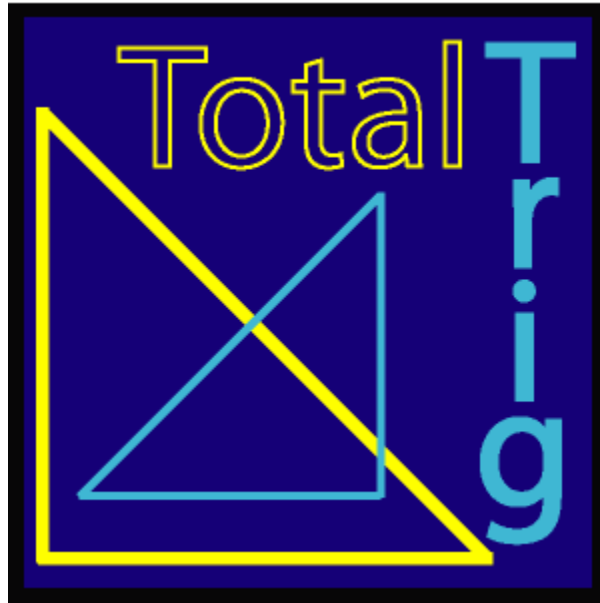


TotalTrig User's Manual



www.multiology.com/palm
support@multiology.com



Copyright © 2004-2005 Multiology, LLC



TotalTrig License Agreement and Warranty Disclaimer

CAREFULLY READ ALL OF THE TERMS AND CONDITIONS OF THIS AGREEMENT BEFORE USING THE SOFTWARE DELIVERED WITH THIS DOCUMENT. BY INSTALLING AND USING THE SOFTWARE, YOU INDICATE YOUR COMPLETE AND UNCONDITIONAL ACCEPTANCE OF THESE TERMS AND CONDITIONS.

This documentation is a legal agreement between you (the purchaser and end-user of the Software) and the developer of the Software (Multiology, LLC) concerning its use. THIS AGREEMENT CONSTITUTES THE COMPLETE AGREEMENT BETWEEN THE PURCHASER AND MULTILOGY, LLC.

1. **LICENSE.** Multiology, LLC grants purchaser a non-exclusive license to use the Software in the manner described in the materials accompanying it. Multiology, LLC retains title to and ownership of the software and the patents, copyrights, trade secrets and other proprietary interests therein. Purchaser may make copies of the software for backup. Purchaser may not make alterations or modifications to the software, nor attempt to discover the source code of the software. The software may not be sublicensed, rented, or leased. Both the license and the right to use the software terminate automatically if purchaser violates any part of this agreement. Purchaser may not disassemble, decompile or otherwise reverse-engineer the Software or otherwise attempt to learn the inner workings, source code, structure, algorithms, or ideas underlying them.

2. **LIMITED WARRANTY.** If faults are discovered in the file(s) in which the software or the accompanying materials are distributed, Multiology, LLC will for a period of ninety (90) days after purchase replace the file(s). Within the warranty period Purchaser must provide Multiology, LLC with proof of purchase. Multiology, LLC and its distributors disclaim all implied warranties, including without limitation warranties of merchantability or performance and fitness for a particular purpose. Multiology, LLC and its distributors will not be liable for any bug, error, omission, defect, deficiency, or nonconformity in any software. As a result, the software is sold "as is," and purchaser assumes the entire risk as to its quality and performance.

3. **LIMITATION OF LIABILITY.** Multiology, LLC and its distributors shall in no event be liable for direct, indirect, special, incidental, contingent, or consequential damages resulting from any defect in the software or its accompanying materials, including damages from loss of data, downtime,

goodwill, damage to or replacement of equipment or property, and any costs of recovering, reprogramming, or reproducing any program or data used in conjunction with the software, even if one or more of them has been advised of the possibility of such damages. Purchaser agrees that Multiology, LLC and its distributors' liability arising out of contract, negligence, strict liability in tort or warranty shall not exceed any amount paid by purchaser for this software. Any written or oral information or advice given by others will in no way increase the scope of this warranty, nor may purchaser rely on any such written or oral communication. Paying the license fee entitles purchaser to use the registered version of the Software, but it does not reduce the limitations outlined in this disclaimer. Multiology, LLC will accept no responsibility for any damages purchaser may suffer because of data lost through the use of the Software. No responsibility will be accepted for any loss of use of any software or hardware resulting from the use of the Software. Neither will any responsibility be accepted for damages resulting from incorrect, incomplete, or misleading information being generated by the Software.

4. **OTHER TERMS AND CONDITIONS.** Users of the Shareware version of the Software are entitled to use that version on as many Palm OS® handhelds as they choose. They are also permitted to copy the files and distribute them to others, so long as the complete and unchanged files are distributed. Users of the Software who pay the license fee and become registered users are entitled to install and use the registered version of the Software on one Palm OS® handheld for each license fee paid. The Software and all the associated documentation are protected by copyright. Under no circumstances may the registered version of the Software be distributed to third parties without the express written consent of Multiology, LLC.

Copyright © 2004-2005 Multiology, LLC. All rights reserved Multiology, LLC. Hot Sync is a registered trademark, and Palm is a trademark of Palm Inc. Third party brand and product names may be trademarks or registered trademarks of their respective holders.



TotalTrig User's Manual

1.0 Introduction

TotalTrig is the most comprehensive trigonometry program for the Palm on the market today. It is comprised of several trigonometric solvers, a comprehensive set of trigonometric definitions and relationships, and a full set of graphs of each of the trigonometric functions.

TotalTrig features three different trigonometric solvers. The Arc-Length Solver determines properties of the sector of a circle. It takes two out of five input values and calculates the other three. The user may enter a combination of the area of one or both sectors of a circle, the radius of the circle, the arc length, or the angle of the sector.

The Right Triangle Solver determines properties of right triangles. It takes two out of five input values and calculates the other three. The user may enter a combination of the angle, area, adjacent side, opposite side, or hypotenuse of the triangle. For triangles that have two solutions, a toggle button appears for toggling between them. This updates the values in each field and redraws the triangle for the new values.

