

How to Normalize Data in Power BI to a 0-1 Scale

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January 27, 2026

RECOMMENDED CITATION

stats writer (2026). *How to Normalize Data in Power BI to a 0-1 Scale*. PSYCHOLOGICAL SCALES. Retrieved from <https://scales.arabpsychology.com/?p=127997>

In the realm of Power BI,
data normalization

is a critical process used to transform raw data onto a standardized scale, typically bounded between 0 and 1.

This standardization is essential for allowing meaningful comparisons between metrics that originally possess vast differences in scale and magnitude.

Techniques such as Min-Max scaling
or Z-score normalization are commonly employed to achieve this standardization.

By applying data normalization within
Power BI, analysts can effectively eliminate the bias introduced by differing units or scales, thereby simplifying the identification of underlying patterns and trends in the data. This crucial step significantly improves
data accuracy and ensures that visualizations and subsequent analysis lead to more informed and accurate decision-making.

To execute this transformation, users primarily rely on powerful calculation languages like DAX to apply complex mathematical operations directly to their datasets.

Power BI: Normalize Data Between 0 and 1

The Core Principle of Min-Max Normalization

To transform numerical values in a dataset so that they uniformly fall within the range of 0 and 1, the statistical technique of Min-Max scaling is utilized. This method recalculates each data point based on the minimum and maximum values observed across the entire series. Understanding this fundamental formula is the first step
in successfully implementing normalization within your data models.

The standard formula for Min-Max normalization is expressed as follows:

$$z_i = (x_i - \min(x)) / (\max(x) - \min(x))$$

In this formula, the variables represent key components of the dataset being analyzed:

z_i : Represents the i th normalized value resulting from the calculation, which will fall between 0 and 1.

x_i : Represents the specific i th raw value from the original dataset column.

$\min(x)$: Denotes the absolute minimum value found across the entire column (x).

max(x): Denotes the absolute maximum value found across the entire column (x).

Implementing Min-Max Scaling Using DAX

Once the theoretical foundation is established, the next phase involves translating this mathematical formula into a practical calculation using DAX (Data Analysis Expressions). In Power BI, you typically create a new calculated column to store the normalized results, ensuring the original data remains untouched and facilitating performance.

The following DAX syntax demonstrates how to efficiently calculate the normalized values using variable definitions to enhance readability and performance:

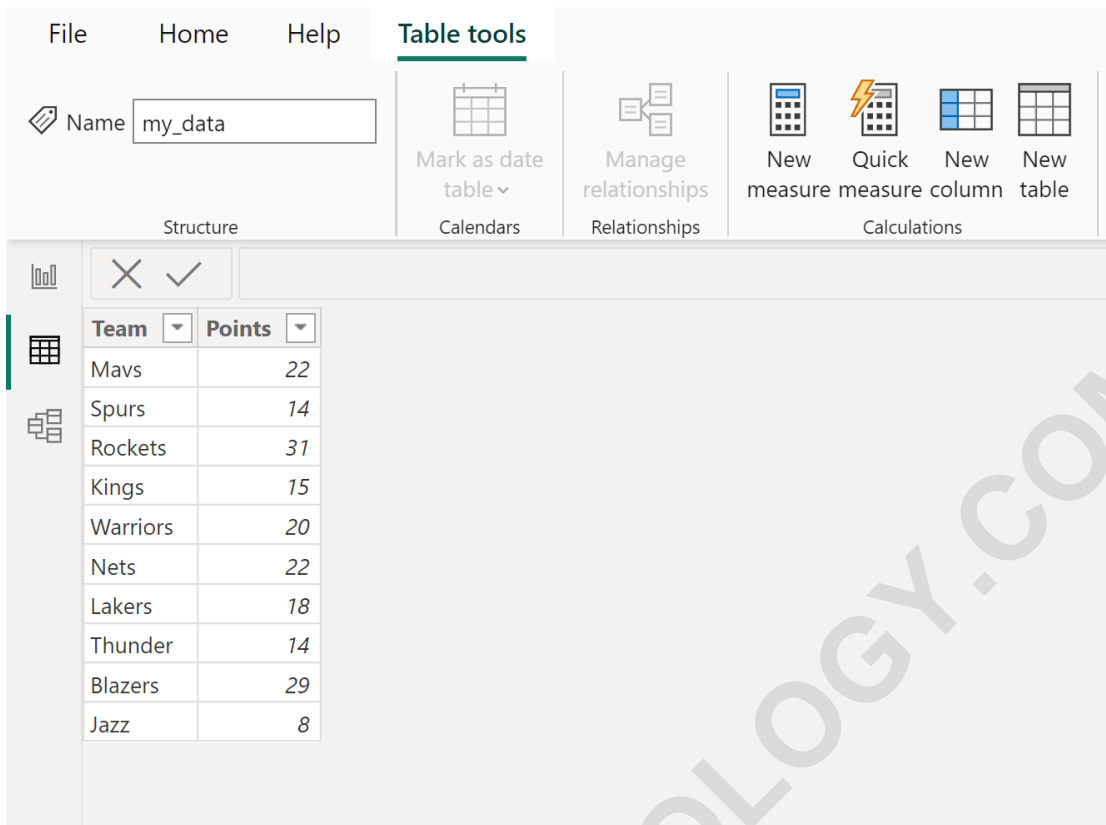
```
Normalized Points =  
VAR Xi = 'my_data'  
VAR MinValue = MIN('my_data')  
VAR MaxValue = MAX('my_data')  
RETURN DIVIDE(Xi - MinValue, MaxValue - MinValue)
```

