Python82 Programming for the TI-82 Advanced Edition Python Graphing Calculator

Version 5.6.3

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Contents

Python82 App

See the following for using, navigating, and running the Python82 App.

- Using Python82 App
- Python82 App Navigation
- Example Activity

Using Python82 App

The Python82 App offers a File Manager, an Editor to create programs, and a Shell to run programs and interact with the Python interpreter. Python programs stored or created as Python82 AppVars will execute from RAM. You may store Python82 AppVars in Archive for memory management [2nde] [mém] 2:.

Python82 App Navigation

Use the shortcut keys on the screen in the App to navigate between workspaces in the Python82 App. In the image, the shortcut tab labels indicate:

* Navigation to the File Manager [Script]

** Navigation the Editor [Édit] or [Éditer]

*** Navigation to the Shell [Shell]

Access shortcut tabs on the screen using the graphing key row immediately under the screen. Also, see Keypad . The Editor>Tools menu and Shell>Tools menu also contain navigation actions.

Example Activity

Use the example activity provided as an experience to become familiar with the workspaces in the Python82 App.

- Create a new program from the File Manager
- Write the program in the Editor
- Execute the program in the Shell in the Python82 App.

Getting Started:

- Run the Python App.

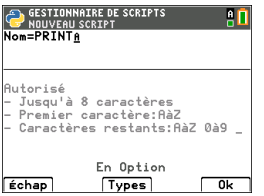
Note: Actual screens may vary slightly from provided images.

Enter new program name from File Manager.

- Press zoom ([Nouv]) to create a new program.

New File Name Entry

- The example program will be PRINT. Enter the program name and press graphe ([Ok]).
- Notice the cursor is in ALPHA lock. Always enter a program name following the given rules on the screen.



TIp: If the cursor is not in ALPHA lock, press 2nde alpha alpha for upper case letters.

Enter program as shown.

TIp: App provides quick entry! Always watch the cursor state as you enter your program!

Alphabet characters on Keypad 	alpha toggles the insert cursor state in the Editor and Shell. _ non-alpha a lower case alpha A upper case ALPHA
Where is the equal sign?	Press sto→ when the cursor is _. 

Where are these located? input() print()	[Fns...] I/O 1:print() 2:input()
Where is double quote?	alpha [“] 
Where are (and)?	Use keypad when cursor is _. 

Try-It! [a A #] and 2nde [catalog] also are helpers for quick entry as needed!

Execute the program PRINT

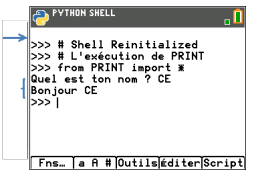
- From the Editor, press trace ([Éxec]) to execute your program in the Shell.
- Enter your name at the “Quel est ton nom ?” prompt.
- Output displays “Bonjour” with your name.

Note: At the Shell prompt >>>, you can execute a command, such as 2+3. If you use any method from math, random, or other available modules, be sure to execute an import module statement first as in any Python coding environment.

Shell cursor state indicator.

Input your name.

Output of PRINT displays.



Setting up a Python Session with your Programs

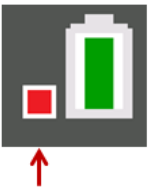
When the Python82 App is launched, the CE connection with the TI-Python experience will synchronize for your current Python session. You will see your list of programs in RAM and dynamic modules, as they synchronize to the Python experience.

When the Python session is established, the status bar contains a green square indicator near the battery icon that signals the Python session is ready for use. In the event the indicator is red , wait for the indicator to change back to green when the Python experience is again available.

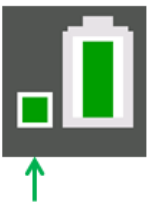
You may see an update of the Python distribution when launching the Python82 App along with program synchronization after the latest update for your TI-82 Advanced Edition Python from education.ti.com/fr.

Disconnecting and Reconnecting the Python82 App

When the Python82 App is running, the status bar contains an indicator that signals whether Python is ready for use. Until the connection is established, the CE keypad may not respond. Best practice is to be aware of the status bar connection indicator while in your Python session.



Python Not Ready



Python Ready

Screen Captures

Using TI Connect™ CE v5.6.3 or higher at education.ti.com/fr, screen captures of any Python82 App screen are allowed.

Python Workspaces

The Python82 App contains three workspaces for your Python programming development.

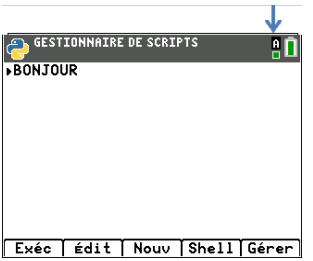
- File Manager
- Editor
- Shell

Python File Manager

The File Manager lists the Python82 AppVars available in RAM on your calculator. You can create, edit, and run programs as well as navigate to the Shell.

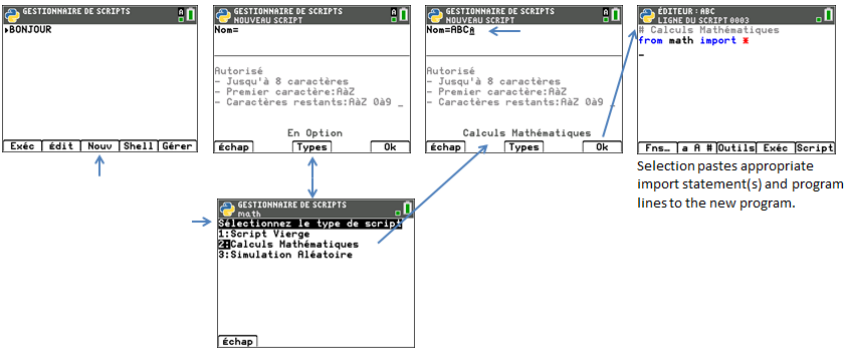
When in alpha state, press any letter on the keypad to jump to programs beginning with that letter.

Press [alpha] if needed when **A** indicator is not in the status bar.



File Manager shortcut keys and menus		
Menus	**Keypress**	**Description**
[Run]	[f(x)]	Select a program using ▲ or ▼. Next, select [Run] to execute your program.
[Edit]	[fenétre]	Select a program using ▲ or ▼. Next, select [Edit] to display the program in the Editor to edit your program.
[New]	[zoom]	Select [New] to enter a new program name and continue to the Editor to enter your new program. On the [New] screen, select [Types] (press [zoom]), to select a Type of program. By selecting a type of program, a template of import statements and frequently used functions and methods will be pasted to your new program for that activity.
[Shell]	[trace]	Select [Shell] to display the Shell prompt (Python interpreter). The Shell will be in the current state.
[Manage]	[graphe]	Select [Manage] to: • View version number. • Replicate, delete or rename a selected program. • View the About screen. • Quit the App. Also use [2nde] [quitter]

Create a New Program Using Program Type Templates



Selection pastes appropriate import statement(s) and program lines to the new program.

- Select [Types] to display Select Program Type menu.
- Import(s) displays on status bar.

Python Editor

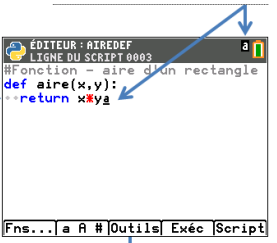
The Python Editor is displayed from a selected program in File Manager or from the Shell. The Editor displays keywords, operators, comments, strings and indents in color. Quick paste of common Python keywords and functions are available as well as direct keypad entry and [a A #] character entry . When pasting a code block such as if.. elif.. else, the Editor offers auto-indent which can be modified as needed as you write your program.

Cursor is always in insert mode. Use 2nde and alpha to toggle cursor. Cursor states are numeric, a, and A. [suppr] behaves as a backspace and delete of a character.

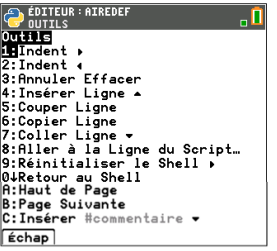
Program line location of the cursor.

Auto indent code blocks.

Gray dots as visual indicator of indented lines.



Useful tools for editing and working in the Shell. Full description below.



Python Editor shortcut keys and menus		
Menus	**Keypress**	**Description**
[Fns…]	f(x)	Select [Fns…] to access menus of commonly used functions, keywords, and operators. Also access selected contents of the math and random modules. **Note:** 2nde [catalog] is also helpful for quick paste.
[a A #]	fenêtre	Select [a A #] to access a character palette as an alternate way to enter many characters.

Python Editor shortcut keys and menus			
Menus	**Keypress**	**Description**	
[Tools]	zoom	Select [Tools] to access features to assist in your editing or your interaction with the Shell.	
		1: Indent ▶	Indents the program line to the right cursor moves to first character of the line.
		2: Indent ◀	Reduces the indent of the program line to the left. Cursor moves to first character of the line.
		3: Undo Clear	Pastes the last cleared line to a new line below the program line containing the cursor. Cursor displays at the end of the pasted line.
		4: Insert Line Above	Inserts a line above the program line with the cursor. Line will indent and display indent dots when appropriate.
		5: Cut Line	Current program line with cursor is cut. Cursor displays on program line below the cut line.
		6: Copy Line	Copies current program line with cursor. A copied program line can be pasted to the Shell prompt. See Shell below.
		7: Paste Line Below	Pastes the last stored program line to the line below the cursor position.
		8: Go to Program Line...	Displays cursor at the beginning of the specified program line.
		9: Go to New Shell	Displays reinitialized Shell.
		0: Return to Shell	Displays Shell in current state.
		A: Page up	Displays 11 program lines above current cursor position as available.
		B: Page Down	Displays 11 program lines below current cursor position as available.
		C: Insert #comment Below	Inserts # on a new line below cursor position.