The Oblique Triangle Solver takes three out of seven input values and calculates the other four. The user may enter any combination of the three angles, three sides, or area of the triangle. For triangles that have two solutions, a toggle button appears for toggling between them. This updates the values in each field and redraws the triangle for the new values.

Comprehensive help is available for each screen in TotalTrig. This help addresses how to use the program and provides insight into the trigonometric background behind each screen.

TotalTrig has several features that set it apart from the competition. Unlike many, if not all, of the other Palm programs on the market, it is the only one of which the author is aware that correctly solves oblique triangles with one obtuse angle (an example of this is found in the Oblique Triangle Solver section below (section 3.2.3)). It is the only program of which the author is aware that takes the area of a triangle as an input in order to calculate the other sides and angles of either an oblique or right triangle. Perhaps its most useful feature is its ability to actually draw the triangles, circles, and segments after the values are calculated. In this manner the user is able to readily see how changing values changes the actual geometry.

For students of trigonometry, TotalTrig is unsurpassed in its completeness. Not only does it correctly solve any triangle, but many definitions and relationships are readily available in a readable and useable format. The definitions and relationships that are available are:

One Angle Definitions and Relationships:

- Basics
- Reciprocals
- Inverses
- Pythagorean
- Double Angle
- Half Angle
- Quadrants
- Symmetry
- Rarely Used

**Two Angle Relationships:**

- Addition
- Subtraction
- Product

General Relationships:

- Law of Sines
- Law of Cosines
- Area Formulas
- Newton's Formulas
- Mollweide's Formulas

Many relationships in TotalTrig are not commonly found in trigonometry textbooks today, yet sometimes using one or more of these relationships or equations can make the difference between solving a problem and failing to arrive at a solution. TotalTrig has screens explaining the exsecant, versine, coversine, and haversine identities. Other screens explain Newton's formula, Mollweide's formula, and how the area of any general triangle is calculated.

TotalTrig is like having a trigonometry textbook with you at all times, except only better!

2.0 Installation and Removal

2.1 System Requirements

TotalTrig is designed to run on any Palm handheld that runs version 3.5 or greater of the Palm operating system. If an operating system is in use lower than version 3.5, then an Alert dialog will appear, and the application will exit.

TotalTrig requires that MathLib be installed, which is a free PalmOS shared library that provides a full set of IEEE-754 double-precision math library functions for Palm applications to use. If MathLib is not installed, an alert screen will appear, as shown in Figure 2.1-1, and TotalTrig will exit when the OK button is pressed. There is, however, a good chance that MathLib is already installed on your system and there is no need to install it again.

The MathLib.prc file is included with this distribution of TotalTrig, so it may be installed with TotalTrig as needed. It can be used with any OS 2.0+ Palm program and is distributed under the terms of the GNU Library General Public License. It is freely available with full source code and documentation at the MathLib Information (<http://www.radiks.net/~rhuebner/mathlib.html>) web page. It is not a part of the TotalTrig program, and you are not paying anything for its use; a copy is simply included in this archive for your convenience.

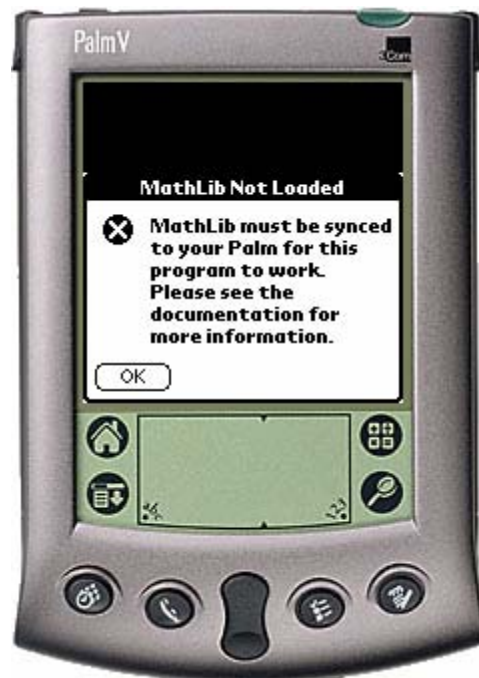


Figure 2.1-1. Alert Screen if MathLib Not Installed

2.2 New Installation

If MathLib is already installed on your system, the TotalTrig.prc file is the only file that needs to be synced to your Palm. If MathLib is not already installed, it must be installed along with TotalTrig. Both MathLib and TotalTrig may be installed by just double clicking the appropriate .prc file (either TotalTrig.prc or MathLib.prc) or using any of the install tools that are available for the Palm. Once this is done, a hotsync should be performed to transfer one or both to the Palm.

2.3 Program Removal

To remove TotalTrig from your handheld, simply go to the Application launcher (tap your handheld's Applications button) on the Palm, select the "Delete..." menu choice from the "App" menu, and then select TotalTrig. Then confirm your choice when the "Delete the TotalTrig application and all data?" alert appears.

3.0 TotalTrig Use

3.1 Data Input

Many of the screens in TotalTrig require data to be input. Each "solver" screen in TotalTrig has a data input area at the bottom in which two or three values may be entered (depending on the solver). Placing the cursor in any of the input fields will automatically place the Palm into numeric entry mode. On some Palm models, the graffiti shift indicator appears in the lower right corner of the screen and will change accordingly when the cursor is in one of these fields. Values may be entered by graffiti strokes, keyboard input, or the software keyboard which can be invoked from the edit menu (or with the shortcut /K). The software keyboard and graffiti help can ONLY be accessed when the cursor is within one of the numeric entry fields.

When TotalTrig is first launched, the Trial Version screen comes up (see Figure 3.1-1) and denotes how many days are left on the free trial. This screen will no longer appear once the program is registered.



On any of the solver screens (arc-length, right triangle, and oblique triangle), whenever any values are input and the "Calc" button is pressed, "input indicators" will then appear beside the values that were input. The size and shape of these indicators may be changed or turned off with the preferences menu option. These allow the user to quickly see which values were input. Figure 3.1-2 shows the default rectangular input indicators when the input values of A, B and b were used.

