Math Suite Millennium
Build 1, 09.2001

Helpful Hints

You will find helpful hints, notes and extra information like this throughout the documentation. These helpful hints will always be found on the left margin.

Did you know?

Math Suite Millennium, Build 1 is the successor to the SR2 release of the TI-Source Math Suite 2000, Second Series.

The name was changed for two reasons. First, the 'TI' in 'TI-Source' conflicted with Texas Instrument's trademark.

The second reason the name was changed was to reflect the enormous changes in the software. Most of the code was completely rewritten from the ground up.

What is '*Math Suite Millennium*'?

Math Suite Millennium, hereafter referred to as *MSM*, is a large, integrated collection of advanced mathematics graphing calculator software. Designed to be highly capable, efficient, easy to use, and completely cross-compatible with the TI-89 and TI-92 Plus (including all AMS and hardware versions).

Many different types of programs and utilities have been developed for advanced graphing calculators, like the TI-89 and TI-92 Plus. Most of these programs are very small and usually perform a very little purpose. They normally aren't documented very well (sometimes not at all), and can be very difficult or awkward to use. The goal of *Math Suite Millennium* is to provide an integrated collection of useful applications that enhance the abilities of the graphing calculator itself.

In addition, the documentation included with this collection aims to be one of the most in-depth, valuable graphing calculator software manuals to date (what good is a program that no one knows how to use?).

What's so different about it?

There are a lot of major changes in *Math Suite Millennium* since *TI-Source Math Suite 2000*. Most components of the software have been completely rewritten and redesigned. Other parts have been removed and new parts and features have been added for efficiency, compatibility and practicality. *Math Suite Millennium* is also completely compatible with all AMS and hardware versions on both the TI-89 and TI-92 Plus. For a more detailed list of features, check the feature list later in the document.

Unlike versions of the discontinued *TI-Source Math Suite 2000, Math Suite Millennium* no longer contains a lesser and greater version (such as *compact* and *plus*). Instead, the software comes in one big, single package.

In addition, a TI-92 version of *Math Suite Millennium* has not been developed. This is due to several factors:

No TI-92 Version

- **Limited Memory:**
  The TI-92 has an extremely limited memory capacity when compared to the TI-89 and TI-92 Plus. Adding additional features to the TI-92 version would only compromise calculator performance.
- **Internal Limitations:**
  Second, limitations in the TI-92 itself make accomplishing certain programming and mathematical tasks difficult.
- **Lack of Time:**
  Most importantly, it would take too much time to develop an additional TI-92 version.

If you would like a version for the TI-92, please download the *TI-Source Math Suite 2000, Second Series SR2*, which can be found at

http://www.ticalc.org/, author's home page (check *readme.txt*), or from other various web sites.

Where do I go from here?

You are encouraged to read through the remaining portions of this documentation, which includes a complete installation and usage guide. Try the included calculator software.

This software is *freeware*, which means you may use it as long as you wish without paying for it! If you wish, you may distribute the entire unmodified package, provided you don't charge a fee for it (please let the author know when you post MSM for download on other sites, so the download list can be updated).

If you have questions, suggestions, comments or concerns about *Math Suite Millennium*, don't hesitate to email the author/programmer, Jason S. Bailey at jasonsbailey@yahoo.com.

Extra Programs & Utilities

In the directory where MSM was extracted, you will find an *'extras'* folder. Inside this folder is a number of calculator program *extras* that have been included with this package. Some are math programs; some are not.

This documentation, or manual, does not cover installation or usage for these extra programs. You will find this information in a file called *'extras.pdf'* in the extras folder.

Quick Tip

If you're looking for something specific in this manual, use the program's 'Find' function.

Did you know?

At the end of each program's section is a *Frequently Asked Questions* section that deals with that specific program.

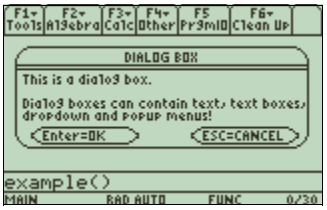
Table of Contents

Terms & Definitions

The following is a list of calculator terms and their definitions that you should know before reading further.

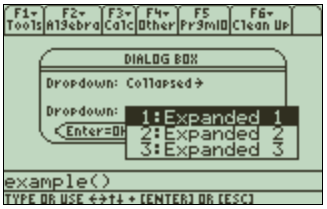
Dialog Box

A dialog box is a graphical box which can contain text, text boxes, drop-down and pop-up menus. Pressing Enter or Escape will close the dialog box and may perform a different action afterwards depending on the key pressed.



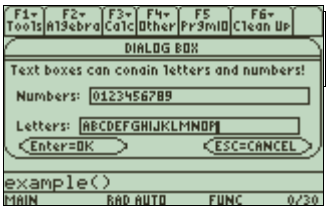
Drop-down Menu

A drop-down menu, found in dialog boxes, allows the user to select an option (by pressing the right arrow key) and expanding the list of predefined menu options. Once the menu is expanded, a pop-up menu appears (see below). After an option is selected, the menu is collapsed (pop-up menu disappears), and displays the selection made.



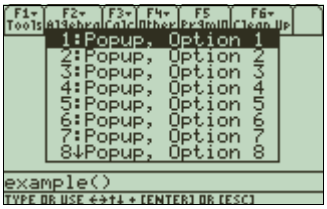
Text Box

A text box, found in dialog boxes, is a small rectangular box which allows the user to type characters, such as numeric values, or alphabetic entries. If the cursor is in a text box that has values in it, you may need to press Enter twice to close the dialog box and continue (once to highlight all of the text in the box).



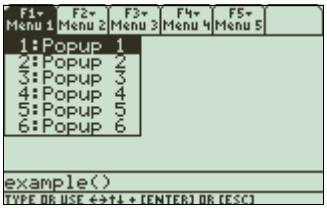
Pop-up Menu

A pop-up menu is a menu with selections arranged in a sort of vertically arranged list. With the up and down arrow keys, one can move a floating black bar to the selection of their choice and press Enter. Or, one can press the key which corresponds to the menu selection (to the left of the selection or option).



Toolbar Menu

A toolbar menu is horizontally arranged at the top of the screen. Selections are made using the function keys (F1, F2, etc.). Depending on the selection, some may display a pop-up menu directly below the toolbar menu selection. Other selections may perform an operation without displaying a pop-up menu (like *Quit (F5)* in most Suite programs).



Components & Features

Math Suite Millennium is a large collection of math programs and functions, each with their own unique list of features. Although a complete list would be too big to display here, a smaller, more condensed list is available below:

- **General (most programs)**
  Ability to save answers or variables used in calculation, view answers in exact or approximate form, access keyboard shortcuts. Enhanced error handling abilities.
- **Diagnostic & Repair**
  Scan the installation for errors, fix errors in registry matrix, scan for presence of system libraries, perform file scan to see if all files are present.
- **Quadratic / Poly Solver**
  Calculates equation's vertex, roots, discriminant, and direction the equation opens (up or down). Also includes a simple polynomial solver.
- **References Center**
  Contains over 35 algebra, calculus, geometry and trig formulas, theorems, and rules. View example graphs for topics such as hyperbolas, circles, linear equations, law of cosines, etc. Also provides access to the *Function Help* application.
- **Simultaneous Equation Solver**
  Solves an unlimited number of simultaneous equations, limited only by memory. Uses advanced paging system to display answers. Contains quick statistics on answers, such as mean, etc. Able to export answers to *Easy Stats Pro*.
- **Linear Equation Tool**
  Calculates information about the linear equation by entering the coordinates of points on the line, such as slope, distance, midpoint, axis intercepts, equation of the line, etc. Built-in Interpolate Editor. Works with 2D and 3D equations, and supports the ability to export answers to *Easy Stats Pro*. Graphs the resulting 2D or 3D equation.
- **Math Suite Manager**
  Provides quick and easy management of Suite options through a graphical interface. Features a efficient sending feature that allows easy transferring of the software to other calculators. Also provides access to all of the Suite applications, as well as keyboard programs that existed before Math Suite Millennium was installed.
- **Numeric Converter**
  Quick and easy unit conversions of any type. Convert binary, binary-coded-decimal, decimal, hexadecimal and octal bases. Convert between temperature units (Kelvin, Celsius, Fahrenheit, Rankine) or between other units of measure supported by the calculator. Also, perform rectangular or polar coordinate conversions.
- **Geometry / Trig Toolbox**
  Graphical triangle solver, Pythagorean theorem utility, trig operations (sine, cosine, arc-cosine, arc-cotangent, etc.), area and volume object utility (example: find the radius, area, circumference and diameter of a circle, etc.).
- **Calculus Toolbox**
  Using a single expression, calculate the anti-derivative, integral, 5-7 derivatives at once, taylor polynomial , limit, and implicit derivatives. Very easy to use.
- **Easy Stats Pro**
  An integration of all the calculator's statistical features, with an integrated list editor. Perform statistical regressions, one and two variable statistics, cumulative list sums, etc. Access TI-Stats Flash application's features. Import existing lists for analysis. Save data to list, or data plot. Also accepts automatic imports directly from other applications, such as the Linear Equation Tool.
- **Function Help**
  View in-depth usage information (and examples) for included Suite functions (such as arccot, binexp, trisolve, xroot, etc.). Acts as part of the References Center program.
- **Shortcuts**
  View keyboard shortcuts (if applicable) for all Suite applications 1-9.
- **Area & Volume Tool**
  Find additional information about 2D (circles, triangles, etc.) or 3D objects (cone, pyramid, sphere, etc.), given one or more values. For example, find the volume of a cone given the height and diameter of the base. Acts as part of the Geometry / Trig

Toolbox.

- **Arccot() function**
  Calculates the trigonometric arc-cotangent of a given value.
- **Arccsc() function**
  Calculates the trigonometric arc-cosecant of a given value.
- **Arcsec() function**
  Calculates the trigonometric arc-secant of a given value.
- **Base() function**
  Converts numeric values to other numbering systems, or bases. Supports binary, binary-coded-decimal, decimal, hexadecimal and octal numbering systems.
- **Binexp() function**
  Performs binomial expansion to binomial expressions.
- **Coord() function**
  Converts between rectangular and polar coordinate systems.
- **Cot() function**
  Calculates the trigonometric cotangent of a given value.
- **Csc() function**
  Calculates the trigonometric co-secant of a given value.
- **Frac() function**
  Displays expressional or numerical fractions as simplified and/or expanded fractions, reguardless of the calculator's *Exact/Approx* mode setting.
- **Implicit() function**
  Calculates the first order implicit derivative of the given equation by using the provided dependent and independent variables of the equation.
- **Inter() function**
  Given two points that exist on a line, interpolates additional values that exist on the same line
- **Sec() function**
  Calculates the trigonometric secant of a given value.
- **Trisolve() function**
  Given partial side and angle information of a triangle, attempts to solve for the existing side and angle values.
- **Xroot() function**
  Calculate any root of any number (example: finds the 3^{rd} root of 27).

By the way...

Amidst the rest of the guide, you will see screen captures (live pictures of a TI-89 or TI-92 Plus LCD screen) to help show you exactly how to perform the task described.

There are several ways to install Math Suite Millennium. Each method has its good and bad factors. You should choose the installation method that is best for you.

Most users will probably install MSM directly from a PC. However, MSM can be installed from another calculator that already has MSM installed on it. This makes sharing MSM with your fellow students or colleagues easier than ever.

These installation instructions assume you will be using the *TI-Graph Link* cable and software (using *Windows*). Those using other programs, on perhaps other platforms (such as *Linux*), shouldn't have trouble modifying these instructions to fit their situation. You should take note that the words *program* and *application* are used interchangeably. They both refer to programs that run on the calculator.

There are basically four different ways MSM can be installed (they are provided for your convenience):

1. Send a **memory backup** from your PC to your calculator.
2. Send a **group file** from your PC to the calculator, then install the software by **running** a calculator **setup** program.
3. Send MSM to the calculator using **another calculator** (with MSM already installed on it) using the *Send MSM* feature, then install the software by **running** a calculator **setup** program.
4. Send MSM to the calculator (in a folder called MSM) using method #2 or #3, then perform a **re-install** by running a calculator setup program.

Install Method 1: Calculator Memory Backup

This method is the easiest way to install MSM on your calculator, but does not allow any customization during setup, as the other installation methods will.

WARNING: You may wish to backup any existing data (programs, functions, variables, etc.) on your calculator before you continue. The following procedure will erase all existing data on your calculator!

Install Memory Backup from a PC

1. Plug the *TI-Graph Link* cable into your calculator and run the *TI-Graph Link* software.
2. Click on the ***Link*** file menu and select ***Send Backup... DO NOT*** perform a typical send by pressing the *send* button or by selecting *Send...* from the *Link* menu. If you do, MSM will be installed incorrectly.
3. Select ***msm1mem.89g*** if you are using a TI-89, or ***msm1mem.9xg*** if you are using a TI-92 Plus from the folder that you extracted MSM.

WARNING: Although content is the same in both files, each file represents a specific pre-defined configuration for each calculator model (with other installation methods, the configuration setup is made by the *msmsetup* calculator program). Thus, you cannot substitute one file for another in this instance (installation method).

4. Hit the ***OK*** button. A small box will appear, asking you to confirm that you want to send the calculator backup. Press ***OK***. Once the backup is sent, setup is complete! If necessary, you can send any calculator data (functions, programs, etc.) that you previously backed up to the calculator.

Install Method 2: Send Group File & Install

Plug the *TI-Graph Link* cable into your calculator and run the *TI-Graph Link* software.

Select ***Send...*** from the ***Link*** file menu or click the send button () on the toolbar (*DO NOT* select *Send Backup...* from the Link menu!).

Select ***msm1calc.89g*** or ***msm1calc.9xg*** from the folder containing MSM. It doesn't matter which file you select; the content is exactly the same in each. It does not matter if the *Retain Folder* option is checked. If checked, *MSM* will be sent to the *main* folder (*DO NOT* send MSM to the MSM folder if it already exists!). Press ***OK***.

Once the *MSM* group file has been sent, check the calculator and see if *MSM* was sent properly. If you checked the *Retain Folder* option in *TI-Graph Link*, you should find *MSM* content (such as *msmsetup*) in the *main* folder. Otherwise, *MSM* should be in the folder you selected during transfer.

Now that the contents of the group file is on the calculator, skip on to the *Finalizing the Installation* section below.

Install Method 3: Send from another calculator

On the source unit (calculator already containing MSM), run the Math Suite Manager (more detailed instructions later in the documentation) and select *Send MSM* from the *Tools (F1)* menu. A dialog box appears with some instructions for you to follow.

Plug the calculators together with the calculator link cable. Ensure the receiving unit is on the Home screen and press Enter on the source unit. When all the files have been sent, the source unit will display a dialog box indicating as such.

Now that MSM is on the calculator, skip on to the *Finalizing the Installation* section below.

Install Method 4: Send & Re-Install

On the receiving unit (the calculator you're going to install MSM on),

create a folder called MSM (case doesn't matter). This can be done by typing *NewFold msm* from the Home screen and pressing Enter.

Send MSM to the receiving unit via install method #2 or #3. If you use method #3, set the current folder mode setting on the receiving unit to *MSM*. Otherwise, un-check the *Retain Folder* option in TI-Graph Link, and select the MSM folder when prompted. Send MSM to the calculator.

