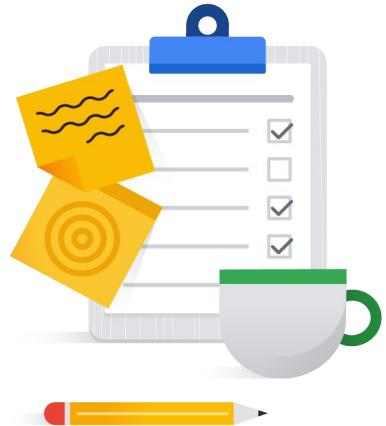


Core analytics concepts

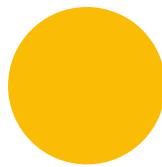
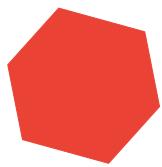
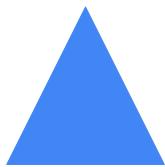
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Google Cloud

Now that we have explored the Looker Interface, let's review the core analytics concepts for analyzing and visualizing data in Looker.

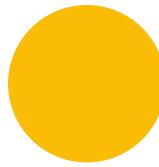
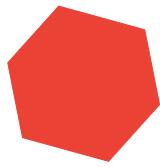
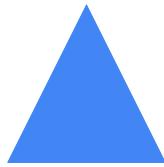
The four core analytics concepts



Google Cloud

Before you start this journey to explore, analyze, and visualize your data in Looker, there are four core analytics concepts that you need to know. If you have used another Business Intelligence tool, these may already be familiar to you.

The four core analytics concepts

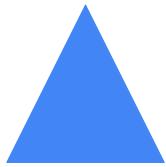


Dimensions

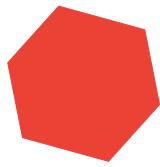
Google Cloud

First, **dimensions** are qualities or attributes of your data. For example, if you are looking to buy an electronic gadget online, you may want to know its brand name, color, and retail price. Each of these would be a dimension of the gadget.

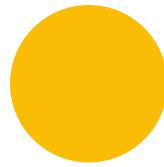
The four core analytics concepts



Dimensions



Measures



Google Cloud

Next, **measures** are aggregate calculations applied across one or many rows of data. For example, what is the total cost for 2 or 3 electronic gadgets? How many do you have in your cart?

The four core analytics concepts

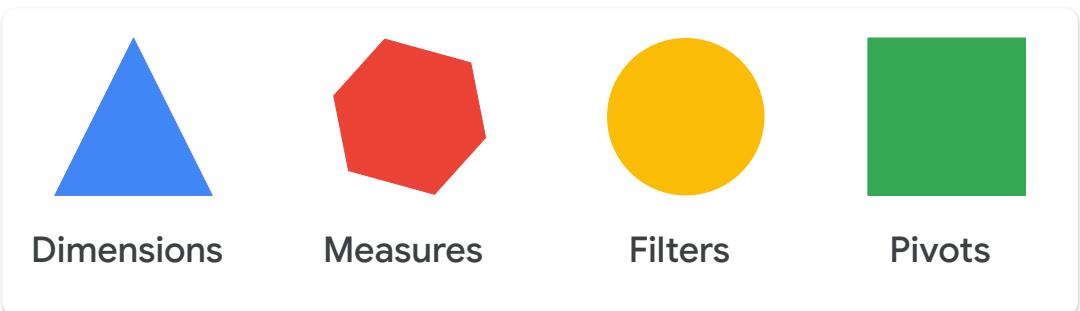


Google Cloud

Third, **filters** are ways to reduce or narrow down the results returned. They don't delete anything from the database; they're only applied to the data that Looker displays on your screen.

When shopping online, you might only want to see gadgets that are blue (which would be a dimension filter), or that have an average rating of 4 out of 5 (which would be a measure filter).

The four core analytics concepts



Google Cloud

And last but not least, **pivots** turn a selected dimension into several columns, like pivot tables in spreadsheet software. Your data basically becomes a matrix, so you can analyze groupings of data.

Within an ecommerce dataset, you might want to see a list of offering levels like “basic,” “deluxe,” and “premier,” and *pivot on* brand name. For each level and brand name, this might let you see how many gadgets are out there, their average rating, and so on.

Using these four core analytics concepts in Looker - dimensions, measures, filters, and pivots - you can start analyzing and visualizing data to answer your key business questions.

Core analytics concepts

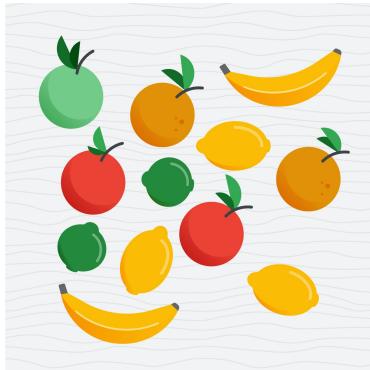
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Google Cloud

Dimensions are attributes or characteristics of your data. Specifically, each column in a database table is a dimension in Looker.

Practice dataset



Fruit Type	Color	Is Round	Price per Pound	Weight	Price
apple	red	yes	\$1.25	0.6	\$0.75
apple	red	yes	\$1.25	0.55	\$0.69
apple	green	yes	\$1.15	0.4	\$0.46
banana	yellow	no	\$0.75	0.7	\$0.53
banana	yellow	no	\$0.75	0.75	\$0.56
orange	orange	yes	\$1.45	0.5	\$0.73
orange	orange	yes	\$1.45	0.45	\$0.65
lemon	yellow	no	\$2.25	0.2	\$0.45
lemon	yellow	no	\$2.25	0.22	\$0.50
lemon	yellow	no	\$2.25	0.19	\$0.43
lime	green	no	\$2.40	0.18	\$0.43
lime	green	no	\$2.40	0.17	\$0.41

Google Cloud

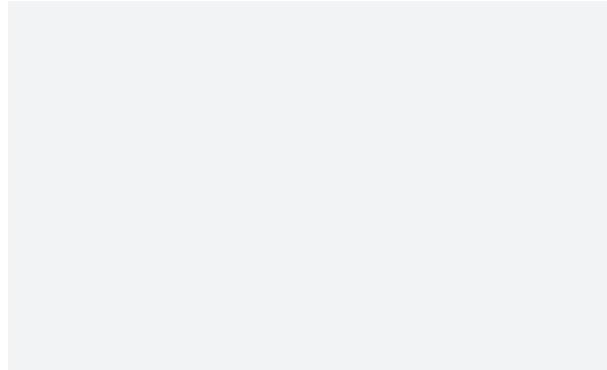
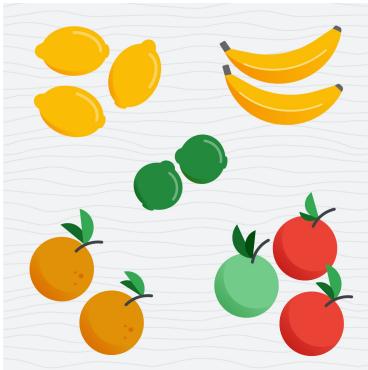
For example, this is a basic 12-row dataset that describes the fruit basket in the image on the left. Each piece of fruit is represented as a row in the table, with each column describing a different attribute or aspect of the fruit.

Each fruit has a type and a color, either is or is not round, and has a price per pound, weight, and unit price.

In Looker, all of these columns are dimensions.

Dimensions: The columns of the table

What types of fruit are in the basket?



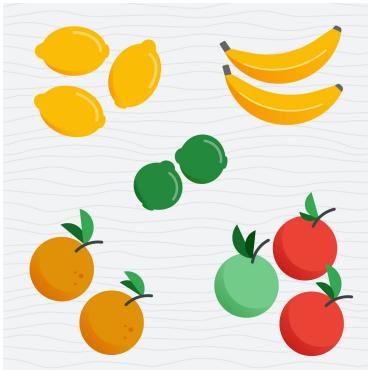
Google Cloud

Using this dataset, you can ask a question like, "What types of fruit are in the basket?"

What is the dimension you need here? Fruit Type!

Dimensions: The columns of the table

Choosing the **Fruit Type dimension** will return the unique fruit names from the data.



Looker

Fruit Basket **Fruit Type**

1	orange
2	apple
3	banana
4	lemon
5	lime

5

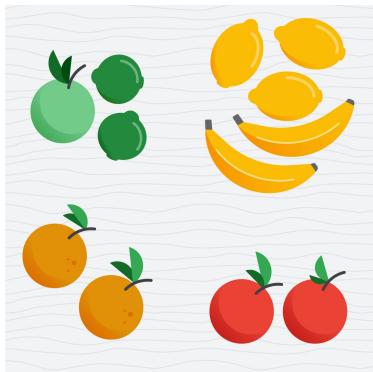
Google Cloud

When you select a dimension in Looker, only the unique possible values are displayed. As such, the **Fruit Type** dimension returns 5 rows for the 12 fruits: one each for oranges, apples, bananas, lemons, and limes.

Even though you can see in the basket there are 3 lemons, 2 bananas, and so on, you don't get multiple rows for them; you have only one row for each.

Dimensions: The columns of the table

What colors are represented by the fruit in the basket?



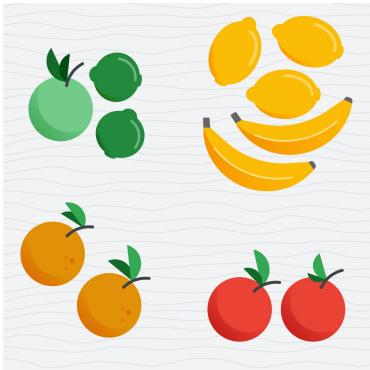
Looker

Google Cloud

Now, you may also want to know, “What colors of fruit are in the basket?” This would require the **Color** dimension in Looker.

Dimensions: The columns of the table

Choosing the **Color dimension** will return the unique colors from the data.



Looker

Fruit Basket **Color**

1	yellow
2	red
3	orange
4	green

4

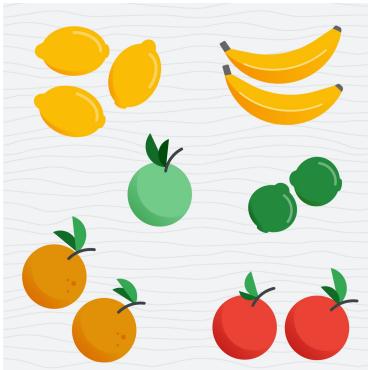
Google Cloud

Again, only the unique possible values are returned.

Instead of getting 12 rows of data, you only get 4—one for each for yellow, red, orange, and green.

Dimensions: The columns of the table

What combinations of fruit types and colors exist in the fruit basket?



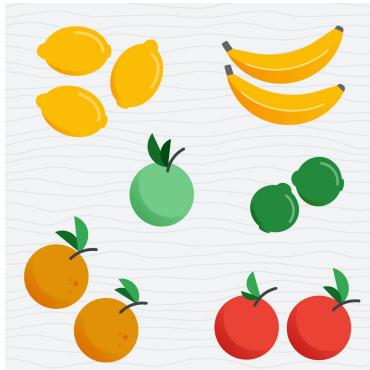
Looker

Google Cloud

Okay, but what if you want to know the combinations of fruit types *and* colors in the fruit basket? Now this would require two dimensions in Looker.

Dimensions: The columns of the table

Choosing the [Fruit Type](#) and [Color dimensions](#) will return all unique combinations of those fields from the data.



