

# How can the Gamma distribution be used in R? Can you provide examples?

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## RECOMMENDED CITATION

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The Gamma distribution is a continuous probability distribution that is commonly used in statistical analysis to model data that is skewed and positive. In R, the Gamma distribution can be used to calculate the probability density function (PDF), cumulative distribution function (CDF), and quantile function. This distribution can also be used to generate random samples for simulation purposes.

Some common applications of the Gamma distribution in R include modeling the wait time for customers in a queue, the amount of rainfall in a given time period, and the lifespan of a product. It can also be used in financial analysis to model stock prices and in healthcare to analyze the length of hospital stays.

To use the Gamma distribution in R, one can use the function "dgamma" to calculate the PDF, "pgamma" to calculate the CDF, and "qgamma" to calculate the quantile function. Additionally, the function "rgamma" can be used to generate random samples from the Gamma distribution.

For example, if we want to calculate the CDF of a Gamma distribution with shape parameter 2 and rate parameter 0.5 at a value of 3, we can use the following code in R:

```
pgamma(3, shape = 2, rate = 0.5)
```

This would give us a value of 0.9817, indicating that there is a 98.17% probability that a random sample from this distribution would be less than or equal to 3.

In summary, the Gamma distribution is a versatile tool in R that can be used in a wide range of applications to analyze and model skewed and positive data.

## Use the Gamma Distribution in R (With Examples)

**In statistics, the gamma distribution is often used to model probabilities related to waiting times.**

**We can use the following functions to work with the gamma distribution in R:**

**dgamma(x, shape, rate) - finds the value of the density function of a gamma distribution with certain shape and**

**rate parameters.pgamma(q, shape, rate)** - finds the value of the cumulative density function of a gamma distribution with certain shape and rate parameters.  
**parameters.qgamma(p, shape, rate)** - finds the value of the inverse cumulative density function of a gamma distribution with certain shape and rate parameters.  
**parameters.rgamma(n, shape, rate)** - generates n random variables that follow a gamma distribution with certain shape and rate parameters.

The following examples show how to use each of these functions in practice.

Example 1: How to Use dgamma()

The following code shows how to use the dgamma() function to create a probability density plot of a gamma distribution with certain parameters:

```
#define x-values
```

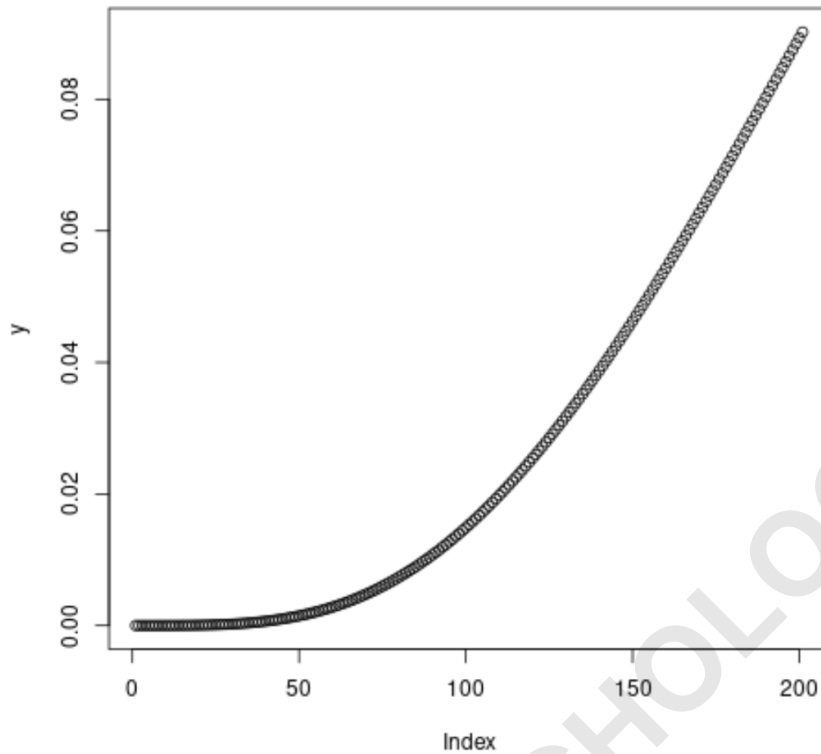
```
x <- seq(0, 2, by=0.01)
```

```
#calculate gamma density for each x-value
```

```
y <- dgamma(x, shape=5)
```

```
#create density plot
```

