



LibreOffice
The Document Foundation

Getting Started Guide

Chapter 9 *Getting Started with Math*

LibreOffice's Equation Editor

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Acknowledgments

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Note for Mac users

Some keystrokes and menu items are different on a Mac from those used in Windows and Linux. The table below gives some common substitutions for the instructions in this chapter. For a more detailed list, see the application Help.

<i>Windows or Linux</i>	<i>Mac equivalent</i>	<i>Effect</i>
Tools > Options menu selection	LibreOffice > Preferences	Access setup options
<i>Right-click</i>	<i>Control+click</i>	Opens a context menu
<i>Ctrl (Control)</i>	⌘ (<i>Command</i>)	Used with other keys
<i>F5</i>	<i>Shift+⌘+F5</i>	Opens the Navigator
<i>F11</i>	<i>⌘+T</i>	Opens the Styles and Formatting window

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What is Math?

Math is LibreOffice's component for writing mathematical equations. It is most commonly used as an equation editor for text documents, but it can also be used with other types of documents or as a stand-alone editor. When used inside Writer, the equation is treated as an object inside the text document.

Note

The equation editor is for writing equations in symbolic form, as in equation 1. If you want to evaluate a numeric value, see the *Calc Guide*.

$$\frac{df(x)}{dx} = \ln(x) + \tan^{-1}(x^2) \quad (1)$$

Getting started

To insert an equation, go to **Insert > Object > Formula**.

The equation editor opens at the bottom of the screen, and the floating Elements window may appear. You will also see a small box with a gray border in your document, where the formula will be displayed, as shown in Figure 1.

