Texas Instruments

Getting Started

with the

TI-73 Explorer™, CBL 2™, and CBR™

CL3456

Important Information

Texas Instruments makes no warranty, either express or implied, including but not limited to any implied warranties of merchantability and fitness for a particular purpose, regarding any programs or book materials and makes such materials available solely on an "as-is" basis. In no event shall Texas Instruments be liable to anyone for special, collateral, incidental, or consequential damages in connection with or arising out of the purchase or use of these materials, and the sole and exclusive liability of Texas Instruments, regardless of the form of action, shall not exceed the purchase price of this product. Moreover, Texas Instruments shall not be liable for any claim of any kind whatsoever against the use of these materials by any other party.

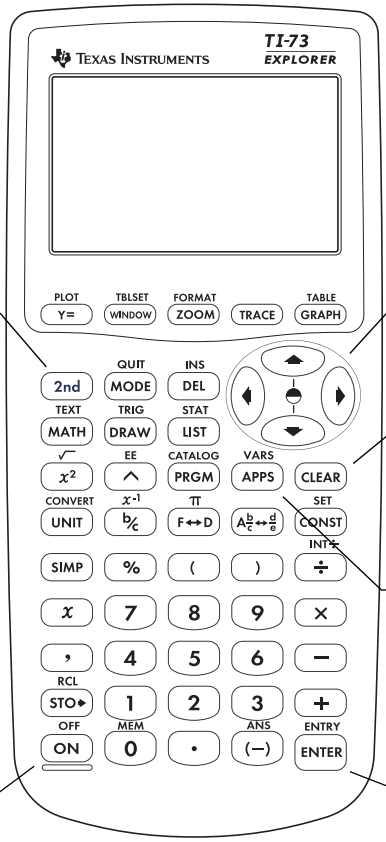
Texas Instruments Incorporated
7800 Banner Drive, M/S 3918
Dallas, TX 75251

Attention: Manager, Business Services

Printed in the United States of America.

Contents

TI-73 Explorer™ keys



2nd
Accesses the secondary functions of keys (shown in yellow above keys).

ON
Turns on the TI-73 Explorer.

▲ ▶ ▼ ◀
Let you move the cursor in four directions on the screen.

CLEAR
Erases entries and answers on the Home screen and entry line.

APPS
Lists the applications installed on your TI-73 Explorer.

ENTER
Evaluates an expression, executes an instruction, and selects a menu item.

Turning on and turning off the TI-73 Explorer™

- To turn on the TI-73 Explorer, press [ON] located at the lower left corner of the device.
- To turn off the TI-73 Explorer, press [2nd], and then the [ON] key. The next time you turn on the TI-73 Explorer, the Home screen appears with the same settings and memory contents retained.

Automatic Power Down™

The Automatic Power Down™ (APD™) feature prolongs battery life by turning off the TI-73 Explorer automatically after five inactive minutes.

When you turn on following APD, the handheld device displays the same information displayed before APD, retaining the same cursor position, settings, memory contents, and any error conditions.

Note: Avoid depleting your batteries by turning off your TI-73 Explorer when not in use.

Adjusting the display contrast

Display brightness and contrast depend on factors such as room lighting, battery freshness, and viewing angle. To adjust the contrast:

1. Press and release [2nd].
2. To darken the screen, press and hold [▲].
   — or —
   To lighten the screen, press and hold [▼].

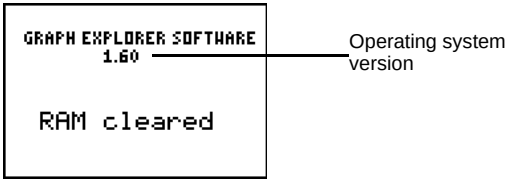
Note: The flashing cursor (■) changes to ↑ when you press the [2nd] key.

As you adjust the setting, a number from 0 (lightest) to 9 (darkest) appears at the upper right corner of the screen.

Note: If the contrast setting is too light or dark, the number will not be viewable.

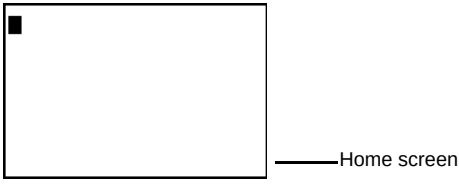
Home screen

The first time you turn on your TI-73 Explorer™, this screen appears:



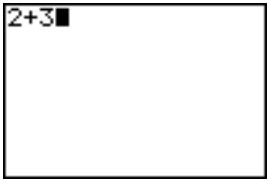
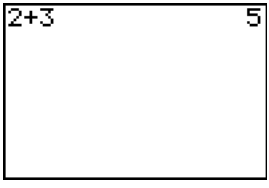
Note: Download the latest operating system (OS) to your Internet-enabled computer using the TI-Connectivity Kit. Both the latest OS and TI Connectivity Kit are available at education.ti.com/shop.