Individual values may be cleared by selecting the "Clr" button to the right of the field. All values may be cleared by selecting the "Clr All" button.

Angles may be toggled to/from radians and degrees by selecting the rad/deg button in the upper right corner of the screen. All angle values are then updated immediately. The default value is degrees.

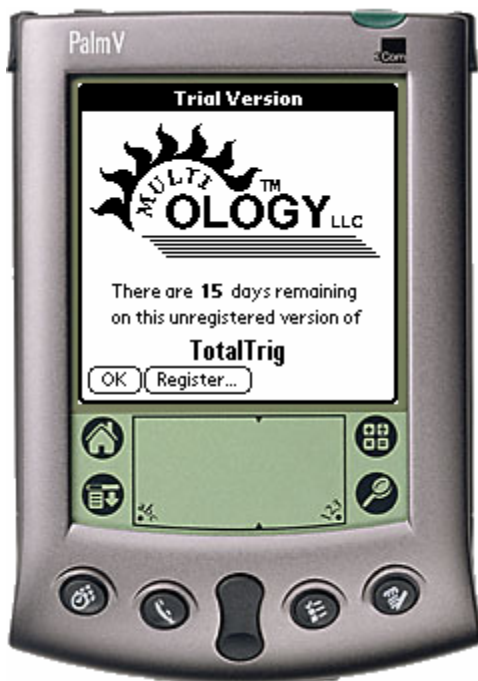


Figure 3.1-1. Initial Launch of TotalTrig

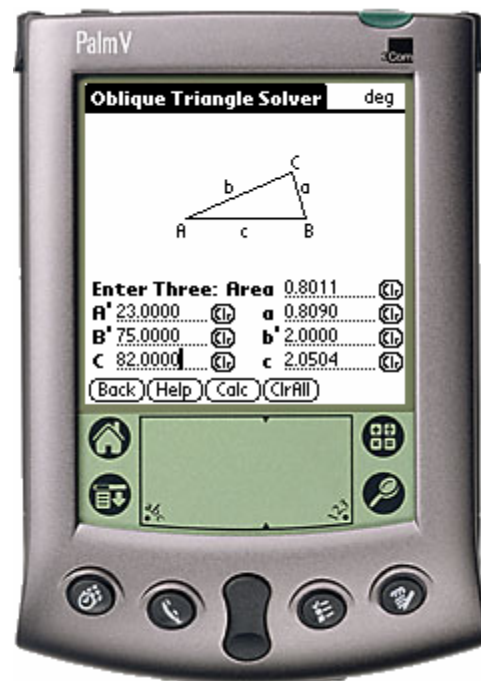


Figure 3.1-2. Default Input Indicators (Oblique Triangle Solver)

3.2 Program Use

The main TotalTrig screen is divided up into four main areas: (1) the "Solvers" area solves various problems, (2) the "Definitions" area defines general trigonometric quantities, (3) the "Relationships" area describes various formulas and relationships among the trigonometric quantities, and (4) a "Graphs" area displays the trigonometric functions. Figure 3.2-1 shows the main TotalTrig screen.

Most screens contain a "Help" button to provide context-sensitive help for the current screen. Each screen, with the exception of the main screen, contains a "Back" button to return to the previous screen. On some Palm models, a graffiti shift indicator appears in the bottom right corner of all screens allowing the user to know the state of the shift or numeric function keys (or graffiti strokes).



Each screen contains an "Options" menu to allow the user to select preferences, register TotalTrig, or find out information about the software. Screens that allow input also display an "Edit" menu that allows the user to undo, cut, copy, paste, invoke the keyboard (if the cursor is in an input field), or invoke graffiti help (if the cursor is in an input field). These menus may be accessed by tapping the menu bar at the top of the screen or by selecting the menu silk-screen button to the left of the graffiti input area. Furthermore, all screens that have either angle inputs or outputs offer a user-selectable button in the upper right-hand corner to toggle the angle values between radians and degrees.



Figure 3.2-1. Main TotalTrig Screen

3.2.1 Arc Length Solver. The Arc Length Solver (Figure 3.2.1-1) determines properties of the sector of a circle. Any two of the following five values may be input.

- Area1 (first sector of circle)
- Area2 (second sector of circle)
- Radius of the circle
- Arc length
- Angle of the sector.

Once the calculate button is pressed, the remaining three values will be determined, and the drawing of the circle will change to show these updated values.

Input values are constrained as follows, and an alert dialog will appear if any are violated.

- (1) The angle (A) must be between 0 and 360 degrees.
- (2) The arc length (s) must be less than 360 degrees times the radius (r).

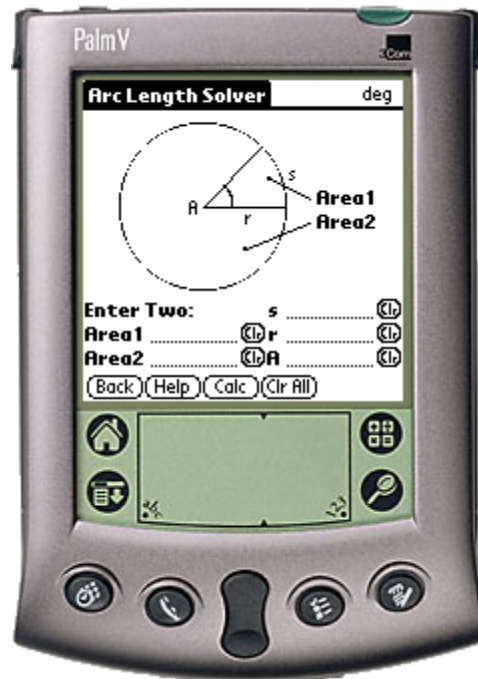


Figure 3.2.1-1. Arc-Length Solver Screen

3.2.2 Right Triangle Solver. The Right Triangle Solver determines properties of right triangles. Any two of the following five values may be input.