Once the send is complete, MSM content (such as *msmsetup*) should be found in the MSM folder. Set the calculator's *current folder* setting to MSM. Run msmsetup (type *msmsetup()* from the Home screen and press Enter). Press Enter at the first dialog box. A second dialog box containing the title *"This will install:"* will appear.

Select the *ReInstall* option from the drop-down menu and press Enter. In the forthcoming dialog box, select whether to install keyboard shortcuts from the drop-down menu (*yes* or *no*) (see *Finalizing the Installation* section below for more information). Press Enter. Soon a dialog box appears, asking you where the MSM functions are currently located. Type MSM in the text box and press Enter. In a few moments a final dialog box appears telling you the setup process is complete. Press Enter and you will be redirected to the Home screen.

Installation is now finalized and complete. Note, however, that MSM function and program variables are not archived with this installation method (selecting *ReInstall*). You'll need to archive the MSM files/variables manually (MSM will automatically un-archive any data that shouldn't be archived when any MSM application is executed).

Dialog Boxes

Some of the dialog boxes depicted in the setup process and in other parts of the documentation are from TI-89's. Others, on the other hand, are from a TI-92 Plus. Even though the dialog boxes may look slightly different, their content is the same.

Don't let these differences confuse you when reading this documentation.

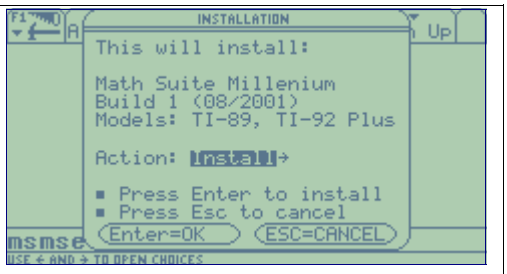
Finalizing the Installation (methods #2 and #3)

MSM should have been sent to the calculator via a PC or a calculator with *MSM* pre-installed. Now it is time to finalize the installation.

Check your calculator's mode settings and find the *current folder* setting. Make sure this is set to the folder that contains *MSM*. ***THIS IS VERY IMPORTANT!*** If you sent *MSM* to your calculator via a PC (*Installation Method 2*) and the *Retain Folder* option was checked, set it to *main*.

At the home screen, type ***msmsetup()*** and press Enter. Make sure you add the closed parenthesis after *msmsetup*. You should get a dialog box like the following (to the right). Press Enter at this screen (or Escape to cancel), and you should see another dialog box appear, like the one below:

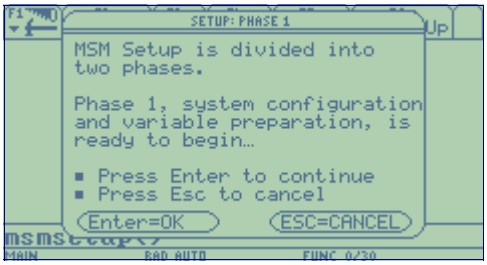
There is a drop-down menu in this dialog box which allows you to select the installation type. *Install* should already be selected (if not, make sure that it is). Press Enter to proceed with the installation or press the Escape key to cancel and return to the Home screen.



Another dialog box will appear, asking you if you wish to install keyboard shortcuts (use the drop-down menu to make your selection). If you select *yes*, the first 9 Suite applications will be

accessible via a keyboard shortcut (diamond and a number). Existing keyboard shortcut programs will be renamed from *kbdprgm1* to *oldprgm1*, etc., and will be accessible after installation via the Math Suite Manager program. If you select *no*, none of the Suite applications will be accessible via shortcuts and any existing keyboard shortcuts will be ignored.

Another dialog box appears, and explains the arrangement of the setup process. Setup is divided into two distinct phases. The first phase prepares the calculator by creating the necessary folders and generating the necessary variables (such as the *registry* configuration matrix). Press Enter at this screen to begin the first phase of the installation.



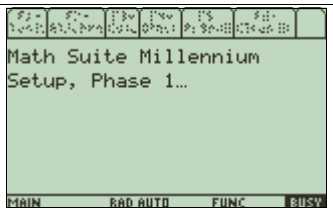
Setup Type...

If you've selected *Uninstall* rather than *Install*, some of the dialog boxes depicted in the installation instructions may not appear. This is also true if you've selected *ReInstall*.

After you have pressed Enter, another box appears, asking you which folder you want the *MSM* functions placed in. This is here for those that like to place all of their math functions (including *MSM's* functions) in one folder for easy access. Type a folder into the text box (or accept the default value) and press Enter.

If the folder doesn't exist, setup will create it for you. Also, the value you enter here will become the default value for the *Folder on Exit* option (discussed later). Please take note that the MSM functions will not be moved into the folder of your choice until *phase 2* of the setup process.

It is also very important that you leave the MSM functions in this folder after setup is completed. This is because some MSM applications call these functions (The *Geom/Trig Toolbox's Triangle Solver* calls the *trisolve()* function, for example). If you move them out of the proper folder, none of the *MSM* applications will be able to locate them, and as a result, some applications will not function properly.



Once you've pressed Enter, the first and shortest phase of the setup process will begin. You will see a short text message on the screen indicating that *setup, phase 1* is in progress.

After a short moment, another dialog box appears, informing you that phase 2 is ready to begin. Press Enter to continue. During phase 2, the final portion of setup, a graphical status screen displays setup's progress while all of the programs and functions are moved to the appropriate folders and archived to save valuable memory space.

During phase 2, you may be prompted with a dialog box warning about *garbage collection*. This can occur because of the intense file archiving operations, and is a very typical occurrence. Press Enter and setup will continue.

If any MSM functions or programs are missing, a dialog box will indicate as such. If this dialog box does appear, make sure you press Enter instead of Escape, or setup will terminate. Take note of any such missing programs or functions so you can send them to the calculator later after setup is finished.

Once setup is complete, a small dialog box will appear, indicating that setup has finished. Press Enter and you will be redirected to the Home screen and setup will terminate.

Installation is now finalized and complete.

Re-Installing Math Suite Millennium

Re-Installation (running *msmsetup* and performing a *ReInstall*) should be performed only under one of the following circumstances (MSM content must already be in the MSM folder):

- The keyboard shortcut programs for MSM were lost and you want them recreated
- The registry configuration matrix (msm\registry) was corrupted or lost, and the MSM can't seem to rebuild it on its own (automatically).

Run *msmsetup* from the *msm* folder (*msm\msmsetup()*). Press Enter at the first dialog box. Select the *ReInstall* option at the second box and press Enter. At the next dialog box, select *Yes* or *No* to whether you wish to install keyboard shortcuts (any existing MSM keyboard shortcuts will be

un-installed first before it installs any new ones). Provide the location of the MSM functions at the next dialog box and press Enter. After a moment, a final dialog box appears, indicating that the re-installation is complete. Press Enter and you will be returned to the Home screen.

See *Installation Method #4* section above for more information.

Un-installing Math Suite Millennium

Un-installing Math Suite Millennium is very painless and extremely easy. Since MSM contains so many files, an uninstall feature is extremely important.

> **WARNING:** By proceeding, you will erase all contents of Math Suite Millennium. Any actions performed cannot be undone. Once it is gone, it must be reinstalled before it will function properly again.

Run *msmsetup* from the *msm* folder (*msm\msmsetup()*). Press Enter at the first dialog box. Once the second dialog box appears (containing *This will install...*), select the *Uninstall* option from the dialog box. Press Enter.

A dialog box appears, informing you that the setup process is divided into two phases. Press Enter to begin the first phase. After a moment, another dialog box appears with a notice that phase 2 is about to begin. Press Enter. A graphical status screen will be displayed and a graphical status indicator will gradually advance as files are deleted. After it completes its task, a dialog box is shown, letting you know the un-install is done. Press Enter to return to the Home screen.

Check the *msm* folder and delete any remaining contents. Some files were needed during the un-install process, and therefore, could not be deleted. Any old keyboard shortcut programs you had before installation should have also been renamed and reinstated as keyboard shortcuts (renamed to *oldprgm1* to *kbdprgm1*, etc.).

Un-install is now complete.

Once MSM has been successfully installed on your graphing calculator, you should familiarize yourself with all of MSM's applications, or programs, as well as the command line functions. In this way you will be able to utilize its full potential. Beyond some general program information is a section for each program. You should take note that the words *program* and *application* are used interchangeably.

Versions

The program's version can be determined by selecting *About* from either the main pop-up menu, or the *Tools (F1)* toolbar menu (whichever applies).

Program Version Numbers

Program version numbers are based on program development. For example, a program which has undergone a large amount of development will have a higher version number than a program that hasn't. Sub-version numbers (decimals, such as the *3* in *1.3*) signify smaller, more subtle changes.

Version numbers do not signify releases. For example, if a program has a version number of 3.0, it doesn't mean the program has been released 3 times. It simply indicates a level of development. During a single development, a program may start at 1.0, and when the software is release to the public, it may be 4.0 after further development and change. It just depends on the amount of work the program has gone through.

Saving Things for Later

Nearly all MSM applications have a *save* feature of some kind. Having a save feature is important because it allows you to save answers or variables for later use.

The *save* menu is usually accessible from a main pop-up menu, or the F2 key on a toolbar menu. Almost all MSM programs that have a save feature have these two options (among possibly others):

Saving Tip

The save dialog box folder setting only shows the current folder.

Bypass the folder setting by typing the full path of the variable you wish to save. For example, if the folder setting was *main*, to save *vtx* in the *vars* folder, type *vars\vtx* in the variable text box.

- **Answers**

Save the current answers. Answers are calculations that the program has made. For example, in the Quad / Poly Solver, the vertex would be a type of answer. Sometimes the save feature allows you to save only the calculation that is currently on the screen. For example, if the vertex were displayed, you could only save the vertex until something else was displayed.

- **Variables**

Save the current variables. Variables are values used in the calculation process. In many instances, they are coefficients to an expression. For example, in the Quad / Poly Solver, coefficients a, b and c would be classified as variables. They are deemed variables because they determine the outcome of the calculation. Usually, you can select some or all of the variables you wish to save via a drop-down menu.

Trailing Dots in pop-up Menus

As you may notice as you use the various programs and applications, some pop-up menu items (normal pop-ups and toolbar pop-ups), some menu selections have trailing dots after them and some don't. The trailing dots indicates that the results of the selection will require you to provide some type of information – a drop-down menu selection, fill in a text box, etc.

For example, selecting *View Approx* from any program doesn't require any extra input from you. Thus, the menu selection doesn't have trailing dots. The *Interpolate Editor* in the *Linear Equation Tool*, for example, requires the additional X or Y value after you have selected *Interpolate* from the toolbar menu. Thus, this menu selection has trailing dots. It is there to let you know when to be ready to provide input. Simple, but informative.

Program Parameters

Every MSM application in the standard installation (excluding any extras) requires a single parameter. Although not a worry if using keyboard shortcuts, it is a big issue if you run MSM programs from the Home screen.

Every MSM application (excluding system library programs, such as *syslib1*, *msmbook1*, etc.) accepts the same type of values – a **0** or a **1**. This parameter is in place to tell the program whether it is being called directly from the Home screen or if it is being called by another program. If it is being called by another program, system settings will be ignored (at start of program and at exit).

As a user, you should always use a value of **1**. So for example, if you wanted to run the *MSM Diagnostics & Repair* program, you would type *msm\msmapp0(1)* and then press Enter. The system uses zero occasionally, but you shouldn't unless you absolutely know what you are doing!

Calculator Mode Settings

If you have chosen to install keyboard shortcuts, you have an added advantage – greater mode preservation support!

As any MSM application begins, it must change several mode settings to properly operate. This is done so you don't have to worry about mode setting conflicts. However, MSM is designed to preserve your original mode settings at all costs. Unfortunately, there will be times when a program is terminated prematurely, either by a program error, lack of memory, or user intervention (ON key press).

If you have installed keyboard shortcuts, and you hit the ON key, the keyboard shortcut program (*main\kbdprgm1*, etc.) will attempt to initiate the exit sequence which restores all of your system settings. Due to the design of the calculator, this won't always work (the ON key will sometimes bypass

the keyboard shortcut program's control), but it works much of the time.

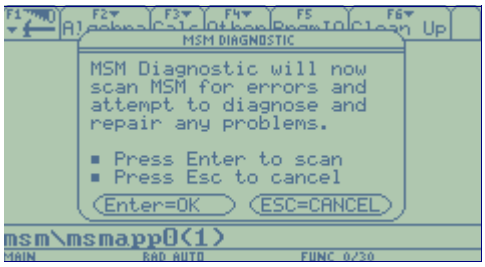
If for any reason you need to restore the old settings, and you don't wish to restore them the old fashioned way (manually via the MODE screen), type *setMode(msm\msmmodes)* and press Enter. Your old settings will be restored. Note that these are the settings that existed the last time a MSM program started properly. Thus, if you use this command, use it abruptly after the program crashes or terminates.

Application 0

The MSM **Diagnostic and Repair** program can be accessed via the Math **Suite Manager** (app 5) or by typing **msm\msmapp0(1)** at the Home screen and pressing Enter.

Application 0: MSM Diagnostic & Repair

The MSM Diagnostic & Repair program is exactly what the name implies – a simple troubleshooting & fix-it program. Although not capable of repairing every possible software problem, it is capable of detecting or repairing many common, simple software problems.



Once the program is invoked, a welcome dialog box appears. As the box indicates, you will need to press Enter to invoke a scan of MSM and its components. Of course, to cancel the program altogether, press the Escape key. After you press Enter, a text message will be displayed, informing you that (all) scans are in progress. After a short wait, the results of all the scans appear. A dialog box is displayed with the first set of scan results.

The first scan checks the presence of all MSM system use programs (*msm\syslib1*, *msm\syslib2*, etc.). The first set of scan results will report on the condition of each system library -- whether it exists or not.

It is more than likely, however, that if the program runs this far without crashing that all system libraries are accounted for. A few scans require the presence of at-least one system library.

The next scan checks the presence of all *MSM* math books (*msm\msmbook1*, *msm\msmbook2*, etc. -- namely, system libraries for the References Center program (application 2)). Like the first scan, the results of this scan will report on the condition of each math book – whether it exists in the *msm* folder or not.

The third scan checks the condition of several temporary variables, such as *msm\transfer* (a medium between system libraries and calling programs), global variables, and the *MSM* graph database variable (*msm\msmgdb*). These variables are unarchived, unlocked, and/or deleted if needed. The scan report indicates that all temporary variables were repaired as necessary.

The next scan checks and repairs any errors in the registry configuration

matrix (*msm\registry*) for errors. This matrix contains information and settings concerning *MSM*. It is very important that you do not tamper with this variable. However, if you have, or if the variable has been corrupted, this scan will attempt to repair or replace the matrix.

The next dialog box asks you if you would like to perform a voluntary file scan of *MSM*. This scan will check for the presence of every *MSM* file (programs & functions). Thus, if you've lost some files, this scan should tell you which ones are missing. If you choose to perform the scan, press Enter. Otherwise, press Escape.

After pressing Enter, the file scan begins, with a graphical status bar showing the scan's progress. If any files are missing, a dialog box will appear with the name of the missing file. Press Enter at this point to continue with the scan or press Escape to cancel.

If necessary, you can abort the file scan manually by pressing the Escape key (press it only once!). A dialog box will soon be displayed, asking you if you'd like to continue or quit. Press Enter to quit or Escape to cancel (and continue with the scan). After the scan completes, a small message indicates the scan is complete. Press Enter and you will be returned to the Home screen.

