

# mathcad → 13

With engineering teams using Mathcad 13 as the centerpiece of a Calculation Management solution, organizations can easily capture, manage, share, and profit from valuable engineering information. Mathcad improves the process of calculation and design, significantly improving on-time product development, regulation compliance, and innovation.

Design and document engineering work simultaneously with complete math functionality and unique, unit-aware calculations for excellent results and significant productivity gains.

## OVERVIEW

**More than 1.8 million individuals use Mathcad to perform, document, and share calculation and design work. The unique Mathcad visual format and easy-to-use, scratchpad interface integrate standard mathematical notation, text, and graphs in a single worksheet—making Mathcad ideal for knowledge capture, calculation reuse, and engineering collaboration. Mathcad lets individuals work with updateable, interactive designs, allowing them to 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, integration, and search capabilities, especially when deployed as an organizational standard. As engineers work, Mathcad automatically creates an auditable trail documenting where calculations/math/data originated, 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 as you're used to seeing them on a blackboard or in a reference book. There is no difficult syntax to learn; you simply type in your equations, then they display with the results. You can use Mathcad equations to solve just about any math problem you can think of, symbolically

## HIGHLIGHTS

- 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
- Store, track, and review technical information, data, and solution values
- 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 units and add your own unit types
- Automate your operations with templates and stylesheets
- Import and export data easily
- Annotate work for search and traceability of equations, results, units, and more

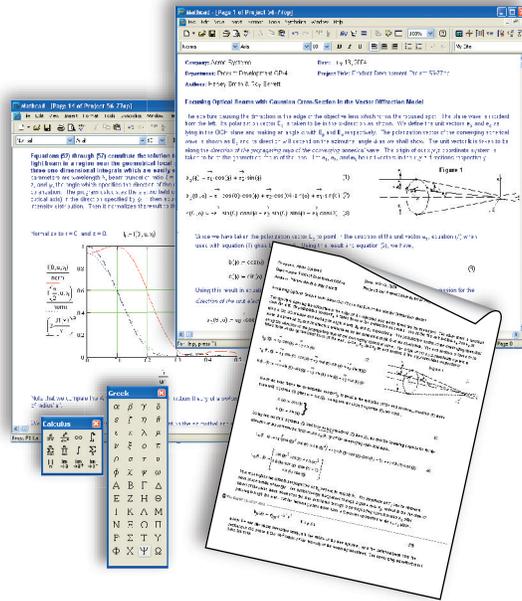
or numerically. You can place text anywhere on the worksheet to document your work.

Mathcad lets you easily mix and convert between unit systems, catching unit mistakes by checking your worksheets for dimensional consistency. You can work in your preferred unit system, or switch to another system for a particular set of equations.

Mathcad simplifies and streamlines documentation, critical to communicating and to 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. By saving your worksheets in XML format, you can reuse the information in other text-based systems, or search and report on worksheets without needing to reopen them in Mathcad.

## COMPUTATIONAL CAPABILITIES

- **High-end numerics:** Performs summations, products, derivatives, integrals, and Boolean operations; applies trigonometric, exponential, hyperbolic, and other functions and transforms.
- **Live symbolics:** Simplifies, differentiates, integrates, and transforms expressions algebraically; Mathcad's patented live symbolics technology automatically recalculates algebraic solutions and allows you to use them in subsequent calculations.



Create engineering documents that effectively communicate technical work and adhere to strict standards. Rich report and document preparation features let you easily create publication-quality documents.

- **Vector and matrix handling:** Manipulates arrays and performs various linear algebra operations, such as finding eigenvalues and eigenvectors.
- **Statistical and data analysis:** Generates random numbers or histograms, fits data to built-in and general functions, interpolates data, and builds probability distribution models.
- **Differential equation solving:** Supports ordinary and partial differential equations, systems of differential equations, and boundary value problems both at the command line and in solve blocks that use natural notation to specify the differential equations and constraints.
- **Convenient unit and variable handling:** Handles real and complex numbers with or without associated units.