Looker

Fruit Basket [Fruit Type](#) | Fruit Basket [Color](#)

1	apple	red
2	lemon	yellow
3	orange	orange
4	banana	yellow
5	lime	green
6	apple	green

6

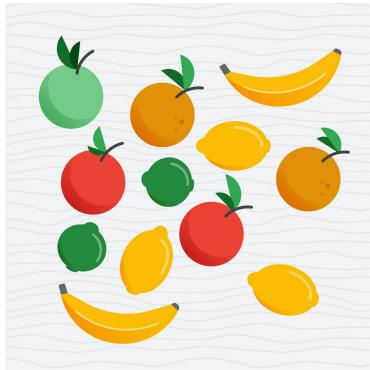
Google Cloud

Notice that you now have 6 rows. Selecting two or more dimensions returns all unique *combinations* of the values. For example, the “apple” type is displayed twice, once for the red apples and again for the green.

Be aware that selecting multiple dimensions may result in more rows or different groupings than you may have initially expected. In analytical queries, the dimensions are grouped by the different unique ways in which they can be combined, such as both fruit type and color.

A different example might be a reporting of metrics by different cities. In this case, selecting only the city dimension may not give you what you want, as all cities with the same name would group together, regardless of their state, province, or territory. To separate the cities with the same name, you would need to add the state, province, or territory, and you will then get the individual cities broken out as expected.

Dimensions: The columns of the table



Fruit Type	Color	Is Round	Price per Pound	Weight	Price
apple	red	yes	\$1.25	0.6	\$0.75
apple	red	yes	\$1.25	0.55	\$0.69
apple	green	yes	\$1.15	0.4	\$0.46
banana	yellow	no	\$0.75	0.7	\$0.53
banana	yellow	no	\$0.75	0.75	\$0.56
orange	orange	yes	\$1.45	0.5	\$0.73
orange	orange	yes	\$1.45	0.45	\$0.65
lemon	yellow	no	\$2.25	0.2	\$0.45
lemon	yellow	no	\$2.25	0.22	\$0.50
lemon	yellow	no	\$2.25	0.19	\$0.43
lime	green	no	\$2.40	0.18	\$0.43
lime	green	no	\$2.40	0.17	\$0.41

Google Cloud

In summary, dimensions help you to identify and select data attributes that you need to answer your questions in Looker.

Each column in a database table is a dimension in Looker, and you can combine dimensions to return all of the unique combinations of the values.

Core analytics concepts

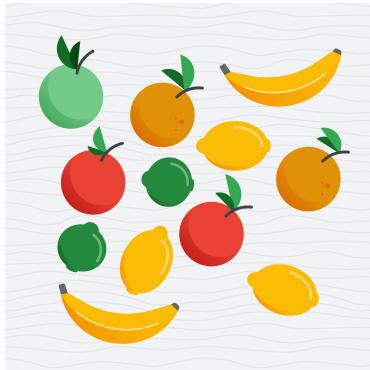
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Google Cloud

Measures are calculations performed across multiple rows of data. As such, measures are aggregates of data attributes, or dimensions.

Practice dataset



Fruit Type	Color	Is Round	Price per Pound	Weight	Price
apple	red	yes	\$1.25	0.6	\$0.75
apple	red	yes	\$1.25	0.55	\$0.69
apple	green	yes	\$1.15	0.4	\$0.46
banana	yellow	no	\$0.75	0.7	\$0.53
banana	yellow	no	\$0.75	0.75	\$0.56
orange	orange	yes	\$1.45	0.5	\$0.73
orange	orange	yes	\$1.45	0.45	\$0.65
lemon	yellow	no	\$2.25	0.2	\$0.45
lemon	yellow	no	\$2.25	0.22	\$0.50
lemon	yellow	no	\$2.25	0.19	\$0.43
lime	green	no	\$2.40	0.18	\$0.43
lime	green	no	\$2.40	0.17	\$0.41

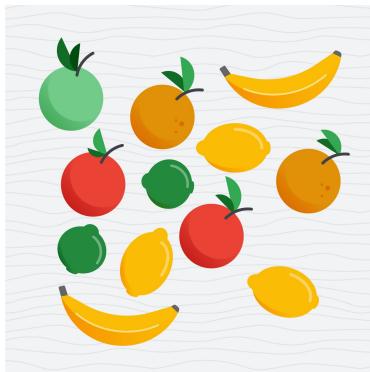
Google Cloud

Using this basic 12-row dataset, you can start to think about different potential aggregations of the dimensions that describe the fruit basket.

For example, each piece of fruit is represented as a row in the table, with each column describing a different attribute or aspect of the fruit, such as type and color.

Measures: The math used to explore the data

How many pieces of fruit are in the basket?



Looker

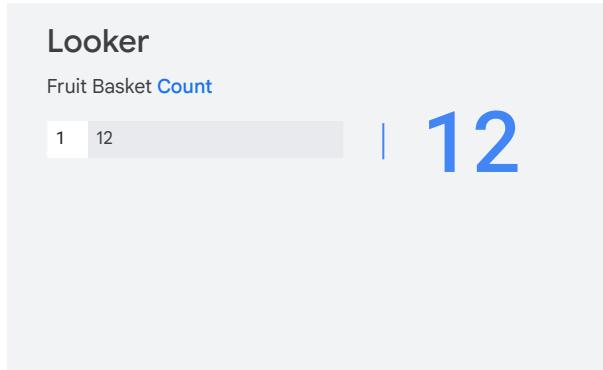
Google Cloud

Now, one question you might have is “How many pieces of fruit are in the basket?”

Any time you have a question like “how many,” you probably want to look for a measure with the word **Count** or **Number** in it.

Measures: The math used to explore the data

Choosing the Count **measure** will tell us how many pieces of fruit we have.

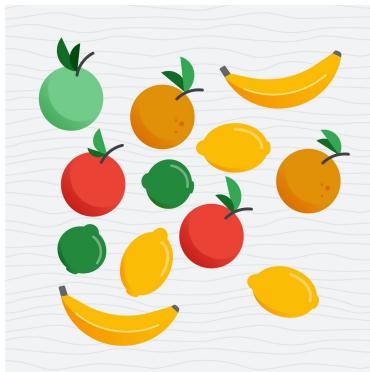


Google Cloud

In this case, you need the **Count** measure, which tells you that the basket has 12 pieces of fruit.

Measures: The math used to explore the data

How much does the basket of fruit weigh?



Looker

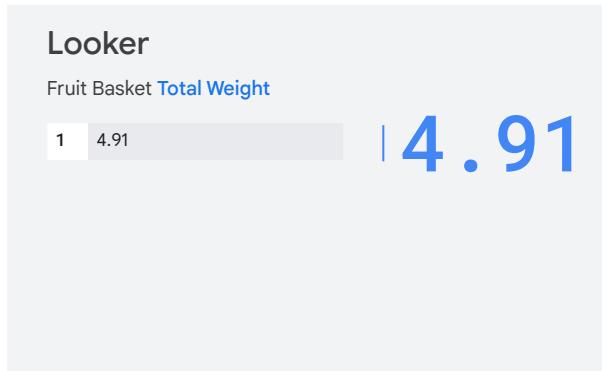
Google Cloud

Another question might be “How much does the basket of fruit weigh?”

Well, in this case, you want to know the *sum* or total of all these fruits’ weights, without the basket.

Measures: The math used to explore the data

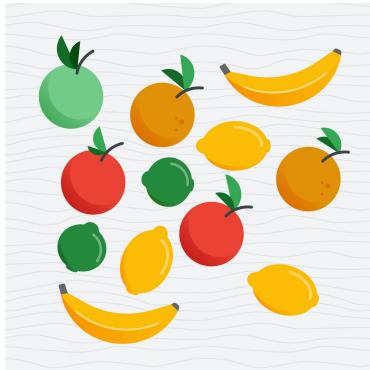
Choosing the Total Weight **measure** will tell us how much the whole fruit basket weighs.



Google Cloud

An existing measure in the dataset might be called something like **Total Weight**, which aggregates the weights of all of individual fruit in the dataset.

Measures: The math used to explore the data



Fruit Type	Color	Is Round	Price per Pound	Weight	Price
apple	red	yes	\$1.25	0.6	\$0.75
apple	red	yes	\$1.25	0.55	\$0.69
apple	green	yes	\$1.15	0.4	\$0.46
banana	yellow	no	\$0.75	0.7	\$0.53
banana	yellow	no	\$0.75	0.75	\$0.56
orange	orange	yes	\$1.45	0.5	\$0.73
orange	orange	yes	\$1.45	0.45	\$0.65
lemon	yellow	no	\$2.25	0.2	\$0.45
lemon	yellow	no	\$2.25	0.22	\$0.50
lemon	yellow	no	\$2.25	0.19	\$0.43
lime	green	no	\$2.40	0.18	\$0.43
lime	green	no	\$2.40	0.17	\$0.41

Google Cloud

In summary, as highlighted in these examples, measures are useful for aggregating dimensions (or data attributes), so that you can easily calculate values such as count, sum, or even averages across your data.

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Google Cloud

In this example, we'll explore how to start using measures to analyze and visualize data.

Example: Exploring measures using customer data

Determine total number of users, and show that number as a single value visualization.



Google Cloud

Specifically, we'll use the **Users** data within the Explore called **Order Items** to determine the number of total users, and then display that number as a single value visualization.

The screenshot shows the Looker interface with the 'Explore' tab selected. On the left, there's a navigation sidebar with sections like 'Events' (which is expanded), 'Dashboards', and 'System Activity'. Under 'Events', the 'Order Items' folder is highlighted with a blue box and a magnifying glass icon pointing to it. The main area displays 'Folders' and 'Looks'. In the 'Folders' section, there are two items: 'Business Pulse' (34 views, created by Jenny) and 'Yearly Revenue' (22 views, 1 favorite, created by Brian). In the 'Looks' section, there is one item: 'Yearly Revenue'. There are sorting and filtering options at the top of each section.

Examples are based on fictional data.

Google Cloud

To access the **Users** data, you can click on the **Explore** tab in the left-side navigation panel, and locate **Order Items** under the **E-Commerce Training** heading.

The screenshot shows the Google Cloud BigQuery Explore interface. On the left, there's a sidebar titled 'Explore' for 'Order Items'. It lists various dimensions and measures. Under 'Dimensions', 'Users' is expanded, showing fields like Age, City, Country, Created Date, Email, First Name, Gender, ID, Last Name, Latitude, Longitude, State, Traffic Source, and Zip. Under 'Measures', 'Count' is listed. A magnifying glass icon is placed over the 'Count' measure, with a callout bubble containing the word 'Count'. The main panel has tabs for 'Data', 'Results', and 'SQL'. At the bottom, it says 'Row Limit 500' and 'Totals'. A large button at the top right says 'Run'.

Examples are based on fictional data.

Google Cloud

The goal is to determine how many users there are in total, and show that number as a single-value visualization.

Any time you have a question with the words “how many,” you probably want a count measure. Within the **Users** view of the **Order Items** Explore, there is a measure called Count.

Click **Count**, and then **Run**.

The screenshot shows the Google Cloud BigQuery Explore interface. On the left, there's a sidebar titled "Explore" with a search bar and a list of datasets: Order Items, All Fields, Custom Fields, Distribution Centers, Inventory Items, Order Items, Products, and Users. Under "Users", there are dimensions like Age, City, Country, and measures like Count. A magnifying glass icon points to the "Visualization" tab in the top navigation bar. The main area shows a table with one row labeled "Users Count". At the bottom, it says "Press 'Run' to explore this data."

Examples are based on fictional data.

Google Cloud

Expand the **Visualization** bar to see and adjust the visualization.

