

ScienceWord and Class Mathematical formulae

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I - Notion of scientific text

We define scientific text as a combination of an ordinary text, mathematical expression such as x^2 , \sqrt{x} , $\frac{1}{x}$, etc., mathematical symbols such as ∇ , ∂ , \neq , \cong , \mathbb{Z} , \odot , \perp , \geq , etc, simple chemical equations such as $\text{NaOH} + \text{HCl} \longrightarrow \text{NaCl} + \text{H}_2\text{O}$, $2\text{H}_2\text{O}_2 \xrightarrow[\star]{\text{FeCl}_3} 2\text{H}_2\text{O} + \text{O}_2\uparrow$, etc.

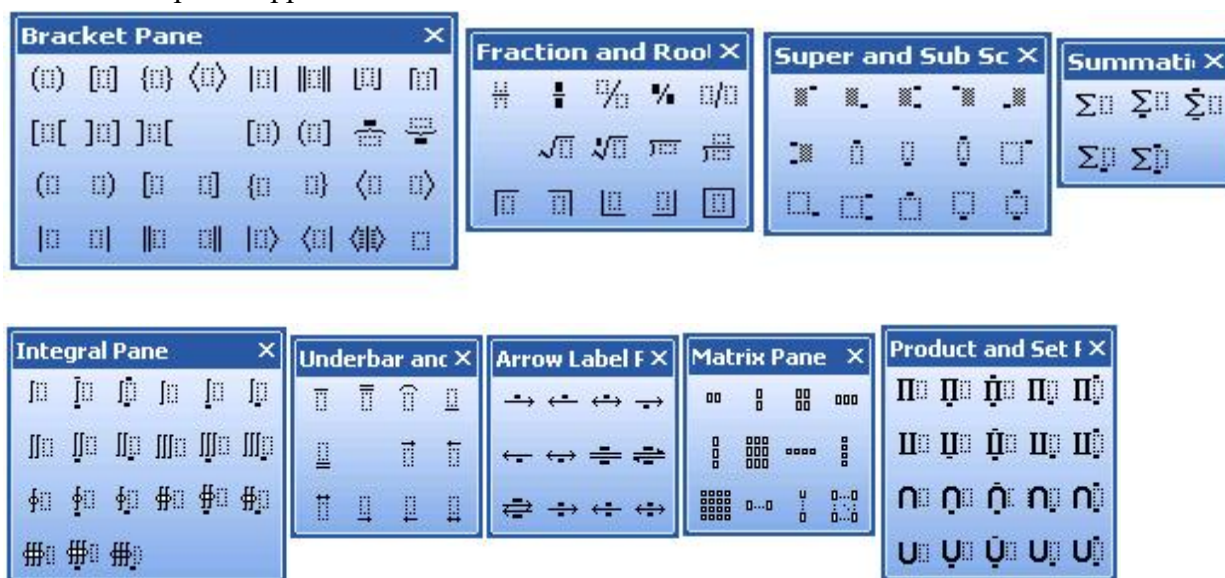
II - Formulae templates



1) Common concept of inserting formulae

Formulae templates are displayed in the "Expression Toolbar".

Expression toolbar → 


By clicking on the buttons of this toolbar from left to right, the panes of the formulae templates appear as follow



When you click on a mathematical model, it appears where the cursor blinks with one or several dotted rectangles () you can type directly any character from the keyboard or click and insert any symbol from symbols toolbar →  .

For example to write the fraction $\frac{3x+\alpha}{2x-\beta}$ click on  in the "Fraction and root" menu. This

model appears where the cursor is positioned and you need only to write “3x+α ” to the numerator and “2x-β” to the denominator. Greek characters α and β are inserted from Greek lower characters menu. We use the arrow keys left (←) and right (→) to position the cursor on the numerator, denominator or outside the fraction. You can also position the cursor by clicking on the mouse at the desired spot.

Generally in mathematical mode made of several input box (dotted rectangles) , Tab key moves the cursor from an input box to the following one; "Shift+Tab" keys move the cursor from an input box to the previous one.

Formulae templates and mathematical Symbols can also be inserted from task pane. In fact, you can also access directly these same panes by clicking on the sub-menu "Formulae" of the menu "Task Pane". (Fig1)

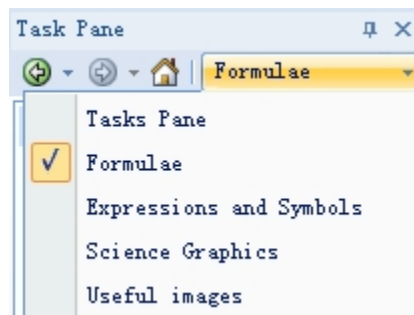


Fig1

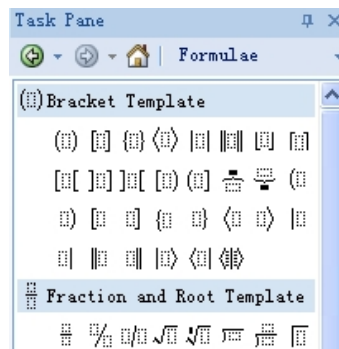



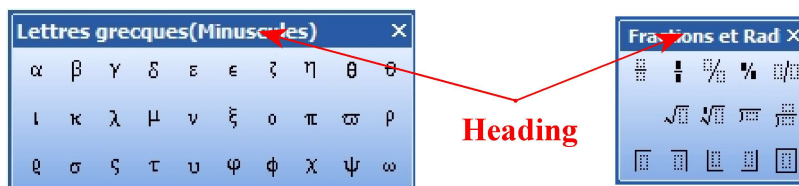
Fig 2

Then you can obtain user-friendly display of the entire formulae templates (Fig 2)

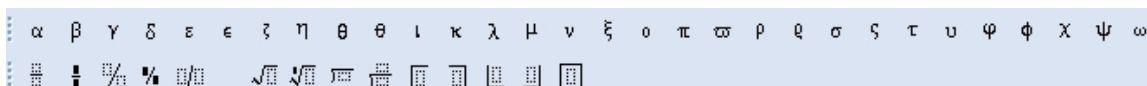
2) What's new and very revolutionary?

a) Flexible formulae and symbols templates

In the case of insertion of several symbols or expressions from the same menu, it is convenient to have this menu displayed on the screen. Just click on the said menu and position the pointer of the mouse on the dotted line which appears just at the entrance of the displayed menu. When the pointer takes the shape of a four-headed arrow , press the left button of the mouse and drag the menu toward the outside to a position convenient to you, then release the left button of the mouse. By acting thus on the menu previously used, we get the following result.



To expand these menus contents as shown below to the main menu bar, just double-click on their headings.



You can also make use of a shortcut key to display a mathematical model. For example, the insertion of a root square is directly obtained by holding “Ctrl” down and by pressing “R” key (a type of operation noted “Ctrl + R”). You can access the list of shortcut keys of common expressions through “Insertion” menu.

b) Formulae templates used as a formatting tool

You can also insert a selected text directly into any formula template just by clicking


on this template! For example: $\beta + y$ $\xrightarrow{\text{Click on } \sqrt{\quad}}$ $\sqrt{\beta + y}$.


You can also from "Insert" menu, input directly into subscript any number that is part

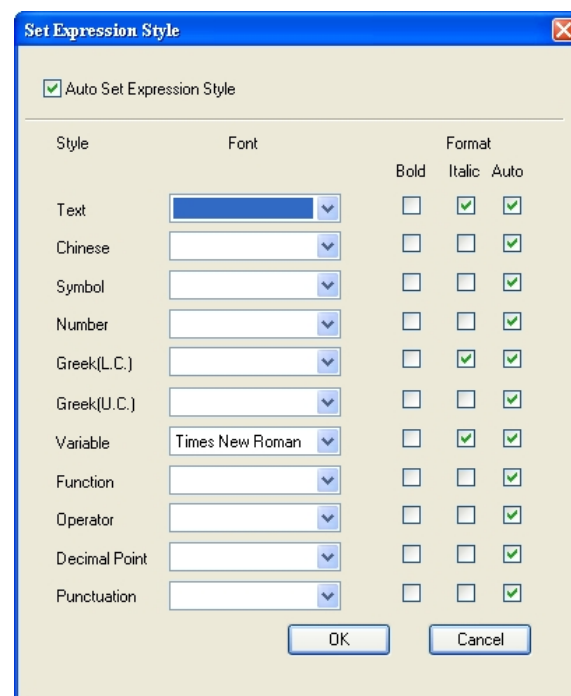
of a selected text! For example $C2O4$ $\xrightarrow{\text{Put numbers in subscript}}$ C_2O_4

III- Automatic formatting of scientific text

You can apply automatically a format as it is set in the opposite "Expression style dialog box" to an ordinary text or a text in formula template. You can access this dialogue box through **Expression Style** in **Format** menu


- To get the ordinary text automatically in the format as it is set in Expression style dialog box, just make sure that "**Intelligent Adjust**  " in the Format Toolbar is activated.. Otherwise it appears as in usual typing mode.

- To get the formulae templates text automatically in the format as it is set in Expression style dialog box, just make sure that "**Auto adjust expression layout**  " in



the Format Toolbar is activated. Otherwise it appears as in usual typing mode.

Practical application

Make sure that "**Intelligent Adjust**" and "**Auto adjust expression layout**  are activated and write the following mathematical expressions:

$$f(x) = x \cos(x) - \sqrt{x + \frac{x \sin(x)}{2\sqrt{x} + x^2 + 5}}, \quad g''(x) = -2 \sin(x) + x \sqrt{\cos(x)}.$$

Make use of Upper Modifier in font dialog box to write the following: $\ddot{x}(t) = \frac{d\dot{x}}{dt}$;

Note that these mathematical expressions are mixed - text writing made of ordinary text and text in formula mode; ordinary text and text in formula mode appear in the same format!

The dialog box of Expression Style shows three main columns: **Style**, **Font**, **Format**.

- **The column "Style"** is related to all types of tools in which a formatting occurs automatically.

Text designates the following characters: **&**, **"**, **'**, **\$**, **£**, **ù**, **@**, ****, **~**, **^**

Symbol designates the following mathematical symbols: **≥**, **≤**, **≠**, **≅**, **≦**, ...

Number designates the numbers **0**, **1**, **2**, **3**, ...**9**...

Greek Letter designates the Greek letters.

Variable designates in general, every letter in English alphabet.

Function is for simplified writing of mathematical functions such as **sin**, **cos**, **tan**, etc., which respectively designate the functions **sine**, **cosine** and **tangent**, etc.

Operator designates the following mathematical symbols: **±**, **+**, **-**, **×**, **∃**, **∀**, **∈**, **∉**, **∪**, **⊙**....

Decimal Point designates the point (**.**) .

Punctuation designates the characters: **,**, **;**, **:**, **!**, **)** and **(** .

