San Francisco], [San Diego], [Los Angeles], [Las Vegas], [Reno], [Carson City] if the current member is [US].

Descendants([Geography];1;Self_After) returns [US], [California], [Nevada], [San Francisco], [San Diego], [Los Angeles], [Las Vegas], [Reno], [Carson City] if the current member is [US].

Descendants([Geography].[US];[Geography].[State];Before_After) returns [US], [San Francisco], [San Diego], [Los Angeles], [Las Vegas], [Reno], [Carson City].

Descendants([Geography].[US];[Geography].[State];Self_Before_After) returns [US], [California], [Nevada], [San Francisco], [San Diego], [Los Angeles], [Las Vegas], [Reno], [Carson City].

Descendants([Geography].[US];[Geography].[City];Leaves) returns [San Francisco], [San Diego], [Los Angeles], [Las Vegas], [Reno], [Carson City].

Related Information

*Aggregate* [page 47]
*Average* [page 49]
*Count* [page 50]
*Max* [page 54]
*Min* [page 56]
*Sum* [page 75]

### 6.1.9.4 IsLeaf

**Description**

Determines whether a member is a leaf member

**Function Group**

Misc

**Syntax**

```
bool member.IsLeaf
```
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>member</td>
<td>Any member</td>
<td>member</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- A leaf member is a member that does not have any child members.
- member is either specified explicitly or is the current member of a hierarchy. If you specify the member explicitly you must specify the full path in the hierarchy. If you specify a hierarchy and the hierarchy is not in the context of the formula, the formula returns an empty value.

Examples

- `[Geography].[US].[California].IsLeaf` returns False if `[California]` has the child members `[Los Angeles], [San Diego], [San Francisco].`
- `[Geography].IsLeaf` returns True if the current member of the `[Geography]` hierarchy is `[Nevada]` and `[Nevada]` has no child members.

6.1.9.5 Key

Description

Returns the key of a member

Syntax

```
string member.Key
```

Function Group

Set
## Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>member</td>
<td>Any member</td>
<td>member</td>
<td>Yes</td>
</tr>
</tbody>
</table>

## Notes

- The key is the internal identifier of a member.
- `member` is either specified explicitly or is the current member of a hierarchy. If you specify the member explicitly you must specify the full path in the hierarchy. If you specify a hierarchy and the hierarchy is not in the context of the formula, the formula returns an empty value.

## Example

```
[Geography].[US].Key returns "XYZ" if the key of the [US] member is "XYZ".
```

## 6.1.9.6 Lag

### Description

Returns a member at the same level as the current member and a given distance before it.

### Syntax

```
member member.Lag(distance)
```

### Function Group

Set
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>member</td>
<td>Any member</td>
<td>member</td>
<td>Yes</td>
</tr>
<tr>
<td>distance</td>
<td>The distance of the member from the current member</td>
<td>int</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- Lag is not used as a standalone function. It is used in the input parameter in aggregate functions that specifies the member set for aggregation.
- If distance is positive, Lag returns the member distance places before member. If distance is negative, Lag returns the member distance places after member.
- member is either specified explicitly or is the current member of a hierarchy. If you specify the member explicitly you must specify the full path in the hierarchy. If you specify a hierarchy and the hierarchy is not in the context of the formula, the formula returns an empty value.
- Lag uses the member order in the hierarchy and query to return the related member.

Examples

[Geography].[US].[California].[San Francisco].Lag(1) returns [San Diego] if [San Diego] is the previous member to [San Francisco] at the City level.

Related Information

*Aggregate* [page 47]
*Average* [page 49]
*Count* [page 50]
*Max* [page 54]
*Min* [page 56]
*Sum* [page 75]

6.1.9.7 Parent

Description

Returns the parent member of a member
Function Group

Set

Syntax

```
member member.Parent
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>member</td>
<td>Any member</td>
<td>member</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- **Parent** is not used as a standalone function. It is used in the input parameter in aggregate functions that specifies the member set for aggregation.
- **member** is either specified explicitly or is the current member of a hierarchy. If you specify the member explicitly you must specify the full path in the hierarchy. If you specify a hierarchy and the hierarchy is not in the context of the formula, the formula returns an empty value.

Examples

```
[Geography].[US].[California].[Los Angeles].Parent
```

returns 
```
[California].
```

Related Information

- Aggregate [page 47]
- Average [page 49]
- Count [page 50]
- Max [page 54]
- Min [page 56]
- Sum [page 75]
6.1.9.8 Siblings

Description

Returns the member and the sibling members of that member.

Function Group

Set

Syntax

member_set member.Siblings

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>member</td>
<td>Any member</td>
<td>member</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Notes

- **Siblings** is not used as a standalone function. It is used in the input parameter in aggregate functions that specifies the member set for aggregation.
- **member** is either specified explicitly or is the current member of a hierarchy. If you specify the member explicitly you must specify the full path in the hierarchy. If you specify a hierarchy and the hierarchy is not in the context of the formula, the formula returns an empty value.
- Sibling members are members from the same level and with the same parent as **member**.

Examples

[Geography].[US].[California].Siblings returns [Nevada], [Arizona] if [Nevada] and [Arizona] are at the same level as [California].
Related Information

*Aggregate* [page 47]
*Average* [page 49]
*Count* [page 50]
*Max* [page 54]
*Min* [page 56]
*Sum* [page 75]

6.1.10 Misc functions

6.1.10.1 Ancestor

**Description**

Returns an ancestor member of a member

**Function Group**

Misc

**Syntax**

```
member Ancestor(member;level|distance)
```

**Input**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>member</td>
<td>Any member</td>
<td>member</td>
<td>Yes</td>
</tr>
<tr>
<td>level</td>
<td>The level of the ancestor</td>
<td>level</td>
<td>Either level or distance is required</td>
</tr>
<tr>
<td>distance</td>
<td>The distance of the ancestor</td>
<td>int</td>
<td>Either level or distance is required</td>
</tr>
<tr>
<td></td>
<td>level from the current level</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Notes

- **Ancestor** is not used as a standalone function. It is used in the input parameter in aggregate functions that specifies the member set for aggregation.
- **member** is either specified explicitly or is the current member of a hierarchy. If you specify the member explicitly you must specify the full path in the hierarchy. If you specify a hierarchy and the hierarchy is not in the context of the formula, the formula returns an empty value.
- **distance** must be positive.

Examples

All examples are based on the [Geography] hierarchy (Country > State > City). The following table shows a subset of the data in the hierarchy.

<table>
<thead>
<tr>
<th>Los Angeles</th>
<th>San Diego</th>
<th>San Francisco</th>
<th>Las Vegas</th>
<th>Reno</th>
<th>Carson City</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>US</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nevada</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ancestor([Geography].[US].[California].[Los Angeles];1) returns [California].

Ancestor([Geography];[Geography].[State]) returns [California] if the current member is [San Diego].

Related Information

- **Aggregate** [page 47]
- **Average** [page 49]
- **Count** [page 50]
- **Max** [page 54]
- **Min** [page 56]
- **Sum** [page 75]

6.1.10.2 BlockName

Description

Returns the block name
Function Group

Misc

Syntax

```c
string BlockName()
```

Examples

`BlockName()` returns "Block1" if it is placed in a block called "Block1".

6.1.10.3 ColumnNumber

Description

Returns the column number

Function Group

Misc

Syntax

```c
int ColumnNumber()
```

Examples

`ColumnNumber()` returns 2 if the formula is placed in the second column of a table.
6.1.10.4  CurrentUser

Description

Returns the BI launch pad login of the current user

Function Group

Misc

Syntax

```plaintext
string CurrentUser()
```

Examples

```
CurrentUser() returns "gkn" if the current user’s login is "gkn".
```

6.1.10.5  ForceMerge

Description

Includes synchronized dimensions in measure calculations when the dimensions are not in the measure’s calculation context

Function Group

Misc

Syntax

```plaintext
num ForceMerge(measure)
```
### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>Any measure</td>
<td>Measure</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Output

The result of the calculation with the synchronized dimensions taken into account

### Notes

- ForceMerge returns #MULTIVALE if applied to a smart measure because the grouping set necessary to calculate the smart measure does not exist.
- ForceMerge is the equivalent of the BusinessObjects/Desktop Intelligence Multicube function.

### Examples

ForceMerge([Revenue]) returns the value of [Revenue], taking into account any synchronized dimensions that do not appear in the same block as the [Revenue] measure.

---

#### 6.1.10.6 GetContentLocale

### Description

Returns the locale of the data contained in the document (the Document Locale)

### Function Group

Misc

### Syntax

```>
string GetContentLocale()
```
Notes

The Document Locale is used to format the data in a document.

Examples

GetContentLocale() returns "fr_FR" if the Document Locale is "French (France)".

6.1.10.7 GetDominantPreferredViewingLocale

Description

Returns the dominant locale in the user’s Preferred Viewing Locale group

Function Group

Misc

Syntax

string GetDominantPreferredViewingLocale()

Notes

- Each group of related locales has a dominant locale, used as a base for all the other locales in the group. For example, US English ("en_US") is the dominant locale in the English locales group. New Zealand English ("en_NZ") is also a member of this group.
- The Translation Manager Guide lists all the Dominant Preferred Viewing Locales.

Examples

GetDominantPreferredViewingLocale returns "en_US" when the Preferred Viewing Locale is "English (New Zealand)".
6.1.10.8  GetLocale

Description

Returns the user’s locale used to format the user interface (the Product Locale)

Function Group

Misc

Syntax

```plaintext
string GetLocale()
```

Notes

The Product Locale is the locale of the user interface (for example, menu items and button text).

Examples

GetLocale() returns "en_US" if the user’s Product Locale is "English (US)".

6.1.10.9  GetLocalized

Description

Returns a string localized according to the user’s Preferred Viewing Locale
Syntax

