

# Mathcad®

## Create and Document Critical Engineering Calculations

Mathcad enables over 250,000 professionals worldwide to perform, document, manage and share calculation and design work. Mathcad's easy-to-use whiteboard interface combines live, natural mathematical notation, text and graphs into a single worksheet—making Mathcad ideal for knowledge capture, calculation, sharing and reuse. Mathcad lets individuals work with update-able, interactive designs, so users can capture the critical methods and values behind each of their engineering projects.

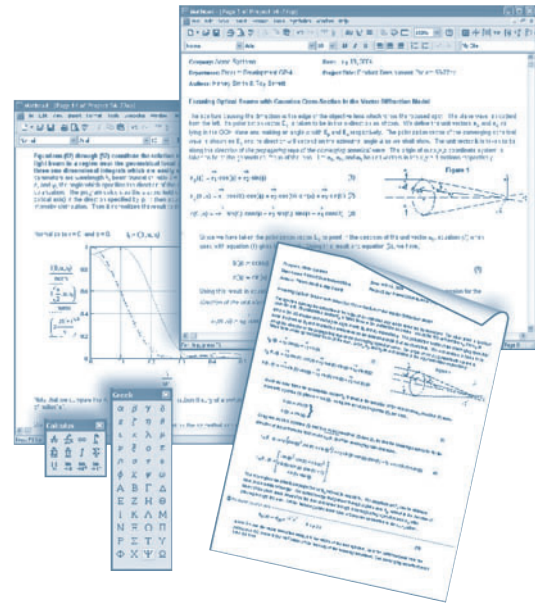
Mathcad's XML architecture enables organizations to go beyond powerful calculation. It delivers an open-engineering data model, enabling publishing, collaboration and integration, especially when deployed as an organizational standard. As engineers work, Mathcad automatically creates an auditable trail of documented calculations, thus simplifying compliance, reporting, verification and troubleshooting.

These capabilities have made Mathcad the world's most widely used engineering calculation tool.

### How Mathcad Works

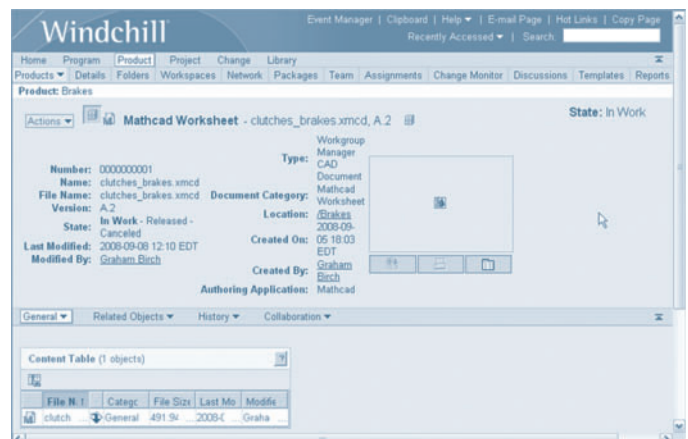
Mathcad lets you type equations just as you would write them on a blackboard or in a reference book. There is no difficult syntax to learn; you simply type in your equations and then see the results. You can use Mathcad equations to solve just about any math problem you can think of, symbolically or numerically. You can place text anywhere on the worksheet to document your work.

Mathcad lets you easily set your preferred unit system and freely mix units of measure, ultimately maintaining dimensional integrity and preventing unit mistakes. You can work in your preferred unit system, or switch to another system for a particular set of equations.



Mathcad lets you create engineering documents that clearly communicate technical work, and adhere to strict standards.

Mathcad simplifies and streamlines documentation, critical to communicating and meeting business and quality assurance standards. By combining equations, text and graphics in a single worksheet, Mathcad makes it easy to keep track of the most complex calculations. And, when used in conjunction with PTC's Windchill®, engineering calculations can be easily managed, standardized and shared across the organization.



Manage your Mathcad worksheets in Windchill, to capture, share and reuse engineering calculation IP.