- **The column "Font"** is for the font given to all types of tools in the column "Style". Some appropriate slots, fitted with an drop-down arrow, provide access to a list of the fonts; every slot is related to a type of tools.

Click on the drop-down arrow in order to select a font and then click on your choice in the list of fonts that appears.

- The column "Format" is for programming two aspects of formatting; "Bold" and "Italic", i.e., for putting a type of tools in bold or in italic characters respectively. Thus, the formatting of a type of tool is activated when the corresponding "Auto" box in this column is ticked off; it is deactivated when this "Auto" box is unticked.

IV - Formatting

1) Flexibility of formulae formatting

You can modify the format of any writing in formula mode.

For example, you can just select only the part " $x \rightarrow x_0$ " of the following limit expression

$\lim_{x \rightarrow x_0} \sin(x) = \sin(x_0)$ and apply the font size 10 and the blue color font and get the following result : $\lim_{x \rightarrow x_0} \sin(x) = \sin(x_0)$.

If you are writing a chemical equation such as $2\text{H}_2\text{O}_2 \xrightarrow[\star]{\text{FeCl}_3} 2\text{H}_2\text{O} + \text{O}_2\uparrow$ where the ordinary text and the text in formula mode are normal scripts, just make sure that "Intelligent Adjust [I]" and "Auto adjust expression layout [A]" are not activated. or when they are activated, make sure that in the Expression Style dialog box the option Italic of the variable is unchecked.

You can select this equation and apply font 16: $2\text{H}_2\text{O}_2 \xrightarrow[\star]{\text{FeCl}_3} 2\text{H}_2\text{O} + \text{O}_2\uparrow$

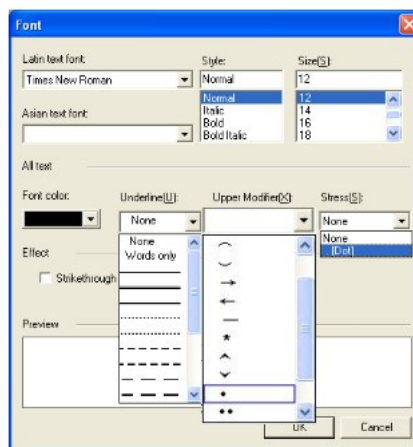
2) Refurbishment

To refurbish a character, a word or a group of words, select it then access the Font dialogue box

The lists of three Underline, Upper, Modifier and Stress boxes that are opens provide these available refurbishment options. Try them!

In mathematics, we use for example an expression such as

$$\tilde{y} = \hat{a} + \hat{b}x \text{ or } \ddot{x}(t) = \frac{d\dot{x}(t)}{dt}$$



3) Particular characteristics of mathematical mode

When mixed - text writing made of simple text and text in formula mode, is carried out on a paragraph line, the passage into the following line in that paragraph is automatic. To start a new paragraph, make sure that you are within the text mode; in other words,

you have to quit the formula mode before typing the "Enter" key. The paragraph marker (¶) proves to be indeed useful since it indicates that a transition to the following paragraph has occurred.

If at the beginning of a paragraph line formula mode writing is carried out, you can only access the following line in that paragraph after you exit the formula mode.

If you therefore write indefinitely on a line, exceeding thus the right margin of the worksheet, simply do recall that it is because you are still in the formula mode. Equally, if a text that you are writing appears in a wrong location, as the denominator of a fraction or under a square root, it simply means that you have not exited the formula template of the fraction or the square root that you have inserted at a given time.

To exit a formula mode, use the right or left arrow key or simply click through the aid of the mouse outside the formula mode at the place where you wish to write a simple text.

4) Note on alignment of the text in the vertical direction

It is common for one to apply in a practical way one of the options of alignment "Text Align" Top Align, Centered, Bottom Align to a paragraph containing a drawing or characters of different font sizes as shown in the following table.

Type of vertical alignment	A series of font sizes (18 to 26) applied to the letter g
Top align	ggggg
Center align	ggggg
Base align	ggggg
Bottom align	ggg

When writing scientific text, we used to deal with characters of different font sizes; that is the case for example of the chemical symbol CH_2 or a mathematical expression such as $a_1x^2 + b_1x + c_1 = 0$ where the size of the subscript or superscript is different from that of the usual writing. Then an inappropriate application of these alignment options to a paragraph could produce non desirable results as shown in the following table.

Alignment option	Chemical symbol	Mathematical equation
Top Align	CH^2	$a^1x^2 + b^1x + c^1 = 0$

Centered	CH ₂	$a_1x^2 + b_1x + c_1 = 0$
Bottom Align	CH ₂	$a_1x^2 + b_1x + c_1 = 0$

When you apply one of these three alignments (Top, Center and Bottom) to a paragraph containing mathematical or chemical formulae, you may avoid a non desired appearance if these are typed in formulae mode or in a text box. The matrix 1×1 could be a suitable template to host these formulae.

Note

When "Base Align" option is applied to a paragraph containing characters of different sizes, there is no particular measure to be taken. If in the paragraph, drawings are inserted in the text, you can align them to the text as you wish through "Up and Down Margin" margin option in the "Set Object Layout Style" of the sub-menu of the contextual menu.

V - Hotkeys

1) Default hotkeys

The typing of a document can be easy and very fast when the insertion of various elements of the document is done only with keys of the keyboard. This is common knowledge to typists. For example, to insert the symbol of the square root (either in the mode "Simple Text" or in the mode "Formula") keep the "Ctrl" key held down and then press "R" (i. e. "Ctrl+ R"). Try it out!

This seems to be quicker than going to search in the menu bar for the square root symbol $\sqrt{\quad}$. We would say simply that the operation "Ctrl+R" is a hotkey (shortcut key) for the insertion of the symbol $\sqrt{\quad}$..

The default hotkeys are the shortcut keys that have been predefined (preset) and which can be executed directly. Most of them can be reset (self-defined) to suit the taste of the user. In the below table are some default hotkeys.

C	Ctrl+Shift+C	$\sum_{\square}^{\square} \square$	Ctrl+Alt+S	∇	Ctrl + Alt + V
N	Ctrl+Shift+N	$\sum_{\square}^{\square} \square$	Ctrl+Shift+S	∃	Shift + Alt + E
Q	Ctrl+Shift+Q	$\overrightarrow{\square}$	Alt+V	⋮	Ctrl + E (Enter equation mode)

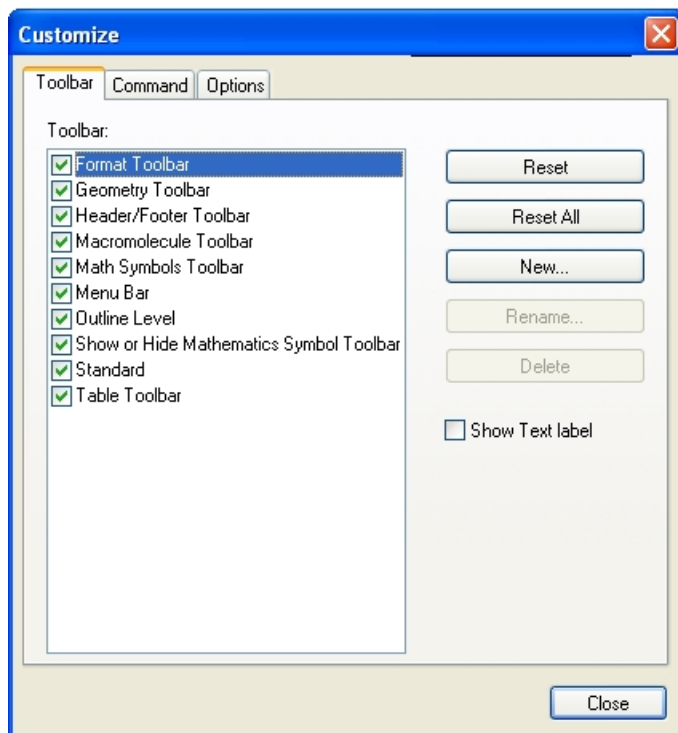
\mathbb{R}	Ctrl+Shift+R	$\int \square$	Ctrl+Alt+I	\in	Ctrl + Alt + E
				\notin	Ctrl + Shift + E
\mathbb{Z}	Ctrl+Shift+Z	$\int \square$	Shift+Alt+I	\wedge	Ctrl + Alt + 6
\emptyset	Ctrl+Shift+O	\div	Ctrl + /	\vee	Shift + Alt + 6
∞	Ctrl+8	\times	Ctrl + Shift + 8	\leq	Alt + ,
$\frac{\square}{\square}$	Ctrl + -	$ \square $	Ctrl + 1	\geq	Alt + .
$\parallel \parallel$	Ctrl + Alt + 1	∂	Ctrl + D	$\hat{\square}$	Ctrl + 6
\square_{\square}	Ctrl + Alt + L	\neq	Ctrl + =	\equiv	Ctrl + Alt + =

2) Setting a new hotkey

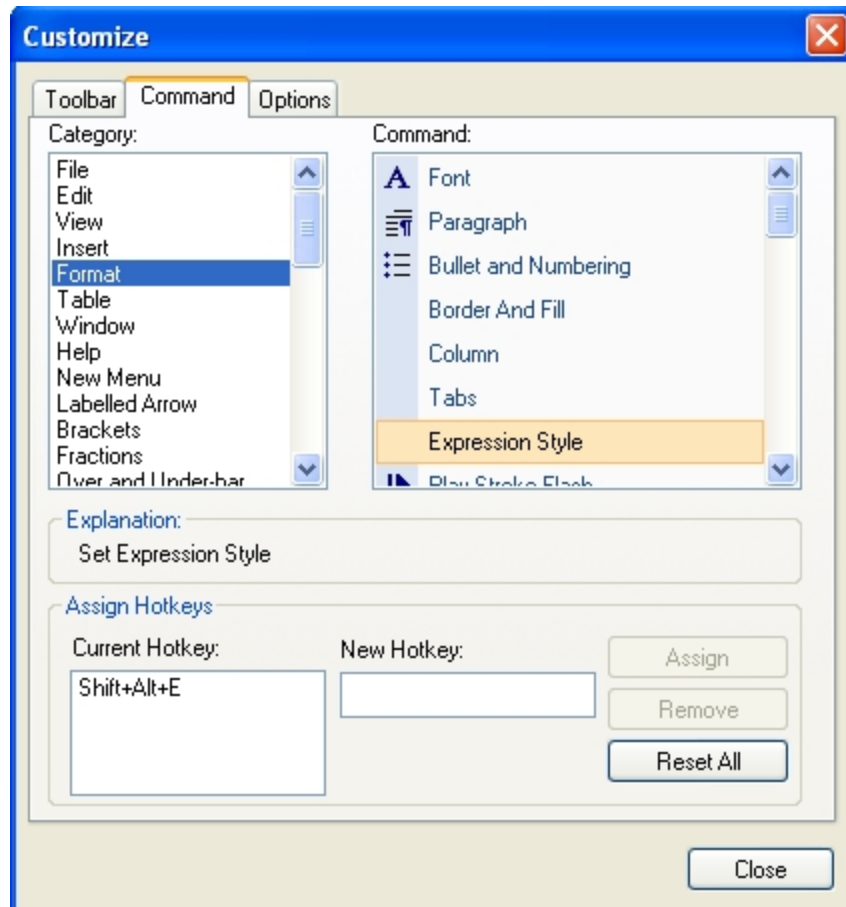
As a practical example, we are going to set a shortcut for Expression style

(i) Click in "View" menu on "Toolbar" and then on "Customize".

