

# Package ‘dprop’

July 22, 2025

**Type** Package

**Title** Computation of Some Important Distributional Properties

**Version** 0.1.0

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**Depends** R (>= 4.0)

**Imports** extraDistr, stats, VaRES

**Description** Generally, most of the packages specify the probability density function, cumulative distribution function, quantile function, and random numbers generation of the probability distributions. The present package allows to compute some important distributional properties, including the first four ordinary and central moments, Pearson's coefficient of skewness and kurtosis, the mean and variance, coefficient of variation, median, and quartile deviation at some parametric values of several well-known and extensively used probability distributions.

**License** GPL-2

**Encoding** UTF-8

**RoxygenNote** 7.2.3

**NeedsCompilation** no

**Repository** CRAN

**Date/Publication** 2023-06-30 11:00:06 UTC

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dprop-package

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*Computation of Some Important Distributional Properties*


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## Description

Generally, most of the packages specify the probability density function, cumulative distribution function, quantile function, and random numbers generation of the probability distributions. The present package allows to compute some important distributional properties, including the first four ordinary and central moments, Pearson's coefficient of skewness and kurtosis, the mean and variance, coefficient of variation, median, and quartile deviation at some parametric values of several well-known and extensively used probability distributions.

## Details

Package: dprop  
Type: Package  
Version: 0.1.0  
Date: 2023-06-28  
License: GPL-2

**Maintainers**

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**Author(s)**

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Beta distribution	<i>Compute the distributional properties of the beta distribution</i>
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---

**Description**

Compute the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the beta distribution.

**Usage**

```
d_beta(alpha, beta)
```

**Arguments**

alpha	The strictly positive shape parameter of the beta distribution ( $\alpha > 0$ ).
beta	The strictly positive shape parameter of the beta distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the beta distribution:

$$f(x) = \frac{\Gamma(\alpha + \beta)}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha-1} (1-x)^{\beta-1},$$

where  $0 \leq x \leq 1$ ,  $\alpha > 0$  and  $\beta > 0$ .

**Value**

d\_beta gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the beta distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoore84@yahoo.com>.

**References**

- Gupta, A. K., & Nadarajah, S. (2004). Handbook of beta distribution and its applications. CRC Press.
- Johnson, N. L., Kotz, S., & Balakrishnan, N. (1994). Beta distributions. Continuous univariate distributions. 2nd ed. New York, NY: John Wiley and Sons, 221-235.

**See Also**

[d\\_kum](#)

**Examples**

d\_beta(2,2)

---

Beta exponential distribution

*Compute the distributional properties of the beta exponential distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the beta exponential distribution.

**Usage**

d\_bexp(lambda, alpha, beta)

**Arguments**

lambda	The strictly positive scale parameter of the exponential distribution ( $\lambda > 0$ ).
alpha	The strictly positive shape parameter of the beta distribution ( $\alpha > 0$ ).
beta	The strictly positive shape parameter of the beta distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the beta exponential distribution:

$$f(x) = \frac{\lambda e^{-\beta \lambda x}}{B(\alpha, \beta)} (1 - e^{-\lambda x})^{\alpha-1},$$

where  $x > 0$ ,  $\alpha > 0$ ,  $\beta > 0$  and  $\lambda > 0$ .

**Value**

d\_bexp gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the beta exponential distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Nadarajah, S., & Kotz, S. (2006). The beta exponential distribution. *Reliability Engineering & System Safety*, 91(6), 689-697.

**See Also**

[d\\_beta](#)

**Examples**

```
d_bexp(1, 1, 0.2)
```

---

Birnbau-Saunders distribution

*Compute the distributional properties of the Birnbau-Saunders distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Birnbau-Saunders distribution.

**Usage**

```
d_bs(v)
```

**Arguments**

`v` The strictly positive scale parameter of the Birnbau-Saunders distribution ( $v > 0$ ).

**Details**

The following is the probability density function of the Birnbau-Saunders distribution:

$$f(x) = \frac{x^{0.5} + x^{-0.5}}{2vx} \phi\left(\frac{x^{0.5} - x^{-0.5}}{v}\right),$$

where  $x > 0$  and  $v > 0$ .

