# Package ‘new.dist’

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**Title** Alternative Continuous and Discrete Distributions

**Version** 0.1.1

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**Description** The aim is to develop an R package, which is the 'new.dist' package, for the probability (density) function, the distribution function, the quantile function and the associated random number generation function for discrete and continuous distributions, which have recently been proposed in the literature. This package implements the following distributions: The Power Muth Distribution, a Bimodal Weibull Distribution, the Discrete Lindley Distribution, The Gamma-Lomax Distribution, Weighted Geometric Distribution, a Power Log-Dagum Distribution, Kumaraswamy Distribution, Lindley Distribution, the Unit-Inverse Gaussian Distribution, EP Distribution, Akash Distribution, Ishita Distribution, Maxwell Distribution, the Standard Omega Distribution, Slashed Generalized Rayleigh Distribution, Two-Parameter Rayleigh Distribution, Muth Distribution, Uniform-Geometric Distribution, Discrete Weibull Distribution.

**License** GPL-3

**URL** https://github.com/akmn35/new.dist,
https://akmn35.github.io/new.dist/

**BugReports** https://github.com/akmn35/new.dist/issues

**Imports** VGAM, expint, pracma

**Suggests** knitr, rmarkdown, roxygen2, stats, testthat (>= 3.0.0)

**VignetteBuilder** knitr

**RdMacros**

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**Encoding** UTF-8

**RoxygenNote** 7.2.3

**NeedsCompilation** no

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**Repository** CRAN

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# R topics documented:



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`bwd` *Bimodal Weibull Distribution*

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### Description

Density, distribution function, quantile function and random generation for a Bimodal Weibull distribution with parameters `shape` and `scale`.

### Usage

```
dbwd(x, alpha, beta = 1, sigma, log = FALSE)

pbwd(q, alpha, beta = 1, sigma, lower.tail = TRUE, log.p = FALSE)
```

```
qbwd(p, alpha, beta = 1, sigma, lower.tail = TRUE)

rbwd(n, alpha, beta = 1, sigma)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `alpha` | a shape parameter. |
| `beta` | a scale parameter. |
| `sigma` | a control parameter that controls the uni- or bimodality of the distribution. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X \leq x\right]$, otherwise, $P\left[X > x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

A Bimodal Weibull distribution with `shape` parameter $\alpha$, `scale` parameter $\beta$,and the `control` parameter $\sigma$ that determines the uni- or bimodality of the distribution, has density

$$f\left(x\right)=\frac{\alpha}{\beta Z_\theta}\left[1+\left(1-\sigma\; x\right)^2\right]\left(\frac{x}{\beta}\right)^{\alpha-1}\exp\left(-\left(\frac{x}{\beta}\right)^{\alpha}\right),$$

where

$$Z_\theta=2+\sigma^2\beta^2\Gamma\left(1+\left(2/\alpha\right)\right)-2\sigma\beta\Gamma\left(1+\left(1/\alpha\right)\right)$$

and

$$x\geq 0,\ \alpha,\beta>0\; and\; \sigma\in\mathbb{R}.$$

## Value

`dbwd` gives the density, `pbwd` gives the distribution function, `qbwd` gives the quantile function and `rbwd` generates random deviates.

## References

Vila, R. ve Niyazi Çankaya, M., 2022, *A bimodal Weibull distribution: properties and inference*, Journal of Applied Statistics, 49 (12), 3044-3062.

## Examples

```
library(new.dist)
dbwd(1,alpha=2,beta=3,sigma=4)
pbwd(1,alpha=2,beta=3,sigma=4)
qbwd(.7,alpha=2,beta=3,sigma=4)
rbwd(10,alpha=2,beta=3,sigma=4)
```

`dLd1` *Discrete Lindley Distribution*

## Description

Density, distribution function, quantile function and random generation for the discrete Lindley distribution.

## Usage

```
ddLd1(x, theta, log = FALSE)

pdLd1(q, theta, lower.tail = TRUE, log.p = FALSE)

qdLd1(p, theta, lower.tail = TRUE)

rdLd1(n, theta)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `theta` | a parameter. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X \leq x\right]$, otherwise, $P\left[X > x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

The Discrete Lindley distribution with a parameter $\theta$, has density

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

where

$$x = 0, 1, ..., \ \theta > 0 \ and \ \lambda = e^{-\theta}.$$

## Value

`ddLd1` gives the density, `pdLd1` gives the distribution function, `qdLd1` gives the quantile function and `rdLd1` generates random deviates.