- Angle
- Area
- Adjacent side
- Opposite side
- Hypotenuse of the triangle

Once the calculate button is pressed, the remaining three values will be determined, and the drawing of the triangle will change to show these updated values. For triangles that have two solutions, a toggle button appears for toggling between them. Figures 3.2.2-1 and 3.2.2-2 show the two solutions for input values of 422.0 for Area and 44.0 for the hypotenuse. This updates the values in each field and redraws the triangle for the new values.

Input values are constrained as follows, and an alert dialog will appear if any are violated.

- (1) The hypotenuse (r) must be greater than the adjacent side (x) or the opposite side (y).
- (2) The angle (A) must be less than 90 degrees.
- (3) When the Area and hypotenuse (r) are input, there are situations where no solutions are found. For example, there is no valid solution when entering a “small” value of r and a “large” value of Area. If this happens, an alert dialog will appear.
- (4) The Toggle button is used to toggle between the two triangle solutions possible when the Area and hypotenuse (r) are input.

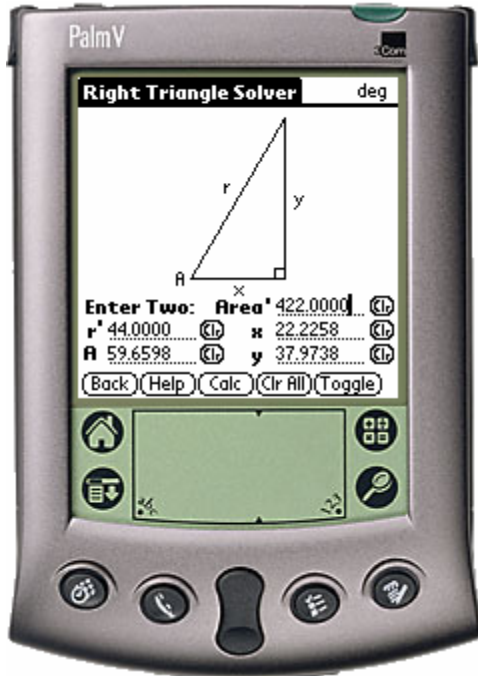


Figure 3.2.2-1. Right Triangle Solver Screen with First Solution

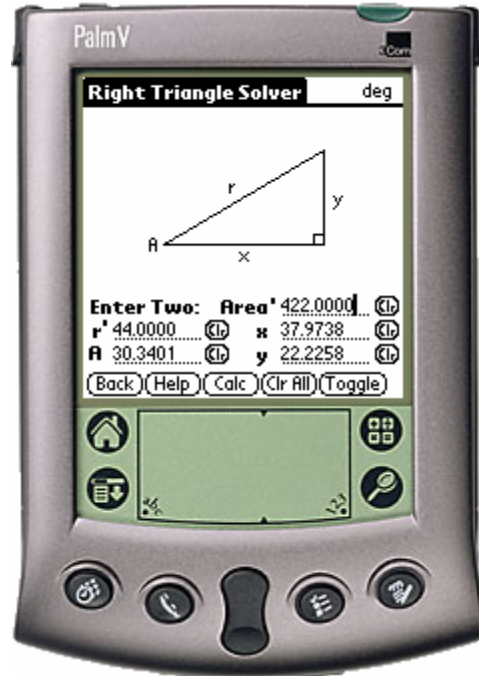


Figure 3.2.2-2. Right Triangle Solver Screen with Second Solution

3.2.3 Oblique Triangle Solver. The Oblique Triangle Solver takes any three out of the following seven input values and calculates the other four.

- Any of the three angles (A, B, or C)
- Any of the three sides (a, b, or c)
- Area of the triangle.

Once the calculate button is pressed, the remaining four values will be determined, and the drawing of the triangle will change to show these updated values. For triangles that have two solutions, a toggle button appears for toggling between them. Figures 3.2.3-1 and 3.2.3-2 show the two solutions for input values of angle A of 32.0 degrees, side a of 44.0 and side b of 55.0. This updates the values in each field and redraws the triangle for the new values.

Input values are constrained as follows, and an alert dialog will appear if any are violated.

- (1) It is not allowed to enter the three angles only. There are an infinite number of solutions when only the three angles are input.
- (2) If one or two angles are input, the sum of these angles must be less than 180 degrees.
- (3) There are certain situations in which no solution is possible. For example, entering "small" numbers for sides a and b and a "large" number for Area will not yield a solution.
- (4) If two sides and one of the angles opposite those two sides are input, there can be no solution, one solution, or two solutions. If there is no solution, an alert dialog will appear. If there are two solutions, then the toggle button will appear.



When the given angle is less than 90 degrees, there will be:

- One solution if the side opposite the given angle is greater than or equal to the other given side.
- One solution, two solutions, or no solution if the side opposite the given angle is less than the other given side.

When the given angle is greater than 90 degrees, there will be:

- No solution when the side opposite the given angle is less than or equal to the other given side.
- One solution if the side opposite the given angle is greater than the other given side.

As was mentioned in the introduction, there are some instances in which TotalTrig will provide a correct solution when other programs on the market do not. An example uses the following values in the Oblique Triangle Solver screen:

$$\begin{aligned} A &= 42.0 \\ b &= 444.0 \\ c &= 212.0 \end{aligned}$$

TotalTrig provides the correct solution ($B = 111.66$, $C = 26.35$, $a = 319.65$), whereas other programs either provide an incorrect solution ($B = 68.35$, $C = 69.66$, $a = 319.65$), or states the data is invalid and no solution can be found.