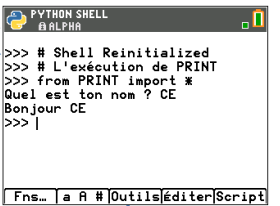
Python Editor shortcut keys and menus		
Menus	**Keypress**	**Description**
[Run]	trace	Select [Run] to execute your program.
[Files]	graphe	Select [Files] to display the File Manager.

Python Shell

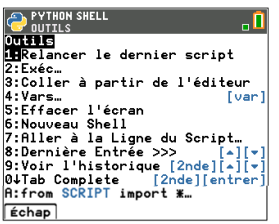
The Python Shell is the console where you can interact with the Python interpreter or run your Python programs. Quick paste of common Python keywords and functions is available as well as direct keypad entry and [a A #] character entry . The Shell prompt can be used to test one line of code pasted from the Editor. Multiple lines of code may also be entered and run at a Shell prompt >>>.

Shell cursor state indicator.

Shell reinitialize when a new program is executed.



Useful tools for working in the Shell. See details below.



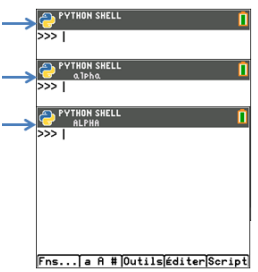
Shell Cursor States

non-alpha

2nde alpha if needed to toggle

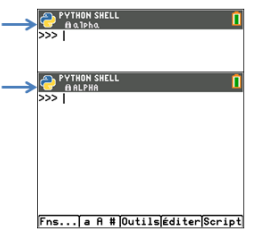
alpha alpha

alpha again ALPHA



2nde alpha lock alpha

alpha again lock ALPHA



<table>
<tr><th colspan="3">Python Shell shortcut keys and menus</th></tr>
<tr><th>Menus</th><th>Keypress</th><th>Description</th></tr>
<tr><td>[Fns…]</td><td>f(x)</td><td>Select [Fns…] to access menus of commonly used functions, keywords, and operators. Also access selected contents of the math and random modules.
Note: 2nde [catalog] is also helpful for quick paste.</td></tr>
<tr><td>[a A #]</td><td>fenêtre</td><td>Select [a A #] to access a character palette as an alternate way to enter many characters.</td></tr>
<tr><td>[Tools]</td><td>zoom</td><td>Select [Tools] to display the following menu items.
<table>
<tr><td>1: Rerun last program</td><td>Reruns last program which was executed in the Shell.</td></tr>
<tr><td>2: Run…</td><td>Displays a list of the Python programs available to run in Shell.</td></tr>
<tr><td>3: Paste from Editor</td><td>Pastes the last copied program line from the Editor to the Shell prompt.</td></tr>
<tr><td>4: Vars…</td><td>Displays the vars from the last program which ran. Does not display program defined vars from an imported program.</td></tr>
<tr><td>5: Clear Screen</td><td>Clears the Shell screen. Does not reinitialize a new Shell.</td></tr>
<tr><td>6: New Shell</td><td>Reinitialize a new Shell.</td></tr>
<tr><td>7: Go to Program Line…</td><td>Displays the Editor from the Shell with cursor on the specified program line.</td></tr>
<tr><td>8: Last Entry>>>
▲ ▼</td><td>Displays up to the last 8 entries at the Shell prompt during a Shell session.</td></tr>
<tr><td>9: View History
2nde ▲
2nde ▼</td><td>Scroll the Shell screen to view up to the last 60 lines of output in the Shell during a Shell session.</td></tr>
<tr><td>0: Tab Complete
2nde entrer</td><td>Displays the names of the variables and functions available for access in the current Shell session.
When a letter of an available variable or function is entered, press 2nde entrer to auto-complete the name if a match is available in the current Shell session.</td></tr>
</table>
</td></tr>
</table>

Python Shell shortcut keys and menus			
Menus	**Keypress**	**Description**	
		A: from PROGRAM import *…	When first executed in a Shell session, PROGRAM will run and vars will only be viewable using Tab Complete. When executed again in the same Shell session, the execution will appear as no execution. This command can also be pasted from [2nde] [catalog].
[Editor]	[trace]	Select [Editor] to display the Editor with the last programs in Editor. If Editor is empty, you can display File Manager.	
[Files]	[graphe]	Select [Files] to display the File Manager.	

Note:

- To break a running Python program, such as if a program is in a continuous loop, press [on]. Press **[Tools]** ([zoom]) > **6:New Shell** as an alternate method to halt a running program.
- When using ti_plotlib module to plot to the plotting area on the Shell, press [annul] to clear the plot and return to the Shell prompt.

Execution Error: Go to Program Line using Shell >Tools

The TI-Python experience will display Python error messages in the Shell when code is executed. If an error is displayed when a program executes, a program line number will display. Use Shell>Tools 7:Go to Program Line… Enter the line number and press **[OK]**. The cursor will display on the first character of the appropriate program line in the Editor. The program line number is displayed in the second line of the Status bar in the Editor.

Entries - Keypad, Catalog, Character Map, and Menus

Tips for fast entry

- Keypad
- Catalog
- [a A #] Character Map
- [Fns…] Menus

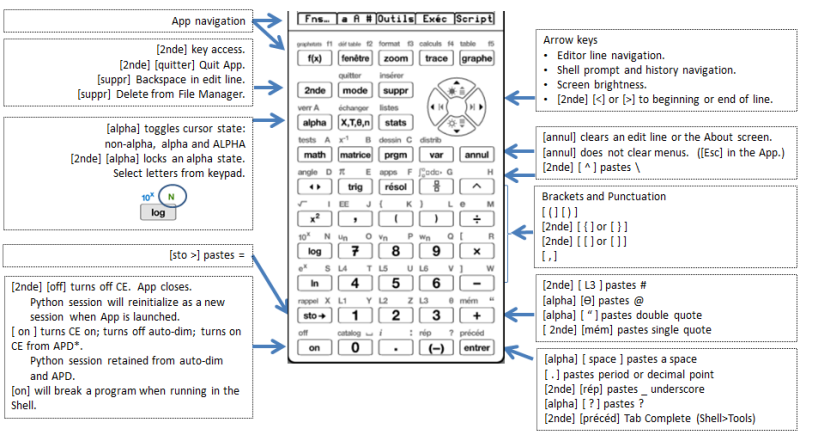
Using the Keypad, Catalog, [a A #], and Fns… menus

When entering code in the Editor or in the Shell, use the following entry methods to quickly paste to the edit line.

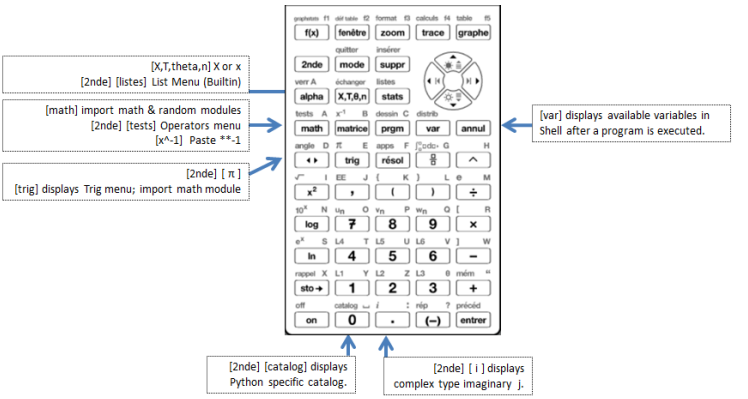
Keypad

When the Python82 App is running, the keypad is designed to paste the appropriate Python operations or open menus designed for easy entry of functions, keywords, methods, operators, etc. Pressing 2nde and alpha will access the second and third functions on a key as in the Operating System.

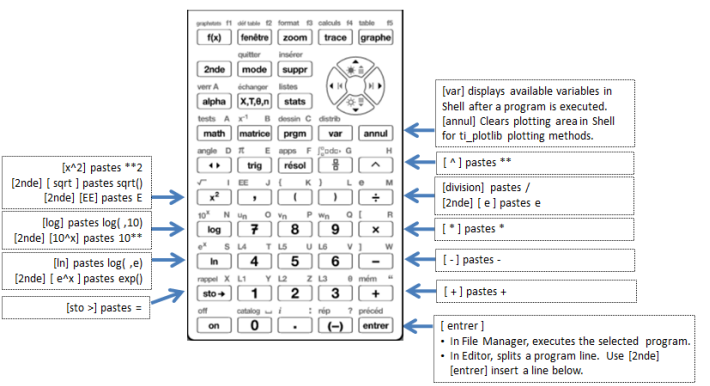
Python82 App Navigation, Editing, and Special Characters by Keypad Rows



