

## TI-15

#### **Calculator and Arithmetic Trainer**

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## **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 (a) and (b) 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 🚳.

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

APD<sup>™</sup> (Automatic Power Down<sup>™</sup>) turns off the TI-15 automatically if no key is pressed for about 5 minutes. Press ⓐ 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.

 $\bigcirc \bigcirc \bigcirc \bigcirc \bigcirc \bigcirc$ 

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 O, O, O, and O.

- Press () and () to scroll through entries or to move the underscore within a menu list.

## Clearing, Correcting and Resetting 🛛 🕞 🗲

<b>←</b>	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.	
🐞 and 📾	To reset, hold down () and () 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	
۵	Calculator is in Problem Solving mode.	
<b>.</b>	Calculator is in Place Value mode.	
Fix	Calculator is rounding results.	
►M	►M has been pressed.	
м	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 (1), Problem Solving function is in Auto mode.	
I	Integer division function is active (appears only when cursor is over the division sign).	
n d÷	Results of division will be displayed in fraction format.	
$\frac{N}{D} \rightarrow \frac{n}{d}$	The fractional result can be simplified.	
↑ ↓	More entry history or menus are available. Press ⊙ or ⊙ to access.	
$\leftarrow \rightarrow$	An entry or menu extends beyond the capacity of the screen. Press ④ or ④ to scroll.	

Mode Setting	g Menus Mode Frac 🗇 🔲		
Key	Menu Choices Displayed		
Mode	. n/d (Decimal or fraction display)		
Mode	+1 ? (Show or hide in Op)		
Mode	OP1 OP2 (Clear stored Op)		
	N Y (Select or reject Reset)		
Frac	U n/d n/d (Select format of fractions)		
Frac	Man Auto (Simplification procedure)		
Mode	Auto Man (Automatic or Manual)		
Mode 🗢	1 2 3 (Level of difficulty)		
Inde 👁 👁	+ - × ÷ ? (Type of operation)		
Mode () Enter	111- (Place Value function)		

Press () or () to underline a menu item. To select the underlined item, press [eger]. To exit, press (Mode).

#### Order of Operations

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

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

## Basic Arithmetic+- $\times$ $\div$ ()Enter

0, 1, 2, 3, 4, 5, 6, 7, 8, 9	Enters numerals 0 through 9.
+, -, ×, ÷	Adds, subtracts, multiplies, divides.
$\overline{\ }$	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  $[int \div]$ , the result is displayed in the form Q r 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 ① ⓓ Unit Frac U∄↔∄ Simp Fac

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

Press a 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. <u>Unit</u>] 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) ⊙ 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.

 $N/D{\rightarrow}n/d$  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.

[년출 ↔ 음) converts a mixed number to an improper fraction or an improper fraction to a mixed number.

 $[F \leftrightarrow D]$  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 from and select n/d, the results of division will be displayed in fraction format, when possible.

#### Percents

Press % after a entering a value to calculate a percent. Press % to convert a decimal or a fraction to a percent.

## **Roots and Powers**

 ✓ 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

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

#### Memory

►M MR/MC

% ▶%

 $\land \checkmark$ 

After a calculation, press  $\boxed{M}$  at some 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  $\underline{\text{MR}/\text{MC}}$  once.

To clear memory, press MR/MCMR/MC

Int÷

#### Stored Operations

**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 Opl or Op2.
- 2. Enter the operator first (+, -,  $\star,$   $\div,$  Int $\div,$  or ^) and then the number.
- 3. Press Opl or Op2.
- 4. Initialize with a starting value.
- 5. Each subsequent time you press [0p] or [0p2], the operation with the constant is applied.

To clear the contents of **Op1** or **Op2**, press (Mod)  $\bigcirc$   $\bigcirc$ , select **Op1** or **Op2**, and press (Eter). Then press (Mod) to return to the last result display.

## Rounding Fix 1000. 100. 10. 1. 0.1 0.01 0.001

You can round results with  $\boxed{Fix}$  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  $\boxed{Fix}$  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 I.	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 **I**. (see below).

