

ScienceWord and Class
Arithmetic and calculation

Dr Emile C. B. COMLAN

Emails: ecomlan@yahoo.com ; ecomlan@scienceoffice.com

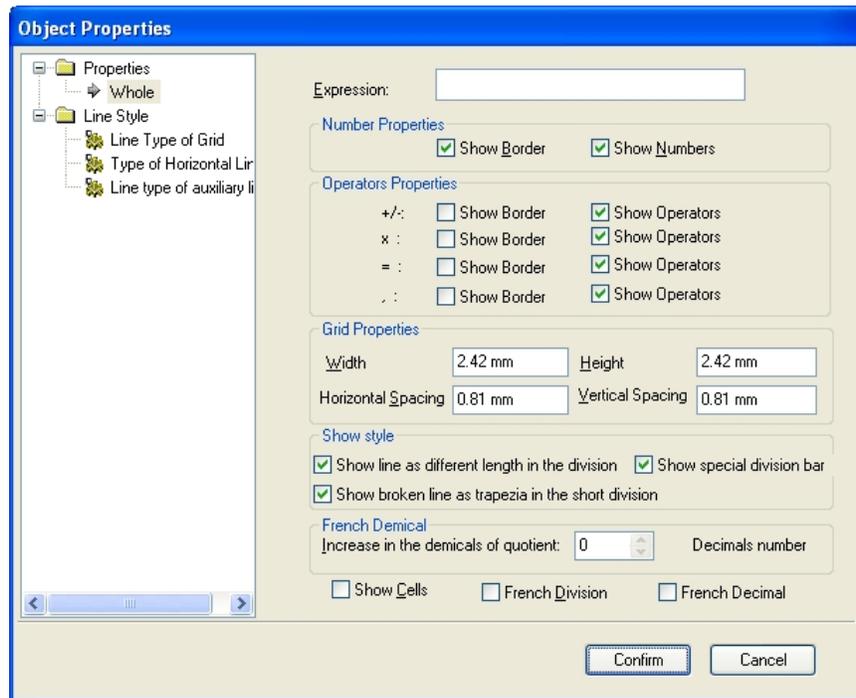
Web site: www.scienceoffice.com

Arithmetic

1) General view

a) Common Calculation

In ScienceWord, you can easily attempt a usual arithmetic calculation (addition, subtraction, multiplication, division, factorization of a number, the Greatest Common Divisor and the Least Common Multiple of any two strictly positive integers) with the possibility of displaying result thanks to the dialogue box below that you can access by clicking on "Arithmetical" in the "Insert" menu:



In **Expression:** window, write out the calculation. Addition and subtraction make use respectively of the "+" et "-" usual symbols, multiplication and division make use respectively of "*" et "/" symbols..

b) Example: Simple addition

In the "Expression" field, write 435 + 129. You may choose to uncheck the "Show border" (illustration (1)) or not (illustration (2) below; then click on "OK". The cursor takes the shape "+". Just click on the worksheet to get calculation displayed.

(1)

$$\begin{array}{r} \boxed{4} \boxed{3} \boxed{5} \\ + \boxed{1} \boxed{2} \boxed{9} \\ \hline = \boxed{5} \boxed{6} \boxed{4} \end{array}$$

(2)

$$\begin{array}{r} 435 \\ + 129 \\ \hline = 564 \end{array}$$

2) General settings

The usual calculations and their corresponding expressions are shown in the following table.

Calculation	Expression
$a+b+c+\dots$	$a+b+c\dots$
$a-b$	$a-b$
$a\times b$	$a*b$
Factorization of a	a
GCD and LCM (a, b)	a, b

a) Example 1: Multiplication and modifications

In the "Expression" field, write $435 * 129$, tick off "Show Border" box, then click on "OK".

While the cursor takes the shape "+", click on the worksheet.

The calculation is displayed as shown opposite

We will now present this result in another shape (changing the size of the space occupied by the calculation).

Ensure that the calculation is selected. If it was not, click in that case on one of the operation separating lines to obtain the selection. Then access afresh the previous "Object Properties" dialogue box through the contextual menu.

Configure "Grid Properties" window the following way: Width:2mm; Height: 2mm; Horizontal: 0.61mm ; Vertical: 0.61mm.