Python82 App Specific Key Presses for Menus and Functions by Keypad Rows



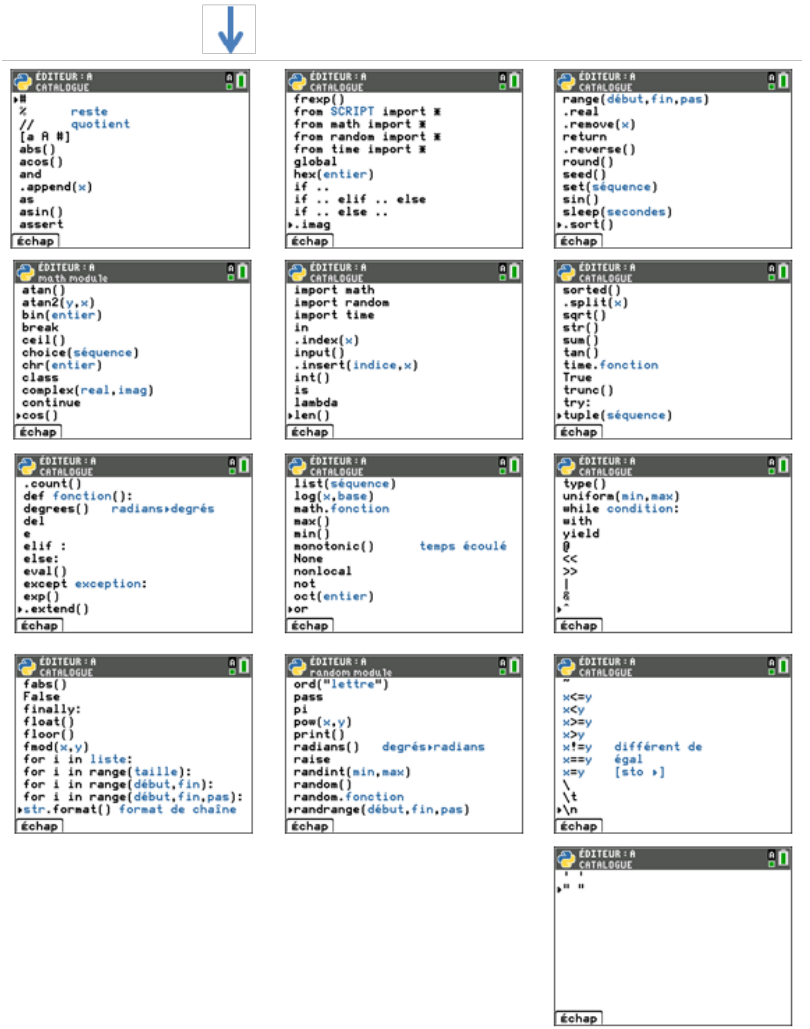
Python82 App Specific Key Presses for Menus and Functions by Keypad Rows



Catalog

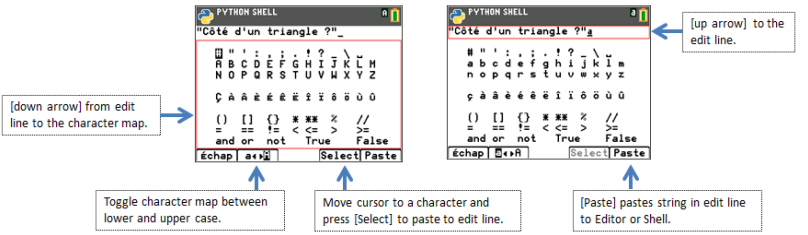
When the Python82 App is running, [2nde] [catalog] will display a list of frequently used delimiters, keywords, functions and operators to quickly paste to an edit line. [2nde] [catalog] is available in Editor and Shell only. For a more detailed description of each Catalog item, please see the Reference Guide. From the top of the catalog menu, use [▲] for circular navigation of the catalog.

When in catalog, select [alpha] and a letter key to display the listing starting at that letter.



[a A #] Character Map

[a A #] shortcut tab to a character palette is a convenient feature to enter strings when in Editor or Shell.



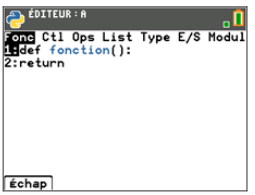
Note: When the cursor focus is in the [a A #] edit line, selected keypad keys are not available. When focus is in the character map, the keypad is restricted.

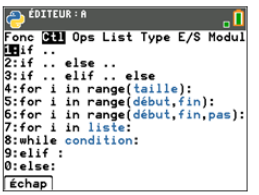
[Fns…] Menus

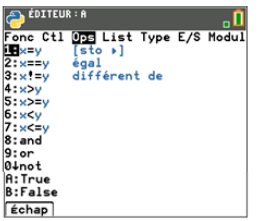
[Fns…] shortcut tab displays menus containing frequently used Python functions, keywords, and operators. The menus also provide access to the selected functions and constants from the math and random modules. While you can enter character by character from the keypad, these menus provide a quick way to paste in Editor or Shell. Press [Fns…] when in Editor or Shell. See also Catalog and Keypad for alternate entry methods.

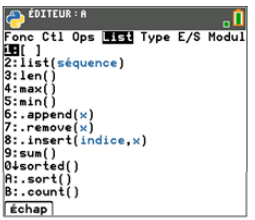
Functions and Modules Submenus

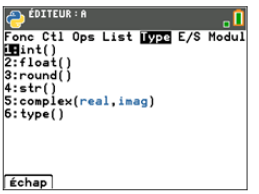
Built-in, Operators and Keywords

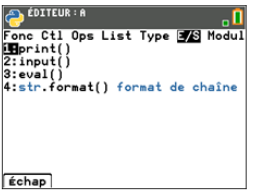












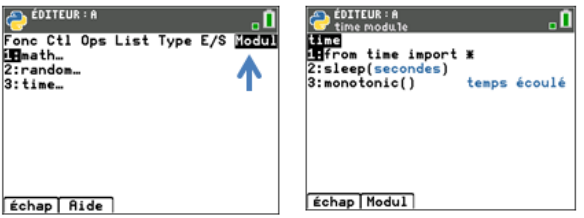
Module Submenus

When using a Python function or constant from a module, always use an import statement to indicate the module location of the function, method or constant.

See What is the Python programming experience?

[Fns…]>Modul: math and random modules

[Fns…]>Modul: time module



Python82 App Messages

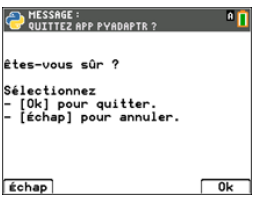
There are several messages that may display while you are in a Python session. Some selected messages are given in the table. Please follow the instructions on the screen and navigate using [quitter], [Échap] or [Ok] as needed.

Memory Management

The available memory for the Python experience will be a maximum of 100 Python programs (PY AppVars) or 50K of memory. The modules that are bundled with the app in this Python release will share the same space with all files.

Use [2nde] [quitter] to quit the App

You will be prompted to make sure you want to quit the App. Quitting the App will stop your Python session. When you run the Python82 App again, your Python82 AppVar programs and modules will synchronize. The Shell will reinitialize.

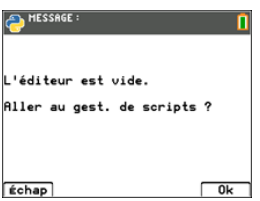


In File Manager, you press [suppr] on a selected Python program or you select from File Manager>Manage 2:Supprimer le script…

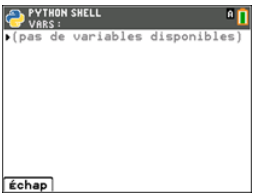
You will see a dialog to delete or escape back to the File Manager.

You attempt to create a new or duplicate a Python program that already exists on your CE either in RAM or Archive or disabled for exam mode. Enter a different name.

You attempt to navigate from the Shell to the Editor but the Editor is empty. Select an appropriate option for your work.



When you execute a Python program, defined variables from the last program executed are listed in the Shell>Tools> 4:Vars… menu to use again in the Shell. If no variables display, you may need to run your program again.



Using TI-SmartView™ CE and the Python Experience

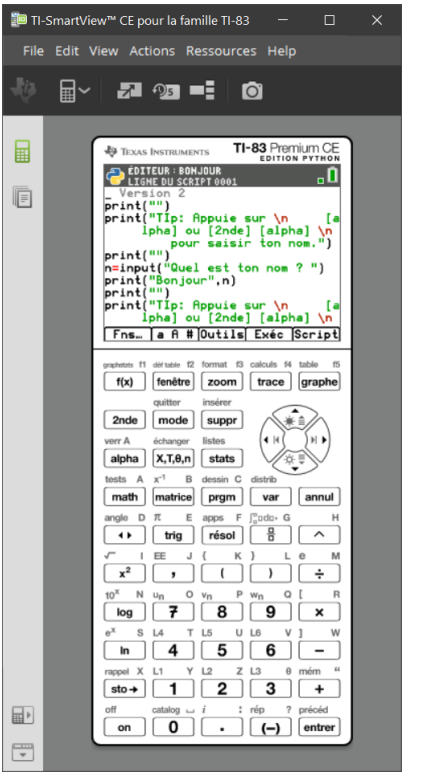
You can use the TI-83 Premium CE *Edition Python* emulator to experience all features of the TI-82 Advanced Edition Python and more.

This guidebook assumes the latest update of TI-SmartView™ CE pour la famille TI-83. Update to the latest TI-SmartView™ CE pour la famille TI-83 at *education.ti.com/83ceupdate*.

The update includes the latest TI-83 Premium CE *Edition Python* emulator OS running the latest Python App. The updated modules of time, ti_system, ti_plotlib, ti_rover* and ti_hub* are included.

Run the Python App on the TI-83 Premium CE *Edition Python* emulator.

- The Python App offers
  - File Manager
  - Editor
  - Execution of your Python program in the Shell*



Hub/Rover Programs

- Create ti_hub/ti_rover Python programs in the CE emulator running the Python App.

  ***Note:** There is no connectivity between TI-SmartView™ CE and TI-Innovator™ Hub or TI-Innovator™ Rover. Programs can be created and then run on the CE calculator.

- Quit the Python App to prepare to transfer the Python AppVar(s) from the emulator. The emulator should not "be busy" running an App or program for the next step.
- Change to the Emulator Explorer workspace and send the program(s) to the computer.
- Use TI Connect™ CE v5.6.3 or higher to send the Python AppVars from the computer to the CE calculator for the TI-Innovator™ Hub/TI-Innovator™ Rover experience.