The screenshot shows the Looker Explore interface. On the left, the 'Order Items' section is expanded, showing various dimensions like 'Age', 'City', 'Country', and measures like 'Count'. A search bar is at the top. In the center, there's a visualization toolbar with icons for different chart types, and a magnifying glass icon is highlighted. Below it is a large, rounded rectangular visualization area containing the number '99,830'. At the bottom of this area is a navigation bar with tabs for 'Data', 'Results', and 'SQL', and a 'Row Limit' dropdown set to 500. The 'Results' tab is selected. On the right side of the interface, there are buttons for 'Run' and 'Edit'.

Examples are based on fictional data.

Google Cloud

Looker tries to guess the right type of visualization based on the data in your results set, and in this case it's right—you do want a single-value visualization, since your results set only contains a single value.

The screenshot shows the Looker interface. At the top is a toolbar with nine icons: grid, bar chart, funnel, scatter plot, line chart, area chart, pie chart, world map, and a large number '6'. Below the toolbar is the 'Explore' interface. On the left is a sidebar with a search bar and a tree view of data sources: Order Items (selected), Custom Fields, Distribution Centers, Inventory Items, Order Items, Products, and Users (with 1 item). Under 'Users' are dimensions: Age, City, Country, Created Date, Email, and First Name. The main area shows a single-value visualization with the value '99,830'. At the bottom are tabs for Data, Results (selected), and SQL, along with Row Limit (500) and Totals checkboxes.

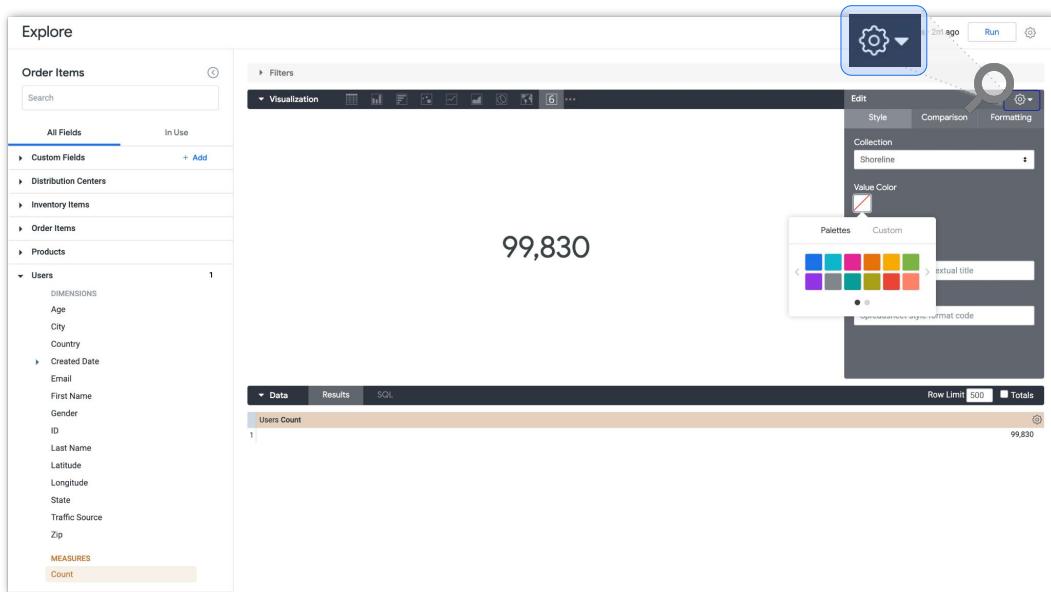
Examples are based on fictional data.

Google Cloud

You can click on these other icons to change the visualization. Looker will tell you if something isn't appropriate for your data.

So the column chart is technically valid, even if it would look pretty silly. A pie chart, on the other hand, "requires one dimension and one numerical measure," so you can't make one with this results set.

The single-value visualization is what you want, so click on the **6** icon to display the single-value visualization.



Examples are based on fictional data.

Google Cloud

You can also change the text to your favorite color.

In the visualization gear menu, navigate to **Style > Value Color** and choose a color.

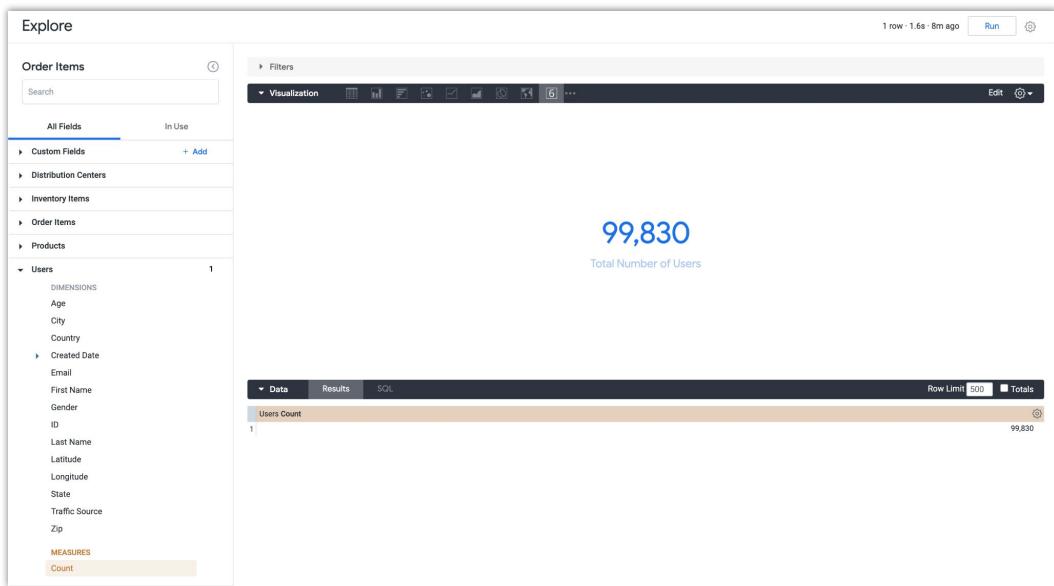
The screenshot shows the Google Cloud Data Studio interface. On the left, there's an 'Explore' sidebar with sections for Order Items, Dimensions (Age, City, Country, Created Date, Email, First Name, Gender, ID, Last Name, Latitude, Longitude, State, Traffic Source, Zip), and Measures (Count). In the center, a visualization titled 'Total Number of Users' is displayed. A callout box highlights the 'Title Override' section in the 'Style' tab of the gear menu, which contains the text 'Total Number of Users'. The visualization itself shows a single row of data: 'Users Count' with value '1'. The top right corner of the interface shows '1 row · 1.6s · 7m ago' and a 'Run' button.

Examples are based on fictional data.

Google Cloud

You can also set the title of the visualization to a more descriptive title such as “Total Number of Users”.

In the visualization gear menu, type “Total Number of Users” into **Title Override** box in the **Style** tab.



Examples are based on fictional data.

Google Cloud

And with that, the single value visualization for Total Number of Users is now complete.

Core analytics concepts

05 Combining dimensions and measures

06 Example 3: Combining dimensions and measures

07 Filtering dimensions

08 Filtering measures

09 Example 4: Time dimensions and filters



Google Cloud

In real-life analytics, you often need to combine dimensions and measures, in order to answer your data questions.

Practice dataset



Fruit Type	Color	Is Round	Price per Pound	Weight	Price
apple	red	yes	\$1.25	0.6	\$0.75
apple	red	yes	\$1.25	0.55	\$0.69
apple	green	yes	\$1.15	0.4	\$0.46
banana	yellow	no	\$0.75	0.7	\$0.53
banana	yellow	no	\$0.75	0.75	\$0.56
orange	orange	yes	\$1.45	0.5	\$0.73
orange	orange	yes	\$1.45	0.45	\$0.65
lemon	yellow	no	\$2.25	0.2	\$0.45
lemon	yellow	no	\$2.25	0.22	\$0.50
lemon	yellow	no	\$2.25	0.19	\$0.43
lime	green	no	\$2.40	0.18	\$0.43
lime	green	no	\$2.40	0.17	\$0.41

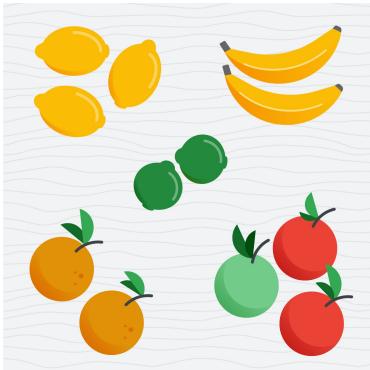
Google Cloud

For example, in this basic 12-row dataset, each piece of fruit is represented as a row in the table, with each column describing a different attribute or aspect of the fruit, such as type and color.

You can also think about which measures might be useful to aggregate the dimensions, such as a total weight or total price.

Dimensions and measures

How many pieces of each fruit type are in the basket?



Looker

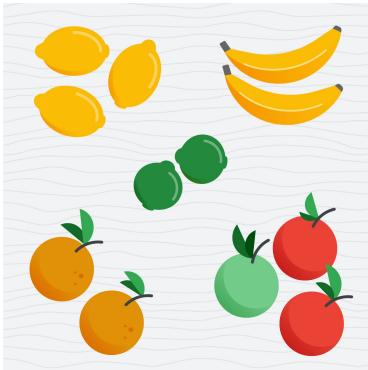
Google Cloud

Now, by combining dimensions and measures, you can ask, "How many pieces of each fruit type are in the basket?"

Let's break down this question.

Dimensions and measures

Choosing the **Fruit Type dimension** and the **Count measure** will tell us how many of each type of fruit we have.



Looker

Fruit Basket **Fruit Type** | Fruit Basket **Count**

1	apple	3
2	lemon	3
3	lime	2
4	banana	2
5	orange	2

Google Cloud

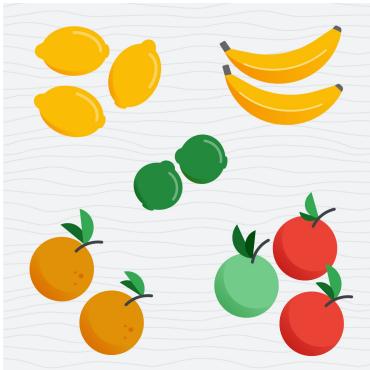
“How many pieces” suggests that you need the **Count** measure, while “of each fruit type” means you need the **Fruit Type** dimension.

Putting these two together, you get the five rows because Looker grabs only the unique possible values of the dimension.

You also see the overall count of 12, split out across those five rows: 3 apples, 3 lemons, and so on.

Dimensions and measures

What is the total cost of each type of fruit in the basket?



Looker

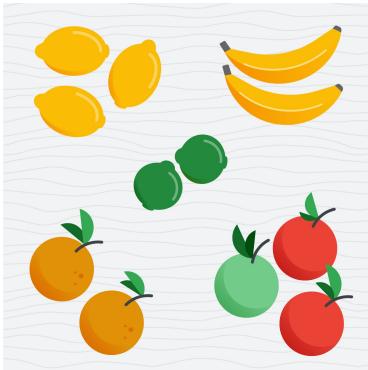
Google Cloud

As another example, you may want to know “What is the total cost of each type of fruit?”

Again, let’s think about what this means in terms of dimensions and measures.

Dimensions and measures

Choosing the **Fruit Type dimension** and the **Total Price measure** will tell us the total cost of each type of fruit.



Looker

Fruit Basket **Fruit Type** | Fruit Basket **Total Price**

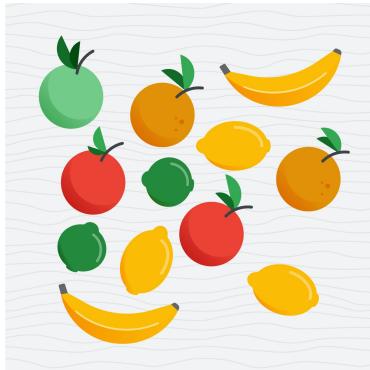
1	apple	\$1.90
2	lemon	\$1.38
3	lime	\$0.84
4	banana	\$1.09
5	orange	\$1.38

Google Cloud

In this case, you need the **Fruit Type** dimension and the **Total Price** measure.

