PANARAY®

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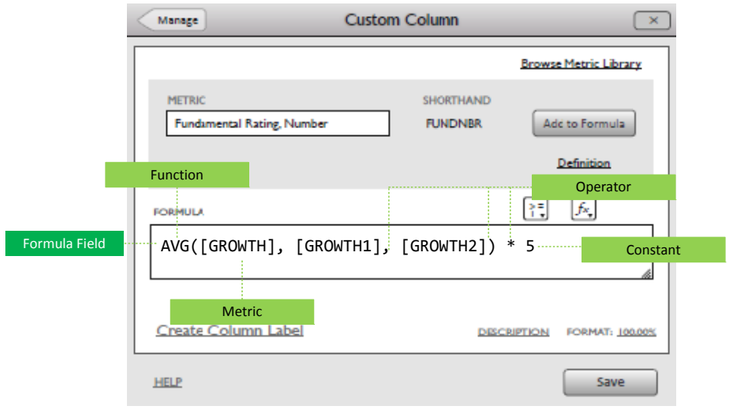
Custom Metrics

Formula Field and Operators



Panaray custom metrics can include the following components: Functions, Metrics, Operators, and Constants.

Functions

Functions
Several built-in functions are available for use in Panaray custom metrics. All available functions will be accessible in the Function dropdown located above the formula field. Users can add a function to the formula by selecting it in the function dropdown or by typing it directly in the formula field.

Operators

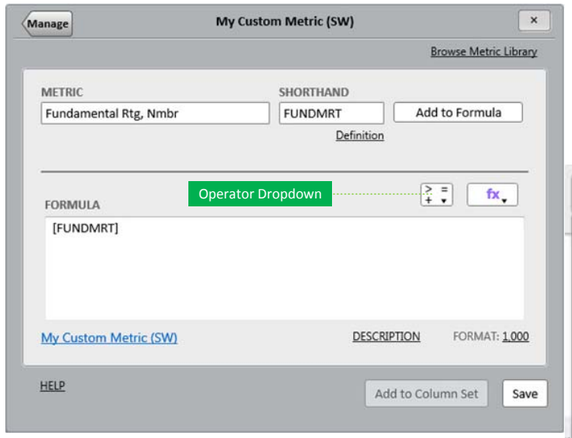
Operators
Four types of operators are supported in Panaray custom metrics: Arithmetic, Comparison, Logical, and Reference. The most common operators (arithmetic and comparison) are accessible in the Operator dropdown located above the formula field. Users can also type any supported operator (including those not listed in the Operator dropdown) directly in the formula field.

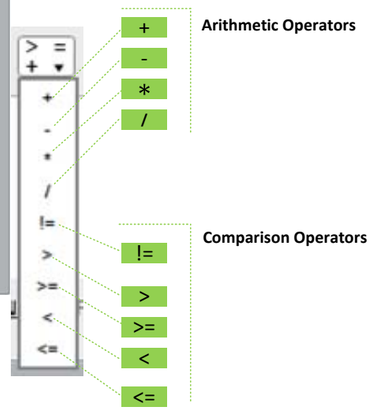
Metrics

Metrics
Metrics are data items in the metric library. Users can include any item from the metric library in the formula for a custom metric, including any of their saved custom metrics or custom metrics that have been shared with them by another user.

Constants

Constants
Also referred to as literals. This is a literal expression used to represent a constant value 'as is'. A constant must be formatted differently depending on the data type of the value it represents; incorrect formatting will cause the calculation to result in an error.





Arithmetic Operators

Comparison Operators

Four types of operators are supported in Panaray custom metrics: Arithmetic, Comparison, Logical, and Reference. The most common operators (arithmetic and comparison) are accessible in the Operator dropdown located above the formula field. Users can include other operators not listed in the Operator dropdown by typing the corresponding symbols/words directly in the formula field (see subsequent pages for more detail).

Arithmetic Operators
Arithmetic operators can be used to negate, add, subtract, multiply, and divide numeric values. They can also be used to add and subtract dates as well as for string concatenation. Users can add an arithmetic operator to a formula by selecting it in the dropdown or by typing the symbol(s) directly in the field.