## Key Features and Benefits

- Design of Experiments (DoE) - Reduce the time and expense of conducting experiments through DoE by understanding the variable interactions that will influence the experiment. DoE helps identify critical factors and optimal settings for a complex process. It provides templates for fewer, yet more intelligent experiments, which are indispensable when having multiple variables and levels.
- Direct access to trusted Roark's and Hick's reference works on Mathcad worksheets by Knovel®
- Direct access to Truenumbers enables you to communicate values across applications, without loss of quantity or unit integrity
- Calculate, model and visualize your technical ideas while reducing errors
- Update interactive designs for instant results
- Document your calculations using unit-aware math notation
- Graph and plot your work instantly with built-in 2D and 3D graphing tools
- Verify, visualize and annotate your solutions for all engineering disciplines
- Integrate your data across applications and systems
- Publish your results using a wide variety of output formats
- Reduce errors in your work with automatic unit checking
- Set your own default unit system and create your own units
- Automate your operations with templates and style sheets
- Import and export data easily
- Integrate with Pro/ENGINEER® to realize unique predictive engineering capabilities
- Integrate with Windchill PDMLink® and Windchill ProductPoint® to quickly and securely share and access knowledge contained in Mathcad worksheets

## Computational Capabilities

- Over 25 new DoE functions can be used for constructing experimental design matrices, developing statistical models, and performing Monte Carlo simulations.
- High-end numerics: Perform summations, products, derivatives, integrals and Boolean operations; apply trigonometric, exponential, hyperbolic and other functions and transforms.
- Live symbolics: Simplify, differentiate, integrate and transform expressions algebraically. Mathcad's patented live symbolics technology automatically recalculates algebraic solutions and allows you to use them in subsequent calculations.

- Vector and matrix handling: Manipulate vectors and arrays, and perform various linear algebra operations, such as finding eigenvalues and eigenvectors.
- Statistics and data analysis: Generate random numbers, calculate histograms, fit data to built-in and general functions, interpolate data, and build probability distribution models.
- Differential equation solving: Solve linear and non-linear systems of equations and boundary value problems; use solve blocks and natural notation to specify sets of constraints.
- Units support: Include units in calculations, perform unit conversions, and automatically check dimensions. Add domain-specific units. Convert results to any unit system or custom values. Currency units effectively document engineering cost and economic evaluations.

## Feature Details

- Math formats and display:
  - Real, imaginary and complex number support
  - Decimal, binary, octal and hexadecimal formats
  - Over 200 built-in units with user-defined default options
  - Support for creating user-defined unit systems
  - Engineering and scientific notation display
  - Mixed integer display
  - Explicit calculations enable variables to be displayed in the equations as defined values, improving visual audit and review of calculations
- Live math and symbolics capabilities:
  - Define and evaluate variables and functions numerically or symbolically
  - Manipulate, transform and extract information from matrices
  - Expand, factor and simplify expressions algebraically
- Built-in operators:
  - More than 17 arithmetic operators, 12 vector and matrix operators, and 5 summation and product operators
  - 2 derivative operators and 5 integration and limit operators
  - 9 evaluation operators
  - 10 Boolean operators
  - Customized, user-defined operator support
  - Arithmetic operations are IEEE-adherent

## “With the capabilities of Mathcad, a designer can improve productivity and enhance analysis capability with minimum effort.”

- Alan Victor, IBM, Applied Microwave & Wireless

- Graphing and visualization:
  - Standard engineering plot-types: x-y plots, a secondary y-axis, polar plots, bar charts, vector, contour, scatter and surface plots
  - 2D and 3D QuickPlot™ and plot annotation capabilities
  - Interactive plot zoom data point selection, and 3D angle adjustment
  - Detailed plot formatting for numbers, ticks, labels, line types, markers, etc.
  - Image viewer with support for BMP, GIF, JPG, PCX, TARGA, PGM, TIFF
  - Image manipulation (zoom/pan/crop, brightness/contrast, rotate/flip/transpose, etc.)
  - Animation of plots or any calculation
- Built-in functions:
  - 80+ core mathematical functions and 10 discrete transform functions
  - 110+ statistics, probability and data analysis functions
  - 18 differential equation and partial differential equation solvers
  - 25+ functions for Design of Experiment
  - 28 file access functions
  - 14 expression-type and string functions
  - 18 finance functions
  - 13 symbolic functions, including numer and denom, for algebraic calculations
  - Data analysis
  - Image and signal processing
  - Vector matrices
  - Plus another 600 functions
- Application customization and extensibility:
  - Native XML file format for simple integration
  - Ability to add user-created functions created in C or C++
  - Embed, link and automate any OLE-compliant application or ActiveX control in Mathcad using VBScript™ or JScript™
  - Use OLE Automation and Visual Basic® to develop solutions incorporating Mathcad computations
- Solving capabilities:
  - 7 built-in functions for solving linear and non-linear systems and root-finding
  - 18 built-in functions for solving ordinary differential equations and partial differential equations
  - Solve block notation for solving systems of linear, non-linear, and differential equations in natural notation, along with constraints
  - Programming and parameterization for repeated solutions
- Document/text editing features:
  - Customizable spellchecker with technical terms database
  - Document templates and stylesheets
  - Hyperlinking
  - Hide, collapse and password lock
  - Support for UNICODE
  - Math font allows insertion of formulas directly into text portions of the worksheet
  - Header and footer that can be customized for a professional-looking document
- Usability features:
  - Automatic recalculation
  - Easy-to-use equation editor
  - Error tracing and redefinition warnings
  - Multi-step undo
  - Flexible data import features, supporting text and numerical entries, engineering format, real and complex data, cut and paste, and import from a wide variety of file formats (Excel®, fixed width, binary, etc.)
  - Enhanced error messages clarify source of problems
  - Program debugging capabilities
  - Comprehensive units support
  - Autosave function
- File formats, publishing and Web support:
  - Save as HTML, XHTML and RTF formats
  - Convert files to Adobe Acrobat® PDF
  - Truenumbers enables outputs to be moved to any publishing format without losing context or integrity

