

Printed in Japan

CASIO

SCIENTIFIC CALCULATOR
CASIO *fx-101*
INSTRUCTION MANUAL



INTRODUCTION

Dear customer,

Congratulations on your purchase of this highly advanced scientific calculator with an independent memory.

In addition to its normal calculator conveniences, it enables you to handle any of 18 most important math functions at one touch of a key.

Although the display capacity is 10 digits, answers in the dynamic range are also shown through scientific notation, 8 digit mantissa and 2 digit exponent of ten up to $10^{\pm 99}$.

To utilize the full features of this calculator, no special training is required but we suggest you study this instruction manual to become familiar with its many abilities.

1 KEYBOARD

(1) POWER SWITCH

Move the switch to the right to start a calculation.

(2) READ-OUT

Shows each entry and result, whether in the regular 10 digit display or in scientific notation, through a green Digitron tube. Suppresses unnecessary 0's (zeroes) in mantissa.

(3) NUMERAL/DECIMAL POINT KEY

Enters numerals. For decimal places, use the key in its logical sequence.

(4) FUNCTION COMMAND AND RESULT KEYS

In the normal four functions, press the numeral and function command keys in the same logical sequence as the formula and the key obtains the answer. A full floating decimal system with underflow works in all calculations to deliver the most significant digits.

(5) MEMORY PLUS (MINUS) KEY

Positively (negatively) accumulates an entry and/or result obtained into the memory. Obtains each answer in four functions and automatically accumulates it into the memory positively (negatively).

(6) MEMORY RECALL KEY

Recalls an accumulated total in the memory without clearing the same.

(7) MEMORY CLEAR KEY

Clears contents of the memory.

(8) CLEAR KEY

Clears display for correction. Function commands (+, -, x or ÷) can be interchanged by successive depression of the appropriate command key.

(9) ALL CLEAR KEY

Clears the entire machine except the memory, and releases the overflow check. There is no need to depress the or key prior to starting each new calculation.

(10) ENTER EXPONENT KEY

Enters the exponent of ten up to ± 99 . To enter 2.56×10^{34} , operate 2 5 6 EXP 3 4.

(11) SQUARE KEY

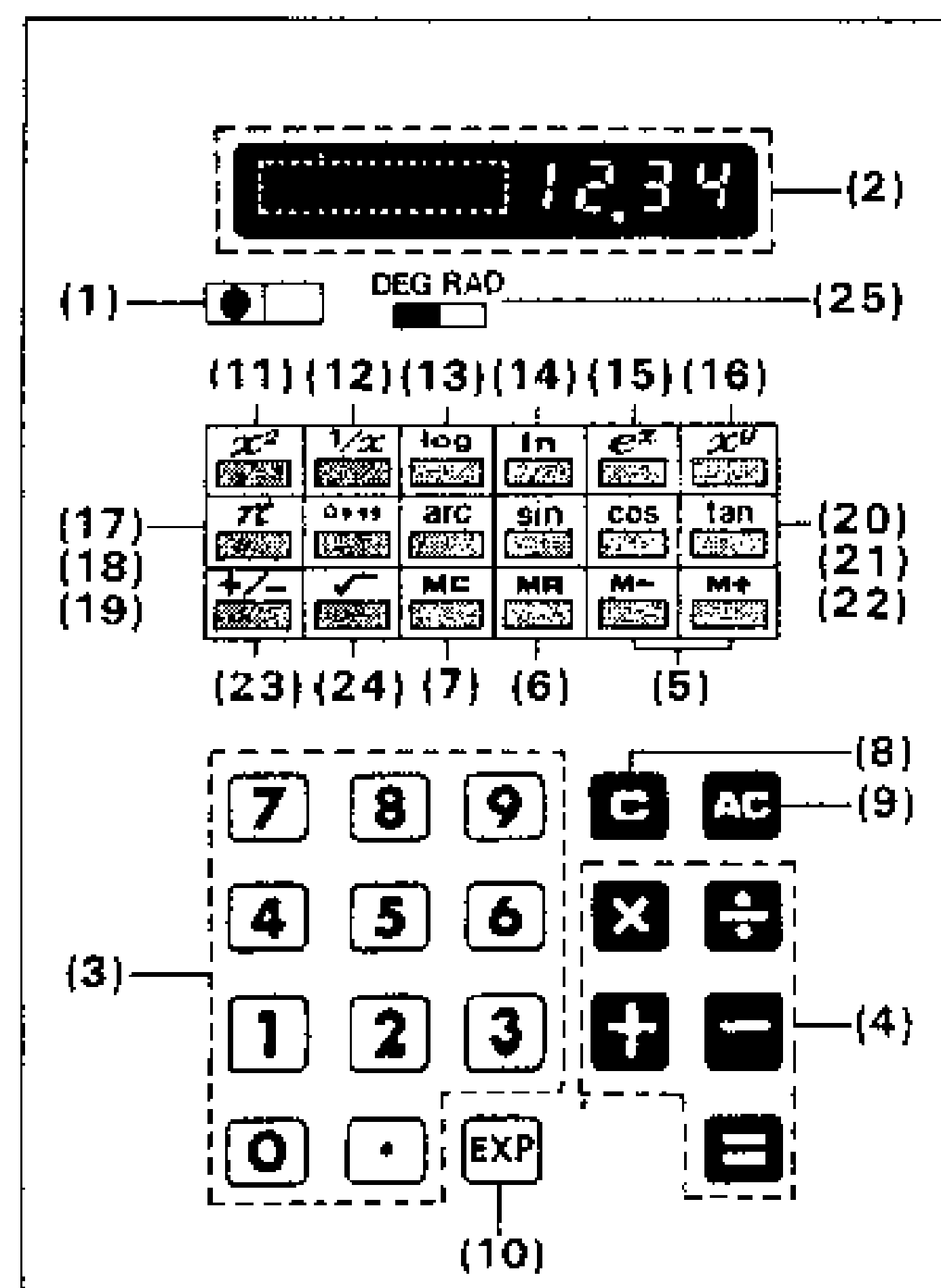
Obtains the square of the number displayed.