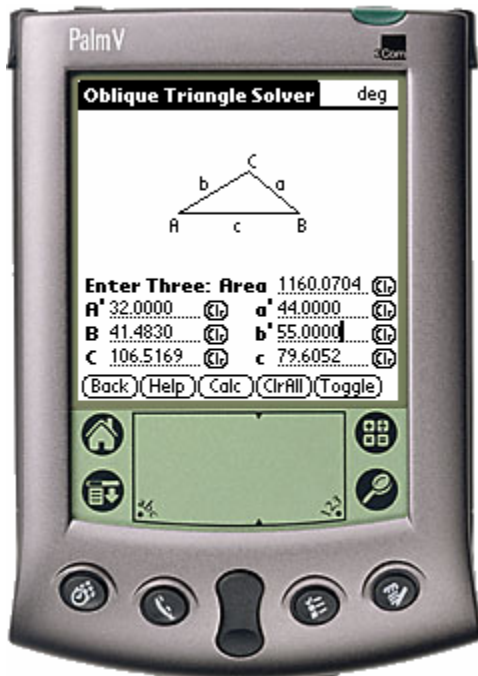


Figure 3.2.3-1. Oblique Triangle Solver Screen with First Solution

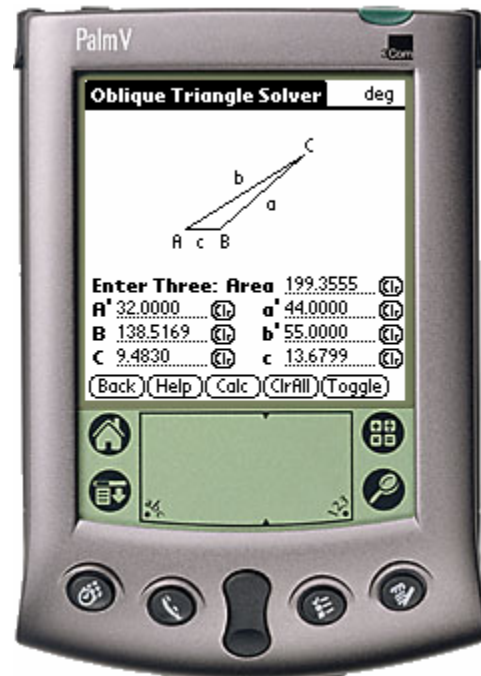


Figure 3.2.3-2. Oblique Triangle Solver Screen with Second Solution



3.2.4 Definitions and Relationships. TotalTrig contains several screens of trigonometric definitions and relationships. Most screens are for information only; however, all definitions screens allow calculations to be performed. Definitions in TotalTrig include basic, reciprocal, and inverse definitions. Relationships are divided among one angle, two angle, and general relationships. Some of the definitions and relationships are described below. An example (Basic Definitions) is shown in Figure 3.2.4-1.

Basics. Entering a value for the angle (A) and selecting the “Calc” button generates values for the sine of A, the cosine of A, and the tangent of A. All values may be cleared by selecting the “Clr All” button. On some Palm models, the graffiti shift indicator appears in the lower right corner of the screen. The angle value may be toggled to/from radians and degrees by selecting the rad/deg button in the upper right corner of the screen. This value is then updated immediately. The graphs of the individual functions may also be selected from this screen.

Reciprocals. Entering a value for the angle (A) and selecting the “Calc” button will generate values for the cosecant of A ($1/\sin A$), the secant of A ($1/\cos A$), and the cotangent of A ($1/\tan A$). All values may be cleared by selecting the “Clr All” button. On some Palm models, the graffiti shift indicator appears in the lower right corner of the screen. The angle value may be toggled to/from radians and degrees by selecting the rad/deg button in the upper right corner of the screen. This value is then updated immediately. The graphs of the individual functions may also be selected from this screen.

Inverses. The inverse trigonometric functions determine an angle given a trigonometric quantity, such as the sine of x. For example, if the value of sine x is given, then the angle (y) that gives the sine of x is the arcsine of x. Entering a value for X and selecting the “Calc” button will generate values for the arcsine of X, the arccosine of X, the arctangent of X, the arc-cosecant of X, the arc-secant of X, and the arc-cotangent of X. The values generated will be in the units specified in the upper right corner of the screen (either radians or degrees).

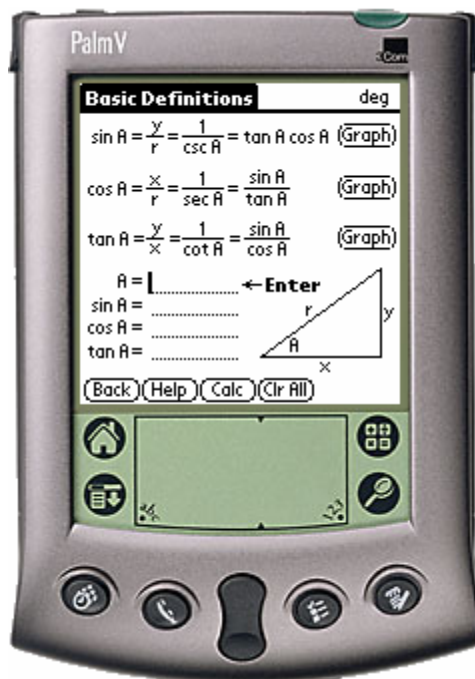


Figure 3.2.4-1. Basic Definitions Screen



Quadrant. Since the hypotenuse (r) of a triangle is always positive, the signs of the functions in the various quadrants depend on the signs of x and y . For example, for a triangle with its hypotenuse in quadrant II (angle between 90 and 180 degrees), the sine of that angle is positive, since $\sin A = y/r$. Similarly $\csc A = r/y$ is positive since both y and r are positive. All other trig functions are negative in this quadrant since they all contain an x term in them.

Law Of Sines. For any triangle ABC, the ratio of a side and the sine of the angle opposite that side is a constant.

Law Of Cosines. For any triangle ABC, the square of any side is equal to the sum of the squares of the other two sides minus twice the product of these sides and the cosine of the included angle.

Area Formulas. The first formula for area (K) is used when one angle and the two adjacent sides of a triangle are known (Figure 3.2.4-2). When two angles and one side of a triangle are known, the other angle may be calculated from $A + B + C = 180$ degrees and the second area formula can then be used. Whenever the three sides are known, then the third formula may be used. In this equation, " s " is the semi-perimeter (one-half the sum of the sides), " r " equals the radius of the inscribed circle ($\sqrt{[(s-a)(s-b)(s-c)]/s}$), and R is the radius of the circumscribed circle ($a/(2 \sin A)$, or $b/(2 \sin B)$, or $c/(2 \sin C)$).

