

Getting started

On/off, cancel operations

To turn On

Press **ON** to turn on the calculator.

To Cancel

When the calculator is on, the **ON** key cancels the current operation.

To turn Off

Press **SHIFT** *OFF* to turn the calculator off.

To save power, the calculator turns itself off after several minutes of inactivity. All stored and displayed information is saved.

If you see the ((•)) annunciator or the Low Bat message, then the calculator needs fresh batteries.

HOME

HOME is the calculator's home view and is common to all aplets. If you want to perform calculations, or you want to quit the current activity (such as an aplet, a program, or an editor), press **HOME**. All mathematical functions are available in the HOME view.

The display

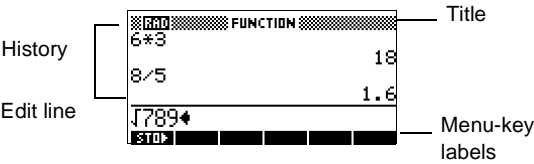
To adjust the contrast

Simultaneously press **ON** and **+** (or **-**) to increase (or decrease) the contrast.

To clear the display

- Press *CANCEL* to clear the edit line.
- Press **SHIFT** *CLEAR* to clear the edit line and the display history.

Parts of the display



Menu key or soft key labels. The labels for the menu keys’ current meanings. STORE is the label for the first menu key in this picture. “Press **STO**►” means to press the leftmost top-row key on the calculator keyboard.

Edit line. The line of current entry.

History. The HOME display (**HOME**) shows up to four lines of history: the most recent input and output. Older lines scroll off the top of the display but are retained in memory.

Title. The name of the current applet is displayed at the top of the HOME view. RAD, GRD, DEG specify whether Radians, Grads or Degrees angle mode is set for HOME. The ▼ and ▲ indicate whether there is more history in the HOME display. Use the ▼ and ▲ to scroll in the HOME display.

Annunciators. Annunciators are symbols that appear above the title bar and give you important status information.

↵	Shift in effect for next keystroke. To cancel, press SHIFT again.
α	Alpha in effect for next keystroke. To cancel, press ALPHA again.
((•))	Low battery power. See chapter 10.
⌚	Busy.
📶	Data is being transferred via infrared or cable.

The keyboard




Menu keys

You press **APLET** to see this screen:

****NEED CALCULATOR SOFT KEY GRAPHIC HERE****

- On the calculator keyboard, the top-row keys are called menu keys because their meanings depend on the context—that’s why their tops are blank. The menu keys are sometimes called “soft keys”.
- The bottom line of the display shows the labels for the menu keys’ current meanings. **SAVE** is the label for the first menu key in this picture. “Press **SAVE**” means to press the leftmost top-row key.

Aplet control keys

Key	Meaning
	Displays the Symbolic view for the current applet. See “Symbolic view” on page 1-22.
	Displays the Plot view for the current applet. See “Plot view” on page 1-22.
	Displays the Numeric view for the current applet. See “Numeric view” on page 1-22.

HOME	Displays the HOME view. See “HOME” on page 1-9.
APLET	Displays the Aplet Library menu list. See “Aplet library” on page 1-21.
VIEWS	Displays the VIEWS menu list. See “Aplet views” on page 1-22.

Entry/Edit keys

Key	Meaning
ON (CANCEL)	Cancels the current operation if the calculator is on by pressing ON . Pressing SHIFT , then ON turns the calculator off.
SHIFT	Accesses the function printed in blue above a key.
HOME	Returns to the HOME view, for performing calculations.
ALPHA	Accesses the alphabetical characters printed in orange below a key. Hold down to enter a string of alpha characters.
ENTER	Enters an input or executes an operation. In calculations, ENTER acts like “=”. When OK or START is present as a menu key, ENTER acts the same as pressing OK or START .
(-)	Enters a negative number. To enter -25, press (-) 25. <i>Note: this is not the same operation that the subtract button performs (-).</i>
X,T,θ	Enters the independent variable by inserting X, T, θ , or N into the display, depending on the current active aplet.
DEL	Deletes the character under the cursor. Acts as a backspace key if the cursor is at the end of the line.

SHIFT CLEAR	Clears all data on the screen. On a settings screen, for example Plot Setup, SHIFT CLEAR returns all settings to their default values.
◀, ▶, ▲, ▼	Moves the cursor (navigation) around the display. Press SHIFT first to move to the beginning, end, top or bottom.
SHIFT CHARS	Displays a menu of all available characters. To type one, use the arrow keys to highlight it, and press OK . To select multiple characters, select each and press ECHO , then press OK .

Shifted keystrokes

There are two shift keys that you use to access the operations and characters printed above the keys: **SHIFT** and **ALPHA**.

