

# Maple 14 Quick Reference Card

Windows® version

## Document Mode vs. Worksheet Mode

Maple offers two primary modes of problem entry and content creation: Document mode and Worksheet mode. Both modes have respective advantages and you can easily switch from one mode to the other for maximum flexibility.

Document Mode	Worksheet Mode
<ul style="list-style-type: none"><li>Quick problem-solving and free-form, rich content composition</li><li>No prompt (<math>\Rightarrow</math>) displayed</li><li>Math is entered and displayed in 2-D</li><li>Solve math problems with right-click menu on input and output</li></ul>	<ul style="list-style-type: none"><li>Traditional Maple problem-solving environment</li><li>Enter problems at a prompt (<math>\Rightarrow</math>)</li><li>Math entered and displayed in 2-D or 1-D</li><li>Press <math>\left[ \text{Enter} \leftarrow \right]</math> to evaluate expression</li><li>Solve math problems with right-click menu on math expressions</li></ul>
Document mode lets you create rich content. For example, the following solves for $x$ without any commands: $\frac{x-2}{\alpha} = 1 \xrightarrow{\text{solve for } x} [[x = 2 + \alpha]]$	The command to perform the same operation can be entered in 2-D Math: $\left[ \begin{array}{l} > \text{solve}\left(\frac{x-2}{\alpha}=1, x\right) \\ & 2 + \alpha \end{array} \right]$ or in 1-D Maple notation: $\left[ \begin{array}{l} > \text{solve}((x-2)/\alpha=1, x); \\ & 2 + \alpha \end{array} \right]$
Toggle Math/Text entry mode $\left[ \text{F5} \right]$ or $\left[ \text{Text} \right]$ $\left[ \text{Math} \right]$ $\left[ \text{Text} \right]$ $\left[ \text{Math} \right]$ on toolbar	Toggle 2-D/1-D Math entry mode $\left[ \text{F5} \right]$ 2-D black font, 1-D red font
Evaluate math expression and display result inline $\left[ \text{Ctrl} \right] \left[ = \right]$	Evaluate math expression and display result on new line $\left[ \text{Enter} \leftarrow \right]$
Evaluate math expression and display result on new line $\left[ \text{Enter} \leftarrow \right]$	Continue on next line without executing $\left[ \text{Shift} \right] \left[ \text{Enter} \leftarrow \right]$
Switch to Worksheet mode (insert prompt) $\left[ \Rightarrow \right]$ on toolbar	Switch to Document mode <b>Format <math>\rightarrow</math> Create Document Block</b>
Show hidden commands <b>View <math>\rightarrow</math> Expand Document Block</b>	Hide commands. Show only results. Highlight commands to be hidden. <b>Format <math>\rightarrow</math> Create Document Block</b>

## Common Operations Available in Both Document and Worksheet Modes

Display quick help	$\left[ \text{F1} \right]$ for <b>Quick Help</b> . $\left[ \text{Ctrl} \right] \left[ \text{F2} \right]$ for <b>Quick Reference Card</b> (this guide)
Refer to previous result using equation numbers	$\left[ \text{Ctrl} \right] \left[ \text{L} \right]$ then enter equation number in dialog
Recompute calculations within a line	$\left[ ! \right]$ on toolbar
Recompute all calculations in a document	$\left[ !!! \right]$ on toolbar
Symbol selection, e.g. $\epsilon$	Enter leading characters $\left[ \text{Esc} \right]$ (or $\left[ \text{Ctrl} \right] \left[ \text{Space} \right]$ ) e.g. <b>eps</b> $\left[ \text{Esc} \right]$
Command completion, e.g. Lambert W function	Enter leading characters $\left[ \text{Esc} \right]$ (or $\left[ \text{Ctrl} \right] \left[ \text{Space} \right]$ ) e.g. <b>Lamb</b> $\left[ \text{Esc} \right]$
Perform context operation on math expression	<b>Right-click</b> any math expression
Insert prompt	$\left[ \Rightarrow \right]$ on toolbar
Insert text paragraph	$\left[ \text{T} \right]$ on toolbar
Drag a copy of an expression to a new location	Highlight the expression, hold $\left[ \text{Ctrl} \right]$ , and drag to a new location

