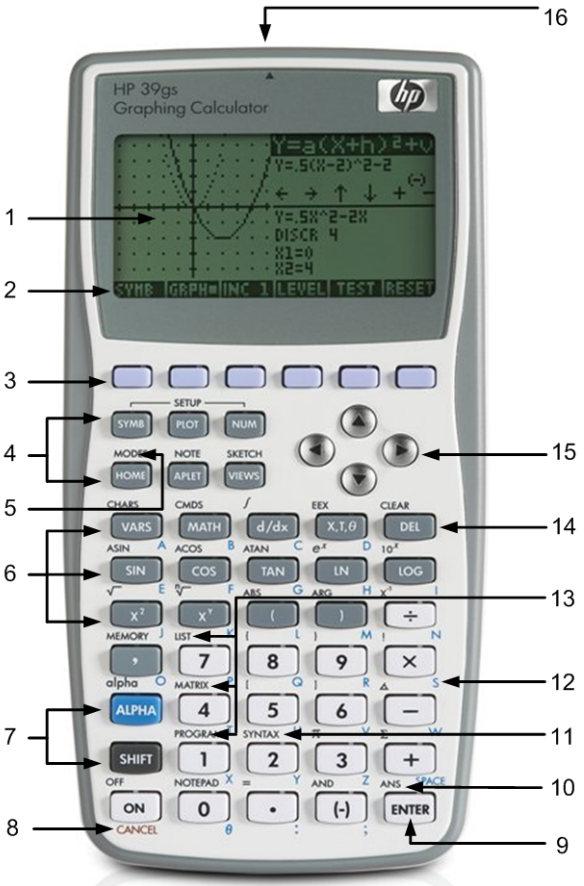
# HP 39gs Graphing Calculator Quick Start Guide

Edition 1
HP Part Number: F2223-90201

# HP 39gs Graphing Calculator



## Keyboard Map Legend

| Number | Feature | Number | Feature |
|---|---|---|---|
| 1 | Screen display 131 x 64 pixels | 9 | Enter key |
| 2 | Context-sensitive menu | 10 | Last Answer (ANS) |
| 3 | Context-sensitive menu keys | 11 | Syntax (HELPWITH) |
| 4 | HP Aplet keys | 12 | Alphabetic entry |
| 5 | Modes | 13 | List, matrix, and program editors |
| 6 | Common math and science functions | 14 | Delete (Clear) |
| 7 | Shift keys | 15 | Cursor keys |
| 8 | On (cancel) | 16 | Wireless connectivity |

The table above and the photo on the previous page illustrate a few of the many features available on the HP 39gs Graphing Calculator. These topics, as well as other features of the calculator, are discussed in the following quick start guide. For a complete list of features of the HP 39gs Graphing Calculator, refer to the *HP 39gs Graphing Calculator User's Guide* on the product CD, and *Mastering the hp 39gs & hp 40gs*. These manuals are also found on the HP website, **www.hp.com**.

## Legal Notices



Hewlett-Packard Company
16399 West Bernardo Drive
MS 66M-785
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# 1 Getting Started

## Introduction

The HP 39gs Graphing Calculator is an easy to use, yet powerful graphing calculator designed for secondary mathematics education and beyond. This quick start guide covers basic tasks, such as entering and editing expressions, plotting graphs, and making tables of values. This guide also serves as an introduction to more advanced tasks, like working with lists or matrices. It is highly recommended you refer to the *HP 39gs Graphing Calculator User's Guide* on the product CD for more information about any topic presented in this guide, and *Mastering the hp 39gs & hp 40gs* located at **www.hp.com/calculators** to thoroughly familiarize yourself with the many features of your new calculator. This manual makes use of certain conventions with text to differentiate between key presses and on screen display options:

- Keyboard keys are represented by CAPITAL letters.
- SHIFT, when followed by CAPITAL letters and (CAPITALS), indicates the shifted functions of the keyboard keys printed in gray above the keys
- Menu items for menu keys are also spelled out in CAPITAL letters, followed by the term, *menu key*
- Field names, choose box options, and other on screen text appear in **BOLD**
- Numbered keys are represented simply by printed numbers: 1, 5, 123.35, etc.

## The Home View

Press the ON key on the keyboard to access the Home view. The HP 39gs *Home* view is divided into four parts, from top to bottom. There is a *Header* at the top, with the name of the Aplet you're currently using and whether you are in degree (**DEG**) or radian (**RAD**) mode. Next comes the *History* of calculations. Below that is the *Entry Line*. Finally, at the bottom is the *Menu* for the menu keys. The top row of keys on the HP 39gs keyboard has no labels. These are the context-sensitive menu keys. These keys take their functionality from the list of functions printed at the bottom of the display, which changes as you use the various features of the calculator. There are six menu keys in all. See Figure 1 for an illustration of these parts of the Home view.

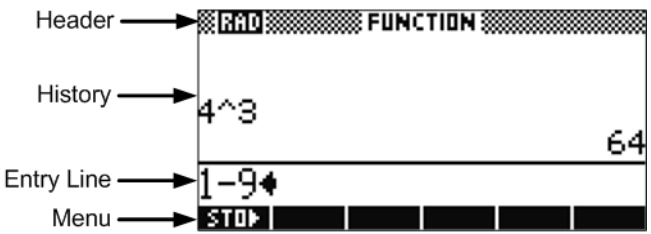



Figure 1 The Home View

Take a moment to verify the screen is at a contrast that is comfortable to your eye. To adjust the display screen, press ON and hold it, and press either the + (PLUS) or the - (MINUS) key repeatedly. Each press of the + or - key increases or decreases the contrast, respectively. To turn the calculator off, press SHIFT followed by ON.

## Modes

To change the angle measure, the number format, or the decimal mark character from a dot to a comma, press SHIFT followed by HOME (MODES). Use the cursor keys to scroll through the fields. With a field highlighted, press the CHOOS menu key to see the available options, and use the cursor keys to scroll. With your selection highlighted, press either the OK menu key to save your settings, or the CANCL menu key to cancel. Once you have set your preferences on the **Home Modes** page, press the HOME key to return to the Home view.

## Entering and Editing Expressions

To calculate the square root of $\sqrt{\frac{2}{3}}$, enter the expression then press ENTER. The HP 39gs displays the results with 12 digits of accuracy (Figure 2).

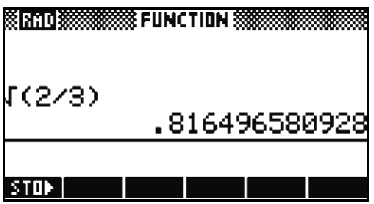



Figure 2

## Menu Keys

Now press the UP cursor key twice to highlight the expression you entered (see Figure 3). Note that two additional menu labels are now displayed: COPY and SHOW. The SHOW command typesets the expression using standard mathematical notation. This command is useful if you want to check that the expression you entered - with one or more sets of parentheses - is exactly what you want. Try it out by pressing the SHOW menu key with $\sqrt{\frac{2}{3}}$ selected.

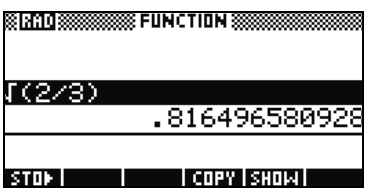



Figure 3

Your display should look like Figure 4. Press the OK menu key when you are ready to continue.


Figure 4

## Deleting and Clearing

Press the COPY menu key to see the expression pasted into the entry line as shown in Figure 5. If you had meant to enter $\sqrt{\frac{2}{5}}$, you can fix it by moving the insert cursor over the 3 by pressing the LEFT cursor key twice, followed by DEL, then 5. Press ON (CANCEL) to cancel any entry, or ENTER to execute the new calculation.

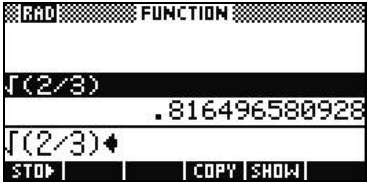



Figure 5

While entering data in the entry line, you can use the delete key (DEL) to delete any character. If the insert cursor is at the end of an entry, pressing DEL deletes the last character. In other words, the DEL key functions like a backspace key when it is at the end of an entry. In Figure 5, pressing the DEL key deletes the right parenthesis.

Note that the shift of the DEL key is CLEAR. Use CLEAR to clear the entire entry line, or press the ON key to cancel any entry. Use the History to show all your work as you solve problems. If you make a mistake, delete the lines from the History by using the DEL key. Again, note that the shift of the DEL key is CLEAR. Use the CLEAR command to delete the entire history. But be careful - there is no undo for this action!

## Last Answer

If you'd like to retrieve your last answer, you can using a feature called, *Answer* (ANS). Press SHIFT followed by ENTER (ANS). See Figure 6.

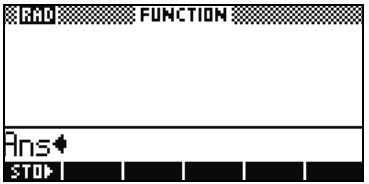



Figure 6

Press ENTER once again to return your last answer to the calculation history, as shown in Figure 7.

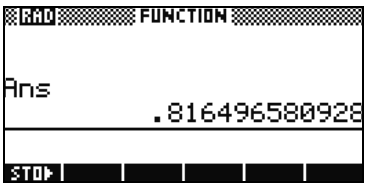



Figure 7

## Storing Values in Variables

Now let's store our numeric approximation of $\sqrt{\frac{2}{3}}$ and label it in the variable A. With the screen displayed in Figure 7, press the STO menu key. Press the ALPHA key, followed by VARS (the key for the letter A) and then press ENTER. To verify you stored the value in A, press ALPHA, then VARS (A), followed by ENTER. Your stored value appears as shown in Figure 8. Note how letters of the alphabet are printed in blue on the keyboard below and to the lower right of many of the keys.

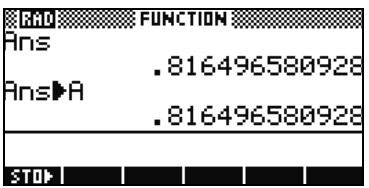



Figure 8

## HELPWITH

As you work, you can find help with a command using the HELPWITH feature. This feature is accessed by pressing SHIFT followed by 2 (SYNTAX). At the prompt, enter the function for which you require syntax help. The HELPWITH command is only available in the Home view.

## Menu Keys, Choose Boxes, Input Fields and Check Boxes

### Menu Keys

The bottom of the display contains a menu of up to six items. Use the blank menu keys located below the display to access these commands and functions.

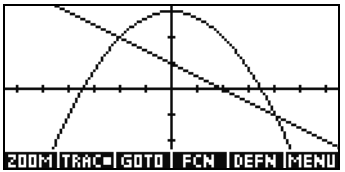



Figure 9

### Choose Box

To change the value in a Choose Box, press the CHOOS menu key, and a list of options appears. Scroll to a new selection and press the OK menu key. You can press the CANCL menu key to return to the previous value.

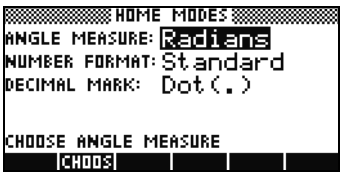



Figure 10

### Input Field

To enter data in an input field, scroll to the field and either press the EDIT menu key to begin editing the current value or begin typing a new value or expression. The value or expression you are entering will appear at the bottom of the display, above the menu.

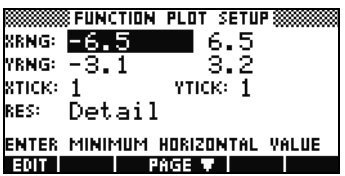



Figure 11

### Check Box

Toggle the option in a Check Box off or on by using the CHK menu key.

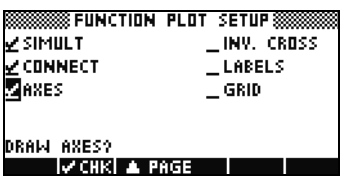



Figure 12

## The Function Aplet

The HP 39gs comes from the factory with the Function Aplet as the default Aplet. Notice the current Aplet name is shown in the display header. The Function Aplet contains all the features commonly used to explore functions, including plotting graphs of one or more functions, exploring tables of function values, and finding points of interest (roots, extrema, intersections, etc.). These features are presented in one or more views of the Function Aplet.

To enter the Function Aplet, press APLET, press the UP or DOWN cursor keys to scroll to the **Function** option in the **Aplet Library**, and press the START menu key. The Function Aplet opens in its Symbolic view.

## Function Symbolic View

The Symbolic view is used to store and manage symbolic representations of functions. You can press SYMB to return to this view at any time.

You can define up to ten functions, F1(X) through F9(X) and F0(X). Figure 13 shows the **Function Symbolic View** with no functions defined and **F1(X)** highlighted.

Note the new menu labels. The EDIT menu key opens an input box to edit the chosen definition, in this case, **F1(X)**.

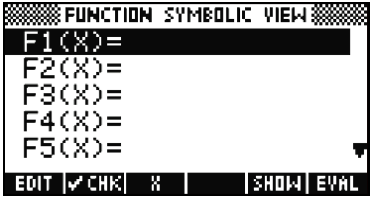



Figure 13

You do not have to press the EDIT menu key to start a definition. Simply start typing and the input box will open. Enter the expression $3 - \frac{x^2}{4}$ in **F1(X)**, as shown in Figure 14, and press ENTER or the OK menu key.

Hint: use the *X* menu key as a typing aid.

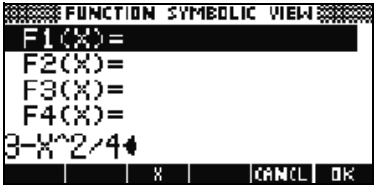



Figure 14

Next, enter $1-\frac{x}{2}$ in **F2(X)** and press ENTER. Your completed **Function Symbolic View** should be the same as that shown in Figure 15. Note the CHK menu key. This menu key toggles each function definition on and off for graphing and table-building. The check mark indicates an item is selected. The EVAL menu key resolves references. If F2(X)=3-F1(X), pressing the EVAL menu key returns $F2(X) = 3-\left(3-\frac{x^2}{4}\right)$. The SHOW menu key performs the same function it does in the Home view.