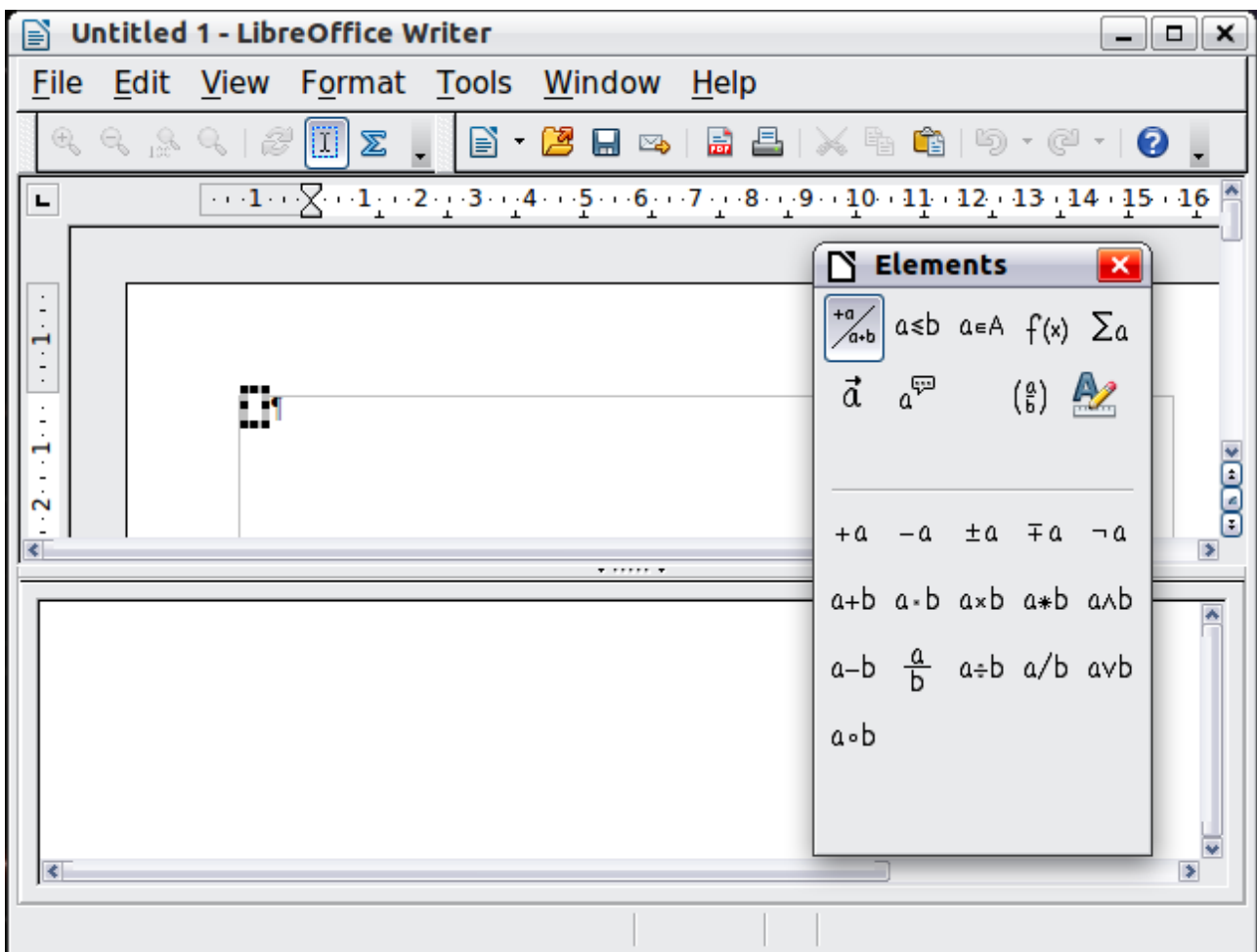


Figure 1: Equation Editor, Elements window, and location of resulting equation

Entering a formula

The equation editor uses a markup language to represent formulas. For example, `%beta` creates the Greek character beta (β). This markup is designed to read in a similar way to English

whenever possible. For example, `a over b` produces a fraction: $\frac{a}{b}$.

You can enter a formula in three ways:

- Select a symbol from the Elements window.
- Right-click on the equation editor and select the symbol from the context menu.
- Type markup in the equation editor.

The context menu and the Elements window insert the markup corresponding to a symbol. This provides a convenient way to learn the LibreOffice Math markup.

Note

Click on the document body to exit the formula editor.
Double-click on a formula to enter the formula editor again.

The Elements window

The simplest method for entering a formula is the Elements window.

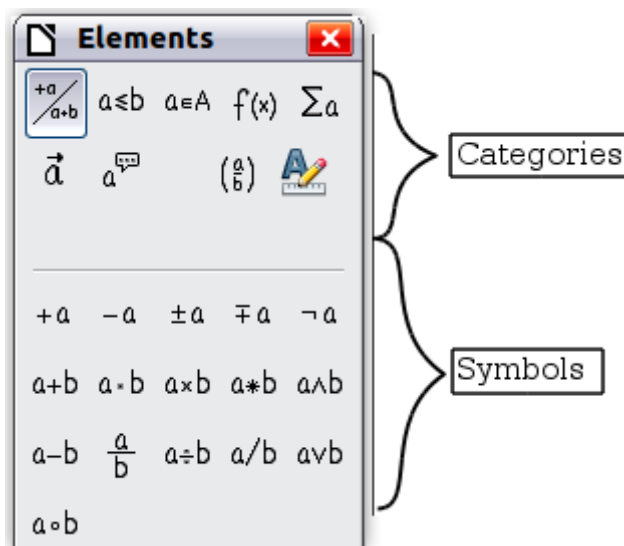


Figure 2: Symbols are divided into categories

The Elements window is divided into two main parts.

- The **top** shows the symbol categories. Click on these to change the list of symbols.
- The **bottom** shows the symbols available in the current category.

Tip

You can hide or show the Elements window with **View > Elements**.

Example 1: 5×4

For this example we will enter a simple formula: 5×4 . On the Elements window:

- 1) Select the top-left button of the categories (top) section.

2) Click on the multiplication symbol.

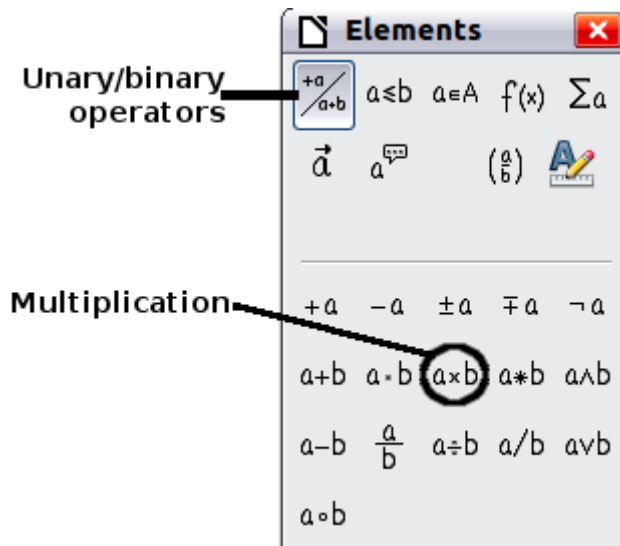


Figure 3: Selecting the multiplication symbol

When you select the multiplication symbol on the Elements window, two things happen:

- The equation editor shows the markup: `<?> times <?>`
- The body of the document shows a gray box like this: $\square \times \square$