## plot(y)



### Example 2: How to Use pgamma()

The following code shows how to use the `pgamma()` function to create a cumulative density plot of a gamma distribution with certain parameters:

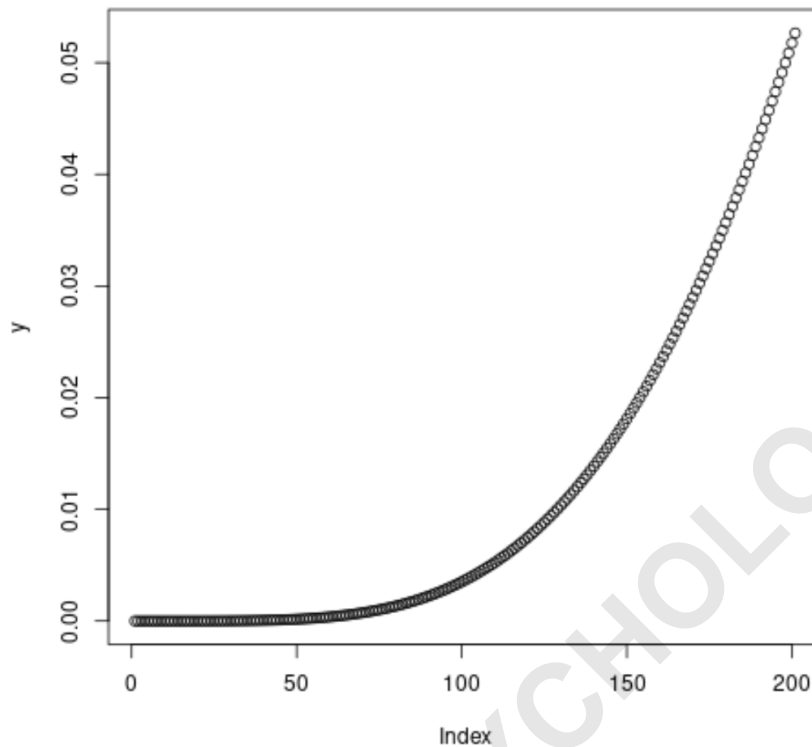
```
#define x-values
```

```
x <- seq(0, 2, by=0.01)
```

```
#calculate gamma density for each x-value
```

```
y <- pgamma(x, shape=5)
```

```
#create cumulative density plot  
plot(y)
```



**Example 3: How to Use qgamma()**

The following code shows how to use the `qgamma()` function to create a quantile plot of a gamma distribution with certain parameters:

```
#define x-values
```