## FEATURE DETAILS

- **Math formats and display:**
  - Real, imaginary, and complex number support
  - Decimal, binary, octal, and hexadecimal formats
  - 18 built-in units with user-defined default options
  - Support for creating user-defined unit systems
  - Engineering and scientific notation display
  - Mixed integer display

- Improved distinction of subscript characters
- New 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

### • Graphing and visualization:

- x-y plots, a secondary y-axis, polar plots, bar charts, vector, contour, scatter, and surface plots
- 2-D QuickPlot™ and plot annotation capabilities
- 3-D graph rendering and properties formatting
- More color options available in an easy-to-use menu
- Image viewer with support for BMP, GIF, JPG, PCX, TARGA, PGM, TIFF
- Image manipulation functionality (zoom/pan/crop, brightness/contrast, rotate/flip/transpose, etc.)
- Better line and symbol markers enhance 2D plot graphics

### • 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
- 28 file access functions
- 14 expression-type and string functions
- 18 finance functions
- Optimized genfit algorithm for faster calculation time and increased accuracy for certain model 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 & Visual Basic® to develop solutions incorporating Mathcad computations
- New software development kit (SDK) for building custom C++ components for integrating with third-party applications inside Mathcad
- Support for setting user's own function libraries

### • Solving capabilities:

- 7 built-in functions for system solving and root-finding
- 18 built-in functions for solving ordinary differential equations and partial differential equations
- Solve block notation for solving systems of linear, nonlinear, and differential equations in natural notation, along with constraints

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

- Alan Victor, IBM, Applied Microwave & Wireless

- Optimized linear algebra routines for faster calculation time; extended form of the eigenvecs function provides left- and right-handed eigenvector matrices; extended Isolve routine provides functionality equivalent to Find solve blocks in command line form
- Programming and parameterization for repeated solutions
- **Document/text editing features:**
  - Customizable spell checker with technical terms database
  - Document templates and style sheets
  - Hyperlinking
  - Hide, collapse, and encrypted password lock
  - Support for multi-byte (international) character sets
  - Right-click menu for inserting math regions into text regions
  - Drag-select a series of regions simultaneously
  - Lengthened scroll distance
- **Usability features:**
  - Automatic unit tracking and conversion
  - New support for custom units such as degrees (both Fahrenheit and Celsius), decibels, and more
  - Automatic recalculation
  - Easy-to-use equation editor
  - Error tracing and redefinition warnings
  - Multi-step undo
  - Mixed format numerics, import, cut and paste (strings,

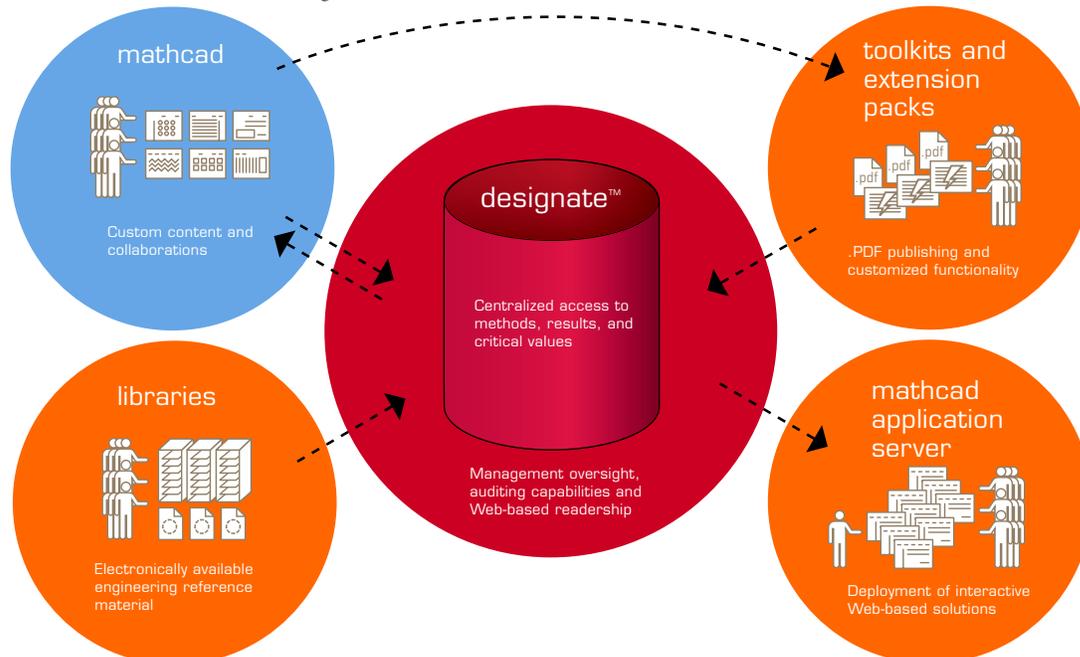
- complex, engineering notation, real numbers)
- Enhanced error messages clarify source of problems
- New program debugging capabilities
- Comprehensive units support
- Autosave function for specific time intervals
- Improved formatting for better presentation and auditing