Note: To break a running Python program in the Shell, such as if a program is in a continuous loop, press [on]. Press [Tools] [zoom] > 6:New Shell as an alternate method to halt a running program.

Reminder: For any computer/TI-Python experience: After creating a Python program in a Python development environment on the computer, please validate your program runs on the calculator/emulator in the TI-Python experience. Modify the program as needed.

Emulator Explorer Workspace

- Please quit the Python App so the emulator is not busy when you access the full features of the Emulator Explorer workspace.
- program.py < > PY AppVar conversions are allowed. This is similar to the TI Connect™ CE v5.6.3 or higher experience when sending programs to the connected CE calculator.
- When sending a program.py file created in another Python environment, your PY AppVar will need to be edited to run as expected in TI-Python. Use the Python App Editor to modify as needed for the unique modules such as ti_plotlib, ti_system, ti_hub and ti_rover.

Data Import Wizard

- *.csv files of data, formatted as stated in the wizard dialog, will convert data into CE list variables. Methods in ti_system can then be used to share lists between the emulator CE OS and the Python App. This feature is similar to the Data Import Wizard in TI Connect™ CE v5.6.3 or higher.

  Note: If decimal numbers are represented with the use of a comma in the *.csv file, the file will not convert using the Data Import Wizard. Please check your computer operating system number formatting and convert the *.csv to use the decimal point representation. The CE calculator list and matrix editor use the number format as, for example, 12.34 and not 12,34.

Using TI Connect™ CE to Convert Python Programs

Please update to TI Connect™ CE v5.6.3 or higher for the latest features including converting *.py programs to a PY AppVar as the calculator file format.

See TI-82 Advanced Edition Python e-Guide for more details on the calculator, TI-SmartView™ CE and TI Connect™ CE.

What is the Python programming experience?

TI-Python is based on CircuitPython, a variant of Python designed to fit in small microcontrollers. The original CircuitPython implementation has been adapted for use by TI.

The internal storage of numbers for computation in this variant of Circuit Python is in limited-precision binary floats and thus cannot exactly represent all possible decimal values. The differences from actual decimal representations that arise when storing these values can lead to unexpected results in subsequent calculations.

- **For Floats** - Displays up to 16 significant digits of precision. Internally, values are stored using 53 bits of precision, which is roughly equivalent to 15-16 decimal digits.
- **For Integers** - The size of integers is limited only by the memory available at the time calculations are performed.

Modules Included in the TI-82 Advanced Edition Python

- Built-ins
- math module
- random module
- time

Note: If you have existing Python programs created in other Python development environments, please edit your program(s) to the TI-Python solution. In general, be aware of compatibility when using any version of Python and Python modules.

When transferring Python programs from a non-TI platform to a TI platform OR from one TI product to another:

- Python programs that use core language features and standard libs (math, random etc.) can be ported without changes

  Note: List length limit is 100 elements.

As with any version of Python, you will need to include imports such as, from math import *, to use any functions, methods, or constants contained in the math module. For an example, to execute the cos() function, use import to import the math module for use.

See CATALOG Listing.

Example:

```
>>>from math import *
>>>cos(0)
1.0
```

Alternate Example:

```
>>>import math
>>>math.cos(0)
1.0
```

Modules available can be displayed in the Shell using the following command

```
>>> help("modules")
__main__ sys gc
random time array
math builtins collections
```

Content of modules can be viewed in the Shell as shown using “import module” and “dir(module).”

Not all module contents appear in the quick paste menus such as [Fns…] or 2nde [catalog].

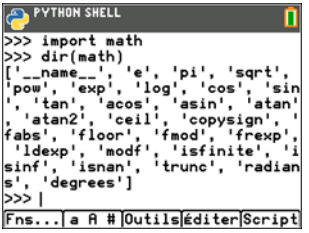
Contents of selected modules and keywords

For list of the modules included in this release, please see:

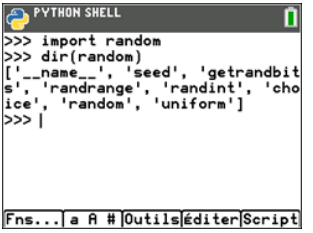
Appendix: Selected TI-Python Built-in, Keywords, and Module Content

Reminder: For any computer/TI-Python experience: After creating a Python program on the computer, please validate your program runs on the calculator in the TI-Python experience. Modify the program as needed.

These screens display the module contents for math and random.

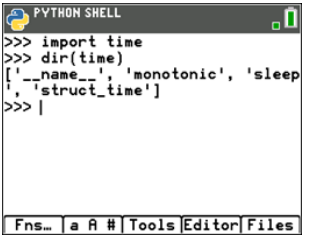


math module



random module

This screen display the module contents for time.



time

Reference Guide for TI-Python Experience

The Python82 App contains menus of functions, classes, controls, operators and keywords for quick pasting in the Editor or Shell. The following reference table contains the listing of features in [2nde] [catalog] when the App is running. For a complete listing of Python functions, classes, operators, and keywords available in this version, please see "Selected TI-Python Built-in, Keywords, and Module Content."

This table is not intended to be an exhaustive list of Python available in this offering. Other functions supported in this Python offering can be entered using the alpha keys from the keypad.

Most examples given in this table run at the Shell prompt (>>>).

CATALOG Listing

Alphabetical List

- A
- B
- C
- D
- E
- F
- G
- H
- I
- L
- M
- N
- O
- P
- R
- S
- T
- U
- W
- Y

#

Delimiter 2nde [catalog]

Syntax: #Your comment about your program.

Description: In Python, a comment begins with the hash tag character, #, and extends to the end of the line. [a A #]

Example:

```
#A short explanation of the code.
```

%

Operator 2nde [catalog]

Syntax: x%y or x % y

Description: Returns remainder of x/y. Preferred use is when x and y are integers. [a A #]

Example:

```
>>>57%2
1
```

See also fmod(x,y).

//

Operator 2nde [catalog]

Syntax: x//y or x // y

Description: Returns the floor division of x/y. [a A #]

Example:

```
>>>26//7
3
>>>65.4//3
21.0
```

[a A #]

Description: Launch [a A #] character palette.

Includes ç à â è é ê ë î ï ô ö ù û

[a A #] shortcut is on screen at fenétre in the Editor or Shell

abs()

Module: Built-in

2nde [catalog]

Syntax: abs(x)

Description: Returns the absolute value of a number. In this release, the argument may be an integer or floating point number.

Example:

```
>>>abs(-35.4)
35.4
```

Note: fabs() is a function in the math module.

acos()

Module: math

trig 7:acos()

Syntax: acos(x)

Description: Returns arc cosine of x in radians.

2nde [catalog]

Example:

```
>>>from math import *
>>>acos(1)
0.0
```

[Fns…] Modul 1:math… > Trig 7:acos()

Alternate Example: [Tools] > 6:New Shell

```
>>>import math
>>>math.acos(1)
0.0
```

import commands can be found in 2nde [catalog]

and

Keyword

2nde [tests]
Ops 8:and

Syntax: x and y

Description: May return True or False. Returns “x” if “x” is False and “y” otherwise. Pastes with space before and after and. Edit as needed.

[Fns…] > Ops 8:and

Example:

```
>>>2<5 and 5<10
True
>>>2<5 and 15<10
False
>>>{1} and 3
3
>>>0 and 5 < 10
0
```

2nde [catalog]

[a A #]

.append(x)

Module: Built-in

2nde [listes]
List
6: .append(x)

Syntax: listname.append(item)

Description: The method append() appends an item to a list.

2nde [catalog]

Example:

```
>>>listA = [2,4,6,8]
>>>listA.append(10)
>>>print(listA)
[2,4,6,8,10]
```

[Fns…] > List
6:.append(x)

as

Keyword

2nde [catalog]

Description: Use as to create an alias when importing a module. See Python documentation for more details.

asin()

Module: math

trig 6:asin()

Syntax: asin()

asin()

Description: Returns arc sine of x in radians.

2nde [catalog]

Example:

```
>>>from math import *
>>>asin(1)
1.570796326794897
```

[Fns…] > Modul 1:math... > Trig 6:asin()

Alternate Example:

```
>>>import math
>>>math.asin(1)
1.570796326794897
```

import commands can be found in 2nde [catalog]

assert

Keyword

2nde [catalog]

Description: Use assert to test a condition in your code. Returns None or if not, execution of the program will display an AssertionError.

atan()

Module: math

trig 8:atan()

Syntax: atan(x)

Description: Returns arc tangent of x in radians.

[Fns…]>Modul 1:math... > Trig 8 :atan()

Example:

```
>>>from math import *
>>>atan(1)*4
3.141592653589793
```

2nde [catalog]

Alternate Example:

```
>>>import math
>>>math.atan(1)*4
3.141592653589793
```

import commands can be found in 2nde [catalog]

atan2(y,x)

Module: math

trig 9:atan2()

Syntax: atan2(y,x)

Description: Returns arc tangent of y/x in radians. Result is in [-pi, pi].

[Fns…] > Modul 1:math… > Trig 9:atan2()

Example:

```
>>>from math import *
>>>atan2(pi,2)
1.003884821853887
```

2nde [catalog]

Alternate Example:

```
>>>import math
>>>math.atan2(math.pi,2)
1.003884821853887
```

import commands can be found in 2nde [catalog]

bin(integer)

Module: Built-in

2nde [catalog]

Syntax: bin(integer)

Description: Displays binary format of the integer argument.

See Python documentation for more details.

Example:

```
>>> bin(2)
'0b10'
>>> bin(4)
'0b100'
```

break

Keyword

2nde [catalog]

Description: Use break to break out of a for or while loop.

ceil()

Module: math

Syntax: ceil(x)

Description: Returns the smallest integer greater than or equal to x.