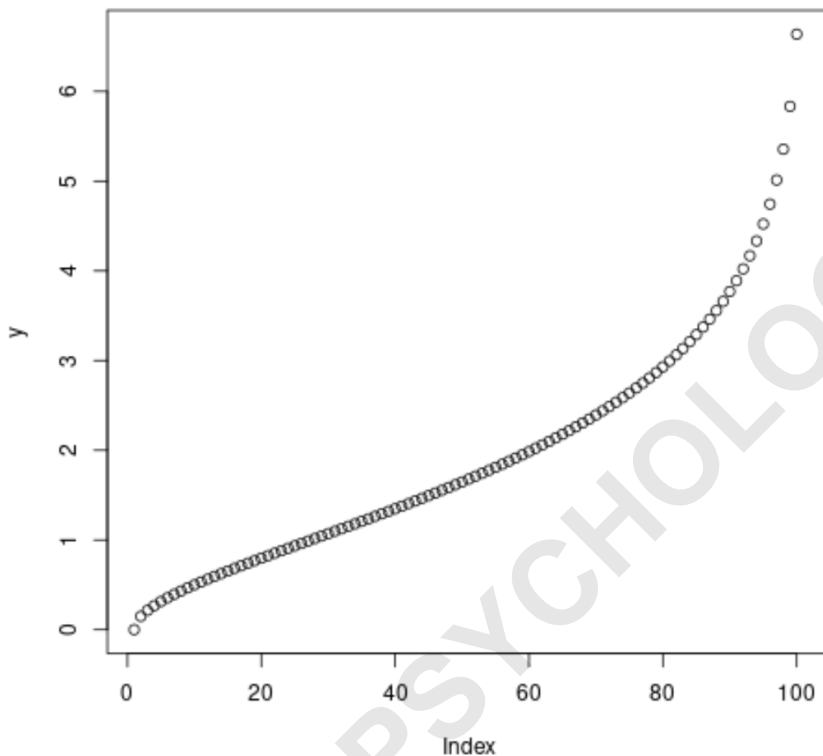
```
x <- seq(0, 1, by=0.01)
```

```
#calculate gamma density for each x-value
```

```
y <- qgamma(x, shape=5)
```

```
#create quantile plot
```

```
plot(y)
```



**Example 4: How to Use rgamma()**

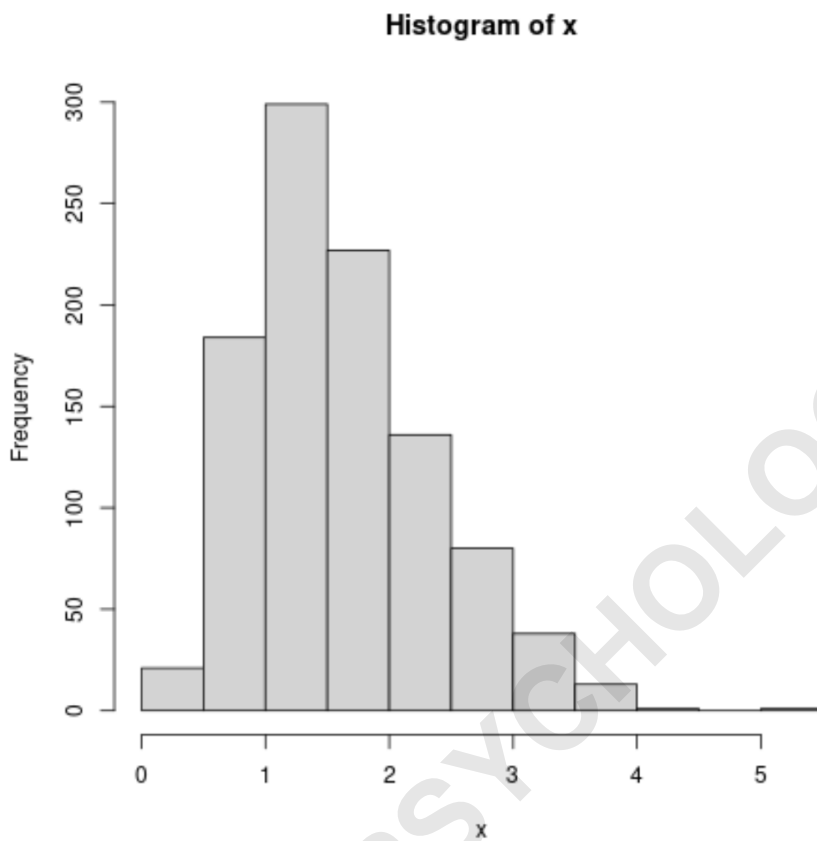
```
#make this example reproducible  
set.seed(0)
```

```
#generate 1,000 random values that follow gamma  
distribution
```

```
x <- rgamma(n=1000, shape=5, rate=3)
```

**#create histogram to view distribution of values**

**hist(x)**



**The following tutorials explain how to use other common statistical distributions in R:**