**Value**

`d_bs` gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Birnbaum-Saunders distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Chan, S., Nadarajah, S., & Afuecheta, E. (2016). An R package for value at risk and expected shortfall. *Communications in Statistics Simulation and Computation*, 45(9), 3416-3434.

**See Also**

[d\\_normal](#)

**Examples**

```
d_bs(5)
```

---

Burr XII distribution *Compute the distributional properties of the Burr XII distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Burr XII distribution.

**Usage**

```
d_burr(k, c)
```

**Arguments**

`k` The strictly positive shape parameter of the Burr XII distribution ( $k > 0$ ).

`c` The strictly positive shape parameter of the Burr XII distribution ( $c > 0$ ).

**Details**

The following is the probability density function of the Burr XII distribution:

$$f(x) = kcx^{c-1} (1 + x^c)^{-k-1},$$

where  $x > 0$ ,  $c > 0$  and  $k > 0$ .

**Value**

`d_burr` gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Burr XII distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshako0r84@yahoo.com>.

**References**

Rodriguez, R. N. (1977). A guide to the Burr type XII distributions. *Biometrika*, 64(1), 129-134.

Zimmer, W. J., Keats, J. B., & Wang, F. K. (1998). The Burr XII distribution in reliability analysis. *Journal of Quality Technology*, 30(4), 386-394.

**See Also**

[d\\_kburr](#)

**Examples**

```
d_burr(2,10)
```

---

Chen distribution

*Compute the distributional properties of the Chen distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Chen distribution.

**Usage**

```
d_chen(k, c)
```

**Arguments**

`k` The strictly positive shape parameter of the Chen distribution ( $k > 0$ ).

`c` The strictly positive scale parameter of the Chen distribution ( $c > 0$ ).

**Details**

The following is the probability density function of the Chen distribution:

$$f(x) = ckx^{k-1}e^{x^k}e^{c-ce^{x^k}},$$

where  $x > 0$ ,  $c > 0$  and  $k > 0$ .

**Value**

`d_chen` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Chen distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Chen, Z. (2000). A new two-parameter lifetime distribution with bathtub shape or increasing failure rate function. *Statistics & Probability Letters*, 49(2), 155–161.

**See Also**

[d\\_wei](#), [d\\_EE](#), [d\\_EW](#)

**Examples**

```
d_chen(0.2, 0.2)
```

---

Chi-squared distribution

*Compute the distributional properties of the Chi-squared distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the (non-central) Chi-squared distribution.

**Usage**

```
d_chi(n)
```



**Arguments**

`n` It is a degree of freedom and the positive parameter of the Chi-squared distribution ( $n > 0$ ).

**Details**

The following is the probability density function of the (non-central) Chi-squared distribution:

$$f(x) = \frac{1}{2^{\frac{n}{2}} \Gamma(\frac{n}{2})} x^{\frac{n}{2}-1} e^{-\frac{x}{2}},$$

where  $x > 0$  and  $n > 0$ .

**Value**

`d_chi` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the (non-central) Chi-squared distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshako0r84@yahoo.com>.

**References**

Ding, C. G. (1992). Algorithm AS275: computing the non-central chi-squared distribution function. *Journal of the Royal Statistical Society. Series C (Applied Statistics)*, 41(2), 478-482.

Johnson, N. L., Kotz, S., & Balakrishnan, N. (1995). *Continuous univariate distributions, volume 2* (Vol. 289). John Wiley & Sons.

**See Also**

[d\\_gamma](#)

**Examples**

`d_chi(2)`

---

Exponential distribution

*Compute the distributional properties of the exponential distribution*

---

### Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponential distribution.

### Usage

```
d_exp(alpha)
```

### Arguments

alpha            The strictly positive scale parameter of the exponential distribution ( $\alpha > 0$ ).

### Details

The following is the probability density function of the exponential distribution:

$$f(x) = \alpha e^{-\alpha x},$$

where  $x > 0$  and  $\alpha > 0$ .

### Value

d\_exp gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponential distribution.

### Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshako0r84@yahoo.com>.

### References

Balakrishnan, K. (2019). Exponential distribution: theory, methods and applications. Routledge.

Singh, A. K. (1997). The exponential distribution-theory, methods and applications, Technometrics, 39(3), 341-341.

### See Also

[d\\_wei](#), [d\\_EE](#)

**Examples**

```
d_exp(2)
```

---

Exponential extension distribution

*Compute the distributional properties of the exponential extension distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponential extension distribution.

