



InterSystems MDX Reference

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InterSystems MDX Reference

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Basic Rules

This reference section provides information on the most basic rules in MDX within [Business Intelligence](#) — rules for identifiers and comments.

Also see [Accessing the BI Samples](#).

Identifiers (MDX)

This section discusses identifiers in [InterSystems MDX](#).

MDX Identifiers and Allowed Variations

Every cube, subject area, relationship, dimension, hierarchy, level, member, property, and measure has an identifier.

Each MDX identifier has one of the following forms:

- A *regular identifier*:

`name`

You can use this form if *name* follows these rules:

- The first character must be either an alphabetic character (Latin-1) or the underscore character (`_`).

In InterSystems MDX, the first character can be numeric if the rest of the characters are also numeric. This InterSystems extension to MDX means that you can conveniently refer to members that have all-numeric names (such as postal codes).

- The other characters must be either alphabetic characters, the underscore character, or numeric characters.
- The name must not be an MDX reserved keyword. Reserved keywords are not case-sensitive in MDX.

- A *delimited identifier*:

`[name]`

You must use this form if *name* does not follow the preceding rules. If *name* includes a right square bracket (`]`), you must escape that by using two right square brackets together (`]]`)

- (Only for members) A *member key*:

`&[key value]`

For information on key values, see [Key Values](#).

Note: *name* is not case-sensitive, but *key value* is.

Important: Note that *name* and *key value* are not expressions. That is, you cannot replace them with string-valued expressions.

Comments (MDX)

This section discusses comments in [InterSystems MDX](#) queries and in stand-alone MDX expressions used within model definitions.

Comments

You can include a comment of the following form in any MDX query or expression, at any place where white space is acceptable.

```
/* comment here */
```

You can include comments of the following forms as separate lines within an MDX query or expression.

```
-- comment
```

Or:

```
// comment
```

You can also use the preceding two forms at the end of a line that contains MDX.

Examples

The following examples show valid MDX queries:

```
select /* change this later */ birthd.decade.members on 1  
from patients
```

```
--comment  
select birthd.decade.members on 1 --comment  
from patients // comment  
//another comment
```


Expression Types (MDX)

This reference section provides information on the [MDX](#) expression types supported in [Business Intelligence](#).

Also see [Accessing the BI Samples](#).

Numeric Expressions (MDX)

This section describes how to create and use numeric expressions in [InterSystems MDX](#).

Details

In InterSystems MDX, a numeric expression can have any of the following forms:

- A numeric literal. For example: 37

The literal cannot start with a decimal point; that is, you must include a leading 0 with any fractional values. For example, 0.1 is valid, but .1 is not valid.

- A percentage literal. For example: 10%

There must be no space between the number and the percent sign.

- An expression that refers to a numeric-valued measure, such as `MEASURES.[%COUNT]`

- An expression that uses an MDX function that returns a numeric value, for example: `AVG(aged.age , MEASURES.[test score])`

Many MDX functions return numeric values, including [AVG](#), [MAX](#), [COUNT](#), and others. Also, the [IIF](#) function can return numeric values; this function evaluates a condition and returns one of two values, depending on the condition.

- An expression that uses mathematical operators to combine numeric expressions. For example: `MEASURES.[%COUNT] / 100`

The system supports the standard mathematical operators: + (addition), - (subtraction), / (division), and * (multiplication). It also supports the standard unary operators: + (positive) and - (negative).

You can use parentheses to control precedence.

In the expression, if any value is null, the expression evaluates to null.

If you divide a value by 0, the system treats the result as null.

Tip: The MDX function [IIF](#) can be useful in such expressions.

- A [member expression](#), such as `[gend].[h1].[gender].[female]`

Note that the value of a member expression depends upon the measure that is currently in use. By default, this expression evaluates to the number of records that belong this member. In contrast, if a specific measure is in use, this expression evaluates to the aggregate value of that measure across those records.

- The MDX identifier for a dimension, such as `[gend]`

Note that the value of this expression depends upon the measure that is currently in use. By default, this expression evaluates to the number of records in the cube. In contrast, if a specific measure is in use, this expression evaluates to the aggregate value of that measure across all records in the cube.

- A reference to a pivot variable that contains a numeric value. To refer to a pivot variable, use the following syntax:

```
$VARIABLE.variablename
```

Where *variablename* is the logical variable name. Do not enclose this expression with square brackets. This syntax is not case-sensitive; nor is the pivot variable name.

For information on defining pivot variables, see [Defining and Using Pivot Variables](#).

Uses

You can use numeric expressions in the following ways:

- As a numeric argument to many MDX functions. For example:
- ```
AVG(diagd.MEMBERS, MEASURES.[%COUNT])
```
- As an element of a [set](#).
  - As the definition of a [calculated member](#) (in this case, a measure).

## Examples

This section shows examples of some of the less common kinds of numeric expressions. The first example shows that a member expression has a numeric value:

```
SELECT gend.hl.gender.female ON 0 FROM patients
 Female
 526
```

The next example is a variation of the preceding:

```
SELECT gend.hl.gender.female+100 ON 0 FROM patients
 Expression
 626
```

As noted earlier, the value of a member expression depends upon the measure that is in use:

```
SELECT gend.hl.gender.female ON 0 FROM patients WHERE MEASURES.[avg age]
 Female
 37.23
```

Similarly:

```
SELECT gend.hl.gender.female+500 ON 0 FROM patients WHERE MEASURES.[avg age]
 Expression
 537.23
```

The next example shows the numeric value of a dimension:

```
SELECT allerd ON 0 FROM patients
 1,000
```

As noted earlier, the value of such an expression depends upon the measure that is in use:

```
SELECT allerd ON 0 FROM patients WHERE MEASURES.[avg allergy count]
 0.99
```

# String Expressions (MDX)

---

This section describes how to create and use string expressions in [InterSystems MDX](#).

## Details

In InterSystems MDX, a string expression can have any of the following forms:

- A string literal (a double quote character, followed by any characters, followed by another double quote character). For example: "label" or "my property"
- A numeric literal.
- An expression that uses an MDX function to return a string. These functions include:
  - [PROPERTIES](#), which returns the value of a property of a member. For example:  
`homed.city.magnolia.PROPERTIES("Population")`  
See the reference section [Intrinsic Properties](#) for intrinsic properties that you can use.
  - [IIF](#), which returns one of two values, depending on the value of a given logical expression.
  - [LOOKUP](#), which looks up a given key in a term list and returns a substitute string.
  - [%LOOKUP](#), which returns one value from a term list.
- An expression that refers to a string-valued measure. For example, suppose that you define a [calculated member](#) as follows:

```
CREATE MEMBER patients.measures.stringtest AS 'IIF(MEASURES.[avg test score]<60, "low","high")'
```

Then the expression `MEASURES.stringtest` is a string expression.

- An expression that uses the MDX concatenation operator (+) to combine other string expressions. For example:

```
"string 1 " + "string 2"
```

For another example:

```
"Pop: " + homed.city.magnolia.PROPERTIES("Population")
```

- A reference to a pivot variable that contains a string value. To refer to a pivot variable, use the following syntax:

```
$VARIABLE.variablename
```

Where *variablename* is the logical variable name. Do not enclose this expression with square brackets. This syntax is not case-sensitive; nor is the pivot variable name.

For information on defining pivot variables, see [Defining and Using Pivot Variables](#).

## Uses

You can use string expressions in the following ways:

- As an argument to the [ORDER](#) function or to the [PROPERTIES](#) function.
- As an element of a [set](#).
- As the definition of a [calculated member](#) (in this case, a measure).

# Logical Expressions (MDX)

This section describes how to create and use logical expressions in [InterSystems MDX](#).

## Details and Uses

MDX does not include a logical data type. However, it provides the [FILTER](#) function and the [IIF](#) function, both of which take an argument that is treated as true or false. In these contexts, InterSystems MDX interprets numeric and string values as true or false, as follows:

- A [numeric expression](#) that evaluates to 0 is treated as false.
- All other [numeric expressions](#) are treated as true.
- All [string expressions](#) are treated as false.

In the same contexts, you can combine true and false values by using the following standard tools:

- Logical comparison operators: > (greater than), >= (greater than or equal to), = (equal to), < (less than), and <= (less than or equal to). For example, the following expression returns true or false, depending on the value of `MEASURES.[%COUNT]`:

```
MEASURES.[%COUNT]>1100
```

For another example, the following expression returns true or false, depending on the name of the current member:

```
colord.CURRENTMEMBER.PROPERTIES("Name")="Red"
```

When a numeric expression is compared to null, the null value is treated as 0.

- The AND operator, the OR operator, and parentheses to control precedence. For example, the following expression returns true or false, depending on the value of `MEASURES.[%COUNT]`:

```
(MEASURES.[%COUNT]>1100) AND (MEASURES.[%COUNT]<1500)
```

When you compare scalar values of different types, the system compares them as follows:

| If                                                  | Then                                                      |
|-----------------------------------------------------|-----------------------------------------------------------|
| Both expressions are numeric                        | Perform a numeric comparison                              |
| Both expressions are strings                        | Perform a string comparison                               |
| One expression is numeric and the other is a string | The numeric expression is less than the string expression |

You cannot use member expressions in a logical comparison expression. For example, the following is not a valid logical expression:

```
homed.CURRENTMEMBER = homed.hl.city.magnolia
```

Instead, you should use the Name property or some other suitable property, all of which are strings. For example, the following is a valid logical expression:

```
homed.CURRENTMEMBER.Properties("Name") = "magnolia"
```

See the reference section [Intrinsic Properties](#) for intrinsic properties that you can use.

Also see the section [Measure Search Expressions](#).

## Tuple Expressions (MDX)

---

This section describes how to create and use tuple expressions in [InterSystems MDX](#).

### Details

In InterSystems MDX, a tuple expression can have either of the following forms:

- A tuple literal, which is a comma-separated list of [member expressions](#), enclosed by parentheses:

```
(member_expr1, member_expr2, member_expr3, ...)
```

Where *member\_expr1*, *member\_expr2*, *member\_expr3*, and so on are member expressions. The parentheses are required.

- A reference to a pivot variable that contains a tuple literal. To refer to a pivot variable, use the following syntax:

```
$VARIABLE.variablename
```

Where *variablename* is the logical variable name. Do not enclose this expression with square brackets. This syntax is not case-sensitive; nor is the pivot variable name.

For information on defining pivot variables, see [Defining and Using Pivot Variables](#).

### Notes and Additional Terminology

In other implementations of MDX, a tuple cannot include more than one member from the same dimension. In InterSystems MDX, a tuple expression *can* include more than one member expression from the same dimension. In most cases, the result is null. However, in Business Intelligence, a level can be based on a list value, which means that a given record can belong to multiple members. For example, the tuple (`allerd.soy`, `allerd.wheat`) represents all patients who are allergic to both soy and wheat, and this tuple could potentially have a non-null value.

If the tuple refers to each dimension in the cube, the tuple is *fully qualified*. Otherwise, it is *partially qualified*. The following shows an example of a partially qualified tuple from the `Patients` cube:

```
(allerd.[dairy products], colord.red, aged.35)
```

Another partially qualified tuple is as follows:

```
(diagd.asthma, aged.[age group].[30 to 59], MEASURES.[%COUNT])
```

Also, note that each data cell returned by a query is a tuple.

The [CROSSJOIN](#) function returns a set of tuples, as does the [NONEMPTYCROSSJOIN](#) function.

### Uses

You can use tuple expressions in the following ways:

- As an element of a [set](#).
- As the argument to the [WHERE](#) clause.



# Member Expressions (MDX)

This section describes how to create and use member expressions in [InterSystems MDX](#).

## Details

In InterSystems MDX, a member expression can have any of the following forms:

- An member literal, which is an explicit reference to a single member by its name:

```
[dimension_name].[hierarchy_name].[level_name].[member_name]
```

Where:

- `[dimension_name]` is an [MDX identifier](#) that names a dimension.
- `[hierarchy_name]` is an [MDX identifier](#) that names a hierarchy within that dimension. You can omit the hierarchy name. If you do, the query uses the first level with the given name, as defined in this dimension.

You can also omit the hierarchy name when you refer to a [calculated member](#), because a calculated member is not in a hierarchy.

- `[level_name]` is an [MDX identifier](#) that names a level within that hierarchy. You can omit the level name. If you do, the query uses the first member with the given name, as defined within this dimension.

You can also omit the level name when you refer to a [calculated member](#), because a calculated member is not in a level.

- `[member_name]` is an [MDX identifier](#) that names a member of that level.

For example:

```
[gend].[h1].[gender].[female]
```

For a measure, a member literal has the following variant form, because any measure is a member of a dimension called Measures. This dimension does not have a hierarchy or a level.

```
[MEASURES].[measure_name]
```

For example:

```
[MEASURES].[%COUNT]
```

Note that although a measure is a member, an expression like the preceding returns a scalar value and cannot be used in all the same ways as other member expressions.

- An explicit reference to a hierarchy as follows:

```
[dimension_name].[hierarchy_name]
```

This expression returns the All member of the dimension to which the hierarchy belongs.

For example:

```
aged.h1
```

The preceding expression returns the All member of the AgeD dimension; in the sample `Patients` cube, the name of this member is `All Patients`.

- An expression that uses an MDX function to return a single member. For example:

```
[gend].[h1].[gender].female.NEXTMEMBER
```

Many MDX functions return members, including [LAG](#), [NEXTMEMBER](#), [PARENT](#), and others.

Note that [%TERMLIST](#) can return a member.

- An expression that uses the internal key of a member to return that member, via the following syntax:

```
[dimension_name].[hierarchy_name].[level_name].[member_key]
```

Where *member\_key* is the value of the KEY property of the member. For example:

```
birthqd.h1.quarter.&[2]
```

Note that *member\_key* is a case-sensitive literal value rather than an expression. That is, you cannot replace it with a string-valued expression.

For information on how KEY values are created, see the reference [Intrinsic Properties](#). Also note that you can use the [PROPERTIES](#) function to find the value of the KEY property or any other property of a member.

- An expression that uses an InterSystems MDX extension to refer to a member in another cube, via the following syntax:

```
[relationship_name].member_expression
```

Where *[relationship\_name]* is an [MDX identifier](#) that names a relationship in the cube used by the query and *member\_expression* is a member expression suitable for that cube.

- A reference to a pivot variable that contains a member expression. To refer to a pivot variable, use the following syntax:

```
$VARIABLE.variablename
```

Where *variablename* is the logical variable name. Do not enclose this expression with square brackets. This syntax is not case-sensitive; nor is the pivot variable name.

For information on defining pivot variables, see [Defining and Using Pivot Variables](#).

For example, the following member expressions are all equivalent:

```
[gend].[h1].[gender].Female
[gend].female
gend.h1.gender.female
gend.h1.FEMALE
gend.female
```

## Calculated Members

Members can be defined within the cube definition, as part of the definition of a level. You can also create *calculated members*, which are typically based on other members. You can define calculated members in two ways:

- Within the [WITH](#) clause of a query. The member is available within the rest of the query, but is not available in other queries.
- Within the [CREATE MEMBER](#) statement. The member is available within the rest of the session (for example, within the rest of the session in the MDX shell).

## Uses

You can use member expressions in the following ways:

- As a member argument to many MDX functions.

- As the argument to the [WHERE](#) clause.
- As an element of a [set](#).

# Level Expressions (MDX)

---

This section describes how to create and use level expressions in [InterSystems MDX](#).

## Details

In InterSystems MDX, a level expression has one of the following forms:

- A level literal, which is a direct reference to the level as follows:

```
[dimension_name].[hierarchy_name].[level_name]
```

Where:

- `[dimension_name]` is an [MDX identifier](#) that names a dimension.
- `[hierarchy_name]` is an [MDX identifier](#) that names a hierarchy within that dimension. You can omit the hierarchy name. If you do, the query uses the first level with the given name, as defined in this dimension.
- `[level_name]` is an [MDX identifier](#) that names a level within that hierarchy.

For example:

```
[gend].[h1].[gender]
```

- An expression that uses an InterSystems MDX extension to refer to a level in another cube, via the following syntax:

```
[relationship_name].level_expression
```

Where *relationship\_name* is the name of a relationship in the cube used by the query and *level\_expression* refers to a level contained in that relationship.

## Uses

You can use level expressions as arguments to the following MDX functions:

- [%TOPMEMBERS](#)
- [ALLMEMBERS](#)
- [MEMBERS](#)
- [ANCESTOR](#)
- [CLOSINGPERIOD](#)
- [OPENINGPERIOD](#)
- [PARALLEL PERIOD](#)

# Hierarchy Expressions (MDX)

This section describes how to create and use hierarchy expressions in [InterSystems MDX](#).

## Details

In InterSystems MDX, a hierarchy expression has one of the following forms:

- A hierarchy literal, which is a direct reference to the hierarchy as follows:

```
[dimension_name].[hierarchy_name]
```

Where:

- [*dimension\_name*] is an [MDX identifier](#) that names a dimension.
- [*hierarchy\_name*] is an [MDX identifier](#) that names a hierarchy within that dimension.

For example:

```
[gend].[h1]
```

- A reference to a dimension:

```
[dimension_name]
```

For example:

```
[gend]
```

The system interprets this as a reference to the first visible hierarchy of that dimension.

- An expression that uses an InterSystems MDX extension to refer to a hierarchy in another cube, via the following syntax:

```
[relationship_name].hierarchy_expression
```

Where *relationship\_name* is the name of a relationship in the cube used by the query and *hierarchy\_expression* refers to a hierarchy contained in that relationship.

## Uses

A bare hierarchy expression returns all records; this expression is equivalent to an All member. (Note that you can use a bare hierarchy expression even if the dimension does not formally define an All level.) For example:

```
SELECT MEASURES.[%count] ON 0, colord.h1 ON 1 FROM patients
```

```

Patient Count
1,000

```

Also, you can use a hierarchy expression as an argument to any of the following functions:

- [%TOPMEMBERS](#)
- [ALLMEMBERS](#)
- [CURRENTMEMBER](#)
- [MEMBERS](#)

## Set Expressions (MDX)

---

This section describes how to create and use set expressions in [InterSystems MDX](#).

### Details

The general syntax for a *set expression* is as follows:

```
{expression1, expression2, ...}
```

This list can include any number of items. In InterSystems MDX, if the list includes only one item, you can omit the curly braces.

In this list, *expression1*, *expression2*, and so on can have any of the following forms:

- [A member expression](#).
- [A numeric expression](#) or [string expression](#).
- A range of members, specified as follows:

```
member1:member2
```

This expression returns a set that consists of the two given members and all members between them, given the order of members in the level that contains them. The members must belong to the same level.

For example:

```
birthd.year.1960:birthd.year.1980
```

For *member2*, you can omit the dimension, hierarchy, and level identifiers. For example:

```
birthd.year.1960:1980
```

- An expression that uses an MDX function that returns a set, for example:

```
homed.zip.MEMBERS
```

Many MDX functions return sets, including [MEMBERS](#), [NONEMPTYCROSSJOIN](#), [ORDER](#), and others.

Note that [%TERMLIST](#) can return a set.

- Another set expression.
- The name of a named set. See the following section.
- [A tuple expression](#).

(Note that in other implementations of MDX, for each tuple in a set, you must use the dimensions in the same order as in the other tuples in the set. For example, if the first tuple uses dimension A in its first list item, all the other tuples must do so as well. InterSystems MDX does not have this restriction. Similarly, in other implementations of MDX, a set cannot include a combination of tuples and other types of set elements. InterSystems MDX does not have this restriction either.)

- A reference to a pivot variable that contains a set expression. To refer to a pivot variable, use the following syntax:

```
$VARIABLE.variablename
```

Where *variablename* is the logical variable name. Do not enclose this expression with square brackets. This syntax is not case-sensitive; nor is the pivot variable name.

For information on defining pivot variables, see [Defining and Using Pivot Variables](#).

You can precede any set expression with the keyword phrase `NON EMPTY`, for example:

```
NON EMPTY {birthd.year.1960:1980}
NON EMPTY birthd.year.1960:1980
NON EMPTY {homed.zip.MEMBERS}
NON EMPTY homed.zip.MEMBERS
```

The `NON EMPTY` keyword phrase suppresses empty elements of the set; the set is evaluated and then empty elements are removed. This keyword is particularly useful with [CROSSJOIN](#) and in scenarios where a filter can potentially cause elements to be null.

## Named Sets

A *named set* consists of two elements: a set name and a set expression. You can define named sets in two ways:

- Within the [WITH](#) clause of a query. The set name is available within the rest of the query, but is not available in other queries.
- Within the [CREATE SET](#) statement. The set name is available within the rest of the session (for example, within the rest of the session in the MDX shell).

## Uses

You can use set expressions in the following ways:

- As a set argument of many MDX functions. Note that for some functions, the set must consist only of [members](#). For other functions, the set must consist only of [members](#) or [tuples](#). The reference documentation notes these requirements where needed.
- As an axis in the [SELECT](#) statement.
- As the definition of a named set, as described in the previous subsection.

## Measure Search Expressions (MDX)

---

This section describes how to create and use measure search expressions, which enable you to access rows from the fact table based on the value of a measure for the facts themselves (that is, at the lowest level rather than at an aggregate level). These expressions are an [InterSystems extension to MDX](#).

### Details

A *measure search expression* has the following syntax, which refers to a special dimension in Business Intelligence called %SEARCH:

```
%SEARCH.&[comparison expression]
```

Where *comparison expression* is a logical expression like the following example:

```
[MEASURES].[test score]>60
```

**Note:** Both sets of square brackets are required: the square brackets around the comparison expression *and* the square brackets of the measure identifier in the comparison expression. Hence a valid search expression always starts with %SEARCH.&[ [

For example, the following query selects all patients with a test score higher than 60:

```
SELECT FROM patients WHERE %SEARCH.&[[MEASURES].[Test Score]>60]
```

```
Result: 6,191
```

More generally, *comparison expression* can be a combination of logical expressions. This expression can include:

- Logical comparison operators: > (greater than), >= (greater than or equal to), = (equal to), < (less than), and <= (less than or equal to).

If the searchable measure contains string values, you can also use the SQL LIKE operator.

- The AND operator, the OR operator, and parentheses to control precedence.
- Numeric literals.
- String literals enclosed in single quotes.
- The SQL expressions IS NULL and IS NOT NULL. For example:

```
SELECT FROM HOLEFOODS WHERE [%Search].&[[Measures].[Units Sold] IS NULL]
```

### Uses

You can use measure search expressions in all the following contexts:

- As the argument for the [%FILTER](#) clause
- As the argument for the [WHERE](#) clause
- As an argument for the [FILTER](#) function.

### Additional Notes

The system parses a measure search expression as follows:

1. %Search is treated as a dimension.



2. Because the comparison expression is enclosed inside &[ ], the system treats it as a KEY value, which permits it to contain arbitrary syntax.
3. The comparison expression is converted to an SQL statement against the fact table.

The preceding means that *comparison expression* can include SQL syntax.

Also, it may be possible to use a measure in a measure search expression even if it is not marked as `searchable="true"` in the cube definition. This attribute value causes the system to do two things:

- Display this measure as an option in advanced filters.
- Add additional index, if needed, to enable the measure to be searchable.

## Quality Measure Expressions (MDX)

---

This section describes how to create and use quality measure expressions, which provide access to the values of quality measures. These expressions are an [InterSystems extension to MDX](#).

### Details

A *quality measure expression* has the following syntax, which refers to a special dimension in Business Intelligence called %QualityMeasure:

```
[%QualityMeasure].&[catalog/set/qm name]
```

Or:

```
[%QualityMeasure].&[catalog/set/qm name/group name]
```

Where:

- *catalog* is the catalog to which the quality measure belongs.
- *set* is a set in that catalog.
- *qm name* is the short name of the quality measure. (The full name of a quality measure is *catalog/set/qm name*.)
- *group name* is the name of a group defined in the given quality measure.

The first expression returns the value of the quality measure. The second expression returns the value of the given group.

### Uses

You can use quality measure expressions in the same way that you use other measures.

# MDX Statements and Clauses

This reference section provides information on the [MDX](#) statements and clauses supported in [Business Intelligence](#).

Also see [Accessing the BI Samples](#).

## %FILTER Clause (MDX)

Applies a filter to a SELECT statement; describes how to slice the results of a SELECT statement. This clause is similar to WHERE except that you can include multiple %FILTER clauses in a statement. %FILTER is an InterSystems extension to MDX.

### Syntax and Details

```
select_statement %FILTER set_expression
```

Where:

- *select\_statement* is [a statement that uses SELECT](#).
- *set\_expression* is [an expression that returns a set of members or tuples](#).

Instead of *set\_expression*, you can use a [measure search expression](#); see the example to see the behavior of %FILTER in this case.

Because InterSystems MDX automatically converts types where appropriate, you can also use a single [member expression](#) or [tuple expression](#) in place of the set expression.

You can include as many %FILTER clauses as needed. This clause is particularly useful when you run queries programmatically, because it enables to you filter the results further by simply appending to the SELECT statement. (In contrast, if you use the WHERE clause and you need to add another filter item, it is necessary to rewrite the [WHERE](#) clause, because only one WHERE clause is permitted.)

**Important:** Each set element is used as a separate slicer axis, and the results of all the slicer axes (of all %FILTER clauses) are aggregated together. This is the process of *axis folding* (a filter is considered to be a query axis). Axis folding means that if a given source record has a non-null result for each slicer axis, that record is counted multiple times.

In axis folding, values are combined according to the aggregation method for that measure, as specified in the cube definition. (In the examples here, %COUNT is added.)

For more details, see [Axis Folding](#) in [How the Business Intelligence Query Engine Works](#).

### Example

If you use the %FILTER clause with a [measure search expression](#), the clause uses the rows of the fact table that do meet the given criteria. (A [measure search expression](#) is an InterSystems extension to MDX that considers the measure values in the fact table itself.)

```
SELECT MEASURES.[%COUNT] ON 0 FROM patients %FILTER %SEARCH.&[[MEASURES].[age]<10]
 Patient Count
 1,370
```

### %SQLRESTRICT

If you have [enabled](#) the %SQLRESTRICT dimension for a cube, you can include an SQL SELECT statement or WHERE clause in your MDX queries against that cube. This will allow run-time restriction via an SQL statement in your MDX query. To use the %SQLRESTRICT dimension, add a %FILTER clause using the following syntax:

```
%FILTER %SQLRESTRICT.&[sqlStatement]
```

where *sqlStatement* is an SQL SELECT statement or an SQL WHERE clause. Any SELECT statement must be designed to return a list of IDs from the source table of the cube. These IDs limit which facts may be considered in the final MDX

result — only facts that correspond to records with an ID in the returned list of IDs are included in the final result. Consider the following example MDX query that uses a *sqlStatement*:

```
SELECT FROM HOLEFOODS
WHERE [Comments].[H1].[Comments].[SELECT ID FROM HoleFoods.SalesTransaction WHERE ID IN (1,2,3,4)]
```

It is also possible to query an external reference table. For example, given the following simplistic tables:

**Table C–1: Example Cube Source Table**

| ID | Name   |
|----|--------|
| 1  | Bill   |
| 2  | Sally  |
| 3  | Tom    |
| 4  | Mike   |
| 5  | Teresa |
| 6  | Alice  |

**Table C–2: Example External Reference Table (Cohort Table)**

| ID | PatientID | Name  | Age |
|----|-----------|-------|-----|
| 1  | 1         | Bill  | 1   |
| 2  | 6         | Sally | 10  |
| 3  | 4         | Tom   | 45  |

the following %SQLRESTRICT subquery would return PatientID values of 1 and 6, leaving only Bill and Alice, who have IDs of 1 and 6 in the Example Cube Source Table, as possible results for your MDX query:

```
%SQLRESTRICT.&[SELECT PatientID From Cohort.Table WHERE Age < 35]
```

Note that the above sample tables are overly simplistic and are for example purposes only.

The %SQLRESTRICT subquery should return a single column of numbers, which are assumed to IDs from the source table.

Alternatively, a WHERE clause may be used as a shortcut to describe a limitation of the source records directly. Consider the following examples:

```
SELECT FROM HOLEFOODS %FILTER %SQLRESTRICT.&[WHERE ID IN (1,2,3,5,10)]
```

```
SELECT FROM HOLEFOODS %FILTER %SQLRESTRICT.&[WHERE Outlet = 24]
```

```
SELECT NON EMPTY [DateOfSale].[Actual].[YearSold].Members ON 1
FROM [HOLEFOODS] %FILTER %SQLRESTRICT.&[WHERE YEAR(DateOfSale)='2017']
```

Internally, this WHERE clause syntax causes the system to insert a SELECT statement into the %SQLRESTRICT subquery, with the target being the source class of the cube that is being queried in the MDX query. For example, these two queries are equivalent, because Holefoods.SalesTransaction is the source class of the Holefoods cube:

```
SELECT FROM HOLEFOODS %FILTER %SQLRESTRICT.&[SELECT ID FROM Holefoods.SalesTransaction WHERE ID IN
(1,2,3,4)]
```

```
SELECT FROM HOLEFOODS %FILTER %SQLRESTRICT.&[WHERE ID IN (1,2,3,4)]
```

## See Also

See the [WHERE clause](#).

# CREATE MEMBER Statement (MDX)

Creates a calculated member that can be used within the current session.

## Syntax and Details

```
CREATE SESSION MEMBER calc_mem_details, FORMAT_STRING='format_details', SOLVE_ORDER=integer
```

Where *calc\_mem\_details* is as follows:

```
cube_name.[dimension_name].[new_member_name] AS 'value_expression'
```

And:

- *cube\_name* is the name of the cube to which you are adding this member.
- *dimension\_name* is the name of the dimension to which you are adding this member.
- *new\_member\_name* is the name of a member; the member may or may not be already defined in the cube. If it is, the definition given here takes precedence.
- *value\_expression* is an MDX expression that defines the calculated member, typically in terms of references to other members. For details, see [WITH Clause](#).
- `FORMAT_STRING='format_details'` is an optional clause that specifies how to display the values. This clause is applicable only for numeric values. See [FORMAT\\_STRING Clause](#).
- `SOLVE_ORDER=integer` is an optional clause that specifies the relative order in which to evaluate this calculated member. This clause is relevant only if the query contains calculated members on both axes. See [SOLVE\\_ORDER Clause](#).

Also see [Identifiers](#).

When you use the MDX shell, a session is started; the session ends when you exit the shell. During this session, if you use the CREATE MEMBER statement, the member that you create is available until the session ends or until you use the [DROP MEMBER](#) statement.

## Example

First, in the MDX shell, we define a new member in the `Patients` cube:

```
>>CREATE SESSION MEMBER patients.MEASURES.scoresquared AS 'MEASURES.[test score]*MEASURES.[test score]'
```

```

Elapsed time: .013701s
```

Then we use the new measure in a query:

```
>>SELECT MEASURES.scoresquared ON 0, aged.[age group].MEMBERS ON 1 FROM patients
 scoresquared
1 0 to 29 66,801,054,681
2 30 to 59 61,070,271,376
3 60+ 9,120,632,004

Elapsed time: .016856s
```

## See Also

- [WITH Clause](#)
- [FORMAT\\_STRING Clause](#)

- [SOLVE\\_ORDER Clause](#)
- [DROP MEMBER Statement](#)



# CREATE SET Statement (MDX)

Creates a named set that can be used within the current session.

## Syntax and Details

```
CREATE SESSION SET cube_name.set_name AS 'set_expression'
```

- *cube\_name* is the name of the cube to which you are adding this set.
- *set\_name* is an unquoted string that names the set. Later you can use this set name in the place of a set expression in any MDX query within the same session.
- *set\_expression* is [an expression that refers to a set](#).

When you use the MDX shell, a session is started; the session ends when you exit the shell. During this session, if you use the CREATE SET statement, the member that you create is available until the session ends or until you use the [DROP SET](#) statement.

## Example

First, in the MDX shell, we define a new named set in the Patients cube:

```
>>CREATE SESSION SET patients.testset AS 'birthd.decade.MEMBERS'
```

```

Elapsed time: .014451s
```

Then we use the named set in a query:

```
>>SELECT MEASURES.[%COUNT] ON 0, testset ON 1 FROM patients
 Patient Count
```

|    |       |       |
|----|-------|-------|
| 1  | 1910s | 71    |
| 2  | 1920s | 223   |
| 3  | 1930s | 572   |
| 4  | 1940s | 683   |
| 5  | 1950s | 1,030 |
| 6  | 1960s | 1,500 |
| 7  | 1970s | 1,520 |
| 8  | 1980s | 1,400 |
| 9  | 1990s | 1,413 |
| 10 | 2000s | 1,433 |
| 11 | 2010s | 155   |

```

Elapsed time: .018745s
```

## See Also

- [WITH Clause](#)
- [DROP SET Statement](#)

## DRILLFACTS Statement (MDX)

---

Displays the lowest-level data associated with the first cell of results of a given `SELECT` statement, using the fact and dimension tables defined by the cube.