```plaintext
string GetLocalized(string[,comment])
```

## Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>string</td>
<td>The string to be translated</td>
<td>string</td>
<td>Yes</td>
</tr>
<tr>
<td>comment</td>
<td>A comment to aid translators</td>
<td>string</td>
<td>No</td>
</tr>
</tbody>
</table>

## Notes

- The `string` parameter can be a string in any formula (for example, in a cell, an alerter message or a variable definition).
- When designing a report, you can use the `comment` parameter to provide further information to help translators translate the string. The comment appears with the string in the Translation Manager tool which translators use to translate reports.
- Each `string + comment` pair generates a separate string to be translated in the Translation Manager tool. As a result, `GetLocalized("Product Total";"Max 20 characters")` and `GetLocalized("Product Total";"Use no more than 20 characters")` might return different translations.

## Examples

GetLocalized("Total for all products") returns the French translation of "Total for all products" if the Preferred Viewing Locale is "fr_FR".

GetLocalized("Total for all products";"Try not to use more than 20 characters") returns the German translation of "Total for all products" if the Preferred Viewing Locale is "de_DE". The function also tells the translator of the report not to use more than 20 characters if possible when translating the string.

## Related Information

GetPreferredViewingLocale [page 197]
6.1.10.10 GetPreferredViewingLocale

Description

Returns the user's preferred locale for viewing document data (the Preferred Viewing Locale)

Function Group

Misc

Syntax

```c
string GetPreferredViewingLocale()
```

Examples

GetPreferredViewingLocale returns "en_US" if the Preferred Viewing Locale is "English (US)".

Related Information

GetLocalized [page 195]
GetDominantPreferredViewingLocale [page 194]

6.1.10.11 If...Then...Else

Description

Returns a value based on whether an expression is true or false

Function Group

Misc
Syntax

If bool_value Then true_value [Else false_value]

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>bool_value</td>
<td>A boolean value</td>
<td>Boolean</td>
<td>Yes</td>
</tr>
<tr>
<td>true_value</td>
<td>The value to return if bool_value is true</td>
<td>Any</td>
<td>Yes</td>
</tr>
<tr>
<td>false_value</td>
<td>The value to return if bool_value is false</td>
<td>Any</td>
<td>Yes if Else is included</td>
</tr>
</tbody>
</table>

Notes

- true_value and false_value can mix datatypes.
- You can use the boolean operators And, Between, InList, Or and Not with If.
- You can nest If conditions by replacing any Else clause with an ElseIf clause. This syntax describes one level of nesting:
  
  If bool_value Then true_value [ElseIf bool_value Then true_value Else false_value...]

- The original syntax of the If function, If(bool_value;true_value;false_value), is also supported.

Examples

If [Sales Revenue]>1000000 Then "High Revenue" returns "High Revenue" for all rows whose revenue is larger than 1,000,000 and nothing for all other rows.

If [Sales Revenue] >1000000 Then "High Revenue" Else [Revenue] returns "High Revenue" for all rows whose revenue is larger than 1,000,000 and the revenue value for all other rows.

If [Sales Revenue]>1000000 Then "High Revenue" Else "Low Revenue" returns "High Revenue" for all rows whose revenue is larger than 1,000,000 and "Low Revenue" for all rows whose revenue is less than 1,000,000.

If [Sales Revenue]>1000000 Then "High Revenue" ElseIf [Sales Revenue] > 800000 Then "Medium Revenue" Else "Low Revenue" returns "High Revenue" for all rows whose revenue is larger than 1000000, "Medium Revenue" for all rows whose revenue is between 800000 and 1000000, and "Low Revenue" for all other rows.
Related Information

If [page 199]
And operator [page 213]
   The And operator links boolean values.
Between operator [page 215]
InList operator [page 215]
Or operator [page 214]
   The Or operator links boolean values.
Not operator [page 214]

6.1.10.12 If

Description

Returns a value based on whether an expression is true or false

Function Group

Misc

Syntax

If(bool_value;true_value;false_value)

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>bool_value</td>
<td>A boolean value</td>
<td>Boolean</td>
<td>Yes</td>
</tr>
<tr>
<td>true_value</td>
<td>The value to return if bool_value is true</td>
<td>Any</td>
<td>Yes</td>
</tr>
<tr>
<td>false_value</td>
<td>The value to return if bool_value is false</td>
<td>Any</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Notes

- `true_value` and `false_value` can mix datatypes.
- You can nest `If` conditions by replacing `false_value` with additional `If` conditions. This syntax shows one level of nesting:

```plaintext
If(bool_value;true_value;If(bool_value;true_value;false_value);false_value)
```

- The `If...Then...Else` syntax is also supported.

Examples

```plaintext
If([Sales Revenue]>1000000;"High Revenue";"Low Revenue")
```
returns "High Revenue" for all rows whose revenue is larger than 1,000,000 and "Low Revenue" for all rows whose revenue is less than 1,000,000.

```plaintext
If([Sales Revenue]>1000000;"High Revenue";[Revenue])
```
returns "High Revenue" for all rows whose revenue is larger than 1,000,000 and the revenue value for all other rows.

Related Information

*If...Then...Else* [page 197]

6.1.10.13 LineNumber

Description

Returns the line number in a table

Function Group

Misc

Syntax

```plaintext
int LineNumber()
```
## Notes

Numbering of the lines in a table starts with the header, which is line 1.

## Examples

`LineNumber()` returns 2 when the function appears at the second line in a table.

### 6.10.14 NameOf

#### Description

Returns the name of an object

#### Function Group

Misc

#### Syntax

```plaintext
string NameOf(obj)
```

#### Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>Any report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>

#### Notes

The `NameOf` function appears in column and row headers in reports.
Examples

NameOf([Reservation Date]) returns "Reservation Date".

6.1.10.15 NoFilter

Description

Ignores filters when calculating a value

Function Group

Misc

Syntax

input_type NoFilter(obj;All|Drill})

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>Any report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>
| All|Drill | • No keyword specified - ignore report and block filters  
    • All - ignore all filters  
    • Drill - ignore report and drill filters | Keyword      | No       |

Notes

- NoFilter(obj;Drill) does not work in query drill mode because the drill filters are added to the query rather than applied to the report data.
- If you end drill mode with drill filters applied, the drill filters become report filters and can change the value of any objects to which NoFilter(obj;Drill) is applied.
Examples

When placed in a block footer, \texttt{NoFilter(Sum([Sales Revenue])}) returns the total sales revenue of all possible rows in the block, even when rows are filtered out of the block.

\texttt{NoFilter(Sum([Sales Revenue]);All)} returns the sum of the sales revenue for all countries including France, even though there is a filter that excludes France from the report.

\texttt{NoFilter(Sum([Sales Revenue]);Drill)} returns the sum of the sales revenue for all countries, even when there is a drill filter on the [Country] dimension.

6.1.10.16 NumberOfPages

Description

Returns the number of pages in a report

Function Group

Misc

Syntax

\begin{verbatim}
integer NumberOfPages()
\end{verbatim}

Examples

\texttt{NumberOfDataPages()} returns 2 if the report has two pages.

6.1.10.17 Page

Description

Returns the current page number in a report
Function Group

Misc

Syntax

```
integer Page()
```

Example

`Page()` returns 2 if it appears in the second page of the report.

6.1.10.18 Previous

Description

Returns a previous value of an object

Function Group

Misc

Syntax