The following dialog box appears



(ii) Click on "Command" button of the dialog box, then in the "Category" sub-menu, select "Format". Then the list of the format menus becomes available in command.



- (iii) Select Expression style from the command list and in New Hotkey box.
- (iv) Hold down Shift and Alt keys and type E.
- (v) Click on the "Assign" button that becomes active. Then "Shift+Alt+E" is displayed in the current hotkey box.
- (vii) Click on Close button to end the operation

Now as you have to try the new defined hotkey, hold down Alt and Shift keys and type E;. You will notice that the dialog box of expression style appears.

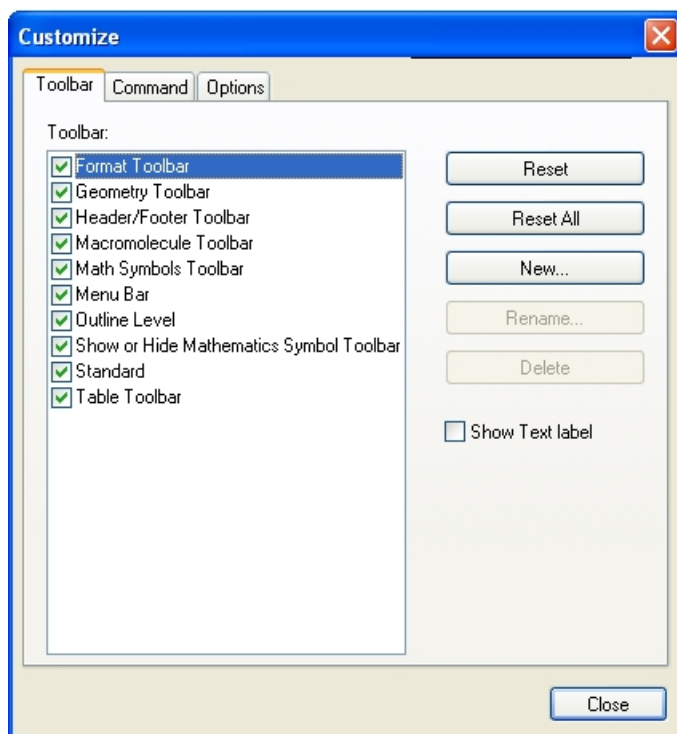
VI - Creating a customized toolbar

For specific needs or convenience, it is possible for you to create the so-called customized toolbars. These are the steps to follow:

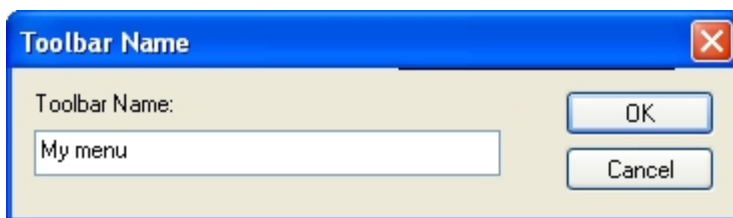
1) Creating a new menu

As previously done, here too, you need to access the customized dialog box. The faster way consists of positioning the pointer on the menu bar, then make a right-click with the

mouse; then click on "Customize" within the contextual menu that appears.



(i) Click on the "New" button of the "**Customize**" dialogue box. The following "**Toolbar Name**" window opens up. Click in the white rectangular box, and type a name: for example "My menu" as shown next:

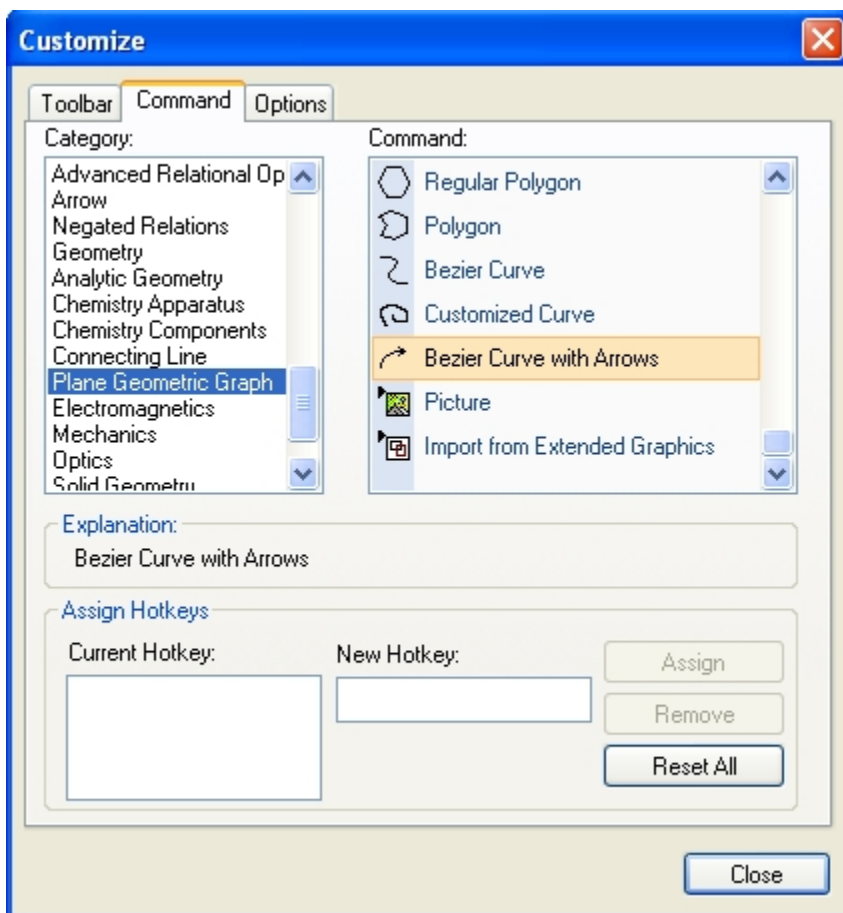


Click on "**OK**" to confirm the name of the toolbar. Then a picture similar to the following



one appears: this is a new toolbar which is still blank (without a menu).

(ii) To fill it, as the Customized dialog box remains opened, just hold down the left button of the mouse and drag menus from toolbars on the screen (for example \in , \notin , \parallel , \subset from Common Relational toolbar, \int and \iint from integral Pane) or from Command list (for example Bezier vector and Import from Extended graphics buttons from the command list of Plane Geometry Graph as shown below).



The new appearance of "My menu" toolbar is as follows

Now close the customized dialog box and verify the functioning of "My menu" toolbar. You just need to click on each element of this menu.

Note

You can bring the following modifications to "My menu" toolbar. To carry out such modifications, open again customized dialog box.

To deactivate "My menu", just uncheck its box ☐ My menu

To activate "My menu", just check its box ☒ My menu

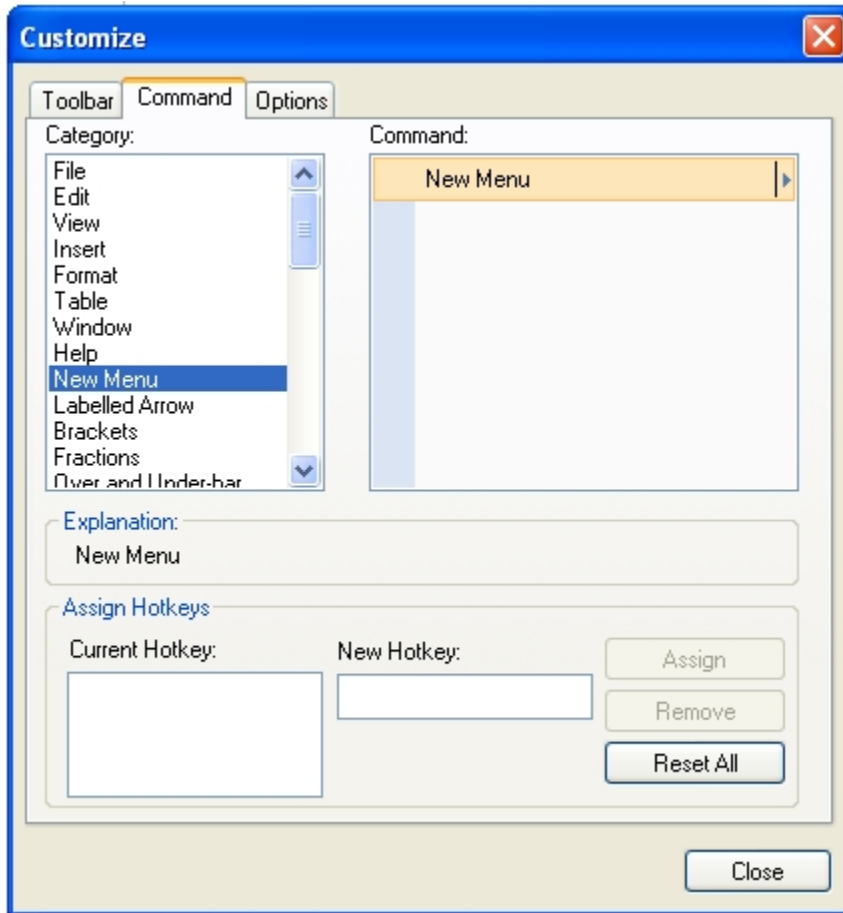
To rename or delete "My menu" as it is activated, just click on "My menu" in customized dialog box. Then the buttons Rename and Delete become active. Click on Rename button to rename "My menu" or on Delete button to delete it.

To remove any element of "My menu", just drag out this element..

2) The command New Menu

You can create sub-toolbars of "My menu" by operating through the Command

New Menu of the Category "**New Menu**" as shown in the dialog box below.