Application 0 (Diagnostic & Repair) – Frequently Asked Questions

- **Question:** The Diagnostic & Repair program won't run. Why?
  Answer: If you are not experiencing a shortage of free memory, you are more than likely missing one of the system libraries. You may need to send them back to the calculator. Check the troubleshooting section for more information.
- **Question:** I ran the Diagnostic & Repair program. It reported registry errors but any of the programs still won't run. What should I do?
  Answer: Run *msmsetup()* and select the *ReInstall* option. If you need more help with this, read the troubleshooting section.

Application 1

The **Quadratic / Polynomial Solver** can be accessed directly from the Home screen by pressing **Diamond** and **1** (if you have chosen to install shortcuts).

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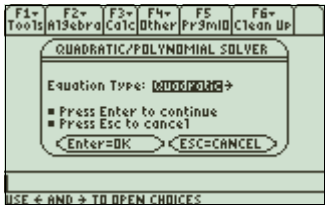
Application 1: Quadratic / Polynomial Solver

The Quadratic / Polynomial Solver is simply a quadratic solver. A basic polynomial solver was added at the request of users.

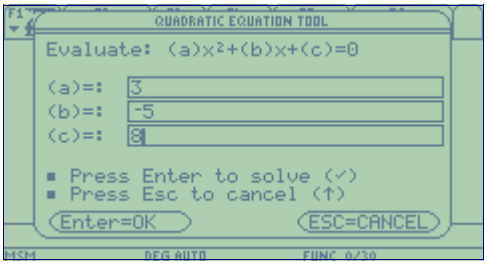


Once the program is activated, a dialog box appears with a single drop-down menu (the main menu). This menu allows you to select the equation type of the equation you want to solve. Typically, you will want to select *Quadratic*, since this is what the program is designed for. Although you could select either one to solve a quadratic equation (recall that a quadratic equation is a base 2 polynomial), the quadratic selection contains tools and information specific to quadratic equations. Select *Polynomial* if you wish to solve a simple algebraic equation, or polynomial. Once you have made your selection, press Enter to continue.

F.Y.I.

Since a quadratic equation is also a polynomial, you could select either option (Q*uadratic* or *Polynomial*) at the beginning of the program. The quadratic solver, however, is designed to study and analyze all of the properties common only to quadratic equations.

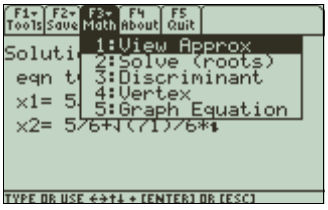
Quadratic Solver



If you selected *Quadratic* from the main menu, a second screen appears (appearance pending Suite *Input Mode* option), allowing you to enter the coefficients of the equation.

Ensure you enter the coefficients in the correct order (in the right text box), as requested by the program. Once you have done this, press Enter to continue to the next screen.

Once the solutions (or roots – where the equation crosses the x-axis) are calculated and displayed, the main quadratic toolbar appears at the top of the screen. From here, you can view the solutions in their approximate forms, view the equation's coefficients (to verify the values you've entered), save answers and more.



The *Math (F3)* menu allows you to take a deeper look at your quadratic equation. From here you can find the equation's vertex, discriminant, and solution (including equation type -- the direction the equation's graph (a parabola) will open – either up or down). Once an option is selected, the appropriate values will be calculated and displayed under the toolbar. You can also approximate the current math operation (solution, vertex, etc.) or graph the equation via this menu, but the program will terminate after the graph operation is completed.

The *Save (F2)* menu allows you to save the current calculation, or answer, (basically what is displayed on the screen) using the *answers* option. It

also allows you to save the equation's coefficients with *variables* option.

To return to the first main menu, select *New Vars...* from the *Tools (F1)* menu. When you are ready to exit the program, press *Quit (F5)* or select *Quit* from the *Tools (F1)* menu.

Program Example

Suppose you wanted to solve the following quadratic equation:

-4x+3x^2-x=-8

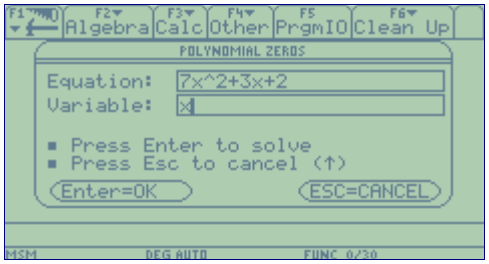
Before we run the Quadratic / Poly Solver, we must prepare the equation by following these steps:

1. Simplify like terms. The equation becomes -5x+3x^2=-8.
2. Display terms in descending order, according to the term's exponent. The equation is displayed as 3x^2-5x=-8.
3. Set the equation equal to zero. Move the -8 to the other side of the equation. The equation becomes 3x^2-5x+8=0.

Run the Quadratic / Poly Solver. Select Quadratic at the first drop-down menu and press Enter. Now, you must enter the coefficients of the equation. Enter **a** (**3**, in the example). Enter **b** (**-5**, in the example). Enter **c** (**8**, in the example). Press Enter.

The solution (roots) to the equation **-4x+3x^2-x=-8** is displayed under the toolbar menu. Both answers should begin with **5/6**....

Polynomial Solver



If you selected *Polynomial* from the drop-down at the main menu at the beginning of the program, the polynomial solver main dialog box will appear.

The polynomial solver is a simple equation solver added at the request of users. Very simple to use, and quick to calculate. Simply enter the equation into the equation text box and the variable you wish to solve for. Press Enter when you are ready to solve. The answer to the equation is displayed under a toolbar menu.

From the toolbar menu, you can save the polynomial equation or its solution. You can also view an approximation of the equation's answer from the *Tools (F1)* menu.

To return to the first main menu, select *New Vars...* from the *Tools (F1)* menu, or press *Quit (F5)* or select *Quit* from the *Tools (F1)* menu.

Application 1 (Quadratic/Poly Solver) – Frequently Asked Questions

- **Question:** Why can't I save the equation type (displayed with solution roots)?
  Answer: Equation type isn't a numeric entity or value that can be saved.
- **Question:** Why don't I get the same toolbar menu when using the poly solver, as compared to using the quadratic solver?
  Answer: The quadratic toolbar menu has tools that are specific to quadratic equations. These options make calculations that do not pertain to other polynomials.

Application 2

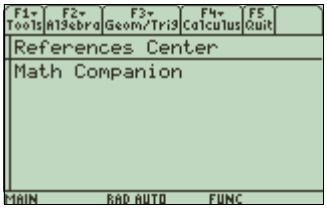
The **References Center** can be accessed directly from the Home screen by pressing **Diamond** and **2** (if you have chosen to install shortcuts).

If you are unfamiliar with the Diamond key, please check your official calculator manual..

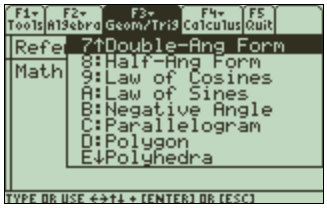
Application 2: References Center

The References Center is an on-calculator quick math reference guide. It contains mathematics information on a myriad of topics. All-in-all, it contains common math formulas, theorems, identities, definitions, rules and hard to remember information.

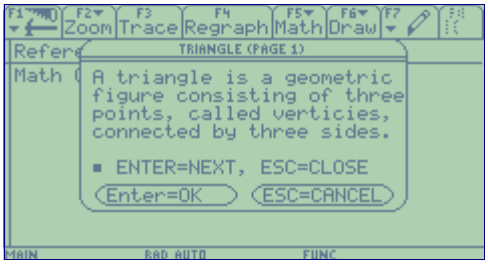
In addition to definitions, the References Center has example graphs, or illustrations, for hard to remember concepts. For example, if you needed to know what a hyperbola was, you could view a definition and some formulas, then view an actual graph of a hyperbola. This addition makes the References Center one of a kind.

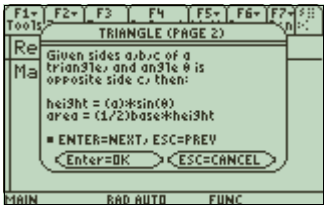


Once the References Center is activated, a toolbar menu appears with the References Center welcome screen. Math topics are categorized by topic. All algebra terms are under the *Algebra (F2)* menu; the geometry & trigonometry terms are under the *Geom/Trig (F3)* menu; and the calculus terms are under the *Calculus (F4)* menu. By pressing keys F2-F4 you will be presented with a list of related topics, or terms, to choose from. After selecting a topic, or term, from the list, a dialog box will appear with relevant information for the topic you have chosen.



Some topics, or terms, have more than one dialog box of information. The term *triangle*, for example, has well over five pages of information. If the term has more than one page, or dialog box, of information the current page will be displayed in the title bar. In addition, the bottom of each dialog box will display very brief key control instructions, like *ENTER=NEXT, Esc=PREV* meaning pressing Enter will take you to the next dialog box and pressing Escape will take you to the previous dialog box. If the next screen happens to be a graph, then you should see *ENTER=GRAPH, Esc=PREV* at the bottom of the dialog box. If the next or previous screen closes the dialog boxes and returns you to the main toolbar menu, the key will be defined as CLOSE. Examples: *ENTER=CLOSE*, or perhaps *Esc=CLOSE*.





From the *Tools (F1)* menu, the *Function Guide* (Application 11) can be accessed. This handy function is a quick reference guide for all of the included MSM functions. Also from the *Tools (F1)* menu, the screen can

be reset (cleared) to its original (welcome screen) state (with the *Reset display* option).

Pressing *Quit (F5)* from the main toolbar menu will exit the program and return you to the Home screen.

Application 2 (References Center) – Frequently Asked Questions

- **Question:** I have found that the References Center is missing some very important math information. Why isn't it there?
  Answer: There are two reasons that the information in question doesn't appear in the References Center. The first reason is perhaps the author hasn't thought of adding it yet. If you wish you can contact the author and suggest the idea. The second reason is that the information may not be common or hard to remember. Remember that the References Center isn't supposed to be a complete mathematics library. It is supposed to be a quick reference guide for common, hard to remember math information, like formulas, theorems, identities, etc.
- **Question:** I am using a TI-89 and have noticed that some of the dialog boxes are a little small and could contain a lot more text. Wouldn't it be easier to put more text in each box so there will be less dialog boxes, or pages?
  Answer: This was done to ensure compatibility between the TI-89 and the TI-92 Plus. Although the TI-92 Plus has a larger screen than the TI-89, the font size in a TI-92 Plus dialog box is larger,. This means that the TI-89 can actually hold more text in a dialog box than a TI-92 Plus. Without *shrinking* TI-89 dialog boxes, the TI-89/TI-92 Plus compatibility could not be possible. This issue is true of all dialog boxes in *Math Suite Millennium*.
- **Question:** I found out that some of the information in the References Center is incorrect. What should I do about it?
  Answer: Make sure the information is, in fact, incorrect. If so, contact the author and inform them of the situation.

Application 3

The **Simultaneous Equation Solver** can be accessed directly from the Home screen by pressing **Diamond** and **3** (if you have chosen to install shortcuts).

If you are unfamiliar with the Diamond key, please check your official calculator manual..

F.Y.I.

You can exit the program at the ***Number=*** prompt by typing ***0*** and pressing Enter. You can also exit by entering **x** or **X** at any of the coefficient prompts (***a1,1=***), etc.

Did you know?

The '**a**' in most of the prompts indicates a coefficient from the left side of the equation (or the side containing the variables).

The '**b**' in a prompt indicates a coefficient from the right side of the equation.

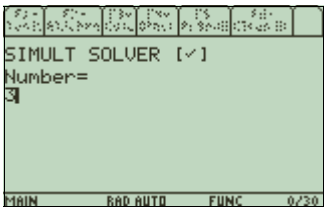
F.Y.I.

Pressing F4 at the bottom of the list (last page of answers) will return you to the beginning of the list.

Application 3: Simultaneous Equation Solver

Limited only by memory, the *Simultaneous Equation Solver* makes solving an unlimited number of simultaneous equations very easy.

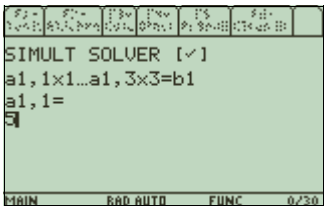
Typing Values Manually (Normally)



Once the program is started, it displays ***Number=*** and waits a numeric value. This *prompt*, as one might call it, may vary in appearance from text to a dialog box, depending on the Suite's *Input Mode* option (described later). At this prompt, enter the number of simultaneous equations you wish to solve and press Enter. If you have three equations, enter a 3; if you have ten equations, enter a 10.

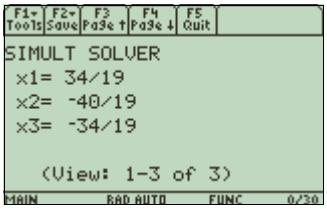
Recall that the number of equations should be equal to the number of variables, or unknowns in each equation. For example, if you have 3 simultaneous equations to solve, you should have three variables in each equation, such as *x,y* and *z* or *a,b* and *c,* etc.

In the next section of the program (again, may vary in appearance), the program asks you for the coefficients of your equations. Below the information about your set of equations (*a1, 1x1...* etc.) is a *prompt* asking you to provide the first coefficient from the first equation. It reads ***a1,1=***.



The prompt changes with each value you enter: ***a1,1=*** to ***a1,2=*** to ***a1,3=***, etc. until you have entered all of the coefficients from the current equation. Then the prompt changes to ***b1=***, asking you for the single numeric value on the right side of the equation. Then the process begins again with the second equation, with the prompt ***a2,1=***.

Once you have entered all of the equation coefficients, the program indicates that it is solving the set of equations. After a short time, the answers appear under a toolbar menu, along with a message indicating which answers are displayed from the total (Examples: *View: 1-3 of 3* or *View: 1-4 of 6*, etc.). If there are more answers than the screen can accommodate, then a down arrow will be displayed near the bottom left corner. If there are answers on the previous page, or screen (Due to pressing F4) an up arrow will appear near the same location.



The page navigation controls (F3 and F4) allow you to change the current list of answers if there are more answers than the screen can display at once. F4 will advance the list, while F3 will retract the list, (return you to the previous page of answers).

The *Save (F2)* menu allows you to save your answers, or the coefficients you've entered. From the *Save Answers* dialog box, you can save all the answers as a matrix or each individual answer as an expression or number. The *Save Variables* dialog box allows you to save all coefficients to the left of the equal sign (side containing variables) as a square matrix, or the values on the right side of the matrix as a one column matrix.

From the *Tools (F1)* menu, you can view the current display in its approximate form (*View approx* selection). You can also view basic statistics on all of the solutions via the same menu (*Statistics* selection). In addition, by selecting the *Export* option, you can export all of the answers directly to the Easy Stats Pro (application 10) program for further statistical analysis without retyping them.

When you are ready to quit the program, press *Quit (F5)*.

Program Example

For example, let's assume you have the following three equations:

1. **5x+7y+6=z+2**
2. **7z+8x-2y=6**
3. **3y-6z-5=-2x+3**

In the above example, we have three equations, and three unknowns (variables) – x, y and z. Using this example, you should enter 3 at the beginning ***Number=*** prompt and press Enter.

Before we continue with the example, we need to rework these equations so they are in a consistent format. They need to be reworked so all of the variables are on the left side of the equation (in the same order), with a single numeric value on the right. This is critical to finding the correct solution. After the equations have been reworked, they appear as the following:

1. **5x+7y-z=-4**
2. **8x-2y+7z=6**
3. **2x+3y-6z=8**

After the beginning number prompt, you will be asked to provide the equation's coefficients. Below the line of equation information is a prompt for the first equation's first coefficient. The prompt displays ***a1,1=***.

Using our example above, type 5 and press Enter. The prompt changes to ***a1,2=*** and asks for the second coefficient from the first equation. Type a 7 and press Enter. The program then changes the prompt to ***a1,3=***. Type -1 (the negative sign, not minus) and press Enter. Even though there isn't a value in front of the -z, we type a -1 because -z= -1z. Finally, in this example, the prompt displays ***b1=*** asking for the coefficient from the right side of the equation. In this example, enter -4 and press Enter.

The prompt then changes to ***a2,1=***, beginning the same procedure for the second equation. Enter the coefficients for all three equations in the same manner as you did the first. The very last value you enter for this example should be 8.

Once the coefficients have been given the program soon displays the solutions in order – x1, x2 and x3. X1 simply means the first solution, x2 refers to the second equation, and so on. Thus, x1 is x in our equations; x2 is y; and x3 is z. Now you have x, y and z. Equations solved.

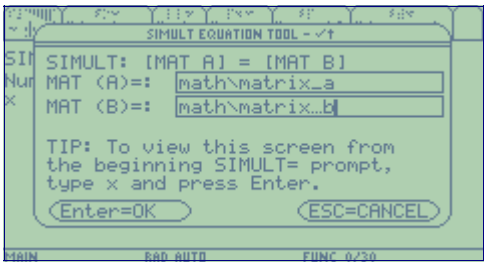
Importing Values From Existing Matrices

One of the *Simultaneous Equation Solver's* best features is its ability to import two existing matrices (ones that already exist on the calculator). This allows you to evaluate two compatible matrices without retyping them into the program.

There are two ways to access the matrix import dialog box. The first requires that you are at the main toolbar menu (when viewing solutions).

From the *Tools (F1)* menu, select *New Vars...* A dialog box appears asking how you would like to input your values, or coefficients. If you wish to input them normally, select *Manual (Normal)*. Or, to import matrices select *Import Matrices* and press Enter.

The second method of accessing the matrix import dialog box isn't as obvious but is much easier than the first. At the ***Simult=*** prompt, type **x** or **X** and press Enter.



Once the matrix import dialog box appears, you should notice the two text boxes. Here you specify the location of the matrix you wish to import. In the first box, specify the location of matrix '**A**' which is a square matrix (equal row and column dimensions). In the second box, specify the location of matrix '**B**' which is a one column matrix containing the same number of rows as matrix '**A**'. If one of the matrices are not in the current folder you will need to specify the full path (*math\matrix_a*, or *math\matrix_b* for example). Press Enter and in a moment the solutions will be displayed and the regular toolbar menu appears. From here the program runs like normal.

Application 3 (Simultaneous Equation Solver) – Frequently Asked Questions

- **Question:** How does the *Simultaneous Equation Solver's* answers compare to the calculator's internal simult() command?
  Answer: The answers are the same because the program calls this function when solving. This means that if the simult() command is updated via an AMS upgrade, those updates are also reflected in the *Simultaneous Equation Solver*.
- **Question:** I tried solving for more than a dozen simultaneous equations and my calculator stopped responding. What is wrong, and what should I do?
  Answer: Nothing is wrong with your calculator. The more equations you wish to solve, the longer the solution process will take. For more than a dozen equations, the calculation process may take a long time – perhaps hours or even longer (please note however that this is a limitation of the calculator itself, not the *Simultaneous Equation Solver*). If you do not wish to wait that long, press the ON key, and the program will terminate. The only problem with doing this is that any settings altered at program startup may not be restored to their original values. This is because all altered settings are restored when you exit. By pressing the ON key, you may be bypassing that exit process.

Application 4

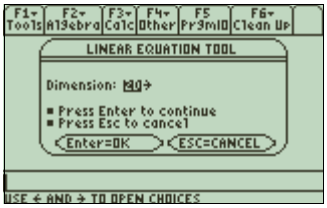
The **Linear Equation Tool** can be accessed directly from the Home screen by pressing **Diamond** and **4** (if you have chosen to install shortcuts).

If you are unfamiliar with the Diamond key, please check your official calculator manual..

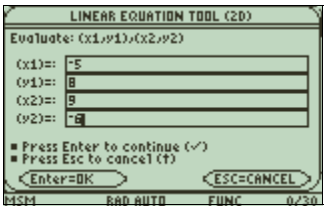
Application 4: Linear Equation Tool

The Linear Equation Tool is a robust and efficient utility that boasts the ability to analyze 2D and 3D linear equations by entering a set of coordinates, or points, that the linear equation runs through.

Once the program is activated, a dialog box with a drop-down menu appears. It asks you to select the *dimension* of the linear equation. Select ***2D*** if you wish to evaluate a ***2D*** equation, and select ***3D*** if you wish to evaluate a ***3D*** equation. Press Enter after you have made your selection. Or, if you wish to quit, press Escape.

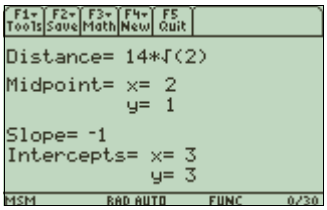


2D Linear Equations



If you selected ***2D*** at the beginning of the program, a dialog box or text input screen (appearance varies, depending on Suite settings) will be displayed, allowing you to enter two sets of points, ***(x1,y1)*** and ***(x2,y2)***, which the linear equation passes through. The first value in each set of points is the horizontal (x-axis) value. The second value is the vertical (y-axis) value. Enter the values into the appropriate text boxes and press Enter to continue. Depending on current Suite settings, pressing Escape will either return you to the beginning of the program, or will terminate the program.

Once you have pressed Enter, a screen-full of linear information will be displayed, under a toolbar menu, about the line passing through the two points you specified (in exact form). Such as the linear **distance** between the two points, the **midpoint** (X and Y values) of the line segment between the two points, the **slope** of the line and the x and y **intercepts** (where the line crosses the x and y axes).



An approximation of these values can be displayed by selecting *View Approx* from the *Math (F3)* menu. This information can also be displayed again by selecting *Linear Info* from the *Math (F3)* menu via the toolbar.

One of the program's strongest features is its integrated *Interpolate Editor*. This feature allows you to interpolate values on the line by providing another value (without re-entering the ordered pairs (x1,y1) and (x2,y2)). For example, you could use the *Interpolate Editor* to find the value of Y on the line when X is 12 (which would in fact be -9).

To access the *Interpolate Editor*, select *Interpolate* from the *Math (F3)* menu. The editor's setup dialog box is displayed. Enter the value you wish to use in the interpolation process in the text box (if you were finding the value of Y in the line when X is 12, enter 12 in the box). Then, below,

select the value you are solving for (X or Y). Press Enter when you are ready to continue, or Escape to close the dialog box and return to the previous screen.

In a second or two, the points you initially entered are displayed with the interpolated X and Y values below. The value you have solved for shows a black box to the left of it. Thus, the interpolated point (X,Y) falls on the line that runs through the points you entered in the beginning.

You can view an approximation of the values by selecting *View Approx* from the *Math (F3)* menu. You can also save the interpolated X and/or Y value by selecting *Answers...* from the *Save (F2)* menu.

To view the linear equation that runs through the points you entered earlier ((x1,y1) and (x2,y2)), select *Build Equation* from the *Math (F3)* menu. An equation like *y=3-x* or *y=(32-10x)/3* will show at the bottom of the dialog box. This equation can be saved by selecting the *Variables...* option from the *Save (F2)* menu.

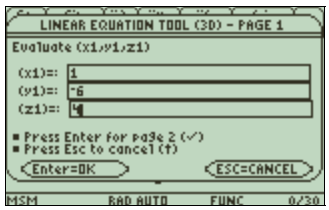
To export the values to other programs or applications, select *Export...* from the *Tools (F1)* menu. An export dialog box appears. Here, select where you wish to export the values. You can export to the *Easy Stats Pro* statistical application, or *Table/Graph* (split screen, with graph in one pane, and table (auto) in the other). Note that by selecting *Table/Graph*, your system variable *y1* will be overwritten and the program will terminate for the export to take place. After you make your selection, press Enter to continue or Escape to close the dialog box and return to the previous screen.

By selecting *Graph Equation* from the *Math (F3)* menu, the program will graph the line, or linear equation, that runs through the points *(x1,y1)* and *(x2,y2)*. Once this option is selected, a confirmation dialog box appears, ensuring you wish to continue. As the dialog box indicates, if you continue, the program will terminate as the graph is displayed so you can use the calculator's built-in tools to analyze it.

To enter new values, select *New...* from the *New (F4)* menu. Press *Quit (F5)* or select *Quit* from the *Tools (F1)* menu to quit the program.

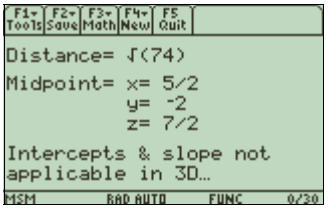
3D Linear Equations

If you selected ***3D*** at the beginning of the program, a text input prompt, or dialog box (depending on your Suite settings) will be displayed. Here, you should enter the points *(x1,y1,z1)*, *(x2,y2,z2)* and *(x3,y3,z3)* which the linear equation runs through.



If a dialog box is visible rather than a text input, then you will need to press Enter after each page to view the next page (enter one point per page). Provide all of the necessary values (9 total), and press Enter.

In a moment, a screen of information emerges below a toolbar menu. This information contains the distance between the points, and the midpoint coordinates (X, Y and Z). At the bottom of the screen is a note informing you that intercepts and slope aren't applicable in 3D (the program doesn't calculate intercepts and slope).



To view an approximation of the values on the screen, select *View Approx* from the *Math (F3)* menu.

By selecting *Build Equation* from the *Math (F3)* menu, you can view the linear equation which runs through the three points *(x1,y1,z1)*, *(x2,y2,z2)* and *(x3,y3,z3)*.

Select *Answers* from the *Save (F2)* menu to save the values calculated. Or, select Variables... and save the values you entered for calculation.

To return to the beginning of the program (enter new values) press *New (F4)*.

To exit, press *Quit (F5)* or select *Quit* from the *Tools (F1)* menu.

Application 4 (Linear Equation Tool) – Frequently Asked Questions

- **Question:** Why won't the *Linear Equation Tool* calculate slope and axis intercepts?
  Answer: Due to the nature of 3D equations, there is no algebraic way to solve for the slope and axis intercepts. If there were, it would probably already be implemented.
- **Question:** After I graph a 2D or 3D equation and later enter the Y= editor, the equation isn't there, and when I go back to the graph screen, it isn't there either! Where did it go?
  Answer: When any MSM program graphs an equation, it bypasses the normal graph variables (y1,y2, etc.) and draws directly to the graph screen. This is done so any system graph variables you may already have (y1, y2, etc.) don't get overwritten. By entering the Y= editor, the calculator clears the graph screen of any graphing.
- **Question:** I calculated a 2D linear equation. Because the form of a linear equation is y=(m)x+b, where *m* is the slope and *b* is the y intercept, I should be able to take the slope and y intercept values and find the linear equation. But the *Build Equation* feature displays a different equation. What's going on?
  Answer: Your methodology for finding linear equations is correct. The *Build Equation* feature uses the same process. However, when the slope and y intercept are fractional, the equation is displayed in terms of a common denominator. Both equations are still correct.

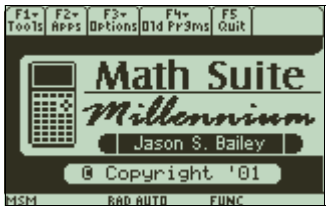
Application 5

The **Math Suite Manager** can be accessed directly from the Home screen by pressing **Diamond** and **5** (if you have chosen to install shortcuts).

If you are unfamiliar with the Diamond key, please check your official calculator manual..

Application 5: Math Suite Manager

The *Math Suite Manager* is a global Suite access and configuration application. From this ample necessity, you can access all Suite applications, and customize Suite settings to your preferences.



Once the *Math Suite Manager* is activated a graphical screen, which will vary upon calculator model, will appear under a toolbar menu. This important menu is, in essence, a gateway to all other Suite programs. In addition, it allows you to access old keyboard programs, transfer MSM to another calculator, manage Suite options, run diagnostics, view Suite version information and view keyboard shortcuts.

Running Applications

The *Math Suite Manager* provides access to all of the Suite applications via the *Apps (F2)* key. Simply select the application you wish to run from the *Apps (F2)* menu. The program you select will be immediately executed. Once the program is completed, *Math Suite Manager* will reappear.

Running Old Keyboard Programs

When MSM was installed, any existing keyboard programs (such as *main\kbdprgm1*, *main\kbdprgm5*, etc.) were renamed (rather than deleted) to facilitate the integration of MSM with the calculator. Although these programs cannot be accessed via keyboard shortcuts anymore, they can be accessed directly via the *Math Suite Manager* by pressing *Old Prgms (F4)*. Select the program you wish to run (select *Prgm 4* to run what used to be *main\kbdprgm4* (now *main\oldprgm4*)). If the program exists, it will be executed. If the program has errors or fails prematurely, a dialog box will indicate that the program either has errors or doesn't exist. Press Enter at this time. Once the program has completed, the *Math Suite Manager* main toolbar menu reappears.

Suite Options Explained

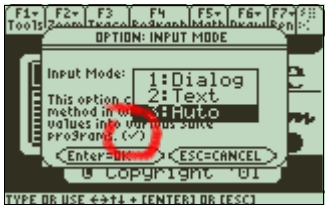
There are 6 Suite options that can be customized via the Math Suite Manager. Press the *Options (F3)* key at the main menu and select the one you wish to change from the menu. A dialog box will appear. drop-down and text boxes may be present, depending on the option selected. The current value or selection for each text box or drop-down is shown. Change the value if needed and press Enter to save your changes.

All option settings are stored in the registry configuration matrix (*msm\registry*). A backup of this matrix is kept incase the original is lost (*msm\regcopy*).

Below is information about each option.

Option 1: Input Mode

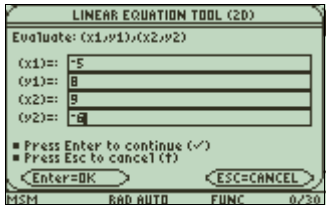
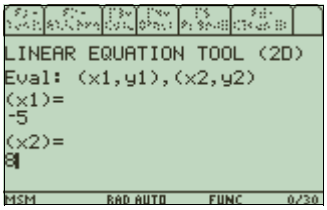
The first option, *Input Mode*, is one of the most important of the features. It controls how values are entered into certain Suite programs. For example, depending on how *Input Mode* is set, you may enter values into a program using a dialog box, or perhaps with a text prompt.



To customize or change *Input Mode*, select *Input Mode* from the *Options (F3)* menu. A dialog box appears with drop-down menu and a text description of the option. At the end of the description, a check mark is displayed. This means that any dialog box or text prompt in any Suite program with a check mark in parenthesis or brackets near it is affected by this option.

The *Dialog* setting forces the affected programs to use dialog boxes when prompting you for values. The *Text* setting forces the same programs to use text prompts when prompting you for values. *Auto* (default) automatically chooses the best input method for each affected program.

Below is the same part of the program (application 4). One is using the *Dialog* setting and one is using the *Text* setting.

Dialog Box	***Text Prompt***
	

There are advantages to both input methods.

Dialog Input	***Text Input***
• Navigation with Escape key • Move cursor between text boxes; edit multiple values before continuing • Won't alter or clear the Prgm I/O screen. • Depending on calculator model, more text may fit in dialog box than Prgm I/O screen	• Text may be easier to read (especially on TI-89) • Alpha lock is disabled automatically so it doesn't have to be turned off (TI-89) • Faster: able to quickly press Enter key to enter value

Choose the option that is best suited for your needs.

Option 2: Custom Menu

The second Suite option, *Custom Menu*, allows you to choose from several pre-defined custom menus. Your *Custom Menu*, a user definable toolbar menu, is accessed manually by pressing 2nd and Home on the TI-89 and 2nd and 3 on the TI-92 Plus.

When you exit any Suite application, the custom menu you have chosen will be applied.

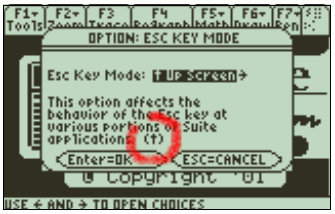
The following custom menu options are available:

- **Suite:** Nearly identical to the normal Home toolbar menu, including all of the MSM functions
- **Programming:** Designed especially for BASIC programmers. Includes common BASIC programming commands (such as *Lbl* and *Goto*) and string functions (such as *expr()* and *string()*)
- **Default:** The calculator's default custom menu. The custom menu that existed when you first turned on your calculator.
- **Disabled:** Disable the custom menu altogether. Nothing occurs when pressing 2nd and Home on the TI-89 or 2nd and 3 on the TI-92 Plus.
- **Ignore:** The current custom menu will be ignored. Your current custom menu will not be altered or changed. This is the default value for the *Custom Menu* option.

By having one of the custom menus selected (*Suite, Programming, Default*, etc.), your *exit time* from Suite applications will be slightly increased, as the program must apply the selected custom menu. The advantage however, is that this feature will ensure the same custom menu exists on the calculator, even with other programs that may alter or change the custom menu.

Option 3: Escape Key Mode

The third Suite option, *Escape Key Mode*, allows you to control the behavior of the Escape key in most Suite programs. Depending on the value of this option, pressing the Escape key may result in exiting the program, or returning to a previous menu.



Select *Escape Key Mode* from the *Options (F3)* mode. A dialog box with one drop-down menu appears. Select the option that is best suited to your needs. The following selections are available:

- **Up Screen:** With this selection, pressing the Escape key will result in navigation to the previous menu or dialog box. This is the default value for this option.
- **Direct Exit:** With this selection, pressing the Escape key will result in a termination of the program (same as selecting *Quit* from a toolbar or pop-up menu).

Select the value of your choice and press Enter. You will be returned to the main toolbar menu.

Menus or dialog boxes with an up arrow in parenthesis in them indicate that the menu is affected by this option. The result of pressing Escape at the menu will depend on the value of the *Escape Key Mode* option.

Option 4: Menu on Exit

The fourth Suite option, *Menu on Exit*, allows you to turn the custom menu

on or off at the exit of a Suite program. Thus, you could ensure the custom menu is on and visible every time you exit a Suite application.

Because the program must perform extra operations, if this option is enabled, your *exit time* will be slightly increased.

Select *Menu on Exit* from the *Options (F3)* menu. A dialog box containing a drop-down menu will be displayed. Three selections are available:

- **Enable:** This selection enables the custom menu (becomes visible) at Suite program exit.
- **Disable:** This selection disables the custom menu (becomes non-visible) at Suite program exit.
- **Ignore:** This selection will ignore the condition of the custom menu (if it is visible, it will stay visible; if it is non-visible, it will stay non-visible). This is the default value for this option.

Make your selection and press Enter. You will be returned to the main toolbar menu.

Option 5: Folder on Exit

Did You Know?

You can activate the **Folder on Exit** option manually, even if the option is disabled, by selecting **Set Current Fold** from the **Tools (F1)** menu. Press Enter at the forthcoming dialog box.

The fifth Suite option, *Folder on Exit*, allows you to set the calculator's current folder setting each time you exit a Suite program. This option is especially handy for non-MSM programs that change the calculator's current folder setting and doesn't restore the previous setting.

Select *Folder on Exit* from the *Options (F3)* menu. A dialog box containing a drop-down menu and a text box will emerge.

The drop-down menu allows you to enable or disable this option. Type the name of the folder in the text box. If the dialog box is set to *Enabled*, the folder specified in the text box will become the calculator's current folder when you exit a Suite application. If enabled, this option will also increase *exit time*.

By default, this option is disabled. In addition, the default folder name is the folder that contains the MSM functions (the folder name you specified during setup). For example, if you decided to place all of the MSM functions in a folder called *math*, then the option's default folder name would be *math* as well.

Option 6: CleanUp on Exit

The sixth and last option, *CleanUp on Exit*, controls post-program clean-up. If enabled, this option will clear the *Program I/O*, *Home*, *Table* and *Graph* screens when you exit a Suite program. If disabled, these screens will be ignored.

Select *CleanUp on Exit* from the *Options (F3)* menu. A dialog box with a drop-down menu is displayed. Select the appropriate value (Enable or Disable) to turn the option on or off. Press Enter to accept your selection. You will be returned to the main toolbar menu.

This option is especially handy in keeping free memory high by keeping these screens cleared. However, it can also be advantageous to disable the option so you can view program output after the program has terminated. For example, after running the *Linear Equation Tool* (application 4) you could display the *Program I/O* screen and still view the linear information (distance, slope, etc.) the program has outputted.

By default, this option is disabled. This option may also dramatically increase Suite application *exit time*.

Resetting the options to their defaults

If necessary, you can reset all of the options to their default values – just as they were after setup.

To reset the options to their defaults, select *Reset...* from the *Options (F3)* menu. A dialog box appears, asking you if you are sure you wish to proceed. To continue, press Enter. In a moment, a dialog box will be displayed, informing you the options were reset. Press Enter and you are returned to the main toolbar menu.

Sending MSM to another calculator

One of the *Math Suite Manager's* most powerful features is its ability to send MSM to another calculator via the link port. Since MSM is composed of many files (programs and functions), transferring all the proper files manually via the *Var-Link* screen can be difficult. This makes this feature very handy.

To send MSM to another calculator, select *Send MSM* from the main toolbar *Tools (F1)* menu. A dialog box will appear to confirm you wish to send. Before you continue, however, do the following:

1. Plug the link cable into the link ports of both calculators. Make sure the connection is firm and tight.
2. Ensure the receiving unit is on the Home screen. **DO NOT** go into the *Var-Link* menu and put it in receive mode.

Once the calculators are ready for transfer, press Enter on the sending unit (the sending unit has MSM already on it). A graphical status bar will appear and advance as the variables are sent to the receiving unit.

In addition, the receiving unit will display the text *"LINK TRANSMISSION ACTIVE: ON KEY ABORT"* in the status bar at the bottom of the screen.

To cancel the transmission, the sending unit should press Escape until a dialog box appears, asking you if you wish to cancel. Press Enter at this time. The receiving unit should also press ON if the transmission is canceled on the sending unit.

If a variable cannot be transmitted (due to transmission problems or if the

variable doesn't exist), a dialog box will appear and will indicate which variable could not be sent. Press Enter to continue sending, or Escape to cancel the transmission process altogether.

Once the transfer is complete, a dialog box will indicate as such. Press Enter and you will be returned to the main toolbar menu. The receiving unit should run *msmsetup()* from the current folder to install MSM. For more information concerning installation, check the installation section earlier in this document.

Application 5 (Math Suite Manager) – Frequently Asked Questions

- **Question:** When I send MSM to another calculator, the program indicates that the receiving unit must have 170K free ram to make the transfer. That is most of the ram. Why is this?
  Answer: When any variable is transferred across calculators, it is transferred to the receiving unit's ram, not its Flash ROM. MSM must be transferred all at once so the MSM setup program can install MSM properly. Since MSM is so large, it takes 170K of free ram to hold MSM. After the MSM setup program is complete, the 170K of ram will be available again, and MSM will reside in Flash ROM (unless there wasn't enough free Flash ROM, or archive memory, to hold all of MSM).
- **Question:** I want to install another program on my calculator. It is called *kbdprgm1* supposed to reside in the *main* folder. But that variable already exists because I installed MSM (and chose to install keyboard shortcuts). What should I do?
  Answer: It is recommended that you rename the variable in question to *oldprgm1* (leave it in the *main* folder). Then you can access the program from the Math Suite Manager via the *Old Prgms (F4)* menu. Simply select *Prgm 1* to run it. This holds true for variables called *kbdprgm5*, etc. Simply rename them to *oldprgm5*, etc.

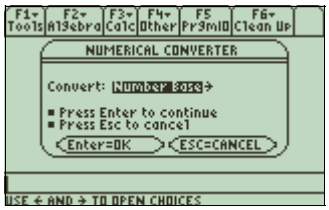
Application 6

The **Numeric Converter** can be accessed directly from the Home screen by pressing **Diamond** and **6** (if you have chosen to install shortcuts).

If you are unfamiliar with the Diamond key, please check your official calculator manual..

Application 6: Numeric Converter

The *Numeric Converter* is a wide-use numeric conversion utility. It converts number bases, units of measure, temperature systems, and coordinate systems.



Once the program is activated, a simple dialog box containing a drop-down menu appears. Select the type of conversion you wish to perform, and press Enter. The following are the conversions that can be performed:

- **Number Base:** Number bases, such as Decimal, Binary, etc.
- **Coordinates:** Rectangular or Polar coordinate systems
- **Temperature:** Units of temperature, such as Fahrenheit, Kelvin, etc.
- **Units:** Units of measure: inches, gallons, Btu's, Ghz, etc.

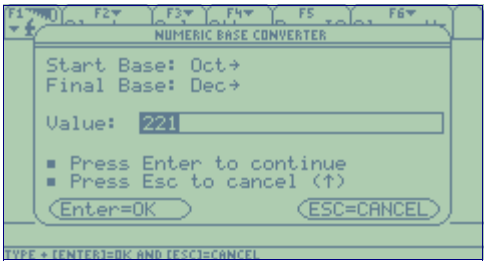
Base Conversions

Did you know?

The TI-89 and the TI-92 Plus cannot perform octal and binary-coded decimal conversions alone. The Numeric Converter allows you to perform such conversions.

If you selected *Number Base* from the beginning menu, a dialog box will appear. The dialog box contains two drop-down menus and a text box.

Select the **start base** (what you are converting *from*) from the first drop-down menu. Then, select the **final base** (what you are converting *to*) from the second drop-down menu.

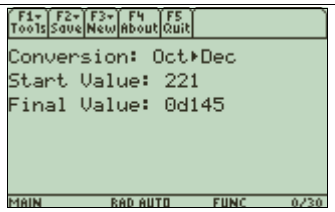


Selections (bases) are abbreviated:

Abbreviation	*Full Title*
BCD	Binary-Coded-Decimal
Bin	Binary (base 2)
Dec	Decimal (base 10)
Hex	Hexadecimal (base 16)
Oct	Octal (base 8)

Type the **numeric value** you wish to convert in the text box below the drop-down menus. Make sure you don't type spaces between digits, especially if you are converting *Binary-Coded Decimal* (BCD). Also, don't add base prefixes (0h, 0d, 0b, etc. -- they will be removed if you do).

Once you are ready to continue, press Enter. After a moment, the results are displayed. At the top of the screen is a toolbar menu. Under that is the conversion that took place (*Oct* to *Dec*, etc.) and the initial value you entered previously. And lastly is the result of the conversion, which contains a prefix indicating the base of the final value.

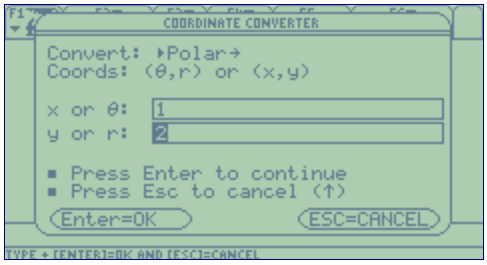


These base prefixes are used in normal calculator operation to denote values in bases other than that defined with the calculator's base setting. For example, if the calculator's base setting was set to DEC (decimal), and you wanted to denote a hexadecimal value of *44A*, you would enter it as *0h44A* rather than *44Ah* like that of the TI-85 or TI-86.

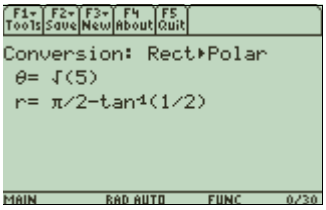
The calculator, however, does not support the use of the 0d (decimal), 0o (octal) or 0BCD (binary-coded decimal) prefixes. Thus, these bases can only be displayed inside the Numeric Converter program.

Coordinate Conversions

If you selected Coordinates from the beginning of the program, a dialog box with a drop-down menu and two text boxes. Select the proper conversion (what you are converting *to*) from the drop-down menu.



Depending on whether you are converting to Rectangular or Polar, put **x** or ^ (theta) in the first text box. Then put y or r in the second box. Press Enter and in a short moment the program will yield the results of the conversion.

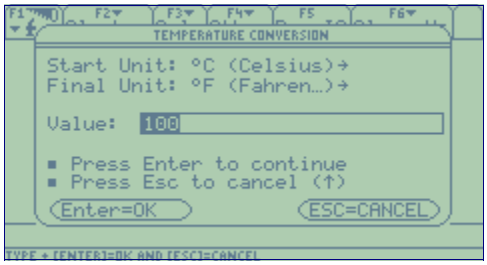


Under the toolbar menu, the type of conversion is displayed. Then, **x** and **y** or ^ (theta) and **r** (depending on the conversion) are displayed.

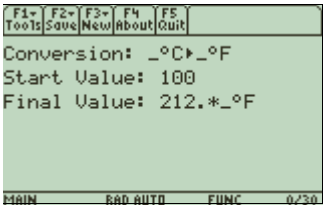
In some cases, the exact answer is displayed, rather than the approximate answer. For example, the program may return the square root of 5 rather than 2.23607. If you need an approximation of the value, it is probably best to save the answer via the *Save (F2)* menu, then approximate the value after you have exited the Numeric Converter (or use MSM's *coord()* function).

Temperature Conversion

If you selected Temperature at the beginning of the program, a dialog box appears with two drop-down menus and a text box.



From the first drop-down menu, select the start temperature unit (unit to convert *from*). Then, select the final temperature unit (unit to convert *to*). Type the temperature you wish to convert (numeric value) in the text box. Press Enter to proceed.



After a short moment, the type of conversion is displayed under a toolbar menu (Celsius to Fahrenheit, etc.). The start value (initial value) and final value (result of conversion) are displayed under the conversion type.

Units are displayed in the same manner as the calculator (**212.*_¬F** simply means 212 degrees Fahrenheit).

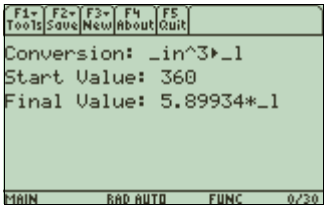
Unit Conversion

If you have chosen to perform a unit conversion, a dialog box containing two drop-down menus and a text box will be displayed. Select the start, or initial unit from the first drop-down and select the final, or target unit from the second drop-down menu.

