

TI-15

Calculator and Arithmetic Trainer

Copyright © 1999 Texas Instruments Incorporated

General Information

The TI-15 has two power sources—battery and solar. It operates in well-lit areas using solar cell, and it operates in other light settings on battery.

Examples: See the *Examples* page for representative problems and keystroke sequences that demonstrate many of the TI-15's functions and capabilities. Before starting each problem set, reset the calculator by pressing 2nd and clear simultaneously to help ensure that your displays are the same as those shown in the examples. In Problem Solving **Auto** mode, however, displays will vary from those shown, because these problems are random.

Basic Operations

To turn the TI-15 on, press on .

If the calculator is on, press off to turn it off.

APD™ (Automatic Power Down™) turns off the TI-15 automatically if no key is pressed for about 5 minutes. Press on after APD to power up again; the display, pending operations, settings, and memory are retained.

Display and Scrolling

The TI-15 has a two-line display; each line has room for 11 characters. Entries that do not fit on the first line wrap to the second, and then scroll when the second line is filled. *Exception:* When computing fractions, the TI-15 displays only one line, which scrolls when a problem exceeds the capacity of the line.

Entries can be up to 88 characters. *Exceptions:* In Stored Operations, the limit is 44 characters. In Man mode, entries do not wrap; entries cannot exceed 11 characters.

When a result exceeds the capacity of the screen, it is displayed in scientific notation. However, if the result is greater than 10^{99} or less than 10^{-99} , you will get an *overflow error* or *underflow error*, respectively.

Scroll with left , right , up , and down .

- Press left and right to scroll through entries or to move the underscore within a menu list.
- Press up and down to scroll through history or, within a menu, to move to the next level of menu lists.

Clearing, Correcting and Resetting

left	Deletes the character to the left of the cursor. In fractions, clears from right bottom to left top.
clear	Clears display and error condition. (Does not clear value from memory.)
MR/MC MR/MC	Clears value from memory.
2nd and clear	To reset, hold down 2nd and clear simultaneously for a few seconds and release. MEM CLEARED displays. This completely clears the calculator and restores all default settings. You can also reset using the Mode menu (see below).

Display Indicators

Indicator	Definition
diamond	Calculator is in Problem Solving mode.
square	Calculator is in Place Value mode.
Fix	Calculator is rounding results.
M	2nd M has been pressed.
M	A value other than zero is in memory.
Op1, Op2	Stored operation function is active.
Auto	In calculator mode, Auto simplification of fractions is active. In diamond , Problem Solving function is in Auto mode.
I	Integer division function is active (appears only when cursor is over the division sign).
$\frac{n}{d}$	Results of division will be displayed in fraction format.
$\frac{N}{D} \rightarrow \frac{n}{d}$	The fractional result can be simplified.
$\uparrow \downarrow$	More entry history or menus are available. Press up or down to access.
$\leftarrow \rightarrow$	An entry or menu extends beyond the capacity of the screen. Press left or right to scroll.

Mode Setting Menus

Key	Menu Choices Displayed
Mode	. n/d (Decimal or fraction display)
Mode left	+1 ? (Show or hide in Op)
Mode right	OP1 OP2 (Clear stored Op)
Mode left right	N Y (Select or reject Reset)
Frac	U n/d n/d (Select format of fractions)
Frac left	Man Auto (Simplification procedure)
Mode diamond	Auto Man (Automatic or Manual)
Mode diamond left	1 2 3 (Level of difficulty)
Mode diamond right	+ - \times \div ? (Type of operation)
Mode diamond left right Enter	11.- -1- (Place Value function)

Press left or right to underline a menu item. To select the underlined item, press Enter . To exit, press Mode .

Order of Operations

The TI-15 uses the Equation Operating System (EOS™) to evaluate expressions.

1st	Expressions inside parentheses.
2nd	Functions that need a) and precede the argument.
3rd	Fractions.
4th	Exponentiation (^) and roots ($\sqrt{\quad}$).
5th	Negation (-).
6th	Multiplication, implied multiplication, division.
7th	Addition and subtraction.
8th	Conversions (U n/d \leftrightarrow n/d, F \leftrightarrow D, $\text{P}\%$).
9th	Enter completes all operations.