Comparison Operators
Comparison operators are used in expressions to compare two values of the same data type (ex. two numbers, two dates, two strings) and return a boolean value of TRUE or FALSE. Users can add a comparison operator to a formula by selecting it in the dropdown or by typing the symbol(s) directly in the field.

Logical Operators
Logical operators allow users to test the truth of a condition contained in a formula. Logical operators must be typed directly in the formula field; they are not included in the Operator dropdown.

Reference Operators
Reference operators allow users to combine multiple metrics into one reference for use in a calculation. In custom metrics, these are used primarily to gather values of a metric from multiple look-back periods for use in functions like MIN(), MAX(), AVG(), and SUM(). Reference operators are not included in the Operator dropdown, but users can type them directly in the formula field.

Operators: Arithmetic and Comparison

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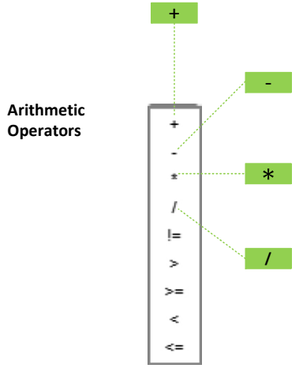
These operators can be used to negate, add, subtract, multiply, and divide numeric values. They can also be used to add and subtract dates as well as for string concatenation. Users can add these operators to a formula by selecting them in the dropdown or by typing the symbol(s) directly in the field.



Arithmetic Operators

+ **Add**
This operator is used to add numbers, concatenate strings, and add a number of days to a date.

Syntax
- expression + expression

Add Numbers
- [GROWTH] + [GROWTH1]
- This formula adds two metrics together and returns the result.

Add Days to a Date
- [PRITDC] + 1
- This formula returns the date that is one day after [PRITDC].

Concatenate Strings
- [ADDR01] + ' ' + [ADDR02] + ' ' + [ADDR03]
- This formula concatenates the metrics into a single string of text with a space between each metric.

- **Subtract**
This operator is used to subtract numbers, negate expressions, subtract days from a date, and calculate the days between two dates.

Syntax
- expression - expression
- - expression

Subtract Numbers
- [GROWTH] - [GROWTH1]
- This formula subtracts [GROWTH1] from [GROWTH]

Subtract Days from a Date
- [PRITDC] - 1
- This formula returns the date that is one day before [PRITDC].

Calculate the difference in days between two dates
- [DUETDC] - [PRITDC]
- This formula returns the number of days between [DUETDC] and [PRITDC].

Negate an expression
- -[GROWTH]
- This example returns [GROWTH] as a negative value. If [GROWTH] is already negative, it changes the value to positive.

***** **Multiply**
This operator is used for numeric multiplication; it is only valid for numeric data types that are not dates.

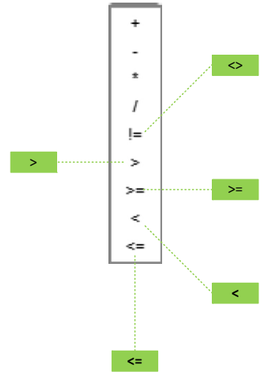
Syntax
- expression * expression

Multiply Numbers
- [BYIELD] * 2
- This formula multiplies [BYIELD] by 2.

/ **Divide**
This operator is used to divide one number by another; it is only valid for numeric data types that are not dates.

Syntax
- expression / expression

Divide Numbers
- [ERNT] / [PRICE]
- This formula divides [ERNT] by [PRICE].



Comparison Operators

Comparison operators are used in expressions to compare two values of the same data type (ex. two numbers, two dates, two strings) and return a boolean value of TRUE or FALSE. Users can add a comparison operator to a formula by selecting it in the dropdown or by typing the symbol(s) directly in the field.

> **Greater than**
example [PRICE] > 10

>= **Greater than or equal to**
example [GROWTH] >= 10

< **Less than**
example [DEBTEQ] < 100

<= **Less than or equal to**
example [PRICE] <= 35

== **Equal to**
example [POSTIV] == 1

!= **Not equal to**
example [PRICE] != [LOW]

Operators: Logical and Reference

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Logical operators must be typed directly in the formula field.

