

Contents

<code>abs(x)</code>	the absolute value of x
<code>ceil(x)</code>	the unique integer n such that $n - 1 < x \leq n$; x (not “.”) if x is missing, meaning that <code>ceil(.a) = .a</code>
<code>cloglog(x)</code>	the complementary log-log of x
<code>comb(n, k)</code>	the combinatorial function $n!/\{k!(n - k)!\}$
<code>digamma(x)</code>	the <code>digamma()</code> function, $d \ln \Gamma(x)/dx$
<code>exp(x)</code>	the exponential function e^x
<code>expm1(x)</code>	$e^x - 1$ with higher precision than <code>exp(x) - 1</code> for small values of $ x $
<code>floor(x)</code>	the unique integer n such that $n \leq x < n + 1$; x (not “.”) if x is missing, meaning that <code>floor(.a) = .a</code>
<code>int(x)</code>	the integer obtained by truncating x toward 0 (thus, <code>int(5.2) = 5</code> and <code>int(-5.8) = -5</code>); x (not “.”) if x is missing, meaning that <code>int(.a) = .a</code>
<code>invcloglog(x)</code>	the inverse of the complementary log-log function of x
<code>invlogit(x)</code>	the inverse of the logit function of x
<code>ln(x)</code>	the natural logarithm, $\ln(x)$
<code>ln1m(x)</code>	the natural logarithm of $1 - x$ with higher precision than <code>ln(1 - x)</code> for small values of $ x $
<code>ln1p(x)</code>	the natural logarithm of $1 + x$ with higher precision than <code>ln(1 + x)</code> for small values of $ x $
<code>lnfactorial(n)</code>	the natural log of n factorial = $\ln(n!)$
<code>lngamma(x)</code>	$\ln\{\Gamma(x)\}$
<code>log(x)</code>	a synonym for <code>ln(x)</code>
<code>log10(x)</code>	the base-10 logarithm of x
<code>log1m(x)</code>	a synonym for <code>ln1m(x)</code>
<code>log1p(x)</code>	a synonym for <code>ln1p(x)</code>
<code>logit(x)</code>	the log of the odds ratio of x , $\text{logit}(x) = \ln\{x/(1 - x)\}$
<code>max(x_1, x_2, \dots, x_n)</code>	the maximum value of x_1, x_2, \dots, x_n
<code>min(x_1, x_2, \dots, x_n)</code>	the minimum value of x_1, x_2, \dots, x_n
<code>mod(x, y)</code>	the modulus of x with respect to y
<code>reldif(x, y)</code>	the “relative” difference $ x - y /(y + 1)$; 0 if both arguments are the same type of extended missing value; <i>missing</i> if only one argument is missing or if the two arguments are two different types of <i>missing</i>
<code>round(x, y)</code> or <code>round(x)</code>	x rounded in units of y or x rounded to the nearest integer if the argument y is omitted; x (not “.”) if x is missing (meaning that <code>round(.a) = .a</code> and that <code>round(.a, y) = .a</code> if y is not missing) and if y is missing, then “.” is returned

<code>sign(x)</code>	the sign of x : -1 if $x < 0$, 0 if $x = 0$, 1 if $x > 0$, or <i>missing</i> if x is missing
<code>sqrt(x)</code>	the square root of x
<code>sum(x)</code>	the running sum of x , treating missing values as zero
<code>trigamma(x)</code>	the second derivative of $\text{lngamma}(x) = d^2 \ln \Gamma(x) / dx^2$
<code>trunc(x)</code>	a synonym for <code>int(x)</code>

Functions

`abs(x)`

Description: the absolute value of x
 Domain: $-8e+307$ to $8e+307$
 Range: 0 to $8e+307$

`ceil(x)`

Description: the unique integer n such that $n - 1 < x \leq n$; x (not “.”) if x is missing, meaning that `ceil(.a) = .a`
 Also see `floor(x)`, `int(x)`, and `round(x)`.
 Domain: $-8e+307$ to $8e+307$
 Range: integers in $-8e+307$ to $8e+307$

`cloglog(x)`

Description: the complementary log-log of x

$$\text{cloglog}(x) = \ln\{-\ln(1 - x)\}$$

 Domain: 0 to 1
 Range: $-8e+307$ to $8e+307$

`comb(n, k)`

Description: the combinatorial function $n! / \{k!(n - k)!\}$
 Domain n : integers 1 to $1e+305$
 Domain k : integers 0 to n
 Range: 0 to $8e+307$ or *missing*

`digamma(x)`

Description: the `digamma()` function, $d \ln \Gamma(x) / dx$
 This is the derivative of $\text{lngamma}(x)$. The `digamma(x)` function is sometimes called the psi function, $\psi(x)$.
 Domain: $-1e+15$ to $8e+307$
 Range: $-8e+307$ to $8e+307$ or *missing*

exp(*x*)Description: the exponential function e^x

This function is the inverse of $\ln(x)$. To compute $e^x - 1$ with high precision for small values of $|x|$, use [expm1\(*x*\)](#).