Basic Arithmetic

0 , 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 , 9	Enters numerals 0 through 9.
+ , - , x , div	Adds, subtracts, multiplies, divides.
.	Inserts decimal point.
(-)	Enters a negative sign. (Does not act as an operator.)
[]	Opens, closes a parenthetical expression.
Enter	Completes all operations.

Integer Division

When you divide a positive whole number by a positive whole number with Int , the result is displayed in the form **Q** **R**, where **Q** is the quotient and **R** is the remainder.

If you use the result of integer division in a subsequent calculation, the TI-15 uses only the quotient; the remainder is dropped.

Fractions

Press Unit after entering a number to designate the numerator of a fraction.

Press Den after entering a number to designate the denominator of a fraction.

Both numerator and denominator must be integers. If you enter a denominator greater than 1000, or if a calculation yields a denominator greater than 1000, the TI-15 displays results in decimal format.

You can input either the numerator or the denominator first.

Unit separates the whole number from the fraction in a mixed number.

Frac displays a menu that lets you specify how fraction results are displayed.

- U n/d** (default) displays results as mixed numbers.
- n/d** displays results as simple (improper) fractions.

Frac left displays a menu that lets you specify the simplification method.

- Man** (default) requires manual simplification of fractions.
- Auto** automatically reduces fraction results to lowest terms.

$\text{N/D} \rightarrow \text{n/d}$ indicates that fraction results can be simplified.

Simp enables you to simplify a fraction manually.

Fac displays the factor that was used to simplify a fraction in your last manual simplification step. Press Fac again to restore the fraction to the screen.

$\text{U} \leftrightarrow \text{A}$ converts a mixed number to an improper fraction or an improper fraction to a mixed number.

$\text{F} \leftrightarrow \text{D}$ converts a fraction to a decimal, or converts a decimal to a fraction, if possible.

If a problem contains both fractions and decimals, the results are displayed in decimal format. However, if you press Mode and select **n/d**, the results of division will be displayed in fraction format, when possible.

Percents

Press $\text{P}\%$ after entering a value to calculate a percent.

Press $\text{P}\%$ to convert a decimal or a fraction to a percent.

Roots and Powers

$\sqrt{\quad}$ lets you obtain the square root of a number. After entering the number, be sure to close the parentheses.

^ raises a number to the power you specify.

Pi

π enters the value of π , which is stored internally to 13 digits (3.141592653590). In some cases, results display with symbolic π , and in other cases as a numeric value.

Memory

After a calculation, press 2nd M Enter to store the displayed result in memory. If memory already contains a value, the new one will replace it. When memory contains a value other than 0, **M** displays on the screen.

To recall the value from memory for use in a calculation, press MR/MC once.

To clear memory, press MR/MC | MR/MC .

Stored Operations

Op1 **Op2**

Op1 and **Op2** each can store an operation with a constant value, which you can repeat by pressing only one key, as many times as desired.

1. Press **Op1** or **Op2**.
2. Enter the operator first (+, -, ×, ÷, Int±, or ^) and then the number.
3. Press **Op1** or **Op2**.
4. Initialize with a starting value.
5. Each subsequent time you press **Op1** or **Op2**, the operation with the constant is applied.

The computation with the stored operation appears on the first line of the display, and the result appears on the second line. If you don't want the computation line to display, press **Mode** **Enter** to hide it. Or, if the expression does not fit on the line, it will not show. When space permits, a counter on the second line shows how many times you have pressed **Op1** or **Op2**.

To clear the contents of **Op1** or **Op2**, press **Mode** **Enter**, select **Op1** or **Op2**, and press **Enter**. Then press **Mode** to return to the last result display.

Rounding

Fix **1000** **100** **10** **1** **0.1** **0.01** **0.001**

You can round results with **Fix** in conjunction with place value keys to specify a given number of places. (The internally stored value is not rounded.) The calculated value is padded with zeros as needed. You must press **Fix** again each time you change the number of places.