```
input_type Previous(dimension|measure|Self [;Row|col][;(reset_dims)][;offset][;NoNull])
```
## Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>dimension</td>
<td>measure</td>
<td>Self</td>
<td>The dimension or measure whose previous value the function returns, or the Self keyword</td>
</tr>
<tr>
<td>Row/Col</td>
<td>Sets the calculation direction</td>
<td>Keyword</td>
<td>No</td>
</tr>
<tr>
<td>reset_dims</td>
<td>The list of dimensions used to reset the calculation</td>
<td>Dimension list</td>
<td>No</td>
</tr>
<tr>
<td>offset</td>
<td>Specifies the value of dimension or measure that is offset rows previous to the current row</td>
<td>Integer</td>
<td>No (default is 1)</td>
</tr>
<tr>
<td>NoNull</td>
<td>Tells the function to return the first non-null value starting from the offset</td>
<td>Keyword</td>
<td>No</td>
</tr>
</tbody>
</table>

## Notes

- The default value of `offset` is 1. `Previous([Revenue];1)` and `Previous([Revenue])` are functionally the same.
- When you include the `NoNull` argument, the function returns the first non-null value of the object beginning from the cell `offset` rows before the current row and counting backwards.
- You can use extended syntax context operators with `Previous`.
- The `Self` operator allows you to refer to the previous value of a cell when it contains content other than one report object.
- You must always place dimensions in parentheses even if there is only one dimension in the list of reset dimensions.
- When you specify a set of reset dimensions you must separate them with semi-colons.
- `Previous` is applied after all report, section and block filters, and all sorts, are applied.
- You cannot apply sorts or filters on formulas that use `Previous`.
- If `Previous` is applied on a measure and the measure returns an undefined value, `Previous` returns an undefined value even if the previous line returned a value.
- `Previous` ignores breaks when placed outside a break header or footer.
- `Previous` returns the value in the previous instance of the footer when placed in a break footer.
- `Previous` is reset in each report section.
- When used in a crosstab, `Previous` does not treat the last value in a row as the previous value of the first value of the next row.
Examples

`Previous([Country];1)` returns the following values in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Revenue</th>
<th>Previous</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>5,000,000</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>2,000,000</td>
<td>US</td>
</tr>
<tr>
<td>France</td>
<td>2,100,000</td>
<td>UK</td>
</tr>
</tbody>
</table>

`Previous([Revenue])` returns the following values in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Revenue</th>
<th>Previous</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>5,000,000</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>2,000,000</td>
<td>5,000,000</td>
</tr>
<tr>
<td>France</td>
<td>2,100,000</td>
<td>2,000,000</td>
</tr>
</tbody>
</table>

`Previous([Revenue];([Country])` returns the following values in the following table:

<table>
<thead>
<tr>
<th>Country</th>
<th>Region</th>
<th>Revenue</th>
<th>Previous</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>North</td>
<td>5,000,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>7,000,000</td>
<td>5,000,000</td>
</tr>
<tr>
<td>UK</td>
<td>North</td>
<td>3,000,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>4,000,000</td>
<td>3,000,000</td>
</tr>
</tbody>
</table>

`Previous([Revenue])` returns the following values in the following crosstab:

<table>
<thead>
<tr>
<th></th>
<th>2004</th>
<th>Previous</th>
<th>2005</th>
<th>Previous</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>5,000,000</td>
<td></td>
<td>6,000,000</td>
<td>5,000,000</td>
</tr>
<tr>
<td>UK</td>
<td>2,000,000</td>
<td></td>
<td>2,500,000</td>
<td>2,000,000</td>
</tr>
<tr>
<td>France</td>
<td>3,000,000</td>
<td></td>
<td>2,000,000</td>
<td>3,000,000</td>
</tr>
</tbody>
</table>

`Previous([Revenue])` returns the following values in the following table with a break on [Country]:

<table>
<thead>
<tr>
<th>Country</th>
<th>Region</th>
<th>Revenue</th>
<th>Previous</th>
</tr>
</thead>
<tbody>
<tr>
<td>US</td>
<td>North</td>
<td>5,000,000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>7,000,000</td>
<td>5,000,000</td>
</tr>
<tr>
<td>US</td>
<td></td>
<td>12,000,000</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Country</th>
<th>Region</th>
<th>Revenue</th>
<th>Previous</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>North</td>
<td>3,000,000</td>
<td>7,000,000</td>
</tr>
<tr>
<td></td>
<td>South</td>
<td>4,000,000</td>
<td>3,000,000</td>
</tr>
</tbody>
</table>
Previous([Revenue]);2;NonNull) returns the following values in the following table:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Revenue</th>
<th>Previous</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Q1</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Q2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Q3</td>
<td>400</td>
<td>500</td>
</tr>
<tr>
<td>2008</td>
<td>Q4</td>
<td>700</td>
<td>500</td>
</tr>
<tr>
<td>2008</td>
<td>Q1</td>
<td>300</td>
<td>400</td>
</tr>
<tr>
<td>2008</td>
<td>Q2</td>
<td></td>
<td>700</td>
</tr>
<tr>
<td>2008</td>
<td>Q3</td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>2008</td>
<td>Q4</td>
<td>200</td>
<td>300</td>
</tr>
</tbody>
</table>

2*Previous(Self) returns the sequence 2, 4, 6, 8, 10...

Related Information

Comparing values using the Previous function [page 243]

The Previous function returns a comparative previous value of an expression.

Self operator [page 224]

The Self operator works with the Previous function.

6.1.10.19 RefValue

Description

Returns the reference value of a report object when data tracking is activated

Function Group

Misc
Syntax

```
input_type RefValue(obj)
```

Examples

```
RefValue([Top Performing Region]) returns "South West" if the value of the [Top Performing Region] variable is "South West" in the reference data.
RefValue([Revenue]) returns 1000 if the value of the [Revenue] measure is 1000 in the reference data.
```

6.1.10.20 RelativeValue

Description

Returns previous or subsequent values of an object

Function Group

Misc

Syntax

```
input_type RelativeValue(measure|detail; slicing_dims; offset)
```

Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>measure</td>
<td>detail</td>
<td>Any measure or a detail of a dimension in the block</td>
<td>Measure or detail</td>
</tr>
<tr>
<td>slicing_dims</td>
<td>The dimensions that provide the calculation context</td>
<td>Dimension list</td>
<td>Yes</td>
</tr>
</tbody>
</table>
### Parameter Description Type Required

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>offset</td>
<td>Specifies the value of measure or detail that is offset rows removed from the current row</td>
<td>Integer</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### Notes

- The object must be a measure or a detail of a dimension available in the block.
- The sort order of the list of values of the slicing dimensions is used to determine the output of the function. The sort order is determined by two factors: sorts applied to the slicing dimensions, and the order in which the slicing dimensions are listed in the function.
- A dimension used as a section master can be specified as a slicing dimension.
- All the slicing dimensions must be present in the block or section header of the block in which the function is placed. If a slicing dimension is later removed from the block, the function returns the #COMPUTATION error.
- If the offset exceeds the number of rows in the list of values of the slicing dimension, the function returns null.
- RelativeValue cannot be used recursively.
- You must always place dimensions in parentheses even if there is only one dimension in the list of slicing dimensions.

### Examples

The RelativeValue column in the table below contains the following formula:

```
RelativeValue([Revenue];([Year]);-1)
```

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Person</th>
<th>Revenue</th>
<th>RelativeValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Smith</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Jones</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Wilson</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
<td>Harris</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Q1</td>
<td>Smith</td>
<td>4000</td>
<td>1000</td>
</tr>
<tr>
<td>2008</td>
<td>Q2</td>
<td>Jones</td>
<td>3400</td>
<td>2000</td>
</tr>
<tr>
<td>2008</td>
<td>Q3</td>
<td>Wilson</td>
<td>2000</td>
<td>1500</td>
</tr>
<tr>
<td>2008</td>
<td>Q4</td>
<td>Harris</td>
<td>1700</td>
<td>3000</td>
</tr>
</tbody>
</table>

### Related Information

#COMPUTATION [page 237]
#COMPUTATION occurs when a slicing dimension specified in the `RelativeValue` function is no longer available in the calculation context of the block where the function is placed.

Comparing values using the `RelativeValue` function [page 243]

The `RelativeValue` function returns comparative values of an expression. The function returns these values independently of the layout of a report.

### 6.1.10.21 ReportName

**Description**

Returns the name of a report

**Function Group**

Misc

**Syntax**

```
string ReportName()
```

**Examples**

`ReportName()` returns "Sales Report" if it is placed in a report called "Sales Report".

### 6.1.10.22 RowIndex

**Description**

Returns the number of a row

**Function Group**

Misc
Syntax

integer RowIndex()

Notes

- Row numbering starts at 0.
- `RowIndex` returns `#MULTIVALUE` when placed in a table header or footer.

Examples

`RowIndex` returns 0 when it appears on the first row of a table.

6.1.10.23 UniqueNameOf

Description

Returns the unique name of an object

Function Group

Misc

Syntax

string UniqueNameOf(obj)
Input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Type</th>
<th>Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>obj</td>
<td>Any report object</td>
<td>Report object</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Examples

UniqueNameOf([Reservation Date]) returns “Reservation Date”.

6.2 Function and formula operators

Operators link the various components in a formula.

Formulas can contain mathematical, conditional, logical, function-specific or extended syntax operators.

6.2.1 Mathematical operators

Mathematical operators are familiar from everyday arithmetic.

There are addition (+), subtraction (-), multiplication (*), division (/) operators that allow you to perform mathematical operations in a formula. The formula `[Sales Revenue] - [Cost of Sales]` contains a mathematical operator, in this case subtraction.

**Note**

When used with character strings, the ‘+’ operator becomes a string concatenation operator. That is, it joins character strings. For example, the formula “John” + ”Smith” returns “John Smith”.

6.2.2 Conditional operators

Conditional operators determine the type of comparison to be made between values.

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>=</td>
<td>Equal to</td>
</tr>
<tr>
<td>&gt;</td>
<td>Greater than</td>
</tr>
<tr>
<td>&lt;</td>
<td>Less than</td>
</tr>
</tbody>
</table>
You use conditional operators with the If function, as in:

```plaintext
If [Revenue] > 10000 Then "High" Else "Low"
```

which returns "High" for all rows where the revenue is greater than or equal to 10000 and "Low" for all other rows.

### 6.2.3 Logical operators

The logical operators are **And**, **Or**, **Not**, **Between** and **InList**.

Logical operators are used in boolean expressions, which return **True** or **False**.

#### 6.2.3.1 And operator

The **And** operator links boolean values.

**Description**

If all the boolean values linked by **And** return true, the combination of all the values also returns true.

**Syntax**

```plaintext
bool_value And bool_value [And bool_value...]
```

**Examples**

```plaintext
If [Resort] = "Bahamas Beach" And [Revenue] > 100000 Then "High Bahamas Revenue" returns "High Bahamas Revenue" if [Resort] = "Bahamas Beach" And [Revenue] > 100000.
```
**6.2.3.2 Or operator**

The or operator links boolean values.

**Description**

If any one boolean value linked by or returns true, the combination of all the values also returns true.

**Syntax**

```
bool_value Or bool_value [Or bool_value...]
```

**Examples**

If [Resort] = "Bahamas Beach" Or [Resort]="Hawaiian Club" Then "US" Else "France"
returns "US" if [Resort]="Bahamas Beach" or "Hawaiian Club", or "France" otherwise.

**6.2.3.3 Not operator**

**Description**

The Not operator returns the opposite of a boolean value.

**Syntax**

```
bool Not(bool_value)
```

**Examples**

If Not([Country] = "US") Then "Not US" returns "Not US" if [Country] has any value other than "US".
### 6.2.3.4 Between operator

#### Description

The **Between** operator determines if a variable is between two values.

#### Syntax

