Maple 12 Quick Reference Card

Windows® version

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 $x = \dfrac{1-a}{2}$
`=` 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 $\{a, c, b\}$
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, FORTRAN, Java, Visual Basic®, MATLAB®)	**Right-click** expression → **Language Conversions**. See **?CodeGeneration** for help and details.
Publish document in HTML, LaTeX, or Microsoft® Word-RTF	**File** → **Export As** → select **HTML, LaTeX,** or **Rich Text Format**

Plotting and Animation

Plot an existing expression	`Control` - **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 2-D 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 simplication	`with(Units[Standard]);`
Enable tolerance calculations	`with(Tolerances);`
Tolerance quantity in 2-D Math	`9` `pm` `Ctrl` `Space` `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**
Interactive Dictionary of Engineering and Mathematical terms	**Help** → **Manuals, Dictionary, and more** → **Dictionary**
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**
Manuals (Getting Started Guide, User Manual)	**Help** → **Manuals, Dictionary, and more** → **Manuals**
Graphing Calculator Interface	Installs as separate program. Launch from **Maple Calculator** icon on desktop.
Interactive education tutors for topics in Calculus, Precalculus, and Linear Algebra	**Tools** → **Tutors**

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P-0593-12-E

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Document Mode vs. Worksheet Mode

Maple 12 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
• Quick problem-solving and free-form, rich content composition	• Traditional Maple problem-solving environment
• No prompt (>) displayed	• Enter problems at a prompt (>)
• Math is entered and displayed in 2-D	• Math entered and displayed in 2-D or 1-D
• Solve math problems with **right-click** menu on input and output	• Press `Enter ←` to evaluate expression
	• Solve math problems with **right-click** menu on math expressions

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:

$$> solve\left(\frac{x-2}{\alpha}=1, x\right)$$
$$2+\alpha$$

or in 1-D Maple notation:
```
> solve((x-2)/alpha=1,x);
                2 + α
```

Action	Document Mode	Action	Worksheet Mode
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

Operation	Shortcut
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 `Ctrl` `Space` or `Esc` e.g. **eps** `Ctrl` `Space`
Command completion, e.g. Lambert W function	Enter leading characters `Ctrl` `Space` or `Esc` e.g. **Lamb** `Ctrl` `Space`
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

Operation	Shortcut
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 $\sqrt{x}$, *n*th root $\sqrt[n]{x}$	Enter leading characters `sqrt` `Ctrl` `Space`, `nthroot` `Ctrl` `Space`
Symbol above, e.g. $\vec{x}$	`x` `Ctrl` `Space` `` `' `` 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 `Ctrl` `Space`	π, e, i	pi, e, i	α, λ	alpha, lambda
	∞	infin	$\geq, \leq, \neq, \pm$	geq, leq, ne, pm