Keys	Action
Fix 1000	Rounds in thousands.
Fix 100	Rounds in hundreds.
Fix 10	Rounds in tens.
Fix 1	Rounds in ones.
Fix 0.1	Rounds to nearest tenth.
Fix 0.01	Rounds to nearest hundredth.
Fix 0.001	Rounds to nearest thousandth.
Fix .	Removes fixed-decimal setting.

These place-value keys also work with **□** (see below).

Problem Solving

Man **?** **Enter**

The **Man** function lets you practice and test your skills in arithmetic. You can choose either **Auto** or **Man** mode.

In **Auto** mode (default), the TI-15 presents problems with one element missing (for example, 5+2=? or 5+?=7 or 5?2=7). You can select the type of problem and choose from three levels of difficulty. The default is addition at level 1.

Level of Difficulty. While in **Man**, press **Mode** to access the menu list and press **1** or **2** or **3** to select the desired level of difficulty (1, 2, or 3). Then press **Enter** **Mode**, and the TI-15 will present problems at the selected level.

Type of Problem. While in **Man**, press **Mode** to access the menu list, and press **1** or **2** or **3** to select the desired type of problem (addition, subtraction, multiplication, division, or find the operator). Then press **Enter** **Mode**, and the TI-15 will present problems of the selected type.

1. You enter an answer.
2. If your answer is correct, the display shows "Yes," clears the screen, and presents another problem.
3. If your answer is not correct, the display shows "No" and indicates whether the correct solution is less than or greater than the answer that you entered.
4. The incorrect answer is cleared from the display, and you enter another answer to that same problem.
5. If you enter three incorrect answers to a given problem, the TI-15 shows the correct answer, clears that problem, and presents a new problem.

Scoreboard. The TI-15 shows a Scoreboard after every fifth problem. Every correct solution you have entered registers a "Yes" in the Scoreboard, and three incorrect answers in a row register one "No." After 100, the Scoreboard returns to zero.

Problem Solving

(continued)

When you first enter **Man** and when you press **Mode**, the display shows the Scoreboard for a moment before presenting problems or before showing the menu.

In **Man** (manual) mode, you compose your own problems. While in **Man**, press **Mode** to access the menu list, and press **1** to select **Man**. Then press **Enter** **Mode**, and the TI-15 is ready for you to enter your problem and your solution. It accepts only non-negative integers in this mode. You indicate a missing element with **?**.

In **Man** mode, it is possible to enter a problem that has one solution, multiple solutions, or no solution. The TI-15 tells you how many solutions the problem has.

- Problems with one missing element generally have only one solution. You get three tries. After three incorrect answers, the calculator displays the correct answer and then clears so you can enter a new problem.
- Problems with two missing elements have multiple solutions. For example, ?+?=5 has 6 solutions; ?x?=24 has 8 solutions. (In this type of problem, the question marks replace the operands; they may not appear in the place of the operator or the answer.) These problems are not cleared after a correct solution or after three incorrect answers; the problem remains so you can enter other solution sets, until you clear the problem manually by pressing **Clear**.
- When the answer to a problem is not a positive integer (such as 9÷2), the TI-15 indicates that it has zero solutions. But if you enter answers, it will tell whether they are greater than or less than the correct answer.

Inequalities. Instead of entering an equation, you can test an inequality using **<**. You get only one try, because the inequality statement is either true or false. With inequalities you can enter decimals. Press **<** once for **<**, and press **<** twice for **>**.

To exit Problem Solving, press **Man** again.

Place Value

□ **1000** **100** **10** **1** **0.1** **0.01** **0.001**

While in **Man**, **Man** mode, you can determine the place value of a digit; determine how many ones, tens, hundreds, thousands, tenths, hundredths and thousandths a number contains; or determine which digit of a given number is in a specified place.

- **Determine Place Value:**
 - After entering a number, you can determine the whole number place or the decimal place of a given digit by pressing **□** and then pressing the digit in question.
 - If you have a number with a repeated digit, when you press this digit the TI-15 analyzes its right-most occurrence. To find the place value of those to the left, press the given digit again before the answer appears. Each time you press the given digit in succession, the display shifts to the next occurrence of this digit to the left and shows the place value for this occurrence.

While in **Man**, **Man** mode, you can access a Place Value menu by pressing **Mode** **Enter**.