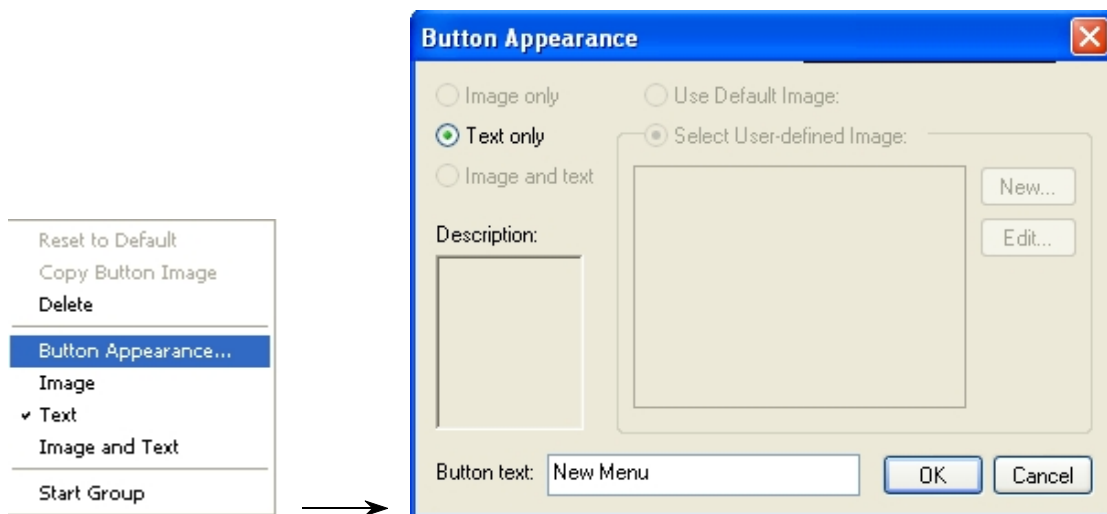
Now click on **New Menu** button and hold down the left button on the mouse to drag a "New menu" to "My menu" and repeat this operation once again. Then "My menu"



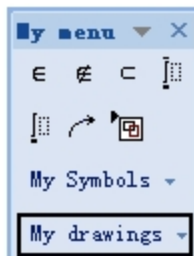
appears as follow

You may want to specify the names of these new menus.

Right click on the first "New menu" and click on "Button appearance" in the contextual menu shown below that opens up

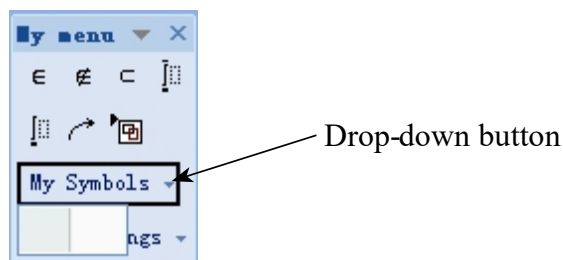


In the button appearance dialog box, change Button text "New Menu" to "My Symbols" and click on "OK" button. Go the same steps to change the name of the second "New menu" to "My drawings".

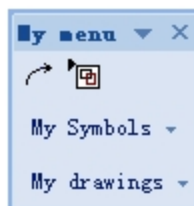


Now "My menu" appears as follow

Drag one by one all the mathematical symbols \in , \notin , \subset , \mathbb{N} and \mathbb{Z} in "My menu" to "My Symbols" at the drop -down button level. Release the dragged symbol into the small

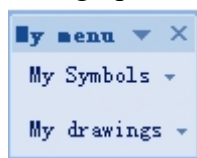


window that opens up



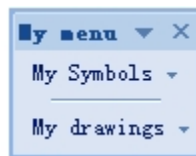
Then "My menu" appears as follow .. Upon clicking on "My Symbols" the list of the mathematical symbols is shown.

Drag the "Bezier vector" and "Import from Extended graphics" buttons to "My drawings".



The new appearance of "My menu" is as follow ..

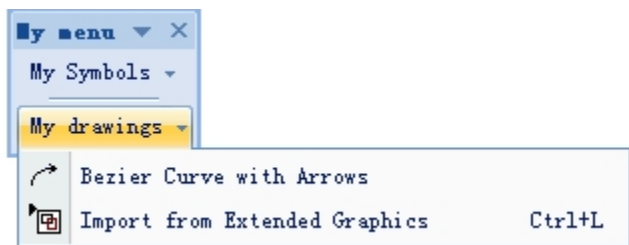
To achieve a more pleasing appearance, you could insert a dash between "My Symbols" and "My drawings". Just right-click on "My drawings" and in the contextual menu that



opens up, click on Start Group and you get the it ..

To end the whole operation, please close Customize dialog box.

Now click on "My drawings" and note that "My drawings" appear as follow.



VII The Fast Input

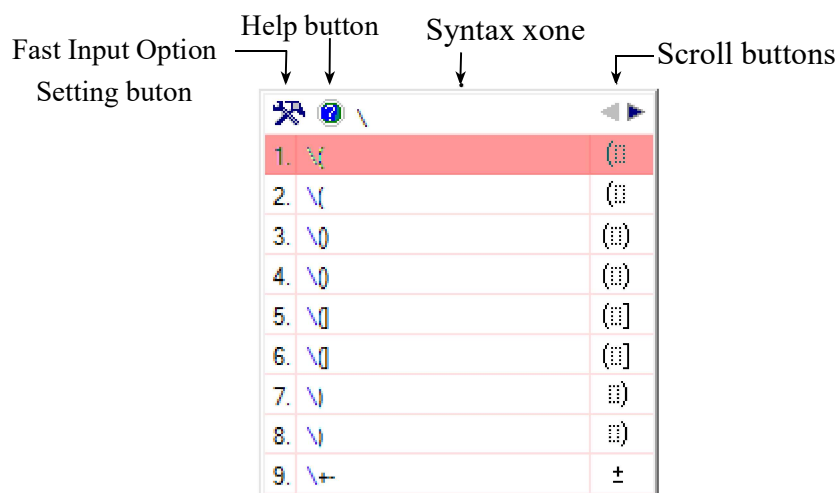
1) Operator guide

The insertion of formulae, symbols and various expressions can be also done in ScienceWord and Class through an operator guide. There are in all six operator guides as shown in the following table:

Operator Guides	Functions
\	Insertion of formulaeor and symbols
`	Insertion of English words
~	Insertion of English words, phonetics and Chinese translation
!	Insertion of International Phonetic Alphabet (IPA)
@	Insertion of Chinese Phonetic Alphabet

When you type any operator guide, a menu pops up and allow you to complete one of the functions described in the table. The current action is cancelled with the space bar or by just left clicking with the mouse anywhere on the working page.

For example, when you type the Backslash "\", you get the following menu that helps to insert formulae templates.



The Fast input options button helps to open Fast input settings.dialog box;

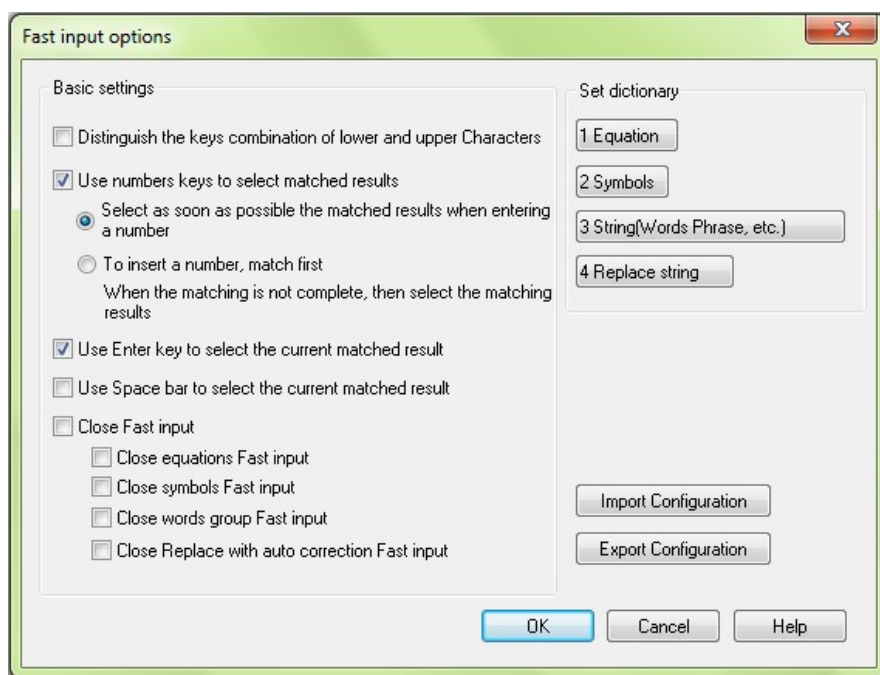
The Help button shows the Fast input hotkeys;

The Syntax zone is the area to write formulae or symbols codes. For example, by typing sqrt, the square root appears selected . To insert any selected item, just type Enter key.

The Scroll buttons (left and right) help to scroll the menu page to page. But you can also use Up arrow key and Down arrow key to select menu items or right arrow key (or PgDn) to forward menu page and left arrow key (or PgUp) to backward menu page.

2) Fast input general settings

Click in Format menu on Fast input options to get the following dialog box.



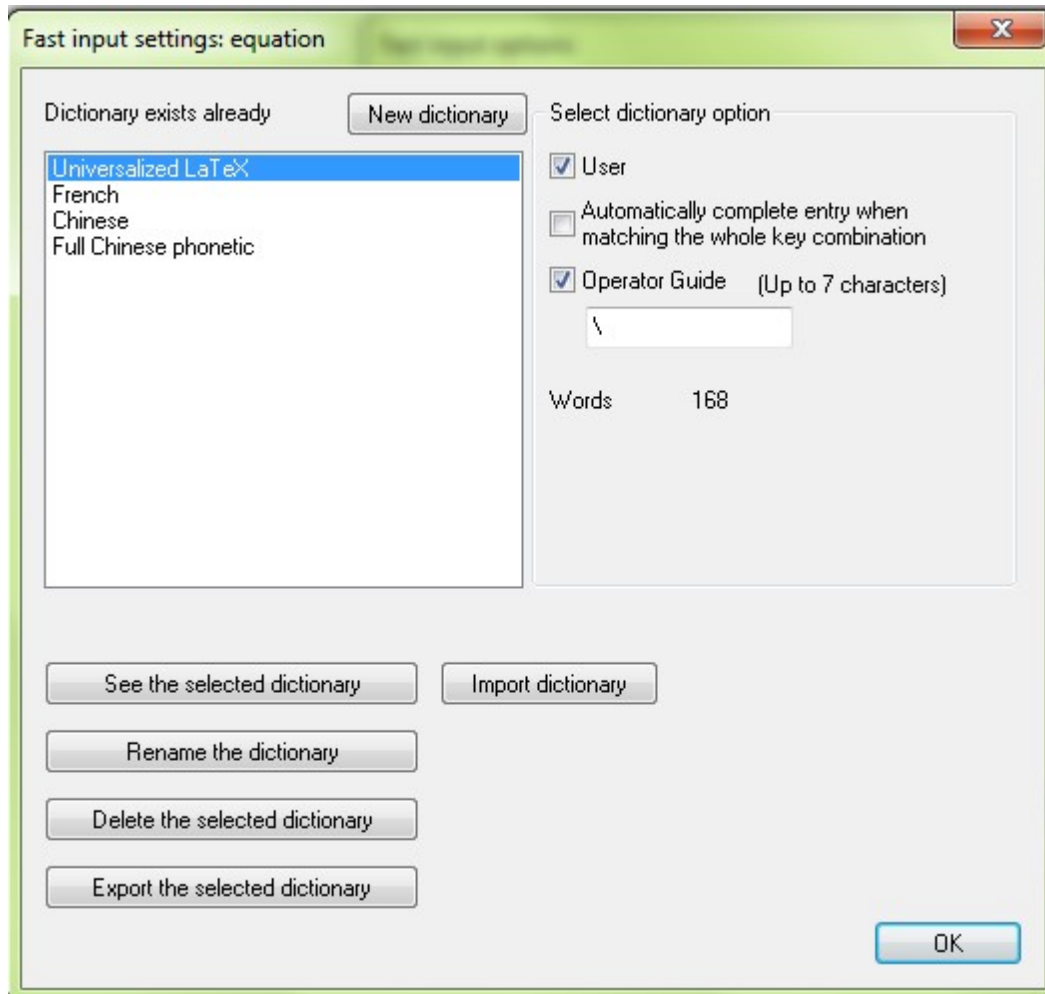
This dialog box shows mainly:

The basic settings Actions to be taken when typing with Fast input options;

The dictionary types available are: **Equations**, **Symbols**, **Strings** and **Replace string**.

a) Equations dictionaries

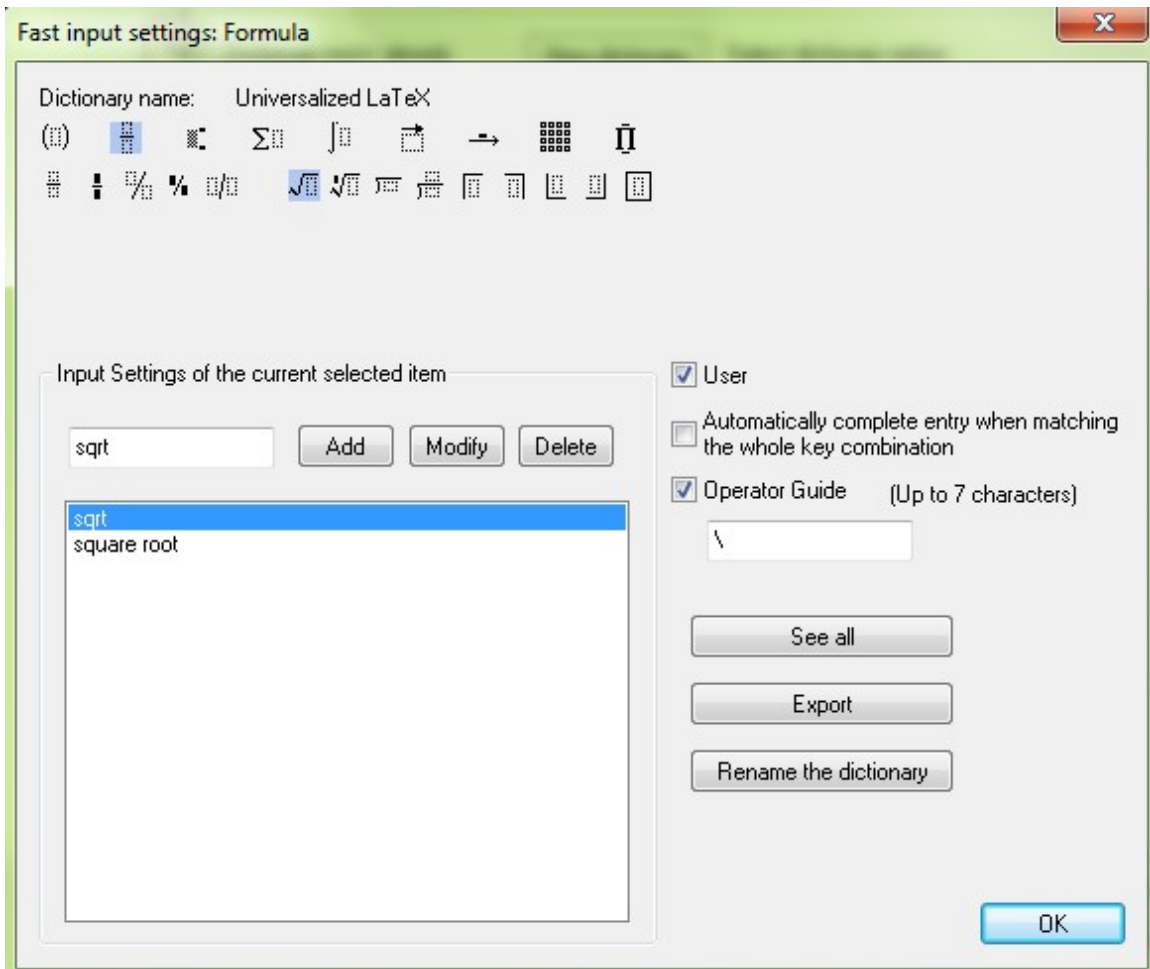
Click on Equations button; then the following dialog box opens up



The dialogue box shows five kinds of settings dictionary **LaTeX style**, **French**, **Chinese**, **Full Chinese phonetic**.

To deactivate a dictionary, just uncheck User option.

To see any kind of settings dictionary, just select it and click on "See the selected dictionary" button. The following dialog box shows the LaTeX style settings. You can add your own setting!



As shown in the image, the universalized **LaTeX dictionary of formula**, the syntaxes `\sqrt` and `\square root` help to insert $\sqrt{\quad}$ from equation formula template. You can click on "See all" to access all the equations settings of the dictionary.

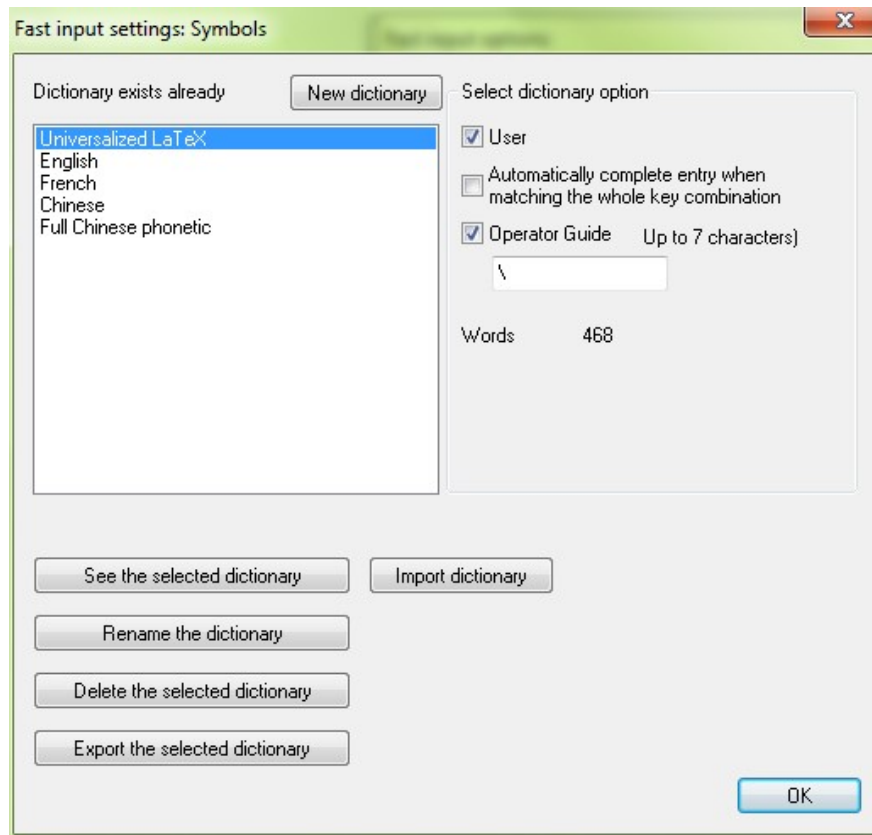
Note

The user can check from **LaTeX dictionary of Symbols** and note that the syntaxes `\Longleftarrow`, `\if and only if` and `\iff` help to insert the symbol \Leftrightarrow .

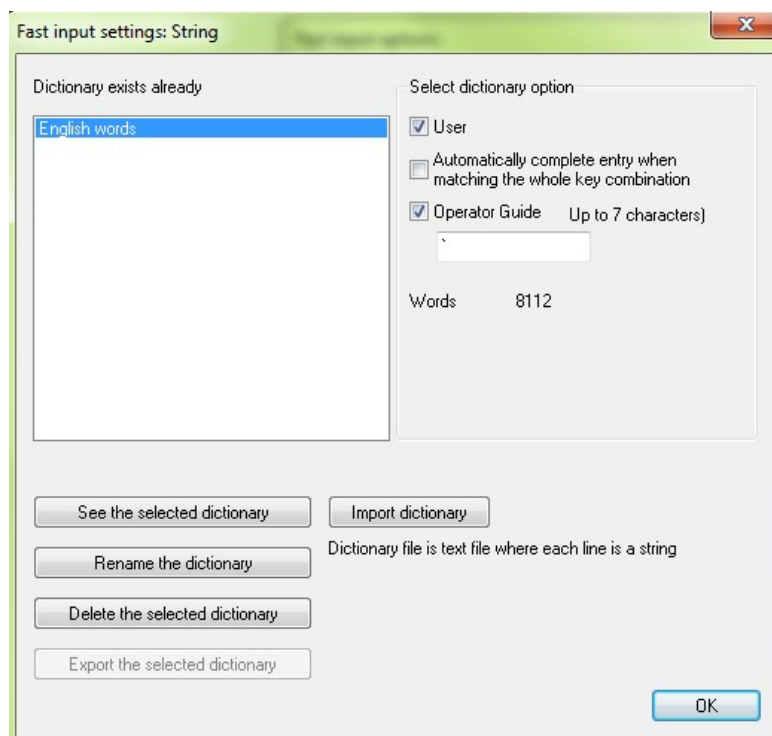
The **French dictionary of symbols** settings allows the user to insert the same symbol \Leftrightarrow using anyone of the following three syntaxes: `\Flèche longue double gauche droite`, `\si et seulement si` or `\ssi`

b) Symbols dictionaries

To access the symbols dictionaries, click from the main setting dialog box of Fast Input Option on **Symbols** button. Then the following dialog box opens up.