This results in these five rows because Looker grabs only the unique possible values of the dimension, and the total price is being calculated for each value.

Dimensions and measures



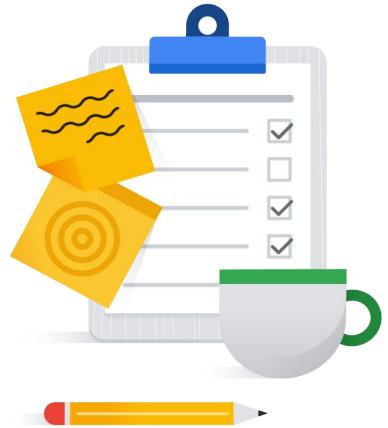
Fruit Type	Color	Is Round	Price per Pound	Weight	Price
apple	red	yes	\$1.25	0.6	\$0.75
apple	red	yes	\$1.25	0.55	\$0.69
apple	green	yes	\$1.15	0.4	\$0.46
banana	yellow	no	\$0.75	0.7	\$0.53
banana	yellow	no	\$0.75	0.75	\$0.56
orange	orange	yes	\$1.45	0.5	\$0.73
orange	orange	yes	\$1.45	0.45	\$0.65
lemon	yellow	no	\$2.25	0.2	\$0.45
lemon	yellow	no	\$2.25	0.22	\$0.50
lemon	yellow	no	\$2.25	0.19	\$0.43
lime	green	no	\$2.40	0.18	\$0.43
lime	green	no	\$2.40	0.17	\$0.41

Google Cloud

In summary, by combining the necessary dimensions and measures, you can answer more complex questions by fully leveraging datasets that have many available attributes and aggregations.

Core analytics concepts

- 05 Combining dimensions and measures
- 06 Example 3: Combining dimensions and measures
- 07 Filtering dimensions
- 08 Filtering measures
- 09 Example 4: Time dimensions and filters



Google Cloud

In this example, we combine dimensions and measures to start answering more complex questions.

Example: Combining dimensions and measures

Identify the top 10 cities with the most users, and display the results as a column chart.



Google Cloud

Specifically, we'll work with the **Users** data in the **Order Items** Explore to identify the top 10 cities that have the most users. Then, we'll display the results as a column chart.

The screenshot shows the Looker interface with the following details:

- Left Navigation:** Shows a sidebar with sections like "Explore", "Events", "E-Commerce Training" (which is expanded), "FAA", "Locker Basics", and "System Activity". A magnifying glass icon is positioned over the "Order Items" link under "Events".
- Top Bar:** Includes a search bar, navigation icons (New, Find, Refresh, Settings, Help), and a user profile icon.
- Main Content:**
 - Folders:** A section titled "Your organization's folders" with a sub-section for "Events". It lists "Order Items" (selected) and "Human Resources".
 - Dashboards:** A section titled "Dashboards" with a sub-section for "Events". It lists "Business Pulse" (selected).
 - Looks:** A section titled "Looks" with a sub-section for "Events". It lists "Yearly Revenue".
- Sort and Filter Options:** Various sorting and filtering controls are present throughout the interface.

Google Cloud

To access the **Users** data, click on the **Explore** tab in the left-side navigation panel, and locate **Order Items** under the **E-Commerce Training** heading.

The screenshot shows the Google Cloud Data Studio 'Explore' interface. On the left, there's a sidebar with a search bar and sections for 'All Fields', 'Custom Fields', 'Distribution Centers', 'Inventory Items', 'Order Items', 'Products', and 'Users'. A magnifying glass icon is placed over the 'Users' section. The main area displays a 'Users' dimension panel with a blue background. The panel is divided into 'DIMENSIONS' and 'MEASURES' sections. Under 'DIMENSIONS', items are listed alphabetically: Age, City, Country, Created Date, Email, First Name, Gender, ID, Last Name, Latitude, Longitude, State, Traffic Source, and Zip. Under 'MEASURES', there is one item: Count. At the top right of the panel, there are 'Row Limit' and 'Totals' checkboxes. The top right corner of the entire interface has a 'Run' button and a refresh icon.

Google Cloud

In the **Users** data, notice that the dimensions on the left-side panel are listed alphabetically, and some dimensions are grouped like Created Date.

If you can't find the dimension you're looking for at a glance, you can use the search function to quickly find what you're looking for.

Explore

Order Items

All Fields In Use

Custom Fields + Add

Distribution Centers

Inventory Items

Order Items

Products

Users 1

Age

City

Country

Created Date

Email

First Name

Gender

ID

Last Name

Latitude

Longitude

State

Traffic Source

Zip

MEASURES

Count

Filters

Visualization

Data Results SQL

Row Limit 500 Totals

Will fetch 500 rows from cache Run ⚙️

Users City

City

Press "Run" to explore this data.

The screenshot shows the Google Cloud BigQuery Explore interface. On the left, there's a sidebar with a tree view of datasets and tables. Under the 'Users' table, 'City' is selected and highlighted with a blue border. A magnifying glass icon is positioned over the 'City' entry. To the right of the sidebar is a main panel with tabs for 'Data', 'Results' (which is selected), and 'SQL'. The results section shows a single row labeled 'Users City'. At the bottom of the main panel, it says 'Press "Run" to explore this data.' The top right of the interface has a 'Run' button and a refresh icon. The top bar also includes a note about fetching 500 rows from cache and a 'Row Limit' dropdown set to 500 with a 'Totals' checkbox.

Google Cloud

The goal is to identify which cities have the most users, so start by selecting the **City** dimension...

The screenshot shows the Google Cloud BigQuery Explore interface. On the left, the 'Explore' sidebar lists various datasets and tables under 'Order Items'. Under the 'Users' section, 'City' is selected as a dimension. In the main area, a query is being constructed:

```

SELECT
    Users.City AS City,
    COUNT(Users.ID) AS UsersCount
FROM
    Users
GROUP BY
    Users.City
ORDER BY
    UsersCount DESC
LIMIT 10
  
```

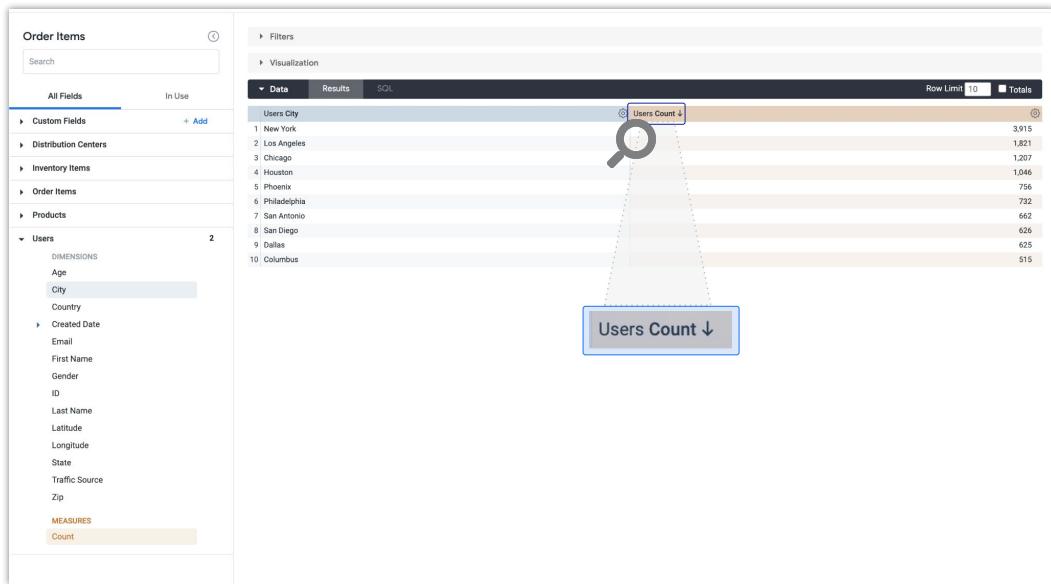
The 'Data' tab is selected. A 'Run' button is at the top right, with a tooltip indicating it will process 3.79 MB. Below the run button is a magnifying glass icon. To the right of the run button is a 'Row Limit 10' button, also with a magnifying glass icon. A callout box highlights the 'Run' button. Another callout box highlights the 'Row Limit 10' button. A third callout box highlights the 'Count' measure in the MEASURES section.

Google Cloud

... and then scroll down and select the **Count** measure to see how many users are in each city.

Since you only want the top 10 cities, set the row limit to 10.

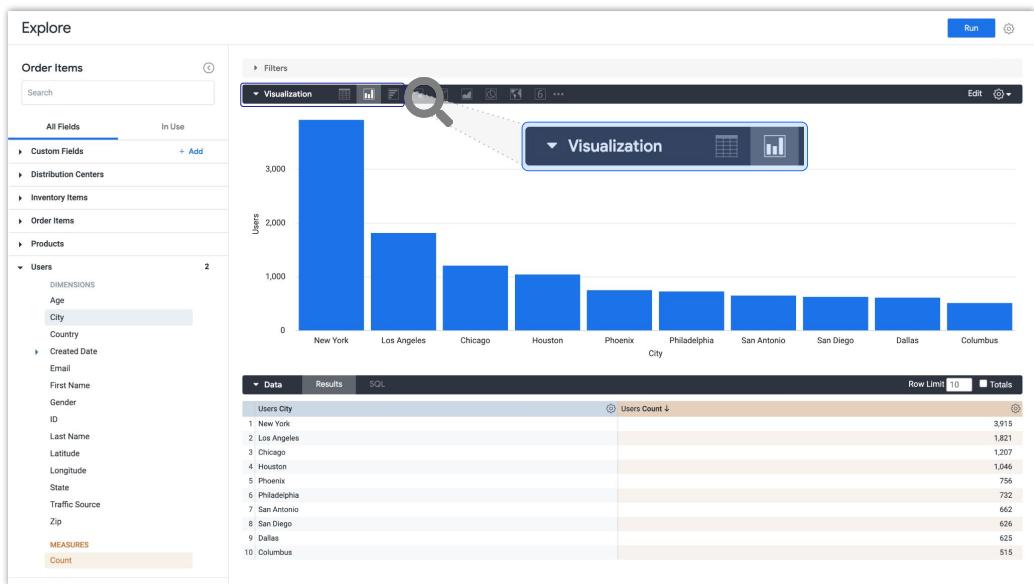
Once that's all set, click **Run** to display the top 10 cities based on the number of users.