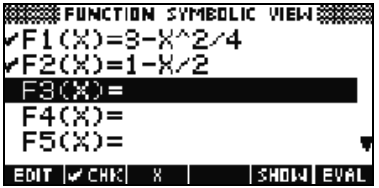



Figure 15

## Function Plot View

The Function Plot view displays the graphs of functions and provides you with the tools you need to explore these graphs. Here you can trace along a graph, find roots and intersections, and estimate the area between curves. In this section, we continue the example from the last section using $F1(X) = 3-\frac{x^2}{4}$ and $F2(X) = 1-\frac{x}{2}$.

Press PLOT to see the graphs of the functions in the current window. See Figure 16.

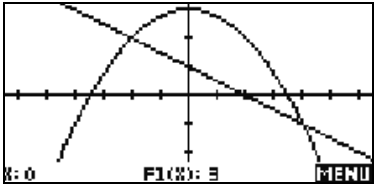



Figure 16

Before we continue, let's look at the default window settings. Press SHIFT followed by PLOT to open the **Function Plot Setup**, as shown in Figure 17. The HP 39gs has 131 pixel columns, allowing the cursor to make 130 steps from one vertical edge of the display to the other. The default setting for the horizontal range (**XRNG**) is [-6.5, 6.5], a distance of 13 units. Thus, each pixel has a width of 0.1 units, very convenient for tracing. Likewise, the display has 64 pixel rows, allowing the cursor 63 vertical steps. The default **YRNG** of [-3.1, 3.2] makes the height of each pixel 0.1. The result is that the pixels are square, graphs are accurately plotted, and tracing increments x-values by 0.1.

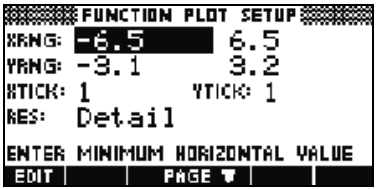



Figure 17

Return to the graphs by pressing the PLOT key. Press the MENU key to restore the menu (Figure 18). The menu consists of 6 items:

- **ZOOM** opens the Zoom menu, with options to zoom in or out, etc.
- **TRACE** toggles the tracing cursor on and off. When active, it appears as in Figure 18, with a small square replacing the letter *E* in *TRACE*
- **GOTO** lets you find any point on the curve being traced by entering a value for x.
- **FCN** opens the Function menu, with the following commands:
    - Root
    - Intersection
    - Extremum (Maximum or Minimum)
    - Slope
    - Signed Area (the area under a curve or between two curves)
- **DEFN** displays the definition of the function being traced
- **MENU** toggles the menu on and off

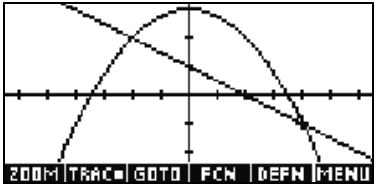



Figure 18

Press the MENU key once to hide the menu. Then press the same key again to bring up the tracer coordinates. This illustrates that tracing can occur with or without the tracer coordinates displayed.

We continue our introduction to the Plot view by finding the root of F1(X) at $x = 2\sqrt{3}$. Use the LEFT and RIGHT cursor keys to trace along F1(X). Use the UP and DOWN cursor keys to move between F1(X) and F2(X). In Figure 19, the tracer has been moved along F1(X) to the pixel closest to the root at $x = 2\sqrt{3}$.

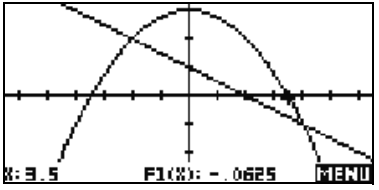



Figure 19

The HP 39gs uses the current cursor location for tasks such as finding roots, intersections, and slope at a point. To find the best numerical approximation to the root, press the MENU key to restore the menu, press the FCN menu key to see the list of options, and select the **ROOT** command (Figure 20). Press the OK menu key. The result, accurate to 12 digits, is shown in Figure 21.


Figure 20

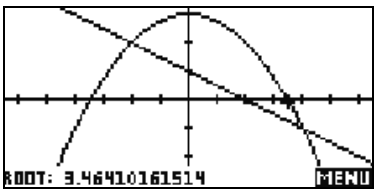



Figure 21

Let's find the intersection of the two graphs at (4, -1). With the cursor at its current location at the root, return to the menu, press the FCN menu key, select the **Intersection** option, and press the OK menu key. The HP 39gs uses the current function being traced as one of the curves involved in the intersection; you must choose the other curve from a list, as shown in Figure 22. All active graphs, as well as the x-axis, are included in this list. With **F2(X)** highlighted as in Figure 22, press the OK menu key. The results are shown in Figure 23, in which the intersection found at (4, -1) is displayed.

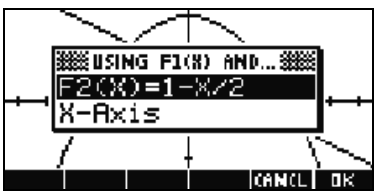



Figure 22

Press the Menu key to restore the menu and explore some of the other options in the Function Plot view. Refer to the *HP 39gs Graphing Calculator User's Guide* on the product CD for more details.

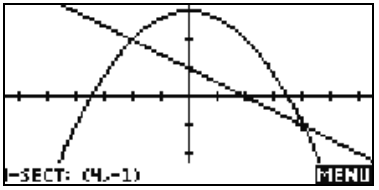



Figure 23

## Function Numeric View

The Function Numeric view provides a table of values for all active functions, as well as the tools needed to explore the table of values. You can define the starting x-value for the table, zoom in or out on a row in the table, etc. In this section, we continue the example in the Function Plot view section with $F1(X) = 3 - \frac{x^2}{4}$ and $F2(X) = 1 - \frac{x}{2}$.

Press NUM to see the table with the default settings. Figure 24 shows the table starting at x=0, with x-values that increase by 0.1. Use the UP and DOWN cursor keys to scroll in a column, or the LEFT and RIGHT cursor keys to move from column to column.

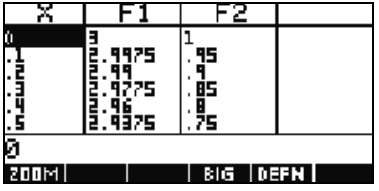



Figure 24

Remember that F1(X) has a root near x=3.5. You can use the DOWN cursor key to scroll to x=3.5, but there is an easier way to get to any *x*-value you wish. Simply move the highlight bar to any cell in the x-column and type in the value you wish to see. The table will automatically reconfigure itself accordingly. In Figure 25, the highlight bar has been moved to the value x=0.3 and the value 3.5 is entered in the entry line.

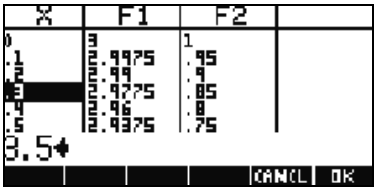



Figure 25

Press ENTER to see the result shown in Figure 26.

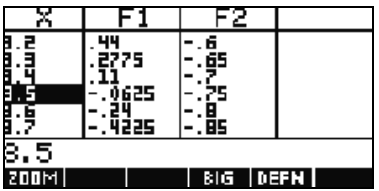



Figure 26

With the x-value 3.5 highlighted, press the ZOOM menu key followed by the OK menu key to select the **ZOOM In** option. Figure 27 shows the result. The *x*-value, 3.5, remains where it was in the table, but the step between x-values has changed from 0.1 to 0.025; in other words, we have zoomed in from 1/10 to 1/40, a factor of 4 (the default zoom factor).

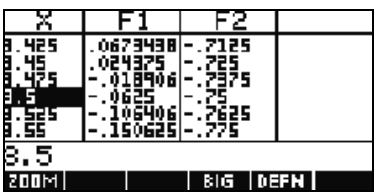



Figure 27

Now we can see that $x$=3.475 is a closer estimate to the root. Highlight this value and zoom in again to get a third, more accurate approximation. This process can be continued, just like zooming in on a point on a graph! Figure 28 shows the second zoom as described above, with $x$=3.4625 as the latest estimate of the root.

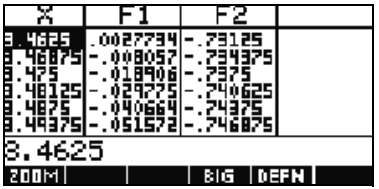



Figure 28

Press SHIFT followed by NUM to see the **Function Numeric Setup** view, as shown in Figure 29. The **NUMSTART** value is the x-value at the top of the table, as seen in Figure 28. The name is somewhat of a misnomer, since one can scroll above this value. The **NUMSTEP** value shown in Figure 29 also corresponds to the two zooms performed on the default step value of 0.1.

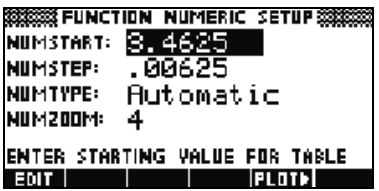



Figure 29

There are two options under the **NUMTYPE** field. The default option is **Automatic**, which means that the HP 39gs will supply x-values and function values in a table defined by the Function Numeric Setup view. The other option is **Build Your Own**. With this option, the HP 39gs presents a blank table. The user enters x-values of his/her choosing, and the calculator records those x-values and supplies the corresponding function values.

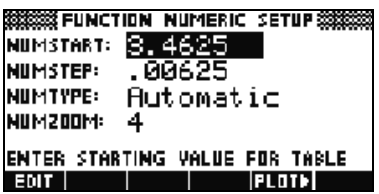



Figure 30

Delete restores the default value for any field, whether the value is numeric or an option from a list. Highlight the **NUMSTART** field and press DEL to see the default NUMSTART value of zero restored, as shown in Figure 31. Pressing SHIFT followed by DEL (CLEAR) restores all default values in a menu.

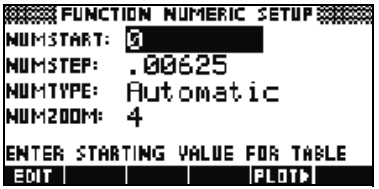



Figure 31

Press SHIFT followed by DEL (CLEAR) to see all fields returned to their default values, as shown in Figure 32.

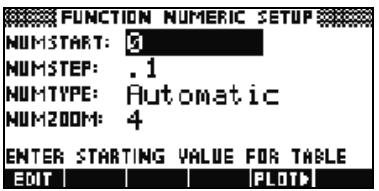



Figure 32

Finally, note the PLOT▶ menu key. If you press this key, the table of x-values will correspond exactly to the tracer values in the **PLOT** view. This way, you can see the same values in both the Plot and Numeric views! Press PLOT▶. The message box shows you the default minimum x-value from Figure 17 as the **NumStart** value and the default pixel width of 0.1 as the **NumStep** value (see Figure 33). To escape, press the CANCL menu key. At this point, press the OK menu key to accept these values.

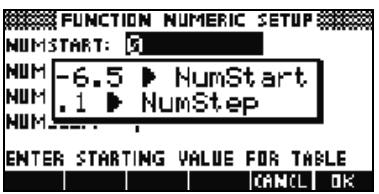



Figure 33

Press NUM. Figure 34 shows the table values corresponding to the default window values.

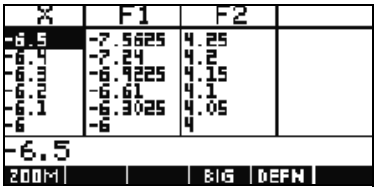



Figure 34

## Aplets

### Introduction

Much of the functionality of the HP 39gs is partitioned into packages called *Aplets*. The HP 39gs comes with 13 HP Aplets, and more can be found online. Each Aplet is designed to address a specific mathematical topic or set of tasks.

The key to working with HP Aplets is to understand that they were designed to have a similar structure. That structure is illustrated by a set of six keys, located in two rows of three keys each near the top left of the HP 39gs keyboard. The keys in the first row are SYMB, PLOT, and NUM; the keys in the second row are HOME, APLET, and VIEWS. As you saw in the previous section on the Function Aplet, SYMB, PLOT, and NUM control the Symbolic, Graphic, and Numeric views of the Aplet, which are the main views of all of the Aplets. Two other views, Plot Setup and Numeric Setup, are found by pressing the SHIFT of PLOT and NUM. Finally, a few Aplets use a Symbolic Setup view, found by pressing SHIFT followed by SYMB. All the data in these views are saved with the Aplet. Pressing HOME always takes you to the calculation history, which is not part of any Aplet, and thus not saved with any Aplet. Finally, pressing VIEWS will show you any additional special views that a particular Aplet might have.

Aplets are launched from the Aplet Library. Press APLET and use the UP and DOWN cursor keys to select an Aplet from the library. To launch the Aplet, press the START menu key, or ENTER.

As you work in an Aplet, you enter data such as definitions of functions, window settings, and preferences of one sort or another. The Aplet records all of this data and automatically saves it for you. If you leave the Aplet and come back later, all that data is still there. In fact, you can save the Aplet with a new name and use the original version of the Aplet for another purpose. The new version, under the new name, still has all of your data. You can send and receive these Aplets from unit to unit, wirelessly, or with a USB connection.

The following sections describe each Aplet briefly, summarizing the Aplet's major views and the functionality available in each view.

## The Function Aplet

Although the Function Aplet has been treated in detail in the previous sections, its functionality is summarized here for purposes of consistency and completeness. The Function Aplet lets you define up to ten functions in x, view their graphs, create tables of values, and find intersections, roots, and extrema. The Function Aplet is the default Aplet when the HP 39gs is shipped from the factory. Table 1-1 summarizes the capabilities of this Aplet. Press APLET, scroll down to select the Function Aplet, and press the START menu key to get started.

