

[Click Here](#)































**Download Article** Learn all the calculations you need with our complete guide Download Article Scientific studies often rely on surveys distributed among a sample of some total population. Your sample will need to include a certain number of people, however, if you want it to accurately reflect the conditions of the overall population it's meant to represent. To calculate your necessary sample size, you'll need to determine several set values and plug them into an appropriate formula. 1 Know your population size. Population size refers to the total number of people within your demographic. For larger studies, you can use an approximated value instead of the precise number.[1] Precision has a greater statistical impact when you work with a smaller group. For instance, if you wish to perform a survey among members of a local organization or employees of a small business, the population size should be accurate within a dozen or so people.[2] Larger surveys allow for a greater deviance in the actual population. For example, if your demographic includes everyone living in the United States, you could estimate the size to roughly 320 million people, even though the actual value may vary by hundreds of thousands. 2 Determine your margin of error. Margin of error, also referred to as "confidence interval," refers to the amount of error you wish to allow in your results.[3] The margin of error is a percentage the indicates how close your sample results will be to the true value of the overall population within your study. Smaller margin of errors will result in more accurate answers, but choosing a smaller margin of error will also require a larger sample. When the results of a survey are presented, the margin of error usually appears as a plus or minus percentage. For example: "35% of people agree with option A, with a margin of error of +/- 5%." In this example, the margin of error essentially indicates that, if the entire population were asked the same poll question, you are "confident" that somewhere between 30% (35 - 5) and 40% (35 + 5) would agree with option A. Advertisement 3 Set your confidence level. Confidence level is closely related to confidence interval (margin of error). This value measures the degree of certainty regarding how well a sample represents the overall population within your chosen margin of error.[4] In other words, choosing a confidence level of 95% allows you to claim that you are 95% certain that your results accurately fall within your chosen margin of error. A larger confidence level indicates a greater degree of accuracy, but it will also require a larger sample. The most common confidence levels are 90% confident, 95% confident, and 99% confident. Setting a confidence level of 95% for the example stated in the margin of error would mean that you are 95% certain that 30% to 40% of the total concerned population would agree with option A of your survey. 4 Specify your standard of deviation. The standard of deviation indicates how much variation you expect among your responses.[5] Extreme answers are more likely to be accurate than moderate results. Plainly stated, if 99% of your survey responses answer "Yes" and only 1% answer "No," the sample probably represents the overall population very accurately. On the other hand, if 45% answer "Yes" and 55% answer "No," there is a greater chance of error. Since this value is difficult to determine you give the actual survey, most researchers set this value at 0.5 (50%). This is the worst case scenario percentage, so sticking with this value will guarantee that your calculated sample size is large enough to accurately represent the overall population within your confidence interval and confidence level. 5 Find your Z-score. The Z-score is a constant value automatically set based on your confidence level. It indicates the "standard normal score," or the number of standard deviations between any selected value and the average/mean of the population.[6] You can calculate Z-scores by hand, look for an online calculator, or find your z-score on a z-score table. Each of these methods can be fairly complex, however. Since confidence levels are fairly standardized, most researchers simply memorize the necessary Z-score for the most common confidence levels: 80% confidence => 1.28 z-score 85% confidence => 1.43 z-score 90% confidence => 1.65 z-score 95% confidence => 1.96 z-score 99% confidence => 2.58 z-score Advertisement 1 Look at the equation.[7] If you have a small to moderate population and know all of the key values, you should use the standard formula. The standard formula for sample size is: Sample Size =  $\lceil \frac{Z^2 * p(1-p)}{e^2} \rceil / \frac{1}{N}$  Where N = population size Z = z-score e = margin of error p = standard of deviation 2 Plug in your values. Replace the variable placeholders with the numerical values that actually apply to your specific survey. Example: Determine the ideal survey size for a population size of 425 people. Use a 99% confidence level, a 50% standard of deviation, and a 5% margin of error. For 99% confidence, you would have a z-score of 2.58. This means that: N = 425 = 2.58 \* 0.5 \* 0.05 = 0.53 Do the math. Solve the equation using the newly inserted numerical values. The solution represents your necessary sample size. Example: Sample Size =  $\lceil \frac{Z^2 * p(1-p)}{e^2} \rceil / \frac{1}{N}$  =  $\lceil \frac{(2.58)^2 * 0.5(1-0.5)}{0.05^2} \rceil / \frac{1}{425}$  =  $\lceil \frac{6.6564 * 0.25}{0.0025} \rceil / 0.00238$  =  $\lceil \frac{1.6641}{0.00238} \rceil$  = 700.00238 (final answer) Advertisement 1 Examine the formula.