To clear the screen, press [CLEAR] twice. A blank screen with a flashing cursor appears called the *Home screen*. You can use the Home screen to enter problems and view results.

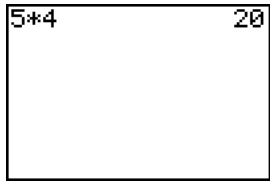


Note: If you press [CLEAR] and do not see a blank Home screen, first press [2nd], and then press [MODE] to select [QUIT].

Example: Add 2 + 3 on the Home screen.

Press	Result
2 [+] **3**	
[ENTER]	

Example: Multiply 5 x 4.

Press	Result
5 [×] **4** [ENTER]	

Entering secondary functions [2nd]

Secondary functions are printed in yellow above the keys. To select a secondary function, first press the yellow [2nd] key, and then press a key with a secondary function.

For example, to view the CATALOG menu, press [2nd] [CATALOG].

Note: The flashing cursor (■) changes to ↑ when you press the [2nd] key.

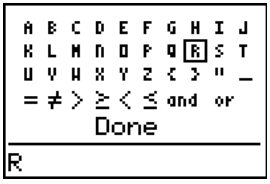
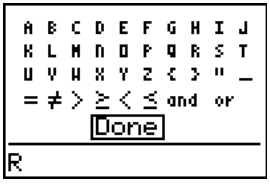
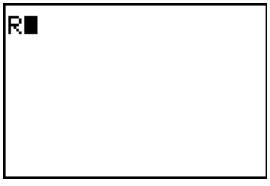
Entering text 2nd [TEXT]

You can use the Text Editor to key in text, such as alphabetic characters, braces, quotation marks, spaces, and relations.

- To access the Text Editor, press 2nd [TEXT].
- To return to the Home screen from the Text Editor:

  Select **Done** in the Text Editor and press ENTER.
  — or —
  To cancel the operation, press 2nd [QUIT].

Example: Insert **R** on the Home screen.

Press	Result
2nd [TEXT] **R** ENTER **Note:** To select **R**, press ◀, ▶, ▼ and ▲ as needed. **R** is pasted to the entry line.	
▼ ▼ ▼ (to select **Done**)	
ENTER	

Clear [CLEAR] *and Quit* [2nd] [QUIT]

Clear [CLEAR]

The [CLEAR] key is located just below the four cursor keys at the upper right corner of the keyboard.

- Pressing [CLEAR] while entering information clears the entry line.
- Pressing [CLEAR] when the cursor is on a blank line clears the Home screen.

Note: Although it does not affect calculations, consider clearing the Home screen before beginning a new problem. We recommend that you press [CLEAR] each time you begin a new example in this guide to ensure that the screen you see matches the one in the example.

Quit [2nd] [QUIT]

If you want to return to the Home screen after pressing a menu key, press [2nd] [QUIT].

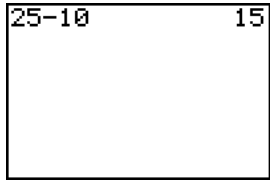
Note: To return to the Home screen and clear it, press [2nd] [QUIT] [CLEAR].

Using subtraction [−] and negation [(−)] keys

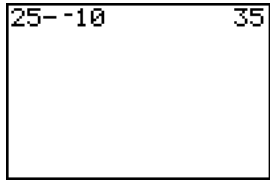
- Use [−] to enter subtraction operations.
- Use [(−)] to enter a negative number in an operation, expression, or on a setup screen.

Note: The TI-73 Explorer™ subtraction and negation symbols appear slightly different to make them easier to distinguish. The negative symbol is raised and slightly shorter.

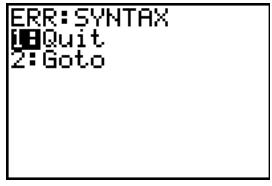
Example: Subtract 10 from 25.

Press	Result
2 5 [−] 1 0 [ENTER]	

Example: Subtract ⁻10 from 25.

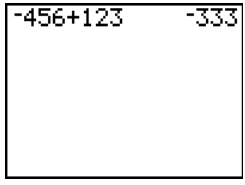
Press	Result
2 5 [−] [(−)] 1 0 [ENTER]	

Example: Subtract ⁻5 from 25.

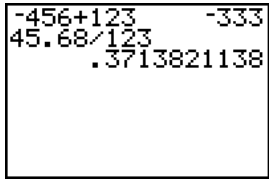
Press	Result
2 5 [−] [−] 5 [ENTER] **Note:** If you use the subtraction key instead of the negation key, an error message will appear. (See "Error messages" on page 28.)	