Table 1-1 Function Aplet Summary

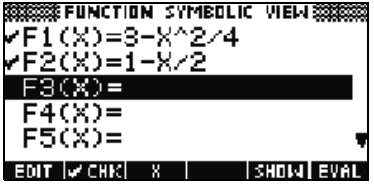
| Summary of Functionality | View Name and Display |
|---|---|
| Press SYMB to return to this view at any time. This view allows you to enter and manage up to ten function definitions in x. The menu commands are:<br>• **EDIT**: edit current function<br>• ✔CHK : toggles a function off or on for graphing and table-building<br>• **X**: a typing aid<br>• **SHOW**: displays the selected function in textbook format<br>• **EVAL**: if the selected function is defined in terms of other function(s), EVAL resolves the reference(s) | **Function Symbolic View**<br>  <br> |

Table 1-1 Function Aplet Summary

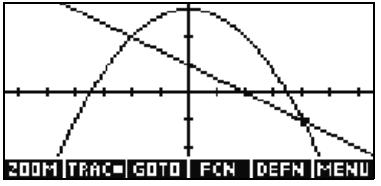
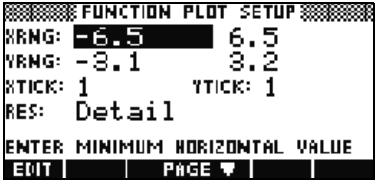
| Summary of Functionality | View Name and Display |
|---|---|
| Press PLOT to enter the Plot view and work with graphs of functions. The menu labels are:<br>• **ZOOM**: enters the Zoom menu, with options to zoom in or out<br>• **TRACE**: toggles tracing cursor off and on<br>• **GOTO**: takes the tracing cursor to the point on the function with a given x-value<br>• **FCN**: opens the Function menu, with options to find:<br>  • Root<br>  • Intersection<br>  • Extremum<br>  • Slope<br>  • Signed area<br>• **DEFN**: displays the symbolic definition of the current function<br>• **MENU**: toggles the menu off and on | **Function Plot View**<br>  <br> |
| Press SHIFT followed by PLOT to enter the Plot Setup. This view helps you manually set up the graphing window and the appearance of the graphs. The fields are:<br>• **XRNG**: the horizontal graphing range<br>• **YRNG**: the vertical graphing range<br>• **XTICK**: horizontal tick mark spacing<br>• **YTICK**: vertical tick mark spacing<br>• **RES**: plot in every pixel column or every other pixel column<br>• **EDIT**: edit the current value<br>• **PAGE ▼**: enter the second page of the view | **Function Plot Setup Page 1**<br>  <br> |

Table 1-1 Function Aplet Summary

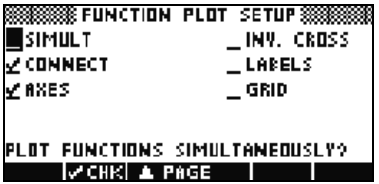
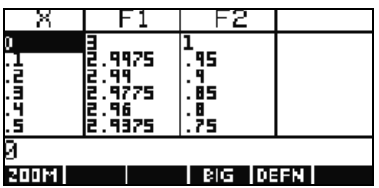
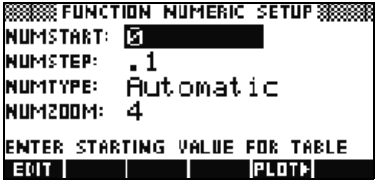
| Summary of Functionality | View Name and Display |
|---|---|
| Press PAGE ▼ to enter the second page of the Plot Setup. In this view, each field is a toggle:<br>• **SIMULT**: draw multiple graphs simultaneously or sequentially<br>• **CONNECT**: connect points on the graph, or not<br>• **AXES**: draw or omit axes<br>• **INV. CROSS**: if set, the cursor center will reverse the pixel it is on (turns it off if it is on, and vice-versa)<br>• **LABELS**: add labels to the axes, or hides them<br>• **GRID**: add a grid of dots that corresponds to the tick mark spacing, or hide them<br>• ▲ PAGE: returns to the first page | **Function Plot Setup Page 2**<br>  |
| Press NUM to enter the Numeric view of the Function Aplet. This view is designed to create and explore a table of function values. Place the highlight bar in any row of the x-column and enter any real value - the table will reconfigure. The menu labels are:<br>• **ZOOM**: zoom in or out on a row in the table<br>• **BIG**: toggles between small and large fonts<br>• **DEFN**: view the definition of each column in the table | **Function Numeric View**<br>  |

Table 1-1 Function Aplet Summary

| Summary of Functionality | View Name and Display |
|---|---|
| Press SHIFT followed by NUM to enter the Numeric Setup. This view helps you manually control the appearance of the table. The fields are:<br>• **NUMSTART**: the first value of x shown in the table<br>• **NUMSTEP**: the common difference between consecutive x-values<br>• **NUMTYPE**: choose between table types:<br>  • Automatic: provides x- and function-values<br>  • Build Your Own: you supply x-values; the Aplet provides the corresponding function-values<br>• **NUMZOOM**: the zoom factor for zooming<br>• **EDIT**: edit the current value in a field<br>• **PLOT▸** : sets NUMSTART and NUMSTEP so that the table shows the same values as the tracing cursor in the Plot view | **Function Numeric Setup**<br>  |

## The Solve Aplet

The Solve Aplet lets you define up to ten equations, each using as many variables as you like. Although you can only solve one equation at a time, you can solve for any of its variables. If an equation has more than one possible solution for one of its variables, you can enter a seed value to retrieve the solution you want. If two or more of your equations share one or more variables, then the current or solved values of those variables are carried over as you move from one equation to the other. Table 1-2 summarizes the functionality of the Solve Aplet. Press the APLET key, scroll down to select the Solve Aplet, and press the START menu key to get started. Like the Function Aplet, the Solve Aplet starts in the Symbolic view.

Table 1-2 Solve Aplet Summary

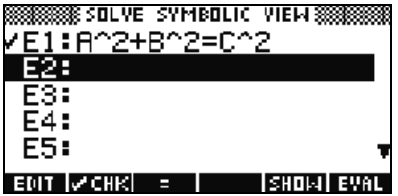
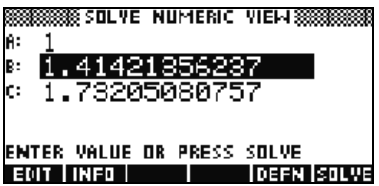
| Summary of Functionality | Veiw Name and Display |
|---|---|
| Press SYMB to return to this view at any time. Use this view to enter and edit up to ten equations, each with as many variables as you like. The menu labels are:<br>• **EDIT**: edit the current equation<br>• ✓CHK : check an equation to make it the current equation<br>• =: a typing aid for entering equations<br>• **SHOW**: see the highlighted equation typeset in standard mathematical notation<br>• **EVAL**: resolves references when one equation is defined in terms of another | **Solve Symbolic View**<br>  <br> |
| Press NUM to enter the Numeric view and enter values for variables whose values are known. Select and solve for a single unknown variable. You can enter a seed value for the unknown variable in case there are multiple solutions. The menu labels are:<br>• **EDIT**: edit the value of the highlighted variable<br>• **INFO**: supplies information about the nature of the solution found<br>• **DEFN**: displays the current equation<br>• **SOLVE**: uses the current value of the highlighted variable to solve for that variable | **Solve Numeric View**<br>  <br> |

Table 1-2 Solve Aplet Summary

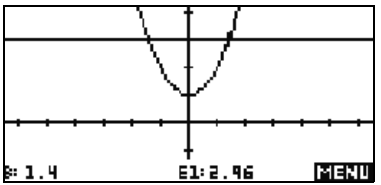
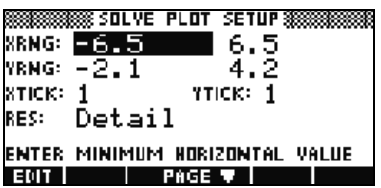
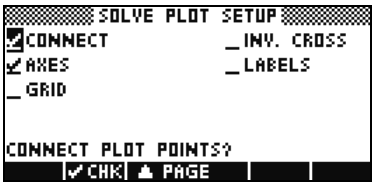
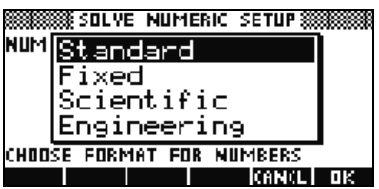
| Summary of Functionality | Veiw Name and Display |
|---|---|
| Press PLOT to enter the Plot view. In this view, the left side of the current equation and the right side of the current equation are plotted as two separate graphs. The variable that is highlighted in the **Solve Numeric View** is taken as the independent variable for graphing purposes.<br>• **MENU**: this toggle reveals and hides the Plot menu, with options for zooming and tracing<br>• **ZOOM**: enters the Zoom menu, with options to zoom in or out<br>• **TRACE**: toggles tracing cursor off and on<br>• **GOTO**: takes the tracing cursor to the point on the function with a given x-value<br>• **DEFN**: displays the symbolic definition of the current function | **Solve Plot View**<br>  |
| Press SHIFT followed by PLOT to enter the Plot Setup. Page 1 of the Solve Plot Setup is the same as page 1 of the Function Plot Setup. The purpose of the page is to allow you to manually set up the graphing window and the appearance of the graphs. | **Solve Plot Setup Page 1**<br>  |

Table 1-2 Solve Aplet Summary

| Summary of Functionality | Veiw Name and Display |
|---|---|
| Press PAGE ▼ to enter the second page of the Plot Setup. Page 2 of the Solve Plot Setup is the same as page 2 of the Function Plot Setup, with one exception. Since only one equation can be active at a time, there is no SIMULT option to select between drawing graphs simultaneously or sequentially. The two graphs are automatically drawn simultaneously. | **Solve Plot Setup Page 2**<br>  <br> |
| Press SHIFT followed by NUM to enter the Numeric Setup. This view has only one function: selection of the format for the numerical representation of variable values in the Numeric view. | **Solve Numeric Setup**<br>  <br> |

## The Sequence Aplet

The Sequence Aplet lets you define up to ten sequences, either recursively or in terms of *n*. You can view a stairstep or cobweb plot of your sequences, and explore a table of sequence values. Table 1-3 summarizes the functionality in this Aplet. Press APLET, scroll down to select the Sequence Aplet, and press the START menu key to get started. Like the Function and Solve Aplets, the Sequence Aplet starts in the Symbolic view.

Table 1-3 Sequence Aplet Summary

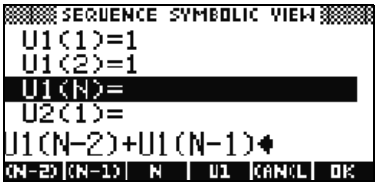
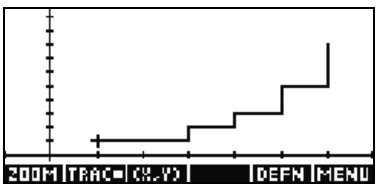
| Summary of Functionality | Veiw Name and Display |
|---|---|
| Press SYMB to return to this view at any time. Use this view to enter and manage up to 10 sequence definitions in n. The first two terms of each sequence are entered numerically, and the nth term is defined either recursively or in terms of *n*. The menu items are:<br>• **(N-2)**, **(N-1)**, **N**, **U1**: typing aids<br>• **CANCL**: cancel the current edit<br>• **OK**: accept the current edit | **Sequence Symbolic View**<br>  |
| Press PLOT to enter the Plot view and work with sequence graphs. The menu items are:<br>• **ZOOM**: enters the Zoom menu, with options to zoom in or out<br>• **TRACE**: toggles the tracing cursor off and on<br>• **(X, Y)**: toggles display of the cursor coordinates off and on<br>• **DEFN**: displays the symbolic definition of the current sequence<br>• **MENU**: toggles the menu off and on | **Sequence Plot View**<br>  |

Table 1-3 Sequence Aplet Summary

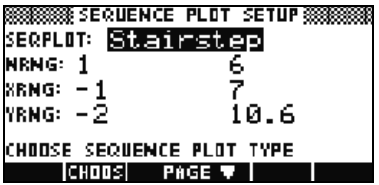
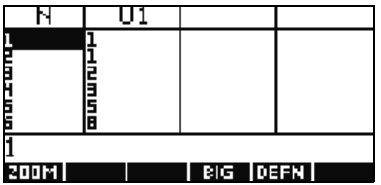
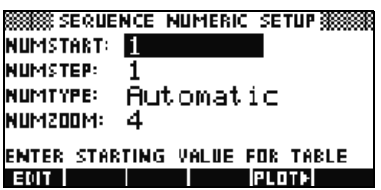
| Summary of Functionality | Veiw Name and Display |
|---|---|
| Press SHIFT followed by PLOT to enter the Plot Setup. Here you can manually set up the graphing window and the appearance of the sequence graphs. The fields are:<br>• **SEQPLOT**: choose between Stairstep and Cobweb plots of each sequence<br>• **NRNG**: the range of terms to plot for each sequence<br>• **XRNG**: the horizontal graphing range<br>• **YRNG**: the vertical graphing range<br>In addition, the menu items are:<br>• **CHOOS**: opens the **SEQPLOT** choose box<br>• **PAGE ▼**: enter the second page of the view | **Sequence Plot Setup Page 1**<br>  <br> |
| Press **PAGE ▼** to enter the 2nd page of the Plot Setup. This view has more options to define the appearance of graphs and the axes. The fields are:<br>• **XTICK:** horizontal tick mark spacing<br>• **YTICK**: vertical tick mark spacing<br>• **SIMULT**: draw multiple graphs simultaneously or sequentially<br>• **CONNECT**: connect points on a graph, or not<br>• **AXES**: draw or omit axes<br>• **INV. CROSS**: if set, the cursor center will reverse the pixel it is on (turn it off if it is on and vice-versa)<br>• **LABELS**: show labels for the axes, or not<br>• **GRID**: adds a grid of dots that corresponds to the tick mark spacing, or not<br>In addition, the menu labels are:<br>• **EDIT**: edit the selected numerical field<br>• **✔CHK** : select or deselect a toggle option<br>• **▲ PAGE**: returns to the first page | **Sequence Plot Setup Page 2**<br>  <br> |

Table 1-3 Sequence Aplet Summary

| Summary of Functionality | Veiw Name and Display |
|---|---|
| Press NUM to enter the Numeric view. This view is the same as the **Function Numeric View**, except that it has an *n*-column first rather than an x-column. Furthermore, all *n*-values must be positive integers. | **Sequence Numeric View**   |
| Press SHIFT followed by NUM to enter the Numeric Setup. This view is the same as the Function Numeric Setup, except **NUMSTEP** is fixed at 1 (any other value will be ignored). | **Sequence Numeric Setup**   |

## The Statistics Aplet

The Statistics Aplet was designed for the study of descriptive statistics. This Aplet provides tools for entering numeric data, calculating 1- and 2-variable summary statistics, and plotting statistical graphs in 1 and 2 variables. This Aplet can provide summary statistics directly to the Inference Aplet to calculate confidence intervals and test hypotheses. The StreamSmart Aplet provides data collected from scientific sensors during experiments directly to the Statistics Aplet for analysis. Table 1-4 summarizes the Statistics Aplet functionality. Press the APLET key, scroll down to select the Statistics Aplet, and press the START menu key to get started. The Statistics Aplet starts in the Numeric view.