Newton's and Mollweide's Formulas. Newton's formulas (Figure 3.2.4-3) (like Mollweide's formulas) are excellent checks to use when trying to determine if a triangle is valid or not. Given sides a , b , and c and angles A , B , and C , then Newton's and Mollweide's formulas are valid if these sides and angles make a valid triangle; otherwise, the formulas fail.

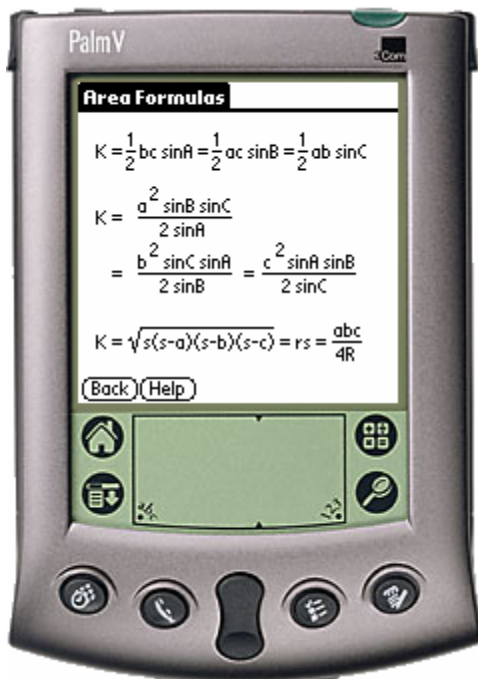


Figure 3.2.4-2. Area Formulas

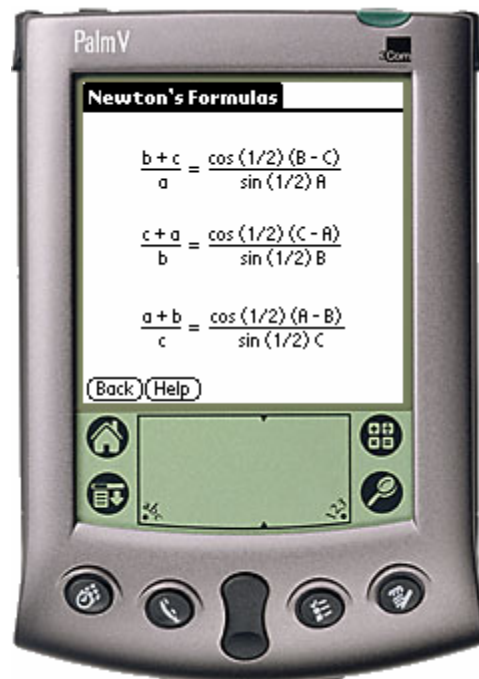


Figure 3.2.4-3. Newton's Formulas

3.2.5 Trigonometric Graphs. All graphs of the basic trigonometric functions share similar properties. All are periodic and extend to plus and minus infinity along the x -axis. Each graph can be shifted vertically by adding a constant to the function. Similarly, each can be shifted



horizontally by adding a constant to the angle of the function. Therefore, the graph of $y = (\sin x) + 20$ (or any other trigonometric function) would be shifted up twenty units along the y-axis and the graph of $y = \sin(x + 20)$ would be shifted twenty degrees (or radians) along the x-axis. An example of one of the trigonometric graphs (tangent) is shown in Figure 3.2.5-1.

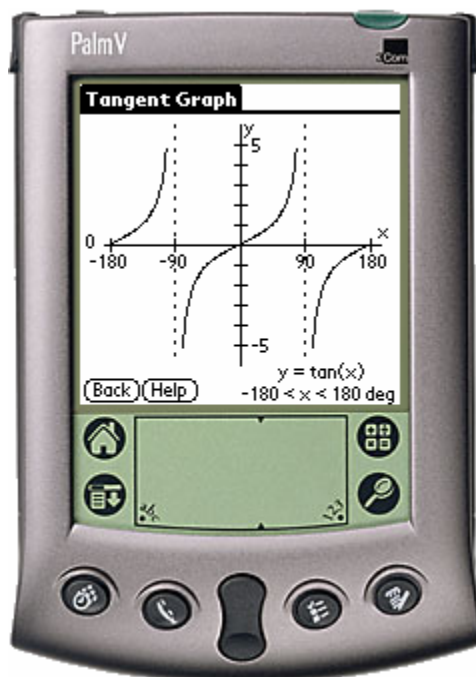


Figure 3.2.5-1. Example of Trigonometric Graph

Sine Graph. The Sine function has a period of 2π and extends to plus and minus infinity along the x-axis. The amplitude of a simple Sine function is one. In general, the Sine curve, $y = a \sin bx$, has an amplitude of "a" and a period of $2\pi/b$.

Cosine Graph. The Cosine function has a period of 2π and extends to plus and minus infinity along the x-axis. The amplitude of a simple Cosine function is one. In general, the Cosine curve, $y = a \cos bx$, has an amplitude of "a" and a period of $2\pi/b$.

Tangent Graph. The Tangent function has a period of π and extends to plus and minus infinity along the x-axis. The amplitude of a simple Tangent function extends from minus infinity to plus infinity. In general, the Tangent curve, $y = a \tan bx$, has a value of -a (in the y direction) at $1/4$ of a period and +a at $3/4$ of a period. The general tangent function has a period of π/b .

Cosecant Graph. The Cosecant function has a period of 2π and extends to plus and minus infinity along the x-axis. The amplitude of a simple Cosecant function extends from minus infinity to plus infinity. In general, the Cosecant curve, $y = a \csc bx$, has a "trough" at +a (coming from the plus infinity direction), a "peak" at -a (coming from the minus infinity direction), and a period of $2\pi/b$.

Secant Graph. The Secant function has a period of 2π and extends to plus and minus infinity along the x-axis. The amplitude of a simple Secant function extends from minus infinity to plus infinity. In general, the Secant curve, $y = a \sec bx$, has "trough" at +a (coming from the plus infinity direction), a "peak" at -a (coming from the minus infinity direction), and a period of $2\pi/b$.