Keyboard math applications

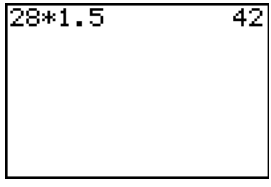
Example: Add -456 + 123.

Press	Result
(−) **4 5 6** + **1 2 3** ENTER	

Example: Divide 45.68 ÷ 123.

Press	Result
4 5 . **6 8** ÷ **1 2 3** ENTER	

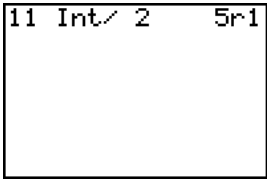
Example: Multiply 28 × 1.5.

Press	Result
2 8 × **1 . 5** ENTER	

Integer division 2nd [INT÷]

2nd [INT÷] divides two positive integers and displays the quotient and remainder (**r**).

Example: Calculate 11 ÷ 2 using integer division.

Press	Result
1 1 2nd [INT÷] **2** ENTER **Note:** The answer is **5** with a remainder of **1**.	

Percent %

Example: Convert 75% to a decimal.

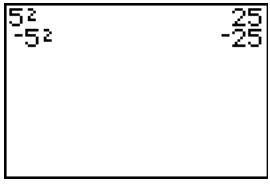
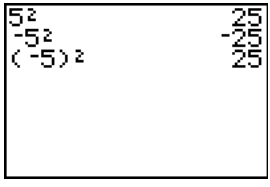
Press	Result
7 5 % ENTER	

Square x^2

Example: Calculate 5^2.

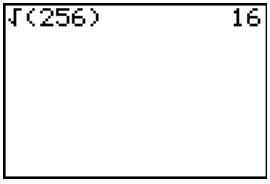
Press	Result
5 x^2 ENTER	

Example: Compare the results of -5^2 and $(-5)^2$.

Press	Result
(–) **5** x^2 ENTER	
((–) **5**) x^2 ENTER	

Square root [2nd] [√]

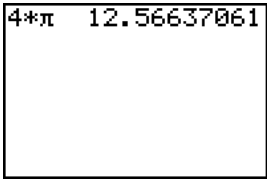
Example: Calculate $\sqrt{256}$.

Press	Result
[2nd] [√] **2 5 6** [)] [ENTER]	

Pi [2nd] [π]

The TI-73 Explorer™ displays π = 3.141592654 but uses 3.1415926535898 in calculations.

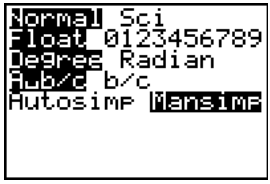
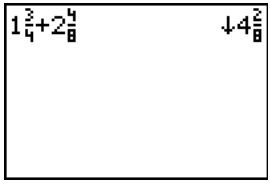
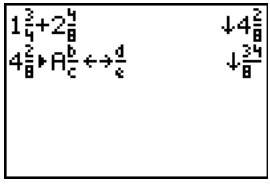
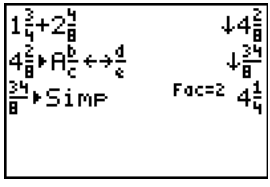
Example: Multiply 4 × π.

Press	Result
4 [×] [2nd] [π] [ENTER]	

Fractions

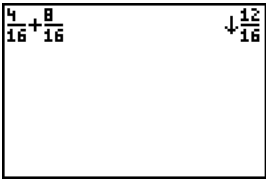
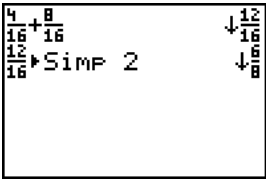
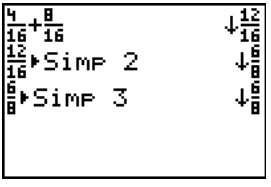
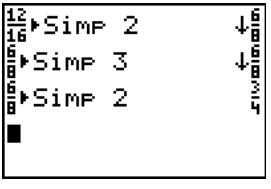
This example shows the stacked fraction and manual simplification features of the TI-73 Explorer™. (See Chapter 3 of the *TI-73 Explorer Software Graphing Calculator Guidebook*.)

Example: Add 1 3/4 + 2 4/8 and manually simplify the result.