## 2-D Math Editing Operations, Keyboard Shortcuts, and Operations

Navigate through expression	<div><div>←</div><div>↓</div><div>→</div><div>↑</div></div>					
Move cursor to different level in expression, e.g. out of exponent	<div><div>⇨</div></div>					
Navigate through placeholders	<div><div>Tab</div></div>					
Add, remove, rearrange palettes	View → Palettes → Arrange Palettes or right-click palette					
Fraction $\frac{x}{y}$ , superscript $x^n$ , subscript $x_n$	<b>x/y</b> , <b>x^n</b> , <b>x_n</b>					
Prime notation for derivatives, e.g. $y'' + y' = 0$ for $\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$	<b>y''</b> + <b>y'</b> = 0					
Square root $\sqrt{x}$ , $n$ th root $\sqrt[n]{x}$	Enter leading characters <b>sqrt</b> <div><div>Esc</div></div> , <b>nthroot</b> <div><div>Esc</div></div>					
Symbol above, e.g. $\vec{x}$	<b>x</b> <div><div>Ctrl</div></div> <div><div>Shift</div></div> <div><div>↑</div></div> then insert symbol, e.g. <div><div>⇨</div></div> from <b>Arrows</b> palette					
To enter literal characters ( <code>_</code> , etc.), precede character with <code>\</code> (backslash)	e.g. <b>foo\_bar</b> produces <b>foo_bar</b>					
Greek letter entry mode (single letter)	<div><div>Ctrl</div><div>Shift</div><div>G</div></div>					
Special characters and symbols: Enter leading characters and <div><div>Esc</div></div>	<div><div><math>\pi, \theta, i</math></div><div><math>\infty</math></div></div>			<div><div><math>\pi, \theta, i</math></div><div><b>infin</b></div></div>	<div><div><math>\alpha, \lambda</math></div><div><math>\geq, \leq, \neq, \pm</math></div></div>	<div><div><b>alpha, lambda</b></div><div><b>geq, leq, ne, pm</b></div></div>

## Expressions vs. Functions

Operations	Expression $x^2+y^2$	Function (operator) $g(x,y) = x^2+y^2$
Definition	$f := x^2 + y^2;$	$g := (x,y) \rightarrow x^2+y^2;$
Evaluate at $x=1, y=2$	$\text{eval}(f, [x=1,y=2]);$ produces 5	$g(1,2);$ produces 5
3-D plot for $x$ from 0 to 1, $y$ from 0 to 1	$\text{plot3d}(f, x=0..1, y=0..1);$	$\text{plot3d}(g(x,y), x=0..1, y=0..1);$
Conversion to other form	$f2 := \text{unapply}(f, x, y);$ $f2(1,2);$ produces 5	$g2 := g(x,1);$ $g2 + z;$ produces $x^2+1+z$

## Important Maple Syntax

$:=$ Assignment	$a:=2; b:=3+x; c:=a+b;$ produces $5 + x$ for $c$
$=$ Mathematical equation	$\text{solve}(2*x + a = 1, x);$ produces $x = \frac{1-a}{2}$
$=$ Boolean equality	$\text{if } a = 0 \text{ then } \dots$
Suppress display of output	Terminate command with a colon, e.g. $1000! :$
[ ] List (ordered)	$z := [c, b, a]; z[1];$ produces $c$
{ } Set (unordered, no duplicates)	$\{a, b, a, c\};$ produces $\{a, b, c\}$
Display help on topic	?topic



## Mathematical Operations

Common manipulations (simplify, factor, expand,...)	Right-click expression and select from menu
Solve equations	Right-click equation $\rightarrow$ <b>Solve</b>
Solve numerically (floating-point)	Right-click equation $\rightarrow$ <b>Numerically Solve</b>
Solve ODE	Right-click DE expression $\rightarrow$ <b>Solve DE Interactively</b>
Integrate, differentiate	Right-click expression $\rightarrow$ <b>Integrate</b> or <b>Differentiate</b>
Evaluate expression at a point	Right-click expression $\rightarrow$ <b>Evaluate at a Point</b>
Create a matrix or vector	Matrix palette $\rightarrow$ <b>Choose</b> $\rightarrow$ <b>Insert</b>
Invert, transpose, solve matrix	Right-click matrix $\rightarrow$ <b>Standard Operations</b> $\rightarrow$ select <b>Inverse, Transpose, ...</b>
Evaluate as floating-point	Right-click expression $\rightarrow$ <b>Approximate</b>
Various operations and tasks	Use Task Templates: <b>Tools</b> $\rightarrow$ <b>Tasks</b> $\rightarrow$ <b>Browse</b>