### Syntax and Details

```
DRILLFACTS select_statement
```

Or:

```
DRILLFACTS select_statement RETURN fieldname1, fieldname2, ...
```

Or:

```
DRILLFACTS select_statement RETURN fieldname1, ... %ORDER BY fieldname3, ...
```

Where:

- *select\_statement* is [a statement that uses SELECT](#).
- *fieldname1, fieldname2, fieldname3, fieldname4*, and so on are names of fields in the fact table class defined by the cube.

If you do not specify the `RETURN` clause, the query returns the IDs of the records.

The `%ORDER BY` clause is an InterSystems extension to MDX. This clause specifies how to sort the displayed records.

For additional details on `RETURN` and `%ORDER BY`, see [DRILLTHROUGH Statement](#).

Internally, the system builds and uses an SQL query.

**Important:** If the `SELECT` statement returns more than one cell of data, the listing shows only the fields associated with the first cell.

### Example

The first example does not use `RETURN`, so it uses the default listing as defined in the cube:

```
DRILLFACTS SELECT diagd.osteoporosis ON 0 FROM patients
```

```
ID
1: 7
2: 13
3: 42
4: 123
5: 140
...
```

The next example uses the `RETURN` clause:

```
drillfacts select diagd.osteoporosis on 0 from patients return dxcolor->dxcolor, dxage,
dxpatgroup->dxpatgroup
```

```
DxColor DxAge DxPatGroup
1: Orange 7 Group A
2: Red 11 Group B
3: <null> 30 Group A
4: Purple 58 Group A
5: Purple 62 None
...
```

## See Also

- [DRILLTHROUGH Statement](#)

## DRILLTHROUGH Statement (MDX)

---

Displays the lowest-level data associated with the first cell of results of a given SELECT statement.

### Syntax and Details

```
DRILLTHROUGH optionalmaxrows select_statement
```

Or:

```
DRILLTHROUGH optionalmaxrows select_statement RETURN fieldname1, fieldname2, ...
```

Or:

```
DRILLTHROUGH optionalmaxrows select_statement RETURN fieldname1, ... %ORDER BY fieldname3, ...
```

Or:

```
DRILLTHROUGH optionalmaxrows select_statement %LISTING [listingname]
```

Where:

- *optionalmaxrows*, which is optional, has the form *MAXROWS integer*.  
This argument specifies the maximum number of rows to return. The default is 1000.
- *select\_statement* is [a statement that uses SELECT](#).
- *fieldname1, fieldname2, fieldname3, fieldname4*, and so on are names of fields in the base class used by the cube.
- *listingname* is the name of a detail listing. This listing must already be defined and the user must have permission to use it. If this name does not include spaces, you can omit the square brackets around it. The name of the listing is case-sensitive.

The RETURN clause specifies the fields to display. The %ORDER BY clause is an InterSystems extension to MDX. If included, this clause specifies how to sort the displayed records.

The %LISTING clause is another InterSystems extension to MDX. This clause specifies the listing to use. If you specify this clause, the system displays the fields as given in that listing.

If you do not specify the RETURN clause or the %LISTING clause, the query uses the default listing defined in the cube.

Internally, the system builds and uses an SQL query.

**Important:** If the SELECT statement returns more than one cell of data, the listing shows only the fields associated with the first cell.

### Additional Options for RETURN and ORDER BY

In the RETURN and %ORDER BY clauses, note the following points:

- You can use arrow syntax to refer to a property in another table. See [Implicit Joins \(Arrow Syntax\)](#).
- You can include aliases.
- You can use standard SQL and InterSystems IRIS® data platform functions. To use a standard SQL function, enclose it within parentheses so that the function name is not interpreted as a field name; this is not necessary for InterSystems SQL functions, which start with the percent character (%).
- You can use more advanced SQL features if you use *source.field\_name* rather than *field\_name*.

For example:

```
... RETURN %ID,%EXTERNAL(Field1) F1,'$' || source.Sales Sales
```

The first line of any listing is a heading that indicates the field names or their aliases. Below the heading, the listing has a column of data below each heading. In this case, the columns would be as follows:

- `%ID` — this column displays the `%ID` field
- `F1` — this column uses the InterSystems SQL `%EXTERNAL` function to return the value of the `Field1` field in `DISPLAY` format
- `Sales` — this column displays the `Sales` field, preceded by a dollar sign (\$)

## Example

The first example does not use `RETURN`, so it uses the default listing as defined in the cube:

```
DRILLTHROUGH SELECT homed.Magnolia ON 1 FROM patients
```

| #  | PatientID  | Age | Gender | TestScore | HomeCity | DoctorGrou |
|----|------------|-----|--------|-----------|----------|------------|
| 1: | SUBJ_10161 | 0   | F      | 76        | 3        | I          |
| 2: | SUBJ_10330 | 0   | F      |           | 3        | II         |
| 3: | SUBJ_10554 | 0   | F      | 68        | 3        | II         |
| 4: | SUBJ_10555 | 0   | F      | 78        | 3        | II         |
| 5: | SUBJ_10686 | 0   | F      | 91        | 3        | I          |

...

The next example uses the `MAXROWS` argument:

```
DRILLTHROUGH MAXROWS 3 SELECT homed.Magnolia ON 1 FROM patients
```

| #  | PatientID  | Age | Gender | TestScore | HomeCity | DoctorGrou |
|----|------------|-----|--------|-----------|----------|------------|
| 1: | SUBJ_10161 | 0   | F      | 76        | 3        | I          |
| 2: | SUBJ_10330 | 0   | F      |           | 3        | II         |
| 3: | SUBJ_10554 | 0   | F      | 68        | 3        | II         |

The next example uses the `RETURN` clause:

```
DRILLTHROUGH SELECT homed.Magnolia ON 1 FROM patients RETURN Gender, HomeCity->PostalCode
```

| #  | Gender | PostalCode |
|----|--------|------------|
| 1: | F      | 34577      |
| 2: | F      | 34577      |
| 3: | F      | 34577      |
| 4: | F      | 34577      |
| 5: | F      | 34577      |

...

The next example also uses the `%ORDER BY` clause:

```
DRILLTHROUGH SELECT homed.Magnolia ON 1 FROM patients RETURN PatientID, Age, Gender %ORDER BY Age
```

| #  | PatientID   | Age | Gender |
|----|-------------|-----|--------|
| 1: | SUBJ_101616 | 0   | F      |
| 2: | SUBJ_102705 | 0   | M      |
| 3: | SUBJ_103210 | 0   | M      |
| 4: | SUBJ_103300 | 0   | F      |
| 5: | SUBJ_103972 | 0   | M      |

...

The last example uses the %ORDER BY clause with two field names to specify the order:

```
DRILLTHROUGH SELECT homed.Magnolia ON 1 FROM patients RETURN PatientID, Age, Gender %ORDER BY Gender, Age
```

| #   | PatientID   | Age | Gender |
|-----|-------------|-----|--------|
| 1:  | SUBJ_101616 | 0   | F      |
| 2:  | SUBJ_103300 | 0   | F      |
| 3:  | SUBJ_105548 | 0   | F      |
| 4:  | SUBJ_105556 | 0   | F      |
| 5:  | SUBJ_106865 | 0   | F      |
| ... |             |     |        |

In this case, the records are sorted first by gender. Within gender, they are sorted by age.

# DROP MEMBER Statement (MDX)

Removes a calculated member defined earlier in the current session.

## Syntax and Details

```
DROP MEMBER cube_name.calculated_member_expression
```

- *cube\_name* is the name of the cube to which you are adding this member.
- *calculated\_member\_expression* is [an expression that refers to a member](#). Typically, *calculated\_member\_expression* has the form `MEASURES.new_measure_name`.

When you use the MDX shell, a session is started; the session ends when you exit the shell. During this session, if you use the [CREATE MEMBER](#) statement, the member that you create is available until the session ends or until you use the `DROP MEMBER` statement.

## Example

```
>>DROP MEMBER patients.MEASURES.avgscore
```

```

Elapsed time: .011952s
```

## See Also

- [CREATE MEMBER Statement](#)

## DROP SET Statement (MDX)

---

Removes a named set defined earlier in the current session.

### Syntax and Details

```
DROP SET cube_name.set_name
```

- *cube\_name* is the name of the cube to which you are adding this member.
- *set\_name* is an unquoted string that names the set.

When you use the MDX shell, a session is started; the session ends when you exit the shell. During this session, if you use the [CREATE SET](#) statement, the set that you create is available until the session ends or until you use the DROP SET statement.

### Example

```
>>DROP SET patients.testset
```

```

Elapsed time: .011825s
```

### See Also

- [CREATE SET Statement](#)



# FORMAT\_STRING Clause (MDX)

Used with a definition of a calculated member, this clause specifies the display format for the data.

## Syntax and Details

You can use this clause when you define a calculated member with the [CREATE MEMBER Statement](#) or with the [WITH Clause](#).

```
FORMAT_STRING = 'positive_piece;negative_piece;zero_piece;missing_piece;'
```

Where:

- *positive\_piece* controls how a positive value is displayed.
- *negative\_piece* controls how a negative value is displayed.
- *zero\_piece* controls how zero is displayed.
- *missing\_piece* controls how a missing value is displayed; this is not currently used.

Each piece is a literal and consists of one or more characters that include one of the following base units:

| Base Unit | Meaning                                                                                                                                                                                               | Example   |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| #         | Display the value without the thousands separator. Do not include any decimal places.                                                                                                                 | 12345     |
| #, #      | Display the value with the thousands separator. Do not include any decimal places. This is the default display format for positive numbers.                                                           | 12,345    |
| #.##      | Display the value without the thousands separator. Include two decimal places (or one decimal place for each pound sign after the period). Specify as many pound places after the period as you need. | 12345.67  |
| #, #.##   | Display the value with the thousands separator. Include two decimal places (or one decimal place for each pound sign after the period). Specify as many pound places after the period as you need.    | 12,345.67 |

You can include additional characters before or after the base unit, as follows:

- If you include a percent sign (%), the system displays the value as a percentage. That is, it multiplies the value by 100 and it displays the percent sign (%) in the position you specify.
- Any other characters are displayed as given, in the position you specify.

If a query includes multiple calculated members with different format strings, the [SOLVE\\_ORDER](#) clause controls which format string is used. (This clause is relevant only if the query contains calculated members on both axes. )

## Examples

The following table shows some examples:

| Example                                                                                                            | Logical Value | Display Value |
|--------------------------------------------------------------------------------------------------------------------|---------------|---------------|
| FORMAT_STRING= '#, #; ( #, # ); '<br>Note that this corresponds to the default way in which numbers are displayed. | 6608.9431     | 6,609         |
|                                                                                                                    | -1234         | (1234)        |
| FORMAT_STRING= '#, #. ###; '                                                                                       | 6608.9431     | 6,608.943     |
| FORMAT_STRING= ' #%; '                                                                                             | 6             | 600%          |
| FORMAT_STRING= '\$#, #; ( \$#, # ); '                                                                              | 2195765       | \$2,195,765   |
|                                                                                                                    | -3407228      | (\$3,407,228) |

## See Also

- [CREATE MEMBER Statement](#)
- [SOLVE\\_ORDER Clause](#)
- [WITH Clause](#)

# SELECT Statement (MDX)

Executes a query and returns the results. This section describes the basic syntax.

## Syntax and Details

```
SELECT set_expression ON 0, set_expression ON 1 FROM cube_name
```

Where:

- The ON clause is an optional axis specification. It has the following form:

```
set_expression ON axis_name_or_number
```

- set\_expression* is an [expression that evaluates to a set](#).
- axis\_name\_or\_number* is COLUMNS (or 0, which is equivalent) or ROWS (or 1, which is equivalent).

You can specify zero, one, or two ON clauses. If you specify two ON clauses, you can specify them in either order.

In other implementations of MDX, if you specify ROWS, you must also specify COLUMNS. In InterSystems MDX, if you specify ROWS but do not specify COLUMNS, the system automatically generates an ON clause for COLUMNS. This clause uses the count measure.

- cube\_name* is the name of the cube to use. The set expressions must make sense within that cube.

If you omit the ON clause, MDX returns the count of records in the cube. If this is a compound cube, this is the sum of the counts of all cubes combined in that compound cube.

For any given cell of the results, to determine the value to use, the system finds the *intersection* of the member used for the column and the member (if any used) for the row:

- If one member is a measure and the other is not a measure, the system finds the value of that measure for that member. For example, if one member is the *Ave Age* measure, and the other member is the 34577 ZIP code, then the corresponding data cell contains the average age of patients whose home ZIP code is 34577.
- If neither member is a measure, the system uses the default measure, which is usually %COUNT. For example, if one member is the gender F, and the other member is the 34577 ZIP code, then the corresponding data cell contains the count of all female patients whose home ZIP code is 34577.

## Example

The following simple example shows patient counts by ZIP code.

```
SELECT MEASURES.[%COUNT] ON 0, homed.zip.MEMBERS ON 1 FROM patients
 Patient Count
1 32006 2,272
2 32007 1,111
3 34577 3,399
4 36711 1,069
5 38928 2,149
```

In the following example, the `patients2` cube does not include the `Home Zip` level. Instead, this cube has a relationship called `Home City` that points to another cube, called `cities`. The query uses this relationship:

```
SELECT MEASURES.[%COUNT] ON 0, city.cityd.city.members ON 1 FROM patients2
```

|               | Patient | Count |
|---------------|---------|-------|
| 1 Cedar Falls |         | 1,097 |
| 2 Centerville |         | 1,136 |
| 3 Cypress     |         | 1,124 |
| 4 Elm Heights |         | 1,089 |
| 5 Juniper     |         | 1,133 |
| 6 Magnolia    |         | 1,063 |
| 7 Pine        |         | 1,124 |
| 8 Redwood     |         | 1,083 |
| 9 Spruce      |         | 1,151 |

## See Also

- [DRILLTHROUGH Statement](#)
- [WHERE Clause](#)
- [WITH Clause](#)

# SET Statement (MDX)

Creates a pivot variable for use in the current session, for the purpose of development. This statement is available only in the MDX shell.

## Syntax and Details

```
SET variable_name variable_value
```

Where:

- *variable\_name* is the name of the pivot variable (without the leading `$variable.` syntax). The name is not case-sensitive; the system ignores the case when you refer to the variable. You cannot create multiple variables with names that differ only in case.

Note that this pivot variable is independent of any cube and is available only for use within the current shell session.

- *variable\_value* is the value of the pivot variable.

For information on pivot variables, see [Defining and Using Pivot Variables](#).

## Examples

The following MDX shell session provides an example:

```
>>set mypivotvar colord.red
mypivotvar is: colord.red
>>select $variable.mypivotvar on 0 from patients

 Red
 129
```

## SOLVE\_ORDER Clause (MDX)

---

Used with a definition of a calculated member, this clause specifies the order in which to apply the definition of this calculated member relative to other calculated members. This clause is relevant only if the query contains calculated members on both axes.

### Syntax and Details

You can use this clause when you define a calculated member with the [CREATE MEMBER Statement](#) or with the [WITH Clause](#).

```
SOLVE_ORDER=integer
```

The SOLVE\_ORDER keyword is not case-sensitive. For *integer*, specify a literal integer. The default is 0.

This clause is useful in a query that has a calculated member as a column and a conflicting calculated member as a row. This clause affects how the system determines the value in the cell *and* the format applied to the cell. By default, the *column* determines [FORMAT\\_STRING](#).

If you instead want the row to determine the format and the value, ensure that SOLVE\_ORDER is higher for the calculated member used as a row.

With one exception, the calculated member with the higher SOLVE\_ORDER is evaluated last and thus controls the results. The exception is that if a row or column uses the [%CELL](#) function, its implicit default SOLVE\_ORDER is 10.

If the row and column both use [%CELL](#) and you want the row to determine the value and format string, set the SOLVE\_ORDER to 11 for the row.

If the column and row members have the same SOLVE\_ORDER, the column member controls the results, as in the default case.

For calculated measures that depend on other calculated measures, the system recognizes the dependencies and evaluates the measures in the appropriate order; you do not need to use SOLVE\_ORDER for these measures.

### See Also

- [CREATE MEMBER Statement](#)
- [FORMAT\\_STRING Clause](#)
- [WITH Clause](#)

# WHERE Clause (MDX)

Applies a filter to a SELECT statement; describes how to slice the results of a SELECT statement.

## Syntax and Details

```
select_statement WHERE set_expression
```

Where:

- *select\_statement* is a [statement that uses SELECT](#).
- *set\_expression* is an [expression that returns a set of members or tuples](#).

Instead of *set\_expression*, you can use a [measure search expression](#); see the example to see the behavior of WHERE in this case.

Because the system automatically converts types where appropriate, you can also use a single [member expression](#) or [tuple expression](#) in place of the set expression.

**Important:** Each set element is used as a separate slicer axis, and the results of all the slicer axes (of all %FILTER clauses) are aggregated together. This is the process of *axis folding* (a filter is considered to be a query axis). Axis folding means that if a given source record has a non-null result for each slicer axis, that record is counted multiple times.

In axis folding, values are combined according to the aggregation method for that measure, as specified in the cube definition. (In the examples here, %COUNT is added.)

For more details, see [Axis Folding](#) in [How the Business Intelligence Query Engine Works](#).

## Example

Compare the following two example SELECT statements, one with a WHERE clause and one without a WHERE clause.

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.MEMBERS ON 1 FROM patients
 Patient Count
1 Cedar Falls 1,039
2 Centerville 1,107
3 Cypress 1,096
4 Elm Heights 1,093
5 Juniper 1,150
6 Magnolia 1,092
7 Pine 1,157
8 Redwood 1,125
9 Spruce 1,141
```

The previous query shows the count of patients in each city. In contrast, consider the following query, which shows the count of male patients in each city:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.MEMBERS ON 1 FROM patients WHERE gend.male
 Patient Count
1 Cedar Falls 509
2 Centerville 569
3 Cypress 517
4 Elm Heights 531
5 Juniper 574
6 Magnolia 527
7 Pine 569
8 Redwood 553
9 Spruce 557
```

To demonstrate the effect of multiple items in the `WHERE` clause, first consider the following query:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.MEMBERS ON 1 FROM patients WHERE colord.green
```

|               | Patient Count |
|---------------|---------------|
| 1 Cedar Falls | 137           |
| 2 Centerville | 129           |
| 3 Cypress     | 150           |
| 4 Elm Heights | 128           |
| 5 Juniper     | 126           |
| 6 Magnolia    | 143           |
| 7 Pine        | 155           |
| 8 Redwood     | 148           |
| 9 Spruce      | 147           |

Now consider the following query, which uses both `gend.male` and `colord.green` as set elements in the `WHERE` clause:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.MEMBERS ON 1 FROM patients WHERE {gend.male,colord.green}
```

|               | Patient Count |
|---------------|---------------|
| 1 Cedar Falls | 646           |
| 2 Centerville | 698           |
| 3 Cypress     | 667           |
| 4 Elm Heights | 659           |
| 5 Juniper     | 700           |
| 6 Magnolia    | 670           |
| 7 Pine        | 724           |
| 8 Redwood     | 701           |
| 9 Spruce      | 704           |

By comparing the results for Cedar Falls, for example, you can see that this query adds the results for male patients *and* the results for patients whose favorite color is green. If you instead wanted to see the results for male patients whose favorite color is green, you would use either a `CROSSJOIN` or a tuple expression in the `WHERE` clause, as follows:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.MEMBERS ON 1 FROM patients
WHERE CROSSJOIN(gend.male,colord.green)
```

|               | Patient Count |
|---------------|---------------|
| 1 Cedar Falls | 56            |
| 2 Centerville | 65            |
| 3 Cypress     | 80            |
| 4 Elm Heights | 59            |
| 5 Juniper     | 73            |
| 6 Magnolia    | 74            |
| 7 Pine        | 82            |
| 8 Redwood     | 70            |
| 9 Spruce      | 74            |

The following example uses a tuple expression in the `WHERE` clause:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.MEMBERS ON 1 FROM patients WHERE (gend.male,aged.60)
```

|               | Patient Count |
|---------------|---------------|
| 1 Cedar Falls | 3             |
| 2 Centerville | 9             |
| 3 Cypress     | 7             |
| 4 Elm Heights | 1             |
| 5 Juniper     | 8             |
| 6 Magnolia    | 2             |
| 7 Pine        | 5             |
| 8 Redwood     | 6             |
| 9 Spruce      | 3             |

You can also use the `WHERE` clause as a way to display a specific measure:

```
SELECT gend.gender.MEMBERS ON 0 FROM patients WHERE MEASURES.[avg test score]
All Patients Female Male
74.78 74.46
```

Notice that the measure name is not shown, however.



If you use the WHERE clause with a [measure search expression](#), the clause uses only rows of the fact table that do meet the given criteria. (A [measure search expression](#) is an InterSystems extension to MDX that considers the measure values in the fact table itself.)

```
SELECT MEASURES.[%COUNT] ON 0 FROM patients WHERE %SEARCH.&[[MEASURES].[age]<10]
 Patient Count
 1,370
```

## See Also

See the [%FILTER](#) clause.

## WITH Clause (MDX)

---

Defines one or more calculated members, named sets, or parameters for use in the `SELECT` statement.

### Syntax and Details

```
WITH with_details1 with_details2 ... select_statement
```

Where:

- *select\_statement* is a [statement that uses SELECT](#)
- *with\_details1*, *with\_details2*, and so on can have one of the following syntaxes:

```
MEMBER calc_mem_definition
```

Or:

```
SET named_set_definition
```

Or:

```
%PARM named_parameter_definition
```

You can mix these subclauses in a single `WITH` clause.

**Tip:** Notice that there is no comma to separate the `WITH` subclauses from each other. Nor is there a comma between the `WITH` clause and the `SELECT` statement.

The following sections provide the details for the `MEMBER`, `SET`, and `%PARM` subclauses.

### WITH MEMBER

In a `WITH` clause, `MEMBER` defines a calculated member for use in the query. The `MEMBER` subclause has the following syntax:

```
MEMBER calc_mem_details, FORMAT_STRING='format_details', SOLVE_ORDER=integer
```

Where *calc\_mem\_details* is as follows:

```
cube_name.[dimension_name].[new_member_name] AS 'value_expression'
```

And:

- *cube\_name* is the name of a cube.
- *dimension\_name* is the name of a dimension.
- *new\_member\_name* is the name of a member; the member may or may not be already defined in the cube. If it is, the definition given here takes precedence.
- *value\_expression* is an MDX expression that defines the calculated member, typically in terms of references to other members.

For example:

```
MEASURES.[test score]/MEASURES.[%COUNT]
```

In any context where you use this calculated member, the system first evaluates the `Test Score` and `%COUNT` measures in that context and then performs the division.

For another example:

```
%OR({colord.red,colord.blue,colord.yellow})
```

This new member refers to all the records of the fact table that correspond to the `red`, `yellow`, or `blue` members of the `colord` dimension.

For other variations, see [Defining Calculated Members](#).

- `FORMAT_STRING='format_details'` is an optional clause that specifies how to display the values. This clause is applicable only for numeric values. See [FORMAT\\_STRING Clause](#).
- `SOLVE_ORDER=integer` is an optional clause that specifies the relative order in which to evaluate this calculated member. This clause is relevant only if the query contains calculated members on both axes. See [SOLVE\\_ORDER Clause](#).

The first example shows a calculated member defined within the `WITH` clause:

```
WITH MEMBER MEASURES.avgage AS 'MEASURES.age/MEASURES.%COUNT'
SELECT MEASURES.avgage ON 0, diagd.MEMBERS ON 1 FROM patients
```

|                |       |
|----------------|-------|
| 1 None         | 33.24 |
| 2 asthma       | 34.79 |
| 3 CHD          | 67.49 |
| 4 diabetes     | 57.24 |
| 5 osteoporosis | 79.46 |

The system first evaluates the `Age` and `%COUNT` measures and then performs the division for the `avgage` measure.

## WITH SET

In a `WITH` clause, `SET` defines a named set for use in the query. The `SET` subclause has the following syntax:

```
SET set_name AS 'set_expression'
```

- *set\_name* is an unquoted string that names the set.
- *set\_expression* is [an expression that refers to a set](#).

The following example shows a named set defined within the `WITH` clause:

```
WITH SET testset AS '{homed.city.members}' SELECT MEASURES.[%COUNT] ON 0, testset ON 1 FROM patients
```

|               | Patient Count |
|---------------|---------------|
| 1 Cedar Falls | 1,045         |
| 2 Centerville | 1,069         |
| 3 Cypress     | 1,150         |
| 4 Elm Heights | 1,104         |
| 5 Juniper     | 1,155         |
| 6 Magnolia    | 1,111         |
| 7 Pine        | 1,138         |
| 8 Redwood     | 1,111         |
| 9 Spruce      | 1,117         |

## WITH %PARM

In a `WITH` clause, `%PARM` defines a named parameter for use in the query. The `%PARM` subclause has the following syntax:

```
%PARM parameter_name AS 'value:default_value'
```

Or:

```
%PARM parameter_name AS 'value:default_value,caption:label'
```

- *parameter\_name* is the name of the parameter.
- *default\_value* is the default value of the parameter.
- *label* is the caption to use when prompting for a value of this parameter.

When you run a query within the MDX shell, the shell prompts you for values of any named parameters.

Then, to refer to the parameter within the query itself, use *@parameter\_name*

For example:

```
>>WITH %PARM c as 'value:Pine' select homed.[city].@c ON 0 FROM patients
Please supply parameter value(s) for this query:
C [Pine]:

 Pine
 1,073

Elapsed time: 2.136337s
>>WITH %PARM c as 'value:Pine' select homed.[city].@c ON 0 FROM patients
Please supply parameter value(s) for this query:
C [Pine]:Magnolia

 Magnolia
 1,113

Elapsed time: 2.627897s
>>WITH %PARM c as 'value:Pine,caption:city' select homed.[city].@c ON 0 FROM patients
Please supply parameter value(s) for this query:
city [Pine]:

 Pine
 1,073

Elapsed time: 2.235228s
>>WITH %PARM c AS 'value:5,caption:count' SELECT TOPCOUNT(birthd.decade.MEMBERS, @c) ON 1 FROM patients
Please supply parameter value(s) for this query:
count [5]:3

1 1970s 1,593
2 1960s 1,505
3 2000s 1,442

Elapsed time: 1.207581s
```

## See Also

The WITH clause defines elements that are available only during the query that defines them.

To define calculated members and named sets for use during the entire session, use the following statements:

- [CREATE MEMBER Statement](#)
- [CREATE SET Statement](#)

For information on defining calculated members and named sets as part of the cube definition (available in all sessions), see [Defining Models for InterSystems Business Intelligence](#).

# MDX Functions

This reference section provides information on the [MDX](#) functions supported in [Business Intelligence](#).

Also see [Accessing the BI Samples](#).

## %ALL (MDX)

Enables you to use a member while ignoring any ROW and COLUMN context that uses the hierarchy to which this member belongs. This function is an InterSystems extension to MDX.

### Returned Type

This function returns a [member](#).

### Syntax and Details

`member_expression.%ALL`

Where:

- member\_expression* is [an expression that evaluates to a member](#).

This function enables you to create calculated members that compare one member of a hierarchy to another member of the hierarchy (for example, comparing one product to all products).

### Example

Sometimes it is necessary to compute values like the following:

- Percentage of one product compared to all products
- Percentage of one product compared to another product

For example, the following query uses a calculated member that equals the patient count for each age group, as a percentage of patients in all the age groups:

```
WITH MEMBER MEASURES.[pct age grps] AS 'aged.CURRENTMEMBER/aged.[all patients].%ALL', FORMAT_STRING='#.##'
SELECT {MEASURES.[%COUNT],MEASURES.[pct age grps]} ON 0,
aged.hl.[age group].MEMBERS ON 1 FROM patients
```

|            | Patient Count | pct age grps |
|------------|---------------|--------------|
| 1 0 to 29  | 4,216         | 0.42         |
| 2 30 to 59 | 4,212         | 0.42         |
| 3 60+      | 1,572         | 0.16         |

The calculated member is defined as the current member of the Aged dimension, divided by the All member of that dimension:

```
aged.CURRENTMEMBER/aged.[all patients].%ALL
```

In contrast, consider the following query in which the calculated member does not use the %ALL function:

```
WITH MEMBER MEASURES.[BADpct age grps] AS 'aged.CURRENTMEMBER/aged.[all patients]', FORMAT_STRING='#.##'
SELECT {MEASURES.[%COUNT],MEASURES.[BADpct age grps]} ON 0,
aged.hl.[age group].MEMBERS ON 1 FROM patients
```

|            | Patient Count | BADpct age grps |
|------------|---------------|-----------------|
| 1 0 to 29  | 4,216         | 1.00            |
| 2 30 to 59 | 4,212         | 1.00            |
| 3 60+      | 1,572         | 1.00            |

In this case, the value of `aged.[all patients]` in each row is the same as the value of `aged.CURRENTMEMBER`, because the row members belong to the same hierarchy as `aged.[all patients]`.

Note that the %ALL function does consider the context given by members of other hierarchies. (It ignores only the hierarchy associated with the member that you use with the function.) For example:

```
WITH MEMBER MEASURES.[pct age grps] AS 'aged.CURRENTMEMBER/aged.[all patients].%ALL', FORMAT_STRING='#.###'
SELECT CROSSJOIN(gend.MEMBERS,{MEASURES.[%COUNT],MEASURES.[pct age grps]}) ON 0,
aged.hl.[age group].MEMBERS ON 1 FROM patients
```

|            | Patient | Coun  | pct age grps | Patient | Coun  | pct age grps |
|------------|---------|-------|--------------|---------|-------|--------------|
| 1 0 to 29  |         | 1,985 | 0.39         |         | 2,231 | 0.45         |
| 2 30 to 59 |         | 2,123 | 0.42         |         | 2,089 | 0.42         |
| 3 60+      |         | 926   | 0.18         |         | 646   | 0.13         |

Here, the first two Patient Count and pct age grps columns correspond to female patients and the second two correspond to male patients. Each pct age grps column indicates the patient count for that gender, as a percentage of all age groups for that gender.

Also note that the %ALL function does not ignore members of its hierarchy if those are used in a [WHERE](#) or [FILTER](#) clause; that is, the %ALL function fully respects all filtering applied to the query. For example:

```
WITH MEMBER MEASURES.[pct of all ages] AS 'aged.CURRENTMEMBER/aged.[all patients].%ALL',
FORMAT_STRING='#.###'
SELECT {MEASURES.[%COUNT],MEASURES.[pct of all ages]} ON 0,
aged.hl.[age group].MEMBERS ON 1 FROM patients
WHERE aged.hl.[age group].[0 to 29]
```

|            | Patient | Count | pct of all ages |
|------------|---------|-------|-----------------|
| 1 0 to 29  |         | 4,216 | 1.00            |
| 2 30 to 59 |         | *     | *               |
| 3 60+      |         | *     | *               |

## See Also

- [%MDX](#)

## %CELL (MDX)

Returns the value of another cell in a pivot table, by position. This function is an InterSystems extension to MDX.

### Returned Type

This function returns a [number](#) or a [string](#).

### Syntax and Details

```
%CELL(relative_column_position,relative_row_position)
```

Where:

- *relative\_column\_position* is an integer. Use 0 for the current column, -1 for the previous column (the column to the left), 1 for the next column (the column to the right), and so on.
- *relative\_row\_position* is an integer. Use 0 for the current row, -1 for the previous row (the column above), 1 for the next row (the column below), and so on.

The system returns the value of the given cell, or null if the cell has no value.

The system evaluates %CELL after resolving the rest of the query; this means that you cannot use this function within an expression used by another function.

### Example

The following example displays rainfall data and cumulative rainfall data for a given span of time:

```
SELECT {MEASURES.[Rainfall Inches],%CELL(-1,0)+%CELL(0,-1)} ON 0, {dated.year.1960:1970} ON 1 FROM cityrainfall
```

|         | Rainfall Inches | Expression |
|---------|-----------------|------------|
| 1 1960  | 177.83          | 177.83     |
| 2 1961  | 173.42          | 351.25     |
| 3 1962  | 168.11          | 519.36     |
| 4 1963  | 188.30          | 707.66     |
| 5 1964  | 167.58          | 875.24     |
| 6 1965  | 175.23          | 1,050.47   |
| 7 1966  | 182.50          | 1,232.97   |
| 8 1967  | 154.44          | 1,387.41   |
| 9 1968  | 163.97          | 1,551.38   |
| 10 1969 | 184.84          | 1,736.22   |
| 11 1970 | 178.31          | 1,914.53   |

Notice that the default label here is Expression. You can use [%LABEL](#) to provide a more suitable label. For example:

```
SELECT {MEASURES.[Rainfall Inches],%LABEL((%CELL(-1,0)+%CELL(0,-1)),"Cumulative Inches")} ON 0, {dated.year.1960:1970} ON 1 FROM cityrainfall
```

|         | Rainfall Inches | Cumulative Inches |
|---------|-----------------|-------------------|
| 1 1960  | 177.83          | 177.83            |
| 2 1961  | 173.42          | 351.25            |
| 3 1962  | 168.11          | 519.36            |
| 4 1963  | 188.30          | 707.66            |
| 5 1964  | 167.58          | 875.24            |
| 6 1965  | 175.23          | 1,050.47          |
| 7 1966  | 182.50          | 1,232.97          |
| 8 1967  | 154.44          | 1,387.41          |
| 9 1968  | 163.97          | 1,551.38          |
| 10 1969 | 184.84          | 1,736.22          |
| 11 1970 | 178.31          | 1,914.53          |

### See Also

- [%CELLZERO](#)



# %CELLZERO (MDX)

Returns the value of another cell in a pivot table or returns zero if that cell has no value. This function is a Business Intelligence extension to MDX.