Press	Result
MODE ▼ ▼ ▼ ▼ ▶ ENTER 2nd [QUIT] (to select **Mansimp**)	
1 UNIT **3** b/c **4** ▶ + **2** UNIT **4** b/c **8** ENTER **Note:** The arrow on the screen indicates that the answer can be simplified.	
A b/c ↔ d/e ENTER (optional step to convert mixed fraction to simple fraction)	
SIMP ENTER (to simplify the result)	

Choosing the simplification factor

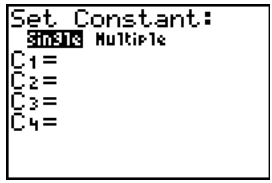
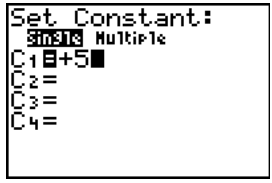
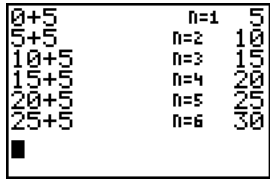
Example: Add 4/16 + 8/16 and choose the simplification factor to reduce the sum to lowest terms.

Press	Result
2nd [QUIT] CLEAR **4** b/c **1 6** ▶ + **8** b/c **1 6** ENTER	
SIMP **2** ENTER	
SIMP **3** ENTER Because the result did not change, try another factor.	
SIMP **2** ENTER Simplification is complete.	

Constants with counter-creating number patterns

The TI-73 Explorer™ Constant feature makes it easy to create number patterns. Watch the pattern in the example below take shape on the Home screen.

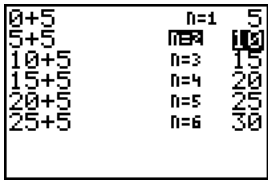
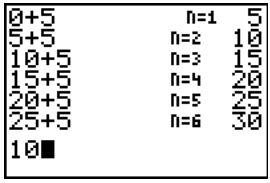
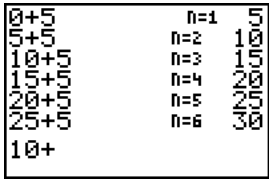
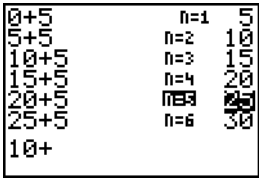
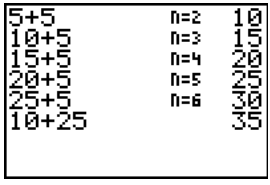
Example: Set up a SINGLE counter, define a constant (+5), and create a number pattern.

Press	Result
2nd [SET] ▲ (if necessary) ENTER	
▼ + 5	
2nd [QUIT] CLEAR	
0 CONST (Press CONST repeatedly until you reach 30.)	

Scrolling on the Home screen

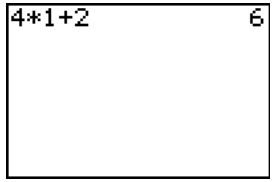
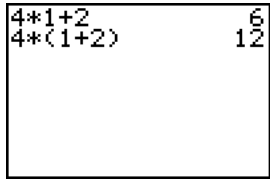
The TI-73 Explorer™ scrolling feature helps make number investigation easy by providing a copy and paste functionality.

Example: Sum the second (5 + 5) and fifth (20 + 5) terms of the number pattern created in the previous example. (See "Constants with counter-creating number patterns" on page 17.)

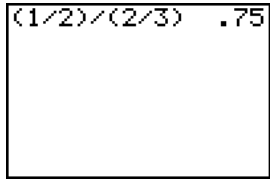
Press	Result
Press ▲ repeatedly to select the second term (n=2).	
ENTER	
+	
Press ▲ repeatedly to select the fifth term (n=5).	
ENTER ENTER	

Using parentheses ( )

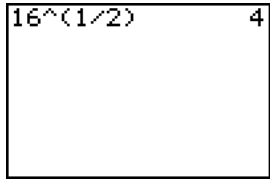
Example: Multiply 4 * 1 + 2 and 4 * (1 + 2).

Press	Result
4 × **1** + **2** ENTER	
4 × (**1** + **2**) ENTER	

Example: Divide 1/2 ÷ 2/3 (not using stacked fraction capability).

Press	Result
(**1** ÷ **2**) ÷ (**2** ÷ **3**) ENTER	

Example: Calculate 16 ^ $\frac{1}{2}$.

Press	Result
1 6 ^ (**1** ÷ **2**) ENTER	

Note: Try each of the examples above without the parentheses and see what happens!

TI-73 Explorer™ menus

You use a menu to enter most TI-73 Explorer functions and instructions on the Home screen.

To select an item from a displayed menu:

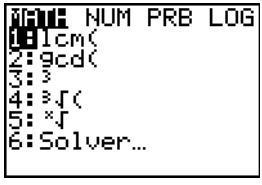
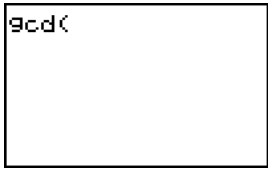
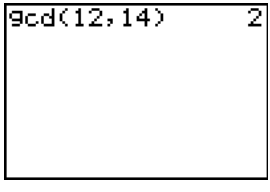
- Press the number or letter displayed to the left of the item.