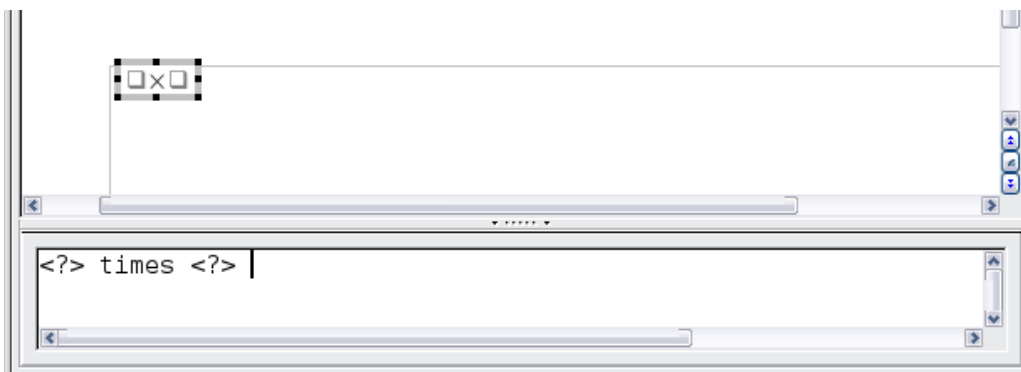


Figure 4: Result of selecting the multiplication symbol

The `<?>` symbols shown in Figure 4 are placeholders that you can replace by other text, for example **5** and **4**. The equation will update automatically, and the result should resemble Figure 5.

Tip

To keep the equation from updating automatically, select **View > AutoUpdate display**. To update a formula manually, press **F9** or select **View > Update**.

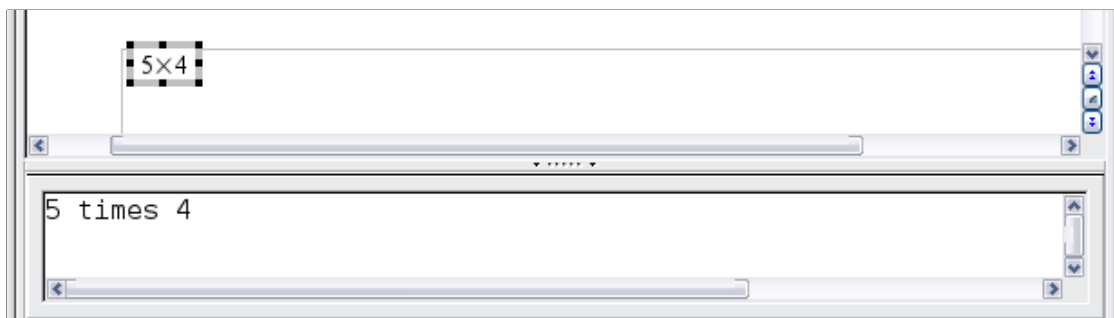


Figure 5: Result of entering 5 and 4 next to the times operator

Right-click (context) menu

Another way to access mathematical symbols is to right-click on the equation editor. This pops up the menu shown in Figure 6. The items in this menu correspond exactly to those in the Elements window.