```plaintext
bool Between(first_value; second_value)
```

#### Notes

- You use `Between` with the `If` function and the `Where` operator.
- Changing the document locale can impact the result returned by the `Between` operator.

#### Examples

If `[Revenue] Between (800000;900000)` Then "Medium Revenue" returns "Medium Revenue" if `[Revenue]` is between 800000 and 900000.

[Sales Revenue] Between (10000;20000) returns true if the sales revenue is between 10000 and 20000.

If `([Sales Revenue] Between (200000;500000);"Medium Revenue";"Low/High Revenue")` returns "Medium Revenue" if `[Sales Revenue]` is 300000.

#### Related Information

*[If...Then...Else](page 197)*

*[Where operator](page 224)*

### 6.2.3.5 InList operator

#### Description

The **InList** operator determines if a value is in a list of values.
Syntax

bool test_value InList(value_list)

Notes

It is the combination of test_value + InList that returns a boolean value, not InList alone.

Examples

If Not ([Country] InList("England";'Scotland''Wales")) Then "Not Britain" Else "Britain" returns "Not Britain" if [Country] is not equal to "England", "Scotland" or "Wales", or "Britain" otherwise.

If [Resort] InList("Bahamas Beach''"Hawaiian Club") Then "US Resort" returns "US Resort" if [Resort] is equal to "Bahamas Beach" or "Hawaiian Club".

Related Information

*If...Then...Else* [page 197]
*Where operator* [page 224]

6.2.4 Function-specific operators

Some functions can take specific operators as arguments.

For example, the Previous function can take the Self operator.

All functions use ) and ( to enclose function arguments. Functions that accept multiple parameters use ; to separate the parameters.

6.2.4.1 All operator

The All operator tells the NoFilter function to ignore all filters.

The All operator can also tell the Count function to count all values, including duplicates.
6.2.4.2 All/Drill operators

The All/Drill operators work with the NoFilter function.

Description

The All/Drill operators determine which filters the NoFilter function ignores.

- Not specified - NoFilter ignores report and block filters
- All - NoFilter ignores all filters
- Drill - NoFilter ignores report filters and drill filters

6.2.4.3 Bottom/Top operators

The Bottom/Top operators work with the Rank function.

Description

The Bottom/Top operators tell the Rank function to rank in descending or ascending order.

- Top - ranks in descending order
- Bottom - ranks in ascending order

Examples

Rank(Revenue; ([Country]); Top) ranks countries by revenue from highest to lowest.
6.2.4.4 Break operator

The Break operator works with the Percentage function.

Description

The Break operator tells Percentage function to account for table breaks.

Examples

The formula Percentage([Revenue]) gives the following result in the following table (percentages are calculated on the total revenue in the block):

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Revenue</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Q1</td>
<td>10000</td>
<td>10%</td>
</tr>
<tr>
<td>2005</td>
<td>Q2</td>
<td>20000</td>
<td>20%</td>
</tr>
<tr>
<td>2006</td>
<td>Q1</td>
<td>30000</td>
<td>30%</td>
</tr>
<tr>
<td>2006</td>
<td>Q2</td>
<td>40000</td>
<td>40%</td>
</tr>
</tbody>
</table>

The formula Percentage([Revenue];Break) gives the following result in the following table (percentages are calculated on the total revenue in each part of the block):

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Revenue</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>Q1</td>
<td>10000</td>
<td>33.3%</td>
</tr>
<tr>
<td>2005</td>
<td>Q2</td>
<td>20000</td>
<td>66.6%</td>
</tr>
<tr>
<td>2006</td>
<td>Q1</td>
<td>30000</td>
<td>42.9%</td>
</tr>
<tr>
<td>2006</td>
<td>Q2</td>
<td>40000</td>
<td>57.1%</td>
</tr>
</tbody>
</table>
6.2.4.5  Distinct/All operators

The Distinct/All operators work with the Count function.
The Distinct/All operators tell the Count function to count distinct values only, or all values.

Examples

Count([Revenue]; Distinct) returns 3 if [Revenue] has the values (5;5;6;4).
Count([Revenue]; All) returns 4 if [Revenue] has the values (5;5;6;4).

6.2.4.6  IncludeEmpty operator

The IncludeEmpty operator works with aggregate functions.

Description

The IncludeEmpty operator tells some aggregate functions (Average, Count, RunningAverage, RunningCount) to include empty values in calculations.

Examples

Average([Revenue]; IncludeEmpty) returns 3 if [Revenue] has the values (5;3;<empty>;4).
Related Information

*Average* [page 49]
*Count* [page 50]
*RunningAverage* [page 62]
*RunningCount* [page 63]

### 6.2.4.7  Index operator

The **Index operator** works with the **UserResponse** and **RefValueUserResponse** functions.

**Description**

The **Index operator** tells the **UserResponse** and **RefValueUserResponse** functions to return the database primary key of the prompt response.

**Related Information**

*UserResponse* [page 130]
*RefValueUserResponse* [page 128]

### 6.2.4.8  Linear operator

The **Linear operator** works with the **Interpolation** function.

**Description**

The **Linear operator** tells the **Interpolation** function to use linear regression with least squares interpolation to supply missing measure values.

Linear regression with least squares interpolation calculates missing values by calculating a line equation in the form $f(x) = ax + b$ that passes as closely as possible through all the available values of the measure.
6.2.4.9 NoNull operator

The NoNull operator works with the Previous function.

Description

The NoNull operator tells the Previous function to ignore null values.

When used with NoNull, Previous returns the first non-null value of the object, beginning from the cell offset rows before the current row and counting backwards.

6.2.4.10 NotOnBreak operator

The NotOnBreak operator works with the Interpolation function.

Description

The NotOnBreak operator tells the Interpolation function to ignore section and block breaks.

Related Information

Interpolation [page 164]

Previous [page 204]
6.2.4.11  PointToPoint operator

The `PointToPoint` operator tells the `Interpolation` function to use point-to-point interpolation to supply missing measure values.

**Description**

Point-to-point interpolation calculates missing values by calculating a line equation in the form \( f(x) = ax + b \) that passes through the two adjacent values of the missing value.

**Related Information**

`Interpolation` [page 164]

6.2.4.12  Row/Col operators

The `Row` operator calculates each value in the row as a percentage of the total value of all the rows in the embedding context. The `Col` operator calculates each value in the column as a percentage of the total value of all the columns in the embedding context.

**Description**

The `Row/Col` operators set the calculation direction of the following functions: `Percentage`, `Previous`, `RunningAverage`, `RunningCount`, `RunningMax`, `RunningMin`, `RunningProduct`, `RunningSum`.

**Notes**

In a crosstab, the value in each cell is calculated by default as a percentage of the total value in the crosstab. The `Row` operator calculates the values in the rows as percentages of the total value for the row. The `Col` operator calculates the values in the columns as percentages of the total value in the column.

**Examples**

In a crosstab, `Percentage([Measure])` gives the following result:
<table>
<thead>
<tr>
<th>Measure</th>
<th>Percentage</th>
<th>Measure</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>10%</td>
<td>500</td>
<td>50%</td>
</tr>
<tr>
<td>200</td>
<td>20%</td>
<td>200</td>
<td>20%</td>
</tr>
</tbody>
</table>

Percentage([Measure]; Row) gives the following result:

<table>
<thead>
<tr>
<th>Measure</th>
<th>Percentage</th>
<th>Measure</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>16.7%</td>
<td>500</td>
<td>83.3%</td>
</tr>
<tr>
<td>200</td>
<td>50%</td>
<td>200</td>
<td>50%</td>
</tr>
</tbody>
</table>

Percentage([Measure]; Col) gives the following result:

<table>
<thead>
<tr>
<th>Measure</th>
<th>Percentage</th>
<th>Measure</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>33.3%</td>
<td>500</td>
<td>83.3%</td>
</tr>
<tr>
<td>200</td>
<td>66.6%</td>
<td>200</td>
<td>16.7%</td>
</tr>
</tbody>
</table>

The Row operator calculates the running aggregate by row. The Col operator calculates the running aggregate by column.

In a crosstab, RunningSum([Measure]) or RunningSum([Measure]; Row) gives the following result:

<table>
<thead>
<tr>
<th>Measure</th>
<th>RunningSum</th>
<th>Measure</th>
<th>RunningSum</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>400</td>
<td>700</td>
<td>250</td>
<td>950</td>
</tr>
</tbody>
</table>

In a crosstab, RunningSum([Measure]; Col) gives the following result:

<table>
<thead>
<tr>
<th>Measure</th>
<th>RunningSum</th>
<th>Measure</th>
<th>RunningSum</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>100</td>
<td>200</td>
<td>700</td>
</tr>
<tr>
<td>400</td>
<td>500</td>
<td>250</td>
<td>950</td>
</tr>
</tbody>
</table>

Related Information

- Percentage [page 58]
- RunningAverage [page 62]
- RunningCount [page 63]
- RunningMax [page 65]
- RunningMin [page 67]
- RunningProduct [page 68]
- RunningSum [page 70]
6.2.4.13  Self operator

The Self operator works with the Previous function.

Description

Refers the Previous function to the previous cell when it does not contain a report object.

Examples

5 + Previous(Self) returns the sequence 5, 10, 15, 20, 25, 30...

1 + 0.5 * Previous(Self) returns the sequence 1, 1.5, 1.75, 1.88...

Related Information

Previous [page 204]

6.2.4.14  Where operator

Description

The Where operator restricts the data used to calculate a measure.

Examples

The formula Average ([Sales Revenue]) Where ([Country] = "US") calculates the average sales where the country is "US".

The formula Average ([Sales Revenue]) Where ([Country] = "US" Or [Country] = "France") calculates the average sales where the country is "US" or "France".

The formula [Revenue] Where (Not ([Country] Inlist ("US"; "France"))) calculates the revenue for the countries other than US and France.

The variable [High Revenue] has the formula [Revenue] Where [Revenue > 500000]. When placed in a block, [High Revenue] displays either the revenue when its value is greater than 500000, or nothing. When placed
in a footer at the bottom of the [High Revenue] column, the formula \( \text{Average ([High Revenue])} \) returns the average of all the revenues greater than 500000.

### Related Information

**And operator** [page 213]

The \( \text{And} \) operator links boolean values.

**Between operator** [page 215]

**InList operator** [page 215]

**Or operator** [page 214]

The \( \text{Or} \) operator links boolean values.

**Not operator** [page 214]

### 6.2.5 Extended syntax operators

You specify input and output contexts explicitly with context operators.

The following table lists the context operators:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>In</td>
<td>Specifies an explicit list of dimensions to use in the context.</td>
</tr>
<tr>
<td>ForEach</td>
<td>Adds dimensions to the default context</td>
</tr>
<tr>
<td>ForAll</td>
<td>Removes dimensions from the default context</td>
</tr>
</tbody>
</table>

The ForAll and ForEach operators are useful when you have a default context with many dimensions. It is often easier to add or subtract from the context using ForAll and ForEach than it is to specify the list explicitly using In.

### 6.2.5.1 In context operator

The \( \text{In} \) context operator specifies dimensions explicitly in a context.

**Example**

**Using In to specify the dimensions in a context**

In this example you have a report showing Year and Sales Revenue. Your data provider also contains the Quarter object but you do not include this dimension in the block. Instead, you want to include an additional column to show the maximum revenue by quarter in each year. Your report looks like this:
You can see where the values in the Max Quarterly Revenue column come from by examining this block in conjunction with a block that includes the Quarter dimension:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>$2,660,699.50</td>
</tr>
<tr>
<td>2001</td>
<td>Q2</td>
<td>$2,279,003.00</td>
</tr>
<tr>
<td>2001</td>
<td>Q3</td>
<td>$1,367,841.00</td>
</tr>
<tr>
<td>2001</td>
<td>Q4</td>
<td>$1,788,580.00</td>
</tr>
<tr>
<td></td>
<td>Max:</td>
<td>$2,660,699.50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>$3,326,172.00</td>
</tr>
<tr>
<td>2001</td>
<td>Q2</td>
<td>$2,840,651.00</td>
</tr>
<tr>
<td>2001</td>
<td>Q3</td>
<td>$2,879,303.00</td>
</tr>
<tr>
<td>2001</td>
<td>Q4</td>
<td>$4,186,120.00</td>
</tr>
<tr>
<td></td>
<td>Max:</td>
<td>$4,186,120.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>$3,742,989.00</td>
</tr>
<tr>
<td>2001</td>
<td>Q2</td>
<td>$4,006,717.50</td>
</tr>
<tr>
<td>2001</td>
<td>Q3</td>
<td>$3,953,395.00</td>
</tr>
<tr>
<td>2001</td>
<td>Q4</td>
<td>$3,356,041.00</td>
</tr>
<tr>
<td></td>
<td>Max:</td>
<td>$4,006,717.50</td>
</tr>
</tbody>
</table>

The Max Quarterly Revenue column shows the highest quarterly revenue in each year. For example, Q4 has the highest revenue in 2002, so the Max Quarterly Revenue shows Q4 revenue on the row showing 2002.

Using the In operator, the formula for Max Quarterly Revenue is

\[
\text{Max ([Sales Revenue] In ([Year];[Quarter])) In ([Year])}
\]

This formula calculates the maximum sales revenue for each (Year,Quarter) combination, then outputs this figure by year.

**Note**

Because the default output context of the block is Year, you do not need to specify the output context explicitly in this formula.
### 6.2.5.2 ForEach context operator

The `ForEach` operator adds dimensions to a context.

**Example**

**Using ForEach to add dimensions to a context**

The following table shows the maximum revenue for each Quarter in a report which contains the Quarter dimension but does not include it in the block:

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales revenue</th>
<th>Max Quarterly Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>8096123.60</td>
<td>2660699.50</td>
</tr>
<tr>
<td>2002</td>
<td>13232246.00</td>
<td>4186120.00</td>
</tr>
<tr>
<td>2003</td>
<td>15059142.80</td>
<td>4006717.50</td>
</tr>
</tbody>
</table>

It is possible to create a formula for the Max Quarterly Revenue column that does not include the `ForEach` operator:

\[
\text{Max ([Sales Revenue] In ([Year];[Quarter])) In ([Year])}
\]

Using the `ForEach` context operator, you can achieve the same result with the following formula:

\[
\text{Max ([Sales Revenue] ForEach ([Quarter])) In ([Year])}
\]

Why? Because the Year dimension is the default input context in the block. By using the `ForEach` operator, you add the Quarter dimension to the context, giving an input context of ([Year];[Quarter]).

### 6.2.5.3 ForAll context operator

The `ForAll` context operator removes dimensions from a context.

**Example**

**Using ForAll to remove dimensions from a context**

You have a report showing Year, Quarter and Sales Revenue and you want to add a column that shows the total revenue in each year, as shown in the following block:
To total revenues by year the input context needs to be (Year); by default it is (Year; Quarter). Therefore, you can remove Quarter from the input context by specifying `ForAll ([Quarter])` in the formula, which looks like this:

```plaintext
Sum([Sales Revenue] ForAll ([Quarter]))
```

Note that you can use the `In` operator to achieve the same thing; in this case the formula is:

```plaintext
Sum([Sales Revenue] In ([Year]))
```

This version of the formula explicitly specifies Year as the context, rather than removing Quarter to leave Year.

### 6.2.6 Set operators

Set operators work on members in hierarchical data.

#### 6.2.6.1 Range operator

**Description**

The range operator (:) returns a set of members between and including two members at the same level.

**Syntax**

```plaintext
first_member:last_member
```
Examples

[Geography]&[US].[California].[Los Angeles]:[Geography]&[US].[California].[San Francisco] returns [Los Angeles], [San Diego], [San Francisco] if the members at the level are in the order ...
[Los Angeles], [San Diego], San Francisco...

\( \text{Sum([Revenue]:{[Geography]&[US].[California].[Los Angeles]:[Geography]&[US].
[California].[San Francisco]})} \) returns the total revenue for Los Angeles, San Diego and San Francisco.

6.3 Extended syntax keywords

Extended syntax keywords are a form of shorthand that allows you to refer to dimensions in extended syntax without specifying those dimensions explicitly.

These keywords help future-proof reports. If formulas do not contain hard-coded references to dimensions, they will continue to work even if dimensions are added to or removed from a report.

There are five extended syntax keywords: Report, Section, Break, Block and Body.

6.3.1 The Block keyword

This topic describes the dimensions referenced by the Block keyword, depending on where it is placed in a report. The Block keyword often encompasses the same data as the Section keyword.

The difference is that Block accounts for filters on a block whereas Section ignores them.

<table>
<thead>
<tr>
<th>When placed in...</th>
<th>References this data...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A block</td>
<td>Data in the whole block, ignoring breaks, respecting filters</td>
</tr>
<tr>
<td>A block break (header or footer)</td>
<td>Data in the whole block, ignoring breaks, respecting filters</td>
</tr>
<tr>
<td>A section (header, footer, or outside a block)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Outside any blocks or sections</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Example

The Block keyword

You have a report showing Year, Quarter and Sales revenue. The report has a section based on Year. The block is filtered to exclude the third and fourth quarters.
The Yearly Average column uses the following formula:

\[
\text{Average}([\text{Sales revenue}] \text{ In Section})
\]

The First Half Average column uses the following formula:

\[
\text{Average}([\text{Sales revenue}] \text{ In Block})
\]

You can see how the Block keyword takes account of the filter on the block.

### 6.3.2 The Body keyword

This topic describes the dimensions referenced by the keyword in a block Body, depending on where it is placed in a report.

<table>
<thead>
<tr>
<th>When placed in...</th>
<th>References this data...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A block</td>
<td>Data in the block</td>
</tr>
<tr>
<td>A block break (header or footer)</td>
<td>Data in the block</td>
</tr>
<tr>
<td>A section (header, footer, or outside a block)</td>
<td>Data in the section</td>
</tr>
<tr>
<td>Outside any blocks or sections</td>
<td>Data in the report</td>
</tr>
</tbody>
</table>
### Example

#### The Body keyword

You have a report showing Year, Quarter and Sales revenue, with a break on Year. The report has a section based on Year and a break on Quarter.

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
<th>Body</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>2,660,700</td>
<td>2,660,699.5</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>2,279,003</td>
<td>2,279,003</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>1,367,841</td>
<td>1,367,840.7</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>1,788,580</td>
<td>1,788,580.4</td>
</tr>
</tbody>
</table>

The Body column has the formula

\[
\text{Sum ([Sales Revenue]) In Body}
\]

The totals in the Body column are the same as those in the Sales revenue column because the Body keyword refers to the data in the block. If you were to remove the Month object, the figures in the Block column would change to correspond with the changed figures in the Sales revenue column. If you were to place the formula in the report footer it would return the total revenue for the body.

### 6.3.3 The Break keyword

The following table describes the dimensions referenced by the Break keyword depending on where it is placed in a report.

<table>
<thead>
<tr>
<th>When placed in...</th>
<th>References this data...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A block</td>
<td>Data in the part of a block delimited by a break</td>
</tr>
<tr>
<td>A block break (header or footer)</td>
<td>Data in the part of a block delimited by a break</td>
</tr>
<tr>
<td>A section (header, footer, or outside a block)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Outside any blocks or sections</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

#### Example

#### The Break keyword

You have a report showing Year, Quarter and Sales revenue:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales revenue</th>
<th>Break Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Q1</td>
<td>$2,660,700</td>
<td>$8,096,124</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>$2,279,003</td>
<td>$8,096,124</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>$1,367,841</td>
<td>$8,096,124</td>
</tr>
<tr>
<td>Year</td>
<td>Quarter</td>
<td>Sales revenue</td>
<td>Break Total</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>---------------</td>
<td>-------------</td>
</tr>
<tr>
<td>2001</td>
<td>Q1</td>
<td>$2,660,700</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2001</td>
<td>Q2</td>
<td>$2,279,003</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2001</td>
<td>Q3</td>
<td>$1,367,841</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2001</td>
<td>Q4</td>
<td>$1,788,580</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2002</td>
<td>Q1</td>
<td>$3,326,172</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2002</td>
<td>Q2</td>
<td>$2,840,651</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2002</td>
<td>Q3</td>
<td>$2,879,303</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2002</td>
<td>Q4</td>
<td>$4,186,120</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2003</td>
<td>Q1</td>
<td>$3,742,989</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2003</td>
<td>Q2</td>
<td>$4,006,718</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2003</td>
<td>Q3</td>
<td>$3,953,395</td>
<td>36,387,512.4</td>
</tr>
<tr>
<td>2003</td>
<td>Q4</td>
<td>$3,366,041</td>
<td>36,387,512.4</td>
</tr>
</tbody>
</table>

The report has break on Year. The Break Total column has the formula:

\[
\text{Sum ([Sales Revenue]) In Break}
\]

Without the Break keyword this column would duplicate the figures in the Sales revenue column, because it would use the default output context ([Year];[Quarter]).

### 6.3.4 The Report keyword

This topic describes the data referenced by the Report keyword, depending on where it is placed in a report:

<table>
<thead>
<tr>
<th>When placed in...</th>
<th>References this data...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A block</td>
<td>All data in the report</td>
</tr>
<tr>
<td>A block break (header or footer)</td>
<td>All data in the report</td>
</tr>
<tr>
<td>A section (header, footer, or outside a block)</td>
<td>All data in the report</td>
</tr>
<tr>
<td>Outside any blocks or sections</td>
<td>All data in the report</td>
</tr>
</tbody>
</table>

**Example**

**The Report keyword**

You have a report showing Year, Quarter and Sales revenue. The report has a column, Report Total, that shows the total of all revenue in the report.
The formula for the Report Total column is as follows:

\[ \text{Sum}([\text{Sales revenue}]) \text{ In Report} \]

Without the Report keyword, this column would duplicate the figures in the Sales Revenue column because it would use the default output context ([Year],[Quarter]).

### 6.3.5 The Section keyword

This topic describes the data referenced by the keyword for a Section, depending on where it is placed in a report.

<table>
<thead>
<tr>
<th>When placed in...</th>
<th>References this data...</th>
</tr>
</thead>
<tbody>
<tr>
<td>A block</td>
<td>All data in the section</td>
</tr>
<tr>
<td>A block break (header or footer)</td>
<td>All data in the section</td>
</tr>
<tr>
<td>A section (header, footer, or outside a block)</td>
<td>All data in the section</td>
</tr>
<tr>
<td>Outside any blocks or sections</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

#### Example

**The Section keyword**

You have a report showing Year, Quarter, and Sales revenue.

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Sales revenue</th>
<th>Section Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>$2,660,700</td>
<td>8,095,814</td>
</tr>
<tr>
<td>Q2</td>
<td>$2,273,650</td>
<td>8,095,814</td>
</tr>
<tr>
<td>Q3</td>
<td>$1,367,841</td>
<td>8,095,814</td>
</tr>
<tr>
<td>Q4</td>
<td>$1,788,580</td>
<td>8,095,814</td>
</tr>
</tbody>
</table>

The report has a section based on Year. The Section Total column has the formula:

\[ \text{Sum} ([\text{Sales Revenue}]) \text{ In Section} \]

The figure in the Section Total column is the total revenue for 2001, because the section break occurs on the Year object. Without the Section keyword this column would duplicate the figures in the Sales revenue column, because it would use the default output context ([Year],[Quarter]).
6.4 Rounding and truncating numbers

Several functions contain a parameter that determines to what level the function rounds or truncates the value it returns.

This parameter accepts an integer that is either greater than 0, 0, or less than 0. The following table explains how numbers are rounded and truncated in these cases:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 0</td>
<td>The function rounds/truncates to (&lt;parameter&gt;) decimal places. Examples: Round(3.13;1) returns 3.1 Round(3.157;2) returns 3.16</td>
</tr>
<tr>
<td>0</td>
<td>The function rounds/truncates to the nearest integer. Examples: Truncate(3.7;0) returns 3 Truncate(4.164;0) returns 4</td>
</tr>
<tr>
<td>&lt; 0</td>
<td>The function rounds/truncates to the nearest 10 (parameter = -1), 100 (parameter = -2), 1000 (parameter = -3) and so on. Examples: Round(123.76;-1) returns 120 Round(459.9;-2) returns 500 Truncate(1600;-3) returns 1000</td>
</tr>
</tbody>
</table>

Note
Numbers are represented internally as doubles and are accurate up to sixteen digits.

Related Information

Round [page 172]  
Truncate [page 177]  
EuroConvertTo [page 156]  
EuroConvertFrom [page 155]  
EuroFromRoundError [page 158]  