  — or —

- Use the cursor keys (▼ or ▲) to select the item, and then press ENTER.

Some menus close automatically when you make a selection. If a menu remains open, press 2nd [QUIT] to exit.

Example: Find the gcd(12, 14) = 2.

Press	Result
MATH	
2 — or — ▼ ENTER	
1 2 , 1 4) ENTER	

Selected TI-73 Explorer™ menus

To select	Description	Press
Mode menu	Lists commands that let you control how numbers are displayed and interpreted	MODE
MATH menu	Lists math functions, including number, probability, and logic	MATH
DRAW menu	• Lists graph and plot drawing tools • Lets you store pictures in memory	DRAW
List Editor	Lets you enter numerical and text, or *categorical*, lists	LIST
Program menu	Lists stored programs and programming commands and instructions	PRGM
APPLICATIONS menu	Lists the Apps installed on your TI-73 Explorer	APPS
Text Editor	Lets you enter text, such as alphabetic characters, braces, test operators, quotation mark, space	2nd [TEXT]
Trigonometry menu	Lists trigonometric functions and angle unit options	2nd [TRIG]
Statistics menu	Lets you open and edit lists and calculate statistical analysis on lists	2nd [STAT]
MEMORY menu	Lets you manage TI-73 Explorer memory	2nd [MEM]
VARS menu	Lists variable names you can paste to the entry line	2nd [VARS]
CATALOG menu	Lists all built-in functions and instructions	2nd [CATALOG]

TI-73 Explorer graphing menus

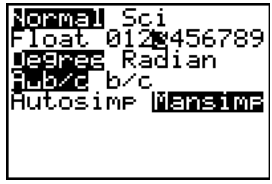
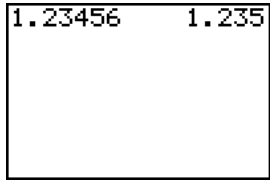
To select	Description	Press
WINDOW menu	Lists domain and range options for the graphing window	WINDOW
ZOOM menu	Lists preset window settings to select	ZOOM
PLOT menu	Lists options that let you set up a plot	2nd [PLOT]

To select	Description	Press
TABLE SETUP menu	Lists options specifying table settings	2nd [TBLSET]
Window format menu	Lets you choose display settings for function graphing and statistical plotting	2nd [FORMAT]

Changing mode settings

Use mode settings to specify how the TI-73 Explorer™ interprets entries and displays answers.

Example: Change the mode setting for decimals from *Float* to *3* decimal places.

Press	Result
MODE ▼ ▶ ▶ ▶ ▶ ENTER	
2nd [QUIT] **1 . 2 3 4 5 6** ENTER **Note:** Rounds to three decimal places.	

Note: You must highlight a mode setting and press ENTER to change it.

Mode settings

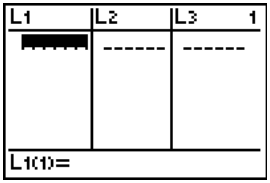
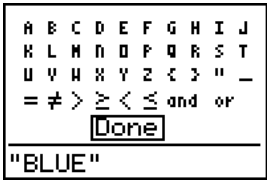
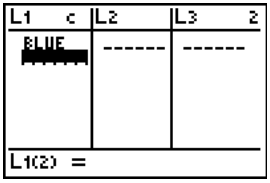
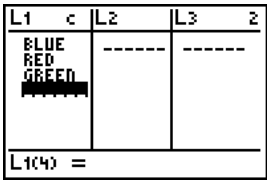
Mode	Description	Display
Numeric Notation	Displays answers in normal or scientific notation	**Normal Sci**
Decimal Notation	Displays answers in fixed- or floating-decimal point	**Float 0123456789**
Angle	Displays angle values in degrees or radians	**Degree Radian**
Display Format (fractions only)	Displays fractions in mixed or simple format	**A␣b/c b/c**
Simplification (fractions only)	Lets you simplify fractions automatically or manually	**Autosimp Mansimp**