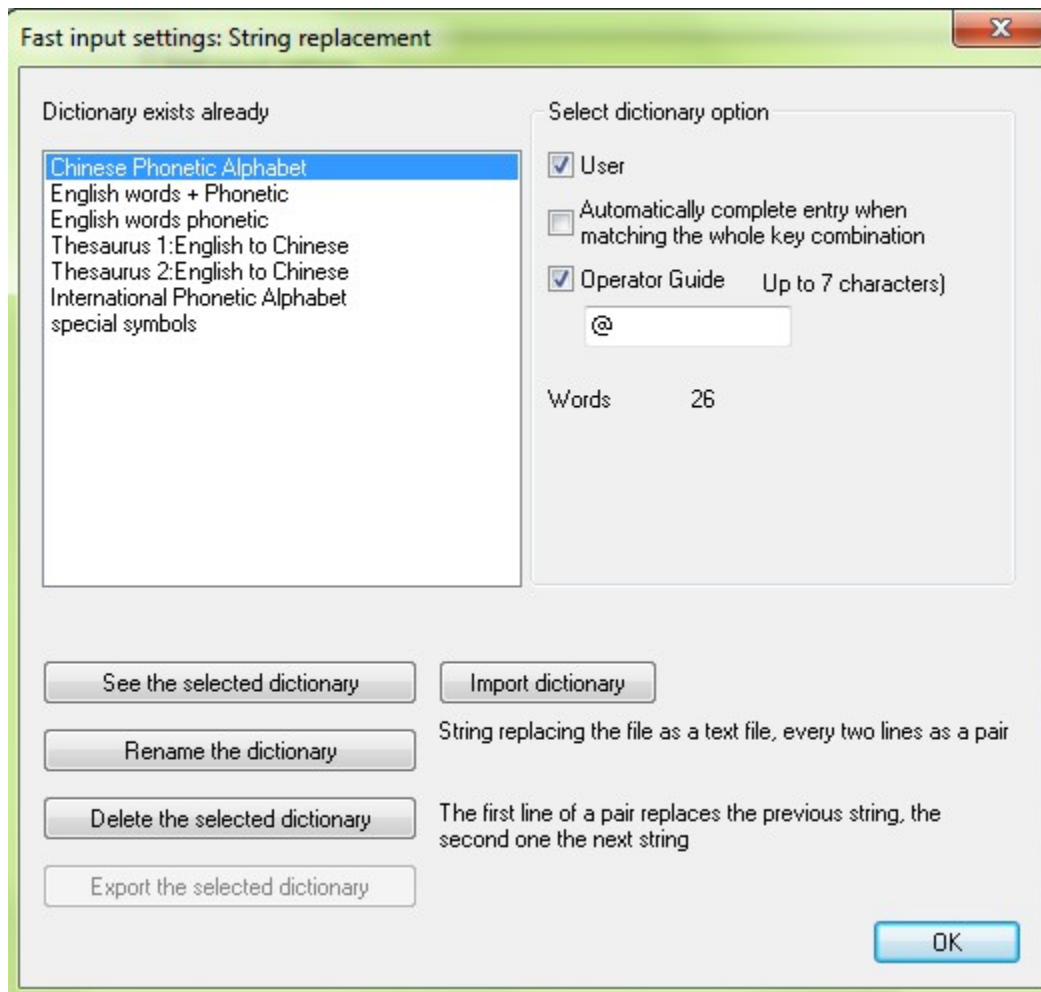
c) Strings dictionary



To access the strings dictionaries, click from the main setting dialog box of Fast Input Option on **Strings** button. Then the dialog box above opens up.

d) Replace strings dictionary

To access the strings dictionaries, click from the main setting dialog box of Fast Input Option on **Replace String** button. Then the following dialog box opens up.



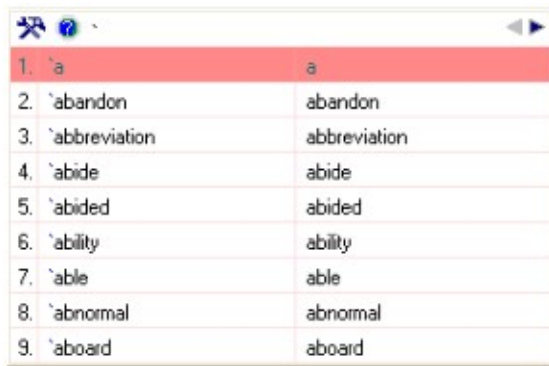
This dialog box shows six kinds of dictionaries: **Chinese Phonetic Alphabet, English words+Phoetic, English words phonetic, Thesaurus1 English to Chinese, Thesaurus2 English to Chinese, International Phonetic Alphabet, special symbols.**

To see any kind of settings dictionary, just select it and click on "See the selected dictionary" button. The following dialog box shows "English words+Phoetic" dictionary. You can add a new string and its corresponding replacement, that is the corresponding expression to be displayed on the screen!

3) Other dictionaries

You can make use of other dictionaries to insert English words and phonetic, International Phonetic Alphabet, etc. To do so take anyone of the following actions

- ✓ Type the operator guide ` (grave accent) . As the menu in Fig1 becomes available, then complete an insertion of English word
- ✓ Type the operator guide ~ (tidle) . As the menu in Fig2 becomes available, then complete an insertion of English word phonetic or its translation into Chinese.
- ✓ Type the operator guide ! (Exclamation) . As the menu in Fig3 becomes available, then complete an insertion of International Phonetic Alphabet.
- ✓ Type the operator guide @. As the menu in Fig4 becomes available, then complete an insertion of Chinese Phonetic Alphabet.



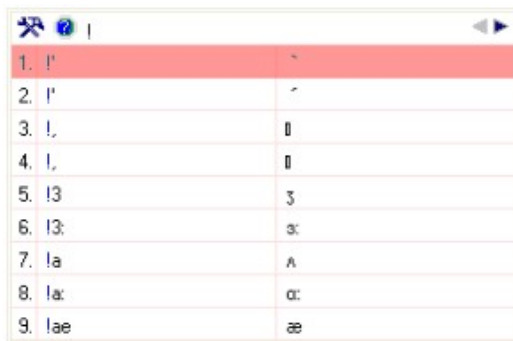
1. `a	a
2. `abandon	abandon
3. `abbreviation	abbreviation
4. `abide	abide
5. `abided	abided
6. `ability	ability
7. `able	able
8. `abnormal	abnormal
9. `aboard	aboard

Fig 1



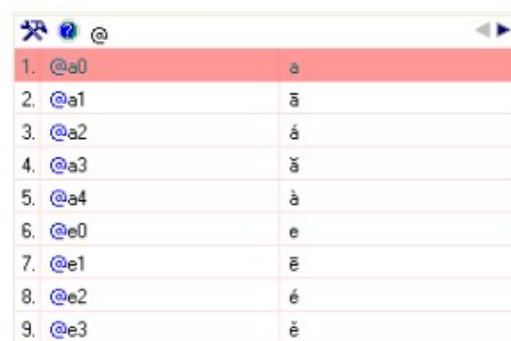
1. ~a	a num. 一, 一个 [ei]
2. ~a	num. 一, 一个 [ei]
3. ~a	[ei]
4. ~a	a [ei]
5. ~abandon	abandon vt. 丢弃, ...
6. ~abandon	vt. 丢弃, 放弃, 抛弃 [ə...
7. ~abandon	[əˈbændən]
8. ~abandon	abandon [əˈbændən]
9. ~abbreviation	abbreviation n...

Fig 2



1. !	~
2. !	~
3. !	~
4. !	~
5. !3	3
6. !3:	3:
7. !a	A
8. !a:	α:
9. !ae	æ

Fig 3



1. @a0	a
2. @a1	ā
3. @a2	á
4. @a3	ǎ
5. @a4	à
6. @e0	e
7. @e1	ē
8. @e2	é
9. @e3	ě


Fig 4


Note that there are three columns in any menu available. The first column shows the number to be keyed to display the item of the third column. The middle one shows the code to be written to get the item of the third column.


VIII - Typing scientific text major principles


1) Scientific expression and text body

ScienceWord and Page Player make available the use of all character fonts installed on your operating system. You may then choose Times New Roman, Arial or any other font type for the body of your document, but all symbols of Mathematic symbols toolbar would appear in NS Math font as default.

To make the appearance of your document pleasant, you may just before typing any mathematical expression activate **Intelligent Adjust**  and deactivate it after typing the expression. The last character written in ordinary text mode in that expression could appear in different font style or font type of your main body.

For example activate **Intelligent Adjust**  and write the following mathematical

expression: $f_{\alpha}(x) = x - \sin(x) - \frac{\sqrt{3}}{4}\alpha^2$. Then deactivate **Intelligent Adjust** .

The current font type is now NS Math brought by α , the last character typed in ordinary text mode. As you are on the point to pursue the typing of the document body with different font type, you have to set back the text body font type through setting font box or the use of "format painter"  tool. This is the common sense..

But, you could get easily the same result if you would have left ahead a small space when typing the text body. Then you would just need to use right arrow key to move to the text body font ahead!


2) Orderly mathematical expressions

a) Example 1

Write the following equations:

$$\begin{aligned} f(x) &= (x-1)(x^n + x^{n-1} + \cdots + x + 1) \\ &= x^{n+1} - 1 \end{aligned}$$


First method: Usual method

Click on  button in the "Format" toolbar to activate the "Intelligent Adjust style" tool, then type: $f(x) = (x-1)(x^n + x^{n-1} + \cdots + x + 1)$. Hit the "Enter" key to change paragraph, then type: $x^{n+1} - 1$.

You get the following result:


$$f(x) = (x-1)(x^n + x^{n-1} + \cdots + x + 1)$$

$$= x^{n+1} - 1.$$

Align the equality symbol "=" of the second line with that of the first line through the aid of the "First Line" indentation button ; you obtain the following result:

$$f(x) = (x-1)(x^n + x^{n-1} + \dots + x + 1)$$


$$= x^{n+1} - 1.$$

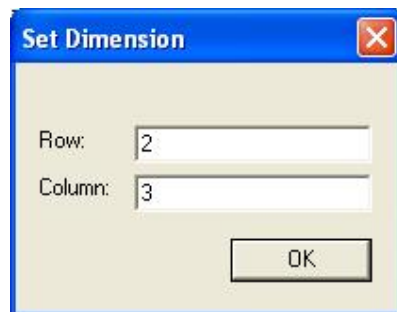
After writing the mathematical expression, click once again on the button  to deactivate the "Intelligent Adjust" tool.

That method is the one commonly used for such equalities alignment.


Second method: Particular method

A very simple method consists in the use of 2×3 matrix (with two rows and three columns).

In "Matrix Pane" menu, click on  "Matrix of Unspecified Dimension" button. Then in the dialogue box that opens, write 2 in the "Row" field and 3 in "Column" field.



Then click on OK button.

You will then obtain matrix 2×3 .

