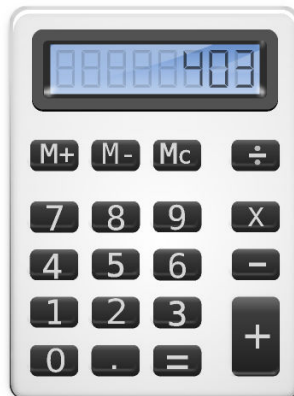


# The KCalc Handbook

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# Contents

<b>1</b>	<b>Introduction</b>	<b>5</b>
<b>2</b>	<b>Usage</b>	<b>6</b>
2.1	General Usage . . . . .	6
2.2	Simple Mode . . . . .	7
2.3	Science Mode . . . . .	7
2.4	Statistical Mode . . . . .	8
2.5	Numeral System Mode . . . . .	8
2.6	Memory Operations . . . . .	9
2.6.1	Standard Memory Operations . . . . .	9
2.6.2	Constants . . . . .	9
2.7	Single Key Accelerators . . . . .	10
<b>3</b>	<b>Comments on Specific Functions</b>	<b>12</b>
3.1	Mod and IntDiv . . . . .	12
3.2	% . . . . .	12
3.3	Lsh and Rsh . . . . .	13
3.4	Cmp, And, Or and Xor . . . . .	13
<b>4</b>	<b>Questions and Answers</b>	<b>14</b>
<b>5</b>	<b>Command Reference</b>	<b>15</b>
5.1	Menu Items . . . . .	15
<b>6</b>	<b>Credits and License</b>	<b>16</b>

### **Abstract**

KCalc is a calculator for your desktop environment. In the simple mode it can be used for basic arithmetic operations, but provides advanced modes for scientific, statistical and numeral system calculations.

# Chapter 1

## Introduction

KCalc offers many more mathematical functions than meet the eye on a first glance. Please study the section on keyboard accelerators and modes in this handbook to learn more about the many functions available.

In addition to the usual functionality offered by most scientific calculators, KCalc offers a number of features, which I think are worthwhile pointing out:

- KCalc provides trigonometric functions, logic operations, and it is able to do statistical calculations.
- KCalc allows you to cut and paste numbers from/into its display.
- KCalc features a *results-stack* which lets you conveniently recall previous results.
- You can configure KCalc's display colors and font.
- You can configure KCalc's precision, the number of displayed digits and the number of digits after the period in the settings dialog.
- KCalc offers a great number of useful [key-bindings](#), which make using KCalc without using a pointing device easy.

Hint: pressing (and holding) the **Ctrl**-key, displays on every button, the corresponding key-binding.

### NOTE

KCalc uses [Infix notation](#) which enforces correct order of operations as taught in school; contrary to [Immediate execution](#) used by many simple calculators.

Have fun with KCalc!

Bernd Johannes Wuebben

## Chapter 2

# Usage

### 2.1 General Usage

General usage is straight forward and similar to the way most simple scientific calculators operate, but take note of the following special KCalc features:

#### Result Stack

Each time you left mouse button click on the = button or press your keyboard's **Enter** or = keys, the display result is written to KCalc's result stack. You can navigate through the result stack with your keyboard's **Ctrl+Z** and **Ctrl+Shift+Z** keys.

#### Percent Function

The percent function works somewhat differently to that on most calculators. However, once understood, its enhanced functionality proves quite useful. See the section about the [percent](#) function for further details.

#### Cut and Paste

- Pressing **Ctrl+C** will place the displayed number on to the clipboard.
- Pressing **Ctrl+V** will paste the clipboard content into the display if the content of the clipboard is a valid floating point number.
- It is still possible to copy/paste by clicking on KCalc's display, but this may disappear in future versions.

#### Advanced functions

When you start KCalc for the first time, the calculator will only display buttons for basic arithmetic computations.

Under the menu entry **Settings** it is possible to select a mode for KCalc: it is possible to choose [Simple](#) or [Science](#) or [Statistic](#) or [Numeral System](#) mode. Please note, that these modes will slightly change as KCalc evolves.

#### Button Layout

To give easy access to all the functions in advanced modes in KCalc, many keys have a second layout. Click on **Shift** or press the shortcut **Ctrl+2** to make the second layout of the buttons visible.

## 2.2 Simple Mode

This mode contains only those buttons and functions, which are essential necessary for basic calculations.

If you just want to sum up all items on an invoice this mode may be your choice.

