Maple 15 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

- Quick problem-solving and free-form, rich content composition
- No prompt (>) displayed
- Math is entered and displayed in 2-D
- Solve math problems with **right-click** menu on input and output

Document mode lets you create rich content. For example, the following solves for x without any commands: $\frac{x-2}{\alpha}=1 \xrightarrow{\text{solve for x}} [[x=2+\alpha]]$

Worksheet Mode

- Traditional Maple problem-solving environment
- Enter problems at a prompt (>)
- Math entered and displayed in 2-D or 1-D
- Press Enter to evaluate expression
- Solve math problems with **right-click** menu on math expressions

The command to perform the same operation can be entered in 2-D Math:

```
> solve((x-2)/alpha=1,x)
                    2 + α
```

or in 1-D Maple notation:

```
> solve((x-2)/alpha=1,x);
                    2 + α
```

Toggle Math/Text entry mode	F5 or Text Math Text Math on toolbar	Toggle 2-D/1-D Math entry mode	F5 2-D black font, `1-D red font`
Evaluate math expression and display result inline	Ctrl =	Evaluate math expression and display result on new line	Enter
Evaluate math expression and display result on new line	Enter	Continue on next line without executing	Shift Enter
Switch to Worksheet mode (insert prompt)	[> on toolbar	Switch to Document mode	**Format ⟶ Create Document Block**
Show hidden commands	**View ⟶ Expand Document Block**	Hide commands. Show only results.	Highlight commands to be hidden. **Format ⟶ Create Document Block**

Common Operations Available in Both Document and Worksheet Modes

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

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

Navigate through expression	← ↓ → ↑
Move cursor to different level in expression, e.g. out of exponent	→
Navigate through placeholders	Tab
Add, remove, rearrange palettes	**View ⟶ Palettes ⟶ Arrange Palettes** or **right-click** palette
Fraction $\frac{x}{y}$, superscript x^n, subscript x_n	`x/y, x^n, x_n`
Prime notation for derivatives, e.g. $y''+y'=0$ for $\frac{d^2y}{dx^2}+\frac{dy}{dx}=0$	`y'' + y' = 0`
Square root $\sqrt{x}$, nth root $\sqrt[n]{x}$	Enter leading characters `sqrt` Esc, `nthroot` Esc
Symbol above, e.g. $\vec{x}$	`x` Ctrl Shift " then insert symbol, e.g. → from **Arrows** palette
To enter literal characters (_, ^, etc.), precede character with \ (backslash)	e.g. `foo\_bar` produces `foo_bar`
Greek letter entry mode (single letter)	Ctrl Shift G

Special characters and symbols: Enter leading characters and Esc

π, e, i	`pi`, `e`, `I`	α, λ	`alpha`, `lambda`
∞	`infin`	$\geq$, $\leq$, $\neq$, $\pm$	`geq`, `leq`, `ne`, `pm`

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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) -> x^2+y^2;`
Evaluate at x=1, y=2	`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	`plot3d(f,x=0..1,y=0..1);`	`plot3d(g(x,y),x=0..1,y=0..1);`

Conversion to other form	`f2 := 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	`solve(2*x + a = 1,x);` produces $x = \frac{1-a}{2}$
= Boolean equality	`if a = 0 then …`
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 ⟶ **Solve**
Solve numerically (floating-point)	**Right-click** equation ⟶ **Numerically Solve**
Solve ODE	**Right-click** DE expression ⟶ **Solve DE Interactively**
Integrate, differentiate	**Right-click** expression ⟶ **Integrate** or **Differentiate**
Evaluate expression at a point	**Right-click** expression ⟶ **Evaluate at a Point**
Create a matrix or vector	Matrix palette ⟶ **Choose** ⟶ **Insert**
Invert, transpose, solve matrix	**Right-click** matrix ⟶ **Standard Operations** ⟶ select **Inverse**, **Transpose**, …
Evaluate as floating-point	**Right-click** expression ⟶ **Approximate**
Various operations and tasks	Use Task Templates: **Tools** ⟶ **Tasks** ⟶ **Browse**

Input and Output

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

Plotting and Animation

Plot an existing expression	Ctrl - **click** expression ⟶ **Plots** ⟶ **Plot Builder**
Plot new expression	**Tools** ⟶ **Assistants** ⟶ **Plot Builder**
Add new expression to existing plot	Highlight and drag expression into plot
Add annotations to plots	**Click** on plot, then Drawing on the toolbar
Animation and parameter plots for functions of several variables	**Right-click** expression ⟶ **Plots** ⟶ **Plot Builder** and select a plot type

Units and Tolerances

Add units to value or expression	Place cursor to right of quantity. Use **Units (SI)** or **Units (FPS)** palette or **right-click** ⟶ **Units** ⟶ **Affix unit**.
Add arbitrary unit	[[*unit*]] from **Units (SI)** or **Units (FPS)** palette and enter desired unit
Simplify units in an expression	**Right-click** expression ⟶ **Units** ⟶ **Simplify**
Convert units	**Right-click** expression ⟶ **Units** ⟶ **Convert**
Enable automatic units simplification	`with(Units[Standard]);`
Enable tolerance calculations	`with(Tolerances);`
Tolerance quantity in 2-D Math	`9 pm` Esc `1.1` for 9 ± 1.1
Tolerance quantity in 1-D Math	`9 &+- 1.1;` for 9 ± 1.1

Select Interactive Tools and Utilities

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

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P-0778-15-E