(12) RECIPROCAL KEY

Obtains the reciprocal of the number displayed.

(13) COMMON LOGARITHM KEY

Obtains the common logarithm of the number displayed.



- (14) \ln NATURAL LOGARITHM KEY
Obtains the natural logarithm of the number displayed.
- (15) e^x EXPONENTIAL KEY
Raises the constant e to x powers.
- (16) x^y POWER RAISING KEY
Raises the base x to y powers.
- (17) π PI KEY
Enters the circular constant in 10 digits (3.141592654).
- (18) $\text{DEG} \rightarrow \text{RAD}$ SEXAGESIMAL \rightarrow DECIMAL CONVERSION KEY
Converts the sexagesimal figure to the decimal scale.
- (19) ARC ARC KEY
Performs inverse trigonometric functions in combination with the \sin , \cos or \tan key.
- (20) \sin SINE KEY
Obtains the sine for the angle on display.
- (21) \cos COSINE KEY
Obtains the cosine for the angle on display.
- (22) \tan TANGENT KEY
Obtains the tangent for the angle on display.
- (23) \pm SIGN CHANGE KEY
Changes the sign of the number displayed from plus to minus and vice versa.
- (24) $\sqrt{\quad}$ SQUARE ROOT KEY
Obtains the square root of the number displayed.
- (25) $\text{DEG} \rightarrow \text{RAD}$ ANGULAR MODE SELECTOR
By setting the selector either at "DEG" (Degree), "RAD" (Radian) position, trigonometric functions can be performed based on the angular measurement indicated by the selector. Answers of the inverse trigonometric functions can also be given in the required angular measurement by the appropriate setting of the selector.

2 IMPORTANT

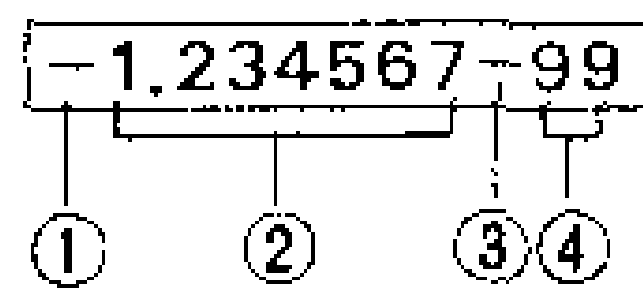
2-1 HANDLING OF THE CALCULATOR

Before operation, please be sure to check that the dry batteries, or connection of the AC adaptor are set correctly.

The calculator should be operated in accordance with this instruction manual with firm and separate

key pressing. Two or more numerals and/or command keys should not be pressed simultaneously, as this may damage the machine.

2-2 SCIENTIFIC NOTATION



The whole display is read: $-1.234567 \times 10^{-99}$

- ① The minus (-) sign for mantissa.
- ② The mantissa.
- ③ The minus (-) sign for exponent.
- ④ The exponent of ten.

When the answer is more than 1×10^{10} or less than 1×10^{-2} , it is automatically shown by the scientific notation, 8 digit mantissa (7 negative digits) and exponents of ten up to ± 99 . Entry can also be made in the form of scientific notation by using the EXP (Enter Exponent) key. Note that the EXP key does not work when the first entry (mantissa) is made exceeding 8 digits (7 digits, when the figure is negative).

EXAMPLE	OPERATION	READ-OUT
$(1.23 \times 10^{10}) + (4.56 \times 10^7)$ $= 1.23456 \times 10^{10}$	1 \square 23 EXP	1.23 00
	10	1.23 10
	\pm	1.23 10
	4 \square 56 EXP	4.56 00
	7	4.56 07
	EXP	1.23456 10

* The answer is read: $1.23456 \times 10^{10} = 12345600000$

2-3 OVERFLOW OR ERROR CHECK

Overflow or error is indicated by an "E" sign in the first column and stops further calculation.

Overflow or error occurs:

- 1) When an answer or accumulated total in the memory becomes more than 1×10^{10} .
- 2) When the function calculations are performed on a number exceeding their input range.

To release the locked registers caused by the overflow check, depress the \square key.

Note: The content of the memory is protected against overflow and the total accumulated so far is recalled by the \square key after the overflow check is released by the \square key.

2-4 DISPOSABLE DRY BATTERY OR AC OPERATION

This calculator operates on either dry batteries or AC with the use of the AC ADAPTOR.

a) DRY BATTERY OPERATION

With four Manganese dry batteries (SUM-3) it operates for approximately 11 hours continuously. Even when battery power decreases, the display will merely darken but cause no miscalculation. When you have finished your calculation, be sure to switch off the power switch to save battery power.

To change batteries, put the power switch off first. Slide open the battery cover and replace batteries.

b) AC OPERATION

If you are in a 117V area, for instance, use a 117V AC ADAPTOR.

When you use an AC ADAPTOR of a different voltage, it may cause damage to both the AC ADAPTOR and calculator.

Plug the applicable AC ADAPTOR (100, 117, 220 or 240V) into the AC outlet and the cord into the calculator. When plugged in, battery power supply stops automatically, so battery power is not wasted.

* To prevent the damage to the calculator, USE ONLY THE AC ADAPTOR recommended by your dealer.

3 BASIC OPERATIONAL EXAMPLES

This calculator computes any of 4 basic functions using 10 most significant digits including the last 2 digits which are not displayed in mantissa, as far as the commands are not interchanged or the \square key is not depressed in the midst of operations.

EXAMPLE	OPERATION	READ-OUT
$741 - 258 + 963 = 1446$	741 \square 258 \square 963 \square	1446.
$(5.6088 \times 10^{12}) \div 45.6 = 1.23 \times 10^{11}$	5 \square 6088 \square 12 \square 45 \square 6 \square	5.6088 00 5.6088 12 1.23 11
$(123 + 65.4 - 789) \times 2.5 = -1501.5$	123 \square 65 \square 4 \square 789 \square 2 \square 5 \square	-1501.5
$0.0003333 \div 100 = 3.333 \times 10^{-6}$	\square 0003333 \square 100 \square	3.333-04 3.333-06
$(-25) \times 3 \div (-1.2) = 62.5$	25 \square 3 \square 1 \square 2 \square \square	62.5

* A negative figure is displayed with the minus (-) sign on the left of the figure, whether in regular display or in scientific notation.

* The \square key changes the sign of displayed number from plus to minus (or vice versa). To enter the negative exponent, use the \square key before or after entering the exponent.

⑦

4 CALCULATION WITH A CONSTANT

ENTRY \times () ENTRY \square Obtains product (quotient).
 ENTRY \square Obtains product (quotient).
 To be set as a constant multiplier (divisor).

The constant is released when a new operation including function calculation is performed. The \square key also releases the constant.

EXAMPLE	OPERATION	READ-OUT
$4,56 \times 23 = 104,88$	$23 \times 4,56 \square$	104,88
$9 \times 23 = 207$	$9 \square$	207
$41 \div 2,5 = 16,4$	$2 \square 5 \div 41 \square$	16,4
$52 \div 2,5 = 20,8$	$52 \square$	20,8

5 MEMORY CALCULATION

a) Automatic accumulation

\square ENTRY \times () ENTRY \square Obtains answer and automatically accumulates it into the memory positively (negatively).
 ENTRY \times () ENTRY \square Obtains answer and automatically accumulates it into the memory positively (negatively).
 Recalls the accumulated total in the memory.
 Clears contents of the memory.

Note: Be sure to depress the \square key prior to starting a memory calculation.