## 2.3 Science Mode

In this mode the left column of buttons is allocated to trigonometric functions:

Buttons	Function
Hyp	Enter Hyperbolic sub mode. Hyp Sin for example is the hyperbolic sine: sinh
Sin	Compute the sine
ShiftSin or Asin	Compute the inverse sine
Cos	Compute the cosine
ShiftCos or Acos	Compute the inverse cosine
Tan	Compute the tangent
ShiftTan or Atan	Compute the inverse tangent
Log	Compute the Log base 10
ShiftLog or 10 <sup>x</sup>	Compute 10 to the power of x
Ln	Compute the natural logarithm. That is the log to base e
ShiftLn or e <sup>x</sup>	Compute e (the base of the natural logarithm) to the power of x

The second column has buttons for algebraic functions:

Buttons	Function
Mod	Compute the remainder in Euclidean division
ShiftMod or IntDiv	Integer division (integer part of the quotient)
1/x	Compute the reciprocal for a number
Shift1/x or nCm	Compute the number of distinct second-operand-element subsets of it that can be formed for any set containing first operand elements (binomial coefficient)
x!	Compute the product of all positive integers less than or equal to the current integer operand (factorial)
x <sup>2</sup>	Compute the square of x
Shiftx <sup>2</sup> or √x	Compute the square root of x
x <sup>y</sup>	x power y
Shift x <sup>y</sup> or x <sup>1/y</sup>	x power 1/y
x <sup>3</sup>	Computes the third (cubic) power of x
Shiftx <sup>3</sup> or √ <sup>3</sup> x	Computes the third (cubic) root of x

$x \cdot 10^y$	Computes the product of the first operand and decimal exponent of the second operand
----------------	--

## 2.4 Statistical Mode

In this mode the left column of buttons is allocated to statistical functions:

Most of the functionality in this mode is centered around the **Dat** button. To create a data list of numbers, enter a number into the calculator and press **Dat**. A sequentially increasing number is shown on the display indicating which position in the Data 'list' the number occupies. A traditional calculator only stores three values for statistical functions: The number of discrete items in a list, the sum of the data items entered and the sum of the square of all data items in the list. KCalc differs by actually storing each discrete value, allowing you to calculate the median value of the data.

Buttons	Function
<b>N</b>	Recall the number of data items entered
<b>ShiftN</b> or $\Sigma x$	Display the sum of all data items entered
<b>Mea</b>	Display the mean of the data items entered
<b>ShiftMea</b> or $\Sigma x^2$	Display the sum of the square of all data items entered
$\sigma_N$	Display the standard deviation (n)
<b>Shift</b> $\sigma_N$ or $\sigma_{N-1}$	Display the population standard deviation (n-1)
<b>Med</b>	Display the median
<b>Dat</b>	Enter a data item
<b>ShiftDat</b> or <b>CDat</b>	Clear last data item entered
<b>CSt</b>	Clear the store of all data item entered

The next two columns hold the buttons with trigonometric and algebraic functions described in the [Science](#) mode section.

## 2.5 Numeral System Mode

This mode contains buttons and functions to calculate in binary, hexadecimal, octal and decimal.

You select the numeral system with the radio buttons on the right. To insert a hexadecimal number for example, just do the following: Select **Hex** from the radio buttons. Then enter a number and note, that you can use the letters **A** to **F** for numbers larger than 9. If you would like to see this number in binary, just select **Bin** from the radio buttons.

Binary, octal and hexadecimal numbers can be displayed as groups of digits separated by whitespaces. Such grouping can improve readability of numbers. For example, hexadecimal number *AF1C42* can be displayed as *AF 1C 42* with separation every second digit. Grouping can be turned off or tweaked. Select **Settings** → **Configure KCalc...** to bring up the configuration dialog and change the setting on **General** page as appropriate.

You may want to select **Show Bit Edit** from the **Settings** menu to see selected bits.

There are logic operators available in this mode. These operators are:



Buttons	Function
<b>AND</b>	Two numbers are logically anded
<b>OR</b>	Two numbers are logically ored
<b>XOR</b>	Two numbers are logically exclusive ored
<b>Lsh</b>	Left shift the value
<b>Rsh</b>	Right shift the value
<b>Cmp</b>	Perform a 1's complement

The second column holds the buttons with algebraic functions described in the [Science](#) mode section.

The third column with the buttons **A** to **F** is enabled only in **Hex** mode.

