



# **Haxial Calculator 1.2 Documentation**

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## Description

Haxial Calculator is a high precision mathematical assistant that evaluates normal (infix) expressions to practically any accuracy. Results can be viewed in normal, fraction or scientific forms and the option of working in a different radix no longer restricts you to the decimal system. Worksheets enable you to solve larger problems in a more suited environment as well as allowing you to save your work. Haxial Calculator incorporates unit, radix and text conversion utilities for your convenience as well as complete support for variables. Tools assisting financial calculations are also included.

## Introduction

Other calculator programs blindly attempt to copy physical hand-held calculators by displaying buttons on the computer screen, and an appearance and function that closely mimics a hand-held calculator. At Haxial, we believe this approach is fundamentally flawed. A computer is a far more powerful device than a hand-held calculator, and thus it is illogical and limiting to duplicate hand-held calculators on a computer. Haxial Calculator allows you to freely type expressions in a form natural to humans and much more suited when using a computer keyboard. For example, you can type a formula such as this into Haxial Calculator:

$$34 + e^{(56 - 24.6487)} * 1.24$$

When you press enter/return Haxial Calculator will interpret the expression, check for syntax errors, evaluate the result and display it to screen using the display mode and accuracy of your choice. Freely typing expressions is far superior to other methods such as clicking buttons.

## Features

### High Precision

Haxial Calculator does not use CPU floating-points. Many other calculators are severely limited in precision because they use CPU floating-points. Haxial Calculator is designed from scratch and it uses a powerful engine that is capable of practically unlimited precision.

### Controlled Precision

When results are displayed in normal or scientific notation you can specify exactly how many digits you want the result to be accurate to. The number of digits is practically unlimited, or to be precise a maximum setting of 1 million fractional digits.

### Radix support other than Radix 10 (Decimal)

No longer are you limited to using the Decimal system. You may select any radix from radix 2 (binary) to radix 36.

### Radix converter

If you need to convert numbers to different radices, this is the utility to do it. Convert a number to any radix from 2 to 36.

### Unit Converter

Ever needed to convert kilobits to kilobytes, miles to kilometers? This utility will convert it.

### Text Converter

This utility allows you to convert different text formats such as Hex (UTF8) and Unicode.

### Finance

Assistants to provide some insight into how various factors influence loans and investments.

### Variables and Constants

Full support for using custom variables. Constants Pi and E are generated to the specified accuracy.

### Simple yet powerful interfaces

Simplicity is everything when it doesn't limit functionality. In addition to the standard interface you may choose to switch to "tiny interface" for a simple compact workspace. If at any time this interface is inadequate, you may switch back to the standard interface instantly with a simple key combination or from a menu selection.

### Haxial Calculator Worksheet (.hcx)

A great alternative to the standard Haxial Calculator interface is using a Haxial Calculator Worksheet. A HCW is best used for multiple lined expressions and more complicated calculations. If you have work in progress, you can simply save the HCW to file for a later date. If you wish to demonstrate a problem to a co-worker, student or colleague this is also a great way to do so in an efficient manner.

### Supports fractions

Fractions are natively supported.

### Supports exponents

Exponents are natively supported.

### Customized error messages

Haxial calculator features custom (easy to read) error messages that let you know of any syntax or general errors that can occur during a calculation.

### Functions and operations

Unlike calculators that are based on cpu floating-point numbers, all functions in Haxial Calculator have to be custom made from scratch so they can support high precision results in different radices. Please see "Accepted input" for a list of functions and operators currently supported.

### Appearance

The appearance of the user interface is highly customizable. Supports "skins" / "schemes".