Table 1-4 Statistics Aplet Summary

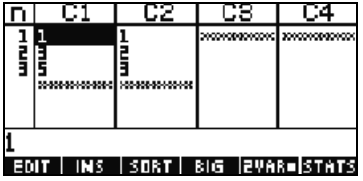
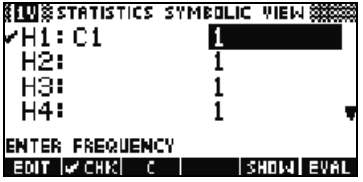
| Summary of Functionality | View Name and Display |
|---|---|
| Press NUM to return to this view at any time. This view contains a table with up to ten columns of data. The menu items are:<br>• **EDIT**: edit the value in the current cell<br>• **INS**: insert a new row in the current column<br>• **SORT**: sort the current column in either ascending or descending order<br>• **BIG**: toggle between large and small fonts<br>• **2VAR**: toggle between 1-var and 2-var statistical analysis<br>• **STATS**: provide summary statistics on the currently defined analyses (see Symbolic view) | **Statistics Numeric View**<br>  |
| Press the 1VAR/2VAR menu key to toggle it to 1VAR, then press SYMB to enter the 1VAR Symbolic view. You can define up to 5 1-variable analyses (H1, H2, … H5) by choosing a data column and a numerical frequency (or optionally, a frequency column). The menu items are:<br>• **EDIT**: edit the name of the column to use in an analysis<br>• ✓CHK : toggles between making an analysis active or inactive for graphing and listing summary statistics<br>• **C**: a typing aid<br>• **SHOW**: displays the fit equation using textbook format | **Statistics Symbolic View 1VAR**<br>  |

Table 1-4 Statistics Aplet Summary

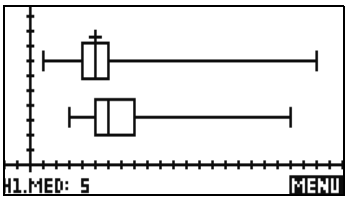
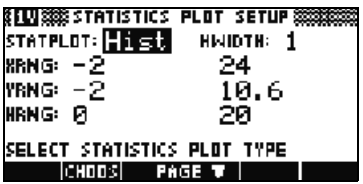
| Summary of Functionality | View Name and Display |
|---|---|
| With the 1VAR/2VAR menu key toggled to 1VAR, press PLOT to enter the 1Var Plot view. This view displays histograms or box-and-whisker plots for active analyses. The menu is similar to the **Function Plot View**, with options for zooming and tracing. | **Statistics Plot View 1VAR**<br>  |
| With the 1VAR/2VAR menu key toggled to 1VAR, press SHIFT followed by PLOT to enter the 1Var Plot Setup. Page 1 of the 1Var Plot Setup contains settings that control the appearance of 1-variable statistical plots.<br>• **STATPLOT**: choose between Histogram and Box-and-Whisker statistical plot types<br>• **HWIDTH**: the bin width for histograms<br>• **XRNG**: the horizontal range of the graph window<br>• **YRNG**: the vertical range of the graph window<br>• **HRNG**: the range for the data to plot | **Statistics Plot Setup Page 1 1VAR**<br>  |
| Press PAGE ▼ to enter the second page of the 1Var Plot Setup. This view contains further settings to control the appearance of the graphing window and the plots. This view is nearly identical to page 2 of the Sequence Plot Setup, except that there is no SIMULT setting. | **Statistics Plot Setup Page 2 1VAR**<br>  |

Table 1-4 Statistics Aplet Summary

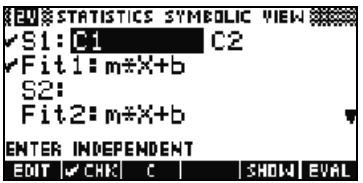
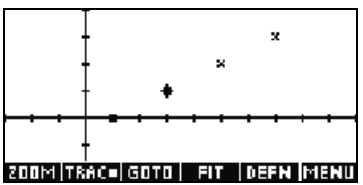
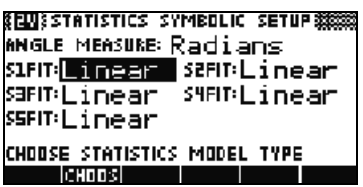
| Summary of Functionality | View Name and Display |
|---|---|
| Press the 1VAR/2VAR menu key to toggle it to 2VAR, then press SYMB to enter the 2VAR Symbolic view. You can define up to 5 2-variable analyses (S1, S2, … S5) by choosing the independent and dependent columns of data involved in each analysis. The menu is the same as the 1Var Symbolic view above. This view also shows the current fit type for each scatter plot. If the scatter plot has been drawn and the fit plotted, the specific equation for the fit is shown here as well. You can enter your own fit expression in x if you wish. | **Statistics Symbolic View 2VAR**<br>  <br> |
| With the 1VAR/2VAR menu key toggled to 2VAR, press PLOT to enter the 2Var Plot view. This view displays scatter plots of numerical data and function fits for each scatter plot. The menu items are:<br>• **ZOOM**: zoom in or out on the graph(s)<br>• **TRACE**: toggle tracing on and off<br>• **GOTO**: jump to a desired data point<br>• **FIT**: toggle displaying a fit for each scatter plot<br>• **DEFN**: show the definition of the current graph being traced<br>• **MENU**: reveal and hide the menu | **Statistics Plot View 2VAR**<br>  <br> |
| With the 1VAR/2VAR menu key toggled to 2VAR, press SHIFT followed by SYMB to enter the Symbolic Setup. This view lets you select the fit type for each scatter plot in the Symbolic view. By default, each fit is set to linear. The only menu item is:<br>• **CHOOSE**: displays a list of the available options for each field | **Statistics Symbolic Setup 2VAR**<br>  <br> |

Table 1-4 Statistics Aplet Summary

| Summary of Functionality | View Name and Display |
|---|---|
| With the 1VAR/2VAR menu key toggled to 2VAR, press SHIFT followed by PLOT to enter page 1 of the 2Var Plot Setup. This view is similar to page 1 of the Function Plot Setup, except that you can choose different marks for each scatter plot. | **Statistics Plot Setup Page 1 2VAR**<br>2V STATISTICS PLOT SETUP<br>XRNG: -8 10<br>YRNG: -2.3 4<br>S1MARK: S2MARK: S3MARK:<br>S4MARK: S5MARK:<br>ENTER MINIMUM HORIZONTAL VALUE<br>EDIT \| PAGE ▼ |
| Press PAGE ▼ to enter page 2 of the 2Var Plot Setup. This view is the same as page 2 of the 1Var Plot Setup, except that here there is an option for connecting the points in each active scatter plot. | **Statistics Plot Setup Page 2 2VAR**<br>2V STATISTICS PLOT SETUP<br>XTICK: 1 YTICK: 1<br>_CONNECT _INV. CROSS<br>✓AXES _LABELS<br>_GRID<br>ENTER HORIZONTAL TICK SPACING<br>EDIT \| ▲ PAGE |

## The Inference Aplet

The Inference Aplet contains tools for Inferential Statistics, including creating confidence intervals and hypothesis testing. This Aplet can import summary statistics from any column of the Statistic Aplet, or any Aplet you have saved that was based on the Statistic Aplet. Table 1-5 summarizes the Inference Aplet functionality. One unique feature of this Aplet is that the various confidence intervals and hypothesis tests contain default values that correspond to the online help sections in the Aplet. Press the APLET key, scroll down to select the Inference Aplet, and press the START menu key to get started. The Inference Aplet starts in the Symbolic view.

Table 1-5 Inference Aplet Summary

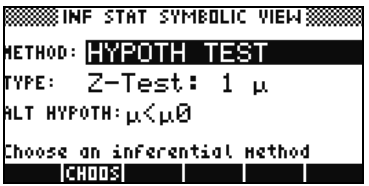
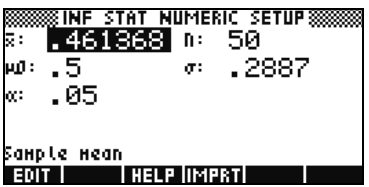
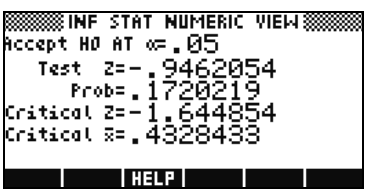
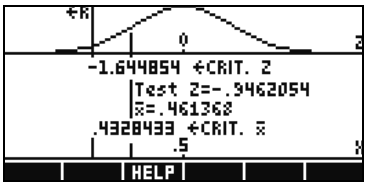
| Summary of Functionality | View Name and Display |
|---|---|
| Press SYMB to return to this view at any time. The **Inference Symbolic View** contains settings to define a confidence interval or hypothesis test. The fields are:<br>• **METHOD**: choose between hypothesis test or confidence interval<br>• **TYPE**: choose from a variety of Z- and T-distributions<br>• **ALT HYPOTH**: choose one of 3 alternative hypotheses (hypothesis test only) | **Inference Symbolic Veiw**<br>  <br> |
| Press SHIFT followed by NUM to enter the **Inference Numeric Setup**. This view lets you complete the numeric side of the definition of your confidence interval or hypothesis test, with fields for the sample statistics (e.g., sample mean $\bar{x}$ and sample size *n*), the population parameters (e.g., null hypothesis mean, $\mu_0$ and standard deviation, $\sigma$ ), and the significance level, $\alpha$ .<br>• **EDIT**: edit the value of the current field<br>• **HELP**: view help pages based on the default values<br>• **IMPRT**: import sample mean $\bar{x}$ and sample size *n* from a column in the Statistics Aplet (or any Aplet based on the Statistics Aplet) | **Inference Numeric Setup**<br>  <br> |
| Press NUM to enter the **Inference Numeric View** and see the confidence interval or hypothesis test results. The results include a mapping from the distribution variable back to the random variable. | **Inference Numeric View**<br>  <br> |

Table 1-5 Inference Aplet Summary

| Summary of Functionality | View Name and Display |
|---|---|
| Press PLOT to enter the **Inference Plot View**. This view displays the same results as the Numeric view. Displaying the results graphically makes the mapping between the distribution variable (Z or T) and the random variable (X) clearer. In the case of the hypothesis test, the relative locations of the reject region and the test statistic are also shown. | **Inference Plot View**   |

## The Parametric Aplet

The Parametric Aplet is quite similar in structure and functionality to the Function Aplet. Table 1-6 lists the similarities and major differences between these two Aplets. Press APLET, scroll down to select the Parametric Aplet, and press the START menu key to get started. The Parametric Aplet opens in the Symbolic view.

Table 1-6 Parametric Aplet Summary

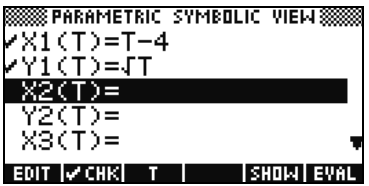
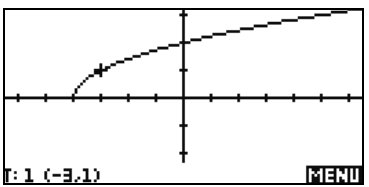
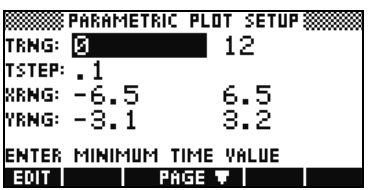
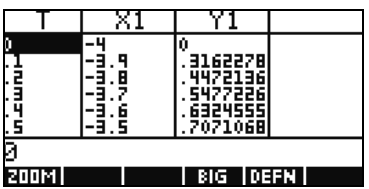
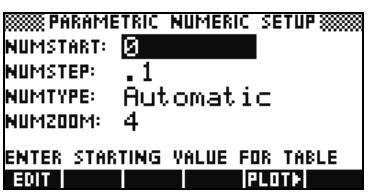
| Summary of Functionality | View Name and Display |
|---|---|
| Press SYMB to return to this view at any time. The **Parametric Symbolic View** contains definitions for up to ten parametric equations, each one defining x(t) and y(t) in terms of t. The menu items are the same as the Function Symbolic view, except here *T* replaces *X* as a typing aid. | **Parametric Symbolic View**<br>  <br> |
| Press PLOT to enter the Parametric Plot view. This view displays the graphs of parametric equations defined in the Symbolic view. The functionality here is the same as in the Function Plot view, except that the FCN functions do not apply here. | **Parametric Plot View**<br>  <br> |
| Press SHIFT followed by PLOT to enter the **Parametric Plot Setup**. This view is similar to the **Function Plot Setup**, except that it contains **TRNG** and **TSTEP** to control the t-values used to generate the (x,y) ordered pairs for graphing. | **Parametric Plot Setup Page 1**<br>  <br> |

Table 1-6 Parametric Aplet Summary

| Summary of Functionality | View Name and Display |
|---|---|
| Press PAGE ▼ to enter page 2 of the **Parametric Plot Setup**, which is similar to page 2 of the Function and Sequence Plot setups. | **Parametric Plot Setup Page 2**<br>  <br> |
| Press NUM to enter the Parametric Numeric view. This view is the same as the Function Numeric view, with an additional t-column; here x and y are both columns dependent on t. | **Parametric Numeric View**<br>  <br> |
| Press SHIFT followed by NUM to enter the **Parametric Numeric Setup**, which is the same as the **Function Numeric Setup**. | **Parametric Numeric Setup**<br>  <br> |

## The Polar Aplet

The Polar Aplet is similar in structure and functionality to the Function and Parametric Aplets. Table 1-7 lists the similarities and major differences among these three Aplets. Press APLET, scroll down to select the Polar Aplet, and press the START menu key to get started. The Polar Aplet starts in the Symbolic view.