This specific calculation creates a new column named **Normalized Points**. This column holds the standardized values derived from the **Points** column within the table designated as **my_data**. Utilizing the DIVIDE function is a best practice in DAX as it handles potential division by zero errors gracefully (which occurs if MaxValue equals MinValue, meaning all values in the column are identical).

Practical Example: Normalizing Basketball Player Scores

To illustrate how to apply data normalization in a real-world scenario, consider a simple table within Power BI named **my_data**. This table tracks critical statistics, specifically the points scored by various basketball players across different teams. Our objective is to normalize the **Points** column to better assess relative performance across the players.

The initial structure of the **my_data** table is shown below, displaying the raw, unscaled scores:

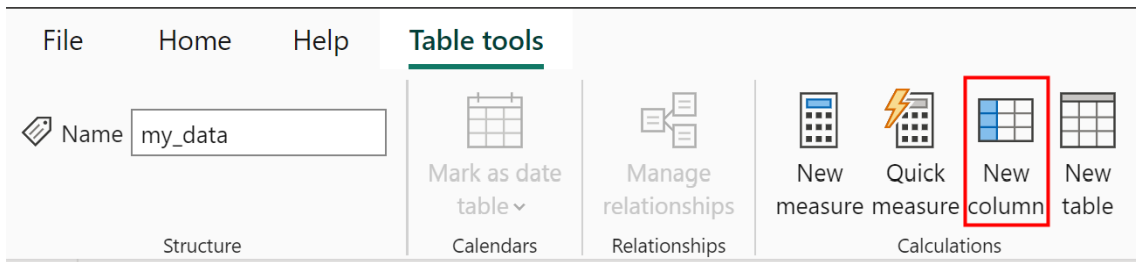


We intend to apply the Min-Max scaling technique to every value in the **Points** column. This transformation will ensure that the lowest score maps precisely to 0, the highest score maps exactly to 1, and all intermediate scores are proportionally scaled between these two bounds, providing immediate context for performance evaluation.

Step-by-Step DAX Implementation in Power BI

The process of adding this calculated column is straightforward within the Power BI Desktop environment. First, ensure you are in the Data view where your table is visible.

To initiate the creation of the new column, navigate to the top ribbon menu and click on the **Table tools** tab. Within this tab, locate and click the **New column** icon, which is essential for defining column-level calculations.



After clicking **New column**, the formula bar will appear. It is here that you input the DAX expression defined previously, which calculates the normalized value for each row relative to the column's minimum and maximum values:

Normalized Points =

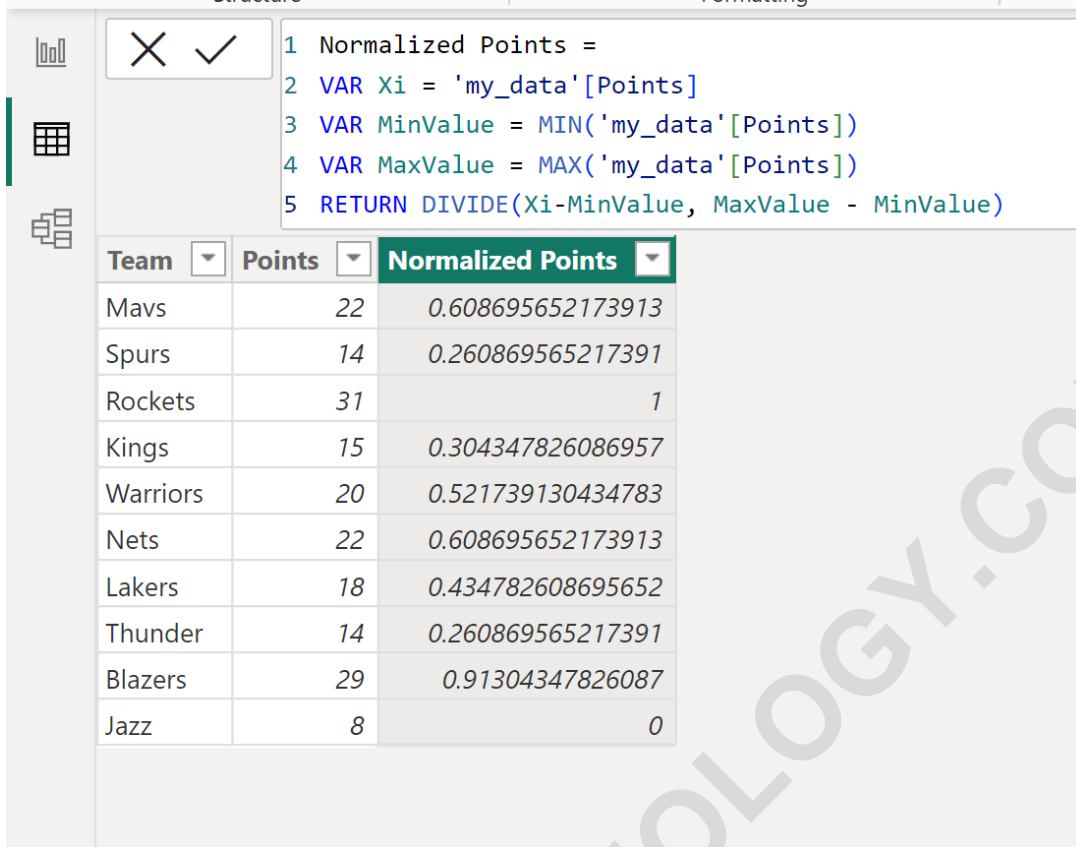
VAR Xi = 'my_data'

VAR MinValue = MIN('my_data')

VAR MaxValue = MAX('my_data')

RETURN DIVIDE(Xi - MinValue, MaxValue - MinValue)

Executing this formula immediately generates the new column named **Normalized Points** within your **my_data** table. This column now contains the standardized, normalized values derived directly from the original **Points** column.



The screenshot shows a Power BI interface with a DAX formula bar and a data table. The formula bar contains the following DAX code:

```

1 Normalized Points =
2 VAR Xi = 'my_data'[Points]
3 VAR MinValue = MIN('my_data'[Points])
4 VAR MaxValue = MAX('my_data'[Points])
5 RETURN DIVIDE(Xi-MinValue, MaxValue - MinValue)

```

The table below shows the result of this calculation for various teams:

Team	Points	Normalized Points
Mavs	22	0.608695652173913
Spurs	14	0.260869565217391
Rockets	31	1
Kings	15	0.304347826086957
Warriors	20	0.521739130434783
Nets	22	0.608695652173913
Lakers	18	0.434782608695652
Thunder	14	0.260869565217391
Blazers	29	0.91304347826087
Jazz	8	0

Observe the newly created column: every single value falls within the designated range of 0 and 1, successfully achieving the goal of data normalization. This standardized representation makes comparisons across different data categories much simpler and more accurate.

Verifying the Calculation Results

To confirm the accuracy of the DAX calculation, it is helpful to walk through the steps for a specific data point from the table. Let us consider the player whose raw score (x_i) was 22 points.

First, we must identify the global minimum and maximum values across the entire **Points** column in the **my_data** table:

The minimum value ($\min(x)$) is 8.

The maximum value ($\max(x)$) is 31.

Now, applying the Min-Max formula to the raw score of 22:

$$z_i = (x_i - \min(x)) / (\max(x) - \min(x))$$

$$z_i = (22 - 8) / (31 - 8)$$

$$z_i = 14 / 23$$

$$z_i \approx 0.60869$$

As demonstrated, the first value in the **Normalized Points** column is indeed **0.60869**, validating the effectiveness and accuracy of the Min-Max scaling implementation using DAX. Every other value in the **Normalized Points** column was calculated using this precise mathematical method, ensuring consistency across the entire dataset.

Further Exploration in Power BI Techniques

Mastering data normalization is just one crucial step toward advanced analytics in Power BI. Exploring other common transformations and statistical tasks can significantly broaden your data modeling and reporting capabilities, leading to deeper insights.

The following tutorials provide guidance on performing other common, essential tasks within the Power BI environment: