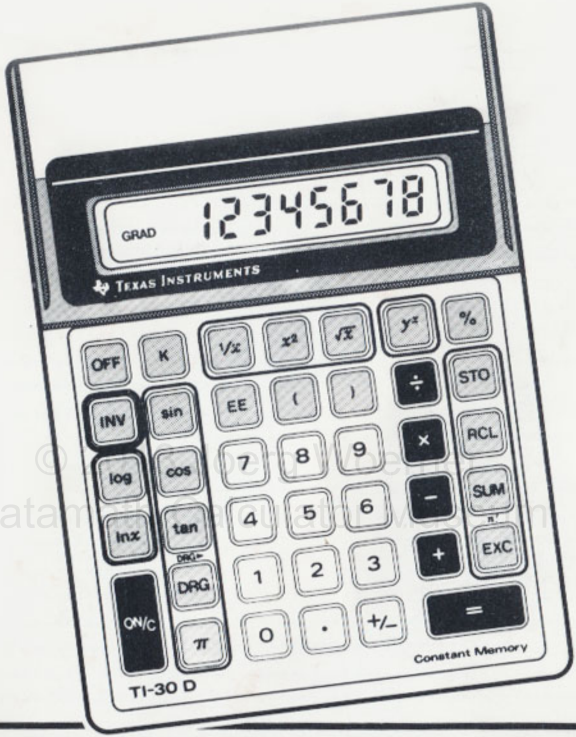


TI·30 D

TEXAS INSTRUMENTS

Texas Instruments
TI-30D

ENGLISH

CONTENTS

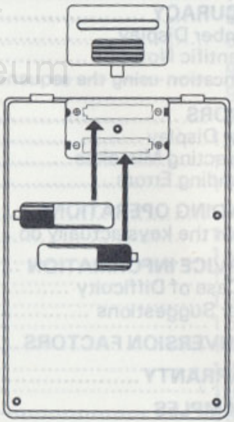
DESCRIPTION

Features and Functions

- Electronic ON and OFF switch with Automatic Power Down (APD). The calculator turns itself off completely after typically about 20 minutes of non-use. This feature can increase the life of each battery by up to 50%.
- AOS(*) - Algebraic method of entry allows you to enter mathematical sequences in the same order that they are algebraically stated.
- Constant Memory(*) holds numbers in user memory even while the calculator is turned off.
- Inverse function indicator tells you when the "inverse" key has been pressed.
- Over 5000 hours of operation can normally be obtained from a new set of batteries.
- 51 Calculator Functions.
- Accuracy - The internal calculating capacity is 11 digits even though only 8 can be displayed.

Battery Replacement

Your calculator uses two alkaline batteries: AA size, 1.5V. Installation is as shown:



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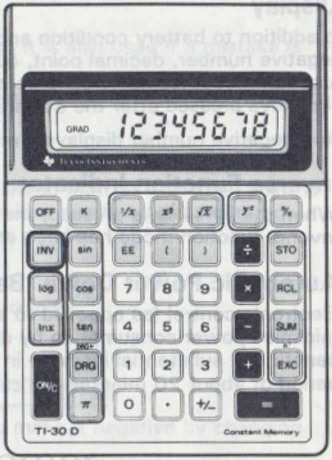
HOW TO USE YOUR CALCULATOR

The following pages describe how to use your calculator in arithmetic calculations, and give instructions on how to use each of the keys illustrated in the drawing opposite.



It is always good practice to find out how to use your calculator first by working with easy numbers. This allows you to check the calculation in your head. Every time you need to use an unfamiliar key you should experiment with questions to which you already know the answer. Thus the examples which we provide may seem rather trivial.
However, once you are confident with the way the calculator works you can go on to use more complicated numbers. So try the exercises we suggest first; if you want more easy examples you can think some up yourself. Then you can try some harder calculations. There are some at the back of the book if you want some suggestions.

The following instructions are intended for the beginner. If you want to know more about how the calculator works, some additional information is included on page 27. This additional section discusses accuracy and precedence, as well as describing the operations more fully.

Constant Memory

When the calculator is turned off and then back on, the display and all pending operations and operands are cleared. However, the user memory is left intact, because of the Constant Memory(*) feature.

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Display

In addition to battery condition and numerical information, the display provides indication of negative number, decimal point, overflow, underflow, angular mode, memory, error and inverse function mode. Numbers as large as 8 digits (7 to the right of the decimal) can be entered. All digit keys pressed after the 8th are ignored.

Any negative number displays a minus sign immediately to the left of the mantissa.

Inverse Function Indicator.

When the INV key is pressed, the ''INV'' indicator is displayed. This is to tell you that the inverse function mode has been selected, to help keep track of your calculation.

Automatic Power Down (Battery Saver)

Electronic control (as opposed to switch control) of ON and OFF, allows the calculator to minimise power consumption by displaying a number for only a limited length of time. The benefit is a substantial increase in the operating life of your batteries. If not interrupted for a period of about 20 minutes the calculator automatically turns itself off.

SIMPLE CALCULATIONS

$\boxed{\text{ON/C}}$ This key turns the calculator on and clears the display. It is also used if a mistake is made when keying in a number.

It is good practice to press $\boxed{\text{ON/C}}$ TWICE before the start of each new problem to clear the calculator of any unfinished business.

$\boxed{\text{OFF}}$ This key turns off the calculator.

$\boxed{0}$-$\boxed{9}$ To enter a number, press the digit keys reading from left to right. If a decimal point is needed, press $\boxed{\cdot}$; it will only appear on the display when another digit is entered.

For example, to enter 32.72, press $\boxed{3}$ $\boxed{2}$ $\boxed{\cdot}$ $\boxed{7}$ $\boxed{2}$

$\boxed{\quad 32.72}$ is now indicated on the display.

$\boxed{+/-}$ **How to change sign** This key changes the sign of the number currently on display.

It is also used to enter a negative number.

Example: Enter −32.72.

Pressing $\boxed{3}$ $\boxed{2}$ $\boxed{\cdot}$ $\boxed{7}$ $\boxed{2}$ $\boxed{+/-}$ displays $\boxed{\quad -32.72}$

Note that the number must be entered *first*. Then you make it negative by changing sign.

$\boxed{=}$ This key completes any preceding operation, such as +, −, × and ÷. See below.

$\boxed{\pi}$ This key enters the number π displaying $\boxed{\quad 3.1415927}$

$\boxed{+}$ **How to add** This key, together with $\boxed{=}$, adds two numbers.

Example: Find 3 + 4.

Pressing $\boxed{3}$ $\boxed{+}$ $\boxed{4}$ $\boxed{=}$, displays $\boxed{\quad 7}$

Notice that the calculation is keyed just as it is read, from left to right. This is a feature of the TI-30 D.

$\boxed{-}$ **How to subtract** This key together with $\boxed{=}$ subtracts one number from another.

Example: Find 3 − 4.

Pressing $\boxed{3}$ $\boxed{-}$ $\boxed{4}$ $\boxed{=}$ displays $\boxed{\quad -1}$

$\boxed{\times}$ **How to multiply** This key together with $\boxed{=}$ multiplies two numbers.

Example: Find 3 × 4.

Pressing $\boxed{3}$ $\boxed{\times}$ $\boxed{4}$ $\boxed{=}$ displays $\boxed{\quad 12}$

$\boxed{\div}$ This key together with $\boxed{=}$ divides one number by another.

How to divide

Example: Find 3 ÷ 4.

Pressing $\boxed{3}$ $\boxed{\div}$ $\boxed{4}$ $\boxed{=}$ displays $\boxed{0.75}$

! *WATCH OUT: If you try to divide by 0. the calculator displays* $\boxed{\textit{Error}}$

Try finding		
(i)	4 + 2	$\boxed{6}$
(ii)	4 − 2	$\boxed{2}$
(iii)	4 × 2	$\boxed{8}$
(iv)	4 ÷ 2	$\boxed{2}$

$\boxed{\textit{Error}}$ When $\boxed{\textit{Error}}$ is displayed, no further calculation is possible until $\boxed{\text{ON/C}}$ is pressed. The entire calculation to date is lost.

$\boxed{\%}$ This key expresses a percentage as a decimal.

How to find percentages

Example: 3% means $\frac{3}{100}$ or 0.03 and

Pressing $\boxed{3}$ $\boxed{\%}$ displays $\boxed{0.03}$

$\boxed{\%}$ can be used to add, subtract, multiply or divide the number currently displayed by a given percentage. This allows quick calculation for discount, VAT, etc.

Example: Find 10% of 20.

Pressing $\boxed{2}$ $\boxed{0}$ $\boxed{X}$ $\boxed{1}$ $\boxed{0}$ $\boxed{\%}$ $\boxed{=}$ displays $\boxed{2}$

Example: Find 20 + 10%

Pressing $\boxed{2}$ $\boxed{0}$ $\boxed{\div}$ $\boxed{1}$ $\boxed{0}$ $\boxed{\%}$ $\boxed{=}$ displays $\boxed{200}$

In general when $\boxed{\%}$ is pressed after $\boxed{+}$, $\boxed{-}$, $\boxed{X}$ or $\boxed{\div}$, a percentage is added, subtracted, multiplied or divided.

Appropriate key sequences are

$$\left.\begin{array}{l}\boxed{+}\\ \boxed{-}\\ \boxed{X}\\ \boxed{\div}\end{array}\right\}\ n\ \boxed{\%}\ \boxed{=}\quad\begin{array}{l}\text{adds n\% to the number displayed}\\ \text{subtracts n\% from the number displayed}\\ \text{multiplies the number displayed by n\%}\\ \text{divides the number displayed by n\%}\end{array}$$

Try finding		
(i)	20% of 100	$\boxed{20}$
(ii)	0.3% of 200	$\boxed{0.6}$
(iii)	£30 + 15%	$\boxed{34.5}$

MORE COMPLICATED CALCULATIONS

[(] [)] How to cope with expressions in **brackets**

Brackets are used in mathematics to indicate a subcalculation, a calculation which must first be evaluated before the rest of the calculation can be completed. (For example, in 2 × (3 + 2) you must first work out 3 + 2 before you can multiply by 2 to get 10.) The TI-30 D is already equipped with brackets so that you can key a calculation just as it is written. Closing with a right bracket completes the calculation begun by the corresponding left bracket.

Example: Find (5 × 7)

Pressing [(] [5] [X] [7] [)] displays 35

The right bracket [)] acts like [=] on all operations after the preceding left bracket [(].

Example: Find 1 + (5 × 7)

Pressing [1] [+] [(] [5] [X] [7] [)] [=] displays 36

After pressing [1] [+] the calculator displays 1

Then [(] [5] [X] [7] [)] displays 35

Pressing [=] completes the calculation, giving 36

Try finding (i) (2 + 3) 5
(ii) 3 − (2 + 3) −2
(iii) 1 + (2 + (3 + 4)) 10

Implied Brackets

It is conventional when writing down arithmetic expressions to interpret 1 + 5 × 7 as meaning 1 + (5 × 7). In other words, multiplication (and division) have **implied** brackets. The TI-30 D also follows this convention.

Example: Find 1 + 5 × 7

Pressing [1] [+] [5] [X] [7] [=] displays 36

The TI-30 D has treated this calculation as though there were brackets around 5 × 7. Division is given similar precedence.

Example: Find 2 − 8 ÷ 4.

Pressing [2] [−] [8] [÷] [4] [=] displays 0

The TI-30 D treats this calculation as though there were brackets around 8 ÷ 4.

Try finding (i) 2 + (4 × 3) 14
(ii) 3 − (2 × 4) −5

(iii) 6 − (8 ÷ 4) $\boxed{4}$

Now try doing these examples again without using brackets.

How to perform longer calculations

In a sequence of only addition and subtraction there is no need to use brackets. The calculation is keyed just as it is read, from left to right.

Example: Find 2 − 3 + 4 − 5 + 6 − 7.

Pressing $\boxed{2}$ $\boxed{-}$ $\boxed{3}$ $\boxed{+}$ $\boxed{4}$ $\boxed{-}$ $\boxed{5}$ $\boxed{+}$ $\boxed{6}$ $\boxed{-}$ $\boxed{7}$ $\boxed{=}$

displays $\boxed{-3}$

The calculation is performed step by step. Each $\boxed{+}$ or $\boxed{-}$ completes the previous step.

Pressing $\boxed{2}$ $\boxed{-}$ $\boxed{3}$ $\boxed{+}$ displays $\boxed{-1}$

Pressing $\boxed{2}$ $\boxed{-}$ $\boxed{3}$ $\boxed{+}$ $\boxed{4}$ $\boxed{-}$ displays $\boxed{3}$ and so on.

Similarly a sequence of only multiplication and division is also performed step by step, reading from left to right.

Example: Find 3 ÷ 4 × 8 ÷ 2 × 5 × 4.

Pressing $\boxed{3}$ $\boxed{\div}$ $\boxed{4}$ $\boxed{\times}$ $\boxed{8}$ $\boxed{\div}$ $\boxed{2}$ $\boxed{\times}$ $\boxed{5}$ $\boxed{\times}$ $\boxed{4}$ $\boxed{=}$

displays $\boxed{60}$

Each $\boxed{\times}$ or $\boxed{\div}$ completes the previous step.

Pressing $\boxed{3}$ $\boxed{\div}$ $\boxed{4}$ $\boxed{\times}$ displays $\boxed{0.75}$

Pressing $\boxed{3}$ $\boxed{\div}$ $\boxed{4}$ $\boxed{\times}$ $\boxed{8}$ $\boxed{\div}$ displays $\boxed{6}$ and so on.

WATCH OUT. $\frac{5}{6 \times 4}$ *needs brackets, since this is really 5 ÷ (6 × 4).*

Pending operations

However, sequences which mix $\boxed{+}$ $\boxed{-}$ with $\boxed{\times}$ or $\boxed{\div}$ involve pending operations.

The section on implied brackets indicates that the TI-30 D computes 1 + 5 × 7 as you might expect. The multiplication is done first. $\boxed{+}$ is held *pending* until the multiplication is completed.

Similarly, in evaluating 2 − 8 ÷ 4, $\boxed{-}$ is held pending while the division is carried out first. In all sequences involving +, −, ×, ÷, $\boxed{+}$ and $\boxed{-}$ are held pending whilst the sequence of $\boxed{\times}$ and $\boxed{\div}$ is in process.

See also the section on Pending Operations in the Additional Information Section.

Example: Find 1 + 6 ÷ 9 × 15 − 2.

Pressing $\boxed{1}$ $\boxed{+}$ $\boxed{6}$ $\boxed{\div}$ $\boxed{9}$ $\boxed{X}$ $\boxed{1}$ $\boxed{5}$ $\boxed{-}$ $\boxed{2}$ $\boxed{=}$ displays $\boxed{9}$

The sequence is keyed just as it is written, from left to right. Notice what is displayed at each stage.

Pressing	*Displays*	
$\boxed{1}$ $\boxed{+}$	1	
$\boxed{6}$ $\boxed{\div}$	6	$\boxed{+}$ is held pending
$\boxed{9}$ $\boxed{X}$	0.6666667	6 ÷ 9 is evaluated and $\boxed{+}$ is still held pending
$\boxed{1}$ $\boxed{5}$ $\boxed{-}$	11	$\boxed{+}$ is completed
$\boxed{2}$ $\boxed{=}$	9	

$\boxed{K}$ This key allows the addition, subtraction, multiplication or division of several different numbers by a fixed number.

How to perform **Repeated Operations**

Example: Multiply 6, 4, 8 and 10 by 2.

Pressing $\boxed{2}$ $\boxed{X}$ $\boxed{K}$ displays $\boxed{2}$

This sequence identifies the constant multiplier 2. Consequent multiplication of numbers by this constant multiplier is illustrated by the examples below.

Pressing	Displays
$\boxed{6}$ $\boxed{=}$	12
$\boxed{4}$ $\boxed{=}$	8
$\boxed{8}$ $\boxed{=}$	16
$\boxed{1}$ $\boxed{0}$ $\boxed{=}$	20

In general $\boxed{\text{Any number}}$ $\boxed{=}$ displays the number multiplied by 2.

Similarly, pressing $\boxed{2}$ $\boxed{+}$ $\boxed{K}$ indicates that 2 is a constant adder; $\boxed{2}$ $\boxed{-}$ $\boxed{K}$ indicates that 2 is to be subtracted from each number. $\boxed{2}$ $\boxed{\div}$ $\boxed{K}$ indicates that 2 is a constant divider; the sequence $\boxed{\text{Number}}$ $\boxed{=}$ now divides that number by 2.

Note that $\boxed{2}$ $\boxed{\div}$ $\boxed{4}$ $\boxed{=}$ displays $\boxed{0.5}$

whereas $\boxed{2}$ $\boxed{\div}$ $\boxed{K}$ $\boxed{4}$ $\boxed{=}$ displays $\boxed{2}$

Try dividing each of the following numbers by 10. You will first need to identify 10 as a constant divisor: press `1` `0` `÷` `K`.

(i)	20	2
(ii)	400	40
(iii)	4.7	0.47

`K` can also be used together with `yˣ`. This allows you to find the xth powers of various numbers.

For example, pressing `3` `yˣ` `K` prepares the calculator to compute the cube of the number entered.

Thus `3` `=` displays	27	($= 3^3$)
`4` `=` displays	64	($= 4^3$)

and so on.

Similarly, `K` together with `INV` `yˣ` allows you to find the xth root of various numbers.

For more details on how to use `yˣ` see the section on `yˣ` under ''How To Use The Special Function Keys''.

Clearing the calculator or pressing any arithmetic operation (i.e. +, −, ×, ÷) cancels the constant that is stored.

SPECIAL FUNCTION KEYS

These function keys do not interfere with the calculation in process. They replace the value currently on display with its function value.

Thus FUNCTION keys can be used at any stage of a calculation.

(Notice that the display is blank for a short time as the calculator computes the result. **DO NOT PRESS the next key until the function value is displayed.**)

The action of each key is described in detail below.

$\boxed{x^2}$ This key squares the number currently on display, so to find the square of a given number you must first enter that number.

How to find **Squares**

Example: Find 2^2.

Pressing $\boxed{2}$ $\boxed{x^2}$ displays $\boxed{4}$

There is no need to press $\boxed{=}$.

After pressing $\boxed{2}$ the calculator displays $\boxed{2}$ and $\boxed{x^2}$ now replaces 2 with 2^2 $(=4)$.

Now try pressing $\boxed{2}$ $\boxed{x^2}$ $\boxed{x^2}$ $\boxed{x^2}$ to get 4, 16, 256 in succession.

$\boxed{x^2}$ can be used at any stage in a calculation.

Example: Find $5 + 2^2 - 6$.

Pressing $\boxed{5}$ $\boxed{+}$ $\boxed{2}$ $\boxed{x^2}$ $\boxed{-}$ $\boxed{6}$ $\boxed{=}$ displays $\boxed{3}$

After pressing $\boxed{2}$ the calculator displays $\boxed{2}$ and $\boxed{x^2}$ replaces 2 with 2^2 $(=4)$ without affecting the rest of the calculation.

Example: Find $(5 + 2)^2 - 6$.

Pressing $\boxed{(}$ $\boxed{5}$ $\boxed{+}$ $\boxed{2}$ $\boxed{)}$ $\boxed{x^2}$ $\boxed{-}$ $\boxed{6}$ $\boxed{=}$ displays $\boxed{43}$

Try finding (i) 4^2 $\boxed{16}$

(ii) $3 + 4^2 + 7$ $\boxed{26}$

(iii) $(3 + 4)^2 + 7$ $\boxed{56}$

$\boxed{\sqrt{x}}$ How to find **Square Roots**

This key finds the positive square root of the number currently on display, so to find the square root of a given number, you must first enter that number.

Example: Find $\sqrt{4}$.

Pressing $\boxed{4}$ $\boxed{\sqrt{x}}$ displays $\boxed{2}$

There is no need to press $\boxed{=}$.

After pressing $\boxed{4}$ the calculator displays $\boxed{4}$ and $\boxed{\sqrt{x}}$ replaces 4 with $\sqrt{4}(=2)$.

Continual pressing of $\boxed{\sqrt{x}}$ displays a succession of square roots 2, 1.41423136, 1.1892071...

$\boxed{\sqrt{x}}$ can be used at any stage of a calculation.

Example: Find $5 + \sqrt{4} - 2$.

Pressing $\boxed{5}$ $\boxed{+}$ $\boxed{4}$ $\boxed{\sqrt{x}}$ $\boxed{-}$ $\boxed{2}$ $\boxed{=}$ displays $\boxed{5}$

After pressing $\boxed{4}$ the calculator displays $\boxed{4}$ and $\boxed{\sqrt{x}}$ replaces 4 with $\sqrt{4}$ (= 2) without affecting the rest of the calculation.

Example: Find $\sqrt{5 + 4} - 6$.

Pressing $\boxed{5}$ $\boxed{+}$ $\boxed{4}$ $\boxed{=}$ $\boxed{\sqrt{x}}$ $\boxed{-}$ $\boxed{6}$ $\boxed{=}$ displays $\boxed{-3}$

After pressing the first $\boxed{=}$ the calculator displays $\boxed{9}$ and $\boxed{\sqrt{x}}$ replaces 9 with $\sqrt{9}(=3)$.

This example may, of course be written $\sqrt{(5 + 4)} - 2$ and correctly evaluated using brackets instead of the $\boxed{=}$ key. Viz: $\boxed{(}$ $\boxed{5}$ $\boxed{+}$ $\boxed{4}$ $\boxed{)}$ $\boxed{\sqrt{x}}$ $\boxed{-}$ $\boxed{2}$ $\boxed{=}$.

! *WATCH OUT. If you try to find the square root of a negative number, the calculator displays* $\boxed{\textit{Error}}$.

Try finding (i) $\sqrt{16}$ $\boxed{4}$

(ii) $3 + \sqrt{16} + 2$ $\boxed{9}$

(iii) $\sqrt{9 + 16} - 2$ $\boxed{3}$

$\boxed{1/x}$ How to find **Reciprocals**

This key finds the reciprocal of the number currently on display, so to find the reciprocal of a given number you must first enter that number.

Example: Find $\frac{1}{5}$

Pressing $\boxed{5}$ $\boxed{1/x}$ displays $\boxed{0.2}$. There is no need to press $\boxed{=}$.

After pressing $\boxed{5}$ the calculator displays $\boxed{5}$ and $\boxed{1/x}$ replaces 5 with $\frac{1}{5}(=0.2)$.

Repeated pressing of $\boxed{1/x}$ alternately gives 0.2, 5, 0.2, 5... $\boxed{1/x}$ can be used at any stage of a calculation.

Example: Find $3 + \frac{1}{5} + 1$.

Pressing $\boxed{3}$ $\boxed{+}$ $\boxed{5}$ $\boxed{1/x}$ $\boxed{+}$ $\boxed{1}$ $\boxed{=}$ displays $\boxed{4.2}$

After pressing $\boxed{5}$ the calculator displays $\boxed{7}$ and $\boxed{1/x}$ replaces 5 with $\frac{1}{5}$ (=0.2) without affecting the rest of the calculation.

Example: Find $\frac{1}{3+5} + 1$.

Pressing $\boxed{3}$ $\boxed{+}$ $\boxed{5}$ $\boxed{=}$ $\boxed{1/x}$ $\boxed{+}$ $\boxed{1}$ $\boxed{=}$ displays $\boxed{1.125}$

After pressing the first $\boxed{=}$, the calculator displays $\boxed{8}$ and $\boxed{1/x}$ replaces 8 with $\frac{1}{8}$ (=0.125).

! *WATCH OUT. If you try to find the reciprocal of 0 the calculator displays* $\boxed{\textit{Error}}$.

Try finding: (i) $\frac{1}{2}$ $\boxed{0.5}$

(ii) $3 + \frac{1}{2} - 2$ $\boxed{1.5}$

(iii) $\frac{1}{3+2} + 4$ $\boxed{4.2}$

INV $\boxed{\text{INV}}$ can be used in conjunction with any of the function keys written in blue. In these cases $\boxed{\text{INV}}$ selects the inverse of the function (i.e. it ''undoes'' the function).

Two keys have dual purposes. In these cases $\boxed{\text{INV}}$ selects the second function marked on the key. (These special cases are $\boxed{\text{EXC}}$/$\boxed{\text{n!}}$ and $\boxed{\text{DRG}}$; they are explained.in more detail under the appropriate heading.)

INV n Fixing the number of decimal places The function $\boxed{\text{INV}}$ **n** allows you to select the number of displayed digits after the decimal point. To do this you need to press $\boxed{\text{INV}}$ n where n is from 0 to 7 and represents the number of decimal places. The calculator rounds the displayed results to the number of places selected, while keeping the internal accuracy of 11 digits. $\boxed{\text{INV}}$ n can be used also to fix the number of decimal digits in scientific notation. If the calculator is in the normal display format and the calculated result exceeds ±99999999 or is below ±00000001, the display automatically converts to scientific notation.

To reset the calculator to normal display format, press $\boxed{\text{INV}}$ 0, $\boxed{\text{INV}}$ 8, $\boxed{\text{INV}}$ 9 or turn the calculator OFF and then ON.

[log]

How to find Common Logs

This key finds the common log (or log to base 10) of the number currently on display, so to find the log of a given number you must first enter that number.

Example: Find $\text{Log}_{10}2$

Pressing [2] [log] displays [0.30103]

There is no need to press [=].

After pressing [2] the calculator displays [2]

and [log] replaces 2 with $\log_{10}2$ (=0.30103).

[log] can be used at any stage of a calculation.

Example: Find $\log_{10}4 + \log_{10}2 - \log_{10}8$.

Pressing [4] [log] [+] [2] [log] [−] [8] [log] [=] displays [0]

Throughout the calculation [log] replaces each number with its log to base 10.

! *WATCH OUT. Occasionally when expecting a zero result you may find a result such as* [−1. −10].

eg $\log_{10}2 + \log_{10}7 - \log_{10}14 = 0$ [−1. −10]

This is -1×10^{-10} in scientific notation and whilst not exactly 0 is very small. This happens due to rounding of functions such as log, sin etc. See also "Additional Information" on page 27.

! *WATCH OUT. If you try to find the log of a negative number or zero the calculator displays* [Error].

Try finding (i) $\log_{10}7$ [0.845098]

(ii) $\log_{10}(2 \times 7) - \log_{10}7$ [0.30103]

(iii) $\log_{10}2 + \log_{10}14 - \log_{10}4$ [0.845098]

! *WATCH OUT. One of the traditional operations with logs has been to assist with complicated multiplication and division using tables to obtain the logs/antilogs. This has required a special convention for handling logs of numbers between 0 — 1 . These are expressed as the log of a number between 1 — 10 (which is positive) and a negative power of 10 to correct the position of the decimal point.*

Example: $\log 0.7 = \bar{1}.845098 = -1 + .845098 = -0.154902$

$\log 0.02 = \bar{2}.30103 = -2 + .30103 = -1.69897$

Your TI-30 D calculator will not use this convention but will express the logarithm correctly as a negative number.

$\boxed{\text{INV}}$ $\boxed{\text{log}}$ This combination of keys "undoes" the log function. It replaces the number currently on display with its antilog, so to find the antilog of a given number you must first enter that number.

How to find **Antilogs** (or 10^x)

Example: Find the antilog of 2 (or 10^2).
(This means, find the number x where $\log_{10}x = 2$)

Pressing $\boxed{2}$ $\boxed{\text{INV}}$ $\boxed{\text{log}}$ displays $\boxed{100}$

There is no need to press $\boxed{=}$. After $\boxed{2}$ the calculator displays $\boxed{2}$ and $\boxed{\text{INV}}$ $\boxed{\text{log}}$ replaces 2 with antilog of 2 (= 100).

! *WATCH OUT.* $\boxed{3}$ $\boxed{\text{log}}$ $\boxed{\text{INV}}$ $\boxed{\text{log}}$ *displays* $\boxed{3}$

After pressing the first $\boxed{\text{log}}$ *the calculator displays* $\boxed{0.4771213}$

But if you enter 0.4771213 and press $\boxed{\text{INV}}$ $\boxed{\text{log}}$ *to find the antilog, the calculator displays* $\boxed{3.0000003}$.

This is because $\log_{10}3$ *is actually stored as 0.47712125468 but only 8 digits are displayed. See also "ACCURACY" on page 27.*

Try finding: (i) the antilog of 3 $\boxed{1000}$

(ii) the antilog of −0.613 $\boxed{0.2437811}$

! *WATCH OUT. If you want to check this in your old log tables you must convert −0.613 to* $\bar{1}.387$ *since the convention in log tables is to keep the decimal portion of the log positive and adjust the decimal point of the antilog by using the +ve or −ve whole number prefix.*

eg log 0.02 = −1.69897 = (conventionally) $\bar{2}.30103$

log 0.002 = −2.69897 = (conventionally) $\bar{3}.30103$

$\boxed{\ln x}$ This key finds the natural log (or log to base *e*) of the number currently on display, so to find the natural log of a given number you must first enter that number.

Example: Find $\log_e 3$.

Pressing $\boxed{3}$ $\boxed{\ln x}$ displays $\boxed{1.0986123}$. There is no need to press $\boxed{=}$.

$\boxed{\ln x}$ can be used at any stage of a calculation.

Example: Find $\log_e 2 + \log_e 3 - \log_e 6$.

Pressing $\boxed{2}$ $\boxed{\ln x}$ $\boxed{+}$ $\boxed{3}$ $\boxed{\ln x}$ $\boxed{-}$ $\boxed{6}$ $\boxed{\ln x}$ $\boxed{=}$ displays $\boxed{0}$

Throughout the calculation $\boxed{\ln x}$ replaces each number with its log to base *e*.

! *WATCH OUT. If you try to find the log of a negative number or zero, the calculator displays* $\boxed{\text{Error}}$.

Try finding (i) $\log_e 7$ 1.9459101

(ii) $\log_e 0.5$ −0.6931472

(iii) $1 + \log_e 0.5$ 0.3068528

INV lnx

How to find e^x

This combination of keys "undoes" the natural log function. It replaces the number, x, currently on display with e^x. So to find e^x for a given number x you must first enter the number x.

Example: Find e^2

Pressing 2 INV lnx displays 7.3890561. There is no need to press =.

After pressing 2 the calculator displays 2 and INV lnx replaces 2 with e^2 (= 7.3890561) without affecting the rest of the calculation.

Example: Find $e^{(3 + 2)} + 1$

Pressing 3 + 2 = INV lnx + 1 = displays 149.41316

After pressing the first = the calculator displays 5 and INV lnx replaces 5 with e^5 (= 148.41316)

Try finding: (i) e^4 54.59815

(ii) $e^{-0.1}$ 0.9048374

(iii) $3 + e^{-0.1}$ 3.9048374

y^x

How to find Powers

This key evaluates powers of positive numbers. Unlike the other function keys y^x *does* require the use of =.

Example: Find 2^3.

Pressing 2 y^x 3 = displays 8. In general y^x finds the x^th power of the number y.

The key sequence is number y^x power =

Multiplication and division have inbuilt precedence over addition and subtraction. For example, to evaluate 1 + 5 × 7 you need only key 1 + 5 X 7 = to get 36. The addition is held pending while the calculator treats the calculation as though there were brackets around (5 × 7). In the same way y^x has inbuilt precedence over addition, subtraction, multiplication and division. These operations are held pending while the power is evaluated. Again the intermediate result is not displayed but the calculator treats the calculation as though there were brackets around the power.

Example: Find $1 + 2^3$.

Pressing [1] [+] [2] [y^x] [3] [=] displays [9]

At no stage of the calculation does the calculator display 2^3 (=8). However it treats the calculation as though there were brackets around 2^3 and evaluates this first before adding 1.

! *WATCH OUT. If you try to find the power of a negative number (e.g. $(-2)^3$), using* [y^x] *the calculator displays* [Error].

But you CAN still calculate powers of negative numbers if you use some mathematical reasoning. It depends on whether the power is odd or even. Remember that, if m is any odd number $(-a)^m = -(a^m)$, and if m is any even number $(-a)^m = a^m$.

Try finding: (i) 3^3 [27]

(ii) $1 + 3^3$ [28]

(iii) $1 + 3^3 + 1$ [29]

[INV] [y^x] How to find **Roots**

This combination of keys finds the positive xth root of a positive number. It too requires the use of [=].

Example: Find $\sqrt[3]{8}$ (or $8^{1/3}$).

Pressing [8] [INV] [y^x] [3] [=] displays [2]

In general [INV] [y^x] is used in the same ways as [y^x].