## References

Gómez-Déniz, E. ve Calderín-Ojeda, E., 2011, *The discrete Lindley distribution: properties and applications*.Journal of statistical computation and simulation, 81 (11), 1405-1416.

## Examples

```
library(new.dist)
ddLd1(1,theta=2)
pdLd1(2,theta=1)
qdLd1(.993,theta=2)
rdLd1(10,theta=1)
```

---

dLd2 *Discrete Lindley Distribution*

---

## Description

Density, distribution function, quantile function and random generation for the discrete Lindley distribution.

## Usage

```
ddLd2(x, theta, log = FALSE)

pdLd2(q, theta, lower.tail = TRUE, log.p = FALSE)

qdLd2(p, theta, lower.tail = TRUE)

rdLd2(n, theta)
```

## Arguments

| | |
|---|---|
| x, q | vector of quantiles. |
| theta | a parameter. |
| log, log.p | logical; if TRUE, probabilities p are given as log(p). |
| lower.tail | logical; if TRUE (default), probabilities are $P\left[X \leq x\right]$, otherwise, $P\left[X > x\right]$. |
| p | vector of probabilities. |
| n | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

the discrete Lindley distribution with a parameter $\theta$, has density

$$f\left(x\right) = \frac{\lambda^{x}}{1+\theta}\left(\theta\left(1-2\lambda\right)+\left(1-\lambda\right)\left(1+\theta x\right)\right),$$

where

$$x = 0, 1, 2, ..., \lambda = \exp\left(-\theta\right)\ and\, \theta > 0.$$

### Value

`ddLd2` gives the density, `pdLd2` gives the distribution function, `qdLd2` gives the quantile function and `rdLd2` generates random deviates.

### References

Bakouch, H. S., Jazi, M. A. ve Nadarajah, S., 2014, *A new discrete distribution, Statistics*, 48 (1), 200-240.

### Examples

```
library(new.dist)
ddLd2(2,theta=2)
pdLd2(1,theta=2)
qdLd2(.5,theta=2)
rdLd2(10,theta=1)
```

---

`EPd` *EP distribution*

---

### Description

Density, distribution function, quantile function and random generation for the EP distribution.

### Usage

```
dEPd(x, lambda, beta, log = FALSE)

pEPd(q, lambda, beta, lower.tail = TRUE, log.p = FALSE)

qEPd(p, lambda, beta, lower.tail = TRUE)

rEPd(n, lambda, beta)
```

### Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `lambda, beta` | are parameters. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X \leq x\right]$, otherwise, $P\left[X > x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

### Details

The EP distribution with parameters $\lambda$ and $\beta$, has density

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

where

$$x > \mathbb{R}_+,\ \beta, \lambda \in \mathbb{R}_+.$$

### Value

`dEPd` gives the density, `pEPd` gives the distribution function, `qEPd` gives the quantile function and `rEPd` generates random deviates.

### References

Kuş, C., 2007, *A new lifetime distribution*, Computational Statistics & Data Analysis, 51 (9), 4497-4509.

### Examples

```
library(new.dist)
dEPd(1, lambda=2, beta=3)
pEPd(1,lambda=2,beta=3)
qEPd(.8,lambda=2,beta=3)
rEPd(10,lambda=2,beta=3)
```

---

## gld *Gamma-Lomax Distribution*

---

### Description

Density, distribution function, quantile function and random generation for the gamma-Lomax distribution with parameters `shapes` and `scale`.

### Usage

```
dgld(x, a, alpha, beta = 1, log = FALSE)

pgld(q, a, alpha, beta = 1, lower.tail = TRUE, log.p = FALSE)

qgld(p, a, alpha, beta = 1, lower.tail = TRUE)

rgld(n, a, alpha, beta = 1)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `a, alpha` | are shape parameters. |
| `beta` | a scale parameter. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X\leq x\right]$, otherwise, $P\left[X>x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

The Gamma-Lomax distribution `shape` parameters $a$ and $\alpha$, and `scale` parameter is $\beta$, has density

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

where

$$x>0,\ a,\alpha,\beta>0.$$

## Value

`dgld` gives the density, `pgld` gives the distribution function, `qgld` gives the quantile function and `rgld` generates random deviates.

## References

Cordeiro, G. M., Ortega, E. M. ve Popović, B. V., 2015, *The gamma-Lomax distribution*, Journal of statistical computation and simulation, 85 (2), 305-319.

Ristić, M. M., & Balakrishnan, N. (2012), *The gamma-exponentiated exponential distribution. Journal of statistical computation and simulation* , 82(8), 1191-1206.

## Examples

```
library(new.dist)
dgld(1, a=2, alpha=3, beta=4)
pgld(1, a=2,alpha=3,beta=4)
qgld(.8, a=2,alpha=3,beta=4)
rgld(10, a=2,alpha=3,beta=4)
```

kd *Kumaraswamy Distribution*

## Description

Density, distribution function, quantile function and random generation for Kumaraswamy distribution with shape parameters.

## Usage

```
dkd(x, lambda, alpha, log = FALSE)

pkd(q, lambda, alpha, lower.tail = TRUE, log.p = FALSE)

qkd(p, lambda, alpha, lower.tail = TRUE)

rkd(n, lambda, alpha)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `alpha, lambda` | are non-negative shape parameters. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X \le x\right]$, otherwise, $P\left[X > x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

Kumaraswamy distribution with non-negative shape parameters $\alpha$ and $\lambda$ has density

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

where

$$0 < x < 1, \ \ \alpha, \lambda > 0.$$

## Value

`dkd` gives the density, `pkd` gives the distribution function, `qkd` gives the quantile function and `rkd` generates random deviates.

## References

Kohansal, A. ve Bakouch, H. S., 2021, *Estimation procedures for Kumaraswamy distribution parameters under adaptive type-II hybrid progressive censoring*, Communications in Statistics-Simulation and Computation, 50 (12), 4059-4078.

## Examples

```
library("new.dist")
dkd(0.1,lambda=2,alpha=3)
pkd(0.5,lambda=2,alpha=3)
qkd(.8,lambda=2,alpha=3)
rkd(10,lambda=2,alpha=3)
```

---

`Ld` *Lindley Distribution*

---

## Description

Density, distribution function, quantile function and random generation for the Lindley distribution.

## Usage

```
dLd(x, theta, log = FALSE)

pLd(q, theta, lower.tail = TRUE, log.p = FALSE)

qLd(p, theta, lower.tail = TRUE)

rLd(n, theta)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `theta` | a parameter. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X\leq x\right]$, otherwise, $P\left[X>x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

The Lindley distribution with a parameter $\theta$, has density

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

where

$$x>0,\ \theta>0.$$

## Value

`dLd` gives the density, `pLd` gives the distribution function, `qLd` gives the quantile function and `rLd` generates random deviates.

## References

Akgül, F. G., Acıtaş, Ş. ve Şenoğlu, B., 2018, *Inferences on stress–strength reliability based on ranked set sampling data in case of Lindley distribution*, Journal of statistical computation and simulation, 88 (15), 3018-3032.

## Examples

```
library(new.dist)
dLd(1,theta=2)
pLd(1,theta=2)
qLd(.8,theta=1)
rLd(10,theta=1)
```

---

md *Maxwell Distribution*

---

## Description

Density, distribution function, quantile function and random generation for Maxwell distribution with parameter `scale`.

## Usage

```
dmd(x, theta = 1, log = FALSE)

pmd(q, theta = 1, lower.tail = TRUE, log.p = FALSE)

qmd(p, theta = 1, lower.tail = TRUE)

rmd(n, theta = 1)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `theta` | a scale parameter. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X \leq x\right]$, otherwise, $P\left[X > x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

Maxwell distribution with `scale` parameter $\theta$, has density

$$f\left(x\right) = \frac{4}{\sqrt{\pi}}\frac{1}{\theta^{3/2}}x^2 e^{-x^2/\theta},$$

where

$$0 \leq x < \infty, \;\; \theta > 0.$$

## Value

dmd gives the density, pmd gives the distribution function, qmd gives the quantile function and rmd generates random deviates.

## References

Krishna, H., Vivekanand ve Kumar, K., 2015, *Estimation in Maxwell distribution with randomly censored data*, Journal of statistical computation and simulation, 85 (17), 3560-3578.

## Examples

```
library(new.dist)
dmd(1,theta=2)
pmd(1,theta=2)
qmd(.4,theta=5)
rmd(10,theta=1)
```

---

# omd *Muth Distribution*

---

## Description

Density, distribution function, quantile function and random generation for on the Muth distribution.

## Usage

```
domd(x, alpha, log = FALSE)

pomd(q, alpha, lower.tail = TRUE, log.p = FALSE)

qomd(p, alpha, lower.tail = TRUE)

romd(n, alpha)
```

## Arguments

| | |
|---|---|
| x, q | vector of quantiles. |
| alpha | a parameter. |
| log, log.p | logical; if TRUE, probabilities p are given as log(p). |
| lower.tail | logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$. |
| p | vector of probabilities. |
| n | number of observations. If length(n) > 1, the length is taken to be the number required. |

## Details

The Muth distribution with a parameter $\alpha$, has density

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

where

$$x > 0,\ \alpha \in (0, 1].$$

## Value

`domd` gives the density, `pomd` gives the distribution function, `qomd` gives the quantile function and `romd` generates random deviates.

## References

Jodrá, P., Jiménez-Gamero, M. D. ve Alba-Fernández, M. V., 2015, *On the Muth distribution, Mathematical Modelling and Analysis*, 20 (3), 291-310.

## Examples

```
library(new.dist)
domd(1,alpha=.2)
pomd(1,alpha=.2)
qomd(.8,alpha=.1)
romd(10,alpha=1)
```

---

`pldd` *Power Log Dagum Distribution*

---

## Description

Density, distribution function, quantile function and random generation for a Power Log Dagum distribution.

## Usage

```
dpldd(x, alpha, beta, theta, log = FALSE)

ppldd(q, alpha, beta, theta, lower.tail = TRUE, log.p = FALSE)

qpldd(p, alpha, beta, theta, lower.tail = TRUE)

rpldd(n, alpha, beta, theta)
```

### Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `alpha, beta, theta` | are parameters. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P[X \le x]$, otherwise, $P[X > x]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

### Details

A Power Log Dagum Distribution with parameters $\alpha$, $\beta$ and $\theta$, has density

$$f(x) = \alpha\left(\beta + \theta\,|x|^{\beta-1}\right) e^{-\left(\beta x + sign(x)(\theta/\beta)|x|^{\beta}\right)} \quad \left(1 + e^{-\left(\beta x + sign(x)(\theta/\beta)|x|^{\beta}\right)}\right)^{-(\alpha+1)},$$

where

$$x \in \mathbb{R},\ \beta \in \mathbb{R},\ \alpha > 0\ and\ \theta \ge 0$$

### Value

`dpldd` gives the density, `ppldd` gives the distribution function, `qpldd` gives the quantile function and `rpldd` generates random deviates.

### Note

The distributions hazard function

$$h(x) = \frac{\alpha\left(\beta + \theta\,|x|^{\beta-1}\right) e^{-\left(\beta x + sign(x)(\theta/\beta)|x|^{\beta}\right)} \left(1 + e^{-\left(\beta x + sign(x)(\theta/\beta)|x|^{\beta}\right)}\right)^{-(\alpha+1)}}{1 - \left(1 + e^{-\left(\beta x + sign(x)(\theta/\beta)|x|^{\beta}\right)}\right)^{-\alpha}}.$$

### References

Bakouch, H. S., Khan, M. N., Hussain, T. ve Chesneau, C., 2019, *A power log-Dagum distribution: estimation and applications*, Journal of Applied Statistics, 46 (5), 874-892.

### Examples

```
library(new.dist)
dpldd(1, alpha=2, beta=3, theta=4)
ppldd(1,alpha=2,beta=3,theta=4)
qpldd(.8,alpha=2,beta=3,theta=4)
rpldd(10,alpha=2,beta=3,theta=4)
```

RA *Ram Awadh Distribution*

## Description

Density, distribution function, quantile function and random generation for a Ram Awadh distribution with parameter `scale`.

## Usage

```
dRA(x, theta = 1, log = FALSE)

pRA(q, theta = 1, lower.tail = TRUE, log.p = FALSE)

qRA(p, theta = 1, lower.tail = TRUE)

rRA(n, theta = 1)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `theta` | a scale parameter. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X \leq x\right]$, otherwise, $P\left[X > x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

Ram Awadh distribution with `scale` parameter $\theta$, has density

$$f\left(x\right) = \frac{\theta^6}{\theta^6 + 120}\left(\theta + x^5\right)e^{-\theta x},$$

where

$$x > 0,\ \theta > 0.$$

## Value

`dRA` gives the density, `pRA` gives the distribution function, `qRA` gives the quantile function and `rRA` generates random deviates.

## References

Shukla, K. K., Shanker, R. ve Tiwari, M. K., 2022, *A new one parameter discrete distribution and its applications*, Journal of Statistics and Management Systems, 25 (1), 269-283.

## Examples

```
library(new.dist)
dRA(1,theta=2)
pRA(1,theta=2)
qRA(.1,theta=1)
rRA(10,theta=1)
```

---

sgrd *Slashed Generalized Rayleigh Distribution*

---

## Description

Density, distribution function, quantile function and random generation for the Slashed generalized Rayleigh distribution with parameters `shape`, `scale` and `kurtosis`.

## Usage

```
dsgrd(x, theta, alpha, beta, log = FALSE)

psgrd(q, theta, alpha, beta, lower.tail = TRUE, log.p = FALSE)

qsgrd(p, theta, alpha, beta, lower.tail = TRUE)

rsgrd(n, theta, alpha, beta)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `theta` | a scale parameter. |
| `alpha` | a shape parameter. |
| `beta` | a kurtosis parameter. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X \leq x\right]$, otherwise, $P\left[X > x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

The Slashed Generalized Rayleigh distribution with `shape` parameter $\alpha$, `scale` parameter $\theta$ and `kurtosis` parameter $\beta$, has density

$$f\left(x\right)=\frac{\beta x^{-\left(\beta+1\right)}}{\Gamma\left(\alpha+1\right)\theta^{\beta/2}}\Gamma\left(\frac{2\alpha+\beta+2}{2}\right)F\left(\theta x^{2};\frac{2\alpha+\beta+2}{2},1\right),$$

where F(.;a,b) is the cdf of the Gamma (a,b) distribution, and

$$x>0,\ \theta>0,\ \alpha>-1\ and\ \beta>0$$

## Value

`dsgrd` gives the density, `psgrd` gives the distribution function, `qsgrd` gives the quantile function and `rsgrd` generates random deviates.

## References

Iriarte, Y. A., Vilca, F., Varela, H. ve Gómez, H. W., 2017, *Slashed generalized Rayleigh distribution*, Communications in Statistics- Theory and Methods, 46 (10), 4686-4699.

## Examples

```
library(new.dist)
dsgrd(2,theta=3,alpha=1,beta=4)
psgrd(5,theta=3,alpha=1,beta=4)
qsgrd(.4,theta=3,alpha=1,beta=4)
rsgrd(10,theta=3,alpha=1,beta=4)
```

---

# sod *Standard Omega Distribution*

---

## Description

Density, distribution function, quantile function and random generation for the Standard Omega distribution.

## Usage

```
dsod(x, alpha, beta, log = FALSE)

psod(q, alpha, beta, lower.tail = TRUE, log.p = FALSE)

qsod(p, alpha, beta, lower.tail = TRUE)

rsod(n, alpha, beta)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `alpha, beta` | are parameters. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

The Standard Omega distribution with parameters $\alpha$ and $\beta$, has density

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

where

$$0<x<1,\ \alpha,\beta>0.$$

## Value

`dsod` gives the density, `psod` gives the distribution function, `qsod` gives the quantile function and `rsod` generates random deviates.

## References

Birbiçer, İ. ve Genç, A. İ., 2022, *On parameter estimation of the standard omega distribution*. Journal of Applied Statistics, 1-17.

## Examples

