[statology.org](https://www.statology.org/dbinom-pbinom-qbinom-rbinom-in-r/)

**A Guide to dbinom, pbinom, qbinom, and rbinom in R - Statology**

Published by Zach View all posts by Zach

5-6 minutes

This tutorial explains how to work with the [binomial distribution](https://www.statology.org/binomial-distribution/) in R using the functions **dbinom**, **pbinom**, **qbinom**, and **rbinom**.

**dbinom**

The function **dbinom**returns the value of the probability density function (pdf) of the binomial distribution given a certain random variable *x*, number of trials (size) and probability of success on each trial (prob). The syntax for using dbinom is as follows:

**dbinom(x, size, prob)**

Put simply, **dbinom**finds the probability of getting a certain number ofsuccesses **(x)** in a certain number of trials **(size)** where the probability of success on each trial is fixed **(prob)**.

The following examples illustrates how to solve some probability questions using dbinom.

**Example 1:** *Bob makes 60% of his free-throw attempts. If he shoots 12 free throws, what is the probability that he makes exactly 10?*

**#find the probability of 10 successes during 12 trials where the probability of**

**#success on each trial is 0.6**

**dbinom(x=10, size=12, prob=.6)**

**# [1] 0.06385228**

The probability that he makes exactly 10 shots is **0.0639**.

**Example 2:** *Sasha flips a fair coin 20 times. What is the probability that the coin lands on heads exactly 7 times?*

**#find the probability of 7 successes during 20 trials where the probability of**

**#success on each trial is 0.5**

**dbinom(x=7, size=20, prob=.5)**

**# [1] 0.07392883**

The probability that the coin lands on heads exactly 7 times is **0.0739**.

**pbinom**

The function **pbinom**returns the value of the cumulative density function (cdf) of the binomial distribution given a certain random variable *q*, number of trials (size) and probability of success on each trial (prob). The syntax for using pbinom is as follows:

**pbinom(q, size, prob)**

Put simply, **pbinom**returns the area to the left of a given value *q*in the binomial distribution. If you’re interested in the area to the right of a given value *q*, you can simply add the argument **lower.tail = FALSE**

**pbinom(q, size, prob, lower.tail = FALSE)**

The following examples illustrates how to solve some probability questions using pbinom.

**Example 1:** *Ando flips a fair coin 5 times. What is the probability that the coin lands on heads more than 2 times?*

**#find the probability of more than 2 successes during 5 trials where the**

**#probability of success on each trial is 0.5**

**pbinom(2, size=5, prob=.5, lower.tail=FALSE)**

**# [1] 0.5**

The probability that the coin lands on heads more than 2 times is **0.5**.

**Example 2:** *Suppose Tyler scores a strike on 30% of his attempts when he bowls. If he bowls 10 times, what is the probability that he scores 4 or fewer strikes?*

**#find the probability of 4 or fewer successes during 10 trials where the**

**#probability of success on each trial is 0.3**

**pbinom(4, size=10, prob=.3)**

**# [1] 0.8497317**

The probability that he scores 4 or fewer strikes is **0.8497**.

**qbinom**

The function **qbinom**returns the value of the inverse cumulative density function (cdf) of the binomial distribution given a certain random variable *q*, number of trials (size) and probability of success on each trial (prob). The syntax for using qbinom is as follows:

**qbinom(q, size, prob)**

Put simply, you can use **qbinom**to find out the pth quantile of the binomial distribution.

The following code illustrates a few examples of **qbinom**in action:

**#find the 10th quantile of a binomial distribution with 10 trials and prob**

**#of success on each trial = 0.4**

**qbinom(.10, size=10, prob=.4)**

**# [1] 2**

**#find the 40th quantile of a binomial distribution with 30 trials and prob**

**#of success on each trial = 0.25**

**qbinom(.40, size=30, prob=.25)**

**# [1] 7**

**rbinom**

The function **rbinom**generates a vector of binomial distributed random variables given a vector length *n*, number of trials (size) and probability of success on each trial (prob). The syntax for using rbinom is as follows:

**rbinom(n, size, prob)**

The following code illustrates a few examples of **rnorm** in action:

**#generate a vector that shows the number of successes of 10 binomial experiments with**

**#100 trials where the probability of success on each trial is 0.3.**

**results <- rbinom(10, size=100, prob=.3)**

**results**

**# [1] 31 29 28 30 35 30 27 39 30 28**

**#find mean number of successes in the 10 experiments (compared to expected**

**#mean of 30)**

**mean(results)**

**# [1] 32.8**

**#generate a vector that shows the number of successes of 1000 binomial experiments**

**#with 100 trials where the probability of success on each trial is 0.3.**

**results <- rbinom(1000, size=100, prob=.3)**

**#find mean number of successes in the 100 experiments (compared to expected**

**#mean of 30)**

**mean(results)**

**# [1] 30.105**

Notice how the more random variables we create, the closer the mean number of successes is to the expected number of successes.

*Note: “Expected number of successes” =* ***n*** *\** ***p*** *where* ***n*** *is the number of trials and* ***p*** *is the probability of success on each trial.*