Table 1-7 Polar Aplet Summary

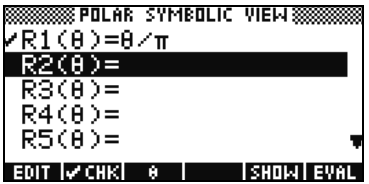
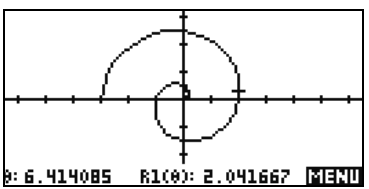
| Summary of Functionality | View Name and Display |
|---|---|
| Press SYMB to return to this view at any time. The **Polar Symbolic View** contains fields to define up to ten polar equations, each one defining R in terms of θ. | **Polar Symbolic View**   |
| Press PLOT to enter the Polar Plot view. This view has the same functionality as the **Parametric Plot View**. | **Polar Plot View**   |

Table 1-7 Polar Aplet Summary

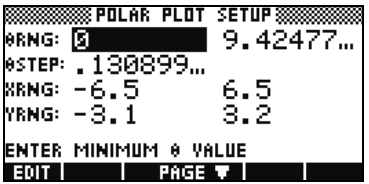
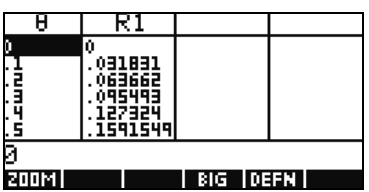
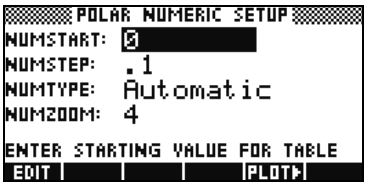
| Summary of Functionality | View Name and Display |
|---|---|
| Press SHIFT followed by PLOT to enter the **Polar Plot Setup**. This view is the same as page 1 of the **Parametric Plot Setup**, except that Polar has θ **RNG** and θ **STEP** instead of **TRNG** and **TSTEP**. | **Polar Plot Setup Page 1**<br>  <br> |
| Press PAGE ▼ to enter page 2 of the Plot Setup, which is identical to page 2 of the **Parametric Plot Setup**. | **Polar Plot Setup Page 2**<br>  <br> |
| Press NUM to enter the Polar Numeric view. This view is similar to the **Function Numeric View**, with a θ-column that is independent, followed by additional R-columns for each polar definition. | **Polar Numeric View**<br>  <br> |

Table 1-7 Polar Aplet Summary

| Summary of Functionality | View Name and Display |
|---|---|
| Press SHIFT followed by NUM to enter the **Polar Numeric Setup**. This view has the same functionality as the Function and Parametric Numeric setups. | **Polar Numeric Setup**   |

## The StreamSmart Aplet

The StreamSmart Aplet was designed to facilitate and simplify the collection of real-world data from scientific sensors. It works with the HP StreamSmart 400 data streamer and any of the scientific sensors available from Fourier Systems™. The StreamSmart Aplet recognizes the sensor(s) automatically and sets up data streaming at rates over 5,000 samples per second, displaying the incoming data as a stream in real time. Table 1-8 summarizes the functionality of this Aplet. See the *HP StreamSmart 400 User Guide* for complete details. Press APLET, scroll down to select the StreamSmart Aplet, and press the START menu key to get started. The StreamSmart Aplet starts in the Plot view.

Table 1-8 StreamSmart Aplet Summary

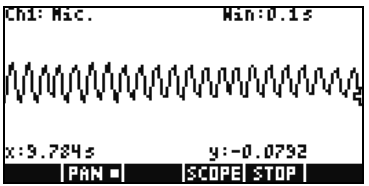
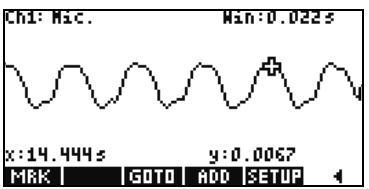
| Summary of Functionality | View Name and Display |
|---|---|
| Press PLOT to return to this view at any time. The StreamSmart Plot view displays the incoming data streams in real time at up to 5,000 samples per second. The top of the display shows the sensor ID and the width of the window in seconds. The bottom of the display shows the current tracer coordinates. The menu items are:<br>• **PAN/ZOOM**: toggles between using the cursor direction keys for panning (scrolling) or zooming on the data stream<br>• **SCOPE:** toggles oscilloscope mode on and off<br>• **START/STOP**: stops and re-starts data streaming | **Plot View (during streaming)**<br>  |
| Press the STOP menu key to stop data streaming. After data streaming stops, the Plot view menu changes substantially to allow selection of a final data set.<br>• **PAN/ZOOM**: same as above<br>• **TRACE**: toggles tracing on and off<br>• **EXPRT**: opens the Export Menu (see below)<br>• ▶: opens page 2 of the menu | **Plot View (post streaming)**<br>  |
| Press the ▶ menu key to enter the 2nd page of the Plot view menu. The menu items are:<br>• **MRK**: sets a mark at the current tracer location; further movement of the tracer shows the delta in both x and y from the mark<br>• **GOTO**: jumps to a particular data value<br>• **ADD**: works with SETUP to select points of interest to add to the data set one point at a time<br>• **SETUP**: defines how ADD works, where the data goes in the Statistics Aplet, etc.<br>• ◀: returns to page 1 of the menu | **Plot View Page 2 (post streaming)**<br>  |

Table 1-8 StreamSmart Aplet Summary

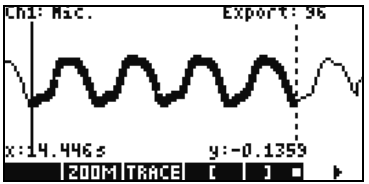
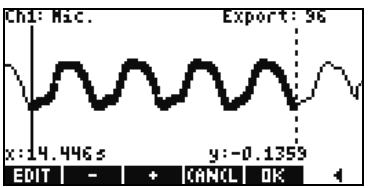
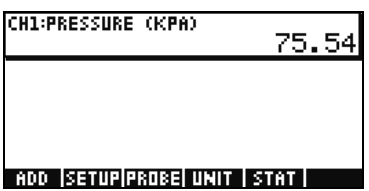
| Summary of Functionality | View Name and Display |
|---|---|
| Press the EXPRT menu key to open page 1 of the Export menu, with tools to zoom, pan, and crop to define a final data set to export to the Statistics Aplet. The menu items are:<br>• **PAN/ZOOM**: as above<br>• **TRACE**: as above<br>• **[**: uses the left- and right-cursor keys to crop data from the left of the data set<br>• **]**: use the left- and right-cursor keys to crop data from the right of the data set<br>• ▶: opens page 2 of the menu | **Export Menu Page 1**<br>  |
| Press the ▶ menu key to enter the 2nd page of the Export Menu. Here you can finalize your selection of the final data set, or cancel and start over. The menu items are:<br>• **EDIT**: manually define a data range<br>• **-**: delete 1 data point from the set<br>• **+**: add a data point to the set<br>• **CANCL**: cancel the currently selected data set and return to the full data set<br>• **OK**: export the currently selected data set to the Statistics Aplet for analysis | **Export Menu Page 2**<br>  |
| Press NUM to enter the Numeric view, which displays a multi-meter view of the incoming data in numerical form. The menu items are:<br>• **ADD**: works with SETUP to add the current sensor reading(s) to a data set in the Statistics Aplet<br>• **SETUP**: defines where the data goes when ADD is pressed, as well as whether or not the user can add a numeric entry to each data point added<br>• **PROBE**: manually identify a sensor<br>• **UNIT**: select another unit for the current sensor, if any other units are available<br>• **STAT**: leaves the StreamSmart Aplet and opens the Statistics Aplet to view and analyze the set of selected data points | **Numeric View**<br>  |

Table 1-8 StreamSmart Aplet Summary

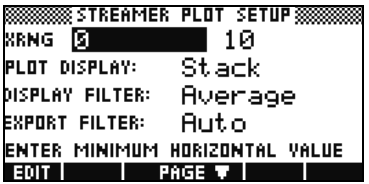
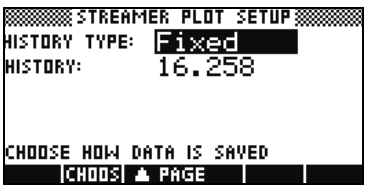
| Summary of Functionality | View Name and Display |
|---|---|
| Press SHIFT followed by PLOT to enter the **Streamer Plot Setup**. This view contains a number of advanced features:<br>• **XRNG**: manually define the time interval represented by the width of the display<br>• **PLOT DISPLAY**: for multiple data streams, choose between stacking or overlapping them<br>• **DISPLAY FILTER**: when each pixel represents multiple data point, choose what value is reported<br>• **EXPORT FILTER**: when each pixel represents multiple data point, choose what value is exported | **Plot Setup Page 1**<br>  |
| Press PAGE to enter page 2 of the Plot Setup, with more advanced features:<br>• **HISTORY TYPE**: choose between a fixed and an automatic history; the latter keeps streaming indefinitely but culls older data as it continues<br>• **HISTORY**: if the history is fixed, StreamSmart keeps all data recorded in the last *n* seconds, where *n* is the value in the **HISTORY** field | **Plot Setup Page 2**<br>  |
| Press SHIFT followed by NUM to enter the Numeric Setup. This view contains a quick way to select units for any sensors attached to the StreamSmart 400. Select a channel and press the CHOOS menu key to select an option from the list of alternate units, if any. | **Numeric Setup**<br>  |

Table 1-8 StreamSmart Aplet Summary

| Summary of Functionality | View Name and Display |
|---|---|
| Press VIEWS to see the other views specific to the StreamSmart Aplet.<br>• **Plot**: opens the Plot view (option not shown)<br>• **Multimeter**: opens the Numeric view (option not shown)<br>• **Plot Setup**: opens the Plot Setup<br>• **Sensor Setup**: manually identify a sensor<br>• **Unit Setup**: opens the Numeric Setup<br>• **Calibrate**: perform 1- or 2-point calibration or a sensor<br>• **Experiment**: define and start a data logging experiment, set the number of seconds to run and the number of samples to take | **Other Views**<br>  |

## Solvers

The Solver Aplets each have only a single view. These Aplets include the Finance Aplet, the Linear Solver, and the Triangle Solver. Each is designed to solve problems of a particular type. The Finance Aplet solves TVM and amortization problems, the Linear Solver finds solutions to systems of linear equations, and the Triangle Solver finds angles and side lengths in problems involving triangles.

## The Finance Aplet

The Finance Aplet solves time-value-of-money (TVM) and amortization problems. See Table 1-9. Press APLET, scroll to the Finance Aplet, and press the START menu key to get started. The Finance Aplet has two pages, one for TVM problems and the other for amortization. As you will see, the amortization page uses values from the TVM page.

Table 1-9 Finance Aplet Summary

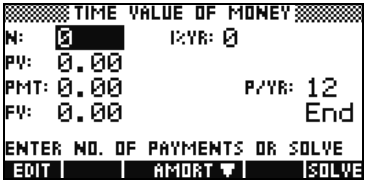
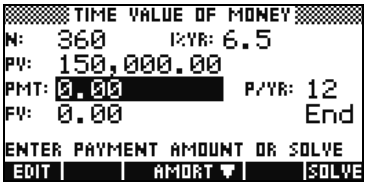
| Summary of Functionality | View Name and Display |
|---|---|
| The top page of the Finance Aplet lets you enter and solve TVM problems. The fields are:<br>• **N**: total number of periods or payments<br>• **I%/YR**: the nominal annual interest rate<br>• **PV**: present value at the start of the cash flow<br>• **PMT**: the payment due per period<br>• **P/YR**: the number of payments made in a year<br>• **END**: whether payment is made at the beginning or end of each period<br>• **FV**: the value at the end of the cash flow<br>The menu contains the following additional functions:<br>• **EDIT**: edit the current value<br>• **AMORT ▼**: enter the Aplet's amortization page<br>• **SOLVE**: solve for the selected variable | **Financial TVM View**<br>  <br> |
| Example 1<br><br>You finance the purchase of a house with a 30-year loan at 6.5% annual interest. The cost of the house is $180,000 and you make a down payment of $30,000. How much are the required monthly payments? Assume payments start at the end of the first period. The figure to the right shows the setup. | **Example 1 Setup**<br>  <br> |

Table 1-9 Finance Aplet Summary

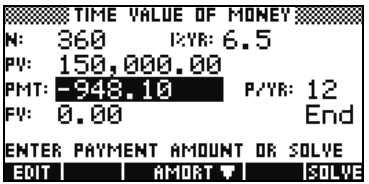
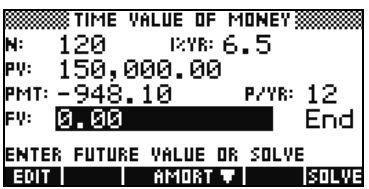
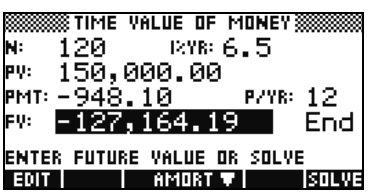
| Summary of Functionality | View Name and Display |
|---|---|
| Solution<br><br>Highlight the **PMT** field and press the SOLVE menu key to view the results shown in the figure to the right. As shown, you will need to make monthly payments of $948.10. Negative values indicate payments you make, while positive values indicate payments made to you. | **Example 1 Solution**<br>  <br> |
| Example 2<br><br>To continue the example, suppose you expect to sell the house after 10 years, repaying the balance of the loan with a balloon payment. What will be the amount of the balloon payment? | **Example 2 Setup**<br>  <br> |
| Solution<br><br>Change the value of **N** to 120 (10 years with 12 payments per year), keep the **PMT** value of -948.10, and highlight the **FV** field as shown in the figure to the right. Press the SOLVE menu key. The balloon payment required to pay off the loan after 10 years would be $127,164.19. | **Example 2 Solution**<br>  <br> |