Google Cloud

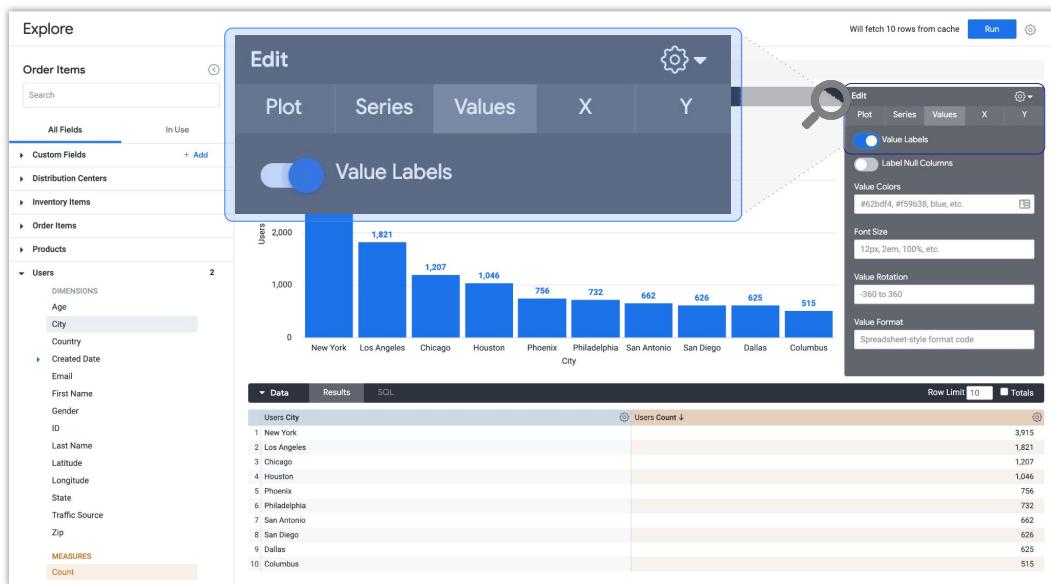
Next, click on the column header to sort the results.

A single click sorts the data from the largest value to the smallest. A second click will sort the data value from smallest to largest.



Google Cloud

You can display the results as a column chart by selecting **Visualization**, then the option for the **column chart**.

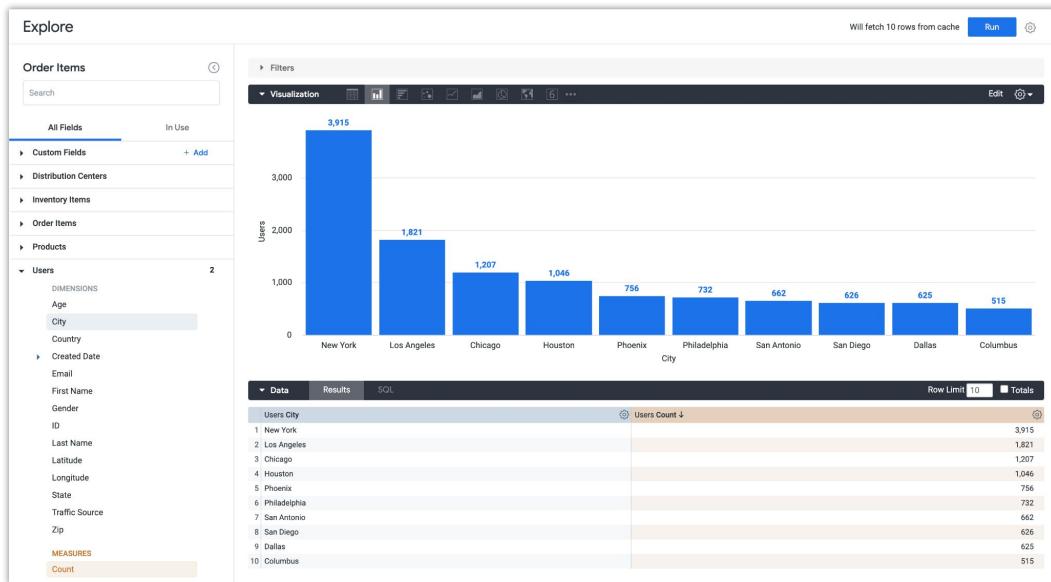


Google Cloud

You can also add labels to the side of each bar, showing the total bar value.

Click on the visualization gear menu, and turn on **Value Labels** under the Values tab.

Each column in the chart will now have its value displayed above the bar.



Google Cloud

Now, the column chart showing the top 10 cities with the most users is complete.

Core analytics concepts

05 Combining dimensions and measures

06 Example 3: Combining dimensions and measures

07 **Filtering dimensions**

08 Filtering measures

09 Example 4: Time dimensions and filters

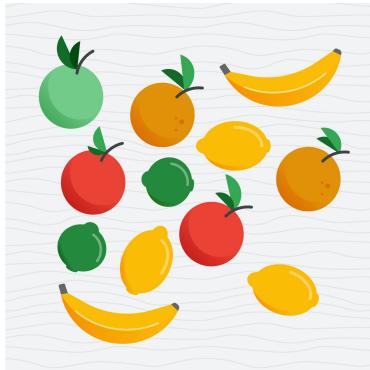


Google Cloud

In Looker, **filters** are ways to reduce or narrow down the results returned based on specific criteria. In this way, filters allow you to hone in on a subset of your data based on desired characteristics.

A key feature of filters is that they don't delete anything from the database; they're only applied to the data that Looker displays on your screen.

Practice dataset



Fruit Type	Color	Is Round	Price per Pound	Weight	Price
apple	red	yes	\$1.25	0.6	\$0.75
apple	red	yes	\$1.25	0.55	\$0.69
apple	green	yes	\$1.15	0.4	\$0.46
banana	yellow	no	\$0.75	0.7	\$0.53
banana	yellow	no	\$0.75	0.75	\$0.56
orange	orange	yes	\$1.45	0.5	\$0.73
orange	orange	yes	\$1.45	0.45	\$0.65
lemon	yellow	no	\$2.25	0.2	\$0.45
lemon	yellow	no	\$2.25	0.22	\$0.50
lemon	yellow	no	\$2.25	0.19	\$0.43
lime	green	no	\$2.40	0.18	\$0.43
lime	green	no	\$2.40	0.17	\$0.41

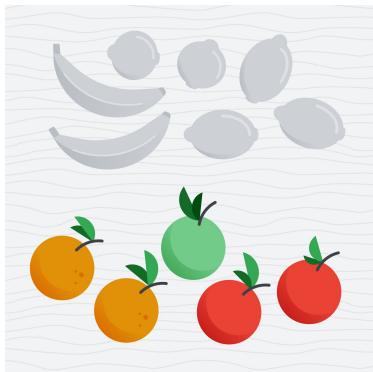
Google Cloud

For example, in this basic 12-row dataset, each piece of fruit is represented as a row in the table, with each column describing a different attribute of the fruit, such as type and color.

How might you want to filter this fruit basket?

Dimensions as filters

Filtering a **dimension** removes rows from the raw data.



Looker

Fruit Basket **Is Round**

is equal to yes

Google Cloud

Well, maybe you want to see only fruits that are round. You can apply a filter on the **Is Round** dimension, and set it equal to “yes”.

This is called applying a *dimension filter*, and what Looker does behind the scenes is to figure out which rows of data need to be included or excluded right from the start.

Dimensions as filters

How many pieces of each fruit type are in the basket if we only include round fruits?



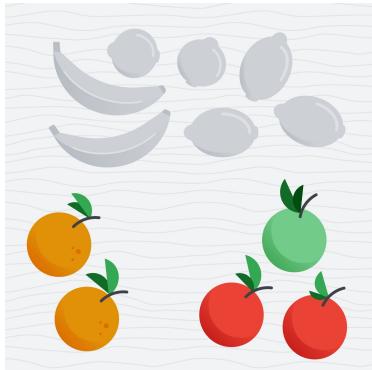
Looker

Google Cloud

Now, using this filter, you can ask a question such as, "How many pieces of each fruit type are there if only round fruits are included?"

Dimensions as filters

The filter on the **dimension** is applied first, and then the data is aggregated.



Looker

Fruit Basket **Is Round**

is equal to yes

Fruit Basket **Fruit Type** | Fruit Basket **Count**

	Fruit Type	Count
1	apple	3
5	orange	2

Google Cloud

Behind the scenes, your database first skips over or ignores the fruits that aren't round, since they don't meet the criterion of our dimension filter.

Then, Looker takes what's left—apples and oranges—and performs the aggregation, so we get 3 apples and 2 oranges.

Dimensions as filters

How many pieces of each fruit type are in the basket if I only include red and orange fruits?



Looker

Google Cloud

Of course, you may also want to know, “How many pieces of each fruit type are in the basket if I only include red and orange fruits?”

Dimensions as filters

Filtering on “Color is equal to orange or red” removes all fruit that doesn’t meet the filter logic.



Looker

Fruit Basket **Color**

is equal to orange red

Fruit Basket **Fruit Type** | Fruit Basket **Count**

1	apple	2
5	orange	2

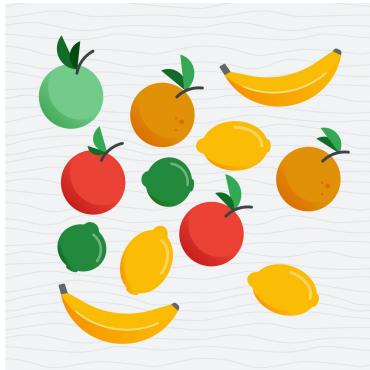
Google Cloud

To answer this question, you can apply a filter on the **Color** dimension and set it equal to “orange” or “red”.

So you get 2 oranges and 2 red apples.

This demonstrates that you can make a filter equal to more than one value.

Dimensions as filters



Fruit Type	Color	Is Round	Price per Pound	Weight	Price
apple	red	yes	\$1.25	0.6	\$0.75
apple	red	yes	\$1.25	0.55	\$0.69
apple	green	yes	\$1.15	0.4	\$0.46
banana	yellow	no	\$0.75	0.7	\$0.53
banana	yellow	no	\$0.75	0.75	\$0.56
orange	orange	yes	\$1.45	0.5	\$0.73
orange	orange	yes	\$1.45	0.45	\$0.65
lemon	yellow	no	\$2.25	0.2	\$0.45
lemon	yellow	no	\$2.25	0.22	\$0.50
lemon	yellow	no	\$2.25	0.19	\$0.43
lime	green	no	\$2.40	0.18	\$0.43
lime	green	no	\$2.40	0.17	\$0.41

Google Cloud

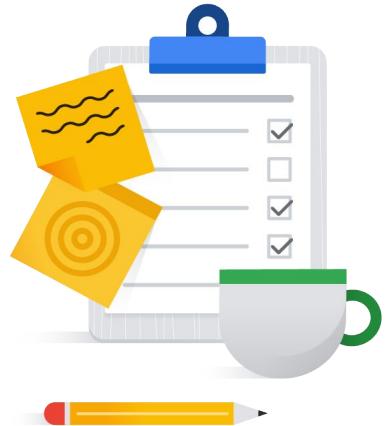
In summary, you can use dimension filters to select only the data you want to see in your results, such as round fruit only, without affecting the underlying data tables.

You can also select more than one value for a particular dimension filter, such as fruit that are either orange or red.

Based on the values you provide in the dimension filter, Looker knows which data rows to include or exclude in the results, making it easy to get the results you want.

Core analytics concepts

- 05 Combining dimensions and measures
- 06 Example 3: Combining dimensions and measures
- 07 Filtering dimensions
- 08 [Filtering measures](#)
- 09 Example 4: Time dimensions and filters

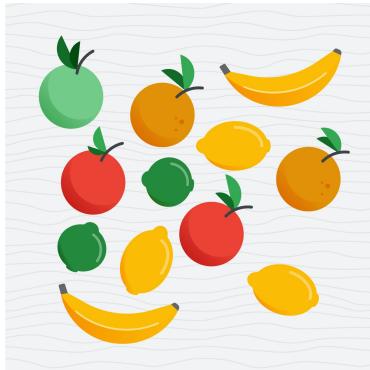


Google Cloud

In Looker, you can filter on both dimensions and measures to select only the data you want to see or include in your results.

In either case, the underlying data is not affected, and Looker knows which data to include or exclude based on the filter.