#### Problem Solving

The  $\circledast$  function lets you practice and test your skills in arithmetic. You can choose either **Auto** or **Man** mode. In  $\circledast$  **Auto** mode (default), the TI-15 presents problems

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

*Type of Problem.* While in , press . or to access the menu list, and press ) or () to select the desired type of problem (addition, subtraction, multiplication, division, or find the operator). Then press Fight (), 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.
- 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.
- 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

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

(continued)

In **Man** (manual) mode, you compose your own problems. While in **A**, press (More to access the menu list, and press **D** to select **Man**. Then press **Em**(More), 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  $\circledast$  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 a.
- 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 O. You get only one try, because the inequality statement is either true or false. With inequalities you can enter decimals. Press O once for <, and press Otwice for >.

To exit Problem Solving, press 🛞 again.

### Place Value 1. 1000. 100. 10. 1. 0.1 0.01 0.001

While in (\*), **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  $\circledast$  , Man mode, you can access a Place Value menu by pressing  $\textcircled{Mode} \odot$ .

- Find out how many ones, tens, hundreds, thousands, tenths, hundredths, or thousandths a number contains (default): If necessary, press (Mode) () [Emer] (), select the 11- setting, and press [Emer] (Mode). Enter the number to be analyzed, press [], and then press [], [0], [00], [000], [01], [00], [00].
- Find out what digit of a number is in a specified place: Press () [= (), select the -1- setting, and press [= () (). Enter the number to be analyzed, press []], and then press [], [0], [00], [000, [0], (0], (00]).

The answer appears briefly and then clears so you can press another digit or place value key. Once the Infunction 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 we before entering a new number to analyze and then activate Infugation.

To exit the **I**. feature, press ear.

#### **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, 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.

 $\ensuremath{\textit{Caution:}}$  Avoid contact with other TI-15 components while changing the battery.

If necessary, press  $\textcircled{\textcircled{a}}$  and  $\textcircled{\textcircled{b}}$  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.

 $\operatorname{Press}\ensuremath{\textcircled{B}}$  and  $\ensuremath{\textcircled{B}}$  simultaneously. This clears all memory and settings.

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

- 🚳 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 (a) and  $(\mbox{\tiny leas})$  simultaneously to reset the calculator.

#### TI Product Service and Warranty Information

#### Product Support

phone:

e-mail:

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

For general questions, contact Texas Instruments Customer Support:

#### 1-800-TI-CARES (1-800-842-2737) ti-cares@ti.com

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

#### phone: 1-972-917-8324

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

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Warranty Duration. This TI electronic product is warranted to the

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	× ÷ Enter () (	$   \mathbf{O} \mathbf{O} \mathbf{O} $
۵		•
Ŧ	2+3 [ <u>Enter</u> ]	2+3= 5
-	7 – 4 <sup>En<u>t</u>er</sup>	7-4= 3
×	2×4 <sup>Enter</sup>	2×4= 8
÷	6÷3 <sup>[Enter]</sup>	6÷3= 2
۲	$\odot \odot \odot$	2+3= 5 7-4= 3
⊙	⊙	7-4= 3 2×4= 8
••		74-42= 32

## Clear + 9÷33 9÷33∢ Clear 4 9÷3Enter 9÷3= 9÷33 9÷33∢ ← Enter + 9÷3=

8÷300 ← 9 Enter

Clear

 $\mathbf{\cdot}$ 

 $9 \div 3 \leftarrow \times 2^{\text{Enter}}$ 9×2=

9÷3=

18

#### $\overline{\phantom{a}}$ $6 \cdot 3 + 2 \cdot 4^{\text{Enter}}$ 6.3+2.4= 8.7 $4 \cdot 2 \times 3 \cdot 1^{\text{Enter}}$ 4.2×3.1= 13.02