! *WATCH OUT. If you try to find the root of a negative number the calculator displays* [Error].

Try finding: (i) $\sqrt[4]{16}$ [2]

(ii) $(27)^{1/3}$ [3]

(iii) $1 + (27)^{1/3}$ [4]

[INV] [n!] How to find **Factorials**

This is a dual purpose key. [INV] [n!] selects the second function, n!

Example: Find 5! (5! = 5 × 4 × 3 × 2 × 1).

Pressing [5] [INV] [n!] displays [120]

There is no need to press [=].

Try finding: (i) 3! [6]

(ii) 4! [24]

! *WATCH OUT.* n *must be an integer, $1 \leqslant n \leqslant 69$. 0! is defined as 1 and this will be displayed by the calculator. Any other values of* n *will cause* [Error] *to be displayed.*

TRIGONOMETRIC FUNCTIONS

The following keys work on the assumption that the number entered is an ANGLE measured in degrees, radians or grads (where 90 degrees = $\frac{\pi}{2}$ radians = 100 grads). The TI-30 D works in each of these three modes. When you first switch the calculator on it *assumes* that angles are measured in degrees. This is the normal operating mode and ''DEG'' appears in the display.

DRG How to change the **Angular Mode**

DRG changes the operating mode of the calculator. When you first switch the calculator on, it is in the degree mode and displays 0. DEG.

Thus it *assumes* that any angles are measured in degrees. If you now press DRG the calculator displays 0. RAD.

(There is no need to press =). This indicates that the calculator is now operating in radian mode and *assumes* that any angles are measured in radians.

Pressing DRG a second time displays 0. GRAD

This indicates that the calculator is now operating in the grad mode and *assumes* angles are measured in grads.

Pressing DRG a third time returns the calculator to degree mode.

You can change the mode at any time, even *after* you have entered an angle.

Note that DRG does not actually convert angles from degrees to radians, it just changes the way the calculator ''thinks'' of angles. When finding sines, cosines and tangents, it is important to ensure that the calculator is in the appropriate mode.

Note when the calculator is in the degree mode, angles are indicated in decimals *not* degrees, minutes and seconds. Thus you must use the degrees and decimals of degrees format to enter an angle (not degrees, minutes and seconds).

INV DRG How to convert from Degrees to Radians

In fact DRG is a dual purpose key, and INV DRG converts angle measurement from degrees to radians (and vice versa).

Example: Convert 30° to radians.

Pressing 3 0 INV DRG displays 0.5235988 RAD

There is no need to press =.

The display also indicates that the calculator is now operating in radian mode. Any angles are now assumed to be measured in radians.

Thus INV DRG converts the angle currently on display *and* changes the mode.

Pressing INV DRG a second time converts the angle to grads, and changes the mode to grads.

Example: Convert 1 radian to degrees.

Pressing DRG 1 INV DRG INV DRG
or 1 DRG INV DRG INV DRG displays DEG 57.29578

To ensure that the calculator thinks of "1" as 1 radian it must be operating in radian mode.

Pressing INV DRG the first time converts to grads.
Pressing INV DRG a second time converts to degrees.
Thus 1 radian = 57.29578 degrees.

Try (i) converting 100° to radians 1.7453293 RAD

(ii) converting π radians to degrees (use π key) DEG 180

(iii) converting π/4 radians to degrees DEG 45

(iv) converting 45° to radians 0.7853982 RAD = π/4

sin How to find Sines

sin finds the sine of the number currently on display. You must first ensure that the calculator is operating in the right mode.

Example: Find sin 30°.

Pressing 3 0 sin displays DEG 0.5

There is no need to press =.

Since the normal operating mode is degrees, this is quite straightforward; the calculator automatically assumes that angles are measured in degrees. If the angle is measured in radians you must change the mode accordingly.

Example: Find sin 1 (i.e. 1 radian).

You must ensure that the calculator is in radian mode.

Pressing 1 DRG sin
or DRG 1 sin displays 0.841471 RAD

`INV` `sin` How to find **$\sin^{-1}$ or arc Sin**

This combination of keys finds $\sin^{-1}$ or arcsin (giving the angle between $-90°$ and $+90°$).

Example: Find $\sin^{-1} 0.5$ (or arc sin 0.5).

Pressing `0` `•` `5` `INV` `sin` displays `DEG 30` (i.e. $\sin^{-1} 0.5 = 30°$)

Since the normal operating mode is degrees, unless you change the mode specifically, `INV` `sin` computes the angle in degrees. You can change the mode at any time and then `INV` `sin` will give the result in radians.

(e.g. `0` `•` `5` `DRG` `INV` `sin` displays `0.5235988 RAD`

i.e. $\sin^{-1} 0.5 = 0.5235988$ radians.

! *WATCH OUT. If you try to find $\sin^{-1}$ of a number bigger than 1 or less than -1, the calculator displays* `Error`.

`cos` How to find **Cosines**

`cos` finds the cosine of the number currently on display. Again you must ensure that the calculator is operating in the appropriate mode.

Example: Find cos 60°.

Pressing `6` `0` `cos` displays `DEG 0.5`. There is no need to press `=`.

If the angle is measured in radians you must change the mode accordingly.

Example: Find cos 1 (i.e. 1 radian).

First ensure that the calculator is in radian mode.

Pressing `1` `DRG` `cos` displays `0.5403023 RAD`

or `DRG` `1` `cos`

`INV` `cos` How to find **$\cos^{-1}$ or arc Cos**

This combination of keys finds $\cos^{-1}$ (or arc cos) giving the angle between 0° and 180°.

Example: Find $\cos^{-1} 0.5$.

Pressing `0` `•` `5` `INV` `cos` displays `DEG 60`

and

pressing `0` `•` `5` `DRG` `INV` `cos` displays `1.0471976 RAD`

(i.e. $\cos^{-1} 0.5 = 60° = 1.0471976$ radians.)

! *WATCH OUT. If you try to find $\cos^{-1}$ of a number bigger than 1 or less than -1 the calculator displays* `Error`.

`tan` How to find **Tangents**

`tan` finds the tangent of the number currently on display. Again you must ensure that the calculator is operating in the appropriate mode.

Example: Find tan 45°.

Pressing `4` `5` `tan` displays `DEG 1`. There is no need to press `=`.

If the angle is measured in radians, you must change the mode accordingly.

Example: Find tan 1 (i.e. 1 radian).

Pressing [1] [DRG] [tan] or [DRG] [1] [tan] displays [1.5574077 RAD]

! *WATCH OUT. If you try to find tan 90° the calculator displays* [*Error*].

[INV] [tan] How to find Tan^{-1} (arc Tan)

This combination of keys finds tan^{-1} (or arc tan) giving the angle between −90° and +90°.

Example: Find tan^{-1} 1.

Pressing [1] [INV] [tan] displays [45 DEG]

and pressing [1] [DRG] [INV] [tan] displays [0.7853982 RAD]

(i.e. tan^{-1}1 = 45° = 0.7853982 radians.)

Try finding:

(i)	(a)	sin 60°	0.8660254 DEG
	(b)	cos 2 (radians)	0.4161468 RAD
	(c)	tan 3 (radians)	0.1425465 RAD
(ii)	(a)	$\sin^{-1}$ 1 (degrees)	90 DEG
	(b)	$\cos^{-1}$ 1 (degrees)	0 DEG
	(c)	$\tan^{-1}$ 5 (radians)	1.3734008 RAD

[sin], [cos] and [tan] (and their inverses) can be used at any stage of a calculation, since they replace the value currently on display with its function value.

Example: Find 3 × tan 45°.

Pressing [3] [X] [4] [5] [tan] [=] displays [3 DEG]

Example: Find 2 ÷ cos $\frac{\pi}{3}$.

Pressing [2] [÷] [(] [π] [÷] [3] [)] [DRG] [cos] [=] displays [4 RAD]

In addition you can change the mode at any stage of the calculation before pressing [cos].

Thus [DRG] [2] [÷] [(] [π] [÷] [3] [)] [cos] [=]
[2] [DRG] [÷] [(] [π] [÷] [3] [)] [cos] [=] all display [4]
[2] [÷] [DRG] [(] [π] [÷] [3] [)] [cos] [=]

Note that you must insert brackets around π/3.