Cotangent Graph. The Cotangent function has a period of π and extends to plus and minus infinity along the x-axis. The amplitude of a simple Cotangent function extends from minus infinity



to plus infinity. In general, the Cotangent curve, $y = a \cot bx$, has a value of $+a$ (in the y direction) at $1/4$ of a period and a value of $-a$ at $3/4$ of a period. The general Cotangent function has a period of π/b .

3.2.5 Inverse Trigonometric Graphs. Like the basic trigonometric graphs, all graphs of the inverse trigonometric functions share similar properties. Each graph is shown (in a solid line) as a restricted function. A full cycle of the each inverse function is shown as a dotted line (to show how it relates to the normal function) but only the portion shown with a solid curve is the actual inverse function. This is because a function can have only one value of Y for each value of X .

You might think that you could reposition the axes by simply rotating the graph counterclockwise (try it!) and turn the inverse function back into the basic function. However, note that the now-rotated horizontal axis is pointing in the wrong direction. For example, the only way to see the original sine function with a rotated inverse sine function is to rotate the inverse sine function counterclockwise and then look at from behind (which is hard to do on the Palm).

Arcsin Graph. This graph shows the inverse sine curve from -180 degrees ($-\pi$ radians) to $+180$ degrees ($+\pi$ radians) for values of X between -1 and $+1$. In order to get the "restricted" inverse sine function we restrict the domain of the original sine function to the interval from -90 to $+90$ degrees ($-\pi/2$ to $+\pi/2$ radians) before performing the inverse.

Stated another way, per the definition of an inverse function, $\arcsin(\sin(x)) = x$ ONLY on the interval from $-\pi/2$ to $+\pi/2$ radians, inclusive. For example, $\arcsin(\sin(\pi)) = \arcsin(0) = 0$, not π as we would expect from a true inverse function.

Arccos Graph. This graph shows the inverse cosine curve from -180 degrees ($-\pi$ radians) to $+180$ degrees ($+\pi$ radians) for values of X between -1 and $+1$. In order to get the "restricted" inverse cosine function we restrict the domain of the original cosine function to the interval from 0 to $+180$ degrees ($+\pi$ radians) before performing the inverse.

Stated another way, per the definition of an inverse function, $\arccos(\cos(x)) = x$ ONLY on the interval from 0 to $+\pi$ radians, inclusive. For example, $\arccos(\cos(-\pi)) = \arccos(-1) = +\pi$, not $-\pi$ as we would expect from a true inverse function.

Arctan Graph. This graph shows the inverse tangent curve from -180 degrees ($-\pi$ radians) to $+180$ degrees ($+\pi$ radians) for values of X between $-\infty$ and $+\infty$. In order to get the "restricted" inverse tangent function we restrict the domain of the original tangent function to the interval from -90 to $+90$ degrees ($-\pi/2$ to $+\pi/2$ radians) before performing the inverse.

Stated another way, per the definition of an inverse function, $\arctan(\tan(x)) = x$ ONLY on the interval from $-\pi/2$ to $+\pi/2$ radians, non-inclusive. Note that the inverse tangent function approaches -90 and $+90$ degrees asymptotically. For example, $\arctan(\tan(-\pi)) = \arctan(0) = 0$, not $-\pi$ as we would expect from a true inverse function.

3.3 Program Preferences

The preferences dialog allows the user to change the way TotalTrig looks and the way it calculates data (Figure 3.3-1).

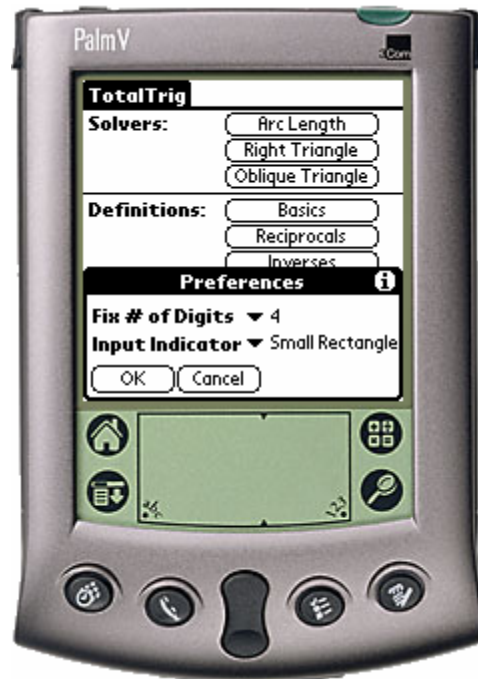


Figure 3.3-1. Preferences Screen

The "Fix # of Digits" popup will adjust the number of digits displayed after the decimal for each calculated field. For example, if "4" is chosen, then four places to the right of the decimal will display. This formatting will only take effect after the "Calc" button is again pressed. One to nine digits may be specified, and the default value is "4".

The "Input Indicator" popup allows the user to change or remove the display of the input field indicators. These indicators appear beside the fields that are used as input values in the arc length, right triangle, and oblique triangle solvers. For example, if A, B and b are input in the oblique triangle solver fields, then the input indicators will appear beside those labels when the "Calc" button is pressed. The indicator choices are:

- (1) None
- (2) Small square
- (3) Small rectangle
- (4) Small plus
- (5) Small x

3.4 Calculation Issues

There are a couple of situations of which the user should be aware: round-off errors and the rounding of answers.

3.4.1 Round-off Errors. It is possible that round-off error will cause the program to not find a solution when one might expect there to be one; however, these situations are extremely rare. An example in which this happens is when the following values are entered:

Angle A = 60.0 degrees
 Side a = 2.0
 Area = 1.732051



The solution to this triangle is *almost* an equilateral triangle with equal angles of 60 degrees and equal sides of length 2. However, due to the rounding of the input area term (which is too large for a solution to be found), one of the terms under the radical in the solution is slightly less than zero. If the area term is changed to 1.7320508 (adding an extra significant digit to the area term) then a solution is found.

3.4.2 Rounding. Rounding is not performed when results are displayed. Therefore, if the accuracy of the last displayed digit is important, then more numbers after the decimal should be used (set with the "Fix # of Digits" on the "Preferences" screen).