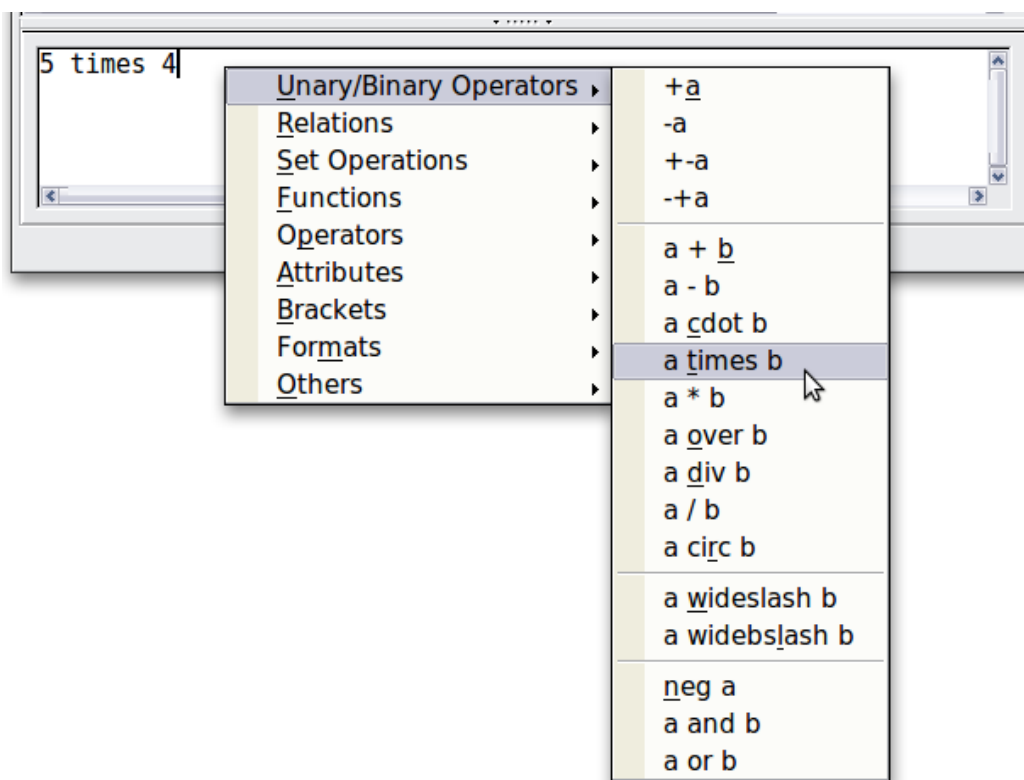


Figure 6: Right-click (context) menu

Markup

You can type the markup directly in the equation editor. For example, you can type **5 times 4** to obtain 5×4 . If you know the markup, this can be the fastest way to enter a formula.

Tip

The formula markup resembles the way the formula reads in English.

Below is a short list of common equations and their corresponding markup.

<i>Display</i>	<i>Command</i>	<i>Display</i>	<i>Command</i>
$a = b$	a = b	\sqrt{a}	sqrt {a}
a^2	a^2	a_n	a_n
$\int f(x) dx$	int f(x) dx	$\sum a_n$	sum a_n
$a \leq b$	a <= b	∞	infinity
$a \times b$	a times b	$x \cdot y$	x cdot y

Greek characters

Greek characters (α , β , γ , θ , etc) are common in mathematical formulas. *These characters are not available in the Elements window or the right-click menu.* Fortunately, the markup for Greek characters is simple: Type a % sign followed by the name of the character, in English.

- To write a *lowercase* character, type the name of the character in lowercase.
- To write an *uppercase* character, type the name of the character in uppercase.

A complete table of Greek characters is provided in the *Math Guide*. See the table below for some examples.

Lowercase	Uppercase
%alpha → α	%ALPHA → A
%beta → β	%BETA → B
%gamma → γ	%GAMMA → Γ
%psi → ψ	%PSI → Ψ
%phi → ϕ	%PHI → Φ
%theta → θ	%THETA → Θ

Another way to enter Greek characters is by using the Symbols catalog window. Choose **Tools > Catalog**. This window is shown in Figure 7. Under *Symbol set*, select **Greek** and double-click on a Greek letter from the list. The markup name of the character is shown below the list window.

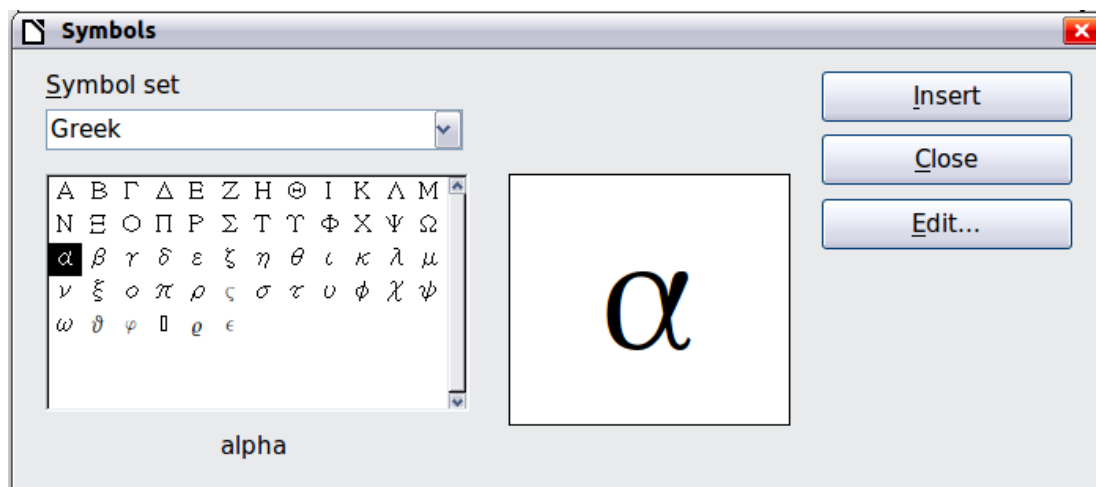


Figure 7: Symbols catalog, used for entering Greek characters and some special symbols

Example 2: $\pi \simeq 3.14159$

For this example we will suppose that:

- We want to enter the above formula (the value of pi rounded to 5 decimal places).
- We know the name of the Greek character (pi).
- But we do not know the markup associated with the \simeq symbol.

Step 1: Type % followed by the text **pi**. This displays the Greek character π .

Step 2: Open the Elements window (**View > Elements**).

Step 3: The \simeq symbol is a relation, so we click on the Relations button. If you hover the mouse over this button you see the tooltip *Relations* (Figure 8).

Figure 9 shows the Selection window after clicking the Relations button. The symbol we want is circled.