EuroToRoundError [page 160]
6.5 Referring to members and member sets in hierarchies

You refer to members and member sets in functions using the syntax \[\text{[hierarchy]}\&\text{path.function}\].

The \textit{path} and \textit{function} parts are optional. In \textit{path}, you refer to each member in square brackets, with members separated by full stops. The names of members and levels are case-sensitive.

\textbf{Example}

\textbf{Referring to members and member sets}

You have the following hierarchy:

\begin{center}
\begin{tabular}{|l|c|}
\hline
\textbf{Sales Hierarchy} & \textbf{Order Amount} \\
\hline
Customer_Type & 277,290,434 \\
\hline
ENTERPRISE & 180,063,361 \\
\hline
Large & 113,905,997 \\
\hline
Nancy Davolio & 44,855,689 \\
Janet Leverling & 44,050,308 \\
Andrew Smith & 30,000,000 \\
\hline
GLOBAL & 91,157,363 \\
\hline
\end{tabular}
\end{center}

- \texttt{[Sales Hierarchy]\&[Customer_Type].[ENTERPRISE].[Large].Children} refers to the [Nancy Davolio], [Janet Leverling] and [Andrew Smith] members.
- \texttt{Sum([Order Amount];{[Sales Hierarchy]\&[Customer_Type].[ENTERPRISE].[Large].children})} returns 113,905,997 (the sum of the measure for the three child members).
- \texttt{[Sales Hierarchy]\&[Customer_Type].[ENTERPRISE].[Large].[Janet Leverling]} refers to the [Janet Leverling] member.
- \texttt{Sum([Order Amount];{[Sales Hierarchy]\&[Customer_Type].[ENTERPRISE].[Large].[Janet Leverling];[Sales Hierarchy]\&[Customer_Type].[ENTERPRISE].[Large].[Nancy Davolio]})} returns 88,905,997 (the sum of the measure for the two members).
- \texttt{[Sales Hierarchy]\&[Customer_Type].[ENTERPRISE].[Large].[Nancy Davolio];[Sales Hierarchy]\&[Customer_Type].[ENTERPRISE].[Large].[Andrew Smith]} refers to the [Nancy Davolio], [Janet Leverling] and [Andrew Smith] members.

\textbf{Note}

You use member sets to override the default calculation context for a hierarchy. In functions that accept member sets, you enclose the member set in \{\}.
- `Sum([Order Amount]; {[Sales Hierarchy] & [Customer_Type].[ENTERPRISE].[Large].[Nancy Davolio]: [Sales Hierarchy] & [Customer_Type].[ENTERPRISE].[Large].[Andrew Smith]})` returns 113,905,997 (the sum of the measure for the three members in the range).
- `[Sales Hierarchy].children` refers to all members in the [Sales Hierarchy] hierarchy.
- `Sum([Order Amount]; [Sales Hierarchy].children)` returns 277,290,434.
7 Troubleshooting formulas

7.1 Formula error and information messages

You can format report data that returns error messages using conditional formatting.

In some cases a formula cannot return a value and returns an error or information message beginning with "#". The message appears in the cell in which the formula is placed.

7.1.1 #COMPUTATION

#COMPUTATION occurs when a slicing dimension specified in the RelativeValue function is no longer available in the calculation context of the block where the function is placed.

#COMPUTATION also occurs when a merged object containing a hierarchy is included in a report.

#COMPUTATION is also related to the misuse of context operators in a formula.

Related Information

RelativeValue [page 208]

7.1.2 #CONTEXT

#CONTEXT appears in a measure when the measure has a non-existent calculation context.

#CONTEXT is related to the #INCOMPATIBLE and #DATASYNC error messages, which appear in dimensions when a block contains a non-existent calculation context.

In the case of #INCOMPATIBLE the context is non-existent because the dimensions are incompatible; in the case of #DATASYNC the context is non-existent because the dimensions are from multiple unsynchronized data providers.

Example

Non-existent calculation context in a query

If a block based on the Island Resorts Marketing universe contains the Reservation Year and Revenue objects, the #CONTEXT error message appears because it is not possible to aggregate revenue by reservation year. (Reservations have not yet generated any revenue.)
7.1.3  #DATASYNC

#DATASYNC occurs when you place a dimension from a different data provider in a block containing dimensions from another data provider, and the two data providers are not synchronized through a merged dimension.

#DATASYNC appears in all dimensions in the block and #CONTEXT in the measures.

**Example**

**Dimensions from different data providers in a block**

If a report based on the Island Resorts Marketing universe contains data providers with the objects (Year, Revenue) and (Quarter), a block containing Year, Quarter and Revenue displays #DATASYNC in the Year and Quarter columns because the two data providers are not synchronized through a merged dimension.

7.1.4  #DIV/0

#DIV/0 occurs when a formula tries to divide a number by zero, which is mathematically impossible.

Zero can never appear as a divisor.

**Example**

**Determining revenue per item**

You have a report showing sales revenues, numbers of items sold and the revenue per item (which is calculated by dividing the sales revenue by the number of items sold).

You had a very bad quarter in which you didn’t create any revenue; the Revenue per Item column returns #DIV/0 for this quarter, because the formula is attempting to divide by zero; that is, divide the revenue by zero number of items sold.

7.1.5  #ERROR

#ERROR is the default error message that covers all errors not covered by other error messages.

7.1.6  #EXTERNAL

#EXTERNAL occurs when a formula references an external function that is not available to use in Web Intelligence.
### 7.1.7 #INCOMPATIBLE

#INCOMPATIBLE occurs when a block contains incompatible objects.

**Example**

**Incompatible objects in a query**

If a block based on the Island Resorts Marketing universe contains the Year and Reservation Year dimensions, the columns containing these dimensions show #INCOMPATIBLE because these objects are incompatible.

### 7.1.8 #MIX

#MIX occurs when an aggregated measure has different units.

For example, a cell shows #MIX if it aggregates currency values denominated in different currencies.

### 7.1.9 #MULTIVALUE

#MULTIVALUE occurs when you place a formula that returns more than one value in a cell that outputs one value only.

**Example**

**Multivalue in a cell**

You have a report showing Country, Resort and Revenue and you add a cell to the report containing the formula [Revenue] ForEach ([Country]). This cell returns #MULTIVALUE because Country has two values in the report: ‘US’ and ‘France’.

One cell cannot display the revenues for both the US and France. Placed outside the table, a cell containing revenue can only aggregate the revenues in the table in some way (for example by summing or averaging them).

If the report is broken into sections on Country, the formula is correct when placed in a section because there is only one value of Country per section. Outside a section, however, the formula still returns #MULTIVALUE.

### 7.1.10 #N/A

When there is a value for a cell in a report that is based on a value from a report that is not available on the underlying data base (for example, a BW error in a BEx Cell), the cell displays #N/A (not available), meaning that the cell is empty because the data cannot be retrieved.
7.1.11  #OVERFLOW

#OVERFLOW occurs when a calculation returns a value that is too large for the software to handle. This value, in exponential form, is 1.7E308 (1.7 followed by 307 zeros).

7.1.12  #PARTIALRESULT

#PARTIALRESULT occurs when all rows associated with a report object were not retrieved.

If #PARTIALRESULT occurs often in your reports and you have the appropriate security rights, modify the MaxRowsRetrieved query property to allow the retrieval of more data. If you do not have the right to modify the query, contact the BI administrator.

If your report contains smart measures it is more likely to display #PARTIALRESULT because smart measures require the retrieval of larger amounts of data than classic measures.

7.1.13  #RANK

#RANK occurs when you try to rank data based on an object that depends on the order of values.

Objects that use the Previous function or any running aggregate function depend on the order of values. Ranking causes these objects to recalculate their values, which then changes the ranking, resulting in a circular dependency. Such a dependency can occur either when you use the Rank dialog box to create a ranking, or when you use the Rank function.

**Example**

**Ranking on running average or previous values**

If you attempt to rank a block on a column that contains the Previous function or any running aggregate function, the entire block returns #RANK.

7.1.14  #RECURSIVE

#RECURSIVE occurs when it is not possible to perform a calculation due to a circular dependency.

**Example**

**Using the NumberOfPages() function**

If you place the NumberOfPages function in a cell whose Autofit Height or Autofit Width properties are set, the cell returns #RECURSIVE because the placing of this formula in an Autofit cell creates a circular dependency. The function needs the exact size of the report to return a value, but the size of the cell, which affects the size of the report, is determined by the cell content.
7.1.15  #REFRESH

#REFRESH appears in report cells whose values are derived from objects that were stripped from a query and then re-added to the query.

Objects are stripped from a query when the Enable query stripping query property is selected and the objects do not contribute to any reports based on the query.

The cells are re-populated with values from the objects when the query is refreshed.

7.1.16  #REPFORMULA

Unable to find a Web Intelligence equivalence.

7.1.17  #SECURITY

#SECURITY occurs when you attempt to use a function for which you do not have security rights.

Example

Using the DataProviderSQL() function

If a user who does not have the right to view data provider SQL places the DataProviderSQL() function in a cell, the #SECURITY message appears in the cell.

7.1.18  #SYNTAX

#SYNTAX occurs when a formula references an object that no longer exists in the report.

Example

Referencing a non-existent object

You have a report that originally showed Year, Quarter and Sales revenue, with an additional column showing difference between the revenue and the average yearly revenue. This figure is given by the variable Difference from Yearly Average.

If the Difference from Yearly Average variable is deleted from the report, the column containing it returns #SYNTAX.
7.1.19  #TOREFRESH

#TOREFRESH appears in cells based on smart measures when the value returned by the smart measure is not available.

This situation occurs when the grouping set containing the value is not available in the data provider.

You remove the #TOREFRESH error by refreshing the data.

Some of the measures are “delegated” (for BW basically this refers to a measure which is not aggregating with SUM): when you define a table or calculation on a measure, this measure is queried in specific context of aggregation (the measure is given for a set of dimensions). If this set of dimensions is a subset of the query dimension set, the measure has to be aggregated along the given dimension set (or grouping set referring group by clause in SQL).

