Cumulative Functions

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Cumulative formulas allow you to calculate the average, max, min, or sum of your data over time. Although we usually talk about cumulative formulas over time, you can use them over any other sequential data. Each of the cumulative formulas accepts a measure and one or more optional grouping by an attribute (like region or department):

```
formula (measure, [attribute, attribute, ...])
```

Only the measure value is required. If you supply both a measure and attributes, the formula returns the aggregate of the measure accumulated by the attribute(s) in the order specified. You should experiment with only a measure and then with an attribute to see which output best meets your use case. Note that the cumulative formulas reset their results for different values of any attribute in your search that is not part of your cumulative formula.

The cumulative formulas are:

Function	Description
`cumulative_average`	Takes a measure and one or more attributes. Returns the average of the measure, accumulated by the attribute(s) in the order specified. For example: `cumulative_average (revenue, order date, state)`
`cumulative_max`	Takes a measure and one or more attributes. Returns the maximum of the measure, accumulated by the attribute(s) in the order specified. For example: `cumulative_max (revenue, state)`
`cumulative_min`	Takes a measure and one or more attributes. Returns the minimum of the measure, accumulated by the attribute(s) in the order specified. or example: `cumulative_min (revenue, campaign)`
`cumulative_sum`	Takes a measure and one or more attributes. Returns the sum of the measure, accumulated by the attribute(s) in the order specified. For example: `cumulative_sum (revenue, order date)`

You may have attributes in your search that are not part of the cumulative formula. The cumulative formula resets its results for different values of any attribute that is not part of your cumulative formula. For example, with a cumulative formula of `cumulative_sum (sales, date)`, if your search includes the attribute `item type`, the cumulative sum formula aggregates the sales by date

separately for different item types. For example:

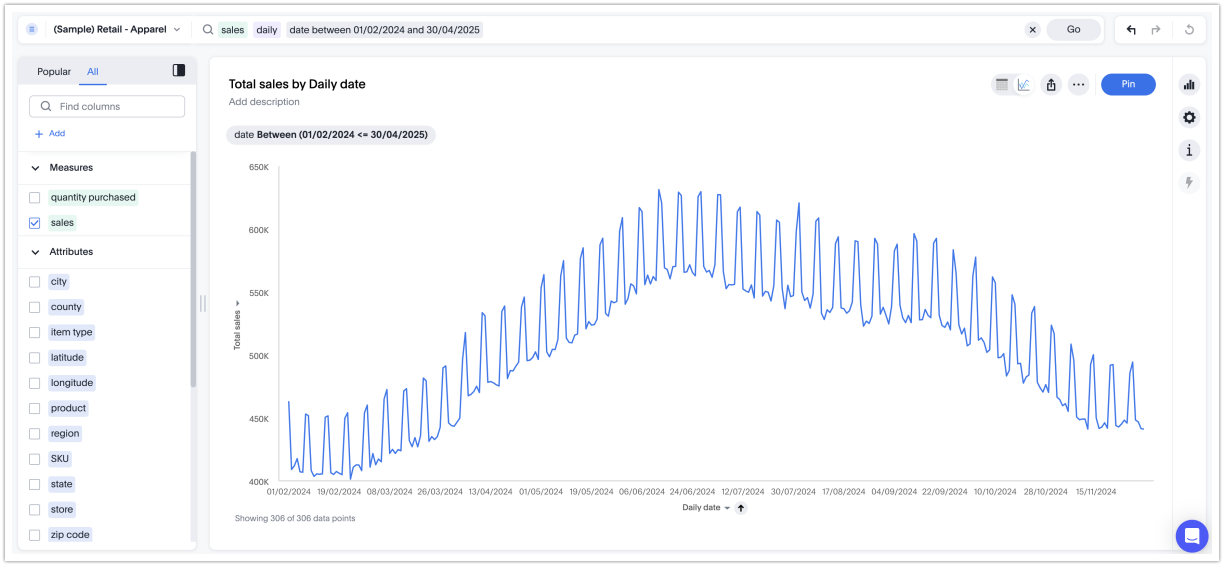
Yearly date - Fiscal	item type	running total sales
FY 2021	Bags	10.23M
FY 2022	Bags	23.16M
FY 2023	Bags	29.55M
FY 2021	Dresses	9.65M
FY 2022	Dresses	22.24M
FY 2023	Dresses	29.94M
FY 2021	Headwear	4.51M
FY 2022	Headwear	10.22M
FY 2023	Headwear	13.29M
FY 2021	Jackets	23.03M
FY 2022	Jackets	56.14M
FY 2023	Jackets	79.61M
FY 2021	Jeans	7.67M
FY 2022	Jeans	17.82M