PRECEDENCE

Standard algebraic rules for the combination of operations have been programmed into the calculator. These algebraic rules assign priorities or precedence to various mathematical operations.

For example: multiplication has precedence over addition.

Thus $1 + 5 \times 7$ is evaluated to give 36.

The complete list of priorities for interpreting expressions is:

1. Special functions (trigonometric, logarithmic, square, square root and reciprocal).
2. Exponentation (y^x). Roots ($\sqrt[x]{y}$).
3. Multiplication. Division.
4. Addition. Subtraction.
5. Equals.

Functions in 1 have precedence over those in 2. Both these categories have precedence over the operations under 3 and so on.

This inbuilt precedence means that many calculations can be keyed in just as they are written.

Example: $4 \div 5^2 \times 7 + 3 \times \sin 30^{\circ\cos 60^\circ} = 3.2413203.$

Pressing:	*Display*	*Comments*
4 ÷	DEG 4	(4÷) is stored.
5 x^2	DEG 25	(5^2) is evaluated immediately.
X	DEG 0.16	($4\div5^2$) is evaluated because x is same priority as ÷.
7 +	DEG 1.12	($4\div5^2\times7$) is evaluated and + is stored since x is higher priority than +.
3 X	DEG 3	(3×) stored.
3 0 sin y^x	DEG 0.5	Sin 30° is evaluated immediately; y^x stored.
6 0 cos	DEG 0.5	Cos 60° is evaluated immediately.
=	DEG 3.2413203	This completes all operations: $\sin 30^{\circ\cos 60^\circ}$ is evaluated, then $3 \times \sin 30^{\circ\cos60^\circ}$ which is added to 1.12.

Thus, by entering the expression just as it is written the calculator correctly interprets this as: $((4 \div 5^2) \times 7) + (3 \times \sin 30^{\circ\cos 60^\circ})$. This enables you to perform complicated calculations directly on the keyboard. When you have a special case where this hierarchy of interpretation does not give you the results you require, use parentheses to clarify the mathematical expression for the calculator.

SCIENTIFIC NOTATION

EE

To enter very large or very small numbers you must use scientific notation. To enter a number in scientific notation the number must first be written as a number between 1 and 10 multiplied by a power of 10.

Example: 123 = 1.23 × 10^2.

Pressing 1 • 2 3 EE 2 displays 1.23 02

The number is entered in scientific notation.

EE =

How to convert from decimal form to scientific notation

Pressing EE together with any operating key (e.g. + − X ÷ or =) converts the number currently on display to scientific notation.

Example: Convert 123 to scientific notation.

Entering 1 2 3 displays 123

Pressing 1 2 3 EE displays 123 00

Pressing 1 2 3 EE + or 1 2 3 EE − etc. displays 1.23 02

i.e. 123 = 1.23 × 10^2.

Note that EE +/− changes the sign of the exponent.

Example: Pressing 3 EE +/− 2 displays 3 −02

This has entered 3 × 10^{-2} or 0.03.

Once the calculator is working in scientific notation, it will convert all numbers subsequently entered into scientific notation until directed otherwise.

Example: Find 12 + 17 − 13.

Pressing 1 2 EE + displays 1.2 01

Pressing 1 2 EE + 1 7 − 1 3 = displays 1.6 01

The calculator automatically converts 17 and 13 to scientific notation before adding or subtracting.

Pressing ON/C directs the calculator to input numbers in decimal form again.

INV EE

How to convert scientific notation to decimal form

Pressing INV EE converts the number on display from scientific notation to decimal form.

Example: Pressing 1 2 3 EE = displays 1.23 02

The number on display is now in scientific notation.

Pressing INV EE displays 123

WATCH OUT. If the exponent is larger than 7 or smaller than − 7 the calculator cannot display the number in decimal form.

HOW TO USE THE MEMORY

Your TI-30 D has a "Constant Memory" that stores a number even when the calculator is turned off. The memory can be used at any time without affecting a calculation.

STO
How to **Store in Memory**

This key stores in the memory a copy of the number currently on display, without removing it from the display. Any number previously stored is now lost.

RCL
How to **Recall from Memory**

This key recalls to the display a copy on the number stored in the memory as if it had just been keyed in. The number is still stored in the memory.

ON/C STO
or
0 STO

Pressing one of these combinations of keys clears the memory. Because the TI-30 D has a constant memory, the memory is not automatically cleared when you switch the calculator off. It is good practice to clear the memory before commencing a new calculation.

SUM

This key adds the number currently on display to the number stored in the memory. The result is then stored in the memory, replacing the previous number.

! *WATCH OUT. Before starting a calculation involving* SUM *make sure that you have cleared the memory.*

Example: Find $1^2 + 2^2 + 3^2 + 4^2$.

First press ON/C STO to clear the memory.

Then pressing 1 x^2 SUM 2 x^2 SUM 3 x^2 SUM 4 x^2 SUM RCL displays 30

There is no need to press + since SUM adds the number to the number already stored in the memory, then stores the total.

EXC

This key swaps the number currently on display with the number stored in the memory. It does not affect the calculation in process.

Example:

Pressing 5 STO displays 5 and stores 5 in the memory.

Pressing x^2 displays 25, 5 is still stored in the memory.

Pressing EXC displays 5. 25 is now stored in the memory.

This is illustrated by pressing RCL which displays 25.

However, 25 is now stored in the memory and is also on display.

So pressing EXC just displays 25 again.

ADDITIONAL INFORMATION

ACCURACY

Number Display

The result of each calculation is actually stored as an 11 digit number, although at most 8 digits are displayed. The 8th digit is rounded up or down according to the 9th digit. Only if the 9th digit is 5 or greater is the 8th digit rounded up. At most 7 digits may follow a decimal point. 11 digit numbers can be entered into the calculator although this is a two-stage process.

Only 8 digits can be entered at one time. To enter an 11 digit number, use two steps. For example, to enter 8765.4321999, write it as

8765 + 0.4321999

Pressing 8765 + 0.4321999 = displays 8765.4322 showing the effect of rounding.

Notice that 1111.9999 + .00009 is displayed as 1112 showing the combined effects of rounding and suppressing insignificant zeros.

π is in fact stored correct to 11 digits.

Pressing π displays 3.1415927

To see the hidden digits subtract 3.141 and multiply by 10000.

Press (π − 3.141) × 10000 displays 5.926536

Thus π is stored as 3.1415926536.

Similarly to see the hidden digits of any number on display, subtract the first 4 significant figures and multiply by 10000.

Scientific Notation

When entering a number in scientific notation the display is limited to five significant figures although 11 significant figures may be entered. The display is not rounded. However after a calculation the display is normally rounded.

Example: Enter 1.2345678 × 10^8.

Pressing 1.2345678 EE 8 displays 1.2345 08

To check that the remaining digits are present but invisible, continue by pressing:

− 1.2345 EE 8 = which displays 6.78 03

This indicates that the remaining digits are indeed stored.

In fact, the calculator stores 11 significant figures. Such numbers need to be entered like other 11 digit numbers.

Example: Enter 1.2345678912 × 10^8 (=123456789.12).

Pressing 1.2345678 EE 8 displays 1.2345 08

then pressing + 9.12 = displays 1.2346 08

Again this illustrates rounding of the 9th digit in the mantissa. Notice that if a number is entered using a function key (such as log), conversion to scientific notation preserves only 8 significant figures.

Notice that the last two digits on the right of the display are used to indicate the exponent of 10. Additional digits can be added after pressing EE but only the *last two numbers* pressed are retained as the exponent.

Note that although it is possible to enter 11 digits in scientific notation many functions only give 8 significant digits in scientific notation. Thus it is better in most cases to restrict working to an 8 digit mantissa in scientific notation although the arithmetic keys +, −, ×, ÷ do work with all 11 digits.

Truncation using the sequence EE INV EE

If EE is immediately followed by INV EE normal display format is restored but any digits not appearing in the display before the first EE key press are dropped from the internal register at the end of the sequence.

e.g. π is stored as 3.1415926536 and is recalled as such when π is pressed. But it is displayed as 3.1415927. However after EE INV EE the calculator holds just 3.1415927. You can try this for yourself using the example on page 27 in "Number Display" by inserting the EE INV EE sequence before trying,to recall the hidden digits.

ERRORS

Error Display

The display shows *Error* whenever the number involved exceeds the limits of the calculator.

