

# Maple 10 Quick Reference Card

UNIX version

## Document Mode vs. Worksheet Mode

Maple 10 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>Press <math>\text{Ctrl} \text{ } [=]</math> to evaluate expression (inline results)</li> <li>Press <math>\text{Enter} \leftarrow</math> to evaluate expression (results on new line)</li> <li>Solve math problems with right-click menu on input and output</li> <li>Switch to Worksheet mode by inserting prompt</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>\text{Enter} \leftarrow</math> to evaluate expression</li> <li>Solve math problems with right-click menu on math expressions</li> <li>Switch to Document mode by creating document block</li> </ul>
Document mode lets you create rich content. For example, the following solves for $x$ without any commands: $\frac{x-2}{\alpha} = 1 \rightarrow \{x=2+\alpha\}$	<pre>&gt; solve(x-2=1,x)       2 + \alpha &gt; solve((x-2)/alpha=1,x);       2 + \alpha</pre>
Toggle Math/Text entry mode: $\text{F5}$ or $\text{Text}$ Math $\text{Text}$ Math on toolbar	Toggle 2-D/1-D Math entry mode: $\text{F5}$ 2-D black font, 1-D red font
Evaluate math expression and display result inline: $\text{Ctrl} \text{ } [=]$	Evaluate math expression and display result on new line: $\text{Enter} \leftarrow$
Evaluate math expression and display result on new line: $\text{Enter} \leftarrow$	Continue on next line without executing: $\text{Shift} \text{ } \text{Enter} \leftarrow$
Switch to Worksheet mode (insert prompt): $\text{Ctrl} \text{ } \text{>}$ on toolbar	Switch to Document mode: <b>Format</b> $\rightarrow$ <b>Create Document Block</b>
Show hidden commands: <b>View</b> $\rightarrow$ <b>Expand Document Block</b>	Hide commands. Show only results. <b>Format</b> $\rightarrow$ <b>Create Document Block</b>

## Common Operations Available in Both Document and Worksheet Modes

Display quick help	$\text{F1}$ for <b>Quick Help</b> . $\text{Ctrl} \text{ } \text{F2}$ for <b>Quick Reference Card</b> (this guide)
Refer to previous result using equation numbers	$\text{Ctrl} \text{ } \text{L}$ then enter equation number in dialog
Recompute calculations within a highlighted selection	<b>!</b> on toolbar
Recompute all calculations in a document	<b>!!!</b> on toolbar
Symbol selection, e.g. $\epsilon$	Enter leading characters $\text{Ctrl} \text{ } \text{Shift} \text{ } \text{Space}$ , e.g. <b>eps</b> $\text{Ctrl} \text{ } \text{Shift} \text{ } \text{Space}$
Command completion, e.g. Lambert W function	Enter leading characters $\text{Ctrl} \text{ } \text{Shift} \text{ } \text{Space}$ , e.g. <b>Lamb</b> $\text{Ctrl} \text{ } \text{Shift} \text{ } \text{Space}$
Perform context operation on math expression	<b>Right-click</b> any math expression
Insert prompt	$\text{Ctrl} \text{ } \text{>}$ on toolbar
Insert text paragraph	<b>T</b> on toolbar

