

Calculator User's Guide

This scientific calculator is standalone, web-based, mobile compatible, and independent of operating system or browser. It operates in the dozenal and decimal bases, converts between them, and includes conversion of common measurements.

It uses Math.js for most functions, going outside of that library for the few that it doesn't have.

Introduction

The large white field at the top is for input of an arithmetical expression. The output of the answer appears in the white field below that. The default base is dozenal. For ζ and ϵ , j and k are the respective keyboard equivalents.

Because there is only a little input validation or error prevention, it is often possible to input incorrectly and get either absurd output or the message "Error" or "NaN."

Colored buttons in the first row

These will be discussed under **Conversion of measurements**.

Buttons in white print

The button **1st** alternates with **2nd** to determine which functions operate from the two brown rows. The button **clear** or the key **x** clears the input and output fields. The button **sci** changes the output to and from scientific notation. For **swap**, see the next item.

Grey buttons, 1st row

The individual bold-face buttons have alternatives. Pressing **swap** and then one of those buttons brings a popup with items to choose from. The first grey button, **doz**, swaps with **dec**, to indicate the active base. The keyboard equivalent to swap **doz** and **dec** is **z**.

spc (default spc 3)

indicates how many digits are grouped before a space is inserted. For those groups, commas and periods are not available.

dig (default dig 3)

indicates how many digits are shown to the right of the radix point. If the number of fractional digits is the same in the two bases, dozenal fractions are more precise. Expressions including imaginary numbers are limited to 12_z or 14_d , others to 20_z or 24_d .

sto (default sto 1)

comprises 6 buttons with swap, allowing storage of up to 6 answers (disabled for conversion of measurements).

rcl

shows 6 fields with stored answers in dozenal or decimal, depending on which base is active. Selecting one of the stored numbers inserts it into the expression field (disabled for conversion of measurements).

In what follows (also for **sto** and **rcl** above), grouped functions in bold type alternate by swapping. Functions may be selected on the calculator display or typed on a keyboard.

Grey buttons, 2nd row

<u>Button</u>	<u>Screen display</u>	<u>Use</u>	<u>Explanation</u>
mod	mod(,)	mod(a,n)	$a \bmod n$
abs	abs()	abs(x)	absolute value of x

rad		radians	angle measurement for trigonometry
⊙		turns	angle measurement for trigonometry
1^\ominus		unciapis	angle measurement for trigonometry
°		degrees	angle measurement for trigonometry

π	pi	constant	≈ 3.1848 (dozenal), 3.1416 (decimal)
τ	tau	constant	≈ 6.3494 (dozenal), 6.2832 (decimal)
e	e	constant	≈ 2.8752 (dozenal), 2.7183 (decimal)
ϕ	phi	constant	≈ 1.7500 (dozenal), 1.6180 (decimal)

+/-	-()	-(x)	change of sign
1/x	1/()	1/(x)	reciprocal

Brown buttons, 1st screen, 1st row

<u>Button</u>	<u>Screen display</u>	<u>Use</u>	<u>Explanation</u>
gcd	gcd(,)	gcd(x,y,...)	greatest common divisor of x, y, \dots
lcm	lcm(,)	lcm(x,y,...)	lowest common multiple of x, y, \dots

frs	frs()	frs(x)	list of factors of x
pfrs	pfrs()	pfrs(x)	list of prime factors of x
pRfrs	pRfrs()	pRfrs(x)	list of prime factors of x with repetitions

$\sigma_0(n)$	sfrs()	sfrs(x)	sum of factors of x
$\sigma_1(n)$	asfrs()	asfrs(x)	sum of factors of x except x

$\tau(n)$	tau()	tau(x)	number of factors of x including 1
$\phi(n)$	phi()	phi(x)	number of totatives of x including 1

x^2	$\wedge 2$	$x\wedge 2$	x squared
\sqrt{x}	sqrt()	sqrt(x)	square root of x

x^y	\wedge	$x\wedge y$	x to the y^{th} power
$\sqrt[y]{x}$	root(,)	root(x,y)	y^{th} root of x (x to the $1/y^{\text{th}}$ power)

