

What is the expected frequency when calculating?

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The expected frequency is the predicted or anticipated number of occurrences of a particular event or outcome when calculating a statistical probability. It is based on mathematical calculations and assumptions, and serves as a benchmark or reference point for comparison with actual observed frequencies. This concept is commonly used in various fields such as statistics, probability theory, and data analysis to make informed decisions and draw meaningful conclusions.

Calculate Expected Frequency

An expected frequency is a theoretical frequency that we *expect* to occur in an experiment.

This type of frequency occurs most often in two types of Chi-Square tests:

Chi-Square Goodness of Fit Test Chi-Square Test of Independence

This tutorial explains how to calculate expected frequencies for each of these two tests.

Expected Frequency in a Chi-Square Goodness of Fit Test

A Chi-Square goodness of fit test is used to determine whether or not a categorical variable follows a hypothesized distribution. With this type of test, we compare the observed frequencies of a categorical variable with the expected frequencies.

For example, suppose a shop owner claims that an equal number of customers come into his shop each weekday. To test this hypothesis, an independent researcher records the number of customers that come into the shop on a given week and finds the following:

Day	Actual Customers
Monday	50
Tuesday	60
Wednesday	40
Thursday	47
Friday	53
Total	250

To calculate the *expected frequency* of customers each day, we can use the following formula:

Expected frequency = Expected percentage * Total count

For this particular example, the shop owner expects an equal amount of customers to come into the shop each day, thus the expected percentage of customers that come in on a given day is 20% of the total customers for the week.

This means we can calculate the expected frequency of customers each day as:

Expected frequency = 20% * 250 total customers = 50

Day	Actual Customers	Expected Customers
Monday	50	50
Tuesday	60	50
Wednesday	40	50
Thursday	47	50
Friday	53	50
Total	250	

Expected Frequency in a Chi-Square Goodness Test of Independence

A Chi-Square Test of Independence is used to determine whether or not there is a significant association between two categorical variables. With this type of test, we also compare a set of observed frequencies with a set of expected frequencies.

For example, 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

To calculate the *expected frequency* of each cell in the table, we can use the following formula:

Expected frequency = (row sum * column sum) / table sum

For example, the expected value for Male Republicans is: $(230 \times 250) / 500 = 115$.

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

Expected Male Republicans = $(230 \times 250) / 500 = 115$

We can repeat this formula to obtain the expected value for each cell in the table:

Observed Frequencies

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

Expected Frequencies

	Republican	Democrat	Independent	Total
Male	115	92.5	42.5	250
Female	115	92.5	42.5	250
Total	230	185	85	500

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