## Returned Type

This function returns a [number](#) or a [string](#).

## Syntax and Details

```
%CELLZERO(relative_column_position,relative_row_position)
```

Where:

- relative\_column\_position* is an integer. Use 0 for the current column, -1 for the previous column (the column to the left), 1 for the next column (the column to the right), and so on.
- relative\_row\_position* is an integer. Use 0 for the current row, -1 for the previous row (the column above), 1 for the next row (the column below), and so on.

The system returns the value of the given cell, or zero if the cell has no value.

## Example

The following query uses three measures. The first measure displays the number of units sold in a given period. The second measure displays the number of units sold in the previous period; this is a calculated measure defined with [PREVMEMBER](#). The third measure displays the change in units sold since the previous period; this is a calculated measure defined with [%CELLZERO](#).

```
WITH MEMBER [MEASURES].[UnitsSoldPreviousPeriod]
AS '%LABEL(([DateOfSale].[Actual].CurrentMember.PrevMember,MEASURES.[units sold]),"Units (Prev Period)")'
MEMBER [MEASURES].[Delta Since Prev Period] AS '%CELLZERO(-2,0)-%CELLZERO(-1,0)'
SELECT
{[Measures].[Units Sold],[MEASURES].[UNITSSOLDPREVIOUSPERIOD],[MEASURES].[DELTA SINCE PREV PERIOD]} ON
0,
[DateOfSale].[Actual].[MonthSold].Members ON 1
FROM [HoleFoods]
%FILTER [PRODUCT].[P1].[PRODUCT CATEGORY].&[Dairy]
```

|             | Units Sold | Units (Prev Peri | Delta Since Prev |
|-------------|------------|------------------|------------------|
| 1 Jan-2009  | *          | *                | 0                |
| 2 Feb-2009  | *          | *                | 0                |
| 3 Mar-2009  | *          | *                | 0                |
| 4 Apr-2009  | 1          | *                | 1                |
| 5 May-2009  | *          | 1                | -1               |
| 6 Jun-2009  | 8          | *                | 8                |
| 7 Jul-2009  | 1          | 8                | -7               |
| 8 Aug-2009  | *          | 1                | -1               |
| 9 Sep-2009  | *          | *                | 0                |
| 10 Oct-2009 | *          | *                | 0                |
| 11 Nov-2009 | *          | *                | 0                |
| 12 Dec-2009 | *          | *                | 0                |
| 13 Jan-2010 | 1          | *                | 1                |
| 14 Feb-2010 | *          | 1                | -1               |
| 15 Mar-2010 | 2          | *                | 2                |
| ...         |            |                  |                  |

## See Also

- [%CELL](#)

## %FIRST (MDX)

Returns the value of the given measure (or other numeric expression) evaluated for the first non-empty member of a set. This function is an InterSystems extension to MDX.

### Returned Type

This function returns a [number](#).

### Syntax and Details

```
%FIRST(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES] . [*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The %FIRST function returns the first non-missing value evaluated for each member of the given set.

### Example

For reference, the following query shows patients with asthma, grouped by birth decade:

```
SELECT MEASURES.[%Count] ON 0, birthd.decade.MEMBERS ON 1 FROM patients WHERE diagd.asthma
```

|          | Patient Count |
|----------|---------------|
| 1 1910s  | *             |
| 2 1920s  | *             |
| 3 1930s  | 1             |
| 4 1940s  | 9             |
| 5 1950s  | 8             |
| 6 1960s  | 11            |
| 7 1970s  | 12            |
| 8 1980s  | 14            |
| 9 1990s  | 11            |
| 10 2000s | 14            |
| 11 2010s | 4             |

The following query uses %FIRST to get the first non-empty set of patients from the preceding set:

```
SELECT MEASURES.[%Count] ON 0, %FIRST(birthd.decade.MEMBERS) ON 1 FROM patients WHERE diagd.asthma
```

|       | Patient Count |
|-------|---------------|
| FIRST | 1             |

### See Also

- [%LAST](#)

# %KPI (MDX)

Returns a value from a KPI or plug-in. This function is an InterSystems extension to MDX.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
%KPI(kpiName,propName,series)
```

Or:

```
%KPI(kpiName,propName,series,paramName1,paramValue1,paramName2,paramValue2)
```

Where:

- *kpiName* is the name of a [KPI](#) or [plugin](#).
- *propName* is the quoted name of a <property> element of the KPI or plug-in.
- *series* is the optional number or the quoted name of a series (row) in the KPI or plug-in. The default is 1.
- *paramName1*, *paramName2*, and so on are optional quoted names of parameters of the KPI or plug-in (in most cases, these are filters). Note that parameter names are case-sensitive.

The order in which you list the filters does not affect the KPI.

You can specify up to 16 parameters and their values.

- *paramValue1*, *paramValue2*, and so on are the corresponding values of the named filters.

%KPI uses all provided parameter values and returns the value of the given *propName* for the given *series*. For KPIs and plug-ins, the caption for a value is the normalized and localized property name.

For MDX-based KPIs and plug-ins, you can use the special %*CONTEXT* parameter to cause the KPI to consider the context of query, which is otherwise ignored. For its value, specify a combination of the following flags:

- "rows" specifies that the context of the current pivot row should be used
- "columns" specifies that the context of the current pivot column should be used
- "filters" specifies that the context of the filters of current pivot should be used
- "all" specifies that all the preceding should be used (this is the default)

Use a pipe character (|) to combine flags, for example: "rows|columns". The value "all" is equivalent to "rows|columns|filters". (The [%MDX](#) function also uses this parameter; see [%MDX](#) for examples.)

**Important:** If you use the `%CONTEXT` parameter, remember to enclose it in quotes. Also, you must specify a value for this parameter unless you use it as the last parameter. For example, the following is valid:

```
%KPI("%DeepSee.Median","MEDIAN",1,"%measure","Amount Sold","%CONTEXT")
```

The following is also valid:

```
%KPI("%DeepSee.Median","MEDIAN",1,"%CONTEXT","all","%measure","Amount Sold")
```

But the following is *not* correct and will not be interpreted as desired:

```
%KPI("%DeepSee.Median","MEDIAN",1,"%CONTEXT","%measure","Amount Sold")
```

KPIs (other than plug-ins) are executed synchronously by default but can be defined to execute asynchronously.

## Example

The following example gets the value of the `PatCount` property for the first row of the `DemoMDX` KPI:

```
SELECT %KPI("demomdx","PatCount") ON 0 FROM patients

 Patient Count
 115
```

The following example defines a calculated measure that uses the `%DeepSee.Plugin.Median` sample plug-in:

```
WITH MEMBER [MEASURES].[Median Amount Sold] AS
'%KPI("%DeepSee.Median","MEDIAN",1,"%measure","Amount Sold","%CONTEXT")'
SELECT NON EMPTY {[Measures].[Amount Sold],[MEASURES].[MEDIAN AMOUNT SOLD]} ON 0,
NON EMPTY [Product].[P1].[Product Name].Members ON 1
FROM [HoleFoods]
```

|                      | Amount Sold | Median Amount Sold |
|----------------------|-------------|--------------------|
| 1 Bagels (dozen)     | 38.96       | 2.95               |
| 2 Bundt Cake         | 1,632.01    | 19.95              |
| 3 Calamari (frozen)  | 566.90      | 22.95              |
| 4 Cheerios (box)     | 600.11      | 3.95               |
| 5 Donuts (dozen)     | 429.36      | 2.95               |
| 6 Free-range Donut   | 1,310.64    | 12.95              |
| 7 Fruit Loops (box)  | 772.83      | 4.95               |
| 8 Lifesavers (roll)  | 248.96      | 1.15               |
| 9 Onion ring         | 377.25      | 4.95               |
| 10 Onion ring        | 28.57       | 5.95               |
| 11 Penne (box)       | 176.72      | 1.95               |
| 12 Pineapple Rings   | 512.00      | 8.95               |
| 13 Pretzels (bag)    | 88.12       | 3.95               |
| 14 Swiss Cheese (sl) | 445.10      | 5.95               |
| 15 Tortellini (froz) | 1,000.89    | 6.95               |
| 16 Unsalted Pretzel  | 316.70      | 4.25               |
| 17 Ziti (box)        | 979.43      | 4.81               |

## Available Plug-in Classes

The system provides several plug-ins for you to use with the `%KPI` function:

### **%DeepSee.Distinct**

Gets the number of distinct values for the given level.

This plug-in provides the property `DISTINCT`. The plug-in accepts the following parameters:

| Parameter | Value                                                                                                                                                    |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| %cube     | Logical name of the cube.                                                                                                                                |
| %level    | MDX identifier for the level or relationship whose distinct values you want to count. For example, [DocD].[H1].[Doctor] or [RelatedCubes/Doctors].[DocD] |

This plug-in is defined by the class %DeepSee.PlugIn.Distinct.

### %DeepSee.Median

Gets the median value for a given measure, across all the lowest-level records used in a cell.

This plug-in provides the property MEDIAN. The plug-in accepts the following parameters:

| Parameter | Value                                                                                           |
|-----------|-------------------------------------------------------------------------------------------------|
| %cube     | Logical name of the cube.                                                                       |
| %measure  | MDX identifier for measure whose values you want to use. For example: [MEASURES].[Measure Name] |

This plug-in is defined by the class %DeepSee.PlugIn.Median.

### %DeepSee.Percentile

Gets a percentile value for a given measure, across all the lowest-level records.

This plug-in provides the property PERCENTILE. The plug-in accepts the following parameters:

| Parameter   | Value                                                                                                            |
|-------------|------------------------------------------------------------------------------------------------------------------|
| %cube       | Logical name of the cube.                                                                                        |
| %measure    | MDX identifier for measure whose values you want to use. For example: [MEASURES].[Measure Name]                  |
| %percentile | The percentile that you want to evaluate. The default is 50, so that the plug-in calculates the 50th percentile. |

This plug-in is defined by the class %DeepSee.PlugIn.Percentile.

Note that these plug-in classes are defined with *PLUGINTYPE* as "Aggregate", which means that the plug-ins cannot be directly used in the Analyzer or in widgets.

## See Also

- [%MDX](#)

## %LABEL (MDX)

Given an MDX expression, returns the same expression with a different label for use as a row or column header. %LABEL can also specify formatting for the row or column. This function is a Business Intelligence extension to MDX.

### Returned Type

This function returns an expression of the same type that you use with the function.

### Syntax and Details

```
%LABEL(MDX_expression, label, format_string, solve_order, cell_style, heading_style)
```

Where:

- *MDX\_expression* is an MDX expression of any type.
- *label* is a string to use as the new label as a row or column header.
- *format\_string* is an optional literal (such as "#.##") that specifies how to display the values. See [FORMAT\\_STRING Clause](#).
- *solve\_order* is an optional integer that specifies the order in which to apply labels. See [SOLVE\\_ORDER Clause](#).
- *cell\_style* is an optional literal that specifies a [Cascading Style Sheet \(CSS\)](#) style definition to apply to the data cells.
- *heading\_style* is an optional literal that specifies a Cascading Style Sheet (CSS) style definition to apply to the heading.

### Example

```
SELECT %LABEL(MEASURES.[avg allergy count], "my label") ON 0, colord.MEMBERS ON 1 FROM patients
```

|          | my label |
|----------|----------|
| 1 None   | 1.04     |
| 2 Blue   | 1.01     |
| 3 Green  | 1.02     |
| 4 Orange | 1.01     |
| 5 Purple | 1.06     |
| 6 Red    | 1.03     |
| 7 Yellow | 1.00     |

In contrast:

```
SELECT MEASURES.[avg allergy count] ON 0, colord.MEMBERS ON 1 FROM patients
```

|          | Avg Allergy Count |
|----------|-------------------|
| 1 None   | 1.04              |
| 2 Blue   | 1.01              |
| 3 Green  | 1.02              |
| 4 Orange | 1.01              |
| 5 Purple | 1.06              |
| 6 Red    | 1.03              |
| 7 Yellow | 1.00              |

For more examples, see [%CELL](#), [CURRENTMEMBER](#), [IIF](#), and [PROPERTIES](#).

### See Also

- [IIF](#)
- [ISNULL](#)

# %LAST (MDX)

Returns the value of the given measure (or other numeric expression) evaluated for the last non-empty member of a set. This function is an InterSystems extension to MDX.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
%LAST(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES] . [*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The %LAST function returns the last non-missing value evaluated for each member of the given set.

## Example

For reference, the following query shows patients with osteoporosis, grouped by birth decade:

```
SELECT MEASURES.[%Count] ON 0, birthd.decade.MEMBERS ON 1 FROM patients WHERE diagd.osteoporosis
```

|          | Patient Count |
|----------|---------------|
| 1 1910s  | 2             |
| 2 1920s  | 5             |
| 3 1930s  | 10            |
| 4 1940s  | 5             |
| 5 1950s  | *             |
| 6 1960s  | *             |
| 7 1970s  | *             |
| 8 1980s  | *             |
| 9 1990s  | *             |
| 10 2000s | *             |
| 11 2010s | *             |

The following query uses %LAST to get the last non-empty set of patients from the preceding set:

```
SELECT MEASURES.[%Count] ON 0, %LAST(birthd.decade.MEMBERS) ON 1 FROM patients WHERE diagd.osteoporosis
```

|      | Patient Count |
|------|---------------|
| LAST | 5             |

## See Also

- [%FIRST](#)

## %LIST (MDX)

Returns a comma-separated list of values, given a set of values. This function is an InterSystems extension to MDX and is intended for use in KPIs.

### Returned Type

This function returns a [string](#) that consists of a comma-separated list of values.

### Syntax and Details

```
%LIST(set_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).

### Example

The following example shows the measure %COUNT for each diagnosis, followed by a string that contains a comma-separated list of those values:

```
WITH SET temp AS 'diagd.MEMBERS'
SELECT MEASURES.[%COUNT] ON 0, {temp,%LIST(temp)} ON 1 FROM patients
```

|                | Patient Count        |  |
|----------------|----------------------|--|
| 1 None         | 8,603                |  |
| 2 asthma       | 676                  |  |
| 3 CHD          | 345                  |  |
| 4 diabetes     | 546                  |  |
| 5 osteoporosis | 212                  |  |
| 6 LIST         | 8603,676,345,546,212 |  |

In the following example, the LIST column contains, for each city, a comma-separated list of the birth counts by decade for that city. This is the basic query used in the scorecard on the [Scorecard with Trend Lines](#) dashboard.

```
SELECT {MEASURES.[%COUNT],%LIST(birthd.decade.MEMBERS)} ON 0, homed.city.MEMBERS ON 1 FROM patients
```

|               | Patient Count | LIST                                   |
|---------------|---------------|----------------------------------------|
| 1 Cedar Falls | 1,079         | 11,22,42,92,115,159,176,135,127,179,21 |
| 2 Centerville | 1,058         | 3,24,51,57,114,157,167,152,161,145,27  |
| 3 Cypress     | 1,095         | 12,14,57,84,105,146,160,159,153,166,39 |
| 4 Elm Heights | 1,086         | 8,22,54,72,121,154,168,135,176,143,33  |
| 5 Juniper     | 1,152         | 9,21,56,79,124,165,200,152,169,155,22  |
| 6 Magnolia    | 1,152         | 6,18,55,83,116,181,190,159,172,145,27  |
| 7 Pine        | 1,120         | 8,22,47,72,108,160,166,173,161,170,33  |
| 8 Redwood     | 1,132         | 6,17,61,90,109,174,189,129,171,154,32  |
| 9 Spruce      | 1,126         | 11,20,70,74,107,167,171,161,164,156,25 |

**Note:** This function is intended for use in KPIs displayed in scorecard widgets. Specifically, you use this as the source value for a scorecard property that displays a trend line or trend bar graphic.



# %LOOKUP (MDX)

Returns one value from a term list. This function is an InterSystems extension to MDX.

## Returned Type

This function returns a [number](#) or a [string](#).

## Syntax and Details

```
%LOOKUP(termlist,key,field,default)
```

Where:

- *termlist* is the name of a term list.
- *key* is a key value in that term list.
- *field* is an optional field (column) name to use to get the value. By default the `value` column is returned.
- *default* is the value to return if the term list, key, or field cannot be found.

Unlike [%TERMLIST](#), %LOOKUP returns a single value.

If a cell in a term list defines a valid member reference, such as `[Outlet].[h1].[city].[boston]`, then %LOOKUP resolves this reference and does not return the member reference as a literal value. This is mainly to be compatible with term lists created for use with %TERMLIST.

For information on defining term lists, see [Defining Term Lists](#).

## Comparison with Other Term List Functions

The following table compares functions that you can use with term lists:

| Function  | Purpose                                                                                                                                                              | Return Value                                                                                |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| %LOOKUP   | Looks up a value, given the key of a term list item. Returns the value of the term list item. You can specify a default value to return.                             | A <a href="#">number</a> or a <a href="#">string</a> (which could be the name of a member). |
| LOOKUP    | Returns a field from a term list item. By default, this field is the key field, but you can return another field instead. You can specify a default value to return. |                                                                                             |
| %TERMLIST | Returns a set based on the given term list.                                                                                                                          | Returns a <a href="#">set</a> .                                                             |

## Example

Consider a term list called `VALUES` with one key-value pair:

```
key value
CutOff 10000000
```

In this case, you can use %LOOKUP as follows:

```
SELECT %LOOKUP("Values","CutOff") ON ROWS FROM HOLEFOODS
==> 10000000
```

For another example, the following query returns the list of cities whose population is greater than the cut off value in the term list:

```
SELECT
FILTER(Outlet.City.Members,Outlet.H1.City.CurrentMember.Properties("Population")>%LOOKUP("Values","CutOff"))
ON ROWS,Outlet.H1.City.CurrentMember.Properties("Population") ON COLUMNS FROM HOLEFOODS
```

## See Also

- [%TERMLIST](#)
- [LOOKUP](#)

## %MDX (MDX)

Executes an MDX query outside of the context of the current query and then returns a single result. This function is a Business Intelligence extension to MDX.

### Returned Type

This function returns a [number](#) or a [string](#).

### Syntax and Details

```
%MDX(mdx_query, parmName1, parmValue1, parmName2, parmValue2)
```

Where:

- *mdx\_query* is a quoted MDX query. It should return a single value; only the upper left cell is used.  
The query can include named parameters, calculated members, and named sets.
- *parmName1*, *parmName2*, and so on are optional named parameters in the query. These must be quoted.  
The order in which you list parameters does not affect the query.  
You can specify up to 16 parameters and their values.
- *parmValue1*, *parmValue2*, and so on are the corresponding values of the named parameters.

This function executes the given query and returns a single value; if the query returns multiple rows or columns, the function returns only the upper left cell. You use this to include a subquery within another query.

The system provides the special `%CONTEXT` parameter which you can use within `%MDX`. For details, see [%KPI](#), which also accepts this parameter.

**Important:** Remember to quote the `%CONTEXT` parameter if you use it.

### Example

You use `%MDX` to obtain a value that you want to include in a query but that would otherwise be affected by the row and column definition of the query. For example, you can use it if you need to access the total record count:

```
WITH MEMBER A.FRACTION AS 'MEASURES.[%COUNT]/%MDX("SELECT FROM patients")'
SELECT { MEASURES.[%COUNT], A.FRACTION } ON 0, diagd.MEMBERS ON 1 FROM patients
```

|                | Patient Count | FRACTION |
|----------------|---------------|----------|
| 1 None         | 8,428         | 0.84     |
| 2 asthma       | 712           | 0.07     |
| 3 CHD          | 343           | 0.03     |
| 4 diabetes     | 485           | 0.05     |
| 5 osteoporosis | 212           | 0.02     |

The following example uses `%MDX` with a named parameter (`City`):

```
SELECT
%MDX("WITH %PARM City AS 'value:[All Cities]'; SELECT FROM HOLEFOODS WHERE Outlet.@City",
"City", Outlet.CurrentMember.Properties("NAME")) ON 0,
Outlet.City.Members on 1 FROM HOLEFOODS
```

|             | NAME  |
|-------------|-------|
| 1 Amsterdam | 1,633 |
| 2 Antwerp   | 421   |
| 3 Atlanta   | 3,331 |
| 4 Bangalore | 3,786 |
| ...         |       |

In this case, the subquery is as follows:

```
WITH %PARM City AS 'value:[All Cities]' SELECT FROM HOLEFOODS WHERE Outlet.@City
```

The following examples show the effect of the %CONTEXT parameter. First, the following query uses %MDX without %CONTEXT:

```
WITH
MEMBER [MEASURES].[PercentOfAllRevenue] AS '100 * MEASURES.[Amount Sold] /
%MDX("SELECT MEASURES.[Amount Sold] ON 0 FROM holefoods")'

SELECT NON EMPTY [Channel].[H1].[Channel Name].Members ON 0,
NON EMPTY [Product].[P1].[Product Category].Members ON 1
FROM [HoleFoods]
WHERE [MEASURES].[PERCENTOFALLREVENUE]
```

|             | No Channel | Online | Retail |
|-------------|------------|--------|--------|
| 1 Candy     | 0.28       | 0.83   | 0.61   |
| 2 Cereal    | 0.11       | 0.58   | 0.39   |
| 3 Dairy     | 0.23       | 2.43   | 1.01   |
| 4 Fruit     | 1.04       | 7.55   | 3.76   |
| 5 Pasta     | 0.79       | 7.19   | 4.14   |
| 6 Seafood   | 3.60       | 22.23  | 10.41  |
| 7 Snack     | 2.58       | 10.84  | 7.28   |
| 8 Vegetable | 1.42       | 6.63   | 4.05   |

The calculated member [MEASURES].[PercentOfAllRevenue] computes the Amount Sold measure for the current pivot table cell, divided by the aggregate value for that measure across the entire cube. This value is then divided by 100, so the values displayed in the results add up to 100.

In contrast, consider the results when we use %CONTEXT as "rows":

```
WITH
MEMBER [MEASURES].[PercentOfRows] AS '100 * MEASURES.[Amount Sold] /
%MDX("SELECT MEASURES.[Amount Sold] ON 0 FROM holefoods", "%CONTEXT", "rows")'

SELECT NON EMPTY [Channel].[H1].[Channel Name].Members ON 0,
NON EMPTY [Product].[P1].[Product Category].Members ON 1
FROM [HoleFoods]
WHERE [MEASURES].[PercentOfRows]
```

|             | No Channel | Online | Retail |
|-------------|------------|--------|--------|
| 1 Candy     | 16.08      | 48.30  | 35.62  |
| 2 Cereal    | 10.29      | 53.69  | 36.02  |
| 3 Dairy     | 6.38       | 66.15  | 27.48  |
| 4 Fruit     | 8.41       | 61.14  | 30.45  |
| 5 Pasta     | 6.49       | 59.33  | 34.18  |
| 6 Seafood   | 9.93       | 61.34  | 28.73  |
| 7 Snack     | 12.46      | 52.38  | 35.16  |
| 8 Vegetable | 11.72      | 54.77  | 33.51  |

In this case, the %MDX subquery uses the row context. As a result, the numbers in each row add up to 100.

Now consider the results when we use %CONTEXT as "columns":

```
WITH
MEMBER [MEASURES].[PercentOfCols] AS '100 * MEASURES.[Amount Sold] /
%MDX("SELECT MEASURES.[Amount Sold] ON 0 FROM holefoods", "%CONTEXT", "columns")'

SELECT NON EMPTY [Channel].[H1].[Channel Name].Members ON 0,
NON EMPTY [Product].[P1].[Product Category].Members ON 1
FROM [HoleFoods]
WHERE [MEASURES].[PercentOfCols]
```

|             | No Channel | Online | Retail |
|-------------|------------|--------|--------|
| 1 Candy     | 2.76       | 1.43   | 1.94   |
| 2 Cereal    | 1.10       | 0.99   | 1.22   |
| 3 Dairy     | 2.34       | 4.18   | 3.19   |
| 4 Fruit     | 10.35      | 12.96  | 11.88  |
| 5 Pasta     | 7.83       | 12.34  | 13.08  |
| 6 Seafood   | 35.83      | 38.14  | 32.89  |
| 7 Snack     | 25.67      | 18.60  | 22.99  |
| 8 Vegetable | 14.12      | 11.37  | 12.80  |

In this case, the numbers in each column add up to 100.

## See Also

- [%KPI](#)

## %NOT (MDX)

Enables you to exclude a single member of a given level. This function is an InterSystems extension to MDX.

### Returned Type

This function returns a [member](#).

### Syntax and Details

`member_expression.%NOT`

Where:

- member\_expression* is a [member identifier](#). (Note that you cannot use a general member expression.)

This function enables you to exclude the given member.

### Example

Often it is necessary for the WHERE clause to exclude a single member. For example, first consider the following query, which uses [EXCEPT](#):

```
SELECT aged.[age bucket].MEMBERS ON 1 FROM patients WHERE EXCEPT(aged.[age group].MEMBERS,aged.[age group].[0 to 29])
```

|   |          |     |
|---|----------|-----|
| 1 | 0 to 9   | *   |
| 2 | 10 to 19 | *   |
| 3 | 20 to 29 | *   |
| 4 | 30 to 39 | 166 |
| 5 | 40 to 49 | 139 |
| 6 | 50 to 59 | 106 |
| 7 | 60 to 69 | 86  |
| 8 | 70 to 79 | 62  |
| 9 | 80+      | 41  |

You can use the %NOT function to rewrite the previous query as follows:

```
SELECT aged.[age bucket].MEMBERS ON 1 FROM patients WHERE aged.[age group].[0 to 29].%NOT
```

|   |          |     |
|---|----------|-----|
| 1 | 0 to 9   | *   |
| 2 | 10 to 19 | *   |
| 3 | 20 to 29 | *   |
| 4 | 30 to 39 | 166 |
| 5 | 40 to 49 | 139 |
| 6 | 50 to 59 | 106 |
| 7 | 60 to 69 | 86  |
| 8 | 70 to 79 | 62  |
| 9 | 80+      | 41  |

If you use this function on the column or row axis, you can see that it returns a member:

```
SELECT aged.[age group].[0 to 29].%NOT ON 1 FROM patients
```

|             |     |
|-------------|-----|
| Not 0 to 29 | 600 |
|-------------|-----|

As you can see the name of the member is NOT followed by the name of the excluded member.

The %NOT function provides several advantages:

- The system does not need to materialize all the members of the level.
- The negation occurs in an earlier part of the processing for greater efficiency.
- %NOT returns a single member which can be combined (internally) with other filters to form simple tuple expressions.

## See Also

- [EXCEPT](#)

## %OR (MDX)

Enables you to combine multiple members into a single member, for efficiency and to avoid double-counting. This function is an InterSystems extension to MDX.

### Returned Type

This function returns a [member](#). The name of the member is the name of the member, followed by +Others.

### Syntax and Details

```
%OR(set_expression)
```

Where:

- set\_expression* is an expression that evaluates to a [set](#) of members or tuples. This expression must be enclosed in curly braces.

This function enables you to combine the given members or tuples into a single unit.

### Example

Often it is necessary for the WHERE clause to contain a set of multiple members. For example:

```
SELECT gend.MEMBERS ON 1 FROM patients WHERE {allerd.[ant bites],allerd.soy,allerd.wheat}
```

|          |    |
|----------|----|
| 1 Female | 56 |
| 2 Male   | 59 |

This query construction, however, means that the system evaluates the query results multiple times (once for each item in the WHERE clause) and then combines them. This can be undesirably slow and can double-count items. (In this example, a given patient can be counted as many as three times, once for each allergy in the WHERE clause.)

With the %OR function, you can rewrite the query as follows:

```
SELECT gend.MEMBERS ON 1 FROM patients WHERE %OR({allerd.[ant bites],allerd.soy,allerd.wheat})
```

|          |    |
|----------|----|
| 1 Female | 55 |
| 2 Male   | 57 |

Note the numbers are lower, because this query does not double-count any patients.

You can use %OR with a set that contains members of different levels (or even that contains tuples). For example:

```
SELECT NON EMPTY [Measures].[%COUNT] ON 0 FROM [Patients]
WHERE %OR({[AgeD].[H1].[Age Bucket].&[80+],[DiagD].[H1].[Diagnoses].&[CHD]})

Patient Count
71
```

If you use this function on the column or row axis, you can see that it returns a member:

```
SELECT %OR({allerd.[ant bites],allerd.soy,allerd.wheat}) ON 1 FROM patients

ant bites+Others 112
```

The %OR function provides several advantages:

- The members of the set are treated as one unit.
- The combination of members occurs in an earlier part of the processing for greater efficiency.



- %OR returns a single member which can be combined (internally) with other filters to form simple tuple expressions.

Also see examples in [Defining Calculated Members](#).

## %SEARCH (MDX)

---

Returns a measure search expression that you can use with the WHERE and %FILTER clauses.

### Returned Type

See the section [Measure Search Expressions](#) in [Expression Types](#).

# %SPACE (MDX)

Inserts a blank row or column with no label. This function is an InterSystems extension to MDX.

## Returned Type

This function returns an empty string.

## Syntax and Details

`%SPACE( )`

## Example

```
SELECT {allerd.MEMBERS,%SPACE(),allersevd.MEMBERS} ON 1 FROM patients
```

|                          |       |
|--------------------------|-------|
| 1 No Data Available      | 3,962 |
| 2 additive/coloring agen | 423   |
| 3 animal dander          | 428   |
| 4 ant bites              | 457   |
| 5 bee stings             | 407   |
| 6 dairy products         | 460   |
| 7 dust mites             | 422   |
| 8 eggs                   | 419   |
| 9 fish                   | 429   |
| 10 mold                  | 438   |
| 11 nil known allergies   | 1,382 |
| 12 peanuts               | 441   |
| 13 pollen                | 424   |
| 14 shellfish             | 431   |
| 15 soy                   | 455   |
| 16 tree nuts             | 452   |
| 17 wheat                 | 419   |
| 18                       |       |
| 19 Nil known allergies   | 1,382 |
| 20 Minor                 | 1,229 |
| 21 Moderate              | 1,205 |
| 22 Life-threatening      | 1,202 |
| 23 Inactive              | 1,184 |
| 24 Unable to determine   | 1,141 |

## %TERMLIST (MDX)

Enables you to create a set of members based on a term list. When used with the [%OR](#) function, %TERMLIST is particularly useful for filtering. This function is an InterSystems extension to MDX.

### Returned Type

This function returns a [set](#).

### Syntax and Details

```
%TERMLIST(term_list_name, flag)
```

Where:

- term\_list\_name* is a [string expression](#) that evaluates to the name of a term list.
- flag*, which is optional, is either "EXCLUDE" or "INCLUDE" (the default).

This function returns a set that, by default, consists of members that are identified by the key values in the term list, in combination with the *term list pattern*. The term list pattern indicates the level to which the members belong, and indicates how to create the full identifiers for the members.

If you specify *flag* as "EXCLUDE", the set instead consists of all members of the given level except for the ones identified in the term list.

For information on defining term lists, see [Defining Term Lists](#).

### Example

For example, suppose that for HoleFoods, we have a term list named MyCities that is defined as follows:

| Terms    |          |
|----------|----------|
| key      | value    |
| Atlanta  | Atlanta  |
| Boston   | Boston   |
| New York | New York |

Suppose that this term list has the following **Pattern** expression:

```
[Outlet].[H1].[City].[*]
```

Then for this term list, the %TERMLIST function returns a set that consists of the Atlanta, Boston, and New York members of the City level. That is, the following two expressions are equivalent:

```
%TERMLIST("MyCities")
```

And:

```
{[Outlet].[H1].[City].[Atlanta],[Outlet].[H1].[City].[Boston],[Outlet].[H1].[City].[New York]}
```

When used with the [%OR](#) function, %TERMLIST is particularly useful for filtering. For example:

```
SELECT FROM holefoods %FILTER %OR(%TERMLIST("MyCities"))
```

## See Also

- [%LOOKUP](#) (which contains [Comparison with Other Term List Functions](#))
- [LOOKUP](#)
- [%OR](#)

## %TIMERANGE (MDX)

---

Enables you to define a range of time members, possibly open-ended. This function is an InterSystems extension to MDX.

### Returned Type

This function returns a [member](#).

### Syntax and Details

```
%TIMERANGE(start_member, end_member, keyword)
```

Where:

- *start\_member* is an optional [expression that evaluates to a member](#) of a time level. If you omit this, the system uses the earliest member of this level.
- *end\_member* is an optional [expression that evaluates to a member](#) of a time level. If you omit this, the system uses the latest member of this level.
- *keyword* is optional and is either INCLUSIVE or EXCLUSIVE

The default is INCLUSIVE.

You must specify *start\_member*, *end\_member*, or both.

### Example

The following example uses both *start\_member* and *end\_member*:

```
SELECT NON EMPTY DateOfSale.YearSold.MEMBERS ON 1 FROM holefoods
WHERE %TIMERANGE(DateOfSale.YearSold.&[2009],DateOfSale.YearSold.&[2011])
```

|        |     |
|--------|-----|
| 1 2009 | 179 |
| 2 2010 | 203 |
| 3 2011 | 224 |

The next example shows an open-ended range:

```
SELECT NON EMPTY DateOfSale.YearSold.MEMBERS ON 1 FROM holefoods
WHERE %TIMERANGE(DateOfSale.YearSold.&[2009])
```

|        |     |
|--------|-----|
| 1 2009 | 179 |
| 2 2010 | 203 |
| 3 2011 | 224 |
| 4 2012 | 114 |

The next example shows another open-ended range, this time using the EXCLUSIVE keyword:

```
SELECT NON EMPTY DateOfSale.YearSold.MEMBERS ON 1 FROM holefoods
WHERE %TIMERANGE(,DateOfSale.YearSold.&[2009],EXCLUSIVE)
```

|        |     |
|--------|-----|
| 1 2007 | 124 |
| 2 2008 | 156 |

# %TIMEWINDOW (MDX)

Returns a set of members of a time dimension that match the given range template.

## Returned Type

This function returns a [set](#) of [members](#).

## Syntax and Details

```
%TIMEWINDOW(periodSet,rangeTemplateStart)
```

Or:

```
%TIMEWINDOW(periodSet,rangeTemplateStart,rangeTemplateEnd)
```

Where:

- *periodSet* is a [set](#) of [members](#) of a time level.
- *rangeTemplateStart* is a [member](#) of a time level within the same hierarchy, at a lower level than *periodSet*.
- *rangeTemplateEnd* is another [member](#) of a time level within the same hierarchy, at a lower level than *periodSet*. If specified, *rangeTemplateEnd* must fall within the same period as *rangeTemplateStart* (for example, these two members must belong to the same year or to the same month).

The default for *rangeTemplateEnd* is *rangeTemplateStart*.

The system generates the set of members from *rangeTemplateStart* to *rangeTemplateEnd* and then uses that as a template to specify a time window. For example, if *rangeTemplateStart* is January 2000, and *rangeTemplateEnd* is June 2000, the time window consists of the dates from 1 January to 30 June of any given year.

Then the function examines each member of the given *periodSet* and, for each, returns the child members that fall within the given time window.

This function is intended for use within the WHERE clause or the %FILTER clause. It includes optimizations to return members of higher time levels where possible, so that large numbers of members are not returned.

## Example

First, the following query uses %TIMEWINDOW as rows. This query examines birth years and for each one, selects only the patients born between 1 January and 5 January, inclusive:

```
SELECT NON EMPTY %TIMEWINDOW(birthd.year.MEMBERS,birthd.[jan 01 1924],birthd.[jan 05 1924]) ON 1
FROM patients
```

|     |            |   |
|-----|------------|---|
| 1   | Jan 4 1918 | 1 |
| 2   | Jan 3 1934 | 1 |
| 3   | Jan 3 1937 | 1 |
| 4   | Jan 4 1937 | 1 |
| 5   | Jan 2 1938 | 1 |
| 6   | Jan 1 1940 | 1 |
| 7   | Jan 1 1941 | 1 |
| 8   | Jan 4 1947 | 1 |
| 9   | Jan 5 1947 | 1 |
| 10  | Jan 2 1949 | 1 |
| 11  | Jan 1 1953 | 1 |
| ... |            |   |

In this example, the range template arbitrarily refers to dates in the year 1924; any year could be used instead.

As noted earlier, this function is primarily meant for use in filtering. The following query simply selects all patients born between 1 January and 5 January of any given year:

```
SELECT MEASURES.[%COUNT] ON 0 FROM patients
WHERE %TIMEWINDOW(birthd.year.MEMBERS,birthd.[jan 01 1924],birthd.[jan05 1924])
 Patient Count
 806
```

The following query uses the same filter but displays patients grouped by birth years:

```
SELECT MEASURES.[%COUNT] ON 0, NON EMPTY birthd.year.MEMBERS on 1
FROM patients
WHERE %TIMEWINDOW(birthd.year.MEMBERS,birthd.[jan 01 1924],birthd.[jan05 1924])

 Patient Count
1 1918 1
2 1934 1
3 1937 2
4 1938 1
5 1940 1
6 1941 1
7 1947 2
8 1949 1
9 1953 1
...
```

To make the result more understandable, the following query uses [%LABEL](#) to apply a better caption:

```
SELECT %LABEL(MEASURES.[%COUNT],"Born Jan 1-5") ON 0, NON EMPTY birthd.year.MEMBERS on 1
FROM patients
WHERE %TIMEWINDOW(birthd.year.MEMBERS,birthd.[jan 01 1924],birthd.[jan 05 1924])

 Born Jan 1-5
1 1918 1
2 1934 1
3 1937 2
4 1938 1
5 1940 1
6 1941 1
7 1947 2
8 1949 1
9 1953 1
...
```



# %TOPMEMBERS (MDX)

Returns a set of all members of the first level in the given hierarchy. Or, given a level, it returns a set of all the members of that level. This function is an InterSystems extension to MDX.

## Returned Type

This function returns a [set](#) of [members](#).

## Syntax and Details

`level_expression.%TOPMEMBERS`

Or:

`hierarchy_expression.%TOPMEMBERS`

Or:

`dimension_expression.%TOPMEMBERS`

Where:

- *level\_expression* is an [expression that returns a level](#). For example:  
`[dimension_name].[hierarchy_name].[level_name]`
- *hierarchy\_expression* is an [expression that returns a hierarchy](#). For example:  
`[dimension_name].[hierarchy_name]`
- *dimension\_expression* is a dimension name, included within square brackets if needed (see [Identifiers](#)). For example:  
`[dimension_name]`

The system interprets this as a reference to the first visible hierarchy within the given dimension.

Given a level name, this function is equivalent to the [MEMBERS](#) function.

Given a hierarchy name, this function returns a set that consists of the members of the first level defined in that hierarchy.

Given a dimension name, this function returns a set that consists of the members of the first level defined in the first visible hierarchy of this dimension.

The Analyzer uses this function when you drag and drop a dimension into the **Rows** or **Columns**. Specifically, when you drag and drop a dimension, the Analyzer uses the expression `[dimension_name].[hierarchy_name].%TOPMEMBERS`, where *hierarchy\_name* is the first hierarchy defined in the dimension.

## Example

For example, consider the following cube contents:

```
BirthD
 H1
 Decade
 Year
 Period
 Date
```

The following query uses the %TOPMEMBERS function with H1 hierarchy (the only hierarchy in this case), so it retrieves all members of the Decade level:

```
SELECT birthd.%TOPMEMBERS ON 1 FROM patients
 All Patients
1 1910s 71
2 1920s 223
3 1930s 572
4 1940s 683
5 1950s 1,030
6 1960s 1,500
7 1970s 1,520
8 1980s 1,400
9 1990s 1,413
10 2000s 1,433
11 2010s 155
```

## See Also

- [MEMBERS](#)

# AGGREGATE (MDX)

Returns the aggregate value for a given measure (or of the current measure), across all elements of a set, according to the aggregation logic of the measure.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
AGGREGATE(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set of members or tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES].[*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The function evaluates the numeric value for each element of the set and returns the aggregate value of those values.

## Example

First, the following query shows values of three measures for the members of the aged.decade level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
birthd.decade.MEMBERS ON 1 FROM patients
```

|          | Patient Count | Encounter Count | Avg Test Score |
|----------|---------------|-----------------|----------------|
| 1 1910s  | 80            | 5,359           | 75.17          |
| 2 1920s  | 227           | 12,910          | 74.20          |
| 3 1930s  | 567           | 33,211          | 74.67          |
| 4 1940s  | 724           | 38,420          | 73.39          |
| 5 1950s  | 1,079         | 46,883          | 73.72          |
| 6 1960s  | 1,475         | 57,814          | 74.16          |
| 7 1970s  | 1,549         | 49,794          | 74.35          |
| 8 1980s  | 1,333         | 35,919          | 74.13          |
| 9 1990s  | 1,426         | 29,219          | 74.79          |
| 10 2000s | 1,406         | 20,072          | 74.95          |
| 11 2010s | 134           | 1,346           | 73.55          |

Next, the following query uses AGGREGATE to find the aggregated values for these measures, across this set of members:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
AGGREGATE(birthd.decade.MEMBERS) ON 1 FROM patients
```

|           | Patient Count | Encounter Count | Avg Test Score |
|-----------|---------------|-----------------|----------------|
| AGGREGATE | 10,000        | 330,947         | 74.28          |

The following query uses the second argument of the AGGREGATE function:

```
SELECT AGGREGATE(birthd.decade.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
 AGGREGATE
 10,000
```

For additional, similar examples, see [AVG](#). Also see examples in [Defining Calculated Members](#).

## See Also

- [AVG](#)

- [MAX](#)
- [MEDIAN](#)
- [MIN](#)
- [PERCENTILE](#)
- [PERCENTILERANK](#)
- [STDDEV](#)
- [STDDEVP](#)
- [SUM](#)
- [VAR](#)
- [VARP](#)

# ALLMEMBERS (MDX)

Returns a set of all members of the given level or hierarchy. Or returns a set of all members of the first hierarchy of a dimension. In either case, any calculated members are also returned.

## Returned Type

This function returns a [set](#) of [members](#).

## Syntax and Details

`level_expression.ALLMEMBERS`

Or:

`hierarchy_expression.ALLMEMBERS`

Or:

`dimension_expression.ALLMEMBERS`

Where:

- *level\_expression* is an [expression that returns a level](#). For example:  
`[dimension_name].[hierarchy_name].[level_name]`
- *hierarchy\_expression* is an [expression that returns a hierarchy](#). For example:  
`[dimension_name].[hierarchy_name]`
- *dimension\_expression* is a dimension name, included within square brackets if needed (see [Identifiers](#)). For example:  
`[dimension_name]`

The system interprets this as a reference to the first visible hierarchy within the given dimension.

Given a level expression, this function returns a set that consists of the members of that level. The members are in the order specified in the level definition in the cube.

Given a hierarchy expression, this function returns a set that consists of the members of all levels in that hierarchy, including the All member, if defined. The members are returned in hierarchical order.

Given a dimension name, this function returns a set that consists of the members of all levels in the first visible hierarchy of that dimension.

In any case, any calculated members are also returned (in contrast to the [MEMBERS](#) function).

For information on hierarchical order, see the [HIERARCHIZE](#) function.

## Example

The following query displays all members of the Home Zip level as rows:

```
SELECT MEASURES.[%COUNT] ON 0, homed.zip.ALLMEMBERS ON 1 FROM patients
```

|         | Patient | Count |
|---------|---------|-------|
| 1 32006 |         | 2,272 |
| 2 32007 |         | 1,111 |
| 3 34577 |         | 3,399 |
| 4 36711 |         | 1,069 |
| 5 38928 |         | 2,149 |

The following query displays all members of all levels in the Home . H1 hierarchy as rows:

```
SELECT MEASURES.[%COUNT] ON 0, homed.h1.ALLMEMBERS ON 1 FROM patients
```

|    | Patient     | Count |
|----|-------------|-------|
| 1  | 32006       | 2,272 |
| 2  | Juniper     | 1,155 |
| 3  | Spruce      | 1,117 |
| 4  | 32007       | 1,111 |
| 5  | Redwood     | 1,111 |
| 6  | 34577       | 3,399 |
| 7  | Cypress     | 1,150 |
| 8  | Magnolia    | 1,111 |
| 9  | Pine        | 1,138 |
| 10 | 36711       | 1,069 |
| 11 | Centerville | 1,069 |
| 12 | 38928       | 2,149 |
| 13 | Cedar Falls | 1,045 |
| 14 | Elm Heights | 1,104 |

The following query shows all measures, each aggregated across the cube:

```
SELECT MEASURES.ALLMEMBERS ON 1, gend.gender.MEMBERS on 0 FROM patients
```

|                     | Female  | Male    |
|---------------------|---------|---------|
| 1 Patient Count     | 5,067   | 4,933   |
| 2 Age               | 187,139 | 170,117 |
| 3 Avg Age           | 36.93   | 34.49   |
| 4 Allergy Count     | 3,067   | 3,131   |
| 5 Avg Allergy Count | 1.02    | 1.04    |
| 6 Encounter Count   | 169,164 | 158,183 |
| 7 Avg Encounter Cou | 33.39   | 32.07   |
| 8 Test Score        | 302,267 | 298,818 |
| 9 Avg Test Score    | 74.78   | 74.46   |

## See Also

- [MEMBERS](#)

# ANCESTOR (MDX)

Returns the ancestor of the given member, within the given level.

## Returned Type

This function returns a [member](#).

## Syntax and Details

```
ANCESTOR(member_expression, ancestor_level)
```

Where:

- member\_expression* is an [expression that returns a member](#).  
This expression cannot refer to a measure.
- ancestor\_level* is an [expression that returns a level](#). For example:

```
[dimension_name].[hierarchy_name].[level_name]
```

This level must be the parent level of *member\_expression* or an ancestor of that member.

This function returns the ancestor of the given member, within the given level.

## Example

The following query displays the year that is the ancestor of March 24, 1943:

```
SELECT MEASURES.[%COUNT] ON 0, ANCESTOR(birthd.[Mar 24 1943],birthd.year) ON 1 FROM patients

Patient Count
1943 76
```

In contrast, the following query displays the period that is the ancestor of March 24, 1943:

```
SELECT MEASURES.[%COUNT] ON 0, ANCESTOR(birthd.[Mar 24 1943],birthd.period) ON 1 FROM patients

Patient Count
Mar-1943 5
```

## See Also

- [CHILDREN](#)
- [CLOSINGPERIOD](#)
- [COUSIN](#)
- [DESCENDANTS](#)
- [OPENINGPERIOD](#)
- [PARENT](#)
- [PERIODSTODATE](#)

## AVG (MDX)

Returns the average value of a given expression (or of the current measure), across all elements of a set that have a non-null value for that expression.

### Returned Type

This function returns a [number](#).

### Syntax and Details

```
AVG(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES].[*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The function evaluates the numeric value for each element of the set, ignores any elements for which this value is null, and computes the average value for the remaining elements.

If you want to include the null elements in the average, use an expression for *optional\_numeric\_expression* that replaces null values with zero values.

If the numeric value is null for all elements, the function returns null.

### Example

First, the following query shows values of three measures for the members of the aged.decade level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
birthd.decade.MEMBERS ON 1 FROM patients
```

|          | Patient Count | Encounter Count | Avg Test Score |
|----------|---------------|-----------------|----------------|
| 1 1910s  | 80            | 5,359           | 75.17          |
| 2 1920s  | 227           | 12,910          | 74.20          |
| 3 1930s  | 567           | 33,211          | 74.67          |
| 4 1940s  | 724           | 38,420          | 73.39          |
| 5 1950s  | 1,079         | 46,883          | 73.72          |
| 6 1960s  | 1,475         | 57,814          | 74.16          |
| 7 1970s  | 1,549         | 49,794          | 74.35          |
| 8 1980s  | 1,333         | 35,919          | 74.13          |
| 9 1990s  | 1,426         | 29,219          | 74.79          |
| 10 2000s | 1,406         | 20,072          | 74.95          |
| 11 2010s | 134           | 1,346           | 73.55          |

Next, the following query shows the average values for these measures for the members of this level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
AVG(birthd.decade.MEMBERS) ON 1 FROM patients
```

|     | Patient Count | Encounter Count | Avg Test Score |
|-----|---------------|-----------------|----------------|
| AVG | 909.09        | 30,086.09       | 74.28          |

Here, each value is the average of the values in a column in the preceding query. For example, the Patient Count value is the average of the Patient Count values in the preceding query.



For another example, we use the second argument for AVG:

```
SELECT AVG(birthd.decade.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
 AVG
 909.09
```

The following example uses AVG in a query that does not specify a measure:

```
SELECT AVG(birthd.decade.MEMBERS) ON 0 FROM patients
 AVG
 909.09
```

In this case, the function uses %COUNT, which counts records in the fact table.

Finally, the following example uses AVG in a query that specifies a measure in the WHERE clause:

```
SELECT AVG(birthd.decade.MEMBERS) ON 0 FROM patients WHERE MEASURES.[encounter count]
 AVG
 30,086.09
```

In this case, the function uses the measure specified in the WHERE clause.

## See Also

- [AGGREGATE](#)
- [MAX](#)
- [MEDIAN](#)
- [MIN](#)
- [STDDEV](#)
- [STDDEVP](#)
- [SUM](#)
- [VAR](#)
- [VARP](#)

# BOTTOMCOUNT (MDX)

Sorts a set and returns a subset from its lower-valued end, given a desired element count.

## Returned Type

This function returns a [set](#) of [members](#) or [tuples](#), depending on the set used.

## Syntax and Details

```
BOTTOMCOUNT(set_expression, element_count, optional_ordering_expression)
```

Where:

- *set\_expression* is an [expression that evaluates to a set](#) of [members](#) or [tuples](#).
- *element\_count* is an integer literal.

The function uses this argument to determine the number of elements to return in the subset. If this argument is greater than the number of elements, all elements are returned.

- *optional\_ordering\_expression* is a [numeric-valued expression](#) that determines the order of the set elements.

Typically, this expression has the form [MEASURES] . [*measure\_name*]

The function evaluates this expression for each element of the set and sorts the elements of the set in ascending order according to this value. Any hierarchies are ignored.

If this argument is omitted, the function uses the current order of the set elements (and this function behaves like the [TAIL](#) function).

## Example

First consider the following query and the results it returns:

```
SELECT MEASURES.[%COUNT] ON 0,
BOTTOMCOUNT(birthd.decade.MEMBERS, 100, MEASURES.[%COUNT]) ON 1
FROM patients
```

|          | Patient Count |
|----------|---------------|
| 1 1910s  | 71            |
| 2 2010s  | 155           |
| 3 1920s  | 223           |
| 4 1930s  | 572           |
| 5 1940s  | 683           |
| 6 1950s  | 1,030         |
| 7 1980s  | 1,400         |
| 8 1990s  | 1,413         |
| 9 2000s  | 1,433         |
| 10 1960s | 1,500         |
| 11 1970s | 1,520         |

Because *count\_expression* is greater than the number of members, all members are returned. The members are sorted in ascending order according to the value of the %COUNT measure.

Next, consider a similar query, using *count\_expression* equal to 3:

```
SELECT MEASURES.[%COUNT] ON 0,
BOTTOMCOUNT(birthd.decade.MEMBERS, 3, MEASURES.[%COUNT]) ON 1
FROM patients
```

|         | Patient Count |
|---------|---------------|
| 1 1910s | 71            |
| 2 2010s | 155           |
| 3 1920s | 223           |

This query selects three members from the lower-valued end of the set.

## See Also

- [TOPCOUNT](#)

# BOTTOMPERCENT (MDX)

Sorts a set and returns a subset from its lower-valued end, given a cutoff percentage that is applied to a total across members.

## Returned Type

This function returns a [set](#) of [members](#) or [tuples](#), depending on the set used.

## Syntax and Details

```
BOTTOMPERCENT(set_expression, percentage, ordering_expression)
```

- set\_expression* is [an expression that evaluates to a set](#) of [members](#) or [tuples](#).
- percentage* is a numeric literal equal to or less than 100. For example, 15 represents 15 percent.

The function uses this argument to determine the cutoff point for elements to return in the subset.

There is usually a member that straddles the cutoff point; this member is assigned to the upper set, rather than the lower set. As a result, in the returned subset, the cumulative total for *ordering\_expression* could be less than *percentage*, as a percentage of the entire set.

- ordering\_expression* is [a numeric-valued expression](#) that determines the order of the set members.

The function evaluates this expression for each element of the set and sorts the elements of the set in ascending order according to this value. Any hierarchies are ignored.

## Example

First consider the following query and the results it returns:

```
SELECT MEASURES.[%COUNT] ON 0,
BOTTOMPERCENT(birthd.decade.MEMBERS, 100, MEASURES.[%COUNT]) ON 1 FROM patients
```

|    |       | Patient Count |
|----|-------|---------------|
| 1  | 1910s | 6             |
| 2  | 1920s | 13            |
| 3  | 2010s | 44            |
| 4  | 1940s | 54            |
| 5  | 1930s | 56            |
| 6  | 1950s | 107           |
| 7  | 1970s | 128           |
| 8  | 1960s | 136           |
| 9  | 1990s | 144           |
| 10 | 1980s | 155           |
| 11 | 2000s | 157           |

Because *percentage* is 100, all members are returned.

Now consider a variation of the preceding, in which *percentage* is 50, so that we see the bottom 50 percent:

```
SELECT MEASURES.[%COUNT] ON 0, BOTTOMPERCENT(birthd.decade.MEMBERS, 50, MEASURES.[%COUNT]) ON 1 FROM patients
```

|   |       | Patient Count |
|---|-------|---------------|
| 1 | 1910s | 6             |
| 2 | 1920s | 13            |
| 3 | 2010s | 44            |
| 4 | 1940s | 54            |
| 5 | 1930s | 56            |
| 6 | 1950s | 107           |
| 7 | 1970s | 128           |

The total for the %COUNT measure for these members is slightly less than the specified threshold (50% of the total).

## See Also

- [TOPPERCENT](#)

# BOTTOMSUM (MDX)

Sorts a set and returns a subset from its lower-valued end, given a cutoff value that is applied to a total across elements.

## Returned Type

This function returns a [set](#) of [members](#) or [tuples](#), depending on the set used.

## Syntax and Details

```
BOTTOMSUM(set_expression, cutoff_value, ordering_expression)
```

- *set\_expression* is [an expression that evaluates to a set of members or tuples](#).
- *cutoff\_value* is a numeric literal.

The function uses this argument to determine the cutoff value for elements to return in the subset.

For all elements in the returned subset, the sum of the values of *ordering\_expression* will be less than or equal to *cutoff\_value*.

- *ordering\_expression* is [a numeric-valued expression](#) that determines the order of the set elements.

The function evaluates this expression for each element of the set and sorts the elements of the set in ascending order according to this value. Any hierarchies are ignored.

## Example

First consider an example in which the cutoff value is high enough to include all members:

```
SELECT MEASURES.[%COUNT] ON 0,
BOTTOMSUM(birthd.decade.MEMBERS, 10000, MEASURES.[%COUNT]) ON 1 FROM patients
```

|          | Patient Count |
|----------|---------------|
| 1 1910s  | 71            |
| 2 2010s  | 155           |
| 3 1920s  | 223           |
| 4 1930s  | 572           |
| 5 1940s  | 683           |
| 6 1950s  | 1,030         |
| 7 1980s  | 1,400         |
| 8 1990s  | 1,413         |
| 9 2000s  | 1,433         |
| 10 1960s | 1,500         |
| 11 1970s | 1,520         |

Now consider a variation in which the cutoff value is set to 2500:

```
SELECT MEASURES.[%COUNT] ON 0,
BOTTOMSUM(birthd.decade.MEMBERS, 2500, MEASURES.[%COUNT]) ON 1 FROM patients
```

|         | Patient Count |
|---------|---------------|
| 1 1910s | 71            |
| 2 2010s | 155           |
| 3 1920s | 223           |
| 4 1930s | 572           |
| 5 1940s | 683           |

## See Also

- [TOPSUM](#)

# CHILDREN (MDX)

Returns a set that contains the children, if any, of a specified member.

## Returned Type

This function returns a [set](#) of [members](#).

## Syntax and Details

`member_expression.CHILDREN`

Where:

- member\_expression* is [an expression that returns a member](#).

This expression cannot refer to a measure.

If the specified member has no children, this function returns an empty set.

## Example

For example:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.[1960s].CHILDREN ON 1 FROM patients
 Patient Count
1 1960 105
2 1961 153
3 1962 144
4 1963 153
5 1964 136
6 1965 149
7 1966 187
8 1967 159
9 1968 169
10 1969 145
```

## See Also

- [ANCESTOR](#)
- [COUSIN](#)
- [DESCENDANTS](#)
- [FIRSTCHILD](#)
- [FIRSTSIBLING](#)
- [LASTCHILD](#)
- [LASTSIBLING](#)
- [PARENT](#)
- [SIBLINGS](#)

## CLOSINGPERIOD (MDX)

---

Returns the last descendent member of the given level, at the same level as the given member. This function is intended primarily for use with time levels.

### Returned Type

This function returns a [member](#).

### Syntax and Details

```
CLOSINGPERIOD(ancestor_level,member_expression)
```

Where:

- ancestor\_level* is an [expression that returns a level](#). For example:

```
[dimension_name].[hierarchy_name].[level_name]
```

This level must be the parent level of *member\_expression* or an ancestor of that member.

- member\_expression* is an [expression that returns a member](#).

This expression cannot refer to a measure.

Given a level and a member, this function returns the last member that is a descendent of the given level *and* that is at the same level as member.

### Example

The following query displays the closing quarter for the year that includes Q3 2003:

```
SELECT MEASURES.[%COUNT] ON 0, CLOSINGPERIOD (birthd.year,birthd.[Q3 2003]) ON 1 FROM patients
Patient Count
Q4 2003 40
```

In contrast, the following query displays the closing quarter for the *decade* that includes Q3 2003:

```
SELECT MEASURES.[%COUNT] ON 0, CLOSINGPERIOD (birthd.decade,birthd.[Q3 2003]) ON 1 FROM patients
Patient Count
Q4 2010 36
```

### See Also

- [ANCESTOR](#)
- [COUSIN](#)
- [OPENINGPERIOD](#)
- [PERIODSTODATE](#)



# COUNT (MDX)

Returns the count of elements in the given set.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
COUNT(set_expression)
```

Or:

```
COUNT(set_expression, EXCLUDEEMPTY)
```

- set\_expression* is [an expression that evaluates to a set](#).

By default, COUNT considers any empty elements and counts them along with the non-empty elements. If you use the EXCLUDEEMPTY keyword, this function returns the number of non-empty elements.

## Example

For example, the following query counts the members of the Home City level:

```
SELECT COUNT(homed.city.MEMBERS) ON 0 FROM patients
```

|         |       |
|---------|-------|
| Results | COUNT |
|         | 9     |

The next examples demonstrate the EXCLUDEEMPTY keyword. First, consider the following query:

```
SELECT aged.[age group].MEMBERS ON 0, diagd.MEMBERS ON 1 FROM patients WHERE MEASURES.[%COUNT]
```

|                |         |          |     |
|----------------|---------|----------|-----|
|                | 0 to 29 | 30 to 59 | 60+ |
| 1 None         | 3,839   | 3,615    | 971 |
| 2 asthma       | 308     | 282      | 113 |
| 3 CHD          | 1       | 93       | 229 |
| 4 diabetes     | 30      | 246      | 228 |
| 5 osteoporosis | *       | *        | 200 |

The following query counts the number of members of the Diagnoses level:

```
WITH SET myset AS 'diagd.MEMBERS'
SELECT COUNT(myset) ON 0 FROM patients
```

|              |       |
|--------------|-------|
| All Patients | COUNT |
|              | 5     |

The following query counts the number of members of the Diagnoses level and uses the [WHERE](#) clause to get only patients in the age group 0 to 29:

```
WITH SET myset AS 'diagd.MEMBERS'
SELECT COUNT(myset) ON 0 FROM patients WHERE aged.[0 to 29]
```

|  |       |
|--|-------|
|  | COUNT |
|  | 5     |

As you can see, although the query uses the [WHERE](#) clause, the COUNT function returns the same value as before; this is because COUNT considers empty elements by default.

The next query is a variation of the preceding but uses EXCLUDEEMPTY:

```
WITH SET myset AS 'diagd.MEMBERS' SELECT COUNT(myset,EXCLUDEEMPTY) ON 0 FROM patients WHERE aged.[0 to 29]
COUNT
4
```

For another example, you can use COUNT with a set of scalar items, rather than the more common set of [members](#):

```
WITH SET test AS '{ "item 1", "item 2", 23 }'
SELECT COUNT(test) ON 0 FROM patients
All Patients
COUNT
3
```

# COUSIN (MDX)

Given a reference member and a member of a higher level in the same hierarchy, this function finds the ancestor of the reference member at that higher level, determines the relative position of the reference member to that ancestor, and then returns the descendent of the higher member that has the same relative position. This function is intended primarily for use with time levels.

## Returned Type

This function returns a [member](#).

## Syntax and Details

`COUSIN(member_expression, higher_member_expression)`

Where:

- *member\_expression* is [an expression that returns a member](#).
- *higher\_member\_expression* is [an expression that returns a member](#) that is a member of a higher level in the hierarchy that contains *member\_expression*.

These expressions cannot refer to measures.

This function finds the ancestor of the reference member at the higher level, determines the relative position of the reference member to that ancestor, and then returns the descendent of the higher member that has the same relative position. If no such member is found, this function returns an empty set.

## Example

For example, the following query finds the cousin of March 24, 1943, within the year 1990:

```
SELECT MEASURES.[%COUNT] ON 0, COUSIN(birthd.[Mar 24 1943],birthd.1990) ON 1 FROM patients
```

|             | Patient Count |
|-------------|---------------|
| Mar 24 1990 | 1             |

In contrast, the following query finds the cousin of March 24, 1943, within January 1990:

```
SELECT MEASURES.[%COUNT] ON 0, COUSIN(birthd.[Mar 24 1943],birthd.[jan-1990]) ON 1 FROM patients
```

|             | Patient Count |
|-------------|---------------|
| Jan 24 1990 | *             |

## See Also

- [ANCESTOR](#)
- [CHILDREN](#)
- [DESCENDANTS](#)
- [FIRSTCHILD](#)
- [FIRSTSIBLING](#)
- [LASTCHILD](#)
- [LASTSIBLING](#)
- [PARALLELPERIOD](#)

- [PARENT](#)
- [SIBLINGS](#)

# CROSSJOIN (MDX)

Returns a set of tuples formed by the cross-product of the specified sets.

## Returned Type

This function returns a [set](#) of [tuples](#).

## Syntax and Details

```
CROSSJOIN(set_expression1, set_expression2)
```

Where:

- set\_expression1* and *set\_expression2* are [expressions that evaluate to sets of members](#).

Note that no more than one of these sets can contain measures or expressions that evaluate to numbers. If both sets contain measures or expressions that evaluate to numbers, the analytics engine issues the error `Two measures cannot be crossjoined`.

The function identifies all the members of each set and then generates a set of tuples that combine each member of the first set with each member of the second set.

**Tip:** The keyword phrase `NON EMPTY` is particularly useful with this function. Note that you can use this keyword phrase immediately before any set expression.