Table 1-9 Finance Aplet Summary

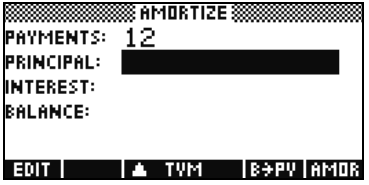
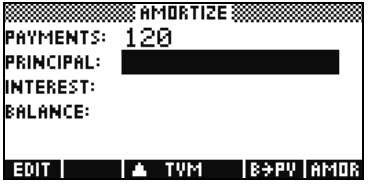
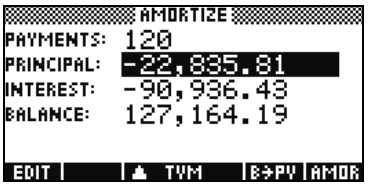
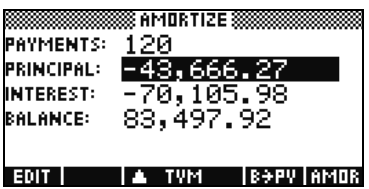
| Summary of Functionality | View Name and Display |
|---|---|
| Amortization Summary of Functionality<br><br>Press the AMORT menu key. The second page of the Finance Aplet deals with amortization schedules. The fields are:<br>• **Payments**: the number of payments in the current batch to amortize<br>• **Principal**: amount of principle paid after the batch of payments<br>• **Interest**: amount of interest paid<br>• **Balance**: outstanding balance after the batch of payments<br>The menu contains the following functions:<br>• **EDIT**: edit the current value<br>• **TVM**: return to the TVM page<br>• **B→ PV**: returns the current balance to the PV field on the TVM page<br>• **AMOR**: amortize the current batch of payments | **Financial Amortization View**<br>  <br> |
| Example 3<br>Continue the previous example by finding the balances due after 10 years and 20 years of payments. | **Example 3 Setup**<br>  <br> |

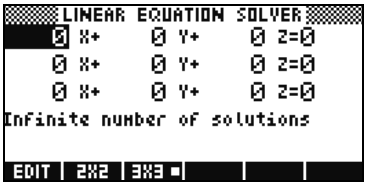
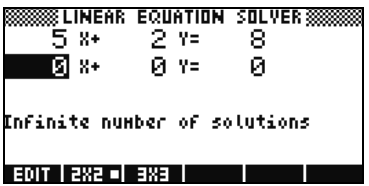
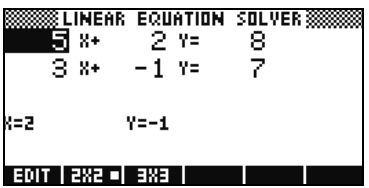
Table 1-9 Finance Aplet Summary

| Summary of Functionality | View Name and Display |
|---|---|
| Solution<br><br>Enter 120 as the number of payments (10 years x 12 payments per year). Then press the AMOR menu key to see that you will have repaid $22,835.81 in principle, another $90,936.43 in interest, and the balance due will be $127,164.19. | **Example 3 Solution**<br>  |
| You can continue the amortization process to see how much the balloon payment would be after 20 years by pressing the **B→PV** (balance-to-present value) menu key and pressing the AMORT menu key. Check to see that the balance would be $83,497.92 after 20 years, as shown in the figure to the right. | **Continue Solution**<br>  |

## The Linear Solver Aplet

The Linear Solver Aplet solves 2x2 and 3x3 systems of linear equations within a single view. By default, the Aplet opens ready to solve 3x3 systems. Note the square on the 3x3 menu key to indicate it is active. Press the 2x2 menu key to switch to solving 2x2 systems of linear equations. The solution statement at the bottom of the Aplet changes in real time to reflect the current values of the parameters in each linear equation. Table 1-10 summarizes the functionality of this Aplet. Press APLET, scroll to the Linear Solver Aplet, and press the START menu key to get started.

Table 1-10 Linear Solver Aplet Summary

| Summary of Functionality | View Name and Display |
|---|---|
| Use this view to enter values for the parameters of each linear equation and view the solution results below the equations. The menu items are:<br>• **EDIT**: edit the value of a parameter<br>• **2x2**: solve a 2x2 system of 2 linear equations in 2 variables<br>• **3x3**: solve a 3x3 system of 3 linear equations in 3 variables | **Linear Equation Solver**<br>  |
| Example<br><br>Find the solution of the linear system:<br>5x + 2y = 8<br>3x - y = 7 | **Example 1**<br>  |
| Solution<br><br>Press the 2x2 menu key to switch and enter the parameters of the first equation, as shown in the figure to the right, then enter the parameters of the second equation. As you enter the values, the solution statement updates in real time. When you are done, the solution is shown as x=2 and y=-1. | **Example Solution**<br>  |

## The Triangle Solver Aplet

This Aplet solves many kinds of geometric and trigonometric problems involving triangles. Press APLET, scroll to Triangle Solver, and press the START menu key to open this Aplet's single view. Table 1-11 summarizes the functionality of this Aplet.

Table 1-11 Triangle Solver Aplet

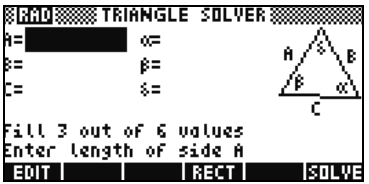
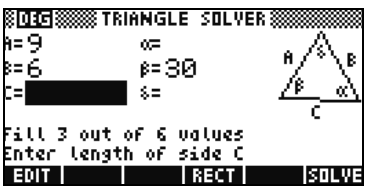
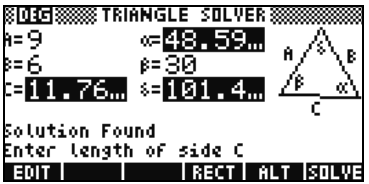
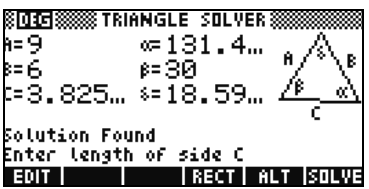
| Summary of Functionality | View Name and Display |
|---|---|
| Each triangle has 3 side lengths (A, B, and C) and three angles, each opposite one of the sides ($\alpha$, $\beta$, and $\delta$ respectively). Enter any 3 values and the Solver will find the other values. Note the heading shows you how angles are currently measured **RAD** (radians) or **DEG** (degrees). Go to MODES (SHIFT followed by HOME) to change this setting. The menu items are:<br>• **EDIT**: edit the current value of a field<br>• **RECT**: switch to right triangle problem-solving<br>• **SOLVE**: solve for the remaining values | **Triangle Solver**<br>  |
| Example<br><br>A triangle has sides of lengths 9 and 6. The angle opposite the second side measures 30°. Find the length of the third side. | **Example 1**<br>  |

Table 1-11 Triangle Solver Aplet

| Summary of Functionality | View Name and Display |
|---|---|
| Solution<br><br>Press SHIFT followed by HOME (MODES) and change to degree angle measure. To start the Triangle Solver Aplet, press APLET, scroll to the Triangle Solver, and press the START menu key. Enter A=9, B=6, and β =30, as shown in the figure to the right. Press the SOLVE menu key to see the results shown in the figure to the right. | **Solution 1**<br>  <br> |
| Note, in this case, there is a second solution. Press the ALT menu key to toggle between the two solutions, as shown in the two figures to the right. | **Solution 2**<br>  <br> |

## Explorer Aplets

Explorer Aplets are designed to facilitate explorations of function families. These Aplets include the Quadratic Explorer and Trig Explorer. Each of these Aplets has multiple views, however, in both cases, the Symbolic and Plot views appear identical. The only difference between these two views is in the control of the environment. While in the Plot view, you manipulate the graph and see the effect on the equation; in the Symbolic view, you change the values of the equation parameters and see the effect on the graph. Both Aplets are unique in that the Plot view is the default view for the Aplet.

## The Quadratic Explorer Aplet

The Quadratic Explorer Aplet is a micro-environment for exploring the relationships among the various representations of quadratic functions. Press APLET, scroll to the Quadratic Explorer Aplet, and press the START menu key to get started. Table 1-12 summarizes the functionality of the Aplet. The Quadratic

Explorer Aplet starts in the Plot view.

Table 1-12 Quadratic Explorer Aplet Summary

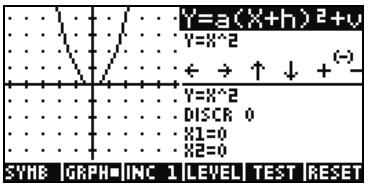
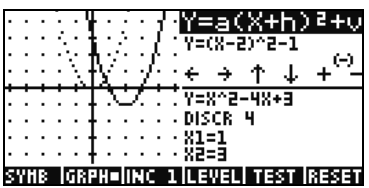
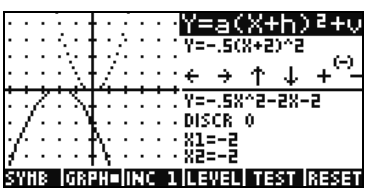
| Summary of Functionality | View Name and Display |
|---|---|
| Press PLOT (or the GRPH menu key) to return to this view at any time. In this view, you can translate and dilate the graph directly and see the resulting effects on the values of the equation parameters as you manipulate the graph. The equation of the current graph is displayed, along with the value of the discriminant and the root or roots (if any). The commands are:<br>• Use the cursor movement keys to translate the graph<br>• Use the + and - keys to dilate the graph<br>• Use the (-) key to reflect the graph over the x-axis | **Quadratic Explorer Aplet**<br>  |
| In addition to the functionality above, the menu has the following additional features:<br>• **SYMB**: switches to the Symbolic view<br>• **GRPH**: switches to Plot view<br>• **INC1**: a toggle that controls the size of each translation or dilation step. The choices are 0.5, 1, and 2.<br>• **LEVEL** toggle among various forms of quadratic functions. The choices are:<br>  • $y=a(x+h)^2+v$ (the default)<br>  • $y=ax^2$<br>  • $y=(x+h)^2$<br>  • $y=x^2+v$<br>• **TEST**: enters test mode<br>• **RESET**: resets the Aplet |  <br>  |

Table 1-12 Quadratic Explorer Aplet Summary

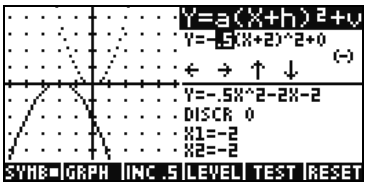
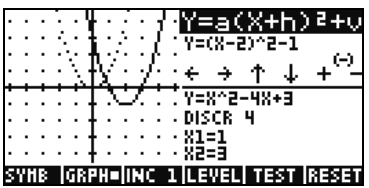
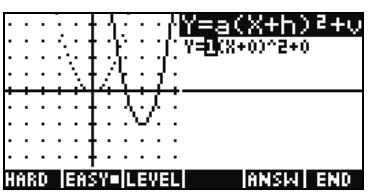
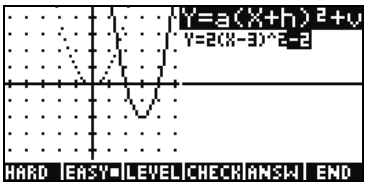
| Summary of Functionality | View Name and Display |
|---|---|
| Press SYMB (or the SYMB menu key) to enter the Symbolic view. In this view, you select a parameter in a quadratic equation, then change its value to see the resulting effect on the shape of the graph. The commands are:<br>• Use the left- and right cursor keys to select a parameter<br>• Use the up- and down-cursor keys to increase or decrease the current parameter's value<br>• Use the (-) key to change the sign of the parameter *a* | **Quadratic Explorer Symbolic View**<br>  |
| The menu items remain the same as in the Plot view. |  |
| Press the TEST menu key to enter the Test view. You can test yourself by supplying the correct parameters for the graph that is displayed. You can make multiple attempts in each problem, correcting errors and learning as you go. | **Quadratic Explorer Test View**<br>  |

Table 1-12 Quadratic Explorer Aplet Summary

| Summary of Functionality | View Name and Display |
|---|---|
| The menu contains the following items:<br>• **HARD**: choose a difficult problem<br>• **EASY**: choose an easy problem<br>• **LEVEL**: choose a type of quadratic equation (see LEVEL in Plot view above)<br>• **CHECK**: checks your current response<br>• **ANSW**: give up and view the correct response<br>• **END**: return to the Plot view | **Quadratic Explorer Test View**<br>  <br><br>  <br> |

## The Trig Explorer Aplet

Similar in concept to the Quadratic Explorer, the Trig Explorer Aplet is a micro-environment for exploring the relationship between the values of parameters in sine or cosine equations and the shape of their graphs. The forms of the sinusoidal equations used are:

$$y = a \cdot \sin(bx + c) + d$$

$$y = a \cdot \cos(bx + c) + d$$

Press APLET, scroll to the Trig Explorer Aplet, and press the START menu key to get started. Table 1-13 summarizes the Aplet's functionality. The Aplet opens in the Plot view.

Table 1-13 Trig Explorer Aplet Summary

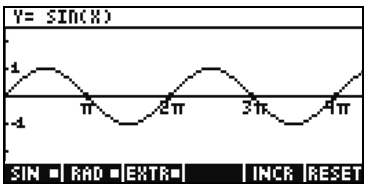
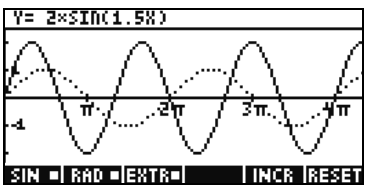
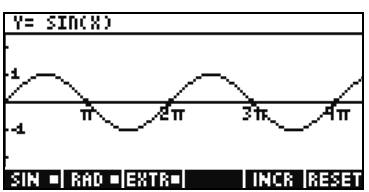
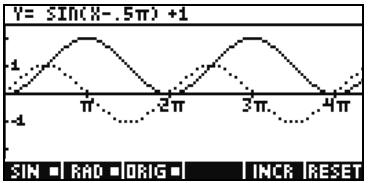
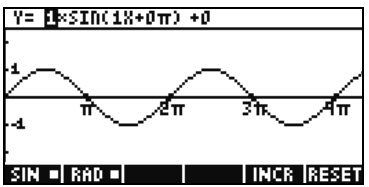
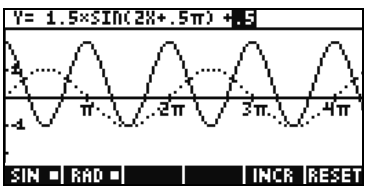
| Summary of Functionality | View Name and Display |
|---|---|
| Press PLOT to return to this view at any time. If needed, press the ORIG menu key to toggle it to EXTR. You can dilate the graph of sin(x) or cos(x) and see the effect on the equation parameter(s). The controls are:<br>• Use the left- and right-cursor keys to dilate the graph with respect to the x-axis<br>• Use the up- and down-cursor keys to dilate the graph with respect to the y-axis | **Trig Explorer with EXTR**<br>  |
| In addition to the controls listed above, the menu contains the following items:<br>• **SIN**: toggles between sin(x) and cos(x)<br>• **RAD**: toggles between radians and degrees<br>• **EXTR/ORIG**: toggles between dilating the graph and translating it with the cursor keys<br>• **INCR**: choose the increment by which the value of c is increased or decreased<br>• **RESET**: reset the Aplet | **Trig Explorer with EXTR**<br>  |
| Press the EXTR menu key to toggle it to ORIG. Now use the cursor keys to translate the graph and see the effect on the equation parameters. The controls are:<br>• Use the left- and right-cursor keys to translate the graph horizontally<br>• Use the up- and down-cursor keys to translate the graph vertically | **Trig Explorer with ORIG**<br>  |

Table 1-13 Trig Explorer Aplet Summary

| Summary of Functionality | View Name and Display |
|---|---|
| The menu items remain the same in either mode of the Plot view. | **Trig Explorer Plot View**<br>  |
| Press the SYMB key to enter the Symbolic view. You can select any parameter in the sinusoidal equation, change its value, and see the result reflected in the shape of the graph. The controls are:<br>• Use the left- and right cursor keys to select a parameter<br>• Use the up- and down-cursor keys to increase or decrease the current parameter's value | **Trig Explorer Symbolic View**<br>  |
| The menu items remain the same as the Plot view, except that the EXTR/ORIG toggle is no longer needed. |  |

## Building Your Aplet Library

As shown in the previous Aplet summaries, the HP 39gs comes with a set of 13 built-in Aplets. These Aplets are in Read-Only Memory (ROM) and cannot be deleted, so pressing the APLET key will always give you access to at least 13 Aplets. However, you can add and delete other Aplets from your Library. The following sections show you how to manage your Aplet Library.