## 2.6 Memory Operations

KCalc supports the memory operations given by standard calculators plus six slots to hold constants.

### 2.6.1 Standard Memory Operations

KCalc can remember results of operations for you, and re-use them in later calculations. You can access these functions via several buttons labeled **MR**, **MS**, **M+** and **MC**.

#### **MS**

The **MS** button stores the currently displayed result in memory.

#### **M+**

The **M+** button adds the current result to the one in memory. So, if you had stored a 20, and the current result is a 5, your memory would contain 25 when you press it. If the memory is empty, it acts like **MS** and simply stores the result.

#### **MR**

The **MR** button gets the value stored in memory and puts it in the display.

#### **MC**

The **MC** button clears the memory.

If a value is stored in memory a **M** will appear in the status bar, next to the calculator mode indicator

### 2.6.2 Constants

The six constants buttons **C1** to **C6** will only be visible after activating the item **Constants Buttons** in the menu **Settings** of the menu bar. They are available in **Science mode** and **Statistics mode**

To see the value stored in each constant hover the button with the mouse pointer.

To store the number shown in the KCalc display in one of the six constants, first press **Shift** followed by the desired button key **C1** up to **C6**.

To use the value stored in any of the constants in a calculation, just press the desired button (**C1** to **C6**), and the corresponding number will appear in the display.

It is possible to change the label of the constants button to make it easier to remember which button holds which constant. Click with the right mouse button on one of the buttons **C1** to **C6**. A popup menu appears, in which you select **Set Name**.

There are many (mostly physical) predefined constants, which can be put on any of the six buttons **C1** - **C6** by selecting the desired constant in the popup menu that appears after right clicking on one of the constant buttons and selecting **Choose from List**. Though the predefined constants can also be accessed via the **Constants** in the menu bar, storing it on a constants button is very handy, if the number is used frequently.

## 2.7 Single Key Accelerators

To simplify entering calculations from the keyboard KCalc has single key accelerators for most functions. For example entering **7R** or **7x** will calculate the reciprocal of 7 (1/7).

During a computation, you can always press **Ctrl** to make each button display its key-binding.

Key	Function	Notes
<b>H</b>	<b>Hyp</b>	Hyperbolic as in Hyp Sin, the sinh
<b>S</b>	<b>Sin</b>	
<b>C</b>	<b>Cos</b>	
<b>T</b>	<b>Tan</b>	
<b>N</b>	<b>Ln</b>	log base e
<b>L</b>	<b>Log</b>	log base 10
<b>Ctrl-2</b>	<b>Shift</b>	Second function for this button. e.g. if you want arcsin type <b>Ctrl-2 s</b>
<b>\</b>	<b>+/-</b>	Change sign
<b> </b>	<b>x<sup>2</sup></b>	
<b>^</b>	<b>x<sup>y</sup></b>	
<b>!</b>	<b>x!</b>	Factorial
<b>E</b>	<b>x10<sup>y</sup></b>	Exponent
<b>&lt;</b>	<b>Lsh</b>	Left shift
<b>&gt;</b>	<b>Rsh</b>	Right shift.
<b>&amp;</b>	<b>AND</b>	Logical AND
<b>x or *</b>	<b>X</b>	Multiply
<b>/</b>	<b>/</b>	Divide
<b>D</b>	<b>Dat</b>	Enter data item in statistical mode
<b> </b>	<b>OR</b>	Logical OR. Note: <b>ShiftOR</b> is XOR
<b>R</b>	<b>1/x</b>	Reciprocal
<b>Enter</b>	<b>=</b>	
<b>Return</b>	<b>=</b>	
<b>Backspace</b>	<b>&lt;=</b>	Delete last number
<b>PgUp</b>	<b>C</b>	Clear
<b>Esc</b>	<b>C</b>	Clear
<b>PgDown</b>	<b>AC</b>	Clear all
<b>Del</b>	<b>AC</b>	Clear all
<b>:</b>	<b>Mod</b>	remainder of dividing
<b>Alt+1 to Alt+6</b>	<b>C1</b>	use the value stored in C1 to C6

## The KCalc Handbook

## Chapter 3

# Comments on Specific Functions

### 3.1 Mod and IntDiv

**Mod gives the remainder of dividing the displayed number by the next input number.**

`22 Mod 8 =` will give the result 6

`22.345 Mod 8 =` will give the result 6.345

**Shift IntDiv does integer division of the displayed number by the next input number.**

`22 Shift IntDiv 8 =` will give the result 2

`22.345 Shift IntDiv 8 =` also gives 2

### 3.2 %

Used instead of the = key, % interprets the final operation carried out in the current calculation as follows:

- If the final operator is + or - the second argument is interpreted as percentage of the first operand.
- If the final operator is \* divide the result of the multiplication by 100.
- If the final operator is / give the left operand as a percentage of the right operand.
- In all other cases the % key gives identical results to the = key.