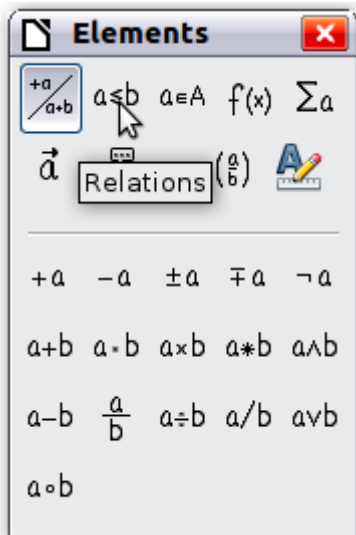


Figure 8: Tooltip indicates the Relations button

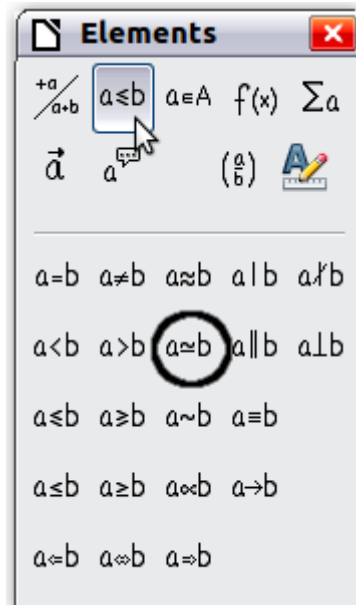


Figure 9: After selecting Relations

Step 4: Click on the $a \simeq b$ symbol. The equation editor now shows the markup `%pi<?> simeq <?>`.

Step 5: Delete the `<?>` text and add **3.14159** at the end of the equation. We end up with the markup `%pi simeq 3.14159`. The result is shown in Figure 10.

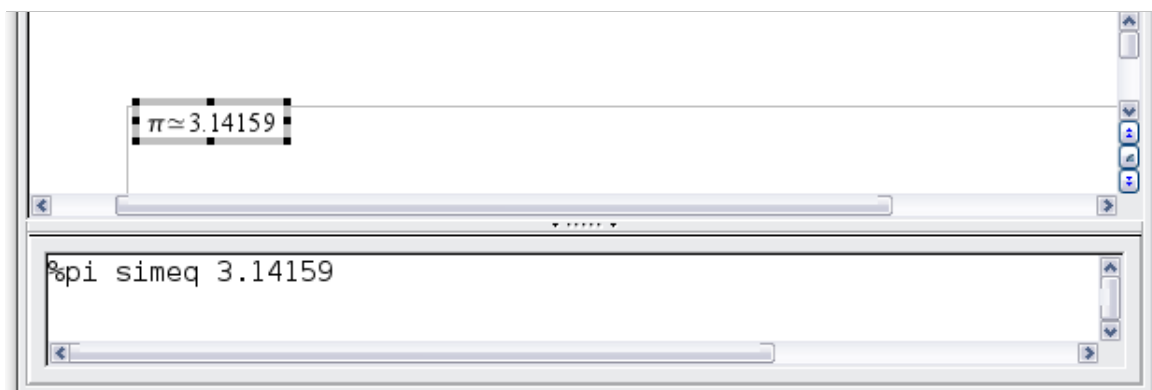


Figure 10. Final result

Customizations

Formula editor as a floating window

The formula editor can cover a large part of the Writer window. To turn the formula editor into a floating window, do this:

- 1) Hover the mouse over the editor frame, as shown in Figure 11.
- 2) Hold down the *Control* key and double-click.

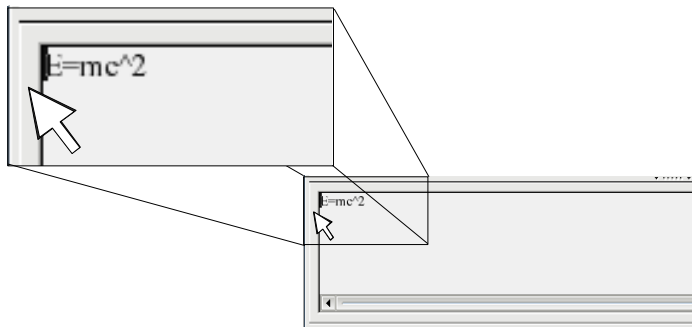


Figure 11: Turning the formula editor into a floating window

Figure 12 shows the result. You can dock the floating window again by using the same steps. Hold down the *Control* key and double-click the window frame.