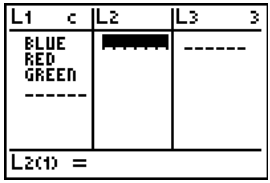
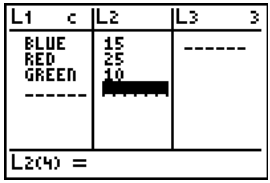
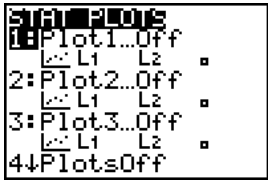
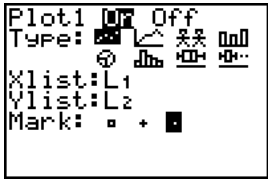
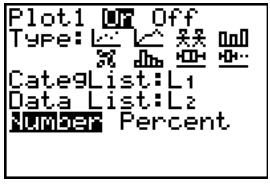
Creating lists and statistical plots

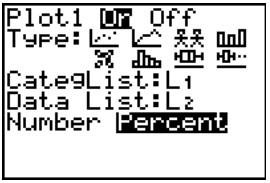
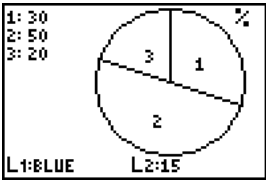
To create categorical and number lists:

1. Use the List Editor to enter the categorical and numerical lists.
2. Use the PLOT menu to plot the lists.

Example: Enter a categorical list in L_1 made up of list elements BLUE, RED, and GREEN, enter a number list in L_2, and plot a pie chart.

Press	Result
[LIST]	
[2nd] [TEXT] **Note:** Press the cursor keys to highlight characters in the Text Editor. **"** [ENTER] **B** [ENTER] **L** [ENTER] **U** [ENTER] **E** [ENTER] **"** [ENTER] **Done** **Note:** To define categorical lists, enclose the first list element in quotation marks.	
[ENTER] [ENTER] **Note:** The lowercase *c* next to L_1 signifies the list is defined as categorical.	
Repeat steps for RED and GREEN. **Note:** You do not have to use quotation marks after the first list element.	

Press	Result
▶ (to move cursor to L2)	
1 5 ENTER **2 5** ENTER **1 0** ENTER **Note:** The mode setting for decimals in this example is set to **Float**. (See "Changing mode settings" on page 23.)	
2nd [PLOT]	
ENTER	
◀ ENTER (to enter statistical plot setup screen and turn Plot 1 on)	
▼ ▶ ▶ ▶ ▶ ENTER (to select the pie chart)	

Press	Result
▼ ▼ ▼ ▶ ENTER (to display numbers on the pie chart as percentages)	
GRAPH TRACE	

Note: Press 2nd [QUIT] to return to the Home screen.

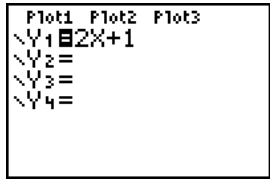
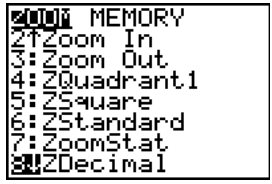
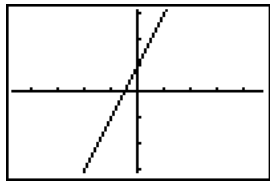
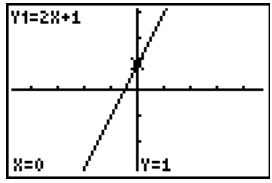
Graphing a line

To graph a line:

1. Display the Y= Editor.
2. Enter the line.
3. Display the graph.

(See the *TI-73 Explorer™ Software Graphing Calculator Guidebook* for more detailed information.)

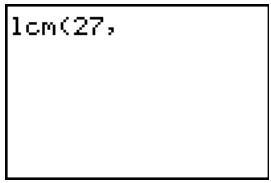
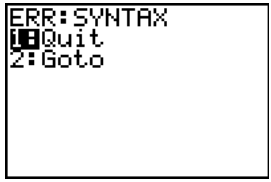
Example: Graph the line Y = 2x + 1.

Press	Result
[Y=] [CLEAR] **2** [x] **+ 1** **Note:** The Y1 equal sign highlights when you enter a character. If another plot or function is highlighted, select it and press [ENTER] to remove the highlight.	
[ZOOM] [▼] [▼] [▼] [▼] [▼] [▼] [▼] (to select **ZDecimal** and set up x and y values on graph) **Note:** The arrow next to **ZDecimal** indicates that you can press [▼] or [▲] to display additional commands.	
[ENTER]	
[TRACE] **Note:** TRACE lets you use the cursor keys to trace to points to see coordinates on the line.	

Error messages

The TI-73 Explorer™ displays an error message whenever an error occurs.

Example: Generate an error by entering the least common multiple function **lcm(** followed by only one number.

Press	Result
2nd [QUIT] CLEAR MATH ENTER **2 7** , (to select **lcm(**)	
ENTER	

- To return to the Home screen with the cursor on a new entry line, select **1:Quit**.
- To correct the error, select **2:Goto**. The TI-73 Explorer returns to the original entry line with the cursor flashing at the location of the error.

