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# JWD-Formula Calculator

With this unconventional "scientific calculator" not only mathematical expressions can be conveniently displayed and resolved, but you can also create your own extensive collection of formulas.

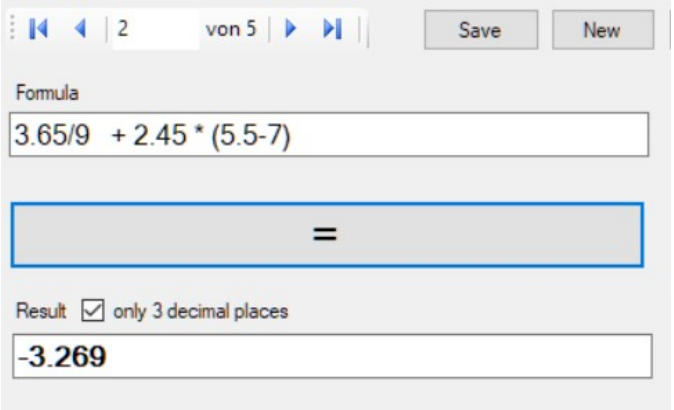
The user interface is self-explanatory.
Use the arrow keys to navigate through the formula database *FormulaDB.dat*, which is loaded automatically when the program starts, and familiarize yourself with the spelling of the formulas using the examples.

## Example 1: Simple calculations

If you only want to use the tool as a simple calculator, just click the "**New**" button and after entering the formula on "=" (or press the ENTER key).

With the checkbox you can limit the number of decimal places to be displayed in the result to 3.

**Decimal separator is, as in all JWD tools with English interface, generally the dot.**




**For such simple calculations, you don't need the arrow keys or the "Save" button!**

## Example 2: Resonant circuit

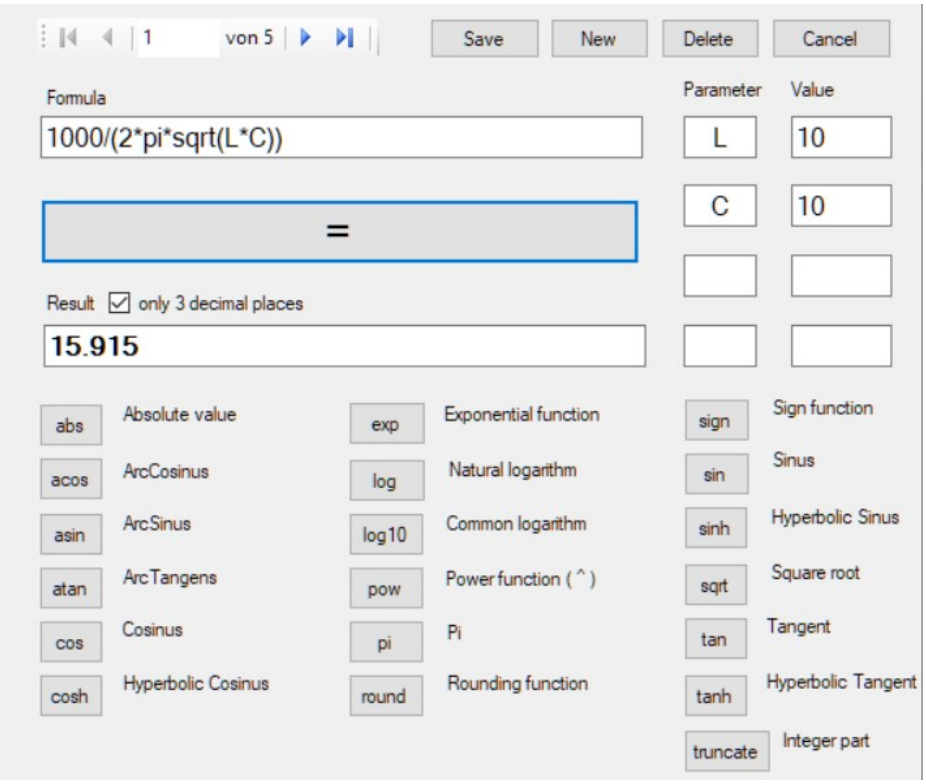
*What is the resonant frequency of an resonant circuit with L=10µH and C=10pF?*

For the inductance in µH and the capacitance in pF you get the resonant frequency in MHz:

$$f\,[MHz] = \frac{1000}{2 \cdot \pi \cdot \sqrt{L[\mu H] \cdot C[pF]}}$$

The square root function (*sqrt*) required for this formula is one of a total of 19 mathematical functions that you can insert directly into the line of the formula editor by clicking on the corresponding button.