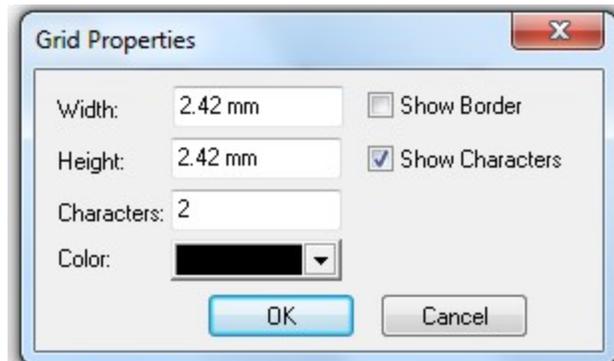
Then validate this modification by clicking on OK. While the cursor takes the shape of "+", click on the worksheet and you obtain the opposite result:

$$\begin{array}{r}
 435 \\
 \times 129 \\
 \hline
 3915 \\
 8700 \\
 43500 \\
 \hline
 = 56115
 \end{array}$$

$$\begin{array}{r}
 435 \\
 \times 129 \\
 \hline
 3915 \\
 8700 \\
 43500 \\
 \hline
 = 56115
 \end{array}$$

If for utilitarian purposes, you wish to bring some modification to any element of the calculation (a number, "×" symbol or "=" symbol), click on this item to select it. Right click to access the contextual menu and then, click on "Properties". In the case of the

choice of figure "2" in the multiplication, the following dialogue box appears:



Note that the respective sizes 2 mm and 2 mm of Width and Height correspond to the previous modifications carried out.

In the "Characters" field you can replace 6 by any figure and only one of the keys of the keyboard. "Show" box offers the option of displaying or concealing this number whether it is ticked off or not when you click on "OK" button.

You can also select any element and type directly from the keyboard to replace it with a character or key the space bar to delete it.

Note: Other options of modification such as colour and width are available in the "Object Properties" dialogue box.

b) Exemple 2 : Division and decimals number, French division

You can perform a division with option of a number of decimals. For example, when you write in expression fields 2408/98, then the decimal option becomes automatically available. the result in (1) is the division with 0 decimal. The result in (2) is the division with 1 decimal..

$ \begin{array}{r} 98 \overline{) 208} \\ \underline{196} \\ 12 \end{array} $ <p>(1)</p>	$ \begin{array}{r} 98 \overline{) 208.0} \\ \underline{196} \\ 120 \\ \underline{98} \\ 22 \end{array} $ <p>(2)</p>
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You can check French division box only or both French division and French decimal boxes with 1 decimal option to get the format of French corresponding divisions in (3)

and (4),

$$(3) \begin{array}{r|l} 2 & 0 & 8 & 9 & 8 \\ 1 & 9 & 6 & 2 \\ \hline & 1 & 2 & & \end{array}$$

$$(4) \begin{array}{r|l} 2 & 0 & 8 & , & 0 & 9 & 8 \\ 1 & 9 & 6 & & & 2 & , & 1 \\ \hline & 1 & 2 & 0 & & 9 & 8 \\ & & & & & 2 & 2 & \end{array}$$

c) Exemple 3 :Factorization of a number

To express the number 200 as the product of prime numbers, you have just to write the number 200 in the expression window of the previous dialogue box and then click "OK". You will obtain as shown in (5) the English format. Through object properties dialog box you can check French division box to get the French format as shown in (6).

$$(5) \begin{array}{l} 2 \left| \begin{array}{l} 200 \\ 100 \\ 50 \end{array} \right. \\ 2 \left| \begin{array}{l} 25 \\ 12.5 \end{array} \right. \\ 5 \left| \begin{array}{l} 2.5 \\ 1.25 \end{array} \right. \\ \hline 5 \end{array}$$

$$(6) \begin{array}{l} 2 \left| \begin{array}{l} 200 \\ 100 \\ 50 \end{array} \right. 2 \\ 2 \left| \begin{array}{l} 25 \\ 12.5 \end{array} \right. 2 \\ 5 \left| \begin{array}{l} 2.5 \\ 1.25 \end{array} \right. 2 \\ \hline 5 \left| \begin{array}{l} 2.5 \\ 1.25 \end{array} \right. 5 \\ \hline 5 \end{array}$$

This result means: $200 = 2^3 \times 5^2$.

d) Example 4 : GCD and LCM of two numbers

We can determine in a simultaneous way the Greatest Common Divisor (GCD) and the Least Common Multiple (LCM) of any two strictly positive integers m and n . All you need is to separate m and n by a comma in the "Expression" field of the "Arithmetical" properties dialogue box.

