

## Variables and memory management

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### Introduction

The HP 39G/40G has approximately 232K of user memory. The calculator uses this memory to store variables, perform computation, and store history.

A variable is an object that you create in memory to hold data. The HP 39G/40G has two types of variables, home variables and aplet variables.

- Home variables are available in all aplets. For example, you can store real numbers in variables A to Z and complex numbers in variables Z0 through to Z9. These can be numbers you have entered, or the results of calculations. These variables are available within all aplets and within any programs.
- Aplet variables apply only to the specific aplet. Aplets have specific variables allocated to them which vary from aplet to aplet.

You use the calculator's memory to store the following objects:

- copies of aplets with specific configurations
- new aplets that you create or download
- aplet variables
- home variables
- variables created through a catalog or editor, for example a matrix or a text note
- programs that you create.

You can use the Memory Manager (  $\boxed{\text{SHIFT}}$  *MEMORY* ) to view the amount of memory available. The catalog views, which are accessible via the Memory Manager, can be used to

transfer variables such as lists or matrices between calculators.

*Note: You can also use the MEM programming command to view the amount of memory available.*

## Storing and recalling variables

You can store numbers or expressions from any previous input or result into variables.

### Numeric Precision

A number stored in a variable is always stored as a 12-digit mantissa with a 3-digit exponent. Numeric precision in the display, however, depends on the display mode (Standard, Fixed, Scientific, Engineering, or Fraction). A displayed number has only the precision that is displayed. If you copy it from the HOME view display history you obtain only the precision displayed, not the full internal precision. On the other hand, the variable *Ans* always contains the most recent result to full precision.

### To store a value

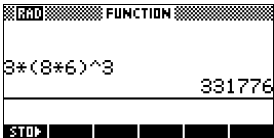
1. On the command line, enter the value or the calculation for the result you wish to store.
2. Press **STO▶**.
3. Enter the variable name and press **ENTER**.

### To store the results of a calculation

If the value you want to store is in the HOME view display history, for example the results of a previous calculation, you need to copy it to the command line, then store it.

1. Perform the calculation for the result you want to store.

3 **\*** ( **8** **\*** **6** ) **x<sup>y</sup>** 3  
**ENTER**



2. Move the highlight to the result you wish to store and press **COPY STO▶** and then enter a variable name.

**▲** **COPY STO▶**  
**ALPHA** A



3. Press **ENTER** to store the result.

The results of a calculation can also be stored directly to a variable.

1. Perform the calculation for the result you want to store in a particular variable name.

2 **x<sup>y</sup>** **( )** 5 **[ / ]** 3 **)**  
**STO▶** **(ALPHA)** B  
**ENTER**

DEG FUNCTION	
2^(5/3)▶B	3.17480210394
STO▶	

### To use variables in calculations

You can use variables in calculations. The calculator substitutes the variable's value in the calculation:

65 **+** **(ALPHA)** A **ENTER**

DEG FUNCTION	
65+A	331841
STO▶	

### To recall a value

To recall a variable's value, type the name of the variable and press **ENTER**.

**(ALPHA)** A **ENTER**

DEG FUNCTION	
A	331776
STO▶	

## The VARS menu

You use the VARS menu to access all variables contained in the calculator except the Formed variable S0-S5, which have no contents. The VARS menu is organised by category. For each variable category in the left column, there is a list of variables in the right column. You select a variable category to display a list of the variables in the category.

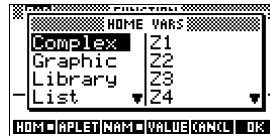
1. Open the VARS menu.

VARs



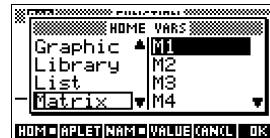
- Use the arrow keys or press the alpha key of the first letter in the category to select a variable category.

For example, to select the Matrix category, press  $\alpha$ .



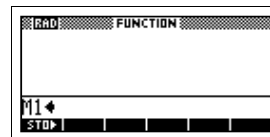
*Note: In this instance, there is no need to press the ALPHA key first to obtain the M on ).*

- Use the arrow keys to select the variable that you want. For example, to select the M1 variable, press  $\rightarrow$ .



- Select the option to place the variable name or the variable value on the command line.
  - Press **VALUE** to indicate that you want the variable's contents to appear on the command line.
  - Press **NAME** to indicate that you want the variable's name to appear on the command line.
- Press **OK** to place the value or name on the command line. The selected matrix appears on the command line.

**OK**



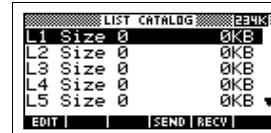
*The VARS menu can also be used to enter the names or values of variables into programs.*

## Example

This example demonstrates how to use the VARS menu to add two lists variables, and to store the results in another list variable.

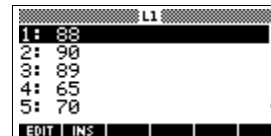
1. Display the List catalog.

**SHIFT** **LIST**



2. Enter the data for L1.

88 OK 90 OK 89 OK  
65 OK 70 OK



3. Return to the List Catalog to create L2.

**SHIFT** **LIST**

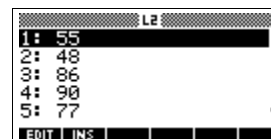
**▼** to select L2

**EDIT**



4. Enter data for L2.

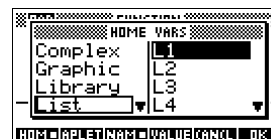
55 OK 48 OK 86 OK  
90 OK 77 OK



5. If necessary, press **HOME** to access HOME.

6. Open the variable menu and select L1.

**VARS** **▼** **▼** **▼** **▶**



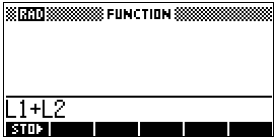
7. Copy it to the command line. *Note: Because the NAME option is highlighted, the variable's name, rather than its contents is copied to the command line.*

OK



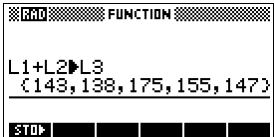
8. Insert the + operator and select the L2 variable from the List variables.

+ VARS  
▼ ▼ ▼ ► ▼ OK



9. Store the answer in the List catalog L3 variable.

STO ► ALPHA L3  
ENTER



*Note: You can type the list name directly from the keyboard.*

Home variables

It is not possible to store data of one type in a variable of another type. For example, you use the Matrix catalog to create matrices. You can create up to ten matrices, and you can store these in variables M0 to M9. You cannot store matrices in variables other than M0 to M9. Refer to “Home variables” on page -252

Category	Available name
Complex	Z0 through Z9  For example, (1,2)STO►Z0 or 2+3i STO►Z1. You can enter a complex number by typing (r,i), where <i>r</i> represents the real component, and <i>i</i> represents the imaginary component.

Category	Available name (Continued)
Graphic	G0 through G9 See “Graphic commands” on page 15-217 for more information on storing graphic objects via programming commands. See “To store into a graphics variable” on page 14-195 for more information on storing graphic object via the sketch view.
Library	Aplet library variables can store applets that you have created, either by saving a copy of a standard applet, or downloading an applet from another source.
List	L0 through L9 For example, {1,2,3} <b>STO►</b> L1.
Matrix	M0 through M9 can store matrices or vectors. For example, [[1,2],[3,4]] <b>STO►</b> M0.
Modes	Modes variables store the modes settings that you can configure using <b>SHIFT MODES</b> .
Notepad	Notepad variables can store notes.
Program	Program variables can store programs.
Real	A through Z and $\theta$ . For example, 7.45 <b>STO►</b> A.

## Aplet variables


Aplet variables store values which are unique to a particular applet. These include the symbolic expressions and equations (see below), as well as the settings for the Plot and Numeric views, and the results of some calculations such as finding roots and intersections.

See the Reference Information chapter for a complete listing of Aplet Variables.



Category	Available names
Function	F0 through to F9 (Symbolic view)
Parametric	X1, Y1 through X9, Y9 and X0, Y0 (Symbolic view)

Category	Available names
Polar	R0 through to R9 (Symbolic view)
Sequence	U0 through U9 (Symbolic view)
Solve	E0 through to E9 (Symbolic view)
Statistics	C0 through C9 (Numeric view)

**To access an  
aplet variable**

Use the VARS menu to access the aplet variables. The **APLET** menu key on the VARS menu switches the menu list to aplet variables. The  symbol next to the menu option indicates the currently selected option.



1. Open the aplet that contains the variable you want to recall.
2. Press  to display the VARS menu.
3. If necessary, press **APLET** to select aplet variables. The available variable types for the aplet are displayed on the left. *Note: The menu options displayed depends on which aplet is selected in the APLET view.*
4. Use the arrow keys to select a variable category in the left column, then press  to access the variables in the right column.
5. Use the arrow keys to select a variable in the right column.

To copy the name of the variable onto the edit line, press **OK**. (NAME is the default setting.)

To copy the value of the variable into the edit line, press **VALUE** and press **OK**.





## Memory Manager

You can use the Memory Manager to determine the available memory on the calculator. You can also use Memory Manager to organize memory. For example, if the available memory is low, you can use the Memory Manager to determine which applets or variables are consuming memory. You can delete variables to free up memory.

### Example

1. Start the Memory Manager. A list of variable categories is displayed.

**[SHIFT]** *MEMORY*

Free memory is displayed in the top right corner and the body of the screen lists each category, the memory it uses, and the percentage of the total memory it uses.

MEMORY MANAGER			FREE
Applets	.6KB	<1%	
Programs	.1KB	<1%	
Notes	0KB	<1%	
Matrices	0KB	<1%	
Lists	.1KB	<1%	
			VIEW

2. Select the category that you want to work with and press **VIEW**. Memory Manager displays memory details of variables within the category.

**[↓]** **[↓]** **[↓]** **VIEW**

MATRIX CATALOG			FREE
M1	1X1 REAL MATRIX	0KB	
M2	1X1 REAL MATRIX	0KB	
M3	1X1 REAL MATRIX	0KB	
M4	1X1 REAL MATRIX	0KB	
M5	1X1 REAL MATRIX	0KB	
			EDIT NEW SEND RECV

3. To delete variables in a category:
  - Press **[DEL]** to delete the selected variable.
  - Press **[SHIFT]** *CLEAR* to delete all variables in the selected category.