Take note that due to the large list of units, they are categorized using headings for easier access. Headings, such as area, capacitance, volume, etc., begin with a black square, and cannot be selected as a start or final unit. If such a selection is made, an error will occur when you try to proceed. You will be forced to change your selection before continuing.

In addition, similar units must be selected. For example, if you select a unit of area for your start unit, you must select a unit of area for the final unit as well. You cannot select a volume start unit and a energy final unit, for example. An attempt to convert non-similar units will result in a conversion failure.

After selecting your start and final selections, provide the value you wish to convert in the text box. Press Enter when you are ready to proceed.



In a moment, the results of the conversion are displayed under a toolbar menu, the conversion type (cubic inches to liters, etc.) and the initial, start value.

Numeric Converter's main toolbar menu

No matter which type of conversion you perform, the same main toolbar menu will be displayed above the conversion results. This menu allows access to all of the program's features and abilities.

To access the program's first dialog box, select *New...* from the *Tools (F1)* menu. It may be easier from here, however, to select the type of conversion from the *New (F3)* menu instead.

Save the answer, or conversion results, by selecting *Answers* from the *Save (F2)* menu. Or, save the value used in the conversion process (the start, or initial value) by selecting *Variables...* from the *Save (F2)* menu.

From the *New (F3)* menu, you can perform another conversion of any kind. Selecting *Base Conversion* is the same as selecting *Number Base* at the beginning of the program. Such is the same with *Temp Conversion* (here) and *Temperature* (beginning), etc.

Application 6 (Numeric Converter) – Frequently Asked Questions

- **Question:** Why can't I save the results of a base conversion as a numeric value? Why must I save it as a string?
  Answer: When a numeric value is entered, it is converted to the calculator's current base (defined via the Modes screen) and displayed. For example, in binary mode, a decimal value would be displayed as a binary value. In addition, the calculator doesn't support certain prefixes, such as 0d, 0o or 0BCD. The calculator would treat a value with these prefixes as 0 times a variable (d, o, or BCD) times the value (0d45 would be interpreted as (0*d*45=0). It would return zero, of course. In conclusion, saving as a string prevents all of these problems and makes reading saved values much easier.
- **Question:** How does base conversion values returned by the Numeric Converter compare to those returned by MSM's base() function?
  Answer: They are identical because the Numeric Converter calls MSM's base() function to perform base conversions.

Application 7

The **Geometry / Trig Toolbox** can be accessed directly from the Home screen by pressing **Diamond** and **7** (if you have chosen to install shortcuts).

If you are unfamiliar with the Diamond key, please check your official calculator manual..

Application 7: Geometry/Trig Toolbox

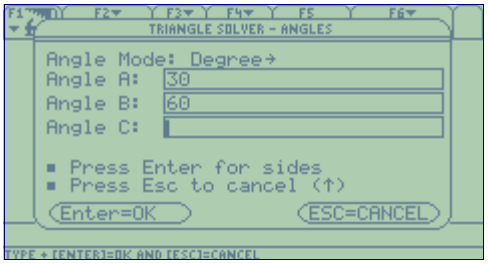
The *Geometry/Trig Toolbox* is a collection of common, easy-to-use geometry and trigonometry utilities, with geometry emphasis.

Once the program is activated, a pop-up menu emerges. All of the program's components and features can be accessed via this main pop-up menu. Press Escape or choose *Close (Quit)* to close the program.

Triangle Solver

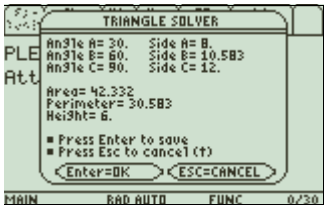
The triangle solver is an advanced, and easy to use geometric solver. By providing given information about a triangle, the triangle solver will calculate the remaining angle and side values, as well as the triangle's area, height, and perimeter (if possible).

To access the triangle solver, select *Triangle Solver* from the main pop-up menu. The text boxes in the dialog box that appears allows you to enter the angle values that you *do* know.



For the values you don't know, simply leave them blank. Or, if you simply cannot stand to leave a text box blank, type *0* or *undef*. Press Enter to proceed to the next dialog box.

A similar dialog box proceeds to emerge, which allows you to enter the known side values. Fill the side values that you know in the appropriate text boxes. For unknown values, leave the box blank, or add a *0* or *undef*. When you are ready to continue, press Enter.



As the answers are being calculated, a text message displays *Please Wait...* After a moment, the results of the calculation are displayed in a dialog box. All angle and side values are shown, as well as the triangle's area, perimeter and height. If a value could not be calculated, it is shown as *undef*.

To save the results of the calculation as a list, press Enter. Otherwise, press Escape to return to the main pop-up menu.

Area & Volume Tool

Selecting *Area & Volume Tool* from the main pop-up menu invokes application 12. A forthcoming pop-up menu allows you to select a 2-dimensional (*circle*, *triangle*, etc.) or 3-dimensional (*cylinder*, *pyramid*, *sphere*, etc.) object to analyze. To return to the Geometry/Trig Toolbox's

main pop-up menu, select *Close (Quit)* from the pop-up menu.

Once you have selected an object from the pop-up menu, you will be prompted to provide values which pertain to the object selected. For example, if you selected *Circle*, you will be prompted for the radius of the circle. After you have entered the required information, additional information (calculated with the values you entered) is displayed in a dialog box. To save the values, press Enter; or press Escape to return to the pop-up menu.

For more detailed information, check the *Application 12: Area & Volume Tool* section later in this document.

Trig Operations (Ops)

The *Geometry/Trig Toolbox* has the capability of performing numerous trigonometric operations that the calculator normally cannot perform. Thus, this feature can be a very handy trig tool.

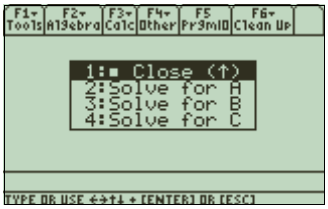
To access this feature, select *Trig Ops* from the main pop-up menu. A dialog box will be shown. Here, select the angle mode you wish to work in (*degrees* or *radians*). Then, select the trig operation you wish to perform from the next drop-down menu, and the numeric value you wish to calculate in the text box.

For example, if you wanted to find the Arc Co-tangent of 32 degrees, select *ArcCot* from the drop-down menu, then type the value of 32 in the text box.

Press Enter and in a moment, the (approximate) result of the calculation is displayed. Press Enter at this dialog box to save the answer, or press Escape to return to the main pop-up menu.

Pythag Theorem

The *Pythagorean Theorem*, a very common formula, is used quite often in most geometry courses. Although the formula is fairly easy to use and remember, it saves some time to have the calculator do the work for you.



Select *Pythag Theorem* from the program's main pop-up menu. A second pop-up menu allows you to select the side of the triangle you wish to solve for (given a right triangle, side *c* is opposite the 90 degree angle; side *a* and *b* are adjacent to acute angles). To return to the previous menu, select *Close*.

After selecting a side to solve for, you are asked for the length values of the other sides. After quickly providing those values, the approximated value (for example, 5.47723 rather than the square root of 30) *and* the exact answer of the side is displayed in a dialog box. To save the

answer, press Enter. Otherwise, press Escape to return to the previous pop-up menu.

Application 7 (Geometry/Trig Toolbox) – Frequently Asked Questions

- **Question:** How does the program's *Triangle Solver* feature compare to MSM's trisolve() function?
  Answer: Values in the program's Triangle Solver are identical to those of the trisolve() function because the program calls this function during the solve process.
- **Question:** Does the program call the MSM trig functions (arccot, sec, etc.) when calculating Trig Ops?
  Answer: No. The program's *Trig Ops* feature does not call any of MSM's functions (arcot, csc, sec, etc.).

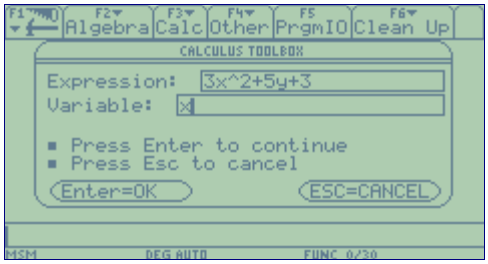
Application 8

The **Calculus Toolbox** can be accessed directly from the Home screen by pressing **Diamond** and **8** (if you have chosen to install shortcuts).

If you are unfamiliar with the Diamond key, please check your official calculator manual..

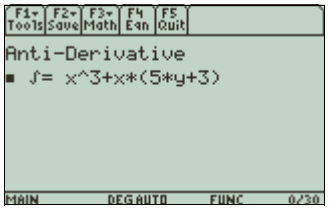
Application 8: Calculus Toolbox

The *Calculus Toolbox* is a bundle of common, integrated, easy-to-use calculus utilities.



As the program is initiated, a dialog box containing two text boxes appears. Enter the expression you wish to analyze in the first text box (don't put an equal sign (=) in the expression).

Below, enter the variable you wish to base your calculations on (x, y, a, b, etc.). Press Enter to proceed with the rest of the program.



After a very short wait, the anti-derivative of the expression you just entered will be shown below the program's main toolbar menu. At this point, you may select other mathematical operations from the *Math (F3)* menu.

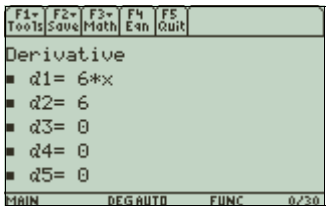
You can also approximate the answer(s) on the screen by selecting *View Approx* from the *Math (F3)* menu; access the program's original dialog box to change the expression and/or variable by pressing *Eqn (F4);* save the answer(s) on the screen by selecting *Answers* from the *Save (F2)* menu; or save the expression by selecting *Variables* from the *Save (F2)* menu.

Anti-Derivative

The anti-derivative is calculated at the beginning of the program, when the main toolbar menu appears. However, if you need to view it again, simply select *Anti-Derivative* from the *Math (F3)* menu. After a short moment, the answer is displayed.

Derivatives

Finding the derivatives of your expression is easy with this program. Select *Derivatives* from the *Math (F3)* menu. A dialog box with a single text box appears. Type the order of the derivative you wish to find and press Enter (or press Escape to return to the main toolbar menu). If you press Enter without providing a value, a default value of 1 will be used.



In a moment, the derivative of the proper order is displayed under the toolbar menu. In addition, the next 3-5 derivatives are calculated below in consecutive order. This feature is handy in seeing multiple derivatives of the expression all at once.

Implicit Derivatives

One of the program's strongest features is its ability to calculate implicit derivatives. Implicit differentiation is performed with very little setup.

To calculate implicit differentiation, select *Implicit Deriv* from the *Math (F3)* menu. A dialog box with a few text boxes will appear. In the first box, type the name of the independent variable (*x*, by default). In the second, or middle, box type the name of the dependent variable (*y*, by default). In the last box, provide the other side of the equation (what the expression you entered earlier is equal to) (by default, this value is *0*). If leave any values empty and press Enter, the default values will be used. Press Enter to proceed.

In a moment, the results of the calculation are displayed under the main toolbar menu. The order of the calculations are designated by a number next to *d*. *d1* refers to the first order, etc.

Integration

To find the integral of the expression, select *Integral* from the *Math (F3)* menu. A dialog box with two text boxes will appear shortly. In the first box, provide the upper limit constraints for the calculation. In the bottom box, provide the lower limit constraints. Press Enter.

After a short pause, the integral of the expression is displayed under the main toolbar menu. The up and down arrows displayed near the answer indicate that the value is an integral (with upper and lower constraints).

Limits

To find the limit of the equation at a specific point and direction, select *Limit* from the *Math (F3)* menu.

When the dialog box appears, type the point in the first text box, and the direction in the second text box. Press Enter, and in a short moment, the limit of the equation at the specified point will be displayed under the main toolbar menu.

Taylor Polynomials

To find the taylor polynomial of the expression, select *Taylor Poly* from the *Math (F3)* menu. In the forthcoming dialog box, type the order and point and press Enter. If you do not provide any values, a default value of 1 for both text boxes will be used.

In a moment, the answer is displayed under the main toolbar menu.

Application 8 (Calculus Toolbox) – Frequently Asked Questions

- **Question:** Why can't I enter an equation at the beginning of the program? It won't accept anything containing an equal sign. Why?
  Answer: Most of the math calculations (derivatives, integration, etc.) are calculated by the calculator's internal commands, which won't accept complete equations (only expressions, no equal signs.).
- **Question:** This program incorrectly calculates certain values. What should I do?
  Answer: Ensure that you are not incorrect. This program has been worked and tested extensively. There shouldn't be any bugs. However, if there are bugs, please email the author and explain the problem in detail.
- **Question:** Does the Calculus Toolbox use the implicit() function?
  Answer: No, it has the same capabilities built directly into the program. There is no need to call the function.

Application 9

Easy Stats Pro can be accessed directly from the Home screen by pressing **Diamond** and **9** (if you have chosen to install shortcuts).

If you are unfamiliar with the Diamond key, please check your official calculator manual..

Application 9: Easy Stats Pro

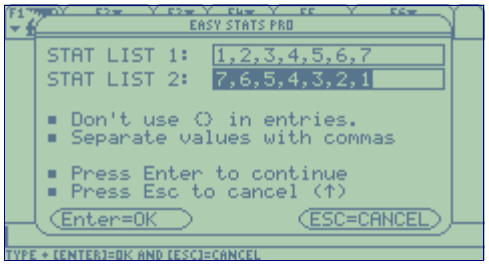
Easy Stats Pro is an integration of all of the calculator's statistical features and capabilities, putting the calculator's powerful statistical analysis tools at your fingertips.

The program begins with a main pop-up menu, which allows you to access all of its functions and features.

The first step in statistical analysis is to provide the program with numeric data to analyze. There are two ways to do this: First, entering the data manually by typing. Second, importing existing matrices or lists. The latter will be covered later.

Entering Statistical Data Manually

Select *Edit Stat Data* from the program's main pop-up menu to access the program's integrated list editor. A dialog box with two text boxes will appear. Enter the list of values in both boxes as needed.



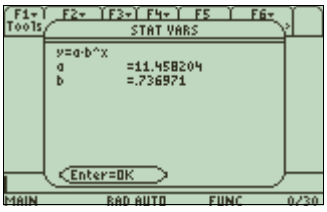
Separate values with commas and don't add braces ({}) to the list (Correct example list: *3,2,1,0,5,7*. Incorrect example list: *{3,2,1,0,5,7}*). Once you have entered the data, press Enter and you will be returned to the main pop-up menu.

Performing Statistical Analysis

Once the program has a list of numeric data, statistical analysis can be performed. All of the program's statistical features are accessible from the program's main pop-up menu.

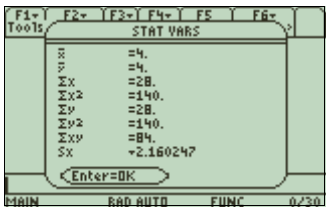
Statistical Regression

Statistical regressions of all kinds can be performed by Easy Stats Pro. Select *View Reg Stat* from the program's main pop-up menu, and a dialog box will soon appear. Select the type of regression you wish to perform from the drop-down menu (additional regression selections will be available if you have installed Texas Instrument's Statistics Flash application). Once you have selected a regression, press Enter.



If the regression can be calculated (applicable system variables will be updated), a dialog box will appear with the statistical regression information. Depending on the regression selected, you may need to use the arrow keys to view all of the stat data in the dialog box. Press Enter to return to the main pop-up menu.