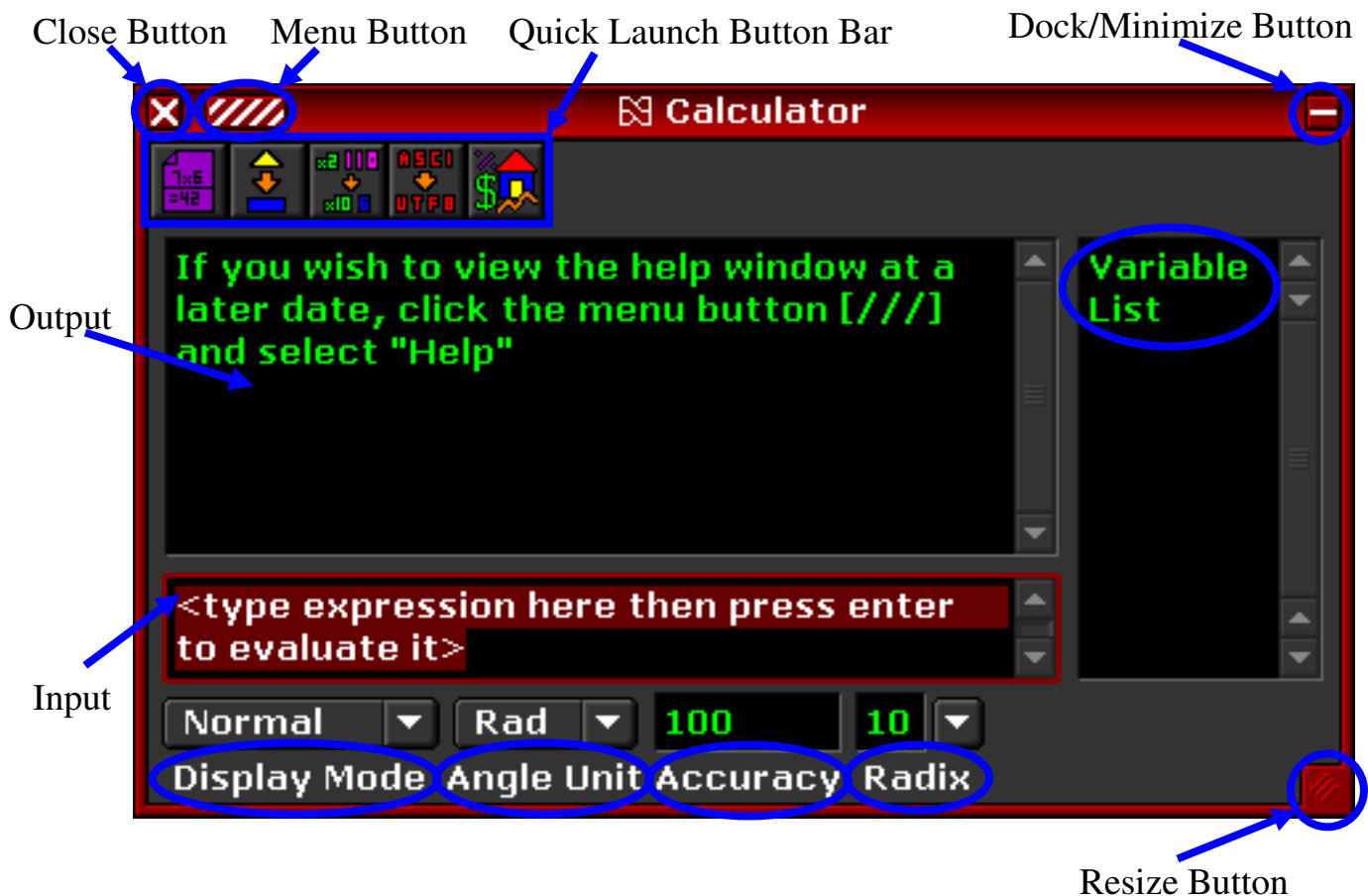
### Multiple Platform Support

Haxial Calculator is not limited to a single platform. Multiple platforms are supported and all platforms have the same unified graphical user interface and behavior to the user. This does not come at a cost to performance unlike applications written using java. See the following System Requirements for a list of supported platforms.

## System Requirements

- Microsoft Windows NT/2000/XP
- MacOS 9 with CarbonLib 1.3.1 or better
- MacOS X (10) or better.
- Linux

## The Main Calculator Window



Close Button

Click this to close the window.

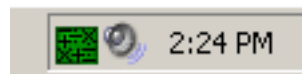


Dock/Minimize Button

Click this to dock or minimize the window. When a window is docked it is "hidden" and is represented by a button in the dock window. To restore the window click the button in the dock corresponding to the window that you wish to restore.



Microsoft Windows Only: If you are running Microsoft Windows you can right click the Dock/Minimize Button to minimize the entire program to the system tray. All windows associated with Haxial Calculator will hide and an icon will appear in the system tray. To restore Haxial Calculator simply click on the icon in the system tray.



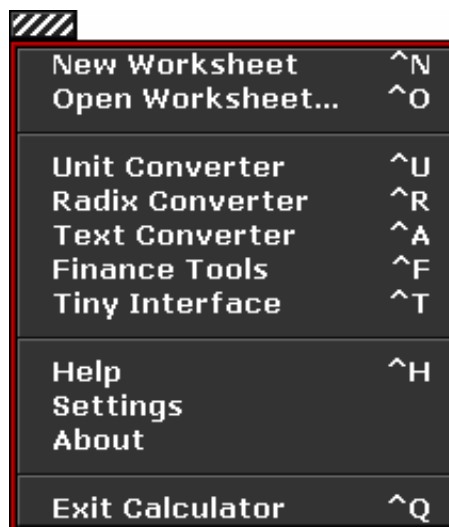
#### Resize Button

Click the mouse button on this resize button and drag the mouse to resize the window.



#### Window Menu Button

Click this to show a menu containing items (Shown below). These items execute a command when they are clicked on.



This is what each command in the menu does:

### New Worksheet

Creates a new worksheet.

### Open Worksheet...

Lets you to select and open a previously saved worksheet file.

### Unit Converter

Shows a window containing a utility that can be used to convert between various units.

### Radix Converter

Shows a window containing a utility that can be used to convert numbers to different radices (number bases).

### Text Converter

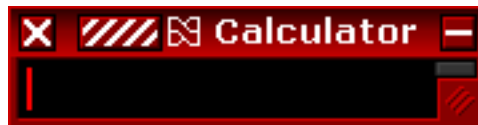
Shows a window containing a utility that can be used to convert between different text formats such as Unicode and Hex (UTF8).

### Finance

Shows a window containing tools to assist in gaining some insight into how various factors influence a loan or investment.

### Tiny Interface

Switches to a very small and simple interface. This is useful for saving screen space when doing simple calculations. (See below).



### Help

Shows a window containing a basic reference/guide and a button for launching this documentation.

### Settings

Shows a window containing various settings that you are able to change.

### About

Shows a window containing information about Haxial Calculator such as the version number and certificate information.

### Exit Calculator

Exits/Quits/Closes Haxial Calculator.



## ***Features of the Main Calculator Window:***

### Input

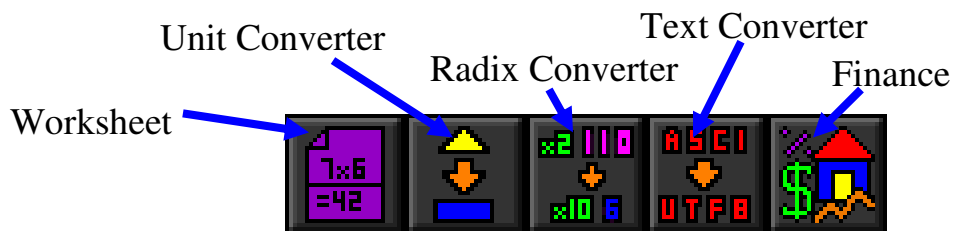
This is where you type the expression to be evaluated. For example, to evaluate "3.8 \* exp(4)" you would enter "3.8 \* exp(4)" (without the quotes) in the input text box then press the enter/return key. The result will appear in the Output.

### Output (History)

Contains a history of past calculations and results.

### Quick Launch Button Bar

Convenient way of launching various Haxial Calculator Features.



### Variable List

Contains a list of all currently declared variables.

### Display Mode Menu

This is where you select how the output will be displayed to the screen. The different modes are as follows:

- |            |   |  |
|------------|---|--|
| Normal     | - | Displays answers normally. e.g. 234.525                  |
| Fraction   | - | Displays answers as a fraction. e.g. 18/7                |
| Scientific | - | Displays answers in scientific notation. e.g. 5.466*10^3 |

### Angle Unit Menu

This is where you select the angle unit of your choice for use with functions that require an angle as input. For example, the “sin” function requires an angle as input. The following unit choices are available:

Rad - Radians  
Deg - Degrees  
Grad - Gradients

### Accuracy

This is where you can change the current accuracy. By default this is set to 100 meaning the result will be calculated to 100 fractional digits.

### Radix

This is where you can change the current radix (number base) that you wish to work with. By default this is set to 10 (Decimal).

### Timer

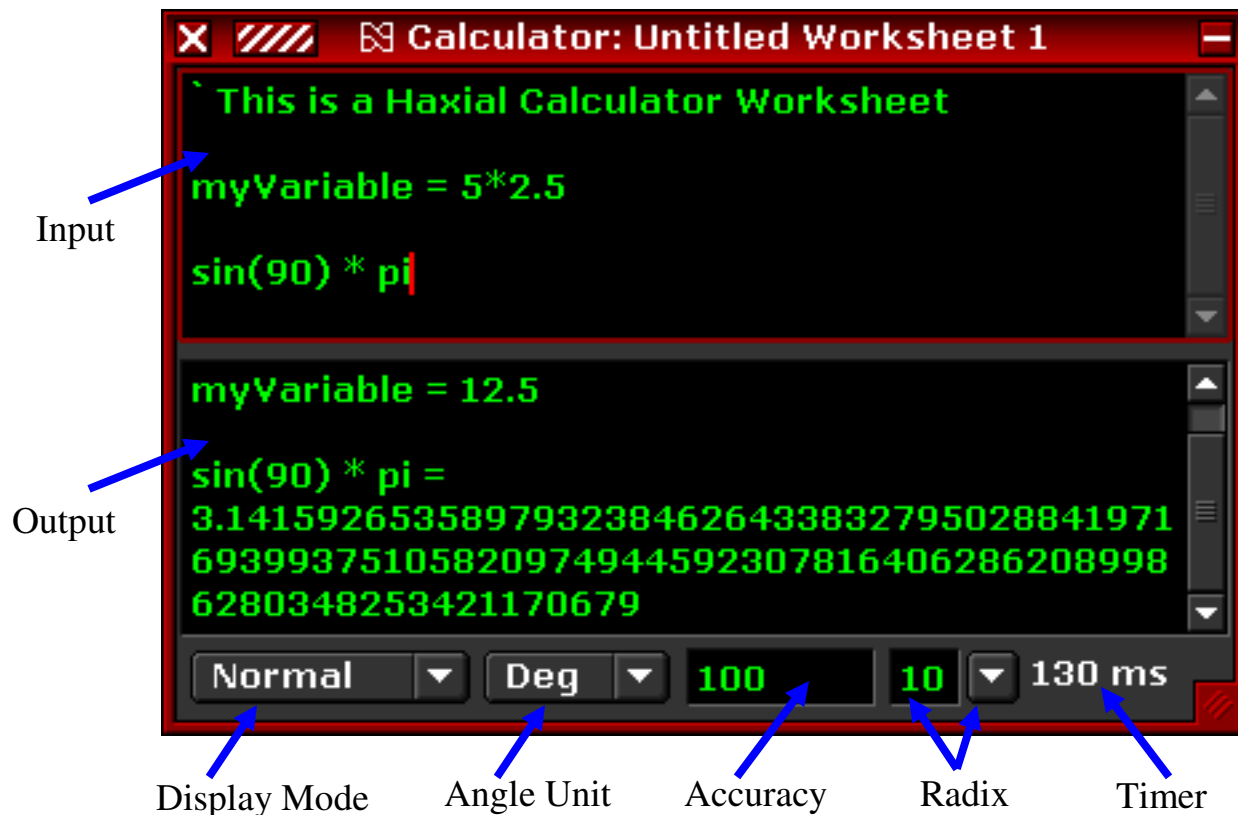
This displays the time it took for the last expression to be evaluated (measured in milliseconds). This will appear once a calculation has completed. (Example below).



Timer

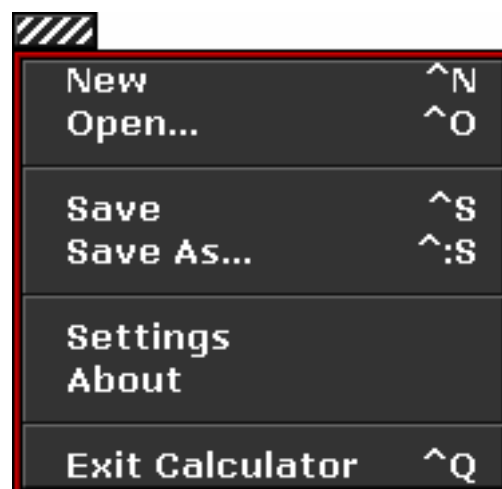
## Worksheets

The following is an example of a worksheet:



You will notice Worksheets have similar features to the Main Calculator Window. Worksheets can be a more suited environment when using multiple lined expressions. The variable list is no longer required as variables are stored only during each calculation. To evaluate an expression use the numeric keypad "enter".

The following is the contents of the window menu for a worksheet:

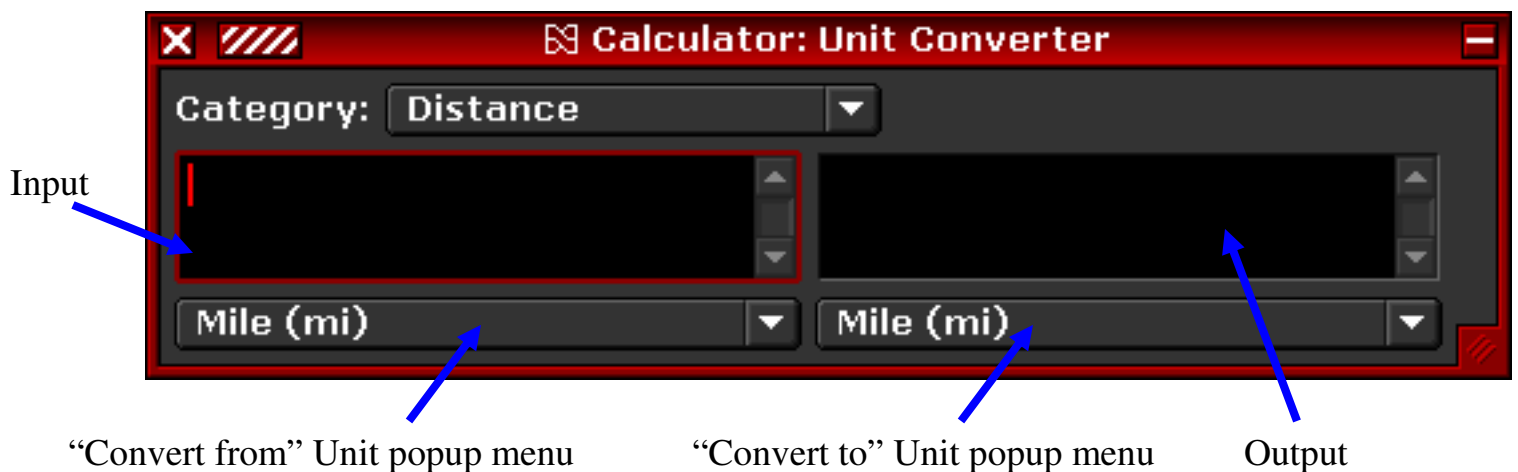


The commands that have not previously been explained are as follows:

- Save - Saves the worksheet to a file.
- Save As... - Opens a window that lets you to specify where you want to save the worksheet.

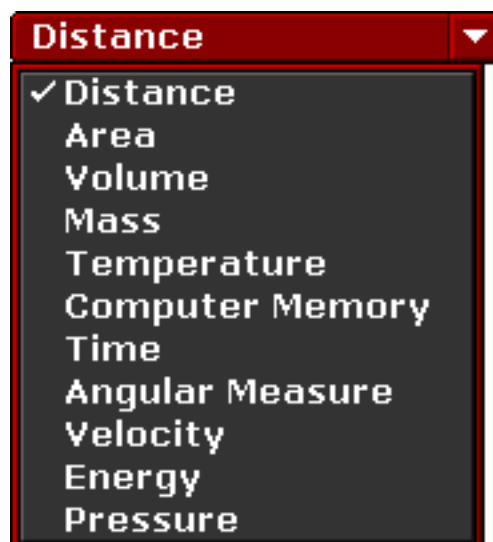
## Unit Converter

The following window will be displayed when you click the item in the main window menu named "Unit Converter" or the Unit Converter Quick Launch Button:



### Category Popup Menu

Click this popup menu to switch between various categories of units.  
(Shown below).



Once you select a category you are able to convert between different units using the unit popup menus. Click a unit popup menu to see a list of all the units in the current selected category. (Example below).



#### Convert From Unit Popup Menu

Click this popup menu and select the unit that you wish to convert from.

#### Convert To Unit Popup Menu

Click this popup menu and select the unit that you wish to convert to.

#### Input

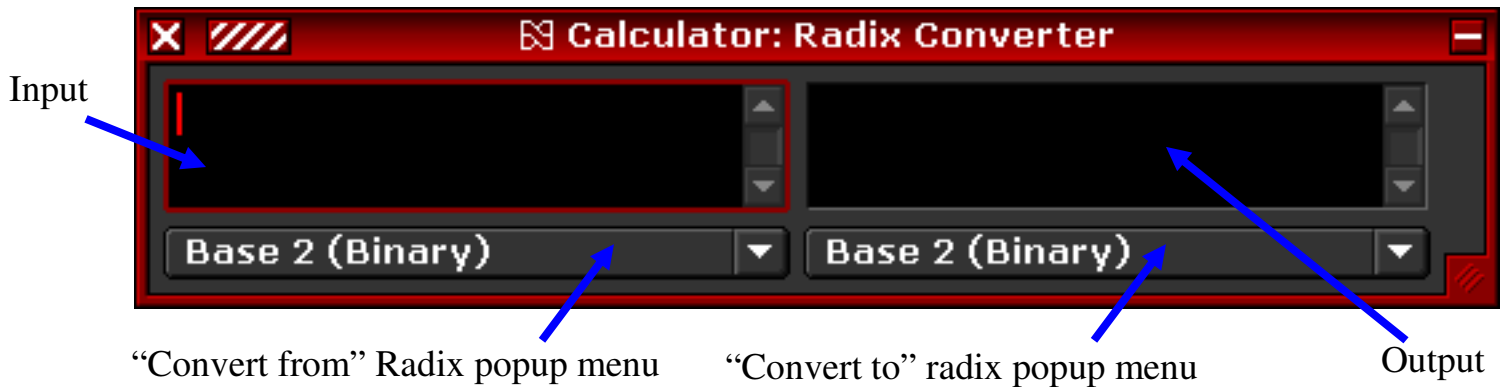
Type the value of the unit you wish to convert from in this text box. The result will be calculated as you type and displayed in the Output.

#### Output

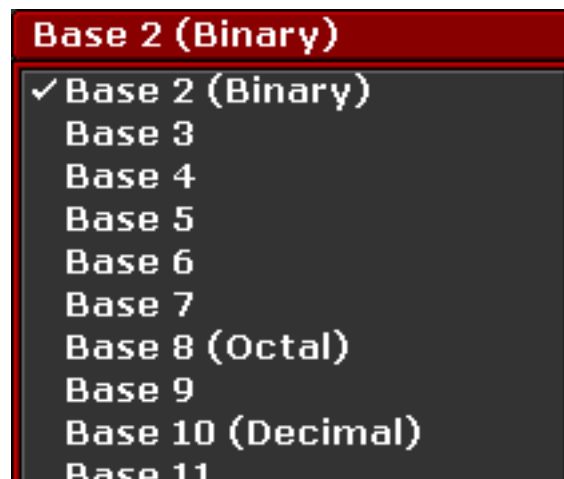
This is where the result of the conversion is displayed.

## Radix Converter

The following window will be displayed when you click the item in the main window menu named "Radix Converter" or the Radix Converter Quick Launch Button:



Click a radix popup menu to see a list of the different bases you may convert between. (Example below).



### “Convert from” Radix popup Menu

Click this popup menu and select the radix (number base) that you wish to convert from.

### “Convert to” Radix popup Menu

Click this popup menu and select the radix (number base) that you wish to convert to.

### Input

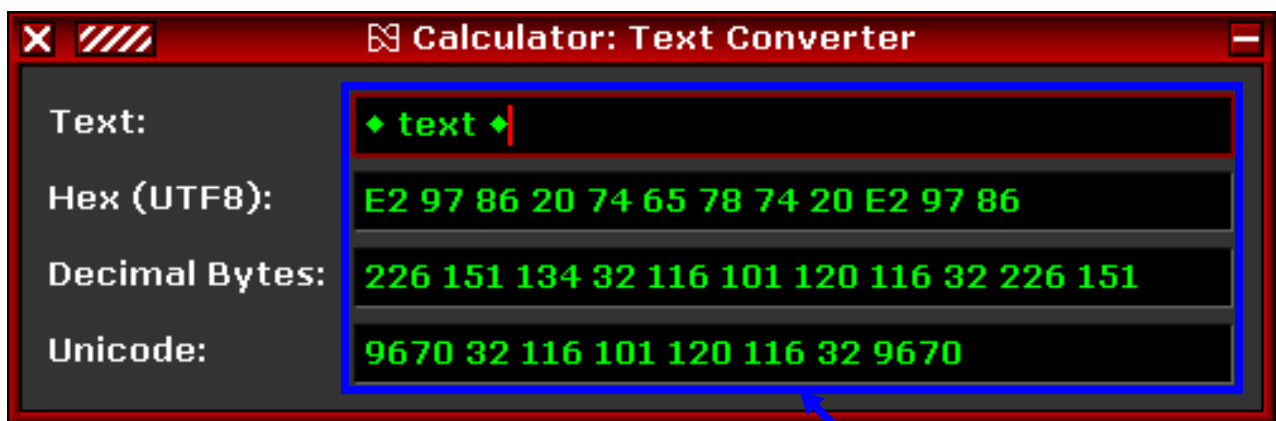
Type the number that you wish to convert from in this text box. The result will be displayed in the Output as you type.

### Output

This is where the result of the conversion is displayed.

## **Text Converter**

The following window will be displayed when you click the item in the main window menu named "Text Converter" or the Text Converter Quick Launch Button:



Input/Output Area

Make a conversion by typing in the text box corresponding to the text format you wish to convert from. The remaining text boxes will be filled with the appropriate conversion. Remember to put spaces in between units of conversions which do not have fixed sized units. This applies to Decimal Bytes and Unicode. You may enter Hex (UTF8) with or without spaces.

## Finance

The following window will be displayed when you click the item in the main window menu named "Finance" or the Finance Quick Launch Button:

The screenshot shows the 'Calculator: Finance' window with the following components and annotations:

- Finance Tool:** A dropdown menu set to 'Loan Calculator'.
- Option:** A dropdown menu set to 'How much can I borrow?'.
- Input:** Fields for 'Interest Rate (%)' (8.5), 'per' (Annum), 'Total Repayment Period' (25), 'Year(s)' (Year(s)), 'Fortnightly' (Fortnightly), and 'repayment of' (1500).
- Output:** Fields for 'Total Loan Value' (404803.3712181598), 'Total Repayments' (976500), and 'Total Interest' (571696.6287818401 or 58.545 %).

Annotations with blue arrows point to the 'Finance Tool', 'Option', 'Input', and 'Output' sections.

The finance window by default has the loan calculator and the “How much can I borrow” option selected. All finance tools have a similar layout. The inputs are displayed above the last separator and the outputs are displayed below the last separator. Finance tools may or may not have an option to further refine the calculation.

### Finance Tool

Select the finance tool of your choice from the popup menu.