**Usage**

```
d_nh(alpha, beta)
```

**Arguments**

alpha	The strictly positive parameter of the exponential extension distribution ( $\alpha > 0$ ).
beta	The strictly positive parameter of the exponential extension distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the exponential extension distribution:

$$f(x) = \alpha\beta(1 + \alpha x)^{\beta-1}e^{1-(1+\alpha x)^\beta},$$

where  $x > 0$ ,  $\alpha > 0$  and  $\beta > 0$ .

**Value**

d\_nh gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponential extension distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshako0r84@yahoo.com>.

**References**

Nadarajah, S., & Haghghi, F. (2011). An extension of the exponential distribution. *Statistics*, 45(6), 543-558.

**See Also**[d\\_exp](#)**Examples**`d_nh(0.5, 1)`


---

 Exponentiated exponential distribution

*Compute the distributional properties of the exponentiated exponential distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponentiated exponential distribution.

**Usage**`d_EE(alpha, beta)`**Arguments**

alpha	The strictly positive scale parameter of the exponential distribution ( $\alpha > 0$ ).
beta	The strictly positive shape parameter of the exponentiated exponential distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the exponentiated exponential distribution:

$$f(x) = \alpha\beta e^{-\alpha x} (1 - e^{-\alpha x})^{\beta-1},$$

where  $x > 0$ ,  $\alpha > 0$  and  $\beta > 0$ .

**Value**

`d_EE` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponentiated exponential distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

- Nadarajah, S. (2011). The exponentiated exponential distribution: a survey. *AStA Advances in Statistical Analysis*, 95, 219-251.
- Gupta, R. D., & Kundu, D. (2007). Generalized exponential distribution: Existing results and some recent developments. *Journal of Statistical Planning and Inference*, 137(11), 3537-3547.

**See Also**

[d\\_EW](#), [d\\_wei](#), [d\\_exp](#)

**Examples**

`d_EE(5,2)`

---

Exponentiated Weibull distribution

*Compute the distributional properties of the exponentiated Weibull distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponentiated Weibull distribution.

**Usage**

`d_EW(a, beta, zeta)`

**Arguments**

- |                   |  |
|-------------------|--|
| <code>a</code>    | The strictly positive shape parameter of the exponentiated Weibull distribution ( $a > 0$ ). |
| <code>beta</code> | The strictly positive scale parameter of the baseline Weibull distribution ( $\beta > 0$ ).  |
| <code>zeta</code> | The strictly positive shape parameter of the baseline Weibull distribution ( $\zeta > 0$ ).  |

**Details**

The following is the probability density function of the exponentiated Weibull distribution:

$$f(x) = a\zeta\beta^{-\zeta}x^{\zeta-1}e^{-\left(\frac{x}{\beta}\right)^{\zeta}} \left[1 - e^{-\left(\frac{x}{\beta}\right)^{\zeta}}\right]^{a-1},$$

where  $x > 0$ ,  $a > 0$ ,  $\beta > 0$  and  $\zeta > 0$ .

**Value**

d\_EW gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the exponentiated Weibull distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Nadarajah, S., Cordeiro, G. M., & Ortega, E. M. (2013). The exponentiated Weibull distribution: a survey. *Statistical Papers*, 54, 839-877.

**See Also**

[d\\_EE](#), [d\\_wei](#)

**Examples**

d\_EW(1,1,0.5)

---

F distribution

*Compute the distributional properties of the F distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the F distribution.

**Usage**

d\_F(alpha, beta)

**Arguments**

alpha            The strictly positive parameter of the F distribution ( $\alpha > 0$ ).

beta             The strictly positive parameter of the F distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the F distribution:

$$f(x) = \frac{1}{B\left(\frac{\alpha}{2}, \frac{\beta}{2}\right)} \left(\frac{\alpha}{\beta}\right)^{\frac{\alpha}{2}} x^{\frac{\alpha}{2}-1} \left(1 + \frac{\alpha}{\beta}x\right)^{-\left(\frac{\alpha+\beta}{2}\right)},$$

where  $x > 0$ ,  $\alpha > 0$  and  $\beta > 0$ .