Key	Description
SHIFT	Use the SHIFT key to access the operations printed in blue above keys. For instance, to access the Modes screen, press SHIFT , then HOME . (<i>MODES</i> is labelled in blue above the HOME key. You do not need to hold down SHIFT . This action is depicted in this manual as “press SHIFT <i>MODES</i> .” To cancel a shift, press SHIFT again.
ALPHA	The alphabetic keys are also shifted keystrokes. For instance, to type Z, press ALPHA Z. (The letters are printed in orange to the lower right of each key.) To cancel Alpha, press ALPHA again. For a lower case letter, press SHIFT ALPHA . For a string of letters, hold down ALPHA while typing.

Math keys

HOME (**HOME**) is the place to do calculations.

- **Keyboard keys.** The most common operations are on the keyboard, such as the arithmetic (like **+**) and

trigonometric (like \sin) functions. Press ENTER to complete the operation: $\text{SHIFT} \sqrt{} 256 \text{ENTER}$ displays 16.



- **MATH menu.** Press MATH to open the Math menu. The Math menu is a comprehensive menu list of math operations that do not appear on the keyboard. It also includes categories for all other functions and constants. The functions are grouped by category, ranging in alphabetical order from Calculus to Trigonometry.



- The arrow keys scroll through the list (\downarrow , \uparrow) and move from the category list to the item list (\leftarrow , \rightarrow).
- Press **OK** to insert the selected command onto the command line.
- Press **CANCL** to dismiss the MATH menu without selecting a command.
- Pressing **CONS** displays the list of Program Constants. You can use these in programs that you develop.
- Pressing **MTH** returns you to the list of Math Functions.

See “Math functions by category” on page 10-136 for details of the maths functions.




When using the MATH menu, or any menu on the HP 39G/40G, pressing an alpha key takes you straight to the first menu option beginning with the alpha character. With this method, you do not need to press ALPHA first. Just press the key that corresponds to the command’s beginning alpha character.

Program commands

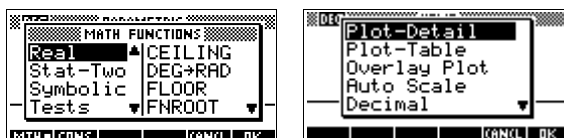
- Pressing $\text{SHIFT} \text{CMDS}$ displays the list of Program Commands. See “Programming commands” on page 15-210.

Inactive keys

If you press a key that does not operate in the current context, a warning symbol like this  appears. There is no beep.

Menu lists

A menu list offers you a choice of items. Menu lists are displayed in one or two columns.



To search a menu list

- The ▼ arrow in the display means more items below.
- The ▲ arrow in the display means more items above.
- Press ▼ or ▲ to scroll through the list. If you press **SHIFT** ▼ or **SHIFT** ▲, you'll go all the way to the end or the beginning of the list. Highlight the item you want to select, then press **OK** (or **ENTER**).
- If there are two columns, the left column shows general categories and the right column shows specific contents within a category. Highlight the category on the left, then highlight the item on the right. The list on the right changes when a different category is highlighted. Press **OK** or **ENTER**.
- To speed-search a list (with no edit line), type the first letter of the word. For example, to find the Matrix category in **MATH**, press **[M]**, the Alpha "M" key.
- To go up a page, you can press **SHIFT** **◀**. To go down a page, press **SHIFT** **▶**.

To cancel a menu list

Press **ON** (for **CANCEL**) or **CANCEL**. This cancels the current operation.

Input forms

An input form shows several fields of information for you to examine and specify. After highlighting the field to edit, you can enter or edit a number (or expression). You can also select

options from a list (CHOOS). Some input forms include items to check (CHK). See below for an example of an input form.

FUNCTION PLOT SETUP

XRNG: -7.8995 8.52145...
YRNG: -3.1 3.2
XTICK: 1 YTICK: 1
RES: Faster
ENTER MINIMUM HORIZONTAL VALUE
EDIT PAGE

FUNCTION PLOT SETUP

☒SIMULT ☐INV. CROSS
☒CONNECT ☒LABELS
☒AXES ☐GRID
PLOT FUNCTIONS SIMULTANEOUSLY?
☒CHK ☐PAGE

Reset input form values

To reset the original, default values in an input form, press `DEL`. To reset all values in the form, press `SHIFT CLEAR`.

Mode settings

You use the Modes input form to set the modes for HOME.



Although the numeric setting in *MODES* affects only the HOME view, the angle setting controls the HOME view and the current aplet. *The angle setting selected in MODES is the angle setting used in both the HOME view and current aplet.* To further configure an aplet, you use the *SETUP* keys (`SHIFT PLOT` and `SHIFT NUM`).

Press `SHIFT MODES` to access the HOME MODES input form.