Example:

```
>>>from math import *
>>>ceil(34.46)
35
>>>ceil(678)
678
```

[math] Modul 1:math... Math 8:ceil()

[2nde] [catalog]

[Fns...] Modul 1:math...Math 8:ceil()

import commands can be found in [2nde] [catalog]

choice(sequence)

Module: random

Syntax: choice(sequence)

Description: Returns a random element from a non-empty sequence.

Example:

```
>>>from random import *
>>>listA=[2,4,6,8]
>>>choice(listA)        #Your result may differ.
4
```

[math] Modul 2:random... Random 5:choice(sequence)

[2nde] [catalog]

[Fns...] Modul 2:random... Random 5:choice(sequence)

import commands can be found in [2nde] [catalog]

chr(integer)

Module: Built-in

2nde [catalog]

Syntax: chr(integer)

Description: Returns a string from an integer input representing the unicode character.

See Python documentation for more details.

Example:

```
>>> char(40)
'('
>>> char(35)
'#'
```

class

Keyword

2nde [catalog]

Description: Use class to create a class. See Python documentation for more details.

complex(real,imag)

Module: Built-in

2nde [catalog]

Syntax: complex(real,imag)

[Fns...]>Type>
5:complex()

Description: Complex number type.

Example:

```
>>>z = complex(2, -3)
>>>print(z)
(2-3j)
>>>z = complex(1)
>>>print(z)
(1+0j)
>>>z = complex()
>>>print(z)
0j
>>>z = complex("5-9j")
>>>print(z)
(5-9j)
```

Note:"1+2j" is correct syntax. Spaces such as "1 + 2j" will display an Exception.

continue

Keyword

2nde [catalog]

Description: Use continue in a for or while loop to end the current iteration. See Python documentation for more details.

cos()

Module: math

trig Trig
4: cos()

Syntax: cos(x)

Description: Returns cos of x. Angle argument is in radians.

2nde [catalog]

Example:

```
>>>from math import *
>>>cos(0)
1.0
>>>cos(pi/2)
6.123233995736767e-17
```

[Fns...] Modul
1:math... > Trig
4:cos()

Alternate Example:

```
>>>import math
>>>math.cos(0)
1.0
```

Note: Python displays scientific notation using e or E. Some math results in Python will be different than in the CE OS.

.count()

Module: Built-in

2nde [catalog]

Syntax: listname.count(item)

Description: count()is a method that returns the number of occurrences of an item in a list, tuple, bytes, str, bytearray, or array.array object.

Example:

```
>>>listA = [2,4,2,6,2,8,2,10]
>>>listA.count(2)
4
```

D

def function():

Keyword

2nde [catalog]

Syntax: def function(var, var,...)

Description: Define a function dependent on specified variables. Typically used with the keyword return.

[Fns…]>Func
1:def function():

Example:

[Fns…]>Func
2:return

```
>>>    def f(a,b):
…          return a*b
…
…
…
>>>        f(2,3)
6
```

degrees()

Module: math

trig Trig
2:degrees()

Syntax: degrees(x)

Description: Converts angle x in radians to degrees.

2nde [catalog]

Example:

```
>>>from math import *
>>>degrees(pi)
180.0
>>>degrees(pi/2)
90.0
```

[Fns…]>Modul
1:math…>Trig
2:degrees()

del

Keyword

2nde [catalog]

Description: Use del to delete objects such as variables, lists, etc.
See Python documentation for more details.

E

e

Module: math

2nde [e] (above ÷)

Syntax: math.e or e if math module was imported

Description: Constant e displays as shown below.

[Fns…] > Modul 1:math… > Const 1:e

Example:

```
>>>from math import *
>>>e
2.718281828459045
```

Alternate Example:

```
>>>import math
>>>math.e
2.718281828459045
```

elif :

Keyword

2nde [catalog]

See if..elif..else.. for details.

[Fns…] > Ctl

1:if..

2:if..else..

3:if..elif..else

9:elif :

0:else:

else:

Keyword

2nde [catalog]

See if..elif..else.. for details.

[Fns…] > Ctl

1:if..

2:if..else..

3:if..elif..else

9:elif :

0:else:

eval()

Module: Built-in

2nde [catalog]

Syntax: eval(x)

Description: Returns the evaluation of the expression x.

[Fns…] I/O
3:eval()

Example:

```
>>>a=7
>>>eval("a+9")
16
>>>eval('a+10')
17
```

except exception:

Keyword

2nde [catalog]

Description: Use except in a try..except code block.
See Python documentation for more details.

exp()

Module: math

2nde [e^x]
(above ln)

Syntax: exp(x)

Description: Returns e**x.

2nde [catalog]

Example:

exp()

```
>>>from math import *
>>>exp(1)
2.718281828459046
```

[Fns…] > Modul 1:math… 4:exp()

Alternate Example: [Tools] > 6:New Shell

```
>>>import math
 >>>math.exp(1)
2.718281828459046
```

import commands can be found in 2nde [catalog].

.extend()

Module: Built-in

2nde [catalog]

Syntax: listname.extend(newlist)

Description: The method extend() is a method to extend newlist to the end of a list.

Example:

```
>>>listA = [2,4,6,8]
>>>listA.extend([10,12])
>>>print(listA)
[2,4,6,8,10,12]
```

fabs()

Module: math

2nde [catalog]

Syntax: fabs(x)

Description: Returns the absolute value of x

[Fns…] > Modul 1:math... 2:fabs()

Example:

```
>>>from math import *
>>>fabs(35-65.8)
30.8
```

import commands can be found in 2nde [catalog].

See also Built-in function abs().

False

Keyword

2nde [tests] (above math)

Description: Returns False when statement executed is False. "False" represents the false value of objects of type bool.

2nde [catalog]

Example:

```
>>>64<=32
False
```

[Fns…] > Ops B:False

[a A #]

finally:

Keyword

2nde [catalog]

Description: Use finally in a try..except..finally code block. See Python documentation for more details.

float()

Module: Built-in

2nde [catalog]

Syntax: float(x)

Description: Returns x as a float.

[Fns…] > Type
2:float()

Example:

```
>>>float(35)
35.0
>>>float("1234")
1234.0
```

floor()

Module: math

math Modul
1:math
9:floor()

Syntax: floor(x)

Description: Returns the largest integer less than or equal to x.

2nde [catalog]

Example:

```
>>>from math import *
>>>floor(36.87)
36
>>>floor(-36.87)
-37
>>>floor(254)
254
```

[Fns…] > Modul
1:math
9:floor()

import commands can be found in 2nde [catalog]

fmod(x,y)

Module: math

Syntax: fmod(x,y)

Description: See Python documentation for more details. Preferred use is when x and y are floats.

May not return the same result as x%y.

Example:

```
>>>from math import *
>>>fmod(50.0,8.0)
2.0
>>>fmod(-50.0,8.0)
-2.0
>>>-50.0 - (-6.0)*8.0      #validation from description
-2.0
```

See also: x%y.

[math] Modul
1:math
7:fmod()

[2nde] [catalog]

[Fns…] > Modul
1:math…
7:fmod()

import commands can be found in [2nde] [catalog]

for i in list:

Keyword

Syntax: for i in list:

Description: Used to iterate over list elements.

Example:

```
>>> for i in [2,4,6]:
…       print(i)
…
…
…
2
4
6
```

[Fns…] Ctl
7:for i in list:

[2nde] [catalog]

for i in range(size):

Keyword

Syntax: for i in range(size)

Description: Used to iterate over a range.

Example:

[Fns…] Ctl 4:for i in range (size):

2nde [catalog]

```
>>> for i in range(3):
…       print(i)
…
…
…
0
1
2
```

for i in range(start,stop):

Keyword

Syntax: for i in range(start,stop)

Description: Used to iterate over a range.

Example:

[Fns…] Ctl 5:for i in range (start,stop):

2nde [catalog]

```
>>> for i in range(1,4):
…       print(i)
…
…
…
1
2
3
```

for i in range(start,stop,step):

Keyword

Syntax: for i in range(start,stop,step)

Description: Used to iterate over a range.

Example:

```
>>> for i in range(1,8,2):
…       print(i)
…
…
…
1
3
4
7
```

[Fns…] Ctl 6:for i in range (start,stop,step):

2nde [catalog]

str.format() string format

Module: Built-in

2nde [catalog]

Syntax:str.format()

Description: Formats the given string. See Python documentation for more details.

Example:

```
>>> print("{+f}".format(12.34))
+12.340000
```

frexp()

Module: math

Syntax: frexp(x)

Description: Returns a pair (y,n) where x == y * 2**n. y is float where 0.5<abs(y)<1; and n is integer.

Example:

```
>>>from math import *
>>>frexp(2000.0)
(0.9765625, 11)
>>>0.9765625 * 2**11      #validate description
2000.0
```

[math] Modul
1:math
A:frexp()

[2nde] [catalog]

[Fns…] > Modul
1:math
A:frexp()

import commands can be found in [2nde] [catalog]

from PROGRAM import *

Keyword

Syntax: from PROGRAM import *

Description: Used to import a program. Imports the public attributes of a Python module into the current name space.

Shell [Tools]
A:from
PROGRAM
import *

[2nde] [catalog]

from math import *

Keyword

Syntax: from math import *

Description: Used to import all functions and constants from the math module.

math Modul
1:math…
1:from math import *

[Fns..] > Modul
1:math…
1:from math import *

2nde [catalog]

from random import *

Keyword

Syntax: from random import *

Description: Used to import all functions from the random module.

math Modul
2:random…
1:from random import *

[Fns..] > Modul
2:random…
1:from random import *

2nde [catalog]

from time import *

Keyword

Syntax: from time import *

Description: Used to import all methods from the time module.