EXAMPLE	OPERATION	READ-OUT
$53 + 2 = 55$	$\square 53 + 2 \square$	55
$+ 23 - 6 = 17$	$23 - 6 \square$	17
72	\square	72
$3 \times (1,2 \times 10^8)$	$\square 3 \times 1,2 \square 8 \square$	360000000
$- 4,5 \times (6 \times 10^{13})$	$4,5 \times 6 \square 13 \square$	2,7 14
$-2,699996 \times 10^{14}$	\square	-2,699996 14

* The constant can also be utilized for automatic accumulation.

b) Direct access to the memory

Any number on display, whether entry or result, is directly accumulated into the memory as many times as the \square or \square key is depressed.

EXAMPLE	OPERATION	READ-OUT
$(78 \div 3) + (78 \div 3) - 6,3 - 6,3 = 39,4$	$\square 78 \div 3 \square \square$	26
	$6,3 \square \square$	6,3
	\square	39,4

⑧

6 FUNCTION CALCULATION

This calculator computes 18 specific functions at one touch independent of basic arithmetic calculations.

So it is necessary to change the order of operation when you desire to use some of the scientific functions as a subroutine of the basic calculation, in order to perform the scientific functions first and to use the result in basic calculation. For example, when you perform such an operation as $[5 \times \sin 30^\circ]$, calculate $[\sin 30^\circ]$ first and multiply 5 to the answer of $[\sin 30^\circ]$ on display. There is no need to depress the \square key prior to starting each new problem.

Remark: This calculator computes as $\pi = 3.141592654$ and $e = 2.718282$ respectively.

6-1 SQUARE ROOT & RECIPROCAL

The $\sqrt{\square}$ key extracts the square root of the number displayed.

Input range: $0 \leq X < 1 \times 10^{100}$

EXAMPLE	OPERATION	READ-OUT
$\sqrt{357 \times 10^6} = 18894.4436\dots$	357 \square 6 \square $\sqrt{\square}$	357. 00 357. 06 18894.44362
$\sqrt{6 - 2\sqrt{5}} = 1.23606797\dots$	\square 6 \square 5 \square 2 \square \square $\sqrt{\square}$	4.472135954 1.527864046 1.236067977

The \square key obtains the reciprocal of the number displayed.

Input range: $|X| < 1 \times 10^{100}, X \neq 0$

EXAMPLE	OPERATION	READ-OUT
$\frac{1}{0.789} = 1.267427122\dots$	\square 789 \square	1.267427122

6-2 LOGARITHMS

The \log key obtains the common logarithms of the number displayed.

Input range: $0 < X < 1 \times 10^{100}$

EXAMPLE	OPERATION	READ-OUT
$\log_{10} 41 = 1.612783\dots$	41 \log	1.6127839
$\log 2.3 = 0.3617278\dots$	2 \square 3 \log	0.36172784

The \ln key obtains the natural logarithms of the number displayed.

Input range: $0 < X < 1 \times 10^{100}$

EXAMPLE	OPERATION	READ-OUT
$\ln 215 = 5.370638\dots$	215 \ln	5.370638
$\ln(3.5 \times 10^8) - \ln 280 = 14.038654\dots$	\square 3 \square 5 \square 8 \ln \square 280 \ln \square \square	14.0386544
$\sqrt[3]{216} = 216^{1/3} = e^{1/3 \ln 216} = 6$	216 \ln \square 3 \square \square	6.

5-3 EXPONENTIATIONS

The \square key obtains the square of the number displayed.
 Input range: $|x| < 1 \times 10^{99}$

EXAMPLE	OPERATION	READ-OUT
$1.23^2 = 1.5129$	1 \square 23 \square	1.5129

The \square key raises the constant e (base) to x powers. In another words, this is to obtain $\text{antilog}_e x$.
 Input range: $|x| \leq 230$

EXAMPLE	OPERATION	READ-OUT
$e^{5.2} = 181.272\dots$	5 \square 2 \square	181.2723
$e^{\frac{\pi}{2}} = 4.810477\dots$	\square \square 2 \square	4.810477
$e^{-0.1} \cdot \sin 46^\circ = 0.6508855\dots$	\square 1 \square \square 46 \square \square \square	0.65088554

The \square key raises the base x to y powers. The number displayed when the \square key is used, is an intermediate result.
 Input range: $0 < x < 1 \times 10^{100}$

EXAMPLE	OPERATION	READ-OUT
$28^{20} = 8.77325\dots \times 10^{26}$	28 \square 20 \square	8.773253 28
$10.25^{1.825} = 69.91511\dots$	10 \square 25 \square 1 \square 825 \square	69.91511
$(1.2 \times 3.6)^{-3} = 0.0124036\dots$	1 \square 2 \square 3 \square 6 \square 3 \square	0.01240363

Note: To obtain $\text{antilog}_e x$, operate ENTRY (10) \square ENTRY (x) \square .