Logical operators allow users to test the truth of a condition contained in a formula. Logical operators must be typed directly in the formula field; they are not included in the Operator dropdown.

AND

This operator is written with an expression on either side, and evaluates whether both expressions are *true*. There is no limit on the number of expressions the user can connect using the logical AND operator.

Syntax

expression AND expression...

Example

- if([PRICE0] > 10 AND [RLST] > 80) {return 1} else {return 0}
- The example formula returns 1 if Price > 10 AND Relative Strength > 80; the formula returns 0 if either condition is not met.

Example

- if([MKTVAT] >= 900 AND [ADVOLV] >= 5000) {return 1} else {return 0}
- This formula limits results to stocks with a market cap greater or equal to $900 million and an average daily dollar volume of at least $5 million.

OR

This operator is written with an expression on either side, and evaluates if any are true. There is no limit on the number of expressions the user can connect using the logical OR operator.

Syntax

expression OR expression...

Example

- if (([PRICE0] > 10 AND [RLST] > 80) OR ([PRICE0] > 7 AND [RLST] > 90)) {return 1} else {return 0}
- The example formula returns a 1 if (Price > 10 and Relative Strength > 80) OR if (Price > 7 and Relative Strength > 90).

Reference operators allow users to combine multiple metrics into one reference for use in a calculation. These types of operators are not included in the Operator dropdown, but users can add them to formulas by typing the corresponding symbols directly in the formula field.

,

The ,(comma) can be used as a union operator to combine multiple metrics into one reference. In this context, it is used primarily to gather values of a metric from multiple look-back periods for use in functions like MIN(), MAX(), AVG(), and SUM().

Syntax

AVG (metric1, metric2, metric3...)

There is no limit on the number of metrics that can be included in the reference, although the calculation time may increase.

Example

MIN ([EIQY], [EIQY1], [EIQY2], [EIQY3], [EIQY4], [EIQY5], [EIQY6], [EIQY7])

This formula returns the minimum earnings per share percent change for the last 8 quarters.

Grouping operators are used to group expressions so that they and their operators are evaluated together. These types of operators are used to control the order in which operators in a formula are evaluated.

( )

The parentheses() operator is used to group expressions so they are evaluated together prior to being combined with other expressions in the formula. Some functions require their arguments be enclosed with parentheses and listed in a specific order (see function requirements for more detail).

Syntax

(expression)

There is no limit on the number of metrics that can be included in the reference, although the calculation time may increase.

Example

MIN ([EIQY], [EIQY1], [EIQY2], [EIQY3], [EIQY4], [EIQY5], [EIQY6], [EIQY7])

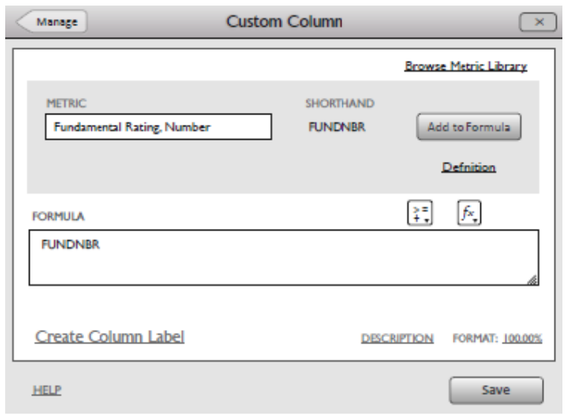
This formula returns the minimum earnings per share percent change for the last 8 quarters. The MIN function requires ().