[8] If you have a very large population or an unknown one, you'll need to use a secondary formula. If you still have values for the remainder of the variables, use the equation: Sample Size =  $\lceil \frac{Z^2 * p(1-p)}{e^2} \rceil / \frac{1}{N}$  Where N = the population size Z = the z-score e = the margin of error p = the standard of deviation Note that this equation is merely the top half of the full formula. 2 Plug your values into the equation. Replace each variable placeholder with the numerical values chosen for your survey. Example: Determine the necessary survey size for an unknown population with a 90% confidence level, 50% standard of deviation, a 3% margin of error. For 90% confidence, use the z-score would be 1.65. This means that: z = 1.65 = 0.03 = 0.53 Do the math. After plugging your numbers into the formula, solve the equation. Your answer will indicate your necessary sample size. Example: Sample Size =  $\lceil \frac{Z^2 * p(1-p)}{e^2} \rceil / \frac{1}{N}$  =  $\lceil \frac{(1.65)^2 * 0.5(1-0.5)}{0.03^2} \rceil / \frac{1}{N}$  =  $\lceil \frac{7.2225 * 0.25}{0.0009} \rceil / \frac{1}{N}$  =  $\lceil \frac{0.6806}{0.0009} \rceil / \frac{1}{N}$  = 756.22 (final answer) Advertisement 1 Look at the formula. Slovin's formula is a very general equation used when you can estimate the population but have no idea about what a certain population behaves. The formula is described as:[9] Sample Size =  $N / (1 + N * e^2)$  Where N = population size e = margin of error Note that this is the least accurate formula and, as such, the least ideal. You should only use this if circumstances prevent you from determining an appropriate standard of deviation and/or confidence level (thereby preventing you from determining your z-score, as well), 2 Plug in the numbers. Replace each variable placeholder with the numerical values that apply specifically to your survey. Example: Calculate the necessary survey size for a population of 240, allowing for a 4% margin of error. Question If the total population size is not given in the problem, what formula will apply? If the population size is not given, then a t-distribution formula is applicable. Question What is t-distribution formula? The t-distribution formula can be used to get the mean of a normally distributed population. Question What is the name of the sample size formula? The sample size formula is also known as Cochran's formula, named after the person who developed it. Ask a Question Advertisement 1 This article was reviewed by Joseph Meyer. Joseph Meyer is a High School Math Teacher based in Pittsburgh, Pennsylvania. He is an educator at City Charter High School, where he has been teaching for over 7 years. Joseph is also the founder of Sandbox Math, an online learning community dedicated to helping students succeed in Algebra. His site is set apart by its focus on fostering genuine comprehension through step-by-step understanding (instead of just getting the correct final answer), enabling learners to identify and overcome misunderstandings and confidently take on any test they face. He received his MA in Physics from Case Western Reserve University and his BA in Physics from Baldwin Wallace University. This article has been viewed 511,268 times. Co-authors: 12 Updated: April 5, 2025 Views: 511,268 Categories: Probability and Statistics Print Send fan mail to authors Thank you for creating a page that has been read 511,268 times! The formulas and the references to them helps researchers to use them and to cite the references. The solved examples help in calculating the sample size easily. ... more Share your story Sample size is a research term used for defining the number of individuals included in a research study to represent a population. The sample size size refers to the total number of respondents included in a study, and the number is often broken down into sub-groups by demographics such as age, gender, and location so that the total sample achieves represents the entire population. Determining the appropriate sample size is important because it affects the reliability and validity of the results. The sample size is determined by several factors, including the desired confidence level, the margin of error (confidence interval), the population size, and the expected proportion of the attribute being measured. Sample Size Formula The field of statistics, the sample size is defined as the number of observations used to calculate population estimates for a specific population. In other words, it refers to the number of individual samples utilized in a data study. It uses the difference between the population and the sample to calculate the correct sample size. It is the process of selecting a group of people from a population to estimate the characteristics of the entire population, known as sampling. It is denoted by the symbol n. For a smaller sample size, the concept of the t distribution is used where the value of the sample size is less than 30. In this test, we utilize the t statistic to test the null hypothesis using both one-tailed and two-tailed tests if the population variance is unknown and the sample size is small. It is also known as adjusted sample size. A = n / (1 + (n - 1)/P) Where, A is the adjusted sample size, n is the sample size, P is the population size. For infinite population size, the formula is expressed in terms of z-value and error margin. n = Z^2(p - p)/m^2 Where, n is the sample size, Z is the