(See Appendix B of the *TI-73 Explorer Software Graphing Calculator Guidebook* for a complete list of error conditions with explanations.)

Sample error messages

Error	Description
BREAK	You pressed ON to break a program execution, halt a DRAW instruction, or stop evaluation of an expression.
DIM MISMATCH	You attempted an operation that references more than one list with different dimensions (number of elements).
DIVIDE BY 0	You attempted to divide by 0. **Note:** Because The TI-73 Explorer allows undefined values on a graph, this error is not displayed during graphing.

Error	Description
DOMAIN	You specified an argument to a function or instruction outside the valid range, such as using a negative frequency in box plots. **Note:** Because The TI-73 Explorer™ allows undefined values on a graph, this error is not displayed during graphing.
ERROR IN XMIT	• The TI-73 Explorer was unable to transmit an item. Check to see that the cable is connected firmly to both units and that the receiving unit is in the receive mode. • You pressed [ON] to break during transmission.
MODE	You pressed [SIMP] to simplify a fraction while in the **Autosimp** mode.
SCALE	The Pictograph scale is invalid and must be an integer between 1 and 99,999.
STAT	You attempted a stat calculation with inappropriate lists.
STAT PLOT	You attempted to display a graph while a stat plot with an undefined list is on.
SYNTAX	The command contains a syntax error. Look for misplaced functions, arguments, parentheses, or commas. (See the *TI-73 Explorer Software Graphing Calculator Guidebook*.)
WINDOW RANGE	A problem exists with the WINDOW variables. • You defined **Xmax**≤**Xmin** or **Ymax** ≤ **Ymin**. • Ensure that your window values are within the limits of the TI-73 Explorer.

MEMORY menu 2nd [MEM]

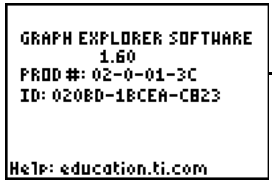
To display the list of commands used to manage TI-73 Explorer™ memory, press 2nd [MEM] to open the MEMORY menu.

To select a command from the MEMORY menu, use the cursor keys to select it and press ENTER.

To exit the MEMORY menu or a command screen and display the Home screen, press either 2nd [QUIT] or CLEAR.

(See Chapter 14 of the *TI-73 Explorer Software Graphing Calculator Guidebook*.)

Example: Display and exit the About screen.

Press	Result
2nd [MEM]	
ENTER (to display the About screen)	
CLEAR CLEAR	

Command	Action
1:About	Displays TI-73 Explorer product information, such as the operating system version number and product ID.
2:Check RAM	Displays the amount of total available memory and the amount of usage for each variable type.

Command	Action
3:Check APPs	Displays the amount of available App memory (up to eight spaces).
4:Delete	Displays a list of variables that you can delete to increase the amount of available RAM.
5:Clear Home	Clears the Home screen.
6:ClrAllList	Clears all lists in memory.
7:Reset	Displays the RESET menu, where you can reset all RAM and all defaults.

3:Check APPs [2nd] [MEM]

The **3:Check APPs** command displays the Spaces Free screen, where you can view the memory available for Apps in terms of *spaces*. Apps spaces are used by preloaded Apps. The preloaded CBL™/CBR™ App uses one space.

The screen also lists the Apps loaded on the TI-73 Explorer™ and the number of spaces each uses.

Note: Because Apps do not use RAM, you cannot delete Apps by pressing [2nd] [MEM] **4:Delete 1:All**. Instead, press [2nd] [MEM] **4:Delete 8:Apps** to delete Apps.

(See Chapter 13 of the *TI-73 Explorer Software Graphing Calculator Guidebook* for information on running Apps on the TI-73 Explorer.)

Resetting memory and defaults

Follow these steps to clear all memory and reset the TI-73 Explorer to factory settings:

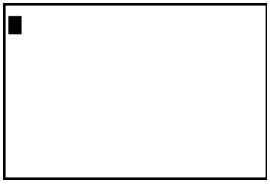
1. To display the MEMORY menu, press [2nd] [MEM].

2. To display the RESET menu, press **7:Reset**.

3. To display the RESET RAM menu, press **1:All RAM**.

4. Press **2:Reset**.

5. Press CLEAR to display the Home screen.



Note: When you reset the TI-73 Explorer™, the display contrast is also reset and might need to be adjusted. See "Adjusting the display contrast" on page 5.

Installing handheld software applications

You can update the functionality of your TI-73 Explorer™ by installing handheld software applications (Apps). Installing Apps on your TI-73 Explorer is similar to installing new software applications on your computer.