**Examples:**

`150 + 50 %` gives 225 (150 plus 50 percent of this amount)

`42 * 3 %` gives 1.26 ( $42 * 3 / 100$ )

`45 / 55 %` gives 81.81... (45 is 81.81.. percent of 55)

### 3.3 Lsh and Rsh

**Lsh** left shifts the integer part of the displayed value (multiplies it by 2) *n* times, where *n* is the next input number, and gives an integer result (base is set to **Bin**):

**10 Lsh 3** = gives *80* (10 multiplied by 2 three times).

**10.345 Lsh 3** = also gives *80*.

**Rsh** right shifts the value (performs an integer divide by 2) *n* times.

**16 Rsh 2** = gives *4* (16 divided by 2 twice).

**16.999 Rsh 2** = also gives *4*.

### 3.4 Cmp, And, Or and Xor

The **Cmp**, **And** and **Or** functions perform bitwise logical operations and therefore appear more meaningful if the base is set to **Hex**, **Oct** or **Bin** rather than **Dec**. In the following examples base is set to **Bin**.

**Cmp** performs a 1's complement (inverts the bits).

**101 Cmp** gives *111...111010*

**AND** does a logical AND.

**101 AND 110** = gives *100*

**OR** does the logical OR.

**101 OR 110** = gives *111*

**XOR** performs the logical XOR (exclusive OR) operation.

**101 XOR 110** = gives *11*

## Chapter 4

# Questions and Answers

1. *How do I get  $e$ , the Euler number?*

Press **1 Shift ex** in the KCalc window, press **1 Ctrl12 N** on the keyboard or use the **Constants** → **Mathematics** menu.

2. *How do I get two fixed digits after the period?*

Select **Settings** → **Configure KCalc...** on the menubar, this will bring up the configuration dialog. Check **Set decimal precision** and adjust the spin control so that it shows a 2.

3. *What about Precision?*

The main factor determining the precision of KCalc is whether your libc and libmath supports the C data type long double. If this is the case, KCalc will detect this at compile time and use it as its fundamental data type to represent numbers.

Adjust the **Precision** in KCalc's **Configure** dialog so that the above computations work correctly. I recommend a precision of 14 if the fundamental data type for your copy of KCalc is long double, otherwise 8 or 10.

Higher precision doesn't necessarily lead to better results. Play with the precision and you will see what I mean.

## Chapter 5

# Command Reference

### 5.1 Menu Items

A brief overview of some special menu items in KCalc:

**Constants** → **Mathematics**

Display Pi, Euler Number or Golden Ratio.

**Constants** → **Electromagnetism**

Display Light Speed, Elementary Charge, Impedance of Vacuum, Permeability of Vacuum or Permittivity of Vacuum.

**Constants** → **Atomic & Nuclear**

Display Planck's Constant, Elementary Charge or Fine-Structure Constant.

**Constants** → **Thermodynamics**

Display Boltzmann Constant, Atomic Mass Unit, Molar Gas Constant, Stefan-Boltzmann Constant or Avogadro's Number.

**Constants** → **Gravitation**

Display Constant of Gravitation or Earth Acceleration.

**Settings** → **Simple Mode**

Displays the simple math buttons.

**Settings** → **Science Mode**

Displays trigonometric and science buttons.

**Settings** → **Statistic Mode**

Displays [statistic buttons](#).

**Settings** → **Numeral System Mode**

Displays [logic buttons](#) and allows changing the numeral system.

**Settings** → **Constants Buttons**

Display constants buttons. They are available in [science mode](#) and [statistic mode](#).

**Settings** → **Show Bit Edit**

Displays a bit edit field. Click on a bit to toggle it. Only available in [numeral system mode](#).

Additionally KCalc has the common **File**, **Edit**, **Settings** and **Help** menu items, for more information read the sections about the [Menus](#) in the KDE Fundamentals.

## Chapter 6

# Credits and License

KCalc Program Copyright (c):

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KCalc was inspired by Martin Bartlett's xfrmcalc, whose stack engine is still part of KCalc.

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