

*Statistics. Simplified.*

A grey icon consisting of three horizontal lines of varying lengths, positioned to the left of the word "MENU".

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## Chi-Square Test of Independence in R (With Examples)

A **Chi-Square Test of Independence** is used to determine whether or not there is a significant association between two **categorical variables**.

This tutorial explains how to perform a Chi-Square Test of Independence in R.

### Example: Chi-Square Test of Independence in R

Suppose we want to know whether or not gender is associated with political party preference. We take a simple random sample of 500 voters and survey them on their political party preference. The following table shows the results of the survey:

	Republican	Democrat	Independent	Total
Male	120	90	40	250
Female	110	95	45	250
Total	230	185	85	500

Use the following steps to perform a Chi-Square Test of Independence in R to determine if gender is associated with

political party preference.

## Step 1: Create the data.

First, we will **create a table** to hold our data:

```
#create table
data <- matrix(c(120, 90, 40, 110, 95, 45), ncol=3, byrow=TRUE)
colnames(data) <- c("Rep","Dem","Ind")
rownames(data) <- c("Male","Female")
data <- as.table(data)

#view table
data
```

	Rep	Dem	Ind
Male	120	90	40
Female	110	95	45

## Step 2: Perform the Chi-Square Test of Independence.

Next, we can perform the Chi-Square Test of Independence using the **chisq.test()** function:

```
#Perform Chi-Square Test of Independence
chisq.test(data)

Pearson's Chi-squared test

data: data
X-squared = 0.86404, df = 2, p-value = 0.6492
```

The way to interpret the output is as follows:

- Chi-Square Test Statistic: **0.86404**
- Degrees of freedom: **2** (calculated as #rows-1 \* #columns-1)

- p-value: **0.6492**

Recall that the **Chi-Square Test of Independence** uses the following null and alternative hypotheses:

- **$H_0$ : (null hypothesis)** The two variables are independent.
- **$H_1$ : (alternative hypothesis)** The two variables are *not* independent.

Since the p-value (0.6492) of the test is not less than 0.05, we fail to reject the null hypothesis. This means we do not have sufficient evidence to say that there is an association between gender and political party preference.

In other words, gender and political party preference are independent.

## Additional Resources

[An Introduction to the Chi-Square Test of Independence](#)

[Chi-Square Test of Independence Calculator](#)

[How to Calculate the P-Value of a Chi-Square Statistic in R](#)

[How to Find the Chi-Square Critical Value in R](#)



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