ON/C must be pressed to release the display. All pending operations are lost and you must begin the calculation again.

Correcting Mistakes

If an incorrect *NUMBER* entry is made, pressing ON/C clears the incorrect number and restores the calculation to its state before you made the mistake. You can simply enter the correct number and continue the calculation.

Pressing ON/C twice clears all calculations, including errors. In this case the calculation must be restarted completely. If you press the wrong function key just press the correct one prior to entering the next number (operand).

Rounding Errors

The higher mathematical functions use iterative calculations. The cumulative error from these calculations in most cases is maintained beyond the 8 digit display so that no inaccuracy is displayed. Most calculations are accurate to ±1 in the 8th digit. Exceptions are the tangent function, where it approaches undefined limits and y^x where y is within $\pm 10^{-6}$ of 1.

PENDING OPERATIONS

The TI-30 D can cope with up to 4 pending operations, with either explicit or implicit brackets. If the calculator tries to store more than 4 such operations it gives an error indication.

Example: Evaluate 1 + (2 + (3 + (4 + 5))).

Pressing 1 + (2 + (3 + (4 + 5))) = displays 15

Each + acts as a pending operation.

However, if you try to evaluate 1 + (2 + (3 + (4 + (5 + 6)))

Pressing 1 + (2 + (3 + (4 + (5 + displays *Error*

The last + is now the 5th pending operation.

Example: Evaluate $1 + 2 \times 3^{(1 + 1)}$.

Pressing 1 + 2 X 3 y^x (1 + 1) = displays 19

However, if you try to evaluate $1 + 2 \times 3^{(1 + 1 \times 2)}$.

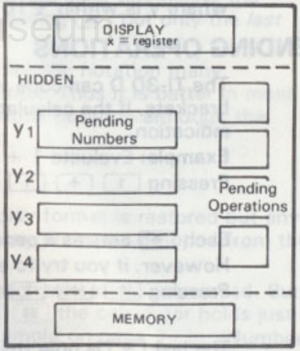
Pressing [1] [+] [2] [X] [3] [yˣ] [(] [1] [+] [1] [X] displays [Error]

The final [X] is the 5th pending operation.

What the keys actually do

While the mathematical intention of the keys is clear from the markings, the actual effect is worth studying in order to make efficient use of your TI-30 D, and to avoid surprises.

The TI-30 D works with two numbers at one time, but it holds five numbers ready for pending calculations as well as a memory controlled by the user. How these pending numbers are held is best illustrated by an example.



Schematic diagram of TI-30 D showing display, memory and hidden pending operation registers.

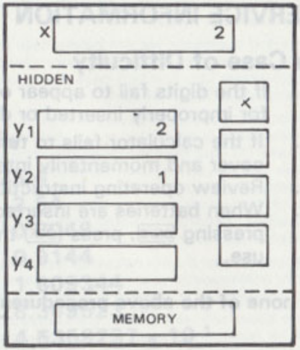
To calculate $1 + 2 \times 3^{(1+1)}$

[1] enters 1 into the display. Notice that the number is volatile, in the sense that pressing [2] changes the number from 1 to 12.

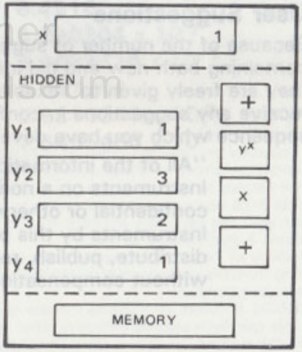
[+] enters 1 into the top y register (y_1) and + as the current pending operations.

[2] enters 2 into the display, where it remains volatile.

[X] dominates or precedes +, so implicit brackets are used. In other words [+] is pushed into the second pending operation and [X] replaces it as the current pending operation. 1 is moved down into register y_2 and 2 replaces it in the y_1 register.



Pressing [3] [y^x] [(] [1] [+] continues to push numbers and operations down the y register and the pending operations until all register are full. Pressing [(] completes all pending operations since the last pressing of [(], while pressing [=] completes all pending operations.



Note that after keying in a number which is still volatile, pressing [(] nullifies the displayed number so that further keyed numbers replace what is displayed. Pressing [ON/C] replaces the displayed number by 0. In both cases, all pending operations remain pending.

SERVICE INFORMATION

In Case of Difficulty

1. If the digits fail to appear on the display (when calculations are not in progress), check for improperly inserted or discharged batteries. See Battery replacement instructions.
2. If the calculator fails to turn off when OFF is pressed, remove the battery compartment cover and momentarily interrupt power to the calculator. Then, check for normal operation.
3. Review operating instructions to be certain that calculations were performed correctly.
4. When batteries are inserted into the calculator and the display does not reset to zero on pressing ON/C, press OFF then ON/C to reset the display and prepare the calculator for your use.

If none of the above procedures corrects the difficulty, please consult your TI supplier.

User Suggestions

Because of the number of suggestions which come to Texas Instruments from many sources, containing both new and old ideas, Texas Instruments will consider such suggestions only if they are freely given to Texas Instruments. It is the policy of Texas Instruments to refuse to receive any suggestions in confidence. Therefore, if you wish us to review any calculator key sequence which you have developed, please include the following in your letter:

> ''All of the information forwarded herewith is presented to Texas Instruments on a non-confidential, non-obligatory basis: no relationship, confidential or otherwise expressed or impliedly, is established with Texas Instruments by this presentation. Texas Instruments may use, copyright, distribute, publish, reproduce, or dispose of the information in any way without compensation to me.''

CONVERSION FACTORS

English to Metric

To Find	Multiply	By
microns	mils	**25.4**
centimetres	inches	**2.54**
metres	feet	**0.3048**
metres	yards	**0.9144**
kilometres	miles	**1.609344**
grams	ounces	28.349523
kilograms	pounds	**4.5359237 x 10^{-1}**
litres	gallons (U.S.)	3.7854118
litres	gallons (Imp.)	4.546090
millilitres (cc)	fl. ounces	29.573530
sq. centimetres	sq. inches	**6.4516**
sq. metres	sq. feet	**9.290304 x 10^{-2}**
sq. metres	sq. yards	**8.3612736 x 10^{-1}**
millilitres (cc)	cu. inches	**16.387064**
cu. metres	cu. feet	2.8316847 x 10^{-2}
cu. metres	cu. yards	7.6455486 x 10^{-1}

Boldface numbers are exact ; others are rounded.

Temperature Conversions

$$°F = \frac{9}{5}(°C) + 32 \qquad °C = \frac{5}{9}(°F - 32)$$

ONE-YEAR WARRANTY

In case of breakdown or damage, please consult your local Texas Instruments relailer.

1. The terms and conditions set out hereinunder shall not apply where you have purchased this calculator directly from Texas Instruments Ltd. in which case the conditions of sale of Texas Instruments Ltd. shall apply.
2. This electronic calculator (including charger if applicable) from Texas Instruments is warranted to the original purchaser for a period of one (1) year from the original purchase date - under normal use and service - against defective materials or workmanship. For those calculators designed to incorporate batteries, this warranty does not cover damage resulting from any battery leakage. Batteries delivered with calculators are for demonstration purposes only.

   This warranty is void if : the calculator has been damaged by accident or unreasonable use, neglect, improper service or other causes not arising out of defects in material or workmanship.

   During the above one-year period, the calculator or its defective parts will be repaired, adjusted and/or replaced with a reconditioned model of equivalent quality, (''RECONDITIONED'') at manufacturer's option without charge to the purchaser when the calculator is returned, by way of the dealer to Texas Instruments with proof-of-purchase date. UNITS RETURNED WITHOUT PROOF-OF-PURCHASE DATE WILL BE REPAIRED AT THE SERVICE RATES IN EFFECT AT THE TIME OF RETURN. In the event of replacement with a reconditioned model, the replacement unit will continue the warranty of the original calculator product or 90 days, whichever is longer.