Variable Statistics



One and two variable statistics can be performed by selecting *View Var Stat* from the program's main pop-up menu. At the next dialog box that appears, select the type of variable statistics you wish to perform (*OneVar* or *TwoVar*) and press Enter. If you select OneVar, another dialog box will appear, allowing you to choose the list that you wish to analyze (*stat list 1*, or *stat list 2*). After you have chosen the proper list, press Enter. Whether you have chosen *OneVar* or *TwoVar*, a dialog box containing the results of the variable statistics will appear (applicable system variables will be updated). You will probably need to use the calculator's arrow keys to view all of the content of the dialog box. Press Enter to return to the program's main pop-up menu.

Cumulative List Sums

Select *Cum List Sums* from the main pop-up menu to view the cumulative lists sums of *stat list 1*, *stat list 2*, and the combination of both lists. The sums are displayed in a forthcoming dialog box. Press Enter to return to the main pop-up menu.

Other Statistics

Select *Other Stats* from the main pop-up menu to view other miscellaneous statistics. You must have Texas Instrument's Statistical Flash application installed to access these statistics. A dialog box will appear, which will allow you to select the type of statistics you wish to view. Pressing Enter when viewing the statistics will return you to the main pop-up menu.

Saving and Importing Data

To access the program's saving and importing features, select *Import/Save* from the main pop-up menu. A second pop-up menu appears, which allows you to select from several options. When you are finished, select *Close*.

Select *Import Data* to import an existing list or matrix into the program. A dialog box appears. Select the stat list you wish to import the list or matrix to (if you select *list 1*, the contents of the list or matrix you import will be visible in the first text box when you select *Edit Stat Data* from the main pop-up menu. The same goes for *list 2*.). In the text box, type the name of the list or matrix you wish to import. If it isn't in the current folder, type the full path name (*main\statlist* instead of just *statlist*, for example). Press Enter and you will be directed to the integrated list editor (*Edit Stat Data* dialog box). The contents of the list or matrix should be in the appropriate text box. The import is now complete.

Select *Save List* to save the contents of *stat list 1* or *stat list 2* so you can use the list later (if you need to perform statistical analysis on the list(s) later, you can save them here, then use the import feature to import them back into the program). In the forthcoming dialog box, select the list (*list 1*

or *list 2*) you wish to save. Below, in the text box, type what you would like the list to be saved as. Press Enter. If the variable is saved properly, a small dialog box will indicate as such. Pressing Enter returns you to the main pop-up menu.

Select *Save as Plot* to save *list 1* and *list 2* as a statistical data plot. A dialog box with three drop-down menus is shown. The first drop-down menu allows you to select the plot number that you want to save to (1-9). Any existing settings for that plot will be erased as the data is saved.

The second drop-down menu allows you to select the type of plot (*scatter*, *xyline*, etc.). The third, gives you control of the plot mark (box, dot, cross, etc.). The last two settings can also be changed after the plot is saved by accessing the plot's properties (via the calculator's *Y= Editor*).

Stat list 1 and *stat list 2* are saved as *main\xlist[n]* and *main\ylist[n]*, respectively, where *[n]* is the plot number you have chosen to save to (for example, if you save to plot 3, the stat lists will be saved as *main\xlist3* and *main\ylist3*). After you have pressed Enter, a dialog box will appear if the save was successful. Press Enter here to be returned to the main pop-up menu.

To completely close the program, select *Close (Quit)* from the program's primary pop-up menu.

Application 9 (Easy Stats Pro) – Frequently Asked Questions

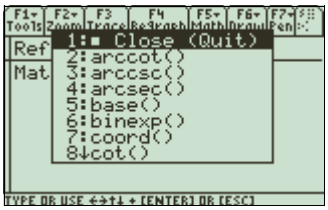
- **Question:** What is *stat list 1* and *stat list 2*?
  Answer: These are the lists you enter to perform statistical analysis, and are defined by selecting *Edit Stat Data* from the main pop-up menu (they may also be called just *list 1* and *list 2*). Type them in the two text boxes in the program's integrated list editor.
- **Question:** Why can't I select Cum List Sum? Each time I try, I get a dimension error.
  Answer: Stat list 1 and Stat list 2 must have the same dimensions (same number of values) for this option to be available.

Application 10

The **Function Guide** can be accessed via the **Reference Center**'s Tools (F1) menu, the **Math Suite Manager**'s Apps (F2) menu, or via the Home screen by typing **msm\msmapp10(1)**.

Application 10: Function Guide

The *Function Guide* is a condensed MSM function usage guide and help. This resource becomes handy when you need quick usage information for any of the MSM functions and don't have immediate access to this documentation.



Once activated, the program displays a list of all of MSM's functions in a pop-up menu. Simply select the function that you wish to view more information about.

Information is not provided for functions that are not included in the standard installation (extras). You will need to check the appropriate documentation for information on these other functions.

Once you have selected a function from the pop-up menu, a dialog box will be shown containing basic usage information. Most of the functions have an example at the bottom, showing you exactly how to use the function.

This information isn't meant to be totally complete, but as a quick reference that always exists on your calculator. If you need more information about any function, you should read the appropriate section in this documentation.

Application 10 (Function Guide) – Frequently Asked Questions

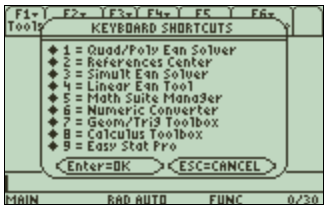
- **Question:** Why aren't the extra MSM functions not listed in the Function Guide (the extra functions not contained in the normal installation group file?
  Answer: The Function Guide only contains information on functions included in the normal installation (msm1calc and msm1mem). Usage information on extra functions included in the MSM archive will be found in the 'extras' documentation.
- **Question:** I followed one of the function's examples as denoted by the Function Guide, and the calculator returned an error. Why won't the examples work?
  Answer: The calculator's mode settings may interfere with the function's results. For example, the calculator's angle mode setting will affect the results of the trisolve() function.

Application 11

A list of **keyboard shortcuts** can be accessed via most program's **Tools (F1) menus**. It can also be displayed via the **Math Suite Manager**'s Apps (F2) menu, or via the Home screen by typing **msm\msmapp11(1)**.

Application 11: Shortcuts

The *shortcuts* application is a very simple program which shows which programs are accessible by shortcut keys via the Home screen, and which key combinations are assigned to each program.

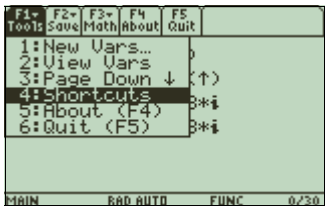


For example, if the program shows that *diamond* and 1 equals the *Quad/Poly Solver*, that means that you can press *diamond* and 1 at the Home screen to initiate the *Quad/Poly Solver*.

Of course, if you have chosen not to install keyboard shortcuts, or if you have deleted some or all of the shortcut programs (*main\kbdprgm1* through *main\kbdprgm9*), these shortcuts may not be applicable.

Most programs with a main toolbar menu provide access to keyboard shortcuts by selecting *Shortcuts* via the *Tools (F1)* menu.

Some others allow access via their main pop-up menu. In any case, you shouldn't have any trouble running this program.



Application 11 (Shortcuts) – Frequently Asked Questions

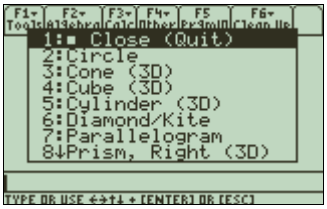
- **Question:** Why isn't this program and others available from the Home screen via a shortcut key?
  Answer: The calculator only allows for only nine keyboard shortcuts (1-9). Since MSM contains more than 9 applications, higher priority programs were given the keyboard shortcuts. This is why most of the MSM programs give access to the shortcuts program.

Application 12

The **Area & Volume Tool** can be accessed via the **Geometry/Trig Toolbox**'s main pop-up menu, the **Math Suite Manager**'s Apps (F2) menu, or via the Home screen by typing **msm\msmapp12(1)**.

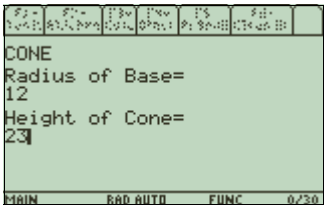
Application 12: Area & Volume Tool

The *Area & Volume Tool* is a simple geometric object utility and a add-on to the Geometry/Trig Toolbox (application 7).



The program starts with a main pop-up menu, containing a list of 2-dimensional and 3-dimensional geometric objects. Menu items representing 3-dimensional objects will have the characters *(3D)* next to them. And, of course, if you choose to quit the program, select *Close (Quit)*.

After making a selection, you will be prompted for information specific to the object you've selected. For example, if you select *Circle*, you will be prompted for the radius of the circle. This information will be used to calculate other information about the object. Again, if you selected *Circle*, the radius you provide will be used to calculate the circle's diameter, area and circumference.



After you have provided the required information, a dialog box with one or more items of information about the object is displayed. If you wish to save the answers, press Enter. Otherwise, press Escape and you will be returned to the program's main pop-up menu.

Application 12 (Area & Volume Tool) – Frequently Asked Questions

- **Question:** I have discovered that one of your formulas are correct (the program incorrectly calculates values for a specific object). What should I do?
  Answer: It is unlikely that any of the formulas are incorrect. However, you may contact the author if you think one of the formulas are incorrect. Before you make contact, however, make sure you have researched the issue and know what you are talking about!
- **Question:** Why can't I select a different value to start with. For example, why can't I use the diameter of a circle rather than the radius to solve for the area and circumference?
  Answer: Many of these calculations are one way (you can't take the answer to re-find the original value). In addition, a selection feature would bloat the program size and slow down execution time. Perhaps a future version will contain some of these features.

Removing Unnecessary Portions

Math Suite Millennium is a very large collection of software. Although most of MSM's features are intended to be necessities, some will not want certain portions of the software. Thus, it will be necessary for some to delete certain files on the calculator, which will free up additional memory. Removing files will not make MSM perform any faster.

WARNING: By proceeding, you will lose data critical pertaining to setup (install, reinstall, or uninstall, sending MSM to other calculators, and the inability to perform common mathematical operations). Proceed only if you are sure you don't need the files in question.

Delete files only when absolutely necessary!

The following are files which can be deleted, and a list of features or abilities which will be lost if the files are deleted.

Files	*Lost Features*
splash89/92	Msm\splash89 can be deleted on a TI-92 Plus. Msm\splash92 can be deleted on a TI-89. By deleting any of these files, you will not be able to share MSM with the other calculator model (if you delete splash92 from your TI-89, you won't be able to share MSM with a TI-92 Plus).
msmsetup	If you delete msmsetup, you won't be able to share MSM to anyone! In addition, you won't be able to uninstall the software automatically. In addition, you won't be able to recreate keyboard shortcuts.
syslib3	By deleting syslib3, the install feature of msmsetup won't work AT ALL. In addition, the diagnostic's file scan feature won't function any more.
Any function	By deleting any MSM function, you will lose any abilities the function may have. Note that some programs rely on certain functions to operate properly, such as trisolve(), base() and coord().

Functions executed at the command line (Home screen) play an equally major role of importance as the programs and applications do. Learning to use all of MSM's functions is well worth the time.

Unlike most applications, functions are affected by the calculator's mode settings, like *Angle*, *Base*, *Exact/Approx*, etc. Keep this in mind when you are using these functions.

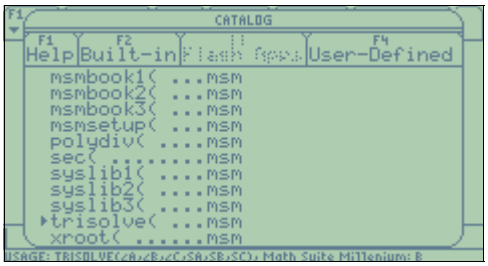
Most of these functions are quickly accessible from the Suite's integrated custom menu. See page 29 of this document for more information.

Function Usage Information

There are many ways to get usage information for any of the MSM functions in the standard distribution (group file). This documentation, for example, contains a complete reference guide to all of these functions. There are times, however, that you will not have direct access to this text. For this purpose, a number of ways to access quick usage information on the calculator itself is provided. Thus, no matter where you are, you have that information at your fingertips.

The most obvious way to get function usage information is to run the Function Guide application, and select the function you want to display. Although this is a good reference, it can take unnecessary time to access the program.

For calculators with AMS 2.x or higher installed, there is an additional, faster, way of accessing function usage information. Access your function catalog (press *CATALOG* on the TI-89 or *2nd* and *2* on the TI-92 Plus. A dialog box appears with a list of all the internal functions of the calculator. Press F4 to view a list of user-defined functions.



Once you have pressed F4, a list of all the programs and functions you have installed will appear (the folder containing the function also appears to the right of the function).

You can use the alpha keys to jump to a specific function. For example, pressing *alpha* + *t* should move the arrow to the functions or programs beginning with *t* (note that alpha lock should be enabled automatically when you enter the catalog).

Once the small arrow on the left is moved to a MSM function, a simple usage guide appears at the bottom of the screen in small print (as well as the software package name (*Math Suite Millennium*) and build number (1). This way, you know the function belongs to MSM). You can also press F1 also, and another dialog box containing basic usage information will appear. Press Enter when in this catalog screen, and the function is

pasted into the Home screen's command line for quick use.

arccot()

The **arccot()** function is available via the **Trig (F3)** menu in the integrated Suite custom menu.

arccot() function

The *arccot* function calculates the arc-cotangent of a value. The calculator's angle mode (degrees or radians) will affect the outcome of the function.

Usage:	**arccot(num)**
Example:	**arccot(32)**

The arccot function takes only one parameter, which must be numeric. Care should be taken to ensure values are within the constraints of the calculator's angle mode setting.

arccsc()

The **arccsc()** function is available via the **Trig (F3)** menu in the integrated Suite custom menu.

arccsc() function

The *arccsc* function calculates the arc-cosecant of a value. The calculator's angle mode (degrees or radians) will affect the outcome of the function.

Usage:	**arcsec(num)**
Example:	**arcsec(19)**

The *arccsc* function takes only one parameter, which must be numeric. Care should be taken to ensure values are within the constraints of the calculator's angle mode setting.

arcsec()

The **arcsec()** function is available via the **Trig (F3)** menu in the integrated Suite custom menu.

arcsec() function

The *arcsec* function calculates the arc-secant of a value. The calculator's angle mode (degrees or radians) will affect the outcome of the function.

Usage:	**arcsec(num)**
Example:	**arcsec(21)**

The *arcsec* function takes only one parameter, which must be numeric. Care should be taken to ensure values are within the constraints of the calculator's angle mode setting.

base()

The **base()** function is available via the **Tools (F1)** menu in the integrated Suite custom menu.

base() function

The *base* function performs conversions between numbering systems.

Usage:	base(num,oldbase,newbase)
Example 1:	base("0h57D","16","Dec")
Example 2:	base("456","Oct","Hex")
Example 3:	base("1024","10","16")
Example 4:	base("10010001","BCD","10")

The base function takes three parameters. The first is a numeric value (encased in double quotations) that you wish to convert to another number system (you must ensure digits are proper for the base you are converting from, otherwise the function will return an error). Quotations are used to prevent automatic conversion by the calculator before the function can begin its calculation.

Did you know?