Calculate a Cumulative Sum

This example demonstrates using the cumulative_sum formula, also known as a running total. To use the cumulative function in a search:

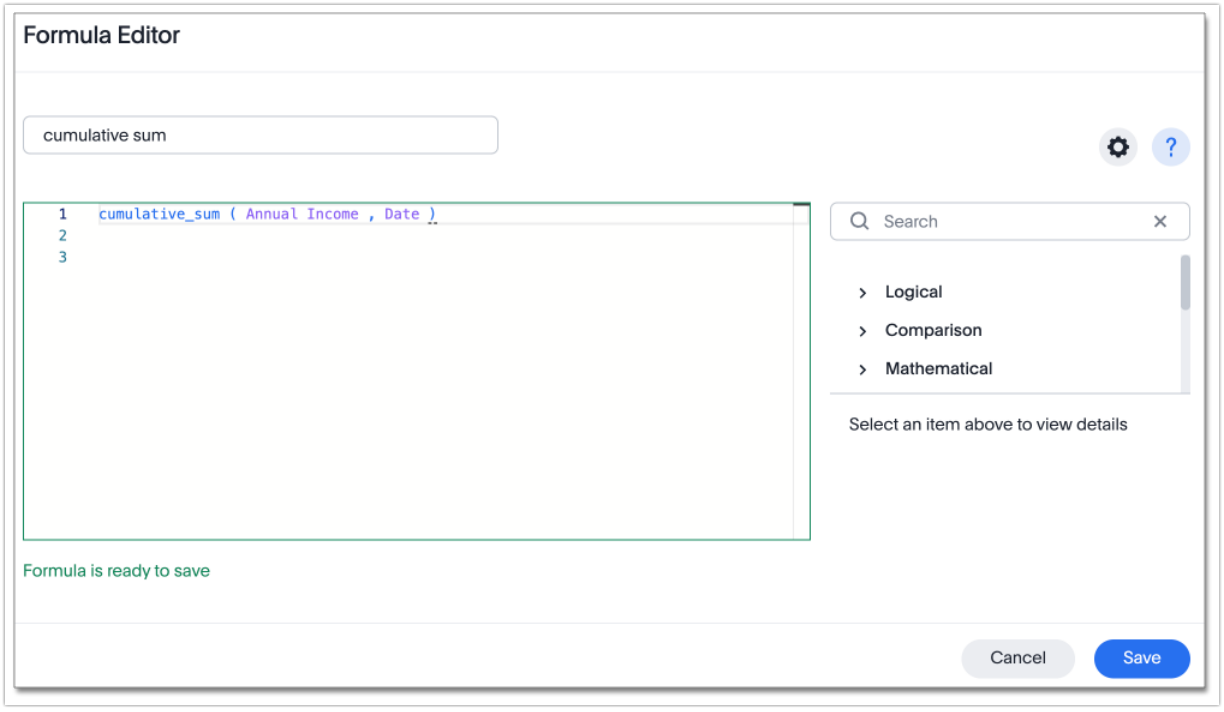
1. Start a new search.

2. Open the Data panel from the upper-right corner if it is not open, navigate to the **Category** or **A to Z** view, click **+ Add**, and select **Formula**. Select the **more options** icon in the upper-right side of the table, and select **Add formula**.