- **File formats, publishing, and Web support:**
  - Save as HTML, XHTML, and XSL-FO formats
  - Save as Adobe Acrobat® PDF
  - HTTP file open support
  - Save to RTF retaining region positioning for Microsoft® Word
  - Publish worksheets to the Mathcad Application Server
- **Data exchange features:**
  - 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
  - Real-time data acquisition from National Instruments® analog I/O boards, and Measurement Computing (formerly ComputerBoards) analog boards
  - Microsoft® Access, FoxPro, and SQL-supported databases as well as ODBC connectivity
  - Enhanced Excel data exchange and integration
- **Connectivity with other applications, including:**
  - Microsoft® Excel and PowerPoint
  - Visual Solutions® VisSim
  - MathWorks MATLAB®
  - National Instruments® LabVIEW™
  - Intergraph® SmartSketch
  - Autodesk® AutoCAD
  - Dassault Systèmes (DSS)/IBM's CATIA™
  - SolidWorks 2005 3D CAD
  - Bentley Microstation®
  - ANSYS Workbench™

## PART OF THE CALCULATION MANAGEMENT SUITE

The Calculation Management Suite™ component diagram

Mathcad is a key component of the Calculation Management Suite. Contact your Mathsoft account manager or authorized distributor for more details on the Calculation Management Suite.



• **Resources:**

- References tables, key formulas and constants
- Technical support knowledgebase
- Online tutorials and discipline-specific examples
- 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

**SOFTWARE ASSURANCE**

Mathsoft continues to evolve and improve its software product line as well as facilitate deployment. An important part of maintaining a business edge is the ability to keep software and technological assets current in the most cost-effective manner possible.

This is why Software Assurance is a powerful resource to help your organization maximize Mathcad to all users, including those who are working from home offices.

- Annual service plan
- Priority support for up to two designated IT contacts and includes interim software updates, service releases and major upgrades
- Unlimited access to technical support via telephone, email, fax, or the extensive Mathcad Knowledge Base.
- Home-use policy allows Mathcad to be installed on home PCs at no extra charge
- All Mathcad releases will be made available at no additional charge during the terms of the plan.



With 20 years of experience, Mathsoft Engineering & Education, Inc. provides comprehensive solutions that streamline the engineering process in a way that can be documented, verified and reused, enabling engineering and product innovation.

[www.mathsoft.com](http://www.mathsoft.com)

**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 2000 SP4, Windows XP SP2 or later

**The following requirements are available on the Mathcad CD:**

- Microsoft .NET Framework® 1.1
- MSXML 4.0 SP2 or later
- Microsoft Data Access Components 2.6 or later
- Internet Explorer 6.0
- Adobe Acrobat Reader 7.0

**Server Requirements for Volume License Deployment**

*Requirements for Mathcad network installations*

*Macrovision FLEXlm® requirements (licensing management solution):*

- PC with Pentium/Celeron, 300 MHz or higher, 400+ MHz recommended
- Windows 2000 SP4, XP 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

*Macrovision® Flexlm requirements (software license management for an organizations' user base):*

- Windows 2000 SP4, XP 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

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