Practice dataset



Fruit Type	Color	Is Round	Price per Pound	Weight	Price
apple	red	yes	\$1.25	0.6	\$0.75
apple	red	yes	\$1.25	0.55	\$0.69
apple	green	yes	\$1.15	0.4	\$0.46
banana	yellow	no	\$0.75	0.7	\$0.53
banana	yellow	no	\$0.75	0.75	\$0.56
orange	orange	yes	\$1.45	0.5	\$0.73
orange	orange	yes	\$1.45	0.45	\$0.65
lemon	yellow	no	\$2.25	0.2	\$0.45
lemon	yellow	no	\$2.25	0.22	\$0.50
lemon	yellow	no	\$2.25	0.19	\$0.43
lime	green	no	\$2.40	0.18	\$0.43
lime	green	no	\$2.40	0.17	\$0.41

Google Cloud

Specifically, Looker will ignore any rows that do not meet the filters provided before returning the results.

For example, in this basic 12-row dataset, each piece of fruit is represented as a row in the table, with each column describing a different attribute of the fruit, such as type and color.

Notice that there are three apples in this dataset: 2 red and 1 green.

Dimensions as filters

The filter on the **dimension** is first applied, and then the data is aggregated. Notice how the apple count changes.



Looker

Fruit Basket **Color**

is equal to orange red

Fruit Basket **Color** | Fruit Basket **Count**

1	apple	2
5	orange	2

Google Cloud

If a dimension such as color is used a filter, then Looker will apply that filter first and then aggregate data based on the measure that has been selected.

In this example filter, only fruit that are orange or red are selected, which means that the green apple in the dataset is not returned in the results. For this reason, the number of apples has decreased from 3 to 2.

Again, this is because the dimension filter removed one apple that was green.

Filter measures

Which types of fruit have exactly two pieces in the basket?



Looker

Google Cloud

But, what if you want to know, “Which types of fruit have exactly two pieces in the basket?”

Filter measures

Filtering a **measure** removes rows from the result set, not from the raw data.

The screenshot shows a Looker dashboard with two main components. On the left, there is a sidebar with the title "Fruit Basket Count" and a filter input labeled "is equal to" with the value "2". On the right, there is a main view titled "Fruit Basket Fruit Type | Fruit Basket Count" which displays a table of fruit types and their counts. The table has three columns: a row number, the fruit type, and its count. The data is as follows:

	Fruit Type	Count
1	apple	3
2	banana	2
3	lemon	3
4	lime	2
5	orange	2

Google Cloud

In this case, you would need to apply a filter on the **Count** measure, setting it to equal 2.

Notice that in this dataset, only the banana, lime, and orange fruit types have a count of two. Both apple and lemon have a count of three, so they should not be returned as part of the results.

Filter measures

After filtering a measure, we are left with all rows in the result set that fit the filter logic.

The screenshot shows the Looker interface. On the left, under 'Fruit Basket Count', there is a dimension filter 'is equal to' with the value '2'. On the right, under 'Fruit Basket Fruit Type | Fruit Basket Count', a table displays the following data:

	Fruit Type	Count
1	banana	2
2	lime	2
3	orange	2

Google Cloud

With this example, you can see that the key difference between filtering dimensions versus measures lies in when Looker decides to exclude data.

With dimension filters, Looker excludes the rows that do not meet the filter at the very beginning, such as excluding fruit that are not red or orange.

With measure filters, Looker first gets all the possible rows and calculates all of the potential aggregations. Then, Looker discards the undesired results at the *end*, before returning the results.

In this specific example, Looker did not return the fruit types that are apple or lemon because they both have a count of three, not two as specified in the measure filter.

Filter measures

Which types of fruit have an average price that is less than \$0.50?



Looker

Google Cloud

Let's consider another example. Maybe you want to know "Which types of fruit have an average price that is less than \$0.50?"

Filter measures

If we filter so that the Average Price measure is less than \$0.50, we first calculate the average price for all fruit types.

The screenshot shows a Looker interface. On the left, there is a sidebar with the title "Looker". Below it, there is a section titled "Fruit Basket Average Price" which contains a filter input field set to "is less than 0.50". To the right of the sidebar is a main content area with a title "Fruit Basket Fruit Type | Fruit Basket Average Price". Below the title is a table with the following data:

1	apple	\$0.63
2	banana	\$0.55
3	lemon	\$0.46
4	lime	\$0.42
5	orange	\$0.69

Google Cloud

First, you need to set a filter on **Average Price** being less than 0.5.

Looker gets all the unique possible fruit types and calculates the average price for each.

Filter measures

We are then left with a result set that only includes fruit types meeting the filter logic.

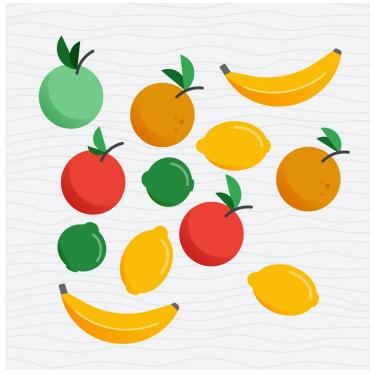
The screenshot shows a Looker dashboard interface. On the left, there is a filter configuration for "Fruit Basket Average Price" set to "is less than 0.50". On the right, there is a results table titled "Fruit Basket Fruit Type | Fruit Basket Average Price" showing two rows: "1 lemon \$0.46" and "2 lime \$0.42".

	Fruit Type	Average Price
1	lemon	\$0.46
2	lime	\$0.42

Google Cloud

Then, it removes the results with an average price of fifty cents or more as the last step, so you are left with only the results that meet the filter logic.

Filter measures



Fruit Type	Color	Is Round	Price per Pound	Weight	Price
apple	red	yes	\$1.25	0.6	\$0.75
apple	red	yes	\$1.25	0.55	\$0.69
apple	green	yes	\$1.15	0.4	\$0.46
banana	yellow	no	\$0.75	0.7	\$0.53
banana	yellow	no	\$0.75	0.75	\$0.56
orange	orange	yes	\$1.45	0.5	\$0.73
orange	orange	yes	\$1.45	0.45	\$0.65
lemon	yellow	no	\$2.25	0.2	\$0.45
lemon	yellow	no	\$2.25	0.22	\$0.50
lemon	yellow	no	\$2.25	0.19	\$0.43
lime	green	no	\$2.40	0.18	\$0.43
lime	green	no	\$2.40	0.17	\$0.41

Google Cloud

In summary, you can filter on either dimensions or measures in Looker to select only the data that you want to see or include in the results.

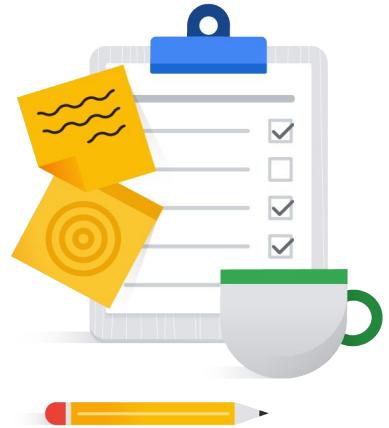
When you use a dimension filter, Looker will exclude the rows that do not meet the criteria at the very beginning of the analysis.

When you use a measure filter, Looker first calculates all of the potential aggregations and then excludes the results that do not meet the desired criteria at the *end* of the analysis, before returning the results.

In either case, Looker handles the inclusion and exclusion of data for you and returns only the data results that you want.

Core analytics concepts

- 05 Combining dimensions and measures
- 06 Example 3: Combining dimensions and measures
- 07 Filtering dimensions
- 08 Filtering measures
- 09 Example 4: Time dimensions and filters



Google Cloud

In Looker, you can apply filters to dimensions and measures to limit the results that are returned from a query.

Example: Time dimensions and filters

Create a line chart that displays the total number of items sold each month in 2019.



Google Cloud

In this example, we'll use filters in the **Orders Items** Explore to create a line chart that displays the total number of items sold each month in 2019.

The screenshot shows the Looker Explore interface. On the left, there's a sidebar with categories like E-Commerce Training, Events, and System Activity. A magnifying glass icon highlights the 'Order Items' link under the E-Commerce Training category. The main area displays 'Your organization's folders' with a search bar and a 'New' button. Below this are sections for 'Folders' (containing 'Human Resources') and 'Dashboards' (listing 'Business Pulse'). The 'Looks' section shows 'Yearly Revenue'. The interface includes sorting and filtering options like 'Sort by Name' and 'Name ▾'.

Examples are based on fictional data.

Google Cloud

From the **Explore** tab, locate **Order Items** under the **E-Commerce Training** heading.

The screenshot shows a data exploration interface with the following details:

- Left Panel (Explore View):**
 - Order Items** is selected.
 - DIMENSIONS:** Created Date, Delivered Date, Inventory Item ID, Order ID, Order Item ID, Returned Date, Sale Price, Shipped Date, Status, User ID.
 - MEASURES:** Average Sale Price, Order Count, Order Item Count (highlighted with a magnifying glass icon), Total Revenue, Total Revenue From Completed Orders.
- Right Panel:**
 - Data** tab is selected.
 - Results:** Shows a single row: Order Items Order Item Count.
 - SQL:** Shows the generated SQL query.
 - Run** button: Will fetch 1 row from cache.
 - Row Limit:** Set to 500, with a checkbox for Totals.

Press "Run" to explore this data.

Examples are based on fictional data.

Google Cloud

"Total number" suggests that you probably want a count, so first expand the **Order Items** view to look for a count measure of ordered items.

Click on the **Order Item Count** measure.

The screenshot shows the Google Cloud BigQuery Explore interface. On the left, the 'Explore' sidebar lists 'Order Items' under 'All Fields' and 'In Use'. It includes sections for 'Custom Fields', 'Distribution Centers', 'Inventory Items', and 'Order Items' (with a count of 2). Under 'DIMENSIONS', 'Created Date' is expanded, showing 'Date' (with 'Month' selected), 'Month Name', 'Quarter', 'Time', 'Week', and 'Year'. Under 'MEASURES', 'Average Sale Price' is listed. On the right, the main area shows a query editor with 'Data' selected. The query is 'SELECT Order Items, Order Item Count FROM Order Items GROUP BY Order Items ORDER BY Order Item Count'. The results pane shows a single row: 'Order Items Order Item Count'. A tooltip 'Press "Run" to explore this data.' is visible. At the top right, it says 'Will process 1.51 MB' and has a 'Run' button.

Examples are based on fictional data.

Google Cloud

“Each month” means you want a monthly report, so you need to choose one of the date dimension groups.

Since you’re looking for items “sold,” Created Date would be best, as an order is “created” in the system when the transaction is made—in other words, when the items are sold to a customer.

Now, expand **Created Date** and click on the **Month** dimension in the Created Date group to get your monthly report.