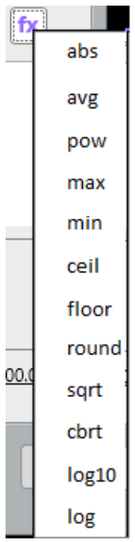
Example

([GROWTH] + [GROWTH1] + [GROWTH2]) / 3

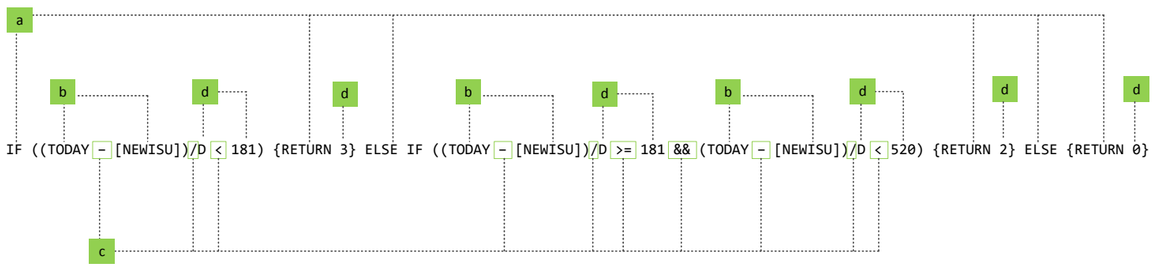
This formula adds the metrics in parentheses and then divides that total by 3.

Functions Overview

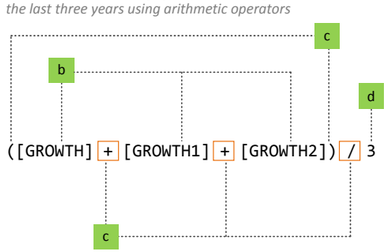




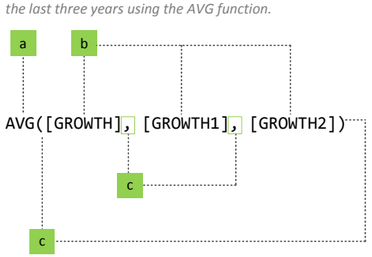
Ex. Use the IF-ELSE function to create a column that represents the number of days a stock has been trading.



Ex. Calculate the average five-year earnings growth rate over the last three years using arithmetic operators



Ex. Calculate the average five-year earnings growth rate over the last three years using the AVG function.



a Function
b Metric
c Operator
d Constant

Several built-in functions will be available for use in Panaray custom metrics. All supported functions will be accessible in the Function dropdown located above the formula field. Users can add a function to a formula by selecting it from the function dropdown or by typing it directly in the formula field.

ABS (numeric_expression**)**
Returns the absolute value of the enclosed numeric expression. Negative expressions are changed to positive.

AVG (expression, expression...**)**
Returns the average of expressions included in the parentheses.

POW (expression, power**)**
Returns a number raised to the specified power.

MAX (expression, expression...**)**
Returns the maximum of the expressions included in the parentheses. If the expression is a string value, this function returns the last value where last is defined by alphabetical order.

MIN (expression, expression...**)**
Returns the minimum of the expressions included in the parentheses. If the expression is a string value, this function returns the first value where first is defined by alphabetical order.

CEIL (expression**)**
Rounding function which always rounds the values up.

FLOOR (expression**)**
Rounding function which always rounds the values down.

ROUND (expression**)**
Rounds the values.

SQRT (expression**)**
Returns the square root of the number in the parentheses.

CBRT (expression**)**
Returns the cube root of the number in the parentheses.

LOG10 (expression, base**)**
Returns the logarithm of a number with a base of 10.

LOG (expression, base**)**
Returns the logarithm of a number for the given base. If the base value is omitted, base 10 is used.

IF expression **return ELSE IF** expression **return ELSE return**
Determines if expressions are true or false. Returns a given value if true and another value if false. There is no limit to the number of ELSEIF values users can include in an IF function.

ISNULL {expression, value if null**}**
Replaces null values with value specified by the user.

Examples: Addition, Subtraction, Absolute Value

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+ and -

These are examples of client custom metrics using basic addition and subtraction. This functionality will be consistent with the custom metrics feature in WONDA.

This formula adds the EPS Rank for the current week (EPSRNK) and the Relative Strength Number Rating (RLST) for the current week.

EPS Rank, current week
RS # Rating, current week

```
EPSRNK + RLST
```

This formula subtracts the Price Close, 11 days ago (PRICE10) from the Price Close, 1 day ago (PRICE).

Price Close, 1 Day Ago
Price Close, 11 Days Ago

```
PRICE - PRICE10
```

This formula calculates an average using the 5 Year EPS Growth Rate % for the current year and the 5 Year EPS Growth Rate % five years ago.