6-4 SEXAGESIMAL \rightarrow DECIMAL CONVERSION

The \square key converts the sexagesimal figure (Degree, Minute and Second) to decimal scale.
 To convert the negative sexagesimal figure, depress the \square key following entry of degree, or after finishing the conversion to the decimal scale.

EXAMPLE	OPERATION	READ-OUT
$47^\circ 25' 36'' = 47.4266666\dots$	47 \square 25 \square 36 \square	47. 47.41666666 47.42666666

6-5 TRIGONOMETRIC FUNCTION

The \square , \square and \square keys obtain each trigonometric value of the entry. In case the degree is given on the sexagesimal scale, it is necessary to convert the figure to the decimal scale before performing the trigonometric functions.

Input range: sin/tan : $|x| < 1440^\circ$ (DEG), $|x| < 8\pi$ (RAD)
 cos : $|x| < 1530^\circ$ (DEG), $|x| < \frac{17}{2}\pi$ (RAD)

EXAMPLE	OPERATION	READ-OUT
$\sin \frac{1}{5}\pi(\text{rad}) = 0.58778525\dots$	DEG RAD 5 $\frac{\pi}{x}$ $\frac{\pi}{y}$ $\frac{\pi}{z}$ $\frac{\pi}{w}$	0.58778525
$\cos 45^\circ = 0.70710678\dots$	DEG RAD 45 $\frac{\pi}{x}$	0.70710678
$\sin (-41^\circ) = -0.6560590\dots$	DEG RAD 41 $\frac{\pi}{x}$ $\frac{\pi}{y}$	-0.65605903
$\tan 85^\circ 14' 30'' = 12.01344\dots$	DEG RAD 85 $\frac{\pi}{x}$ 14 $\frac{\pi}{y}$ 30 $\frac{\pi}{z}$	85. 85.23333333 85.24166666 12.013449
$\sin 30^\circ + \sin 18^\circ = 0.80901\dots$	DEG RAD $\frac{\pi}{x}$ 30 $\frac{\pi}{y}$ $\frac{\pi}{z}$ 18 $\frac{\pi}{w}$ $\frac{\pi}{v}$	0.809017

Note: The value of cot, sec and cosec can be found from the following formula.

$$\cot A = \frac{1}{\tan A}; \sec A = \frac{1}{\cos A}; \operatorname{cosec} A = \frac{1}{\sin A}$$

EXAMPLE	OPERATION	READ-OUT
$\cot 18^\circ = 3.0776835\dots$	DEG RAD 18 $\frac{\pi}{x}$ $\frac{\pi}{y}$	3.077683501
$\sec 12^\circ = 1.0223405\dots$	DEG RAD 12 $\frac{\pi}{x}$ $\frac{\pi}{y}$	1.022340585
$\operatorname{cosec} 15^\circ = 3.8637033\dots$	DEG RAD 15 $\frac{\pi}{x}$ $\frac{\pi}{y}$ $\frac{\pi}{z}$ 1 $\frac{\pi}{w}$ $\frac{\pi}{v}$	3.863703336

6-6 INVERSE TRIGONOMETRIC FUNCTION

The $\frac{\pi}{x}$ key performs each inverse trigonometric function in combination with the $\frac{\pi}{y}$, $\frac{\pi}{z}$, or $\frac{\pi}{w}$ key.

Input range: $\sin^{-1} / \cos^{-1} : |x| \leq 1$; $\tan^{-1} : |x| < 1 \times 10^{100}$.

Answers are given in their principal value:

$$-90^\circ \leq \sin^{-1} x \leq 90^\circ; 0^\circ \leq \cos^{-1} x \leq 180^\circ; -90^\circ \leq \tan^{-1} x \leq 90^\circ$$

EXAMPLE	OPERATION	READ-OUT
$\sin^{-1} 0.64 = 39.7918\dots$	DEG RAD $\frac{\pi}{x}$ 64 $\frac{\pi}{y}$ $\frac{\pi}{z}$	39.79182
$\cos^{-1} 0.25 = 75.5224\dots$	DEG RAD $\frac{\pi}{x}$ 25 $\frac{\pi}{y}$ $\frac{\pi}{z}$	75.52249
$\tan^{-1} 4.7 = 77.98852\dots$	DEG RAD 4 7 $\frac{\pi}{x}$ $\frac{\pi}{y}$	77.98852