Did you know that the calculator cannot perform octal or binary-coded-decimal conversions alone.

The second and third parameters are the old base (first) and the new base (last). Either parameter can be entered as the base number encased in double quotations ("10" for decimal, "16" for hexadecimal, "8" for octal, etc.). The following abbreviations can also be used instead (they are case-sensitive: *bin* cannot be substituted for *Bin*):

Value	*Legal Digits*	*Description*
"Bin"	***0-1***	Binary (base 2) conversions
"BCD"	***0-1***	Binary-coded decimal conversions
"Dec"	***0-9***	Decimal (base 10) conversions
"Hex"	***0-9, A-F***	Hexadecimal (base 16) conversions
"Oct"	***0-7***	Octal (base 8) conversions

The Numeric Converter (application 6) calls this function when performing base conversions. Thus, you will get the same results from either the function or the application.

binexp()

The **binexp()** function is available via the **Calc (F5)** menu in the integrated Suite custom menu.

binexp() function

The *binexp* function performs binomial expansion, and returns an expanded polynomial expression.

Usage:	binexp(expr1,expr2,exp)
Example 1:	binexp(5x,3y,2)
Example 2:	binexp(3a,11b,7)

The binexp function takes three parameters. The first two parameters are the first and second monomials of the binomial. The last parameter is the power, or exponent, that the entire binomial is raised to. For example, to expand the binomial **(5x+3y)^2** you would enter it as **binexp(5x,3y,2)**.

coord()

The **coord()** function is available via the **Algebra (F4)** menu in the integrated Suite custom menu.

coord() function

The *coord* function performs rectangular or polar coordinate conversions based on an ordered pair, and returns a list of the new coordinates.

Usage:	**coord(list,string)**
Example 1:	**coord({4,3},"Polar")**
Example 2:	**coord({2,36},"Rect")**

The *coord* function requires only two parameters. The first is the ordered pair, or set of coordinates, that need to be converted. They should be entered as a list (surrounded by curly braces {}). The first value of the ordered pair (depending on whether you are starting with *rectangular* or *polar*) should be x or ^; the second should be y or r.

The last parameter is the coordinate system you wish to convert to, and should be entered as a string. The following values (case-sensitive) are acceptable as the third parameter:

- **"Rect"**
- **"Polar"**
- **"▶Rect"**
- **"▶Polar"**

cot()

The **cot()** function is available via the **Trig (F3)** menu in the integrated Suite custom menu.

cot() function

The *cot* function calculates the co-tangent of a value. The calculator's angle mode (degrees or radians) will affect the outcome of the function.

Usage:	**cot(num)**
Example:	**cot(30)**

The *cot* function takes only one parameter, which must be numeric. Care should be taken to ensure values are within the constraints of the calculator's angle mode setting.

csc()

The **csc()** function is available via the **Trig (F3)** menu in the integrated Suite custom menu.

csc() function

The *csc* function calculates the co-secant of a value. The calculator's angle mode (degrees or radians) will affect the outcome of the function.

Usage:	**csc(num)**
Example:	**csc(30)**

The *csc* function takes only one parameter, which must be numeric. Care should be taken to ensure values are within the constraints of the calculator's angle mode setting.

frac()

The **frac()** function is available via the **Algebra (F4)** menu in the integrated Suite custom menu.

frac() function

The *frac* function displays values as fractions, regardless of the *Exact/Approx* mode setting.

Usage 1:	**frac(num)**
Usage 2:	**frac(expr)**
Example:	**frac(.56)**

The *frac* function takes only one parameter, which can be a number or expression. If the value is a number, the result is displayed as a simplified fraction, even if the *Exact/Approx* mode is set to *Approximate*. If the value is an expression, it is factored, expanded and simplified before it is displayed.

implicit()

The **implicit()** function is available via the **Calc (F4)** menu in the integrated Suite custom menu.

implicit() function

The *implicit* function calculates the first-order implicit derivative of the given expression or equation, using the specified dependent and independent variables.

Usage:	**implicit(expr,indvar,depvar)**
Example 1:	**implicit(x^2-y^2,x,y)**
Example 2:	**implicit(2a^3+5b+4=6,a,b)**

The *implicit* function takes three parameters. The first is an expression (no equal sign (=)) or equation (equality), such as *x^2-y^2=0*. If an equal sign is not present, the expression will be set equal to zero before the derivative is calculated.

The second parameter is the *independent variable* in the expression or equation. The last parameter is the *dependent variable* in the expression or equation. If these two variables are not located inside the expression, and error will result.

inter()

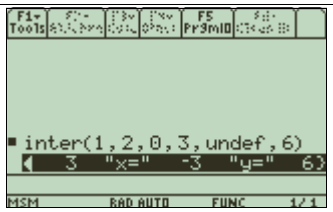
The **inter()** function is available via the **Algebra (F4)** menu in the integrated Suite custom menu.

inter() function

The *inter* function interpolates additional values from a linear equation based on existing points, or ordered (x,y) pairs, residing on the line.

Usage:	**inter(x1,y1,x2,y2,x,y)**
Example:	**inter(1,2,0,3,undef,6)**

The *inter* function takes a whole six parameters. The first two parameters are an ordered pair of the first point on the line. The third and fourth parameters are an ordered pair of the second point on the line. The last two specify the third point on the line, where one of the parameters (x or y) is unknown. Substitute the unknown value with *undef*.



For example, if you wanted to find the value of x when y is 6 on a line that runs through the points *(1,2)* and *(0,3)*, you'd enter it as *inter(1,2,0,3,undef,6)* and you would find that the value of x is -3.

logb()

The **logb()** function is available via the **Algebra (F4)** menu in the integrated Suite custom menu.

logb() function

The *logb* function calculates logarithms beyond the base of 10.

Usage:	**logb(base,num)**
Example:	**logb(3,27)**

The *logb* function utilizes two parameters. The first is the base of the logarithm and the second is the number value to be used in the calculation of the logarithm. Use the *Exact/Approx* mode to control exact or approximate results.

polydiv()

The **polydiv()** function is available via the **Algebra (F4)** menu in the integrated Suite custom menu.

polydiv() function

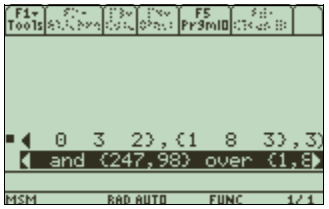
The *polydiv* function performs polynomial long division, and will return the quotient of the division process.

Usage:	**polydiv(numlist,denlist,format)**
Example:	**polydiv({4,0,3,2},{1,8,3},1)**

Did you know?

The calculator's built-in polyEval() function can perform polynomial long division, but doesn't return the quotient in the same way as polydiv().

The *polydiv* function requires three parameters. The first and second are lists containing the coefficients of the numerator and denominator (respectively). The last specifies how answers will be displayed. The following are valid values for the format parameter:



Value	*Description*
1	Results are displayed as a simplified expression
2	Results are displayed as a string containing a non-simplified expression
3	Results are displayed as a string containing coefficient lists of a non-simplified expression

Non-simplified answers are generally displayed as *quotient* + *remainder*.

sec()

The **sec()** function is available via the **Trig (F3)** menu in the integrated Suite custom menu.

sec() function

The *sec* function calculates the secant of a value. The calculator's angle mode (degrees or radians) will affect the outcome of the function.

Usage:	**sec(num)**
Example:	**sec(42)**

The *sec* function takes only one parameter, which must be numeric. Care should be taken to ensure values are within the constraints of the calculator's angle mode setting.

trisolve()

The **trisolve()** function is available via the **Trig (F3)** menu in the integrated Suite custom menu.

trisolve() function

The *trisolve* function, provided with partial angle and side information from a triangle, will attempt to calculate the remaining angle and side values, as well as the triangle's area, perimeter and height. The calculator's angle mode (degrees or radians) will affect the outcome of the function.

Usage:	**trisolve(∠A,∠B,∠C,side a,side b,side c)**
Example 1:	**trisolve(30,60,0,5,0,12)**
Example 2:	**trisolve(25,undef,undef,4,8,undef)**

The *trisolve* function uses six parameters. The first three are angles A,B and C (respectively). The last three are sides a,b and c (respectively). Side a is opposite angle A, side b is opposite angle B, etc.

Provide the triangle's angle and side values that you know. Use *0* (zero) or *undef* for values that you don't know. In a moment, the function will return a list of all angle and side values in addition to the area, perimeter and height. Values that could not be calculated are shown as *undef*. Use the *Exact/Approx* mode to control exact or approximate results.

xroot()

The **xroot()** function is available via the **Algebra (F4)** menu in the integrated Suite custom menu.

xroot() function

The *xroot* function calculates the root of any given number. For example, you could use *xroot* to find the 3rd root of 27.

Usage:	**xroot(root,num)**
Example:	**xroot(3,27)**

The *xroot* function uses only two parameters. The first is the root you wish to find, and the last is the number you wish to find the root of.

Function Frequently Asked Questions

The following is a list of frequently asked questions for all of MSM's functions:

- **Question:** The *base* function returns "ERROR: BASE" and terminates. What is going on?
  Answer: The function cannot work properly unless the calculator's base mode is set to decimal (*Dec*). If you need to have the base setting to something other than decimal, use the Numeric Converter (app 6) instead (it has to change the calculator's *base* setting, but restores the original value when it exits).

- **Question:** Does the *base* function use the built-in base commands (▶Dec, ▶Bin, ▶Hex)?
  Answer: No. It will, however, return the same results.

- **Question:** Why do parameters need to be encased in double quotations (as strings)?
  Answer: Consider the following: Let's say you were going to convert a hexadecimal value of 5D to decimal. Suppose the calculator's base setting was set to Bin (binary), and parameters were not entered as strings. Without the 0h prefix, the value of 5D would be taken as 5 times D. With the prefix, the value would automatically be converted to binary as 0b1011101 before the function could begin to work with the values. The function would then receive the values, and think that you were converting 0h1011101 from hexadecimal to decimal, which would result in 0h16847105, rather than 0h93. Entering values as strings (with double quotations) prevents this from occuring.

- **Question:** The *trisolve()* function is returning wacky results. What's going on?
  Answer: You probably have the calculator's *Angle* mode set to the wrong value. Remember, calculator modes can affect the behavior of MSM functions.

Troubleshooting

Although extensive work has been taken to ensure program the best possible stability and performance in MSM, problems could still occur. Most common problems can be corrected or diagnosed by the *Diagnostics & Repair* program. Some other problems, however, must be taken care of by the user.

The following are common problems that could occur, what possibly causes them, and what to do to fix them:

#	Problem	Cause	Solution
1	There is a very long pause before the program or function actually begins to do anything (BUSY indicator is visible). Once the program or function begins, it runs just fine until the next time it is run.	The programs or functions in question are not tokenized. Every time a program or function is executed, it must be tokenized (a compilation of sorts). Since the programs or functions are archived or locked, they have to be re-tokenized each time they are run.	Unarchive or unlock (whichever is necessary) the program or function variables which exhibit this behavior. Ensure they are not archived or locked, and run each of them. After they have all been executed, re-archive them.
2	Certain programs crash, indicating that required functions cannot be found (such as the Geometry/Trig Toolbox and the Numeric Converter).	MSM can't find the required functions to perform the desired operation. If the information in the registry matrix is incorrect, MSM may look in the wrong folder in a futile attempt to find the function(s).	Run the Diagnostics & Repair program. If that doesn't seem to fix the problem, run msmsetup and select the Re-Install option. Lastly, you may have to send the software back to the calculator.
3	While trying to send MSM to another calculator, one or both calculators stop responding.	A timeout or memory error may have occurred between the two calculators.	Press ON on both calculators. Stop the sending process. Get rid of any portions of MSM on the receiving unit and start over. If that doesn't work, try sending the files manually via the Var-Link screen.
4	One of the MSM applications crashed and the calculator's previous settings weren't restored.	The crash prevented the calculator from running its exit sequence, which restores the original mode settings.	From the Home screen, type *setMode(msm\msmmodes)* and press Enter. If the Math Suite Manager crashed (app 5) you will also have to type *RclGDB msm\msmgdb* and press Enter.
5	One of the MSM applications crashed with a dimension error.	An answer to a calculation may have been too large (too many characters) to fit in a dialog box.	Inform the author about the error. Include the program you were running and what you were doing.
6	TI-Graph Link returns a checksum or similar error when you try to send MSM to your calculator.	Your version of TI-Graph Link may be slightly incompatible with the MSM group file.	Ungroup the group file with TI-Graph Link. Then, open up each program file and save it with TI-Graph Link. Send all the files individually.

General Frequently Asked Questions

The following is a list of frequently asked questions pertaining to the entire *Math Suite Millennium* project.

- **Question:** Why the name *Math Suite Millennium*?
  Answer: As of 2001, we're just beginning a new millennium. New software for a brand-new millennium.

- **Question:** Why are TI-89 screen shots used more in the documentation than the TI-92 Plus?
  Answer: The TI-89's screen is much smaller. TI-92 Plus screen shots are so large, it makes wrapping text near or around them more them difficult.

- **Question:** Why such a large software package? Why didn't you distribute each program in MSM separately?
  Answer: MSM is meant to be one, do-it-all package that can be installed all at once. Besides, MSM is integrated – the programs won't run without each other. This is done to shorten the overall size of the package without removing features.

- **Question:** Can I contribute to the MSM project?
  Answer: Contact the author and make your proposal. Generally speaking, if you are familiar with mathematics and TI-BASIC programming and are dedicated, you may be able to help. More people means a greater project.

- **Question:** I really like MSM. I feel I owe you something for it. What can I give in return for it?
  Answer: The unmodified MSM distribution costs you nothing. However, if you use the software regularly and wish to donate something in return, please email jasonsbailey@yahoo.com. A generous gesture is great encouragement for further developments. Also, donations speak loudly when you're making big suggestions...

- **Question:** How long did it take you to build MSM?
  Answer: MSM builds upon, and is the replacement for, the old *TI-Source Math Suite 2000* software project. Altogether, it took over 3 years to develop MSM.

- **Question:** Where is your home page?
  Answer: The location of my home page varies. Check the readme (readme.txt) file included with the MSM package for more information.

- **Question:** What is your profession?
  Answer: Computers. Computer upgrade & repair, computer networking, web design and custom CGI programming.

Credits

Math Suite Millennium is an evolution of more than 3 years of work. It began as the *TI-Source Math Suite 2000*, and has drastically changed since then. Although it has been developed by only a single individual, many others have offered information, suggestions, encouragement and other types of help.

Development Software

The following are some of the programs, among others, used in the formation of this software and its documentation:

- Sun StarOffice 5.2 <http://www.sun.com/staroffice>
- Linux-Mandrake <http://www.linux-mandrake.com/>
- Free PDF <http://www.webxd.com/zipguy>
  - Ghostscript <http://www.cs.wisc.edu/~ghost/>
  - Aladdin Ghostscript <http://www.ghostscript.com/>
- Virtual TI 2.5 beta 5 <http://vti.acz.org/>
- TI-Graph Link <http://education.ti.com/>

Special Thanks

Special thanks goes to the following individuals:

- John Silcox <jsilcox@kent.k12.md.us> for the constant math help and dedicated beta testing
- Layne Hales <lhales@srjh.emery.k12.ut.us> for the math information and assistance
- Remaining beta testers and contributors

Most importantly, thanks to all of you that use and enjoy this software. Your support and encouragement are greatly appreciated!

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