Brown buttons, 1st screen, 2nd row

<u>Button</u>	<u>Screen display</u>	<u>Use</u>	<u>Explanation</u>
nCr	nCr(,)	nCr(n,r)	comb'n of n things taken r at a time
nCRr	nCRr(,)	nCRr(n,r)	comb'n of n things taken r at a time with repetitions

nPr	nPr(,)	nPr(n,r)	perm'n of n things taken r at a time
nPRr	nPRr(,)	nPRr(n,r)	perm'n of n things taken r at a time with repetitions

avg	avg(,)	avg(x,y,...)	average of x, y, \dots
std	std(,)	std(x,y,...)	unbiased standard dev'n of x, y, \dots
stduc	stduc([,])	stduc([x,y,...])	uncorrected standard dev'n of x, y, \dots

ln	log()	log(x)	natural logarithm of x
e^x	e [^]	e [^] x	e to the x^{th} power

log₁₀	log10()	log10(x)	base 10 _z or 10 _a logarithm of x
log₂	log2()	log2(x)	base 2 logarithm of x

log_y	log(,)	log(x,y)	logarithm of x to the base y

Brown buttons, 2nd screen, 1st row

<u>Button</u>	<u>Screen display</u>	<u>Use</u>	<u>Explanation</u>
sin	sin()	sin(x)	sine of x
asin	asin()	asin(x)	inverse of sine of x

The other buttons work the same way for the other trigonometric functions.

Brown buttons, 2nd screen, 1st row

<u>Button</u>	<u>Screen display</u>	<u>Use</u>	<u>Explanation</u>
sinh	sinh()	sinh(x)	hyperbolic sine of x
asinh	asinh()	asinh(x)	inverse of hyperbolic sine of x

The other buttons work the same way for the other hyperbolic trigonometric functions.

Grey buttons, 3rd row

<u>Button</u>	<u>Screen display</u>	<u>Use</u>	<u>Explanation</u>
.	.	doz or dec point	for dozenal or decimal fractions
,	,	separator	for inside brackets in expressions

%	(.01)	x(.01)	pergrossage or percentage of x
!	!	x!	factorial of x

i	i	i	$\sqrt{-1}$ (imaginary number)
Γ	gamma()	gamma(x)	gamma of x

Grey buttons, 4th to 6th rows

The numerals ζ and ϵ are greyed out (unusable) when decimal is the active base. The button “del” is the backspace button. The buttons < and > move the cursor in the expression back or ahead. The = button, equivalent to pressing ENTER or RETURN, returns the answer to the expression that has been entered.

Conversion of measurements

The colored buttons in the first row are for conversion, of the measures listed below.

time	time units
d-time	time of day
freq	frequency
veloc	velocity (speed)
dist	distance (length, width, height, depth, breadth)
area	area
d-vol	dry volume
f-vol	fluid volume
mass	mass
force	force (weight)
press	pressure
en'gy	energy (work, heat, potential)
power	power
temp	temperature
angle	angle
e-imp	electrical impedance
e-qty	electrical quantity
e-pot'l	electrical potential
e-curr	electrical current

Selecting the red button to the left, with the double harpoons, brings a dropdown menu of the items in the left column above. The other colored buttons represent, from left to

right, the metrologies Primel, TGM, Imperial, US Customary, and Système international (metric).

After selecting a measure (e.g. dist), select a metrology and then, from its dropdown menu, a unit (e.g. Primel lengthel). Repeat as desired (e.g. TGM grafut; USC inch; metric centimeter). Entering a quantity to the right of one of the units that have just appeared on the left produces the equivalent quantity of each of the selected units. Primel and TGM always appear in dozenal, the other three in decimal.

To exit conversions, select the current measure (e.g. dist) and then select the double harpoons.

Note: For the measure *d-time*, input into the Primel field must start with a dozenal point (or 0 plus a dozenal point); its maximal input is .nnnnn. The maximal input for TGM is nn.nnn. Input into one of the lower three fields (USC, Imperial, SI) must be in the complete format hh:mm:ss.