### Option

Some finance tools have an option to further refine what you want to consider in your calculation. Select the option which best suits the situation you are considering.



## Input

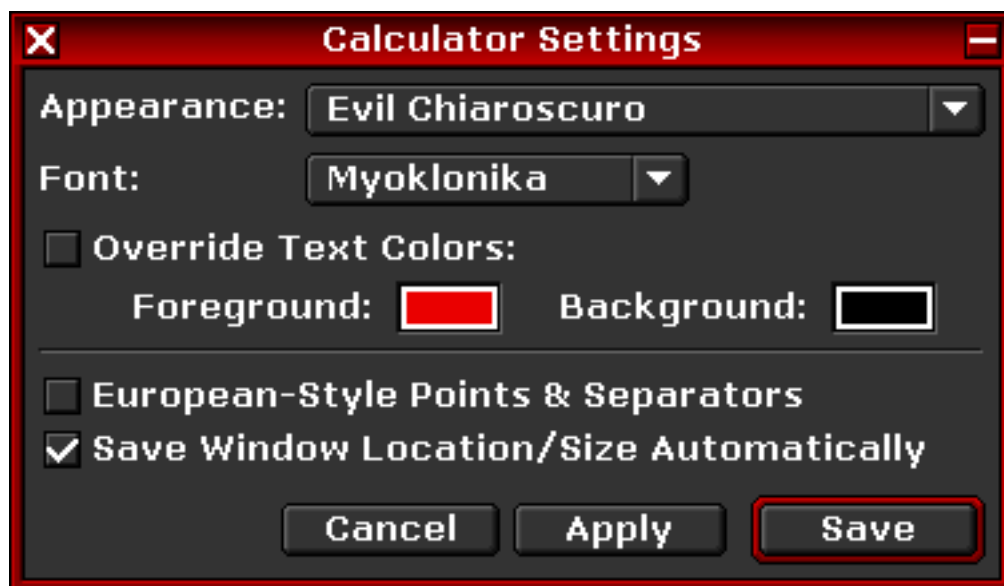
Inputs are displayed above the last separator. Select your inputs by entering the appropriate data into the text boxes and by selecting the option you desire from the appropriate menus.

## Output

Outputs are displayed below the last separator. After all the inputs have been entered the results will be displayed in the output. The output will update automatically if you make any changes to the input.

## Settings Window

The following window will be displayed when you click the item in a window menu named "Settings":



## Appearance

This lets you change the appearance of Calculator to something that is more aesthetically pleasing to you. Please note that more appearance options are available than shown in this menu — you can download more Appearance files (“.hap” files) from the Haxial website or other sources. Place your “.hap” files into a folder named “Appearances” in the same folder as the Calculator program, and then show the Settings window in Calculator, and the contents of the Appearances menu will be replaced with the contents of the folder. For more information, please visit this website:

<http://www.haxialsoftware.com/appearance/>

## Font

This lets you change the type of font used for text in Calculator.

## Override Text Colors

If you tick this, you can control the color of the text used throughout Calculator. The Foreground color is the color of the text itself, whereas the Background color is the color of the space “behind” the text.

## European-Style Points & Separators

If you tick this, the default point (.) and separator (,) are “swapped”.

Using the following number as an example:

One thousand and one fifth (using an optional separator).

Without "European-Style Decimal Points & Separators" ticked and using an optional separator to represent thousands:

1,000.2

With "European-Style Decimal Points & Separators" ticked and using an optional separator to represent thousands:

1.000,2

## Save Window Location/Size Automatically

If you tick this, the window location and size of selected windows will be automatically saved or “remembered”. If this option is not ticked an extra menu item will appear in selected window menus named “Save Window Location/Size”. You can use this to manually save the Location/Size of a window.

## Accepted Input

Valid infix expressions are accepted. Spacing is ignored. For example, the following are some examples of valid expressions.

$(45 * 6) / 34.6$   
 $\text{bubbles} = 4 * 10 ^ 3$   
 $\log_2(45 + 2.3) * \text{bubbles}$   
 $\exp(2) - \pi$

Valid infix expressions may be constructed from the following:

### Operators:

+	Add
-	Subtract\Negate
*	Multiply
/	Divide
^	Power
!	Factorial
=	Assign

band	Bit/Binary AND
bor	Bit/Binary OR
bxor	Bit/Binary XOR
band	Bit/Binary NAND
bnor	Bit/Binary NOR
bxnor	Bit/Binary XNOR

