

# How do I perform one sample and two sample Z-tests in Excel?

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The process of performing one sample and two sample Z-tests in Excel involves utilizing the built-in statistical functions to analyze a sample or two samples of data. This allows for the comparison of a population mean to a specific value or the comparison of two population means. The steps typically involve inputting the data into a spreadsheet, calculating the sample mean and standard deviation, determining the appropriate Z-test formula, and using the appropriate function to calculate the Z-score and corresponding p-value. These tests can provide valuable insights and help make informed decisions based on the data being analyzed.

## Perform One Sample & Two Sample Z-Tests in Excel

**A one sample z-test is used to test whether a population mean is significantly different than some hypothesized value.**

**A two sample z-test is used to test whether two population means are significantly different from each other.**

**The following examples show how to perform each type of test in Excel.**

### Example 1: One Sample Z-Test in Excel

**Suppose the IQ in a population is normally distributed with a mean of  $\mu = 100$  and standard deviation of  $\sigma = 15$ .**

**A scientist wants to know if a new medication affects IQ levels, so she recruits 20 patients to use it for one month and records their IQ levels at the end of the**

**month.**

**We can use the following formula in Excel to perform a one sample z-test to determine if the new medication causes a significant difference in IQ levels:**

**=Z.TEST(A2:A21, 100, 15)**

**The following screenshot shows how to use this formula in practice:**

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|    | A         | B | C              | D        | E | F | G |
|----|-----------|---|----------------|----------|---|---|---|
| 1  | <b>IQ</b> |   | <b>P-value</b> | 0.181587 |   |   |   |
| 2  | 88        |   |                |          |   |   |   |
| 3  | 92        |   |                |          |   |   |   |
| 4  | 94        |   |                |          |   |   |   |
| 5  | 94        |   |                |          |   |   |   |
| 6  | 96        |   |                |          |   |   |   |
| 7  | 97        |   |                |          |   |   |   |
| 8  | 97        |   |                |          |   |   |   |
| 9  | 97        |   |                |          |   |   |   |
| 10 | 99        |   |                |          |   |   |   |
| 11 | 99        |   |                |          |   |   |   |
| 12 | 105       |   |                |          |   |   |   |
| 13 | 109       |   |                |          |   |   |   |
| 14 | 109       |   |                |          |   |   |   |
| 15 | 109       |   |                |          |   |   |   |
| 16 | 110       |   |                |          |   |   |   |
| 17 | 112       |   |                |          |   |   |   |
| 18 | 112       |   |                |          |   |   |   |
| 19 | 113       |   |                |          |   |   |   |
| 20 | 114       |   |                |          |   |   |   |
| 21 | 115       |   |                |          |   |   |   |
| 22 |           |   |                |          |   |   |   |
| 23 |           |   |                |          |   |   |   |
| 24 |           |   |                |          |   |   |   |

The one-tailed p-value is 0.181587. Since we're performing a two-tailed test, we can multiply this value by 2 to get  $p = 0.363174$ .

Since this p-value is not less than .05, we do not have sufficient evidence to reject the null hypothesis.

Thus, we conclude that the new medication does not significantly affect IQ level.

## Example 2: Two Sample Z-Test in Excel

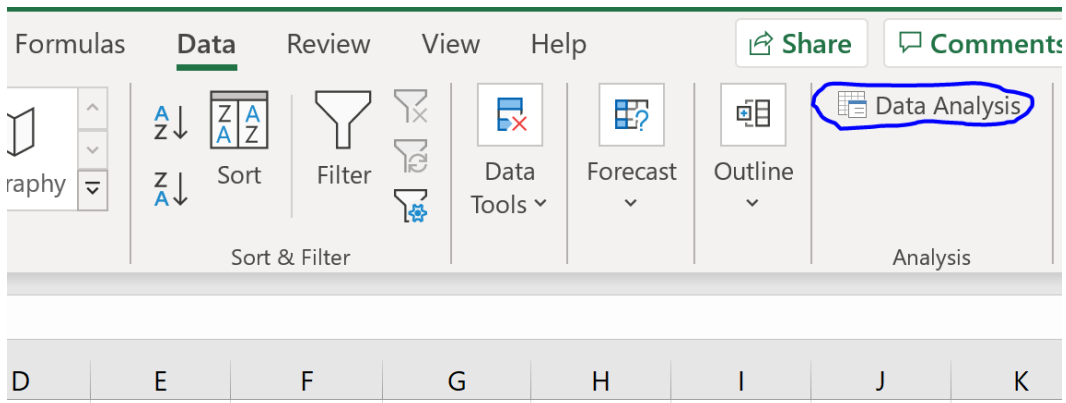
Suppose the IQ levels among individuals in two different cities are known to be normally distributed each with population standard deviations of 15.

A scientist wants to know if the mean IQ level between individuals in city A and city B are different, so she selects a of 20 individuals from each city and records their IQ levels.