## Saving and Sharing Aplets

This section contains step-by-step instructions for creating, saving, and sharing an Aplet called *Fibonacci* that is based on the Sequence Aplet.

**Description** | **Display**

1. Press APLET, highlight the Sequence Aplet, and press the RESET menu key to clear this Aplet of data. Press the OK menu key to complete the reset and then press the START menu key.

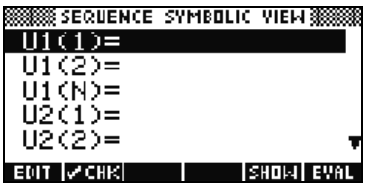



Figure 35

2. The Sequence Aplet starts in the Symbolic view, with ten sequence definitions (Figure 35). The Fibonacci Sequence definition is:

**U1(1)=1**

**U1(2)=1**

**U1(N)=U1(N-2)+U1(N-1)**

Enter this definition of U1 as shown in Figure 36.

Tip: use the menu keys to enter (N-2), (N-1), etc.

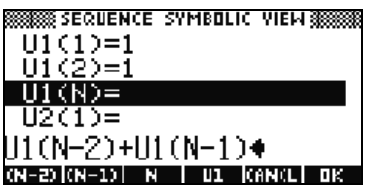



Figure 36

| Description | Display |
|---|---|

3. Press the NUM key to see a table of values for the sequence. Figure 37 shows the first six terms of each sequence. You can explore the sequences using the direction keys. With the highlight bar in the N column, you can also manually enter any counting number and the table will jump to that value.


Figure 37

4. Now that the sequence has been defined and you have checked the results, it is time to save the Aplet under a new name. Press the APLET key and then press the SAVE menu key. Press the A…Z menu key to lock the Alpha-shift on and enter a new name for the Aplet, as shown in Figure 38. Press the OK menu key to accept your new name and the Aplet will show up as a new Aplet in the Library (Figure 39).


Figure 38

5. Use the SEND menu key to send your new Aplet wirelessly. Select the Aplet you want to share, then align the arrows at the top of the sending and receiving calculators. Have the person receiving the Aplet press the RECEIVE menu key when you press the SEND menu key. Both of you should choose the default option of **HP39 (IrDA)** by pressing the OK menu key, and the transfer will complete within a few seconds.

6. When you press the START menu key on the new Aplet, the definitions for the sequences appear. Press the NUM key to start exploring the sequences numerically.


Figure 39

The advantage you get from saving an Aplet is that now you can use the underlying Aplet for some other problem and still come back to the saved Aplet at any time. For example, you can save the Solve Aplet with multiple Physics formulas as *Physics*, then use the Solve Aplet to solve other equations. Your Physics Aplet is still available - just as you left it. The Fibonacci Aplet you have just created and shared is a very simple example of a custom Aplet based on one of the built-in HP Aplets. In fact, these custom Aplets can contain programs, notes, and sketches. Please see the *HP 39gs Graphing Calculator*

*User's Guide* for more details on customizing your Aplets.

## Downloading Aplets

Another way to build your Aplet Library is by downloading HP 39gs Aplets from web sites that you trust. HP has a number of HP Aplets available at www.hp.com/calculators. Once you have downloaded an Aplet onto your PC, you will need to use the HP 39gs Connectivity Kit to load these new Aplets onto your HP 39gs. You can download the Connectivity Kit from the same URL above.

## Backing Up Your Aplet Library

There are two ways to back up your Aplet Library. The best way is to use the HP 39gs Connectivity Kit to copy your Aplet Library to your PC periodically. In a pinch, you can also keep a second HP 39gs handy with a back-up of all your Aplets.

## Deleting Custom Aplets

At some point, if you have loaded too many Aplets, the HP 39gs will run out of memory space. In this case, back up your Aplet Library to your PC using the HP 39gs Connectivity Kit and delete one or more of the Aplets on your HP 39gs. To delete an Aplet, select it from the Aplet Library and press the DELETE menu key. You will be prompted to confirm the deletion; press the OK menu key to confirm, or the CANCL menu key to cancel deletion.

## Tips and Tricks Summary

The following section illustrates in more detail the functions you used in the example problem in the previous section using the Function Aplet. Menu keys, deleting and clearing, and the various functions associated with the user interface were shown in the example, and are explained here in more detail. In addition, this section discusses a few more advanced features and information about lists, matrices, and programs, as well as some basic information about the calculator. If you require more detailed information on the 39s calculator, refer to the *HP 39gs Graphing Calculator User's Guide* located on the web at www.HP.com, located in *Handhelds and Calculators* under the *Shop for Products and Services* tab.

## More about Input Boxes, Choose Boxes, and Check Boxes

### Input Boxes

The most common user interface device is the *Input* box. Figure 40 shows the Function Aplet's Plot Setup view, with the **Minimum Horizontal Value** highlighted. The value, **–6.5**, sits in an input box. You can edit the current value by pressing the EDIT menu key, or enter any acceptable value in this box simply by typing it. Figure 41 shows the user entering a value of zero in the input box. Notice that editing occurs at the bottom of the screen rather than in the field itself. Because users often want to enter complex expressions rather than just a few digits, using the entire bottom of the display for entry gives you a

larger typing area and lets you see the whole expression. This approach is used consistently in all Aplets.

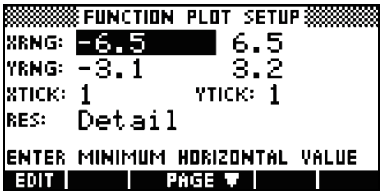



Figure 40 Plot Setup Menu

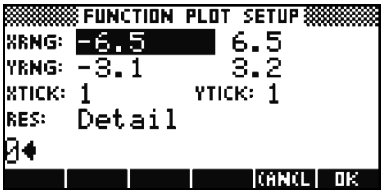



Figure 41 An Input Box

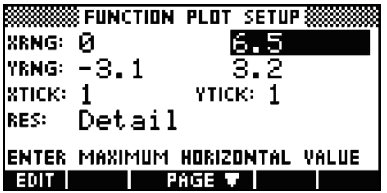



Figure 42 The New Value

## Choose Boxes

Some of the menus use *Choose boxes* to present you with different options for one or more fields in the menu. Figure 43 shows the Mode Menu with the **ANGLE MEASURE** field highlighted. The second menu key is now labeled, CHOOS. Pressing the CHOOS menu key opens the Choose box for this field, with options to choose **Degrees**, **Radians**, or **Grads** (gradients). See Figure 44. Use the cursor keys to make your selection and then press the OK menu key (Figure 45). Throughout the core Aplets, the ENTER key is identical to the OK menu key, and the ON key is identical to the CANCL menu key.

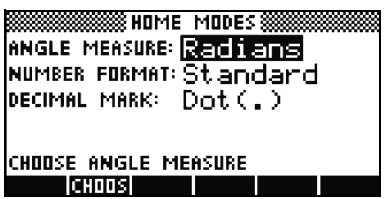



Figure 43 Mode Menu

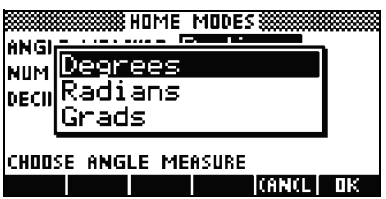



Figure 44 A Choose Box

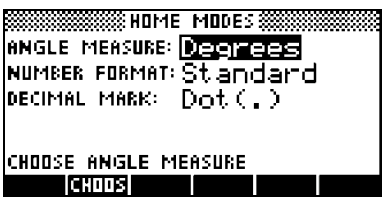



Figure 45 Switch to Degrees

## Check Boxes

Some of the menus utilize check boxes to toggle an option off and on. Figure 46 shows the **Function Plot Setup** menu's second page. All the options here (drawing axes, drawing a grid, showing labels, etc.) are controlled via check boxes. The second menu label shows **CHK** with a check mark beside it. With any check box field highlighted, press the CHK menu key to enable/disable the selected option. Figure 47 shows the **Draw Axes** option disabled; pressing PLOT with this feature disabled shows the graphs without the axes drawn (Figure 48).

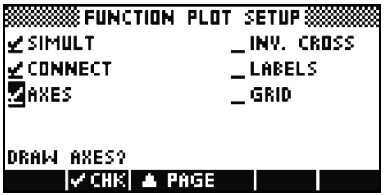



Figure 46

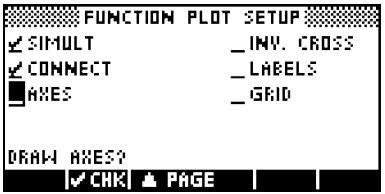



Figure 47

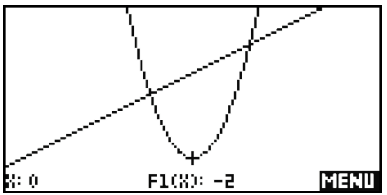



Figure 48

## Delete and Clear

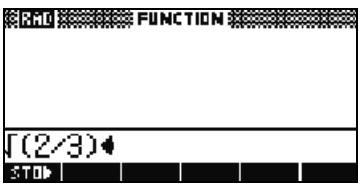
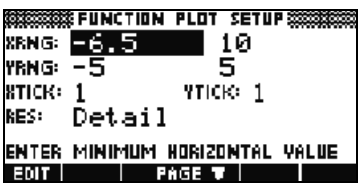
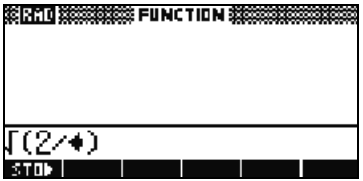
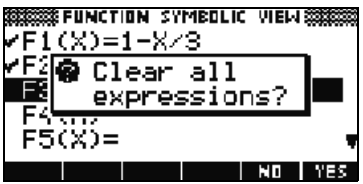
| Display | Description |
|---|---|
|  | With the cursor at the end of an entry line:<br>• DEL works like a backspace key, deleting the character to its left<br>• CLEAR (and ON) deletes the entire line |
|  | With any field in a form highlighted:<br>• DEL restores the field's default value<br>• CLEAR restores the default values of all fields in the current form |



Figure 49 Cursor at the End of a Line



Figure 50 Highlighted Field

| Display | Description |
|---|---|
|  <br>Figure 51 Cursor over an Entry | With the cursor over a character in an entry:<br>• DEL deletes the character under the cursor<br>• CLEAR (and ON) deletes the entire line |
|  <br>Figure 52 Symbolic View and Catalog Delete and Clear | With any expression in a symbolic view or catalog (list, matrix, or program) highlighted:<br>• DEL deletes the object<br>• CLEAR brings up an option to delete all objects in the view or catalog<br>  • Press YES to clear all<br>  • press NO to cancel |
|  <br>Figure 53 Numeric View Delete and Clear | With any value in the Statistics Aplet Numeric view highlighted:<br>• DEL deletes the value and moves the following values up one row<br>• CLEAR brings up an option to delete the column containing the highlight bar or all columns<br>  • Use the up- and down-cursor keys to select either the current or all columns and press OK<br>  • Press CANCL to cancel |

**Display**

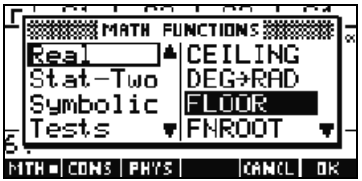



Figure 54


Figure 55


Figure 56

**Description**

## The MATH Menu

Press the MATH key to see an extensive menu of advanced math commands in a two-column table. The first column contains a list of topics and the second column shows the commands in each topic. Use the up- and down-cursor keys to scroll through the lists; use the left- and right-cursor keys to switch between the columns. Highlight the command you want and press the OK menu key to paste it into an edit line, or press the CANCL menu key to return to the edit line.

You can always type in any command letter by letter, and the HP 39gs will accept it.

## The Physical Constants Menu

Press the MATH key and then the PHYS menu key to see a list of physical constants, arranged by subject. Choose a subject, then scroll to the constant you want. Press the INFO key to see the value of the constant. Press the OK key to paste the constant into the edit line or CANCL to return to the edit line.

## The Program Commands Menu

Press the SHIFT of the MATH key to see the two-column Program Commands Menu. The program commands are grouped by topic; the topics appear in the left column and the commands under each topic are found in the right column.

You can always type a command in letter by letter and the HP 39gs will accept it.

**Display** | **Object**


Figure 57 List Catalog

## Lists

Press SHFT+7 (LIST) to see the List Catalog. There are 10 lists available, named L1-L9 and L0.


Figure 58 Empty List

Select the list you want to work with and press the OK menu key to edit it. If the list is empty, you will see an Empty List message.