## Example

For example:

```
SELECT MEASURES.[%COUNT] ON 0, CROSSJOIN(diagd.MEMBERS, aged.[age group].MEMBERS) ON 1 FROM patients
```

|                           | Patient Count |
|---------------------------|---------------|
| 1 None->0 to 29           | 3,839         |
| 2 None->30 to 59          | 3,615         |
| 3 None->60+               | 971           |
| 4 asthma->0 to 29         | 308           |
| 5 asthma->30 to 59        | 282           |
| 6 asthma->60+             | 113           |
| 7 CHD->0 to 29            | 1             |
| 8 CHD->30 to 59           | 93            |
| 9 CHD->60+                | 229           |
| 10 diabetes->0 to 29      | 30            |
| 11 diabetes->30 to 59     | 246           |
| 12 diabetes->60+          | 228           |
| 13 osteoporosis->0 to 29  | *             |
| 14 osteoporosis->30 to 59 | *             |
| 15 osteoporosis->60+      | 200           |

In contrast, suppose that we add the `NON EMPTY` keyword phrase:

```
SELECT MEASURES.[%COUNT] ON 0, NON EMPTY CROSSJOIN(diagd.MEMBERS, aged.[age group].MEMBERS) ON 1 FROM patients
```

|                       | Patient Count |
|-----------------------|---------------|
| 1 None->0 to 29       | 3,839         |
| 2 None->30 to 59      | 3,615         |
| 3 None->60+           | 971           |
| 4 asthma->0 to 29     | 308           |
| 5 asthma->30 to 59    | 282           |
| 6 asthma->60+         | 113           |
| 7 CHD->0 to 29        | 1             |
| 8 CHD->30 to 59       | 93            |
| 9 CHD->60+            | 229           |
| 10 diabetes->0 to 29  | 30            |
| 11 diabetes->30 to 59 | 246           |
| 12 diabetes->60+      | 228           |
| 13 osteoporosis->60+  | 200           |

For another example:

```
SELECT CROSSJOIN([GenD].[H1].[Gender].Members,
{[Measures].[%COUNT],[Measures].[Avg Age]}) ON 0,[DiagD].[H1].[Diagnoses].Members ON 1
FROM [Patients]
```

|                | Patient Coun | Avg Age | Patient Coun | Avg Age |
|----------------|--------------|---------|--------------|---------|
| 1 None         | 419          | 35.61   | 412          | 32.36   |
| 2 asthma       | 51           | 37.12   | 33           | 27.79   |
| 3 CHD          | 17           | 70.47   | 19           | 62.42   |
| 4 diabetes     | 25           | 63.96   | 21           | 57.67   |
| 5 osteoporosis | 20           | 80.55   | 2            | 74.50   |

## See Also

- [NONEMPTYCROSSJOIN](#)

# CURRENTMEMBER (MDX)

Enables you to refer to a member programmatically within an iteration through the members of a hierarchy.

## Returned Type

This function returns a [member](#).

## Syntax and Details

`hierarchy_expression.CURRENTMEMBER`

`dimension_expression.CURRENTMEMBER`

- *hierarchy\_expression* is an [expression that evaluates to a hierarchy](#).
- *dimension\_expression* is a dimension name, included within square brackets if needed (see [Identifiers](#)). For example:

```
[dimension_name]
```

The system interprets this as a reference to the first visible hierarchy within the given dimension.

You use this function in a context that iterates through a hierarchy. The CURRENTMEMBER function returns the given member, in that context.

In abstract, this function has the same purpose as does **\$this** in ObjectScript.

**Note:** The CURRENTMEMBER function is not supported with the MEASURES dimension. That is, *dimension\_expression* cannot be MEASURES.

## Example

In the following example, cities are used as rows. The data shown in the column is the Principal Export property for each city, retrieved via the [PROPERTIES](#) function.

```
SELECT homed.CURRENTMEMBER.PROPERTIES("Principal Export") ON 0, homed.city.MEMBERS ON 1
FROM patients
```

|               |             |
|---------------|-------------|
|               | Home ZIP    |
| 1 Cedar Falls | iron        |
| 2 Centerville | video games |
| 3 Cypress     | gravel      |
| 4 Elm Heights | lettuce     |
| 5 Juniper     | wheat       |
| 6 Magnolia    | bundt cake  |
| 7 Pine        | spaghetti   |
| 8 Redwood     | peaches     |
| 9 Spruce      | mud         |

The following variation uses the [%LABEL](#) function to provide a better caption for the data column:

```
SELECT %LABEL(homed.CURRENTMEMBER.PROPERTIES("Principal Export"),"Exports") ON 0,
homed.city.MEMBERS ON 1 FROM patients
```

|               |             |
|---------------|-------------|
|               | Export      |
| 1 Cedar Falls | iron        |
| 2 Centerville | video games |
| 3 Cypress     | gravel      |
| 4 Elm Heights | lettuce     |
| 5 Juniper     | wheat       |
| 6 Magnolia    | bundt cake  |
| 7 Pine        | spaghetti   |
| 8 Redwood     | peaches     |
| 9 Spruce      | mud         |

The following query shows both the Principal Export and Population properties of the City level:

```
SELECT {%LABEL(homed.CURRENTMEMBER.PROPERTIES("Principal Export"),"Export"),
%LABEL(homed.CURRENTMEMBER.PROPERTIES("Population"),"Population")} ON 0,
homed.city.MEMBERS ON 1 FROM patients
```

|               | Export      | Population |
|---------------|-------------|------------|
| 1 Cedar Falls | iron        | 90,000     |
| 2 Centerville | video games | 49,000     |
| 3 Cypress     | gravel      | 3,000      |
| 4 Elm Heights | lettuce     | 33,194     |
| 5 Juniper     | wheat       | 10,333     |
| 6 Magnolia    | bundt cake  | 4,503      |
| 7 Pine        | spaghetti   | 15,060     |
| 8 Redwood     | peaches     | 29,192     |
| 9 Spruce      | mud         | 5,900      |



# DESCENDANTS (MDX)

Returns the members that are the descendants of a given member, within the specified level or levels.

## Returned Type

This function returns a [set](#) of [members](#).

## Syntax and Details

```
DESCENDANTS(member_expression, level_expression, OPTIONAL_FLAG)
```

Or:

```
DESCENDANTS(member_expression, level_offset, OPTIONAL_FLAG)
```

- *member\_expression* is an [expression that evaluates to a member](#). In the following discussion, this member is the *target member*.
- *level\_expression* is a [level identifier](#). This must identify a level that is in the same hierarchy as the target member and that is lower in the hierarchy (more granular).

As an alternative, you can specify *level\_offset*, which is an integer that indicates a level relative to the one that contains the target member. For example, use 1 to specify the next lowest level.

In the following discussion, the phrase *target level* refers to the level specified by *level\_expression* or *level\_offset*.

- *OPTIONAL\_FLAG* specifies the level or levels whose members should be returned. This option describes a relationship to the target level. If specified, *OPTIONAL\_FLAG* must be one of the following keywords, which are not case-sensitive:
  - SELF (the default) — Returns *only* descendants that are members of the target level.
  - AFTER — Returns descendants that are members of all levels *below* the target level.
  - BEFORE — Returns all descendants *up to and including* the target member. That is, it returns descendants that are members of all levels *above* the target level, and it also returns the target member.
  - BEFORE\_AND\_AFTER — Returns descendants from both *above* and *below* the target level, but does *not* include members from the target level.
  - SELF\_AND\_AFTER — Returns descendants that are members of the target level, as well as descendants from all levels *below* it.
  - SELF\_AND\_BEFORE — Returns descendants that are members of the target level, descendants that belong to all levels *above* the specified level, and the target member.
  - SELF\_BEFORE\_AFTER — Returns descendants from all levels, *including* the target member.

In this case, the target level does not affect the outcome.

When the function returns members of more than one level, the hierarchy affects the order of the members as follows: A member of a higher level is followed by its children from the next lowest level, followed by the next member of the higher level, and so on. See the example for SELF\_AND\_AFTER.

**Note:** This implementation of DESCENDANTS does not support the optional LEAVES flag.

## Example

For reference, in the Patients cube, the BirthD dimension contains the following levels, from highest to lowest:

- [BirthD].[H1].[Decade]
- [BirthD].[H1].[Year]
- [BirthD].[H1].[Quarter Year] (which represents year plus quarter)
- [BirthD].[H1].[Period] (which represents year plus month)
- [BirthD].[H1].[Date] (which represents year plus month plus day)

The following example gets all the descendants of the year 1990, within the [BirthD].[H1].[Period] level:

```
SELECT DESCENDANTS(birthd.1990,birthd.period) ON 1 FROM patients

1 Jan-1990 *
2 Feb-1990 2
3 Mar-1990 1
4 Apr-1990 1
5 May-1990 1
6 Jun-1990 *
7 Jul-1990 2
8 Aug-1990 2
9 Sep-1990 1
10 Oct-1990 3
11 Nov-1990 1
12 Dec-1990 *
```

This example uses the default for *OPTIONAL\_FLAG* (SELF), so the function returns only descendants of 1990 that are members of the period level.

The following variation uses NON EMPTY and thus filters out periods when no patients were born:

```
SELECT NON EMPTY DESCENDANTS(birthd.1990,birthd.period) ON 1 FROM patients

1 Feb-1990 2
2 Mar-1990 1
3 Apr-1990 1
4 May-1990 1
5 Jul-1990 2
6 Aug-1990 2
7 Sep-1990 1
8 Oct-1990 3
9 Nov-1990 1
```

The period level is two levels below the year level, and the following query (which uses *level\_offset* as 2) is equivalent to the first query:

```
SELECT DESCENDANTS(birthd.1990,2) ON 1 FROM patients

1 Jan-1990 *
2 Feb-1990 2
3 Mar-1990 1
4 Apr-1990 1
5 May-1990 1
6 Jun-1990 *
7 Jul-1990 2
8 Aug-1990 2
9 Sep-1990 1
10 Oct-1990 3
11 Nov-1990 1
12 Dec-1990 *
```

The next variation uses AFTER:

```
SELECT DESCENDANTS(birthd.1990,birthd.period,AFTER) ON 1 FROM patients

1 Jan 1 1990 *
2 Jan 2 1990 *
3 Jan 3 1990 *
...
363 Dec 29 1990 *
364 Dec 30 1990 *
365 Dec 31 1990 *
```

This example returns descendants of 1990 of all levels *below* the period level. In this case, there is only one lower level: date, which corresponds to year plus month plus day of the month.

The next variation uses `SELF_AND_AFTER`. This example returns members of more than one level and demonstrates the order in which these members are returned.

```
SELECT DESCENDANTS(birthd.1990,birthd.period,SELF_AND_AFTER) ON 1 FROM patients
```

|     |             |   |
|-----|-------------|---|
| 1   | Jan-1990    | * |
| 2   | Jan 1 1990  | * |
| 3   | Jan 2 1990  | * |
| 4   | Jan 3 1990  | * |
| ... |             |   |
| 33  | Feb-1990    | 2 |
| 34  | Feb 1 1990  | * |
| 35  | Feb 2 1990  | * |
| 36  | Feb 3 1990  | 1 |
| ... |             |   |
| 346 | Dec-1990    | * |
| 347 | Dec 1 1990  | * |
| 348 | Dec 2 1990  | * |
| 349 | Dec 3 1990  | * |
| ... |             |   |
| 377 | Dec 31 1990 | * |

The next variation uses `BEFORE`:

```
SELECT DESCENDANTS(birthd.1990,birthd.period,BEFORE) ON 1 FROM patients
```

|   |         |    |
|---|---------|----|
| 1 | 1990    | 14 |
| 2 | Q1 1990 | 3  |
| 3 | Q2 1990 | 2  |
| 4 | Q3 1990 | 5  |
| 5 | Q4 1990 | 4  |

In this case, the query obtains all descendants of 1990 that are members of the levels *above* the period level (that is, it returns members of the quarter year level). Notice that 1990 is also returned.

## See Also

- [CHILDREN](#)
- [COUSIN](#)
- [FIRSTCHILD](#)
- [FIRSTSIBLING](#)
- [LASTCHILD](#)
- [LASTSIBLING](#)
- [PARENT](#)
- [SIBLINGS](#)

## DISTINCT (MDX)

---

Examines a set, removes duplicate elements, and returns a set of the remaining elements.

### Returned Type

This function returns a [set](#).

### Syntax and Details

`DISTINCT(set_expression)`

- set\_expression* is [an expression that evaluates to a set](#).

### Example

For example, suppose that the query must return a specific city as reference, which is needed for comparison to the other cities. Consider the following query, which displays a reference city, followed by a set of cities with a given patient count:

```
WITH SET refcity AS '{homed.juniper}'
SELECT MEASURES.[%COUNT] ON 0,
{refcity,FILTER(homed.city.MEMBERS,MEASURES.[%COUNT]>1100)} ON 1 FROM patients
```

|               | Patient Count |
|---------------|---------------|
| 1 Juniper     | 1,197         |
| 2 Cedar Falls | 1,188         |
| 3 Centerville | 1,155         |
| 4 Cypress     | 1,221         |
| 5 Elm Heights | 1,266         |
| 6 Juniper     | 1,197         |
| 7 Magnolia    | 1,156         |
| 8 Pine        | 1,139         |
| 9 Redwood     | 1,144         |
| 10 Spruce     | 1,135         |

Compare to the following query, which removes the duplicate city:

```
WITH SET refcity AS '{homed.juniper}' SELECT MEASURES.[%COUNT] ON 0,
DISTINCT({refcity,FILTER(homed.city.MEMBERS,MEASURES.[%COUNT]>1100)}) ON 1 FROM patients
```

|               | Patient Count |
|---------------|---------------|
| 1 Juniper     | 1,197         |
| 2 Cedar Falls | 1,188         |
| 3 Centerville | 1,155         |
| 4 Cypress     | 1,221         |
| 5 Elm Heights | 1,266         |
| 6 Magnolia    | 1,156         |
| 7 Pine        | 1,139         |
| 8 Redwood     | 1,144         |
| 9 Spruce      | 1,135         |

# EXCEPT (MDX)

Examines two sets and returns a set that consists of the elements of the first set, except for any elements that are also in the second set. This function optionally eliminates duplicates in that set.

## Returned Type

This function returns a [set](#).

## Syntax and Details

```
EXCEPT(set_expression1, set_expression2, ALL)
```

```
EXCEPT(set_expression1, set_expression2)
```

- *set\_expression1* and *set\_expression2* are [expressions that evaluate to sets](#).
- The optional keyword ALL, if included, specifies that all duplicates should be retained. By default, if the first set includes any duplicate elements, only the first of those is included.

If *set\_expression2* includes elements that are not in *set\_expression1*, those elements are ignored. The returned set includes only elements from *set\_expression1*.

## Example

Consider the following query which defines two named sets:

```
WITH SET set1 AS '{allerd.eggs,allerd.eggs,allerd.soy,allerd.wheat}'
SET set2 AS '{allerd.[diary products],allerd.pollen,allerd.wheat}'
SELECT MEASURES.[%COUNT] ON 0, EXCEPT(set1,set2) ON 1 FROM patients
```

|        | Patient Count |
|--------|---------------|
| 1 eggs | 451           |
| 2 soy  | 462           |

This query shows the members of *set1* that are not also in *set2*. Notice that the member *allerd.eggs* is listed twice within *set1*, but is shown only once in the result.

In contrast, the following variation uses the ALL keyword:

```
WITH SET set1 AS '{allerd.eggs,allerd.eggs,allerd.soy,allerd.wheat}'
SET set2 AS '{allerd.[diary products],allerd.pollen,allerd.wheat}'
SELECT MEASURES.[%COUNT] ON 0, EXCEPT(set1,set2,ALL) ON 1 FROM patients
```

|        | Patient Count |
|--------|---------------|
| 1 eggs | 451           |
| 2 eggs | 451           |
| 3 soy  | 462           |

## See Also

- [INTERSECT](#)
- [UNION](#)

## FILTER (MDX)

Examines a set and returns the subset in which the given expression is true for each element. The set order is unchanged.

### Returned Type

This function returns a [set](#).

### Syntax and Details

```
FILTER(set_expression, logical_expression)
```

- set\_expression* is [an expression that evaluates to a set](#).
- logical\_expression* is [a logical expression](#), typically that examines a measure value or a property value.

Instead of *logical\_expression*, you can use a [measure search expression](#); see the example to see the behavior of FILTER in this case.

### Example

For example, consider the following query, which returns only cities with more than 1150 patients.

```
SELECT MEASURES.[%COUNT] ON 0,
FILTER(homed.city.MEMBERS, MEASURES.[%COUNT]>1150) ON 1 FROM patients
```

|               | Patient Count |
|---------------|---------------|
| 1 Cedar Falls | 1,188         |
| 2 Centerville | 1,155         |
| 3 Cypress     | 1,221         |
| 4 Elm Heights | 1,266         |
| 5 Juniper     | 1,197         |
| 6 Magnolia    | 1,156         |

In comparison, consider the following query, which returns cities with any patient count:

```
SELECT MEASURES.[%COUNT] ON 0,
FILTER(homed.city.MEMBERS, MEASURES.[%COUNT]>=0) ON 1 FROM patients
```

|               | Patient Count |
|---------------|---------------|
| 1 Cedar Falls | 1,188         |
| 2 Centerville | 1,155         |
| 3 Cypress     | 1,221         |
| 4 Elm Heights | 1,266         |
| 5 Juniper     | 1,197         |
| 6 Magnolia    | 1,156         |
| 7 Pine        | 1,139         |
| 8 Redwood     | 1,144         |
| 9 Spruce      | 1,135         |

For another example, the following query uses a more complex filter expression:

```
SELECT MEASURES.[%COUNT] ON 0,
FILTER(diagd.members, (MEASURES.[%COUNT]>500 and MEASURES.[%COUNT]<1000)) ON 1
FROM patients
```

|            | Patient Count |
|------------|---------------|
| 1 asthma   | 746           |
| 2 diabetes | 555           |

The next example uses a filter expression that evaluates a property:

```
SELECT homed.CURRENTMEMBER.PROPERTIES("Population") ON 0,
FILTER(homed.city.MEMBERS,homed.CURRENTMEMBER.PROPERTIES("Population")>20000) ON 1 FROM patients
```

|               | ZIP    |
|---------------|--------|
| 1 Cedar Falls | 90,000 |
| 2 Centerville | 49,000 |
| 3 Elm Heights | 33,194 |
| 4 Redwood     | 29,192 |

If you use FILTER with a [measure search expression](#), the function returns only those members that are based on at least one fact that meets the given criteria. (A [measure search expression](#) is an InterSystems extension to MDX that considers the measure values in the fact table itself.)

```
SELECT {MEASURES.[%COUNT]} ON 0, FILTER(diagd.members, %SEARCH.&[[MEASURES].[age]<10]) ON 1 FROM patients
```

|          | Patient Count |
|----------|---------------|
| 1 None   | 8,425         |
| 2 asthma | 703           |

This query shows the diagnoses that have at least one patient under ten years old. For other diagnoses such as diabetes and osteoporosis, there are no such young patients.

## See Also

- [IIF](#)

# FIRSTCHILD (MDX)

Returns the first child of the given member.

## Returned Type

This function returns a [member](#).

## Syntax and Details

`member_expression.FIRSTCHILD`

Where:

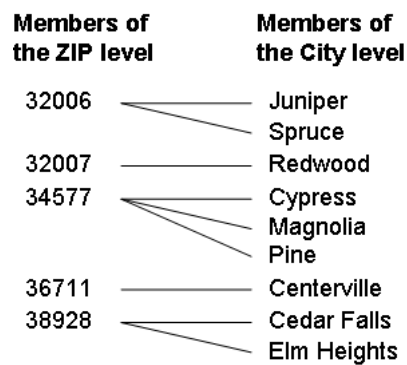
- member\_expression* is [an expression that returns a member](#).

This expression cannot refer to a measure.

The function returns the first child of this member. To determine which child is first, the function considers the default order of the set of children.

## Example

For example, consider the following hierarchy:



Now consider the following query:

```
SELECT MEASURES.[%COUNT] ON 0, homed.zip.[34577].FIRSTCHILD ON 1 FROM patients
```

|         |               |
|---------|---------------|
|         | Patient Count |
| Cypress | 1,089         |

For another example:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.1960.FIRSTCHILD ON 1 FROM patients
```

|          |               |
|----------|---------------|
|          | Patient Count |
| Jan-1960 | 5             |

## See Also

- [CHILDREN](#)
- [COUSIN](#)
- [DESCENDANTS](#)
- [FIRSTSIBLING](#)



- [LASTCHILD](#)
- [LASTSIBLING](#)
- [PARENT](#)
- [SIBLINGS](#)

# FIRSTSIBLING (MDX)

---

Returns the first sibling of the given member.

## Returned Type

This function returns a [member](#).

## Syntax and Details

`member_expression.FIRSTSIBLING`

Where:

- *member\_expression* is [an expression that returns a member](#).

This expression cannot refer to a measure.

This function examines all the children of the parent of the given member, and returns the first member of that set (considering the default order of that set).

This function can return the same member that you specify as an argument (if that member is the first sibling).

## Example

For example:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.[Mar 2003].FIRSTSIBLING ON 1 FROM patients
```

|          | Patient Count |
|----------|---------------|
| Jan-2003 | 10            |

## See Also

- [CHILDREN](#)
- [COUSIN](#)
- [DESCENDANTS](#)
- [FIRSTCHILD](#)
- [LASTCHILD](#)
- [LASTSIBLING](#)
- [PARENT](#)
- [SIBLINGS](#)

# HEAD (MDX)

Returns a subset from the start of a set, using the current order of the set.

## Returned Type

This function returns a [set](#).

## Syntax and Details

HEAD(*set\_expression*, *optional\_integer\_expression*, *optional\_sample\_flag*)

- set\_expression* is [an expression that evaluates to a set](#).

**Important:** When *set\_expression* is a [CROSSJOIN](#) or [NONEMPTYCROSSJOIN](#) expression and the slicer axis contains related cube terms, HEAD may return inaccurate results. This is because under these conditions the HEAD subset is evaluated before the join indexes have been computed.

- optional\_integer\_expression* is an integer literal.

The default value for this argument is 1.

The function uses this argument to determine the number of elements to return in the subset.

- optional\_sample\_flag*, if included, is `SAMPLE`

This optional flag has an effect only in the case where the *set\_expression* contains multiple nested [CROSSJOIN](#) expressions. In such cases, by default, the system does not attempt to determine the subset until *set\_expression* has been fully evaluated and all the set elements are known. If you include the *optional\_sample\_flag*, the system truncates the results as each [CROSSJOIN](#) is evaluated; this approach can be considerably faster but can result in a subset that contains fewer elements than given by the *optional\_integer\_expression*.

Note that when you use drag and drop actions in the Analyzer to create queries that use the HEAD function for a set that contains multiple nested [CROSSJOIN](#) expressions, the Analyzer automatically adds this flag.

This function returns a set that consists of the specified number of elements from the start of the given set (considering the current order of the set). If *integer\_expression* is less than 1, the function returns the empty set. If *integer\_expression* is greater than the number of elements of the set, the function returns the original set.

The elements of the subset are returned in the same order specified by the original set.

## Example

```
SELECT MEASURES.[%COUNT] ON 0, HEAD(birthd.decade.MEMBERS, 3) ON 1
FROM patients
```

|         | Patient Count |
|---------|---------------|
| 1 1910s | 71            |
| 2 1920s | 223           |
| 3 1930s | 572           |

## See Also

- [TAIL](#)

## HIERARCHISE (MDX)

---

Synonym for [HIERARCHIZE](#).

### See Also

- [HIERARCHIZE](#)

# HIERARCHIZE (MDX)

Given a set, returns a set that is in hierarchical order (the order specified by the hierarchy).

## Returned Type

This function returns a [set](#) of [members](#).

## Syntax and Details

```
HIERARCHIZE(set_expression)
```

Or:

```
HIERARCHIZE(set_expression, POST)
```

Where:

- *set\_expression* is [an expression that evaluates to a set](#) of [members](#).
- If `POST` is specified, child members precede their parents. This is called *post-natural order*.

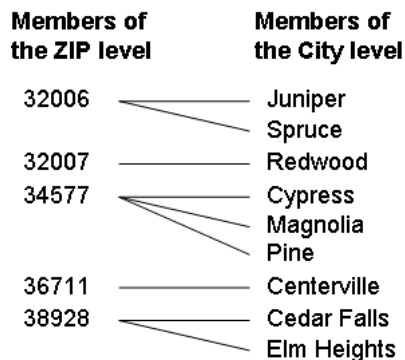
If the set members are in different hierarchies, the order of the hierarchies themselves is indeterminate. That is, if some members are from hierarchy A and the others are from hierarchy B, the A members will be listed consecutively in hierarchical order and the B members will be listed consecutively in hierarchical order, but there is no rule governing whether the A members or the B members are first overall.

## Example

Within a hierarchy, the hierarchical order is determined as follows:

- The All member of the dimension, if present, is first.
- The next member is the first member of the highest level of that hierarchy.
- The next member is the first child of that member.

And so on. For example, consider the following hierarchy:



To see the overall hierarchical order of these members, we use the following query, which uses a set consisting of all members of dimension to which these members belong:

```
SELECT MEASURES.[%COUNT] ON 0, HIERARCHIZE(homed.members) ON 1 FROM patients
```

|                | Patient Count |
|----------------|---------------|
| 1 32006        | 2,272         |
| 2 Juniper      | 1,155         |
| 3 Spruce       | 1,117         |
| 4 32007        | 1,111         |
| 5 Redwood      | 1,111         |
| 6 34577        | 3,399         |
| 7 Cypress      | 1,150         |
| 8 Magnolia     | 1,111         |
| 9 Pine         | 1,138         |
| 10 36711       | 1,069         |
| 11 Centerville | 1,069         |
| 12 38928       | 2,149         |
| 13 Cedar Falls | 1,045         |
| 14 Elm Heights | 1,104         |

The following example creates a set of several members of the Home City and Home ZIP levels and then uses the HIERARCHIZE function to place these members into hierarchical order:

```
SELECT MEASURES.[%COUNT] ON 0,
HIERARCHIZE({homed.36711, homed.38928, homed.[elm heights], homed.Spruce}) ON 1
FROM patients
```

|               | Patient Count |
|---------------|---------------|
| 1 36711       | 1,069         |
| 2 Spruce      | 1,117         |
| 3 38928       | 2,149         |
| 4 Elm Heights | 1,104         |

In contrast, the next example uses the POST keyword:

```
SELECT MEASURES.[%COUNT] ON 0,
HIERARCHIZE({homed.36711, homed.38928, homed.[elm heights], homed.Spruce}, POST) ON 1
FROM patients
```

|               | Patient Count |
|---------------|---------------|
| 1 36711       | 1,069         |
| 2 Spruce      | 1,117         |
| 3 Elm Heights | 1,104         |
| 4 38928       | 2,149         |

## See Also

- [ORDER](#)

## IIF (MDX)

Returns one of two values, depending on the value of a given logical expression.

### Returned Type

This function returns a [number](#) or a [string](#), depending on the arguments used and the value of the logical expression.

### Syntax and Details

```
IIF(check_expression, expression1, expression2)
```

- expression1* and *expression2* are [numeric](#) or [string](#) expressions. They do not have to be the same type.  
InterSystems MDX does not support other types of arguments.  
To compare to a null value, use the [ISNULL](#) function instead.
- check\_expression* is a [logical expression](#), typically that compares a measure or a property to a constant.

If *check\_expression* is true, the function returns the value given by *expression1*. Otherwise, it returns the value given by *expression2*.

### Example

For example:

```
SELECT IIF(MEASURES.[%COUNT]<500, "fewer than 500", "500 or more") ON 0, diagd.MEMBERS ON 1 FROM patients
```

|                | IIF            |
|----------------|----------------|
| 1 None         | 500 or more    |
| 2 asthma       | 500 or more    |
| 3 CHD          | fewer than 500 |
| 4 diabetes     | 500 or more    |
| 5 osteoporosis | fewer than 500 |

As a variation, the following query uses [%LABEL](#) to apply a suitable caption to the data column:

```
SELECT %LABEL(IIF(MEASURES.[%COUNT]<500, "fewer than 500", "500 or more"),"Patient Count") ON 0,
diagd.MEMBERS ON 1 FROM patients
```

|                | Patient Count  |
|----------------|----------------|
| 1 None         | 500 or more    |
| 2 asthma       | 500 or more    |
| 3 CHD          | fewer than 500 |
| 4 diabetes     | 500 or more    |
| 5 osteoporosis | fewer than 500 |

For another example, the following query uses the value of a property:

```
SELECT %LABEL(IIF(homed.h1.CURRENTMEMBER.PROPERTIES("Population")>20000,"big","small"),
"Town Size") ON 0,
homed.city.MEMBERS ON 1 FROM patients
```

|               | Town Size |
|---------------|-----------|
| 1 Cedar Falls | big       |
| 2 Centerville | big       |
| 3 Cypress     | small     |
| 4 Elm Heights | big       |
| 5 Juniper     | small     |
| 6 Magnolia    | small     |
| 7 Pine        | small     |
| 8 Redwood     | big       |
| 9 Spruce      | small     |

The following example examines the name of the member and conditionally suppresses display of a measure:

```
WITH MEMBER MEASURES.iif AS 'IIF(homed.CURRENTMEMBER.PROPERTIES("name")="Pine"," ",
MEASURES.[%COUNT])' SELECT MEASURES.iif ON 0, homed.city.MEMBERS ON 1 FROM patients
```

|               | iif   |
|---------------|-------|
| 1 Cedar Falls | 1,120 |
| 2 Centerville | 1,106 |
| 3 Cypress     | 1,139 |
| 4 Elm Heights | 1,078 |
| 5 Juniper     | 1,109 |
| 6 Magnolia    | 1,122 |
| 7 Pine        |       |
| 8 Redwood     | 1,128 |
| 9 Spruce      | 1,108 |

## See Also

- [ISNULL](#)
- [FILTER](#)



# INTERSECT (MDX)

Returns a set that consists of the elements that occur in both of the two given sets, optionally eliminating duplicates in that set.

## Returned Type

This function returns a [set](#).

## Syntax and Details

```
INTERSECT(set_expression1, set_expression2, ALL)
```

Or:

```
INTERSECT(set_expression1, set_expression2)
```

- *set\_expression1* and *set\_expression2* are [expressions that evaluate to sets](#).
- The optional keyword `ALL`, if included, specifies that all duplicates in the second set should be retained. By default, if the returned set includes any duplicate elements, only the first of those is included.

This keyword does not affect duplicates in the first set.

## Example

Consider the following query which defines two named sets:

```
WITH SET set1 AS '{allerd.eggs,allerd.soy,allerd.wheat,allerd.wheat}'
SET set2 AS '{allerd.[dairy products],allerd.pollen,allerd.soy,allerd.wheat}'
SELECT MEASURES.[%COUNT] ON 0, INTERSECT(set1,set2) ON 1 FROM patients
Patient Count
1 soy 462
2 wheat 479
```

In contrast, consider the following variation, which uses the `ALL` keyword:

```
WITH SET set1 AS '{allerd.eggs,allerd.soy,allerd.wheat,allerd.wheat}'
SET set2 AS '{allerd.[dairy products],allerd.pollen,allerd.soy,allerd.wheat}'
SELECT MEASURES.[%COUNT] ON 0, INTERSECT(set1,set2,ALL) ON 1 FROM patients
Patient Count
1 soy 462
2 wheat 479
3 wheat 479
```

Finally, you can of course use more interesting sets as arguments. For example:

```
WITH SET set1 AS 'TOPCOUNT(homed.city.members,5,MEASURES.[avg allergy count])'
SET set2 AS 'TOPCOUNT(homed.city.members,5,MEASURES.[avg age])'
SELECT MEASURES.[%COUNT] ON 0, INTERSECT(set1,set2) ON 1 FROM patients
Patient Count
1 Centerville 1,155
2 Magnolia 1,156
```

## See Also

- [EXCEPT](#)
- [UNION](#)

## ISNULL (MDX)

---

Evaluates a scalar MDX expression and returns either its value or an alternative value (if the value of the expression is null). This function is an InterSystems extension to MDX.

### Returned Type

This function returns an expression of the same type that you use with the function.

### Syntax and Details

```
ISNULL(MDX_expression, value_if_null)
```

Where:

- *MDX\_expression* is a scalar MDX value (a [numeric](#), [string](#), or [logical](#) expression).
- *value\_if\_null* is the value to return if *MDX\_expression* evaluates to null.

### Example

The following shows a simple example:

```
SELECT ISNULL(MEASURES.[%COUNT], "None") ON 0, birthd.decade.MEMBERS ON 1 FROM patients where diagd.chd
```

|          | ISNULL |
|----------|--------|
| 1 1910s  | None   |
| 2 1920s  | 1      |
| 3 1930s  | 12     |
| 4 1940s  | 3      |
| 5 1950s  | 10     |
| 6 1960s  | 3      |
| 7 1970s  | None   |
| 8 1980s  | 1      |
| 9 1990s  | None   |
| 10 2000s | None   |
| 11 2010s | None   |

### See Also

- [IIF](#)
- [%LABEL](#)

# LAG (MDX)

Given a level member and a nonnegative integer, this function counts backward in the level and returns a previous member. The details are different for time dimensions and data dimensions.

## Returned Type

This function returns a [member](#).

## Syntax and Details

```
member_expression.LAG(optional_integer_expression)
```

Where:

- member\_expression* is [an expression that returns a member](#).

This expression cannot refer to a measure.

- optional\_integer\_expression* is a nonnegative integer literal.

The default value for this argument is 0; in this case, the function returns the member given by *member\_expression*.

If *integer\_expression* is 1, this function is equivalent to the [PREVMEMBER](#) function.

This function examines the members of the level to which the given member belongs, counts backward from the current member (using *integer\_expression*), and returns the member at that position. For time dimensions, this function ignores any parent level. For data dimensions, this function considers the parent level; it counts backward from the current member within the given parent member. (Note that the terms *time dimension* and *data dimension* refer specifically to the dimension type as defined in the cube. See [Defining Models for InterSystems Business Intelligence](#).)