   THIS CONDITION 2 SHALL NOT AFFECT THE STATUTORY RIGHTS OF A CONSUMER AS DEFINED IN THE CONSUMER TRANSACTIONS (RESTRICTIONS ON STATEMENTS) ORDER 1976 (AS AMENDED).
3. Save as expressly provided in Condition 2, Texas Instruments shall be under no liability of whatsoever kind, howsoever caused whether or not due to the negligence or wilful default of Texas Instruments or its servants or agents arising out of or in connection with this calculator provided that nothing contained in this condition 3 shall exclude or restrict :
   - (I) Any liability of Texas Instruments for death or personal injury resulting from the negligence of Texas Instruments or its servants or agents; or
   - (II) Any liability of Texas Instruments for loss or damage arising from this calculator proving defective while in consumer use (within the meaning of Sec. 5 (2) (A) Unfair Contract Terms Act. 1977) and resulting from the negligence of Texas Instruments or its servants or agents.

EXAMPLES • BEISPIELE • **EXEMPLES** • ESEMPI
VOORBEELDEN • EXEMPEL • **EKSEMPLER**
ESIMERKKEJÄ • **EXEMPLOS** • EJEMPLOS

$-3.7 - (-7.09) + 0.014 = 3.404$

3 • 7 +/− −	−3.7
7 • 0 9 +/− +	3.39
• 0 1 4 =	3.404

$-4 \times 7.3 \div 2 = -14.6$

4 +/− X	−4
7 • 3 ÷	−29.2
2 =	−14.6

$5 + (8/(9 - (2/3))) = 5.96$

5 + (	5
8 ÷ (	8
9 − (	9
2 ÷	2
3)	0.6666667
)	8.3333333
)	0.96
=	5.96

$3 \times (4^{(2^{-(\sqrt[4]{7})})}) = 4.7000433$

ON/C	0
3 X (	3
4 y^x (	4
2 y^x (	2
7 INV y^x	7
4)	1.6265766
+/−	−1.6265766
)	0.3238558
)	1.5666811
=	4.7000433

31 + 1.8026 = 32.8026
745.797 + 1.8026 = 747.5996
−8.002 + 1.8026 = −6.1994

ON/C	0
1 • 8 0 2 6 + K	1.8026
3 1 =	32.8026
7 4 5 • 7 9 7 =	747.5996
8 • 0 0 2 +/− =	−6.1994

$(3.75)^{-3.2} \cdot (0.1066)^{-3.2} \cdot (0.0692)^{-3.2}$

3 • 2 +/− y^x K	−3.2
3 • 7 5 =	0.0145579
• 1 0 6 6 =	1291.7455
• 0 6 9 2 =	5148.2603

$2.86^{-.42} = 0.6431707$

2 • 8 6 y^x	2.86
• 4 2 +/−	−0.42
=	0.6431707

$\sqrt[3.12]{1460} = 10.332744$

1 4 6 0 INV y^x	1460
3 • 1 2 =	10.332744

$e^{(7.5 + \ln 1.4)} = 2531.2594$

ON/C (	0
7 • 5 +	7.5
1 • 4 lnx	0.3364722
)	7.8364722
INV lnx	2531.2594

$\log(303 + 10^{1.36}) = 2.5130959$

ON/C (	0
3 0 3 +	303
1 . 3 6 INV log	22.908677
)	325.90868
log	2.5130959

$\sin(0.3012\,\pi)^{-\tan 16.2°} = 1.0626654$

MODE : Rad

OFF ON/C DRG (	0 RAD
. 3 0 1 2 X	0.3012 RAD
π	3.1415927 RAD
)	0.9462477 RAD
sin	0.8112271 RAD
y^x	0.8112271 RAD
INV DRG INV DRG 1 6 .	0.2905269 DEG
2 tan +/− =	1.0626654 DEG

$\sqrt{\arctan 9.72} + \dfrac{1}{\arcsin .808} = 9.1905773$ deg.

MODE : Deg

9 . 7 2 INV tan	84.126039 DEG
$\sqrt{x}$ +	9.1720248 DEG
. 8 0 8 INV sin	53.900984 DEG
$1/x$	0.0185525 DEG
=	9.1905773 DEG

$\tanh 2.99 = 0.9949551$

2 . 9 9 X	2.99
2 =	5.98
INV lnx STO −	395.44037
1 = +	394.44037
(RCL +	395.44037
1 =	0.9949551

$\sinh^{-1} 86.213 = 5.1500018$

8 6 . 2 1 3 +	86.213
(	
x^2 +	7432.6814
1)	7433.6814
$\sqrt{x}$	86.218799
=	172.4318
lnx	5.1500018

28.3 × 7 = 198.1
173 + 16 = 189
312 − 42 + 7.8 = 277.8
TOTAL 664.9

2 8 . 3 X	28.3
7 = STO	198.1
1 7 3 +	173
1 6 = SUM	189
3 1 2 −	312
4 2 +	270
7 . 8 = SUM	277.8
RCL	664.9

$A^2 + 2AB + B^2 = 2.2960826$
$A = 0.258963$ $B = 1.25632$

. 2 5 8 9 6 3	
STO x^2 +	0.0670618
1 . 2 5 6 3 2	1.25632
X	
EXC	0.258963
X	0.3253404
2 +	0.7177426
RCL	1.25632
x^2	1.5783399
=	2.2960826

2 × 3 + 4 × 5 = 26

2 X	2
3 +	6
4 X	4
5 =	26

1/2 − 3/4 = −.25

1 +	1
2 −	0.5
3 +	3
4 =	− 0.25

sin 30°·cos 60° + cos 30°·sin 60° = 1

MODE : Deg.

3 0 sin X	0.5 DEG
6 0 cos +	0.25 DEG
3 0 cos X	0.8660254 DEG
6 0 sin =	1 DEG

$$\frac{3\cdot\ln 2}{4\cdot\ln 2 + 6\cdot\ln 5} = 0.1673027$$

3 X	3
2 lnx	0.6931472
+	2.0794415
(4 X	4
2 lnx +	2.7725887
6 X	6
5 lnx	1.6094379
)	12.429216
=	0.1673027

$$\frac{3 + (\sin(.45\pi)) \times (\pi^2 - 2)}{\tan[(2.7)^2 + \ln(8.21)^3]} = 6.3279647$$

MODE : Rad.

OFF ON/C DRG (	0 RAD
3 + (	3 RAD
• 4 5 X	0.45 RAD
π	3.1415927 RAD
)	1.4137167 RAD
sin X (	0.9876883 RAD
π	3.1415927 RAD
x^2 −	9.8696044 RAD
2)	7.8696044 RAD
) + ((	10.772717 RAD
2 • 7 x^2 + (	7.29 RAD
8 • 2 1 y^x	8.21 RAD
3)	553.38766 RAD
lnx	6.3160588 RAD
)	13.606059 RAD
tan	1.7023983 RAD
=	6.3279647 RAD

$(e^{-1.2} + 3) \times (4 + 5^{2.6}) = 229.97174$

ON/C (	
1 • 2 +/− INV lnx +	0.3011942
3) X (	3.3011942
4 +	4
5 y^x	5
2 • 6 =	229.97174

$3x^2 + 8x + 5 = 0.$

$$x_1 = \frac{-8 + \sqrt{(8)^2 - (4)\cdot(3)\cdot(5)}}{2 \times 3} = -1$$

$$x_2 = \frac{-8 - \sqrt{(8)^2 - (4)\cdot(3)\cdot(5)}}{2 \times 3} = -1.6666667$$

ON/C (		0
8 +/− + (		− 8
8 x^2 −		64
4 X		4
3 X		12
5)		4
√x STO		2
) + (		− 6
2 X		2
3 =	*(x_1)	− 1
(8 +/− −		− 8
RCL		2
) ÷ (		− 10
2 X		2
3 =	*(x_2)	− 1.6666667

TEXAS INSTRUMENTS

Last Name
Familienname
Nom
Cognome
Achternaam
Efternamn
Efternavn
Sukunimi
Ultimo nome
Appellidos

First Name
Vorname
Prénom
Nome
Voornaam
Förnamn
Fornavn
Etunimi
Primeiro nome
Nombre

Address
Adresse
Indirizzo
Adres
Gatuadress
Osoite
Endereco
Dirección

Town
Ort
Ville
Città
Stad
By
Kaupunki
Cidade/Vila
Ciudad

P.O. Code
Postleitzahl
Code Postal
Codiee Postale
Postcode
Postnr.
Postinumero
Codigo postal
D. Postal

Country
Land
Pays
Paese
Maa
Pais

Date, **Datum**, Data,
Päivämäärä, Dato, **Fecha**

TEXAS INSTRUMENTS

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