- Find out how many ones, tens, hundreds, thousands, tenths, hundredths, or thousandths a number contains (default): If necessary, press **Mode** **Enter**, select the **11**- setting, and press **Enter** **Mode**. Enter the number to be analyzed, press **□**, and then press **1**, **10**, **100**, **1000**, **0.1**, **0.01**, or **0.001**.
- Find out what digit of a number is in a specified place: Press **Mode** **Enter**, select the **-1**- setting, and press **Enter** **Mode**. Enter the number to be analyzed, press **□**, and then press **1**, **10**, **100**, **1000**, **0.1**, **0.01**, or **0.001**.

The answer appears briefly and then clears so you can press another digit or place value key. Once the **□** function is active, it is not necessary to press this key before each digit or place you wish to examine for a given number. You need to press **Clear** before entering a new number to analyze and then activate **□** again.

To exit the **□** feature, press **Clear**.

Error Conditions

Arith Error	Arithmetical error.
Syn Error	Syntax error.
-0 Error	Attempting to divide by zero.
Mem Error	Error in attempting to store entry in memory.
Op Error	Error following steps for using Op1 or Op2.
Overflow Error	Overflow.
Underflow Error	Underflow.

In some cases, **Clear** restores the last display before the error message appeared.

Errors appear in history as **Error**.

Battery Replacement

Place protective cover over the TI-15 and lay the calculator face down.

Remove screws from back of case, using a small Phillips screwdriver.

Carefully separate front from back, starting from the bottom. **Caution:** Be careful not to damage any internal parts.

Remove old battery, using a small Phillips screwdriver, if necessary. Replace with new battery. Replace back of case.

Caution: Avoid contact with other TI-15 components while changing the battery.

If necessary, press **Clear** and **Clear** at the same time to reset the TI-15 (clears memory and all settings).

Caution: Dispose of old batteries properly. Do not incinerate batteries or leave where a child can find them.

In Case of Difficulty

Review instructions to be certain calculations were performed correctly.

Press **Clear** and **Clear** simultaneously. This clears all memory and settings.

Check the battery to ensure that it is fresh and properly installed. Change the battery when:

- **Clear** does not turn the unit on, or
- The screen goes blank, or
- You get unexpected results.

To continue using the TI-15 until you can change the battery:

1. Expose the solar panel to brighter light.
2. Press **Clear** and **Clear** simultaneously to reset the calculator.

TI Product Service and Warranty Information

Product Support

Customers in the U.S., Canada, Puerto Rico, and the Virgin Islands

For general questions, contact Texas Instruments Customer Support:

phone: **1-800-TI-CARES**
(1-800-842-2737)
e-mail: **ti-cares@ti.com**

For technical questions, call the Programming Assistance Group of Customer Support:

phone: **1-972-917-8324**

Customers outside the U.S., Canada, Puerto Rico, and the Virgin Islands

Contact TI by e-mail or visit the TI calculator home page on the World Wide Web.

e-mail: **ti-cares@ti.com**
Internet: **www.ti.com/calc**

$\sqrt{\square}$	$\sqrt{\square} 25 \square \text{Enter}$	$\sqrt{(25)}=$ 5
\wedge	$5 \wedge 2 \text{Enter}$	$5^2=$ 25
	$8 \wedge 13 \text{Enter}$	$8^{\wedge}13=$ $5.498 \times 10^{\wedge}11$

π	$\pi \times 3 \text{Enter}$	$\pi \times 3=$ 3π
	$\pi \times 4 \wedge 2 \text{Enter}$	$\pi \times 4^{\wedge}2=$ 16π
	$2 + 3 \times \pi \text{Enter}$	$2 + 3 \times \pi=$ 11.42477796

MR/MC	$96 + 85 \text{Enter}$	$96 + 85=$ 181
M	$\div 2 \text{Enter}$	$181 \div 2=$ 90.5
Clear		M ←
	$98 + 87 \text{Enter}$	$98 + 87=$ 185
	$\div 2 \text{Enter}$	$185 \div 2=$ 92.5
MR/MC	$+ \text{MR/MC} \text{Enter}$	$92.5 + 90.5=$ 183
	$\div 2 \text{Enter}$	$183 \div 2=$ 91.5
	$\text{MR/MC} \text{MR/MC} \text{Clear}$	←