For example to find the GCD and LCM of 180 and 200, just type 200,180 in the expression fields of Arithmetical properties dialogue box as follow: The two numbers are just separated with a comma.

By clicking on OK, you have the following result:

$$\begin{array}{r}
 2 \mid 2 \ 0 \ 0 \ , \ 1 \ 8 \ 0 \\
 2 \mid 1 \ 0 \ 0 \ , \ 9 \ 0 \\
 5 \mid \quad 5 \ 0 \ , \ 4 \ 5 \\
 \quad 1 \ 0 \ , \quad 9
 \end{array}$$

It follows that:

$$[200,180] = 2^2 \times 5 = 20$$

$$(200,180) = 200 \times 9 = 180 \times 10 = 2^2 \times 5 \times 10 \times 9 = 1800$$

When two m and n numbers are mutual prime, for example 17 and 29, the result shows only the two numbers as follow:

$$1 \ 7 \ , \ 2 \ 9$$

e) Example 5 : Subtraction and multiple addition

You can just perform a simple subtraction using only one time the sign minus $-$. But you can perform multiple addition using several times the sign $+$.

$$\begin{array}{r}
 \quad \quad \quad 8 \ 7 \ 6 \ 5 \ 4 \\
 - \quad 7 \ 9 \ 8 \ 7 \ 6 \ . \ 7 \ 8 \\
 \hline
 = \quad \quad 7 \ 7 \ 7 \ 7 \ . \ 2 \ 2
 \end{array}
 \qquad
 \begin{array}{r}
 \quad \quad \quad 8 \ 4 \ 3 \ 6 \\
 \quad \quad \quad 8 \ 7 \ 6 \ . \ 9 \ 8 \\
 \quad \quad 4 \ 3 \ 5 \ 6 \ 7 \\
 + \quad \quad \quad 8 \ 7 \ 6 \ . \ 9 \ 6 \ 4 \\
 \hline
 = \quad 5 \ 3 \ 7 \ 5 \ 6 \ . \ 9 \ 4 \ 4
 \end{array}$$

3) Calculation with number base

There is just a little difference between the decimal system format and the one of any other systems number base

For exemple the calculation $543_6 \times 324_8 = 222774_8$ will be presented as shown in (A).

(A)

$$\begin{array}{r}
 \quad \quad \quad 5 \ 4 \ 3_8 \\
 \quad \quad \quad \times 3 \ 2 \ 4_8 \\
 \hline
 \quad \quad 2 \ 6 \ 1 \ 4 \\
 \quad 1 \ 3 \ 0 \ 6 \\
 \hline
 2 \ 0 \ 5 \ 1 \\
 \hline
 2 \ 2 \ 2 \ 7 \ 7 \ 4_8
 \end{array}$$

(B)

$$\begin{array}{r}
 \quad \quad \quad 5 \ 4 \ 3 \\
 \quad \quad \quad \times 3 \ 2 \ 4 \\
 \hline
 \quad \quad 2 \ 1 \ 7 \ 2 \\
 \quad 1 \ 0 \ 8 \ 6 \\
 \hline
 1 \ 6 \ 2 \ 9 \\
 \hline
 = \quad 1 \ 7 \ 5 \ 9 \ 3 \ 2
 \end{array}$$

Class and ScienceWord present as default the decimal system calculation, as shown in (B).

To get the same result you need to set in the object properties dialogue box of the arithmetic calculation, the "invisible line" option for Horizontal Line. Then you get the result as shown in (C).

In the next steps you have to select each number that does not correspond to the needed value and type directly the appropriate one (D).

Finally, select the equal sign and press Space Bar to delete it.

	5 4 3		5 4 3
	x 3 2 4		x 3 2 4
(C)	2 1 7 2	(D)	2 6 1 4
	1 0 8 6		1 3 0 6
	1 6 2 9		2 0 5 1
	= 1 7 5 9 3 2		2 2 2 7 7 4

Draw three lines and use the super label to the base 8 as shown in (E). Select all the objects and click from format menu on "Group" tool.

	5 4 3 ₈
	x 3 2 4 ₈
(E)	2 6 1 4
	1 3 0 6
	2 0 5 1
	2 2 2 7 7 4 ₈

Note: The factors of some numbers are not always obvious. Finding the prime factorization of numbers like 42059 without a calculator, computer, or list of primes is difficult. It should be noted that, $42059 = 137 \times 307$. ScienceWord and Class have the advantage not only of providing the result, but also of presenting it in an acceptable format when teaching the factorization of composite numbers.

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