z-value, p is the proportion of population (generally taken as 0.5), m is the margin of error. Sample Size Formula for Estimating a Population Mean To estimate a population mean with a certain level of confidence, the sample size can be determined using: n = ((Z \* sigma)/E)^2 Where: nnn = required sample size ZZZ = Z-value (the number of standard deviations from the mean in a standard normal distribution corresponding to the desired confidence level, e.g., 1.96 for 95% confidence) sigma = population standard deviation EEE = margin of error (the maximum acceptable difference between the sample mean and the population mean) Sample Size Formula for Estimating a Population Proportion To estimate a population proportion with a certain level of confidence, the sample size can be determined using: n = ((Z \* sqrt(p \* q))/E)^2 Where: nnn = required sample size ZZZ = Z-value (the number of standard deviations from the mean in a standard normal distribution corresponding to the desired confidence level, e.g., 1.96 for 95% confidence) ppp = estimated population proportion qqq = 1 - p (the complement of p) EEE = margin of error (the maximum acceptable difference between the sample proportion and the population proportion) Sample Size Formula for Finite Population Correction When the population size is finite and relatively small, the sample size formula can be adjusted using the finite population correction (FPC): adjusted\_n = (n \* (1 + (n - 1)/N)) How to use Sample Size Formula To compute the necessary sample size, it's essential to first determine several values before applying them to the right formula. Here are the steps to achieve this: Step 1: Identifying Key Values Key values such as the population size need to be determined. This value represents the total count of individuals within a specific demographic. For larger studies, an approximate population size may be used, while precision is crucial for smaller groups to ensure statistical significance. Step 2: Determining Margin of Error or Confidence Interval The margin of error, a critical metric in research, indicates the allowable error within a study. It is expressed as a percentage that illustrates how closely the sample results reflect the true values of the overall population. A smaller margin typically requires a larger sample to maintain accuracy. Step 3: Setting the Confidence Level The confidence level correlates closely with the margin of error, measuring the certainty with which a sample represents the entire population within the chosen margin of error. Common confidence levels include 90%, 95%, and 99%, with higher levels indicating greater accuracy but necessitating larger samples. Step 4: Specifying the Standard Deviation Measures response variability within a study. Researchers often use 0.5 (50%) as a conservative estimate to ensure the sample size is adequate to represent the population accurately under the chosen confidence level and interval. Step 5: Calculating the Z-Score The Z-score, linked to the confidence level, indicates the number of standard deviations a selected value is from the population mean. This value is usually memorized by researchers for commonly used confidence levels due to its consistent application across studies: Confidence Level 80%: z-score 1.28 Confidence Level 85%: z-score 1.43 Confidence Level 90%: z-score 1.65 Confidence Level 95%: z-score 1.96 Confidence Level 99%: z-score 2.58 Advertisement 1 Look at the equation.[7] If you have a small to moderate population and know all of the key values, you should use the standard formula. The standard formula for sample size is: Sample Size =  $\lceil \frac{Z^2 * p(1-p)}{e^2} \rceil / \frac{1}{N}$  Where N = population size Z = z-score e = margin of error p = standard of deviation 2 Plug in your values. Replace the variable placeholders with the numerical values that actually apply to your specific survey. Example: Determine the ideal survey size for a population size of 425 people. Use a 99% confidence level, a 50% standard of deviation, and a 5% margin of error. For 99% confidence, you would have a z-score of 2.58. This means that: N = 425 = 2.58 \* 0.5 \* 0.05 = 0.53 Do the math. Solve the equation using the newly inserted numerical values. The solution represents your necessary sample size. Example: Sample Size =  $\lceil \frac{Z^2 * p(1-p)}{e^2} \rceil / \frac{1}{N}$  =  $\lceil \frac{(2.58)^2 * 0.5(1-0.5)}{0.05^2} \rceil / \frac{1}{425}$  =  $\lceil \frac{6.6564 * 0.25}{0.0025} \rceil / \frac{1}{0.00238}$  =  $\lceil \frac{1.6641}{0.00238} \rceil$  = 700.00238 (final answer) Advertisement 1 Examine the formula.[8] If you have a very large population or an unknown one, you'll need to use a secondary formula. If you still have values for the remainder of the variables, use the equation: Sample Size =  $\lceil \frac{Z^2 * p(1-p)}{e^2} \rceil / \frac{1}{N}$  Where N = the population size Z = the z-score e = the margin of error p = the standard of deviation Note that this equation is merely the top half of the full formula. 2 Plug your values into the equation. Replace each variable placeholder with the numerical values chosen for your survey. Example: Determine the necessary survey size for an unknown population with a 90% confidence level, 50% standard of deviation, a 3% margin of error. For 90% confidence, use the z-score would be 1.65. This means that: z = 1.65 = 0.03 = 0.53 Do the math. After plugging your numbers into the formula, solve the equation. Your answer will indicate your necessary sample size. Example: Sample Size =



[illegible]