### Functions:

$\text{sqrt}(\text{input})$	Square Root	
$\text{cbrt}(\text{input})$	Cube Root	
$\log_e(\text{input})$	Natural Logarithm	
$\ln(\text{input})$	Natural Logarithm	
$\log(\text{base}, \text{input})$	Logarithm	example -> $\log(10, 25.125)$
$\log_{\langle \text{base} \rangle}(\text{input})$	Logarithm	example -> $\log_{10}(25.125)$
$\exp(\text{input})$	Exponential	
$\sin(\text{input})$	Sine	
$\cos(\text{input})$	Cosine	

<code>tan(input)</code>	Tangent
<code>csc(input)</code>	Cosecant
<code>sec(input)</code>	Secant
<code>cot(input)</code>	Cotangent
<code>sinh(input)</code>	Hyperbolic Sine
<code>cosh(input)</code>	Hyperbolic Cosine
<code>tanh(input)</code>	Hyperbolic Tangent
<code>csch(input)</code>	Hyperbolic Cosecant
<code>sech(input)</code>	Hyperbolic Secant
<code>coth(input)</code>	Hyperbolic Cotangent

<code>abs(input)</code>	Absolute Value
<code>floor(input)</code>	Floor
<code>ceil(input)</code>	Ceiling
<code>mod(inputA, inputB)</code>	Modulus
<code>quot(inputA, inputB)</code>	Quotient

<code>bnot(input, bitLength)</code>	Bit/Binary Not
<code>bshl(input, numberOfBits)</code>	Bit/Binary Shift Left
<code>bshr(input, numberOfBits)</code>	Bit/Binary Shift Right
<code>brotl(input, numberOfBits)</code>	Bit/Binary Rotate Left
<code>brotr(input, numberOfBits)</code>	Bit/Binary Rotate Right

### Constants (built in):

e  
pi

### Read-Only Variables (built in):

<code>ans</code>	last answer
<code>answer</code>	last answer

### Brackets:

( Open Bracket  
) Close Bracket

## Numbers:

Numbers represented by the characters 0-9 A-Z a-z will be accepted according to the current number base selected.

A-Z and a-z are equivalent for representing numbers (case insensitive). Numbers starting with A-Z or a-z must have a 0 (zero) appended to the start so they can be recognized as numbers.

## Variables:

Variables are case sensitive and may consist of the characters 0-9, A-Z, a-z.

Variables must start with a character A-Z or a-z and must not be named the same as any built in constants, variables or functions.

For example, the following variable names are valid:

x  
MyVariable  
oranges10

The following variable names are NOT valid:

sqrt  
10apples  
ans

## Variable commands (the following does not apply to worksheets):

delete <variable name>  
delete all

For example if you declared the variable named "Result" as follows.

Result = 65

To delete this variable, you would type the following into the input text box and then press enter/return:

delete Result

The variable will be deleted and you will see it removed from the variable list.

## Order of Evaluation

When evaluating an expression there is a default order of evaluation for the various operators and functions. Brackets can be used to force the order of evaluation to be different to the default order of evaluation shown below.

Note:

- Items listed first have higher precedence.
- Items on the same line have equal precedence. When items equal precedence they are evaluated left to right.

Brackets	( )
Functions	functionName(variable1, variable2...variableN)
Unary +ve/-ve	+, -
Factorial	!
Exponentiation	^
Multiply/Divide	*, /
Add/Subtract	+, -
Bit AND/NAND	band, bband
Bit XOR/XNOR	bxor, bxnor
Bit OR/NOR	bor, bnor
Assignment	=

## Keyboard Shortcuts

You can press the following keyboard combinations instead of using the menus:

Control-Q or Command-Q:	Quit/exit the program.
Control-N or Command-N:	Create a new worksheet file.
Control-O or Command-O:	Open a worksheet file.
Control-U or Command-U:	Show the Unit converter.
Control-R or Command-R:	Show the Radix converter.
Control-T or Command-T:	Show the Text converter.
Control-F or Command-F:	Show the Finance window.
Control-M or Command-M:	Switch between Tiny Mode and Full Mode.
Control-H or Command-H:	Shows the Help window.

Control-Backspace or Command-Backspace clears the input/output (history) whilst in the main window:

## Extra Features, Tips and Tricks

### Auto-convert and display results to common radices.

Press the shift key in addition to pressing enter/return when evaluating expressions to display the result in common radices (binary, octal, decimal, hexadecimal).

### Press enter/return when the input text box is empty.

"ans" will automatically be inserted into the input text box.

### Press ctrl/command and backspace/delete.

The input and output text boxes will be cleared.

## Any Questions/Suggestions/Feedback?

Your feedback and suggestions are welcomed. Feel free to send a message to Haxial using the form on this webpage:

<http://www.haxialsoftware.com/contact/>

## Please Support the Development of this Product

Please support the development of this program and other Haxial products by paying for it. Haxial Calculator is not free, but it only costs \$15. Your money funds the development of this product. You can pay at the Haxial website, which is <http://www.haxialsoftware.com/>. Thank you.

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