Domain: $-8e+307$ to 709 Range: 0 to $8e+307$ **expm1(*x*)**Description: $e^x - 1$ with higher precision than $\exp(x) - 1$ for small values of $|x|$ Domain: $-8e+307$ to 709 Range: -1 to $8e+307$ **floor(*x*)**Description: the unique integer n such that $n \leq x < n + 1$; x (not “.”) if x is missing, meaning that $\text{floor}(.a) = .a$

Also see [ceil\(*x*\)](#), [int\(*x*\)](#), and [round\(*x*\)](#).

Domain: $-8e+307$ to $8e+307$ Range: integers in $-8e+307$ to $8e+307$ **int(*x*)**Description: the integer obtained by truncating x toward 0 (thus, $\text{int}(5.2) = 5$ and $\text{int}(-5.8) = -5$); x (not “.”) if x is missing, meaning that $\text{int}(.a) = .a$

One way to obtain the closest integer to x is $\text{int}(x + \text{sign}(x)/2)$, which simplifies to $\text{int}(x + 0.5)$ for $x \geq 0$. However, use of the [round\(\)](#) function is preferred. Also see [round\(*x*\)](#), [ceil\(*x*\)](#), and [floor\(*x*\)](#).

Domain: $-8e+307$ to $8e+307$ Range: integers in $-8e+307$ to $8e+307$ **invcloglog(*x*)**Description: the inverse of the complementary log-log function of x

$$\text{invcloglog}(x) = 1 - \exp\{-\exp(x)\}$$

Domain: $-8e+307$ to $8e+307$ Range: 0 to 1 or *missing***invlogit(*x*)**Description: the inverse of the logit function of x

$$\text{invlogit}(x) = \exp(x) / \{1 + \exp(x)\}$$

Domain: $-8e+307$ to $8e+307$ Range: 0 to 1 or *missing*

`ln(x)`Description: the natural logarithm, $\ln(x)$

This function is the inverse of $\exp(x)$. The logarithm of x in base b can be calculated via $\log_b(x) = \log_a(x)/\log_a(b)$. Hence,

$$\log_5(x) = \ln(x)/\ln(5) = \log(x)/\log(5) = \log_{10}(x)/\log_{10}(5)$$

$$\log_2(x) = \ln(x)/\ln(2) = \log(x)/\log(2) = \log_{10}(x)/\log_{10}(2)$$

You can calculate $\log_b(x)$ by using the formula that best suits your needs. To compute $\ln(1-x)$ and $\ln(1+x)$ with high precision for small values of $|x|$, use `ln1m(x)` and `ln1p(x)`, respectively.

Domain: $1e-323$ to $8e+307$ Range: -744 to 709 `ln1m(x)`Description: the natural logarithm of $1-x$ with higher precision than $\ln(1-x)$ for small values of $|x|$ Domain: $-8e+307$ to $1 - \text{epsdouble}$ Range: -37 to 709 `ln1p(x)`Description: the natural logarithm of $1+x$ with higher precision than $\ln(1+x)$ for small values of $|x|$ Domain: $-1 + \text{epsdouble}$ to $8e+307$ Range: -37 to 709 `lnfactorial(n)`Description: the natural log of n factorial = $\ln(n!)$

To calculate $n!$, use `round(exp(lnfactorial(n)), 1)` to ensure that the result is an integer. Logs of factorials are generally more useful than the factorials themselves because of overflow problems.

Domain: integers 0 to $1e+305$ Range: 0 to $8e+307$ `lngamma(x)`Description: $\ln\{\Gamma(x)\}$

Here the gamma function, $\Gamma(x)$, is defined by $\Gamma(x) = \int_0^\infty t^{x-1} e^{-t} dt$. For integer values of $x > 0$, this is $\ln((x-1)!)$.

`lngamma(x)` for $x < 0$ returns a number such that `exp(lngamma(x))` is equal to the absolute value of the gamma function, $\Gamma(x)$. That is, `lngamma(x)` always returns a real (not complex) result.

Domain: $-2,147,483,648$ to $1e+305$ (excluding negative integers)Range: $-8e+307$ to $8e+307$

$\log(x)$

Description: a synonym for $\ln(x)$

$\log_{10}(x)$

Description: the base-10 logarithm of x

Domain: $1e-323$ to $8e+307$

Range: -323 to 308

$\log_{1m}(x)$

Description: a synonym for $\ln_{1m}(x)$

$\log_{1p}(x)$

Description: a synonym for $\ln_{1p}(x)$

$\text{logit}(x)$

Description: the log of the odds ratio of x , $\text{logit}(x) = \ln\{x/(1-x)\}$

Domain: 0 to 1 (exclusive)

Range: $-8e+307$ to $8e+307$ or *missing*

$\max(x_1, x_2, \dots, x_n)$

Description: the maximum value of x_1, x_2, \dots, x_n

Unless all arguments are *missing*, missing values are ignored.