**Value**

d\_F gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the F distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Johnson, N. L., Kotz, S., & Balakrishnan, N. (1995). Continuous univariate distributions, volume 2 (Vol. 289). John Wiley & Sons.

**See Also**

[d\\_gamma](#)

**Examples**

d\_F(2,10)

---

Frechet distribution    *Compute the distributional properties of the Frechet distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Frechet distribution.

**Usage**

d\_fre(alpha, beta, zeta)

**Arguments**

alpha	The parameter of the Frechet distribution ( $\alpha > 0$ ).
beta	The parameter of the Frechet distribution ( $\beta \in (-\infty, +\infty)$ ).
zeta	The parameter of the Frechet distribution ( $\zeta > 0$ ).

**Details**

The following is the probability density function of the Frechet distribution:

$$f(x) = \frac{\alpha}{\zeta} \left( \frac{x - \beta}{\zeta} \right)^{-1-\alpha} e^{-\left(\frac{x-\beta}{\zeta}\right)^{-\alpha}},$$

where  $x > \beta$ ,  $\alpha > 0$ ,  $\zeta > 0$  and  $\beta \in (-\infty, +\infty)$ . The Frechet distribution is also known as inverse Weibull distribution and special case of the generalized extreme value distribution.

**Value**

`d_fre` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Frechet distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Abbas, K., & Tang, Y. (2015). Analysis of Frechet distribution using reference priors. *Communications in Statistics-Theory and Methods*, 44(14), 2945-2956.

**See Also**

[d\\_wei](#)

**Examples**

```
d_fre(5, 1, 0.5)
```

---

Gamma distribution      *Compute the distributional properties of the gamma distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the gamma distribution.

**Usage**

```
d_gamma(alpha, beta)
```



**Arguments**

alpha	The strictly positive parameter of the gamma distribution ( $\alpha > 0$ ).
beta	The strictly positive parameter of the gamma distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the gamma distribution:

$$f(x) = \frac{\beta^\alpha}{\Gamma(\alpha)} x^{\alpha-1} e^{-\beta x},$$

where  $x > 0$ ,  $\alpha > 0$  and  $\beta > 0$ .

**Value**

d\_gamma the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the gamma distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Burgin, T. A. (1975). The gamma distribution and inventory control. *Journal of the Operational Research Society*, 26(3), 507-525.

**See Also**

[d\\_wei](#), [d\\_naka](#)

**Examples**

```
d_gamma(2,2)
```

---

Gompertz distribution *Compute the distributional properties of the Gompertz distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Gompertz distribution.

**Usage**

```
d_gompertz(alpha, beta)
```

**Arguments**

alpha	The strictly positive parameter of the Gompertz distribution ( $\alpha > 0$ ).
beta	The strictly positive parameter of the Gompertz distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the Gompertz distribution:

$$f(x) = \alpha e^{\beta x - \frac{\alpha}{\beta}(e^{\beta x} - 1)},$$

where  $x > 0$ ,  $\alpha > 0$  and  $\beta > 0$ .

**Value**

`d_gompertz` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Gompertz distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Soliman, A. A., Abd-Allah, A. H., Abou-Elheggag, N. A., & Abd-Elmougod, G. A. (2012). Estimation of the parameters of life for Gompertz distribution using progressive first-failure censored data. *Computational Statistics & Data Analysis*, 56(8), 2471-2485.

**See Also**

[d\\_fre](#)

**Examples**

```
d_gompertz(2, 2)
```

---

Gumbel distribution     *Compute the distributional properties of the Gumbel distribution*

---

### Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Gumbel distribution.

### Usage

```
d_gumbel(alpha, beta)
```

### Arguments

alpha                    Location parameter of the Gumbel distribution ( $\alpha \in (-\infty, +\infty)$ ).  
beta                      The strictly positive scale parameter of the Gumbel distribution ( $\beta > 0$ ).

### Details

The following is the probability density function of the Gumbel distribution:

$$f(x) = \frac{1}{\beta} e^{-(z+e^{-z})},$$

where  $z = \frac{x-\alpha}{\beta}$ ,  $x \in (-\infty, +\infty)$ ,  $\alpha \in (-\infty, +\infty)$  and  $\beta > 0$ .

### Value

d\_gumbel gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Gumbel distribution.

### Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

### References

Gomez, Y. M., Bolfarine, H., & Gomez, H. W. (2019). Gumbel distribution with heavy tails and applications to environmental data. *Mathematics and Computers in Simulation*, 157, 115-129.

### See Also

[d\\_gompertz](#), [d\\_fre](#)

### Examples

```
d_gumbel(1, 2)
```

---

Inverse-gamma distribution

*Compute the distributional properties of the inverse-gamma distribution*

---

### Description

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the inverse-gamma distribution.

### Usage

```
d_ingam(alpha, beta)
```

### Arguments

alpha	The strictly positive parameter of the inverse-gamma distribution ( $\alpha > 0$ ).
beta	The strictly positive parameter of the inverse-gamma distribution ( $\beta > 0$ ).

### Details

The following is the probability density function of the inverse-gamma distribution:

$$f(x) = \frac{\beta^\alpha}{\Gamma(\alpha)} x^{-\alpha-1} e^{-\frac{\beta}{x}},$$

where  $x > 0$ ,  $\alpha > 0$  and  $\beta > 0$ .

### Value

d\_ingam gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the inverse-gamma distribution.

### Author(s)

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshako0r84@yahoo.com>.

### References

- Rivera, P. A., Calderín-Ojeda, E., Gallardo, D. I., & Gómez, H. W. (2021). A compound class of the inverse Gamma and power series distributions. *Symmetry*, 13(8), 1328.
- Glen, A. G. (2017). On the inverse gamma as a survival distribution. *Computational Probability Applications*, 15-30.

**See Also**[d\\_gamma](#)**Examples**`d_ingam(5,2)`

---

**Kumaraswamy Burr XII distribution***Compute the distributional properties of the Kumaraswamy Burr XII distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy Burr XII distribution.

**Usage**`d_kburr(a, b, k, c)`**Arguments**

- a                    The strictly positive parameter of the Kumaraswamy distribution ( $a > 0$ ).
- b                    The strictly positive parameter of the Kumaraswamy distribution ( $b > 0$ ).
- k                    The strictly positive parameter of the Burr XII distribution ( $k > 0$ ).
- c                    The strictly positive parameter of the Burr XII distribution ( $c > 0$ ).

**Details**

The following is the probability density function of the Kumaraswamy Burr XII distribution:

$$f(x) = \frac{abkcx^{c-1}}{(1+x^c)^{k+1}} \left[1 - (1+x^c)^{-k}\right]^{a-1} \left\{1 - \left[1 - (1+x^c)^{-k}\right]^a\right\}^{b-1},$$

where  $x > 0$ ,  $a > 0$ ,  $b > 0$ ,  $k > 0$  and  $c > 0$ .

**Value**

`d_kburr` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy Burr XII distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Paranaiba, P. F., Ortega, E. M., Cordeiro, G. M., & Pascoa, M. A. D. (2013). The Kumaraswamy Burr XII distribution: theory and practice. *Journal of Statistical Computation and Simulation*, 83(11), 2117-2143.

**See Also**

[d\\_kum](#), [d\\_kexp](#)

**Examples**

`d_kburr(1.5, 1, 1, 7)`

---

Kumaraswamy distribution

*Compute the distributional properties of the Kumaraswamy distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy distribution.

**Usage**

`d_kum(alpha, beta)`

**Arguments**

alpha            The strictly positive parameter of the Kumaraswamy distribution ( $\alpha > 0$ ).  
beta             The strictly positive parameter of the Kumaraswamy distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the Kumaraswamy distribution:

$$f(x) = \alpha\beta x^{\alpha-1} (1 - x^\alpha)^{\beta-1},$$

where  $0 \leq x \leq 1$ ,  $\alpha > 0$  and  $\beta > 0$ .

**Value**

`d_kum` gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation at some parametric values based on the Kumaraswamy distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshako0r84@yahoo.com>.

**References**

El-Sherpieny, E. S. A., & Ahmed, M. A. (2014). On the kumaraswamy distribution. *International Journal of Basic and Applied Sciences*, 3(4), 372.

Mitnik, P. A. (2013). New properties of the Kumaraswamy distribution. *Communications in Statistics-Theory and Methods*, 42(5), 741-755.

Dey, S., Mazucheli, J., & Nadarajah, S. (2018). Kumaraswamy distribution: different methods of estimation. *Computational and Applied Mathematics*, 37, 2094-2111.