5 Year EPS % Growth Rate, Current Year
5 Year EPS % Growth Rate, 5 Years Ago

```
((GROWTH + GROWTH5) / 2)
```

This formula calculates the number of trading days between the Earning Due Date (Trade Day of the Century) and the Current Price Date (Trade Day of the Century).

Earnings Due Date, TDC
Current Price Date, TDC

```
[DUETDC] - [PRITDC]
```

ABS

These are examples of client custom metrics using the ABS function to return the absolute value of the expression enclosed in parenthesis. This functionality will be the same in PANARAY as it currently is in WONDA.

This formula returns the absolute change between the current week's Datagraph Rating and the Datagraph Rating 4 weeks ago.

Datagraph Rating, Current Week
Datagraph Rating, 4 Weeks ago

```
ABS(DGRT – DGRT3)
```

This formula calculates the percent change between the trailing 4 quarters EPS for the most recent quarter and 1 quarter ago.

EPS Trailing 4 Quarters, Most Recent
EPS Trailing 4 Quarters, 1 Quarter Ago
EPS Trailing 4 Quarters, 1 Quarter Ago

```
(ERNT – ERNT1) / ABS(ERNT1) * 100
```

This formula calculates the percent change between the trailing 4 quarters Sales for the most recent quarter and 1 quarter ago.

Sales Trailing 4 Quarters, Most Recent
Sales Trailing 4 Quarters, 1 Quarter Ago
Sales Trailing 4 Quarters, 1 Quarter Ago

```
(SALT - SALT1) / ABS(SALT1) * 100
```

Examples: Is Null, Max, Min

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ISNULL

These are examples of client custom metrics which use the ISNULL function. This function, which replaces null values with a value specified by the user, will be built into the PANARAY custom metrics feature.

This formula uses data items from a company's balance sheet to calculate a sub-total, which is then divided by 1 million. The ISNULL function is used to replace null values for some of the data items with 0's.

Market Value, Total All Classes
Long Term Debt and Mortgages
Current Portion of Long Term Debt
Convertible Debt, Last Quarter
Cash and Marketable Securities

```
(MKTVAT + ISNULL{[LTDBQ], 0} + ISNULL{[LDEPQ], 0} + ISNULL{[CDEPQ], 0} - ISNULL{[CSMKQ], 0}) / 1000000
```

This formula uses data items from a company's cash flow statement to calculate a total. The ISNULL function is used to replace null Annualized Dividend values with 0's.

Cash flow from Operations
Capital Expenditures
Annualized Dividend
Shares Outstanding, All Classes

```
((TFUNDS + EFUNDS) / CPTQ) - ISNULL{[AINDIV],0}
```

This formula sums the earnings before interest and taxes in the last reported quarter with the depreciation and amortization in the last reported quarter. If depreciation and amortization in the last reported quarter is null, the value is replaced with 0.

Earnings Before Interest and Taxes in the last quarter reported
Depreciation and Amortization in the last reported quarter

```
EBITQ + ISNULL{[DEPAQ],0}
```

MAX & MIN

These functions return the maximum or minimum of a set of values defined in parenthesis. The syntax requirements are the same for both functions: MAX (expression, expression, expression…) and MIN (expression, expression, expression…).

This formula selects the highest value from the following data items and multiples it by 1.05: volume on most recent trading day, average daily volume last 5 days, average daily volume last 10 days, average daily volume last 15 days, and average daily volume last 20 days.

MAX Function
Average Daily Volume, 5 Days
Average Daily Volume, 15 Days
Volume on Most Recent Trading Day
Average Daily Volume, 10 Days
Average Daily Volume, 20 Days

```
1.05 * MAX(VOLUM, AV5, AV10, AV15, AV20)
```

This formula selects the highest price from the last five trading days. It includes the intraday high for the current day (HIGH0) and highs for the last 5 trading days (HIGH - HIGH4)

MAX Function
High Price 1 Days Ago
High Price 3 Days Ago
High Price 5 Days Ago
Intraday High Price
High Price 2 Days Ago
High Price 4 Days Ago

```
MAX(HIGH0, HIGH, HIGH1, HIGH2, HIGH3, HIGH4)
```