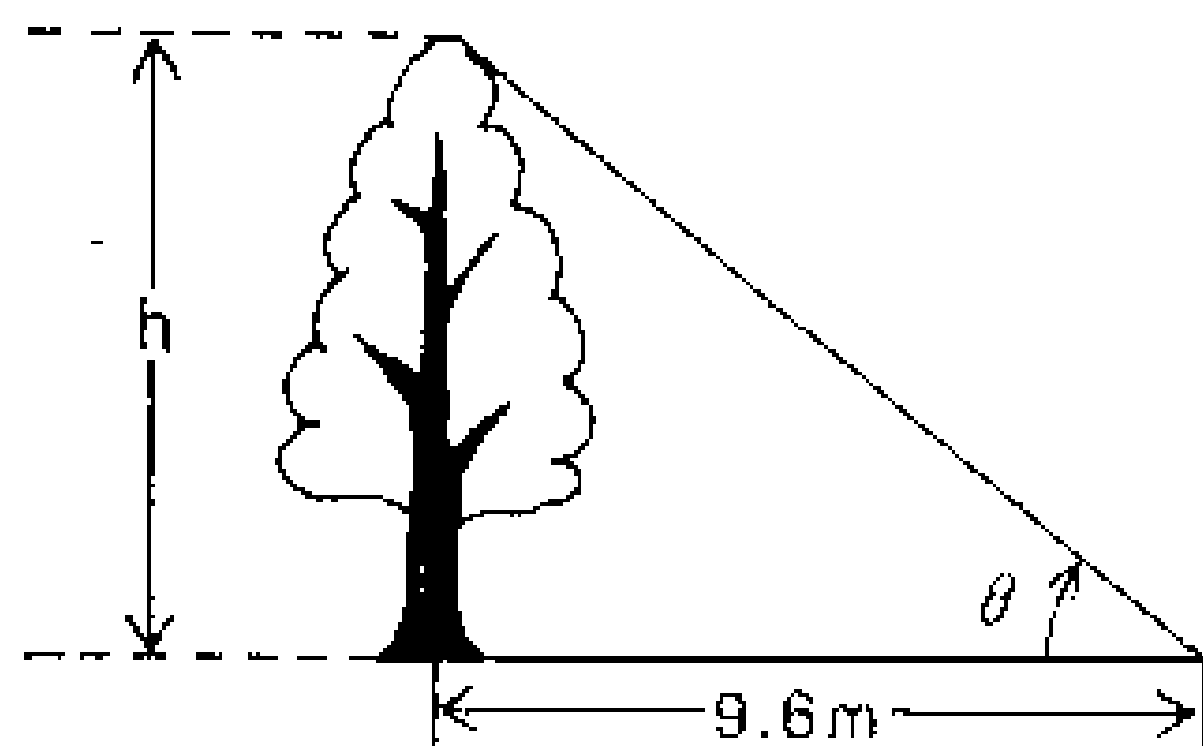
6-7 CALCULATION INVOLVING Pi (π)

The $\frac{\pi}{x}$ key enters the circular constant in 10 digits (3.141592654).

EXAMPLE	OPERATION	READ-OUT
$2\pi = 6.28318530\dots$	$\frac{\pi}{x}$ 2 $\frac{\pi}{y}$	6.283185308
$e^{-1/\pi} = 2.39997\dots$	$\frac{\pi}{x}$ 1 $\frac{\pi}{y}$ $\frac{\pi}{z}$ $\frac{\pi}{w}$ $\frac{\pi}{v}$	2.399972114

7 APPLICATIONS ¹⁷

- 1) Determine the height of tree h when the length of shadow is 9.6m and the angle θ is $68^\circ 20'$ in the figure shown below.



$$h = 9.6 \times \tan(68^\circ 20') \text{ (m)}$$

OPERATION	READ-OUT
DEG RAD 68 20 TAN 9.6 =	24.16464672

- 2) Determine the resistance (Ω) of a copper wire when its section area is $5.5 \text{ (mm}^2\text{)}$ and length is 2 (km).