For normal measures the system is doing carrying out the aggregation, for delegated measures this aggregation is delegated to the underlying database. For this the system needs to query again this database. Since this is not automatic, it displays #TOREFRESH and waits for the user to proceed with a refresh. Once the user refreshes, the system will run the additional query to get the requested aggregation and then replace #TOREFRESH by the appropriate value.

7.1.20  #UNAVAILABLE

#UNAVAILABLE appears when it is not possible to calculate the value of a smart measure.

This occurs when it is not possible to display the values in a filtered smart measure without applying a filter to the query. Because this carries a risk of impacting other reports based on the same query, no filter is applied.
8 Comparing values using functions

8.1 Comparing values using the Previous function

The **Previous** function returns a comparative previous value of an expression.

The value returned depends on the layout of the report.

For more powerful comparison capabilities, use the **RelativeValue** function. **RelativeValue** returns a previous or subsequent comparative value of an expression. The value returned does not depend on the layout of the report.

**Related Information**

- Previous [page 204]
- RelativeValue [page 208]
- Comparing values using the RelativeValue function [page 243]

**8.2 Comparing values using the RelativeValue function**

The **RelativeValue** function returns comparative values of an expression. The function returns these values independently of the layout of a report.

**When using RelativeValue, you specify the following:**

- The expression whose comparative value you want to find (the expression must be a measure or a detail of a dimension available in the block)
- The list of slicing dimensions
- The offset.

The function uses the slicing dimensions, the offset, and the sub-axis dimensions (which are implied by the slicing dimensions) to return a comparative value. The sub-axis dimensions are all the other dimensions in the calculation context apart from the slicing dimensions.

Expressed in general terms, **RelativeValue** returns the value of the expression in the row which, in the list of values of the slicing dimensions, is **offset** rows removed from the current row, and where the values of the sub-axis dimensions are the same as in the current row.

**Note**

All slicing dimensions must always be in the calculation context of the block in which the function is placed. If a slicing dimension is subsequently removed, the function returns #COMPUTATION.
Example

In this example, the RelativeValue column contains the following formula:

\[ \text{RelativeValue}([\text{Revenue}] ; ([\text{Year}]) ; -1) \]

- The expression is [Revenue];
- The slicing dimension is [Year];
- The offset is -1 (the function returns the immediately previous value in the list).

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Person</th>
<th>Revenue</th>
<th>RelativeValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Smith</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Jones</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q3</td>
<td>Wilson</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
<td>Harris</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Q1</td>
<td>Smith</td>
<td>4000</td>
<td>1000</td>
</tr>
<tr>
<td>2008</td>
<td>Q2</td>
<td>Jones</td>
<td>3400</td>
<td>2000</td>
</tr>
<tr>
<td>2008</td>
<td>Q3</td>
<td>Wilson</td>
<td>2000</td>
<td>1500</td>
</tr>
<tr>
<td>2008</td>
<td>Q4</td>
<td>Harris</td>
<td>1700</td>
<td>3000</td>
</tr>
</tbody>
</table>

Expressed as a business question, the formula returns the revenue generated by the same sales person in the same quarter in the previous year.

Expressed as a calculation in words, the formula returns the value of [Revenue] (the expression) in the row where the value of [Year] (the slicing dimension) is the previous value from the list of values of the [Year] object, and where the values of [Quarter] and [Sales Person] (the sub-axis dimensions) are the same as in the current row.

Related Information

RelativeValue [page 208]

8.2.1 Slicing dimensions and the RelativeValue function

The RelativeValue function uses the list of values of the slicing dimensions to find the comparative row.

The function returns the comparative value of the expression specified in the function that is offset number of rows away in the list of slicing dimensions.

As a result, the sort order of the slicing dimensions is crucial in determining the function output.
Example

Multiple slicing dimensions

In the table below, the RelativeValue column has the following formula:

\[
\text{RelativeValue}([\text{Revenue}]; ([\text{Year}]; [\text{Quarter}]); -1)
\]

- The expression is \([\text{Revenue}]\);
- The slicing dimensions are \(([\text{Year}]; [\text{Quarter}]);\);
- The offset is -1 (the function returns the immediately previous value in the list).

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Person</th>
<th>Revenue</th>
<th>RelativeValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Smith</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Smith</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q3</td>
<td>Smith</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
<td>Smith</td>
<td>3000*</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Jones</td>
<td>4000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Jones</td>
<td>3400</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q3</td>
<td>Jones</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
<td>Jones</td>
<td>1700</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Q1</td>
<td>Smith</td>
<td>5000**</td>
<td>3000*</td>
</tr>
<tr>
<td>2008</td>
<td>Q2</td>
<td>Smith</td>
<td>3000***</td>
<td>5000**</td>
</tr>
<tr>
<td>2008</td>
<td>Q3</td>
<td>Smith</td>
<td>2700****</td>
<td>3000***</td>
</tr>
<tr>
<td>2008</td>
<td>Q4</td>
<td>Smith</td>
<td>6800</td>
<td>2700****</td>
</tr>
</tbody>
</table>

Expressed as a business question, the formula returns the revenue generated by the same sales person in the previous quarter.

Expressed as a calculation in words, the formula returns the value of \([\text{Revenue}]\) in the row where the values of \([\text{Year}]\) and \([\text{Quarter}]\) represent the previous value in the \(([\text{Year}]; [\text{Quarter}])\) list of values, and where the value of \([\text{Sales Person}]\) is the same as in the current row.

The function uses the list of values of the slicing dimensions to find the comparative revenue:
The sort order of the slicing dimensions determines the output of the function. The * in the tables show the sort order.

Related Information

RelativeValue [page 208]

8.2.2 Slicing dimensions and sections

A slicing dimension can be in the section master cell of a report.

Example

Slicing dimension in a section header

In the table below, the RelativeValue column has the following formula:

\[
\text{RelativeValue}([\text{Revenue}];([\text{Year}];[\text{Quarter}]);-1)
\]

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Person</th>
<th>Revenue</th>
<th>RelativeValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Smith</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>Smith</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>Smith</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>Smith</td>
<td>3000*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q1</td>
<td>Jones</td>
<td>4000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>Jones</td>
<td>3400</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>Jones</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>Jones</td>
<td>1700</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Person</th>
<th>Revenue</th>
<th>RelativeValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Q1</td>
<td>Smith</td>
<td>5000**</td>
<td>3000*</td>
</tr>
<tr>
<td></td>
<td>Q2</td>
<td>Smith</td>
<td>3000***</td>
<td>5000**</td>
</tr>
<tr>
<td></td>
<td>Q3</td>
<td>Smith</td>
<td>2700 ****</td>
<td>3000***</td>
</tr>
<tr>
<td></td>
<td>Q4</td>
<td>Smith</td>
<td>6800</td>
<td>2700****</td>
</tr>
</tbody>
</table>

The function uses the list of values of the slicing dimensions to find the comparative revenue:
The sort order of the slicing dimensions determines the output of the function. The * in the tables show the sort order.

### Related Information

*RelativeValue*[ page 208]

#### 8.2.3 Order of slicing dimensions

Because the sort order of the list of values of the slicing dimensions determines the output of RelativeValue, the order in which the slicing dimensions are specified impacts the output of the function.

### Example

**Order of slicing dimensions**

In the table below, the RelativeValue column has the following formula:

RelativeValue([Revenue]; ([Year]; [Quarter]); -1)

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Person</th>
<th>Revenue</th>
<th>RelativeValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Smith</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Smith</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q3</td>
<td>Smith</td>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
<td>Smith</td>
<td>3000</td>
<td>*</td>
</tr>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Jones</td>
<td>4000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Jones</td>
<td>3400</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q3</td>
<td>Jones</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
<td>Jones</td>
<td>1700</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Quarter</td>
<td>Sales Person</td>
<td>Revenue</td>
<td>RelativeValue</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>--------------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td>2008</td>
<td>Q1</td>
<td>Smith</td>
<td>5000**</td>
<td>3000*</td>
</tr>
<tr>
<td>2008</td>
<td>Q2</td>
<td>Smith</td>
<td>3000***</td>
<td>5000**</td>
</tr>
<tr>
<td>2008</td>
<td>Q3</td>
<td>Smith</td>
<td>2700****</td>
<td>3000***</td>
</tr>
<tr>
<td>2008</td>
<td>Q4</td>
<td>Smith</td>
<td>6800</td>
<td>2700****</td>
</tr>
</tbody>
</table>

Expressed as a business question, the formula returns the revenue generated by the same sales person in the previous quarter.

The sort order of the slicing dimensions is as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Q1</td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
</tr>
<tr>
<td>2007</td>
<td>Q3</td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
</tr>
<tr>
<td>2008</td>
<td>Q1</td>
</tr>
<tr>
<td>2008</td>
<td>Q2</td>
</tr>
<tr>
<td>2008</td>
<td>Q3</td>
</tr>
<tr>
<td>2008</td>
<td>Q4</td>
</tr>
</tbody>
</table>

The function is changed to:

```
RelativeValue([Revenue];([Quarter];[Year]);-1)
```

The sort order of the slicing dimensions becomes:

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Year</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>2007</td>
<td>*</td>
</tr>
<tr>
<td>Q1</td>
<td>2008</td>
<td>**</td>
</tr>
<tr>
<td>Q2</td>
<td>2007</td>
<td>***</td>
</tr>
<tr>
<td>Q2</td>
<td>2008</td>
<td>****</td>
</tr>
<tr>
<td>Q3</td>
<td>2007</td>
<td>*****</td>
</tr>
<tr>
<td>Q3</td>
<td>2008</td>
<td>******</td>
</tr>
<tr>
<td>Q4</td>
<td>2007</td>
<td>*******</td>
</tr>
<tr>
<td>Q4</td>
<td>2008</td>
<td>********</td>
</tr>
</tbody>
</table>

The sort order has the following impact on the function result:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Person</th>
<th>Revenue</th>
<th>RelativeValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Smith</td>
<td>1000*</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Smith</td>
<td>2000***</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q3</td>
<td>Smith</td>
<td>1500****</td>
<td></td>
</tr>
<tr>
<td>Year</td>
<td>Quarter</td>
<td>Sales Person</td>
<td>Revenue</td>
<td>RelativeValue</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
<td>--------------</td>
<td>---------</td>
<td>---------------</td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
<td>Smith</td>
<td>3000****</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Jones</td>
<td>4000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Jones</td>
<td>3400</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q3</td>
<td>Jones</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
<td>Jones</td>
<td>1700</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Q1</td>
<td>Smith</td>
<td>5000**</td>
<td>1000*</td>
</tr>
<tr>
<td>2008</td>
<td>Q2</td>
<td>Smith</td>
<td>3000****</td>
<td>2000***</td>
</tr>
<tr>
<td>2008</td>
<td>Q3</td>
<td>Smith</td>
<td>2700*****</td>
<td>1500*****</td>
</tr>
<tr>
<td>2008</td>
<td>Q4</td>
<td>Smith</td>
<td>6800*******</td>
<td>3000******</td>
</tr>
</tbody>
</table>

Expressed as a business question, the formula now returns the revenue generated by the same sales person in the same quarter of the previous year.

The change in the sort order of the slicing dimension changes the meaning of the formula. The * in the tables indicate the sort order.

Related Information

RelativeValue [page 208]

8.2.4 Slicing dimensions and sorts

Because the sort order of the list of values of the slicing dimensions determines the function output, a sort applied to any dimension in the slicing dimensions impacts the function output.

Example

A custom sort applied to a slicing dimension

In the table below, the RelativeValue column has the following formula:

RelativeValue([Revenue];([Year];[Quarter]);-1)

A custom sort (Q1, Q2, Q4, Q3) is applied to [Quarter], giving the following result for the function:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Person</th>
<th>Revenue</th>
<th>RelativeValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Smith</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Smith</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
<td>Smith</td>
<td>3000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q3</td>
<td>Smith</td>
<td>1500*</td>
<td></td>
</tr>
</tbody>
</table>
The sorted list of slicing dimensions is as follows:

<table>
<thead>
<tr>
<th>Year</th>
<th>Quarter</th>
<th>Sales Person</th>
<th>Revenue</th>
<th>RelativeValue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Q1</td>
<td>Jones</td>
<td>4000</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q2</td>
<td>Jones</td>
<td>3400</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q4</td>
<td>Jones</td>
<td>1700</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>Q3</td>
<td>Jones</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>Q1</td>
<td>Smith</td>
<td>5000**</td>
<td>1500*</td>
</tr>
<tr>
<td>2008</td>
<td>Q2</td>
<td>Smith</td>
<td>3000***</td>
<td>5000**</td>
</tr>
<tr>
<td>2008</td>
<td>Q4</td>
<td>Smith</td>
<td>6800****</td>
<td>3000***</td>
</tr>
<tr>
<td>2008</td>
<td>Q3</td>
<td>Smith</td>
<td>2700</td>
<td>6800****</td>
</tr>
</tbody>
</table>

The * in the tables show the sort order.

Related Information

*RelativeValue* [page 208]

### 8.2.5 Using RelativeValue in crosstabs

The *RelativeValue* function works in crosstabs in exactly the same way as in vertical tables.

The layout of the data in a crosstab has no impact on the function output.
Related Information

RelativeValue [page 208]