**See Also**

[d\\_beta](#)

**Examples**

```
d_kum(2,2)
```

---

Kumaraswamy exponential distribution

*Compute the distributional properties of the Kumaraswamy exponential distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy exponential distribution.

**Usage**

```
d_kexp(lambda, a, b)
```

**Arguments**

<code>a</code>	The strictly positive shape parameter of the Kumaraswamy distribution ( $a > 0$ ).
<code>b</code>	The strictly positive shape parameter of the Kumaraswamy distribution ( $b > 0$ ).
<code>lambda</code>	The strictly positive parameter of the exponential distribution ( $\lambda > 0$ ).

**Details**

The following is the probability density function of the Kumaraswamy exponential distribution:

$$f(x) = ab\lambda e^{-\lambda x} (1 - e^{-\lambda x})^{a-1} \left\{ 1 - (1 - e^{-\lambda x})^a \right\}^{b-1},$$

where  $x > 0$ ,  $a > 0$ ,  $b > 0$  and  $\lambda > 0$ .

**Value**

`d_kexp` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy exponential distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Cordeiro, G. M., & de Castro, M. (2011). A new family of generalized distributions. *Journal of Statistical Computation and Simulation*, 81(7), 883-898.

**See Also**

[d\\_kburr](#), [d\\_kum](#)

**Examples**

```
d_kexp(0.2, 1, 1)
```

---

Kumaraswamy normal distribution

*Compute the distributional properties of the Kumaraswamy normal distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy normal distribution.

**Usage**

```
d_kumnorm(mu, sigma, a, b)
```



**Arguments**

mu	The location parameter of the normal distribution ( $\mu \in (-\infty, +\infty)$ ).
sigma	The strictly positive scale parameter of the normal distribution ( $\sigma > 0$ ).
a	The strictly positive shape parameter of the Kumaraswamy distribution ( $a > 0$ ).
b	The strictly positive shape parameter of the Kumaraswamy distribution ( $b > 0$ ).

**Details**

The following is the probability density function of the Kumaraswamy normal distribution:

$$f(x) = \frac{ab}{\sigma} \phi\left(\frac{x-\mu}{\sigma}\right) \left[\Phi\left(\frac{x-\mu}{\sigma}\right)\right]^{a-1} \left[1 - \Phi\left(\frac{x-\mu}{\sigma}\right)\right]^{b-1},$$

where  $x \in (-\infty, +\infty)$ ,  $\mu \in (-\infty, +\infty)$ ,  $\sigma > 0$ ,  $a > 0$  and  $b > 0$ . The functions  $\phi(\cdot)$  and  $\Phi(\cdot)$ , denote the probability density function and cumulative distribution function of the standard normal variable, respectively.

**Value**

d\_kumnorm gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Kumaraswamy normal distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshako0r84@yahoo.com>.

**References**

Cordeiro, G. M., & de Castro, M. (2011). A new family of generalized distributions. *Journal of Statistical Computation and Simulation*, 81(7), 883-898.

**See Also**

[d\\_kburr](#), [d\\_kexp](#), [d\\_kum](#)

**Examples**

```
d_kumnorm(0.2, 0.2, 2, 2)
```

---

Laplace distribution    *Compute the distributional properties of the Laplace or double exponential distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Laplace distribution.

**Usage**

```
d_lap(alpha, beta)
```

**Arguments**

alpha                    Location parameter of the Laplace distribution ( $\alpha \in (-\infty, +\infty)$ ).  
beta                     The strictly positive scale parameter of the Laplace distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the Laplace distribution:

$$f(x) = \frac{1}{2\beta} e^{-\frac{|x-\alpha|}{\beta}},$$

where  $x \in (-\infty, +\infty)$ ,  $\alpha \in (-\infty, +\infty)$  and  $\beta > 0$ .

**Value**

d\_lap gives the first four ordinary moments, central moments, mean, variance, Pearson's coefficient of skewness, kurtosis, coefficient of variation, median and quartile deviation at some parametric values based on the Laplace distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshako0r84@yahoo.com>.

**References**

Cordeiro, G. M., & Lemonte, A. J. (2011). The beta Laplace distribution. *Statistics & Probability Letters*, 81(8), 973-982.