$\max(2, 10, ., 7) = 10$

$\max(., ., .) = .$

Domain x_1 : $-8e+307$ to $8e+307$ or *missing*

Domain x_2 : $-8e+307$ to $8e+307$ or *missing*

...

Domain x_n : $-8e+307$ to $8e+307$ or *missing*

Range: $-8e+307$ to $8e+307$ or *missing*

$\min(x_1, x_2, \dots, x_n)$

Description: the minimum value of x_1, x_2, \dots, x_n

Unless all arguments are *missing*, missing values are ignored.

$\min(2, 10, ., 7) = 2$

$\min(., ., .) = .$

Domain x_1 : $-8e+307$ to $8e+307$ or *missing*

Domain x_2 : $-8e+307$ to $8e+307$ or *missing*

...

Domain x_n : $-8e+307$ to $8e+307$ or *missing*

Range: $-8e+307$ to $8e+307$ or *missing*

`mod(x, y)`Description: the modulus of x with respect to y

$$\text{mod}(x, y) = x - y \text{ floor}(x/y)$$

$$\text{mod}(x, 0) = .$$

Domain x : $-8\text{e}+307$ to $8\text{e}+307$ Domain y : 0 to $8\text{e}+307$ Range: 0 to $8\text{e}+307$ `reldif(x, y)`Description: the “relative” difference $|x - y|/(|y| + 1)$; 0 if both arguments are the same type of extended missing value; *missing* if only one argument is missing or if the two arguments are two different types of *missing*Domain x : $-8\text{e}+307$ to $8\text{e}+307$ or *missing*Domain y : $-8\text{e}+307$ to $8\text{e}+307$ or *missing*Range: 0 to $8\text{e}+307$ or *missing*`round(x, y)` or `round(x)`Description: x rounded in units of y or x rounded to the nearest integer if the argument y is omitted; x (not “.”) if x is missing (meaning that `round(. a)` = . a and that `round(. a, y)` = . a if y is not missing) and if y is missing, then “.” is returned

For $y = 1$, or with y omitted, this amounts to the closest integer to x ; `round(5.2, 1)` is 5, as is `round(4.8, 1)`; `round(-5.2, 1)` is -5 , as is `round(-4.8, 1)`. The rounding definition is generalized for $y \neq 1$. With $y = 0.01$, for instance, x is rounded to two decimal places; `round(sqrt(2), .01)` is 1.41. y may also be larger than 1; `round(28, 5)` is 30, which is 28 rounded to the closest multiple of 5. For $y = 0$, the function is defined as returning x unmodified.

For values of x exactly at midpoints, where it may not be clear whether to round up or down, x is always rounded up to the larger value. For example, `round(4.5)` is 5 and `round(-4.5)` is -4 . Note that rounding a number is based on the floating-point number representation of the number instead of the number itself. So `round()` is sensitive to representation errors and precision limits. For example, 0.15 has no exact floating-point number representation. Therefore, `round(0.15, 0.1)` is 0.1 instead of 0.2. See [\[U\] 13.12 Precision and problems therein](#) for details.

Also see `int(x)`, `ceil(x)`, and `floor(x)`.

Domain x : $-8\text{e}+307$ to $8\text{e}+307$ Domain y : $-8\text{e}+307$ to $8\text{e}+307$ Range: $-8\text{e}+307$ to $8\text{e}+307$ `sign(x)`Description: the sign of x : -1 if $x < 0$, 0 if $x = 0$, 1 if $x > 0$, or *missing* if x is missingDomain: $-8\text{e}+307$ to $8\text{e}+307$ or *missing*Range: $-1, 0, 1$ or *missing*

`sqrt(x)`

Description: the square root of x
 Domain: 0 to 8e+307
 Range: 0 to 1e+154

`sum(x)`

Description: the running sum of x , treating missing values as zero

For example, following the command `generate y=sum(x)`, the j th observation on y contains the sum of the first through j th observations on x . See [D] [egen](#) for an alternative sum function, `total()`, that produces a constant equal to the overall sum.

Domain: all real numbers or *missing*
 Range: $-8e+307$ to $8e+307$ (excluding *missing*)

`trigamma(x)`

Description: the second derivative of $\text{lngamma}(x) = d^2 \ln \Gamma(x) / dx^2$

The `trigamma()` function is the derivative of `digamma(x)`.

Domain: $-1e+15$ to $8e+307$
 Range: 0 to $8e+307$ or *missing*

`trunc(x)`

Description: a synonym for `int(x)`

Video example

[How to round a continuous variable](#)

References

- Abramowitz, M., and I. A. Stegun, eds. 1964. *Handbook of Mathematical Functions with Formulas, Graphs, and Mathematical Tables*. Washington, DC: National Bureau of Standards.
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Also see

- [FN] [Functions by category](#)
- [D] [egen](#) — Extensions to generate
- [D] [generate](#) — Create or change contents of variable
- [M-4] [Intro](#) — Categorical guide to Mata functions
- [U] [13.3 Functions](#)

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