The following screenshot shows the IQ levels for the individuals in each sample:

|    | A             | B             | C | D | E | F | G |
|----|---------------|---------------|---|---|---|---|---|
| 1  | <b>City A</b> | <b>City B</b> |   |   |   |   |   |
| 2  | 82            | 90            |   |   |   |   |   |
| 3  | 84            | 91            |   |   |   |   |   |
| 4  | 85            | 91            |   |   |   |   |   |
| 5  | 89            | 91            |   |   |   |   |   |
| 6  | 91            | 95            |   |   |   |   |   |
| 7  | 91            | 95            |   |   |   |   |   |
| 8  | 92            | 99            |   |   |   |   |   |
| 9  | 94            | 99            |   |   |   |   |   |
| 10 | 99            | 108           |   |   |   |   |   |
| 11 | 99            | 109           |   |   |   |   |   |
| 12 | 105           | 109           |   |   |   |   |   |
| 13 | 109           | 114           |   |   |   |   |   |
| 14 | 109           | 115           |   |   |   |   |   |
| 15 | 109           | 116           |   |   |   |   |   |
| 16 | 110           | 117           |   |   |   |   |   |
| 17 | 112           | 117           |   |   |   |   |   |
| 18 | 112           | 128           |   |   |   |   |   |
| 19 | 113           | 129           |   |   |   |   |   |
| 20 | 114           | 130           |   |   |   |   |   |
| 21 | 114           | 133           |   |   |   |   |   |
| 22 |               |               |   |   |   |   |   |
| 23 |               |               |   |   |   |   |   |
| 24 |               |               |   |   |   |   |   |
| 25 |               |               |   |   |   |   |   |
| 26 |               |               |   |   |   |   |   |

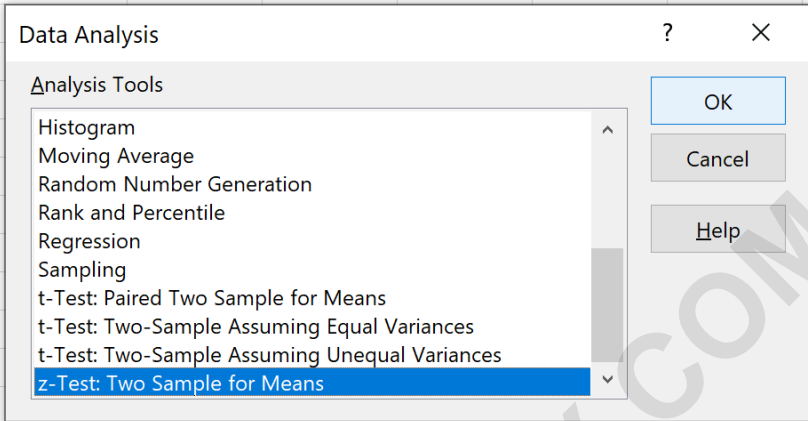
**To perform a two sample z-test to determine if the mean IQ level is different between the two cities, click the Data tab along the top ribbon, then click the Data Analysis button within the Analysis group.**



**If you don't see Data Analysis as an option, you need to first in Excel.**

**Once you click this button, select z-Test: Two Sample for Means in the new window that appears:**

|    | A             | B             | C | D | E | F | G | H |
|----|---------------|---------------|---|---|---|---|---|---|
| 1  | <b>City A</b> | <b>City B</b> |   |   |   |   |   |   |
| 2  | 82            | 90            |   |   |   |   |   |   |
| 3  | 84            | 91            |   |   |   |   |   |   |
| 4  | 85            | 91            |   |   |   |   |   |   |
| 5  | 89            | 91            |   |   |   |   |   |   |
| 6  | 91            | 95            |   |   |   |   |   |   |
| 7  | 91            | 95            |   |   |   |   |   |   |
| 8  | 92            | 99            |   |   |   |   |   |   |
| 9  | 94            | 99            |   |   |   |   |   |   |
| 10 | 99            | 108           |   |   |   |   |   |   |
| 11 | 99            | 109           |   |   |   |   |   |   |
| 12 | 105           | 109           |   |   |   |   |   |   |
| 13 | 109           | 114           |   |   |   |   |   |   |
| 14 | 109           | 115           |   |   |   |   |   |   |
| 15 | 109           | 116           |   |   |   |   |   |   |
| 16 | 110           | 117           |   |   |   |   |   |   |
| 17 | 112           | 117           |   |   |   |   |   |   |
| 18 | 112           | 128           |   |   |   |   |   |   |
| 19 | 113           | 129           |   |   |   |   |   |   |
| 20 | 114           | 130           |   |   |   |   |   |   |
| 21 | 114           | 133           |   |   |   |   |   |   |
| 22 |               |               |   |   |   |   |   |   |
| 23 |               |               |   |   |   |   |   |   |
| 24 |               |               |   |   |   |   |   |   |
| 25 |               |               |   |   |   |   |   |   |



The image shows an Excel spreadsheet with two columns of data, 'City A' and 'City B', and a 'Data Analysis' dialog box open. The dialog box is titled 'Data Analysis' and has a list of 'Analysis Tools'. The tool 'z-Test: Two Sample for Means' is selected and highlighted in blue. Other tools in the list include Histogram, Moving Average, Random Number Generation, Rank and Percentile, Regression, Sampling, t-Test: Paired Two Sample for Means, t-Test: Two-Sample Assuming Equal Variances, and t-Test: Two-Sample Assuming Unequal Variances. The dialog box also has 'OK', 'Cancel', and 'Help' buttons.