2nde [catalog]

math Modul
3:time…
1:from time import *

[Fns…]>Modul
3:time…
1:from time import *

G

global

Keyword 2nde [catalog]

Description: Use global to create global variables inside a function.

See CircuitPython documentation for more details.

hex(integer)

Module: Built-in

2nde [catalog]

Syntax: hex(integer)

Description: Displays hexadecimal format of the integer argument. See Python documentation for more details.

Example:

```
>>> hex(16)
'0x10'
>>> hex(16**2)
'0x100'
```

I

"if ":

See if..elif..else.. for details.

2nde [catalog]

[Fns…] > Ctl

1:if..

2:if..else..

3:if..elif..else

9:elif :

0:else:

if..elif..else..

Keyword

2nde [catalog]

Syntax: ••Gray indent identifiers automatically provided in the Python82 App for ease of use.

if :

••

elif :

••

else:

[Fns…] > Ctl

1:if..

2:if..else..

3:if..elif..else

9:elif :

0:else:

Description: if..elif..else is a conditional statement. The Editor provides automatic indents as gray dots to assist your correct programming indents.

Example: Create and run this program, say S01, from the Editor

```
def f(a):
••if a>0:
••••print(a)
••elif a==0:
••••print("zero")
••else:
••••a=-a
••••print(a)
```

Shell interaction

```
>>> # Shell Reinitialized
>>> # Running S01
>>>from S01 import *      #automatically pastes
>>>f(5)
5
>>>f(0)
zero
>>>f(-5)
5
```

if..else..

Keyword 2nde [catalog]

See if..elif..else.. for details.

[Fns…] > Ctl

1:if..

2:if..else..

3:if..elif..else

9:elif :

0:else:

.imag

Module: Built-in 2nde [catalog]

Syntax:var.imag

Description: Returns the imaginary part of a specified variable of complex number type.

Example:

```
>>>a=complex(4,5)
>>>a.real
4
>>>a.imag
5
```

import math

Keyword

Syntax: import math 2nde [catalog]

Description: The math module is accessed using this command. This instruction imports the public attributes of the "math" module within its own namespace.

import random

Keyword

Syntax: import random

2nde [catalog]

Description: The random module is accessed using this command. This instruction imports the public attributes of the "random" module within its own namespace.

import time

Keyword

2nde [catalog]

Syntax: import time

Description: The time module is accessed using this command. This instruction imports the public attributes of the time module within its own name-space.

See:[Fns…] > Modul: time module.

in

Keyword

2nde [catalog]

Description: Use in to check if a value is in a sequence or to iterate a sequence in a for loop.

.index(x)

Module: Built-in

2nde [catalog]

Syntax:var.index(x)

Description: Returns the index or position of an element of a list. See Python documentation for more details.

Example:

```
>>> a=[12,35,45]
>>> print(a.index(12))
0
>>> print(a.index(35))
```

.index(x)

```
1
>>> print(a.index(45))
2
```

input()

Module : Built-in

2nde [catalog]

Syntax: input()

Description: Prompt for input

[Fns…] I/O
2:input()

Example:

```
>>>input("Name? ")
Name? Me
'Me'
```

Alternate Example:

```
Create Program A
len=float(input("len: "))
print(len)


Run Program A
>>> # Shell Reinitialized
>>> # Running A
>>>from A import *
len: 15        (enter 15)
15.0          (output float 15.0)
```

.insert(index,x)

Module : Built-in

2nde [listes] List
8:.insert(index,x)

Syntax: listname.insert(index,x)

Description: The method insert() inserts an item x after index within a sequence.

2nde [catalog]

Example:

```
>>>listA = [2,4,6,8]
>>>listA.insert(3,15)
>>>print(listA)
[2,4,6,15,8]
```

[Fns…] > List
8:.insert(index,x)

int()

Module : Built-in

2nde [catalog]

Syntax: int(x)

Description: Returns x as an integer object.

[Fns…] > Type
1:int()

Example:

```
>>>int(34.67)
34
>>>int(1234.56)
1234
```

is

Keyword

2nde [catalog]

Description: Use is to test if two objects are the same object.

lambda

Keyword

2nde [catalog]

Syntax: lambda arguments : expression

Description: Use lambda to define an anonymous function. See Python documentation for details.

len()

Module: Built-in

2nde [listes]
(above stats)
List
3:len()

Syntax: len(sequence)

Description: Returns the number of items in the argument. The argument may be a sequence or a collection.

2nde [catalog]

See Python documentation for more details.

Example:

[Fns…] > List
3:len()

```
>>>mylist=[2,4,6,8,10]
>>>len(mylist)
5
```

list(sequence)

Module: Built-in

2nde [listes]
(above stats)
List
2:list(sequence)

Syntax: list(sequence)

Description: Mutable sequence of items of the save type.

2nde [catalog]

list()" converts its argument into the "list" type. Like many other sequences, the elements of a list do not need to be of the same type.

Example:

[Fns…] > List
2:list(sequence)

```
>>>mylist=[2,4,6,8]
>>>print(mylist)
[2,4,6,8]
```

Example:

list(sequence)

```
>>>mylist=[2,4,6,8]
>>>print(mylist)
[2,4,6,8]
>>> list({1,2,"c", 7})
[7, 1, 2, 'c']
>>> list("foobar")
['f', 'o', 'o', 'b', 'a', 'r']
```

log(x,base)

Module: math

Syntax: log(x,base)

Description: log(x) with no base returns the natural logarithm x.

Example:

```
 >>>from math import *
>>>log(e)
1.0
>>>log(100,10)
2.0
>>>log(32,2)
5.0
```

2nde log for log (x,10)

2nde ln for log (x) (natural log)

math Modul
1:math…
6:log(x,base)

2nde [catalog]

[Fns…] > Modul
1:math…
6:log(x,base)

import commands can be found in 2nde [catalog]

math.function

Module: math

2nde [catalog]

Syntax: math.function

Description: Use after import math command to use a function in the math module.

Example:

```
>>>import math
>>>math.cos(0)
1.0
```

max()

Module: Built-in

2nde [listes]
(above stats)
List
4:max()

Syntax: max(sequence)

Description: Returns the maximum value in the sequence. See Python documentation for more information on max().

2nde [catalog]

Example:

```
>>>listA=[15,2,30,12,8]
>>>max(listA)
30
```

[Fns...] > List
4:max()

min()

Module: Built-in

2nde [listes]
(above stats)
List
5:min()

Syntax: min(sequence)

Description: Returns the minimum value in the sequence. See Python documentation for more information on min().

2nde [catalog]

Example:

```
>>>listA=[15,2,30,12,8]
>>>min(listA)
2
```

[Fns...] > List
5:min()

monotonic() elapsed time

Module: time

2nde [catalog]

Syntax: monotonic() elapsed time

Description: Returns a value of time from the point of execution. Use the return value to compare against other values from monotonic().

[Fns...]>Modul or math
3:time
3:momotonic()

Example:

Sample program:

import commands can be found in 2nde [catalog] or in the time Modul menu.

```
from time import *
a=monotonic()
sleep(15)
b=monotonic()
print(b-a)
```

```
Run the program EXAMPLE until execution stops.
>>>15.0
```

None

Keyword 2nde [catalog]

Description: None represents the absence of a value.

Example: [a A #]

```
>>> def f(x):
…       x
…
…
…
>>> print(f(2))
None
```

nonlocal

Keyword 2nde [catalog]

Syntax: nonlocal

Description: Use nonlocal to declare a variable is not local. See Python documentation for more details.

not

Keyword 2nde [tests] Ops 0:not

Syntax: not x

Description: Evaluates to True if x is False and False otherwise. Pastes with space before and after the keyword not. Edit as needed. [Fns…] > Ops 0:not

Example:

```
>>> not 2<5      #edit the space before not
False
>>>3<8 and not 2<5
False
```

2nde [catalog]

[a A #]

oct(integer)

Module: Built-in

2nde [catalog]

Syntax: oct(integer)

Description: Returns the octal representation of the integer. See Python documentation for more details.

Example:

```
>>> oct(8)
'0o10'
>>> oct(64)
'0o100'
```

or

Keyword

2nde [tests] Ops 9:or

Syntax: x or y

[Fns…] > Ops 9:or

Description: May return True or False. Returns x if x evaluates as True and y otherwise. Pastes with space before and after or. Edit as needed.

2nde [catalog]

Example:

```
>>>2<5 or 5<10
True
>>>2<5 or 15<10
True
>>>12<5 or 15<10
False
>>> 3 or {}
3
>>> [] or {2}
{2}
```

[a A #]

ord("character")

Module: Built-in

2nde [catalog]

Syntax: ord("character")

Description: Returns the unicode value of the character. See Python documentation for more details.

Example:

```
>>> ord("#")
35
>>> ord("/")
47
```

pass

Keyword

2nde [catalog]

Description: Use pass in an empty function or class definition as a placeholder for future code as you build out your program. Empty definitions will not cause an error when program is executed.

pi

Module: math

2nde [π] (above trig)

Syntax: math.pi or pi if math module imported.

Description: Constant pi displays as shown below.

[Fns…] > Modul 1:math… > Const 2:pi

Example:

```
>>>from math import *
>>>pi
3.141592653589793
```

Alternate Example:

```
>>>import math
>>>math.pi
3.141592653589793
```

pow(x,y)

Module: math

math Modul 1:math 5:pow(x,y)

Syntax: pow(x,y)

Description: Returns x raised to the power y. Converts both x and y to float. See Python documentation for more information.

2nde [catalog]

Use the built-in pow(x,y) function or ** for computing exact integer powers.