```
library(new.dist)
dsod(0.4, alpha=1, beta=2)
psod(0.4, alpha=1, beta=2)
qsod(.8, alpha=1, beta=2)
rsod(10, alpha=1, beta=2)
```

---

`tpmd` *Power Muth Distribution*

---

## Description

Density, distribution function, quantile function and random generation for the Power Muth distribution with parameters `shape` and `scale`.

## Usage

```
dtpmd(x, beta = 1, alpha, log = FALSE)

ptpmd(q, beta = 1, alpha, lower.tail = TRUE, log.p = FALSE)

qtpmd(p, beta = 1, alpha, lower.tail = TRUE)

rtpmd(n, beta = 1, alpha)
```

### Arguments

| | |
|---|---|
| x, q | vector of quantiles. |
| beta | a scale parameter. |
| alpha | a shape parameter. |
| log, log.p | logical; if TRUE, probabilities p are given as log(p). |
| lower.tail | logical; if TRUE (default), probabilities are $P\left[X \leq x\right]$, otherwise, $P\left[X > x\right]$. |
| p | vector of probabilities. |
| n | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

### Details

The Power Muth distribution with `shape` parameter $\alpha$ and `scale` parameter $\beta$ has density

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

where

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

### Value

`dtpmd` gives the density, `ptpmd` gives the distribution function, `qtpmd` gives the quantile function and `rtpmd` generates random deviates.

### Note

Hazard function;

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

### References

Jodra, P., Gomez, H. W., Jimenez-Gamero, M. D., & Alba-Fernandez, M. V. (2017). *The power Muth distribution* . Mathematical Modelling and Analysis, 22(2), 186-201.

### Examples

```
library(new.dist)
dtpmd(1, beta=2, alpha=3)
ptpmd(1,beta=2,alpha=3)
qtpmd(.5,beta=2,alpha=3)
rtpmd(10,beta=2,alpha=3)
```

`tprd` *Two-Parameter Rayleigh Distribution*

## Description

Density, distribution function, quantile function and random generation for the Two-Parameter Rayleigh distribution with parameters `location` and `scale`.

## Usage

```
dtprd(x, lambda = 1, mu, log = FALSE)

ptprd(q, lambda = 1, mu, lower.tail = TRUE, log.p = FALSE)

qtprd(p, lambda = 1, mu, lower.tail = TRUE)

rtprd(n, lambda = 1, mu)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `lambda` | a scale parameter. |
| `mu` | a location parameter. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X \leq x\right]$, otherwise, $P\left[X > x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

The Two-Parameter Rayleigh distribution with `scale` parameter $\lambda$ and `location` parameter $\mu$, has density

$$f\left(x\right) = 2\lambda\left(x - \mu\right)e^{-\lambda\left(x-\mu\right)^{2}},$$

where

$$x > \mu,\ \lambda > 0.$$

## Value

`dtprd` gives the density, `ptprd` gives the distribution function, `qtprd` gives the quantile function and `rtprd` generates random deviates.

## References

Dey, S., Dey, T. ve Kundu, D., 2014, *Two-parameter Rayleigh distribution: different methods of estimation*, American Journal of Mathematical and Management Sciences, 33 (1), 55-74.

## Examples

```
library(new.dist)
dtprd(5, lambda=4, mu=4)
ptprd(2,lambda=2,mu=1)
qtprd(.5,lambda=2,mu=1)
rtprd(10,lambda=2,mu=1)
```

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ugd *Uniform-Geometric Distribution*

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## Description

Density, distribution function, quantile function and random generation for the Uniform-Geometric distribution.

## Usage

```
dugd(x, theta, log = FALSE)

pugd(q, theta, lower.tail = TRUE, log.p = FALSE)

qugd(p, theta, lower.tail = TRUE)

rugd(n, theta)
```

## Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `theta` | a parameter. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P\left[X \leq x\right]$, otherwise, $P\left[X > x\right]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

## Details

The Uniform-Geometric distribution with shape parameter $\theta$, has density

$$f\left(x\right) = \theta \left(1 - \theta\right)^{x-1} LerchPhi\left[\left(1 - \theta\right), 1, x\right],$$

where

$$LerchPhi\left(z, a, v\right) = \sum_{n=0}^{\infty} \frac{z^n}{\left(v + n\right)^a}$$

and

$$x = 1, 2, \ldots, \;\; 0 < \theta < 1.$$

## Value

dugd gives the density, pugd gives the distribution function, qugd gives the quantile function and rugd generates random deviates.