 $96 \cdot 3 \div 2 \cdot 52 \text{Enter}$ 

## 96.3÷2.52= 38.21428571 (–) (-) 5+(-)2Enter 5+ -2= 5--2 5---2= $4 \times (-) 2^{Enter}$ 4× -2= -8

תח			
	$3 \times 4 + 2^{Enter}$	3×4+2= 14	
	3×((4+2)) Enter	3×(4+2)= 18	
[Int÷]			
Int÷	9[Int÷]4[Enter]	9÷4= 2 r 1	
	•••	I 944=	
Unit 🔟 (	a] (Simp) (Fac)		
Unit 🗅 ā	3 [Jnit] 5 [] 18 (7 + 1 [Jnit] 7 [] 18 (7 = 1	$\frac{N \to n}{D \to d}$ $3 \frac{5}{18} + 1 \frac{7}{18} = 4 \frac{12}{18}$	
Simp	Simp Enter	$4\frac{12}{18} \mathbf{s} \mathbf{S} \qquad 4\frac{6}{9}$	
Fac	Fac	2	
	(Fac) (Simp) (Enter)	$4\frac{6}{9}$ s $4\frac{2}{3}$	
	Fac	3	
Frac, Uª⇔ª F↔D			
Frac		Un/d <u>n/d</u>	

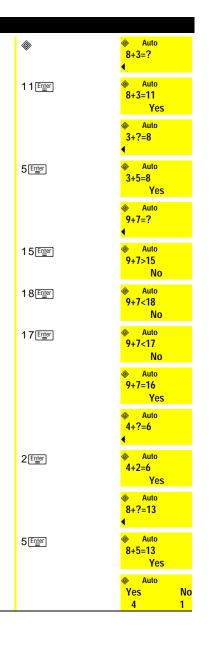
		<u></u>
	(Frac)	•
	3 Unit) 1 <u>n</u> 8 (a) + 1 Unit) 3 <u>n</u> 8 (a) Enter 3 n 8 (a) Enter	$3\frac{1}{8}+1\frac{3}{8}=\frac{\frac{N}{D}-\frac{n}{d}}{\frac{36}{8}}$
	Simp 4 Enter	$\frac{36}{8}$ > S4 $\frac{9}{2}$
Uª⇔ª	[]	$4\frac{1}{2}$
F⇔D	F⇔D	4.5
		4.5
<b>%</b>		

% ►%			
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	2 <u>∏</u> 5₫ <b>▶</b> % <sup>Enter</sup>	<sup>2</sup> / <sub>5</sub> ▶% 4	10%

$\land$		
$\overline{\mathbf{V}}$	√25) Etter	√(25)= 5
		5^2=         25
	8A13Enter	8^13= 5.498×10^11
π		
π	$\pi \times 3^{Enter}$	π×3= 3π
		π×4^2= 16π
	2+3×π <sup>Enter</sup>	<mark>2+3×π=</mark> 11.42477796
►M MR/MC		
	96+85 <sup>[[nter]</sup>	

	90 <u>+</u> 85 <u>Eu</u> er	96+85= 181
►M	÷2 <sup>Enter</sup> ►M <sup>Enter</sup>	M 181÷2= 90.5
	Clear	M •
	98+87 <sup>Enter</sup>	M 98+87= 185
	÷2 <sup>Enter</sup>	M 185÷2= 92.5
[MR/MC]		M 92.5+90.5= 183
	÷2 <sup>Enter</sup>	м 183÷2= 91.5
	MR/MC MR/MC 📾	•

Opl Op2		
	Op) (+) 5 Op)	Op1 +5
	2001	Op1 2+5 1 7
		0p1 7+5 2 12
		0p1 12+5 3 17
<u>Op2</u>	0p2 × 20p2	Op1 Op2 ×2
	3002	Op1 Op2 3×2 1 6
	Op2	Op1 Op2 6×2
		2 12 Op1 Op2 12+5 1 17
<b>a</b> i <b>a</b>		0.51
Clear Op		OP 1 OP 2 CLEAR
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Fix 0.1 (	<u>).01 (0.001 []. [0.] [0</u>	00.] [1000.]
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## CE

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15÷3⊗⊗4

15÷3>4

Yes

-1

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