**Once you click OK, you can fill in the following information:**

|    | A             | B             | C | D | E | F | G |
|----|---------------|---------------|---|---|---|---|---|
| 1  | <b>City A</b> | <b>City B</b> |   |   |   |   |   |
| 2  | 82            | 90            |   |   |   |   |   |
| 3  | 84            | 91            |   |   |   |   |   |
| 4  | 85            | 91            |   |   |   |   |   |
| 5  | 89            | 91            |   |   |   |   |   |
| 6  | 91            | 95            |   |   |   |   |   |
| 7  | 91            | 95            |   |   |   |   |   |
| 8  | 92            | 99            |   |   |   |   |   |
| 9  | 94            | 99            |   |   |   |   |   |
| 10 | 99            | 108           |   |   |   |   |   |
| 11 | 99            | 109           |   |   |   |   |   |
| 12 | 105           | 109           |   |   |   |   |   |
| 13 | 109           | 114           |   |   |   |   |   |
| 14 | 109           | 115           |   |   |   |   |   |
| 15 | 109           | 116           |   |   |   |   |   |
| 16 | 110           | 117           |   |   |   |   |   |
| 17 | 112           | 117           |   |   |   |   |   |
| 18 | 112           | 128           |   |   |   |   |   |
| 19 | 113           | 129           |   |   |   |   |   |
| 20 | 114           | 130           |   |   |   |   |   |
| 21 | 114           | 133           |   |   |   |   |   |
| 22 |               |               |   |   |   |   |   |
| 23 |               |               |   |   |   |   |   |
| 24 |               |               |   |   |   |   |   |
| 25 |               |               |   |   |   |   |   |
| 26 |               |               |   |   |   |   |   |

**z-Test: Two Sample for Means** ? X

**Input**

Variable 1 Range:  ↑

Variable 2 Range:  ↑

Hypothesized Mean Difference:

Variable 1 Variance (known):

Variable 2 Variance (known):

Labels

Alpha:

**Output options**

Output Range:  ↑

New Worksheet Ply:

New Workbook

**Once you click OK, the results will appear in cell E1:**

|    | A             | B             | C | D | E                            | F             | G             | H |
|----|---------------|---------------|---|---|------------------------------|---------------|---------------|---|
| 1  | <b>City A</b> | <b>City B</b> |   |   | z-Test: Two Sample for Means |               |               |   |
| 2  | 82            | 90            |   |   |                              |               |               |   |
| 3  | 84            | 91            |   |   |                              | <i>City A</i> | <i>City B</i> |   |
| 4  | 85            | 91            |   |   | Mean                         | 100.65        | 108.8         |   |
| 5  | 89            | 91            |   |   | Known Variance               | 225           | 225           |   |
| 6  | 91            | 95            |   |   | Observations                 | 20            | 20            |   |
| 7  | 91            | 95            |   |   | Hypothesized Mean Difference | 0             |               |   |
| 8  | 92            | 99            |   |   | z                            | -1.71817      |               |   |
| 9  | 94            | 99            |   |   | P(Z<=z) one-tail             | 0.042883      |               |   |
| 10 | 99            | 108           |   |   | z Critical one-tail          | 1.644854      |               |   |
| 11 | 99            | 109           |   |   | P(Z<=z) two-tail             | 0.085765      |               |   |
| 12 | 105           | 109           |   |   | z Critical two-tail          | 1.959964      |               |   |
| 13 | 109           | 114           |   |   |                              |               |               |   |
| 14 | 109           | 115           |   |   |                              |               |               |   |
| 15 | 109           | 116           |   |   |                              |               |               |   |
| 16 | 110           | 117           |   |   |                              |               |               |   |
| 17 | 112           | 117           |   |   |                              |               |               |   |
| 18 | 112           | 128           |   |   |                              |               |               |   |
| 19 | 113           | 129           |   |   |                              |               |               |   |
| 20 | 114           | 130           |   |   |                              |               |               |   |
| 21 | 114           | 133           |   |   |                              |               |               |   |
| 22 |               |               |   |   |                              |               |               |   |
| 23 |               |               |   |   |                              |               |               |   |
| 24 |               |               |   |   |                              |               |               |   |

**The test statistic for the two sample z-test is -1.71817 and the corresponding p-value is .085765.**

**Since this p-value is not less than .05, we do not have sufficient evidence to reject the null hypothesis.**

**Thus, we conclude that the mean IQ level is not significantly different between the two cities.**

**The following tutorials explain how to perform other**

## common statistical tests in Excel:

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