The screenshot shows a data exploration interface with the following details:

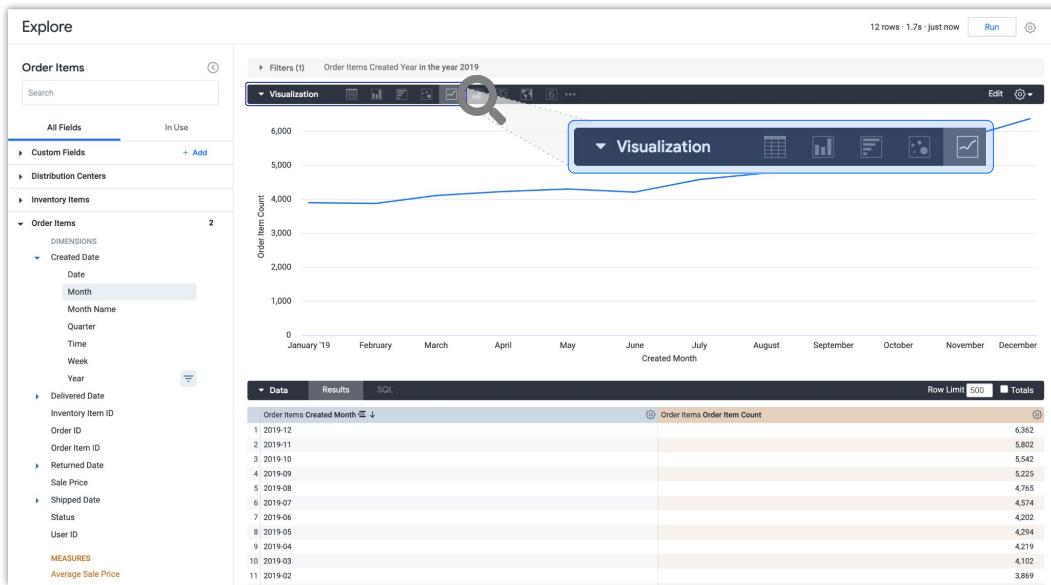
- Explore Section:** Shows a search bar and a sidebar with categories like All Fields, Custom Fields, Distribution Centers, Inventory Items, and Order Items.
- Filters Section:** Displays a single filter: "Order Items Created Year" with the operator "is in the year" and the value "2019".
- Run Button:** A large blue button labeled "Run" is at the top right.
- Run Status:** Below the Run button, it says "Will process 1 MB" and "Run".
- Search Bar:** A magnifying glass icon is positioned over the "Year" input field in the filter section.
- Press Run:** A note below the filters says "Press 'Run' to explore this data."

Examples are based on fictional data.

Google Cloud

Recall that you only want to look at the year 2019, so you can click on the **Filter** button next to **Year** to specify this.

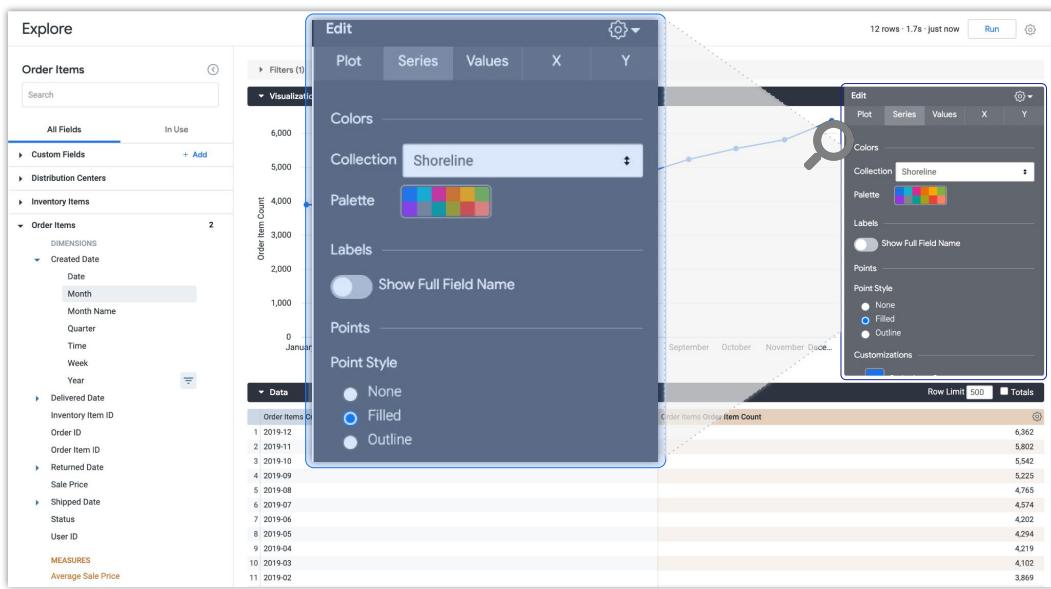
Set the operator to “is in the year”, and type 2019 in the text box. Then, click **Run**.



Examples are based on fictional data.

Google Cloud

Now, open the visualization pane, and make sure the type is set to **line** chart.

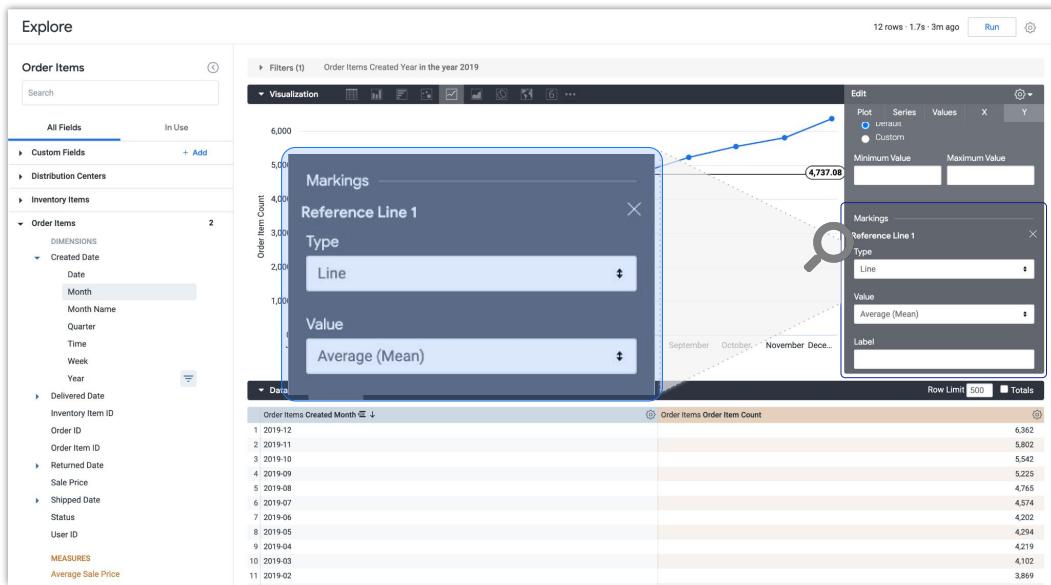


Examples are based on fictional data.

Google Cloud

Next, change the style of the data points within the line chart.

In the **Series** tab of the visualization settings, you can choose a Point Style of “None”, “Filled”, or “Outline”. This example uses **Filled**.



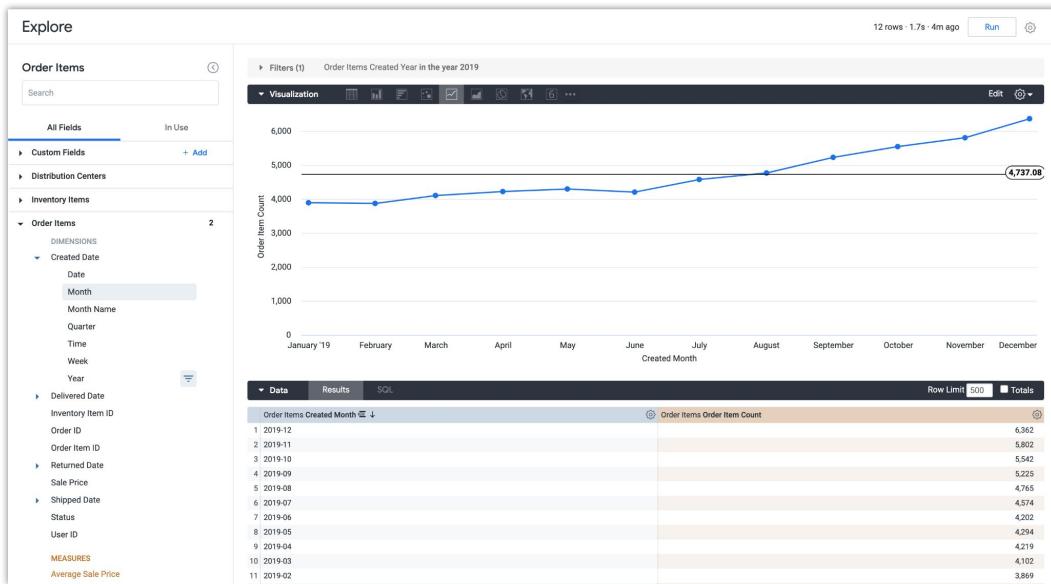
Examples are based on fictional data.

Google Cloud

Finally, you can add in a reference line that shows the average profit across the year.

In the “Y” tab of the visualization settings, scroll down to the bottom, and click on the **Add Reference Line** button.

Then, set the type to **Line** and the value to **Average (Mean)**.



Examples are based on fictional data.

Google Cloud

The final line chart is now ready and displays the total number of items sold each month in 2019 with the yearly average as a reference line.

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In Looker, pivots allow you to turn a selected dimension into several columns, which creates a matrix of your data similar to a pivot table in spreadsheet software.

This is very useful for analyzing metrics by different groupings of your data, such as getting counts for category or label in your dataset.

Display results with pivots

Pivoting enables **dimensions** to be displayed horizontally. Pivoting on **Is Round** creates new column headers based on the unique values in **Is Round**.

Looker

Fruit Basket **Color** | Fruit Basket **Is Round** | Fruit Basket **Count**

yellow	no	5
orange	yes	2
red	yes	2
green	no	2
green	yes	1

Google Cloud

For example, from this basic 5-row dataset, you can ask something like, How many pieces of fruit do I have for each color, and is the fruit round or not?

While this display is adequate to see that you have 5 fruits that are yellow and not round, 2 that are orange and round, etc, it's not easy to compare all the colors against each other, or just the ones that are round against each other.

Display results with pivots

Pivoting enables **dimensions** to be displayed horizontally. Pivoting on **Is Round** creates new column headers based on the unique values in **Is Round**.

Looker

Fruit Basket	Is Round	yes	no
Fruit Basket	Color	Fruit Basket Count	Fruit Basket Count
orange	2	-	-
red	2	-	-
green	1	2	-
yellow	-	5	-

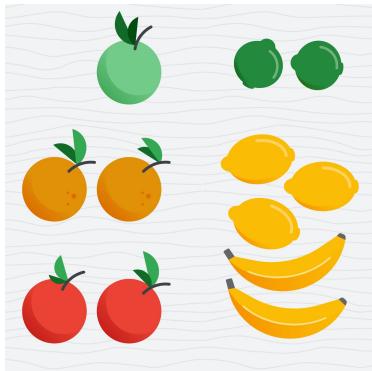
Google Cloud

Applying a pivot to the **Is Round** dimension transforms the display of the data into a format that is more meaningful and easy to interpret.

When you pivot on a dimension, each unique possible value of that dimension becomes its own column header. Any measures are then repeated under each column header.

Display results with pivots

The **Is Round** categories **yes** and **no** become our new column headers.
All of the round fruit is in the first column.



Looker

Fruit Basket Color	Is Round yes	Is Round no
Fruit Basket Color	Fruit Basket Count	Fruit Basket Count
orange	2	-
red	2	-
green	1	2
yellow	-	5

Google Cloud

In this case, you have one column for **Is Round** being “yes” and another for “no”.

It becomes much easier to compare just the counts of round fruit across colors, and the counts of not-round fruit.

It also shows you gaps in your data, where you don’t have *any* round or not-round fruit for a particular color.

Display results with pivots

Looker

Fruit Basket [Is Round](#) yes no

Fruit Basket Color	Fruit Basket Count	Fruit Basket Count
orange	2	-
red	2	-
green	1	2
yellow	-	5

Google Cloud

In summary, pivots allow you to create and display a matrix of your data, similar to a pivot table in spreadsheet software.

Specifically, pivots turn a selected dimension into several columns and are applied only to the visual display of your results.

With pivots, Looker allows you to regroup your data, so that you can easily compare results by different groupings and identify potential gaps, all while leaving your underlying data unaffected.

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in Looker



Google Cloud

Whenever you have a question involving one dimension “by” another dimension, that’s a clue that a pivot might come in handy.