## Input and Output

Interactive data import assistant	<b>Tools</b> $\rightarrow$ <b>Assistants</b> $\rightarrow$ <b>Import Data</b>
Import audio or image file	<b>Tools</b> $\rightarrow$ <b>Assistants</b> $\rightarrow$ <b>Import Data</b>
Code generation (C, FORTRAN, Java, Visual Basic®, MATLAB®)	Right-click expression $\rightarrow$ <b>Language Conversions</b> . See ? <b>CodeGeneration</b> for help and details.
Publish document in HTML, PDF, LaTeX, or Microsoft® Word-RTF	<b>File</b> $\rightarrow$ <b>Export As</b> $\rightarrow$ select <b>HTML, PDF, LaTeX, or Rich Text Format</b>

## Plotting and Animation

Plot an existing expression	 - click expression $\rightarrow$ <b>Plots</b> $\rightarrow$ <b>Plot Builder</b>
Plot new expression	<b>Tools</b> $\rightarrow$ <b>Assistants</b> $\rightarrow$ <b>Plot Builder</b>
Add new expression to existing plot	Highlight and drag expression into plot
Add annotations to plots	Click on plot, then  on the toolbar
Animation and parameter plots for functions of several variables	Right-click expression $\rightarrow$ <b>Plots</b> $\rightarrow$ <b>Plot Builder</b> and select a plot type

## Units and Tolerances

Add units to value or expression	Place cursor to right of quantity. Use <b>Units (SI)</b> or <b>Units (FPS)</b> palette or right-click $\rightarrow$ <b>Units</b> $\rightarrow$ <b>Affix unit</b> .
Add arbitrary unit	 from <b>Units (SI)</b> or <b>Units (FPS)</b> palette and enter desired unit
Simplify units in an expression	Right-click expression $\rightarrow$ <b>Units</b> $\rightarrow$ <b>Simplify</b>
Convert units	Right-click expression $\rightarrow$ <b>Units</b> $\rightarrow$ <b>Convert</b>
Enable automatic units simplification	<b>with(Units[Standard]);</b>
Enable tolerance calculations	<b>with(Tolerances);</b>
Tolerance quantity in 2-D Math	$9 \text{ pm} \left( \text{unc} \right) 1.1$ for $9 \pm 1.1$
Tolerance quantity in 1-D Math	$9 \text{ &+;- } 1.1;$ for $9 \pm 1.1$

## Select Interactive Tools and Utilities

Quick introductory tour	<b>Help</b> $\rightarrow$ <b>Take a Tour of Maple</b>
Show available task templates	<b>Tools</b> $\rightarrow$ <b>Tasks</b> $\rightarrow$ <b>Browse</b>
Plot Builder	Right-click expression $\rightarrow$ <b>Plots</b> $\rightarrow$ <b>Plot Builder</b> , or <b>Tools</b> $\rightarrow$ <b>Assistants</b> $\rightarrow$ <b>Plot Builder</b>
ODE Analyzer	<b>Tools</b> $\rightarrow$ <b>Assistants</b> $\rightarrow$ <b>ODE Analyzer</b>
Data Analysis Assistant	<b>Tools</b> $\rightarrow$ <b>Assistants</b> $\rightarrow$ <b>Data Analysis</b>
Unit Conversion utility	<b>Tools</b> $\rightarrow$ <b>Assistants</b> $\rightarrow$ <b>Units Calculator</b>
Back-Solving Assistant	<b>Tools</b> $\rightarrow$ <b>Assistants</b> $\rightarrow$ <b>BackSolver</b>
Apply numeric formatting	Right-click expression $\rightarrow$ <b>Numeric Formatting</b>
Share Maple documents using the MapleCloud™ Document Exchange	<b>MapleCloud</b> palette
Maple Portal	<b>Help</b> $\rightarrow$ <b>Manuals, Resources and more</b> $\rightarrow$ <b>Maple Portal</b>
Manuals	<b>Help</b> $\rightarrow$ <b>Manuals, Resources, and more</b> $\rightarrow$ <b>Manuals</b>
Graphing Calculator Interface	Installs as separate program. Launch from <b>Start</b> $\rightarrow$ <b>Maple</b> $\rightarrow$ <b>Maple Calculator</b>
Interactive education tutors for topics in Calculus, Precalculus, and Linear Algebra	<b>Tools</b> $\rightarrow$ <b>Tutors</b>