# Maple 10 Quick Reference Card

## Document Mode vs. Worksheet Mode

<table>
<thead>
<tr>
<th>Document Mode</th>
<th>Worksheet Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Quick problem-solving and free-form, rich content composition</td>
<td>• Traditional Maple problem-solving environment</td>
</tr>
<tr>
<td>• No prompt (&gt; displayed</td>
<td>• Enter problems at a prompt (&gt;</td>
</tr>
<tr>
<td>• Math is entered and displayed in 2-D</td>
<td>• Math entered and displayed in 2-D or 1-D</td>
</tr>
<tr>
<td>• Press ( \text{eval} ) to evaluate expression (inline results)</td>
<td>• Press ( \text{eval} ) to evaluate expression</td>
</tr>
<tr>
<td>• Press ( \text{eval} ) to evaluate expression (results on new line)</td>
<td>• Solve math problems with right-click menu on math expressions</td>
</tr>
<tr>
<td>• Solve math problems with right-click menu on input and output</td>
<td>• Switch to Document mode by creating document block</td>
</tr>
<tr>
<td>• Switch to Worksheet mode by inserting prompt</td>
<td></td>
</tr>
</tbody>
</table>

Document mode lets you create rich content. For example, the following solves for \( x \) without any commands:

\[
\frac{x - 2}{\alpha} = 1 \rightarrow (x = 2 + \alpha)
\]

<table>
<thead>
<tr>
<th>Configure Math/Text entry mode</th>
<th>Configure 2-D/1-D Math entry mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>or on toolbar</td>
<td>2-D black font, 1-D red font</td>
</tr>
</tbody>
</table>

Evaluate math expression and display result inline or on toolbar

Evaluate math expression and display result on new line or on toolbar

Switch to Worksheet mode (insert prompt) or on toolbar

Show hidden commands or on toolbar

### Common Operations Available in Both Document and Worksheet Modes

<table>
<thead>
<tr>
<th>Operation</th>
<th>Document Mode</th>
<th>Worksheet Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display quick help</td>
<td>( \text{Quick Help} )</td>
<td>( \text{Quick Help} )</td>
</tr>
<tr>
<td>Refer to previous result using equation numbers</td>
<td>( \text{previous result} ) then enter equation number in dialog</td>
<td>( \text{previous result} ) then enter equation number in dialog</td>
</tr>
<tr>
<td>Recompute calculations within a highlighted selection</td>
<td>( \text{Recompute} ) on toolbar</td>
<td>( \text{Recompute} ) on toolbar</td>
</tr>
<tr>
<td>Recompute all calculations in a document</td>
<td>( \text{Recompute all calculations} ) on toolbar</td>
<td>( \text{Recompute all calculations} ) on toolbar</td>
</tr>
<tr>
<td>Symbol selection, e.g. ( \varepsilon )</td>
<td>Enter leading characters ( \varepsilon )</td>
<td>Enter leading characters ( \varepsilon )</td>
</tr>
<tr>
<td>Command completion, e.g. Lambert W function</td>
<td>Enter leading characters ( \text{Lamb} )</td>
<td>Enter leading characters ( \text{Lamb} )</td>
</tr>
<tr>
<td>Perform context operation on math expression</td>
<td>Right-click any math expression</td>
<td></td>
</tr>
<tr>
<td>Insert prompt</td>
<td>( \text{Insert prompt} ) on toolbar</td>
<td></td>
</tr>
<tr>
<td>Insert text paragraph</td>
<td>( \text{Insert text paragraph} ) on toolbar</td>
<td></td>
</tr>
</tbody>
</table>

### 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**
- **Add, remove, rearrange palettes**
- **Add fraction, subscript, subscript**
- **Prime notation for derivatives, e.g. \( y'' + y' = 0 \)**
- **Square root, \( \sqrt[n]{x} \)**
- **Symbol above, e.g. \( \pi \)**
- **To enter literal characters (\_\_, \^\_, etc.), precede character with (backslash)**
- **Greek letter entry mode (single letter)**
- **Special characters and symbols:** Enter leading characters and static text
### Expressions vs. Functions

<table>
<thead>
<tr>
<th>Operation</th>
<th>Expression (x^2y^2)</th>
<th>Function (operator) (g(x,y) = x^2y^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>(f := x^2 + y^2;)</td>
<td>(g := (x,y) \rightarrow x^2+y^2;)</td>
</tr>
<tr>
<td>Evaluate at (x=1, y=2)</td>
<td>(eval(f, [x=1,y=2]);) produces 5</td>
<td>(g(1,2);) produces 5</td>
</tr>
<tr>
<td>3-D plot for (x) from 0 to 1, (y) from 0 to 1</td>
<td>(plot3d(f,x=0..1,y=0..1);)</td>
<td>(plot3d(g(x,y),x=0..1,y=0..1);)</td>
</tr>
<tr>
<td>Conversion to other form</td>
<td>(f2 := unapply(f,x,y);) (f2(1,2);) produces 5</td>
<td>(g2 :=) (</td>
</tr>
</tbody>
</table>

### 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 \(x = 1-\frac{a}{2};\)
- **= Boolean equality**
  - \(if\ a = 0 \ then \ ... \end;\)
- **Suppress display of output**
  - Terminate command with a colon, e.g. \(10001:\)
- **Display help on topic**
  - \(?topic\)

### Mathematical Operations

- **Common manipulations (simplify, factor, expand, ...)**
- **Solve equations**
  - Right-click expression and select from menu
- **Solve numerically (floating-point)**
  - Right-click expression, **Solve Numerically**
- **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 or 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, **Tasks > 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**
  - Right-click expression, **Plots > Plot Builder**
- **Plot new expression**
  - Tools > Assistants > Plot Builder
- **Add new expression to existing plot**
  - Highlight and drag expression into plot
- **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**
  - Insert 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**
  - \(9 \ pm\) \(1.1;\) for \(9 \pm 1.1\)
- **Tolerance quantity in 1-D Math**
  - \(9 \pm\) \(1.1;\) for \(9 \pm 1.1\)

### 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 > Unit Converter
- **Manuals (Getting Started Guide, User Manual)**
  - Help > Manuals, Dictionary, and more > Manuals
- **Interactive education tutors for topics in Calculus, Precalculus, and Linear Algebra**
  - Tools > Tutors