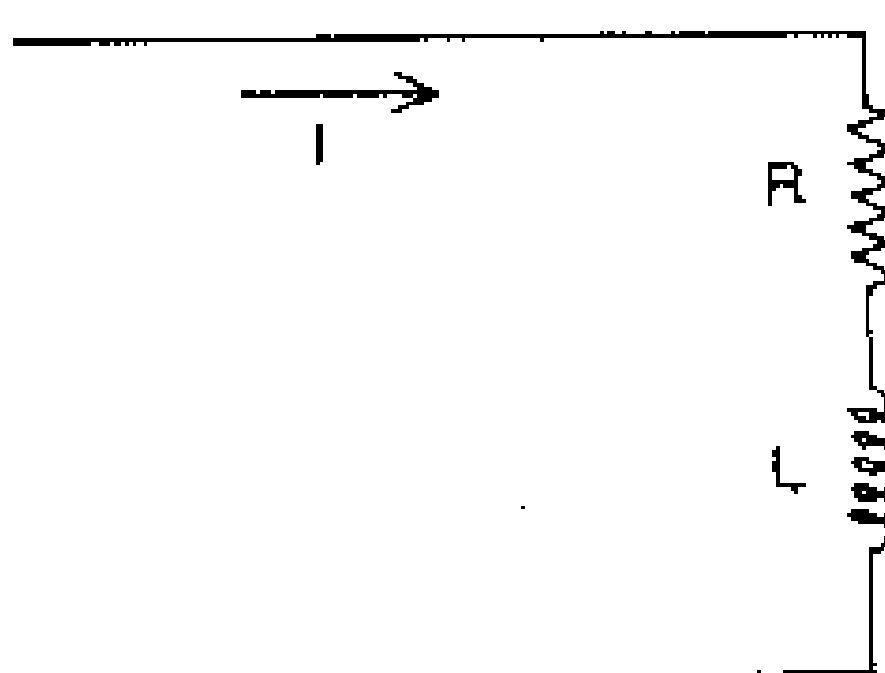
Note: Moment of resistance is $1.72 \times 10^{-8} \text{ (}\Omega\text{m)}$.

[FORMULA] $R = P \cdot \frac{L}{A} \text{ (}\Omega\text{)}$

P : Moment of resistance (Ωm)
L : Length (m)
A : Section area (m^2)

OPERATION	READ-OUT
1 72 8 2 3 5 5 6 =	6.254545454

3) ELECTRIC CURRENT IN TRANSIENT PHENOMENA



Determine the ratio of electric current (i) in the RL circuit ($R = 20\Omega$, $L = 3\text{H}$) shown left 0.2 second after the switch is closed.

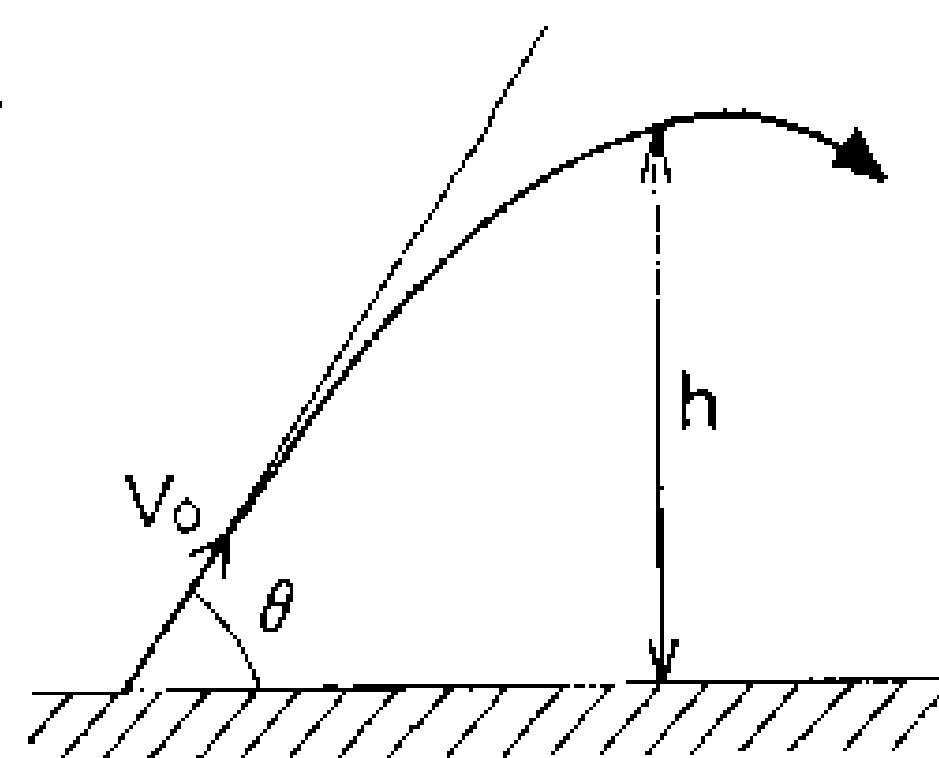
[FORMULA] $i = \frac{E}{R} (1 - e^{-\frac{R}{L}t})$, $I = \frac{E}{R}$

$$\therefore \frac{i}{I} \times 100 = (1 - e^{-\frac{R}{L}t}) \times 100$$

OPERATION	READ-OUT
20 3 2 3 1 1 0 0 =	73.64029

4) PARABOLIC MOVEMENT

To obtain the height of a ball 3 seconds after throwing it at a 50° angle and at an initial velocity of 30 m/sec. (not calculating air resistance).