After downloading an App to your computer, use TI Connect™ or TI-GRAPH LINK™ software and a TI Connectivity cable to install the App on your TI-73 Explorer. You can find the latest Apps and a TI Connectivity Kit at education.ti.com/shop.

Note: Before downloading an App, ensure your TI-73 Explorer has enough memory available. (See "3:Check APPs 2nd [MEM]" on page 31.) If not, consider saving an existing App to your computer and then deleting it from your handheld to increase the amount of free space available.

Instructions for Windows® using TI Connect

Desktop icon method

1. Connect your computer and handheld device with the TI Connectivity cable.
2. Turn on the handheld device and go to the Home screen.
3. Select an App file to transfer to the handheld device.
4. Drag the App file to the TI Connect desktop icon on the Windows desktop.
5. A message advises you when installation is complete. Remove the TI Connectivity cable from the computer or device.

DeviceExplorer method

1. Connect your computer and handheld device with the TI Connectivity cable.
2. Turn on the handheld device and go to the Home screen.
3. Start the TI Connect software and click **DeviceExplorer**. The software automatically detects the type of connected TI device and displays the contents.
4. On the **DeviceExplorer** icon toolbar, click the Windows Explorer icon.
5. Locate an App file to transfer to the handheld device.
6. Drag the App file to the TI Connect desktop icon on the Windows desktop.
7. A message advises you when installation is complete. Remove the TI Connectivity cable from the computer or device.

Instructions for Macintosh® using TI Connect™

1. Connect your computer and handheld device with the TI Connectivity cable.
2. Turn on the handheld device and go to the Home screen.
3. Start the TI Connect software and click **Connection** to connect with the handheld device.
4. From the displayed list, select a device type and computer port.
5. Click **Connect**. The device window appears.
6. Locate an App file to transfer to the handheld device.
7. Drag the App file anywhere in the device window.
8. A message advises you when installation is complete. Remove the TI Connectivity cable from the computer or device.

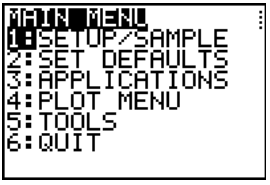
Running software applications

Example: Run the CBL™/CBR™ App on your TI-73 Explorer™.

Press	Result
APPS	
Press ▼ or ▲ as needed to run the CBL/CBR App. ENTER	

Collecting data using the CBL™/CBR™ App

Example: Run the RANGER program from the CBL/CBR App.

Press	Result
To run the CBL/CBR App, see "Running software applications" on page 35	
Press any key.	
▼ ▼ ENTER (to run the RANGER program)	
ENTER	
▼ ENTER (to set defaults)	

Each menu item helps you quickly set up data collection using the CBR. Investigate on your own.

Collecting data using the CBL 2™

To use the CBL 2 data collection system for the first time and use the temperature probe to collect data:

1. Insert batteries in the CBL 2.
2. Connect the CBL 2 to the TI-73 Explorer™ using the unit-to-unit cable.

   Note: You can also use the cradle. (For instructions, see the diagram on the cradle, or see *Getting Started With the CBL 2*.)
3. To delete the DataMate programs prior to installing the DataMate App, reset the memory on your TI-73 Explorer. (See "Resetting memory and defaults" on page 31.)

   Note: Before downloading the DataMate App, ensure that your TI-73 Explorer has at least 3 App spaces available. (See "3:Check APPs [2nd] [MEM]" on page 31.) If not, consider saving an existing App to your computer and then deleting it from your handheld to increase the amount of free space available.
4. Put the TI-73 Explorer in Receive mode.
   a. Press [APPS]. **Link** is highlighted.
   b. Press [ENTER].
   c. Press [▶] to select RECEIVE.
   d. Press [ENTER].
5. Press TRANSFER on the CBL 2. The CBL 2 detects the type of handheld device connected and sends the specified version of the DataMate App.

   Note: The DataMate App controls the CBL 2 and its data collection.
6. Plug in the stainless steel temperature sensor to CBL2 channel 1 (CH1).
7. Run the DataMate App.
   a. Press [APPS].
   b. Press [▼] or [▲] to select DATAMATE, and then press [ENTER].

   The DataMate App automatically identifies the Stainless Steel Temperature sensor, loads its calibration factors, and displays the name of the sensor and temperature in degrees C. DataMate also loads a default temperature experiment.
8. To start collecting data with the default experiment, hold the temperature sensor in your hand and press **2:START**.

9. A real-time graph measuring temperature appears. After about 30 seconds, press STO▸ to stop collecting data.

You just successfully collected and plotted data.

For other DataMate options (including other sensors, analysis, and data saving), see *Getting Started With the CBL 2*, or visit:

education.ti.com/guides