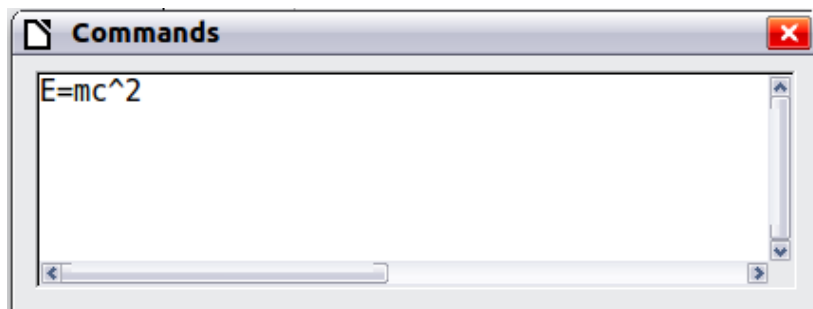


Figure 12: Formula editor as a floating window

How can I make a formula bigger?

This is one of the most common questions people ask about LibreOffice Math. The answer is simple, but not intuitive:

- 1) Start the formula editor and choose **Format > Font size**.

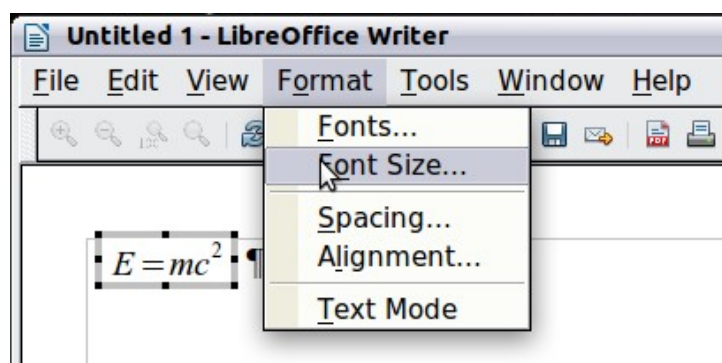


Figure 13: Changing the font size for a formula

2) Select a larger font size under *Base size* (top-most entry).

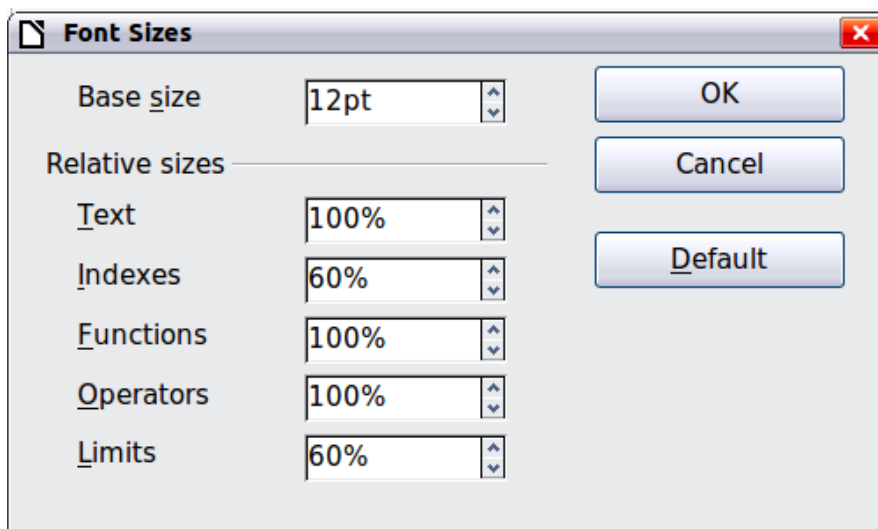


Figure 14. Edit Base size (top) to make a formula bigger

The result of this change is illustrated in Figure 3.

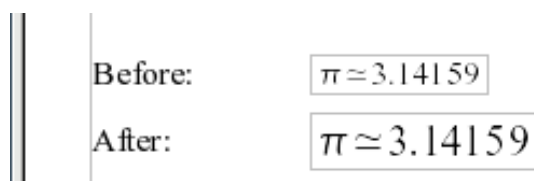


Figure 15. Result of changing the base font size

Formula layout

The most difficult part of using LibreOffice Math comes when writing complicated formulas. This section provides some advice.

Brackets are your friends

LibreOffice Math knows nothing about order of operation. You *must* use brackets to state the order of operations explicitly. Consider the following example.

Markup	Result
2 over x + 1	$\frac{2}{x} + 1$
2 over {x + 1}	$\frac{2}{x+1}$

Equations over more than one line

Suppose you want to type an equation covering more than one line. For example: $x=3$
 $y=1$

Your first reaction would be to simply press the *Enter* key. However, if you do this, the markup goes to a new line but the resulting equation does not. You must type the newline command explicitly. This is illustrated in the table below.

Markup	Result
x = 3 y = 1	$x=3 y=1$
x = 3 newline y = 1	$x=3$ $y=1$

How do I add limits to my sum/integral?

The sum and int commands can (optionally) take the parameters *from* and *to*. These are used for lower and upper limits respectively. These parameters can be used singly or together. Limits for integrals are usually treated as subscripts and superscripts.