**See Also**

[d\\_normal](#)

**Examples**

```
d_lap(2,4)
```

---

 Log-normal distribution

*Compute the distributional properties of the log-normal distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the log-normal distribution.

**Usage**

```
d_lnormal(mu, sigma)
```

**Arguments**

mu	The location parameter ( $\mu \in (-\infty, +\infty)$ ).
sigma	The strictly positive scale parameter of the log-normal distribution ( $\sigma > 0$ ).

**Details**

The following is the probability density function of the log-normal distribution:

$$f(x) = \frac{1}{x\sigma\sqrt{2\pi}} e^{-\frac{(\log(x)-\mu)^2}{2\sigma^2}},$$

where  $x > 0$ ,  $\mu \in (-\infty, +\infty)$  and  $\sigma > 0$ .

**Value**

d\_lnormal gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the log-normal distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshako0r84@yahoo.com>.

**References**

Johnson, N. L., Kotz, S., & Balakrishnan, N. (1995). Continuous Univariate Distributions, Volume 1, Chapter 14. Wiley, New York.

**See Also**[d\\_normal](#)**Examples**`d_lnormal(1,0.5)`


---

Logistic distribution *Compute the distributional properties of the logistic distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the logistic distribution.

**Usage**`d_logis(mu, sigma)`**Arguments**

`mu` Location parameter of the logistic distribution ( $\mu \in (-\infty, +\infty)$ ).

`sigma` The strictly positive scale parameter of the logistic distribution ( $\sigma > 0$ ).

**Details**

The following is the probability density function of the logistic distribution:

$$f(x) = \frac{e^{-\frac{(x-\mu)}{\sigma}}}{\sigma \left(1 + e^{-\frac{(x-\mu)}{\sigma}}\right)^2},$$

where  $x \in (-\infty, +\infty)$ ,  $\mu \in (-\infty, +\infty)$  and  $\sigma > 0$ .

**Value**

`d_logis` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the logistic distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Johnson, N. L., Kotz, S., & Balakrishnan, N. (1995). Continuous univariate distributions, Volume 2 (Vol. 289). John Wiley & Sons.

**See Also**

[d\\_lnormal](#)

**Examples**

```
d_logis(4,0.2)
```

---

Lomax distribution	<i>Compute the distributional properties of the Lomax distribution</i>
--------------------	--

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Lomax distribution.

**Usage**

```
d_lom(alpha, beta)
```

**Arguments**

alpha	The strictly positive parameter of the Lomax distribution ( $\alpha > 0$ ).
beta	The strictly positive parameter of the Lomax distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the Lomax distribution:

$$f(x) = \frac{\alpha}{\beta} \left(1 + \frac{x}{\beta}\right)^{-\alpha-1},$$

where  $x > 0$ ,  $\alpha > 0$  and  $\beta > 0$ .

**Value**

`d_lom` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Lomax distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoore84@yahoo.com>.

**References**

Abd-Elfattah, A. M., Alaboud, F. M., & Alharby, A. H. (2007). On sample size estimation for Lomax distribution. *Australian Journal of Basic and Applied Sciences*, 1(4), 373-378.

**See Also**

[d\\_gamma](#)

**Examples**

`d_lom(10,10)`

---

Nakagami distribution *Compute the distributional properties of the Nakagami distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Nakagami distribution.

**Usage**

`d_naka(alpha, beta)`

**Arguments**

alpha	The strictly positive parameter of the Nakagami distribution ( $\alpha > 0$ ).
beta	The strictly positive parameter of the Nakagami distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the Nakagami distribution:

$$f(x) = \frac{2\alpha^\alpha}{\Gamma(\alpha)\beta^\alpha} x^{2\alpha-1} e^{-\frac{\alpha x^2}{\beta}},$$

where  $x > 0$ ,  $\alpha > 0$  and  $\beta > 0$ .

**Value**

`d_naka` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Nakagami distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshako0r84@yahoo.com>.

**References**

Schwartz, J., Godwin, R. T., & Giles, D. E. (2013). Improved maximum-likelihood estimation of the shape parameter in the Nakagami distribution. *Journal of Statistical Computation and Simulation*, 83(3), 434-445.