[FORMULA] $h = V_0 t \sin \theta - \frac{1}{2}gt^2$

h : Height of ball at T seconds after thrown
 V_0 : Initial velocity (m/sec.)
 t : Time (sec.)
 θ : Throwing angle to level surface
 g : Gravitational acceleration (9.8 m/sec.^2)

OPERATION	READ-OUT
DEG RAD 50 30 3 3 9 8 2 =	24.8439996

8 SPECIFICATIONS

CAPABILITIES:

Normal functions — 4 basic functions, chain & mixed operation, constants for x/\div , automatic accumulation in 4 functions, true credit balance and calculations involving decimal places.

Scientific functions — Trigonometric & Inverse Trigonometric functions by degree or radian, Common & Natural Logarithmic functions, Exponentiations (Exponentials, Squares & Powers), Square roots, Reciprocals, Sexagesimal/Decimal conversion, Pi entry and Scientific notation.

CAPACITY:	Input range	Output accuracy
Entry/basic functions	10 digit mantissa or 8 digit mantissa plus 2 digit exponent (powers of ten from 10^{99} to 10^{-99}).	
$\sin x / \tan x$	$ x < 1440^\circ$ (DEG), $ x < 8\pi$ (RAD)	± 1 in the 8th digit
$\cos x$	$ x < 1530^\circ$ (DEG), $ x < \frac{17}{2}\pi$ (RAD)	— " —
$\sin^{-1} x / \cos^{-1} x$	$ x \leq 1$	± 1 in the 7th digit
$\tan^{-1} x$	$ x < 1 \times 10^{100}$	— " —
$\log x / \ln x$	$0 < x < 1 \times 10^{100}$	± 1 in the 8th digit
e^x	$ x \leq 230$	± 1 in the 7 digits
x^y	$0 < x < 1 \times 10^{100}$	— " —
\sqrt{x}	$0 \leq x < 1 \times 10^{100}$	Up to 10 digits
x^2	$ x < 1 \times 10^{100}$	— " —
$1/x$	$ x < 1 \times 10^{100}, x \neq 0$	— " —
\circ, \dots	Up to second	— " —
π	10 digits	— " —

DECIMAL POINT: Full floating mode with underflow.

NEGATIVE NUMBER: Indicated by the floating minus (-) sign for mantissa. The minus sign appears in the 3rd column for a negative exponent.

OVERFLOW: Indicated by an "E" sign, locking the calculator.

READ-OUT: Green digitron tube and zero suppression.

MAIN COMPONENT: One chip LSI.

POWER CONSUMPTION: 0.45 W

POWER SOURCE:

AC 100, 117, 220 or 240V ($\pm 10V$), 50/60Hz with applicable AC Adaptor.

DC Four AA size Manganese dry batteries (SUM-3) operate abt. 11 hours continuously.
Four AA size Alkaline dry batteries (AM-3) operate abt. 25 hours continuously.

USABLE TEMPERATURE: $0^\circ\text{C} \sim 40^\circ\text{C}$ ($32^\circ\text{F} \sim 104^\circ\text{F}$)

DIMENSIONS: 34 mm H x 96 mm W x 160 mm D (1-3/8" H x 3-3/4" W x 6-1/4" D)

WEIGHT: 290 g (10.2 oz) including batteries.

②

CARE OF YOUR NEW ELECTRONIC CALCULATOR

This calculator is a durable, precision-made instrument which will provide you with years of trouble-free service.

To help ensure this we recommend that the inside of the calculator not be touched. It is also inadvisable to subject the calculator to hard knocks, drops, and unduly strong key pressing.

Extreme cold (below 0°C or 32°F), heat (above 40°C or 104°F) and humidity may also effect the function of the calculator. When you do not use the calculator for a long period, take out the batteries to prevent damage if the batteries leak.

Special care should be taken not to leave dead batteries inside the calculator.

Please make sure you switch off the power when you finish your calculations or intend to open the cover to change batteries.

Should the calculator need service, take the unit to the store where purchased or to a nearby dealer.

Ex. $i = 7.75\%$ annual rate

$n = 365$ days/yr.

$$\left(1 + \frac{i}{n}\right)^n = \left[1 + \frac{.0775}{365}\right]^{365} = 1.080573$$

or 8.06%
comp. daily