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

Navigate through expression	$\leftarrow$ , $\downarrow$ , $\rightarrow$ , $\uparrow$								
Move cursor to different level in expression, e.g. out of exponent	$\rightarrow$								
Navigate through placeholders	$\text{Tab}$								
Add, remove, rearrange palettes	<b>View</b> $\rightarrow$ <b>Palettes</b> $\rightarrow$ <b>Arrange Palettes</b> 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. $y^n + y' = 0$ 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> $\text{Ctrl} \text{ } \text{Shift} \text{ } \text{Space}$ , <b>nthroot</b> $\text{Ctrl} \text{ } \text{Shift} \text{ } \text{Space}$								
Symbol above, e.g. $\vec{x}$	<b>x</b> $\text{Ctrl} \text{ } \text{Space}$ $\vec{\quad}$ then insert symbol, e.g. $\rightarrow$ from <b>Arrows</b> palette								
To enter literal characters ( $\_$ , $\^$ , etc.), precede character with $\backslash$ (backslash)	e.g. <b>foo\_bar</b> produces <b>foo_bar</b>								
Greek letter entry mode (single letter)	$\text{Ctrl} \text{ } \text{Shift} \text{ } \text{G}$								
Special characters and symbols: Enter leading characters and $\text{Ctrl} \text{ } \text{Shift} \text{ } \text{Space}$	<table border="1"> <tbody> <tr> <td><math>\pi</math>, <math>e</math>, <math>i</math></td> <td><b>pi</b>, <b>e</b>, <b>i</b></td> <td><math>\alpha</math>, <math>\lambda</math></td> <td><b>alpha</b>, <b>lambda</b></td> </tr> <tr> <td><math>\infty</math></td> <td><b>infin</b></td> <td><math>\geq</math>, <math>\leq</math>, <math>\neq</math>, <math>\pm</math></td> <td><b>geq</b>, <b>leq</b>, <b>ne</b>, <b>pm</b></td> </tr> </tbody> </table>	$\pi$ , $e$ , $i$	<b>pi</b> , <b>e</b> , <b>i</b>	$\alpha$ , $\lambda$	<b>alpha</b> , <b>lambda</b>	$\infty$	<b>infin</b>	$\geq$ , $\leq$ , $\neq$ , $\pm$	<b>geq</b> , <b>leq</b> , <b>ne</b> , <b>pm</b>
$\pi$ , $e$ , $i$	<b>pi</b> , <b>e</b> , <b>i</b>	$\alpha$ , $\lambda$	<b>alpha</b> , <b>lambda</b>						
$\infty$	<b>infin</b>	$\geq$ , $\leq$ , $\neq$ , $\pm$	<b>geq</b> , <b>leq</b> , <b>ne</b> , <b>pm</b>						

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## 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 $x=1, y=2$	<code>eval(f, [x=1,y=2]);</code> produces 5	<code>g(1,2);</code> produces 5
3-D plot for $x$ from 0 to 1, $y$ from 0 to 1	<code>plot3d(f,x=0..1,y=0..1);</code>	<code>plot3d(g(x,y),x=0..1,y=0..1);</code>
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

<code>:=</code> Assignment	<code>a:=2; b:=3+x; c:=a+b;</code> produces $5 + x$ for $c$
<code>=</code> Mathematical equation	<code>solve(2*x + a = 1, x);</code> produces $x = \frac{1-a}{2}$
<code>=</code> Boolean equality	<code>if a = 0 then ...</code>
Suppress display of output	Terminate command with a colon, e.g. <code>10001 :</code>
Display help on topic	<code>?topic</code>

## 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>Solve Numerically</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, LaTeX, or Microsoft® Word-RTF	<b>File</b> $\rightarrow$ <b>Export As</b> $\rightarrow$ select <b>HTML, LaTeX, or Rich Text Format</b>

## Plotting and Animation

Plot an existing expression	Right-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
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	[ <b>units</b> ] 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	with <b>(Units [Standard])</b> ;
Enable tolerance calculations	with <b>(Tolerances)</b> ;
Tolerance quantity in 2-D Math	<code>9 pm</code> <input type="text" value="Ctrl"/> <input type="text" value="Shift"/> <input type="text" value="Space"/> <code>1.1</code> for $9 \pm 1.1$
Tolerance quantity in 1-D Math	<code>9 &amp;+ - 1.1</code> ; 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>
Interactive Dictionary of Engineering and Mathematical terms	<b>Help</b> $\rightarrow$ <b>Manuals, Dictionary, and more</b> $\rightarrow$ <b>Dictionary</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>Unit Converter</b>
Manuals (Getting Started Guide, User Manual)	<b>Help</b> $\rightarrow$ <b>Manuals, Dictionary, and more</b> $\rightarrow$ <b>Manuals</b>
Interactive education tutors for topics in Calculus, Pre-calculus, and Linear Algebra	<b>Tools</b> $\rightarrow$ <b>Tutors</b>



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