- Data exchange features:
  - Enhanced data exchange with Excel 2007 integration
  - Native XML file format for simple data exchange
  - Data Import Wizard
  - Data import for .mat files, Excel files, Lotus® 1-2-3, ASCII, binary and others
  - Microsoft® Access, FoxPro®, and SQL-supported databases, as well as ODBC connectivity
- Integration with Pro/ENGINEER
  - Bidirectional integration enables efficient and accurate data exchange between applications
  - Supports dynamic, live updates to calculations and CAD models
  - Values or results of calculations performed in Mathcad drive parameters and dimensions in the CAD model
  - CAD parameters and dimensions can be sent to Mathcad as inputs to calculations
  - Support for units and units conversion
- Integration with Windchill
  - Effectively manage Mathcad worksheets
  - Check-in and check-out Mathcad worksheets from either the Mathcad or Windchill user interface
  - Quickly search attribute labels and contents of Mathcad worksheets stored within Windchill
  - Preserve and access all versions of worksheets
  - Improves management and tracking of Mathcad - Pro/ENGINEER dependencies
- Connectivity with other applications, including:
  - Built in integration with Microsoft Excel
  - Built in integration with MathWorks MATLAB®
  - National Instruments® LabVIEW™
  - Bentley MicroStation®
  - ANSYS® Workbench™
- Resources:
  - Direct access to Knovel Math content
  - References tables, key formulas and constants
  - Technical support knowledgebase
  - Detailed tutorials across all Mathcad functionality
  - Easy-to-use online help with Search and Index
  - More than 300 QuickSheets for standard analyses and tasks

- 11 language dictionaries
- User forums and Web Library
- Active maintenance customers receive one year of maintenance support

## Specifications

### Client Hardware Requirements

- Pentium®/Celeron® processor, 400 MHz or higher; 700+ MHz recommended
- 256 MB of RAM; 512 MB or more recommended
- 550 MB of hard disk space (250 MB for Mathcad, 100 MB for prerequisites, 200 MB temporary space during installation)
- CD-ROM or DVD drive (for CD installation only)
- SVGA or higher graphics card and monitor
- Mouse or compatible pointing device

### Client Software Requirements

- Windows® XP SP3 and Windows Vista®

### Server Requirements for Volume License Deployment

Requirements for Mathcad network installations Acreesso™ FLEXnet® requirements (licensing management solution):

- PC with Pentium/Celeron, 300 MHz or higher; 400+ MHz recommended
- Windows XP SP1 or later
- At least 150 MB of hard disk space
- CD-ROM or DVD drive
- SVGA or higher graphics card and monitor
- Mouse or compatible pointing device

Acreesso FLEXnet requirements (software license management for an organization's user base):

- Windows XP SP1 or later
- 16 MB free memory (for license management process)
- 9 MB of hard disk space (not including log file)
- CD-ROM or DVD drive
- SVGA or higher graphics card and monitor
- Mouse or compatible pointing device

### Learn More About Mathcad

For more information on Mathcad, visit [www.ptc.com/go/mathcad](http://www.ptc.com/go/mathcad).

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