Within any time dimension, this function is more useful for a timeline-based time level (such as Period, which groups records by year and month) than for a date-part-based time level (such as Month, which groups records only by month). If the level is based on a date part, this function returns null when it refers to a level beyond the end of the set; see an example of a similar scenario in [PREVMEMBER](#). For a fuller discussion, see [Introduction to Time Levels](#).

## Example

The first examples use a time dimension. Consider the following query, shown for reference:

```
SELECT MEASURES.[%COUNT] ON 0,
{birthd.1948,birthd.1949,birthd.1950,birthd.1951,birthd.1952} ON 1
FROM patients
```

|        | Patient Count |
|--------|---------------|
| 1 1948 | 10            |
| 2 1949 | 4             |
| 3 1950 | 12            |
| 4 1951 | 8             |
| 5 1952 | 6             |

The following query uses LAG:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.1951.LAG(1) ON 1 FROM patients
Patient Count
1950 12
```

For another example:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.1951.LAG(2) ON 1 FROM patients
Patient Count
1949 4
```

In this sample, the year level is the child of the decade level, which means that the members 1949 and 1950 belong to different parents. As you can see, the LAG function ignores the parent level when you use the function with a time dimension.

The second examples use a data dimension (the HomeD dimension). To see the hierarchy in this dimension, see the examples in the [FIRSTCHILD](#) function. The following query uses LAG with this dimension:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.Magnolia.LAG(1) ON 1 FROM patients

Patient Count
Cypress 104
```

Because this is a data dimension, this query retrieves the previous member of the city level within the parent ZIP code. Within this ZIP code, Cypress is the first city, so the following query returns no results:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.Cypress.LAG(1) ON 1 FROM patients

Patient Count
*
```

## See Also

- [LEAD](#)
- [NEXTMEMBER](#)
- [PREVMEMBER](#)

# LASTCHILD (MDX)

Returns the last child of the given member.

## Returned Type

This function returns a [member](#).

## Syntax and Details

`member_expression.LASTCHILD`

Where:

- member\_expression* is [an expression that returns a member](#).

This expression cannot refer to a measure.

The function returns the last child of this member. To determine which child is last, the function considers the default order of the set of children.

## Example

For example:

```
SELECT MEASURES.[%COUNT] ON 0, homed.zip.[34577].LASTCHILD ON 1 FROM patients
```

|      | Patient Count |
|------|---------------|
| Pine | 1,100         |

To see a picture of the hierarchy used in this example, see the [FIRSTCHILD](#) function.

For another example:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.[1950].LASTCHILD ON 1 FROM patients
```

|          | Patient Count |
|----------|---------------|
| Dec-1950 | 8             |

## See Also

- [CHILDREN](#)
- [COUSIN](#)
- [DESCENDANTS](#)
- [FIRSTSIBLING](#)
- [FIRSTCHILD](#)
- [LASTSIBLING](#)
- [PARENT](#)
- [SIBLINGS](#)

# LASTSIBLING (MDX)

---

Returns the last sibling of the given member.

## Returned Type

This function returns a [member](#).

## Syntax and Details

`member_expression.LASTSIBLING`

Where:

- *member\_expression* is [an expression that returns a member](#).

This expression cannot refer to a measure.

This function examines all the children of the parent of the given member, and returns the last member of that set (considering the default order of that set).

This function can return the same member that you use as its argument (if that is the last sibling).

## Example

For example:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.[Mar 2003].LASTSIBLING ON 1 FROM patients
```

|          | Patient Count |
|----------|---------------|
| Dec-2003 | 17            |

## See Also

- [CHILDREN](#)
- [COUSIN](#)
- [DESCENDANTS](#)
- [FIRSTCHILD](#)
- [FIRSTSIBLING](#)
- [LASTCHILD](#)
- [PARENT](#)
- [SIBLINGS](#)

# LEAD (MDX)

Given a level member and a nonnegative integer, this function counts forward in the level and returns a later member. The details are different for time dimensions and data dimensions.

## Returned Type

This function returns a [member](#).

## Syntax and Details

```
member_expression.LEAD(optional_integer_expression)
```

Where:

- member\_expression* is [an expression that returns a member](#).

This expression cannot refer to a measure.

- optional\_integer\_expression* is a nonnegative integer literal.

The default value for this argument is 0; in this case, the function returns the member given by *member\_expression*.

If *integer\_expression* is 1, this function is equivalent to the [NEXTMEMBER](#) function.

This function examines the members of the level to which the given member belongs, counts forward from the current member (using *integer\_expression*), and returns the member at that position. For time dimensions, this function ignores any parent level. For data dimensions, this function considers the parent level; it counts forward from the current member within the given parent member. (Note that the terms *time dimension* and *data dimension* refer specifically to the dimension type as defined in the cube. See [Defining Models for InterSystems Business Intelligence](#).)

Within any time dimension, this function is more useful for a timeline-based time level (such as Period, which groups records by year and month) than for a date-part-based time level (such as Month, which groups records only by month). If the level is based on a date part, this function returns null when it refers to a level beyond the end of the set; see an example of a similar scenario in [NEXTMEMBER](#). For a fuller discussion, see [Introduction to Time Levels](#).

## Example

The first examples use a time dimension. Consider the following query, shown for reference:

```
SELECT MEASURES.[%COUNT] ON 0,
{birthd.1948,birthd.1949,birthd.1950,birthd.1951,birthd.1952} ON 1
FROM patients
```

|        | Patient Count |
|--------|---------------|
| 1 1948 | 10            |
| 2 1949 | 4             |
| 3 1950 | 12            |
| 4 1951 | 8             |
| 5 1952 | 6             |

The following query uses LEAD:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.1948.LEAD(1) ON 1 FROM patients
```

|      | Patient Count |
|------|---------------|
| 1949 | 4             |

For another example:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.1948.LEAD(3) ON 1 FROM patients
```

|      | Patient Count |
|------|---------------|
| 1951 | 8             |

In this sample, the year level is the child of the decade level, which means that the members 1948 and 1951 belong to different parents. As you can see, the LEAD function ignores the parent level when you use the function with a time dimension.

The second examples use a data dimension (the HomeD dimension). To see the hierarchy in this dimension, see the examples in the [FIRSTCHILD](#) function. The following query uses LEAD with this dimension:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.Magnolia.LEAD(1) ON 1 FROM patients
```

|      | Patient Count |
|------|---------------|
| Pine | 114           |

Because this is a data dimension, this query retrieves the next member of the city level within the parent ZIP code. Within this ZIP code, Pine is the last city, so the following query returns no results:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.Pine.LEAD(1) ON 1 FROM patients
```

|  | Patient Count |
|--|---------------|
|  | *             |

## See Also

- [LAG](#)
- [NEXTMEMBER](#)
- [PREVMEMBER](#)



# LOG (MDX)

Returns the base-ten logarithm of the given numeric value.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
LOG(numeric_expression)
```

Where:

- numeric\_expression* is [an expression that evaluates to a number](#).

Typically, this expression has the form [MEASURES].[*measure\_name*]

## Example

The first example shows the base-ten logarithm for the %COUNT measure:

```
SELECT LOG(MEASURES.[%COUNT]) ON 0 FROM patients
 LOG
 4
```

The next example uses the [%LABEL](#) function to apply a more detailed caption:

```
SELECT %LABEL(LOG(MEASURES.[%COUNT]), "LOG PAT CNT") ON 0 FROM patients
 LOG PAT CNT
 4
```

## See Also

- [POWER](#)
- [SQRT](#)

## LOOKUP (MDX)

Looks up a given key in a term list and returns a substitute string. This function enables you to perform string replacements within a query. This function is an InterSystems extension to MDX.

### Returned Type

This function returns a [string](#).

### Syntax and Details

```
LOOKUP(term_list_name, lookup_value,default,alternative_field)
```

Where the arguments are [string expressions](#) as follows:

- *term\_list\_name* evaluates to the name of a term list.
- *lookup\_value* evaluates to the string to look up in the term list.
- *default*, which is optional, evaluates to the value to return if *lookup\_value* is not found in the term list.
- *alternative\_field*, which is optional, is the name of the field to return. The default is "value".

This argument is not case-sensitive.

This function examines the given term list, finds the term whose "key" field equals the string given by *lookup\_value* and then returns the value contained in the field identified by *alternative\_field*.

All term lists have at least two fields: "key" and "value". You can add additional fields. For information, see [Defining Term Lists](#)

The system notes the most recent modification time stamp of any term list and invalidates any query cache that uses an outdated term list.

### Example

For example, suppose that for HoleFoods, we have a term list named Teams that is defined as follows:

| Terms    |         |
|----------|---------|
| key      | value   |
| Atlanta  | Braves  |
| Boston   | Red Sox |
| New York | Yankees |

Here is a simple query that uses this term list:

```
SELECT Lookup("Teams",Outlet.Boston.Properties("NAME")) ON ROWS FROM HOLEFOODS
Lookup Red Sox
```

Here is a more complex query:

```
SELECT Lookup("Teams",Outlet.CURRENTMEMBER.Properties("NAME"),"No Team") ON 0,
outlet.city.MEMBERS ON 1 FROM HOLEFOODS
```

|             | Lookup  |
|-------------|---------|
| 1 Amsterdam | No Team |
| 2 Antwerp   | No Team |
| 3 Atlanta   | Braves  |
| 4 Bangalore | No Team |
| 5 Barcelona | No Team |
| 6 Beijing   | No Team |
| 7 Berlin    | No Team |
| 8 Boston    | Red Sox |
| 9 Brasilia  | No Team |
| ...         |         |

## See Also

- [%LOOKUP](#) (which contains [Comparison with Other Term List Functions](#))
- [%TERMLIST](#)

# MAX (MDX)

Returns the maximum value of a given expression (or of the current measure), across all elements of a set.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
MAX(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES].[*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The function evaluates the numeric value for each element of the set and returns the largest of those values.

## Example

First, the following query shows values of three measures for the members of the aged.decade level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
birthd.decade.MEMBERS ON 1 FROM patients
```

|          | Patient Count | Encounter Count | Avg Test Score |
|----------|---------------|-----------------|----------------|
| 1 1910s  | 80            | 5,359           | 75.17          |
| 2 1920s  | 227           | 12,910          | 74.20          |
| 3 1930s  | 567           | 33,211          | 74.67          |
| 4 1940s  | 724           | 38,420          | 73.39          |
| 5 1950s  | 1,079         | 46,883          | 73.72          |
| 6 1960s  | 1,475         | 57,814          | 74.16          |
| 7 1970s  | 1,549         | 49,794          | 74.35          |
| 8 1980s  | 1,333         | 35,919          | 74.13          |
| 9 1990s  | 1,426         | 29,219          | 74.79          |
| 10 2000s | 1,406         | 20,072          | 74.95          |
| 11 2010s | 134           | 1,346           | 73.55          |

Next, the following query shows the maximum values for these measures for the members of this level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
MAX(birthd.decade.MEMBERS) ON 1 FROM patients
```

|     | Patient Count | Encounter Count | Avg Test Score |
|-----|---------------|-----------------|----------------|
| MAX | 1,549         | 57,814          | 75.17          |

Here, each value is the maximum of the values in a column in the preceding query. For example, the Patient Count value is the maximum of the Patient Count values in the preceding query.

Notice that these maximum values do not belong to the same member. For example, the decade with the highest patient count is not the same as the decade with the highest average test score.

For another example, we use the second argument for MAX:

```
SELECT MAX(birthd.decade.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
```

|  | MAX   |
|--|-------|
|  | 1,549 |

For additional, similar examples, see [AVG](#).

## See Also

- [AGGREGATE](#)
- [AVG](#)
- [MEDIAN](#)
- [MIN](#)
- [PERCENTILE](#)
- [PERCENTILERANK](#)
- [STDDEV](#)
- [STDDEVP](#)
- [SUM](#)
- [VAR](#)
- [VARP](#)

## MEDIAN (MDX)

Returns the value closest to the median value, for a given expression (or of the current measure), across all elements of a set that have a non-null value for that expression.

### Returned Type

This function returns a [number](#).

### Syntax and Details

```
MEDIAN(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES].[*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The function evaluates the numeric value for each element of the set, ignores any set elements for which this value is null, and finds the value that is closest to the median for the remaining elements.

**Tip:** To instead find the median value across the lowest-level records, use the [%KPI](#) function with the sample plug-in class %DeepSee.PlugIn.Median. To see examples, download and set up the samples as described in [Accessing the BI Samples](#); then display the User Portal in the namespace where you downloaded the samples and look at the sample dashboards in the KPIs & Plug-ins folder.

### Example

First, the following query shows values of three measures for the members of the aged.decade level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
birthd.decade.MEMBERS ON 1 FROM patients
```

|          | Patient Count | Encounter Count | Avg Test Score |
|----------|---------------|-----------------|----------------|
| 1 1910s  | 80            | 5,359           | 75.17          |
| 2 1920s  | 227           | 12,910          | 74.20          |
| 3 1930s  | 567           | 33,211          | 74.67          |
| 4 1940s  | 724           | 38,420          | 73.39          |
| 5 1950s  | 1,079         | 46,883          | 73.72          |
| 6 1960s  | 1,475         | 57,814          | 74.16          |
| 7 1970s  | 1,549         | 49,794          | 74.35          |
| 8 1980s  | 1,333         | 35,919          | 74.13          |
| 9 1990s  | 1,426         | 29,219          | 74.79          |
| 10 2000s | 1,406         | 20,072          | 74.95          |
| 11 2010s | 134           | 1,346           | 73.55          |

Next, the following query shows the average values for these measures for the members of this level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
MEDIAN(birthd.decade.MEMBERS) ON 1 FROM patients
```

|        | Patient Count | Encounter Count | Avg Test Score |
|--------|---------------|-----------------|----------------|
| MEDIAN | 1,079         | 33,211          | 74.20          |

Here, each value is the median of the values in a column in the preceding query. For example, the Patient Count value is the median value of the Patient Count values in the preceding query.

For another example, we use the second argument for MEDIAN:

```
SELECT MEDIAN(birthd.decade.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
MEDIAN
1,079
```

For additional, similar examples, see [AVG](#).

## See Also

- [AGGREGATE](#)
- [AVG](#)
- [MAX](#)
- [MIN](#)
- [PERCENTILE](#)
- [PERCENTILERANK](#)
- [STDDEV](#)
- [STDDEVP](#)
- [SUM](#)
- [VAR](#)
- [VARP](#)

# MEMBERS (MDX)

---

Returns a set of all members of the given level or hierarchy, not including any calculated members.

## Returned Type

This function returns a [set](#) of [members](#).

## Syntax and Details

`level_expression.MEMBERS`

Or:

`hierarchy_expression.MEMBERS`

Or:

`dimension_expression.MEMBERS`

Where:

- *level\_expression* is an [expression that returns a level](#). For example:

`[dimension_name].[hierarchy_name].[level_name]`

- *hierarchy\_expression* is an [expression that returns a hierarchy](#). For example:

`[dimension_name].[hierarchy_name]`

- *dimension\_expression* is a dimension name, included within square brackets if needed (see [Identifiers](#)). For example:

`[dimension_name]`

The system interprets this as a reference to the first visible hierarchy within the given dimension.

Given a level name, this function returns a set that consists of the members of that level, not including any calculated members. The members are in the default order specified in the level definition in the cube. This default order is as follows:

- For non-date levels, members are sorted in increasing order alphabetically by name, unless the cube specifies a different sort order. The system provides flexible options for the default sort order of each level.
- For date levels, members are sorted chronologically.

Given a hierarchy name, this function returns a set that consists of the members of all levels in that hierarchy, including the All member, if defined. The members are returned in hierarchical order. For information on hierarchical order, see the [HIERARCHIZE](#) function.

Given a dimension name, this function returns a set that consists of the members of all levels of the first visible hierarchy in this dimension.



## Example

The following query displays all members of the Home Zip dimension as rows:

```
SELECT MEASURES.[%COUNT] ON 0, homed.zip.MEMBERS ON 1 FROM patients
```

|         | Patient Count |
|---------|---------------|
| 1 32006 | 2,272         |
| 2 32007 | 1,111         |
| 3 34577 | 3,399         |
| 4 36711 | 1,069         |
| 5 38928 | 2,149         |

The following query displays all members of all levels in the homed.h1 hierarchy as rows:

|                |       |
|----------------|-------|
| 1 32006        | 2,272 |
| 2 Juniper      | 1,155 |
| 3 Spruce       | 1,117 |
| 4 32007        | 1,111 |
| 5 Redwood      | 1,111 |
| 6 34577        | 3,399 |
| 7 Cypress      | 1,150 |
| 8 Magnolia     | 1,111 |
| 9 Pine         | 1,138 |
| 10 36711       | 1,069 |
| 11 Centerville | 1,069 |
| 12 38928       | 2,149 |
| 13 Cedar Falls | 1,045 |
| 14 Elm Heights | 1,104 |

## See Also

- [ALLMEMBERS](#)

## MIN (MDX)

Returns the minimum non-null value of a given expression (or of the current measure), across all elements of a set.

### Returned Type

This function returns a [number](#).

### Syntax and Details

```
MIN(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES].[*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The function evaluates the numeric value for each element of the set and returns the smallest of those values, ignoring any null values.

### Example

First, the following query shows values of three measures for the members of the aged.decade level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
birthd.decade.MEMBERS ON 1 FROM patients
```

|          | Patient Count | Encounter Count | Avg Test Score |
|----------|---------------|-----------------|----------------|
| 1 1910s  | 80            | 5,359           | 75.17          |
| 2 1920s  | 227           | 12,910          | 74.20          |
| 3 1930s  | 567           | 33,211          | 74.67          |
| 4 1940s  | 724           | 38,420          | 73.39          |
| 5 1950s  | 1,079         | 46,883          | 73.72          |
| 6 1960s  | 1,475         | 57,814          | 74.16          |
| 7 1970s  | 1,549         | 49,794          | 74.35          |
| 8 1980s  | 1,333         | 35,919          | 74.13          |
| 9 1990s  | 1,426         | 29,219          | 74.79          |
| 10 2000s | 1,406         | 20,072          | 74.95          |
| 11 2010s | 134           | 1,346           | 73.55          |

Next, the following query shows the minimum values for these measures for the members of this level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
MIN(birthd.decade.MEMBERS) ON 1 FROM patients
```

|     | Patient Count | Encounter Count | Avg Test Score |
|-----|---------------|-----------------|----------------|
| MIN | 80            | 1,346           | 73.39          |

Here, each value is the minimum of the values in a column in the preceding query. For example, the Patient Count value is the minimum of the Patient Count values in the preceding query.

Notice that these minimum values do not belong to the same member. For example, the decade with the lowest patient count is not the same as the decade with the highest lowest test score.

For another example, we use the second argument for MIN:

```
SELECT MIN(birthd.decade.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
MIN
80
```

For additional, similar examples, see [AVG](#).

## See Also

- [AGGREGATE](#)
- [AVG](#)
- [MAX](#)
- [MEDIAN](#)
- [PERCENTILE](#)
- [PERCENTILERANK](#)
- [STDDEV](#)
- [STDDEVP](#)
- [SUM](#)
- [VAR](#)
- [VARP](#)

## NEXTMEMBER (MDX)

Returns the next member of the level to which the given member belongs. The details are different for time dimensions and data dimensions.

### Returned Type

This function returns a [member](#).

### Syntax and Details

`member_expression.NEXTMEMBER`

Where:

- `member_expression` is [an expression that returns a member](#).

This expression cannot refer to a measure.

This function examines the members of the level to which the given member belongs, and returns the next member of that set (considering the default order of that set). For data dimensions, this function considers the parent level; it looks for the next member within the given parent member. (Note that the terms *time dimension* and *data dimension* refer specifically to the dimension type as defined in the cube. See [Defining Models for InterSystems Business Intelligence](#).)

The NEXTMEMBER function is equivalent to [LEAD\(1\)](#).

Within any time dimension, this function is more useful for a timeline-based time level (such as Period, which groups records by year and month) than for a date-part-based time level (such as Month, which groups records only by month). See the examples. For a fuller discussion, see [Introduction to Time Levels](#).

### Example

The first examples use a time dimension. Consider the following query, shown for reference:

```
SELECT MEASURES.[%COUNT] ON 0,
{birthd.1948,birthd.1949,birthd.1950,birthd.1951,birthd.1952} ON 1
FROM patients
```

|        | Patient Count |
|--------|---------------|
| 1 1948 | 10            |
| 2 1949 | 4             |
| 3 1950 | 12            |
| 4 1951 | 8             |
| 5 1952 | 6             |

The following query uses NEXTMEMBER:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.1948.NEXTMEMBER ON 1 FROM patients
```

|      | Patient Count |
|------|---------------|
| 1949 | 4             |

For another example:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.1949.NEXTMEMBER ON 1 FROM patients
```

|      | Patient Count |
|------|---------------|
| 1950 | 12            |

In this sample, the year level is the child of the decade level, which means that the members 1949 and 1950 belong to different parents. As you can see, the NEXTMEMBER function ignores the parent level when you use the function with a time dimension.

The second examples use a data dimension (the HomeD dimension). To see the hierarchy in this dimension, see the examples in the [FIRSTCHILD](#) function. The following query uses NEXTMEMBER with this dimension:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.Magnolia.NEXTMEMBER ON 1 FROM patients
```

|      | Patient Count |
|------|---------------|
| Pine | 114           |

Because this is a data dimension, this query retrieves the next member of the city level within the parent ZIP code. Within this ZIP code, Pine is the last city, so the following query returns no results:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.Pine.NEXTMEMBER ON 1 FROM patients
```

|  | Patient Count |
|--|---------------|
|  | *             |

For time level that is based on *part* of the date, this function returns null for the last member of the level. Consider the Month level, which groups records only by month. When we use this function with December, the engine returns null:

```
SELECT [BirthQD].[H1].[Month].[December].NEXTMEMBER ON 1 FROM patients
```

|  |   |
|--|---|
|  | * |
|--|---|

For a fuller discussion, see [Introduction to Time Levels](#).

## See Also

- [LAG](#)
- [LEAD](#)
- [PREVMEMBER](#)

## NONEMPTYCROSSJOIN (MDX)

---

Returns a set that consists of the cross-product of the given sets, excluding any tuples that are null.

### Returned Type

This function returns a [set](#) of [tuples](#).

### Syntax and Details

```
NONEMPTYCROSSJOIN(set_expression1, set_expression2)
```

Where:

- set\_expression1* and *set\_expression2* are [expressions that evaluate to sets](#) of [members](#).

The function identifies all the members of each set and then generates a set of tuples that combine each member of the first set with each member of the second set. The returned set does not include empty tuples.

**Note:** If you use this function in a query that refers to a [compound cube](#), it returns the same results as [CROSSJOIN](#). This is necessary to ensure that the subqueries have the same number of rows and can be combined. In this case, to exclude empty tuples, precede the function with the keyword phrase NON EMPTY.

### Example

For example:

```
SELECT MEASURES.[%COUNT] ON 0,
NONEMPTYCROSSJOIN(diagd.MEMBERS, aged.[age group].MEMBERS) ON 1 FROM patients
```

|                       | Patient Count |
|-----------------------|---------------|
| 1 None->0 to 29       | 363           |
| 2 None->30 to 59      | 348           |
| 3 None->60+           | 120           |
| 4 asthma->0 to 29     | 36            |
| 5 asthma->30 to 59    | 37            |
| 6 asthma->60+         | 11            |
| 7 CHD->30 to 59       | 13            |
| 8 CHD->60+            | 23            |
| 9 diabetes->0 to 29   | 1             |
| 10 diabetes->30 to 59 | 20            |
| 11 diabetes->60+      | 25            |
| 12 osteoporosis->60+  | 22            |

# OPENINGPERIOD (MDX)

Returns the first descendent member of the given level, at the same level as the given member. This function is intended primarily for use with time levels.

## Returned Type

This function returns a [member](#).

## Syntax and Details

```
OPENINGPERIOD(ancestor_level,member_expression)
```

Where:

- ancestor\_level* is an [expression that returns a level](#). For example:

```
[dimension_name].[hierarchy_name].[level_name]
```

This level must be the parent level of *member\_expression* or an ancestor of that member.

- member\_expression* is an [expression that returns a member](#).

This expression cannot refer to a measure.

Given a level and a member, this function returns the first member that is a descendent of the given level *and* that is at the same level as member.

## Example

The following query displays the opening quarter for the year that includes Q3 2003:

```
SELECT MEASURES.[%COUNT] ON 0, OPENINGPERIOD(birthd.year,birthd.[Q3 2003]) ON 1 FROM patients
Patient Count
Q1 2003 35
```

In contrast, the following query displays the opening quarter for the *decade* that includes Q3 2003:

```
SELECT MEASURES.[%COUNT] ON 0, OPENINGPERIOD(birthd.decade,birthd.[Q3 2003]) ON 1 FROM patients
Patient Count
Q1 2000 33
```

## See Also

- [ANCESTOR](#)
- [CLOSINGPERIOD](#)
- [COUSIN](#)
- [PERIODSTODATE](#)

# ORDER (MDX)

Returns a set that is ordered as specified.

## Returned Type

This function returns a [set](#).

## Syntax and Details

```
ORDER(set_expression, ordering_expression, optional_keyword)
```

Where:

- *set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#).
- *ordering\_expression* is [a numeric expression](#) or [a string expression](#) that determines the order of the set elements.

For numeric values, typically *ordering\_expression* is [MEASURES].[*measure\_name*]

The function evaluates this expression for each element of the set and sorts the elements of the set according to this value.

- *optional\_keyword* controls how MDX handles any hierarchies in the set. Use one of the following keywords:
  - ASC — Use this to sort in ascending order (using the value returned by *ordering\_expression*), while preserving the hierarchy. For information on hierarchical order, see [HIERARCHIZE](#).

If you omit the keyword, the function sorts in this way.

  - DESC — Use this to sort in descending order (using the value returned by *ordering\_expression*), while preserving the hierarchy.
  - BASC — Use this to break the hierarchy and sort all members in ascending order (using the value returned by *ordering\_expression*).
  - BDESC — Use this to break the hierarchy and sort all members in descending order (using the value returned by *ordering\_expression*).

## Example

For example, the following query sorts cities in descending order by average test score, respecting the ZIP codes to which the cities belong:

```
SELECT MEASURES.[avg test score] ON 0,
ORDER(homed.city.MEMBERS, MEASURES.[avg test score], DESC) ON 1 FROM patients
```

|               | Avg Test Score |
|---------------|----------------|
| 1 Pine        | 75.67          |
| 2 Magnolia    | 74.65          |
| 3 Cypress     | 74.61          |
| 4 Centerville | 74.85          |
| 5 Cedar Falls | 74.62          |
| 6 Elm Heights | 74.36          |
| 7 Juniper     | 74.52          |
| 8 Spruce      | 74.14          |
| 9 Redwood     | 74.16          |

To see a picture of the hierarchy used in this example, see the [FIRSTCHILD](#) function.



In contrast, the following example uses the BDESC keyword and disregards the hierarchy:

```
SELECT MEASURES.[avg test score] ON 0,
ORDER(homed.city.MEMBERS, MEASURES.[avg test score], BDESC) ON 1 FROM patients
```

|               | Avg Test Score |
|---------------|----------------|
| 1 Pine        | 75.67          |
| 2 Centerville | 74.85          |
| 3 Magnolia    | 74.65          |
| 4 Cedar Falls | 74.62          |
| 5 Cypress     | 74.61          |
| 6 Juniper     | 74.52          |
| 7 Elm Heights | 74.36          |
| 8 Redwood     | 74.16          |
| 9 Spruce      | 74.14          |

For another example, the following query defines a string measure (as a calculated member) and then uses it with the ORDER function:

```
WITH MEMBER measures.stringtest AS 'IIF(MEASURES.[avg test score]<75, "low","high")'
SELECT {MEASURES.[avg test score],MEASURES.stringtest} on 0,
ORDER(homed.city.MEMBERS,measures.stringtest,BASC) ON 1 FROM patients
```

|               | Avg Test Score | stringtest |
|---------------|----------------|------------|
| 1 Pine        | 75.67          | high       |
| 2 Cedar Falls | 74.62          | low        |
| 3 Centerville | 74.85          | low        |
| 4 Cypress     | 74.61          | low        |
| 5 Elm Heights | 74.36          | low        |
| 6 Juniper     | 74.52          | low        |
| 7 Magnolia    | 74.65          | low        |
| 8 Redwood     | 74.16          | low        |
| 9 Spruce      | 74.14          | low        |

## See Also

- [HIERARCHIZE](#)

# PARALLELPERIOD (MDX)

Given a reference member, a parent level of that member, and an integer, this function counts backward in the parent level, finds a previous member in that level, and then returns its child that has the same position as the reference member.

## Returned Type

This function returns a [member](#).

## Syntax and Details

```
PARALLELPERIOD(level_expression,offset,member_expression)
```

Where:

- level\_expression* is an [expression that returns a level](#). For example:

```
[dimension_name].[hierarchy_name].[level_name]
```

This level must be a higher level within the hierarchy that contains the reference member.

- offset* is an integer literal.

You can use negative integers.

- member\_expression* is [an expression that returns a member](#).

This expression cannot refer to a measure.

This is used as the reference member.

For the given member, this function examines the ancestor within the given level, counts backward from that member (using *offset*), finds another member in that level, and returns the child member that has the same position as the reference member.

This function ignores the hierarchy; that is, two members can be considered adjacent even if they have different parents.

## Example

For example, the following query finds the quarter that is parallel to Q1 1943, by looking back one year:

```
SELECT MEASURES.[%COUNT] ON 0, PARALLELPERIOD(birthd.year,1,birthd.[Q1 1943]) ON 1 FROM patients
```

|         | Patient Count |
|---------|---------------|
| Q1 1942 | 22            |

In contrast, the following query finds the quarter that is parallel to Q1 1943, by looking one *decade* backward:

```
SELECT MEASURES.[%COUNT] ON 0, PARALLELPERIOD(birthd.decade,1,birthd.[Q1 1943]) ON 1 FROM patients
```

|         | Patient Count |
|---------|---------------|
| Q1 1939 | 17            |

As noted previously, you can specify a negative integer for *offset*. The following query finds the quarter that is parallel to Q1 1943, by looking ahead three years:

```
SELECT MEASURES.[%COUNT] ON 0, PARALLELPERIOD(birthd.year,-3,birthd.[Q1 1943]) ON 1 FROM patients
```

|         | Patient Count |
|---------|---------------|
| Q1 1946 | 18            |

## See Also

- [COUSIN](#)

## PARENT (MDX)

---

Returns the member that is the parent of the given member.

### Returned Type

This function returns a [member](#).

### Syntax and Details

`member_expression.PARENT`

Where:

- member\_expression* is [an expression that returns a member](#), possibly the All member for the dimension.

This expression cannot refer to a measure.

The function returns the parent of this member.

Apart from measures, every member belongs to a level, and every level belongs to a hierarchy, which defines the parent-child relationships among the members. The system creates an All level (with a single All member), at the highest part of each hierarchy (unless the cube disables the All level for the dimension).

### Example

For example:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.[Elm Heights].PARENT ON 1 FROM patients
```

|       | Patient Count |
|-------|---------------|
| 38928 | 2,276         |

To see a picture of the hierarchy used in this example, see the [FIRSTCHILD](#) function.

### See Also

- [ANCESTOR](#)
- [CHILDREN](#)
- [COUSIN](#)
- [DESCENDANTS](#)
- [FIRSTCHILD](#)
- [FIRSTSIBLING](#)
- [LASTCHILD](#)
- [LASTSIBLING](#)
- [SIBLINGS](#)

# PERCENTILE (MDX)

Evaluates a given expression (or the current measure), across all elements of a set, and returns the value that is at a given percentile level.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
PERCENTILE(set_expression, optional_numeric_expression, optional_percentile_value)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES] . [measure\_name]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

- optional\_percentile\_value* is a numeric literal that represents the percentile to find. For example, use 30 to find the 30th percentile, which is the value that is greater than 30 percent of the other values.

If you omit this argument, the system computes the 50th percentile.

The function evaluates the numeric value for each element of the set and returns the value that is at the given percentile.

**Tip:** To instead find a value at the percentile across the lowest-level records, use the [%KPI](#) function with the sample plug-in class %DeepSee.Plugin.Percentile. To see examples, download and set up the samples as described in [Accessing the BI Samples](#); then display the User Portal in the namespace where you downloaded the samples and look at the sample dashboards in the KPIs & Plug-ins folder.