[Fns…] > Modul 1:math 5:pow(x,y)

Example:

```
>>>from math import *
>>>pow(2,3)
>>>8.0
```

pow(x,y)

Example using: Built-in:

[Tools] > 6:New Shell

import commands can be found in 2nde [catalog]

```
>>>pow(2,3)
8
>>>2**3
8
```

print()

Module: Built-in

2nde [catalog]

Syntax: print(argument)

Description: Displays argument as string.

[Fns…] > I/O 1:print()

Example:

```
>>>x=57.4
>>>print("my number is =", x)
my number is= 57.4
```

radians()

Module: math

Syntax: radians(x)

Description: Converts angle x in degrees to radians.

Example:

```
>>>from math import *
>>>radians(180.0)
3.141592653589793
>>>radians(90.0)
1.570796326794897
```

[trig] Trig
1:radians()

[2nde] [catalog]

[Fns…] > Modul
1:math… > Trig
1:radians()

raise

Keyword

Syntax: raise exception

Description: Use raise to raise a specified exception and stop your program.

[2nde] [catalog]

randint(min,max)

Module: random

Syntax: randint(min,max)

Description: Returns a random integer between min and max.

Example:

```
>>>from random import *
>>>randint(10,20)
>>>15
```

Alternate Example:

```
>>>import random
>>>random.randint(200,450)
306
```

Results will vary given a random output.

[math] Modul
2:random
4:randint
(min,max)

[Fns…] > Modul
2:random…
4:randint
(min,max)

[2nde] [catalog]

import commands can be found in

randint(min,max)

2nde [catalog]

random()

Module: random

Syntax: random()

Description: Returns a floating point number from 0 to 1.0. This function takes no arguments.

Example:

```
>>>from random import *
>>>random()
0.5381466990230621
```

Alternate Example:

```
>>>import random
>>>random.random()
0.2695098437037318
```

Results will vary given a random output.

math Modul 2:random… Random 2:random()

[Fns…] > Modul 2:random… Random 2:random()

2nde [catalog]

import commands can be found in 2nde [catalog]

random.function

Module: random

Syntax: random.function

Description: Use after import random to access a function in the random module.

Example:

```
>>>import random
>>>random.randint(1,15)
2
```

Results will vary given a random output.

2nde [catalog]

randrange(start,stop,step)

Module: random

math Modul

randrange(start,stop,step)

Syntax: randrange(start,stop,step)

Description: Returns a random number from start to stop by step.

Example:

```
>>>from random import *
>>>randrange(10,50,2)
12
```

Alternate Example:

```
>>>import random
>>>random.randrange(10,50,2)
48
```

Results will vary given a random output.

2:random…
Random
6:randrange
(start,stop,step)

[math] Modul
2:random…
Random
6:randrange
(start,stop,step)

[2nde] [catalog]

import commands can be found in [2nde][catalog]

range(start,stop,step)

Module: Built in

[2nde] [catalog]

Syntax: range(start,stop,step)

Description: Use range function to return a sequence of numbers. All arguments are optional. Start default is 0, step default is 1 and sequence ends at stop.

Example:

```
>>> x = range(2,10,3)
>>> for i in x
…       print(i)
…
…
2
5
8
```

.real

Module: Built-in

[2nde] [catalog]

Syntax:var.real

.real

Description: Returns the real part of a specified variable of complex number type.

Example:

```
>>>a=complex(4,5)
>>>a.real
4
>>>a.imag
5
```

.remove(x)

Module: Built-in

Syntax: listname.remove(item)

Description: The method remove() removes the first instance of item from a sequence.

Example:

```
>>>listA = [2,4,6,8,6]
>>>listA.remove(6)
>>>print(listA)
[2,4,8,6]
```

2nde [listes]
List
7:.remove(x)

2nde [catalog]

[Fns…] > List
7:.remove(x)

return

Module: Built-in

Syntax: return expression

Description: A return statement defines the value produced by a function. Python functions return None by default. See also: def function():

Example:

```
>>>  def f(a,b):
…         return a*b
…
…
…
>>>       f(2,3)
6
```

2nde [catalog]

[Fns…] > Func
1:def function():

[Fns…] > Func
2:return

.reverse()

Module: Built-in 2nde [catalog]

Syntax: listname.reverse()

Description: Reverses the order of items in a sequence.

Example:

```
>>>list1=[15,-32,4]
>>>list1.reverse()
>>>print(list1)
[4,-32,15]
```

round()

Module: Built in 2nde [catalog]

Syntax: round(number, digits)

Description: Use round function to return a floating point number rounded to the specified digits. Default digit is 0 and returns the nearest integer.

Example:

```
>>>round(23.12456)
23
>>>round(23.12456,3)
23.125
```

seed()

Module: random

math Modul 2:random… Random 7:seed()

Syntax: seed() or seed(x) where x is integer

Description: Initialize random number generator.

Example:

[Fns…] > Modul 2:random… Random 7:seed()

```
>>>from random import *
>>>seed(12)
>>>random()
0.9079708720366826
>>>seed(10)
>>>random()
0.9063990882481896
>>>seed(12)
>>>random()
0.9079708720366826
```

2nde [catalog]

Results will vary given a random output.

import commands can be found in 2nde [catalog]

set(sequence)

Module: Built-in

2nde [catalog]

Syntax: set(sequence)

Description: Returns a sequence as a set. See Python documentation for more details.

Example:

```
>>> print(set("83CE")
{'E', '8', '3', 'C'}
```

sin()

Module: math

trig 3:sin()

Syntax: sin()

Description: Returns sine of x. Argument angle is in

2nde [catalog]

sin()

radians.

Example:

```
>>>from math import *
>>>sin(pi/2)
1.0
```

[Fns…] > Modul
1:math… > Trig
3:sin()

import commands can be found in 2nde [catalog]

sleep(seconds)

Module: time

Syntax: sleep(seconds)

Description: Sleep for a given number of seconds. Seconds argument is a float.

Example:

Sample program:

```
from time import *
a=monotonic()
sleep(15)
b=monotonic()
print(b-a)
```

Run the program TIME

```
>>>15.0
```

2nde [catalog]

[Fns…]>Modul
or math
3:time
2:sleep()

import commands can be found in 2nde [catalog]

.sort()

Module: Built-in

Syntax: listname.sort()

Description: The method sorts a list in place. See Python documentation for more details.

Example:

```
>>>listA=[4,3,6,2,7,4,8,9,3,5,4,6]
>>>listA.sort()
>>>print(listA)      #listA updated to a sorted list
[2,3,3,4,4,4,5,6,6,7,8,9]
```

2nde [listes]
(above stats
List A:.sort()

2nde [catalog]

[Fns…] >
List
A:sort()

sorted()

Module: Built-in

Syntax: sorted(sequence)

Description: Returns a sorted list from sequence.

Example:

```
>>>listA=[4,3,6,2,7,4,8,9,3,5,4,6]
>>>sorted(listA)
[2,3,3,4,4,4,5,6,6,7,8,9]
>>>print(listA)      #listA did not change
[4,3,6,2,7,4,8,9,3,5,4,6]
```

2nde [listes]
(above stats)
List
0:sorted()

2nde [catalog]

[Fns...] > List
0:sorted()

.split(x)

Module: Built-in

Syntax:var.split(x)

Description: Method returns a list by specified separator. See Python documentation for more details.

Example:

```
>>> a="red,blue,green"
>>> a.split(",")
['red', 'blue', 'green']
```

2nde [catalog]

sqrt()

Module: math

Syntax: sqrt(x)

Description: Returns square root of x.

Example:

```
>>>from math import *
>>>sqrt(25)
5.0
```

math Modul
1:math
3:sqrt()

2nde [catalog]

[Fns...] >
Modul
1:math
3:sqrt()

sqrt()

import commands can be found in 2nde [catalog].

str()

Module: Built-in

2nde [catalog]

Syntax: str(argument)

Description: Converts "argument" to a string.

[Fns…] > Type 3 :str()

Example:

```
>>>x=2+3
>>>str(x)
'5'
```

sum()

Module: Built-in

2nde [listes] (above stats) List 9:sum()

Syntax: sum(sequence)

Description: Returns the sum of the items in a sequence.

Example:

2nde [catalog]

```
>>>listA=[2,4,6,8,10]
>>>sum(listA)
30
```

[Fns…] > List 9:sum()

tan()

Module: math

Syntax: tan(x)

Description: Returns tangent of x. Angle argument is in radians.

Example:

```
>>>from math import *
>>>tan(pi/4)
1.0
```

[trig] 5:tan()

[Fns…] > Modul 1:math… > Trig 5:tan()

[2nde] [catalog]

import commands can be found in [2nde] [catalog]

time.function

Module: Built-in

Syntax: time.function

Description: Use after import time to access a function in the time module.

Example:

See:[Fns…]>Modul: time module.

[2nde] [catalog]

True

Keyword

Description: Returns True when statement executed is True. "True" represents the true value of objects of type bool.

Example:

```
>>>64>=32
True
```

[2nde] [tests] (above [math])

[2nde] [catalog]

[Fns…] > Ops

True

A:True

[a A #]

trunc()

Module: math

Syntax: trunc(x)

Description: Returns the real value x truncated to an integer.

Example:

```
>>>from math import *
>>>trunc(435.867)
435
```

math Modul
1:math…
0:trunc()

2nde [catalog]

[Fns…] > Modul
1:math…
0:trunc()

import commands can be found in 2nde [catalog]

try:

Keyword

Description: Use try code block to test the code block for errors. Also used with except and finally. See Python documentation for more details.

2nde [catalog]

tuple(sequence)

Module: Built-in

Syntax: tuple(sequence)

Description: Converts sequence into a tuple. See Python documentation for more details.