Markup	Result
sum from k = 1 to n a_k	$\sum_{k=1}^n a_k$
int from 0 to x f(t) dt or int_0^x f(t) dt	$\int_0^x f(t) dt$ or $\int_0^x f(t) dt$
int from Re f	$\int_{\mathbb{R}} f$
sum to infinity 2^{-n}	$\sum_{-\infty}^{\infty} 2^{-n}$

Note

For more details on integrals and sums, see the *LibreOffice Math Guide*.

Brackets with matrices look ugly!

For background, we start with an overview of the matrix command.

Markup	Result
matrix { a # b ## c # d }	$\begin{matrix} a & b \\ c & d \end{matrix}$

Note

Rows are separated by two #'s and entries within each row are separated by one #.

The first problem people have with matrices is that brackets do not scale with the matrix:

Markup	Result
<code>(matrix { a # b ## c # d })</code>	$\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

LibreOffice Math also provides scalable brackets that grow in size to match the size of their contents. Use the commands *left*(and *right*) to make scalable brackets.

Markup	Result
<code>left(matrix { a # b ## c # d } right)</code>	$\left(\begin{matrix} a & b \\ c & d \end{matrix} \right)$

Tip

Use *left*[and *right*] to obtain scalable square brackets.

How do I make a derivative?

Making derivatives essentially comes down to one trick: *Tell LibreOffice it's a fraction*.

In other words, you have to use the *over* command. Combine this with either the letter *d* (for a total derivative) or the *partial* command (for a partial derivative) to achieve the effect of a derivative.

Note

Notice that we have to use braces (squiggly brackets) to make the derivative.

Markup	Result
<code>{df} over {dx}</code>	$\frac{df}{dx}$
<code>{partial f} over {partial y}</code>	$\frac{\partial f}{\partial y}$
<code>{partial^2 f} over {partial t^2}</code>	$\frac{\partial^2 f}{\partial t^2}$

How do I align my equations at the equals sign?

LibreOffice Math does not have a command for aligning equations on a particular character, but you can use a matrix to do this, as shown below.

Markup	Result
<code>matrix{ alignr x+y # {}={ } # alignl 2 ## alignr x # {}={ } # alignl 2-y }</code>	$\begin{array}{rcl} x+y & = & 2 \\ x & = & 2-y \end{array}$

The empty braces around the = sign are necessary because = is a binary operator and thus needs an expression on each side.

You can reduce the spacing around the = sign by changing the intercolumn spacing of the matrix:

- 1) With the equation editor open, choose **Format > Spacing** from the menu bar.
- 2) In the Spacing dialog (Figure 16), click the **Category** button and select **Matrices** in the drop-down menu.
- 3) Enter **0%** for *Column spacing* and click **OK**.

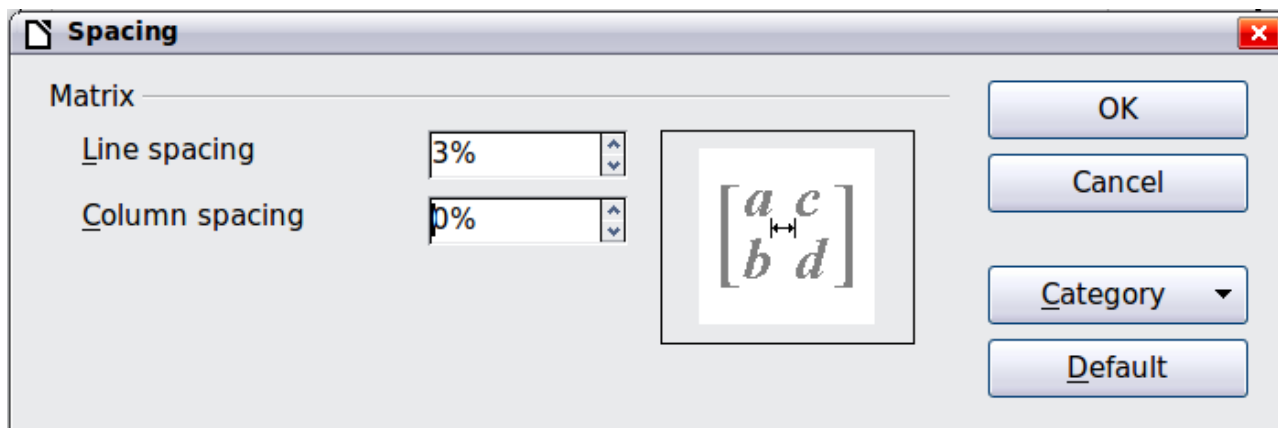


Figure 16: Changing spacing in a matrix formula

Numbering equations

Equation numbering is one of LibreOffice Math's best hidden features. The steps are simple, but obscure:

- 1) Start a new line.
- 2) Type **fn** and then press *F3*.