**See Also**

[d\\_gamma](#)

**Examples**

```
d_naka(2,2)
```

---

Normal distribution     *Compute the distributional properties of the normal distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the normal distribution.

**Usage**

```
d_normal(alpha, beta)
```

**Arguments**

alpha	Location parameter of the normal distribution ( $\alpha \in (-\infty, +\infty)$ ).
beta	The strictly positive scale parameter of the normal distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the normal distribution:

$$f(x) = \frac{1}{\beta\sqrt{2\pi}} e^{-0.5\left(\frac{x-\alpha}{\beta}\right)^2},$$

where  $x \in (-\infty, +\infty)$ ,  $\alpha \in (-\infty, +\infty)$  and  $\beta > 0$ . The parameters  $\alpha$  and  $\beta$  represent the mean and standard deviation, respectively.

**Value**

`d_normal` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the normal distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Patel, J. K., & Read, C. B. (1996). Handbook of the normal distribution (Vol. 150). CRC Press.

**See Also**

[d\\_lnormal](#)

**Examples**

```
d_normal(4,0.2)
```

---

Rayleigh distribution *Compute the distributional properties of the Rayleigh distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Rayleigh distribution.

**Usage**

```
d_rayl(alpha)
```

**Arguments**

`alpha` The strictly positive parameter of the Rayleigh distribution ( $\alpha > 0$ ).

**Details**

The following is the probability density function of the Rayleigh distribution:

$$f(x) = \frac{x}{\alpha^2} e^{-\frac{x^2}{2\alpha^2}},$$

where  $x > 0$ ,  $\alpha > 0$ .



**Value**

d\_rayl gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Rayleigh distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Forbes, C., Evans, M. Hastings, N., & Peacock, B. (2011). Statistical Distributions. John Wiley & Sons.

**See Also**

[d\\_wei](#)

**Examples**

d\_rayl(2)

Student's t distribution

*Compute the distributional properties of the Student distribution*

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Student t distribution.

**Usage**

d\_st(v)

**Arguments**

v                      The strictly positive parameter of the Student distribution ( $v > 0$ ), it is also called a degree of freedom.

**Details**

The following is the probability density function of the Student t distribution:

$$f(x) = \frac{\Gamma(\frac{v+1}{2})}{\sqrt{v\pi}\Gamma(\frac{v}{2})} \left(1 + \frac{x^2}{v}\right)^{-(v+1)/2},$$

where  $x \in (-\infty, +\infty)$  and  $v > 0$ .

**Value**

`d_st` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Student t distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Yang, Z., Fang, K. T., & Kotz, S. (2007). On the Student's t-distribution and the t-statistic. *Journal of Multivariate Analysis*, 98(6), 1293-1304.

Ahsanullah, M., Kibria, B. G., & Shakil, M. (2014). Normal and Student's t distributions and their applications (Vol. 4). Paris, France: Atlantis Press.

**See Also**

[d\\_chi](#)

**Examples**

```
d_st(6)
```

---

Weibull distribution    *Compute the distributional properties of the Weibull distribution*

---

**Description**

Compute the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Weibull distribution.

**Usage**

```
d_wei(alpha, beta)
```

**Arguments**

<code>alpha</code>	The strictly positive scale parameter of the Weibull distribution ( $\alpha > 0$ ).
<code>beta</code>	The strictly positive shape parameter of the Weibull distribution ( $\beta > 0$ ).

**Details**

The following is the probability density function of the Weibull distribution:

$$f(x) = \frac{\beta}{\alpha} \left(\frac{x}{\alpha}\right)^{\beta-1} e^{-\left(\frac{x}{\alpha}\right)^\beta},$$

where  $x > 0$ ,  $\alpha > 0$  and  $\beta > 0$ .

**Value**

`d_wei` gives the first four ordinary moments, central moments, mean, and variance, Pearson's coefficient of skewness and kurtosis, coefficient of variation, median and quartile deviation based on the selected parametric values of the Weibull distribution.

**Author(s)**

Muhammad Imran.

R implementation and documentation: Muhammad Imran <imranshakoor84@yahoo.com>.

**References**

Hallinan Jr, Arthur J. (1993). A review of the Weibull distribution. *Journal of Quality Technology*, 25(2), 85-93.

**See Also**

[d\\_EE](#)

**Examples**

```
d_wei(2,2)
```

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