Example:

2nde [catalog]

tuple(sequence)

```
>>>a=[10,20,30]
>>>tuple(a)
(10,20,30)
```

type()

Module: Built-in

2nde [catalog]

Syntax: type(object)

[Fns…]>Type>6:type ()

Description: Returns the type of the object.

Example:

```
>>>a=1.25
>>>print(type(a))
<class 'float'>
>>>b=100
>>>print(type(b))
<class 'int'>
>>>a=10+2j
>>>print(type(c))
<class 'complex'>
```

uniform(min,max)

Module: random

Syntax: uniform(min,max)

Description: Returns a random number x (float) such that min <= x <= max.

Example:

```
>>>from random import *
>>>uniform(0,1)
0.476118
>>>uniform(10,20)
16.2787
```

Results will vary given a random output.

math Modul 2:random… Random 3:uniform (min,max)

2nde [catalog]

[Fns…] > Modul 2:random… Random 3:uniform (min,max)

import commands can be found in 2nde [catalog]

while condition:

Keyword

[Fns…] Ctl
8:while condition:

Syntax: while condition:

Description: Executes the statements in the following code block until "condition" evaluates to False.

2nde [catalog]

Example:

```
>>> x=5
>>> while x<8:
…       x=x+1
…       print(x)
…
…
6
7
8
```

@

Operator

alpha [θ]
(above 3)

Description: Decorator – See general Python documentation for details.

2nde [catalog]

<<

Operator

2nde [catalog]

Syntax: x<<n

Description: Bitwise left shift by n bits.

>>

Operator

2nde [catalog]

Syntax: x>>n

Description: Bitwise right shift by n bits.

|

Operator 2nde [catalog]

Syntax: x|y

Description: Bitwise or.

&

Operator 2nde [catalog]

Syntax: x&y

Description: Bitwise and.

^

Operator 2nde [catalog]

Syntax: x^y

Description: Bitwise exclusive or.

~

Operator 2nde [catalog]

Syntax: ~x

Description: Bitwise not; the bits of x inverted.

x<=y

Operator

Syntax: x<=y

Description: Comparison; x less than or equal to y.

Example:

```
>>>2<=5
True
>>>3<=0
False
```

math
1:math > Ops
7:x<=y

2nde [catalog]

[Fns…] > Ops
7:x<=y

[a A #]

x<y

Operator

Syntax: x<y

Description: Comparison; x strictly less than y.

Example:

```
>>>6<10
True
>>>12<-15
False
```

math
1:math > Ops
6:x<y

2nde [catalog]

[Fns…] > Ops
6:x<y

[a A #]

x>=y

Operator

Syntax: x>=y

Description: Comparison; x greater than or equal to y.

Example:

```
>>>35>=25
True
>>>14>=65
False
```

math
1:math > Ops
5:x>=y

2nde [catalog]

[Fns…] > Ops
5:x>=y

[a A #]

x>y

Operator

Syntax: x>y

Description: Comparison; x strictly greater than y.

Example:

```
>>>35>25
True
>>>14>65
False
```

math
1:math > Ops
4:x>y

2nde [catalog]

[Fns…] > Ops
4:x>y

[a A #]

x!=y

Operator

Syntax: x!=y

Description: Comparison; x not equal to y.

Example:

```
>>>35!=25
True
>>>14!=10+4
False
```

math
1:math > Ops
3:x!=y

2nde [catalog]

[Fns…] > Ops
3:x!=y

[a A #]

x==y

Operator

Syntax: x==y

Description: Comparison; x is equal to y.

Example:

```
>>>75==25+50
True
>>>1/3==0.333333
False
>>>1/3==0.3333333      #equal to stored Python value
True
```

math
1:math > Ops
2:x==y

2nde [catalog]

[Fns…] > Ops
2:x==y

[a A #]

x=y

Operator

Syntax: x=y

Description:y is stored in variable x

Example:

```
>>>A=5.0
>>>print(A)
5.0
>>>B=2**3      #Use [ ^ ] on keypad for **
>>>print(B)
8
```

sto→

math
1:math > Ops
1:x=y

2nde [catalog]

[Fns…] > Ops
1:x=y

[a A #]

\

Delimiter

Description: Backslash character.

2nde [catalog]

[a A #]

\t

Delimiter

Description: Tab space between strings or characters.

2nde [catalog]

\n

Delimiter

Description: New line to display string neatly on the screen.

2nde [catalog]

' '

Delimiter

2nde [mém] (above +)

Description: Two single quotes paste.

Example:

2nde [catalog]

```
>>>eval('a+10')
17
```

[a A #]

" "

Delimiter

alpha ["] (above +)

Description: Two double quotes paste.

Example:

2nde [catalog]

```
>>>print("Ok")
```

[a A #]

with

Keyword

2nde [catalog]

Description: See Python documentation for more details.

yield

Keyword 2nde [catalog]

Description: Use yield to end a function. Returns a generator. See Python documentation for more details.

Appendix

Selected TI-Python Built-in, Keywords, and Module Content

Built-ins

Built-ins	Built-ins	Built-ins
__name__	abs -- <function>	BaseException -- <class 'BaseException'>
__build_class__ -- <function>	all -- <function>	ArithmeticError -- <class 'ArithmeticError'>
__import__ -- <function>	any -- <function>	AssertionError -- <class 'AssertionError'>
__repl_print__ -- <function>	bin -- <function>	AttributeError -- <class 'AttributeError'>
bool -- <class 'bool'>	callable -- <function>	EOFError -- <class 'EOFError'>
bytes -- <class 'bytes'>	chr -- <function>	Exception -- <class 'Exception'>
bytearray -- <class 'bytearray'>	dir -- <function>	GeneratorExit -- <class 'GeneratorExit'>
dict -- <class 'dict'>	divmod -- <function>	ImportError -- <class 'ImportError'>
enumerate -- <class 'enumerate'>	eval -- <function>	IndentationError -- <class 'IndentationError'>
filter -- <class 'filter'>	exec -- <function>	IndexError -- <class 'IndexError'>
float -- <class 'float'>	getattr -- <function>	KeyboardInterrupt -- <class 'KeyboardInterrupt'>
int -- <class 'int'>	setattr -- <function>	ReloadException -- <class

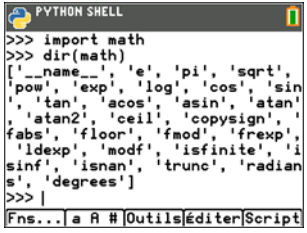
Built-ins	Built-ins	Built-ins
		'ReloadException'>
list -- <class 'list'>	globals -- <function>	KeyError -- <class 'KeyError'>
map -- <class 'map'>	hasattr -- <function>	LookupError -- <class 'LookupError'>
memoryview -- <class 'memoryview'>	hash -- <function>	MemoryError -- <class 'MemoryError'>
object -- <class 'object'>	help -- <function>	NameError -- <class 'NameError'>
property -- <class 'property'>	hex -- <function>	NotImplementedError -- <class 'NotImplementedError'>
range -- <class 'range'>	id -- <function>	OSError -- <class 'OSError'>
set -- <class 'set'>	input -- <function>	OverflowError -- <class 'OverflowError'>
slice -- <class 'slice'>	isinstance -- <function>	RuntimeError -- <class 'RuntimeError'>
str -- <class 'str'>	issubclass -- <function>	StopIteration -- <class 'StopIteration'>
super -- <class 'super'>	iter -- <function>	SyntaxError -- <class 'SyntaxError'>
tuple -- <class 'tuple'>	len -- <function>	SystemExit -- <class 'SystemExit'>
type -- <class 'type'>	locals -- <function>	TypeError -- <class 'TypeError'>
zip -- <class 'zip'>	max -- <function>	UnicodeError -- <class 'UnicodeError'>
classmethod -- <class 'classmethod'>	min -- <function>	ValueError -- <class 'ValueError'>
staticmethod -- <class 'staticmethod'>	next -- <function>	ZeroDivisionError -- <class 'ZeroDivisionError'>

Built-ins	Built-ins	Built-ins
Ellipsis -- Ellipsis	oct -- <function>	
	ord -- <function>	
	pow -- <function>	
	print -- <function>	
	repr -- <function>	
	round -- <function>	
	sorted -- <function>	
	sum -- <function>	

keywords

keywords	keywords	keywords
False	elif	lambda
None	else	nonlocal
True	except	not
and	finally	or
as	for	pass
assert	from	raise
break	global	return
class	if	try
continue	import	while
def	in	with
del	is	yield

math

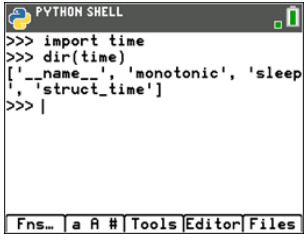


math	math	math
__name__	acos -- <function>	frexp -- <function>
e -- 2.71828	asin -- <function>	ldexp -- <function>
pi -- 3.14159	atan -- <function>	modf -- <function>
sqrt -- <function>	atan2 -- <function>	isfinite -- <function>
pow -- <function>	ceil -- <function>	isinf -- <function>
exp -- <function>	copysign -- <function>	isnan -- <function>
log -- <function>	fabs -- <function>	trunc -- <function>
cos -- <function>	floor -- <function>	radians -- <function>
sin -- <function>	fmod -- <function>	degrees -- <function>
tan -- <function>		

random

random	random	random
__name__	randint -- <function>	
seed -- <function>	choice -- <function>	
getrandbits -- <function>	random -- <function>	
randrange -- <function>	uniform -- <function>	

time



time	time	time
__name__		
monotonic		
sleep		
struc_time		

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