Setting	Options
Angle Measure	<p>Angle values are:</p> <p>Degrees. 360 degrees in a circle.</p> <p>Radians. 2π radians in a circle.</p> <p>Grads. 400 grads in a circle.</p> <p><i>The angle setting selected in Modes is the angle setting used in both the HOME view and current aplet.</i></p> <p>This is done to ensure that trigonometric calculations done in the current aplet and the HOME view will give the same result.</p>

Setting	Options (Continued)
Number Format	<p>Standard. Full-precision display.</p> <p>Fixed. Displays results rounded to a number of decimal places. Example : 123.456789 becomes 123.4568 in Fixed 4 format.</p> <p>Scientific. Displays result with an exponent, one digit to the left of the decimal point, and the specified number of decimal places. Example : 123.456789 becomes 1.23E2 in Scientific 2 format.</p> <p>Engineering. Displays result with an exponent that is a multiple of 3, and the specified number of significant digits beyond the first one. Example : 123.456E7 becomes 1.23E9 in Engineering 2 format.</p> <p>Fraction. Displays results as fractions based on the specified number of decimal places for precision. Examples: 123.456789 becomes 123 in Fraction 2 format, and .333 becomes 1/3 and 0.142857 becomes 1/7. See “Using fractions” on page 1-30.</p>
Decimal Mark	<p>Dot or Comma. Displays a number as 12456.98 (Dot mode) or as 12456,98 (Comma mode). Dot mode uses commas to separate elements in lists and matrices, and to separate function arguments. Comma mode uses periods as separators in these contexts.</p>

Example: To set angle measure

This example demonstrates how to change the angle measure from the default mode, degrees, to radians for the current aplet.

1. Press **[SHIFT] MODES** to open the HOME MODES input form

The cursor (highlight) is on the first line, ANGLE MEASURE.



- Press **CHOOS** to display a list of choices.



- Press **▼** to select Radians, and press **OK**. The angle measure changes to radians.
- Press **HOME** to return to HOME view.



Hint

Whenever an input form has a list of choices for a field, you can press **+** to cycle through them instead of using **CHOOS**.

Aplets

Aplets are the application environments where you explore different classes of mathematical operations. You select the application environment, or applet, that you want to work with.

Aplets come from a variety of sources:

- Built-in the HP 39G/40G (initial purchase).
- Aplets created by saving existing applets which have been modified with specific configurations. See “Creating new applets based on existing applets” on page 16-239.
- Downloaded from the HP Calculators website or another calculator.

Aplets are stored in the Aplet library. See “Aplet library” on page 1-21 for further information.

The following applets are built-in to the HP 39G/40G. You can modify configuration settings for the graphical, tabular and symbolic views of these applets. See “Aplet view configuration” on page 1-24 for further information.

Aplet name	Use this applet to explore:
Function	Real-valued, rectangular functions y in terms of x . Example: $y = 2x^2 + 3x + 5$

Aplet name	Use this applet to explore: (Continued)
Parametric	Parametric relations x and y in terms of t . Example: $x = \cos(t)$ and $y = \sin(t)$.
Polar	Polar functions r in terms of an angle θ . Example: $r = 2\cos(4\theta)$.
Sequence	Sequence functions U in terms of n , or in terms of previous terms in the same or another sequence, such as U_{n-1} and U_{n-2} . Example: $U_1=0$, $U_2=1$, and $U_n=U_{n-2}+U_{n-1}$
Solve	Equations in one or more real-valued variables. Example: $x + 1 = x^2 - x - 2$.
Statistics	One-variable (x) or two-variable (x and y) statistical data.
Inference	Confidence intervals and Hypothesis tests based on the Normal and Students-t distributions.

In addition to the standard applets which can be used in a variety of applications, the HP39G/40G is supplied with two built in teaching applets: Quadratic Explorer and Trig Explorer. These applets are developed specifically as an aid when teaching particular concepts. You are restricted from modifying configuration settings for one or more of the graphical, tabular, or symbolic views of these applets.

A great many more teaching applets can be found at HP's web site and other web sites created by educators, together with accompanying documentation, often with student work sheets. These can be down-loaded free of charge and transferred to the HP39G using the separately supplied Connectivity Kit.

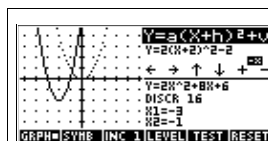
Quadratic Explorer applet

The **Quadratic Explorer** applet is used to investigate the behaviour of $y = a(x + h)^2 + v$ as the values of a , h and v change, both by manipulating the equation and seeing the change in the graph, *and* by manipulating the graph and seeing the change in the equation.

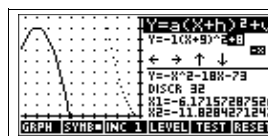


More detailed documentation, and an accompanying student work sheet can be found at HP's web site.

When first **STARTED**, the applet will be in **GRPH** mode, in which the arrow keys, the $+$ and $-$ keys and the $(-)$ key are used to change the shape of the graph. This changing shape is reflected in the equation displayed at the top right corner of the screen, while the original graph is retained for comparison. In this mode the graph controls the equation.



It is also possible to have the equation control the graph. Pressing **SYMB** will display the equation (see right).



Pressing the left/right arrows will move between parameters, while pressing the up/down arrows will change their values.

Pressing **LEVEL** allows the user to select whether all three parameters will be explored or only one at a time.

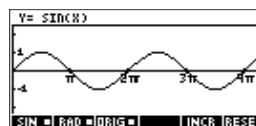
A **TEST** button is provided to evaluate the student's knowledge. Pressing **TEST** will display a 'target' quadratic graph. The student must manipulate the equation's parameters to make the equation match the target graph. When a student feels that they have correctly chosen the parameters a **CHECK** button will evaluate the answer and provide effective visual feedback. An **ANSW** button is provided for those who give up!



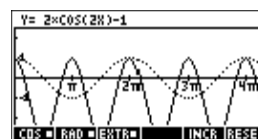
Trig Explorer applet

The **Trig Explorer** applet is used to investigate the behaviour of the graph of $y = a \sin(bx + c) + d$ as the values of a , b , c and d change, both by manipulating the equation and seeing the change in the graph, or by manipulating the graph and seeing the change in the equation.

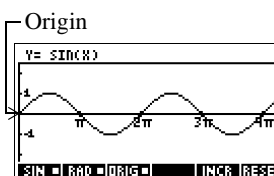
When the user presses **START** in the **APLET** view, the screen shown right is displayed.



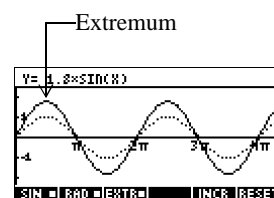
In this mode, the graph controls the equation. Pressing the \uparrow \downarrow and \leftarrow \rightarrow arrows transforms the graph, with these transformations reflected in the equation.



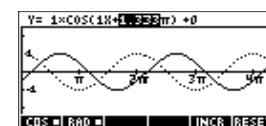
The button labelled **ORIG** is a toggle between **ORIG** and **EXTR**. When **ORIG** is chosen, the 'point of control' is at the origin (0,0) and the arrow buttons will control vertical and horizontal transformations. When **EXTR** is chosen the 'point of control' is on the first extremum of the graph (ie. for the sine graph at $(\frac{\pi}{2}, 1)$).



The arrow keys change the amplitude and frequency of the graph. This is most easily seen by experimenting.



Pressing **SYMB** displays the full equation at the top of the screen, and changes so that the equation is controlling the graph. Pressing the \rightarrow and \leftarrow arrows moves from parameter to parameter. Pressing the \uparrow and \downarrow arrow keys change their values.



The default setting for this applet is to display in Radian measure but this can be changed to degrees by toggling the **RAD** menu key.

Aplet library

Aplets are stored in the Aplet library. Press the **APLET** key to display the library of available aplets, and to select the one that you want to work with.

To open an applet

- Press **[APLET]** to display the Applet library menu list. Select the applet and press **START** or **[ENTER]**.

Applet views

When you have configured an applet to define the relation or data that you want to explore, you can display it in different Views. These views compose an applet problem and its solution. Here are illustrations of the three major applet views (Symbolic, Plot, and Numeric), the six supporting applet VIEWS (from the VIEWS menu), and the two user-defined views (Note and Sketch).

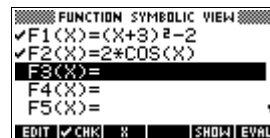
From within an applet, you can return to HOME any time by pressing **[HOME]**.

Symbolic view

Press **[SYMB]** to display the applet's Symbolic view.

You use this view to define the function(s) or equation(s) that you want to explore.

See "About the Symbolic view" on page 2-37 for further information.

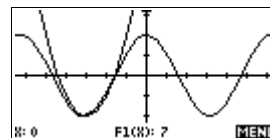


Plot view

Press **[PLOT]** to display the applet's Plot view.

In this view, the functions that you have defined are displayed graphically.

See "About the Plot view" on page 2-40 for further information.



Numeric view

Press **[NUM]** to display the applet's Numeric view.

In this view, the functions that you have defined are displayed in tabular format.

See "About the numeric view" on page 2-51 for further information.

X	F1	F2
0	2	2
.1	7.61	1.990008
.2	8.24	1.960133
.3	8.84	1.910679
.4	9.56	1.842122
.5	10.25	1.755165

ZOOM BIG DEFN

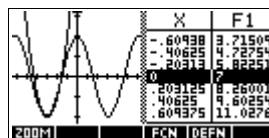
Plot-Table view

The VIEWS menu contains the Plot-Table view.

(VIEWS)

Select Plot-Table)

Splits the screen into the plot and the data table. See “Other views for scaling and splitting the graph” on page 2-48 for further information.



Plot-Detail view

The VIEWS menu contains the Plot-Detail view.

(VIEWS)

Select Plot-Detail)

Splits the screen into the plot and a close-up.



See “Other views for scaling and splitting the graph” on page 2-48 for further information.

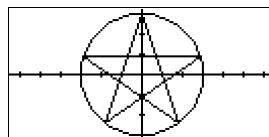
Overlay Plot view

The VIEWS menu contains the Overlay Plot view.

(VIEWS)

Select Overlay Plot)

Plots the current expression(s) *without* erasing any pre-existing plot(s).

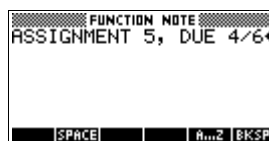


See “Other views for scaling and splitting the graph” on page 2-48 for further information.

Note view

Press [SHIFT]NOTE to display the applet’s note view.

This note is transferred with the applet if it is sent to another calculator or to a PC. A note view contains text to supplement an applet.



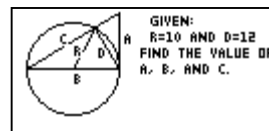
See “Notes and Sketches” on page 14-191 for further information.

Sketch view

Press [SHIFT]SKETCH to display the applet’s sketch view.

Displays pictures to supplement an applet.

See “Notes and Sketches” on page 14-191 for further information.



Aplet view configuration

You use the *SETUP* keys ([SHIFT] [PLOT] , and [SHIFT] [NUM]) to configure the aplet. For example, press $\text{[SHIFT] [SETUP-PLOT]}$ ([SHIFT] [PLOT]) to display the input form for setting the aplet's plot settings. Angle measure is controlled using the *MODES* view.

Plot Setup

Press $\text{[SHIFT] [SETUP-PLOT]}$. Sets parameters to plot a graph.

```

┌───────────┐
│FUNCTION PLOT SETUP│
├───────────┤
│X-RNG: -6.5 6.5│
│Y-RNG: -7.1285... 7.5│
│X-TICK: 1 Y-TICK: 1│
│RES: Faster│
│ENTER MINIMUM HORIZONTAL VALUE│
│EDIT PAGE▼│
└───────────┘

```

Numeric Setup

Press $\text{[SHIFT] [SETUP-NUM]}$. Sets parameters for building a table of numeric values.

```

┌───────────┐
│FUNCTION NUMERIC SETUP│
├───────────┤
│NUMSTART: 0│
│NUMSTEP: .1│
│NUMTYPE: Automatic│
│NUMZOOM: 4│
│ENTER STARTING VALUE FOR TABLE│
│EDIT PLOT│
└───────────┘

```

Symbolic Setup

This view is only available in the Statistics aplet in 2VAR mode, where it plays an important role in choosing data models. Press ($\text{[SHIFT] [SETUP SYMB]}$).

```

┌───────────┐
│STATISTICS SYMBOLIC SETUP│
├───────────┤
│ANGLE MEASURE: Radians│
│CHOOSE ANGLE MEASURE│
│CHOOSE│
└───────────┘

```

To change VIEWS

Each view is a separate “environment.” To change a view, select a different view from the VIEW menu. To change to the HOME view, press [HOME] . You do not explicitly close the current view, you just enter another one—like passing from one room into another in a house. Data that you enter is automatically saved as you enter it. You do not need to save data when you change VIEWS.

To save aplet configuration

You can save an aplet configuration that you have used, and transfer the aplet to other HP 39G/40G calculators. See “Sending and receiving aplets” on page 16-242.

Mathematical calculations

The most commonly used math operations are on the keyboard. Access to the rest of the math functions is via the Math functions menu. Press [MATH] to display the Math Functions menu.

To access programming commands, press **[SHIFT]** **CMD5**. See “Programming commands” on page 15-210 for further information.

Where to start

The home base for the calculator is the HOME view (**[HOME]**). You can do all calculations here, and you can access all **[MATH]** operations.

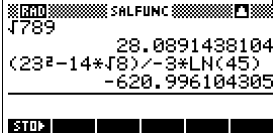
Entering expressions

- Enter an expression into the HP 39G/40G in the same left-to-right order that you would write the expression. This is called *algebraic entry*.
- To enter functions, select the key or MATH menu item for that function. You can also enter a function by using the Alpha keys to spell out its name.
- Press **[ENTER]** to evaluate the expression you have in the edit line (where the blinking cursor is). An *expression* can contain numbers, functions, and variables.

Example

Calculate $\frac{(23^2 - (14\sqrt{8}))}{-3} \ln(45)$:

[23] **[x²]**
[−] **[14]**
[*] **[SHIFT]** **[√]** **[8]** **[)]**
[/] **[(−)]** **[3]** **[)]**
[ln] **[45]** **[)]**
[ENTER]



Calculator display showing the result of the calculation: 28.0891438104 and -620.996104305.

Long results

If the result is too long to fit in the display line, or if you want to see an expression in textbook format, press **[▲]** to highlight it and then press **SHOW**.

Negative numbers

Type **[(−)]** to start a negative number or to insert a negative sign.

If a negative number will be raised to a power, enclose it in parentheses. For example, $(-5)^2 = 25$, whereas $-5^2 = -25$.

Scientific notation (powers of 10)

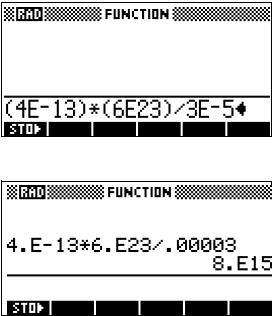
A number like 5×10^4 or 3.21×10^{-7} is written in *scientific notation*, that is, in terms of powers of ten. This is simpler to work with than 50000 or 0.000000321. To enter numbers like these, use **EEX**. (This is easier than using **[*]** **[10]** **[x^y]**.)

Example

Calculate $\frac{(4 \times 10^{-13})(6 \times 10^{23})}{3 \times 10^{-5}}$

(4 [SHIFT] EEX
(-) 13)
* (6 [SHIFT] EEX
23) / 3 [SHIFT] EEX
(-) 5

[ENTER]



Explicit and implicit multiplication

Implied multiplication takes place when two operands appear with no operator in between. If you enter AB, for example, the result is A*B.

However, for clarity, it is better to include the multiplication sign where you expect multiplication in an expression. It is clearest to enter AB as A*B.



Implied multiplication will not always work as expected. For example, entering A(B+4) will not give A*(B+4). Instead an error message of 'Invalid User Function' is displayed. This is because the calculator interprets A(B+4) as meaning 'evaluate function A at the value B+4', and function A does not exist. When in doubt, insert the * sign manually.

Parentheses

You need to use parentheses to enclose arguments for functions, such as SIN(45). You can omit the final parenthesis at the end of an edit line. The calculator inserts it automatically.

Parentheses are also important in specifying the order of operation. *Without* parentheses, the HP 39G/40G calculates according to the order of *algebraic precedence* (the next topic). Following are some examples using parentheses.

Entering...	Calculates...
SIN 45 + [SHIFT] π	sin (45 + π)
SIN 45) + [SHIFT] π	sin (45) + π
√x 85 * 9	√85 × 9

Entering...	Calculates...
\sqrt{x} (85 * 9)	$\sqrt{85 \times 9}$

Algebraic precedence order of evaluation

Functions within an expression are evaluated in the following order of precedence. Functions with the same precedence are evaluated in order from left to right.

1. Expressions within parentheses. Nested parentheses are evaluated from inner to outer.
2. Prefix functions, such as SIN and LOG.
3. Postfix functions, such as !
4. Power function, ^, NTHROOT.
5. Negation, multiplication, and division.
6. Addition and subtraction.
7. AND and NOT.
8. OR and XOR.
9. Left argument of | (where).
10. Equals, =.

Largest and smallest numbers

The smallest number the HP 39G/40G can represent is 1×10^{-499} (1E-499). A smaller result is displayed as zero. The largest number is $9.9999999999 \times 10^{499}$. A larger result is still displayed as this number.

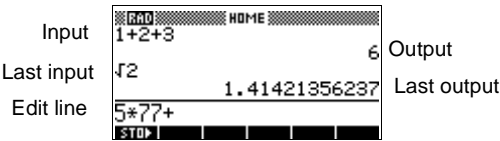
Clearing numbers

- $\boxed{\text{DEL}}$ clears the character under the cursor. When the cursor is positioned after the last character, $\boxed{\text{DEL}}$ deletes the character to the left of the cursor, that is, it performs the same as a backspace key.
- *CANCEL* ($\boxed{\text{ON}}$) clears the edit line.
- $\boxed{\text{SHIFT}}$ *CLEAR* clears all input and output in the display, including the display history.

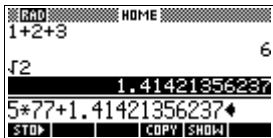
Using previous results

The HOME view display ($\boxed{\text{HOME}}$) shows you four lines of input/output history. An unlimited (except by memory)

number of previous lines are available by scrolling. You can retrieve and reuse any of these values or expressions.



When you highlight a previous input or result (by pressing \uparrow), the **COPY** and **SHOW** menu labels appear.



To copy a previous line

Highlight the line (press \uparrow) and press **COPY**. The number (or expression) is copied into the edit line.

To re-use the last result

Press SHIFT **ANS** (last answer) to put the last result from the HOME view display into an expression. **ANS** is a variable that is updated each time you press ENTER .

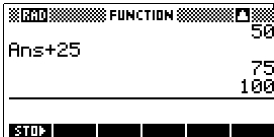
To repeat a previous line

To repeat the very last line, just press ENTER . Otherwise, highlight the line (press \uparrow) first, and then press ENTER . The highlighted expression or number is re-entered. If the previous line is an expression in **ANS**, the calculation is repeated iteratively.

Example

See how SHIFT **ANS** retrieves and reuses the last result (50), and ENTER updates **ANS** (from 50 to 75 to 100).

50 ENTER + 25
 ENTER ENTER



You can use the last result as the first expression in the edit line without pressing SHIFT **ANS**. Pressing $+$, $-$, $*$, or \div , (or other operators that require a preceding argument) automatically enters **ANS** before the operator.

You can reuse any other expression or value in the HOME view display by highlighting the expression (using the arrow

keys), then pressing **COPY**. See “Using previous results” on page 1-27 for more details.

The variable *ANS* is different from the numbers in HOME’s display history. A value in *ANS* is stored internally with the full precision of the calculated result, whereas the displayed numbers match the display mode.



When you retrieve a number from *ANS*, you obtain the result to its full precision. When you retrieve a number from the HOME view’s display history, you obtain exactly what was displayed.

Pressing **ENTER** evaluates (or re-evaluates) the *last input*, whereas pressing **SHIFT** **ANS** copies the *last result* (as *ANS*) into the edit line.

Storing a value in a variable

You can save an answer in a variable and use the variable in later calculations. There are 27 variables available for storing real values. These are A through Z and θ . See Chapter 6, “Variables, aplets and memory management” for more information on variables. For example:

1. Perform a calculation.

45 **+** 8 **x^y** 3
ENTER

FUNCTION	
45+8^3	557
STO>	

2. Store the result in the A variable.

STO> **ALPHA** A **ENTER**


FUNCTION	
45+8^3	557
Ans→A	557
STO>	





3. Re-use the value in another calculation.

95 **+** 2 ***** **ALPHA** A


FUNCTION	
Ans→A	557
95+2*A	1209
STO>	

Accessing the display history

Pressing  enables the highlight bar in the display history. While the highlight bar is active, the following menu and keyboard keys are very useful:

Key	Meaning
 , 	Scrolls through the display history and highlight display lines.
COPY	Copies the highlighted expression to the position of the cursor in the edit line.
SHOW	Displays the current expression in standard mathematical form.
	Deletes the highlighted expression from the display history, unless there is a cursor in the edit line.
 <i>CLEAR</i>	Clears all lines of display history and the edit line.

Clearing the display history


It's a good habit to clear the display history ( *CLEAR*) whenever you are done working in the HOME view. It saves calculator memory to clear the display history. Remember that *all* your previous inputs and results are saved until you clear them.

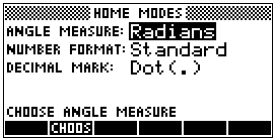
Using fractions

To work with fractions in the HOME view, you set the number format to Fractions, as follows:

Setting Fraction mode

1. In HOME, open the HOME Modes input form.

 *MODES*



2. Select Number Format and press **CHOOS** to display the options, then select Fraction.



- Press **OK** to select the option, then select the precision value.



- Enter the precision that you want to use, and press **OK** to set the precision. Press **HOME** to return to the HOME view.

See “Setting fraction precision” below for more information.

Setting fraction precision

The fraction precision setting determines the precision in which the HP39G/40G converts a decimal value to a fraction. The greater the precision value that is set, the closer the fraction is to the decimal value.

By choosing a precision of 1 you are saying that the fraction only has to match 0.234 to at least 1 decimal place ($3/13$ is 0.23076...).

The fractions used are found using the technique of continued fractions.

When converting recurring decimals this can be important. For example, at precision 6 the decimal 0.6666 becomes $3333/5000$ ($6666/10000$) whereas at precision 3, 0.6666 becomes $2/3$, which is probably what you would want.

For example, when converting .234 to a fraction, the precision value has the following effect:

- Precision set to 1:



- Precision set to 2:

RAD	FUNCTION
.234	3/13
.234	7/30
STOP	

- Precision set to 3:

RAD	FUNCTION
.234	7/30
.234	11/47
STOP	

- Precision set to 4

RAD	FUNCTION
.234	11/47
.234	117/500
STOP	

Fraction calculations

When entering fractions:

- You use the $\frac{\Box}{\Box}$ key to separate the numerator part and the denominator part of the fraction.
- To enter a mixed fraction, for example, $1\frac{1}{2}$, you enter it in the format $(1+\frac{1}{2})$.

For example, to perform the following calculation:

$$3(2\frac{3}{4} + 5\frac{7}{8})$$

1. Set the mode Number format to fraction.

SHIFT MODES ∇
 CHOOS select
 Fraction ENTER \blacktriangleright 4

HOME MODES
ANGLE MEASURE: Radians
NUMBER FORMAT: Fraction 4
DECIMAL MARK: Dot(.)
TITLE: HOME
CHOOSE ANGLE MEASURE
CHOOS

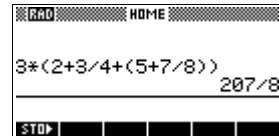
2. Return to the HOME view and enter the calculation.

3 * ((2 + 3
 $\frac{\Box}{\Box}$ 4) + (5 + 7
 $\frac{\Box}{\Box}$ 8))

RAD	HOME
3*((2+3/4)+(5+7/8))	
STOP	

- Evaluate the calculation.

ENTER



Converting decimals to fractions

To convert a decimal value to a fraction:

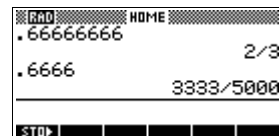
- Set the number mode to Fraction.
- Either retrieve the value from History, or enter the value on the command line.
- Press **ENTER** to convert the number to a fraction.

Converting a number to a fraction

When converting a number to a fraction, keep the following points in mind:

- When converting a recurring decimal to a fraction, set the fraction precision to about 6, and ensure that you include more than six decimal places in the recurring decimal that you enter.

In this example, the fraction precision is set to 6. The top calculation returns the correct result. The bottom one does not.



- To convert an exact decimal to a fraction, set the fraction precision to at least two more than the number of decimal places in the decimal.

In this example, the fraction precision is set to 6.



Complex numbers

Complex results

The HP 39G/40G can return a complex number as a result for some math functions. A complex number appears as an ordered pair (x, y) , where x is the real part and y is the imaginary part. For example, entering $\sqrt{-1}$ returns $(0,1)$.

To enter complex numbers

Enter the number in either of these forms, where x is the real part, y is the imaginary part, and i is the imaginary constant, $\sqrt{-1}$:

- (x, y) or
- $x + iy$.

To type i , press [SHIFT] [ALPHA] I , or copy i from the Constant category in the MATH menu.

Storing complex numbers

There are 10 variables available for storing complex numbers: Z0 through to Z9. To store a complex number in a variable:

- Enter the complex number, press and enter the variable to store the number in.

$\text{[(] 4 [.] 5 [)] STO} \blacktriangleright$
 $\text{[ALPHA] Z0 [ENTER]}$



Catalogs and editors

The HP 39G/40G has several catalogs and editors. You use them to create specific objects, or to manipulate specific objects. They access features and stored values (numbers or text or other items) that are independent of aplets.

- A *catalog* lists items, which you can delete or transmit, for example an aplet.
- An *editor* lets you create or modify items and numbers, for example a note or a matrix.

Catalog/Editor	Contents
Aplet library ([APLET])	Aplets.
List ([SHIFT] LIST)	Lists. In HOME, lists are enclosed in { }. See Chapter 13, “Using lists.”
Matrix ([SHIFT] MATRIX)	One- and two-dimensional arrays. In HOME, arrays are enclosed in []. See Chapter 12, “Using matrices.”

Catalog/Editor	Contents (Continued)
Notepad (SHIFT <i>NOTEPAD</i>)	Notes (short text entries). See Chapter 14, “Notes and sketches.”
Sketch editor (SHIFT <i>SKETCH</i>)	Sketches and diagrams. See Chapter 14, “Notes and sketches.”
Program (SHIFT <i>PROGRAM</i>)	Programs that you create, or associated with user-defined aplets. See Chapter 15, “Programming.”

Differences between the HP 38G and the HP 39G/40G

CAS

The HP 40G is packaged with a computerized algebra system (CAS). Refer to the CAS Manual for further information.

Memory manager

The HP 39G/40G incorporates a memory manager that you can use to see how much memory that objects that you have created or loaded are occupying. See “Memory Manager” on page 11-165 for more information.

Plot Goto function

In Plot view, you can use the **GOTO** menu key to jump to a value on the plot instead of having to trace the plot to locate values. See “Exploring the graph” on page 2-42 for more information.

Statistics Pred function

When you choose the **FIT** option in the Descriptive Stats **PLOT** screen, it is now possible to **TRACE** along the regression curve. Once a data set and regression curve is displayed, pressing the up and down arrows will move between the data and the curve of regression. When the regression curve is selected, the values displayed in the **PLOT** view status line are the **PREDY** values. On the HP 38G, the Trace function would select known data points only.

Inference aplet

To complement the Statistics aplet, a new Inference aplet has been added. Use this module to perform hypothesis tests and determine confidence intervals. See “Inference aplet” on page 9-117 for more information.

Trig Explorer and Quadratic Explorer aplets

The teaching applets Trig Explorer and Quadratic Explorer have been added to the calculator. These two applets add powerfully to the capabilities of the calculator in the classroom.