3.5 Program Help

At any time, the "About TotalTrig" menu item can be selected from the "Options" menu and the "Help..." button chosen to display online program help. Alternatively, the "i" button in the upper right hand corner may be chosen to display the same help screen. Figure 3.5-1 shows the "About TotalTrig" screen.

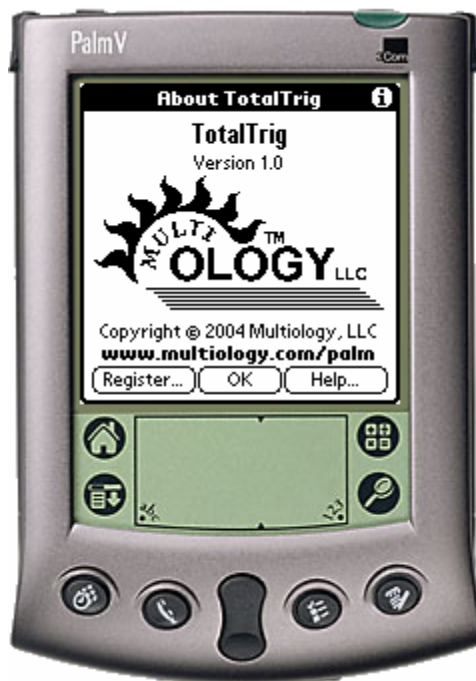


Figure 3.5-1. About TotalTrig Screen

3.6 TotalTrig Registration

After TotalTrig is installed the user will have 15 days in which to evaluate the software. Each time the software is invoked during this 15-day period, a reminder will appear to let the user know how many days remain for evaluation (Figure 3.6-1). After this 15-day period is up, the software will become disabled and none of the buttons on the TotalTrig main screen will launch any other screens.

To register TotalTrig, visit either www.handango.com or www.palmgear.com and purchase a license (search for TotalTrig). The purchaser will have to supply the exact HotSync ID of their device, which is displayed on the registration screen for TotalTrig. An unlock code will be generated and sent to the purchaser by email. This code must then be entered in the input field at the bottom of the TotalTrig registration screen (Figure 3.6-2). This registration screen may be displayed by selecting either the "Register..." menu item from the "Options" menu or selecting the "About TotalTrig" menu item from the "Options" menu and then selecting the "Register..." button.



If the software has previously been registered, a dialog will appear stating that the software has already been registered.

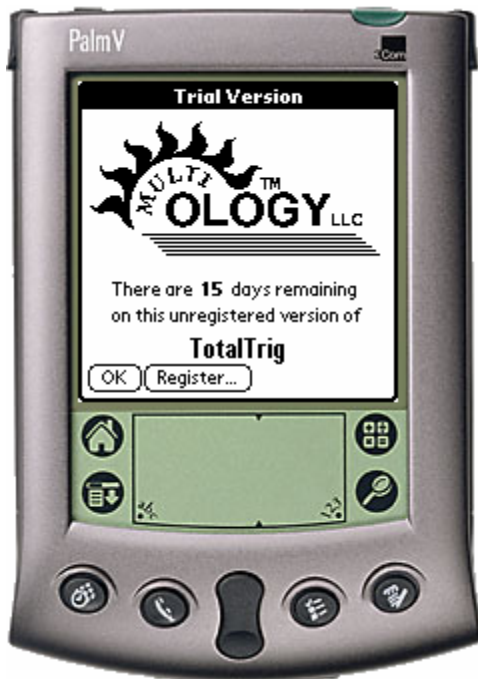


Figure 3.6-1. Days to Expiration

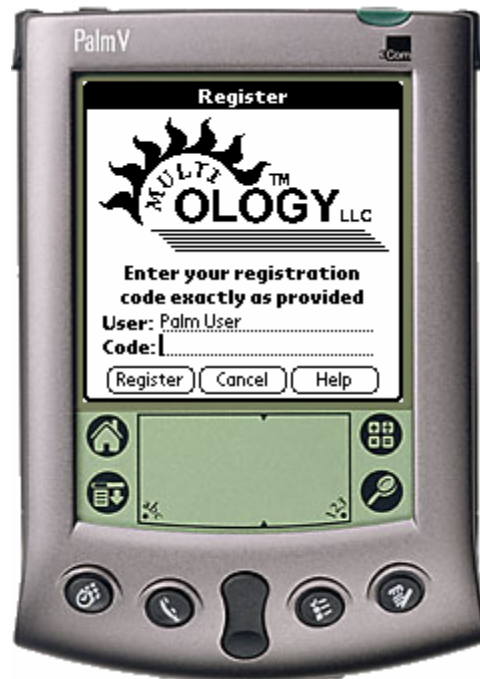


Figure 3.6-2. TotalTrig Registration Screen



4.0 Release History

TotalTrig 1.0 (May 23, 2004)

- Initial version.

TotalTrig 1.1 (August 15, 2005)

- Added graphs for inverse sine, inverse cosine, and inverse tangent functions.
- Added help for inverse sine, cosine, and tangent function.
- Fixed error when two sides and one opposite side are input in the oblique triangle solver screen. When two angles are input that are equal, the program incorrectly gave a second triangle as a solution (the "Toggle" button appeared). This second triangle had values for the other side and one other angle that were very close to zero, or even negative. This roundoff problem has been corrected.
- Added more aesthetically pleasing clear buttons for the arc length, right triangle solver, and oblique triangle solver screens.
- Changed "Clr All" button on arc length, right triangle solver, oblique triangle solver, basic definitions, reciprocal definitions, and inverse definitions screens to "Clear".
- Changed registration method to immediate fulfillment. This provides the purchaser with a code that may immediately be input into the program to unlock its full capabilities.

5.0 Contact Us

We appreciate your use of our software, solicit your input regarding your experiences with TotalTrig, and welcome all feedback, positive or negative. Our contact information is below.

5.1 Website

www.multiology.com/palm

5.2 Email

Web page issues:

webmaster@multiology.com

Customer service:

support@multiology.com