Example: Working with pivots

Find the total revenue of each product category by product department.



Google Cloud

Let's run through a pivot example to find the total revenue from each product category by product department, and then display the results as a stacked bar chart.

The screenshot shows the Looker interface with the 'Explore' tab selected. On the left, there's a sidebar with categories like 'E-Commerce Training', 'Events' (which is expanded), 'FAA', 'Looker Basics', and 'System Activity'. Under 'Events', 'Order Items' is selected and highlighted with a blue box. A magnifying glass icon is positioned over this blue box. The main area is titled 'Your organization's folders' and contains sections for 'Folders', 'Dashboards', and 'Looks'. In the 'Folders' section, there are entries for 'Analytics' (with a blue box around it) and 'Human Resources'. In the 'Dashboards' section, there's one entry: 'Business Pulse'. In the 'Looks' section, there's one entry: 'Yearly Revenue'. Each entry has a preview thumbnail, a name, a description, and various interaction icons (like sort, filter, and more).

Examples are based on fictional data.

Google Cloud

First, from the **Explore** tab, locate **Order Items** under the **E-Commerce Training** heading.

Explore

Order Items

All Fields In Use

Custom Fields + Add

Distribution Centers

Inventory Items

Order Items 1

Dimensions

Created Date

Delivered Date

Inventory Item ID

Order ID

Order Item ID

Returned Date

Sale Price

Shipped Date

Status

User ID

Measures

Average Sale Price

Order Count

Order Item Count

Total Revenue

Total Revenue From Completed Orders

Products

Users

Filters

Visualization

Data Results SQL

Row Limit 500 Totals

Will process 1.51 MB Run

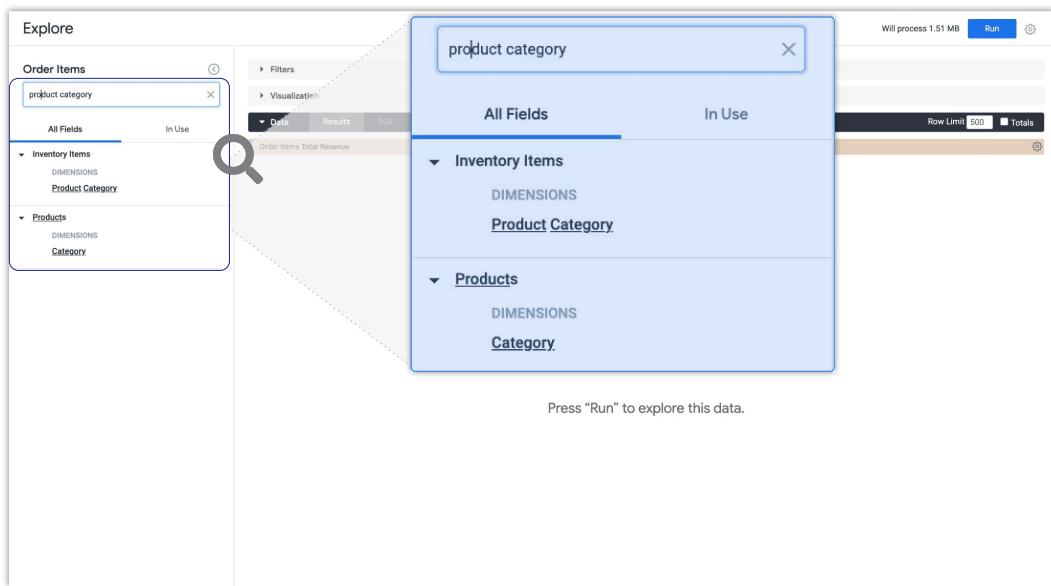
Press "Run" to explore this data.

The screenshot shows the Google Cloud BigQuery Explore interface. On the left, the 'Order Items' view is selected, displaying various dimensions and measures. A magnifying glass icon highlights the 'Total Revenue' measure in the 'MEASURES' section of the sidebar. In the main results area, a blue box surrounds the 'Total Revenue' column header. Dotted lines connect the magnifying glass icon to this blue box, indicating a search or selection action.

Examples are based on fictional data.

Google Cloud

Next, select the **Total Revenue** measure from the **Order Items** view.



Examples are based on fictional data.

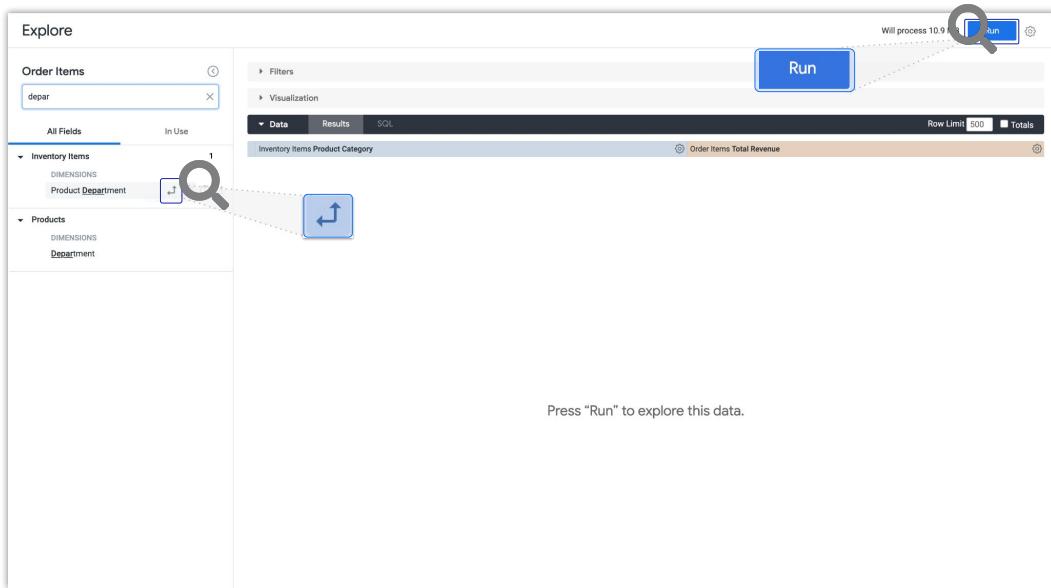
Google Cloud

Next, you need the product category. Where is that again?

Don't forget, any time you feel overwhelmed by all the views and fields, you can use the field picker's search bar to surface keywords. There's **Product Category** in the **Inventory Items** view and **Category** in the **Products** view. Go with **Product Category** in the **Inventory Items** view.

You may see multiple options while searching in real Explores in your company's Looker instance as well. Depending on how your data is structured, the same field may appear under multiple views.

We recommend trying both if you're worried about the accuracy of the results—and, when in doubt, seek help from your company's LookML developer team.



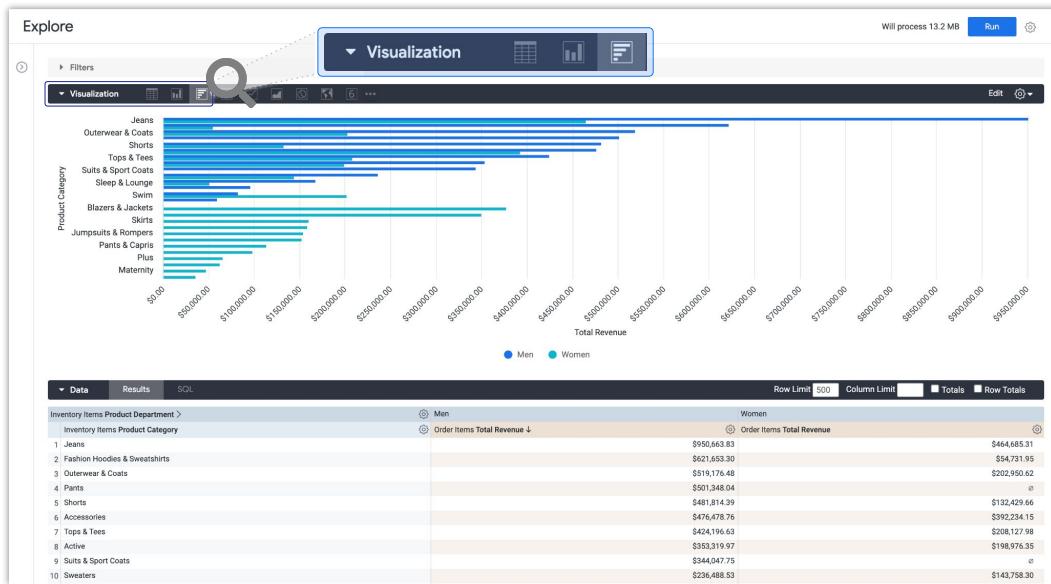
Examples are based on fictional data.

Google Cloud

A search for “department” also yields fields under both the **Inventory Items** and **Products** views, so again, go with the one in the **Inventory Items** view. However, you’ll want to pivot on this item, so you need to click on the **Pivot** button.

Click **Run** to see the results.

Note that if you simply clicked on the field name to add it to your result set without pivoting first, you can still pivot later by clicking on the gear icon for the column header and then clicking **Pivot**.

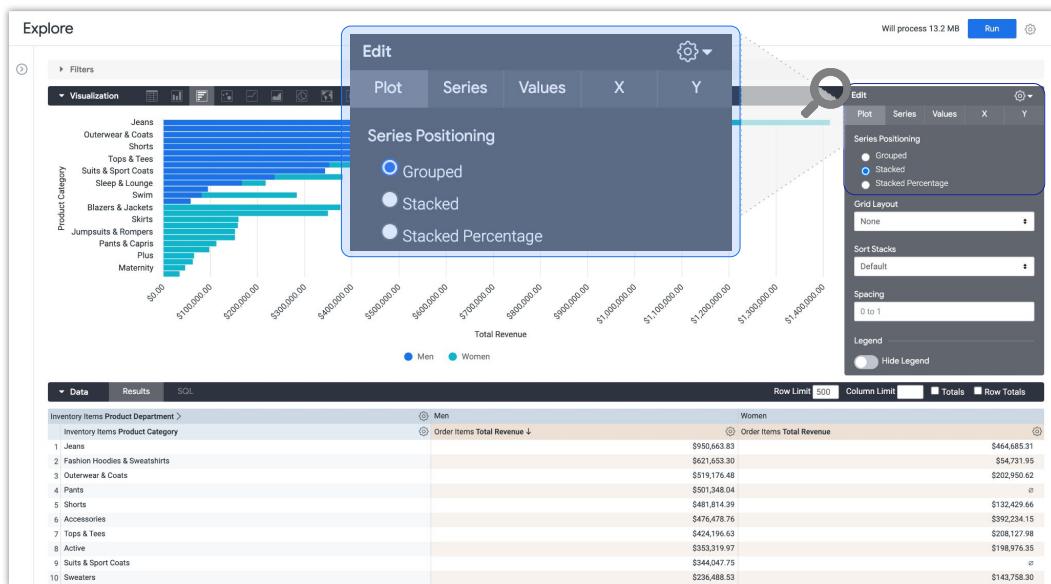


Examples are based on fictional data.

Google Cloud

In the visualization pane, you can click on the bar icon to make it a horizontal bar chart.

Overall, this visualization is a good start, but it doesn't give a clear idea of how the various categories compare for *overall* revenue across both men's and women's departments. For example, which category made more revenue from men's and women's products combined?



Examples are based on fictional data.

Google Cloud

Thanks to the pivot, you can edit this to be a stacked bar chart by selecting **Stacked** under the **Plot** tab of the visualization settings.

The stacked bar chart allows you to see that there is more overall combined revenue from Jeans than for any other category.

And with that, the visualization of total revenue from each product category *by* department is now complete.