Figure 59 Enter Numbers in a List

Type in the first number in the list and press the Enter key. The HP 39gs will enter 1:, followed by the value you entered. When you have completed the list you can return to the List Catalog and send the list to another HP 39gs. You can also receive a list from another HP 39gs. In programs or the Home view, you can reference L1 to perform operations on your new list.

**Display** | **Object**

## Matrices


Figure 60 Matrix Catalog

Press SHIFT+4 (MATRIX) to enter the Matrix Catalog. There are 10 matrices available, named M1-M9 and M0.


Figure 61 New Matrix

Press either the EDIT or NEW menu key to start a new matrix. EDIT assumes you want a real matrix; NEW allows you to select either a vector or a matrix, and either real or complex values.

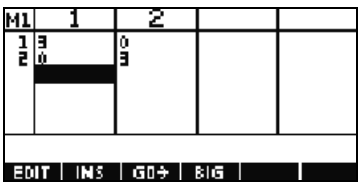



Figure 62 Enter Values

You do not have to define the dimensions of a matrix beforehand. Just start typing in values. You can enter values row by row, or column by column; the GO menu key toggles through the options.

As with lists, you can send them to another HP 39gs or receive them from another HP 39gs. In programs or the Home view, you can reference M1 to perform operations on your matrix.

| Display | Object |
|---|---|
|  <br>Figure 63 Program Catalog | Programs<br><br>Press SHIFT+1 (PROGRAM) to enter the Program Catalog. Press the New menu key to start a new program and enter a name for your new program. |
|  <br>Figure 64 Enter Program Name | You can type your program in letter by letter if you know the command names, or press SHIFT+MATH (CMDS) to enter the Program Commands Catalog and choose your commands. |
|  <br>Figure 65 Letter by Letter | |

| Display | Object |
|---|---|
|   Figure 66 | You can send your program to another HP 39gs or receive a program from another HP 39gs. Enter your program name in the Home view and press ENTER to run your program. |

## Replacing the Batteries

The calculator takes 4 AAA (LR03) batteries as a main power source and one CR2032 lithium battery for memory backup. When the low battery symbol is displayed, you need to replace the batteries as soon as possible. **Warning!** There is danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions. Do not mutilate, puncture, or dispose of batteries in fire. The batteries can burst or explode, releasing hazardous chemicals.

Please install the batteries according to the following procedure:

To install the main batteries:

1. Turn off the calculator.
2. Slide up the battery compartment cover.
3. Remove the old batteries.
4. Insert 4 new AAA (LR03) batteries into the main compartment.
5. Make sure each battery is inserted in the indicated direction.

Follow these steps to install the new backup battery. It is recommended you replace this battery every five years:

1. Turn off the calculator.
2. Remove the back cover of the battery compartment. The lithium battery is located underneath the small square cover located above the AAA batteries. Carefully remove the cover by sliding the tabs forward to align with the slots and gently lift the cover off.
3. Remove the old battery.
4. Insert a new CR2032 lithium battery with its positive polarity facing up.
5. Replace the back cover of the backup battery.
6. Replace the cover to the battery compartment.
7. Press ON to turn on the calculator.

## Resetting the calculator

If the calculator locks up and seems to be stuck, you can reset it using a keyboard reset. Resetting cancels certain operations, restores certain conditions, and clears the temporary memory locations. It does not erase stored data, such as variables, Aplets or Aplet databases, and programs. To reset, press and hold the ON key and the third menu key from the left simultaneously for a second or two, then release them.

To erase all memory and reset defaults: **this action erases everything you have stored and returns the calculator to its default settings.**

1. Press and hold the ON key, the first menu key, and the last menu key simultaneously for a second or two, then release them.
2. If the calculator still does not turn on, try inserting the end of a straightened paper clip into the small hole on the back of the calculator. Press gently for one second, then release. Press the ON key.

## Warranty and Contact Information

**HP Limited Hardware Warranty and Customer Care**

This HP Limited Warranty gives you, the end-user customer, express limited warranty rights from HP, the manufacturer. Please refer to HP's web site for an extensive description of your limited warranty entitlements. In addition, you may also have other legal rights under applicable local law or special written agreement with HP.

**Limited Hardware Warranty Period**

Duration: 12 months total (may vary by region, please visit **www.hp.com/support** for latest information).

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**FOR CONSUMER TRANSACTIONS IN AUSTRALIA AND NEW ZEALAND: THE WARRANTY TERMS CONTAINED IN THIS STATEMENT, EXCEPT TO THE EXTENT LAWFULLY PERMITTED, DO NOT EXCLUDE, RESTRICT OR MODIFY AND ARE IN ADDITION TO THE MANDATORY STATUTORY RIGHTS APPLICABLE TO THE SALE OF THIS PRODUCT TO YOU.**

Notwithstanding the above disclaimers, HP expressly warrants to you, the end-user customer, that HP hardware, accessories and supplies will be free from defects in materials and workmanship after the date of purchase, for the period specified above. If HP receives notice of such defects during the warranty period, HP will, at its option, either repair or replace products which prove to be defective. Replacement products may be either new or like-new.

HP also expressly warrants to you that HP software will not fail to execute its programming instructions after the date of purchase, for the period specified above, due to defects

in material and workmanship when properly installed and used. If HP receives notice of such defects during the warranty period, HP will replace software media which does not execute its programming instructions due to such defects.

**Exclusions**

HP does not warrant that the operation of HP products will be uninterrupted or error free. If HP is unable, within a reasonable time, to repair or replace any product to a condition as warranted, you will be entitled to a refund of the purchase price upon prompt return of the product with proof of purchase.

HP products may contain remanufactured parts equivalent to new in performance or may have been subject to incidental use.

Warranty does not apply to defects resulting from (a) improper or inadequate maintenance or calibration, (b) software, interfacing, parts or supplies not supplied by HP, (c) unauthorized modification or misuse, (d) operation outside of the published environmental specifications for the product, or (e) improper site preparation or maintenance.

## Customer Care

In addition to the one year hardware warranty your HP calculator also comes with one year of technical support. If you need assistance, HP customer care can be reached by either email or telephone. Before calling please locate the call center nearest you from the list below. Have your proof of purchase and calculator serial number ready when you call.

Telephone numbers are subject to change, and local and national telephone rates may apply. For more support information, please visit the web at: **www.hp.com/support**.

Table 1-14 Customer Care Contact Information

| Country | Hotline Phone | Country | Hotline Phone | Country | Hotline Phone | Country | Hotline Phone |
|---|---|---|---|---|---|---|---|
| Algeria | www.hp.com/ support | Anguila | 1-800-711-2884 | Antigua | 1-800-711-2884 | Argentina | 0-800-555-5000 |
| Aruba | 800-8000 ; 800-711-2884 | Australia | 1300-551-664 | Austria | 01 360 277 1203 | Bahamas | 1-800-711-2884 |
| Barbados | 1-800-711-2884 | Belgium (English) | 02 620 00 86 | Belgium (French) | 02 620 00 85 | Bermuda | 1-800-711-2884 |
| Bolivia | 800-100-193 | Botswana | www.hp.com/ support | Brazil | 0-800-709-7751 | British Virgin Islands | 1-800-711-2884 |
| Bulgaria | www.hp.com/ support | Canada | 800-HP-INVENT | Cayman Island | 1-800-711-2884 | Chile | 800-360-999 |
| China | 800-820-9669 | Columbia | 01-8000-51-4746-8368 (01-8000-51-HP INVENT) | Costa Rica | 0-800-011-0524 | Croatia | www.hp.com/ support |

| Country | Hotline Phone | Country | Hotline Phone | Country | Hotline Phone | Country | Hotline Phone |
|---|---|---|---|---|---|---|---|
| Curacao | 001-800-872-2881 + 800-711-2884 | Czech Republic | 296 335 612 | Denmark | 82 33 28 44 | Dominica | 1-800-711-2884 |
| Dominican Republic | 1-800-711-2884 | Egypt | www.hp.com/ support | El Salvador | 800-6160 | Equador | 1-999-119 ; 800-711-2884 (Andinatel)<br>1-800-225-528; 800-711-2884 (Pacifitel) |
| Estonia | www.hp.com/ support | Finland | 09 8171 0281 | France | 01 4993 9006 | French Antilles | 0-800-990-011; 800-711-2884 |
| French Guiana | 0-800-990-011; 800-711-2884 | Germany | 069 9530 7103 | Ghana | www.hp.com/ support | Greece | 210 969 6421 |
| Grenada | 1-800-711-2884 | Guadelupe | 0-800-990-011; 800-711-2884 | Guatemala | 1-800-999-5105 | Guyana | 159 ; 800-711-2884 |
| Haiti | 183 ; 800-711-2884 | Honduras | 800-0-123 ; 800-711-2884 | Hong Kong | 800-933011 | Hungary | www.hp.com/ support |
| India | 1-800-114772 | Indonesia | (21)350-3408 | Ireland | 01 605 0356 | Italy | 02 754 19 782 |
| Jamaica | 1-800-711-2884 | Japan | 00531-86-0011 | Kazakhstan | www.hp.com/ support | Latvia | www.hp.com/ support |
| Lebanon | www.hp.com/ support | Lithuania | www.hp.com/ support | Luxembourg | 2730 2146 | Malaysia | 1800-88-8588 |
| Martinica | 0-800-990-011; 877-219-8671 | Mauritius | www.hp.com/ support | Mexico | 01-800-474-68368 (800 HP INVENT) | Montenegro | www.hp.com/ support |
| Montserrat | 1-800-711-2884 | Morocco | www.hp.com/ support | Namibia | www.hp.com/ support | Netherlands | 020 654 5301 |
| Netherland Antilles | 001-800-872-2881 ; 800-711-2884 | New Zealand | 0800-551-664 | Nicaragua | 1-800-0164; 800-711-2884 | Norway | 23500027 |
| Panama | 001-800-711-2884 | Paraguay | (009) 800-541-0006 | Peru | 0-800-10111 | Philippines | (2)-867-3351 |

| Country | Hotline Phone | Country | Hotline Phone | Country | Hotline Phone | Country | Hotline Phone |
|---|---|---|---|---|---|---|---|
| Poland | www.hp.com/ support | Portugal | 021 318 0093 | Puerto Rico | 1-877 232 0589 | Romania | www.hp.com/ support |
| Russia | 495-228-3050 | Saudi Arabia | www.hp.com/ support | Serbia | www.hp.com/ support | Singapore | 6272-5300 |
| Slovakia | www.hp.com/ support | South Africa | 0800980410 | South Korea | 00798-862-0305 | Spain | 913753382 |
| St Kitts & Nevis | 1-800-711-2884 | St Lucia | 1-800-478-4602 | St Marteen | 1-800-711-2884 | St Vincent | 01-800-711-2884 |
| Suriname | 156 ; 800-711-2884 | Swaziland | www.hp.com/ support | Sweden | 08 5199 2065 | Switzerland | 022 827 8780 |
| Switzerland | 01 439 5358 | Switzerland (Italian) | 022 567 5308 | Switzerland (French) | 022 827 8780 | Taiwan | 00801-86-1047 |
| Thailand | (2)-353-9000 | Trinidad & Tobago | 1-800-711-2884 | Tunisia | www.hp.com/ support | Turkey | www.hp.com/ support |
| Turks & Caicos | 01-800-711-2884 | UAE | www.hp.com/ support | United Kingdom | 0207 458 0161 | Uruguay | 0004-054-177 |
| US Virgin Islands | 1-800-711-2884 | USA | 800-HP INVENT | Venezuela | 0-800-474-68368 (0-800 HP INVENT) | Vietnam | +65-6272-5300 |
| Zambia | www.hp.com/ support | | | | | | |

## Product Regulatory & Environment Information

**Federal Communications Commission Notice**

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

**Modifications**

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

**Cables**

Connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods to maintain compliance with FCC rules and regulations. Applicable only for products with connectivity to PC/laptop.

**Declaration of Conformity for products Marked with FCC Logo, United States Only**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

If you have questions about the product that are not related to this declaration, write to:
Hewlett-Packard Company
P.O. Box 692000, Mail Stop 530113
Houston, TX 77269-2000

For questions regarding this FCC declaration, write to:
Hewlett-Packard Company
P.O. Box 692000, Mail Stop 510101 Houston, TX 77269-2000 or call HP at 281-514-3333

To identify your product, refer to the part, series, or model number located on the product.

**Canadian Notice**

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

**Avis Canadien**

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

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This product complies with the following EU Directives:

- Low Voltage Directive 2006/95/EC
- EMC Directive 2004/108/EC

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by Hewlett-Packard for this product or product family.

This compliance is indicated by the following conformity marking placed on the product:

CE | CE XXXX*

This marking is valid for non-Telecom products and EU harmonized Telecom products (e.g. Bluetooth).

This marking is valid for EU non-harmonized Telecom products. *Notified body number (used only if applicable-refer to the product label).

Hewlett-Packard GmbH, HQ-TRE, Herrenberger Strasse 140, 71034 Boeblingen, Germany

The official EU CE declaration of conformity for this device may be found at http://www.hp.com/go/certificates.

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| | |
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**Disposal of Waste Equipment by Users in Private Household in the European Union**

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the shop where you purchased the product.

**Chemical Substances**

HP is committed to providing our customers with information about the chemical substances in our products as needed to comply with legal requirements such as REACH (*Regulation EC No 1907/2006 of the European Parliament and the Council)*. A chemical information report for this product can be found at:

http://www.hp.com/go/reach

**Perchlorate Material - special handling may apply**

This calculator's Memory Backup battery may contain perchlorate and may require special handling when recycled or disposed in California.

**产品中有毒有害物质或元素的名称及含量**

**根据中国《电子信息产品污染控制管理办法》**

| 部件名称 | 有毒有害物质或元素 | | | | | |
|---|---|---|---|---|---|---|
| | 铅 (Pb) | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr(VI)) | 多溴联苯 (PBB) | 多溴二苯醚 (PBDE) |
| PCA | X | O | O | O | O | O |
| 外壳/机箱 | O | O | O | O | O | O |

O：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006标准规定的限量要求以下。

X：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006标准规定的限量要求。

表中标有"X"的所有部件都符合欧盟RoHS法规

"欧洲议会和欧盟理事会2003年1月27日关于电子电器设备中限制使用某些有害物质的2002/95/EC号指令"

注：环保使用期限的参考标识取决于产品正常工作的温度和湿度等条件