# What is the definition of joint frequency and what are some examples?

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Joint frequency refers to the number of times that two or more events occur together in a given dataset or population. It is a statistical measure used to determine the relationship between two variables. For example, if we are studying the relationship between gender and income, the joint frequency would tell us how many individuals in the dataset are both female and have a certain income level. This information can help us identify any patterns or correlations between the two variables. Other examples of joint frequency include the number of times a certain medical condition occurs in patients who have a particular genetic mutation, or the number of times a specific type of crime is committed by individuals of a certain age group. In summary, joint frequency is a useful tool in statistical analysis to understand the association between two or more variables.

## Joint Frequency: Definition & Examples

## A two-way frequency table is a table that displays the frequencies for two categorical variables.

## For example, the following two-way table shows the results of a survey that asked 100 people which sport they liked best: baseball, basketball, or football.

## The rows display the gender of the respondent and the columns show which sport they chose:



| | Baseball | Basketball | Football | Total |
|---|---|---|---|---|
| Male | 13 | 15 | 20 | 48 |
| Female | 23 | 16 | 13 | 52 |
| Total | 36 | 31 | 33 | 100 |

## The marginal frequencies are the frequencies shown in

## the margins of the table:

| | Baseball | Basketball | Football | Total |
|---|---|---|---|---|
| Male | 13 | 15 | 20 | 48 |
| Female | 23 | 16 | 13 | 52 |
| Total | 36 | 31 | 33 | 100 |

Marginal frequencies of gender

Marginal frequencies of sports

## These values tell us the total values for each variable. For example:

## 36 total respondents chose baseball as their favorite sport31 total respondents chose basketball as their favorite sport33 total respondents chose football as their favorite sport

## We can also see:

## 48 total respondents were male52 total respondents were female

## The joint frequencies are the frequencies shown in the cells of the table:

| | Baseball | Basketball | Football | Total |
|---|---|---|---|---|
| Male | 13 | 15 | 20 | 48 |
| Female | 23 | 16 | 13 | 52 |
| Total | 36 | 31 | 33 | 100 |

Joint Frequencies

**These values are known as "joint" frequencies because they tell us the frequency of two values that occur jointly.**

**For example, we can see:**

**There were a total of 13 respondents who were male *and* preferred baseball.There were a total of 15 respondents who were male *and* preferred basketball.There were a total of 20 respondents who were male *and* preferred football.There were a total of 23 respondents who were female *and* preferred baseball.There were a total of 16 respondents who were female *and* preferred basketball.There were a total of 13 respondents who were female *and* preferred football.**

**Notice that the sum of all the joint frequencies adds up to the total number of survey respondents:**

**Total survey respondents = 13 + 15 + 20 + 23 + 16 + 13 = 100.**

### What Are Joint Relative Frequencies?

**A joint relative frequency tells us the frequency of one variable *relative* to another variable.**

**For example, consider our two-way table from earlier:**

| | Baseball | Basketball | Football | Total |
|---|---|---|---|---|
| Male | 13 | 15 | 20 | 48 |
| Female | 23 | 16 | 13 | 52 |
| Total | 36 | 31 | 33 | 100 |

**Question 1: What is the joint relative frequency that a survey respondent prefers baseball, given that the respondent is a female?**

**To answer this, we will only consider the row that contains female responses. We'll then take the number of females who prefer baseball and divide by the total number of females.**

**This turns out to be 23/52 = 0.4423 = 44.23%**

| | Baseball | Basketball | Football | Total |
|---|---|---|---|---|
| Male | 13 | 15 | 20 | 48 |
| Female | 23 | 16 | 13 | 52 |
| Total | 36 | 31 | 33 | 100 |

**In other words, 44.23% of all female survey respondents prefer baseball as their favorite sport.**

**Question 2: What is the joint relative frequency that a survey respondent is male, given that they prefer football as their favorite sport?**

**To answer this, we will only consider the column that contains football as the favorite sport. We'll then take the number of males who prefer football and divide by the total number of respondents who preferred football.**

**This turns out to be 20/33 = 0.606 = 60.6%**

| | Baseball | Basketball | Football | Total |
|---|---|---|---|---|
| Male | 13 | 15 | 20 | 48 |
| Female | 23 | 16 | 13 | 52 |
| Total | 36 | 31 | 33 | 100 |

**In other words, 60.6% of all survey respondents who**

**prefer football are male.**