The *fn* is replaced by a numbered formula:

$$E = mc^2 \quad (2)$$

Now you can double-click on the formula to edit it. For example, here is the Riemann Zeta function:

$$\zeta(z) = \sum_{n=1}^{\infty} \frac{1}{n^z} \quad (3)$$

You can cross-reference an equation ("as shown in Equation (2)") with these steps:

- 1) Choose **Insert > Cross-reference** from the menu bar.
- 2) On the *Cross-references* tab (Figure 17), under *Type*, select *Text*.
- 3) Under *Selection*, select the equation number.
- 4) Under *Format*, select *Reference*.

Click **Insert**.

Done! If you later add more equations to the paper before the referenced equation, all the equations will automatically renumber and the cross-references will update.

Tip

To insert the equation number without parentheses around it, choose *Numbering* under *Format* instead of *Reference*.

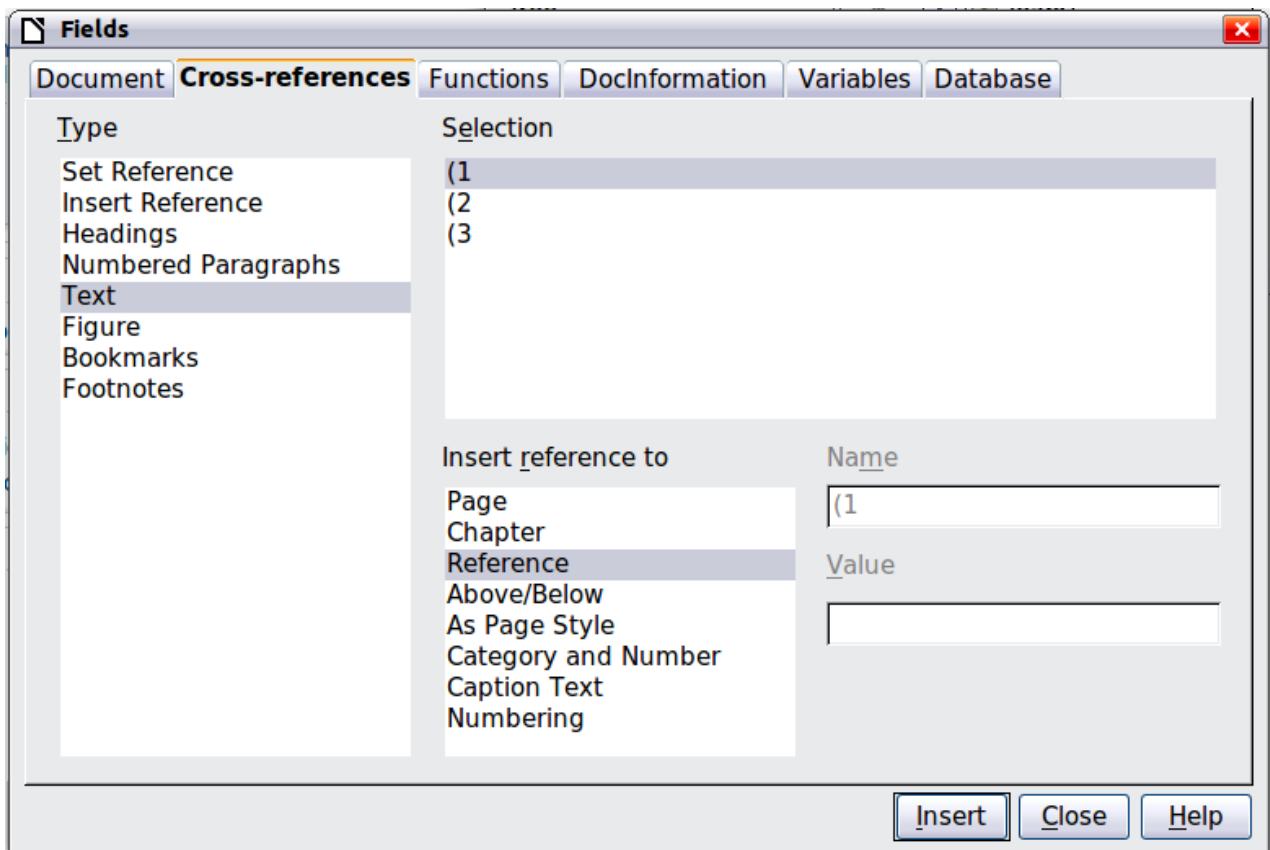


Figure 17. Inserting a cross-reference to an equation number

Math commands reference

For a full list of the commands available in Math, please see the *LibreOffice Math Guide*.

- Unary / binary operators
- Relational operators
- Set operations
- Functions
- Operators
- Attributes
- Miscellaneous
- Brackets
- Formats
- Characters – Greek
- Characters – Special