Simply write $f(x)$ at level of the first row and the first column, $(x-1)(x^n + x^{n-1} + \dots + x + 1)$ expression at the level of the first row and the third column, "=" in the two rows of the second column, $x^{n+1} - 1$ expression at the level of the second row and the third column,:

$$f(x) = (x-1)(x^n + x^{n-1} + \dots + x + 1)$$

$$= x^{n+1} - 1$$

You can use the Spacing Bar to relocate this expression block or the paragraph options.

b) Example 2


Write the following mathematical expressions

$$(X_1, X_2) \leq_{lr} (Y_1, Y_2) \Leftrightarrow \begin{cases} \mu_1 \leq \theta_1 & (a) \\ \frac{\sigma_2}{\rho\sigma_1}(\mu_1 - \theta_1) \leq (\mu_2 - \theta_2) \leq \frac{\rho\sigma_2}{\sigma_1}(\mu_1 - \theta_1) & (b) \\ \rho = \beta > 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (c) \end{cases}$$

or

$$\begin{cases} \mu_1 \leq \theta_1, \mu_2 \leq \theta_2 & (d) \\ \rho = \beta = 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (e) \end{cases}$$

We can use an arrangement similar to the one in a) as follow:

Write first the " $(X_1, X_2) \leq_{lr} (Y_1, Y_2) \Leftrightarrow$ "- relation, then a left brace $\left\{ \right.$, then a three rows and two columns matrix, then proceed with the filling of that matrix as in the particular method of a) . Then get out of the brace template and type "Enter" key to change paragraph. Thereafter, write "or". Type again "Enter" key to change paragraph, insert a new left brace $\left\{ \right.$ and insert a two rows and two columns matrix. Thereafter, fill that matrix as done previously . Finally adjust the last left brace on the first one through the aid of the First line Indentation button  at the level of the horizontal ruler as in the usual method of a) .

You obtain the following result:

$$(X_1, X_2) \leq_{lr} (Y_1, Y_2) \Leftrightarrow \begin{cases} \mu_1 \leq \theta_1 & (a) \\ \frac{\sigma_2}{\rho\sigma_1}(\mu_1 - \theta_1) \leq (\mu_2 - \theta_2) \leq \frac{\rho\sigma_2}{\sigma_1}(\mu_1 - \theta_1) & (b) \\ \rho = \beta > 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (c) \end{cases}$$

or

$$\begin{cases} \mu_1 \leq \theta_1, \mu_2 \leq \theta_2 & (d) \\ \rho = \beta = 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (e) \end{cases}$$

Position the cursor at the end of each of these expressions " $\mu_1 \leq \theta_1$ ", " $\rho = \beta > 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2$ ", " $\mu_1 \leq \theta_1, \mu_2 \leq \theta_2$ " then press on the space bar to obtain the following result:

$$(X_1, X_2) \leq_{lr} (Y_1, Y_2) \Leftrightarrow \begin{cases} \mu_1 \leq \theta_1 & (a) \\ \frac{\sigma_2}{\rho\sigma_1}(\mu_1 - \theta_1) \leq (\mu_2 - \theta_2) \leq \frac{\rho\sigma_2}{\sigma_1}(\mu_1 - \theta_1) & (b) \\ \rho = \beta > 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (c) \end{cases}$$

or

$$\begin{cases} \mu_1 \leq \theta_1, \mu_2 \leq \theta_2 & (d) \\ \rho = \beta = 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (e) \end{cases}$$

You can also position the cursor at the beginning of each of these expressions " $\mu_1 \leq \theta_1$ ", " $\rho = \beta > 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2$ ", " $\mu_1 \leq \theta_1, \mu_2 \leq \theta_2$ ", (a), (b), (c), (d) and (e), then press the space bar to obtain the following result :

$$(X_1, X_2) \leq_{lr} (Y_1, Y_2) \Leftrightarrow \begin{cases} \mu_1 \leq \theta_1 & (a) \\ \frac{\sigma_2}{\rho\sigma_1}(\mu_1 - \theta_1) \leq (\mu_2 - \theta_2) \leq \frac{\rho\sigma_2}{\sigma_1}(\mu_1 - \theta_1) & (b) \\ \rho = \beta > 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (c) \end{cases}$$

or


$$\begin{cases} \mu_1 \leq \theta_1, \mu_2 \leq \theta_2 & (d) \\ \rho = \beta = 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (e) \end{cases}$$

Remark: The technique of fully alignment described next in **c) Example3** can be used to get the same results and even faster.

c) Example3 " Fully Align"


Write the web site address of Novoasoft company as follows:

www.novoasoft.com/English

Then click on "  Fully Align" button in the Format Toolbar. You obtain the following result:


w w w . n o v o a s o f t . c o m / E n g l i s h

All the characters on that line (this paragraph) are spread uniformly on that line (the same distance is between any two consecutive characters) .


Now, insert from "  Bracket " menu the absolute value $|$ symbol. Exit the template then insert afresh the absolute value to obtain two absolute value templates: $|$ $||$ $|$

Copy from the web site address the following: "www.novoasoft.com/ ", then paste it in the first absolute value; copy also from the address the following: "English", then paste it in the second absolute value. You obtain the following:

$|$ www.novoasoft.com/ $||$ English $|$

Exit the absolute value with the right arrow key (the cursor blinks in simple text mode) , then click on "  Fully Align" button in the Format Toolbar. You obtain in fact the spacing of the two symbols of the absolute value as follow:

$|$ www.novoasoft.com/ $|$ $|$ English $|$

But if a space is created with the space bar before the insertion of the absolute values on the line, as in the example spacing $|$ www.novoasoft.com/ $||$ English $|$, by clicking on "  Fully Align" button (while the cursor blinks in simple text mode) , you obtain the following result:

$|$ www.novoasoft.com/ $|$ $|$ English $|$

The alignment takes into account all spaces created on the line.

Now we are going to apply this kind of alignment of mathematical templates to the two systems in example 2.


Insert therefore a matrix 1×1 (or click on expressions mode from Bracket template or use the shortcut key Ctrl+E) then exit the formula template and insert afresh a second one as shown below:

$\left[\begin{array}{c} \\ \end{array} \right]$.

Position the cursor right at the beginning of the first relation, hold down "Shift" key then operate the selection by pressing the right arrow key (see the following illustration) :

$$(X_1, X_2) \leq_{lr} (Y_1, Y_2) \Leftrightarrow \begin{cases} \mu_1 \leq \theta_1 & (a) \\ \frac{\sigma_2}{\rho\sigma_1}(\mu_1 - \theta) \leq (\mu_2 - \theta_2) \leq \frac{\rho\sigma_2}{\sigma_1}(\mu_1 - \theta_1) & (b) \\ \rho = \beta > 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (c) \end{cases}$$

Copy it and paste it in the first matrix.

Position the cursor in the second matrix and write (1). Exit the matrix through the aid of the right arrow key (the cursor blinks in text mode) , then click on "  Fully Align" button. You obtain the following result:

$$(X_1, X_2) \leq_{lr} (Y_1, Y_2) \Leftrightarrow \left\{ \begin{array}{ll} \mu_1 \leq \theta_1 & (a) \\ \frac{\sigma_2}{\rho\sigma_1}(\mu_1 - \theta_1) \leq (\mu_2 - \theta_2) \leq \frac{\rho\sigma_2}{\sigma_1}(\mu_1 - \theta_1) & (b) \\ \rho = \beta > 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (c) \end{array} \right. \quad (1)$$

Write "or".


Insert afresh the two juxtaposed matrices 1×1 (or expression mode)



Position then the cursor right at the beginning of the second relation, hold down the "Shift" key then carry out the selection by pressing on the right arrow key (see the illustration below) :

$$\left\{ \begin{array}{ll} \mu_1 \leq \theta_1, \mu_2 \leq \theta_2 & (d) \\ \rho = \beta = 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (e) \end{array} \right.$$

Copy it and paste it in the first matrix.

Position the cursor in the second matrix and write (2). Exit the matrix through the aid of the right arrow key (the cursor blinks in text mode) , then click on "  Fully Align" button. You obtain the following:

$$\left\{ \begin{array}{ll} \mu_1 \leq \theta_1, \mu_2 \leq \theta_2 & (d) \\ \rho = \beta = 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (e) \end{array} \right. \quad (2)$$

Finally, adjust the left brace on that of the first relation through the aid First Line Indentation button of the paragraph at the level of the horizontal ruler, so as to obtain the following:

$$\left\{ \begin{array}{ll} \mu_1 \leq \theta_1, \mu_2 \leq \theta_2 & (d) \\ \rho = \beta = 0, \sigma_1 = \alpha_1, \sigma_2 = \alpha_2 & (e) \end{array} \right. \quad (2)$$

Note

In the examples treated here, the first line indentation option of paragraph at the level of the horizontal ruler, has made it possible to align two relations. Note that this option makes it possible to adjust to the left any number of relations or mathematic expressions. Other alignment options of paragraph such as "Hanging Indentation" and "Right Indentation" make it possible to obtain other type of adjustment (respectively at the left and at the right) following the vertical direction.

d) Use of the tabulation

You can set Tab Stop to get the following alignment.

$$(A)' = A \quad 4.1$$

$$(A + B)' = A' + B' \quad 4.2$$

$$(AB)' = B' A' \quad 4.3$$

or

$$(A)' = A \quad 4.1$$

$$(A + B)' = A' + B' \quad 4.2$$

$$(AB)' = B' A' \quad 4.3$$

e) Other types of alignment

(i) Multiple alignment

In this example, the "First line" indentation of the paragraph plays the role of tabulation "Tabs" and "Hanging" indentation. The technique used here underlines the efficiency of the use of "First line" indentation of paragraph in the numbering of the mathematical expressions on any line of the worksheet.

● Write the following mathematical result where all lines are paragraphs; in other words, the movement to successive lines are made in simple text mode when typing on "Enter" key. Use respectively "[]" Left bracket, "[]" Right bracket" and "[]" Square bracket" in the "[]" Bracket Pane" menu.

$$\begin{aligned} E(\varepsilon_{it} \varepsilon_{jt} \varepsilon_{lt} \varepsilon_{mt}) &= E[(p_{i1} v_{1t} + p_{i2} v_{2t} + \dots + p_{in} v_{nt})(p_{j1} v_{1t} + p_{j2} v_{2t} + \dots + p_{jn} v_{nt}) \\ &\times (r)(p_{m1} v_{1t} + p_{m2} v_{2t} + \dots + p_{mn} v_{nt})] \\ &= [(p_{i1} p_{j1} + p_{i2} p_{j2} + \dots + p_{in} p_{jn})(p_{l1} p_{m1} + p_{l2} p_{m2} + \dots + p_{ln} p_{mn})] \\ &+ [(p_{i1} p_{l1} + p_{i2} p_{l2} + \dots + p_{in} p_{ln})(p_{j1} p_{m1} + p_{j2} p_{m2} + \dots + p_{jn} p_{mn})] \end{aligned}$$

$$+ \left[(p_{i1}p_{m1} + p_{i2}p_{m2} + \dots + p_{in}p_{mn}) (p_{j1}p_{l1} + p_{j2}p_{l2} + \dots + p_{jn}p_{ln}) \right]$$

$$= \sigma_{ij}\sigma_{lm} + \sigma_{il}\sigma_{jm} + \sigma_{im}\sigma_{jl}.$$

- You can select the second, the third and the fourth lines as shown below and use the

first line Indentation button to get quickly the following

$$E(\varepsilon_{it}\varepsilon_{jt}\varepsilon_{lt}\varepsilon_{mt}) = E \left[(p_{i1}v_{1t} + p_{i2}v_{2t} + \dots + p_{in}v_{nt}) (p_{j1}v_{1t} + p_{j2}v_{2t} + \dots + p_{jn}v_{nt}) \right.$$

$$\times (r) (p_{m1}v_{1t} + p_{m2}v_{2t} + \dots + p_{mn}v_{nt})$$

$$+ \left[(p_{i1}p_{l1} + p_{i2}p_{l2} + \dots + p_{in}p_{ln}) (p_{j1}p_{m1} + p_{j2}p_{m2} + \dots + p_{jn}p_{mn}) \right]$$

$$+ \left[(p_{i1}p_{m1} + p_{i2}p_{m2} + \dots + p_{in}p_{mn}) (p_{j1}p_{l1} + p_{j2}p_{l2} + \dots + p_{jn}p_{ln}) \right]$$

$$= \sigma_{ij}\sigma_{lm} + \sigma_{il}\sigma_{jm} + \sigma_{im}\sigma_{jl}.$$

- Select the last line and use the first line Indentation button to align the equality symbols. Then define the right Tab Stop to number it as shown below..