3. Enter the cumulative_sum formula, providing a measure and one or more attributes.

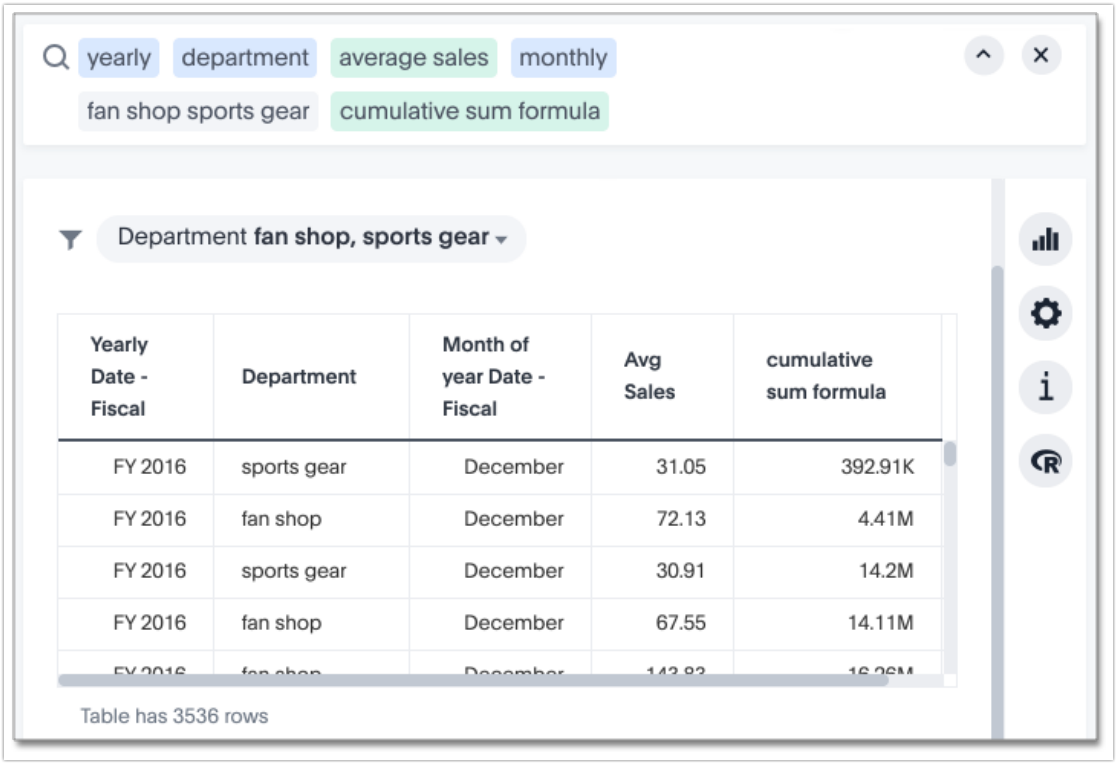
This example returns the sum of yearly income, accumulated by the date.



4. Name the formula by selecting its title and typing a new name.

5. Select **Save**.

The formula will appear in the search bar and in the table as its own column.



A table summary displaying the cumulative sum within the entire table will appear at the bottom. You can select it to toggle between different aggregations.

Calculate a Cumulative Sum of a Unique Count

Alchemer Dashboard doesn't have a purpose-built function for calculating a cumulative sum, or other cumulative formula, for a unique count. However, for many use cases, you can use a `group_aggregate` to facilitate this type of count. Adding a `group_aggregate` to your formula allows you to pass the aggregate function (in this case, `unique count`) in the windowing function (in this case, `cumulative_sum`).

See the following example for the general formula for a cumulative sum of a unique count. In this example, we calculate the cumulative sum of unique customer names, using `monthly date` as our aggregation bucket.

```
cumulative_sum (group_aggregate (unique count (Customer Name ),query_groups (),query_filters ()),start_of_month (Date) )
```

The result looks something like this:

Cumulative Unique Customers

cumulative_sum (group_aggregate (unique count (Customer...

Monthly Date ↑	cumulative customers
Oct 2021	3,548
Nov 2021	7,111
Dec 2021	10,699
Jan 2022	14,308
Feb 2022	17,890
Mar 2022	21,517
Apr 2022	25,148
May 2022	28,755
Jun 2022	32,320
Jul 2022	35,905
Aug 2022	39,469
Sep 2022	43,028
Oct 2022	46,579
Nov 2022	50,125
Dec 2022	53,696

You can use this syntax on any cumulative formula: average, maximum, minimum, and sum.

> This syntax produces a unique count for each individual result, such as **Oct 2021**. However, it doesn't produce a unique count across results. If a customer name appears in both October 2021 and November 2021, for example, that customer would be counted in both those months.

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