After entering and clicking on the "=" button (or pressing the ENTER key) you will see that the resonant frequency is 15.915... MHz:




**Hints**

- Uppercase or lowercase or inserted spaces are meaningless.
- Otherwise, the syntax corresponds to that of Visual Basic and should be immediately understandable for everyone.
- The number of opening parentheses must always be equal to the number of closing brackets, otherwise there is an error message.
- The file *FormulaDB.dat* must always be located in the application directory.
  It is recommended to create a backup copy.

## Example 3: Characteristic impedance of a balanced two-wire cable

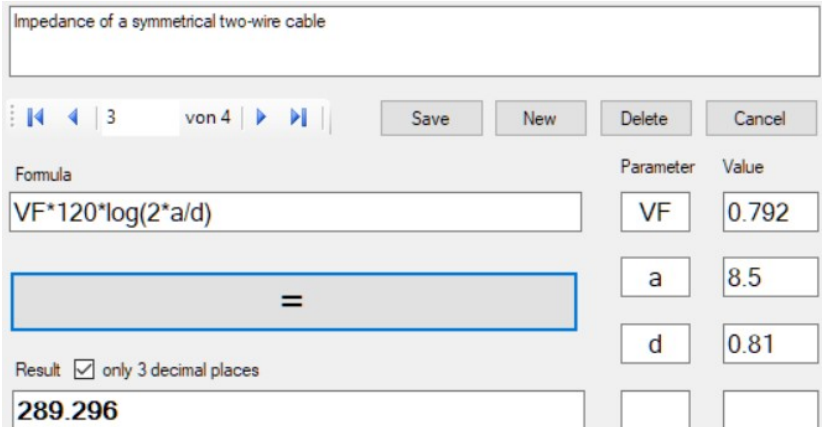
*What is the impedance of a two-wire cable with a shortening factor of 0.792, a conductor spacing of 8.5mm and a wire diameter of 0.81mm?*

For symmetrical two-wire lines, according to /1/ under the condition a /d > 3,6, the relationship is:

Zw = VF * 120Ω * ln(2a / d)

VF = shortening factor;
a = distance between both lines (mm)
d = wire diameter(mm)
Zw = impedance(Ω)

The following example, taken from /1/, refers to a 300-Ω tape line sold by DX-Wire:

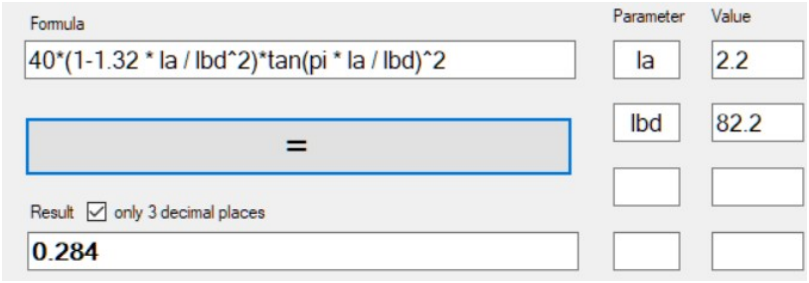



The impedance is Zw = 289.3Ω.

## Example 4: Radiation resistance of electrically short antennas

*What is the radiation resistance of a 2.2m long vertical antenna for the 80m band? (λ = 82.2m)?*

A formula taken from /2/ is used (a = length of the radiator; lbd = wavelength):




The real part of the radiation resistance is Rs = 0.284Ω.

### Literature

/1/ Neibig, U., DL4AAE: Dämpfung und Verkürzungsfaktor von Zweidrahtleitungen. FUNKAMATEUR 65 (2016), H.11, S. 1034-1039

/2/ Janzen, G. DF6SJ „Kurze Antennen“, DARC-Verlag, 1989