$$E(\varepsilon_{it}\varepsilon_{jt}\varepsilon_{lt}\varepsilon_{mt}) = E \left[(p_{i1}v_{1t} + p_{i2}v_{2t} + \dots + p_{in}v_{nt}) (p_{j1}v_{1t} + p_{j2}v_{2t} + \dots + p_{jn}v_{nt}) \right.$$

$$\times (r) (p_{m1}v_{1t} + p_{m2}v_{2t} + \dots + p_{mn}v_{nt})$$

$$+ \left[(p_{i1}p_{l1} + p_{i2}p_{l2} + \dots + p_{in}p_{ln}) (p_{j1}p_{m1} + p_{j2}p_{m2} + \dots + p_{jn}p_{mn}) \right]$$

$$+ \left[(p_{i1}p_{m1} + p_{i2}p_{m2} + \dots + p_{in}p_{mn}) (p_{j1}p_{l1} + p_{j2}p_{l2} + \dots + p_{jn}p_{ln}) \right]$$

$$= \sigma_{ij}\sigma_{lm} + \sigma_{il}\sigma_{jm} + \sigma_{im}\sigma_{jl} \quad (22)$$

(ii) Practical application to the uniform distribution on a line

We apply this option to obtain the uniform distribution of three let braces containing

mathematical expressions. To write for example $\begin{vmatrix} a & b \\ c & d \end{vmatrix}$ determinant, insert first the

symbol of the absolute value, then two lines and two rows matrix. Finally insert letters a ,

b, c , and d .

Train yourself at reproducing the following where "Fully Align" option is just applied to three left braces that contain each two equations and one index $S_i, i \in \{1,2,3\}$

Note that the same distance separate two consecutive systems.

$$\left\{ \begin{array}{l} \left| \begin{array}{cc} x & y^3 \\ x & x^2 \end{array} \right| = 7x + y \\ \left| \begin{array}{cc} 0 & y \\ 2 & 3 \end{array} \right| = 30 \end{array} \right. (S_1) \quad \left\{ \begin{array}{l} \left| \begin{array}{ccc} x & 2 & -3 \\ y & 5 & x^2 \\ -2 & x & y \end{array} \right| = 9 \\ 2x^2 + \sqrt{3}y - 1 = 0 \end{array} \right. (S_2) \quad \left\{ \begin{array}{l} 6xy + y^2 = 6 \\ \left| \begin{array}{ccc} x-1 & y+1 & 5 \\ 0 & x & 4 \\ y & 2 & 1 \end{array} \right| = 0 \end{array} \right. (S_3)$$

IX - Particular formatting and the use of auxiliary tools

1) The use of paragraph options in formula template

When writing a mathematical expression, you may need to insert several times a formula template. For example when writing the expression $\frac{\sqrt{x}}{\sqrt{2}-1}$, the fraction template is used one time and the square root template two times. If you are moving the cursor from left to right to cross this expression, then the cursor will go template to template and through different level of layers.

All the paragraph options (alignment, indentation, spacing) are applicable at each level of a layer in formula mode!

As practical applications, let show how paragraph options work with the calculation in number bases.



Example

Click on "[] Expression mode" from Bracket Template menu (or simply press Ctrl key and type E, its shortcut). Then,

- Type in the dotted rectangle [] that appears the number in base five numeration system 343_5 .
- Move out from the subscript where 5 is written and key Enter key to create a new paragraph in the Expression mode template and write $+123_5$.
- Move out from the subscript where 5 is written and key again Enter key to create a new paragraph in the Expression mode template and write 1021_5 .

Then you will get the result as shown in ①.

$$\begin{array}{r}
 343_5 \\
 +123_5 \\
 \hline
 1021_5
 \end{array}
 \quad
 \begin{array}{r}
 343_5 \\
 +123_5 \\
 \hline
 1021_5
 \end{array}
 \quad
 \begin{array}{r}
 343_5 \\
 +123_5 \\
 \hline
 1021_5
 \end{array}
 \quad
 \begin{array}{r}
 343_5 \\
 +123_5 \\
 \hline
 1021_5
 \end{array}
 \quad
 \begin{array}{r}
 343_5 \\
 +123_5 \\
 \hline
 1021_5
 \end{array}$$

Place the cursor just before the first number written in the Expression mode template and press the down arrow key to select the three paragraphs as shown in ② and click on the right alignment tool , to get ③. Then click between + and 1 in the second row and use Space Bar to adjust the gap and get a result as shown in ④. Then select the second row and click in in underbar and Overbar template on Underbar . Do the same with the third row to get ⑤.

Note: You can also use the Arithmetic tool to complete easily the above or more complicated calculations (see ScienceWord and Class Arithmetic Calculation).

2) The use of drawing and super label

ScienceWord makes it possible to write formulae with all kinds of formatting in drawing label. Besides any drawing inserted into text can be copied and paste in formula template with its original layout settings. The applications of such a flexibility are many.

In the following example we are completing a matrix with several blocs and lines between them. The steps are as follows:

- Draw a rectangle
- Select the left top vertex and click from drawing toolbar on super label
- Type once the space bar to create a little space and insert the parenthesis from bracket menu and then a 8 rows-6 columns matrix. Fill it (for exemple as shown)
- Select the right top vertex or right bottom vertex and use arrow keys to shift them in order to have a good adjustment.
- Join perpendicularly the sides as shown in Fig1.
- Select the rectangle and the points created on the rectangle sides during the creation of crossing lines. Then click on line style in drawing toolbar. Select Invisible line

3	4	12	$\frac{y}{x - \sqrt{2}}$	56	12
$x - 3y$	$\sqrt{3}$	65	76	76	87
2	$\frac{1}{x}$	34	5	5	$7 - y$
12x	54y	56	8	345	54
x	$54 - y - x$	45	54	76	54
54	12	0	0	0	1
3	7x	0	0	67	3
43	43	$\frac{1}{y - x}$	4	y	x

Fig1

option. You may change the color of the crossing lines and finally insert the object into text as shown in Fig2.

Fig 2

3	4	12	$\frac{y}{x-\sqrt{2}}$	56	12
$x-3y$	$\sqrt{3}$	65	76	76	87
2	$\frac{1}{x}$	34	5	5	$7-y$
12x	54y	56	8	345	54
x	$54-y-x$	45	54	76	54
54	12	0	0	0	1
3	7x	0	0	67	3
43	43	$\frac{1}{y-x}$	4	y	x

Before the insertion into text you may add a customized (smooth) curve and combine as shown below in fig3.

Fig 3

3	4	12	$\frac{y}{x-\sqrt{2}}$	56	12
$x-3y$	$\sqrt{3}$	65	76	76	87
2	$\frac{1}{x}$	34	5	5	$7-y$
12x	54y	56	8	345	54
x	$54-y-x$	45	54	76	54
54	12	0	0	0	1
3	7x	0	0	67	3
43	43	$\frac{1}{y-x}$	4	y	x


Note: Any drawing inserted into text in ScienceWord can be copied as text or as drawing and pasted in Class.

3) Other technique using indentation and Expression mode: Copy and Paste

Example

Let complete the process of the following polynomials division: $2x - 1 \overline{) 2x^3 + x^2 - 3}$

The method is described as follows:

1. Make sure that you are at the beginning of a new paragraph and type at the divisor $2x - 1$. Click in fraction menu on  "Long Division with Quotient" tool and type the

$$x^2 + x + \frac{1}{2}$$


quotient and dividend $\overline{) 2x^3 + x^2 + 0x - 3}$ and move the cursor out from the formula mode

$$x^2 + x + \frac{1}{2}$$

(long division template) , The result should be: $2x - 1 \overline{) 2x^3 + x^2 + 0x - 3}..$

2. Key the Enter key to write every partial calculation. You would get the following where the paragraph mark indicates the passage to a new paragraph. The line spacing option is "Line clearance" set at 0 mm

$$\begin{array}{r} x^2 + x + \frac{1}{2} \\ 2x - 1 \overline{) 2x^3 + x^2 + 0x - 3} \\ 2x^3 - x^2 \\ 2x^2 + 0x \\ 2x^2 - x \\ x - 3 \\ x - \frac{1}{2} \\ - \frac{5}{2} \end{array}$$

Then make use of the "First Line" left indentation button  and the Underbar from Underbar and Overbar Template menu to get the following

$$\begin{array}{r} x^2 + x + \frac{1}{2} \\ 2x - 1 \overline{) 2x^3 + x^2 + 0x - 3} \\ \underline{2x^3 - x^2} \\ 2x^2 + 0x \\ \underline{2x^2 - x} \\ x - 3 \end{array}$$

$$\begin{array}{r} x - \frac{1}{2} \\ \hline -\frac{5}{2} \end{array}$$

Then you can select the process as shown below and paste it into a text box.

$$\begin{array}{r} x^2 + x + \frac{1}{2} \\ 2x - 1 \overline{) 2x^3 + x^2 + 0x - 3} \\ \underline{2x^3 - x^2} \\ 2x^2 + 0x \\ \underline{2x^2 - x} \\ x - 3 \\ \underline{x - \frac{1}{2}} \\ -\frac{5}{2} \end{array}$$

To adjust the text box size, just select the text box and right-click; then from the contextual menu that opens up, click on "Adjust text box".

When the text box is inserted into text, it may be needed to get it up to a particular level of the text. Then one of the following four alignment options of the paragraph Base align, Top align, Centre align and Bottom align can help.

When the Base align option of the paragraph is used, proceed as follows:

- i. Select the text box and right-click to access the object layout style dialog box.
- ii. Type the appropriate value in the Down Margin slot.
- iii. Click on OK button to get the desired result.

Note: You can find from the book "[ScienceWord and Class drawing basic notions](#)" a practical technique to align objects inserted into text.

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