## Example

For reference, the following query shows the Patient Count measure for the members of the aged.year level. The [ORDER](#) function sorts these members into order by their value of Patient Count so that we can easily compare the later results to this query:

```
SELECT MEASURES.[%COUNT] ON 0, ORDER(birthd.year.MEMBERS,MEASURES.[%COUNT],BASC) ON 1 FROM patients
```

|         | Patient Count |
|---------|---------------|
| 1 1916  | 1             |
| 2 1921  | 1             |
| 3 1922  | 1             |
| 4 1925  | 1             |
| 5 1941  | 1             |
| 6 1914  | 2             |
| ...     |               |
| 82 1967 | 18            |
| 83 1969 | 18            |
| 84 1973 | 18            |
| 85 1978 | 18            |
| 86 1979 | 18            |
| 87 1981 | 18            |
| 88 2002 | 18            |
| 89 2009 | 18            |
| 90 1968 | 19            |
| 91 1998 | 21            |

|    |      |    |
|----|------|----|
| 92 | 1991 | 23 |
| 93 | 2003 | 23 |
| 94 | 1977 | 25 |

Next, the following query shows the 5th percentile value for these members:

```
SELECT MEASURES.[%COUNT] ON 0, PERCENTILE(birthd.year.MEMBERS,,5) ON 1 FROM patients
```

|              | Patient Count |
|--------------|---------------|
| 5 Percentile | 1             |

That is, the 5th percentile consists of birth years that have at most 1 patient.

The following query shows the 95th percentile instead:

```
SELECT MEASURES.[%COUNT] ON 0, PERCENTILE(birthd.year.MEMBERS,,95) ON 1 FROM patients
```

|               | Patient Count |
|---------------|---------------|
| 95 Percentile | 18            |

That is, the 95th percentile consists of birth years that have 18 or fewer patients.

For another example, we use the second argument for PERCENTILE:

```
SELECT PERCENTILE(birthd.year.MEMBERS,MEASURES.[%COUNT],50) ON 1 FROM patients
```

|               |    |
|---------------|----|
| 50 Percentile | 10 |
|---------------|----|

For additional, similar examples, see [AVG](#).

## See Also

- [AGGREGATE](#)
- [AVG](#)
- [MAX](#)
- [MEDIAN](#)
- [MIN](#)
- [PERCENTILERANK](#)
- [STDDEV](#)
- [STDDEVP](#)
- [SUM](#)
- [VAR](#)
- [VARP](#)

# PERCENTILERANK (MDX)

For a given numeric value, this function evaluates a given expression (or the current measure), across all elements of a set, and returns the percentile rank of that expression — the percentage of values that are the same or lower.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
PERCENTILERANK(set_expression, numeric_expression, comparison_value)
```

Where:

- *set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- *numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form `[MEASURES].[measure_name]`

- *comparison\_value* is a numeric literal that represents the value against which the system compares the numeric expression for all set members.

The function evaluates *numeric\_expression* for each element of the set, compares that value to *comparison\_value*, and returns the percentile rank of the comparison value.

## Example

For reference, the following query shows the `Patient Count` measure for the members of the `aged.year` level. The [ORDER](#) function sorts these members into order by their value of `Patient Count` so that we can easily compare the later results to this query:

```
SELECT MEASURES.[%COUNT] ON 0, ORDER(birthd.year.MEMBERS,MEASURES.[%COUNT],BASC) ON 1 FROM patients
```

|         | Patient Count |
|---------|---------------|
| 1 1916  | 1             |
| 2 1921  | 1             |
| 3 1922  | 1             |
| 4 1925  | 1             |
| 5 1941  | 1             |
| 6 1914  | 2             |
| 7 1918  | 2             |
| 8 1920  | 3             |
| 9 1927  | 3             |
| 10 1931 | 3             |
| 11 1934 | 3             |
| 12 1926 | 4             |
| 13 1932 | 4             |
| 14 1949 | 4             |
| 15 1955 | 4             |
| 16 1956 | 4             |
| 17 1928 | 5             |
| 18 1930 | 5             |
| 19 1937 | 5             |
| 20 1938 | 5             |
| 21 1966 | 5             |
| 22 1929 | 6             |
| 23 1940 | 6             |
| 24 1952 | 6             |
| 25 1939 | 7             |
| ...     |               |
| 93 2003 | 23            |
| 94 1977 | 25            |

Next, the following query shows the percentile rank of a member that has 5 patients:

```
SELECT PERCENTILERANK(birthd.year.MEMBERS,MEASURES.[%Count],5) ON 1 FROM patients
```

|           |       |
|-----------|-------|
| Rank of 5 | 19.68 |
|-----------|-------|

That is, if you consider birth years that have 5 patients or fewer, these birth years constitute 19.68% of the set of years.

## See Also

- [AGGREGATE](#)
- [AVG](#)
- [MAX](#)
- [MEDIAN](#)
- [MIN](#)
- [PERCENTILE](#)
- [STDDEV](#)
- [STDDEVP](#)
- [SUM](#)
- [VAR](#)
- [VARP](#)



# PERIODSTODATE (MDX)

Returns the set of child or descendent members of the given level, up to and including the given member. This function is intended primarily for use with time levels.

## Returned Type

This function returns a [set](#) of [members](#).

## Syntax and Details

```
PERIODSTODATE(ancestor_level,member_expression)
```

Where:

- ancestor\_level* is an [expression that returns a level](#). For example:

```
[dimension_name].[hierarchy_name].[level_name]
```

This level must be either an ancestor to the member given by *member\_expression*.

- member\_expression* is an [expression that returns a member](#).

This expression cannot refer to a measure.

Given a level and a member, this function returns a set that consists of a range of members, from the first member that is a descendent of the given level, up to and including the given member. The members are in the default order specified in the level definition in the cube.

## Example

The following query displays all quarters up to Q3 2003, within the year:

```
SELECT MEASURES.[%COUNT] ON 0, PERIODSTODATE(birthd.year,birthd.[Q3 2003]) ON 1 FROM patients
```

|           | Patient Count |
|-----------|---------------|
| 1 Q1 2003 | 35            |
| 2 Q2 2003 | 44            |
| 3 Q3 2003 | 43            |

In contrast, the following query displays all quarters up to Q3 2003, within the *decade*:

```
SELECT MEASURES.[%COUNT] ON 0, PERIODSTODATE(birthd.decade,birthd.[Q3 2003]) ON 1 FROM patients
```

|            | Patient Count |
|------------|---------------|
| 1 Q1 2000  | 33            |
| 2 Q2 2000  | 33            |
| 3 Q3 2000  | 45            |
| 4 Q4 2000  | 39            |
| 5 Q1 2001  | 37            |
| 6 Q2 2001  | 40            |
| 7 Q3 2001  | 36            |
| 8 Q4 2001  | 37            |
| 9 Q1 2002  | 39            |
| 10 Q2 2002 | 35            |
| 11 Q3 2002 | 40            |
| 12 Q4 2002 | 38            |
| 13 Q1 2003 | 35            |
| 14 Q2 2003 | 44            |
| 15 Q3 2003 | 43            |

This function returns a [set](#) expression in the form of a range of members. That is, for example, the following two expressions are equivalent:

```
PERIODSTODATE(birthd.decade,birthd.[Q3 2003])
birthd.[Q1 2000]:birthd.[Q3 2003]
```

## See Also

- [ANCESTOR](#)
- [COUSIN](#)
- [CLOSINGPERIOD](#)
- [OPENINGPERIOD](#)

# POWER (MDX)

Returns the given numeric value raised to the power of the second argument.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
POWER(numeric_expression, power)
```

Where:

- *numeric\_expression* is [an expression that evaluates to a number](#).  
Typically, this expression has the form [MEASURES].[*measure\_name*]
- *power* is [a numeric expression](#).  
Typically, this expression is an integer.  
If you use a decimal value less than 1, be sure to start the number with 0. For example: 0.5

## Example

The first example shows the %COUNT measure raised to the third power:

```
SELECT POWER(MEASURES.[%COUNT],3) ON 0 FROM patients

 POWER
1,000,000,000,000
```

The next example uses the [%LABEL](#) function to apply a more detailed caption:

```
SELECT %LABEL(POWER(MEASURES.[%COUNT],3),"PAT CNT^3") ON 0 FROM patients

 PAT CNT^3
1,000,000,000,000
```

The following example shows a fractional power:

```
SELECT POWER(MEASURES.[%COUNT],0.5) ON 0 FROM patients

 POWER
 100
```

## See Also

- [LOG](#)
- [SQRT](#)

# PREVMEMBER (MDX)

Returns the previous member of the level to which the given member belongs. The details are different for time dimensions and data dimensions.

## Returned Type

This function returns a [member](#).

## Syntax and Details

`member_expression.PREVMEMBER`

Where:

- `member_expression` is [an expression that returns a member](#).

This expression cannot refer to a measure.

This function examines the members of the level to which the given member belongs, and returns the previous member of that set (considering the default order of that set). For time dimensions, this function ignores any parent level. For data dimensions, this function considers the parent level; it counts backward from the current member within the given parent member. (Note that the terms *time dimension* and *data dimension* refer specifically to the dimension type as defined in the cube. See [Defining Models for InterSystems Business Intelligence](#).)

The PREVMEMBER function is equivalent to [LAG\(1\)](#).

Within any time dimension, this function is more useful for a timeline-based time level (such as Period, which groups records by year and month) than for a date-part-based time level (such as Month, which groups records only by month). See the examples. For a fuller discussion, see [Introduction to Time Levels](#).

## Example

The first examples use a time dimension. Consider the following query, shown for reference:

```
SELECT MEASURES.[%COUNT] ON 0,
{birthd.1948,birthd.1949,birthd.1950,birthd.1951,birthd.1952} ON 1
FROM patients
```

|        | Patient Count |
|--------|---------------|
| 1 1948 | 10            |
| 2 1949 | 4             |
| 3 1950 | 12            |
| 4 1951 | 8             |
| 5 1952 | 6             |

The following query uses PREVMEMBER:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.1951.PREVMEMBER ON 1 FROM patients
```

|      | Patient Count |
|------|---------------|
| 1950 | 12            |

For another example:

```
SELECT MEASURES.[%COUNT] ON 0, birthd.1950.PREVMEMBER ON 1 FROM patients
```

|      | Patient Count |
|------|---------------|
| 1949 | 4             |

In this sample, the year level is the child of the decade level, which means that the members 1949 and 1950 belong to different parents. As you can see, the PREVMEMBER function ignores the parent level when you use the function with a time dimension.

The second examples use a data dimension (the HomeD dimension). To see the hierarchy in this dimension, see the examples in the [FIRSTCHILD](#) function. The following query uses PREVMEMBER with this dimension:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.Magnolia.PREVMEMBER ON 1 FROM patients
```

|         | Patient Count |
|---------|---------------|
| Cypress | 104           |

Because this is a data dimension, this query retrieves the previous member of the city level within the parent ZIP code. Within this ZIP code, Cypress is the first city, so the following query returns no results:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.Cypress.PREVMEMBER ON 1 FROM patients
```

|  | Patient Count |
|--|---------------|
|  | *             |

For time level that is based on *part* of the date, this function returns null for the first member of the level. Consider the Month level, which groups records only by month. When we use this function with January, the engine returns null:

```
SELECT [BirthQD].[H1].[Month].[January].PREVMEMBER ON 1 FROM patients
```

|  |   |
|--|---|
|  | * |
|--|---|

For an example that uses PREVMEMBER to get the number of units sold in a previous time period, see [%CELLZERO](#).

## See Also

- [LAG](#)
- [LEAD](#)
- [NEXTMEMBER](#)

# PROPERTIES (MDX)

Returns the value of the given property, for the given member.

## Returned Type

This function returns a [string](#).

## Syntax and Details

```
member_expression.PROPERTIES(property_name,default_value))
```

Where:

- member\_expression* is [an expression that returns a member](#).

This expression cannot refer to a measure.

- property\_name* is a string that equals the name of the property.

All members have certain intrinsic properties, listed in [Intrinsic Properties](#). A cube definition can include definitions of additional properties.

- default\_value* is an optional value to return if the member does not have a value for this property. If you omit this argument and if the given member does not have the property, the function returns @NOPROPERTY.

This argument is an InterSystems extension to MDX.

Names of properties are not case-sensitive.

## Example

The following example gets the value of the KEY property, which is an intrinsic property:

```
SELECT docd.hl.CURRENTMEMBER.PROPERTIES("KEY") ON 0, docd.[doctor].MEMBERS ON 1 FROM patients
```

|                  | Doctor |
|------------------|--------|
| 1 None           | <null> |
| 2 Adam, Dan      | 41     |
| 3 Adam, Danielle | 391    |
| ...              |        |

The following variation uses [%LABEL](#) to provide a better caption:

```
SELECT %LABEL(docd.hl.CURRENTMEMBER.PROPERTIES("key"),"key") ON 0,
docd.doctor.MEMBERS ON 1 FROM patients
```

|                  | key    |
|------------------|--------|
| 1 None           | <null> |
| 2 Adam, Dan      | 41     |
| 3 Adam, Danielle | 391    |
| ...              |        |

The following example uses [CURRENTMEMBER](#) and iterates through the ZIP codes to retrieve the values of two intrinsic properties: ID and LEVEL\_NUMBER:

```
WITH SET test AS '{homed.hl.CURRENTMEMBER.PROPERTIES("id"),
homed.hl.CURRENTMEMBER.PROPERTIES("level_number")}'
SELECT test ON 0, homed.zip.MEMBERS ON 1 FROM patients
```

|         | Home ZIP | Home ZIP |
|---------|----------|----------|
| 1 32006 | 2        | 1        |
| 2 32007 | 4        | 1        |
| 3 34577 | 1        | 1        |
| 4 36711 | 5        | 1        |
| 5 38928 | 3        | 1        |

As a variation, the following query uses [%LABEL](#) to provide better captions:

```
WITH SET test AS '{%LABEL(homed.h1.CURRENTMEMBER.PROPERTIES("id"),"id"),
%LABEL(homed.h1.CURRENTMEMBER.PROPERTIES("level_number"),"level_number")}'
SELECT test ON 0, homed.zip.MEMBERS ON 1 FROM patients
```

|         | id | level_number |
|---------|----|--------------|
| 1 32006 | 2  | 1            |
| 2 32007 | 4  | 1            |
| 3 34577 | 1  | 1            |
| 4 36711 | 5  | 1            |
| 5 38928 | 3  | 1            |

For more examples, see [CURRENTMEMBER](#).

## RANK (MDX)

Returns an integer that indicates the rank of the given member, within the given set.

### Returned Type

This function returns a [number](#).

### Syntax and Details

```
RANK(member_expression, set_expression, optional_numeric_expression)
```

Where:

- *member\_expression* is [an expression that returns a member](#).
- *set\_expression* is [an expression that returns a set](#).
- *optional\_numeric\_expression* is [a numeric-valued expression](#) that the function evaluates for each member in the set.

Typically, this expression is [MEASURES].[*measure\_name*]

- If you specify this argument, the system evaluates this expression for the member and for every other member in the set. The system then returns an integer that indicates how the given member ranks compared to these other members. The member with the lowest value is at position 1.
- If you do not specify this argument, the system returns the ordinal position of the member within the given set. The first position is 1.

### Example

For example, the following query shows the rank of the member `colord.green` within the set of members of the `colord` dimension, when the members are ranked by patient count:

```
SELECT RANK(colord.green, colord.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
```

|         |       |
|---------|-------|
| Results | Green |
|         | 2     |

To see that this is correct, consider the following query, which sorts the members of this dimension by the patient count:

```
SELECT MEASURES.[%COUNT] ON 0,
ORDER(colord.MEMBERS, MEASURES.[%COUNT]) ON 1 FROM patients
```

|          | Patient Count |
|----------|---------------|
| 1 None   | 1,243         |
| 2 Green  | 1,304         |
| 3 Blue   | 2,381         |
| 4 Orange | 1,302         |
| 5 Purple | 1,276         |
| 6 Red    | 1,244         |
| 7 Yellow | 1,250         |



---

# ROUND (MDX)

---

Evaluates a numeric MDX expression and returns a rounded value. This function is an InterSystems extension to MDX.

## Returned Type

This function returns a [numeric expression](#).

## Syntax and Details

```
ROUND(numeric_expression,decimal_places)
```

Where:

- *numeric\_expression* is a [numeric expression](#).
- *decimal\_places* is an integer literal that specifies the number of decimal places to use for the returned value. The default is 0.

## Example

The following shows a simple example:

```
SELECT ROUND(MEASURES.[avg allergy count],2) ON 0,
patgrp.[patient group].MEMBERS ON 1 FROM patients
```

|           | ROUND |
|-----------|-------|
| 1 Group A | 0.97  |
| 2 Group B | 1.06  |
| 3 None    | 0.97  |

## SIBLINGS (MDX)

---

Returns a set that contains the specified member and all its siblings.

### Returned Type

This function returns a [set](#) of [members](#).

### Syntax and Details

`member_expression.SIBLINGS`

Where:

- *member\_expression* is [an expression that returns a member](#).

This expression cannot refer to a measure.

### Example

For example:

```
SELECT MEASURES.[%COUNT] ON 0, homed.cypress.SIBLINGS ON 1 FROM patients
```

|            | Patient Count |
|------------|---------------|
| 1 Cypress  | 1,089         |
| 2 Magnolia | 1,073         |
| 3 Pine     | 1,039         |

To see a picture of the hierarchy used in this example, see the [FIRSTCHILD](#) function.

### See Also

- [CHILDREN](#)
- [COUSIN](#)
- [DESCENDANTS](#)
- [FIRSTCHILD](#)
- [FIRSTSIBLING](#)
- [LASTCHILD](#)
- [LASTSIBLING](#)
- [PARENT](#)

---

# SQRT (MDX)

---

Returns the square root of the given numeric value.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
SQRT(numeric_expression)
```

Where:

- numeric\_expression* is [an expression that evaluates to a number](#).

Typically, this expression has the form `[MEASURES].[measure_name]`

## Example

The first example shows the square root of the Patient Count measure:

```
SELECT SQRT(MEASURES.[%COUNT]) ON 0 FROM patients
 Sqrt
 100
```

The next example uses the [%LABEL](#) function to apply a more detailed caption:

```
SELECT %LABEL(SQRT(MEASURES.[%COUNT]), "SQRT PAT CNT") ON 0 FROM patients
 Sqrt PAT CNT
 100
```

## See Also

- [LOG](#)
- [POWER](#)

## STDDEV (MDX)

Returns the standard deviation of a given expression (or of the current measure), across all elements of a set.

### Returned Type

This function returns a [number](#).

### Syntax and Details

```
STDDEV(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES].[*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The function evaluates the numeric value for each element of the set and returns the standard deviation of those values.

### Example

First, the following query shows two measure values for the members of the `aged.decade` level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count]} ON 0,
birthd.decade.MEMBERS ON 1 FROM patients
```

|          | Patient Count | Encounter Count |
|----------|---------------|-----------------|
| 1 1910s  | 80            | 5,359           |
| 2 1920s  | 227           | 12,910          |
| 3 1930s  | 567           | 33,211          |
| 4 1940s  | 724           | 38,420          |
| 5 1950s  | 1,079         | 46,883          |
| 6 1960s  | 1,475         | 57,814          |
| 7 1970s  | 1,549         | 49,794          |
| 8 1980s  | 1,333         | 35,919          |
| 9 1990s  | 1,426         | 29,219          |
| 10 2000s | 1,406         | 20,072          |
| 11 2010s | 134           | 1,346           |

Next, the following query shows the standard deviations for these measures for the members of this level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count]} ON 0,
STDDEV(birthd.decade.MEMBERS) ON 1 FROM patients
```

|        | Patient Count | Encounter Count |
|--------|---------------|-----------------|
| STDDEV | 579.41        | 18,401.33       |

Here, each value is the standard deviation of the values in a column in the preceding query. For example, the `Patient Count` value is the standard deviation of the `Patient Count` values in the preceding query.

For another example, we use the second argument for STDDEV:

```
SELECT STDDEV(birthd.decade.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
STDDEV
579.41
```

For additional, similar examples, see [AVG](#).

## See Also

- [AGGREGATE](#)
- [AVG](#)
- [MAX](#)
- [MEDIAN](#)
- [MIN](#)
- [PERCENTILE](#)
- [PERCENTILERANK](#)
- [STDDEVP](#)
- [SUM](#)
- [VAR](#)
- [VARP](#)

# STDDEVP (MDX)

Returns the population standard deviation of a given expression, across all elements of a set.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
STDDEVP(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES].[*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell.

The function evaluates the numeric value for each element of the set and returns the population standard deviation of those values.

## Example

First, the following query shows two measure values for the members of the `aged.decade` level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count]} ON 0,
birthd.decade.MEMBERS ON 1 FROM patients
```

|          | Patient Count | Encounter Count |
|----------|---------------|-----------------|
| 1 1910s  | 80            | 5,359           |
| 2 1920s  | 227           | 12,910          |
| 3 1930s  | 567           | 33,211          |
| 4 1940s  | 724           | 38,420          |
| 5 1950s  | 1,079         | 46,883          |
| 6 1960s  | 1,475         | 57,814          |
| 7 1970s  | 1,549         | 49,794          |
| 8 1980s  | 1,333         | 35,919          |
| 9 1990s  | 1,426         | 29,219          |
| 10 2000s | 1,406         | 20,072          |
| 11 2010s | 134           | 1,346           |

Next, the following query shows the population standard deviations for these measures for the members of this level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count]} ON 0,
STDDEVP(birthd.decade.MEMBERS) ON 1 FROM patients
```

|         | Patient Count | Encounter Count |
|---------|---------------|-----------------|
| STDDEVP | 552.44        | 17,544.98       |

Here, each value is the population standard deviation of the values in a column in the preceding query. For example, the `Patient Count` value is the population standard deviation of the `Patient Count` values in the preceding query.

For another example, we use the second argument for `STDDEVP`:

```
SELECT STDDEVP(birthd.decade.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
```

|  | STDDEVP |
|--|---------|
|  | 552.44  |

For additional, similar examples, see [AVG](#).

## See Also

- [AGGREGATE](#)

- [AVG](#)
- [MAX](#)
- [MEDIAN](#)
- [MIN](#)
- [PERCENTILE](#)
- [PERCENTILERANK](#)
- [STDDEV](#)
- [SUM](#)
- [VAR](#)
- [VARP](#)

## STDEV (MDX)

---

Synonym for STDDEV.

### See Also

- [STDDEV](#)



# STDEVP (MDX)

---

Synonym for STDDEVP.

## See Also

- [STDDEVP](#)

## SUBSET (MDX)

---

Returns a set of elements from a given set, by position. The first member is at position 0.

### Returned Type

This function returns a [set](#).

### Syntax and Details

```
SUBSET(set_expression, first_element_position, optional_element_count)
```

Where:

- *set\_expression* is [an expression that evaluates to a set](#).
- *first\_element\_position* is an integer literal that specifies the position of the first element to return.  
The position of the first element is 0.
- *optional\_element\_count* is an integer literal that specifies the position of the number of element to return.  
If you omit this argument, the function returns the element at *first\_element\_position* and all elements that follow it.

### Example

```
SELECT MEASURES.[%COUNT] ON 0, SUBSET(homed.city.MEMBERS, 0, 3) ON 1 FROM patients
```

|               | Patient | Count |
|---------------|---------|-------|
| 1 Cedar Falls |         | 1,188 |
| 2 Centerville |         | 1,155 |
| 3 Cypress     |         | 1,221 |

In contrast, consider this example, which shows the complete set:

```
SELECT MEASURES.[%COUNT] ON 0, homed.city.MEMBERS ON 1 FROM patients
```

|               | Patient | Count |
|---------------|---------|-------|
| 1 Cedar Falls |         | 1,188 |
| 2 Centerville |         | 1,155 |
| 3 Cypress     |         | 1,221 |
| 4 Elm Heights |         | 1,266 |
| 5 Juniper     |         | 1,197 |
| 6 Magnolia    |         | 1,156 |
| 7 Pine        |         | 1,139 |
| 8 Redwood     |         | 1,144 |
| 9 Spruce      |         | 1,135 |

# SUM (MDX)

Returns the sum of a given expression (or of the current measure), across all elements of a set.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
SUM(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES].[*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The function evaluates the numeric value for each element of the set and returns the sum of those values.

## Example

First, the following query shows values of three measures for the members of the aged.decade level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
birthd.decade.MEMBERS ON 1 FROM patients
```

|          | Patient Count | Encounter Count | Avg Test Score |
|----------|---------------|-----------------|----------------|
| 1 1910s  | 80            | 5,359           | 75.17          |
| 2 1920s  | 227           | 12,910          | 74.20          |
| 3 1930s  | 567           | 33,211          | 74.67          |
| 4 1940s  | 724           | 38,420          | 73.39          |
| 5 1950s  | 1,079         | 46,883          | 73.72          |
| 6 1960s  | 1,475         | 57,814          | 74.16          |
| 7 1970s  | 1,549         | 49,794          | 74.35          |
| 8 1980s  | 1,333         | 35,919          | 74.13          |
| 9 1990s  | 1,426         | 29,219          | 74.79          |
| 10 2000s | 1,406         | 20,072          | 74.95          |
| 11 2010s | 134           | 1,346           | 73.55          |

Next, the following query shows the sums for these measures for the members of this level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count],MEASURES.[avg test score]} ON 0,
SUM(birthd.decade.MEMBERS) ON 1 FROM patients
```

|     | Patient Count | Encounter Count | Avg Test Score |
|-----|---------------|-----------------|----------------|
| SUM | 10,000        | 330,947         | 817.08         |

Here, each value is the sum of the values in a column in the preceding query. For example, the Patient Count value is the sum of the Patient Count values in the preceding query. The Avg Test Score value is the sum of the average test scores and is probably not a useful value.

For another example, we use the second argument for SUM:

```
SELECT SUM(birthd.decade.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
SUM
10,000
```

For additional, similar examples, see [AVG](#).

## See Also

- [AGGREGATE](#)
- [AVG](#)
- [MAX](#)
- [MEDIAN](#)
- [MIN](#)
- [PERCENTILE](#)
- [PERCENTILERANK](#)
- [STDDEV](#)
- [STDDEVP](#)
- [VAR](#)
- [VARP](#)

# TAIL (MDX)

Returns a subset from the end of a set, using the current order of the set.

## Returned Type

This function returns a [set](#).

## Syntax and Details

`TAIL(set_expression, optional_integer_expression)`

- *set\_expression* is [an expression that evaluates to a set](#).
- *optional\_integer\_expression* is an integer literal.

The default value for this argument is 1.

The function uses this argument to determine the number of elements to return in the subset.

This function returns a set that consists of the specified number of elements from the end of the given set (considering the current order of the set). If *integer\_expression* is less than 1, the function returns the empty set. If *integer\_expression* is greater than the number of elements of the set, the function returns the original set.

The elements of the subset are returned in the same order specified by the original set.

## Example

```
SELECT MEASURES.[%COUNT] ON 0, TAIL(birthd.decade.MEMBERS, 3) ON 1
FROM patients
```

|         | Patient Count |
|---------|---------------|
| 1 1990s | 1,413         |
| 2 2000s | 1,433         |
| 3 2010s | 155           |

## See Also

- [HEAD](#)

# TOPCOUNT (MDX)

Sorts a set and returns a subset from its higher-valued end, given a desired element count.

## Returned Type

This function returns a [set](#) of [members](#) or [tuples](#), depending on the set used.

## Syntax and Details

```
TOPCOUNT(set_expression, element_count, optional_ordering_expression)
```

Where:

- *set\_expression* is an [expression that evaluates to a set](#) of [members](#) or [tuples](#).
- *element\_count* is an integer literal.

The function uses this argument to determine the number of elements to return in the subset. If this argument is greater than the number of elements, all elements are returned.

- *optional\_ordering\_expression* is a [numeric-valued expression](#) that determines the order of the set elements.

Typically, *ordering\_expression* is [MEASURES].[*measure\_name*]

The function evaluates this expression for each element of the set and sorts the elements of the set in descending order according to this value. Any hierarchies are ignored.

If this argument is omitted, the function uses the current order of the set elements (and this function behaves like the [HEAD](#) function).

## Example

First consider the following query and the results it returns:

```
SELECT MEASURES.[%COUNT] ON 0,
TOPCOUNT(birthd.decade.MEMBERS, 100, MEASURES.[%COUNT]) ON 1 FROM patients
```

|    | Patient | Count |
|----|---------|-------|
| 1  | 1970s   | 1,520 |
| 2  | 1960s   | 1,500 |
| 3  | 2000s   | 1,433 |
| 4  | 1990s   | 1,413 |
| 5  | 1980s   | 1,400 |
| 6  | 1950s   | 1,030 |
| 7  | 1940s   | 683   |
| 8  | 1930s   | 572   |
| 9  | 1920s   | 223   |
| 10 | 2010s   | 155   |
| 11 | 1910s   | 71    |

Because *count\_expression* is greater than the number of members, all members are returned. The members are sorted in ascending order according to the value of the %COUNT measure.

Next, consider a similar query, using *count\_expression* equal to 3:

```
SELECT MEASURES.[%COUNT] ON 0,
TOPCOUNT(birthd.decade.MEMBERS, 3, MEASURES.[%COUNT]) ON 1 FROM patients
```

|   | Patient | Count |
|---|---------|-------|
| 1 | 1970s   | 1,520 |
| 2 | 1960s   | 1,500 |
| 3 | 2000s   | 1,433 |

This query selects three members from the higher-valued end of the set.

## See Also

- [BOTTOMCOUNT](#)

# TOPPERCENT (MDX)

Sorts a set and returns a subset from its higher-valued end, given a cutoff percentage that is applied to a total across set elements.

## Returned Type

This function returns a [set](#) of [members](#) or [tuples](#), depending on the set used.

## Syntax and Details

```
TOPPERCENT(set_expression, percentage, ordering_expression)
```

- set\_expression* is [an expression that evaluates to a set](#) of [members](#) or [tuples](#).
- percentage* is a numeric literal that is less than or equal to 100. That is, 15 represents 15 percent.

The function uses this argument to determine the cutoff point for elements to return in the subset.

There is usually a member that straddles the cutoff point; this member is assigned to the upper set, rather than the lower set. As a result, in the returned subset, the cumulative total for *ordering\_expression* could be greater than *percentage*, as a percentage of the entire set.

- ordering\_expression* is [a numeric-valued expression](#) that determines the order of the set elements.

The function evaluates this expression for each element of the set and sorts the elements of the set in descending order according to this value. Any hierarchies are ignored.

## Example

First consider the following query and the results it returns:

```
SELECT MEASURES.[%COUNT] ON 0,
TOPPERCENT(birthd.decade.MEMBERS, 100, MEASURES.[%COUNT]) ON 1 FROM patients
```

|          | Patient Count |
|----------|---------------|
| 1 2000s  | 157           |
| 2 1980s  | 155           |
| 3 1990s  | 144           |
| 4 1960s  | 136           |
| 5 1970s  | 128           |
| 6 1950s  | 107           |
| 7 1930s  | 56            |
| 8 1940s  | 54            |
| 9 2010s  | 44            |
| 10 1920s | 13            |
| 11 1910s | 6             |

Because *percentage* is 100, all members are returned.

Now consider a variation of the preceding, in which *percentage* is 50, so that we see the top 50 percent:

```
SELECT MEASURES.[%COUNT] ON 0, TOPPERCENT(birthd.decade.MEMBERS, 50, MEASURES.[%COUNT]) ON 1 FROM patients
```

|         | Patient Count |
|---------|---------------|
| 1 2000s | 157           |
| 2 1980s | 155           |
| 3 1990s | 144           |
| 4 1960s | 136           |

The total for the %COUNT measure for these members is a little more than 50% of the total. (If the 1960s were omitted, the total count would be less than 50%.)



## See Also

- [BOTTOMPERCENT](#)

# TOPSUM (MDX)

Sorts a set and returns a subset from its higher-valued end, given a cutoff value that is applied to a total across elements.

## Returned Type

This function returns a [set](#) of [members](#) or [tuples](#), depending on the set used.

## Syntax and Details

```
TOPSUM(set_expression, cutoff_value, ordering_expression)
```

- *set\_expression* is [an expression that evaluates to a set of members or tuples](#).
- *cutoff\_value* is a numeric literal.

The function uses this argument to determine the cutoff value for elements to return in the subset.

For all elements in the returned subset, the sum of the values of *ordering\_expression* will be less than or equal to *cutoff\_value*.

- *ordering\_expression* is [a numeric-valued expression](#) that determines the order of the set members.

The function evaluates this expression for each element of the set and sorts the elements of the set in descending order according to this value. Any hierarchies are ignored.

## Example

First consider an example in which the cutoff value is high enough to include all members:

```
SELECT MEASURES.[%COUNT] ON 0,
TOPSUM(birthd.decade.MEMBERS, 10000, MEASURES.[%COUNT]) ON 1 FROM patients
```

|    | Patient | Count |
|----|---------|-------|
| 1  | 1970s   | 1,520 |
| 2  | 1960s   | 1,500 |
| 3  | 2000s   | 1,433 |
| 4  | 1990s   | 1,413 |
| 5  | 1980s   | 1,400 |
| 6  | 1950s   | 1,030 |
| 7  | 1940s   | 683   |
| 8  | 1930s   | 572   |
| 9  | 1920s   | 223   |
| 10 | 2010s   | 155   |
| 11 | 1910s   | 71    |

Now consider a variation in which the cutoff value is set to 2500:

```
SELECT MEASURES.[%COUNT] ON 0,
TOPSUM(birthd.decade.MEMBERS, 2500, MEASURES.[%COUNT]) ON 1 FROM patients
```

|       | Patient | Count |
|-------|---------|-------|
| 1970s |         | 1,520 |

## See Also

- [BOTTOMSUM](#)

# UNION (MDX)

Returns a set that consists of the elements of the two given sets, optionally eliminating duplicates.

## Returned Type

This function returns a [set](#).

## Syntax and Details

```
UNION(set_expression1, set_expression2, ALL)
```

Or:

```
UNION(set_expression1, set_expression2)
```

- set\_expression1* and *set\_expression2* are [expressions that evaluate to sets](#).
- The optional keyword ALL, if included, specifies that all duplicates should be retained. By default, if the returned set includes any duplicate elements, only the first of those is included.

## Example

Consider the following query which defines two named sets:

```
WITH SET set1 AS '{allerd.eggs,allerd.soy,allerd.wheat}'
SET set2 AS '{allerd.[dairy products],allerd.pollen,allerd.soy,allerd.wheat}'
SELECT MEASURES.[%COUNT] ON 0, UNION(set1,set2) ON 1 FROM patients
```

|                  | Patient Count |
|------------------|---------------|
| 1 eggs           | 451           |
| 2 soy            | 462           |
| 3 wheat          | 479           |
| 4 dairy products | 463           |
| 5 pollen         | 447           |

This query shows all the members that are in *set1* and *set2*.

In contrast, consider the following variation, which uses the ALL keyword to keep duplicates:

```
WITH SET set1 AS '{allerd.eggs,allerd.soy,allerd.wheat}'
SET set2 AS '{allerd.[dairy products],allerd.pollen,allerd.soy,allerd.wheat}'
SELECT MEASURES.[%COUNT] ON 0, UNION(set1,set2,ALL) ON 1 FROM patients
```

|                  | Patient Count |
|------------------|---------------|
| 1 eggs           | 451           |
| 2 soy            | 462           |
| 3 wheat          | 479           |
| 4 dairy products | 463           |
| 5 pollen         | 447           |
| 6 soy            | 462           |
| 7 wheat          | 479           |

Finally, you can of course use more interesting sets as arguments. For example:

```
WITH SET set1 AS 'TOPCOUNT(homed.city.members,5,MEASURES.[avg allergy count])'
SET set2 AS 'TOPCOUNT(homed.city.members,5,MEASURES.[avg age])'
SELECT MEASURES.[%COUNT] ON 0, UNION(set1,set2) ON 1 FROM patients
```

|               | Patient Count |
|---------------|---------------|
| 1 Juniper     | 1,197         |
| 2 Spruce      | 1,135         |
| 3 Centerville | 1,155         |
| 4 Redwood     | 1,144         |
| 5 Magnolia    | 1,156         |
| 6 Cedar Falls | 1,188         |
| 7 Elm Heights | 1,266         |
| 8 Pine        | 1,139         |

## See Also

- [EXCEPT](#)
- [INTERSECT](#)

# VAR (MDX)

Returns the variance of a given expression (or of the current measure), across all elements of a set.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
VAR(set_expression, optional_numeric_expression)
```

Or:

```
VAR(set_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES] . [measure\_name]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The function evaluates the numeric value for each element of the set and returns the variance of those values.

## Example

First, the following query shows two measure values for the members of the aged.decade level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count]} ON 0,
birthd.decade.MEMBERS ON 1 FROM patients
```

|          | Patient Count | Encounter Count |
|----------|---------------|-----------------|
| 1 1910s  | 80            | 5,359           |
| 2 1920s  | 227           | 12,910          |
| 3 1930s  | 567           | 33,211          |
| 4 1940s  | 724           | 38,420          |
| 5 1950s  | 1,079         | 46,883          |
| 6 1960s  | 1,475         | 57,814          |
| 7 1970s  | 1,549         | 49,794          |
| 8 1980s  | 1,333         | 35,919          |
| 9 1990s  | 1,426         | 29,219          |
| 10 2000s | 1,406         | 20,072          |
| 11 2010s | 134           | 1,346           |

Next, the following query shows the variances for these measures for the members of this level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count]} ON 0,
VAR(birthd.decade.MEMBERS) ON 1 FROM patients
```

|     | Patient Count | Encounter Count |
|-----|---------------|-----------------|
| VAR | 335,710.89    | 338,609,051.69  |

Here, each value is the variance of the values in a column in the preceding query. For example, the Patient Count value is the variance of the Patient Count values in the preceding query.

For another example, we use the second argument for VAR:

```
SELECT VAR(birthd.decade.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
```

|  | VAR        |
|--|------------|
|  | 335,710.89 |

For additional, similar examples, see [AVG](#).

## See Also

- [AGGREGATE](#)
- [AVG](#)
- [MAX](#)
- [MEDIAN](#)
- [MIN](#)
- [PERCENTILE](#)
- [PERCENTILERANK](#)
- [STDDEV](#)
- [STDDEVP](#)
- [SUM](#)
- [VARP](#)

# VARIANCE (MDX)

---

Synonym for VAR.

## See Also

- [VAR](#)

## VARIANCEP (MDX)

---

Synonym for VARP.

### See Also

- [VARP](#)



# VARP (MDX)

Returns the population variance of a given expression, across all elements of a set.

## Returned Type

This function returns a [number](#).

## Syntax and Details

```
VARP(set_expression, optional_numeric_expression)
```

Where:

- set\_expression* is [an expression that evaluates to a set](#), typically a set of [members](#) or [tuples](#).
- optional\_numeric\_expression* is a [numeric-valued expression](#) that the function evaluates for each set element.

Typically, this expression has the form [MEASURES].[*measure\_name*]

If you do not specify a numeric expression, the system uses the measure used by the current result cell. For example, this might be the measure used on the 0 axis or the measure specified in the WHERE clause, if any. If the query itself does not specify a measure, the system instead uses %COUNT, which counts records in the fact table.

The function evaluates the numeric value for each element of the set and returns the population variance of those values.

## Example

First, the following query shows two measure values for the members of the aged.decade level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count]} ON 0,
birthd.decade.MEMBERS ON 1 FROM patients
```

|          | Patient Count | Encounter Count |
|----------|---------------|-----------------|
| 1 1910s  | 80            | 5,359           |
| 2 1920s  | 227           | 12,910          |
| 3 1930s  | 567           | 33,211          |
| 4 1940s  | 724           | 38,420          |
| 5 1950s  | 1,079         | 46,883          |
| 6 1960s  | 1,475         | 57,814          |
| 7 1970s  | 1,549         | 49,794          |
| 8 1980s  | 1,333         | 35,919          |
| 9 1990s  | 1,426         | 29,219          |
| 10 2000s | 1,406         | 20,072          |
| 11 2010s | 134           | 1,346           |

Next, the following query shows the population variances for these measures for the members of this level:

```
SELECT {MEASURES.[%COUNT],MEASURES.[encounter count]} ON 0,
VARP(birthd.decade.MEMBERS) ON 1 FROM patients
```

|      | Patient Count | Encounter Count |
|------|---------------|-----------------|
| VARP | 305,191.72    | 307,826,410.63  |

Here, each value is the population variance of the values in a column in the preceding query. For example, the Patient Count value is the population variance of the Patient Count values in the preceding query.

For another example, we use the second argument for VARP:

```
SELECT VARP(birthd.decade.MEMBERS, MEASURES.[%COUNT]) ON 0 FROM patients
 VARP
 305,191.72
```

For additional, similar examples, see [AVG](#).

## See Also

- [AGGREGATE](#)
- [AVG](#)
- [MAX](#)
- [MEDIAN](#)
- [MIN](#)
- [PERCENTILE](#)
- [PERCENTILERANK](#)
- [STDDEV](#)
- [STDDEVP](#)
- [SUM](#)
- [VAR](#)

# VISUALTOTALS (MDX)

Given a set of members in hierarchical order, returns that set with its visual totals. In the visual totals, the actual value for any higher-level member is replaced with the sum of the values for the children that are included in the query.

## Returned Type

This function returns a set of members.

## Syntax and Details

VISUALTOTALS(*set\_expression*, *optional\_parent\_name\_pattern*)

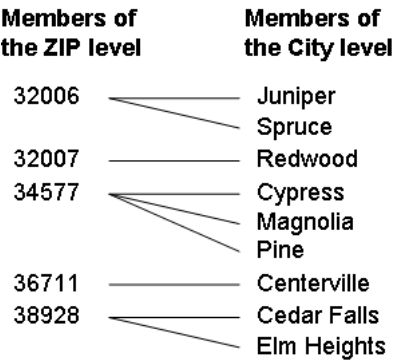
Where:

- set\_expression* is an expression that evaluates to a set of members. This set can include members at different levels within the same dimension but the members should be in hierarchical order.
- optional\_parent\_name\_pattern* is a string that includes an asterisk (\*) in the place where the parent name is to be used. For example: "SUB \*" or "\*" (SUBTOTAL) "

If you omit this, no extra strings are added to the parent names.

## Example

First, for reference, the following figure shows the hierarchy used in this example:



Consider the following query, which does not use VISUALTOTALS:

```
WITH SET demo AS 'HIERARCHIZE({homed.32006,homed.34577,homed.CYPRESS,homed.PINE,homed.SPRUCE})'
SELECT MEASURES.[%COUNT] ON 0, demo ON 1 FROM patients
Patient Count
1 32006 2,272
2 Spruce 1,117
3 34577 3,399
4 Cypress 1,150
5 Pine 1,138
```

This query shows the patient count for each of the listed ZIP codes and cities. The patient count for each ZIP code is the total patient count for that ZIP code.

Now consider the following variation, which does use VISUALTOTALS:

```
WITH SET demo AS 'HIERARCHIZE({homed.32006,homed.34577,homed.CYPRESS,homed.PINE,homed.SPRUCE})'
SELECT MEASURES.[%COUNT] ON 0, VISUALTOTALS(demo) ON 1 FROM patients
```

|           | Patient Count |
|-----------|---------------|
| 1 32006   | 1,117         |
| 2 Spruce  | 1,117         |
| 3 34577   | 2,288         |
| 4 Cypress | 1,150         |
| 5 Pine    | 1,138         |

In this case, the patient count for any higher-level members (the ZIP codes) reflects only the children that are included in the query. For example, the patient count for ZIP code 34577 is the sum of the patient counts for the cities of Pine and Cypress.

For another variation, consider the following query, which is like the preceding except that it also uses the second argument to VISUALTOTALS:

```
VISUALTOTALS */WITH SET demo AS
'HIERARCHIZE({homed.32006,homed.34577,homed.CYPRESS,homed.PINE,homed.SPRUCE})'
SELECT MEASURES.[%COUNT] ON 0, VISUALTOTALS(demo,"* (included cities)") ON 1 FROM patients
```

|                           | Patient Count |
|---------------------------|---------------|
| 1 32006 (included cities) | 1,117         |
| 2 Spruce                  | 1,117         |
| 3 34577 (included cities) | 2,288         |
| 4 Cypress                 | 1,150         |
| 5 Pine                    | 1,138         |

The values shown are the same as in the preceding query, but each ZIP code is shown with the trailing string (included cities).

## See Also

- [HIERARCHIZE](#)

# Intrinsic Properties (MDX)

This reference section provides information on the intrinsic properties for levels in cubes in [Business Intelligence](#).

Also see [Accessing the BI Samples](#).

## Intrinsic Properties (MDX)

This section lists the intrinsic properties for levels in cubes.

### Intrinsic Properties

All members have the following intrinsic properties. The table shows examples using the city of Juniper from the sample.

| Property                 | Details                                                                                                                                                                                              | Example  |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| <i>KEY</i>               | Key for the member, for use with the syntax <code>&amp;[key]</code> when referring to the member, as discussed in <a href="#">Member Expressions</a> . For details, see <a href="#">Key Values</a> . | Juniper  |
| <i>ID</i>                | Internal ID of the member.                                                                                                                                                                           | 6        |
| <i>NAME</i>              | Display name of the member. This is taken from the source value or (if present) from the value of a property marked <code>isName="true"</code>                                                       | Juniper  |
| <i>MEMBER_NAME</i>       |                                                                                                                                                                                                      |          |
| <i>CAPTION</i>           |                                                                                                                                                                                                      |          |
| <i>CUBE_NAME</i>         | Uppercase version of the logical name of the cube to which this member belongs. This is controlled by the <code>name</code> attribute of the cube.                                                   | PATIENTS |
| <i>LEVEL_NUMBER</i>      | Number of the level to which this member belongs. Level 0 is the All level.                                                                                                                          | 3        |
| <i>LEVEL_CAPTION</i>     | Localized version of the <code>displayName</code> of the current level. The <code>displayName</code> attribute is specified within the cube definition.                                              | City     |
| <i>LEVEL</i>             | Uppercase version of the logical name of the level. This is controlled by the <code>name</code> attribute of the level in the cube definition.                                                       | CITY     |
| <i>HIERARCHY_CAPTION</i> | Localized version of the <code>displayName</code> of the current hierarchy. The <code>displayName</code> attribute is specified within the cube definition.                                          | H1       |
| <i>HIERARCHY</i>         | Uppercase version of the logical name of the hierarchy. This is controlled by the <code>name</code> attribute of the hierarchy in the cube definition.                                               | H1       |
| <i>DIMENSION_CAPTION</i> | Localized version of the <code>displayName</code> of the current dimension. The <code>displayName</code> attribute is specified within the cube definition.                                          | HomeD    |
| <i>DIMENSION</i>         | Uppercase version of the logical name of the dimension. This is controlled by the <code>name</code> attribute of the dimension in the cube definition.                                               | HOMED    |

Names of properties are not case-sensitive.

## Key Values (MDX)

This section describes how the system generates KEY values for level members.

### Key Values

The system generates KEY values as follows. Note that these values are case-sensitive, unlike all other items in MDX.

| Scenario                                                    | Format of KEY value                                                                              | Example Member Name <sup>*</sup> | Corresponding KEY Value               |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------|
| Null member                                                 | <null>                                                                                           | None                             | <null>                                |
| All member                                                  | *                                                                                                | All Patient Addresses            | *                                     |
| Member of a level that uses the HourNumber time function    | Integer that represents the hour number                                                          | 2                                | 2                                     |
| Member of a level that uses the DayMonthYear time function  | Integer that represents the date in <b>\$HOROLOG</b> format                                      | Dec 27 2004                      | 59896                                 |
| Member of a level that uses the DayNumber time function     | Integer that represents the day number                                                           | 21                               | 21                                    |
| Member of a level that uses the WeekNumber time function    | Integer that represents the day number                                                           | 6                                | 6                                     |
| Member of a level that uses the MonthNumber time function   | Integer that represents the month number                                                         | July                             | 7                                     |
| Member of a level that uses the WeekYear time function      | String in the form YYYYMMWW                                                                      | 2012W06                          | 2012W06                               |
| Member of a level that uses the MonthYear time function     | Integer in the form YYYYMM                                                                       | July 2010                        | 201007                                |
| Member of a level that uses the QuarterNumber time function | Integer that represents the quarter number                                                       | Q3                               | 3                                     |
| Member of a level that uses the QuarterYear time function   | Integer in the form YYYYQQ                                                                       | Q4 2010                          | 201004                                |
| Member of a level that uses the Year time function          | Four-digit integer that represents the year number                                               | 2009                             | 2009                                  |
| Member of a level that uses the Decade time function        | Four-digit integer that represents the year number, followed by s                                | 1990s                            | 1990s                                 |
| Member of a computed dimension                              | Member name, followed by a colon, followed by the SQL SELECT statement that retrieves the values | member 1                         | shown after this table <sup>***</sup> |
| Other scenarios                                             | Source value of the member (which is also used as the member name by default) <sup>**</sup>      | Juniper                          | Juniper                               |
|                                                             |                                                                                                  | Sorenson, Violet                 | 169                                   |

\* For levels in time dimensions, this column shows their default display names. Depending on how the level is defined, the member names might be different. See [Defining Models for InterSystems Business Intelligence](#).

\*\* In a well-defined cube, each member key is unique. See [Defining Member Keys and Names Appropriately](#).

\*\*\* The key for a member of a computed dimension might be as follows:

```
&[member 1:select ID from BI_Model_PatientsCube.Fact WHERE MxAge<50 AND DxHomeCity->PxName='Elm Heights']
```

You can use the [PROPERTIES](#) function to find the value of the KEY property or any other property of a member.



# NOW Member for Time Levels

This reference section provides information on the NOW member for date/time levels in [Business Intelligence](#).

Also see [Accessing the BI Samples](#).

## NOW Member (MDX)

This section provides information on the NOW member for date/time levels. This syntax is an InterSystems extension to MDX.

### Basic Syntax

```
date_time_level.[NOW]
```

Where:

- date\_time\_level* is a [level expression](#) that refers to a level in a date/time dimension.

This syntax returns the member of the given level that corresponds to the current date and time. The following table shows examples (created on 24 May 2012):

| Expression                | Returned member                 |
|---------------------------|---------------------------------|
| birthd.decade.NOW         | birthd.decade.2010s             |
| birthd.[quarter year].NOW | birthd.[quarter year].[Q2 2012] |
| birthqd.[quarter].NOW     | birthd.[quarter year].Q2        |
| birthtd.NOW               | birthtd.4pm                     |

NOW is not case-sensitive. Also, the square brackets around it are optional unless you are using one of the variations discussed below in this topic.

### Dates Relative to Now

You can also use expressions of the following form:

```
date_time_level.[NOW-integer]
```

Or:

```
date_time_level.[NOW+integer]
```

The following table shows examples (created on 24 May 2012):

| Expression                    | Returned member                 |
|-------------------------------|---------------------------------|
| birthd.decade.[NOW-4]         | birthd.decade.1970s             |
| birthd.[quarter year].[NOW-4] | birthd.[quarter year].[Q2 2011] |
| birthqd.quarter.[NOW-4]       | birthqd.quarter.Q2              |

Be careful when using such expressions with a time level that is independent of the overall calendar. In such cases, `[NOW-integer]` refers to an earlier bucket in a cycle. Notice the third example in the table. The `birthqd.quarter` level groups records by quarter, independent of year. For this level, NOW refers only to the current quarter number. This level has four members in a cycle, and for this level, `[NOW-4]` is equivalent to `[NOW]`.

The same logic applies to expressions of the form `[NOW+integer]`.

## Restrictions on Use in Range Expressions

You cannot use NOW in range expressions for a level that is based on any of the following time functions:

| Time Function... | Typical Members | Notes                                                          |
|------------------|-----------------|----------------------------------------------------------------|
| QuarterNumber    | Q4              | These levels are independent of the year                       |
| MonthNumber      | November        |                                                                |
| DayNumber        | 24              | This level is independent of the year and the part of the year |
| HourNumber       | 1am             | These levels are independent of the day                        |
| MinuteNumber     | 01:24           |                                                                |

## Additional Options for Day Levels

For a level that is based on the **DayMonthYear** time function, Business Intelligence supports the additional expressions that use a combination of year count, month count, and day count, as follows:

```
daymonthyear_level.[NOW-offset_expression]
```

Or:

```
daymonthyear_level.[NOW+offset_expression]
```

In simple cases, *offset\_expression* is *nnynmmnnd*, as follows:

- *nn* is a one or two digit integer.
- The optional unit *ny* specifies the number of years.
- The optional unit *nm* specifies the number of months.
- The optional unit *nd* specifies the number of days.

The following table shows examples (created on 24 May 2012):

| Expression               | Returned member           |
|--------------------------|---------------------------|
| birthd.date.[NOW-4y3m2d] | birthd.date.[Feb 22 2008] |
| birthd.date.[NOW-1m]     | birthd.date.[Apr 24 2012] |

By default, the units are added together. For example, 4y3m2d means four years plus three months plus two days.

You can instead include a minus sign between units to subtract. 1y-1d means one year, minus one day. For example:

| Expression                            | Returned member                         |
|---------------------------------------|-----------------------------------------|
| dateofsale.actual.daysold.[NOW-1y-1d] | dateofsale.actual.daysold.[May 25 2011] |

The system automatically accounts for leap years. The internal logic also accounts for the varying lengths of the months.



# A

## Quick Function Reference (MDX)

The following table summarizes the syntax and return type of each supported MDX function in [Business Intelligence](#).

| Function                   | Syntax                                                                                                                                | Return Type                               |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| <a href="#">%ALL</a>       | <i>member_expression</i> .%ALL                                                                                                        | member                                    |
| <a href="#">%CELL</a>      | %CELL( <i>relative_column_position</i> , <i>relative_row_position</i> )                                                               | number or string                          |
| <a href="#">%CELLZERO</a>  | %CELLZERO( <i>relative_column_position</i> , <i>relative_row_position</i> )                                                           | number or string                          |
| <a href="#">%FIRST</a>     | %FIRST( <i>set_expr</i> , <i>optional_numeric_expr</i> )                                                                              | number                                    |
| <a href="#">%KPI</a>       | %KPI( <i>kpi_name</i> , <i>kpi_prop_name</i> , <i>kpi_series_name</i> , <i>parm</i> , <i>value</i> , <i>parm</i> , <i>value</i> ,...) | number                                    |
| <a href="#">%LABEL</a>     | %LABEL( <i>MDX_expr</i> , <i>label</i> , <i>format_details</i> , <i>solve_order</i> , <i>cell_style</i> , <i>heading_style</i> )      | same as <i>MDX_expr</i>                   |
| <a href="#">%LAST</a>      | %LAST( <i>set_expr</i> , <i>optional_numeric_expr</i> )                                                                               | number                                    |
| <a href="#">%LIST</a>      | %LIST( <i>set_expr</i> )                                                                                                              | string<br>(comma-separated list)          |
| <a href="#">%LOOKUP</a>    | %LOOKUP( <i>term_list</i> , <i>key</i> , <i>field</i> , <i>default</i> )                                                              | number or string                          |
| <a href="#">%MDX</a>       | %MDX("MDX select query", <i>parm</i> , <i>value</i> , <i>parm</i> , <i>value</i> , <i>parm</i> , <i>value</i> ,...)                   | number or string                          |
| <a href="#">%NOT</a>       | <i>member_expression</i> .%NOT                                                                                                        | member                                    |
| <a href="#">%OR</a>        | %OR( <i>set_expr</i> )                                                                                                                | member                                    |
| <a href="#">%SEARCH</a>    | %SEARCH.&[ <i>comparison_expression</i> ]                                                                                             | <a href="#">measure search expression</a> |
| <a href="#">%SPACE</a>     | %SPACE()                                                                                                                              | empty space                               |
| <a href="#">%TERMLIST</a>  | %TERMLIST( <i>term_list_name</i> , INCLUDE   EXCLUDE)                                                                                 | set                                       |
| <a href="#">%TIMERANGE</a> | %TIMERANGE( <i>start_member</i> , <i>end_member</i> , INCLUSIVE   EXCLUSIVE)                                                          | member                                    |

| Function                      | Syntax                                                                                                                                                   | Return Type              |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
| <a href="#">%TIMEWINDOW</a>   | <code>%TIMEWINDOW(set_expr, start_member, optional_end_member)</code>                                                                                    | set of members           |
| <a href="#">%TOPMEMBERS</a>   | <code>level_expr.%TOPMEMBERS</code><br><code>hierarchy_expr.%TOPMEMBERS</code><br><code>dimension_expr.%TOPMEMBERS</code>                                | set of members           |
| <a href="#">AGGREGATE</a>     | <code>AGGREGATE(set_expr, optional_numeric_expr)</code>                                                                                                  | number                   |
| <a href="#">ALLMEMBERS</a>    | <code>level_expr.ALLMEMBERS</code><br><code>hierarchy_expr.ALLMEMBERS</code><br><code>dimension_expr.ALLMEMBERS</code>                                   | set of members           |
| <a href="#">ANCESTOR</a>      | <code>ANCESTOR(member_expr, ancestor_level)</code>                                                                                                       | member                   |
| <a href="#">AVG</a>           | <code>AVG(set_expr, optional_numeric_expr)</code>                                                                                                        | number                   |
| <a href="#">BOTTOMCOUNT</a>   | <code>BOTTOMCOUNT(set_expr, element_count, optional_ordering_expr)</code>                                                                                | set of members or tuples |
| <a href="#">BOTTOMPERCENT</a> | <code>BOTTOMPERCENT(set_expr, element_count, optional_ordering_expr)</code>                                                                              | set of members or tuples |
| <a href="#">BOTTOMSUM</a>     | <code>BOTTOMSUM(set_expr, element_count, optional_ordering_expr)</code>                                                                                  | set of members or tuples |
| <a href="#">CHILDREN</a>      | <code>member_expr.CHILDREN</code>                                                                                                                        | set of members           |
| <a href="#">CLOSINGPERIOD</a> | <code>CLOSINGPERIOD(ancestor_level, member_expr)</code>                                                                                                  | member                   |
| <a href="#">COUNT</a>         | <code>COUNT(set_expr)</code><br><code>COUNT(set_expr, EXCLUDEEMPTY)</code>                                                                               | number                   |
| <a href="#">COUSIN</a>        | <code>COUSIN(member_expr, higher_member_expr)</code>                                                                                                     | member                   |
| <a href="#">CROSSJOIN</a>     | <code>CROSSJOIN(set_expr1, set_expr2)</code><br><code>NON EMPTY CROSSJOIN(set_expr1, set_expr2)</code>                                                   | set of tuples            |
| <a href="#">CURRENTMEMBER</a> | <code>hierarchy_expr.CURRENTMEMBER</code><br><code>dimension_expr.CURRENTMEMBER</code>                                                                   | member                   |
| <a href="#">DESCENDANTS</a>   | <code>DESCENDANTS(member_expression, level_expression, OPTIONAL_FLAG)</code><br><code>DESCENDANTS(member_expression, level_offset, OPTIONAL_FLAG)</code> | set of members           |
| <a href="#">DISTINCT</a>      | <code>DISTINCT(set_expr)</code>                                                                                                                          | set                      |
| <a href="#">EXCEPT</a>        | <code>EXCEPT(set_expr1, set_expr2, ALL)</code><br><code>EXCEPT(set_expr1, set_expr2)</code>                                                              | set                      |
| <a href="#">FILTER</a>        | <code>FILTER(set_expr, logical_expr)</code>                                                                                                              | set                      |

| Function                    | Syntax                                                                                                                        | Return Type      |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------------|
| FIRSTCHILD                  | <i>member_expr</i> .FIRSTCHILD                                                                                                | member           |
| FIRSTSIBLING                | <i>member_expr</i> .FIRSTSIBLING                                                                                              | member           |
| HEAD                        | HEAD( <i>set_expr</i> , <i>optional_integer_expr</i> , <i>optional_sample_flag</i> )                                          | set              |
| HIERARCHIZE,<br>HIERARCHISE | HIERARCHIZE( <i>set_expr</i> )<br>HIERARCHIZE( <i>set_expr</i> , POST)                                                        | set of members   |
| IIF                         | IIF( <i>logical_expr</i> , <i>expression1</i> , <i>expression2</i> )                                                          | number or string |
| INTERSECT                   | INTERSECT( <i>set_expr1</i> , <i>set_expr2</i> )                                                                              | set              |
| ISNULL                      | ISNULL( <i>scalar_expression</i> , <i>scalar_value_if_null</i> )                                                              | number or string |
| LAG                         | <i>member_expr</i> .LAG( <i>optional_nonnegative_integer_expr</i> )                                                           | member           |
| LASTCHILD                   | <i>member_expr</i> .LASTCHILD                                                                                                 | member           |
| LASTSIBLING                 | <i>member_expr</i> .LASTSIBLING                                                                                               | member           |
| LEAD                        | <i>member_expr</i> .LEAD( <i>optional_nonnegative_integer_expr</i> )                                                          | member           |
| LOG                         | LOG( <i>numeric_expr</i> )                                                                                                    | number           |
| LOOKUP                      | LOOKUP( <i>term_list_name</i> , <i>lookup_value</i> , <i>default</i> , <i>alternative_field</i> )                             | string           |
| MAX                         | MAX( <i>set_expr</i> , <i>optional_numeric_expr</i> )                                                                         | number           |
| MEDIAN                      | MEDIAN( <i>set_expr</i> , <i>optional_numeric_expr</i> )                                                                      | number           |
| MEMBERS                     | <i>level_expr</i> .MEMBERS<br><i>hierarchy_expr</i> .MEMBERS<br><i>dimension_expr</i> .MEMBERS                                | set of members   |
| MIN                         | MIN( <i>set_expr</i> , <i>optional_numeric_expr</i> )                                                                         | number           |
| NEXTMEMBER                  | <i>member_expr</i> .NEXTMEMBER                                                                                                | member           |
| NONEMPTYCROSSJOIN           | NONEMPTYCROSSJOIN( <i>set_expr1</i> , <i>set_expr2</i> )                                                                      | set of tuples    |
| OPENINGPERIOD               | OPENINGPERIOD( <i>ancestor_level</i> , <i>member_expr</i> )                                                                   | member           |
| ORDER                       | ORDER( <i>set_expr</i> , <i>ordering_expr</i> , ASC   DESC   BASC   BDESC)<br>ORDER( <i>set_expr</i> , <i>ordering_expr</i> ) | set              |
| PARALLELPERIOD              | PARALLELPERIOD( <i>level_expr</i> , <i>offset</i> , <i>member_expr</i> )                                                      | member           |
| PARENT                      | <i>member_expr</i> .PARENT                                                                                                    | member           |
| PERCENTILE                  | PERCENTILE( <i>set_expr</i> , <i>numeric_expr</i> , <i>numeric_expr</i> , <i>optional_percentile_value</i> )                  | number           |
| PERCENTILERANK              | PERCENTILERANK( <i>set_expr</i> , <i>numeric_expr</i> , <i>comparison_value</i> )                                             | number           |

| Function        | Syntax                                                                                            | Return Type              |
|-----------------|---------------------------------------------------------------------------------------------------|--------------------------|
| PERIODSTODATE   | PERIODSTODATE( <i>ancestor_level</i> , <i>member_expr</i> )                                       | set of members           |
| POWER           | POWER( <i>numeric_expr</i> , <i>numeric_expr_for_power</i> )                                      | number                   |
| PREVMEMBER      | <i>member_expr</i> .PREVMEMBER                                                                    | member                   |
| PROPERTIES      | <i>member_expr</i> .PROPERTIES( <i>property_name</i> )                                            | string                   |
| RANK            | RANK( <i>tuple_expr</i> , <i>set_expr</i> , <i>optional_numeric_expr</i> )                        | number                   |
| ROUND           | ROUND( <i>numeric_expr</i> , <i>decimal_places</i> )                                              | number                   |
| SIBLINGS        | <i>member_expr</i> .SIBLINGS                                                                      | set of members           |
| SQRT            | SQRT( <i>numeric_expr</i> )                                                                       | number                   |
| STDDEV, STDEV   | STDDEV( <i>set_expr</i> , <i>optional_numeric_expr</i> )                                          | number                   |
| STDDEVP, STDEVP | STDDEVP( <i>set_expr</i> , <i>optional_numeric_expr</i> )                                         | number                   |
| SUBSET          | SUBSET( <i>set_expr</i> , <i>first_element_expr</i> , <i>optional_element_count</i> )             | set                      |
| SUM             | SUM( <i>set_expr</i> , <i>optional_numeric_expr</i> )                                             | number                   |
| TAIL            | TAIL( <i>set_expr</i> , <i>optional_integer_expr</i> )                                            | set                      |
| TOPCOUNT        | TOPCOUNT( <i>set_expr</i> , <i>element_count</i> , <i>optional_ordering_expr</i> )                | set of members or tuples |
| TOPPERCENT      | TOPPERCENT( <i>set_expr</i> , <i>element_count</i> , <i>optional_ordering_expr</i> )              | set of members or tuples |
| TOPSUM          | TOPSUM( <i>set_expr</i> , <i>element_count</i> , <i>optional_ordering_expr</i> )                  | set of members or tuples |
| UNION           | UNION( <i>set_expr1</i> , <i>set_expr2</i> )<br>UNION( <i>set_expr1</i> , <i>set_expr2</i> , ALL) | set                      |
| VAR, VARIANCE   | VAR( <i>set_expr</i> , <i>optional_numeric_expr</i> )                                             | number                   |
| VARP, VARIANCEP | VARP( <i>set_expr</i> , <i>optional_numeric_expr</i> )                                            | number                   |
| VISUALTOTALS    | VISUALTOTALS( <i>set_expr</i> , <i>optional_parent_name_pattern</i> )                             | set of members           |