Op1	$\text{Op1} + 5 \text{Op1}$	Op1 +5
	2Op1	Op1 2+5 1 7
	Op1	Op1 7+5 2 12
	Op1	Op1 12+5 3 17
Op2	$\text{Op2} \times 2 \text{Op2}$	Op1 Op2 $\times 2$
	3Op2	Op1 Op2 3×2 1 6
	Op2	Op1 Op2 6×2 2 12
	Op1	Op1 Op2 12+5 1 17

Clear Op	$\text{Mode} \leftarrow \leftarrow \rightarrow \text{Enter}$	Op1 OP 1 OP 2 CLEAR
	Mode	Op1 12+5 17

Fix	0.1 0.01 0.001 L $10.$ $100.$ $1000.$	
	$42 \square 394 \square 97 \square$	4128.412508
	382Enter	
Fix $1000.$	Fix $1000.$	Fix 4000
$100.$	Fix $100.$	Fix 4100
$10.$	Fix $10.$	Fix 4130
$1.$	Fix $1.$	Fix 4128
0.1	Fix 0.1	Fix 4128.4
0.01	Fix 0.01	Fix 4128.41
0.001	Fix 0.001	Fix 4128.413
\square	Fix \square	4128.412508

		Auto $8+3=?$ ←
	11Enter	Auto $8+3=11$ Yes
		Auto $3+?=8$ ←
	5Enter	Auto $3+5=8$ Yes
		Auto $9+7=?$ ←
	15Enter	Auto $9+7>15$ No
	18Enter	Auto $9+7<18$ No
	17Enter	Auto $9+7<17$ No
		Auto $9+7=16$ Yes
		Auto $4+?=6$ ←
	2Enter	Auto $4+2=6$ Yes
		Auto $8+?=13$ ←
	5Enter	Auto $8+5=13$ Yes
		Auto Yes No 4 1

1 2 3	Mode	Auto
	Mode	1 2 3
	Mode	Auto
	Mode	6+400=?
406	Enter	Auto
	Mode	6+400=406
	Mode	Yes
+ - x ÷ ?	Mode	Auto
	Mode	+ - x ÷ ?
	Mode	Auto
	Mode	10x40=?
400	Enter	Auto
	Mode	10x40=400
	Mode	Yes
	Mode	Auto
	Mode	70-40=?
20	Enter	Auto
	Mode	70-40>20
	Mode	No
30	Enter	Auto
	Mode	70-40=30
	Mode	Yes

Mode	Mode	Auto	Man
	Mode		
14	- ?	Enter	10
	Enter	10	Enter
	Mode	14-?=10	
	Mode	1 sol	
4	Enter	14-4=10	
	Mode	Yes	
? x ?	Enter	24	Enter
	Mode	?x?=24	
	Mode	8 sol	
8	Enter	3	Enter
	Mode	8x3=24	
	Mode	Yes	
	Mode	?x?=24	
	Mode		
7	x	6	Enter
	Mode	7x6<43	
	Mode	Yes	
15	÷	3	Enter
	Mode	15÷3>4	
	Mode	Yes	

Mode	Mode	Auto	Man
	Mode		
4379	÷	652	Enter
	Mode	4379.652	
3		4379.652	
	Mode	-3	
	Mode	4379.652	
	Mode	3→100	
5		4379.652	
	Mode	-----5	
	Mode	4379.652	
	Mode	5→0.01	
	Mode	7653	÷
	Mode	498	Enter
	Mode	7653.498	
	Mode	7653.498	
	Mode	7	
	Mode	7653.498	
	Mode	765349.	
	Mode	11-	
	Mode	-1-	
	Mode	7653.498	
	Mode	7653.498	
	Mode	--5	
	Mode	7653.498	
	Mode	-----4	



Copyright© 1999 Texas Instruments Incorporated

Texas Instruments
 7800 Banner Dr.
 Dallas, TX 75251 U.S.A.
www.ti.com/calc



Texas Instruments Holland B.V.
 Rutherfordweg 102
 3542 CG Utrecht - The Netherlands