## References

Akdoğan, Y., Kuş, C., Asgharzadeh, A., Kınacı, İ., & Sharafi, F. (2016). *Uniform-geometric distribution*. Journal of Statistical Computation and Simulation, 86(9), 1754-1770.

## Examples

```
library(new.dist)
dugd(1, theta=0.5)
pugd(1,theta=.5)
qugd(0.6,theta=.1)
rugd(10,theta=.1)
```

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# uigd — *Unit Inverse Gaussian Distribution*

---

## Description

Density, distribution function, quantile function and random generation for the Unit Inverse Gaussian distribution mean and scale.

## Usage

```
duigd(x, mu, lambda = 1, log = FALSE)

puigd(q, mu, lambda = 1, lower.tail = TRUE, log.p = FALSE)

quigd(p, mu, lambda = 1, lower.tail = TRUE)

ruigd(n, mu, lambda = 1)
```

## Arguments

| | |
|---|---|
| x, q | vector of quantiles. |
| mu | a mean parameter. |
| lambda | a scale parameter. |
| log, log.p | logical; if TRUE, probabilities p are given as log(p). |
| lower.tail | logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$. |
| p | vector of probabilities. |
| n | number of observations. If length(n) > 1, the length is taken to be the number required. |

## Details

The Unit Inverse Gaussian distribution `scale` parameter $\lambda$ and `mean` parameter $\mu$, has density

$$f(x) = \sqrt{\frac{\lambda}{2\pi}} \frac{1}{x^{3/2}} e^{-\frac{\lambda}{2\mu^2 x}(x-\mu)^2},$$

where

$$x > 0,\ \mu, \lambda > 0.$$

## Value

`duigd` gives the density, `puigd` gives the distribution function, `quigd` gives the quantile function and `ruigd` generates random deviates.

## References

Ghitany, M., Mazucheli, J., Menezes, A. ve Alqallaf, F., 2019, *The unit-inverse Gaussian distribution: A new alternative to two-parameter distributions on the unit interval, Communications in Statistics-Theory and Methods*, 48 (14), 3423-3438.

## Examples

```
library(new.dist)
duigd(1, mu=2, lambda=3)
puigd(1,mu=2,lambda=3)
quigd(.1,mu=2,lambda=3)
ruigd(10,mu=2,lambda=3)
```

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# `wgd` *Weighted Geometric Distribution*

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## Description

Density, distribution function, quantile function and random generation for the Weighted Geometric distribution.

## Usage

```
dwgd(x, alpha, lambda, log = FALSE)

pwgd(q, alpha, lambda, lower.tail = TRUE, log.p = FALSE)

qwgd(p, alpha, lambda, lower.tail = TRUE)

rwgd(n, alpha, lambda)
```

### Arguments

| | |
|---|---|
| `x, q` | vector of quantiles. |
| `alpha, lambda` | are parameters. |
| `log, log.p` | logical; if TRUE, probabilities p are given as log(p). |
| `lower.tail` | logical; if TRUE (default), probabilities are $P[X \leq x]$, otherwise, $P[X > x]$. |
| `p` | vector of probabilities. |
| `n` | number of observations. If `length(n) > 1`, the length is taken to be the number required. |

### Details

The Weighted Geometric distribution with parameters $\alpha$ and $\lambda$, has density

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

where

$$x \in \mathbb{N} = 1, 2, \ldots,\ \lambda > 0\ and\ 0 < \alpha < 1.$$

### Value

`dwgd` gives the density, `pwgd` gives the distribution function, `qwgd` gives the quantile function and `rwgd` generates random deviates.

### References

Najarzadegan, H., Alamatsaz, M. H., Kazemi, I. ve Kundu, D., 2020, *Weighted bivariate geometric distribution: Simulation and estimation*, Communications in Statistics-Simulation and Computation, 49 (9), 2419-2443.

### Examples

```
library(new.dist)
dwgd(1,alpha=.2,lambda=3)
pwgd(1,alpha=.2,lambda=3)
qwgd(.98,alpha=.2,lambda=3)
rwgd(10,alpha=.2,lambda=3)
```

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